2012 FEDERAL VETERINARY WORKFORCE EMERGENCY RESPONSE AND POST-OUTBREAK ASSESSMENT ESTIMATES

These estimates were derived from Post-Outbreak assessments and Foot-and-Mouth disease modeling. They provide an initial reference and recommendations for veterinary workforce needs during emergency animal disease responses.

Administered by the Federal Veterinary Workforce Talent Management Advisory Council (TMAC)

2012 Federal Veterinary Workforce- Emergency Response & Post-Outbreak Assessment Estimates

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"This analysis is an initial effort to estimate the number of veterinarians needed in an FMD outbreak response in the US"

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Executive Summary

In 2009, the Government Accountability Office (GAO) issued a report with recommendations to improve the ability of the federal veterinary workforce to carry out mission-critical activities. Two GAO recommendations address emergency response.
The first recommendation was:
"to improve estimates of the veterinarian workforce needed to respond to a large-scale foot-and-mouth disease outbreak".
The second recommendation was:
"to improve the ability of the federal veterinarian workforce to respond to zoonotic outbreaks in the future while also effectively carrying out routine activities"
The Federal Veterinary Workforce Talent Management Advisory Council (TMAC) was established to address the impending national shortage of Federal veterinarians and its ability to complete their mission critical duties, assess current and future sufficiency of the veterinarian workforce, and respond Animal Health Emergencies. As a result, the TMAC conducted post-outbreak assessments and conducted Foot-and-Mouth Disease scenario modeling to determine

The 2012 outbreak assessment and FMD modeling data suggests the following:

- The number of veterinarians needed in an animal disease outbreak is dependent on a number of factors
- Post-Outbreak assessments can be used to help determine veterinary workforce needs
- More attention is needed in documenting the workforce compositions during an outbreak

- A 100 day FMD outbreak in a single State will require at least 880 veterinarians
- A 1 year FMD outbreak in multiple States will require over 4500 veterinarians

INTRODUCTION

This document is written to address the 2009 Veterinary Workforce GAO audit recommendations. In the report, the veterinarian workforce challenge most commonly cited by federal and state agencies involved in the four recent zoonotic outbreaks reviewed was insufficient veterinary workforce capacity. Specifically, officials interviewed at 12 of the 17 agencies involved in the recent outbreaks indicated they did not have enough veterinarians to respond to these outbreaks while continuing to carry out their routine activities.[1] It was also recommended to improve estimates of the veterinary workforce needed to respond to a large-scale foot-and-mouth disease outbreak.[2] In order to address these two issues in the GAO Report, the Emergency Planning Action Team under the auspices of the Talent Management Advisory Committee reviewed data from past animal disease outbreaks both domestic and foreign as well as studies conducted using expert panels and subject matter experts.

Background

Since there has not been a FMD outbreak in the US since 1929, there was not a readily available source of U.S. FMD data for our analysis of the federal veterinary workforce in responding to a large scale foot-and-mouth disease outbreak. Therefore TMAC had to use data from other available sources to make a "best estimate" for the requirements of veterinarians needed for a response to an animal disease outbreak in the US. The most recent outbreak of a foreign animal disease in the US was from Exotic Newcastle Disease in 2002 which was a regional outbreak in southwest US and cost the United States over $160 million to contain. There have been several FMD outbreaks in foreign countries in the past decade or so. The outbreak in the United Kingdom, which occurred in 2001, affected over 10,512 farms and affected with more than 6,000,000 animals depopulated. This resulted in an economic loss of over $11.6 billion. The 2010 foot and mouth disease outbreak (FMD) in Japan which lasted from 4/20/2010- 7/5/2010 resulted in 331,608 animals affected which cost the country between 1.3-2.6 billion dollars in losses. In 2011, a foot and mouth disease outbreak occurred in South Korea. In this outbreak, 1.4 million animals being infected which resulted in a $2.7 billion economic loss. In trying to assess the veterinary workforce utilized in these various outbreaks, the outbreaks in Japan and South Korea had insufficient and inconsistent information as to veterinary manpower; therefore, this information could not be utilized to give insight into estimation of veterinary manpower during an animal disease outbreak. There were three Subject Matter Expert (SME) studies available:

