United States Department of Agriculture

Animal and Plant Health Inspection Service

Veterinary Services

National Animal Health Monitoring System

May 2018

Report 4

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Equine 2015

Biosecurity Assessment of U.S. Equine Operations, 2015

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Cover photograph courtesy of Dr. Kathrine Flynn.

Items of Note

From May 1 through October 15, 2016, USDA veterinary medical officers (VMOs) and/or animal health technicians (AHTs) administered a questionnaire as part of the second phase of the Equine 2015 study. Operations that participated in phase II were offered a free biosecurity assessment of their operation, performed by a VMO or AHT. This report is based on the VMO/AHT assessments of the participating operations.

Storage of feed and water sources

A higher percentage of small operations (5 to 9 equids) than large operations (20 or more equids) stored grain in rodent-proof containers (79.0 and 51.3 percent, respectively).

On more than one-half of operations (56.0 percent) equids had access to surface water.

Three-fourths of operations (75.5 percent) housed individual or groups of equids in a way that separated them from other individual or groups of equids. Of these operations, 64.6 percent allowed individual or groups of equids to share a common water source.

Cleanliness/maintenance of equine areas

Less than 10 percent of operations had any of the following facilities assessed as not clean: stalls (9.2 percent of operations), feed storage areas (5.8 percent), pastures (5.0 percent), and paddock/turnout areas (7.4 percent). Overall, 95.8 percent of operations had an equine pasture area and, of these operations, 85.7 percent kept them moderately or well maintained.

Just over one-fourth of operations had high or moderate fly activity in equine housing areas (27.8 percent) and on pasture (27.5 percent). Fly activity assessments were conducted from May 1 to October 15, 2016, and were based on the VMOs'/AHTs' knowledge of operations in their geographic location.

Equine health records and written biosecurity protocols

Overall, 54.4 percent of operations kept handwritten or computerized health records that were adequate to assess equine health, and 29.2 percent kept no health records. The percentage of operations that kept adequate health records was higher in the South Central region (65.5 percent) than in the West region (30.8 percent).

A written protocol regarding biosecurity and other aspects of infection control was viewable to VMOs/AHTs on 1.8 percent of operations. Daily cleaning protocols for the facility were viewable on 6.5 percent of operations, and protocols for when to contact a veterinarian were viewable on 11.6 percent.

Infection control related to new arrivals

Overall, 64.8 percent of operations had an area where newly arriving equids or equids with a contagious disease could be housed and kept separate from healthy resident equids, reducing the risk of introducing disease to the operation. Of operations that had an area where newly arriving equids or equids with a contagious disease could be housed and kept separate from healthy resident equids, 61.3 percent isolated these animals in a secluded barn, pen, or run, ensuring no possible direct contact with resident equids.

Of operations that had an area where newly arriving equids or equids with a contagious disease could be kept, about 80 percent had isolation areas that were assessed as adequate for preventing disease transmission by nose-to-nose contact, sharing tack, or sharing water buckets/sources.

Hygiene management

Overall, 41.7 percent of operations had adequate hand-hygiene options available in equine housing areas. A higher percentage of large operations (20 or more equids) had adequate hand-hygiene options than medium (10 to 19 equids) or small operations (5 to 9 equids). A higher percentage of operations in the Northeast region than in the West region (62.5 and 14.7 percent, respectively) had adequate hand-hygiene options.

A higher percentage of large operations than small operations had disposable gloves available (83.3 and 53.9 percent, respectively) or used disinfectants (74.8 and 49.0 percent, respectively). A higher percentage of operations in the Northeast and Southeast regions (63.9 and 70.5 percent, respectively) had disinfectant available than in the South Central region (31.3 percent).

Optimal biosecurity measures

Using several key maintenance practices in combination—e.g., the method of feed storage, type of water source, and cleanliness of equine area—can improve an operation's biosecurity. Key maintenance practices include storing feed in rodent-proof containers; preventing access to surface water; housing groups or individual equids separately; keeping fly activity low; and maintaining moderately or very clean stalls, feed storage areas, pastures, and pens/turnouts. In total, 21.9 percent of operations optimally managed feed, access to surface water, and cleanliness.

For the 95.8 percent of operations with pasture for equids, 85.7 percent had well- or moderately well-maintained pastures, and 71.3 percent had low or no fly activity in pastures.

About one-half of operations (51.3 percent) had optimal manure management, which entailed storing manure away from equine exercise and housing areas or not storing manure at all.

Overall, 3.2 percent of operations had materials on-hand to maintain optimal hygiene management, including disposable gloves, footwear covers, coveralls, footbath materials, disinfectant, and equipment to create a physical barrier restricting human traffic.

