
Chapter 3

The Future Demand for Food Supply Veterinarians in Industrial Veterinarian Careers in Pharmaceutical Companies

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Introduction

This study provides a systematic analysis of the likely future demand and potential shortages for food supply veterinary medicine (FSVM) professionals employed in industrial veterinary positions in pharmaceutical organizations. Six inter-related questions are addressed:

- I. What are the issues and trends likely to drive the future demand for industrial food supply veterinarians employed in pharmaceutical firms?
- II. Assuming a continuation of currently unfolding trends and the absence of major catastrophic events, what will be the demand for industrial-pharmaceutical food supply veterinarians over the next several years?
- III. What are the specialized activities (e.g., roles, responsibilities, skill areas, clients served, etc.) that will have substantially higher or lower demand relative to the general pattern of demand in the industrial-pharmaceutical food supply area?
- IV. What are the issues and trends likely to drive the future supply of veterinarians entering industrial food supply veterinary careers in pharmaceutical careers?
- V. Given the pattern of emerging trends and factors influencing supply and demand, and assuming the absence of any major catastrophic events, what will be the likely surplus or shortage of industrial-pharmaceutical food supply veterinarians over the next several years?
- VI. Given the answers to the first five questions, how can the pharmaceutical industry and the FSVM profession take action now to create a better future?

This report provides a description of the research method used and then presents the answers to each of these six questions.

The Delphi Forecasting Technique

Food supply veterinarians live in a changing world. Predicting the future is never an easy task and the changing context of the FSVM profession makes the linear extrapolation of historical trends with econometric models, as was used in the KPMG Mega Study, more problematic. The Delphi forecasting method¹ is an expert judgment forecasting method and is the main alternative to historical trend-based methods. It is the best method for identifying emerging trends and the likely patterns of future demand for FSVM professionals, and determining whether there will be shortages or surpluses of food supply veterinarians in the future.

The Delphi method works hand-in-hand with strategic planning processes in that it appreciates that the future is only partly a function of unfolding larger societal forces that cannot be easily managed or changed. It appreciates that the future is largely a function of trends that, if better understood now, can be acted upon before the future arrives. It is designed to identify leverage points that are important to planned change efforts. Strategic action by thoughtful leaders taken now can change the pattern of future demand and shortages/surpluses that experts predict will occur if current trends continue and no catastrophic events occur.

In this study, 13 different sectors of FSVM profession were identified and a Delphi forecasting process was used to evaluate each sector. The FSVM sectors evaluated are: Academe, Dairy, Swine, Poultry, Beef Cattle, State/Provincial Public Service, three sectors of US Federal Service (Public Health, Animal Health, and Food

¹ For a recent review of the scientific literature on this forecasting technique, see Rowe, G., & Wright, G. (1999). The Delphi Technique as a Forecasting Tool: Issues and Analysis, *International Journal of Forecasting*, 15, 353-375.

Safety & Security), Canadian Federal, Industrial Veterinarians in Pharmaceutical Firms, Small Ruminants, and Mixed Food Animal Practitioners in Rural Settings. After identifying a sector, experts were identified and their participation solicited. In general, panels of 15-25 members for each sector were created.

The Delphi method gathers expert opinion and then provides a structured feedback process where experts have an opportunity to consider the views of other experts. The feedback process is structured so that experts can change their predictions without any dysfunctional group dynamics that can plague interacting groups. It sets up a learning process where one expert has an opportunity to reconsider his or her judgment in the face of conflicting viewpoints from other experts. This should make the Delphi panel collectively smarter at the end of the process. The Delphi process used had three stages:

1. Panel members completed a first survey on issues relevant to demand forecasting. Specifically, we included potential influence items, identified from the FSVM literature, and asked panel members to rate each item's influence on the future supply or demand for food supply veterinarians in their sector. We also included open-ended questions giving panel members an opportunity to suggest additional relevant issues not included in the initial listing. After getting panel members to think about the trends and issues driving future demand, we then asked them to forecast demand changes over various time periods between 2004 and 2016. Panel members then rated the influence of various supply related trends. This was designed to help them think about likely future labor supply flows and prepared them to forecast whether there would be shortages or surpluses of veterinarians over these same time periods.

2. The results of the first survey were incorporated into the second survey. New items were derived from a content analysis of the open-ended replies. Demand and supply influence items with higher levels of disagreement within the panel were repeated, and the average rating and middle 50% range (between the 25th and 75th percentile) information was presented with each repeated item. A brief report explaining the general patterns in the data, including explanations for disagreement within the panel on future demand and shortage/surplus forecasts, accompanied the second survey. Thus, when panel members re-estimated future demand and shortages/surpluses they did this while considering panel information from the first survey.
3. The third survey followed a similar design strategy. Items with higher disagreement were repeated and the panel average and middle 50% range information were presented in this last survey. In addition, a brief report summarized the results of the second survey. Finally, items describing 18 different possible solutions to shortages were added to this survey.

Panel members came primarily from the US but experts that focused on Canada were also included. Panel members identified whether they had focused on the Canadian or the US context and additional analysis evaluated whether there seemed to be significant differences between the ratings of the US and Canadian sub-groups. While we see all panel members as having good expertise, we appreciate that some may be more expert than others. Panel members rated their own forecasting expertise and additional analyses contrasted those better than the median “expertise” score with those on the less-expert side of the median. This analysis identified items where there were significant differences

between those two sub-groups. Whenever Canadian versus US and expert versus less-expert differences were found, they were noted in the feedback to the panel. Examples of three of the surveys used for one expert panel are displayed in Appendix A, B, and C.

Issues and Trends Driving Future Demand for Food Supply Veterinarians in Industrial Veterinarian Careers in Pharmaceutical Companies Careers

The panel responded to both panel-suggested demand-related items that are unique to the industrial-pharmaceutical area, as well as items drawn from the general FSVM literature. This latter set of 25 items was included in the first surveys to all 13 panels included in this study. In addition to rating the 25 general items, panel members provided suggestions on additional issues influencing demand in the industrial-pharmaceutical FSVM sector. Twelve additional items were derived from those open-ended comments for a total of 37 items. In the second survey, the additional 12 items, and items where there was fair disagreement within the panel, were repeated. Higher agreement on several items was reached in the second survey and only the items with greater disagreement were repeated a final time in the third survey. The following are the survey items seen as *increasing* future demand (starting with the most influential issues and trends first):

Trends Increasing Demand

1. Public concerns over food safety (5.85 on a 7-point scale)²
Note that the self-rated forecasting experts' sub-group mean of 5.00 was significantly lower than the less-expert sub-group mean of 6.43.
2. Customer demand for product support services (mean: 5.83)
3. Increasing concern for animal welfare (mean: 5.69)
4. Higher customer demand for technical veterinary expertise (mean: 5.67)

² The items were rated on a 7-point Likert-type scale and evaluated based on the expected influence on future demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

5. Demand for more educational programs for customers (mean: 5.67)
6. Growing need to track animals entering the food chain (mean: 5.50)
Note that the self-rated forecasting experts' sub-group mean of 4.80 was significantly lower than the less-expert sub-group mean of 6.00.
7. Demand for veterinarians in sales positions (mean: 5.42)
8. Zoonotic disease-related human health concerns (mean: 5.38)
Note that the self-rated forecasting experts' sub-group mean of 4.60 was significantly lower than the less-expert sub-group mean of 5.86.
9. Higher expertise within producer operations (mean: 5.33)
10. Public concerns over bio-terrorism (mean: 5.25)
Note that mean of 5.86 for those focused on the US context was significantly higher than the mean of 4.50 for those focused on the Canadian context.
11. Larger food animal producer operations (mean: 5.17)
12. Increasing concern for animal health (mean: 5.15)
13. Required third party certification or verification of standards (mean: 5.08)
14. Client use of veterinary herd management services (mean: 5.08)
15. Availability of highly technical or specialized services (mean: 5.08)
16. Required high levels of technical skills in industrial positions (mean: 5.00)
17. Move to larger sized producer operations (mean: 5.00)
Note that the self-rated forecasting experts' sub-group mean of 4.60 was significantly lower than the less-expert sub-group mean of 5.43.

Note that items with a mean rating of 4.0 to 5.0 (between the “4. No Influence and “5. Slight Increase” scale anchor points) are not presented. See Exhibit B for a listing of these items as well as the distributions and ratings of all items used in the 1st, 2nd, or 3rd wave surveys. The mean values noted for each of the above (and following) items are from the last survey in which that item appeared.

Items with means below 4.0 are seen as leading to decreases in demand for food supply veterinarians. The three survey items noted below are trends rated as *decreasing* future demand, starting with the most influential factors first:

Trends Decreasing Demand

1. Mergers and consolidation in the pharmaceutical industry (mean: 3.33)³
Note that mean of 2.86 for those focused on the US context was significantly lower than the mean of 4.00 for those focused on the Canadian context.
2. Fewer new animal health products being developed (mean: 3.67)
3. Part-time farmers needing more veterinary services (mean: 3.91)
Note that the self-rated forecasting experts' sub-group mean of 3.25 was significantly lower than the less-expert sub-group mean of 4.33. Also, note that mean of 3.50 for those focused on the US context was significantly lower than the mean of 4.40 for those focused on the Canadian context.

The Planning Matrix

The ratings of these items are important to the extent that they can be used to understand and plan for the future. Some items noted above identify issues or trends that are “actionable,” or are areas where strategic actions can be taken to alter the expected pattern of influence suggested by the panel’s mean score. Others items identify issues that are fairly fixed constraints and less actionable. Such constraints include general societal concerns where the cooperation of other entities beyond the FSVM profession, such as governments, is needed to change the expected pattern of influence on future demand.

³ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence. See Exhibit B for a listing of these items as well as the distributions and ratings of all items used in the 1st, 2nd, or 3rd wave surveys. Note that items with a mean rating of 4.0 to 5.0 (between the “4. No Influence and “5. Slight Increase” scale anchor points) are not presented. The mean values noted for each of the above (and the following) items are from the last survey in which that item appeared.