- A Target Capability Listing that was developed by an expert workgroup under the auspices of the Federal Emergency Management Agency (FEMA) which used an US nationwide FMD outbreak.
- A draft development of the Saturation Model and the NAASDM model which was developed under the auspices of APHIS also using a nationwide outbreak; and
- A draft development of the Saturation Model and the NAASDM model which was developed under the auspices of APHIS also using a regional outbreak

[1] GAO-09-178 Veterinarian Workforce: Action are Needed to Ensure Sufficient Capacity for Protecting Public and Animal Health, page 8, Feb 2009

[2] GAO-09-178 Veterinarian Workforce: Action are Needed to Ensure Sufficient Capacity for Protecting Public and Animal Health, page 43, paragraph 5, Feb 2009

Method

The goal was to use the existing available data to determine an estimate of veterinary workforce needed to respond effectively and efficiently to a worse-case scenario FMD outbreak in the US. FMD was chosen because this disease was specifically stated in the GAO report and it would also represent the worst-case scenario. Since there has not been an FMD outbreak in the US since 1929, it was decided to approach the problem by identifying both the lower and upper boundaries for veterinarians used in animal disease outbreak responses within the past 10 years. By examining these data points, it is expected that a reasonable estimate of the number of veterinarians needed in an animal disease could be made for the United States. Important considerations:

A. Post-Outbreak Assessments within the United States: The Exotic Newcastle Disease (END) response was used to define the lower boundaries for the number of veterinarians needed for a response. END was used since it was an actual United States response to a foreign animal disease. Although END involved a different species (poultry), END was not a typical poultry outbreak where most affected birds would be in large commercial operations. Rather the END outbreak involved mostly backyard operations and therefore required a much more intensive workforce that has similarities to the more traditional livestock operations. However, another factor that was considered is that in END the individual animal is smaller and easier to restrain, so it would not be as manpower intensive as an FMD outbreak in livestock on a per animal basis.

B. Utilization of the Saturation Model: The output of the Saturation Model (SaM) was used to facilitate the analysis of resource requirements in response to a hypothetical national outbreak of a highly contagious disease for FMD. The model provides information about how many individuals might be required to respond during each day of the outbreak and if there are a sufficient number of qualified people to deploy, i.e. VMOs, animal health technicians, and others as well as when the shortages might occur.

Several limitations were identified with the modeling effort:

1. No scenarios were run based on populations where one type of production stands out, other than beef cattle. For example, no State with many very large dairy or swine herds was included. Therefore, the increased spread, other exposures, and workload issues associated were not included.

2. No adjustments were made for management in different States, other than that which would be expected because of the different mix of herd types (dairy, beef, and swine).

Note: Please keep in mind that the model is not validated. It has not been approved for official use at this time.

C. Utilization of the Target Capabilities List: The Target Capabilities List (TCL) describes the capabilities related to the four homeland security mission areas: Prevent, Protect, Respond, and Recover. It defines and provides the basis for assessing preparedness. It also establishes national guidance for preparing the Nation for major all-hazards events, such as those defined by the National Planning Scenarios. The Guidelines provide the vision and establishes national priorities. A "Consensus of the Community" approach was used to develop the TCL. Stakeholders from Federal, State, local, territorial, and tribal governments, the private sector, and nongovernmental organizations came together in four national workshops and capability working groups to define the capabilities. The result from the TCL was used as an expert panel view of a national level FMD outbreak.

D. Post-Outbreak FMD assessments outside the United States: In 2011, there were FMD outbreaks in Japan and in South Korea. The initial intent was to use the veterinary workforce data from these two outbreaks as examples of FMD outbreaks in economically developed countries where the outbreak and response could be similar to those of the US and could be used to fill gaps in the US data. However, the

disparities between sources were so divergent that they could not serve that purpose. Therefore, the analysis of the Japan and South Korea was not used in this study.

