



American Veterinary Medical Association



American Animal Hospital Association



Association of American Veterinary Medical Colleges

# The Current and Future Market for Veterinarians and Veterinary Medical Services in the United States

## Executive Summary May, 1999

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### **PREAMBLE prepared by the AVMA/AAHA/AAVMC Joint Steering Committee**

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As the profession of veterinary medicine sits at the brink of the next century and millennium, we are truly at a crossroads in our professional history. Significant societal problems, new driving forces, our economic viability, and technologic challenges have combined to create unprecedented opportunities and potential difficulties. Without question, our collective professional future is in flux and the fundamental ways of how we work, what we work on, when we work, why we work, and with whom we work, are all being called into question.

The AVMA, AAHA, and AAVMC commissioned KPMG LLP in April 1998 to analyze and prepare a comprehensive study of the profession as we approach this watershed point in our history. Sensing the profound importance of this special time, the 3 organizations wanted to ensure that the veterinary profession remains productive, responsive and economically successful. Just as important, the groups also understand that our future success will be judged by our responsiveness to the changing needs and expectations of society and our ability to adapt and acquire new knowledge and skills in meeting these diverse needs.

The KPMG study is a comprehensive, far-reaching, and seminal work that contains in-depth analyses and special insights of veterinary medicine as we approach

the next century. Issues of supply, demand, income, gender, market forces and characteristics of successful practices and public and private practitioners were expertly examined and clarified. The study suggests that there is a group of serious problems that need our special and sustained attention. These problems are frequently manifested by economic pressures in some segments of the profession. At the same time, opportunities abound but may not be realized unless we are able to reconcile the need to adapt and change our current inefficient structures, inappropriate business practices and attitudes, and habitual ways of delivering services that may be incompatible with our future success. Finally, the study suggests that our traditional approaches and past requisite skills and levels of knowledge may not be commensurate with the rapid changes and new demands of food-animal industries and the shifting requirements needed for the corporate and public opportunities of the future, including public health, biomedical research, and the global food system.

The study disclosed compelling evidence for change and the need for a proactive, comprehensive plan that could be implemented to both counter the serious problems found and exploit a group of remarkable opportunities. To achieve the AVMA/AAHA/AAVMC's goal of ensuring a productive, successful, responsive and economically viable profession, the 3 organizations also interpreted the report as a "call to action." The groups are establishing plans for a national dialogue on the critical issues of the report. A goal of the 3 associations is to develop and implement concrete and effective strategies to ensure our future relevance, direction, responsiveness, capacity, and economic health that will lead us to a renaissance for the profession and those we serve as we begin the next century.

The AVMA/AAHA/AAVMC Joint Steering Committee has reviewed the report prepared by KPMG, and has identified the following 6 critical issues, all of which must be successfully addressed to improve the economic health of the profession.

● **Veterinarians' Income**

The income of individual veterinarians seriously lags behind that of similar professions, and impacts the ability to repay student loans, to attract the best and brightest to the profession, and to invest in personal and professional growth. Further, pricing of veterinary services may not be appropriate relative to the real cost of the service and the value being delivered.

● **Economic Impact of Large Numbers of Women in the Profession**

This study indicates that income of women veterinarians is seriously below that of their male colleagues. There is additional evidence that women work fewer hours, are less likely to be practice owners, and may price their services below that of men. There is concern that these factors may be reducing the income levels of all veterinarians.

● **Global Demand for All Categories of Veterinary Services**

While consumer (animal owner) spending on veterinary services has been robust, there is substantial opportunity to further increase demand. There also is evidence that there is a potentially significant market for veterinarians and veterinary services, particularly in nontraditional and nonprivate practice arenas.

● **Inefficiency of the Delivery System**

The majority of animal care is still being delivered through a highly fragmented and inefficient system. This includes issues related to excess capacity, staff utilization, and use of capital resources.

● **Supply of Veterinarians**

There is evidence that in purely economic terms, there is an excess of veterinarians, which is a cause of downward price pressure and is projected to result in stagnant veterinary incomes over the next 10 years. More important, the characteristics of the supply may not closely match the demand, and there is evidence that modifications in the education of veterinarians will enable the profession to capitalize on emerging markets and to create new services.

● **Skills, Knowledge, Aptitude, and Attitude of Veterinarians and Veterinary Students**

While there is ample evidence that the scientific and clinical skills of the profession remain very high, there is also evidence that veterinarians lack some of the skills and aptitudes that result in economic success. Additionally there is evidence that veterinarians' self perception of their abilities and their perception of what they can contribute to society potentially limit the professional and economic growth of the veterinary medical profession. ¶

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## Executive Summary—Introduction

The veterinary services industry in the United States has undergone substantial change over the last generation. KPMG was asked to investigate some of the trends that had been identified by the leadership of the profession, including:

- flat or declining real incomes of veterinarians,<sup>a</sup>
- changes in the makeup of the labor force of the veterinary profession,
- substantial increases in veterinary student debt,
- evidence of excess capacity in private animal hospitals and clinics,
- changes in the financing of animal health expenditures,
- emergence of large corporate organizations that deliver veterinary services,
- changes in how people view their pets and other animals,
- greater awareness of public health and environmental issues,
- continued consolidation in the agriculture sector,
- more open world trading arrangements,
- rapid advances in technology.

KPMG LLP's Economic Consulting Services was engaged by the American Veterinary Medical Association, the American Animal Hospital Association, and the Association of American Veterinary Medical Colleges in April of 1998 to prepare a comprehensive study of the industry, including an analysis of these trends. After nearly 11 months of data collection, literature review, and analysis, KPMG has produced a comprehensive report that examines the major issues affecting the veterinary medical profession.

To carry out the study, KPMG has collected information from many secondary sources and has also collected data through surveys of all segments of the veterinary services industry. The final report is extensive and is intended to integrate the results of several reports that have been produced as part of the project. The final report, which is over 700 pages long, includes results from the following:

- an extensive literature review,
- 5 focus groups for veterinarians (private practice, academics, government, industry, and early stage and students),
- 3 surveys of veterinary service suppliers (private practice veterinarians, nonprivate practice veterinarians, early stage veterinarians, and students),
- 6 surveys of demanders of veterinarians and veterinary services (government, industry and large agribusiness producers, livestock producers, pet owners and non-pet-owners, and horse owners),
- an extensive effort to build models of the supply and demand for veterinary services,
- use of these models to forecast the requirements for veterinarians and the available supply of veterinarians through the year 2015 for a "most likely" scenario and alternative scenarios,

<sup>a</sup>There are many places in this report where we use the word "real." The word "real" indicates that we are referring to inflation adjusted dollars.

- statistical analysis of factors associated with healthy veterinary practices, performed using AVMA Biennial Economic Survey data and the KPMG survey of private practice veterinarians,
- employers' comments about their satisfaction with the skills and knowledge that veterinarians have, and the types of skills and knowledge necessary to perform jobs in various areas

Here we will highlight the most important points of the study.

## Focus Groups: Key findings

At the beginning of the project, 5 focus group sessions were held for different segments of the profession. The objective of these sessions was to explore why participants decided to enter the field of veterinary medicine, satisfaction with the profession, perception of success within the profession, opinions about education and training, and opinions about the future of veterinary medicine. The major highlights of these sessions are summarized here.

- Established veterinarians were very satisfied with their choice of profession.
- Private practitioners love working with animals and people.
- Industry and government veterinarians enjoy the intellectual content of their jobs.
- The norm for success is still seen as owning a private practice.
- Many participants said they were not prepared for the clinical medical procedures and the management requirements of private practice.
- Most felt that the core basic science curriculum was necessary and useful.
- Many said that they did not get enough management, communications, and other skills necessary for nonprivate practice.
- All agreed that it would be very difficult for the schools to provide such skills in an already crowded curriculum.
- Many felt that it would be better to make such skills a prerequisite for admittance to veterinary school.
- A notable comment from an industry participant was, "From the very, very outset, communicate to students that there are all these different fields of veterinary medicine and they are of equal value."
- Faculty members were the most optimistic in their view of the prospects for veterinarians working in many different areas. They see many opportunities in nonprivate practice areas.
- Private practitioners worry about the future, especially about the expense for new students to go to veterinary school.
- There was no obvious consensus about whether there were too few or too many veterinarians.

## Central Economic Issues

The center of the analysis is the core of the economics of veterinary medicine in the recent past, currently, and a view to the future. We organize the analysis into demand, supply, prices, and income.

## Demand

The estimates we have developed for expected demand are derived from a variety of sources and analyses. Companion animal and food animal demand projections have been developed using sophisticated econometric models of demand that were developed by Inforum, a consulting group associated with the University of Maryland, that specializes in applications of a complex input-output econometric model of the economy of the United States. These models take into account key demographic and income trends. Government, academic, and nonprivate practice estimates come principally from surveys of these employment segments and from focus group discussion.

Demand for veterinary services has grown significantly faster than growth in the overall economy. For the period 1980 through 1997, there has been an increase in expenditures on veterinary services of nearly 7.2% annually in real (inflation-adjusted) dollars. This compares with a 2.9% annual real increase for all consumer expenditures during the period 1980 through 1997. Although the expected growth in veterinary services spending through the year 2015 is substantial, it is expected to decline relative to the high growth period of the 1980s and 1990s. Still, a fairly robust annual real growth rate of 5.1% for expenditures on veterinary services is expected through the year 2015. This growth rate is considerably higher than the 2.0% expected growth in total consumer expenditures through the year 2015.

Part of the reason that the growth rate in demand for veterinary services will slow is the aging of the population. Older people have a lower likelihood of owning pets. However, the impact of an aging population is mitigated to some degree by the fact that although the probability that a household will use veterinary services at all declines as the age of the household head increases, the amount of spending on veterinary services increases with age for users of veterinary services.

The growth in demand for veterinarians that will occur through the year 2015 is primarily driven by demand for services for companion animals. Although there are some increases in the demand for veterinarians expected from nonprivate practice sources, these increases are small relative to the increase in demand for veterinarians due to the demand for services to companion animals. Growth in the number of companion animal veterinarians required to satisfy the increase in demand for veterinary services is expected to be 32% through the year 2015 when measured by the number of persons, and 24% when measured by the number of full-time equivalent veterinarians (FTEs).

Because the average veterinarian works more than the standard (40 hour) week, the absolute number of small animal private practice FTEs required (54,794 by the year 2015) is greater than the absolute number of persons required (52,741 by the year 2015). The growth in the number of persons required (32%) is greater than growth in the number of FTEs required (24%) because trends in hours worked suggest that veterinarians will work fewer hours in the future. The reduction in hours worked in the future is due to 2 forces. The first is that hours per week are expected to

fall slightly throughout the economy. The second, and more powerful influence, is that the veterinarian work force is becoming proportionally more female, and women tend to work in the market place fewer hours than men on average.

Other findings about demand in various segments of the veterinary services industry are as follows.

- Overall, the demand model predicts only 3% more veterinarians working in the large animal practice segment by the year 2015 and a 1.7% decline in FTE veterinarians required to provide services to the large animal practice segment.
- We expect a modest increase in the demand for veterinary services by meat producers (beef, pork); however, the demand for veterinarians will remain flat due to continued consolidation in the livestock producing sector.
- Demand for veterinarians serving the dairy industry will fall as consolidation continues.
- Expenditures on veterinary services by poultry and egg producers will increase significantly. But due to the very concentrated nature of the poultry and egg industry, we expect that only a small number of new veterinarians will be required to provide services for the poultry and egg industry.
- There is little or no growth expected in the academic or government segments.
- Growth in demand for veterinarians in industry is expected to be 24% through the year 2015 when measured in persons and 17% when measured in FTEs.
- Some growth is expected in the small but important areas of public health, environment, and food safety. However, veterinarians must compete there with scientists and medical doctors and their representation will be determined by their ability to compete. We learned that veterinarians' role in these areas is not generally recognized or understood by consumers.

Table 1 summarizes the results for each major segment of the industry by the number of veterinarians (persons), and the number of FTEs.

## Supply

To analyze the current and expected supply of veterinarians, KPMG developed a sophisticated computer model of the supply of veterinarians. The model tracks the veterinary labor force through time according to a number of dimensions such as age, industry segment, school where degree was conferred, geographic region, and gender. Additions and subtractions from the labor force are based on the number of admissions at veterinary medical schools, historical and expected retirement rates, time off for childbirth, and time off for post-veterinary medical degree training.

Growth in the supply of actively employed veterinarians since 1980 has been especially robust. Supply has increased from 32,500 in 1980 to 63,751 in 1997. This represents an increase of 96% over the period or 4% at an annualized rate of growth.