Figure 1 Planning Matrix

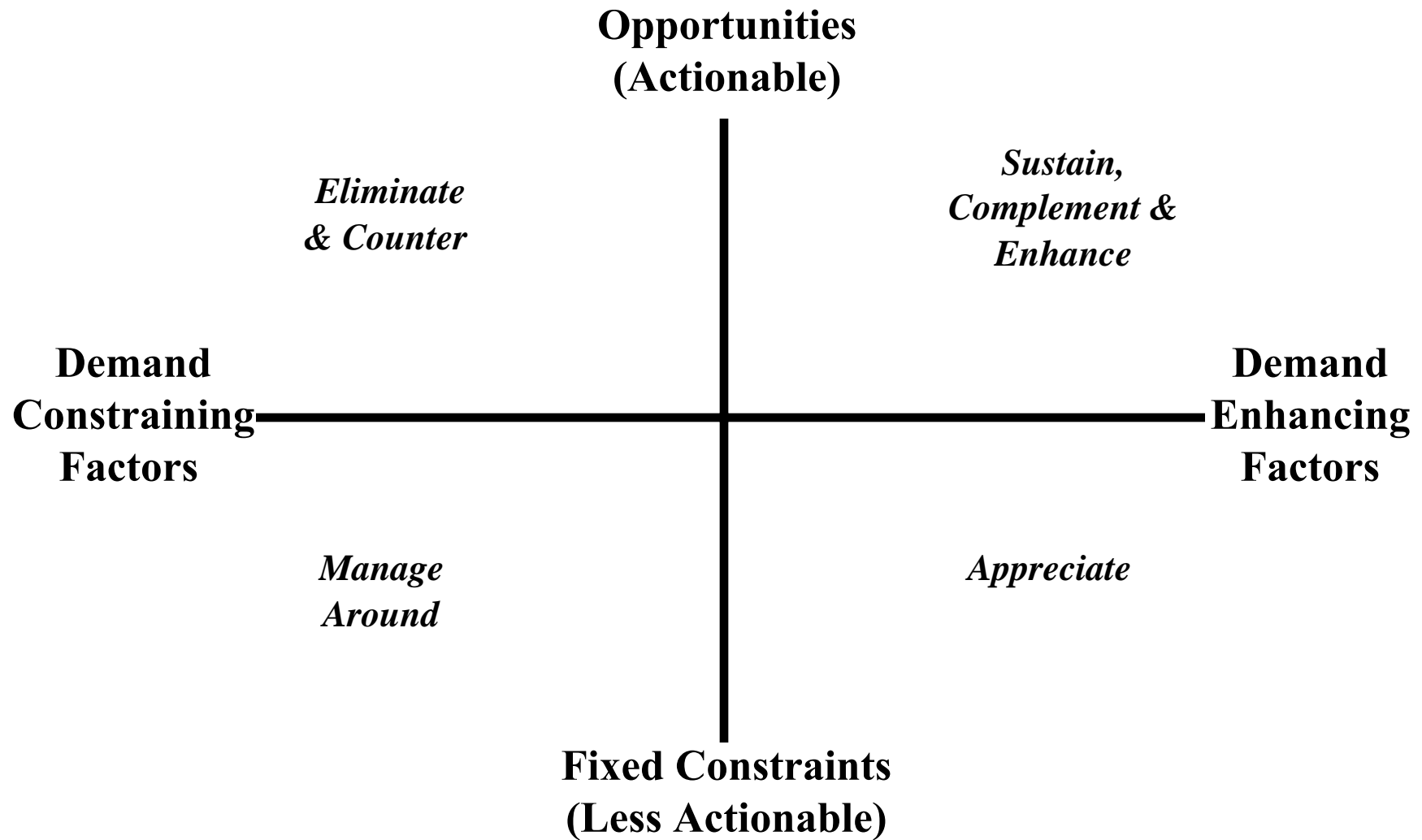
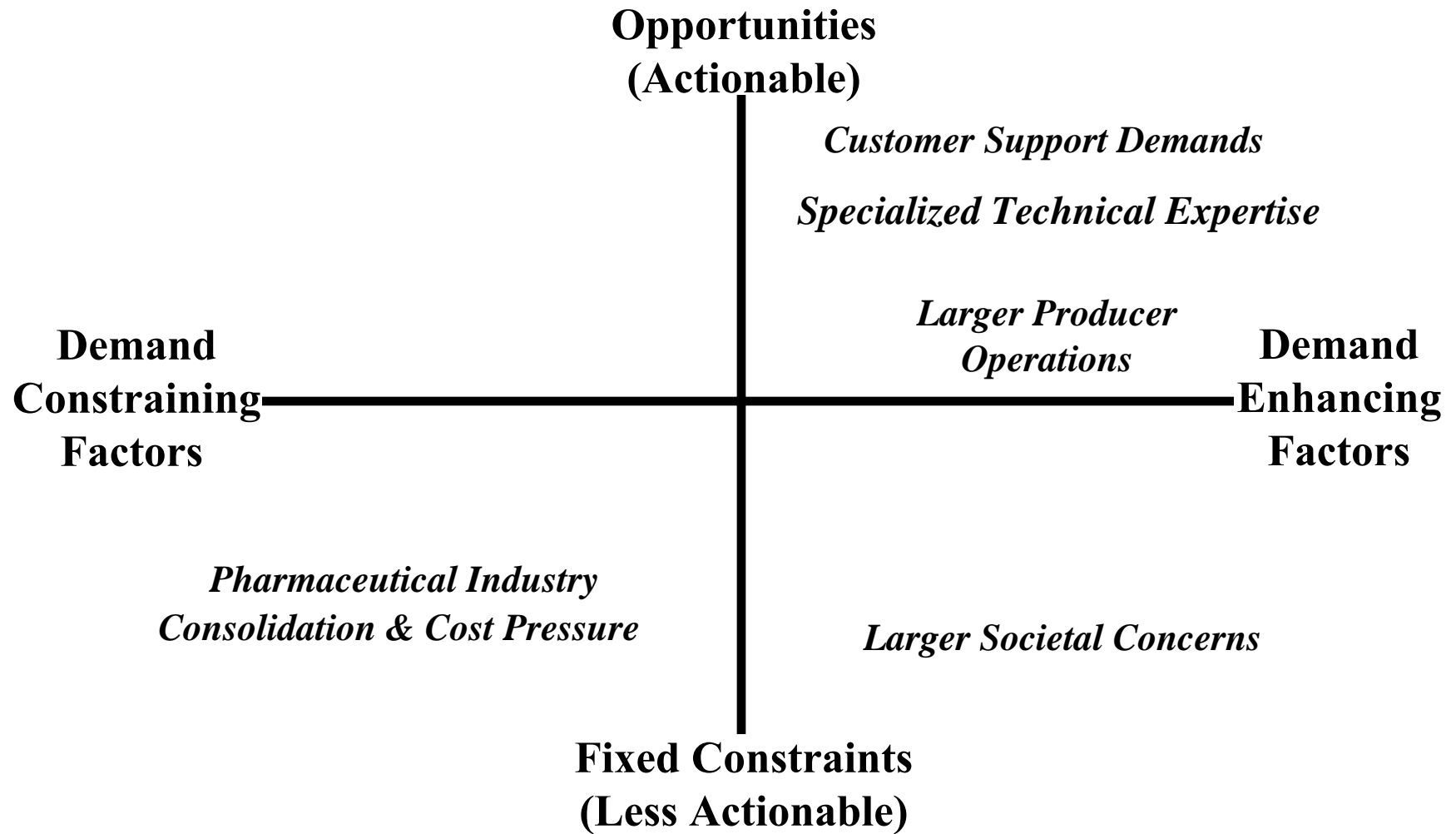


Figure 1 presents a planning matrix useful in organizing the pattern of results and guiding future strategic action. As noted in that figure, the best targets for strategic action are on the “actionable” or top-half of the figure. In order to increase future demand, actionable demand-constraining factors (that map to the top left-hand side of the figure) must be eliminated or countered in some fashion. The top, right-side quadrant represents actionable demand-enhancing trends that can be sustained, complemented, or enhanced in some way. The lower quadrants represent less-manageable trends and factors. Any strategic responses to the challenges uncovered by this research need to be mindful of these constraints.

This planning matrix can be used to organize the results of the analysis of the demand related issues and trends. The three demand-decreasing items above can be mapped to the left-side of Figure 1. Figure 2 captures the pattern of results. For example, items 1 (mergers and consolidation in the pharmaceutical industry) and 2 (fewer animal health products) both relate to a Pharmaceutical Industry Consolidation & Cost Pressures theme. This theme is noted in the lower-left quadrant since it is the result of larger economic forces that cannot be readily changed by strategic action. Rather, it is a constraint that must be managed around. The larger theme that explains item 3 (part-time farmer) is less clear. Clearly the panel does not see this as something that is increasing demand for industrial veterinarians. There are no trends or issues expected to decreasing demand that can be changed with strategic action and logically fit in the upper-left hand quadrant of Figure 2.

Figure 2

Demand Diminishing & Enhancing Issues in the Industrial Veterinarians Sector



Many of the 17 demand-increasing items summarized above relate to larger societal concerns. Public concerns over food safety (item 1) is the higher rated item and similar concerns over animal welfare (item 3) is seen as having the third strongest influence on increasing demand. Both of these factors relate to a *Larger Societal Concerns* theme. Additional dimensions of this theme are indicated by item 8 (zoonotic disease concerns), item 10 (bio-terrorism concerns), and item 12 (animal health concerns). These items have long been demand factors for the profession, but have become larger issues in the public eye over recent years. These are not factors that are easily changed by strategic actions in the profession, but should be appreciated in the strategic planning process. This *Larger Societal Concerns* theme is noted in the lower-left quadrant of Figure 2 since these are less actionable.

Item 4 relates to customers demanding more technical veterinary expertise and is similar to item 15 (availability of specialized services) and item 16 (required high levels of technical skills). These illustrate a *Specialized Technical Expertise* theme. Since these demand factors can be directly managed and enhanced by strategic initiatives, it is noted in the upper-left “actionable” quadrant of Figure 2. A few items illustrated another quite actionable opportunity, *Customer Support Demands*, which is also noted in the upper-left quadrant. The primary items that identify this theme are item 2 (customer demands for product support) and item 5 (more educational programs for customers). Items 7 (demand for veterinarians in sales positions) and item 9 (higher expertise within producer operations) are also related to this “higher customer demand” theme. The last theme noted in the upper-left quadrant of Figure 2 is *Larger Producer Operations*. Items 11 (larger food animal producer operations) and item 17 (move to larger sized producer

operations) illustrate this theme, and item 14 (client use of veterinary herd management services) is a secondary indicator.

The *Larger Producer Operations* theme has been placed near the middle line in recognition that there are larger economic forces, such as consolidation, behind this theme; however, it is included in the upper-left quadrant to note that there are strategic opportunities and ways to complement or sustain this demand-enhancing factor. Note that while the increasing size of producer operations is a demand increasing opportunity for industrial veterinarians, this same factor was not always seen as increasing demand in other FSVM sectors.

The Future Demand for Food Supply Veterinarians in Industrial Veterinarians Careers in Pharmaceutical Companies

The Delphi process gave panel members an opportunity to make initial estimates of future demand over several time periods in the first survey. The second survey and the feedback report that summarized the general patterns seen in the first survey provided an opportunity to re-estimate future demand. The Delphi methodology encourages panelists to reconsider their estimates in light of the views of other panel members. The third survey and accompanying report on the second survey results was a second opportunity to reconsider and make final projections of future demand.

Demand estimates were grouped into three time periods: Short-Term (fall of 2004 to fall of 2007), Medium-Term (fall of 2007 to fall of 2010) and Long-Term (fall of 2010 to fall of 2016). Demand estimates were stated in the form of the expected percentage increase or decrease from the start to the end of these time periods. Both range and point estimates are provided. The range estimates identify the middle 50% of panel members (the estimates between the 25th percentile and 75th percentile of the distribution, or inter-quartile range) and the point estimates include both the arithmetic mean and the median (or estimate at the 50th percentile) of the distribution of estimates. Figures 3 through 5 provide the results of each time period. Figure 6 provides a summary of the results of the final survey for all three time periods.

Figure 3

Short-Term Demand Change (2004-07)

2nd Survey Results:

- Mid-50% = +1.0% to +9.8%
- Mean = +6.4% (■)
- Median = +6.0% (▲)

3rd Survey Results:

- Mid-50% = +1.0% to +7.0%
- Mean = +3.7% (■)
- Median = +3.5% (▲)

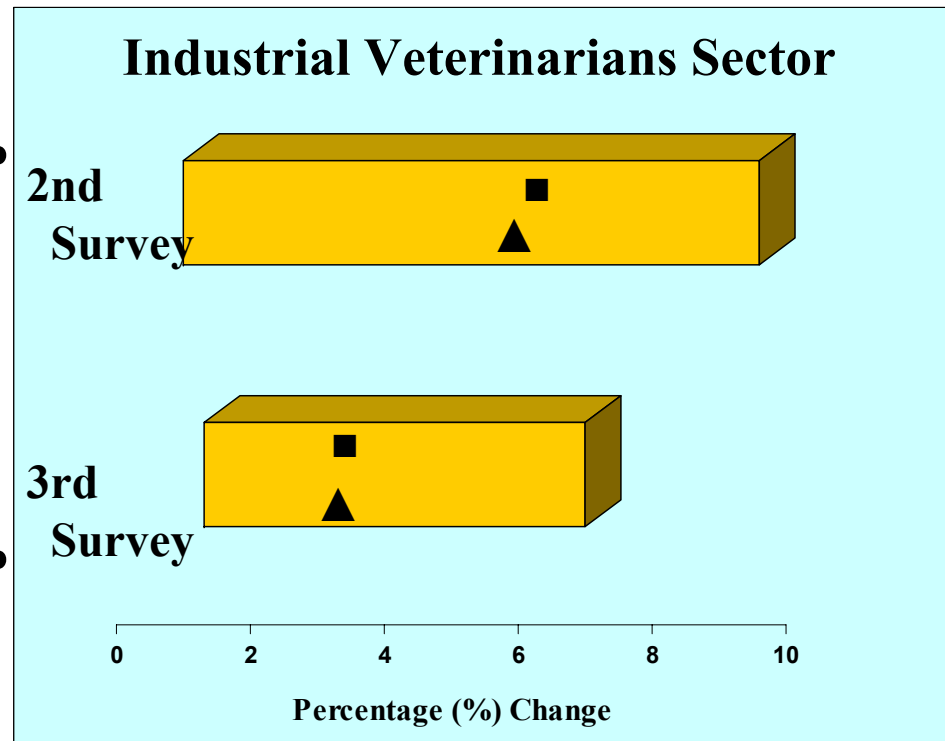


Figure 4

Medium-Term Demand Change (2007-10)

2nd Survey Results:

- Mid-50%: +1.0% to +6.8%
- Mean = +4.3% (■)
- Median = +4.5% (▲)

3rd Survey Results:

- Mid-50%: +2.0% to +7.0%
- Mean = +4.4% (■)
- Median = +5.0% (▲)

