Chapter 11

The Future Demand for Food Supply Veterinarians in Federal Government Careers
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>The Delphi Forecasting Technique</td>
<td>5</td>
</tr>
<tr>
<td>Issues and Trends Driving the Future Demand for Federal Government Food Supply Veterinarians</td>
<td>9</td>
</tr>
<tr>
<td>The Future Demand for Federal Government Food Supply Veterinarians</td>
<td>25</td>
</tr>
<tr>
<td>Specialized Activities Increasing or Decreasing in Demand</td>
<td>34</td>
</tr>
<tr>
<td>Trends and Issues Driving the Future Supply of Federal Government Food Supply Veterinarians</td>
<td>37</td>
</tr>
<tr>
<td>The Future Shortages of Federal Government Food Supply Veterinarians</td>
<td>52</td>
</tr>
<tr>
<td>Solutions for the Future Shortage of Federal Government Food Supply Veterinarians</td>
<td>61</td>
</tr>
<tr>
<td>Conclusion: A Need for Action</td>
<td>64</td>
</tr>
<tr>
<td>Supplemental Information</td>
<td>68</td>
</tr>
</tbody>
</table>
Introduction

This study provides a systematic critique of the likely future demand and potential shortages for food supply veterinary medicine (FSVM) professionals employed in federal government positions. This chapter summarizes the results of four related Delphi panels: (1) US Federal – Public Health, (2) US Federal – Animal Health, (3) US Federal Food Safety & Security, and (4) Canadian Federal Government. The US Federal – Public Health panel included many experts from the US FDA and CDC agencies. The US Federal – Animal Health panel drew heavily from those employed in APHIS, and the US Federal Food Safety & Security panel included many experts in the FSIS agency. The Canadian Federal Government panel included experts from various Canadian government sectors including CFIA and Health Canada.

Each panel addressed six inter-related questions and was asked to focus on their particular federal government area:

I. What are the issues and trends likely to drive the future demand for food supply veterinarians in federal government roles?

II. Assuming a continuation of currently unfolding trends and the absence of major catastrophic events, what will be the demand for federal government 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 various federal government food supply areas?

IV. What are the issues and trends likely to drive the future supply of food supply veterinarians entering federal government 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 federal government food supply veterinarians over the next several years?

VI. Given the answers to the first five questions, how can the federal government and the FSVM profession take action now to create a better future?

This chapter 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 method\(^1\) 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 recognizes that the future is largely a function of trends that, if better understood now, can be altered before the likely 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 Government Service (Public Health, Animal Health, and Food Safety & Security), Canadian Federal Government Service, Industrial

Veterinarians in Pharmaceuticals, 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 14-25 members for each sector were created. Each of the four federal government panels tended to be smaller than other panels. They ranged from 12 in the Canadian Federal panel to 17 in the Federal – Animal Health Delphi panel. Collectively, these panels capture the views of 59 experts that originally agreed to participate. (Note that not all original participants completed all surveys.)

The Delphi method gathers the experts’ forecasts and views, and then provides a structured feedback process where each expert has an opportunity to consider the collective views of other panel experts. The feedback process is structured so that panel members can change their predictions without any of the dysfunctional group dynamics that often plague interacting groups. It sets up a learning process where experts have an opportunity to reconsider their judgments in the face of conflicting viewpoints. 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 asked open-ended questions that gave 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 will 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 influences items where there was higher levels of disagreement within the panel were repeated and the average rating and middle 50% range (between the 25th and 75th percentile) information were 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 in the second survey were repeated and the panel average and middle 50% range information were presented in this last survey. The final demand and shortage forecasts were made in this 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.

Additional analyses (e.g., One way ANOVA) contrasted each of the four governmental panels and identified statistically significant differences between these panels. Given the sample size and statistical power consideration, a p < .10 significance level is generally used. A number of items included in the second and third surveys were
developed from open-ended replies to questions in the first survey. This has the advantage of “grounding” the items in the panel members views. It does result in items that are uniquely worded and asked in only one panel. This precludes being able to compare responses to those items over all panels.

While we see all panel members as having good expertise, we appreciate that some maybe 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 in each panel. T-test analysis is used to identify items where there were statistically significant differences between those two sub-groups. We use p < .05 to determine statistical significance in analyses with the combined four-panel group. In order to counter the statistical power constraints associated with smaller sample sizes, we use a p < .10 cutoff in analyses using a single panel.

Examples of three of the surveys used for the mixed food animal panel are displayed in Appendix A, B, and C. These three surveys are typical of all the questionnaires used in the demand studies. Additional information at the end of this chapter identifies the temporary website links to each of the surveys for this Delphi panel.
Issues and Trends Driving Future the Demand for
Federal Government Food Supply Veterinarians

The panel responded to both panel-suggested demand-related items that are unique to this panel, 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 their panel area. Additional items derived from those open-ended comments for each panel were also evaluated. In the second survey, the additional panel-generated items and original 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 highest-rated survey items seen as increasing future demand (starting with the most influential issues and trends first). These are from the common set of 25 items rated over all panels in the first survey.

**Trends Increasing Demand**

**All Federal Government (Fed-Combined) Panels:**

1. Zoonotic disease-related human health concerns (mean: 6.10 on a 7-point scale)\(^2\)
   
   *Note that the Federal-Food Safety & Security panel mean (5.67) was significantly lower than the Federal-Food Animal panel mean of 6.41.*

2. Public concerns over food safety (mean: 5.92)

3. Public concerns over bio-terrorism (mean: 5.83)

4. Growing need to track animals entering the food chain (mean: 5.71)

---

\(^2\) 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. More access to global markets for food exports (mean: 5.58)

6. Increasing concerns for animal welfare (mean: 5.53)

7. Required third-party certification or verification of standards (mean: 5.38)

8. Increasing concern for animal health (mean: 5.35)

9. Need to protect indigenous wildlife from exotic diseases (mean: 5.19)

10. Need to understand animal-human health eco-systems (mean: 5.17)

Follow-up analysis was conducted to identify the top-rated items seen as increasing future demand in each of the four panels. Note that the means reported are from the last survey in which that item appeared and include both items asked of all panels and panel-specific items that were generated from open-ended comments in each panel:

**Federal – Public Health (Fed-PH) Panel:**

1. Zoonotic disease-related human health concerns (mean: 6.13)

2. Public concerns over bio-terrorism (mean: 6.07)

3. Public concerns over food safety (mean: 6.00)

4. Growing need to track animals entering the food chain (5.63)

5. Increasing globalization of the food supply system (mean: 5.53)

6. More access to global markets for food exports (mean: 5.50)

7. Increasing recognition of the veterinarian’s role in public health (mean: 5.47)

8. Need to understand animal-human health eco-system (mean: 5.33)

9. Availability highly technical or specialized services (mean: 5.33)

10. Increasing concern for animal health (mean: 5.27)

11. Veterinary services agreements required for agri-business loans (mean: 5.23)

12. Increasing concern for animal welfare (mean: 5.07)
Federal – Animal Health (Fed-AH) Panel:

1. Zoonotic disease-related human health concerns (mean: 6.41)
2. Public concerns over food safety (mean: 6.00)
3. More demands for certifications and auditing (mean: 5.86)
4. Growing need to track animals entering the food chain (5.76)
5. Growing need to control zoonotic disease threats (mean: 5.71)
6. Public concerns over bio-terrorism (mean: 5.71)
7. Increasing concern for animal welfare (mean: 5.69)
8. Increasing concern for animal health (mean: 5.65)
9. Growing needs for emergency response capabilities (mean: 5.64)
10. Increasing globalization of the food supply system (mean: 5.50)
11. Required government inspections for mandated bio-security practices (mean: 5.43)
12. Increased awareness of agro-terrorism threats (mean: 5:43)
13. More animal welfare consultations and oversight (mean: 5.43)
14. Need to protect indigenous wildlife from exotic disease (mean: 5.41)
15. Required third-party certification or verification of standards (mean: 5.38)
16. Need to understand animal-human health eco-system (mean: 5.33)
17. More access to global markets for food exports (mean: 5.29)
18. Availability of highly technical or specialized services (mean: 5.21)

Federal – Food Safety & Security (Fed-FS/S) Panel:

1. Public concerns over food safety (mean: 6.00)
2. Public concerns over bio-terrorism (mean: 5.80)
3. Zoonotic disease-related human health concerns (mean: 5.79)
4. Growing need to track animals entering the food chain (mean: 5.71)
5. Increasing USDA international surveillance demands (mean: 5.71)
6. More anti-terrorism positions going to food supply veterinarians (mean: 5.71)
   *Note that the self-rated forecasting experts’ sub-group mean of 6.14 was significantly higher than the less-expert sub-group mean of 5.17.*
7. DVMs being seen as a key resource in achieving food system safety (mean: 5.71)
8. More access to global markets for food exports (mean: 5.67)
9. More demands for certifications and auditing (mean: 5.50)
10. Increasing concern for animal welfare (mean: 5.47)
11. Increasing globalization of the food supply system (mean: 5.43)
12. Import and export oversight requirements at borders (mean: 5.36)
13. Required third-party certification or verification of standards (mean: 5.21)
14. Need to understand animal-human health eco-system (mean: 5.15)
15. Increasing concern for animal health (mean: 5.15)
16. Availability of highly technical or specialized services (mean: 5.14)
17. Constraints on non-DVMs giving prescription drugs (mean: 5.09)

**Federal – Canadian Government (Fed-CDN) Panel:**

1. Expanding veterinary public health demands (mean: 6.44)
2. Zoonotic disease-related human health concerns (mean: 6.17)
3. Public concerns over food safety (mean: 5.92)
4. Development of international disease monitoring and reporting standards (mean: 5.89)
5. Need for national surveillance of emerging diseases (mean: 5.89)
6. Need for risk management and related communication activities (mean: 5.80)

7. Increasing concern for animal welfare (mean: 5.75)

8. Growing need to track animals entering the food chain (mean: 5.75)
   Note that the self-rated forecasting experts’ sub-group mean of 5.00 was significantly lower than the less-expert sub-group mean of 6.40.

9. Required third-party certifications or verification of standards (mean: 5.75)

10. Public concerns over bio-terrorism (mean: 5.75)

11. Increasing international trade of food and animal products (mean: 5.67)

12. More access to global markets for food exports (mean: 5.67)

13. Veterinary roles in the aquatic animal health area (mean: 5.56)

14. Required capacity to counter food related terrorism threats (mean: 5.44)

15. Need to protect indigenous wildlife from exotic diseases (mean: 5.44)
   Note that the self-rated forecasting experts’ sub-group mean of 5.00 was significantly lower than the less-expert sub-group mean of 6.25.

16. Availability of highly technical or specialized services (mean: 5.33)

17. Need to understand animal-human health eco-system (mean: 5.33)

Note that demand-influencing 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-1 through B-4 for a listing of these items for each panel as well as the distributions and ratings of all items used in the 1st, 2nd, or 3rd wave surveys. The mean values reported for each of the above (and following) items are from the last survey in which that item appeared (except for the “Fed-Combined” listings which necessarily comes from the first survey that asked all four panels to rate a common set of 25 demand-influencing items).

**Trends Decreasing Demand**
Items with means below 4.0 are seen as leading to decreases in demand for federal government food supply veterinarians. The survey items noted below are factors rated as decreasing future demand for federal government food supply veterinarians starting with the most influential factors first.

All Federal Government (Fed-Combined) Panels:

1. Curtailment of government support of veterinary services (mean: 3.32)³
2. Federal and/or State/Provincial budgetary constraints (mean: 3.58)
3. Lack of veterinarian’s practice management and business skill (mean: 3.72)
4. Slow adoption of new technologies by veterinarians (mean: 3.75)
5. Client concerns about veterinary service costs (mean: 3.83)

Follow-up analysis was conducted to identify the items seen as decreasing future demand in each of the four panels. Note that the means reported are from the last survey in which that item appeared and include both items rated by all panels and panel-specific items that were generated from open-ended comments in each panel:

Federal – Public Health (Fed-PH) Panel:

1. Federal and/or State/Provincial budgetary constraints (mean: 2.82)
2. Curtailment of government support of veterinary services (mean: 2.83)
3. Slow adoption of new technologies by veterinarians (mean: 3.50)
4. Lack of veterinarian’s practice management and business skill (mean: 3.57)
5. Public health veterinarian functions being performed by non-DVMs (mean: 3.58)
6. Client concerns about veterinary service costs (mean: 3.93)

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.
Federal – Animal Health (Fed-AH) Panel:

1. Curtailment of government support of veterinary services (mean: 3.21)
   *Note that the self-rated forecasting experts’ sub-group mean of 2.71 was significantly lower than the less-expert sub-group mean of 3.71.*

2. Federal and/or State/Provincial budgetary constraints (mean: 3.36)

3. Decreasing funding for animal agricultural programs (mean: 3.43)
   *Note that the self-rated forecasting experts’ sub-group mean of 3.00 was significantly lower than the less-expert sub-group mean of 3.86.*

4. Veterinarian functions being performed by non-DVMs (mean: 3.71)

5. Client concerns about veterinary service costs (mean: 3.87)

Federal – Food Safety & Security (Fed-FS/S) Panel:

1. More veterinarian functions being performed by non-DVMs (mean: 2.92)

2. Federal and/or State/Provincial budgetary constraints (mean: 2.93)
   *Note that the self-rated forecasting experts’ sub-group mean of 2.71 was significantly lower than the less-expert sub-group mean of 3.33.*

3. Curtailment of government support of veterinary services (mean: 2.93)

4. Decreasing emphasis on animal agriculture issues in the federal budget (mean: 3.31)

5. Slow adoption of new technologies by veterinarians (mean: 3.36)

6. Lack of veterinarian’s practice management and business skill (mean: 3.42)

7. DVMs doing fewer inspections at slaughter facilities (mean: 3.50)

8. Client concerns about veterinary service costs (mean: 3.58)
   *Note that the self-rated forecasting experts’ sub-group mean of 4.00 was significantly higher than the less-expert sub-group mean of 3.17.*

Federal – Canadian Government (Fed-CDN) Panel:

1. Federal and/or State/Provincial budgetary constraints (mean: 3.22)

2. Curtailment of government support of veterinary services (mean: 3.56)
3. Lack of veterinarian’s practice management and business skill (mean: 3.64)
4. Efficiencies in inspection processes (mean: 3.80)
5. Need for fewer inspection certifications (mean: 3.89)
6. Move to larger sized producer operations (mean: 3.90)
7. Client concerns about veterinary service costs (mean: 3.91)

**The Planning Matrix**

The ratings of the demand-influence items presented above 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 in other words, that strategic actions can be taken to alter the expected pattern of influence suggested by the panel’s mean score. Others items identify demand influences that are fairly fixed constraints and are not likely to be greatly changed by strategic actions. These less-actionable items typically represent general societal concerns and trends where cooperation of external entities beyond the FSVM profession, such as different levels of governments and other constituencies beyond the veterinary profession, are needed to alter the expected pattern of influence on future demand.

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 (on the top left-hand side of the figure) must be lessened or countered. The top right-hand 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.
Figure 1
Planning Matrix

Opportunities
(Actionable)

Demand Enhancing Factors

Demand Constraining Factors

Fixed Constraints
(Less Actionable)

Eliminate & Counter

Sustain, Complement & Enhance

Manage Around

Appreciate

Manage Around

Appreciate
Demand-Increasing Factors. This planning matrix can be used to organize the results of the analysis of the demand related issues and trends. The various demand-decreasing items above mapped to the left side of Figure 1. Given the variety and length of the various listing presented above, not every item will be referenced in creating a planning matrix. Rather we will note the general themes captured by those lists. Figure 2 captures the themes evident in the results. The top two demand-decreasing items, item 1 (curtailment of government support) and item 2 (budgetary constraints) in the first All Federal Government Panels (Fed-Combined) listing in the Trends Decreasing Demand section presented above, all relate to declining government resources. This trend comprises the Governmental Budgetary Constraints theme noted in the lower-left quadrant of Figure 2. These same two items are ranked as the first and second item in all of the separate panel listings, except for the Federal – Food Safety & Security (Fed-FS/S) panel where they are ranked second and third. The Fed-FS/S listing adds a related unique item generated by comments to the survey: item 3 (decreasing emphasis on animal agriculture issues in the federal budget). An addition unique, but very similarly worded item (item 3 – decreasing funding for animal agriculture programs), is included in the Federal – Animal Health (Fed-AH) panel results. The Government Budgetary Constraints theme is obviously the dominant trend that is decreasing demand. However, changing this demand impediment is difficult and it is less actionable than other demand constraints. Multiple competing interests and politics play out in government allocation decisions. While a little success on this front may go a long way to help demand, other initiatives focused on more actionable trends should be included in any strategy focused on countering demand-decreasing trends.
Figure 2
Demand Diminishing & Enhancing Issues in the Federal Government Sector

Opportunities (Actionable)

Demand Enhancing Factors
- Specialized Technical Services & Certifications
  - Regulatory & Global Food System
  - Animal-Human Health Concerns
  - Food Safety Concerns
  - Bio-Security/Agro-Terrorism Concerns
  - Animal Welfare Concerns

Demand Constraining Factors
- Fixed Constraints (Less Actionable)
  - Governmental Budgetary Constraints
- Weak Business Skill & Use of Technology
- Cost Pressure & Labor Substitution Trends

Constraining Factors

Enhancing Factors
The remaining demand-decreasing items noted on the various lists have fewer external constraints and are more manageable. In fact, success in eliminating or countering these trends may provide help in changing the budgetary constraints trend. Item 6 (client concerns about costs) in the Fed-Combined listing is an indicator of the Cost Pressures & Labor Substitution theme. This is placed in the upper-left quadrant of Figure 2. This same item is also noted in the Federal – Public Health (Fed-PH) panel listing as item 6. It appears in the Federal – Canadian Government (Fed-CDN) listing as item 7 and the Fed-AH and Fed-FS/S listing as item 5 and item 8, respectively. Additional items from the four panels substantiate and elaborate this theme. “Veterinarian functions being performed by non-DVMs” is noted by item 5 in the Fed-PH panel and item 4 in the Fed-AH panel. The Fed-FS/S panel notes this same item as its highest rated item (#1) and adds a unique item 7 (DVMs doing fewer inspections at slaughter facilities). The Fed-CDN panel adds two related unique items, item 4 (efficiencies in the inspections process) and item 5 (need for fewer inspection certifications). These are all related to cost pressures, but they also add a related dimension of substituting labor and minimizing higher cost DVMs in operations. While the larger economic constraints in federal employment are challenging to manage around, there are opportunities for strategic initiatives that will better demonstrate the benefits of using veterinarians by demonstrating the value added of having a more optimal labor mix (veterinarians and non-veterinary substitutes) for the key federal government FSVM tasks. Both efficiency as well as effectiveness must be demonstrated.

Finally, item 3 (lack of business skills) and item 4 (slow adoption of new technology) in the Fed-Combined listing are key indicators of the Weak Business Skills & Use of Technology theme. These same items are also noted in the Fed-PH panel (items 3
and 4) and Fed-FS/S (items 5 and 6), and one of these same items is included in the Fed-CDN panel listing (item 3). The Fed-AH panel did not include either item in their listing of demand-decreasing factors. While this is a more important issue for private practice veterinarians, it appears that better training, the development of business acumen, and better use of technological tools will also help federal government food supply veterinarians meet work requirements and improve the demand for their FSVM talents.

**Demand-Increasing Factors.** The demand-increasing factors summarized on the various “Trends Increasing Demand” lists map to the right-side of the Figure 2 planning matrix. Many relate to larger societal concerns that have traditionally supported the demand for food supply veterinarians in governmental roles. Rather than identify these as one theme, four related “societal concerns” themes are presented in the lower quadrant of Figure 2. **Bio-Security/Agro-Terrorism Concerns** have emerged in recent years as an important concern for the federal government food supply veterinarians. For the Fed-Combined listing at the start of this section, the third-highest ranked item is “public concerns over bio-terrorism (mean: 5.83). The four panel listings of demand increasing factors note this same item. It was the second highest rated item in the Fed-PH and Fed-FS/S listing. It is ranked lower in the Fed-AH (item 6) and Fed-CDN (item 10) listings. A number of panel-generated items, derived from open-ended comments to first survey, also touch on this theme. These include item 11 (inspections mandated by bio-security practices) and item 12 (increased awareness of agro-terrorism threats) in Fed-AH listing, item 6 (more anti-terrorism positions) in the Fed-FS/S panel listing, and item 14 (counter food related terrorism threats) in the Fed-CDN listing.

The **Animal-Human Health Concerns** theme is a second general societal concern. The highest rated item (zoonotic disease concerns) from the Fed-Combined listing is
linked to this theme. That same item is the highest rated item in the Fed-PH and Fed-AH lists, and the second and third highest rated item in the other two panels. Other items that flag this as an important theme include item 8 (need to understand animal-human heath eco-systems) and item 10 (concern for animal health) in the in the Fed-PH listing. The Fed-AH listing included these as items 8 and 16, and adds a unique related item as 5 (need to control zoonotic disease threats). The Fed-FS/S included related items as 14 (animal-human health eco-systems) and 15 (animal health concerns). Finally, the Fed-CDN panel flags this theme with two panel-specific items: item 4 (international disease monitoring and reporting standards) and item 5 (surveillance of emerging diseases).

A third general societal concern, Food Safety Concerns, was noted as the second highest rated item in the Fed-Combined listing. This same item (public concerns over food safety) was listed as item 1 in the Fed-FS/S listing, item 3 in the Fed-PH listing, item 2 in the Fed-AH panel listing, and was seen as the third highest rated item by the Fed-CDN panel. The Fed-FS/S panel added a unique related item as 7 (DVMs being seen as a key resource in achieving food system safety).

The fourth societal concern noted in the lower-right quadrant of Figure 7 that is increasing demand is Animal Welfare Concerns. This, like terrorism threat concerns, has been emerging as a more important factor. The ratings of related items suggest that it is currently less important than the other three societal concerns. Item 6 in the Fed-Combined listing (concern for animal welfare) is the primary item identifying this theme, and each of the panels note it in their lists. It ranks as low as item 12 in the Fed-PH listing and as high as item 7 in both the Fed-AH and Fed-CDN listings. The Fed-AH panel added a related unique item as item 13 (more animal welfare consultations).
While strategic actions are not likely to greatly influence these four general societal concerns, the profession needs to appreciate the importance of these issues and respond with programs and initiatives that are responsive to the demand-increasing benefits of these trends. While being responsive to these four themes can enhance demand and guide strategic action, two additional themes, noted in the upper-right quadrant of Figure 2, have even stronger prospects for enhancing demand and serving as the basis for strategic action. These are logical extensions of the four noted societal concerns.

The Regulatory & Global Food System theme is noted by items 4 (need to track animals entering the food chain) and 5 (access to global markets) in the Fed-Combined listing. These same items were also ranked as items 4 and 5 in the Fed-PH listing. Similarly, the Fed-AH panel ranked these two items as 4 and 17 and added a related unique factor as item 10 (increasing globalization of the food supply system). The Fed-CDN panel also included these same two items (8 and 12) and added a unique related factor (item 11 - international trade of food and animal products). Understandably, the Fed-FS/S panel also ranked these same two items (4 and 8) and also added three additional unique items that relate to this theme. These are items 5 (increasing USDA international surveillance demands), 11 (globalization of the food supply system), 12 (import and export oversight requirements at borders). This theme is a very direct extension of the Food Safety Concerns theme. Federal government food supply veterinarians are in a position to both create programs that are responsive to the regulations and shape the regulations that will in turn influence future demand. Thus, this is a theme that is very actionable. The FSVM profession can consider strategic actions
that will enhance or extend the demand-influence currently projected by the four federal government panels.

The *Specialized Technical Services & Certifications* theme is illustrated by item 7 (required third-party certifications or verification of standards) in the Fed-Combined listing. This same item is included in the listings for the Fed-CDN (item 9), Fed-AH (item 15), and Fed-FS/S (item 13) panels. Additional items related to this theme include item 3 (more demands for certifications and auditing) and item 18 (highly technical or specialized services) in the Fed-AH panel. These same two items are included in the Fed-FS/S panel as item 9 and item 16, and one of them is ranked as 16 in the Fed-CDN listing.
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 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 feedback report on the second survey results was final opportunity to reconsider and make final projections of future demand. As is often the case with Delphi panels, the range of estimates from the first survey was quite wide and then narrowed with each successive survey.