Table 1—Demand for veterinarians—employment forecast by major employer segment

Employment segment	1997	2000	2005	2010	2015	Growth 1997–2015
<b>Persons</b>						
Academic	5,784	5,792	5,829	5,865	5,900	2.0%
Industry*	1,962	2,009	2,152	2,337	2,431	23.9%
Government	3,986	3,989	4,021	4,049	4,064	2.0%
Private practice						
Small animal	39,875	41,416	44,667	48,415	52,741	32.3%
Large animal	11,726	11,738	11,951	12,049	12,081	3.0%
<b>Total veterinarians</b>	<b>63,351†</b>	<b>64,944</b>	<b>68,620</b>	<b>72,715</b>	<b>77,217</b>	<b>21.9%</b>
<b>Full-time equivalents</b>						
Academic	7,056	7,056	7,056	7,056	7,056	0.0%
Industry	2,406	2,456	2,577	2,742	2,824	17.4%
Government	4,420	4,420	4,420	4,420	4,420	0.0%
Private practice						
Small animal	44,285	45,656	48,272	51,256	54,794	23.7%
Large animal	15,377	15,288	15,311	15,217	15,122	-1.7%
<b>Total veterinarians</b>	<b>73,544</b>	<b>74,876</b>	<b>77,636</b>	<b>80,691</b>	<b>84,216</b>	<b>14.5%</b>

\*The number of veterinarians employed in the industry segment is undercounted in 1997. We used AVMA membership data and data from the Association of Industrial Veterinarians to develop the industry numbers. It has been reported that many industry veterinarians are not members of either of these associations and therefore the estimate of employment in industry is low. Conceivably, it could be twice as large as the estimate reported here. †Sum of persons in segments in 1997 do not add exactly to total due to rounding.

The supply model predicts that the growth rate has slowed and will continue to slow until the supply of veterinarians peaks around 76,600 in the year 2017.<sup>b</sup> Table 2 illustrates the deceleration in growth expected.<sup>c</sup> Over the period 1997 through 2005 we expect an average net increase in veterinarians of 829 per year. For the years 2005 through 2010, we expect the net increase per year to slow to an average of 474 veterinarians; and for the years 2010 through 2015, we expect the net increase per year to further decline to 262. By 2017, we expect the number of veterinarians to reach a steady state such that entrants into the profession are just matched by exits from the profession.<sup>d</sup> The reason for the slowdown in the rate of growth in the population of veterinarians is that the supply of new veterinarians has been very stable due to the fairly constant number of slots available at the 27 veterinary medical colleges. The number of exits is increasing slowly as the population increases and ages and will approach (by the year 2017) the point where the number of exits will just match the number of entrants, resulting in a steady state population of 76,600.

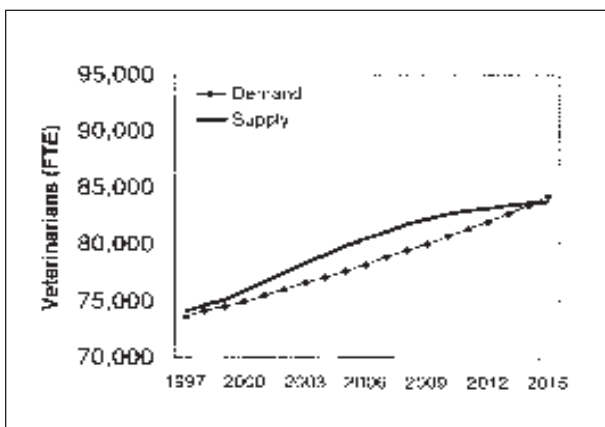


Figure 1—Supply and demand for FTE veterinarians forecast.

### Gap between supply and demand

Figure 1 brings together the supply and demand forecasts for FTE veterinarians. The figure indicates that our models predict a slightly higher supply than required demand in 1998. The models also predict that the difference between supply and demand is increasing until it peaks in 2008 and then begins to decline such that demand and supply balance by the year 2014. The implications of these results are that there will continue to be downward price pressure on veterinary services' prices and

downward pressure on veterinarians' incomes. Relief, in the form of pressure for increased prices and incomes, will only arrive when supply and demand growth align late in the forecast period.

The notion of a gap between supply and demand should be viewed only as an indicator of the pressure on the price of veterinarians' services (ie, veterinarian incomes). If supply exceeds demand and the distance between supply and demand widens, downward pressure is placed on veterinarians' incomes. Conversely, if demand were to exceed supply and this difference were to grow over time, this would be indicative of upward pressure on veterinarians' incomes.

### Prices

Data collected by the Bureau of Economic Analysis of the Department of Commerce show that veterinary service prices have not risen as fast as general consumer prices since at least 1972. Figure 2 shows a price index for veterinary services and the price index for personal consumption expenditures from 1972 through 1998. The price of veterinary services was high relative to the price of other consumer goods until 1992. Throughout the period, the price of veterinary services has been declining relative to the price of all

<sup>b</sup>The KPMG forecast includes a new California school of veterinary medicine. This adds about 1,060 total additional veterinarians to the supply by the year 2015.

<sup>c</sup>It is important to note that although we expect a slowing down in the rate of growth, we still expect an increase in the total number of veterinarians until 2017. Think of the population as a stock and the growth rate as a flow into the stock. There is always a natural tendency for growth rates to slow as the stock gets larger since there is a larger base upon which the growth rate is estimated. Once the population (stock) gets large enough and old enough, the retirement rates will naturally approach the number of new entrants if the number of entrants remain fixed. In the case of veterinarians, we have calculated the steady state population to be 76,600.

<sup>d</sup>Note that the 2017 estimate is not shown. The forecast period for the models end in the year 2015. However, extension of the model through 2017 showed that supply peaks in 2017.

Table 2—Supply of veterinarians (history and forecast)

	1980	1990	1997	2005	2010	2015	Growth	
							1980–1997	1997–2015
Veterinarians	32,500	48,666	63,751	70,381	74,173	76,272	96.0%	19.6%
Growth*	—	4.0%	3.9%	1.24%	1.06%	0.56%	4.0%	0.78%

\*Growth rates are annualized rates from period indicated to the period in preceding column.

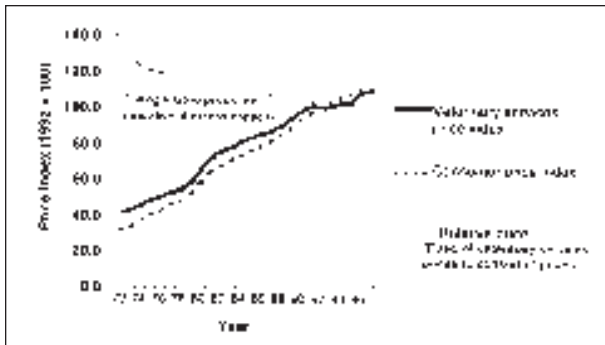


Figure 2—Consumer prices, veterinary services prices, and relative price.

other consumer purchases. It is likely that supply pressure has led to excess capacity and subsequent downward price pressure in this industry leading to the relative price declines that are exhibited in the figure.

**Price elasticity of demand**—In discussing the importance of pricing in connection with the prospects of the veterinary profession, a distinction must be drawn between the price sensitivity of overall market demand and the price sensitivity of the demand facing an individual practice.

Market demand is the overall level of demand for veterinary services within a geographic market. Market demand will depend on the overall level of prices charged for veterinary services within that market and various other factors. If the overall price of veterinary services rises (and all other factors are unchanged), we would generally expect a decline in the quantity of services purchased as measured, for example, by number of visits. The decline could be manifested through a variety of channels, including decreased overall pet ownership, decreased demand for routine or preventive care, and increased use of lower-cost care alternatives.

The demand facing an individual practice will, in part, be influenced by the overall factors that determine market demand. Unlike market demand, however, the demand facing an individual practice can be strongly affected by competition among veterinary practices within a geographic market. If pet owners shop for the lowest-cost provider of veterinary services and if the geographic market has a relatively large number of providers, demand facing an individual practice might be very sensitive to price even if overall market demand is not. If pet owners feel that the services of other veterinarians are good substitutes for the services of an individual veterinarian, then the practice price elasticity will differ substantially from that of the market. In this case, a price increase by an individual

practice would immediately lead to loss of existing and new customers to other practices in the area. But, if pet owners are more concerned with quality of service, convenience, long-term relationships, and other non-

price factors, a price increase by an individual practice would cause relatively little loss of business. In this case, the price sensitivity of the individual practice would look more like that of the overall market.

For either the market or an individual practice, a price increase will generally lead to at least some decline in the quantity of services purchased. However, the decline could be associated with either an increase or a decrease in dollars spent. If the proportionate decline in quantity is less than the proportionate increase in price, total dollars spent will rise. For example, if prices increase by 10% and quantity demanded falls by 5%, total dollars spent will rise by 5%. Economists use the term “price elasticity” to denote the ratio of percentage change in demand to percentage change in price. If this ratio is less than 1,<sup>6</sup> an increase in price will lead to a smaller decrease in demand, and total dollars spent will increase; in this case, demand is said to be “inelastic.” Conversely, a ratio greater than 1 means that the percentage decline in demand is higher than the percentage increase in price; in this case, total dollars spent decline, and demand is said to be “elastic.”

We have conducted surveys of pet owners that included questions that can help determine how price sensitive consumers are. We asked pet owners to rate the importance of 12 factors when choosing a veterinarian. Price was mentioned ninth in order of importance from the list of these factors. Items of more significance than price when choosing a veterinarian are:

- (1) veterinarian is kind and gentle
- (2) veterinarian is respectful and informative
- (3) reputation of veterinarian for high-quality care
- (4) past experience with veterinarian
- (5) range of services
- (6) location
- (7) convenient hours
- (8) recommendation from friend or neighbor

We also asked people whether they would still use their current veterinarian if the veterinarian raised prices by 10% and by 20%. Seventy four percent of respondents agreed or strongly agreed that they would continue to use their veterinarian if the veterinarian raised prices by 10%; 58% agreed or strongly agreed that they would continue to use their veterinarian if the veterinarian raised prices by 20%. As one would expect, these results differ by income of the pet owners. Nearly 70% of pet owners making over \$100,000

<sup>6</sup>In absolute value. Actually, in the usual case where an increase in price leads to a reduction in demand, the price elasticity is negative. This discussion follows common usage in economics, and takes the negative value for granted.

Table 3—Average expenditures that pet owners report they will spend for successful treatment of a pet by type of pet, income, age, education, and gender

Chance of successful treatment	All owners	Pet type		Income				Age		Education		Gender	
		Dog	Cat	< \$40	\$40–\$59	\$60–\$99	≥ \$100	< 45	≥ 45	HS	College	Male	Female
75%	688	747	651	607	786	719	865	742	637	615	728	583	704
10%	356	382	358	318	401	351	515	381	331	292	386	428	344

HS = High school.

agreed that they would continue while only 50% of pet owners making less than \$40,000 said they would continue to use their veterinarian if prices were raised by 20%. For horse owners, the insensitivity to price may be even stronger. Eighty nine percent of respondents agreed or strongly agreed that they would continue to use their veterinarian if the veterinarian raised prices by 10%; 77% agreed or strongly agreed that they would continue to use their veterinarian if the veterinarian raised prices by 20%.

Pet owners and horse owners were also asked whether they strongly agreed, agreed, disagreed, or strongly disagreed with a series of statements. Sixty eight percent of pet owners and 73% of horse owners agreed or strongly agreed that fees are very low compared with the value of the pet. In response to the question asked in the opposite way, 43% of pet owners and 30% of horse owners agreed or strongly agreed that the fees their veterinarian charges are too high. When asked about what one improvement veterinarians could make to the practice, the most frequently mentioned response was to lower fees (36% of pet owners and 26% of horse owners made this choice). Finally, review of the responses of the 47% of pet owners who said they had switched veterinary clinics revealed the third most frequently cited reason for switching was to find lower prices (21% of the 47% who switched said they had done so to find lower prices). This suggests that at least 10% of pet owners have switched to find lower prices; 37% of horse owners said they had switched veterinarians. Of these, only 7% claimed that they switched for price reasons.

Pet owners also stated they would be willing to pay \$688 on average if the pet had a 75% chance of successful treatment. The amount they stated they would be willing to pay dropped to \$356 when the chance of successful treatment is only 10%. Table 3 includes some interesting differences in these amounts by pet type, gender, age, education, and income.

Horse owners would pay an average of \$1,827 for a 75% chance of curing their horse and \$828 for a 10% chance. Horse owners also say they would pay an average of \$3,314 to keep their favorite horse from dying and \$2,010 for their least favorite horse.