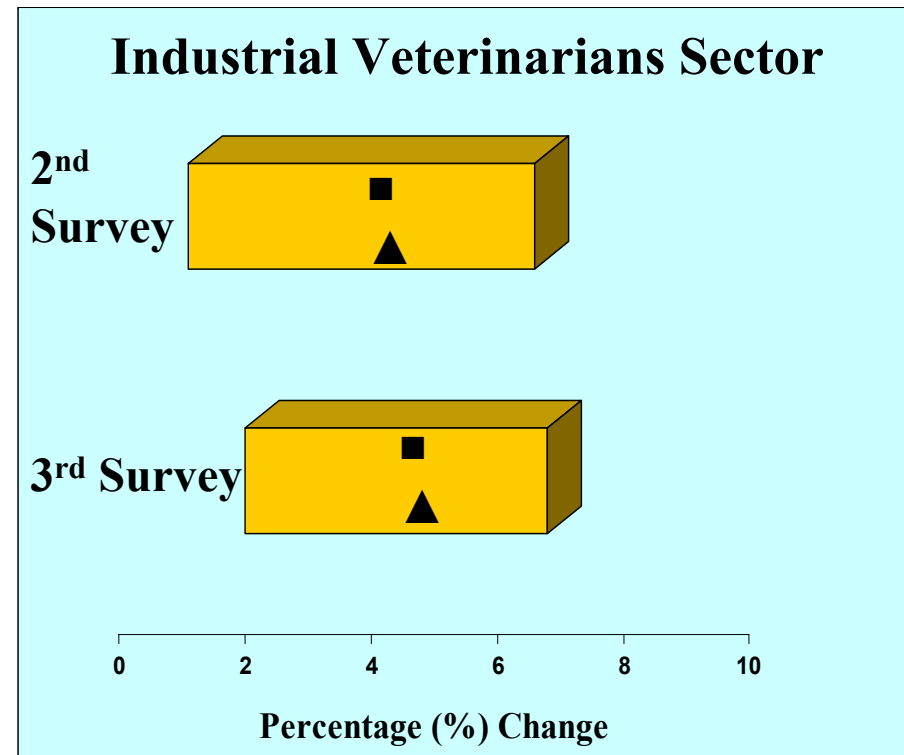


Figure 5

Long-Term Demand Change (2010-16)

2nd Survey Results:

- Mid-50%: +2.0% to +8.0%
- Mean = +5.5% (■)
- Median = +5.0% (▲)

3rd Survey Results:

- Mid-50%: +0.8% to +9.5%
- Mean = +5.4 % (■)
- Median = +5.0 % (▲)

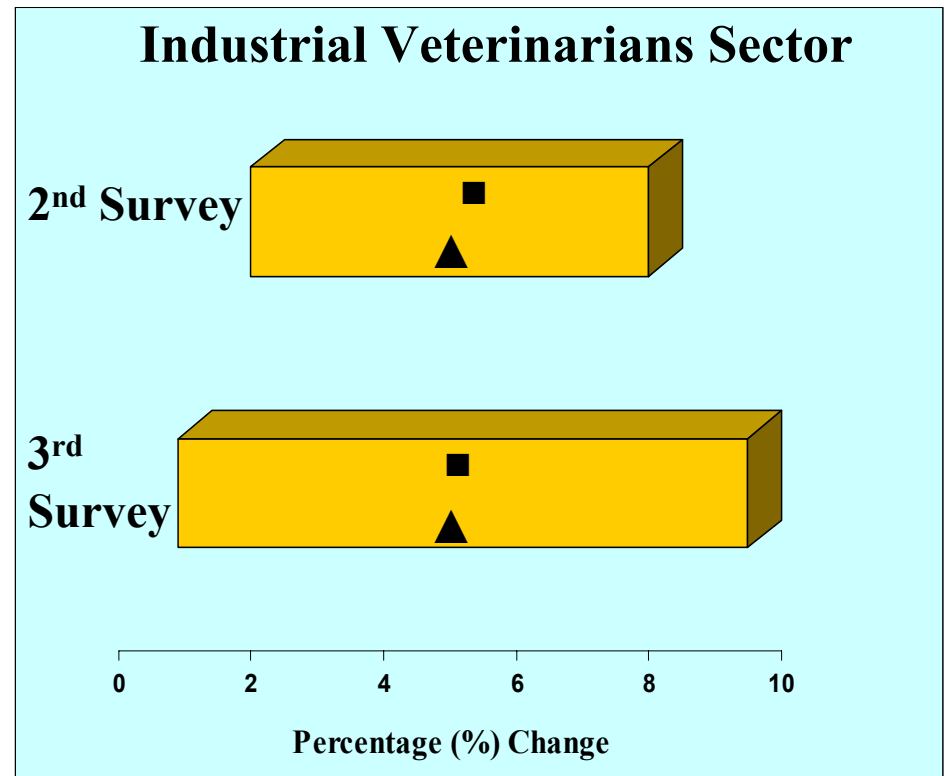


Figure 6

Future Demand Summary

Short-Term (2004-07):

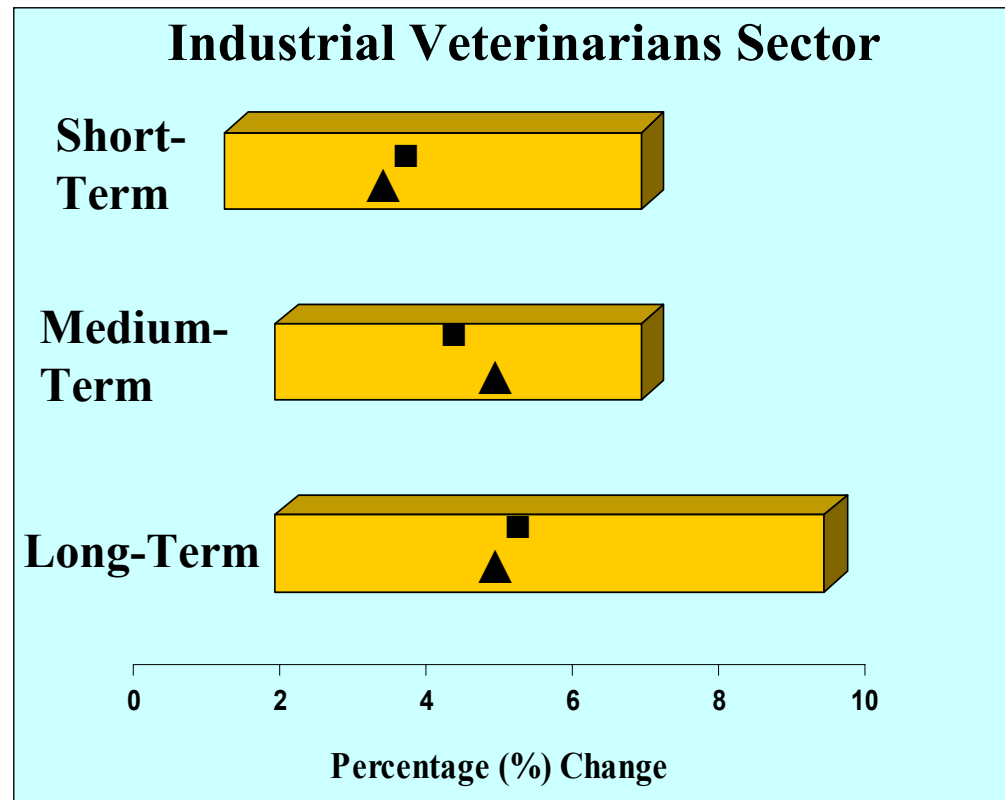
- Mid-50% = +1.0% to +7.0%
- Mean = +3.7% (■)
- Median = +3.5% (▲)

Medium-Term (2007-10):

- Mid-50%: +2.0% to +7.0%
- Mean = +4.4% (■)
- Median = +5.0% (▲)

Long-term (2010-16):

- Mid-50%: +2.0% to +9.5%
- Mean = +5.4% (■)
- Median = +5.0% (▲)



There is a general consensus that demand is increasing. The middle 50% of the panel projected demand increases over all three time periods in the final survey. The point estimates seen in the means and median scores varied between +3.5% and +6.0%. While there was general agreement that demand will increase, there remained after the final Delphi round some disagreement on the exact extent that demand is expected to increase. For example, in the middle 50% of panel members in forecasting the short-term increases in demand ranged from +2.0% to +7.0%. While this is narrower than the +1.0% to +9.8% range seen in the second round survey, it still suggests ample disagreement. There was understandably a wider range of projections for the longer-term forecast. There is naturally more room for uncertainty about how trends will play out in the future.

Further analysis was done to evaluate the basis for these differing perceptions within the panel. T-test analyses contrasting the demand forecasts of Canada-focused panelists versus US-focused members found no significant difference in the forecasts of those two sub-groups. Additional t-test analyses based on self-rated forecasting expertise found significant differences. Those at or above the median self-rated forecasting expertise score always projected significantly less demand than the less-expert sub-group in the second round forecasts. The differences in the final survey were always in the direction of the expert sub-group seeing less demand, but these differences only reach statistical significance ($p < .027$) in the medium term forecast. There was a tendency for the third-survey means of the less-expert sub-group to make larger shifts toward the expert sub-group in the third-round survey (than vice versa). Had the more stable expert

sub-group been used to establish the third survey means presented in Figures 3 to 6, we would have seen the following:

- Short-Term Demand (2004-07): +3.2% increase in demand
- Medium-Term Demand (2007-10): +2.6% increase in demand
- Long-Term Demand (2004-07): +4.8% increase in demand

In summary, those in the more-expert subgroup are more conservative in their estimates and tended to see weaker future demand increases. This, at least, partially explains the wide range of estimates seen in this panel.

Varying Estimates of Demand

To better understand the range of demand forecasts made by panel members, the third-survey forecasts over all time periods were averaged and those seeing rating demand increases at or above the median score versus those projecting lower increases in demand were created. Those in the *higher-demand* sub-group had a median score of +7.33%, while those in the *lower-demand* sub-group had a median score of +2.17%. T-test analyses were used to evaluate the extent that these two sub-groups rated the various demand-increasing or -decreasing (summarized in the previous section) items differently. Several significant differences in their ratings of the demand-influencing factors were found. The following factors are seen by those projecting higher (versus lower) future demand increases as having significantly *higher* influence on demand:⁴

- Public concerns over food safety (mean is 6.50 in the higher-demand sub-group vs. 5.17 in the lower-demand sub-group)
- Demand for more educational programs for customers (6.17 in the higher-demand sub-group vs. 5.17 in the lower-demand sub-group)

⁴ The scale introduced earlier should be used in interpreting the mean values for the high vs. low increasing demand for these and the next set of items: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

- Growing need to track animals entering the food chain (6.17 in the higher-demand sub-group vs. 4.83 in the lower-demand sub-group)
- Government restrictions in the development of new products (5.50 in the higher-demand sub-group vs. 3.83 in the lower-demand sub-group)
- Required high levels of technical skills in industrial positions (5.50 in the higher-demand sub-group vs. 4.50 in the lower-demand sub-group)
- Higher expertise within producer operations (5.83 in the higher-demand sub-group vs. 4.83 in the lower-demand sub-group)

Those seeing stronger demand seemed to be more optimistic about a variety of demand influences. Each of the items noted above related to each of the themes noted on the right hand-side of Figure 2 (e.g., *Customer Support Demands*, *Specialized Technical Expertise*, etc.). The significantly higher ratings of influence (means) of those in the higher- versus lower-demand sub-groups, plus differences associated with panel member's self-rated expertise, go far in explaining the range of opinions on future demand.

Specialized Activities Increasing in Demand

Open-ended questions in the first survey invited panel members to identify activity areas (e.g., roles, responsibilities, skill areas, clients served, etc.) where there will be a substantial future increase or decrease in demand. These suggestions were content analyzed and 9 areas received multiple mentions. These were used to form items which panel members rated in the second survey. The *higher-demand* activity areas (starting with the highest rated areas) are:

1. Sales and marketing support (mean: 5.58 on a 7-point scale)⁵
2. Product support services (mean: 5.58)
3. Staff training for larger producer operations (mean: 5.42)
4. Specialized knowledge requiring advanced training (mean: 5.17)
5. Consultations on routine herd health issues (mean: 4.73)
6. Quantitative analysis to evaluate effectiveness (mean: 4.67)
7. Managerial and administrative activities (mean: 4.58)

The other activity areas are seen as facing relatively lower demand in the future.