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. The pattern of estimates generally followed the usual Delphi outcome of broader ranged early round estimates, indicating some disagreement, followed by a narrowing of estimates (more agreement) in the later survey rounds. 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.
**2nd Survey Results:**
- Mid-50% = +4.0% to +11.5%
- Mean = +8.8% (■)
- Median = +7.0% (▲)

**3rd Survey Results:**
- Mid-50% = +3.0% to +8.5%
- Mean = +6.2% (■)
- Median = +5.5 (▲)
Figure 4
Medium-Term Demand Change (2007-10)

2nd Survey Results:
- Mid-50%: +2.0% to +10.0%
- Mean = +5.4\% (■)
- Median = +5.0\% (▲)

3rd Survey Results:
- Mid-50%: +3.0% to +6.0%
- Mean = +4.8\% (■)
- Median = +5.0\% (▲)
Figure 5
Long-Term Demand Change (2010-16)

2\textsuperscript{nd} Survey Results:
• Mid-50%: +4.0% to +14.3%
• Mean = +8.5% (■)
• Median = +8.0% (▲)

3\textsuperscript{rd} Survey Results:
• Mid-50%: +2.5% to +11.0%
• Mean = +6.4% (■)
• Median = +6.0% (▲)
Figure 6
Future Demand Summary

Short-Term (2004-07):
• Mid-50% = +3.0% to +8.5%
• Mean = +6.2% (■)
• Median = +5.5% (▲)

Medium-Term (2007-10):
• Mid-50%: +3.0% to +6.0%
• Mean = +4.8% (■)
• Median = +5.0% (▲)

Long-term (2010-16):
• Mid-50%: +2.5% to +11.0%
• Mean = +6.4% (■)
• Median = +6.0% (▲)
There is a strong consensus that demand is increasing in all federal government panels. The middle 50% of the panel (between the 25th and 75th percentile of the distribution) projected demand increases over all three time periods in the final survey. The point estimates seen in the means and median scores varied between +4.8% and +6.4% in the final survey. Estimates tended to be higher in the second survey. While there was general agreement that demand will increase, there remained after the final Delphi round, disagreement on the exact extent that demand is expected to increase. There was understandably a wider range of projections for the longer-term forecast. This is indicated by the breadth of the middle 50% range. Greater uncertainty (which is inherent in longer range forecasts) as to how projected trends will play out logically lead to a wider-range of predictions.

Differences between Panels

Further analysis was done to evaluate the basis for these differing perceptions within the four panels. Clearly the first explanation is that demand changes may be different in each of the four federal panels. There were not any statistically significant differences (based on One way ANOVA tests, p < .10) between the means noted for each panel. The lack of statistical significance is based on not only the magnitude of difference between means, but is also highly influenced by small panel sample sizes and high variance within each panel. Consequently, even differences that appear large do not reach statistical significance. The ranges and point estimates in each panel are occasionally quite different. For example, the Fed-CDN mean for the long-term demand increases of +2.7% is not quite statistically different (p < .10) than the Fed-AH panel mean of +9.7%. However, even though we can not definitively say that the panel means represent
different populations (given the lack statistical differences), these numerical differences
do help to partial explain the wider middle 50% ranges in some forecasts.

The middle 50% ranges and point estimates from the third survey for each of the
panels are as follows:

• Short-Term Demand:
  o Fed-Public Health: Mid-50% Range: +2.0% to +6.8%; mean: +5.8%,
    median: +4.5%
  o Fed-Animal Health: Mid-50% Range: +2.5% to +6.0%; mean: +4.5%,
    median: +5.0%
  o Fed-Food Safety/Security: Mid-50% Range: +4.0% to +12.0%; mean:
    +7.4%, median: +7.5%
  o Fed-Canada: Mid-50% Range: +5.0% to +10.5%; mean: +7.6%, median: 7.0%

• Medium-Term Demand:
  o Fed-Public Health: Mid-50% Range: +3.0% to +7.0%; mean: +5.1%,
    median: 5.0%
  o Fed-Animal Health: Mid-50% Range: +3.0% to +5.0%; mean: +4.2%,
    median: +4.0%
  o Fed-Food Safety/Security: Mid-50% Range: +2.3% to +7.5%; mean:
    +4.8%, median: +5.0%
  o Fed-Canada: Mid-50% Range: +2.5 to +7.5% ; mean: +5.2%, median:
    +5.0%

• Long-Term Demand:
  o Fed-Public Health: Mid-50% Range: +2.3% to +11.8%; mean: +6.3%,
    median: 6.0%
  o Fed-Animal Health: Mid-50% Range: +4.3% to +12.8% ; mean: +9.2%,
    median: +10.5%
  o Fed-Food Safety/Security: Mid-50% Range: +2.3% to +7.5%; mean:
    +4.8%, median: +5.0%
Fed-Canada: Mid-50% Range: 0% to +4.0% ; mean: +2.7%, median: +3.0%

The panel-specific demand change predictions show some (non-statistically significant) variations around the numbers for the four panels combined. For the short-term demand changes, all panels projected demand increases. The Fed-Combine median of a +5.5% increase is flanked by a +4.5% increase in the Fed-PH panel and a +7.5% increase in the Fed-FS/S panel. For the medium-term, there are similar predictions of demand increases. The panel medians were either +4.0% or +5.0%, i.e., very close to the +5.0% overall median score noted in Figures 4 and 6. For the long-term forecast we see a broader range of median scores, with the +6.0% four-panel combined score being flanked by the Fed-CDN panel score of +3.0% on the low side up to +10.5% in the Fed-AH panel.

**Differing Perceptions of Demand Influences**

To further understand the variety of predictions noted in the middle 50% ranges, additional analyses were done that contrasting those making demand increase forecasts that were higher versus lower than the median score (+5.5%) for all three forecast periods combined. T-test analysis evaluated whether these two sub-groups rated the 25 demand influence factors included in all panels differently. The “higher-demand increases” sub-group (compared to the “lower-demand increases” sub-group) rated the following factors as having a stronger influence on demand increases:4

- Public concerns over bio-terrorism: The higher-demand increases sub-group mean was 6.20 (on the 7-point scale) versus the lower-demand increases sub-group mean of 5.42.

---

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.
• More access to global food markets for food exports: Higher-demand increases mean was 5.71 (on the 7-point scale) versus the lower-demand increases sub-group mean of 5.24.

The higher-demand sub-group also rated the following two demand influences as having a stronger influence on demand decreases by a significantly margin:

• Slow adoptions of new technologies by veterinarians: The higher-demand increases sub-group mean was 3.67 (on the 7-point scale) versus the lower-demand increases sub-group mean of 4.19.

• Lack of veterinarian’s practice management and business skills: Higher-demand increases mean was 3.43 (on the 7-point scale) versus the lower-demand increases sub-group mean of 4.24.

Those seeing stronger increasing demand are more optimistic that the recent concerns about bio-terrorism threats and the globalization of the food supply system will significantly increase demand. Conversely, they are also more pessimistic about the brake on demand that is associated with weak business skills and resistance to technological tools. All four of these areas of difference are directly related to themes noted in Figure 2.
Specialized Activities Increasing or Decreasing 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 several areas in each panel received multiple mentions. While some of the items are highly similar to items in other panels, it should be noted that these items were developed from comments that were independent of comments made in other panels. These comments were used to form items which members of each panel rated in the second survey. The higher-demand and the lower-demand activity areas for each panel are as follows:

Federal – Public Health (Fed-PH) Panel:

1. Foreign animal disease assessments (mean: 5.60 on a 7-point scale)\(^5\)
2. Imported food related tasks (mean: 5.47)
3. Bio-terrorism prevention consulting (mean: 5.40)
4. Animal identification and tracking activities (mean: 5.33)
5. Inspections at national borders (mean: 5.27)
6. Meat testing (mean: 5.00)
7. Third party verification of food safety tasks (mean: 4.73)
8. Slaughter house inspection duties (mean: 4.40)

\(^5\) The activity area items were rated on a 7-point Likert-type scale and evaluated based on forecasted increase or decrease in demand relative to the expected general pattern of demand change. 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 Difference, 5. Slight Increase, 6. Increase, 7. Strong Increase.
Only one activity area was seen as facing relatively lower future demand in the Federal - Public Health area: Small farm related activities (mean: 3.80)

Federal – Animal Health (Fed-AH) Panel:

1. Expertise in foreign animal diseases (mean: 6.21)
2. Epidemiology and microbiology expertise (mean: 6.21)
3. Surveillance and risk assessments (mean: 6.14)
4. Public health related skills (mean: 6.14)
5. Communication and “people” skills (mean: 6.07)
6. Data analysis and management (mean: 5.93)
7. Animal welfare related skills (mean: 5.92)
8. Research skills (mean: 5.79)
9. Aquaculture related expertise (mean: 5.71)
10. Rapid diagnosis skills (mean: 5.62)
11. Administrative and managerial skills (mean: 5.57)
12. Import/export inspection and verification (mean: 5.43)
13. Skills in traditional disease eradication programs (mean: 5.07)
14. Pharmaceutical industry related knowledge (mean: 4.69)

No items were identified as decreasing activity areas by the Fed-AH panel.

Federal – Food Safety & Security (Fed-FS/S) Panel:

1. Public health related skills (mean: 6.36)
2. Food safety and security system auditing (mean: 6.14)
3. Epidemiology and microbiology expertise (mean: 6.00)
4. Communication and “people” skills (mean: 5.86)
5. Food safety research skills (mean: 5.71)
6. Quality management/assurance skills (mean: 5.57)
7. Administration and managerial skills (mean: 5.43)

Only one activity area was seen as facing relatively lower future demand in the Federal – Food Safety & Security area: In-plant inspection activities (mean: 3.86)

**Federal – Canadian Government (Fed-CDN) Panel:**

1. Risk management activities (mean: 6.22)
2. On farm food safety activities (mean: 6.00)
3. Interaction with international veterinary organizations (mean: 6.00)
4. Global regulatory and export certifications activities (mean: 6.00)
5. HACCP audit activities (mean: 5.78)
6. Epidemiology (mean: 5.78)
7. Communications with the public (mean: 5.78)
8. Anti-microbial resistance related activities (mean: 5.56)

The one activity area seen as facing relatively lower future demand in the future by the Federal-CDN panel is: Meat and poultry direct inspection activities (mean: 3.78)

The various activities areas projected as increasing demand provide some details to the general themes noted on the right-hand side of Figure 2. Most of the activity areas can be quite easily categorized into themes. These activity areas provide more detail on the skills, roles, and responsibilities involved. The two more-actionable themes in the upper-right quadrant of Figure 2, *Specialized Technical Services & Certifications* and *Regulatory & Global Food System*, are related to many of the above listed items.
Trends and Issues Driving the Future Supply of Federal Government Food Supply Veterinarians

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. Additional supply-related influence items were drawn from open-ended comments to the first survey. For areas where multiple mentions were made, new items were created and included in the second survey to each panel. Items from the original 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. Both the lists for items rated by all four panels combined from the list of 17 items in the first survey as well as the panel-specific supply influencing items are summarized.

Trends Increasing Supply

None of the 17 items rated by all four panels in the first survey had an overall mean that was over the “4. No Influence” mid-point of the scale and could be considered as a trend that is increasing the supply of food supply veterinarians in federal government positions. The results of each panel rating of the original 17 supply-influencing items, and additional panel-suggested supply-related items included in the second and third surveys, were used to create a listing of the highest-rated trends or factors increasing the future supply of veterinarians entering federal government food supply careers: 6

6 The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future supply of veterinarians entering federal government 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. The means are from the last survey in which they were rated. Only items with a mean greater than 4.20 are included in these lists.
Federal – Public Health (Fed-PH) Panel:

1. Increasing interest in public service since 9/11 (mean: 5.07)
   
   Note that the self-rated forecasting experts’ sub-group mean of 5.40 was significantly higher than the less-expert sub-group mean of 4.71.

2. DVM debt-forgiveness legislation for under-served areas (mean: 4.87)

3. Opportunities to move to other DVM career areas (mean: 4.73)

4. Expected high number of food supply veterinarians retiring in the near future (mean: 4.50)

5. Pay levels compared to other employment opportunities (mean: 4.42)

Federal – Animal Health (Fed-AH) Panel:

1. Increasing awareness of food animal career opportunities (mean: 5.46)

2. Funding of National Veterinary Medical Services Act (mean: 5.43)

3. Expected high number of food supply veterinarians retiring in the near future (mean: 4.43)

4. Pay levels compared to other employment opportunities (mean: 4.21)

Federal – Food Safety & Security (Fed-FS/S) Panel:

1. Funding of National Veterinary Medical Services Act (mean: 5.46)

2. Growth of combination DVM-MPH graduate programs (mean: 5.08)

3. Movement of DVMs from private practice to government employment (mean: 5.00)

4. Opportunities to move to other DVM careers (mean: 4.86)
   
   Note that the self-rated forecasting experts’ sub-group mean of 5.29 was significantly higher than the less-expert sub-group mean of 4.33.

5. Attractiveness of government employment security and lifestyle (mean: 4.71)

6. More women veterinarians entering the workforce (mean: 4.36)

7. Pay levels compared to other employment opportunities (mean: 4.21)
Federal – Canadian Government (Fed-CDN) Panel

1. Opportunities for regular work hours (mean: 5.33)

2. Veterinary schools reserving spaces for food animal oriented students (mean: 5.00)

3. Externships during the last year of DVM program (mean: 4.89)
   Note that the self-rated forecasting experts’ sub-group mean of 4.25 was significantly lower than the less-expert sub-group mean of 5.50.

4. Career development opportunities in government roles (mean: 4.78)
   Note that the self-rated forecasting experts’ sub-group mean of 4.25 was significantly lower than the less-expert sub-group mean of 5.50.

5. Inflows of underemployed DVMs from food animal practices (mean: 4.56)

6. Physical demands of large animal veterinary work (mean: 4.50)

7. Need to work long hours and emergency calls (mean: 4.40)

8. Salary levels of federal government positions (mean: 4.22)

9. Expected high number of food supply veterinarians retiring in the near future (mean: 4.20)

In reviewing these four lists of supply-increasing trends or factors, two characteristics stand out. First, these items are not generally rated as strong influence factors. Only one or two items per panel had a mean of 5.0 or higher and reached the “5. Increase Slightly” level. Also, these are not particularly long lists. The federal government panels seemed to have an easier time identifying factors that are decreasing supply. Second, the listings are fairly varied. A few common themes are apparent and these will be presented at the conclusion of this section, but there are several items that are unique to each panel. This represents a challenging circumstance to the FSVM profession. A few consistent themes with high ratings could provide strong leverage points for countering labor shortages. Such obvious levers are not readily apparent in the above listings.
Trends Decreasing Supply

The panel rated several trends and factors that are leading to *decreases* in the future supply of food supply veterinarians entering into federal government careers. These are presented starting with the most extreme supply-decreasing factors: 7

All Federal Government (Fed-Combined) Panels:

1. Poor income opportunities in food supply careers (mean: 2.61)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.27 was significantly lower than the less-expert sub-group mean of 3.17.*

2. Less emphasis on food animal practices in veterinary colleges (mean: 2.70)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.33 was significantly lower than the less-expert sub-group mean of 3.22.*

3. Little exposure to food supply career options in college (mean: 2.72)

4. Federal and/or State/Provincial budgetary constraints (mean: 2.74)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.38 was significantly lower than the less-expert sub-group mean of 3.22.*

5. Lack of positive role models in veterinary food supply practice (mean:2.78)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.55 was significantly lower than the less-expert sub-group mean of 3.22.*

6. Lack of food supply practice related externships for students (mean: 2.86)

7. Lack of spousal career options in rural areas (mean: 2.93)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.63 was significantly lower than the less-expert sub-group mean of 3.39.*

8. Limited life style and career opportunities in rural areas (mean: 3.12)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.78 was significantly lower than the less-expert sub-group mean of 3.22.*

9. High debt load of veterinary school graduates (mean: 3.16)  
   *Note that the self-rated forecasting experts’ sub-group mean of 2.78 was significantly lower than the less-expert sub-group mean of 3.68.*

---

7 The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of academic food supply 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.
10. Perceived lack of demand for food animal skills (mean: 3.18)

11. Need to work long hours and emergency calls (mean: 3.31)

12. Limited capacity of existing veterinary colleges in the US and/or Canada (mean: 3.32)

Federal – Public Health (Fed-PH) Panel

1. Little exposure to food supply career options in college (mean: 3.00)

2. Federal and/or State/Provincial budgetary constraints (mean: 3.07)

3. Lack of food supply practice related externships for students (mean: 3.13)

4. Lack of positive role models in veterinary food supply practice (mean: 3.23)

5. Lack of spousal career options in rural areas (mean: 3.40)

6. Less emphasis on food animal practices in veterinary colleges (mean: 3.40)

7. Perceived lack of demand for food animal skills (mean: 3.50)

8. High debt load of veterinary school graduates (mean: 3.55)

9. Limited life style and career opportunities in rural areas (mean: 3.60)

10. Physical demands of large animal veterinary work (mean: 3.63)

11. Lack of cultural and recreational opportunities in rural areas (mean: 3.64)

Federal – Animal Health (Fed-AH) Panel

1. Lack of food supply practice related externships for students (mean: 2.81)

2. Federal and/or State/Provincial budgetary constraints (mean: 2.93)

3. Little exposure to food supply career options in college (mean: 2.93)

4. Lack of positive role models in veterinary food supply practice (mean: 2.94)

5. Lack of spousal career options in rural areas (mean: 2.94)

6. Limited life style and career opportunities in rural areas (mean: 2.94)
7. Less emphasis on food animal practices in veterinary colleges (mean: 3.14)

8. High debt load of veterinary school graduates (mean: 3.21)

Note that the self-rated forecasting experts’ sub-group mean of 2.57 was significantly higher than the less-expert sub-group mean of 3.86.

9. Poor income opportunities in food supply careers (mean: 3.21)

10. Need to work long hours and emergency calls (mean: 3.29)

11. Physical demands of large animal veterinary work (mean: 3.41)

12. Lack of cultural and recreational opportunities in rural areas (mean: 3.47)

13. Limited capacity of existing veterinary colleges in the US and/or Canada (mean: 3.50)

14. More women veterinarians entering the workforce (mean: 3.53)

Federal – Food Safety & Security (Fed-FS/S) Panel

1. Federal and/or State/Provincial budgetary constraints (mean: 2.50)

2. Lack of spousal career options in rural areas (mean: 2.50)

3. Little exposure to food supply career options in college (mean: 2.53)

4. Less emphasis on food animal practices in veterinary colleges (mean: 2.57)

5. Limited life style and career opportunities in rural areas (mean: 2.93)

6. Perceived lack of demand for food animal skills (mean: 3.00)

7. Lack of cultural and recreational opportunities in rural areas (mean: 3.14)

8. Limited capacity of existing veterinary colleges in the US and/or Canada (mean: 3.15)

9. Lack of food supply practice related externships for students (mean: 3.21)

10. Negative views of federal service careers (mean: 3.21)

11. Poor income opportunities in food supply careers (mean: 3.36)

12. Lack of positive role models in veterinary food supply practice (mean: 3.38)
Federal – Canadian Government (Fed-CDN) Panel

1. Little exposure to food supply career options in college (mean: 2.33)
2. Lack of positive role models in veterinary food supply practice (mean: 2.45)
3. Less emphasis on food animal practices in veterinary colleges (mean: 2.55)
4. Perceived lack of demand for food animal skills (mean: 2.75)
5. Lack of food supply practice related externships for students (mean: 2.75)
6. Limited capacity of existing veterinary colleges in the US and/or Canada (mean: 2.83)
7. Federal and/or State/Provincial budgetary constraints (mean: 2.89)
8. Requirement of education beyond a DVM (mean: 3.17)
9. Lack of cultural and recreational opportunities in rural areas (mean: 3.33)
10. Urbanization and fewer veterinary students with rural backgrounds (mean: 3.44)
11. More women veterinarians entering the workforce (mean: 3.50)
12. High debt load of veterinary school graduates (mean: 3.56)
13. Lack of spousal career options in rural areas (mean: 3.60)

Patterns of Influences on Supply

The above lists of supply influences are far ranging. While there are novel influences that apply to particular panels, there are also items that are noted in all panel listing. This is particularly true of the Supply Decreasing Trends noted above. Across those lists we see several coherent themes over all panel lists. The planning matrix in Figure 7 presents the underlying themes evident in both the supply-decreasing and supply-increasing listings of trends.
Supply Decreasing Factors. Perhaps the most extreme supply-diminishing theme apparent in the above lists is the CVM Non-FSVM Focus. From the Fed-Combined listing at the start of the previous section, four related items identify this theme: item 2 (less emphasis on food animal practices), item 3 (little exposure to food supply career options), item 6 (lack of food supply practice related externships), and item 10 (perceived lack of demand for food animal skills). The last item (perceived lack of demand) is likely the consequence of the other three. These same items are often included in the panel-specific listings. The Fed-PH listing notes these same factors as items 1, 3, 6, and 7. The Fed-AH listing identifies three of these same four factors as items 1, 3, and 7. For the Fed-FS/S panel, those same four items are noted as 3, 4, 6, and 9. Finally, in the Fed-CDN listing they are noted as items 1, 3, 4, and 5. This theme represents actionable opportunities for the FSVM profession. While change is never easy, changing the less than adequate focus on FSVM at colleges of veterinary medicine can be done without the high support and involvement of external entities. Progress on this change can be done with a reallocation of resources rather than new monies. Of course, external financial resources would certainly aid the change effort. Faculties of veterinary colleges can, with the support and encouragement from other sectors of the FSVM profession, review how they are influencing students to move away from food supply careers. Given the actionable nature of this theme, it is noted in the upper-left quadrant of Figure 7.
Figure 7
Supply Diminishing & Enhancing Issues in the Federal Government Sector

Opportunities (Actionable)

CVM Non-FSVM Focus
Ineffective Role Models

Structure of Career Opportunity

Supply Enhancing Factors

Debt Forgiveness Initiatives

Expected Near-Term Retirement

Income Opportunities

Supply Constraining Factors

Student Debt

Limited CVM Capacity

Governmental Budgetary Constraints

Rural Economic/Social Constraints

Fixed Constraints (Less Actionable)
Another theme related to supply decreases and linked to highly rated supply-decreasing items is *Ineffective Role Models*. From the Fed-Combined listing, item 5 (lack of positive role models) identifies this theme, and this same item is also included in the Fed-PH (item 4), Fed-AH (item 4), Fed-FS/S (item 12), and Fed-CDN (item 2) panel listings. This theme is perhaps even more actionable than the previous theme and is also noted in the upper-left quadrant of Figure 7. Mentoring initiatives both within colleges and in the larger FSVM profession can be designed and implemented to turn this theme away from a negative or supply-diminishing force and, possibly, turn it into a supply-enhancing factor.

The *Student Debt* theme represents another supply constraint. It was noted as item 9 (high debt load of veterinary graduates) in the Fed-Combined listing and was mentioned in all panels except the Fed-FS/S. This theme is noted in the upper-left quadrant of Figure 7, but near the middle line. While there are opportunities to lessen this supply constraint, it must be recognized that the funding of higher education will likely continue to shift the financing burden of state public education to private entities, including student tuition levies. Both private and government initiatives, such as reasonable funding for the National Veterinary Services Act in the US, will help lessen this influence of supply-constraint; however, they will not eliminate it.

The other themes represent less actionable constraints on supply. Changing these can make a large impact but will require the cooperation of multiple external entities. In some cases, they represent larger social patterns that are a function of many forces. The *Rural Economics/Social Constraints*, noted in the lower-left quadrant of Figure 7 is an example of a more highly constrained supply influence. It is identified by item 7 (spousal career options in rural areas) and item 8 (lifestyle and career opportunities in rural areas)
on the Fed-Combined listing. The three US federal government panel listings noted these items and added a third, “lack of cultural and recreational opportunities in rural areas.” (For example, this is item 11 in the Fed-PH panel listing.) The Fed-CDN panel noted the cultural and recreation opportunities constraint (item 9) and the spousal career options factor (item 13), and adds a related unique item (10 – urbanization and fewer veterinary students with rural backgrounds).

*Governmental Budgetary Constraints* was a supply-decreasing theme that all panels seem to appreciate. This theme is identified by item 4 (Federal and/or State/Provincial budgetary constraints) in the Fed-Combined listing. This same item is ranked as either first or second on the three US federal government panel lists and is item 7 in the Fed-CDN listing. Deficits, competing demands for federal dollars, and a tax adverse electorate will continue to challenge those in federal government entities to find adequate financial resources to hire adequate numbers of food supply veterinarians. It would appear that these four panels believe that new food supply veterinarians will continue to understand those constraints and look for alternatives.

The final general supply constraint theme evident in the various lists is *Limited CVM Capacity*. While the items identifying this theme approached the mid-point of the scale (4. No Influence) indicating that this is not a strong constraint, it was noted in the Fed-Combined list (item 12 – “limited capacity of existing veterinary colleges in the US and/or Canada”) as well as all four of the panel-specific listings.

The view that “limited income opportunities” is constraining supply was evaluated, but not included as a general theme. The related item was noted as the most extreme constraint on the Fed-Combined listing. However, it was not included in two of the four panel-specific listings. The rating of this item illustrates how views change over
the phases of the Delphi process as information from other panel members is shared and members have an opportunity to reconsider their views and re-rate trends and factors. The Fed-Combined listing is from the first survey placed “limited income opportunities” item (item 1) as having the highest average mean overall all four panels. In each panel, there was fairly high variance around the mean rating of this item and it was included for re-rating in the second and, in some cases, the third survey. The Fed-PH panel illustrates how panels shifted their views of this item. In the first round, this item (poor income opportunities in food supply careers) was seen as the most extreme supply constraint (mean: 2.69) in the Fed-PH panel. After reviewing the first survey results, the mean for this item became less extreme and changed to 2.98 mean in the second survey. Since there was still a pattern of disagreement within the panel, it was included in the third survey and, after reviewing the second wave data, the panel members completing the third survey rated it as 3.73, which was close to the “no influence” mid-point of the scale. This result is a function of those staying activity in the Delphi process moderating their view of the influence of this item and those having more extreme views dropping out of the process and not completing the final survey.

Supply Increasing Factors. The four lists presented on the first page of this section identified the Trends Increasing Supply for each panel. As noted earlier, those lists were fairly short, did not have an abundance of strong influence factors, and were quite varied. These items were evaluated to identify apparent themes present in those lists of supply increasing factors. These themes are presented in the right-hand side of Figure 7.