Responses to these survey questions provide mixed results. While pet owners rank price low in importance in terms of selecting a veterinarian, they also clearly express some concern about fees. Horse owners are less concerned about fees.

In addition to reporting what people say they will pay, we also analyzed data on actual expenditures. We estimated the price elasticity of demand as part of the effort to estimate the demand for veterinary services.

We used data from the Bureau of Labor Statistics Consumer Expenditure Survey and Census Bureau demographic data to develop price elasticity of demand and income-elasticity measures.

On the basis of models we have estimated, we have found that demand for veterinary services is not very responsive to price changes. We estimate an aggregate price elasticity of demand of  $-0.43$ . This means that for every increase of 10% in price, demand declines by only 4.3% resulting in a net increase of 5.7% in revenue. This is similar to the inelastic results that have been found by other studies. For example, Daneshvary and Schwer found price elasticities of  $-0.18$  for dogs and  $-0.28$  for cats.<sup>1</sup> A 1992 Ontario Veterinary Medical Association study<sup>2</sup> found an elasticity of  $-0.55$  and the 1984 AVMA study by Kushman and Wise<sup>3</sup> found a price elasticity of  $-0.2$ .

Consistent with the inelastic nature of demand, there is some evidence that practices that charge higher prices earn more than practices that charge lower prices. This evidence is found in private practice pricing data and financial data that were collected from veterinarians. We compared pricing by the top 25 percent (financially healthy) of small animal practices with the bottom 25 percent (less healthy), as determined by the ratio of net income per veterinarian.

Table 4 shows differences in the relative price index for the healthy (top 25%) and less healthy (bottom 25%) practices. We created the relative price index to compare key prices within a veterinary practice. Among the items we included when constructing this index are the fees for examinations, surgery, radiology fees, spay and neuter fees, and vaccination fees. The price index is constructed relative to local consumer prices for each practice. In this way, we adjust for geographic price level differences. The index measures how high a practice sets its prices relative to the local price level.

Healthy practices have an average price index of 1.15, while the least healthy practices have an index of 0.97.

The average value of the relative price index is higher for the healthiest 25% of practices (as defined by the real net income per veterinarian) than for the 25% least healthy. Thus, it would appear that healthier practices charge higher prices relative to their local

Table 4—Relative price index for practices

Financial health group	Average price index
Top 25% (healthiest)	1.15
Bottom 25% (least healthy)	0.97

Practices are assigned to the top 25% and bottom 25% groups on the basis of the practice's amount of real net income per veterinarian.

Table 5—Nominal and real income of veterinarians, physicians, and dentists

Income	1985	1995	Growth 1985–1995
Current dollars			
Physicians (median)	\$92,000	\$160,000	73.9%
Veterinarians (median—owners)	\$51,064	\$61,532	20.5%
Veterinarians (mean—associates)	\$30,665	\$47,543	55.0%
Veterinarians (mean— owners and associates)	\$42,498	\$57,507	35.3%
Dentists (generalist owners)	\$64,130	\$122,860	91.6%
Real 1996 dollars			
Physicians (median)	\$133,139	\$163,253	22.6%
Veterinarians (median—owners)	\$73,898	\$62,783	-15.0%
Veterinarians (mean—associates)	\$44,377	\$48,510	9.3%
Veterinarians (mean— owners and associates)	\$61,502	\$58,676	-4.6%
Dentists (generalist owners)	\$92,807	\$125,358	35.1%

Sources: Income data come from the AVMA, American Medical Association, Association of American Dental Schools, and Bureau of Labor Statistics.

general price level for services, on average, than do the least healthy. These results merit caution. We relied entirely on the accuracy of the reported prices in constructing the price indexes, but we believe a more accurate way to perform this type of analysis would be to use prices that have been audited for accuracy. More work should be performed to verify these results using an alternative data source.

### Income

Stagnant real income is the most significant problem that veterinarians face. Income growth for veterinarians has been far less than income growth in other professions requiring similar education (eg, dentistry or human medicine). Table 5 shows veterinarians' incomes and the incomes of physicians and dentists in current and real 1996 dollars over the 10-year period from 1985 through 1995. Incomes of veterinarians have fallen in real terms while the real incomes of physicians and dentists have experienced considerable growth.

Although our models predict substantial continued growth in the demand for companion animal services, supply growth (growth in the number of veterinarians) will exceed demand growth through much of the forecast period. The models predict that demand will not catch up to supply until the year 2014. This means there is not likely to be significant upward pressure on veterinarian incomes until late in the forecast period.

Veterinarians do not rank income very highly on a list of reasons for entering the field of veterinary medicine. New veterinarians and students rank income seventh in a list of 8 reasons for choosing the profession of veterinary medicine. Among items ranked more highly than income are desire to work with and care for animals, interest in science and medicine, good stable career with steady work, desire to help people, honor and respect accorded to the veterinarian, and desire to work outdoors. Only the response for "influenced by a friend or relative" ranked lower than income on the list of reasons for choosing the profession.

While income did not rank highly as a reason for entering the field, its importance became apparent when respondents were asked to rank the most impor-

tant attributes of their jobs. Income came in 12th out of 19 items in terms of importance for early stage veterinarians but rose to second for private and third for nonprivate practice veterinarians. Benefits were cited as the most important job attribute for nonprivate practice veterinarians. These results suggest that there is considerable misperception on the part of early stage veterinarians about the relatively low incomes earned by veterinarians. We can only surmise that when the reality of paying bills sets in, income becomes significantly elevated in importance.

### Alternative scenarios

A number of scenarios have been run using the supply and demand models that were developed. The purpose of running the scenarios was to see how sensitive the results are to changes in some of the model assumptions. The results of some of these scenarios show the following:

- The effect of a 1% increase or 1% decrease in class size is almost irrelevant, accounting for only an increase or decrease of 273 veterinarians by the year 2015.
- The effect of a 10% decrease in class size accelerates the date when supply and demand balance by 4 years (from the year 2014 through 2010). Pressure for price increases for veterinary services and income increases for veterinarians will be felt 4 years earlier in this scenario. The effect of a 10% increase in class size will postpone the date when pressure for price and income increases will arrive until after the end of the forecast period.
- A higher human population forecast (which is based on the Department of the Census high population projections) results in a demand for nearly 1,000 more veterinarians by the year 2005 and 3,500 more by the year 2015.<sup>f</sup>
- Holding constant the percentage of female enrollment in veterinary medical colleges at 67%, rather than allowing it to rise to 78%, results in a 323 FTE increase in the supply of veterinarians by the year 2005 and a 1,025 FTE increase by the year 2015.<sup>g</sup>
- The baseline forecast assumes a fairly robust 5.1% growth rate in veterinary services through the year 2015. A 1 percent higher growth rate in the demand for veterinary services (over the entire forecast period), in inflation-adjusted dollars, would raise the demand for veterinarians by about 9,800 veterinarians by the year 2015. A 1 percent lower growth rate in the demand for veterinary services (over the entire forecast period), in inflation-adjusted dollars, would lower the demand for veterinarians by about 9,000 veterinarians by the year 2015. These scenarios demonstrate how important the rate of growth in demand is to the veterinary services industry.

<sup>f</sup>The census high population scenario assumes that the population is higher by 26.6 million people by the year 2015.

<sup>g</sup>This is solely due to the fact that women tend to work fewer hours than men. In our baseline scenario, female enrollment gradually increases throughout the forecast period until it peaks at 78% in the year 2010 and remains constant through the year 2015. Therefore, in the alternative scenario where there are more men, there are a greater number of FTEs.



## **Forces Having Impact in the Market for Veterinary Services**

A number of forces that are worth considering separately will work their impact on the demand for, or the supply of, veterinary services.

### **Legal boundaries of the practice of veterinary medicine**

In every state there are laws limiting the practice of veterinary medicine to licensed veterinarians. The work within those limits has grown with population but there is ongoing erosion. Substitution of capital, assistants and technicians, effective drugs that reduce overall demand for veterinary services, and over-the-counter products all erode the demand for veterinarians.

New areas with growth potential are often outside the legal boundaries. In these areas such as biotechnology, veterinarians have to compete without legal advantage against all comers.

### **Role of women in veterinary medicine**

Women are rapidly becoming a majority in the profession. They now make up nearly 70% of veterinary students and 36% of practicing veterinarians. We expect that their representation within the veterinary medical schools will peak at 78% by 2015 and the female proportion of veterinarians will increase to 50% by the year 2004 and 67% by the year 2015.

On average, women currently work 3 to 4 fewer hours per week than males. In general, the survey results suggest that on average, women will provide fewer hours than men in the future, have lower earnings expectations than men, are not as interested in practice ownership, and may have a tendency to price lower than men. Female private practice veterinarians also have a lower self-evaluation of their business management and financial skills. Female, nonprivate practice veterinarians have a lower self-evaluation of their communication, personnel management, business management, and marketing skills than males.

There are some unexplained differences between male and female earnings. The reason behind the apparent lower incomes of female practice owners is not well understood. This is not a condition that is specific to veterinary medicine. It is a fact in all medical fields. Although there appears to be less of a gender wage gap in veterinary medicine than in other fields such as dentistry or human medicine, a fair size gap does exist and seems to widen rather than decline as years of experience increase. This lower income for women is apparent, even when accounting for differences in hours worked and experience.

One possible explanation for at least a portion of the earnings gap is whether there are significant differences in how female practice owners set their prices relative to how male practice owners set their prices. There is some weak evidence (marginally statistically significant) that women may price as much as 9% lower than men on average.<sup>h</sup>

The profession would be wise to communicate to veterinarians in general, and women in particular, the benefits of practice ownership and the importance of value-based pricing. In addition, it may be wise to

encourage practice management skills more for women to elevate their sense of competency in some of the skills they seem to feel they are less competent in than men, such as business management, personnel management, financial skills, and marketing.

The relationship between income and gender is one of concern to both men and women veterinarians. Our surveys have shown that women expect that they may earn less than men. With regard to their overall work experience, men's and women's priorities are similar in more respects than they differ. Those differing areas have an effect on both men and women, though, and so are not just a "woman's issue." For instance, a lack of interest in practice ownership could have a substantial effect on the future of veterinary practice, which is of concern and interest to all veterinarians.

### **Student debt**

Increased student debt is a significant issue facing many recent graduates, and current and future students in graduate and professional fields. Significant increases in student debt have been occurring throughout the past decade. This is true for nearly all graduate fields, and is especially apparent in medicine, dentistry, veterinary medicine, and law.

**Debt problem or income problem?**—Veterinary medicine is more adversely affected by increased student debt than other graduate degrees. This is principally because veterinarians' ability to repay student loans is lagging behind other professions, because increases in veterinarians' incomes have not kept pace with increases in their student debt. While physicians and dentists have a higher absolute debt burden than veterinarians (\$71,500 for physicians, \$75,700 for dentists and \$42,800 for veterinarians in the year 1996), physicians' and dentists' ability to carry the debt has generally kept better pace with the increase in debt. Veterinarians, on the other hand, have experienced a rise in debt burden that has surpassed the increase in their incomes. Therefore, we believe that it is probably more appropriate to characterize veterinarians' debt problem as not purely a debt problem but as an income problem. The debt part of the problem is no different than the problem faced by other professional occupations, such as human medicine and dentistry.

The implications of carrying higher levels of debt for veterinarians are quite serious. As in dentistry, the norm for the veterinary profession is for a veterinarian to eventually become a private practice owner. Unlike other professions, such as law and medicine, where it is possible for individuals to practice as employees without making substantial capital investments in office and equipment, veterinarians must secure financing to fund practice ownership. With the levels of education debt that they are carrying and the relatively limited income opportunities available, veterinarians will find it more difficult to acquire financing that is necessary to start a

<sup>h</sup>Given the crude price constructs that we have developed (we asked people to provide prices for various services and created an aggregate index), we think it may be useful to try and corroborate this result in some further work where audited price data would be used rather than relying on the accuracy of the reported prices.

private practice. With more limited opportunity to start a private practice, veterinarians (working as employees) will find themselves in even worse financial condition since there is a substantial disparity in pay between practice owners and employees. This, of course, makes the student debt burden even more severe for veterinarians because it contributes to a vicious cycle. By limiting their ability to secure financing and thereby reducing their ownership opportunities, it thereby affects their ability to repay the debt that they have accumulated to enter the profession.