E. Utilization of the North American Animal Disease Spread Model (NAADSM): A second modeling study was conducted for a regional FMD outbreak scenario using the output from the NAASDM to drive the workload for the Saturation Model (SaM). The SaM is based upon scenario and assumptions by the user Subject Matter Experts (SME). These SME's have performed the required tasks and they know how long it takes to perform those tasks. The NAADSM scenario centered on a simulated outbreak in Texas since Texas was considered the state with the highest likelihood for FMD introduction. User established parameters define model behavior in terms of: disease progression, disease spread by direct contact, direct contact, airborne/local dissemination, and the application of control measures such as quarantine, movement restrictions, depopulation, and vaccination.

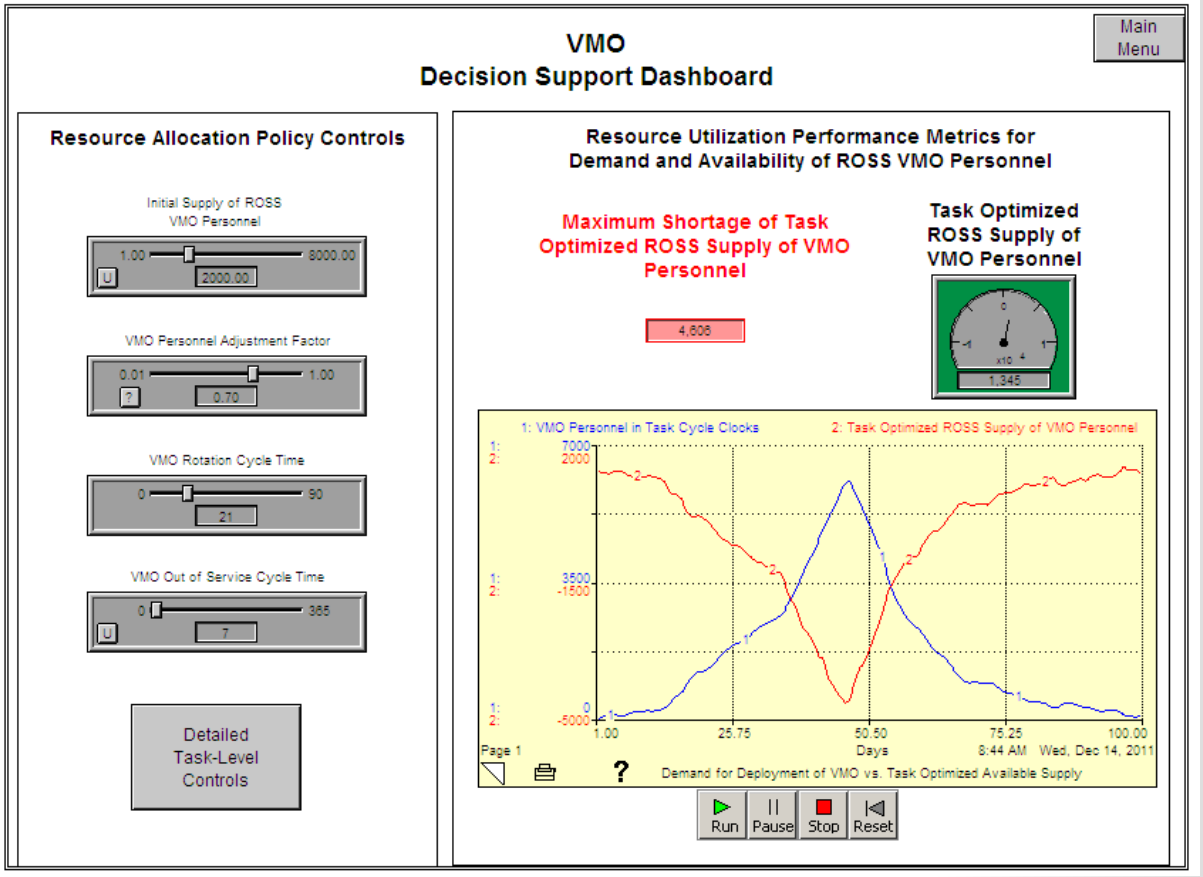
Findings

A. The Exotic Newcastle Disease (END) outbreak was used to determine what is considered to be the lower-range veterinary workforce requirement needed to respond to a national disease outbreak- since it was regional and involved poultry instead of livestock. Normally, poultry outbreaks would involve fewer personnel, including veterinarians, since they are typically in large houses containing thousands of birds per house. In this outbreak, however, most of the sites on which birds were depopulated during the 2002-03 END outbreak were "backyard" premises that had a small number of birds. Nearly 80 percent of the premises had fewer than 50 birds depopulated, and half of the premises had fewer than 15 birds depopulated. The average number of birds depopulated on a backyard premises was about 59, while on commercial premises, the average number of birds depopulated was over 120,000. Data indicate a slowly increasing level of fewer than 200 personnel during the early winter of 2002, followed by a huge increase after the diagnosis of END in a commercial poultry premises near the end of 2002. This diagnosis required an increase in workforce needs and an increased level of effort of more than 1,400 personnel was maintained until June 2003. After that time workforce needs decreased quickly throughout the remainder of the summer. The number of veterinarians utilized during the END outbreak was 687 with the total number of individual veterinarians on site during March 2003 being 468. For more detail on the END outbreak