A theme noted by all four panels is the Structure of Career Opportunity. The following items identify this theme. Item 3 (opportunities to move to other DVM career
areas) in the Fed-PH panel, item 1 (increasing awareness of food animal career options) in the Fed-AH panel, items 3 (movement of DVMs from private practice to government employment) and 4 (opportunities to move to other DVM careers) in the Fed-FS/S panel, and items 4 (career development in opportunities in government roles) and 5 (inflows of underemployed DVMs from food animal practices) in the Fed-CDN panel. Professionals are attracted to roles that aid the development of their competencies and position them for opportunities to move to other jobs. These various items note mechanisms that create career opportunities. It has been noted in the upper-right quadrant since it seems possible to enhance and extend this factor and use it to attract more veterinarians to this area. It may be the best actionable opportunity to attract new FSVM employees into federal employment. Doing this would require that career development opportunities be identified and developed into a compelling story. This information should be used to promote and market advantages of federal FSVM careers.

Income Opportunities was a second theme. One item in each of the panels identified this theme. It should be noted that this is not an influential theme. Many of the items had means that approach the 4.20 cut-off for inclusion. This theme was identified by item 5 (pay levels compared to other employment opportunities) in the Fed-PH panel. This same item was included as item 4 in the Fed-AH list and item 7 in the Fed-PS/S panel listing. The Fed-CDN panel added a related item as item 8 (salary levels of federal government programs). The issue of pay is a rather interesting factor in the federal panels. “Poor income opportunities in food supply careers” was first noted as a strong factor decreasing supply in the first survey; however, the ratings of that item in subsequent surveys moved it close to the “no-influence” middle section of the scale. The item referenced for this theme, “Pay levels compared to other employment
opportunities,” is an independent and more neutrally worded item that ended up being seen as having a weak but positive influence on supply. Pay levels for food supply veterinarians are a part of the larger federal service compensation system. As such it is expected to be fairly constrained and, for this reason, this factor is noted in the lower-right quadrant of Figure 7.

*Debt Forgiveness Initiatives* is a theme referenced by items in all three US federal panels but not the Canadian panel. The related items are: item 2 (DVM debt-forgiveness legislation) in the Fed-PH panel and the “funding of the National Veterinary Medical Services Act” (item 2 in the Fed-AH panel and item 1 in the Fed-FS/S panel). Some progress as been made recently on this front. However, in the current fiscal/political environment all new federal spending is likely to be highly constrained by competing interests. For this reason, this theme is place in the upper-right quadrant, but near the middle line, in Figure 7.

A second theme noted by two US federal panels and the Canadian panel is *Expected Near-Term Retirements*. This theme is identified by item: “expected high numbers of food supply veterinarians retiring in the near future.” This item appears as item 4 in the Fed-PH panel, item 3 in the Fed-AH panel, and item 9 in the Fed-CDN panel. The Fed-FS/S panel did not include this item. While the increase of FSVM related retirements in the near term will provide opportunities and draw in an increased supply of new food supply veterinarians *entering* into federal employment, this theme should not be used to infer that the *aggregate supply* will necessarily be increased by this factor. If retirees are not all replaced with food supply veterinarians, the aggregate supply will go down even though there is increased opportunities for new hires. The retirement rate is
largely age-based and (even with early retirement programs) is not highly actionable. For this reason, it is placed in the lower-right quadrant.

There are a number of supply-increasing items that are not connected to the above noted themes and are not consistently referenced in all four panels. For example, the highest rated item in the Fed-PH panel was “increasing interest in public service since 9/11” (mean: 5.07). Similar items were not noted by the other panel. In the Fed-FS/S panel, “more women veterinarians entering the workforce” (mean: 4.36 – item 6) was noted as having a weak but positive influence on supply increases. No other panels noted this item. A couple of panels did identify items that relate to a work/life balance theme. Related items are item 5 (attractiveness of government employment security and lifestyle) in the Fed-FS/S panel and item 1 (opportunities for regular work hours) in the Fed-CDN panel.
After rating demand and supply related factors, panel members were asked to project the “most likely” estimate of the percent that available supply veterinarians will 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 the same three time periods used to forecast future demand: 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 replies) and the arithmetic mean and the median (i.e., the 50th percentile of the distribution of estimates) are used to summarize these forecasts. Figures 8 though 10 provide the results of each time period. Figure 11 provides the summary of the results from the final survey for all three periods.
**2nd Survey Results:**
- Mid-50% = -3.0% to -10.0%
- Mean = -6.8% (■)
- Median = -6.5% (▲)

**3rd Survey Results:**
- Mid-50% = 3.4% to -8.3%
- Mean = -6.4% (■)
- Median = -5.3% (▲)

---

**Figure 8**  
Short-Term Shortages (2004-07)
Figure 9
Medium-Term Shortages (2007-10)

2nd Survey Results:
• Mid-50% = -3.0% to -10.0%
• Mean = -6.4% (■)
• Median = -5.0% (▲)

3rd Survey Results:
• Mid-50% = -3.0% to -9.5%
• Mean = -5.8% (■)
• Median = -5.0% (▲)
2\textsuperscript{nd} Survey Results:
- Mid-50%: -2.3\% to -10.0\%
- Mean = -6.0\% (■)
- Median = -5.0\% (▲)

3\textsuperscript{rd} Survey Results:
- Mid-50%: -2.8\% to -8.0\%
- Mean = -5.3\% (■)
- Median = -4.5\% (▲)
Figure 11
Future Shortages Summary

Short-Term (2004-07):
• Mid-50% = -3.4% to -8.3%
• Mean = -6.4% (■)
• Median = -5.3% (▲)

Medium-Term (2007-10):
• Mid-50%: -3.0% to -9.5%
• Mean = -5.8% (■)
• Median = -5.0% (▲)

Long-term (2010-16):
• Mid-50%: -2.8% to -8.0%
• Mean = -5.3% (■)
• Median = -4.5% (▲)
The panel reached agreement that, given current trends, there will be a shortage of federal government food supply veterinarians over the next several years. The point estimates for each time period is that there will be a 5% to 6% shortage. The middle 50% (between the 25th and 75th percentile of the distribution) range estimate was always in the shortage range. In fact, only one to three panel members over all four panels combined ever projected a future surplus. The minimum range was around -3.0% for all three time periods and the maximum of the range was between -8.0% and -9.5%. The resulting ranges are fairly broad. This reflects the differing assumptions that panel members are making concerning how supply and demand forces will unfold over the next several years.

One possible reason for the breadth of the four-panel combined mid-50% range projections is that forecasted shortages differ from panel to panel. One-way ANOVA was used to test for significant mean differences over all four panels, but did not find significant differences. One contrast that narrowly missed the p < .10 level of significance was in the final short-term shortage projects. The Fed-AH panel projected a -9.0% mean (shortage), while the Fed-PH panel mean was a more conservative -4.2% (shortage). As was the case for the demand estimates summarized in a previous section, even statistically non-significant differences between panel means can lead to wider ranges of shortage estimates. The following are the shortage estimate information for each panel:

- Short-Term Shortages:
  - Fed-Public Health: Mid-50% Range: -1.9% to -7.1%; mean: -4.2%, median: -4.3%
  - Fed-Animal Health: Mid-50% Range: -4.0% to 13.5%; mean: -9.0%, median: -8.0%
Fed-Food Safety/Security: Mid-50% Range: -3.8% to -7.5%; mean: -6.8%, median: +5.8%
Fed-Canada: Mid-50% Range: -2.5% to -6.8%; mean: -5.0%, median: -4.8%

- Medium-Term Shortages:
  Fed-Public Health: Mid-50% Range: -3.0% to -9.0%; mean: -5.6%, median: -5.5%
  Fed-Animal Health: Mid-50% Range: -2.0% to -10.0%; mean: -6.0%, median: -4.5%
  Fed-Food Safety/Security: Mid-50% Range: -3.5% to -10.0%; mean: -5.2%, median: -5.0%
  Fed-Canada: Mid-50% Range: -4.3% to -9.0%; mean: -6.7%, median: -5.5%

- Long-Term Shortages:
  Fed-Public Health: Mid-50% Range: -3.0% to -8.3%; mean: -5.9%, median: -5.0%
  Fed-Animal Health: Mid-50% Range: -2.3% to -8.5%; mean: -5.6%, median: -4.5%
  Fed-Food Safety/Security: Mid-50% Range: -2.0% to -8.8%; mean: -4.8%, median: -4.0%
  Fed-Canada: Mid-50% Range: -1.8% to -6.6%; mean: -4.6%, median: -4.0%

While there was some variability between panels in different time periods, notably in the short-term time frame, there was fair consistency between the point estimates of shortages. The median values ranged from -4.3% to -8.0% in the short-term, -4.5% to -5.5% in the medium-term, and -4.0% to -5.0%. The means tended to indicate higher shortages.
Sub-group analysis based on self-rated forecasting expertise was also explored to understand the range of shortage estimates. While some statistically significant (p < .05) differences in the second survey estimates identify the tendency for experts to see deeper shortages, the differences were not as large in the final survey and they did not reach significance.

Do those seeing deeper shortages see the various demand-influence and supply-influence factors (evaluated in prior sections) differently? If they do, this would further explain the range of shortage projections. T-test analyses were use to contrast those making more conservative estimates versus those projecting more extreme shortages. A median split, based on the median shortage estimated over all time periods in all panels, was used to place panelists into “limited-shortages” and “deeper-shortages” sub-groups. The results indicate that there are not significant differences between how those two groups rate the supply influencing factors, but several differences did appear in the analysis of the demand influencing factors. Those seeing deeper future shortages (beyond -5%) differ from the more conservative panelists in that they see more extreme demand-constraint problems associated with:

- Federal and State/Provincial budgetary constraints (mean: 3.24 on a 7-point scale vs. 4.00 in the limited-shortages sub-group)\(^8\)

Those seeing deeper shortages also see the following demand-increasing factors as having a significantly higher influence on demand increases that are associated with:

- Public concerns for over food safety (mean: 6.06 on a 7-point scale vs. 5.53 in the limited-shortages sub-group)\(^9\)

---

\(^8\) The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of federal government food supply veterinarians. The mean rating in parentheses is for the sub-group that sees deeper shortages (those seeing a 5% or higher average shortage) and the second mean is for the limited-shortages sub-group (less than a 5% 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.
• More access to global markets for food exports (mean: 5.88 versus 5.28 in the limited-shortages sub-group)

• Zoonotic disease-related human health concerns (mean: 6.24 versus 5.68 in the limited-shortages sub-group)

• Availability of highly technical or specialized services (mean: 5.41 versus 4.56 in the limited-shortages sub-group)

• Growing need to track animals entering the food chain (mean: 6.00 versus 5.28 in the limited-shortages sub-group)

The sub-group forecasting more extreme shortages sees more potential in how key demand-increasing influences will shape the future. The items noted above relate to the following three themes presented on the left-hand side of Figure 7: Specialized Technical Services & Certifications, Regulatory & Global Food System, and Animal-Human Health Concerns. The single demand-constraining item noted above relates directly to the Government Budgetary Constraints theme. That is noted in the lower-left quadrant of Figure 7.

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

Government Food Supply Veterinarians

How can the FSVM profession prepare for a better future and counter the trends that are going to lead to a consistent shortage of federal government veterinarians? Eighteen different potential solutions were developed and evaluated by all 13 panels. The panel ratings are based on 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 is seen as being “highly effective” at eliminating the expected shortages. The mean value provides the arithmetic average of all rating. The following are the solutions that are rated above the mid-point of the scale. These are listed in order of how the members of the four federal panels (Fed-Combined) rated the effectiveness of these solutions in eliminating shortages:

1. Student debt repayment and scholarship programs for service in areas of need (mean: 5.84)\(^{10}\)

   Note that the self-rated forecasting experts’ sub-group mean of 6.22 was significantly higher than the less-expert sub-group mean of 5.52.

2. Paid externship requirement in food supply medicine during the summer (mean: 4.88)

3. Expanded post-graduate fellowships in food supply areas (mean: 4.83)

4. More involvement of food supply practitioners in training veterinary students (mean: 4.80)

5. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities (mean: 4.80)

\(^{10}\) Panel members rated the extent that each possible solution will lead to an elimination of a shortage of DVMs in academic settings. The following scale should be used in interpreting the mean rating of each possible solution: 1. Not at all Effective, 3. Slightly Effective, 5. Effective, 7. Highly Effective.
6. Provide expanded job placement services in the food supply veterinary medicine areas (mean: 4.79)

7. Expanded paid work-study programs during the final year of the DVM program (mean: 4.69)

8. Appointment of more food supply faculty at colleges of veterinary medicine (mean: 4.69)

9. Mentoring initiatives for students and those starting a food supply career (mean: 4.53)

10. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities (mean: 4.41)

11. Expand the Centers of Excellence concept with a nationally recognized focus on different food supply sectors (mean: 4.40)
   *Note that the self-rated forecasting experts’ sub-group mean of 4.77 was significantly higher than the less-expert sub-group mean of 4.08.*

12. Increased focus of food supply coverage early in the DVM curriculum (mean: 4.37)

13. Focused recruitment of women students in food supply areas (mean: 4.11)
   *Note that the Fed-CDN panel mean (3.25) was significantly different than the Fed-FS/S panel mean of 4.64. The Fed-AH mean (4.36) and the Fed-PH panel mean (3.75) were not significantly different than the other two panels.*

14. Reserve class slots for academically qualified students with food supply interests and relevant background (mean: 4.10)

15. Focused recruitment of high school and college students with food supply interests into veterinary colleges (mean: 4.02)
   *Note that the Fed-PH panel mean (3.27) and the Fed-CDN panel mean (3.38) were significantly different than the Fed-AH panel mean of 4.79. The Fed-FS/S mean (4.07) was not significantly different than the other three panels.*

These actions represent possible tactics that can be integrated into a larger strategy for dealing with future shortages. Several tactics related to enhancing the interest of pre-veterinary students. For example, tactics identified by items 1 (debt repayment/scholarships), 5 (marketing campaigns), 13 (focused recruitment of women),
13 (reserve class slots), and 15 (focused recruitment of high school/college students) should all have the effect of increasing the supply of students who are interested in food supply careers applying to veterinary colleges. The first item (debt repayment) should also encourage them to stay in a food supply track. Many items focus on changing the experience that students will have over their DVM experience. The appointment of more food supply faculty (item 8) will facilitate students getting more early exposure to food supply careers (item 12). Giving students more hands-on educational experience was the focus of several items including items 2 (paid externship requirement), 3 (postgraduate fellowships), 7 (paid work-study programs), and 9 (mentoring initiatives). Using more practitioners (item 4) represents an additional resource that would help deliver this hands-on experience. Collectively, these tactics should also help retain more students in a FSVM career path. Finally, items 10 (Reserve Corps) and 11 (Centers of Excellence) represent large-scale, governmental initiatives that will address both larger societal needs and deliver more resources that will help educate and employ food supply veterinarians.
Conclusion: A Need for Action

This study finds a clear pattern of increasing demand and significant future shortages in the federal government sector of the food supply veterinary medicine profession. The Veterinarian’s Oath clearly underscores the obligation of the veterinary profession to address the needs of society. Food supply veterinarians in federal government positions have a clear appreciation for this duty and are in roles centrally focused on protecting society. However, if the projected shortages unfold along the currently forecasted course without correction, the FSVM profession as a whole, and food supply veterinarians in federal government positions in particular, will not be able to fulfill this societal obligation!

Food supply veterinarians with federal government responsibilities have a unique role in protecting animal and human health, ensuring a safe food system, and serving related public health needs. In addition to these responsibilities, they also play important roles in protecting society from both bio-security threats and the significant negative economic consequences that will occur if both natural and intentional threats are not held in check. Vacant federal government positions will stretch the system and expose society to serious risks.

Globalization, particularly globalization of the food supply system, significantly raises the ante to any gamble that ignores this labor shortage problem. It takes years to produce veterinarians for such roles and there are not ready labor substitutes with the breadth and depth of skills that FSVM professionals bring to the fight against these threats. The lack of strong supply-increasing trends in this sector, which can serve as levers and focal points for strategic actions, and the presence of plenty of supply-
decreasing trends should be an extra concern to leaders in the FSVM profession and government policy makers.

There are also negative secondary effects that should be appreciated. Labor shortages can also affect how well other FSVM sectors will be able to do their part in the larger system that helps provide animal health and related human health, food safety and security, and agro-terrorism protections. Veterinarians in federal roles help inform other food supply veterinarians (such as rural veterinarians on the front lines of a disease outbreak), explain and implement needed regulations, and integrate the threat event details into the important larger picture of emerging threats. Public and animal health disasters are countered by earlier identification and quick containment. Shortages can lead to information exchange breakdowns that will lead those in charge to operate in the dark. This can lead to disastrous health and economic consequences.

The presence of shortages in other sectors as well as federal government veterinarians compounds this problem. Shortages in multiple sectors leave each battling the others for the too few available food supply veterinarians needed for too many vacant positions. This is a zero-sum game where, in the short-run, there is a loser for each winner. No sector can really win this long-term competition. Public health, the safety of the food supply system, and our national economic well-being could end up being the unequivocal loser.

The premise of this research and the pattern of results underscore that the future we will live in tomorrow is created by the collective actions we take today. While there are larger societal trends, such as continuing governmental budgetary constraints, that will not be significantly changed in the near future and must be adjusted to and managed around, the future is not simply a deterministic function of unchangeable large social and
economic forces. It is very much created by our choices. Many of the trends and issues shaping the future of the food supply veterinary profession are created by choices within the profession. These are the “actionable” targets of opportunity that strategic change must address. These choices can and should be thoughtfully reviewed and revised.

Strategic actions implemented in the near-term can change the trends that will otherwise continue to shape a future that is precarious for both federal government food supply veterinarians and society in general. While some new DVMs are recruited directly into federal government FSVM positions, the career flows in this profession also channels veterinarians from other sectors into government positions. This means that strategic efforts focused on addressing labor shortages in those other sectors as well as increasing numbers of FSVM tracked students in colleges of veterinary medicine should, over time, help channel a larger supply of FSVM professionals into the government sector. Corrective actions will require a well thought out strategy. We should not expect unplanned or localized responses to shortages to add up to an optimal solution. Unnecessary negative economic impacts and challenges to societal well-being is the natural consequence to such non-strategic responses. The veterinary profession can do better! Fulfilling its Oath and responsibilities to society demands immediate strategic action to counter the trends seen in the federal government sector as well as other FSVM sectors.

The demand growth and future shortages forecasted for federal government food supply veterinarians are conservative. The estimates are based on the explicit assumptions 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! Recent history tells us we must be prepared to counter such events.
Government food supply veterinarians are first responders in our public health systems. If the supply of food supply veterinarians is not increased and disaster strikes, we will be short of FSVM professionals by larger percentages than noted in this report.

The planning matrix and supporting analyses provides guidance on the *opportunities* and *constraints* that must be considered in planning future action. This is, however, only a starting point. The profession must also address where its *strengths* and *weaknesses* are located to move beyond this starting point. Thoughtful leaders in the larger profession and those in federal government roles need to identify where they have the best advantage to guide effective collective action. 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 developing effective elements of an effective coherent strategy of collective action. This will change the profession and enable it to better fill its obligations to society.
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 federal government 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 designs of all second- and third-round surveys are quite similar. Try these web-links to view copies of the three surveys completed by each the federal government panels:

Federal – Public Health Panel:

Federal – Animal Health Panel:

Federal – Food Safety & Security Panel:
Federal – Canadian Panel:


2. Exhibit A provides a listing of all members who originally agreed to participate in each of the four federal government Delphi panel.

3. Exhibits B and C provides copies of the interim feedback reports that accompanied the second and third surveys for each panel. The first reports (Exhibit B-1 to B-4) summarized trends found in the first survey data and provides guidance for interpreting the feedback incorporated into the second survey. The second reports (Exhibit C-1 to C-4) served a similar function for the second survey data trend and accompanied the third survey.

4. Exhibit D-1 to D-4 provides summaries of the data results for major sections of the three surveys completed by each of the federal government Delphi panel.
Exhibit A-1

Original Federal – Public Health Delphi Panel Members11

1. Frederick Angulo
2. Dave Ashford
3. Karen Becker
4. William Courtney
5. Bernadette Dunham
6. Paul Garbe
7. Hugh Mainzer
8. Nina Marino
9. Lynn Post
10. Morris Potter
11. Julia Punderson
12. John Sanders
13. Peter Scants
14. Steven Vaughn
15. Bettye Walters
16. Linda Youngman

11 Note that not all panel members completed all surveys. These individuals originally agreed to participate.
Exhibit A-2

Original Federal – Animal Health Delphi Panel Members12

1. Bruce Carter
2. John R. Clifford
3. Randall Corm
4. W. Ron Delavan
5. Jere Dick
6. Cyril Gay
7. Michael Gilder
8. Kathleen Hartman
9. Robert Eckert
10. Larry Heider
11. Beth Lautner
12. David Morris
13. Valerie Ragan
14. Mo Salman
15. Alfonso Torres
16. Thomas Walton

12 Note that not all panel members completed all surveys. These individuals originally agreed to participate.
Exhibit A-3

Original Federal – Food Safety & Security Delphi Panel Members\textsuperscript{13}

1. Isabel Arrington
2. Joe Blair
3. Dale Boyle
4. Chris Bratcher
5. Bonnie Buntain
6. Col. Jack Fournier
7. Doug Fulnechek
8. Barb Masters
9. Patrick McCaskey
10. Kenneth Petersen
11. Charles Pixel
12. John Prucha
13. John Ragan
14. Bernard Salamone
15. Alice Thaler

\textsuperscript{13} Note that not all panel members completed all surveys. These individuals originally agreed to participate.
Exhibit A-4

Original Federal – Canadian Delphi Panel Members¹⁴

1. Judith Bossé
2. Catherine Brisson
3. Keith Campbell
4. Jim Clark
5. Graham Clarke
6. Robert Clarke
7. Brian Evans
8. Peter Eyre
9. Glen Gifford
10. Ann Godkin
11. Jaspinder Komal
12. Susan Read
13. Bill Teeter

¹⁴ Note that not all panel members completed all surveys. These individuals originally agreed to participate.
Federal - Public Health Panel
1st Survey Interim Feedback Report

This report summarizes replies to the 1st survey of the Federal - Public Health 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 Federal – Public Health 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 information from the 1st survey that is included 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. 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. For example, item #1 in the first section of the 2nd survey (“Increasing concern for animal welfare”) has the following notation:

“1st Survey: Average = 5.3 & Mid-50% = 4 to 6; Experts = 5.8 (vs. 4.9)”

This indicates that the average rating was 5.3 on a 7-point scale (just over “5. Slight Increase”) and the middle-50% of panelists (between the 25th and 75th percentiles) rated it from “4. No Influence” to “6. Increase”. “Experts = 5.8 (vs. 4.9)” indicates that those more confident in their ratings (self-rated “experts) had a significantly higher average (5.8) than the less-expert group average of 4.9. This indicates that experts saw “increasing concern for animal welfare” as having a more positive influence on demand compared to those less confident in their forecasts. 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 Food Supply Veterinarians in Federal - Public Health Careers

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:

- Zoonotic disease-related human health concerns
- Public concerns over bio-terrorism
- Public concerns over food safety
- More access to global markets for food exports
- Growing need to track animals entering the food chain
The top-rated influences seen as decreasing future demand are:

- Curtailment of government support of veterinary services
- Federal and/or State/Provincial budgetary constraints
- Slow adoption of new technologies by veterinarians
- Lack of veterinarian’s practice management & business skills
- Client concerns about veterinary service costs

II. Future Demand Estimates for Federal – Public Health FSVM Veterinarians

The average value for the general forecast of future demand for the 1st survey was 5.7 on a 7-point scale (below “6. Increase”). The middle 50% of panelists (between the 25th to 75th percentiles) rated future demand with either “5. Slightly Increase” or “6. Increase”. There were no systematic differences in contrasts between self-rated experts vs. less-expert panelists. (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” increase (or decrease) in future demand for several time periods. Panel members saw demand increases that averaged 5% for future time periods and the middle 50% (those between the 25th and 75th percentile) of forecasted demand increases ranging between 0% to +10%.

III. Factors Influencing the Supply for Federal – Public Health FSVM Veterinarians

The more extreme negative influences on the future supply of FSVM veterinarians (low ratings on the question #10 items in the 1st survey) are:

- Poor income opportunities in food supply careers
- Lack of positive role models in veterinary food supply practice
- High debt load of veterinary school graduates
- Federal and/or State/Provincial budgetary constraints
- Little exposure to food supply career options in college
- Lack of food supply practice-related externships for students

IV. Projected Shortage or Surplus for Federal – Public Health FSVM Veterinarians

The general question asking the panel to estimate the degree of surplus vs. shortage over the next 12 years produced an average of 4.9 (just under “5. Slight Shortage”) on a 7-point scale (see question #10 in the 2nd survey) and experts saw higher demand (5.5/7 vs. 4.5/7). Additional questions asked the “most likely” estimates of a surplus or shortage of DVMs for several time periods. The average shortage estimate was -5.0%. The middle 50% always projected shortages within a -15% to 0% range - never a surplus. This is quite a large range and indicates a substantial level of disagreement within the panel. Self-rated experts always saw more extreme shortages. These
contrasts with the “less expert” sub-group’s ratings approached, but did not reach, statistical significance.