These *lower-demand* areas are:

1. Involvement in individual animal care (mean: 3.58)
2. Training support for small producer operations (mean: 4.00)

Figure 2 noted two actionable demand-enhancing strengths that industrial-pharmaceutical food supply veterinarians enjoy. They are the *Specialized Technical*

⁵ The items were rated on a 7-point Likert-type scale and evaluated based on forecasted increase in demand relative to the expected general pattern of demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 4. No Difference, 5. Slight Increase, 6. Increase, 7. Strong Increase. There were no significant differences in the ratings of expert versus less-expert subgroups on these activity areas.

Services and *Customer Support Demands* factors. Of the seven activity areas noted above higher-demand activities, all but item 7 (managerial and administrative activities) are closely related to those two themes. Serving large producer customers (see item 3) and focusing on herd health issues (see item 5) with technical expertise (see items 4 and 6) is higher demand than serving smaller producers and focusing in on individual animal care. The last two areas were noted as not increasing in demand. Other activity items relate to supporting other pharmaceutical company functions and jointly serving customers in a more coordinated fashion (see items 1 and 2 from the higher-demand activity listing).

Trends and Issues Driving the Future Supply of Food

Supply Veterinarians in Pharmaceutical-Industrial Roles

The panel responded to both panel-suggested supply related items as well as items drawn from the general FSVM literature. The latter set of 17 items was included in surveys to all 13 panels in this study. Five additional supply-related influence items were drawn from open-ended comments to the first survey and included in the second survey. Items from the initial set of 17 items were also included in the second survey where there was fair disagreement within the panel on the influence of an item. The final survey included items with fair disagreement seen in the second survey ratings. The mean value from the last survey in which the item was asked is used in the listing noted below. The following are the highest-rated trends or issues seen as *increasing* the future supply of veterinarians entering industrial-pharmaceutical food supply careers:

Trends Increasing Supply

1. Expectations of a better lifestyle (mean: 5.58 on a 7-point scale)⁶
2. Income opportunities in industrial veterinary roles (mean: 5.42)
3. Expected high number of food supply veterinarians retiring in the near future (mean: 4.83)
4. Lack of cultural and recreational opportunities in rural areas (mean: 4.83)
5. High debt load of veterinary school graduates (mean: 4.73)
6. Need to work long hours and emergency calls (mean: 4.58)
7. Lack of spousal career options in rural areas (mean: 4.50)

⁶ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future supply of veterinarians entering industrial-pharmaceutical food supply careers. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

8. Poor income opportunities in other veterinary medicine areas (mean: 4.50)
Note that the self-rated more-expert sub-group mean of 3.60 was significantly less than the less-expert sub-group mean of 5.14.
9. Fewer opportunities in other veterinary medicine areas (mean: 4.50)
10. Limited lifestyle and career opportunities in rural areas (mean: 4.50)
Note that the self-rated more-expert sub-group mean of 3.80 was significantly less than the less-expert sub-group mean of 5.00.

The panel rated several trends and factors that are leading to a *decrease* in the future supply of food supply veterinarians entering into industrial-pharmaceutical careers. These are presented starting with the most extreme supply-decreasing factors:

Trends Decreasing Supply

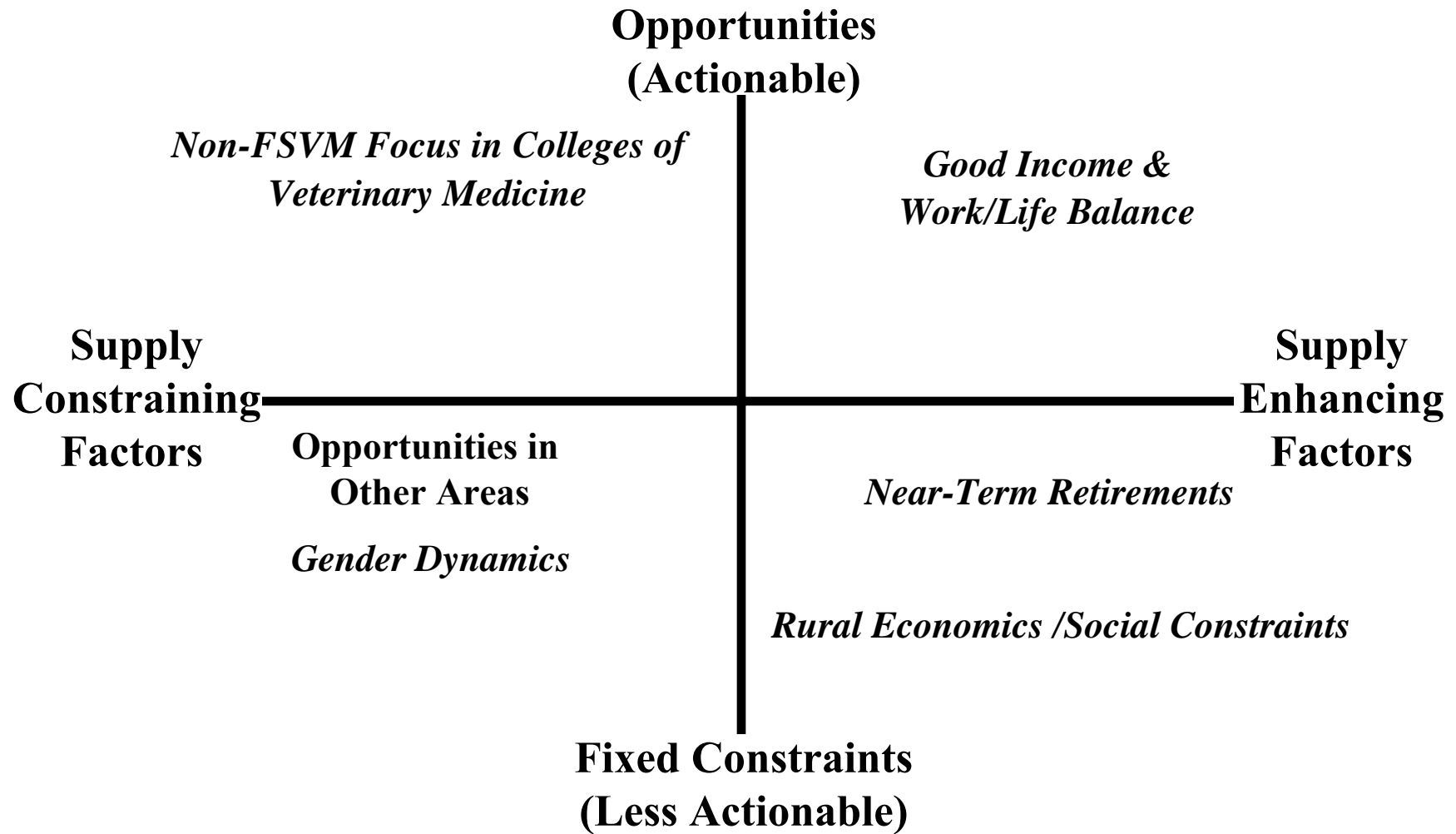
1. Little exposure to food supply career options in college (mean: 3.58)⁷
2. Less emphasis on food animal practice in veterinary colleges (mean: 3.67)
3. Perceived lack of demand for food animal skills (mean: 3.82)
4. Lack of food supply practice-related externships for students (mean: 3.91)
Note that the self-rated more-expert sub-group mean of 3.40 was significantly less than the less-expert sub-group mean of 4.33.
5. More women veterinarians entering the workforce (mean: 3.92)
6. Increasing opportunities in other veterinary medicine areas (mean: 3.92)
Note that the sub-group focused on the Canadian context had a significantly lower mean, 3.40, which indicates a stronger supply-decreasing influence, than those focused on the US context (mean: 4.29).

These supply-related factors can also be organized into the planning matrix introduced earlier. Figure 7 captures the general pattern seen in the above listings. The list of six supply-constraining factors all map to the left-side of that figure. The more extreme impediments to the future supply, such as items 1 (little exposure to food supply

⁷ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of dairy practice veterinarians. The mean rating for each item is noted in parentheses. The following scale anchor points will help in the interpretation of those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

Figure 7

Supply Diminishing & Enhancing Issues in the Industrial Veterinarians Sector



career options), 2 (less emphasis on food animal practice), and 4 (lack of food supply practice-related externships) all illustrate a *Non-FSVM Focus in Colleges of Veterinary Medicine* theme. Item 3 (perceived lack of demand for food animal skills) is logically a consequence of this non-FSVM focus. This is placed in the upper-right quadrant of Figure 7. It is an actionable strategic opportunity. This trend can be addressed and changed without the cooperation or resources of external entities.

A number of the items constraining supply reflect larger societal and economic trends and, as such, are less actionable. They need to be understood and managed around. Item 6 (opportunities in other areas) related to a general increasing in other areas, such as companion animal practice, that serve to pull students away from the FSVM area. This is noted as the *Opportunities in Other Areas* theme. This has been placed in the lower-left quadrant to note that there are larger economic constraints that make this issue less actionable. The *Gender Dynamics* theme is also noted in the lower-quadrant of Figure 7. It is related to item 5 (more women veterinarians) to patterns that have its basis in larger societal forces and, as a result, is not easily changeable.

The 10 supply-increasing trends and issues presented above represent opportunities for promoting the pharmaceutical-industrial veterinarian sector. These map to the right-side of Figure 7. Note that many of these items are rated as having a modest influence on demand. Only two items had means above 5.0. Items 1 (a better lifestyle), 2 (income opportunities), and item 8 (poor income opportunities in other areas) relate to a *Good Income & Work/Life Balance* theme noted in the upper-right, or actionable, quadrant of Figure 7. Item 5 (high debt load) may be related in the sense that the higher incomes in industrial veterinary positions provide attractive opportunities to pay off debt.

There are opportunities to advertise and promote these benefits and increase the supply of veterinarians to these roles.

The remaining items more logically map to the lower-right quadrant. The *Rural Economics/Social Constraints* theme is related to larger economic and social trends that are not easily managed. This theme is flagged by item 4 (lack of cultural and recreational opportunities in rural areas), item 7 (lack of spousal career opportunities), and item 10 (limited lifestyle and career opportunities in rural areas). While the means indicate that these are not strong supply-increasing factors, industrial veterinarian positions do seem to provide opportunities for veterinarians in other FSVM sectors. In other panels, these factors were associated with supply decreases. Thus, this factor pushes veterinarians away from other sectors, such as beef and dairy practices, and pulls them toward industrial positions. The *Near-Term Retirements* theme, noted by item 3, is related to the demographics of the profession. This was rated as a factor that will increase the number of new veterinarians *entering* into the profession. Since the retirement rate is largely age-based (even with early retirement programs), it is not highly actionable. The panel anticipates that there will be large number of retirements in the near future and their departure will create opportunities and will increase the supply of veterinarians *entering* industrial FSVM careers. An important related, but unrated, issue is the influence that the expected retirement bulge may have on the *aggregate* supply of food supply veterinarians. If these retirees are not replaced, the aggregate supply will go down even though there are more opportunities for new veterinarians entering industrial-pharmaceutical roles.

The Future Shortages of Food Supply Veterinarians in Pharmaceutical-Industrial Roles

After rating demand and supply related factors, panel members were asked to project the “most likely” estimate of the percent that available supply veterinarians would differ from the expected demand over various time periods. The Delphi process gave panel members an opportunity to make initial estimates of future shortages or surpluses in the first survey. Second and third survey estimates provided additional opportunities to reconsider earlier estimates after considering the views of other panel members.

Estimates of shortages were grouped into three time periods: Short-Term (fall of 2004 to fall of 2007), Medium-Term (fall of 2007 to fall of 2010) and Long-Term (fall of 2010 to fall of 2016). Panelists were instructed to assume a continuation of current trends and an absence of any catastrophic events in making their forecasts. These estimates are stated in the form of the expected average percentage surplus or shortage over each time period.

As was the case with demand estimates, both the range (i.e., the middle 50% of estimates) and the arithmetic mean and the median (i.e., the 50th percentile of the distribution of estimates) are used to summarize these forecasts. Figures 7 through 9 provide the results of each time period. Figure 10 provides the summary of the results from the final survey for all three periods.

The panel reached agreement that, given current trends, there will be a shortage of industrial-pharmaceutical food supply veterinarians over the next several years. The point estimates for the short-term (2004-2007) was -3.5% or -4.0% gap from expected demand (a shortage).