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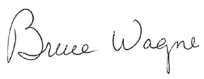
Acknowledgments

We would like to thank the State and Federal veterinary medical officers (VMOs) and animal health technicians (AHTs) who visited the equine operations and performed the biosecurity assessment. Their hard work and dedication to USDA's National Animal Health Monitoring System (NAHMS) were invaluable. The roles of the equine owners/operators, NAHMS study coordinators, VMOs, and AHTs were critical in providing quality data for the Equine 2015 study. We would also like to thank our out-of-house reviewers and the personnel at the Center for Epidemiology and Animal Heath for their efforts in generating and distributing findings from the Equine 2015 study.

All participants are to be commended, particularly the equine owners/operators whose voluntary efforts made the Equine 2015 study possible.



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Suggested bibliographic citation for this report:
USDA. 2018. Equine 2015 Report 4: “Biosecurity Assessment of U.S. Equine Operations, 2015”
USDA–APHIS–VS–CEAH–NAHMS. Fort Collins, CO
#743.0418

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Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the USDA's Veterinary Services (VS) and is designed to help meet the Nation's animal health information needs. Equine 2015 is the third NAHMS study of the U.S. equine industry.

For the Equine 2015 study, the USDA's National Agricultural Statistics Service (NASS) cooperated with VS to select a representative sample of equine operations with 5 or more equids in 28 States based on the 2012 Census of Agriculture. Detailed information on methods and numbers of respondents in this study can be found in the Methodology section beginning on p 74.

From May 1 through October 15, 2016, veterinary medical officers (VMOs) and/or animal health technicians (AHTs) conducted a voluntary 20-item biosecurity assessment for operations that participated in the study's second phase. This assessment provided a snapshot of the operations' biosecurity practices. Because the assessment was based on a one-time visit, VMOs/AHTs might not have actually seen the processing of new equine arrivals or the isolation or containment of an equine contagious disease. Before visiting the operations, VMOs/AHTs were provided with biosecurity assessment training, which included a manual describing the assessment items using examples and illustrations, live webinar training sessions, and training modules.

The biosecurity assessment called for the VMOs/AHTs to identify the operation's potential risk of introducing or spreading disease agents by viewing the following: (1) storage of feed and water source; (2) cleanliness/maintenance of equine areas; (3) presence of equine health records and written biosecurity protocols; and (4) infection control related to new arrivals or contagious disease cases.

Following the VMO/AHT visit, equine operations received the assessment of their facility, which included information on each of the items in the biosecurity assessment and information on how the operation could decrease the risk of disease introduction or spread. Additionally, participants received a general USDA–VS information sheet on recommended biosecurity practices for equine operations.

Photograph courtesy of Stacy Gardner.

Terms Used in This Report

Biosecurity: Measures intended to prevent the introduction and/or spread of disease.

Cohort: A subset of a population that can be classified as a group.

Feed concentrate: Whole grain feed or nonforage supplement that is not a vitamin or mineral.

Equid: Animal of the family Equidae. Only domestic horses, miniature horses, ponies, mules, donkeys/burros, and zedonks (zebra-donkey cross) were included in the Equine 2015 study.

Operation: An area of land managed as a unit by an individual, partnership, or hired manager.

Optimal: All criteria for category met.

- **Grain, surface water exposure, and cleanliness criteria:** Grain stored in rodent-proof containers; access to surface water prohibited; individual or groups of equids housed separately; stalls, feed storage areas, pastures, pens/turnouts are moderately or very clean, and fly activity is low.
- **Manure management criteria:** Manure stored away from equine exercise and housing areas or no manure stored on the operation.
- **Hygiene management criteria:** Disposable gloves, footwear covers, coveralls, footbath materials, and disinfectants are available, and equipment is on-hand to set up a physical barrier restricting human traffic.
- **Infection control for new arrivals criteria:** Secluded barn or pen that prohibits contact with resident equids onsite; isolated areas are 150 feet or more from areas used for resident equids; nose-to-nose contact among isolated equids and resident equids is prevented; tack or water sources are not shared; movement of personnel is restricted; and aerosol spread is prevented.

Paddock/pen: Enclosure where equids are held.

Pasture: Land covered with vegetation suitable for equids to graze.

Primary function of operation: The main purpose of the operation, i.e., boarding/training, breeding farm, farm/ranch, and residence with equids for personal use.

Population estimates: Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. An estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). An estimate of 3.4 with a standard error of 0.3 results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported as (0.0). If there were no reports of the event, no standard error was reported (—). We consider estimates in which the 95% CIs do not overlap to be substantially different.