Next Steps…

The patterns that are starting to emerge tell an interesting story for DVMs in Federal – Public Health FSVM careers. While it has some similarities to patterns seen in the State Public Service panel and the other two Federal Public Service panels, it is one that is unique from what I am seeing in other areas 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!

Dr. J. Bruce Prince
Professor of Management
Kansas State University
785-532-7459
jbprince@ksu.edu

July 12, 2005
Exhibit B-2

Federal - Animal Health Panel
1st Survey Interim Feedback Report

This report summarizes replies to the 1st survey of the Federal - Animal Health 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 Federal – Animal Health 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 information from the 1st survey that is included 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. 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. For example, item #1 in the first section of the 2nd survey (“Availability of highly technical or specialized services”) has the following notation:

“1st Survey: Average = 5.0 & Mid-50% = 4 to 6; Experts = 5.4 (vs. 4.5)"

This indicates that the average rating was 5.0 on a 7-point scale (“5. Slight Increase”) and the middle-50% of panelists (between the 25th and 75th percentiles) rated it from “4. No Influence” to “6. Increase”. “Experts = 5.4 (vs. 4.5)” indicates that those more confident in their ratings (self-rated “experts) had a significantly higher average (5.4) than the less-expert group average of 4.5 on the 7-point scale. This indicates that experts saw “Availability of highly technical or specialized services” as having a more positive influence on demand compared to those less confident in their forecasts. 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 Food Supply Veterinarians in Federal - Animal Health Careers

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:

- Zoonotic disease-related human health concerns
- Public concerns over food safety
- Public concerns over bio-terrorism
- Growing need to track animals entering the food chain
- Increasing concern for animal welfare
- Increasing concern for animal health
The top-rated influences seen as decreasing future demand are:

- Curtailment of government support of veterinary services
- Federal and/or State/Provincial budgetary constraints
- Client concerns about veterinary service costs

II. Future Demand Estimates for Federal – Animal Health Food Supply Veterinarians

The average value for the general forecast of future demand for the 1st survey was 5.8 on a 7-point scale (just below “6. Increase”). The middle 50% of panelists (between the 25th to 75th percentiles) rated future demand with either “5. Slight Increase” or “6. Increase”. Self-rated experts (vs. the less-expert subgroup) forecasted higher increasing demand. The expert sub-group mean was 6.1 (just above “6. Increase Moderately”) vs. the less-expert sub-group mean of 5.4 (between “5. Increase Slightly” and “6. Increase Moderately”). (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” increase (or decrease) in future demand for several time periods. Panel members saw demand increases that averaged 5% for the last three future time periods and the middle 50% (those between the 25th and 75th percentile) of forecasted demand increases ranging between +1.0% to +9.0% for all time periods.

Those seeing stronger demand increases (compared to those forecasting weaker demand increases) rated each of the following demand influences as having a higher positive influence on demand:

- Zoonotic disease-related human health concerns
- Need to understand animal-human health eco-systems
- Limited understanding of food quality and safety issues
- Client use of veterinary herd health management services
- Increasing concerns for animal health
- Increasing concerns for animal welfare

III. Factors Influencing the Supply for Federal – Animal Health Food Supply Veterinarians

The more extreme negative influences on the future supply of Federal – Animal Health veterinarians (low ratings on the question #10 items in the 1st survey) are:

- Less emphasis on food animal practice in veterinary colleges
- Poor income opportunities in food supply careers
- Lack of food supply practice-related externships for students
- Federal and/or State/Provincial budgetary constraints
IV. Projected Shortage or Surplus for Federal – Animal Health 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 5.9 (just under “6. Shortage”) on the 7-point scale (see question #10 in the 2nd survey) and the middle 50% marked “6. Shortage”. In fact, 69% of the panel marked this choice. There were not systematic differences between how experts versus the less-expert subgroup 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 ranged from -3.0% to -8.5%. The middle 50% always projected shortages within a -14.3% to -1% range - never a surplus. This is quite a large range and indicates a substantial level of disagreement within the panel. Contrasts between the “expert” and “less expert” subgroups did not show any significant patterns.

Next Steps…

The patterns that are starting to emerge tell an interesting story for DVMs in Federal – Animal Health Food Supply careers. While there are some similarities to patterns seen in the State Public Service and Federal – Public Health panels, it is one that is unique from what I am seeing in other areas of food supply veterinary medicine! (I have yet to analyze the Federal – Food Safety & Security panel.) Your replies to the 2nd survey will add to and clarify this story even more.

Thank you for your continuing help and involvement!

Dr. J. Bruce Prince
Professor of Management
Kansas State University
785-532-7459
jbprince@ksu.edu

July 11, 2005
Exhibit B-3

Federal – Food Safety & Security Panel
1st Survey Interim Feedback Report

This report summarizes replies to the 1st survey of the Federal - Food Safety & Security 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 Federal – Food Safety & Security 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 information 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. For example, item #1 in the first section of the 2nd survey (“Curtailment of government support of veterinary services”) has the following notation:

“1st Survey: Average = 3.4 & Mid-50% = 2 to 4; Experts = 4.0 (vs. 2.6)”

This indicates that the average rating was 3.4 on a 7-point scale (between “3. Slight Decrease” and “No Influence”) and the middle-50% of panelists (between the 25th and 75th percentiles) rated it from “2. Decrease” to 4. No Influence”. “Experts = 4.0 (vs. 2.6)” indicates that those more confident in their ratings (self-rated “experts”) had a significantly higher average (4.0) than the less-expert group average of 2.6 on the 7-point scale. This indicates that experts saw “Curtailment of government support of veterinary services” as having a less negative influence on demand compared to those less confident in their forecasts. 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 Food Supply Veterinarians in Federal – Food Safety & Security Careers

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 bio-terrorism
- Public concerns over food safety
- Growing need to track animals entering the food chain
- More access to global markets for food exports
- Zoonotic disease-related human health concerns
The top-rated influences seen as decreasing future demand are:

- Curtailment of government support of veterinary services
- Slow adoption of new technologies by veterinarians
- Lack of veterinarian’s practice management & business skills
- Client concerns about veterinary service costs
- Move to larger sized producer operations
- Federal and/or State/Provincial budgetary constraints

II. Future Demand Estimates for Federal – Food Safety & Security Veterinarians

The average value for the general forecast of future demand for the 1st survey was 5.4 on a 7-point scale (between “5. Increase Slightly” and “6. Increase”). The middle 50% of panelists (between the 25th to 75th percentiles) rated future demand with either “5. Slight Increase” or “6. Increase”. There was not a significant difference between self-rated experts and the less-expert sub-group. (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” increase (or decrease) in future demand for several time periods. Panel members saw demand increases that averaged +5% for all but the first time period (and it was a +2.5% increase). The middle 50% (those between the 25th and 75th percentile) of forecasted demand increases ranging between 0% and +20.0% for all time periods. This is a wide range of ratings and indicates that there is plenty of disagreement within the panel about the degree that demand is increasing.

Those seeing stronger future demand increases (vs. those seeing lower demand increases) rated the following demand influences (from question #1) as having a significantly higher positive (or less negative) influence on demand:

- Public concerns over bio-terrorism
- More access to global markets for food exports
- Public concerns over food safety
- Use of non-DVMs, such as veterinary technicians
- Limited understanding of food quality and safety issues

III. Factors Influencing the Supply for Federal – Food Safety & Security Veterinarians

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

- Federal and/or State/Provincial budgetary constraints
- Lack of spousal career options in rural areas
- Less emphasis on food animal practice in veterinary colleges
- Little exposure to food supply career options in college
- Lack of food supply practice-related externships for students

IV. Projected Shortage or Surplus for Federal – Food Safety & Security Veterinarians

The general question asking the panel to estimate the degree of surplus vs. shortage over the next 12 years produced an average of 5.9 (just under “6. Shortage”) on a 7-point scale (see question #10 in the 2nd survey) and the middle 50% marked “6. Shortage”. In fact, 69% of the panel marked this choice. There were not systematic differences between how experts versus the less-expert group 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 over all time periods ranged from -5.0% to -11.8%. The middle 50% always projected shortages within a -20.0% to -1.8% range - never a surplus. This is quite a large range and indicates a substantial level of disagreement within the panel. Self-rated experts always projected more extreme shortages but these differences were not statistically strong.

Next Steps…

The patterns that are starting to emerge tell an interesting story for DVMs in Federal – Food Safety & Security careers. While there are some similarities to patterns seen in the State Public Service, Federal – Public Health and Federal – Animal Health panels, it is one that is unique from what I am seeing in other areas 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!

Dr. J. Bruce Prince
Professor of Management
Kansas State University
785-532-7459
jbprince@ksu.edu

July 11, 2005
Federal – Canadian Panel
1st Survey Interim Feedback Report

This report summarizes replies to the 1st survey of the Federal Public Service – Canada 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 Federal – Canadian 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 information 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. 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 = 4.3 & Mid-50% = 3 to 6; Experts = 5.0 (vs. 3.0)”

This indicates that the average rating was 4.3 on a 7-point scale (just over “4. No Influence”) and the middle-50% of panelists (those between the 25th and 75th percentiles) rated it from “3. Slight Decrease” to 6. Increase”. The notation “Experts = 5.0 (vs. 3.0)” indicates that those more confident in their ratings (self-rated “experts) had a significantly higher average (5.0) than the less-expert group average of 3.0 on the 7-point scale. That is, experts saw the “Use of non-DVMs, such as veterinary technicians” as having a more positive influence on demand compared to those less confident in their forecasts. 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 Food Supply Veterinarians Careers

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:

- Zoonotic disease-related human health concerns
- Public concerns over food safety
- Required 3rd-party certification or verification of standards
- Public concerns over bio-terrorism
- Increasing concern for animal welfare
- Growing need to track animals entering the food chain
- More access to global markets for food exports
The top-rated influences seen as decreasing future demand are:

- Curtailment of government support of veterinary services
- Federal and/or State/Provincial budgetary constraints
- Lack of veterinarian’s practice management & business skills
- Client concerns about veterinary service costs
- Move to larger sized producer operations

II. Future Demand Estimates for Food Supply Veterinarians

The average value for the general forecast of future demand for the 1st survey was 5.3 on a 7-point scale (between “5. Increase Slightly” and “6. Increase Moderately”). The middle 50% of panelists (those between the 25th to 75th percentiles) rated future demand with either “5. Slight Increase” or “6. Increase”. There was not a significant difference between self-rated experts and the less-expert sub-groups. (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” increase (or decrease) in future demand for several time periods. Panel members saw demand increases that averaged between +2.4% and +6.1% over different time periods. The middle 50% (those between the 25th and 75th percentile) of forecasted demand increases ranging between 0% and +10.0%. This indicates a fairly degree of disagreement within the panel about the degree that demand is increasing.

Those seeing stronger future demand increases differed from those seeing lower demand increases in how they rated the demand influences (from question #1). Those seeing stronger demand increases (compared to those seeing lower demand) also rated the following as having a significantly higher positive influence on demand:

- Zoonotic disease-related human health concerns
- Constraints on non-DVMs giving prescription drugs
- Need to protect indigenous wildlife from exotic diseases
- Growing need to track animals entering the food chain
- Need to understand animal-human health eco-systems

III. Factors Influencing the Supply of Veterinarians

The more extreme negative influences that are constraining the future supply of Canadian Federal Food Supply veterinarians (low ratings on the question #10 items in the 1st survey – see question 8 in the 2nd survey for related questions) are:

- Little exposure to food supply career options in college
- Lack of positive role modes in veterinary food supply practice
• Poor income opportunities in food supply careers
• Less emphasis on food animal practice in veterinary colleges

IV. Projected Shortage or Surplus of Canadian Federal 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 5.9 (just under “6. Shortage”) on a 7-point scale (see question #10 in the 2nd survey) and the middle 50% marked “6. Shortage”. In fact, 62% of the panel marked this choice. There were no systematic differences between how experts versus the less-expert group 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 over time periods after the fall of 2005 ranged from -5.9% to -7.9%. The middle 50% always projected shortages within a -15.0% to -1.5% range - never a surplus. This is quite a large range and indicates a substantial level of disagreement within the panel.

Next Steps…

The patterns that are starting to emerge tell an interesting story for DVMs in Canadian Federal Food Supply veterinary careers. While there are some similarities to patterns seen in the State & Provincial Public Service and US Federal Public Service panels, it is one that is unique from what I am seeing in other areas 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!

Dr. J. Bruce Prince
Professor of Management
Kansas State University
785-532-7459
jbprince@ksu.edu

August 30, 2005
Exhibit C-1

Federal – Public Health Career Delphi Panel
2nd Survey Interim Feedback Report

This report summarizes replies to the 2nd survey of the Federal – Public Health 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. For example, item #1 in the first section of the 3rd survey (“Move to larger sized producer operations”) has the following notation:

“2nd Survey: Average = 4.6 & Mid-50% = 4 to 6; Experts = 5.2 (vs. 3.9)”

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 4 to 6 (from “4. No Influence” and “6. Increase”). The “Experts = 5.2 (vs.3.9)” notation indicates that there was a significant difference between self-rated “experts” (versus the “less expert” subgroup). Experts saw a stronger positive influence on this factor (5.2/7 or just above “5. Slight Increase”). Those rating themselves as less-expert than the panel median on the 1st survey “forecasting expertise” scale saw a more neutral or negative influence (3.9/7 or just under “4. No Influence”). 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.

I. Factors Influencing Demand in Federal-Public Health 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:

- Zoonotic disease-related human health concerns
- Public concerns over bio-terrorism
- Public concerns over food safety
• More access to global markets for food exports
• Growing need to track animals entering the food chain
• Increasing globalization of the food supply system
• Increasing recognition of veterinarians’ role in public health

The top-rated influences seen as decreasing future demand (from both surveys) are:

• Curtailment of government support of veterinary services
• Federal and/or State/Provincial budgetary constraints
• Slow adoption of new technologies by veterinarians
• Lack of veterinarians’ practice management & business skill
• Public health veterinarian functions being performed by non-DVMs

II. Future Demand Estimates for Federal-Public Health Food Supply Veterinarians

The average value for the general forecast of future demand from the 2nd survey is 5.5 (between “5. Increase Slightly” and “6. Increase Moderately”). The middle 50% of the panel rating future demand with these same two ratings.

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. The average was between +4.4% to +8.0% increases over these time periods and the middle 50% always projected increasing demand veterinary services between +2% to +10% in those time periods. This is a fairly wide range and indicates that while there is agreement that demand is increasing there is a fair level of disagreement within the panel on the extent that it is increasing.

Panel members seeing stronger future demand (compared to those seeing weaker demand) rated each of the following “demand influences” (from question 1 in the 2nd survey) as having a significantly more positive (or stronger) influence on demand:

• Increasing concern for animal health
• Availability of highly technical or specialized services
• Increasing recognition of the veterinarian’s role in public health
• More access to global markets for food exports

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. Areas of lowest increasing demand are: Small farm related activities and Slaughter house inspection duties. The areas of the highest increasing demand included:

• Foreign animal disease assessments
• Imported food related tasks
• Bio-terrorism prevention consulting
Those seeing *stronger* future demand also saw relatively *higher* demand for the following activities and skills (compared to those seeing weaker overall demand increases):

- Inspections at national boarders
- Bio-terrorism prevention consulting
- Slaughter house inspection duties

### III. Factors Influencing the Supply for Federal-Public Health Food Supply Veterinarians

The more extreme *negative* influences on the future supply for Federal – Public Health food supply veterinarians noted in the two previous surveys are:

- Poor income opportunities in food supply careers
- Lack of positive role models in veterinary food supply practice
- High debt load of veterinary school graduates
- Federal and/or State/Provincial budgetary constraints
- Little exposure to food supply career options in college
- Lack of food supply practice-related externships for students

The more extreme *positive* influences on the future supply of federal-public health food supply veterinarians noted are:

- Increasing interest in public service since 9/11
- DVM debt-forgiveness legislation for under-served areas
- Pay levels compared to other employment opportunities

### IV. Projected Shortage or Surplus of Federal-Public Health Food Supply Veterinarians

The panel continues to see a general shortage of Federal – Public Health veterinarians. The question on the general forecast (see question #9, 3rd survey) produced an average of 5.2/7 (just over “5. Slight Shortage”. The middle 50% of panel members rating this question “4. Very Close Match” to “6. Shortage”. The specific shortage estimates over all time periods projected shortages of -3.9% to -6.9% and the middle 50% (between the 25th and 75th percentile) always predicted a shortage within the range between the -9.0% to 0%.

**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 Federal-Public Health 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.

Dr. J. Bruce Prince  
Professor of Management  
Kansas State University  
785-532-7459  
jbprince@ksu.edu

September 17, 2005
Federal – Animal Health Careers Delphi Panel
2<sup>nd</sup> Survey Interim Feedback Report

This report summarizes replies to the 2<sup>nd</sup> survey of the Federal – Animal Health Delphi panel. This brief report is focused on helping you be more informed as you complete the 3<sup>rd</sup> survey. (A full summary of the panel’s data will be provided after I analyze the 3<sup>rd</sup> survey.)

This report identifies a few key patterns and more specific information from the 2<sup>nd</sup> survey is included in the 3<sup>rd</sup> survey. Questions with more disagreement are repeated in the 2<sup>nd</sup> survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are noted in the 2<sup>nd</sup> 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 1<sup>st</sup> survey) versus those rating themselves as “less expert” in making forecasts, then those contrasts are noted. For example, item #1 in the first section of the 3<sup>rd</sup> survey (“Use of non-DVMs, such as veterinary technicians”) has the following notation:

“2nd Survey: Average = 4.2 & Mid-50% = 3 to 5”

This indicates that the average of the panel was 4.2 on a 7-point scale (just over “4. No Influence” and the middle-50% of panelists (those between the 25<sup>th</sup> and 75<sup>th</sup> percentiles) rated it from “3. Slight Decrease” to “5. Slight Increase”). Statistical information from the 2<sup>nd</sup> survey will be presented in this format throughout the 3<sup>rd</sup> survey.

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

I. Factors Influencing Demand for Food Supply Veterinary Careers

The first section in the 1<sup>st</sup> 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 2<sup>nd</sup> survey. The top-rated influences seen as increasing future demand over both surveys are:

- Zoonotic disease-related human health concerns
- Public Concerns over food safety
- More demands for certifications and auditing
- Growing needs for emergency response capabilities
- Growing need to control zoonotic disease
- Public concerns over bio-terrorism
- Growing need to track animals entering the food chain

The top-rated influences seen as decreasing future demand (from both surveys) are:

- Curtailment of government support of veterinary services
- Decreasing funding for animal agriculture programs
- Federal and/or State/Provincial budgetary constraints
- Client concerns about veterinary service costs
- More veterinarian functions being performed by non-DVMs

II. Future Demand Estimates for Food Supply Veterinarians

The average value for the general forecast of future demand from the 2nd survey is 5.4 (between “5. Increase Slightly” and “6. Increase Moderately”). The middle 50% of the panel rating future demand with these same two ratings and 57% of the panel members selected “6. Increase Moderately.”

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. The average was between +2.5% to +5.0% increases over these time periods and the middle 50% always projected increasing demand for veterinary services between +1.0% to +8.3% in those time periods. The range of forecasts narrowed considerably in 2nd versus the 1st round survey but there is still plenty of disagreement on exactly how much demand will increase. The middle 50% (between the 25th and 75th percentiles) always projected increasing demand.

Panel members seeing stronger future demand (compared to those seeing weaker demand) rated each of the following “demand influences” (from question 1 in the 2nd survey) as having a significantly less negative influence on demand: (1) Use of non-DVMs, such as veterinary technicians, and (2) Slow adoption of new technologies by veterinarians. Those seeing stronger future demand also saw a stronger positive influence on demand from “More demands for certifications and auditing” compared to those seeing weaker future demand.

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 “in-plant inspection activities.” The areas of the highest increasing demand included:

- Epidemiology and microbiology expertise
- Expertise in foreign animal disease
- Surveillance and risk assessments
- Public health related skills
- Communication and “people” skills

Those seeing stronger future demand rated many of these activities and skills similar to those seeing weaker overall demand increases. The one exception was that those seeing stronger demand rated “Pharmaceutical industry related knowledge” as having a significantly higher increase in demand.
III. Factors Influencing the Supply of Food Supply Veterinarians

The more extreme negative influences on the future supply for Federal – Animal Health food supply veterinarians noted in the two previous surveys are:

- Less emphasis on food animal practice in veterinary colleges
- Federal and/or State/Provincial budgetary constraints
- High debt loads of veterinary school graduates
- Poor income opportunities in food supply careers

The more extreme positive influences on the future supply of Federal – Animal Health food supply veterinarians noted are:

- Increasing awareness of the food animal career opportunities
- Funding of National Veterinary Medical Services Act

IV. Projected Shortage or Surplus of Food Supply Veterinarians

The panel continues to forecast a shortage of Federal – Animal Health veterinarians. The question on the general forecast (see question #9, 3rd survey) produced an average of 5.5 (between “5. Slight Shortage” and “6. Shortage.” 64% of the panel members (and the middle 50%) selected “6. Shortage.” The specific shortage estimates over all time periods projected shortages of -4.5% to -8.0% and the middle 50% (between the 25th and 75th percentile) always predicted shortages and these were within the range between -10.5% to -1.5%. 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 did 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 Federal-Animal Health 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.

Dr. J. Bruce Prince  
Professor of Management  
Kansas State University  
785-532-7459  
jbprince@ksu.edu  

September 28, 2005
Exhibit C-3

Federal – Food Safety & Security Careers Delphi Panel
2nd Survey Interim Feedback Report

This report summarizes replies to the 2nd survey of the Federal – Food Safety & Security 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. For example, item #1 in the first section of the 3rd survey (“Curtailment of government support of veterinary services”) has the following notation:

“2nd Survey: Average = 3.2 & Mid-50% = 3 to 4”

This indicates that the average of the panel was 3.2 on a 7-point scale (just over “3. Slight Decrease” and the middle-50% of panelists (those between the 25th and 75th percentiles) rated it 3 to 4 (from “3. Slight Decrease” to “4. No Influence”). 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.

I. 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
- Zoonotic disease-related human health concerns
- Public concerns over bio-terrorism
- Growing need to track animals entering the food chain
- DVMs being seen as a key resource in achieving food system safety
- More anti-terrorism positions going to food supply veterinarians
- Increasing USDA international surveillance demands
The top-rated influences seen as decreasing future demand (from both surveys) are:

- More veterinarian functions being performed by non-DVMs
- Federal and/or State/Provincial budgetary constraints
- Curtailment of government support of veterinary services
- Decreasing emphasis on animal agriculture issues in the federal budget
- Slow adoption of new technologies by veterinarians
- Lack of veterinarians’ practice management & business skill

II. Future Demand Estimates for Federal-Public Health Food Supply Veterinarians

The average value for the general forecast of future demand from the 2nd survey is 5.5 (between “5. Increase Slightly” and “6. Increase Moderately”). The middle 50% of the panel rating future demand with these same two ratings.

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. The average was between +3.5% to +7.0% increases over these time periods and the middle 50% always projected increasing demand for veterinary services between +.8% to +10.5% in those time periods. The range of forecasts narrowed considerably in 2nd versus the 1st round survey but there is still plenty of disagreement on exactly how much demand will increase. The middle 50% (between the 25th and 75th percentiles) always projected increasing demand.

Panel members seeing stronger future demand (compared to those seeing weaker demand) rated each of the following “demand influences” (from question 1 in the 2nd survey) as having a significantly more positive (or stronger) influence on demand:

- Increasing globalization of the food supply system
- Import and export oversight requirements at borders
- DVMs being seen as a key resource in achieving food system safety

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 “in-plant inspection activities.” The areas of the highest increasing demand included:

- Public health related skills
- Food safety and security system auditing
- Epidemiology and microbiology expertise
- Communication and “people” skills

Those seeing stronger future demand also saw relatively higher demand for the following activities and skills (compared to those seeing weaker overall demand increases):
• In-plant inspection activities
• Food safety and security system auditing
• Food safety research skills
• Quality management/assurance skills

III. Factors Influencing the Supply of Food Supply Veterinarians

The more extreme negative influences on the future supply for Federal - Food Safety & Security food supply veterinarians noted in the two previous surveys are:

• Negative views of federal service careers
• Poor income opportunities in food supply careers
• Lack of positive role models in veterinary food supply practice

The more extreme positive influences on the future supply of federal-public health food supply veterinarians noted are:

• Funding of National Veterinary Medical Services Act
• Growth of combination DVM-MPH graduate programs
• Movement of DVMs from private practice to government employment

IV. Projected Shortage or Surplus of Food Supply Veterinarians

The panel continues to forecast a shortage of Federal – Food Safety & Security veterinarians. The question on the general forecast (see question #9, 3rd survey) produced an average of 5.9/7 (just under “6. Shortage”). The middle 50% of panel members rating this question “5. Slight Shortage” to “6. Shortage.” The specific shortage estimates over all time periods projected shortages of -5.5% to -8.5% and the middle 50% (between the 25th and 75th percentile) always predicted a shortage within the range between -11.5% to -2.0%. While the range of estimates noted by the breadth of the middle 50% of panelists indicates plenty of disagreement on the extent shortages, the range of forecasts narrowed significantly in the 2nd (versus the 1st survey). This indicates progress towards 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 Federal-Food Safety & Security 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.