Figure 8

Short-Term Shortages (2004-07)

2nd Survey Results:

- Mid-50% = +1.0 % to -8.0%
- Mean = -3.1% (■)
- Median = -1.0% (▲)

3rd Survey Results:

- Mid-50% = -1.0% to -6.0%
- Mean = -3.5%(■)
- Median = -4.0% (▲)

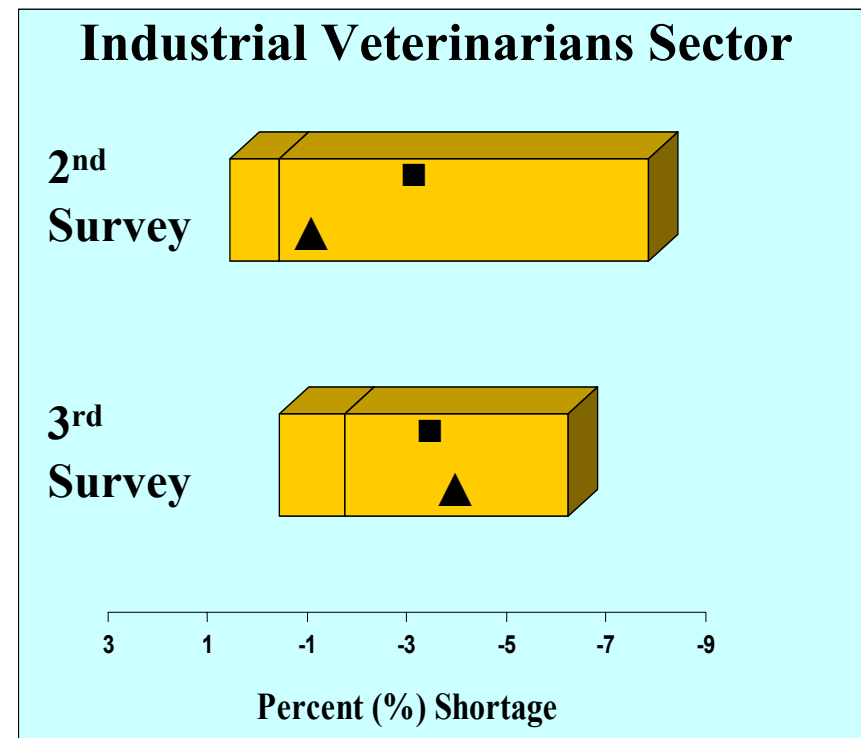


Figure 9

Medium-Term Shortages (2007-10)

2nd Survey Results:

- Mid-50% = +3.0% to -3.0%
- Mean = -0.6% (■)
- Median = 0% (▲)

3rd Survey Results:

- Mid-50% = -.3% to -4.8%
- Mean = -2.8%(■)
- Median = -2.5% (▲)

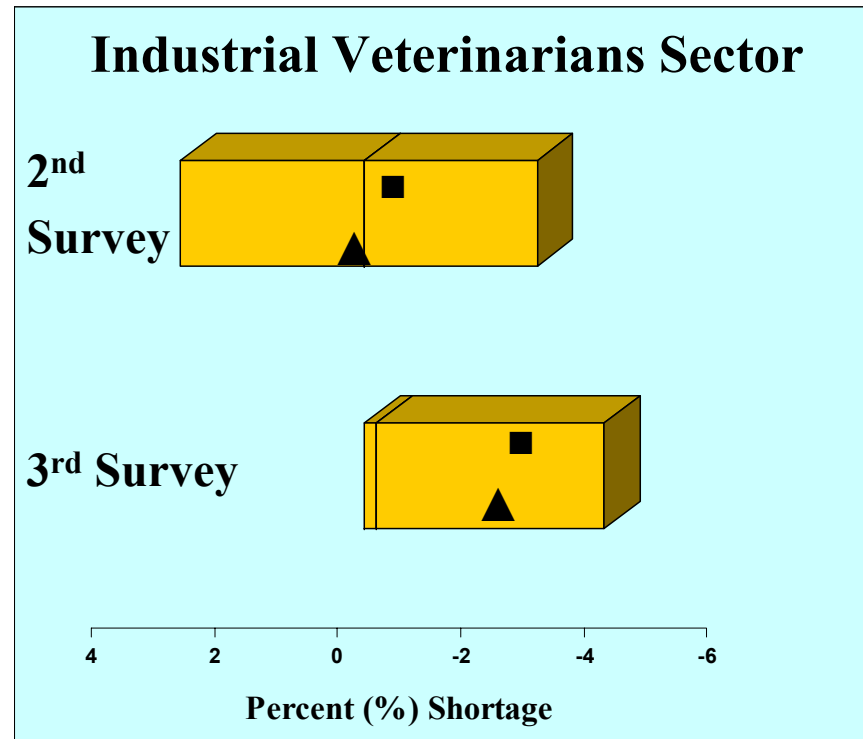


Figure 10

Long-Term Shortages (20010-16)

2nd Survey Results:

- Mid-50%: -0.8% to -4.8%
- Mean = -2.0% (■)
- Median = -0.8% (▲)

3rd Survey Results:

- Mid-50%: 0% to -4.9%
- Mean = -2.9% (■)
- Median = -2.0% (▲)

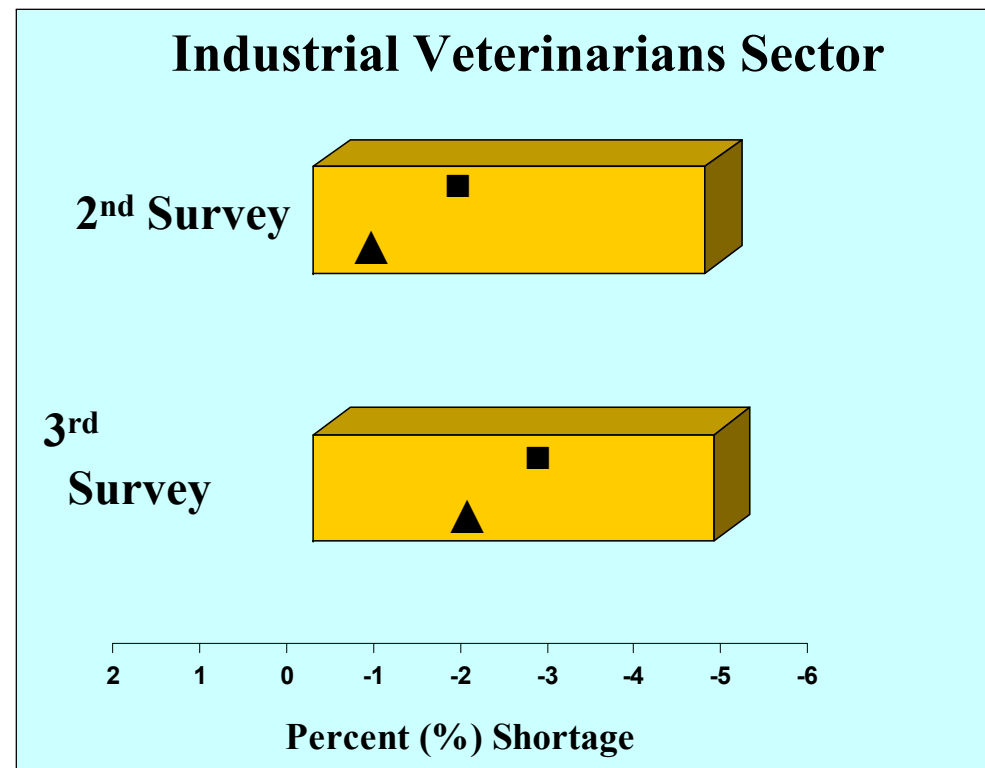


Figure 11

Future Shortages Summary

Short-Term (2004-07):

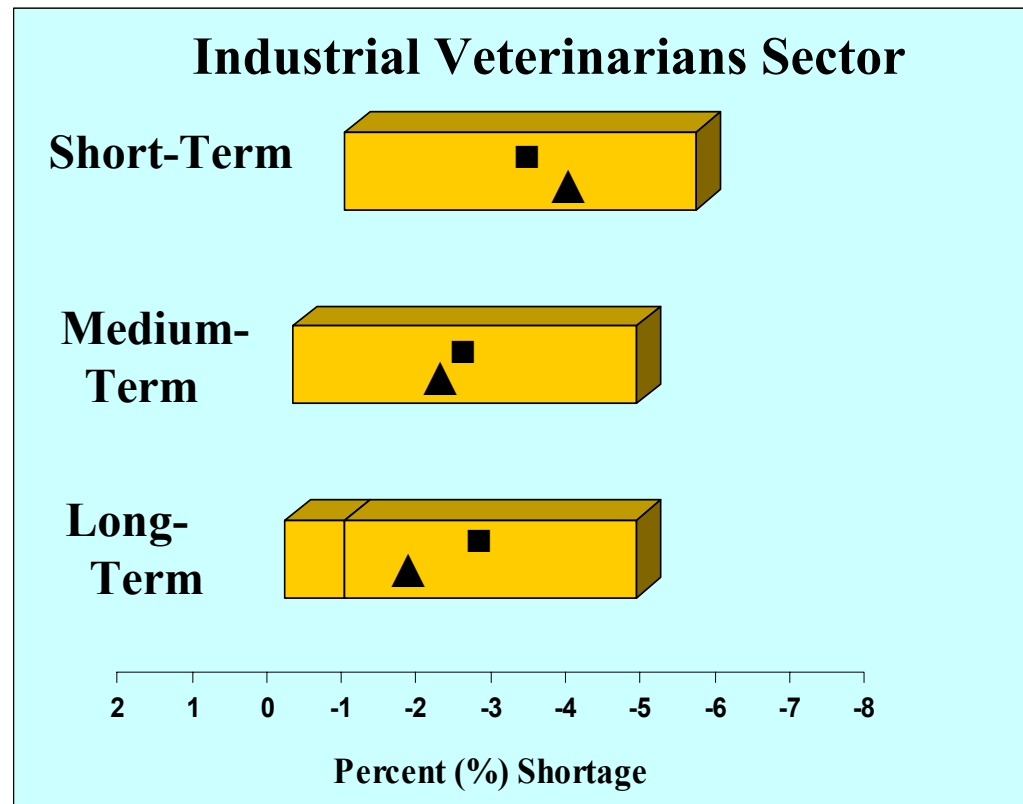
- Mid-50% = -1.0% to -6.0%
- Mean = -3.5% (■)
- Median = -4.0% (▲)

Medium-Term (2007-10):

- Mid-50%: -0.3% to -4.8%
- Mean = -2.8% (■)
- Median = -2.5% (▲)

Long-term (2010-16):

- Mid-50%: -0.8% to -4.8%
- Mean = -2.9% (■)
- Median = -2.0% (▲)



The gap gets smaller after the 2007 period and the point estimates are in the -2.0% to -2.9% range. The middle 50% of estimates for those latter two periods are from -.8% and .3% on the low side to just under 5.0% on the high end of the range. During the first two time periods, we see an indication of increasing agreement as the middle 50% range narrows in the third survey compared to the second survey. The second survey medians were fairly close to zero indicating a closer match between supply and demand but moved into the negative numbers, indicating shortages, in the final survey round. T-test analyses did not find any statistically significant differences between the country of focus or the forecasting expertise sub-groups. The US-focused means provided estimates of slightly deeper shortages for the medium-term (-3.3%) and long-term (-3.4%), while the Canadian-focused means indicated less deep shortages of -2.2% for both of those periods. Note that the distribution of shortages had occasional values that were outside of the general range of replies by an extreme degree. These “outliers” were eliminated prior to doing the final calculations.