As we have already mentioned, this problem is more severe for veterinarians than for other health professionals such as dentists and physicians simply because dentists' and physicians' incomes have been keeping better pace with rises in educational debt. To illustrate this point, we show a few simple calculations comparing the ability of dentists, physicians, and veterinarians to carry their debt burdens. Table 6 shows debt, income, monthly payment amounts, and monthly payment to income ratios for different professionals. The table illustrates that veterinarians' monthly payments have risen at the same pace as those of comparable health professions but that their payment to income ratio has grown considerably over the 10-year period. While the payment to income ratios for dentistry and medicine have increased by between 0.8% and 0.9% of monthly income, there has been a 3.5% increase in the ratio of debt payment to monthly income for veterinarians. Veterinarians now pay a considerably higher percentage of their monthly income to pay off debt than their dentist or physician counterparts (10% versus 8.6% for dentists and 5.3% for physicians).<sup>1</sup>

### Trade in animal food products

Increasingly market-oriented domestic policies and foreign trade policies in many countries, stemming from both multilateral and unilateral reforms, are expected to contribute to an expanding growth in the export of live animals and animal products. Expected gains in developing countries' incomes will result in increased diet diversification and increased meat demand. Long-term forecasted export gains reflect expectations of strong economic progress in most developing regions, including China, South and Southeast Asia, Latin America, North Africa, and the Middle East.<sup>4</sup>

**Export forecast**—In general, higher incomes in developing countries are projected to lead to further diet diversification that will include rising meat demand. Notwithstanding the recent slowdown in Asian economic growth, the US Department of Agriculture (USDA) is forecasting global economic growth that will result in a steady increase in demand for domestic meat and meat products. Existing negotiated reductions in trade barriers, primarily in East

<sup>1</sup>The monthly payment necessary to pay off student loans assumes a 10-year life for the loan and an 8% interest rate. These are simple assumptions and the lifetimes of the loans and interest rates will differ in reality but the intent is to see how the monthly debt payments relative to income have compared across different occupational categories.

Table 6—Student debt, income, monthly debt payments, and payment-to-income ratios

	1985	1995
<b>Student debt</b>		
Physicians (median)	\$28,500	\$58,000
Veterinarians (median)	\$19,000	\$39,483
Dentists (mean)	\$33,227	\$70,939
<b>Income</b>		
Physicians (median)	\$92,000	\$160,000
Veterinarians (median—owners)	\$51,064	\$61,532
Veterinarians (mean—associates)	\$30,665	\$47,543
Veterinarians (mean—owners and associates)	\$42,498	\$57,507
Dentists (generalist owners)	\$64,130	\$122,860
<b>Monthly debt payments</b>		
Physicians (median)	\$346	\$704
Veterinarians (median)	\$231	\$479
Dentists	\$403	\$822
<b>Monthly payment/income ratios</b>		
Physicians	4.5%	5.3%
Veterinarian—(owners)	5.4%	9.3%
Veterinarian—(associates)	9.0%	12.1%
Veterinarians (owners and associates)	6.5%	10.0%
Dentists	7.5%	8.6%

Sources: Debt data come from the AVMA senior surveys and from the American Association of Medical Colleges. Income data come from the AVMA, American Medical Association, Association of American Dental Schools, and Bureau of Labor Statistics.

Asia, will help to spur trade growth, with particularly healthy growth from the Pacific Rim.

The USDA projects rising meat demand in several countries, with US producers well positioned to provide a variety of meat products to satisfy overseas markets. In general, the value of US meat exports is projected to grow an average of 4.2% per year through 2007. That growth is somewhat slower than the rapid ascent of the last several years. Total exports of animals and animal products are expected to be valued at \$12.2 billion for 1998.<sup>2</sup>

Exports of meat and meat products tend to increase domestic production; the greater the extent to which exports account for domestic production, the greater the potential influence of the export sector on the demand for veterinary services. Table 7 contains data on the annualized growth rate of exports and the share of US meat production that USDA expects to be exported in 1998.

Chicken, pork, and turkey exports are all expected to show strong growth. Pork exports are expected to grow the fastest, by 6% per year. Pork exports are expected to increase in the near term particularly because of the existence of foot and mouth disease in

Table 7—Annualized growth rate of exports and share of US meat expected to be exported in 1998

Product	Production, 1998 million lb*	Export share of total production, 1998	Export annual growth rate,† 1998–2007
Beef	25,884	8.4%	3.1%
Pork	18,822	6.2%	6.0%
Broilers	27,566	16.0%	4.6%
Turkey	5,270	10.5%	4.4%

\*Numbers for Production and Export share are taken from Table 10—US Meat Supply & Use, *Agricultural Outlook*, Economic Research Service, USDA, AGO-254, September 1998. †Calculations based on data obtained from Tables 23-26, *USDA Agricultural Baseline Projections to 2007*.  
Source: US Department of Agriculture.

Taiwan; long-term gains reflect environmental constraints in competitor countries that limit production growth. However, pork exports amount to only about 6.2% of domestic pork production. Chicken and turkey exports are forecasted to grow 4.6% and 4.4% per year, respectively. Although the export growth numbers represent substantial increases, their impact on domestic production is limited given their small overall share of total US production (with the possible exception of broilers).

**Import forecast**—Growth in US imports of animal products is anticipated to slow from 5.9% annually in fiscal years 1997 through 2000, to 3.2% annually in fiscal 2000 through 2007. In fiscal 1999, live-animal imports are expected to drop. Because of expansion of hog-packer capacity in Canada and the continued rebuilding of cattle stock by Canada and Mexico, US imports of live hogs and live cattle are expected to decrease. Live-animal imports in fiscal 1999 are projected at \$1.5 billion, \$200 million below the fiscal 1998 level. Imports of animals and products in fiscal 1998 will be at \$6.9 billion, 7% higher than in fiscal 1997. All agricultural imports in fiscal 1998 are expected to be valued at \$38 billion. Thus, the firms and organization that handle and produce animals and imports are not expected to have substantial effect on US domestic production.

**Trade effects on demand for veterinary services**—The impact of foreign trade in live animals and animal products on employment projections for the veterinary profession is twofold. To the extent that trade increases domestic production, it creates additional demand for use of veterinary services by animal producers for the domestic and international marketplace (in contrast, a decrease in trade can decrease demand for such services). To the extent that changes in the level of exports and imports require additional inspection services (to meet domestic and international requirements), demand for veterinary services will increase.

While data are not collected on veterinarian employment directly attributable to US trade in agricultural products, crude estimates can be pieced together to get a sense of just how strong or weak an influence trade plays in the demand for veterinary services. One such measure can be constructed by first calculating the share that US imports and exports represent of total US supply of red meats and poultry meats, a data series that is readily available. Then, assume that utilization of veterinarians for import and export meat inspection together with export production is roughly the same as their utilization in related practices overall.<sup>1</sup> Using trade data for 1997, this very rough cut at trade related employment reveals that almost 15 percent (or 1,268 of 8,647) of veterinarians

involved in large animal practices and food safety derive their employment from the trade sector.<sup>5</sup>

The United States has run a sizable positive trade balance for years, although it has been declining. The trade-balance surplus for all agricultural goods was \$21 billion in fiscal 1997, down from fiscal 1996's \$27 billion. The forecasted surplus for fiscal 1998 is \$17 billion.<sup>5</sup> The impact of increasing exports on demand for veterinary employment is not likely to be substantial in the near term, for 2 reasons. First, exports are small compared with domestic production—greater than 10% only for chickens. Although the growth in exports of meats and animal products is strong, domestic employment of veterinarians will continue to be determined largely by domestic consumption. Second, the ability of federal and state inspection agencies to increase the use of veterinarians is determined more by budgets than by volume of agricultural products available for export and import. It is likely that a large change in the volume of products for inspection would need to occur before the federal and state demand for veterinary services would increase substantially.

Much of the long-term growth in US exports is contingent on an economic recovery in Asia beginning in 2001. If the Asian economic problems worsen or if Asia drags other regions into recession, current export forecasts could prove to be overoptimistic. Given current export-growth expectations, we do not expect a large increase in the demand for veterinary services due to export growth.

### **Pet health insurance**

Usage of pet health insurance is extremely low in the United States. Increased utilization could increase the demand for services, especially by providing an option to economic euthanasia.

In a survey of pet owners, we have asked how much pet owners would be willing to pay for pet health insurance. Of 617 respondents, 282 (45.7%) said they were not interested and would pay nothing, 139 (22.5%) said they would pay \$5 per month, 93 (15.1%) said they would pay \$10 per month, 53 (8.6%) said they would pay \$15 per month and 33 (5.3%) said they would pay \$20 or more per month.

In a survey of horse owners, 45% of 285 respondents said they were not interested in insurance. 36% said they would pay \$20 per month, 8% said they would pay \$30 per month and 7% said they would pay \$40 or more.

These results suggest that there is some potential for this market but that price is a significant issue for pet owners; 46% of pet owners are not prospects at all, 22% are not good prospects because they will not pay much, and 14% of pet owners are reasonable or good prospects. For horse owners, the prospects seem brighter since they indicate that they are less price sensitive. Over 50% said they would pay \$20 or more per month. Fourteen percent of the pet owner population and half of the horse owner population are still a sizable market to pursue.

### **Other Factors Impacting the Market**

There are changes and attitudes among pet owners and those who don't own pets that have significant

<sup>1</sup>The phrase "related practices" is taken here to be the sum of veterinarians employed in the food safety sector and those who are self employed in practices classified as predominately or exclusively large, and half of those in self practice that are classified as mixed. The figure for the former group comes from 1998 National Association of Federal Veterinarians. The figures on the latter are taken from the Center for Information Management, AVMA membership data, 1997.

effects on the market for veterinary services. This section examines changes in the human-animal bond and changes in pet preferences. We also report on the public's perception of veterinarians and on veterinarians' and their employers' perceptions of the factors impacting demand for veterinary services.

### **Human-animal bond**

The phrase "human-animal bond" remains loosely defined. It encompasses the many forms of people's interactions with animals, including companionship, pleasure, fun, physical security and protection, physical health and service. The human-animal bond is complex and is the motivating factor in people's maintaining pets in their homes at such a high rate.

An increasing interest in the human-animal bond has been observed and described by veterinarians, pet owners, and those working with service animals, such as dogs for the handicapped and the elderly. Many veterinary teaching hospitals have instituted programs devoted to exploration of the human-animal bond, and several organizations focus on it. In addition, a great deal of mass media attention is focused on pets. It is now common to see pet-related cards in stores' greeting-card sections, including birthday, "get well," and sympathy cards. Health benefits of pets might reduce human health-care costs and conceivably influence the incidence of pet-ownership. An increased interest in the disabled, service dogs, and medical-assistance dogs can be documented, although the total number or change in the number of these dogs is unknown. All those reported trends suggest a heightening attachment between people and animals.

People more attached to their pets are likely to be more willing to spend money on veterinary services for pets. In veterinary private practice, recognition of the human-animal bond is an important determinant of a successful practice. There is a growing recognition that provision of veterinary services in a manner that acknowledges the human-animal bond will lead to better outcomes for veterinary practices and their patients.

Several veterinary teaching hospitals now have divisions or departments concerned with the human-animal bond. Their functions are to educate veterinary students and to perform research. Education about the ramifications of the human-animal bond is important for veterinary students. Those who understand the bond apparently will be more successful in private practice than those who do not.

**Commitment to pets**—Most studies of pet ownership concentrate on numbers of pets. Results of nearly all these studies agree that households with children are more likely to own pets than those without.

Families with elementary-school children might be more likely to own pets than families with older, younger, or no children.<sup>6</sup> In one study, the age of children and the mother's employment status were important predictors of pet-ownership and of children's involvement with their pets.<sup>7</sup>

Results of several studies,<sup>6,8</sup> show that families with children are more likely to own pets than those without children; about 58% of all households own pets com-

pared with 80% for households with children. Families with fewer children are more likely to own pets than those with many children. Children with no siblings and both parents working might be perceived by their parents to "need" a pet more than other children.

It is not known whether these families spend more or less on veterinary services than other pet owners or whether children's attachment influences veterinary expenditures. It is possible that families with more children spend less on their pets either because of lower commitment or because of the financial obligations that come with raising a larger family.

Pet owners' willingness to pay for veterinary service is at least as important as the number of pets in determining the demand for veterinary services. Factors that might contribute to willingness to pay include the total number of pets in the household, number of children, family income, and attachment to pets by the person making the spending decision. A greater number of pets or children might dilute the resources available to spend on each pet or dilute the commitment of a given child to a given pet or of a parent to a pet.