B. Modeling of a National FMD outbreak scenario used the output from the North American Animal Disease Spread Model (NAASDM) to drive the workload for the Saturation Model (SaM). The SaM is based upon scenario and assumptions that are input by the user (SME) as to who performs the required task and how long it takes to perform those tasks. A one year outbreak, (although an outbreak could last much longer) a slowly percolating outbreak, or a prolonged outbreak with small numbers of cases continuing to occur on occasion would not tax the response capability as much as a rapidly spreading outbreak where the number of affected herds increased rapidly. In the scenario, 44 states were considered to have FMD as a worst-case consideration. Six states were considered disease free, although they would still have tracing and investigation activities. In all 50 states, it was assumed that 10 percent of herds would need investigation (for reasons such as: potential movement of animals, people, equipment, etc., report of suspicious signs that turned out to be something other than FMD; exposure to false positive herds, etc.). The 44 affected states were divided into three groups designed to reflect – roughly – the density of herds in the state and the overall number of herds. This information was used to determine how serious the outbreak would be and how many neighboring herds would need investigation/each infected herd. Twelve states (with the most densely populated cattle herds) were in the Group 1 and they were sorted randomly. The first half (6) were defined as having a 'severe' outbreak – defined as infection in 3 percent of the herds over the course of one year. The next one-quarter of the states (3 of them) would have a 'medium' outbreak (1.5 percent of herds infected) and the last one-quarter of the states would have a 'moderate' outbreak (.75 percent of herds).

In the second group of states, after sorting randomly, one-third of the states would fall in each outbreak group. In the third group of states, one-third of the randomly sorted herds would have a 'medium' outbreak (3 percent) and two-thirds a 'moderate' outbreak (.75 percent). This means that in the densest states with the most herds, at the worst, almost 20 percent of herds could be visited by personnel for some reason – 3 percent because of infection, 3 times that number (9 percent) because they are neighbors, and 10 percent more for investigation for any other reason. This scenario was used as the input to SaM and was run for both 100 day and 354 days duration with 800 and 1000 VMO's as initial supply, The personnel rotation policy was 21 days rotation and 20 days off; another with a 21 days rotation and 7 days off; and a third scenario with 2000 VMO's 21 days, 7 days off. The other variables in the SaM were left in their default setting developed by the modeling team. The tasks included all the various response teams; such as diagnosis, epidemiology, vaccination, appraisal, cleaning and disinfecting. The model includes only VMO's that will be performing activities and does not include VMO's assigned to an Incident Management Team (IMT) or any other work not directly associated with the performance of activities on premises.