Dr. J. Bruce Prince  
Professor of Management  
Kansas State University  
785-532-7459  
jbprince@ksu.edu

September 27, 2005
Exhibit C-4

**Food Supply Veterinarians in Canadian Federal Careers Delphi Panel**

2nd Survey Interim Feedback Report

This report summarizes replies to the 2nd survey of the Federal - Canadian 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. For example, item #1 in the first section of the 3rd survey (“Use of non-DVMs, such as veterinary technicians”) has the following notation:

“2nd Survey: Average = 4.2 & Mid-50% = 3 to 5”

This indicates that the average of the panel was 4.2 on a 7-point scale (just over “4. No Influence”) and the middle-50% of panelists (those between the 25th and 75th percentiles) rated it from “3. Slight Decrease” to “5. Slight Increase”). 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.*

I. 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:

- Expanding veterinary public health demands
- Zoonotic disease-related human health concerns
- Public Concerns over food safety
- Development of international disease monitoring and reporting standards
- Need for national surveillance of emerging diseases
- Required 3rd party certifications of verification of standards
- Public concerns over bio-terrorism

The three influences seen as decreasing future demand was:

- Curtailment of government support of veterinary services
- Need for fewer inspections certifications
- Lack of veterinarian practice management & business skill
II. Future Demand Estimates for Food Supply Veterinarians

The average value for the general forecast of future demand from the 2\textsuperscript{nd} survey is 5.3 (just over “5. Increase Slightly”). The middle 50\% of the panel rating future demand as “5. Increase Slightly” or “6. Increase Moderately” and 56\% of the panel rated future demand as “6. Increase Moderately.”

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. The average was between +1.6\% to +4.8\% increases over these time periods and the middle 50\% projected increasing demand for veterinary services between 0\% to +10\% in those time periods. For the middle 50\% (between the 25\textsuperscript{th} and 75\textsuperscript{th} percentiles) either no change in demand (0\% change) or slightly higher increasing demand was lower boundary indicating that most agree that demand is increasing.

Panel members seeing stronger future demand (compared to those seeing weaker demand) rated “Use of non-DVMs, such as veterinary technicians” as a significantly less negative influence on demand. The following additional “demand influences” (from question 1 in the 2\textsuperscript{nd} survey) were seen by those seeing stronger (versus weaker) future demand as having a significantly more positive influence on demand:

- Availability of highly technical or specialized services
- Need for risk management and related communications activity
- Need to understand animal-human health eco-systems

Selected activities and skills projected to have uniquely higher or lower demand were identified in the 1\textsuperscript{st} survey and rated by the panel in the 2\textsuperscript{nd} survey. The single activity area of more extreme decreasing demand is “Meat and poultry direct inspection activities.” The areas of the highest increasing demand included:

- Risk management activities
- On farm food safety activities
- Interactions with international veterinary organizations
- Global regulatory and export certification activities

Those seeing stronger future demand rated “Antimicrobial resistance related activities” as an activity that is significantly higher than those seeing weaker overall demand.

III. Factors Influencing the Supply of Food Supply Veterinarians

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

- Little exposure to food supply career options in college
• Lack of positive role models in veterinary food supply practice
• Less emphasis on food animal practice in veterinary colleges
• Lack of spousal career options in rural areas
• Federal and/or State/Provincial budgetary constraints

The more extreme positive influences on the future supply of Canadian Federal food supply veterinarians are:

• Opportunities for regular work hours
• Expected high number of food supply veterinarians retiring in the near future
• Veterinary schools reserving spaces for food animal oriented students
• Externships during the last year of the DVM program
• Career development opportunities in government roles

IV. Projected Shortage or Surplus of Food Supply Veterinarians

The panel generally saw a future shortage of food supply veterinarians. The question on the general forecast (see question #9, 3rd survey) produced an average of 6.0 (or “6. Shortage”) and 78% of the panel members selected rating. The specific average shortage estimates over all time periods projected either -4.9% to -6.8% shortages and the middle 50% (between the 25th and 75th percentile) always forecasted shortages and these were in the range of -10.0% to -5.0%.

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 Canadian Federal Government 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.

Dr. J. Bruce Prince
Professor of Management
Kansas State University
785-532-7459
jbprince@ksu.edu

October 7, 2005
### Exhibit D-1

Section I. Factors Influencing Future Demand for Veterinarians in the Federal—Public Health FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Public concern over food Safety</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.0</td>
<td>.73</td>
<td>5.3 to 6.8</td>
<td>16</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>23.1</td>
<td>30.8</td>
<td>46.2</td>
<td>4.4</td>
<td>1.26</td>
<td>3.5 to 5.5</td>
<td>13</td>
</tr>
<tr>
<td>3. Public concern over bio-terrorism</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>6.7</td>
<td>93.3</td>
<td>6.1</td>
<td>.80</td>
<td>6 to 7</td>
<td>15</td>
</tr>
<tr>
<td>4. Zoonotic disease-related human health concerns</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.1</td>
<td>.81</td>
<td>5.3 to 7</td>
<td>16</td>
</tr>
<tr>
<td>5. Required third party certification or verification of standards</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>21.4</td>
<td>35.7</td>
<td>42.9</td>
<td>4.4</td>
<td>1.28</td>
<td>3.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>6. Limited public understanding of food quality and safety issues</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>6.7</td>
<td>40</td>
<td>53.3</td>
<td>4.8</td>
<td>1.32</td>
<td>4 to 6</td>
<td>15</td>
</tr>
<tr>
<td>7. More meat consumption in the US and Canada</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>9.1</td>
<td>36.4</td>
<td>54.5</td>
<td>4.5</td>
<td>1.04</td>
<td>4 to 5</td>
<td>11</td>
</tr>
<tr>
<td>8. More access to global markets for food exports</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>20</td>
<td>80</td>
<td>5.7</td>
<td>1.10</td>
<td>5 to 7</td>
<td>15</td>
</tr>
<tr>
<td>9. Changing dietary habits in third-world countries</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>60</td>
<td>40</td>
<td>4.7</td>
<td>1.03</td>
<td>4 to 6</td>
<td>15</td>
</tr>
<tr>
<td>10. Need to protect indigenous wildlife from exotic diseases</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>31.3</td>
<td>68.8</td>
<td>4.9</td>
<td>.85</td>
<td>4 to 5</td>
<td>16</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>60</td>
<td>20</td>
<td>20</td>
<td>3.3</td>
<td>1.58</td>
<td>2 to 4</td>
<td>15</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>73.3</td>
<td>6.7</td>
<td>20</td>
<td>3.1</td>
<td>1.67</td>
<td>2 to 4</td>
<td>15</td>
</tr>
<tr>
<td>13. Increasing concern for animal wildlife</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>26.7</td>
<td>73.3</td>
<td>5.3</td>
<td>1.03</td>
<td>4 to 6</td>
<td>15</td>
</tr>
<tr>
<td>14. Increasing concern for animal health</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>33.3</td>
<td>66.7</td>
<td>5.3</td>
<td>1.10</td>
<td>4 to 6</td>
<td>15</td>
</tr>
<tr>
<td>15. Need to understand animal-human health eco-systems</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>6.7</td>
<td>40</td>
<td>53.3</td>
<td>5.1</td>
<td>1.28</td>
<td>4 to 6</td>
<td>15</td>
</tr>
</tbody>
</table>

<sup>14</sup> The “1<sup>st</sup>” refers to the 1<sup>st</sup> Delphi survey. The “2<sup>nd</sup>” refers to the 2<sup>nd</sup> Delphi survey, while the “3<sup>rd</sup>” refers to the 3<sup>rd</sup> Delphi survey.

<sup>15</sup> The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Rank</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>9th</th>
<th>10th</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>Need to understand animal-human health eco-systems</td>
<td>2nd</td>
<td>0</td>
<td>13.3</td>
<td>86.7</td>
<td>5.3</td>
<td>.90</td>
<td>5 to 6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Availability of highly technical or specialized services</td>
<td>1st</td>
<td>7.1</td>
<td>21.4</td>
<td>71.4</td>
<td>4.9</td>
<td>1.14</td>
<td>4 to 6</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Veterinary services agreements required for agri-business loans</td>
<td>2nd</td>
<td>0</td>
<td>7.7</td>
<td>92.3</td>
<td>5.2</td>
<td>.60</td>
<td>5 to 6</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Growing need to track animals entering the food chain</td>
<td>1st</td>
<td>0</td>
<td>12.5</td>
<td>87.5</td>
<td>5.6</td>
<td>.96</td>
<td>5 to 6</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Constraints on non-DVMs giving prescription drugs</td>
<td>1st</td>
<td>0</td>
<td>38.5</td>
<td>61.5</td>
<td>4.9</td>
<td>.86</td>
<td>4 to 6</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Slow adoption of new technologies by veterinarians</td>
<td>1st</td>
<td>57.1</td>
<td>35.7</td>
<td>7.1</td>
<td>3.5</td>
<td>1.23</td>
<td>3 to 4</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Move to larger sized producer operations</td>
<td>1st</td>
<td>35.7</td>
<td>7.1</td>
<td>57.1</td>
<td>4.5</td>
<td>1.70</td>
<td>3 to 6</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Client use of veterinary herd management services</td>
<td>1st</td>
<td>25</td>
<td>12.5</td>
<td>62.5</td>
<td>4.4</td>
<td>1.37</td>
<td>3 to 5</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Client concerns about veterinary service costs</td>
<td>1st</td>
<td>50</td>
<td>42.9</td>
<td>7.1</td>
<td>3.6</td>
<td>1.22</td>
<td>3 to 4</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Part-time farmers needing more veterinary services</td>
<td>1st</td>
<td>13.3</td>
<td>46.7</td>
<td>40</td>
<td>4.5</td>
<td>1.06</td>
<td>4 to 5</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Lack of veterinarian’s practice management and business skill</td>
<td>2nd</td>
<td>6.7</td>
<td>6.7</td>
<td>86.7</td>
<td>5.5</td>
<td>1.13</td>
<td>5 to 6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Increasing recognition of the veterinarians’ role in public health</td>
<td>2nd</td>
<td>0</td>
<td>13.3</td>
<td>86.7</td>
<td>5.5</td>
<td>.92</td>
<td>5 to 6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Public health veterinarian functions being performed by non-DVMs</td>
<td>2nd</td>
<td>26.7</td>
<td>66.7</td>
<td>6.7</td>
<td>3.6</td>
<td>1.24</td>
<td>3 to 4</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Public health veterinarian functions being performed by non-DVMs</td>
<td>3rd</td>
<td>50</td>
<td>41.7</td>
<td>8.3</td>
<td>3.6</td>
<td>1.00</td>
<td>3 to 4.5</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Labor efficiencies gained with new technologies</td>
<td>2nd</td>
<td>13.3</td>
<td>40</td>
<td>46.7</td>
<td>4.5</td>
<td>.92</td>
<td>4 to 5</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Exhibit D-1 (continued)

Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern (Federal—Public Health FSVM Careers)

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Lower(^{16})</th>
<th>% No Difference</th>
<th>% Higher</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Foreign animal disease assessments</td>
<td>2(^{nd})</td>
<td>0</td>
<td>13.3</td>
<td>86.7</td>
<td>5.6</td>
<td>1.06</td>
<td>5 to 7</td>
<td>15</td>
</tr>
<tr>
<td>2. Imported food related tasks</td>
<td>2(^{nd})</td>
<td>0</td>
<td>13.3</td>
<td>86.7</td>
<td>5.5</td>
<td>.92</td>
<td>5 to 6</td>
<td>15</td>
</tr>
<tr>
<td>3. Third party verification of food safety tasks</td>
<td>2(^{nd})</td>
<td>6.7</td>
<td>40</td>
<td>53.3</td>
<td>4.7</td>
<td>1.03</td>
<td>4 to 5</td>
<td>15</td>
</tr>
<tr>
<td>4. Animal identification and tracking activities</td>
<td>2(^{nd})</td>
<td>0</td>
<td>33.3</td>
<td>66.7</td>
<td>5.3</td>
<td>1.23</td>
<td>4 to 7</td>
<td>15</td>
</tr>
<tr>
<td>5. Bio-terrorism prevention consulting</td>
<td>2(^{nd})</td>
<td>6.7</td>
<td>26.7</td>
<td>73.3</td>
<td>5.4</td>
<td>1.06</td>
<td>4 to 6</td>
<td>15</td>
</tr>
<tr>
<td>6. Meat testing</td>
<td>2(^{nd})</td>
<td>0</td>
<td>20</td>
<td>80</td>
<td>5.3</td>
<td>.96</td>
<td>5 to 6</td>
<td>15</td>
</tr>
<tr>
<td>7. Inspections at national borders</td>
<td>2(^{nd})</td>
<td>26.7</td>
<td>60</td>
<td>13.3</td>
<td>3.8</td>
<td>.78</td>
<td>3 to 4</td>
<td>15</td>
</tr>
<tr>
<td>8. Small farm related activities</td>
<td>2(^{nd})</td>
<td>20</td>
<td>40</td>
<td>40</td>
<td>4.4</td>
<td>1.06</td>
<td>4 to 5</td>
<td>15</td>
</tr>
</tbody>
</table>

\(^{16}\) The “% Lower” is the percentage that marked 1, 2 or 3. This ranges from “Significantly Lower” to “Slightly Lower” on the 7-point scale. The “% No Difference” is the percent that marked 4. This is the mid-point of the scale. The “% Higher” is the percentage marking 5, 6 or 7, which ranged from “Slightly Higher” to “Significantly Higher.”
### Exhibit D-1 (continued)

#### Section III. Factors Influencing Future Supply for Veterinarians in the Federal—Public Health FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease&lt;sup&gt;17&lt;/sup&gt;</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>62.5</td>
<td>25</td>
<td>12.5</td>
<td>3.3</td>
<td>1.39</td>
<td>2 to 4</td>
<td>16</td>
</tr>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>46.7</td>
<td>46.7</td>
<td>6.7</td>
<td>3.4</td>
<td>.91</td>
<td>3 to 4</td>
<td>15</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>33.3</td>
<td>26.7</td>
<td>40</td>
<td>4.1</td>
<td>1.49</td>
<td>3 to 5</td>
<td>15</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>20</td>
<td>46.7</td>
<td>33.3</td>
<td>4.1</td>
<td>.99</td>
<td>4 to 5</td>
<td>15</td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>31.3</td>
<td>50</td>
<td>18.8</td>
<td>3.6</td>
<td>1.31</td>
<td>2.3 to 4</td>
<td>16</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>43.8</td>
<td>25</td>
<td>31.3</td>
<td>3.8</td>
<td>1.80</td>
<td>2 to 5.8</td>
<td>16</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>33.3</td>
<td>40</td>
<td>26.7</td>
<td>3.9</td>
<td>1.13</td>
<td>3 to 5</td>
<td>15</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>41.7</td>
<td>33.3</td>
<td>25</td>
<td>3.9</td>
<td>1.00</td>
<td>3 to 4.8</td>
<td>12</td>
</tr>
<tr>
<td>5. Little exposure to food supply career options in college</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>80</td>
<td>13.3</td>
<td>6.7</td>
<td>3.0</td>
<td>1.07</td>
<td>2 to 3</td>
<td>15</td>
</tr>
<tr>
<td>6. Lack of food supply practice-related externships for students</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>73.3</td>
<td>20</td>
<td>6.7</td>
<td>3.1</td>
<td>1.06</td>
<td>2 to 4</td>
<td>15</td>
</tr>
<tr>
<td>7. Lack of positive role models in veterinary food supply practice</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>71.4</td>
<td>21.4</td>
<td>7.1</td>
<td>2.9</td>
<td>1.35</td>
<td>2 to 4</td>
<td>14</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>75</td>
<td>18.8</td>
<td>6.3</td>
<td>2.7</td>
<td>1.45</td>
<td>1 to 3.8</td>
<td>16</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>64.3</td>
<td>35.7</td>
<td>0</td>
<td>2.9</td>
<td>1.00</td>
<td>2 to 4</td>
<td>14</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>45.5</td>
<td>36.4</td>
<td>18.2</td>
<td>3.7</td>
<td>1.10</td>
<td>3 to 4</td>
<td>11</td>
</tr>
<tr>
<td>9. Lack of cultural and recreational opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>35.7</td>
<td>57.1</td>
<td>7.1</td>
<td>3.6</td>
<td>1.08</td>
<td>3 to 4</td>
<td>14</td>
</tr>
<tr>
<td>10. Lack of spousal career options in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>60</td>
<td>33.3</td>
<td>6.7</td>
<td>3.4</td>
<td>1.00</td>
<td>3 to 4</td>
<td>15</td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>46.7</td>
<td>46.7</td>
<td>6.7</td>
<td>3.6</td>
<td>.91</td>
<td>3 to 4</td>
<td>15</td>
</tr>
<tr>
<td>12. Federal and/or state/provincial budgetary constraints</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>75</td>
<td>18.8</td>
<td>6.3</td>
<td>2.9</td>
<td>1.39</td>
<td>2 to 3.8</td>
<td>16</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>66.7</td>
<td>20</td>
<td>13.3</td>
<td>2.9</td>
<td>1.67</td>
<td>2 to 4</td>
<td>15</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>53.3</td>
<td>20</td>
<td>26.7</td>
<td>3.7</td>
<td>1.28</td>
<td>3 to 5</td>
<td>15</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>43.8</td>
<td>18.8</td>
<td>37.5</td>
<td>3.8</td>
<td>1.91</td>
<td>2 to 5.8</td>
<td>16</td>
</tr>
</tbody>
</table>

<sup>17</sup>The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
<table>
<thead>
<tr>
<th>Factor</th>
<th>Rank</th>
<th>Frequency</th>
<th>Value</th>
<th>SD</th>
<th>Trend</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td></td>
<td>2nd</td>
<td>40</td>
<td>0</td>
<td>60</td>
<td>3.9</td>
<td>1.79</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td></td>
<td>3rd</td>
<td>16.7</td>
<td>25</td>
<td>58.3</td>
<td>4.5</td>
<td>.91</td>
</tr>
<tr>
<td>15. Limited capacity of existing veterinary colleges in the US and/or Canada</td>
<td></td>
<td>1st</td>
<td>33.3</td>
<td>60</td>
<td>6.7</td>
<td>3.7</td>
<td>1.05</td>
</tr>
<tr>
<td>16. Perceived lack of demand for food animals</td>
<td></td>
<td>1st</td>
<td>57.1</td>
<td>35.7</td>
<td>7.1</td>
<td>3.5</td>
<td>.94</td>
</tr>
<tr>
<td>17. Requirement for education beyond a DVM</td>
<td></td>
<td>1st</td>
<td>46.2</td>
<td>38.5</td>
<td>15.4</td>
<td>3.8</td>
<td>1.17</td>
</tr>
<tr>
<td>60. Cost of living in areas of federal public service employment</td>
<td></td>
<td>2nd</td>
<td>21.4</td>
<td>71.4</td>
<td>7.1</td>
<td>3.8</td>
<td>.70</td>
</tr>
<tr>
<td>61. DVM debt forgiveness legislation for under served areas</td>
<td></td>
<td>2nd</td>
<td>6.7</td>
<td>26.7</td>
<td>66.7</td>
<td>4.9</td>
<td>.99</td>
</tr>
<tr>
<td>62. Increasing interest in public service since 9/11</td>
<td></td>
<td>2nd</td>
<td>0</td>
<td>26.7</td>
<td>73.3</td>
<td>5.1</td>
<td>.80</td>
</tr>
<tr>
<td>63. Pay levels compared to other employment opportunities</td>
<td></td>
<td>2nd</td>
<td>20</td>
<td>13.3</td>
<td>66.7</td>
<td>4.7</td>
<td>1.23</td>
</tr>
<tr>
<td>64. Opportunities to move to other DVM career areas</td>
<td></td>
<td>2nd</td>
<td>14.3</td>
<td>28.6</td>
<td>57.1</td>
<td>4.6</td>
<td>1.16</td>
</tr>
<tr>
<td>65. Pay levels compared to other employment opportunities</td>
<td></td>
<td>3rd</td>
<td>25</td>
<td>16.7</td>
<td>58.3</td>
<td>4.4</td>
<td>1.00</td>
</tr>
<tr>
<td>66. Opportunities to move to other DVM career areas</td>
<td></td>
<td>3rd</td>
<td>0</td>
<td>36.4</td>
<td>63.6</td>
<td>4.7</td>
<td>.65</td>
</tr>
</tbody>
</table>
### Section IV. Solutions for Shortages: Federal—Public Health FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Less Effective</th>
<th>% Effective</th>
<th>% Highly Effective</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reserve class slots for academically qualified students with food supply interests and relevant background</td>
<td>3rd</td>
<td>54.5</td>
<td>45.5</td>
<td>0</td>
<td>3.6</td>
<td>1.57</td>
<td>3 to 5</td>
<td>11</td>
</tr>
<tr>
<td>2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors</td>
<td>3rd</td>
<td>30</td>
<td>60</td>
<td>10</td>
<td>4.5</td>
<td>1.43</td>
<td>3 to 5</td>
<td>10</td>
</tr>
<tr>
<td>3. Focused recruitment of high school and college students with food supply interests into veterinary colleges</td>
<td>3rd</td>
<td>63.6</td>
<td>27.3</td>
<td>9.1</td>
<td>3.3</td>
<td>1.62</td>
<td>2 to 5</td>
<td>11</td>
</tr>
<tr>
<td>4. Increased focus of food supply coverage early in DVM curriculum</td>
<td>3rd</td>
<td>18.2</td>
<td>63.6</td>
<td>18.2</td>
<td>4.6</td>
<td>1.03</td>
<td>4 to 5</td>
<td>11</td>
</tr>
<tr>
<td>5. Expanded business and practice management coverage in DVM curriculum</td>
<td>3rd</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>4.2</td>
<td>2.15</td>
<td>1.8 to 6</td>
<td>10</td>
</tr>
<tr>
<td>6. Expanded postgraduate fellowships in food supply areas</td>
<td>3rd</td>
<td>10</td>
<td>60</td>
<td>30</td>
<td>5.1</td>
<td>1.10</td>
<td>4.8 to 6</td>
<td>10</td>
</tr>
<tr>
<td>7. Expanded paid work-study programs during the final year of DVM</td>
<td>3rd</td>
<td>45.5</td>
<td>54.5</td>
<td>0</td>
<td>4.0</td>
<td>1.00</td>
<td>3 to 5</td>
<td>11</td>
</tr>
<tr>
<td>8. More involvement of food supply practitioners in training veterinary students</td>
<td>3rd</td>
<td>18.2</td>
<td>54.5</td>
<td>27.3</td>
<td>5.0</td>
<td>1.18</td>
<td>5 to 6</td>
<td>11</td>
</tr>
<tr>
<td>9. Provide expanded job placement services in the food supply veterinary medicine areas</td>
<td>3rd</td>
<td>36.4</td>
<td>45.4</td>
<td>18.2</td>
<td>4.4</td>
<td>1.21</td>
<td>3 to 5</td>
<td>11</td>
</tr>
<tr>
<td>10. Appointment of more food supply faculty at colleges of veterinary medicine</td>
<td>3rd</td>
<td>18.2</td>
<td>45.5</td>
<td>36.4</td>
<td>5.1</td>
<td>1.22</td>
<td>5 to 6</td>
<td>11</td>
</tr>
<tr>
<td>11. Paid externship requirement in food supply medicine during the summer</td>
<td>3rd</td>
<td>27.3</td>
<td>45.5</td>
<td>27.3</td>
<td>4.6</td>
<td>1.80</td>
<td>3 to 6</td>
<td>11</td>
</tr>
<tr>
<td>12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities</td>
<td>3rd</td>
<td>27.3</td>
<td>36.4</td>
<td>36.4</td>
<td>4.7</td>
<td>1.95</td>
<td>3 to 6</td>
<td>11</td>
</tr>
<tr>
<td>13. Student debt repayment and scholarship programs for service in food supply areas of need</td>
<td>3rd</td>
<td>9.1</td>
<td>27.3</td>
<td>63.6</td>
<td>5.7</td>
<td>1.79</td>
<td>5 to 7</td>
<td>11</td>
</tr>
<tr>
<td>14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities</td>
<td>3rd</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>4.2</td>
<td>2.30</td>
<td>1.8 to 6.3</td>
<td>10</td>
</tr>
</tbody>
</table>

18 The “% Less Effective” is the percentage that marked 1, 2 or 3. This ranges from “Not at all Effective to Slightly Effective” on the 7-point scale. The “% Effective is the percentage marking 4 or 5 where 5 is “Effective.” The “% Highly Effective” is the percentage marking 6 or 7 where 7 is “Highly Effective.”
<table>
<thead>
<tr>
<th>Number</th>
<th>Initiative Description</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>9th</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>Low cost (subsidized) consulting in business and practice management for new food supply DVMs</td>
<td>44.4</td>
<td>44.4</td>
<td>11.1</td>
<td>3.7</td>
<td>1.94</td>
<td>1.5</td>
<td>9</td>
</tr>
<tr>
<td>16.</td>
<td>Mentoring initiatives for students and those starting a food supply career</td>
<td>27.3</td>
<td>45.5</td>
<td>27.3</td>
<td>4.6</td>
<td>1.50</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>17.</td>
<td>Focused recruitment of women students in food supply areas</td>
<td>37.5</td>
<td>50</td>
<td>12.5</td>
<td>3.8</td>
<td>1.49</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>18.</td>
<td>Development and dissemination of Business Best Practices for food supply veterinary enterprises</td>
<td>30</td>
<td>60</td>
<td>10</td>
<td>4.0</td>
<td>1.70</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
## Exhibit D-2