Varying Estimates of Shortages

Additional analysis was conducted to further explore the range of shortage forecasts within the panel. These analyses were used to determine the factors that differentiated those making more conservative estimates versus those projecting more extreme shortages. A median split, based on the median shortage estimated over all time periods was used to place panelists into “limited-shortages” and “deeper-shortages” sub-groups. The limited-shortages sub-group had a median shortage of -.8% and the deeper-shortages sub-group had a median shortage of -5.1%. That analysis indicates that those seeing deeper future shortages differ from the more conservative panelists primarily in how they

view demand issues, in that they see *more extreme demand-increasing* influences associated with:

- Public concerns over food safety (mean: 6.33 on a 7-point scale vs. 5.33 in the limited-shortages sub-group)⁸
- Zoonotic disease-related human health concerns (mean: 6.00 vs. 4.67 in the limited-shortages sub-group)
- Need to protect indigenous wildlife from exotic diseases (mean: 5.17 vs. 4.00 in the limited-shortages sub-group)
- Increasing concern for animal welfare (mean: 6.33 vs. 5.44 in the limited-shortages sub-group)
- Required high levels of technical skill in industrial positions (mean: 5.50 vs. 4.50 in the limited-shortages sub-group)

Those seeing deeper shortages also see the following *skill areas* as having

significantly *higher* future demand:

- Sales and marketing support demand (mean: 6.00 on a 7-point scale vs. 5.17 in the limited-shortages sub-group)⁹
- Specialized knowledge required for advanced training (mean: 5.67 versus 4.67 in the limited-shortages sub-group)
- Staff training for large producer operations (mean: 6.00 versus 4.83 in the limited-shortages sub-group)

While the analysis of supply related factors did not identify any clear supply-constraint explanations for the varying estimates for future shortages, the demand factors

⁸ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future demand of industrial-pharmaceutical food supply veterinarians. The mean rating in parentheses is for the sub-group that sees deeper shortages (those seeing a 3% or higher average shortage) and the second mean is for the limited-shortages sub-group (less than a 3% average shortage). The following scale anchor points will help in the interpretation of those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

⁹ The items were rated on a 7-point Likert-type scale and evaluated based on the extent that these activities will experience higher or lower demand relative to the general pattern of demand. The mean rating in the parentheses is for the sub-group seeing deeper shortages (those seeing a 3% or higher average shortage) and the second mean is for the limited-shortages sub-group (seeing less than a 3% average shortage). The following scale anchor points will help in the interpretation of these means: 1. Significantly Lower, 2. Lower, 3. Slightly Lower, 4. No Change, 5. Slightly Higher, 6. Higher, 7. Significantly Higher.

provided insights into differing views of future shortages. The sub-group seeing more extreme shortages is more optimistic about how key demand-increasing influences will play out in the future. Those in the deeper-shortages sub-group, see general societal concerns (food safety, animal welfare, and human health related concerns) as providing significantly stronger demand increase, pressures those in FSVM in industrial positions. They also see significantly stronger demand for training large producer's staff and needs to assisting sales and marketing personnel in their efforts to serve customers.

Solutions for the Future Shortage of Food Supply Veterinarians in Pharmaceutical-Industrial Roles

How can the FSVM profession prepare for a better future and counter the trends that are going to lead to at least limited shortages of industrial-pharmaceutical veterinarians? 18 different potential solutions were developed and evaluated by all 13 panels. The panels rated the extent to which each solution will *eliminate* the expected veterinarian shortages. In interpreting the mean ratings noted below, one should keep in mind that a rating of 7 on the 7-point rating scale indicates that a solution would be “highly effective” at *eliminating* the expected shortage. The mean provides the arithmetic average of all ratings. The following are the 12 solutions that are rated above the mid-point of the scale. These are listed in order of rated effectiveness in eliminating shortages:

1. More involvement of food supply practitioners in training veterinary students (mean of 5.82 on a 7-point scale)¹⁰
2. Student debt repayment and scholarship programs for service in areas of need (mean: 5.33)
3. Provide expanded job placement services in the food supply veterinary medicine areas (mean of 4.92)
4. Appointment of more food supply faculty at colleges of veterinary medicine (mean: 4.83)
5. Reserve class slots for academically qualified students with food supply interests and relevant background (mean: 4.75)

Note that those focused on the Canadian context had a significantly lower mean (mean: 4.33) compared to those focused on the US context (mean: 5.60).

¹⁰ Panel members rated the extent that each possible solution will lead to an *elimination* of shortages. This high standard should be noted in interpreting the meaning of the mean rating. The following rating scale was used: 1. Not at all Effective, 3. Slightly Effective, 5, Effective, 7. Highly Effective.

6. Expand the Centers of Excellence concept where veterinary colleges provide a professional program with a nationally recognized focus on different food supply sectors (mean: 4.58)
7. Expanded post-graduate fellowships in food supply areas (mean: 4.58)
Note that the self-rated forecasting experts' sub-group mean of 3.20 was significantly lower than the less-expert sub-group mean of 5.57.
8. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities (mean: 4.45)
9. Paid externship requirement in food supply medicine during the summer (mean: 4.33)
10. Increased focus of food supply coverage early in DVM curriculum (mean: 4.33)
11. Focused recruitment of high school and college students with food supply interests into veterinary colleges (mean: 4.00)
12. Expanded business and practice management coverage in DVM curriculum (mean of 4.00)
Note that the self-rated forecasting experts' sub-group mean of 2.60 was significantly lower than the less-expert sub-group mean of 5.00.

These actions represent possible tactics that can be integrated into a larger strategy for dealing with future shortages. Tactics related to enhancing the interest of pre-veterinary students (item 8 and 11) and reserving slots for qualified FSVM-oriented students (item 5) should help increase the number of FSVM students and graduates. Student debt repayment and FSVM scholarships (item 2) will also attract and retain FSVM-oriented students. Several of the items focus on changing the FSVM-oriented learning experiences and opportunities that veterinary students will have during their DVM experience. This includes having more involvement of FSVM practitioners (item 1) and the appointment of more food supply faculty (item 4), which will facilitate students getting more early exposure to food supply careers (item 8). These teaching resources will help increase food supply coverage earlier in the curriculum (item 10) and

expand business and practice management coverage (item 12) as well. More hands-on learning opportunities, such as post-graduate fellowships (item 7) and paid externships (item 9), are additional ways to change students' DVM educational experience. Item 3 is focused on providing better placement services to link graduates to food supply oriented jobs. Finally, the Centers of Excellence concept (item 6) is a larger-scale initiative that could incorporate several ideas included on the listing of solutions.

Conclusion: A Need for Action

The data from this study reveals a pattern of increasing demand and future shortages in the food supply veterinary medicine profession. The demand increases and shortages projected by this panel are not as significant as seen in some other sectors. That said the demand increases are stronger than some other sectors and the shortages are deeper than others. The demand increases represent a healthy situation. There is modest but growing demand. Shortages while not extreme, particularly in the years beyond 2007, suggest the need for careful monitoring and additional strategies to augment the available supply of industrial veterinarians to pharmaceutical firms.

Many industrial veterinarians move into pharmaceutical industry roles from other FSVM sectors, so initiatives that increase the supply to those other areas and reduce the shortages faced by those areas will also increase the reserve of food supply veterinarians that can be recruited into industrial positions. Conversely, continued shortages in those other sectors will likely sustain shortage problems in the industrial-pharmaceutical sector.

A clear premise of this research is the future that we will live in tomorrow is created by the collective actions and strategic choices we make today. The industrial-pharmaceutical sector faces fewer problems and has income and lifestyle advantages that can be leveraged to attract more veterinarians into vacated industrial roles and deal with the shortages they are likely to face without strategic action. Similarly, the rural economics and related spousal career and other family constraints (noted in Figure 7 and related discussion) that are supply-decreasing forces for other FSVM sector are not problems that the industrial-pharmaceutical FSVM sector must overcome. While

potential labor shortage problems in the industrial-pharmaceutical sector seem more manageable than some other sectors, professionals in this sector must appreciate that they are uniquely dependent on the overall health of the FSVM profession. Shortages and related problems in other areas will have a ripple effect that will reach this sector if not addressed with broader strategic initiatives.

While consolidation within pharmaceutical firms provides a brake on demand for industrial veterinarians, there also appears to be ample opportunities for the profession to leverage their specialized skills and the need to deliver customer value adding services through cooperative action with other employees in related functional areas. Other functional areas in pharmaceutical firms need support from industrial veterinarians. Overall, there is increasing demand for their services, and strategic initiatives to further leverage demand-increasing factors as needed. The listing of skill areas that are increasing in demand, and demand-increase trends and factors, should guide those initiatives.

The shortages forecasted for industrial-pharmaceutical food supply veterinarians, as is the case for the forecasts in other sectors, are conservative. The point estimates (means and medians) and range of shortages noted by the middle 50% of panel experts are based on the explicit assumption that no major disease, agro-terrorism, or other severe or catastrophic events will occur. It is one thing to hope for such luck; it is another thing to plan for this rosy scenario! History tells us we must be prepared to counter such events. While other sectors will likely be more impacted by catastrophic events, such events will challenge all sectors, including FSVM professionals in pharmaceutical firms.

The planning matrix and supporting analyses provides guidance on the *opportunities* and *constraints* that should be considered in planning future action. This is, however, only a starting point. The profession must address where its *strengths* and *weaknesses* are in moving beyond these starting point. Representatives from this sector need to be a part of that discussion. Thoughtful leaders in the FSVM profession need to identify where they have the best advantage to guide effective collective action and solve challenging problems. All professions have strengths and weaknesses; effective leaders understand how to leverage their strengths while being mindful of their weaknesses. The solutions identified in the previous section provide a starting point for the process of identifying key elements of a larger coherent strategy of collective action. This is needed if the FSVM profession is going to meet the challenges it faces and position itself to better fill its obligations to society.

In summary, the industrial-pharmaceutical FSVM sector has manageable challenges in front of them. The shortages projected by the panel beyond 2007 can be addressed and likely resolved. The biggest threat for this sector is the shortage problems faced by other sectors and the ripple effect that those problems will cause. Initiatives that help those other areas will have a beneficial influence the FSVM industrial-pharmaceutical sector and help develop a ready reservoir of labor needed for potential future shortages. It is in the best interest of those in this sector to be an active participant in designing and implementing solutions that are more directly aimed at helping those other sectors.

Supplemental Information

The following additional information is provided to helping the reader understand the results reported in this chapter:

1. Temporary links to the three the industrial veterinarians panel surveys are noted, but these will not be available indefinitely. The larger final report, which presents the results of Delphi panels focused on other sectors, includes a sample copy of three surveys for one selected panel. While the first survey was quite similar in all 13 panels, the nature of the Delphi process resulted in questions that formed unique surveys for the second and third rounds of each panel. However, the general design of all second- and 1 third-round surveys are similar. Try these web-links to view a copy of the three surveys completed by the industrial veterinarians panel:
 - a. First Survey: <http://survey.cba.ksu.edu/prince/indvet1/index.htm>
 - b. Second Survey: <http://survey.cba.ksu.edu/prince/indvet2/index.htm>
 - c. Third Survey: <http://survey.cba.ksu.edu/prince/indvet3/index.htm>
2. Exhibit A provides a listing of all members that completed at least the first survey.
3. Exhibits B and C provides copies of the interim feedback reports that accompanied the second and third surveys. The first report (Exhibit B) summarizes trends found in the first survey data and provides guidance for interpreting the feedback incorporated into the second survey. The second report (Exhibit C) serves a similar function for the second survey data trend and accompanied the third survey.

4. Exhibit D provides a summary of the data results for major sections of the three surveys completed by the industrial-pharmaceutical Delphi panel.

Exhibit A

Original Industrial Veterinarians
Delphi Panel Members¹¹

- | | |
|----------------------|--------------------|
| 1. Austin Belschner | 9. Murray Jelinski |
| 2. Seven Connell | 10. Fred Lehman |
| 3. B. Joe Dedrickson | 11. Tom Overbay |
| 4. Paul Dick | 12. Myron Roth |
| 5. Pierre Gadbois | 13. Bill Seglar |
| 6. Ray Glick | 14. Maurice Smith |
| 7. Bruce Groves | 15. Michael Vaughn |
| 8. Brian Huseman | 16. Don Wilson |

¹¹ Note that not all panel members completed all surveys. These individuals originally agreed to participate.

Exhibit C

Industrial Veterinarians in Pharmaceutical Firms Panel 1st Survey Interim Feedback Report

This report summarizes replies to the 1st survey of the Industrial Veterinarians in Pharmaceuticals Delphi forecasting panel. *This brief report is focused on helping you be more informed as you complete the 2nd survey.* (A full summary of the panel's data will be provided after you complete the 3rd survey.)

This report identifies a few key patterns and directs you to more specific results from the 1st survey that is provided in the 2nd survey. Questions with more disagreement are repeated in the 2nd survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are also noted in the 2nd survey. (Survey items with good consensus are not repeated.) When there is a difference between self-rated forecasting “experts” (i.e., those rating themselves as more confident in their estimates than the panel's median score on question #32 of the 1st survey) *versus* those rating themselves as “less expert” in making forecasts, then those contrasts are noted. Significant differences between Canadian versus US panel members are noted. For example, item #1 in the first section of the 2nd survey (“Use of non-DVMs, such as veterinary technicians”) has the following notation:

“1st Survey: Average = 4.5 & Mid-50% = 3 to 6”

This indicates that the average rating was 4.5 on a 7-point scale (between “4. No Influence” and 5. Slight Increase”) and the middle-50% of panelists (those between the 25th and 75th percentiles) rated it from “3. Slight Decrease” to “6. Increase”. This indicates high disagreement on the influence of the “use of non-DVMs.” Several saw it as increasing demand while several others saw it as decreasing demand and the rest saw it as not influencing demand for industrial veterinarians. Since no mention is made of Canadian vs. US or expert vs. less expert ratings, this means that the statistical analysis found no differences on this issue between those subgroups. (Note that such subgroup differences exist on items #2 and #9 of the first section of the 2nd survey.) Statistical information from the 1st survey will be presented in this format throughout the 2nd survey.