A summary of the output from all the model runs shows there were approximately 6,000 VMOs needed for response to the scenario as depicted by the model assumptions, as can be seen in this



Graph 1: Number of veterinarians needed during a national FMD outbreak.
The blue line annotates the number of veterinarian required for response which is approximately 6,000. The redline track the veterinarian shortages with the assumption that there were approximately 2,000 available at onset (not used in this analysis).

C. The TCL is a national-level, generic model of operationally-ready-capabilities defining all-hazards preparedness. The TCL was developed by a group of SMEs from Federal, State and local level with over 120 national associations, non-governmental organizations, and the private sector. Stakeholders

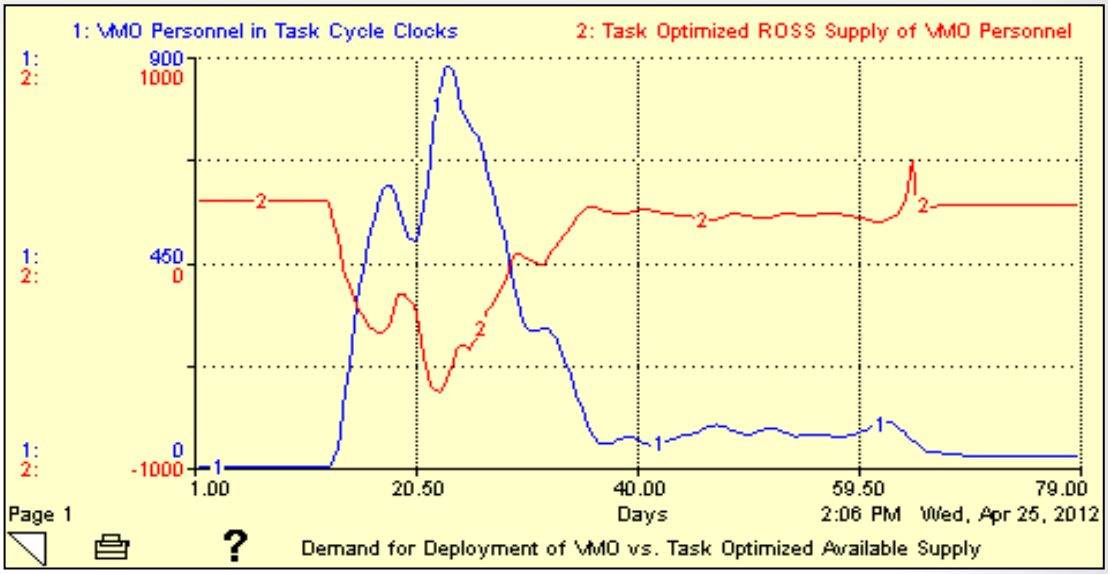
participated through national stakeholder workshops, working groups, and broad national reviews. The TCL study was based upon a total of 40,000 herds involved with the median herd size of 670 head for a total of 26,800,000 head. Although the total number of veterinarians required to respond was not identified, the total number of responders required was calculated as 105,043.

D. A study was conducted for a regional outbreak scenario using the output from the NAASDM to drive the workload for the Saturation Model (SaM). The SaM is based upon scenario and assumptions that are inputs by the user Subject Matter Experts (SME) as to who performs the required task and how long it takes to perform those tasks. The scenario was centered on Texas since it was considered the state with the highest likelihood for FMD introduction. The specifics of the scenario were as follows:

a. Four thousand outbreaks were simulated
b. Longest simulated individual herd FMD outbreak- 79 days
c. 110 herds were detected
d. 5,320 herds were investigated
e. 115 herds were appraised, depopulated, disposed of, & premises cleaned and disinfected
f. 4,875 herds were vaccinated
g. Length of the outbreak was 100 days