### Section I. Factors Influencing Future Demand for Veterinarians in the Federal—Animal Health FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease 15</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Public concern over food safety</td>
<td>1st</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.0</td>
<td>.35</td>
<td>6 to 6</td>
<td>17</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>1st</td>
<td>31.3</td>
<td>31.3</td>
<td>37.5</td>
<td>4.4</td>
<td>1.31</td>
<td>3 to 5.8</td>
<td>16</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>2nd</td>
<td>28.6</td>
<td>35.7</td>
<td>35.7</td>
<td>4.2</td>
<td>1.25</td>
<td>3 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>3rd</td>
<td>35.7</td>
<td>42.9</td>
<td>21.4</td>
<td>4.0</td>
<td>1.04</td>
<td>3 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>3. Public concern over bio-terrorism</td>
<td>1st</td>
<td>0</td>
<td>5.9</td>
<td>94.1</td>
<td>5.7</td>
<td>.77</td>
<td>5 to 6</td>
<td>17</td>
</tr>
<tr>
<td>4. Zoonotic disease-related human health concerns</td>
<td>1st</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.4</td>
<td>.62</td>
<td>6 to 7</td>
<td>17</td>
</tr>
<tr>
<td>5. Required third party certification or verification of standards</td>
<td>1st</td>
<td>0</td>
<td>6.3</td>
<td>93.8</td>
<td>5.4</td>
<td>.72</td>
<td>5 to 6</td>
<td>16</td>
</tr>
<tr>
<td>6. Limited public understanding of food quality and safety issues</td>
<td>1st</td>
<td>26.7</td>
<td>33.3</td>
<td>40</td>
<td>4.3</td>
<td>1.11</td>
<td>3 to 5</td>
<td>15</td>
</tr>
<tr>
<td>6. Limited public understanding of food quality and safety issues</td>
<td>2nd</td>
<td>15.4</td>
<td>30.8</td>
<td>53.8</td>
<td>4.5</td>
<td>.97</td>
<td>4 to 5</td>
<td>13</td>
</tr>
<tr>
<td>7. More meat consumption in the US and Canada</td>
<td>1st</td>
<td>6.3</td>
<td>37.5</td>
<td>56.3</td>
<td>4.8</td>
<td>.93</td>
<td>4 to 5.8</td>
<td>16</td>
</tr>
<tr>
<td>7. More meat consumption in the US and Canada</td>
<td>2nd</td>
<td>6.3</td>
<td>37.5</td>
<td>56.3</td>
<td>4.7</td>
<td>.87</td>
<td>4 to 5</td>
<td>16</td>
</tr>
<tr>
<td>8. More access to global markets for food exports</td>
<td>1st</td>
<td>0</td>
<td>23.5</td>
<td>76.5</td>
<td>5.3</td>
<td>.92</td>
<td>4.5 to 6</td>
<td>17</td>
</tr>
<tr>
<td>9. Changing dietary habits in third-world countries</td>
<td>1st</td>
<td>6.3</td>
<td>37.5</td>
<td>56.3</td>
<td>4.7</td>
<td>.87</td>
<td>4 to 5</td>
<td>16</td>
</tr>
<tr>
<td>10. Need to protect indigenous wildlife from exotic diseases</td>
<td>1st</td>
<td>0</td>
<td>11.8</td>
<td>88.2</td>
<td>5.4</td>
<td>.80</td>
<td>5 to 6</td>
<td>17</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>1st</td>
<td>62.5</td>
<td>6.3</td>
<td>31.3</td>
<td>3.8</td>
<td>1.57</td>
<td>3 to 5</td>
<td>16</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>2nd</td>
<td>57.1</td>
<td>7.1</td>
<td>35.7</td>
<td>3.9</td>
<td>1.46</td>
<td>3 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>3rd</td>
<td>57.2</td>
<td>21.4</td>
<td>21.4</td>
<td>3.4</td>
<td>1.15</td>
<td>2 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>1st</td>
<td>56.3</td>
<td>18.8</td>
<td>25</td>
<td>3.6</td>
<td>1.71</td>
<td>2 to 4.8</td>
<td>16</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>2nd</td>
<td>71.4</td>
<td>14.3</td>
<td>14.3</td>
<td>3.2</td>
<td>1.19</td>
<td>2 to 4</td>
<td>14</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>3rd</td>
<td>64.3</td>
<td>28.6</td>
<td>7.1</td>
<td>3.2</td>
<td>.89</td>
<td>2.8 to 4</td>
<td>14</td>
</tr>
<tr>
<td>13. Increasing concern for animal wildlife</td>
<td>1st</td>
<td>0</td>
<td>12.5</td>
<td>87.5</td>
<td>5.7</td>
<td>.95</td>
<td>5 to 6</td>
<td>16</td>
</tr>
<tr>
<td>14. Increasing concern for animal health</td>
<td>1st</td>
<td>0</td>
<td>5.9</td>
<td>94.1</td>
<td>5.7</td>
<td>.93</td>
<td>5 to 6.5</td>
<td>17</td>
</tr>
<tr>
<td>15. Need to understand animal-human health eco-systems</td>
<td>1st</td>
<td>0</td>
<td>20</td>
<td>80</td>
<td>5.3</td>
<td>.90</td>
<td>5 to 6</td>
<td>15</td>
</tr>
<tr>
<td>16. Availability of highly technical or specialized services</td>
<td>1st</td>
<td>7.1</td>
<td>21.4</td>
<td>71.4</td>
<td>5.1</td>
<td>1.17</td>
<td>4 to 6</td>
<td>14</td>
</tr>
<tr>
<td>16. Availability of highly technical or specialized services</td>
<td>2nd</td>
<td>0</td>
<td>14.3</td>
<td>85.7</td>
<td>5.2</td>
<td>.70</td>
<td>5 to 6</td>
<td>14</td>
</tr>
<tr>
<td>17. Veterinary services agreements required for agri-business loans</td>
<td>1st</td>
<td>0</td>
<td>50</td>
<td>50</td>
<td>4.8</td>
<td>.93</td>
<td>4 to 5</td>
<td>16</td>
</tr>
</tbody>
</table>

---

14 The “1st” refers to the 1st Delphi survey. The “2nd” refers to the 2nd Delphi survey, while the “3rd” refers to the 3rd Delphi survey.

15 The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Growing need to track animals entering the food chain</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>5.9</td>
<td>94.1</td>
<td>5.8</td>
<td>.97</td>
</tr>
<tr>
<td>19. Constraints on non-DVMs giving prescription drugs</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>58.8</td>
<td>41.2</td>
<td>4.7</td>
<td>.93</td>
</tr>
<tr>
<td>20. Slow adoption of new technologies by veterinarians</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>25</td>
<td>50</td>
<td>25</td>
<td>4.0</td>
<td>1.16</td>
</tr>
<tr>
<td>20. Slow adoption of new technologies by veterinarians</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>7.1</td>
<td>78.6</td>
<td>14.3</td>
<td>4.1</td>
<td>.66</td>
</tr>
<tr>
<td>21. Move to larger sized producer operations</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>29.4</td>
<td>29.4</td>
<td>41.2</td>
<td>4.3</td>
<td>1.57</td>
</tr>
<tr>
<td>21. Move to larger sized producer operations</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>30.8</td>
<td>15.4</td>
<td>53.8</td>
<td>4.5</td>
<td>1.45</td>
</tr>
<tr>
<td>21. Move to larger sized producer operations</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>21.4</td>
<td>35.7</td>
<td>42.8</td>
<td>4.4</td>
<td>1.09</td>
</tr>
<tr>
<td>22. Client use of veterinary herd management services</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>6.3</td>
<td>25</td>
<td>68.8</td>
<td>4.8</td>
<td>.78</td>
</tr>
<tr>
<td>23. Client concerns about veterinary service costs</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>26.7</td>
<td>53.3</td>
<td>20</td>
<td>3.9</td>
<td>.83</td>
</tr>
<tr>
<td>24. Lack of veterinarian’s practice management and business skill</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>29.4</td>
<td>41.2</td>
<td>29.4</td>
<td>4.1</td>
<td>.99</td>
</tr>
<tr>
<td>25. Part-time farmers needing more veterinary services</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>35.3</td>
<td>64.7</td>
<td>4.9</td>
<td>.90</td>
</tr>
<tr>
<td>90. Increasing globalization of the food supply system</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>14.3</td>
<td>85.7</td>
<td>5.5</td>
<td>.94</td>
</tr>
<tr>
<td>91. Growing needs for emergency response capabilities</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>5.8</td>
<td>.70</td>
</tr>
<tr>
<td>91. Growing needs for emergency response capabilities</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>5.6</td>
<td>.63</td>
</tr>
<tr>
<td>92. More animal welfare consultations and oversight</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>5.4</td>
<td>.85</td>
</tr>
<tr>
<td>93. More demands for certifications and auditing</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>5.9</td>
<td>.77</td>
</tr>
<tr>
<td>94. Growing need to control zoonotic disease threats</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>7.1</td>
<td>0</td>
<td>92.9</td>
<td>5.7</td>
<td>1.07</td>
</tr>
<tr>
<td>95. Increased usage of animals in pharmaceutical research</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>7.1</td>
<td>50</td>
<td>42.9</td>
<td>4.6</td>
<td>1.08</td>
</tr>
<tr>
<td>96. Increased awareness of agro-terrorism threats</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>5.4</td>
<td>.85</td>
</tr>
<tr>
<td>97. Required government inspections for mandates bio-security practices</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>14.3</td>
<td>85.7</td>
<td>5.4</td>
<td>.94</td>
</tr>
<tr>
<td>98. Veterinarian functions being performed by non-DVMs</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>42.9</td>
<td>35.7</td>
<td>21.4</td>
<td>3.9</td>
<td>1.14</td>
</tr>
<tr>
<td>98. Veterinarian functions being performed by non-DVMs</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>35.7</td>
<td>57.1</td>
<td>7.1</td>
<td>3.7</td>
<td>.61</td>
</tr>
<tr>
<td>99. Decreasing funding for animal agriculture programs</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>69.2</td>
<td>15.4</td>
<td>15.4</td>
<td>3.2</td>
<td>1.01</td>
</tr>
<tr>
<td>99. Decreasing funding for animal agriculture programs</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>50</td>
<td>42.9</td>
<td>7.1</td>
<td>3.4</td>
<td>.85</td>
</tr>
</tbody>
</table>
### Exhibit D-2

Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern (Federal—Animal Health FSVM Careers)

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Lower&lt;sup&gt;16&lt;/sup&gt;</th>
<th>% No Difference</th>
<th>% Higher</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication and “people” skills</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>6.1</td>
<td>.92</td>
<td>5.8 to 7</td>
<td>14</td>
</tr>
<tr>
<td>2. Research skills</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>5.8</td>
<td>.89</td>
<td>5 to 6.3</td>
<td>14</td>
</tr>
<tr>
<td>3. Expertise in foreign animal diseases</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.2</td>
<td>.58</td>
<td>6 to 7</td>
<td>14</td>
</tr>
<tr>
<td>4. Epidemiology and microbiology expertise</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.2</td>
<td>.58</td>
<td>6 to 7</td>
<td>14</td>
</tr>
<tr>
<td>5. Animal welfare related skills</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.7</td>
<td>92.3</td>
<td>5.9</td>
<td>.86</td>
<td>5.5 to 6.5</td>
<td>13</td>
</tr>
<tr>
<td>6. Data analysis and management</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>5.9</td>
<td>.83</td>
<td>5.8 to 6.3</td>
<td>14</td>
</tr>
<tr>
<td>7. Public health related skills</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.1</td>
<td>.66</td>
<td>6 to 7</td>
<td>14</td>
</tr>
<tr>
<td>8. Rapid diagnosis skills</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>7.7</td>
<td>0</td>
<td>92.3</td>
<td>5.6</td>
<td>.96</td>
<td>5 to 6</td>
<td>13</td>
</tr>
<tr>
<td>9. Pharmaceutical industry related knowledge</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>53.8</td>
<td>46.2</td>
<td>4.7</td>
<td>.95</td>
<td>4 to 5</td>
<td>13</td>
</tr>
<tr>
<td>10. Administrative and managerial skills</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>14.3</td>
<td>85.7</td>
<td>5.6</td>
<td>1.02</td>
<td>5 to 6.3</td>
<td>14</td>
</tr>
<tr>
<td>11. Surveillance and risk assessments</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>6.1</td>
<td>.86</td>
<td>6 to 7</td>
<td>14</td>
</tr>
<tr>
<td>12. Skills in traditional disease eradication programs</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>7.1</td>
<td>28.6</td>
<td>64.3</td>
<td>5.1</td>
<td>1.27</td>
<td>4 to 6.3</td>
<td>14</td>
</tr>
<tr>
<td>13. Import/export inspection and verification</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>21.4</td>
<td>78.6</td>
<td>5.4</td>
<td>1.02</td>
<td>4.8 to 6</td>
<td>14</td>
</tr>
<tr>
<td>14. Aquaculture related expertise</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>7.1</td>
<td>0</td>
<td>92.9</td>
<td>5.7</td>
<td>1.07</td>
<td>5 to 6.3</td>
<td>14</td>
</tr>
</tbody>
</table>

<sup>16</sup>The “% Lower” is the percentage that marked 1, 2 or 3. This ranges from “Significantly Lower” to “Slightly Lower” on the 7-point scale. The “% No Difference” is the percent that marked 4. This is the mid-point of the scale. The “% Higher” is the percentage marking 5, 6 or 7, which ranged from “Slightly Higher” to Significantly Higher.”
Exhibit D-2 (continued)

Section III. Factors Influencing Future Supply for Veterinarians in the Federal—Animal Health FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>87.5</td>
<td>0</td>
<td>12.5</td>
<td>2.4</td>
<td>1.46</td>
<td>1 to 3</td>
<td>16</td>
</tr>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>78.6</td>
<td>7.1</td>
<td>14.3</td>
<td>2.8</td>
<td>1.25</td>
<td>2 to 3.3</td>
<td>14</td>
</tr>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>78.6</td>
<td>7.1</td>
<td>14.3</td>
<td>3.1</td>
<td>1.17</td>
<td>2 to 3.3</td>
<td>14</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>52.9</td>
<td>17.6</td>
<td>29.4</td>
<td>3.5</td>
<td>1.51</td>
<td>2 to 5</td>
<td>17</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>35.7</td>
<td>42.9</td>
<td>21.4</td>
<td>3.8</td>
<td>1.37</td>
<td>3 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>42.9</td>
<td>42.9</td>
<td>14.3</td>
<td>3.6</td>
<td>.84</td>
<td>3 to 4</td>
<td>14</td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>41.2</td>
<td>47.1</td>
<td>11.8</td>
<td>3.4</td>
<td>1.12</td>
<td>2.5 to 4</td>
<td>17</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>70.6</td>
<td>17.6</td>
<td>11.8</td>
<td>3.2</td>
<td>1.38</td>
<td>2 to 4</td>
<td>17</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>50</td>
<td>42.9</td>
<td>7.1</td>
<td>3.3</td>
<td>1.07</td>
<td>2.8 to 4</td>
<td>14</td>
</tr>
<tr>
<td>5. Little exposure to food supply career options in college</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>86.7</td>
<td>6.7</td>
<td>6.7</td>
<td>2.9</td>
<td>1.34</td>
<td>2 to 3</td>
<td>15</td>
</tr>
<tr>
<td>6. Lack of food supply practice-related externships for students</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>87.5</td>
<td>6.3</td>
<td>6.3</td>
<td>2.8</td>
<td>1.28</td>
<td>2 to 3</td>
<td>16</td>
</tr>
<tr>
<td>7. Lack of positive role models in veterinary food supply practice</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>88.2</td>
<td>0</td>
<td>11.8</td>
<td>2.9</td>
<td>1.30</td>
<td>2 to 3</td>
<td>14</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>81.3</td>
<td>6.3</td>
<td>12.5</td>
<td>2.6</td>
<td>1.63</td>
<td>1.3 to 3</td>
<td>16</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>78.6</td>
<td>0</td>
<td>21.4</td>
<td>3.2</td>
<td>1.53</td>
<td>2.8 to 3.5</td>
<td>14</td>
</tr>
<tr>
<td>9. Lack of cultural and recreational opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>58.8</td>
<td>29.4</td>
<td>11.8</td>
<td>3.5</td>
<td>1.23</td>
<td>3 to 4</td>
<td>17</td>
</tr>
<tr>
<td>10. Lack of spousal career options in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>82.4</td>
<td>5.9</td>
<td>11.8</td>
<td>2.9</td>
<td>1.14</td>
<td>2 to 3</td>
<td>17</td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>82.4</td>
<td>5.9</td>
<td>11.8</td>
<td>2.9</td>
<td>1.14</td>
<td>2 to 3</td>
<td>17</td>
</tr>
<tr>
<td>12. Federal and/or state/provincial budgetary constraints</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>76.5</td>
<td>17.6</td>
<td>5.9</td>
<td>2.8</td>
<td>1.19</td>
<td>2 to 3.5</td>
<td>17</td>
</tr>
<tr>
<td>12. Federal and/or state/provincial budgetary constraints</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>78.6</td>
<td>21.4</td>
<td>0</td>
<td>2.9</td>
<td>.73</td>
<td>2 to 3.3</td>
<td>14</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>64.7</td>
<td>23.5</td>
<td>11.8</td>
<td>3.1</td>
<td>1.64</td>
<td>2 to 4</td>
<td>17</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>64.3</td>
<td>14.3</td>
<td>21.4</td>
<td>3.2</td>
<td>1.42</td>
<td>2 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>71.4</td>
<td>21.4</td>
<td>7.1</td>
<td>3.2</td>
<td>1.05</td>
<td>2.8 to 4</td>
<td>14</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>52.9</td>
<td>5.9</td>
<td>41.2</td>
<td>3.8</td>
<td>2.05</td>
<td>2 to 5.5</td>
<td>17</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>35.7</td>
<td>7.1</td>
<td>57.1</td>
<td>4.2</td>
<td>1.72</td>
<td>2.8 to 6</td>
<td>14</td>
</tr>
</tbody>
</table>

<sup>17</sup>The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
<table>
<thead>
<tr>
<th>Factor</th>
<th>1st Rank</th>
<th>2nd Rank</th>
<th>3rd Rank</th>
<th>4th Rank</th>
<th>5th Rank</th>
<th>6th Rank</th>
<th>7th Rank</th>
<th>8th Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected high number of food supply veterinarians retiring in the near future</td>
<td>3rd</td>
<td>28.6</td>
<td>14.3</td>
<td>57.1</td>
<td>4.4</td>
<td>1.28</td>
<td>3 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>Limited capacity of existing veterinary colleges in the US and/or Canada</td>
<td>1st</td>
<td>50</td>
<td>43.8</td>
<td>6.3</td>
<td>3.5</td>
<td>.73</td>
<td>3 to 4</td>
<td>16</td>
</tr>
<tr>
<td>Perceived lack of demand for food animals</td>
<td>1st</td>
<td>68.8</td>
<td>18.8</td>
<td>12.5</td>
<td>3.4</td>
<td>1.26</td>
<td>3 to 4</td>
<td>16</td>
</tr>
<tr>
<td>Perceived lack of demand for food animals</td>
<td>2nd</td>
<td>61.5</td>
<td>23.1</td>
<td>15.4</td>
<td>3.5</td>
<td>1.56</td>
<td>3 to 4</td>
<td>13</td>
</tr>
<tr>
<td>Requirement for education beyond a DVM</td>
<td>1st</td>
<td>41.2</td>
<td>47.1</td>
<td>11.8</td>
<td>3.8</td>
<td>1.19</td>
<td>3 to 4</td>
<td>17</td>
</tr>
<tr>
<td>Requirement for education beyond a DVM</td>
<td>2nd</td>
<td>35.7</td>
<td>28.6</td>
<td>35.7</td>
<td>4.0</td>
<td>1.41</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>Requirement for education beyond a DVM</td>
<td>3rd</td>
<td>46.2</td>
<td>23.1</td>
<td>30.8</td>
<td>3.9</td>
<td>1.14</td>
<td>3 to 5</td>
<td>13</td>
</tr>
<tr>
<td>Perceived lack of demand for food animals</td>
<td>2nd</td>
<td>38.5</td>
<td>15.4</td>
<td>46.2</td>
<td>4.1</td>
<td>1.66</td>
<td>3 to 5</td>
<td>13</td>
</tr>
<tr>
<td>Requirement for education beyond a DVM</td>
<td>1st</td>
<td>28.6</td>
<td>50</td>
<td>21.4</td>
<td>4.1</td>
<td>1.07</td>
<td>3 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>Opportunities for non-governmental jobs</td>
<td>2nd</td>
<td>28.6</td>
<td>15.4</td>
<td>46.2</td>
<td>4.1</td>
<td>1.66</td>
<td>3 to 5</td>
<td>13</td>
</tr>
<tr>
<td>Perceived lack of demand for food animals</td>
<td>3rd</td>
<td>28.6</td>
<td>15.4</td>
<td>46.2</td>
<td>4.1</td>
<td>1.66</td>
<td>3 to 5</td>
<td>13</td>
</tr>
<tr>
<td>Funding of National Veterinary Medical Services Act</td>
<td>2nd</td>
<td>14.3</td>
<td>0</td>
<td>85.7</td>
<td>4.9</td>
<td>1.44</td>
<td>5 to 6</td>
<td>14</td>
</tr>
<tr>
<td>Pay levels compared to other employment opportunities</td>
<td>3rd</td>
<td>14.3</td>
<td>0</td>
<td>85.7</td>
<td>4.9</td>
<td>1.44</td>
<td>5 to 6</td>
<td>14</td>
</tr>
<tr>
<td>Pay levels compared to other employment opportunities</td>
<td>2nd</td>
<td>38.5</td>
<td>7.7</td>
<td>53.8</td>
<td>4.2</td>
<td>1.82</td>
<td>2.5 to 5.5</td>
<td>13</td>
</tr>
<tr>
<td>Increasing awareness of food animal career opportunities</td>
<td>3rd</td>
<td>28.6</td>
<td>28.6</td>
<td>42.9</td>
<td>4.2</td>
<td>1.37</td>
<td>3 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>Pay levels compared to other employment opportunities</td>
<td>2nd</td>
<td>0</td>
<td>15.4</td>
<td>84.6</td>
<td>5.5</td>
<td>.88</td>
<td>5 to 6</td>
<td>13</td>
</tr>
</tbody>
</table>
## Exhibit D-2 (continued)

### Section IV. Solutions for Shortages: Federal—Animal Health FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Less Effective&lt;sup&gt;18&lt;/sup&gt;</th>
<th>% Effective</th>
<th>% Highly Effective</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reserve class slots for academically qualified students with food supply interests and relevant background</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>35.7</td>
<td>50</td>
<td>14.3</td>
<td>4.4</td>
<td>1.69</td>
<td>2.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>21.4</td>
<td>71.4</td>
<td>7.1</td>
<td>4.3</td>
<td>1.38</td>
<td>3.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>3. Focused recruitment of high school and college students with food supply interests into veterinary colleges</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>14.3</td>
<td>78.6</td>
<td>7.1</td>
<td>4.8</td>
<td>.80</td>
<td>5 to 5</td>
<td>14</td>
</tr>
<tr>
<td>4. Increased focus of food supply coverage early in DVM curriculum</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>21.4</td>
<td>78.6</td>
<td>0</td>
<td>4.2</td>
<td>.98</td>
<td>3.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>5. Expanded business and practice management coverage in DVM curriculum</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>35.7</td>
<td>57.1</td>
<td>7.1</td>
<td>3.7</td>
<td>1.38</td>
<td>2.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>6. Expanded postgraduate fellowships in food supply areas</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>0</td>
<td>85.7</td>
<td>14.3</td>
<td>4.9</td>
<td>.62</td>
<td>4.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>7. Expanded paid work-study programs during the final year of DVM</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>7.1</td>
<td>71.4</td>
<td>21.4</td>
<td>4.9</td>
<td>1.00</td>
<td>4 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>8. More involvement of food supply practitioners in training veterinary students</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>7.1</td>
<td>78.6</td>
<td>14.3</td>
<td>4.9</td>
<td>.73</td>
<td>5 to 5</td>
<td>14</td>
</tr>
<tr>
<td>9. Provide expanded job placement services in the food supply veterinary medicine areas</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>7.1</td>
<td>64.3</td>
<td>28.6</td>
<td>5.1</td>
<td>.77</td>
<td>5 to 6</td>
<td>14</td>
</tr>
<tr>
<td>10. Appointment of more food supply faculty at colleges of veterinary medicine</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>21.4</td>
<td>64.3</td>
<td>14.3</td>
<td>4.6</td>
<td>1.15</td>
<td>3.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>11. Paid externship requirement in food supply medicine during the summer</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>21.4</td>
<td>50</td>
<td>28.6</td>
<td>4.9</td>
<td>1.35</td>
<td>4.5 to 6</td>
<td>14</td>
</tr>
<tr>
<td>12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>7.1</td>
<td>71.4</td>
<td>21.4</td>
<td>4.9</td>
<td>.83</td>
<td>4.8 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>13. Student debt repayment and scholarship programs for service in food supply areas of need</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>0</td>
<td>28.6</td>
<td>71.4</td>
<td>6.1</td>
<td>.83</td>
<td>5 to 7</td>
<td>14</td>
</tr>
<tr>
<td>14. Development of a government-supported Reserve Corps of food</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>7.7</td>
<td>61.5</td>
<td>30.8</td>
<td>4.9</td>
<td>1.41</td>
<td>4 to 6</td>
<td>13</td>
</tr>
</tbody>
</table>