Some analysts have begun to try to understand the bond better by separating it into measurable components: "attachment" and "commitment," which are measured on the Miller-Rada Commitment to Pets Scale.<sup>9</sup> According to that study, attachment is the affection for or status of a pet in the family, and commitment reflects the willingness to spend resources on the pet. Preliminary results indicate that the factors associated with commitment—such as age, health, and number of children—are different from the factors associated with attachment. Of the factors that might be useful in predicting expenditures on veterinary services, those associated with commitment might be better indicators than those associated with attachment. High commitment was found in younger healthy persons who had few children. Income does not appear to be an important contributor to commitment, but it does affect the probability of owning a pet.

Veterinarians who recognize that there is little or no correlation between people's income and their commitment to their pets know that they cannot make assumptions regarding pet owners' willingness to pay for veterinary services. It is not known how much more income private practitioners could realize if they were more able to recognize and provide the level of services necessary to satisfy the needs created by the human-animal bond.

The effect of a potentially heightened human-animal bond on the demand for veterinarians and veterinary services is uncertain. Private practitioners must recognize the bond and provide services in a manner that acknowledges it if they are to be successful. The phrase "human-animal bond" remains loosely defined. Such constructed indicators as the Miller-Rada Commitment-to-Pets scale help to define different aspects of the human-animal bond. If, indeed, a strengthening of the human-animal bond translates into an increasing commitment to pets, that will increase demand for veterinary services.

We asked pet owners and non-pet-owners some questions that can be used to suggest the strength of

the relationship between people and their pets. On the basis of these responses, we find that the human-animal bond is strong as evidenced by the following:

- 93% of respondents say their families would be upset if anything happened to their pet.
- 85% of respondents believe people are more attached to their pets now because pets are more like members of the family now.
- Pet owners say they would pay \$688 for a 75% chance of successfully treating their pet and \$356 for only a 10% chance of successful treatment.
- Pet owners say they would pay an average of \$1,042 to keep their favorite pet (dog) from dying and \$657 to keep their favorite pet (cat) from dying.
- Horse owners would pay an average of \$1,827 for a 75% chance of successfully treating their horse and \$828 for a 10% chance.
- Horse owners say they would pay an average of \$3,314 to keep their favorite horse from dying and \$2,010 for their least favorite horse.
- Pet owners also say they would pay an average of \$92 per month to keep their pet healthy while horse owners say they would pay \$165 per month.

### Changes in pet preferences

Pet population and ownership data from the 1980s and 1990s suggest that some changes have been taking place in the number and types of pets owned in the United States. There has been an overall increase in the number of pet-owning households, but, more important, there have been some substantial shifts in the types of pets owned. Of some importance to the veterinary services industry is that there has been a reduction in the share of households that own dogs and cats and an increase in the share of households that own less traditional pets, such as birds, fish, ferrets, rabbits, and other reptiles. This is a noteworthy development because traditional pets are more likely to receive veterinary care.

The dog population appears to be stable or increasing only slightly. The cat population has increased appreciably relative to the dog population. The decline in dog-owning households relative to cat-owning households is a disturbing trend for the veterinary services industry because dog owners tend to spend more on veterinary services than cat owners. In addition, cat owners are more price sensitive than dog owners and are less likely to seek veterinary care than dog owners.

A more positive trend is that although household ownership rates for traditional pets have dropped there is marginal evidence of an increase in the number of pets per household.<sup>k</sup>

### Public perception of veterinarians

Veterinarians rate very favorably in public opinion among their clientele relative to 7 other occupations (physician, accountant, chiropractor, lawyer, dentist, teacher, and pharmacist).

Horse owners rank veterinarians first among all of these professional occupations with respect to intelli-

gence, level of education (tied with physicians), compassion, honesty, trustworthiness, and technical proficiency. Pet owners rank veterinarians first in compassion, honesty, and trustworthiness, second in intelligence, and third in level of education and technical proficiency.

Non-pet-owners do not think as highly of veterinarians. The only time veterinarians show up in the top 3 ratings is for compassion. Non-pet-owners rated veterinarians fifth in trustworthiness, seventh in intelligence, fifth in level of education, and fourth in honesty and technical proficiency.

Non-pet-owners are not generally aware that veterinarians work in areas other than animal health and welfare, and wildlife protection; 28% of non-pet-owners and 33% of pet owners are aware that veterinarians work in environmental health, 17% of non-pet-owners and 24% of pet owners are aware that veterinarians work in public health, 11% of non-pet-owners, and 17% of pet owners are aware that veterinarians work in food safety.

Horse owners are somewhat more aware of veterinarians' varied areas of work; 47% of horse owners are aware that veterinarians work in environmental health, 34% are aware that veterinarians work in public health, and 37% are aware that veterinarians work in food safety.

### Employers' and veterinarians' perceptions of the factors driving demand

This project carried out a large battery of surveys of various groups of veterinarians, their employers, and the public. We surveyed and interviewed veterinarians and employers about growth and about their skills and training. In this section, we report some of the findings from these surveys.

We asked small livestock producers, industry, and government employers their opinions about how the demand for veterinary services would be affected by the following factors. These factors were chosen on the basis of numerous discussions with knowledgeable people working in the veterinary services industry. The factors are in Table 8. For example, while many employers believe that public health issues will increase the demand for veterinary services, not many believe that alternative medicine will increase the demand for services; 65% of small livestock producers, 69% of industry employers, 68% of government employers, and 76% of nonprivate practice veterinarians agree that public health/zoonotic disease is one of the most important factors that will increase the demand for veterinarians in the future. Other factors that are frequently mentioned are grouped by various employment sectors (the frequency with which each of these items was mentioned as somewhat or greatly increasing demand is shown in parentheses):

#### **Government employers**

- use of new scientific, medical, or computer technology (65%)
- public concern for food safety (65%)
- animal welfare concerns or regulations (65%)

<sup>k</sup>According to AVMA and Pet Food Institute surveys.

Table 8—Factors\* employers of veterinarians and veterinarians were asked to rate in terms of their impact on demand for veterinary services

Factor	Factor
Public health/zoonotic disease†	Animal behavior consulting‡
Use of new scientific, medical, or computer technology†	Internet use by animal owners‡
Animal drug regulations†	Regulation of international trade‡
Biomedical science/research†	Use of clinical research tools†
Public concern for food safety†	E-mail for consulting or other uses‡
Animal welfare concerns or regulations†	Telemedicine‡
Environmental concerns†	Competition from other countries†
Production enhancing technology‡	Access to research grants‡
Continued consolidation in livestock agriculture‡	Direct state of federal funding‡
Increased cost of veterinary services	Agricultural price supports/programs‡
	Alternative medicine‡

\*The factors are presented in roughly the order of importance that employers of veterinarians attach to these factors.†Areas that were mentioned most frequently as factors that would greatly increase, or somewhat increase, demand. ‡Factors that are mentioned less frequently.

### Industry/agribusiness employers

- animal welfare concerns or regulations (73%)
- use of new scientific, medical, or computer technology (69%)
- biomedical science/research (69%)
- animal drug regulations (66%)

### Small livestock producers

- use of new scientific, medical, or computer technology (62%)
- animal drug regulations (62%)
- use of clinical research tools (62%)
- biomedical science/research (60%)

In addition to employers, we also asked veterinarians to identify growth areas using a slightly different list of factors. The factors most frequently mentioned as somewhat increasing, or greatly increasing, demand were:

### Nonprivate practice veterinarians

- use of new scientific, medical, or computer technology (77%)
- biomedical science/research (72%)
- public concern for food safety (71%)

### Private practice veterinarians

- use of new scientific, medical, or computer technology (82%)
- internet use by animal owners (76%)
- human-animal bond (75%)
- pet wellness/nutrition programs (74%)
- animal behavior consulting (73%)
- critical care (67%)
- pet health insurance (66%)

### Nonprivate Practice Areas

Substantial efforts were made to analyze opportunities in the nonprivate practice areas of veterinary medicine. Accumulating reliable data on the nonprivate practice segment was more difficult than for the private practice segment because there is such a variety of nontraditional veterinary jobs that veterinarians per-

form and data sources are limited. We relied mainly on surveys of nonprivate practice veterinarians to develop our estimates for the prospects in the government, academic, and industry segments.

### Food safety

The effect on the demand for veterinarians and veterinary services due to heightened concern about food safety is uncertain. Although there are indications that there will be a need for more stringent oversight of the food-safety process, there is no assurance that veterinarians will be the primary beneficiaries of this change.

Overall, we see food safety as a field with potential opportunity for the veterinary profession, but it is unlikely that numerous new opportunities for veterinarians will emerge without substantial engagement and focus by the veterinary colleges and the veterinary medical associations. It must be kept in perspective that although this is a potential growth field, veterinarians are not the only group capable of providing services in it. In addition, other forces are affecting the demand for services that veterinarians are providing to agribusiness, including continued consolidation in the agricultural sector; these forces are ultimately at least as important as potential increases in the demand for food safety. Highlights from the surveys are presented.

Of all industry and agribusiness groups surveyed, 25% felt that food safety or food inspection were very to somewhat important functions within the jobs that veterinarians performed in their organizations. This diverse group included everything from medical supply companies to meat processor/packers. About half of the processors and livestock producers felt these functions or skills were very to somewhat important. More of the processors and producers felt that food safety knowledge was important for veterinarians to meet their job responsibilities, and most of those were satisfied with their veterinarians' food safety duties or functions.

Of those companies or organizations that said they were involved in food safety, almost as many said they used a nonveterinarian for that work as did those using a veterinarian. Most of those using nonveterinarians said they hired scientists for food safety work or for innovative processes in food safety; a few said they could not find a veterinarian or that a veterinarian was not needed for that work. One producer (of 10) and 3 (of 9) processors said that nonveterinarians had an important role in performing food safety work in their organization. None of the producers and only one processor thought that additional training in food safety would be advantageous to veterinarians working for them. Among industry and agribusiness companies, 59% said that food safety concerns would greatly or somewhat increase their demand for veterinary services. Those who felt that food safety concerns would increase demand ranged from 90% of drug companies to 78% of processor/packers, 60% of livestock producers, and 22% of medical facilities.

Surveys of small livestock producers revealed that 15% used their veterinarian as the main source for information about food safety (40% said they had no need for this information). One-third or less felt that food safety duties of their veterinarian were very to

somewhat important, that additional food safety training would be beneficial for their veterinarian, that a veterinarian would be better than a nonveterinarian in food safety duties, or that a veterinarian would be more cost-effective than a nonveterinarian for food safety duties. Despite their overall lukewarm response to veterinarians' role in food safety, 58% of respondents said that public concern for food safety would greatly or somewhat increase demand for veterinary services.

Veterinarians themselves view the impact of food safety concerns on their jobs as more significant than do their employers or clients. Overall, 71% of nonprivate practitioners surveyed felt that public concern for food safety would greatly to somewhat increase demand for their services (all the agribusiness veterinarians and most of the government veterinarians thought so). About half (47%) of private practitioners thought that food safety concerns would increase demand for their services (ranging from 33% of small animal practitioners to 65% of food animal practitioners. Pet and horse owners were both unlikely (17% versus 37%) to select "food safety" as an area in which they thought veterinarians worked, although that concept occurred to horse owners somewhat more often. The veterinarian's role in food safety is not well understood by the public.

### **Environment**

All veterinarians must be aware of environmental issues in their everyday work. Animal tissues, chemicals, "sharps," and other hazardous materials must be disposed of properly. Veterinarians working in positions involving environmental issues include those in: food production (where the emphasis is on waste management), environmental toxicology (threats to humans, domestic animals, and wildlife by environmental contamination), nonprofit work (wildlife rehabilitation on an individual-case basis) consulting with a variety of private companies and government agencies on environmental issues that affect domestic and wild animals.

Work performed by state departments of public health and by the Army and Air Force can also involve environmental issues that affect human health.

The extent of an increase in the demand for veterinarians and veterinary services due to heightened concern about the environment is uncertain. The total number of veterinarians working specifically and directly with environmental issues is small, and even with growth it will remain a small segment of the total veterinary profession in the near future. However, motivated individual veterinarians with an interest in environmental issues should be able to find a niche for their work. Additional training will be required, and veterinarians will compete with nonveterinarian scientists for such jobs.

### **Animal welfare**

Animal welfare is another area in which veterinarians work. Although the exact numbers are not known, they are not very large. Only 50 of the AVMA's membership identify their principal field as animal welfare.