Neither NAADSM or SaM currently estimate the numbers of herds which may need to be sampled for surveillance purposes during an outbreak or at the end of an outbreak to provide proof of freedom of disease. **As a result, the numbers of Federal VMO's required for surveillance are not included in this study, but could be significant**. The number of Federal Veterinary Medical Officers (VMOs) needed to carry out various activities on each day of the simulated FMD outbreak ranged from 0 to approximately 880, with the peak demand being on approximately day 22. An understanding of the following limitations is essential in order to correctly interpret model results:

a. Additional constraints on personnel availability – such as limitations for working with "clean" and "infected" herds are not considered within these estimates
b. The outbreak profile and corresponding workforce requirements reflect the number of herds that were depopulated and vaccinated
c. This model does not reflect the number of herds that were waiting to be depopulated and vaccinated on each day of the simulated outbreak
d. The strain of FMD virus represented by this analysis is type O. Additional work is necessary in order to appropriately model other strains
e. The disease model parameters represent commercial livestock demographics in Texas only
f. To provide an estimate of the number of federal veterinarians required to respond to an outbreak of national scale requires that simulation modeling be carried out at a national scale; however, current versions of NAADSM are best suited for modeling individual regions
g. The current version of NAADSM does not allow users to model vaccination strategies beyond that of a containment vaccination zone



Graph 2: Number of veterinarians required for a regional FMD outbreak

he blue line annotates the number of veterinarian required for response which is approximately 880. The redline track the veterinarian shortages with the assumption that there were approximately 2,000

DISCUSSION

Since the last FMD outbreak in the US occurred in 1929, empirical data is not available for analysis to determine the veterinary workforce requirement to respond to an FMD outbreak in the US. Consequently, data from other outbreaks, such as one in another species (poultry) and one in a foreign country had to be used. The advantage of using real world outbreaks are that assumptions are minimized and issues important to the response are much less likely to be missing from the scenario. The actual outbreak reflects a real world scenario, uses the real world participants, and captures real world decisions in real timeframes. But there are also the potential for many limitations. First of all, even though the country may be a socioeconomically developed country similar to the US, their agriculture practices may not be very similar which would impact the way the disease spreads. Additionally there may be cultural difference and what the country finds as acceptable in the treatment of animals that either allows or drives the countries response. The data collected to determine workforce requirements is normally a low priority during the response phase. After the response, personnel quickly return to their normal jobs to perform tasks that were on hold during the response. Lastly, there are no universally accepted criteria for the collection of the data. As an example, when the number of veterinarians that were used in support of a real world FMD outbreak are reported, it is not clear if this number represents the number of veterinarian that participated at some time during the outbreak (even if as little as one week or one day) or if the number represents the total number of veterinary positions that were utilized at any time. In addition, it may not be clear if veterinarians from outside organizations were included or if federal veterinarians supported by the government were included.

The use of expert panels and modeling with overcomes the problems with lack of data issue, but introduces other problems such as having to make assumptions about the scenario and the expert panel estimating data elements with very little real world data or experience with the disease to support their decisions.

This lack of well-defined data makes it very difficult to develop an accurate estimate of the veterinary workforce resources to respond to a national FMD outbreak.

SUMMARY

This analysis is an initial effort to identify a reasonable method that can be used to estimate the number of veterinarians needed to respond to a FMD outbreak in the US. Based upon this analysis, it is estimated that a range of 6,000 veterinarians are needed to respond to a large national FMD outbreak and 880 veterinarians needed in a one State outbreak that is resolved in 100 days. It must be emphasized that these are initial analysis and should be verified with following evolutions and analysis. To make the predictions more accurate, a data collection plan is needed to capture real world outbreak data and refine data requirements for the further development of the NAASDM and Saturation Model. This additional data is needed so that modeling efforts can be more sophisticated to address state, regional and national scenarios. An important next step would be to identify the response needed by each veterinary specialty because a response will require veterinarians with varying skills, experience, and specialty training. Similarly, the model needs to differentiate between personnel to effectively define the composition of emergency support teams.