<sup>18</sup> The “% Less Effective” is the percentage that marked 1, 2 or 3. This ranges from “Not at all Effective to Slightly Effective” on the 7-point scale. The “% Effective is the percentage marking 4 or 5 where 5 is “Effective.” The “% Highly Effective” is the percentage marking 6 or 7 where 7 is “Highly Effective.”
<table>
<thead>
<tr>
<th>Supply DVMs for disease surveillance and control activities</th>
<th>3rd</th>
<th>33.3</th>
<th>50</th>
<th>16.7</th>
<th>3.8</th>
<th>1.70</th>
<th>2.3 to 4.8</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Low cost (subsidized) consulting in business and practice management for new food supply DVMs</td>
<td>3rd</td>
<td>14.3</td>
<td>71.4</td>
<td>14.3</td>
<td>4.6</td>
<td>.93</td>
<td>4 to 5</td>
<td>14</td>
</tr>
<tr>
<td>16. Mentoring initiatives for students and those starting a food supply career</td>
<td>3rd</td>
<td>21.4</td>
<td>64.3</td>
<td>14.3</td>
<td>4.4</td>
<td>1.01</td>
<td>3.8 to 5</td>
<td>14</td>
</tr>
<tr>
<td>17. Focused recruitment of women students in food supply areas</td>
<td>3rd</td>
<td>30.8</td>
<td>69.2</td>
<td>0</td>
<td>3.9</td>
<td>1.14</td>
<td>3 to 5</td>
<td>13</td>
</tr>
<tr>
<td>18. Development and dissemination of Business Best Practices for food supply veterinary enterprises</td>
<td>3rd</td>
<td>21.4</td>
<td>64.3</td>
<td>14.3</td>
<td>4.4</td>
<td>1.01</td>
<td>3.8 to 5</td>
<td>14</td>
</tr>
</tbody>
</table>
### Exhibit D-3

**Section I. Factors Influencing Future Demand for Veterinarians in the Fed-Food FSVM Careers**

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Public concern over food safety</td>
<td>1st</td>
<td>0</td>
<td>13.3</td>
<td>86.7</td>
<td>5.7</td>
<td>1.03</td>
<td>5 to 7</td>
<td>15</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>1st</td>
<td>33.3</td>
<td>44.4</td>
<td>22.2</td>
<td>4.0</td>
<td>1.66</td>
<td>2.5 to 5</td>
<td>9</td>
</tr>
<tr>
<td>3. Public concern over bio-terrorism</td>
<td>1st</td>
<td>0</td>
<td>6.7</td>
<td>93.3</td>
<td>5.8</td>
<td>.94</td>
<td>5 to 7</td>
<td>15</td>
</tr>
<tr>
<td>4. Zoonotic disease-related human health concerns</td>
<td>1st</td>
<td>0</td>
<td>13.3</td>
<td>86.7</td>
<td>5.7</td>
<td>.98</td>
<td>5 to 6</td>
<td>15</td>
</tr>
<tr>
<td>5. Required third party certification or verification of standards</td>
<td>1st</td>
<td>0</td>
<td>21.4</td>
<td>78.6</td>
<td>5.4</td>
<td>1.01</td>
<td>4.8 to 6</td>
<td>14</td>
</tr>
<tr>
<td>6. Limited public understanding of food quality and safety issues</td>
<td>1st</td>
<td>8.3</td>
<td>33.3</td>
<td>58.3</td>
<td>4.7</td>
<td>.89</td>
<td>4 to 5</td>
<td>12</td>
</tr>
<tr>
<td>7. More meat consumption in the US and Canada</td>
<td>1st</td>
<td>0</td>
<td>27.3</td>
<td>72.7</td>
<td>4.8</td>
<td>.60</td>
<td>4 to 5</td>
<td>11</td>
</tr>
<tr>
<td>8. More access to global markets for food exports</td>
<td>1st</td>
<td>0</td>
<td>6.7</td>
<td>93.3</td>
<td>5.7</td>
<td>.90</td>
<td>5 to 6</td>
<td>15</td>
</tr>
<tr>
<td>9. Changing dietary habits in third-world countries</td>
<td>1st</td>
<td>0</td>
<td>25</td>
<td>75</td>
<td>5.0</td>
<td>.74</td>
<td>4.3 to 5.8</td>
<td>12</td>
</tr>
<tr>
<td>10. Need to protect indigenous wildlife from exotic diseases</td>
<td>1st</td>
<td>0</td>
<td>35.7</td>
<td>64.3</td>
<td>5.0</td>
<td>.96</td>
<td>4 to 6</td>
<td>14</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>1st</td>
<td>53.3</td>
<td>26.7</td>
<td>20</td>
<td>3.7</td>
<td>1.22</td>
<td>3 to 4</td>
<td>15</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>1st</td>
<td>54.5</td>
<td>36.4</td>
<td>9.1</td>
<td>3.4</td>
<td>1.57</td>
<td>2 to 4</td>
<td>14</td>
</tr>
<tr>
<td>13. Increasing concern for animal health</td>
<td>1st</td>
<td>0</td>
<td>6.7</td>
<td>93.3</td>
<td>5.5</td>
<td>.83</td>
<td>5 to 6</td>
<td>15</td>
</tr>
<tr>
<td>15. Need to understand animal-human health eco-systems</td>
<td>1st</td>
<td>0</td>
<td>58.3</td>
<td>41.7</td>
<td>4.8</td>
<td>1.12</td>
<td>4 to 6</td>
<td>12</td>
</tr>
</tbody>
</table>

---

14 The “1st” refers to the 1st Delphi survey. The “2nd” refers to the 2nd Delphi survey, while the “3rd” refers to the 3rd Delphi survey.

15 The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
|   |   |   |   |   |   |   |
|---|---|---|---|---|---|
| 16. Availability of highly technical or specialized services | 1<sup>st</sup> | 15.4 | 15.4 | 69.2 | 5.1 | 1.26 | 4 to 6 |
| 16. Availability of highly technical or specialized services | 2<sup>nd</sup> | 7.1 | 14.3 | 78.6 | 5.1 | 1.29 | 4 to 6 |
| 17. Veterinary services agreements required for agri-business loans | 1<sup>st</sup> | 0 | 27.3 | 72.7 | 5.0 | .89 | 4 to 5 |
| 18. Growing need to track animals entering the food chain | 1<sup>st</sup> | 0 | 14.3 | 85.7 | 5.7 | 1.07 | 5 to 7 |
| 18. Growing need to track animals entering the food chain | 2<sup>nd</sup> | 0 | 21.4 | 78.6 | 5.6 | 1.15 | 4.8 to 7 |
| 18. Growing need to track animals entering the food chain | 3<sup>rd</sup> | 0 | 14.3 | 85.7 | 5.7 | 1.07 | 5 to 7 |
| 19. Constraints on non-DVMs giving prescription drugs | 1<sup>st</sup> | 0 | 45.5 | 54.5 | 5.1 | 1.22 | 4 to 6 |
| 19. Constraints on non-DVMs giving prescription drugs | 2<sup>nd</sup> | 7.1 | 28.6 | 64.3 | 4.9 | 1.03 | 4 to 5.3 |
| 20. Slow adoption of new technologies by veterinarians | 1<sup>st</sup> | 63.6 | 27.3 | 9.1 | 3.4 | .81 | 3 to 4 |
| 21. Move to larger sized producer operations | 1<sup>st</sup> | 46.2 | 38.5 | 15.4 | 3.7 | 1.03 | 3 to 4 |
| 21. Move to larger sized producer operations | 2<sup>nd</sup> | 46.2 | 15.4 | 38.5 | 4.2 | 1.35 | 3 to 5 |
| 21. Move to larger sized producer operations | 3<sup>rd</sup> | 21.4 | 57.1 | 21.4 | 4.0 | .68 | 3.8 to 4.3 |
| 22. Client use of veterinary herd management services | 1<sup>st</sup> | 7.7 | 38.5 | 53.8 | 4.6 | .96 | 4 to 5 |
| 23. Client concerns about veterinary service costs | 1<sup>st</sup> | 50 | 41.7 | 8.3 | 3.6 | .67 | 3 to 4 |
| 24. Lack of veterinarian’s practice management and business skill | 1<sup>st</sup> | 58.3 | 33.3 | 8.3 | 3.4 | .79 | 3 to 4 |
| 25. Part-time farmers needing more veterinary services | 1<sup>st</sup> | 0 | 50 | 50 | 4.7 | .78 | 4 to 5 |
| 100. More anti-terrorism positions going to food supply veterinarians | 2<sup>nd</sup> | 0 | 14.3 | 85.7 | 5.7 | .99 | 5 to 6.3 |
| 101. Increasing USDA international surveillance demands | 2<sup>nd</sup> | 0 | 7.1 | 92.9 | 5.7 | .83 | 5 to 6 |
| 102. DVMs being seen as a key resource in achieving food system safety | 2<sup>nd</sup> | 0 | 16.7 | 83.3 | 5.8 | 1.14 | 5 to 7 |
| 108. Decreasing emphasis on animal agriculture issues in the federal budget | 3<sup>rd</sup> | 0 | 0 | 100 | 5.7 | .83 | 5 to 6.3 |
| 109. More veterinarian functions being performed by non-DVMs | 2<sup>nd</sup> | 76.9 | 15.4 | 7.7 | 2.9 | 1.04 | 2 to 3.5 |
Exhibit D-3 (continued)

Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern (Fed-Food FSVM Careers)

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Lower(^{16})</th>
<th>% No Difference</th>
<th>% Higher</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50%</th>
<th>Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration and managerial skills</td>
<td>2(^{nd})</td>
<td>0</td>
<td>21.4</td>
<td>78.6</td>
<td>5.4</td>
<td>1.09</td>
<td>4.8 to 6.3</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Quality management/assurance skills</td>
<td>2(^{nd})</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>5.6</td>
<td>.85</td>
<td>5 to 6</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Food safety and security system auditing</td>
<td>2(^{nd})</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>6.1</td>
<td>1.03</td>
<td>5 to 7</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Communication and “people” skills</td>
<td>2(^{nd})</td>
<td>0</td>
<td>21.4</td>
<td>78.6</td>
<td>5.9</td>
<td>1.23</td>
<td>4.8 to 7</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Public health related skills</td>
<td>2(^{nd})</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>6.4</td>
<td>1.01</td>
<td>5.8 to 7</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Food safety research skills</td>
<td>2(^{nd})</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>5.7</td>
<td>.91</td>
<td>5 to 6.3</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Epidemiology and microbiology expertise</td>
<td>2(^{nd})</td>
<td>0</td>
<td>7.1</td>
<td>92.9</td>
<td>6.0</td>
<td>.96</td>
<td>5 to 7</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>In-plant inspection activities</td>
<td>2(^{nd})</td>
<td>50</td>
<td>28.6</td>
<td>21.4</td>
<td>3.9</td>
<td>1.35</td>
<td>3 to 4.3</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

\(^{16}\) The “% Lower” is the percentage that marked 1, 2 or 3. This ranges from “Significantly Lower” to “Slightly Lower” on the 7-point scale. The “% No Difference” is the percent that marked 4. This is the mid-point of the scale. The “% Higher” is the percentage marking 5, 6 or 7, which ranged from “Slightly Higher” to “Significantly Higher.”
### Section III. Factors Influencing Future Supply for Veterinarians in the Fed-Food FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease(^{17})</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>1(^{st})</td>
<td>78.6</td>
<td>21.4</td>
<td>0</td>
<td>2.6</td>
<td>1.02</td>
<td>2 to 3.3</td>
<td>14</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>1(^{st})</td>
<td>66.7</td>
<td>6.7</td>
<td>26.7</td>
<td>3.4</td>
<td>1.84</td>
<td>2 to 5</td>
<td>15</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>2(^{nd})</td>
<td>35.7</td>
<td>28.6</td>
<td>35.7</td>
<td>4.1</td>
<td>1.21</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>3(^{rd})</td>
<td>28.6</td>
<td>14.3</td>
<td>57.1</td>
<td>4.4</td>
<td>1.01</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>1(^{st})</td>
<td>46.7</td>
<td>33.3</td>
<td>20</td>
<td>3.2</td>
<td>1.47</td>
<td>2 to 4</td>
<td>15</td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>2(^{nd})</td>
<td>35.7</td>
<td>30.8</td>
<td>30.8</td>
<td>4.2</td>
<td>1.28</td>
<td>3 to 5</td>
<td>13</td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>3(^{rd})</td>
<td>28.6</td>
<td>35.7</td>
<td>35.7</td>
<td>4.2</td>
<td>1.05</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>1(^{st})</td>
<td>50</td>
<td>21.4</td>
<td>28.6</td>
<td>3.4</td>
<td>1.51</td>
<td>2 to 5</td>
<td>14</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>2(^{nd})</td>
<td>35.7</td>
<td>14.3</td>
<td>50</td>
<td>4.4</td>
<td>1.45</td>
<td>3 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>3(^{rd})</td>
<td>28.6</td>
<td>28.6</td>
<td>42.9</td>
<td>4.1</td>
<td>1.10</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>5. Little exposure to food supply career options in college</td>
<td>1(^{st})</td>
<td>93.3</td>
<td>0</td>
<td>6.7</td>
<td>2.5</td>
<td>.92</td>
<td>2 to 3</td>
<td>15</td>
</tr>
<tr>
<td>6. Lack of food supply practice-related externships for students</td>
<td>1(^{st})</td>
<td>84.6</td>
<td>7.7</td>
<td>7.7</td>
<td>2.7</td>
<td>1.11</td>
<td>2 to 3</td>
<td>13</td>
</tr>
<tr>
<td>6. Lack of food supply practice-related externships for students</td>
<td>2(^{nd})</td>
<td>53.8</td>
<td>30.8</td>
<td>15.4</td>
<td>3.5</td>
<td>1.13</td>
<td>3 to 4</td>
<td>14</td>
</tr>
<tr>
<td>6. Lack of food supply practice-related externships for students</td>
<td>3(^{rd})</td>
<td>71.4</td>
<td>21.4</td>
<td>7.1</td>
<td>3.2</td>
<td>.80</td>
<td>3 to 4</td>
<td>14</td>
</tr>
<tr>
<td>7. Lack of positive role models in veterinary food supply practice</td>
<td>1(^{st})</td>
<td>69.2</td>
<td>23.1</td>
<td>7.7</td>
<td>2.8</td>
<td>1.17</td>
<td>2 to 4</td>
<td>13</td>
</tr>
<tr>
<td>7. Lack of positive role models in veterinary food supply practice</td>
<td>2(^{nd})</td>
<td>61.5</td>
<td>23.1</td>
<td>15.4</td>
<td>3.4</td>
<td>1.19</td>
<td>2.5 to 4</td>
<td>13</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>1(^{st})</td>
<td>71.4</td>
<td>7.1</td>
<td>21.4</td>
<td>2.7</td>
<td>1.54</td>
<td>1 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>2(^{nd})</td>
<td>71.4</td>
<td>7.1</td>
<td>21.4</td>
<td>3.4</td>
<td>1.01</td>
<td>3 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>9. Lack of cultural and recreational opportunities in rural areas</td>
<td>1(^{st})</td>
<td>57.1</td>
<td>35.7</td>
<td>7.1</td>
<td>3.1</td>
<td>1.03</td>
<td>2 to 4</td>
<td>14</td>
</tr>
<tr>
<td>10. Lack of spousal career options in rural areas</td>
<td>1(^{st})</td>
<td>85.7</td>
<td>7.1</td>
<td>7.1</td>
<td>2.5</td>
<td>1.02</td>
<td>2 to 3</td>
<td>14</td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>1(^{st})</td>
<td>64.3</td>
<td>28.6</td>
<td>7.1</td>
<td>2.9</td>
<td>1.14</td>
<td>2 to 4</td>
<td>14</td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>2(^{nd})</td>
<td>57.1</td>
<td>21.4</td>
<td>21.4</td>
<td>3.6</td>
<td>1.08</td>
<td>3 to 4.3</td>
<td>14</td>
</tr>
<tr>
<td>12. Federal and/or state/provincial budgetary constraints</td>
<td>1(^{st})</td>
<td>92.9</td>
<td>0</td>
<td>7.1</td>
<td>2.5</td>
<td>.94</td>
<td>2 to 3</td>
<td>14</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>1(^{st})</td>
<td>60</td>
<td>6.7</td>
<td>33.3</td>
<td>3.1</td>
<td>1.60</td>
<td>2 to 5</td>
<td>15</td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>2(^{nd})</td>
<td>50</td>
<td>14.3</td>
<td>35.7</td>
<td>4.1</td>
<td>1.35</td>
<td>3 to 6</td>
<td>14</td>
</tr>
</tbody>
</table>

\(^{17}\) The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
| 13. | High debt load of veterinary school graduates | 3<sup>rd</sup> | 42.9 | 14.3 | 42.9 | 4.1 | 1.27 | 3 to 5 | 14 |
| 14. | Expected high number of food supply veterinarians retiring in the near future | 1<sup>st</sup> | 42.9 | 14.3 | 42.9 | 3.7 | 2.05 | 1 to 6 | 14 |
| 14. | Expected high number of food supply veterinarians retiring in the near future | 2<sup>nd</sup> | 35.7 | 28.6 | 35.7 | 4.1 | 1.44 | 3 to 5 | 14 |
| 14. | Expected high number of food supply veterinarians retiring in the near future | 3<sup>rd</sup> | 53.8 | 7.7 | 38.5 | 3.9 | 1.21 | 3 to 5 | 13 |
| 15. | Limited capacity of existing veterinary colleges in the US and/or Canada | 1<sup>st</sup> | 53.8 | 46.2 | 0 | 3.2 | .90 | 2 to 4 | 13 |
| 16. | Perceived lack of demand for food animals | 1<sup>st</sup> | 69.2 | 30.8 | 0 | 3.0 | .91 | 2.5 to 4 | 13 |
| 17. | Requirement for education beyond a DVM | 1<sup>st</sup> | 38.5 | 53.8 | 7.7 | 3.6 | .77 | 3 to 4 | 13 |
| 69. | Movement of DVMs from private practice to government employment | 2<sup>nd</sup> | 0 | 35.7 | 64.3 | 5.0 | 1.04 | 4 to 5.3 | 14 |
| 70. | Attractiveness of government employment security and lifestyle | 2<sup>nd</sup> | 7.1 | 42.9 | 50 | 4.7 | 1.07 | 4 to 5.3 | 14 |
| 71. | Growth of combination DVM-MPH graduate programs | 2<sup>nd</sup> | 0 | 23.1 | 76.9 | 5.1 | .86 | 4.5 to 5.5 | 13 |
| 72. | Funding of National Veterinary Medical Services Act | 2<sup>nd</sup> | 0 | 7.7 | 92.3 | 5.5 | .88 | 5 to 6 | 13 |
| 73. | Pay levels compared to other employment opportunities | 2<sup>nd</sup> | 14.3 | 28.6 | 57.1 | 4.8 | 1.19 | 4 to 6 | 14 |
| 73. | Pay levels compared to other employment opportunities | 3<sup>rd</sup> | 28.6 | 21.4 | 50 | 4.2 | 1.12 | 3 to 5 | 14 |
| 74. | Opportunities to move to other DVM careers | 2<sup>nd</sup> | 0 | 42.9 | 57.1 | 4.9 | .95 | 4 to 5.3 | 14 |
| 75. | Negative views of federal service careers | 2<sup>nd</sup> | 64.3 | 28.6 | 7.1 | 3.2 | .89 | 2.8 to 4 | 14 |
**Exhibit D-3 (continued)**

### Section IV. Solutions for Shortages of Veterinarians in the Fed-Food FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Less Effective</th>
<th>% Effective</th>
<th>% Highly Effective</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reserve class slots for academically qualified students with food supply interests and relevant background</td>
<td>3rd</td>
<td>21.4</td>
<td>57.1</td>
<td>21.4</td>
<td>4.5</td>
<td>1.45</td>
<td>3.8 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors</td>
<td>3rd</td>
<td>28.4</td>
<td>64.3</td>
<td>7.1</td>
<td>4.2</td>
<td>.98</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>3. Focused recruitment of high school and college students with food supply interests into veterinary colleges</td>
<td>3rd</td>
<td>42.9</td>
<td>42.9</td>
<td>14.3</td>
<td>4.1</td>
<td>1.49</td>
<td>3 to 5</td>
<td>14</td>
</tr>
<tr>
<td>4. Increased focus of food supply coverage early in DVM curriculum</td>
<td>3rd</td>
<td>35.7</td>
<td>35.7</td>
<td>28.6</td>
<td>4.7</td>
<td>1.86</td>
<td>3 to 7</td>
<td>14</td>
</tr>
<tr>
<td>5. Expanded business and practice management coverage in DVM curriculum</td>
<td>3rd</td>
<td>42.9</td>
<td>35.7</td>
<td>21.4</td>
<td>4.1</td>
<td>1.82</td>
<td>2 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>6. Expanded postgraduate fellowships in food supply areas</td>
<td>3rd</td>
<td>21.4</td>
<td>50</td>
<td>28.6</td>
<td>4.7</td>
<td>1.49</td>
<td>3.8 to 6</td>
<td>14</td>
</tr>
<tr>
<td>7. Expanded paid work-study programs during the final year of DVM</td>
<td>3rd</td>
<td>14.3</td>
<td>42.9</td>
<td>42.9</td>
<td>5.1</td>
<td>1.61</td>
<td>4 to 7</td>
<td>14</td>
</tr>
<tr>
<td>8. More involvement of food supply practitioners in training veterinary students</td>
<td>3rd</td>
<td>28.6</td>
<td>50</td>
<td>21.4</td>
<td>4.6</td>
<td>1.28</td>
<td>3 to 5.3</td>
<td>14</td>
</tr>
<tr>
<td>9. Provide expanded job placement services in the food supply veterinary medicine areas</td>
<td>3rd</td>
<td>21.4</td>
<td>50</td>
<td>28.6</td>
<td>4.8</td>
<td>1.58</td>
<td>3.8 to 6.3</td>
<td>14</td>
</tr>
<tr>
<td>10. Appointment of more food supply faculty at colleges of veterinary medicine</td>
<td>3rd</td>
<td>35.7</td>
<td>28.6</td>
<td>35.7</td>
<td>4.5</td>
<td>1.99</td>
<td>2 to 6.3</td>
<td>14</td>
</tr>
<tr>
<td>11. Paid externship requirement in food supply medicine during the summer</td>
<td>3rd</td>
<td>28.6</td>
<td>28.6</td>
<td>42.9</td>
<td>4.9</td>
<td>1.99</td>
<td>3 to 7</td>
<td>14</td>
</tr>
<tr>
<td>12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities</td>
<td>3rd</td>
<td>21.4</td>
<td>50</td>
<td>28.6</td>
<td>4.8</td>
<td>1.58</td>
<td>3.8 to 6</td>
<td>14</td>
</tr>
<tr>
<td>13. Student debt repayment and scholarship programs for service in food supply areas of need</td>
<td>3rd</td>
<td>7.1</td>
<td>21.4</td>
<td>71.4</td>
<td>6.0</td>
<td>1.52</td>
<td>5 to 7</td>
<td>14</td>
</tr>
<tr>
<td>14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities</td>
<td>3rd</td>
<td>57.1</td>
<td>28.6</td>
<td>14.3</td>
<td>3.6</td>
<td>1.79</td>
<td>2 to 5</td>
<td>14</td>
</tr>
</tbody>
</table>

---

18 The “% Less Effective” is the percentage that marked 1, 2 or 3. This ranges from “Not at all Effective to Slightly Effective” on the 7-point scale. The “% Effective” is the percentage marking 4 or 5 where 5 is “Effective.” The “% Highly Effective” is the percentage marking 6 or 7 where 7 is “Highly Effective.”
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Rank</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Low cost (subsidized) consulting in business and practice management for new food supply DVMs</td>
<td>3rd</td>
<td>66.7</td>
<td>33.3</td>
<td>0</td>
<td>2.8</td>
<td>1.49</td>
</tr>
<tr>
<td>16</td>
<td>Mentoring initiatives for students and those starting a food supply career</td>
<td>3rd</td>
<td>28.6</td>
<td>50</td>
<td>21.4</td>
<td>4.6</td>
<td>1.40</td>
</tr>
<tr>
<td>17</td>
<td>Focused recruitment of women students in food supply areas</td>
<td>3rd</td>
<td>28.6</td>
<td>50</td>
<td>21.4</td>
<td>4.6</td>
<td>1.39</td>
</tr>
<tr>
<td>18</td>
<td>Development and dissemination of Business Best Practices for food supply veterinary enterprises</td>
<td>3rd</td>
<td>61.5</td>
<td>23.1</td>
<td>15.4</td>
<td>3.7</td>
<td>1.60</td>
</tr>
</tbody>
</table>
## Exhibit D-4