Our investigation into the area of animal welfare has yielded the following main findings:

- Veterinarians and pet owners show increasing interest in and concern for animal welfare.
- Most studies of animal welfare issues are qualitative, and most work of "animal welfare" groups revolves around gathering or disseminating information or around legislative efforts. Little of their work includes veterinarians.
- Increasing public concern for animal welfare might increase donations to animal welfare and shelter groups.
- Government budget cutbacks and tax reductions (city, county, and federal) will tend to reduce funds available to animal shelters.
- Most shelters use veterinarians on a part-time or as-needed basis. Shelters identify facility improvement as their number 1 priority if they have extra funds.
- The major direct role for veterinarians concerned with animal welfare is in enforcement of the Animal Welfare Act (AWA) by the Animal Care Division of the US Department of Agriculture Animal and Plant Health Inspection Service.
- The Animal Care Division has reduced its veterinary staff, and projections include further budget cuts.
- The AWA stipulates that animals kept in research laboratories receive veterinary services. Laboratory animal veterinarians and consultant veterinarians might find opportunities in industry. However, industry consolidation and the "herd health" nature of laboratory animal work limit the number and growth of those jobs.
- No changes to the AWA are expected, but, even if changes did occur, they would not result in substantially increased demand for veterinarians.
- Over half of the agribusiness and industry groups contacted said that increased concern for animal welfare would increase their demand for veterinary services. Because this demand segment is small, it will not have a large effect on the overall demand for veterinarians.

### **Usage of veterinarians and nonveterinarians in emerging and scientific areas**

Industry and government employers of veterinarians were also asked to identify whether veterinarians or other types of professionals were working in various nonprivate practice areas. Table 9 shows the areas and the percentage of respondents who said that their organizations used veterinarians or other professionals for work in these areas.

These results are suggestive of the very diverse set of areas that veterinarians are involved in. These results also illustrate that many of these are niche areas where veterinarians vie with other professionals for these types of jobs. Although many of these areas will grow substantially and there will be some opportunities for veterinarians, these areas are currently so small that even rapid growth will not produce opportunities for large numbers of veterinarians through the year 2015.

Table 9—Government and industry use of veterinarians and non-veterinarians for work in emerging and scientific areas

Areas of work	Staff veterinarian	Nonveterinarian
Public health/zoonotic disease		
Government	68%*	7%
Industry	27%	8%
Epidemiology		
Government	61%	7%
Industry	19%	11%
Food safety		
Government	52%	10%
Industry	16%	14%
Toxicology		
Government	42%	3%
Industry	19%	17%
Pathology		
Government	39%	0%
Industry	36%	8%
International assistance		
Government	32%	3%
Industry	16%	11%
Unique solutions to food safety		
Government	29%	19%
Industry	6	13%
Laboratory animal medicine		
Government	26%	7%
Industry	39%	0
Community work		
Government	26%	7%
Industry	2%	25%
Transgenic animals		
Government	19%	7%
Industry	9%	13%
Biomedical science/research (eg, molecular biology, animal biotechnology, immunology)		
Government	19%	13%
Industry	25%	23%
Unique solutions to environmental problems		
Government	16%	13%
Industry	6%	25%
Innovative reproductive technology		
Government	13%	7%
Industry	16%	9%
Aquaculture (food fish health, pet fish health)		
Government	10%	16%
Industry	3%	6%
Xenotransplantation		
Government	10%	0%
Industry	9%	2%
Hybridization		
Government	0%	3%
Industry	5%	8%
Transgenic Plants		
Government	0%	13%
Industry	2%	6%

\*Percentages refer to those who said they were doing work in the area.

## Skills and Knowledge

Surveys were used to collect information about skills traditionally associated with veterinary medicine as well as skills and knowledge in a variety of scientific areas.

Surveys were sent to every segment of the veterinary profession: from newly graduated and experienced veterinarians in private practice, industry, and government (ie, the supply side of services), to managers who have responsibility for hiring veterinarians including 27 government agencies, 8 industry seg-

ments,<sup>1</sup> and private practice owners (ie, the demand side for services). Employers were surveyed about jobs that were filled by veterinarians as well as those that could be, but that were currently filled by nonveterinarians. The surveys specified various skills and competencies and asked about their importance and about how well veterinarians are currently prepared to offer these skills and competencies. Survey questions also probed the reasons for use of nonveterinarians.

According to employers of veterinarians that we surveyed, clinical medical knowledge and clinical surgical skills are more important skills in private practice than in any other employment sector. While 87% of new graduates rated themselves as good to excellent on these skills, only 47% of private practice owners rated the new graduates as good, and less than half of veterinarians not in private practice rated new graduates as good. Less than half of the private practice respondents (48%) thought it was easy or somewhat easy to find any veterinarians with adequate skill level in these areas.

The respondents to the industry survey represent a diverse set of industry segments. There is a broad spectrum of veterinary services needed in this sector. As such, it offers opportunities for veterinarians with interests in consulting, research and development, business management, and employee management. More than one-third (36%) of all industry employers indicated that some jobs within their company had specific job requirements that were not met by a veterinarian with just a veterinary medical degree, but which could be filled by a veterinarian if they had additional training. The areas of training cited most often were speaking/writing; business, administration, and personnel management; sales/marketing; financial and computer skills. The respondents from medical/research facilities were an exception; they indicated that only an additional degree and research training would be helpful for veterinarians to expand their job opportunities in this sector.

Industry respondents also indicated that there were jobs filled by nonveterinarians for which veterinarians were at least as qualified. The reason given most often (by more than 50%) for not employing veterinarians was that the positions required much less training than a veterinary degree provides. About one-fourth of respondents indicated that it was more cost effective to hire a nonveterinarian (though 44% of processor/packers said this), and one-fourth said they would hire a veterinarian if he or she had specific additional skills.

Industry groups varied in their need for veterinarians with additional degrees or board certification. All medical/research facilities employers responded that additional degrees or board certification was very or somewhat important for their positions, as did 73% of drug companies and 56% of processor/packers. When asked about jobs with their company that are or could be filled by a veterinarian, the industry respondents characterized those jobs with respect to the need for a

<sup>1</sup>Industry coverage is composed of drug companies, livestock producers, processor/packers, medical supply/equipment, medical/research facilities, feed companies, biotechnology companies, and pet product companies.



veterinary medical degree as follows: required (46%); highly desirable (17%); helpful, but not required (18%); and irrelevant (19%). The percentage of those positions for which industry groups considered board certification to be required was reported as: required (23%); highly desirable (28%); helpful (23%); and irrelevant (27%). The percentage of those positions for which a PhD or masters degree was considered to be required was 13% (though 28% for drug companies); highly desirable (24%); helpful (34%; though only 10% for processors); and irrelevant (29%).

Regarding positions that are or could be filled by a veterinarian, 27 government employers characterized the need for a veterinary medical degree as: required (57%); highly desirable (13%); helpful, but not required (13%); and irrelevant (17%). Government respondents described the need for board certification in their positions as: required (14%); highly desirable (22%); helpful, but not required (29%); and irrelevant (35%). Additionally, those agencies said that a PhD or masters degree was required in 24% of those positions; highly desirable in 19%; helpful, but not required in 30%; and irrelevant in 27%.

Of 12 government respondents (10 federal) that said they had jobs with specific requirements that would not be met by a veterinarian, but could be with additional training, 6 said an additional degree or board certification were very or somewhat important for those jobs. The skill sets noted most often for which veterinarians would need additional training were: research skills; speaking/writing; computer skills; personnel management and administration; teaching; epidemiology; or a specific additional degree.

When asked about positions that could possibly be filled by a veterinarian but are not, 39% of government employers said those positions require much less training than a veterinary degree provides, and 35% would hire a veterinarian if he or she had specific skills or knowledge. This contrasts with the view of those who work as veterinarians in government (via the nonprivate practice survey), where over half (53%) said there were on average 23 jobs within their agency that were currently filled by nonveterinarians but for which veterinarians are at least as or better qualified.

Problem solving abilities, as represented by critical thinking skills, are in high demand across all employing sectors, especially in private practice. While new graduates and currently employed veterinarians rate themselves very highly on this skill, employers are not as satisfied. Less than half of private practice employers (40%), and only 28% of veterinarians not in private practice, rate new graduates as having good critical thinking skills. However, almost all of those respondents rate themselves good to excellent on critical thinking skills (87% and 91% respectively).

Business related skills are widely perceived by all groups as required skills to succeed in a traditional veterinarian job, as well as, to better compete for veterinary related jobs for which a veterinary medical degree is not a prerequisite.

Although nonprivate practice employment is small, there are some opportunities for veterinarians to expand into jobs currently held by nonveterinarians,

but doing so will require either additional training or another degree.

## Aspects of the Veterinary Practice

Another part of our work was to take a careful look at the business aspects of the veterinary practice.

### Capacity utilization

The issue of whether there is excess capacity in the veterinary services industry is a complex issue.<sup>m</sup> Anecdotes from some private practitioners suggest that there is excess capacity, but there is also evidence that many practices are resource constrained because they are unable to hire new associates. To get a better understanding of this issue, we assembled as much available information as we could find and also asked practitioners a number of questions that would help us better understand the issue.

The AAHA has reported that many of its members have extended hours without substantially increasing the volume of business, in effect stretching out case volume into longer operating hours. An AAHA study, prepared in 1995, made the conjecture that excess capacity in the industry may be the explanation for why veterinarians' incomes are low, while at the same time, there appears to be plentiful employment opportunities for veterinarians. This conjecture is based on the notion that the demand for veterinarians is in part determined by the need to cover the longer hours that the practice must remain open in order to provide convenient hours of operation.

To test this hypothesis, we looked at the relationship between hours open and reported excess capacity with the belief that practices that were open longer should report greater excess capacity if practices needed more labor to cover longer operating hours. The results do not suggest that there is a positive relationship between how much excess capacity is reported and hours open. This suggests that practices are not necessarily staying open longer, and just performing the same amount or little additional work within those longer hours of operation.

**Survey results for capacity utilization questions**—KPMG's 1998 survey of veterinarians asked private practice owners to specify how much of an increase in caseload that they could handle without extending hours of operation or hiring. The survey also asked how much their caseload would have to increase for them to hire an additional assistant or technician, and an additional veterinarian. The objective of these questions was to determine how much excess capacity there is in the delivery of veterinary services. The results for these questions are displayed in Table 10.

As the table shows, small animal practices report that they could increase caseload by 20% before extending hours, 22% before hiring a new technician, and 42% before hiring a new veterinarian. Large animal practices report that they could increase caseload by 20% before extending hours, 31% before hiring a new technician, and 45% before hiring a new veterinarian.

<sup>m</sup>Excess capacity is defined as a situation where more services could be delivered without expanding the use of inputs such as veterinarians, technicians, or facilities and equipment.

Table 10—Capacity utilization responses by size of practice

Change in practice	Small animal			Large animal		
	< 2*	≥ 2*	Total	< 2*	≥ 2*	Total
Hire a new technician/ assistant†	27%	15%	22%	47%	18%	31%
Hire a new veterinarian‡	52%	31%	42%	76%	23%	45%
Extend operating hours§	22%	18%	20%	32%	13%	20%

\*No. of veterinarians in the practice. †How much would your caseload have to increase for you to hire a new technician or assistant? ‡ How much would your caseload have to increase for you to hire a new veterinarian? § How much more business do you think that your practice can handle without hiring or extending operating hours?

These seem like fairly large increases and appear to support the notion that these practices have substantial excess capacity. However, a more careful look at these responses is required because the small size of many veterinary practices coupled with the fact that a veterinarian is an “indivisible” input (defined later), has considerable influence on how to interpret these results.

**Indivisibility**—Although these results appear to suggest that there is excess capacity, they may also be at least partially explained by indivisibility. Indivisibility is a term that economists use to refer to the idea that some inputs cannot be split into half or quarter units. You cannot use half a veterinarian or half of a x-ray machine. While labor is more divisible than capital equipment due to the ability to hire part-time labor, there are still impediments to using inputs such as labor that are not easily divisible. The chief impediment is the difficulty in finding part-time labor if it is needed, and of finding people to work the odd hours that are necessary to handle emergencies and convenience hours.

Although indivisibility is a problem in all health fields, medical practices are larger and therefore it is easier to use a part-time worker to fill in for permanent employees. In addition, the greater number of physicians per practice means that they can substitute for one another without as much burden being placed on any one individual. On the other hand, veterinary practices tend to be very small. In 1995, the median number of veterinarians was approximately 2 per practice. Therefore, using the most efficient amount of labor is much more difficult for a veterinary practice than it is for a large hospital or group medical practice and it is especially difficult for the small veterinary practices.