Please review this feedback before (or as) you complete the 2nd survey.

I. Factors Influencing Demand for Industrial Food Supply Veterinarians

The first section in the 1st survey asked you to rate the influence of 25 different demand related issues. The top-rated influences seen as *increasing* future demand are:

- Public concerns over food safety
- Increasing concern for animal welfare
- Zoonotic disease-related human health concerns

- Growing need to track animals entering the food chain
- Required 3rd-party certification or verification of standards

The top-rated influences seen as *constraining* (or *not increasing*) future demand are:

- Part-time farmers needing more veterinary services
- Curtailment of government support of veterinary services
- Veterinary service agreements required for agri-business loans
- Lack of veterinarian's practice management & business skills
- Slow adoption of new technologies by veterinarians

II. Future Demand Estimates for Industrial Food Supply Veterinarians

The average value for the general forecast of future demand for the 1st survey was 4.9 on a 7-point scale (just under “5. Increase Slightly”). The middle 50% of panelists (between the 25th to 75th percentiles) rated future demand between “4. Stay Exactly the Same” to “6. Increase Moderately”. There was not significant differences between the ratings of self-rated experts versus those in the less-expert sub-group or between Canadians versus those focused on the US setting. (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” percentage increase (or decrease) in future demand for several time periods. Panel members saw future demand *increases* (beyond this fall) that averaged between +3.0% and +4.3%. The middle 50% (those between the 25th and 75th percentile) forecasted demand increases ranging between 0% and +9.3%. This indicates fair agreement that demand is increasing but more disagreement about the extent that it is increasing.

Those seeing stronger future demand increases also rate the following demand influences (from question #1) as having a significantly *higher positive influence* on demand compared to those seeing lower demand increases or decreases:

- Move to larger sized producer operations
- Public concerns over food safety
- Need to protect indigenous wildlife from exotic diseases
- Need to understand animal-human health eco-systems
- Zoonotic disease-related human health concerns

III. Factors Influencing the Supply of Industrial Food Supply Veterinarians

The more extreme negative influences on the future supply of industrial food supply veterinarians (low ratings on the question #10 items in the 1st survey – see question 8 in the 2nd survey for a related question) are:

- Less emphasis on food animal practice in veterinary colleges

- Perceived lack of demand for food animal skills
- Little exposure to food supply career options in college
- Lack of positive role models in veterinary food supply practice
- Limited capacity of existing veterinary colleges in the US and/or Canada
- Lack of food supply practice-related externships for students

IV. Projected Shortage or Surplus for Industrial Food Supply Veterinarians

The general question asking the panel to estimate the degree of surplus vs. shortage over the next 12 years produced an average of 4.7 (just under “5. Slight Shortage”) on a 7-point scale (see question #10 in the 2nd survey) and the middle 50% marked “4. very close match” to “6. shortage.” There were not systematic differences between how experts versus the less-expert group and Canadian vs. US panel members rated this question. Additional questions asked the “most likely” percentage estimates of a surplus or shortage of DVMs for several time periods. The average shortage estimate for future time periods (after 2005) is between -4.0% and -5.8%. The middle 50% always projected shortages within a -15.0% to 0% range - never a surplus. This is a fairly wide range and indicates disagreement within the panel on the extent of future shortages.

Next Steps...

The patterns that are starting to emerge tell an interesting story for DVMs in industrial veterinary roles in pharmaceutical firms. While there are some similarities between the patterns noted above, this is fairly unique area of food supply veterinary medicine! Your replies to the 2nd survey will add to and clarify this story even more.

Thank you for your continuing help and involvement!

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September 7, 2005

Industrial Veterinarians in Pharmaceutical Careers Delphi Panel

2nd Survey Interim Feedback Report

This report summarizes replies to the 2nd survey of the Industrial-Pharmaceutical Delphi panel. *This brief report is focused on helping you be more informed as you complete the 3rd survey.* (A full summary of the panel's data will be provided after I analyze the 3rd survey.)

This report identifies a few key patterns and more specific information from the 2nd survey is included in the 3rd survey. Questions with more disagreement are repeated in the 2nd survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are noted in the 2nd survey. When there is a difference between self-rated forecasting “experts” (i.e., the half who rated themselves as more confident in their estimates than the panel's median score on question #30 of the 1st survey) versus those rating themselves as “less expert” in making forecasts, then those contrasts are noted. Also, where there is a significant difference between those focused on the Canadian versus the US setting, then their respective means are noted. For example, item #1 in the first section of the 3rd survey (“Federal and/or State/Provincial budgetary constraints”) has the following notation:

“2nd Survey: Average = 4.6 & Mid-50% = 4 to 6”

This indicates that the average of the panel was 4.6 on a 7-point scale (between “4. No Influence” and “5. Slight Increase”) and the middle-50% of panelists (those between the 25th and 75th percentiles) rated it from “4. No Influence” to “5. Slight Increase”). There were no differences between how Canadians versus US panel members or between how experts versus less-expert forecasters rated this questions, so contrasting means are not presented. Statistical information from the 2nd survey will be presented in this format throughout the 3rd survey.

Please review this feedback before (or as) you complete the 3rd survey.

V. Factors Influencing Demand for Food Supply Veterinary Careers

The first section in the 1st survey asked you to rate the influence of 25 different demand related issues. Several of these plus new items suggested by the panel were included in the 2nd survey. The top-rated influences seen as *increasing* future demand over both surveys are:

- Public Concerns over food safety
- Customer demand for product support services
- Increasing concern for animal welfare
- Demand for more educational programs for customers

- Higher customer demand for technical veterinary expertise
- Higher expertise within producer operations

The one influence seen as *decreasing* future demand was “Mergers and consolidation in the pharmaceutical industry.”

VI. Future Demand Estimates for Food Supply Veterinarians

The average value for the general forecast of future demand from the 2nd survey is 5.1 (just over “5. Increase Slightly”). The middle 50% of the panel rating future demand with a “5. Increase Slightly” rating. In fact, 75% of the panel selected this rating.

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. The average was between +2.5% to +4.3% increases over these time periods and the middle 50% projected increasing demand for veterinary services between 0% to +6.8% in those time periods. In general the range of forecasts narrowed in 2nd versus the 1st round survey but there is still plenty of disagreement on exactly how much demand will increase. For the middle 50% (between the 25th and 75th percentiles) either no change in demand (0% change) or slightly higher increasing demand was lower boundary.

Panel members seeing *stronger* future demand (compared to those seeing *weaker* demand) rated “Mergers and consolidation in the pharmaceutical industry” as a significantly *less negative* influence on demand. The following additional “demand influences” (from question 1 in the 2nd survey) were seen by those seeing *stronger* (versus weaker) future demand as having a significantly more positive influence on demand:

- Federal and/or State/Provincial budgetary constraints
- Government restrictions in the development of new products
- Growing need to track animals entering the food chain
- Fewer new animal health products being developed
- Larger food animal producer operations
- Required higher level technical skills in industrial positions

Selected activities and skills projected to have uniquely higher or lower demand were identified in the 1st survey and rated by the panel in the 2nd survey. The most extreme area of *decreasing* demand is “involvement in individual animal care.” The areas of the *highest* increasing demand included:

- Sales and marketing support
- Product support services
- Staff training for large producer operations
- Specialized knowledge requiring advanced training

Those seeing *stronger* future demand rated these last four “increasing demand” activities significantly higher than those seeing weaker overall demand.

VII. Factors Influencing the Supply of Food Supply Veterinarians

The more extreme *negative* influences on the future supply for Industrial-Pharmaceutical food supply veterinarians noted in the two previous surveys are:

- Little exposure to food supply career options in college
- Less emphasis on food animal practice in veterinary colleges
- Perceived lack of demand for food animal skills
- Lack of food supply practice-related externships for students

The more extreme *positive* influences on the future supply of Industrial-Pharmaceutical food supply veterinarians noted are:

- Expectations of a better lifestyle
- Income opportunities in industrial veterinary roles

VIII. Projected Shortage or Surplus of Food Supply Veterinarians

While the panel generally saw a “slight increase” in demand, it also tended to project a fairly close match between supply and demand. The question on the general forecast (see question #9, 3rd survey) produced an average of 4.5 (between “4. Very Close Match” and “5. Slight Shortage.” 58% of the panel members selected “4. Very Close Match” The specific average shortage estimates over all time periods projected either 0% to -2.0% shortages and the middle 50% (between the 25th and 75th percentile) tended to include both shortages (as high as -5.0%) and surpluses (as high as +2.3%). While the range of estimates (noted by the breadth of the middle 50% of panelists) is still fairly wide and indicates plenty of disagreement on the extent of future shortages, the range of forecasts narrowed in the 2nd (versus the 1st survey). This indicates increasing agreement.

Next Steps...

The patterns flagged in the 1st survey have become clearer in the 2nd survey. This presents a unique and interesting story for DVMs in Industrial - Pharmaceutical Careers. Your replies to the third and final survey will add to and clarify this story even more. Besides making the final estimates to some previously seen questions, you will evaluate several potential solutions for the shortage problem noted by the majority.

Thank you for your continuing help and involvement! The final survey will have a large influence on the conclusions we will reach about this important area of food supply veterinary medicine.

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Section I. Factors Influencing Future Demand for Veterinarians in the Industrial-Pharmaceutical FSVM Careers

Survey Item	Survey Wave	% Decrease	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Public concern over food Safety	1 st	0	7.7	92.3	5.9	.90	5 to 6.5	13
2. Use of non-DVMs, such as veterinary technicians	1 st	27.3	27.3	45.5	4.5	1.70	3 to 6	11
2. Use of non-DVMs, such as veterinary technicians	2 nd	25	58.3	16.7	4.0	1.13	3.3 to 4	12
3. Public concern over bio-terrorism	1 st	0	30.8	69.2	5.2	1.17	4 to 6.5	13
3. Public concern over bio-terrorism	2 nd	0	16.7	83.3	5.3	.87	5 to 6	12
4. Zoonotic disease-related human health concerns	1 st	0	15.4	84.6	5.4	.96	5 to 6	13
5. Required third party certification or verification of standards	1 st	0	30.8	69.2	5.3	1.11	4 to 6	13
5. Required third party certification or verification of standards	2 nd	0	33.3	66.7	5.1	1.00	4 to 6	12
6. Limited public understanding of food quality and safety issues	1 st	15.4	30.8	53.8	4.5	1.45	4 to 5.5	13
6. Limited public understanding of food quality and safety issues	2 nd	0	50	50	4.7	.78	4 to 5	12
7. More meat consumption in the US and Canada	1 st	7.7	38.5	53.8	4.6	.87	4 to 5	13
8. More access to global markets for food exports	1 st	0	38.5	61.5	4.8	.73	4 to 5	13
9. Changing dietary habits in third-world countries	1 st	0	38.5	61.5	4.8	.73	4 to 5	13
10. Need to protect indigenous wildlife from exotic diseases	1 st	8.3	41.7	50	4.6	1.00	4 to 5	12
11. Federal and/or state/provincial budgetary constraints	1 st	8.3	50	41.7	4.6	1.08	4 to 5	12
11. Federal and/or state/provincial budgetary constraints	2 nd	16.7	41.7	41.7	4.6	1.24	4 to 5.8	12
11. Federal and/or state/provincial budgetary constraints	3 rd	25	41.7	33.3	4.2	1.47	3.3 to 5	12
12. Curtailment of government support of veterinary services	1 st	8.3	50	41.7	4.3	.99	4 to 5	12
12. Curtailment of government support of veterinary services	2 nd	16.7	25	58.3	4.8	1.34	4 to 5.8	12
12. Curtailment of government support of veterinary services	3 rd	25	50	25	4.0	1.35	3.3 to 4.8	12
13. Increasing concern for animal wildlife	1 st	0	7.7	92.3	5.7	.95	5 to 6.5	13
14. Increasing concern for animal health	1 st	0	7.7	92.3	5.2	.56	5 to 5.5	13
15. Need to understand animal-human health eco-systems	1 st	0	45.5	54.5	4.8	.98	4 to 5	11
16. Availability of highly technical or specialized services	1 st	8.3	25	66.7	5.1	1.24	4 to 6	12
16. Availability of highly technical or specialized services	2 nd	0	33.3	66.7	4.8	.72	4 to 5	12
17. Veterinary services agreements required for agri-business loans	1 st	0	72.7	27.3	4.4	.67	4 to 5	11
18. Growing need to track animals entering the food chain	1 st	0	33.3	66.7	5.3	1.23	4 to 6.8	12
18. Growing need to track animals entering the food chain	2 nd	0	25	75	5.4	1.24	4.3 to 7	12
18. Growing need to track animals entering the food chain	3 rd	0	16.7	83.3	5.5	1.09	5 to 6.8	12
19. Constraints on non-DVMs giving prescription drugs	1 st	8.3	58.3	33.3	4.5	1.00	4 to 5.8	12
20. Slow adoption of new technologies by veterinarians	1 st	16.7	50	33.3	4.4	1.38	4 to 5.8	12
20. Slow adoption of new technologies by veterinarians	2 nd	0	72.7	27.3	4.3	.47	4 to 5	11
21. Move to larger sized producer operations	1 st	0	30.8	69.2	5.0	.82	4 to 6	13