### Section I. Factors Influencing Future Demand for Veterinarians in the Federal-Canadian FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Public concern over food safety</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>8.3</td>
<td>91.7</td>
<td>5.9</td>
<td>.79</td>
<td>6 to 6</td>
<td>12</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>27.3</td>
<td>36.4</td>
<td>36.4</td>
<td>4.3</td>
<td>1.62</td>
<td>3 to 6</td>
<td>11</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>44.4</td>
<td>11.1</td>
<td>44.4</td>
<td>4.2</td>
<td>1.39</td>
<td>3 to 5</td>
<td>9</td>
</tr>
<tr>
<td>2. Use of non-DVMs, such as veterinary technicians</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>20</td>
<td>70</td>
<td>10</td>
<td>4.0</td>
<td>1.25</td>
<td>3.8 to 4</td>
<td>10</td>
</tr>
<tr>
<td>3. Public concern over bio-terrorism</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>8.3</td>
<td>91.7</td>
<td>5.8</td>
<td>.76</td>
<td>5.3 to 6</td>
<td>12</td>
</tr>
<tr>
<td>4. Zoonotic disease-related human health concerns</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>6.2</td>
<td>.87</td>
<td>6 to 6</td>
<td>12</td>
</tr>
<tr>
<td>5. Required third party certification or verification of standards</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>16.7</td>
<td>83.3</td>
<td>5.8</td>
<td>.88</td>
<td>4 to 6</td>
<td>10</td>
</tr>
<tr>
<td>6. Limited public understanding of food quality and safety issues</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>30</td>
<td>70</td>
<td>5.1</td>
<td>1.04</td>
<td>4 to 5</td>
<td>11</td>
</tr>
<tr>
<td>7. More meat consumption in the US and Canada</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>18.2</td>
<td>27.3</td>
<td>54.5</td>
<td>4.6</td>
<td>1.04</td>
<td>4 to 5</td>
<td>11</td>
</tr>
<tr>
<td>8. More access to global markets for food exports</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>8.3</td>
<td>91.7</td>
<td>5.7</td>
<td>.78</td>
<td>5 to 6</td>
<td>12</td>
</tr>
<tr>
<td>9. Changing dietary habits in third-world countries</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>33.3</td>
<td>66.7</td>
<td>5.3</td>
<td>1.16</td>
<td>4 to 6</td>
<td>12</td>
</tr>
<tr>
<td>9. Changing dietary habits in third-world countries</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>30</td>
<td>44.4</td>
<td>5.5</td>
<td>1.23</td>
<td>4 to 6</td>
<td>9</td>
</tr>
<tr>
<td>9. Changing dietary habits in third-world countries</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>0</td>
<td>70</td>
<td>30</td>
<td>5.1</td>
<td>.88</td>
<td>4 to 6</td>
<td>10</td>
</tr>
<tr>
<td>10. Need to protect indigenous wildlife from exotic diseases</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>25</td>
<td>75</td>
<td>5.4</td>
<td>1.08</td>
<td>4.3 to 6</td>
<td>12</td>
</tr>
<tr>
<td>10. Need to protect indigenous wildlife from exotic diseases</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>22.2</td>
<td>77.8</td>
<td>5.4</td>
<td>1.01</td>
<td>4.5</td>
<td>9</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>63.6</td>
<td>27.3</td>
<td>9.1</td>
<td>3.6</td>
<td>1.29</td>
<td>3 to 4</td>
<td>11</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>50</td>
<td>12.5</td>
<td>37.5</td>
<td>4.3</td>
<td>1.49</td>
<td>3 to 6</td>
<td>8</td>
</tr>
<tr>
<td>11. Federal and/or state/provincial budgetary constraints</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>66.7</td>
<td>33.3</td>
<td>0</td>
<td>3.2</td>
<td>.67</td>
<td>3 to 4</td>
<td>9</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>63.6</td>
<td>27.3</td>
<td>9.1</td>
<td>3.3</td>
<td>1.27</td>
<td>3 to 4</td>
<td>11</td>
</tr>
<tr>
<td>12. Curtailment of government support of veterinary services</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>66.7</td>
<td>11.1</td>
<td>22.2</td>
<td>3.6</td>
<td>1.24</td>
<td>3 to 4.5</td>
<td>9</td>
</tr>
<tr>
<td>13. Increasing concern for animal welfare</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>5.8</td>
<td>.75</td>
<td>5 to 6</td>
<td>12</td>
</tr>
<tr>
<td>14. Increasing concern for animal health</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>8.3</td>
<td>91.7</td>
<td>5.3</td>
<td>.75</td>
<td>5 to 5.8</td>
<td>12</td>
</tr>
<tr>
<td>15. Need to understand animal-human health eco-systems</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0</td>
<td>27.3</td>
<td>72.7</td>
<td>5.5</td>
<td>1.13</td>
<td>4 to 6</td>
<td>11</td>
</tr>
<tr>
<td>15. Need to understand animal-human health eco-systems</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0</td>
<td>33.3</td>
<td>66.7</td>
<td>5.3</td>
<td>1.12</td>
<td>4 to 6</td>
<td>9</td>
</tr>
</tbody>
</table>

---

14 The “1<sup>st</sup>” refers to the 1<sup>st</sup> Delphi survey. The “2<sup>nd</sup>” refers to the 2<sup>nd</sup> Delphi survey, while the “3<sup>rd</sup>” refers to the 3<sup>rd</sup> Delphi survey.
15 The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
| 16. Availability of highly technical or specialized services | 1st | 25 | 16.7 | 58.3 | 4.6 | 1.24 | 3.3 to 5 | 12 |
| 16. Availability of highly technical or specialized services | 2nd | 0 | 22.2 | 77.8 | 5.3 | 1.12 | 4.5 to 6.5 | 9 |
| 16. Availability of highly technical or specialized services | 3rd | 20 | 20 | 60 | 4.4 | .84 | 3.8 to 5 | 10 |
| 17. Veterinary services agreements required for agri-business loans | 1st | 0 | 58.3 | 41.7 | 4.6 | .79 | 4 to 5 | 12 |
| 18. Growing need to track animals entering the food chain | 1st | 0 | 8.3 | 91.7 | 5.8 | .87 | 5 to 6 | 12 |
| 19. Constraints on non-DVMs giving prescription drugs | 1st | 0 | 41.7 | 58.3 | 5.1 | 1.17 | 4 to 6 | 12 |
| 19. Constraints on non-DVMs giving prescription drugs | 2nd | 0 | 50 | 50 | 4.8 | .89 | 4 to 5.8 | 8 |
| 20. Slow adoption of new technologies by veterinarians | 1st | 10 | 80 | 10 | 4.1 | .74 | 4 to 4 | 10 |
| 21. Move to larger sized producer operations | 1st | 50 | 25 | 25 | 3.9 | 1.24 | 3 to 4.8 | 12 |
| 21. Move to larger sized producer operations | 2nd | 11.1 | 55.6 | 33.3 | 4.3 | .87 | 4 to 5 | 9 |
| 21. Move to larger sized producer operations | 3rd | 30 | 50 | 20 | 3.9 | .74 | 3 to 4.3 | 10 |
| 22. Client use of veterinary herd management services | 1st | 16.7 | 66.7 | 16.7 | 4.1 | 1.17 | 4 to 4 | 12 |
| 23. Client concerns about veterinary service costs | 1st | 18.2 | 63.6 | 18.2 | 3.9 | .83 | 4 to 4 | 11 |
| 24. Lack of veterinarian’s practice management and business skill | 1st | 18.2 | 81.8 | 0 | 3.6 | .81 | 4 to 4 | 11 |
| 25. Part-time farmers needing more veterinary services | 1st | 9.1 | 54.5 | 36.4 | 4.5 | .93 | 4 to 5 | 11 |
| 110. Need for national surveillance of emerging diseases | 2nd | 0 | 0 | 100 | 5.9 | .33 | 6 to 6 | 9 |
| 111. Development of international disease monitoring and reporting standards | 2nd | 0 | 11.1 | 88.9 | 5.9 | .93 | 5.5 to 6.5 | 9 |
| 112. Expanding veterinary public health demands | 2nd | 0 | 0 | 100 | 5.9 | .53 | 6 to 7 | 9 |
| 113. Changes in veterinary drug approval processes | 2nd | 11.1 | 22.2 | 66.7 | 4.7 | .87 | 4 to 5 | 9 |
| 114. Increasing international trade of food and animal products | 2nd | 0 | 0 | 100 | 5.7 | .50 | 5 to 6 | 9 |
| 115. Veterinary roles in the aquatic animal health area | 2nd | 0 | 11.1 | 88.9 | 5.6 | .88 | 5 to 6 | 9 |
| 116. Need for risk management and related communication activities | 2nd | 0 | 33.3 | 66.7 | 5.4 | 1.24 | 4 to 6.5 | 9 |
| 116. Need for risk management and related communication activities | 3rd | 0 | 0 | 100 | 5.8 | .79 | 5 to 6.3 | 10 |
| 117. Deliver veterinary activities in 3rd world countries | 2nd | 0 | 22.2 | 77.8 | 5.2 | .83 | 4.5 to 6 | 9 |
| 118. Required capacity to counter food related terrorism threats | 2nd | 0 | 11.1 | 88.9 | 5.4 | .88 | 5 to 6 | 9 |
| 119. Efficiencies in inspection processes | 2nd | 33.3 | 33.3 | 33.3 | 4.2 | 1.56 | 3 to 5.5 | 9 |
| 119. Efficiencies in inspection processes | 3rd | 50 | 20 | 30 | 3.8 | 1.23 | 3 to 5 | 10 |
| 120. Need for fewer inspection certifications | 2nd | 33.3 | 55.6 | 11.1 | 3.9 | .93 | 3 to 4 | 9 |
| 121. Implementation of internationally accepted food safety programs | 2nd | 22.2 | 0 | 77.8 | 5.2 | 1.39 | 4 to 6 | 9 |
| 121. Implementation of internationally accepted food safety programs | 3rd | 10 | 10 | 80 | 5.2 | 1.03 | 4.8 to 6 | 10 |
### Exhibit D-4 (continued)

**Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern (Federal-Canadian FSVM Careers)**

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Lower(^{16})</th>
<th>% No Difference</th>
<th>% Higher</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication with the public</td>
<td>2(^{nd})</td>
<td>0</td>
<td>22.2</td>
<td>77.8</td>
<td>5.8</td>
<td>1.20</td>
<td>4.5 to 7</td>
<td>9</td>
</tr>
<tr>
<td>2. Interaction with international veterinary organizations</td>
<td>2(^{nd})</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>6.0</td>
<td>.87</td>
<td>5 to 7</td>
<td>9</td>
</tr>
<tr>
<td>3. Risk management activities</td>
<td>2(^{nd})</td>
<td>0</td>
<td>11.1</td>
<td>88.9</td>
<td>6.2</td>
<td>.97</td>
<td>6 to 7</td>
<td>9</td>
</tr>
<tr>
<td>4. Epidemiology</td>
<td>2(^{nd})</td>
<td>0</td>
<td>11.1</td>
<td>88.9</td>
<td>5.8</td>
<td>.97</td>
<td>5 to 6.5</td>
<td>9</td>
</tr>
<tr>
<td>5. HACCP audit activities</td>
<td>2(^{nd})</td>
<td>11.1</td>
<td>0</td>
<td>88.9</td>
<td>5.8</td>
<td>1.20</td>
<td>5.5 to 6.5</td>
<td>9</td>
</tr>
<tr>
<td>6. Global regulatory and export certifications activities</td>
<td>2(^{nd})</td>
<td>11.1</td>
<td>0</td>
<td>88.9</td>
<td>5.9</td>
<td>1.27</td>
<td>5.5 to 7</td>
<td>9</td>
</tr>
<tr>
<td>7. On farm food safety activities</td>
<td>2(^{nd})</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>6.0</td>
<td>.71</td>
<td>5.5 to 6.5</td>
<td>9</td>
</tr>
<tr>
<td>8. Antimicrobial resistance related activities</td>
<td>2(^{nd})</td>
<td>0</td>
<td>11.1</td>
<td>88.9</td>
<td>5.6</td>
<td>.88</td>
<td>5 to 6</td>
<td>9</td>
</tr>
<tr>
<td>9. Meat and poultry direct inspection activities</td>
<td>2(^{nd})</td>
<td>55.6</td>
<td>11.1</td>
<td>33.3</td>
<td>3.8</td>
<td>1.56</td>
<td>2.5 to 5.5</td>
<td>9</td>
</tr>
</tbody>
</table>

\(^{16}\) The “% Lower” is the percentage that marked 1, 2 or 3. This ranges from “Significantly Lower” to “Slightly Lower” on the 7-point scale. The “% No Difference” is the percent that marked 4. This is the mid-point of the scale. The “% Higher” is the percentage marking 5, 6 or 7, which ranged from “Slightly Higher” to Significantly Higher.”
### Section III. Factors Influencing Future Supply for Veterinarians in the Federal-Canadian FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Decrease</th>
<th>% No Influence</th>
<th>% Increase</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>50% Range</th>
<th>Middle</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Less emphasis on food animal practice in veterinary colleges</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>72.7</td>
<td>27.3</td>
<td>0</td>
<td>2.6</td>
<td>1.04</td>
<td>2 to 4</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>41.7</td>
<td>25</td>
<td>33.3</td>
<td>3.6</td>
<td>1.38</td>
<td>2.3 to 5</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>55.6</td>
<td>11.1</td>
<td>33.3</td>
<td>3.8</td>
<td>1.56</td>
<td>2.5 to 5.5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>2. More women veterinarians entering the workforce</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>50</td>
<td>40</td>
<td>10</td>
<td>3.5</td>
<td>1.18</td>
<td>2.3 to 4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>58.3</td>
<td>25</td>
<td>16.7</td>
<td>3.3</td>
<td>1.22</td>
<td>2.3 to 4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>22.2</td>
<td>33.3</td>
<td>44.4</td>
<td>4.3</td>
<td>1.00</td>
<td>3.5 to 5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>3. Physical demands of large animal veterinary work</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>4.5</td>
<td>1.27</td>
<td>3.8 to 5.3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>75</td>
<td>8.3</td>
<td>16.7</td>
<td>2.7</td>
<td>1.37</td>
<td>2 to 3.8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>33.3</td>
<td>0</td>
<td>66.7</td>
<td>4.4</td>
<td>1.42</td>
<td>3 to 5.5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>4. Need to work long hours and emergency calls</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>30</td>
<td>0</td>
<td>70</td>
<td>4.4</td>
<td>1.51</td>
<td>2.8 to 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5. Little exposure to food supply career options in college</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>91.7</td>
<td>8.3</td>
<td>0</td>
<td>2.3</td>
<td>.89</td>
<td>2 to 3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6. Lack of food supply practice-related externships for students</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>91.7</td>
<td>8.3</td>
<td>0</td>
<td>2.8</td>
<td>.62</td>
<td>2 to 3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>7. Lack of positive role models in veterinary food supply practice</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>81.8</td>
<td>18.2</td>
<td>0</td>
<td>2.5</td>
<td>1.04</td>
<td>2 to 3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>80</td>
<td>10</td>
<td>10</td>
<td>2.4</td>
<td>1.35</td>
<td>1 to 3.3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>8. Poor income opportunities in rural areas</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>44.4</td>
<td>44.4</td>
<td>11.1</td>
<td>3.8</td>
<td>.97</td>
<td>3 to 4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>9. Lack of cultural and recreational opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>58.3</td>
<td>33.3</td>
<td>8.3</td>
<td>3.3</td>
<td>.89</td>
<td>3 to 4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>10. Lack of spousal career options in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>72.7</td>
<td>9.1</td>
<td>18.2</td>
<td>2.8</td>
<td>1.33</td>
<td>2 to 4</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>10. Lack of spousal career options in rural areas</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>3.9</td>
<td>1.36</td>
<td>2.5 to 5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10. Lack of spousal career options in rural areas</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>50</td>
<td>20</td>
<td>30</td>
<td>3.6</td>
<td>1.51</td>
<td>2.8 to 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>75</td>
<td>16.7</td>
<td>8.3</td>
<td>3.0</td>
<td>1.21</td>
<td>2 to 3.8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>33.3</td>
<td>22.2</td>
<td>44.4</td>
<td>4.0</td>
<td>1.41</td>
<td>2.5 to 5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>11. Limited lifestyle and career opportunities in rural areas</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>50</td>
<td>10</td>
<td>40</td>
<td>3.9</td>
<td>1.29</td>
<td>3 to 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>12. Federal and/or state/provincial budgetary constraints</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>81.8</td>
<td>18.2</td>
<td>0</td>
<td>2.6</td>
<td>1.03</td>
<td>2 to 3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>12. Federal and/or state/provincial budgetary constraints</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>88.9</td>
<td>11.1</td>
<td>0</td>
<td>2.9</td>
<td>.60</td>
<td>2.5 to 3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>45.5</td>
<td>27.3</td>
<td>27.3</td>
<td>3.6</td>
<td>1.12</td>
<td>3 to 5</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

<sup>17</sup> The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13. High debt load of veterinary school graduates</td>
<td>2nd</td>
<td>55.6</td>
<td>22.2</td>
<td>22.2</td>
<td>3.6</td>
<td>1.01</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td>1st</td>
<td>58.3</td>
<td>25</td>
<td>16.7</td>
<td>3.3</td>
<td>1.87</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td>2nd</td>
<td>11.1</td>
<td>22.2</td>
<td>66.7</td>
<td>5.2</td>
<td>1.39</td>
</tr>
<tr>
<td>14. Expected high number of food supply veterinarians retiring in the near future</td>
<td>3rd</td>
<td>30</td>
<td>10</td>
<td>60</td>
<td>4.2</td>
<td>1.40</td>
</tr>
<tr>
<td>15. Limited capacity of existing veterinary colleges in the US and/or Canada</td>
<td>1st</td>
<td>83.3</td>
<td>16.7</td>
<td>0</td>
<td>2.8</td>
<td>.72</td>
</tr>
<tr>
<td>16. Perceived lack of demand for food animals</td>
<td>1st</td>
<td>91.7</td>
<td>8.3</td>
<td>0</td>
<td>2.8</td>
<td>.75</td>
</tr>
<tr>
<td>17. Requirement for education beyond a DVM</td>
<td>1st</td>
<td>58.3</td>
<td>41.7</td>
<td>0</td>
<td>3.2</td>
<td>.84</td>
</tr>
<tr>
<td>76. Externships during last year of DVM program</td>
<td>2nd</td>
<td>0</td>
<td>33.3</td>
<td>66.7</td>
<td>4.9</td>
<td>.78</td>
</tr>
<tr>
<td>77. Inflows of underemployment DVMs from food animal practices</td>
<td>2nd</td>
<td>11.1</td>
<td>44.4</td>
<td>44.4</td>
<td>4.6</td>
<td>1.01</td>
</tr>
<tr>
<td>78. Salary levels of federal government positions</td>
<td>2nd</td>
<td>44.4</td>
<td>0</td>
<td>55.6</td>
<td>4.2</td>
<td>1.20</td>
</tr>
<tr>
<td>79. Opportunities for regular work hours</td>
<td>2nd</td>
<td>0</td>
<td>11.1</td>
<td>88.9</td>
<td>5.3</td>
<td>.71</td>
</tr>
<tr>
<td>80. Veterinary schools reserving spaces for food animal oriented students</td>
<td>2nd</td>
<td>0</td>
<td>22.2</td>
<td>77.8</td>
<td>5.0</td>
<td>.71</td>
</tr>
<tr>
<td>81. Perceived lack of jobs in the food animal area</td>
<td>2nd</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>4.1</td>
<td>1.05</td>
</tr>
<tr>
<td>82. Career development opportunities in government roles</td>
<td>2nd</td>
<td>11.1</td>
<td>22.2</td>
<td>66.7</td>
<td>4.8</td>
<td>.97</td>
</tr>
<tr>
<td>83. Urbanization and fewer veterinary students with rural backgrounds</td>
<td>2nd</td>
<td>55.6</td>
<td>33.3</td>
<td>11.1</td>
<td>3.4</td>
<td>.88</td>
</tr>
</tbody>
</table>
Section IV. Solutions for Shortages of Supply for Veterinarians in the Federal-Canadian FSVM Careers

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Survey Wave</th>
<th>% Less Effective</th>
<th>% Effective</th>
<th>% Highly Effective</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Middle 50% Range</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reserve class slots for academically qualified students with food supply interests and relevant background</td>
<td>3rd</td>
<td>70</td>
<td>20</td>
<td>10</td>
<td>3.8</td>
<td>1.40</td>
<td>3 to 5</td>
<td>10</td>
</tr>
<tr>
<td>2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors</td>
<td>3rd</td>
<td>11.1</td>
<td>77.8</td>
<td>11.1</td>
<td>4.8</td>
<td>1.09</td>
<td>4 to 5</td>
<td>9</td>
</tr>
<tr>
<td>3. Focused recruitment of high school and college students with food supply interests into veterinary colleges</td>
<td>3rd</td>
<td>40</td>
<td>50</td>
<td>10</td>
<td>3.7</td>
<td>1.83</td>
<td>2.5 to 5</td>
<td>10</td>
</tr>
<tr>
<td>4. Increased focus of food supply coverage early in DVM curriculum</td>
<td>3rd</td>
<td>40</td>
<td>60</td>
<td>0</td>
<td>3.8</td>
<td>1.23</td>
<td>2.3 to 5</td>
<td>10</td>
</tr>
<tr>
<td>5. Expanded business and practice management coverage in DVM curriculum</td>
<td>3rd</td>
<td>70</td>
<td>20</td>
<td>10</td>
<td>2.9</td>
<td>1.91</td>
<td>1.8 to 4.3</td>
<td>10</td>
</tr>
<tr>
<td>6. Expanded postgraduate fellowships in food supply areas</td>
<td>3rd</td>
<td>40</td>
<td>20</td>
<td>40</td>
<td>4.6</td>
<td>2.07</td>
<td>2.8 to 7</td>
<td>10</td>
</tr>
<tr>
<td>7. Expanded paid work-study programs during the final year of DVM</td>
<td>3rd</td>
<td>30</td>
<td>50</td>
<td>20</td>
<td>4.5</td>
<td>1.51</td>
<td>3 to 5.5</td>
<td>10</td>
</tr>
<tr>
<td>8. More involvement of food supply practitioners in training veterinary students</td>
<td>3rd</td>
<td>30</td>
<td>50</td>
<td>20</td>
<td>4.6</td>
<td>1.65</td>
<td>3 to 5.5</td>
<td>10</td>
</tr>
<tr>
<td>9. Provide expanded job placement services in the food supply veterinary medicine areas</td>
<td>3rd</td>
<td>22.2</td>
<td>44.4</td>
<td>33.3</td>
<td>4.8</td>
<td>1.39</td>
<td>3.5 to 6</td>
<td>9</td>
</tr>
<tr>
<td>10. Appointment of more food supply faculty at colleges of veterinary medicine</td>
<td>3rd</td>
<td>20</td>
<td>50</td>
<td>30</td>
<td>4.6</td>
<td>1.84</td>
<td>3.8 to 6.3</td>
<td>9</td>
</tr>
<tr>
<td>11. Paid externship requirement in food supply medicine during the summer</td>
<td>3rd</td>
<td>22.2</td>
<td>22.2</td>
<td>55.6</td>
<td>5.2</td>
<td>1.72</td>
<td>3.5 to 7</td>
<td>9</td>
</tr>
<tr>
<td>12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities</td>
<td>3rd</td>
<td>30</td>
<td>30</td>
<td>40</td>
<td>4.7</td>
<td>1.49</td>
<td>3 to 6</td>
<td>10</td>
</tr>
<tr>
<td>13. Student debt repayment and scholarship programs for service in food supply areas of need</td>
<td>3rd</td>
<td>10</td>
<td>40</td>
<td>50</td>
<td>5.4</td>
<td>1.43</td>
<td>4 to 7</td>
<td>10</td>
</tr>
<tr>
<td>14. Development of a government-supported Reserve Corps of food</td>
<td>3rd</td>
<td>22.2</td>
<td>22.2</td>
<td>55.6</td>
<td>5.3</td>
<td>1.50</td>
<td>4 to 6.5</td>
<td>9</td>
</tr>
</tbody>
</table>

18 The “% Less Effective” is the percentage that marked 1, 2 or 3. This ranges from “Not at all Effective to Slightly Effective” on the 7-point scale. The “% Effective is the percentage marking 4 or 5 where 5 is “Effective.” The “% Highly Effective” is the percentage marking 6 or 7 where 7 is “Highly Effective.”
Estimating FSVM Demand and Maintaining the Availability of Veterinarians for Careers in Food Supply Related Disciplines in the United States and Canada

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>AA</th>
<th>SAA</th>
<th>OAA</th>
<th>OAO</th>
<th>Input</th>
<th>Output</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply DVMs for disease surveillance and control activities</td>
<td>3rd</td>
<td>55.6</td>
<td>33.3</td>
<td>11.1</td>
<td>3.3</td>
<td>1.73</td>
<td>2 to 5</td>
</tr>
<tr>
<td>Low cost (subsidized) consulting in business and practice management for new food supply DVMs</td>
<td>3rd</td>
<td>40</td>
<td>40</td>
<td>20</td>
<td>4.2</td>
<td>1.55</td>
<td>3 to 5.3</td>
</tr>
<tr>
<td>Mentoring initiatives for students and those starting a food supply career</td>
<td>3rd</td>
<td>60</td>
<td>40</td>
<td>0</td>
<td>3.3</td>
<td>.95</td>
<td>2.8 to 4</td>
</tr>
<tr>
<td>Focused recruitment of women students in food supply areas</td>
<td>3rd</td>
<td>66.7</td>
<td>33.3</td>
<td>0</td>
<td>2.9</td>
<td>1.05</td>
<td>2 to 4</td>
</tr>
</tbody>
</table>