Practice size will have a significant effect on how to interpret the results of the 2 questions that ask how much more business can be handled without hiring a new veterinarian or technician.<sup>19</sup> Consider a practice with one veterinarian. This practice may report that it would have to double its business (do 100% more business) to hire a new veterinarian. Is this response indicative of a capacity problem or just a reflection of the indivisible nature of the veterinarian as an input? A practice with 10 veterinarians may report the need to perform only 10% more business to hire a new veterinarian. If we were to compare the responses of these 2 practices, we might come to the conclusion that there was more excess capacity in the first than in the second. But this is not necessarily true. It is only because

of the indivisibility of inputs that the first practice reports a higher amount of additional business needed to hire while the second practice reports a much lower amount of business required to hire. Therefore, we cannot simply look at these raw responses without correcting for size of the practice. Table 10 illustrates this by breaking the practices into 2 size groups. Consistent with the discussion about indivisibility and its impact on reporting excess capacity, the larger size practices (greater than 2 veterinarians) tend to report that a smaller amount of additional business is required to hire a veterinarian or a technician/assistant.

One test that we have performed when looking at these results is to compare practices that are open longer hours to practices that are not open as many hours. We would expect that practices that are open longer hours would report that they could handle more business without hiring or extending hours than practices that are open fewer hours (if the conjecture that there is excess capacity is correct). In fact, we find that, on average, practices that are open more hours report that they can handle less additional business without extending hours (indicating less excess capacity) than practices that are open shorter hours.

Figure 3 shows the results for the question of how much additional business that a practice can handle without hiring or extending hours broken out by hours of operation. The response to this question is the cleanest measure of excess capacity that we have available. We have presented the survey results for this question, broken out by hours that the practice is open in order to demonstrate that there does not seem to be a positive relationship between how much excess capacity is reported and hours open. This is another piece of evidence that suggests that practices are not necessarily staying open longer, and just performing the same amount of work within those longer hours of operation.

**Regression analysis**—Regression analysis was also used to investigate the relationship between the

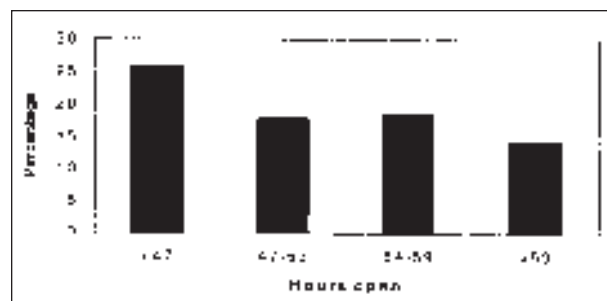


Figure 3—Percentage caseload increase can handle without extending hours/hiring, small animal practice.

<sup>19</sup>The question about how much extra caseload you could handle before extending hours does not suffer from the “indivisibility” problem. It is unlikely that the responses include the combined effect of indivisibility and capacity because responses should be independent of the size of the practice. This contrasts with the questions that ask how much we need to increase caseload before hiring. The response to these questions is very likely dependent on practice size.

<sup>20</sup>When not controlling for size, operating hours is significant and positive in these regressions.

required increase in caseload and operating hours. This technique allows us to look at this relationship while simultaneously adjusting for practice size. The size of practice variable (number of veterinarians) is significant. The variable for hours of operation is insignificant in explaining reported excess capacity when controlling for size of practice.<sup>9</sup> This leads us to believe that reported excess capacity is explained by indivisibility rather than by longer operating hours (within which additional work could be performed).

**Revenue per veterinarian**—If practices must remain open longer hours and are not commensurately increasing cases as is conjectured, then this would imply that revenue per veterinarian should be lower for practices that are open longer hours, *ceteris paribus*. Falling revenue per veterinarian would lead to lower wages despite increased demand for labor to cover longer operating hours.

The practice level revenue data collected from the KPMG survey does not support this hypothesis. In particular, these data indicate that there is a positive relationship between revenue per veterinarian and the number of hours that the practice is open. This relationship can be seen in Figure 4. If practices have expanded hours without commensurately increasing revenue per veterinarian, then we would not expect to observe higher revenue per veterinarian in practices with longer operating hours.

**Visits**—There is another feature of private practices over the past 20 years that does not support the assertion that there is significant underutilization within veterinary practices today. The AVMA Biennial Economic Surveys provide information on the number of visits per week reported by private practice owners. These data reveal a gradual upward trend in the average and median number of visits per week for private practices. For small animal practices, as can be seen in Figure 5, the average number of visits per week rises from 117 in 1984 to 162 in 1994. The increase in the number of visits could simply reflect an increase in the average size of veterinary practices over this period. To control for this potential scale effect, we also looked at

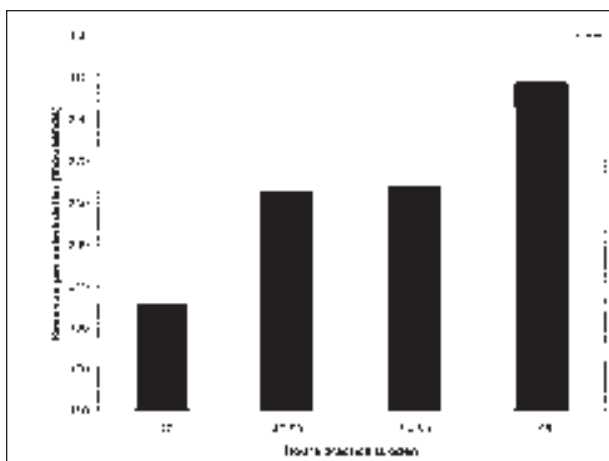


Figure 4—Revenue per veterinarian, by hours open, small animal practice.

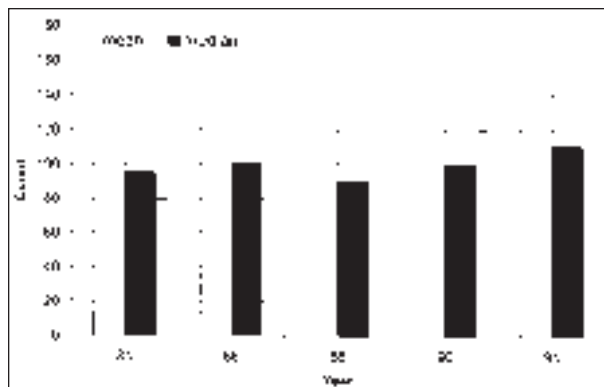


Figure 5—Visits per week, small animal practices.

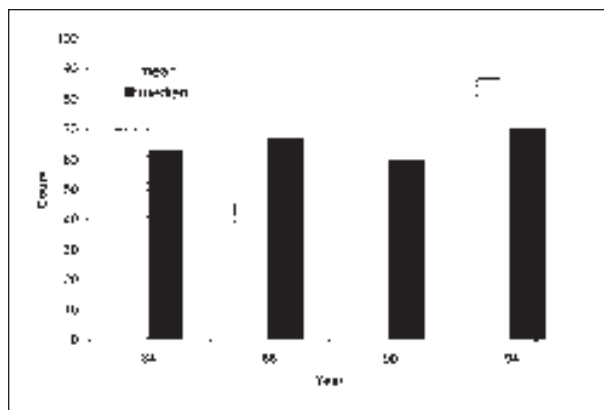


Figure 6—Visits per week per veterinarian, small animal practices.

the average and median number of visits per veterinarian. Figure 6 shows that there is an upward trend in visits per veterinarian as well. This suggests that veterinarians are being used more intensively and is consistent with evidence that technician and assistant labor are being used more extensively.

**Final thoughts on capacity utilization issue**—Responses to KPMG's survey of veterinarians suggest that there is some, but not a lot, of excess capacity in the provision of veterinary services. The most direct question that attempted to gather information on this issue was the question of how much more business a practice could handle without extending hours or hiring. Respondents from small animal and large animal practices said that, on average, they could handle 20% more business without extending hours or hiring.

Responses for some of the questions required adjustment of the responses to separate out indivisibility from true excess capacity. How much more business a practice can handle without extending hours is least affected by size of practice, and therefore we did not adjust the responses. However, we believe that there is still some upward bias in the reported responses because of some degree of indivisibility that we have not adjusted for. Therefore, we believe that 20% is the upper limit of actual excess capacity. We are uncertain as to just how much higher than actual excess capacity this 20% estimate is. Other evidence that we have

presented is not consistent with the notion that there is a high degree of excess capacity in the provision of veterinary services. However, our analysis has drawn out the importance of indivisibility and the fact that, what may be viewed as substantial excess capacity, is really indivisibility that is an artifact of the small size of veterinary services.

The small size of practices and the indivisibility of a veterinarian are also the reason that veterinarians are required to work the long hours. In a small practice, owners cannot justify hiring until some threshold increase in demand is apparent. If they cannot hire, they must work extra hours to cover whatever demand cannot be satisfied by more standard work hours.

Larger practices have a better capability to manage the problem of delivering the appropriate amount of labor hours to meet the amount demanded. With a larger number of veterinarians per practice, it does not take as great a change in demand to add a position. Larger practices have a better capability to manage the problem of delivering the appropriate amount of labor hours to meet the amount demanded.

Some thought should be given to developing arrangements that more effectively share labor (and capital) across practices. Consolidation of practices is unlikely to alleviate this problem because most consolidation has not affected the smallest of practices. This is because most consolidation has been initiated by large corporate veterinary organizations. These organizations have expressed their preference for adding to their organization by purchasing clinics with revenues of at least \$750,000 per year and will not affect the smallest of practices.

### **Competition**

Veterinary practices report robust competition for customers. Half of private practitioners see competition as either stronger or somewhat stronger than it was 5 years ago, whereas 37% see competition as about the same, and 8% see competition as weaker or somewhat weaker. By practice type, equine, small, and mixed animal practitioners observe stronger competition than large animal practitioners do; 59% of equine, 52% of small, and 50% of mixed animal practitioners describe competition as stronger versus 41% of large animal practitioners.

Among practice owners who have seen a decline in revenue (1 of every 7 respondents to our survey), about 53% of them point to the reason for the decline as attributable to a reduction in demand for their services (20%), new competition moved into area (17%), or more aggressive pricing by their competitors (16%). Those are all suggestive of increased competition or declining demand.<sup>p</sup>

Thirty-eight percent of the practice owners who responded to our survey said that they had observed practice failures. The 5 most frequently mentioned reasons for practice failure are insufficient client base (39%), new competition (25%), poor client manage-

ment (24%), poor office management (22%), and poor communication skills (20%).

### **Revenue and expense trends: food and drug costs**

We have examined detailed revenue and expense data using AVMA Biennial Economic Survey data from the years 1983 through 1995. We constructed a time series to reveal trends in these data. The resulting time patterns for the revenue and expense data we have examined are in Table 11.

**Total revenue**—Real revenue has been rising modestly for small animal practices and slightly faster for mixed animal practices. It has been rising only slightly for large animal practices and has fallen for equine practices.

**Total expenses**—Total expenses have approximately mirrored the pattern of real revenue growth, increasing fastest for mixed and small animal practices, modestly (but outstripping revenue growth) for large animal practices, and declining for equine practices.

**Net income**—The pattern of revenue and expense changes has resulted in only a small increase in real net income for small animal practices and to declines in real net income for large animal and equine practices. Only mixed animal practices have seen a significant increase in real net income, bringing them closer in range to the net incomes observed for the 3 other practice types.

**Costs of goods and services**—Real costs of goods and services have risen about twice as fast as total revenue for small animal and mixed animal practices. For equine practices, these costs have declined, but not nearly as fast as revenues have declined. For large animal practices, these costs have grown modestly, but given the almost nonexistent growth in revenues, these cost increases have still significantly exceeded their corresponding revenue increases.

**Labor costs**—Labor costs have increased modestly over this 12-year period but considerably slower than total expenses for small animal and large animal practices. Labor costs have fallen for equine practices at a faster rate than total costs have fallen for these practices. Labor costs have risen somewhat faster for mixed animal practices but have still risen much slower than other expenses. Labor cost detail is also available for veterinarian and other staff labor costs. Labor costs (in constant dollars) for veterinarian employees have fallen for small animal practices while labor costs for other staff have increased for these practices. Labor cost increases for veterinarians at large animal and equine practices have surpassed the change in labor costs for all other staff. At mixed animal practices, labor cost increases for veterinarian employees have lagged behind the increase in labor costs for other staff.

**Overhead expenses**—All practice types except for mixed animal practice show a decline in real overhead expenses. A small increase in real overhead expense has

<sup>p</sup>But the main reason cited for a reduction in revenue was that they chose to reduce volume of business (21%).