22. Client use of veterinary herd management services	1 st	0	33.3	66.7	5.1	.90	4 to 6	12
23. Client concerns about veterinary service costs	1 st	0	63.6	36.4	4.7	1.19	4 to 5	11
24. Lack of veterinarian's practice management and business skill	1 st	16.7	50	33.3	4.4	1.38	4 to 5.8	12
24. Lack of veterinarian's practice management and business skill	2 nd	8.3	75	16.7	4.0	.74	4 to 4	12
25. Part-time farmers needing more veterinary services	1 st	18.2	63.6	18.2	3.9	.83	4 to 4	11
122. Customer demand for product support services	2 nd	0	0	100	5.8	.94	5 to 7	12
123. Higher customer demand for technical veterinary expertise	2 nd	0	0	100	5.7	.99	5 to 7	12
124. Business managerial role opportunities for veterinarians	2 nd	8.3	25	66.7	4.9	1.17	4 to 5	12
125. Demand for veterinarians in sales positions	2 nd	8.3	8.3	83.3	5.3	1.44	5 to 6.8	12
125. Demand for veterinarians in sales positions	3 rd	0	8.3	91.7	5.4	.90	5 to 6	12
126. Demand for a larger veterinary presence in the new business development area	2 nd	8.3	25	66.7	5.0	1.21	4 to 5.8	12
126. Demand for a larger veterinary presence in the new business development area	3 rd	0	33.3	66.7	4.8	.72	4 to 5	12
127. Demand for more educational programs for customers	2 nd	0	8.3	91.7	5.7	.99	5 to 6.8	12
128. Government restrictions in the development of new products	2 nd	0	54.5	45.5	4.8	1.08	4 to 6	11
128. Government restrictions in the development of new products	3 rd	25	25	50	4.6	1.24	3.3 to 6	12
129. Mergers and consolidation in the pharmaceutical industry	2 nd	66.7	16.7	16.7	3.5	1.38	3 to 4	12
129. Mergers and consolidation in the pharmaceutical industry	3 rd	66.7	25	8.3	3.3	1.07	3 to 4	12
130. Fewer new animal health products being developed	2 nd	18.2	36.4	45.5	4.6	1.50	4 to 6	11
130. Fewer new animal health products being developed	3 rd	41.7	50	8.3	3.7	.65	3 to 4	12
131. Required higher level technical skills in industrial positions	2 nd	0	41.7	58.3	5.2	1.19	4 to 6	12
131. Required higher level technical skills in industrial positions	3 rd	0	33.3	66.7	5.0	.95	4 to 5.8	12
132. Larger food animal producer operations	2 nd	8.3	16.7	75	5.2	1.19	4.3 to 6	12
132. Larger food animal producer operations	3 rd	0	25	75	4.8	.45	4.3 to 5	12
133. Higher expertise within producer operations	2 nd	0	16.7	83.3	5.5	1.09	5 to 6.8	12
133. Higher expertise within producer operations	3 rd	0	8.3	91.7	5.3	.78	5 to 6	12

Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern for Industrial-Pharmaceutical FSVM Careers)

Survey Item	Survey Wave	% Decrease	% No Difference	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Sales and marketing support	2 nd	0	0	100	5.6	.79	5 to 6	12
2. Product support services	2 nd	0	8.3	92.7	5.6	.90	5 to 6	12
3. Managerial and administrative activities	2 nd	8.3	41.7	50	4.6	1.00	4 to 5	12
4. Quantitative analysis to evaluate effectiveness	2 nd	8.3	33.3	58.3	4.7	.89	4 to 5	12
5. Specialized knowledge requiring advanced training	2 nd	0	25	75	5.2	.94	4.3 to 6	12
6. Staff training for large producer operations	2 nd	0	16.7	83.3	5.4	1.00	5 to 6	12
7. Involvement in individual animal care	2 nd	41.7	41.7	16.7	3.6	1.31	3 to 4	12
8. Training support for small producer operations	2 nd	33.3	33.3	33.3	4.0	1.13	3 to 5	12
9. Consultations on routine herd health issues	2 nd	9.1	36.4	54.5	4.8	1.35	4 to 6	11

Section III. Factors Influencing Future Supply for Veterinarians in the Industrial-Pharmaceutical FSVM Careers

Survey Item	Survey Wave	% Decrease	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Less emphasis on food animal practice in veterinary colleges	1 st	61.5	23.1	15.4	3.5	1.56	2 to 4	13
1. Less emphasis on food animal practice in veterinary colleges	2 nd	58.3	33.3	8.3	3.7	1.16	3 to 4	12
2. More women veterinarians entering the workforce	1 st	41.7	16.7	41.7	4.3	1.77	3 to 5.8	12
2. More women veterinarians entering the workforce	2 nd	25	58.3	16.7	3.9	.67	3.3 to 4	12
3. Physical demands of large animal veterinary work	1 st	25	33.3	41.7	4.3	1.42	3.3 to 5.8	12
3. Physical demands of large animal veterinary work	2 nd	8.3	66.7	25	4.3	.75	4 to 4.8	12
4. Need to work long hours and emergency calls	1 st	33.3	16.7	50	4.3	1.56	3 to 6	12
4. Need to work long hours and emergency calls	2 nd	36.4	18.2	45.5	4.2	1.60	3 to 5	11
4. Need to work long hours and emergency calls	3 rd	16.7	25	58.3	4.6	1.00	4 to 5	12
5. Little exposure to food supply career options in college	1 st	53.8	7.7	38.5	4.0	1.47	3 to 5	13
5. Little exposure to food supply career options in college	2 nd	58.3	25	16.7	3.5	1.17	3 to 4	12
5. Little exposure to food supply career options in college	3 rd	58.3	25	16.7	3.6	1.08	3 to 4	12
6. Lack of food supply practice-related externships for students	1 st	36.4	36.4	27.3	4.2	1.33	3 to 5	11
6. Lack of food supply practice-related externships for students	2 nd	36.4	45.5	18.2	3.9	.94	3 to 4	11
7. Lack of positive role models in veterinary food supply practice	1 st	41.7	33.3	25	4.2	1.64	3 to 5.5	12
7. Lack of positive role models in veterinary food supply practice	2 nd	8.3	66.7	25	4.4	1.08	4 to 4.8	12
8. Poor income opportunities in rural areas	1 st	33.3	8.3	58.3	4.5	1.68	3 to 6	12
8. Poor income opportunities in rural areas	2 nd	25	50	25	4.0	1.35	3.3 to 4.8	12
8. Poor income opportunities in rural areas	3 rd	33.3	16.7	50	4.5	1.45	3 to 5	12
9. Lack of cultural and recreational opportunities in rural areas	1 st	8.3	41.7	50	4.8	1.27	4 to 5.8	12
10. Lack of spousal career options in rural areas	1 st	33.3	25	41.7	4.3	1.50	3 to 5.8	12
10. Lack of spousal career options in rural areas	2 nd	16.7	41.7	41.7	4.6	1.31	4 to 5	12
10. Lack of spousal career options in rural areas	3 rd	16.7	41.7	41.7	4.5	1.45	4 to 5	12
11. Limited lifestyle and career opportunities in rural areas	1 st	33.3	25	41.7	4.4	1.56	3 to 6	12
11. Limited lifestyle and career opportunities in rural areas	2 nd	16.7	41.7	41.7	4.5	1.17	4 to 5	12
12. Federal and/or state/provincial budgetary constraints	1 st	8.3	58.3	33.3	4.3	.62	4 to 5	12
13. High debt load of veterinary school graduates	1 st	18.2	27.3	54.5	4.7	1.27	4 to 6	11
14. Expected high number of food supply veterinarians retiring in the near future	1 st	33.3	8.3	58.3	4.4	1.44	3 to 5	12
14. Expected high number of food supply veterinarians retiring in the near future	2 nd	16.7	50	33.3	4.4	1.44	4 to 5	12
14. Expected high number of food supply veterinarians retiring in the near future	3 rd	0	41.7	58.3	4.8	.94	4 to 5	12
15. Limited capacity of existing veterinary colleges in the US and/or Canada	1 st	16.7	58.3	25	4.2	.84	4 to 4.8	12
16. Perceived lack of demand for food animals	1 st	36.4	45.5	18.2	3.8	1.08	3 to 4	11
17. Requirement for education beyond a DVM	1 st	45.5	9.1	45.5	4.4	1.57	3 to 5	11

17. Requirement for education beyond a DVM	2 nd	16.7	50	33.3	4.3	1.07	4 to 5	12
84. Income opportunities in industrial veterinary roles	2 nd	0	0	100	5.4	.67	5 to 6	12
85. Expectations of a better lifestyle	2 nd	0	0	100	5.6	.79	5 to 6	12
86. Fewer opportunities in other veterinary medicine areas	2 nd	8.3	58.3	33.3	4.5	1.09	4 to 5	12
87. Requirement for specialized education beyond DVM	2 nd	25	58.3	16.7	4.2	1.19	3.3 to 4	12
88. Increasing opportunities in other veterinary medicine areas	2 nd	25	58.3	16.7	3.9	.67	3.3 to 4	12

Section IV. Solutions to Shortages in the Industrial-Pharmaceutical FSVM Sector

Survey Item	Survey Wave	% Decrease	% No Difference	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Reserve class slots for academically qualified students with food supply interests and relevant background	3 rd	25	58.3	16.7	4.8	1.22	3.5 to 5	12
2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors	3 rd	33.3	33.3	33.3	4.6	1.83	3 to 6	12
3. Focused recruitment of high school and college students with food supply interests into veterinary colleges	3 rd	41.7	41.7	16.7	4.0	1.71	3 to 5	12
4. Increased focus of food supply coverage early in DVM curriculum	3 rd	33.3	41.7	25	4.3	1.83	2.3 to 5.8	12
5. Expanded business and practice management coverage in DVM curriculum	3 rd	50	33.3	16.7	4.0	1.95	2.3 to 5	12
6. Expanded postgraduate fellowships in food supply areas	3 rd	33.3	33.3	33.3	4.6	2.02	3 to 6.8	12
7. Expanded paid work-study programs during the final year of DVM	3 rd	41.7	50	8.3	3.8	1.59	3 to 5	12
8. More involvement of food supply practitioners in training veterinary students	3 rd	0	45.5	54.5	5.8	1.08	5 to 7	11
9. Provide expanded job placement services in the food supply veterinary medicine areas	3 rd	25	33.3	41.7	4.9	1.73	3.5 to 6	12
10. Appointment of more food supply faculty at colleges of veterinary medicine	3 rd	33.3	16.7	50	4.8	2.08	3 to 6.8	12
11. Paid externship requirement in food supply medicine during the summer	3 rd	41.7	25	33.3	4.3	1.92	2.3 to 6	12
12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities	3 rd	36.4	36.4	27.3	4.5	2.16	2 to 7	11
13. Student debt repayment and scholarship programs for service in food supply areas of need	3 rd	25	25	50	5.3	1.83	3.5 to 7	12
14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities	3 rd	63.6	27.3	9.1	3.2	1.83	1 to 5	11
15. Low cost (subsidized) consulting in business and practice management for new food supply DVMs	3 rd	50	33.3	16.7	3.5	1.98	2 to 5	12
16. Mentoring initiatives for students and those starting a food supply career	3 rd	50	50	0	3.8	1.22	3 to 5	12
17. Focused recruitment of women students in food supply areas	3 rd	58.3	41.7	0	3.2	1.53	2 to 5	12
18. Development and dissemination of Business Best Practices for food supply veterinary enterprises	3 rd	75	25	0	2.6	1.44	1.3 to 3.8	12