Table 11—Real revenues and expenses (medians in dollars) deflated using Consumer Price Index (CPI); 1982–1984 = 1.00)

	1985*	1987*	1989*	1993*	1995*	Growth 1983–1995
<b>Small animal practice</b>						
Revenue	255,811	264,269	277,671	317,804	316,517	23.7%
Total expenses†‡	178,820	180,930	198,828	227,811	227,418	27.2%
Labor	77,014	75,537	81,967	93,598	90,840	18.0%
Goods and services	45,617	48,040	54,521	66,517	68,929	51.1%
Overhead	42,604	42,669	45,437	45,123	40,963	-3.9%
Fixed	22,065	23,249	24,724	22,131	17,439	-21.0%
Variable	13,455	12,655	12,961	14,056	14,194	5.5%
Discretionary	7,083	6,765	7,752	8,936	9,329	31.7%
Net income	76,991	83,339	78,789	89,992	89,099	15.7%
<b>Large animal practice</b>						
Revenue	346,377	346,859	368,824	353,951	358,313	3.4%
Total Expenses†‡	235,267	247,599	260,623	260,662	277,766	18.1%
Labor	65,970	70,568	79,384	76,833	74,960	13.6%
Goods and services	107,911	110,930	117,627	120,822	124,482	15.4%
Overhead	38,722	38,567	40,715	38,382	33,932	-12.4%
Fixed	13,023	13,485	14,461	11,997	8,493	-34.8%
Variable	19,868	19,043	19,199	19,532	19,094	-3.9%
Discretionary	5,832	6,039	7,055	6,854	6,345	8.8%
Net income	111,109	99,260	108,201	93,289	80,546	-27.5%
<b>Mixed animal practice</b>						
Revenue	261,160	269,008	281,376	296,922	341,007	30.6%
Total expenses†‡	196,693	202,837	204,181	220,530	247,916	26.0%
Labor	66,124	69,963	72,819	74,985	85,919	29.9%
Goods and services	60,717	66,367	78,487	90,622	100,785	66.0%
Overhead	34,737	36,174	38,895	41,003	40,726	17.2%
Fixed	14,609	16,512	18,397	17,086	13,266	-9.2%
Variable	15,372	15,059	14,923	17,327	20,147	31.1%
Discretionary	4,756	4,603	5,576	6,590	7,314	53.8%
Net income	64,468	66,171	77,196	76,392	93,091	44.4%
<b>Equine practice</b>						
Revenue	327,655	352,901	327,094	310,823	298,757	-8.8%
Total expenses†‡	232,141	261,034	244,680	241,774	223,501	-3.7%
Labor costs	83,300	103,397	94,438	80,624	75,382	-9.5%
Goods and services	86,847	84,026	67,292	76,143	84,834	-2.3%
Overhead	45,274	52,870	49,780	41,184	39,677	-12.4%
Fixed	13,400	16,050	17,092	13,989	12,276	-8.4%
Variable	24,122	27,809	24,490	19,816	18,508	-23.3%
Discretionary	7,752	9,011	8,198	7,378	8,894	14.7%
Net income	95,514	91,867	82,414	69,049	75,256	-21.2%

\*Two-year averages. †Labor costs include associate veterinarians' salaries, ancillary staff salaries, pension and profit sharing, payroll taxes, medical and liability insurance. Cost of goods and services include drugs/medical supplies, pet food and other feed, laboratory and radiology fees. Fixed overhead includes office rent, equipment rental, building equipment repair and maintenance, property taxes and insurance, and interest (all liabilities). Variable overhead includes vehicle expense, telephone and utilities, computer and office expense. Discretionary overhead includes accounting and legal fees, promotion and advertising, continuing education, and miscellaneous expenses. ‡The sum of expense detail will not add to total expenses. Total expenses have been collected from the total expense response from biennial surveys. The detailed expense items have also been collected from these line items from the AVMA Biennial Economic Surveys. Respondents do not always accurately report detailed expense items such that they sum to reported total expenses. Where there were significant discrepancies, these respondents were dropped from the analysis. However, there are still numerous cases where detailed expenses do not add exactly to reported totals; hence the sum of detailed expense items do not add to totals reported in these tables.

Source: AVMA Biennial Economic Surveys.

total costs, these costs are larger than all other cost categories for all practice types except small animal practice. For small animal practice, labor costs exceed the costs of goods and services. However, the gap between labor costs and the costs of goods and services is narrowing because costs of goods and services are rising significantly faster than labor costs.

As shown in Table 11, the costs of goods and services have grown in real dollars significantly faster than total real dollar revenue for all practice types. For example, for small animal practice, costs of goods and services have risen by at least 50% from 1983 to 1995.

At the same time, real revenue has increased by only 25%. This could possibly imply a negative drag on net income due to costs of goods and services rising faster than revenue. This is not entirely unambiguous, however, because it could possibly be the case that revenue associated with these costs may be increasing faster than the costs themselves and faster than other revenue. Only reliable data on the source of revenues would be able to definitively determine whether the

costs of goods and services are exceeding the revenues attributable to these costs.

occurred for mixed animal practices. Although we are not completely certain why overhead expenses have declined in real terms, the most likely answer is due to the decline in interest rates. Interest payments on debt are included in fixed overhead and these payments must have declined considerably over this period.

The most notable issue revealed by these data is that the costs of goods and services have increased significantly faster than all other costs over the 12-year period covered by these surveys. This is true for all practice types, but is most significant for small and mixed animal practices. Costs of goods and services include drugs, pet food supplies, and laboratory diagnostic and radiology fees. In terms of importance to

costs of goods and services are exceeding the revenues attributable to these costs.

To examine this point, we have used AVMA Biennial Economic Survey data. Since 1985, practices have been asked to attribute their revenues to the source of those revenues. However, we do not have as much confidence in this particular part of the AVMA Biennial Economic Surveys because the reporting rates for these data are low and significant cleaning and elimination of outliers was necessary to use these data.

Nevertheless, we have compared the growth in revenue that is attributed to the cost of goods to the expenses attributed to the goods and found that, in general, cost increases have exceeded revenue increases.

Table 12—Revenue sources and expenses (in dollars): median food, drug, radiology and laboratory fees

	1985	1987	1989	1993	1995	Growth 1985–1995
<b>Small animal</b>						
Revenue	76,297	81,641	111,846	119,413	145,618	90.9%
Expenses	52,976	54,950	77,465	104,407	101,705	92.0%
<b>Large animal</b>						
Revenue	159,385	171,331	163,965	140,982	203,769	27.8%
Expenses	116,535	133,001	151,339	177,356	195,457	67.7%
<b>Mixed animal</b>						
Revenue	88,495	94,000	110,905	74,921	114,514	29.4%
Expenses	70,200	79,066	111,557	135,284	167,000	137.9%
<b>Equine</b>						
Revenue	111,072	123,429	77,692	90,000	120,244	8.3%
Expenses	109,391	78,447	84,000	124,923	128,935	17.9%

Source: AVMA Biennial Economic Surveys

Although we have less confidence in the results for the components of revenues than we have for total revenue, there is nothing in these data to cause us to refute the basic premise that costs of goods and services are rising faster than the revenues associated with these costs. Table 12 shows the revenue data that practices have stated as coming from food, drug, and laboratory fees, as well as corresponding costs attributed to these same items. Expenses are growing considerably faster than fees for large animal, mixed animal, and equine practices. Expenses are growing at about the same rate as fees for small animal practices. More work needs to be done to verify this preliminary finding.

More research should be undertaken to study the margins that veterinarians are receiving on drugs and pet food products. Since these costs are such a large portion of total costs, it is exceedingly important that appropriate margins are earned on these products. The evidence from these data is that it is questionable whether veterinarians are getting sufficient mark up on this category of revenue.

Consistent with the previous finding that food and drug costs have been rising faster than revenues is the fact that practices that depend more on food and drug sales are not as likely to be as financially healthy as practices with lesser dependence on food and drug sales. We put forth this finding on the basis of analysis that we performed using private practice financial data from the AVMA's Biennial Survey. In this analysis, we have compared the top 25 percent of practices in terms of financial health with the bottom 25 percent. (For this analysis, we measured financial health as the ratio of net income per veterinarian). Table 13 shows the average ratio of food and drug expenses to total revenues for small and large animal practices.

### Staff utilization

Figure 7 is based on published Bureau of Labor Statistics, Office of Employment Surveys data on technicians and assistants to veterinarians. Table 13—Food and drug expenses as a share of total revenues (small and large animal practices)

Financial health group	Small animal	Large animal
Top 25% (healthiest)	19.1%	26.5%
Bottom 25% (least healthy)	25.4%	40.0%

Practices are assigned to the top 25% and bottom 25% groups based on the practice's amount of net income per veterinarian.

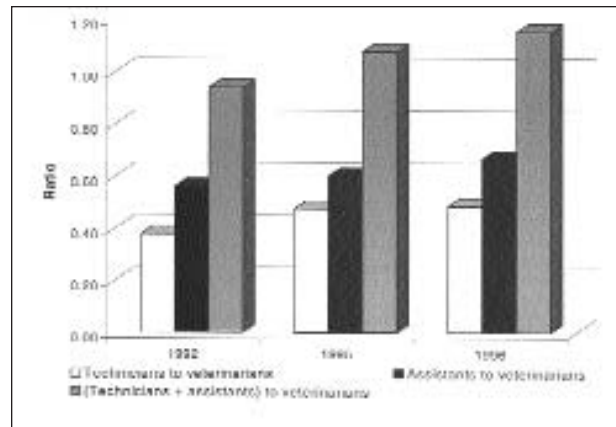


Figure 7—Utilization of veterinary technicians and veterinary assistants per veterinarian.

nicians and assistants and a constructed comprehensive employment series for veterinarians. The chart displays Bureau of Labor Statistics information for 1992, 1995, and 1996 (1996 is the most recent year for which data are available). In the 5-year period presented, the use of technicians and assistants has been steadily, although modestly, increasing, from 0.94 per veterinarian in 1992 to 1.15 per veterinarian in 1996. There has been a slight change in the type of assistance used more intensively. The data suggest that as veterinarians have increased the use of technicians and assistants in the delivery of services, there has been a slight preference for the use of technicians over assistants. The use of technicians accounted for 40% of the total measure in 1992 (0.38 of 0.94) and 43% of the total in 1996 (0.49 of 1.15).

There is some evidence that practices that utilize technicians and assistants more are financially better off than those who are less reliant on staff labor. Practices that use technicians and assistants more have a higher probability of being financially healthy than practices with lesser utilization of technicians and assistants. We come to this conclusion on the basis of analysis that we performed using private practice financial data and data on usage of assistants and technicians that we collected in our veterinarian survey. In this analysis, we have compared the top 25 percent of practices in terms of financial health with the bottom 25 percent (for this analysis, we measured financial health as the ratio of net income per veterinarian). Table 14 shows the ratio for small animal practices.

The average number of technicians and assistants to veterinarians for the top 25% (healthiest) practices is 2.3, whereas the average ratio of technicians and assistants to veterinarians for the least healthy practices is only 1.6. The healthier practices are utilizing more nonveterinarians, in comparison to the least healthy practices.

Table 14—Ratio of technicians and assistants to veterinarians

Financial health group	Ratio
Top 25% (healthiest)	2.3
Bottom 25% (least healthy)	1.6

Practices are assigned to the top 25% and bottom 25% groups based on the practice's amount of real net income per veterinarian.

## References

1. Daneshvary N, Schwer RK. The nature of demand for companion pet health care. *J Appl Bus Res* 1993;9:24–32.
2. R. K. House & Associates Ltd. Results of the 1992 economic survey. Ontario, Canada: Ontario Veterinary Medical Association.
3. Wise JK, Kushman JE. Synopsis of US veterinary medical manpower study: demand and supply from 1980 to 2000. *J Am Vet Med Assoc* 1985;187:358–361.
4. *USDA agricultural baseline projections to 2007*, Tables 23–26, 34, Office of the Chief Economist, USDA, Staff Report WAOB-98-1, February 1998.
5. US Meat Supply & Use. *Agricultural outlook*, Tables 10 and 25, Economic Research Service, USDA, AGO-254, September 1998.
6. Melson G, Schwarz R, Beck AM. Importance of companion animals in children's lives—implications for veterinary practice. *J Am Vet Med Assoc* 1997;211:1512–1518.
7. Melson GE. Availability of and involvement with pets by children: determinants and correlates. *Anthrozoos* 1988;2:45–52.
8. Rost DH, Hartmann A. Children and their pets. *Anthrozoos* 1994;7:242–254.
9. Staats A, Miller D, Carnot MJ, et al. The Miller-Rada Commitment to Pets Scale. *Anthrozoos* 1996;9:88–94.