Regions:

Northeast: Connecticut, Delaware, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Wisconsin

Southeast: Alabama, Florida, Kentucky, North Carolina, Tennessee, Virginia

South Central: Arkansas, Kansas, Missouri, Oklahoma, Texas

West: Arizona, California, Colorado, Montana, Oregon, Wyoming

Resident equid: An equid that spent or was expected to spend more time at the operation than at any other operation. The operation was its home base.

Size of operation: Size groupings were based on the number of equids on the operation on May 1, 2015: small operations (5 to 9 equids), medium (10 to 19 equids), and large (20 or more equids).

Vector: Organism that transmits pathogens from one animal to another. Examples of vectors include biting flies, ticks, and rodents/wildlife. A biological vector requires the biologic development of a pathogen in the vector’s body and the transmission of the pathogen to another organism. Mechanical vector transmission involves only the physical transfer of pathogens, such as organisms transferred by feet or mouth parts of an insect, without the biologic development of the pathogen.

Section I: Biosecurity Assessment of Equine Operations

Note: Where applicable, column or row totals are shown as 100.0 to aid in interpretation; however, estimates may not sum to 100.0 due to rounding.

A. Feed Storage, Water Sources, and Housing

Rodents can transmit disease agents by contaminating equine feed, which makes storing feed concentrate in rodent-proof containers an essential element of biosecurity. Overall, 73.0 percent of operations stored feed in rodent-proof containers. The percentage of operations that stored feed in rodent-proof containers was higher on small operations than on large operations (79.0 and 51.3 percent, respectively). Overall, 20.7 percent of all operations did not store feed in rodent-proof containers. A higher percentage of large operations than small operations did not store feed concentrate in rodent-proof containers (44.8 and 14.5 percent, respectively).

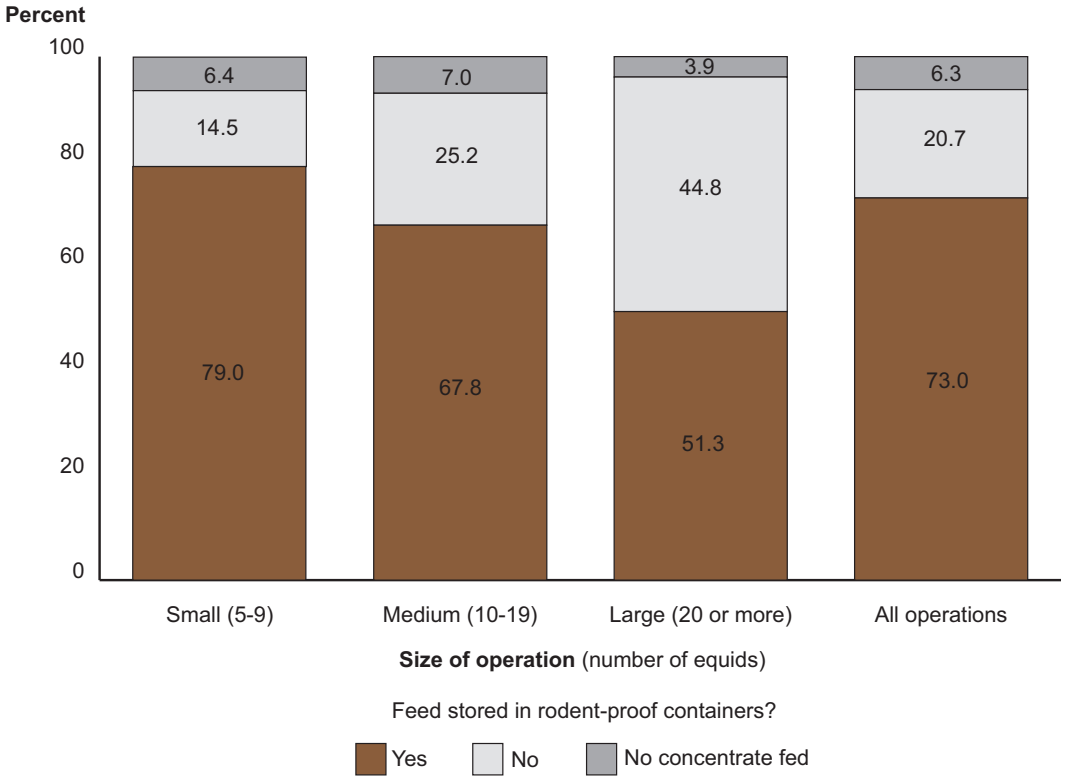
A.1. Percentage of operations that stored feed concentrate in rodent-proof containers, by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Feed stored in rodent-proof containers?	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Yes	79.0	(4.6)	67.8	(7.7)	51.3	(8.0)	73.0	(3.7)
No	14.5	(4.0)	25.2	(7.1)	44.8	(8.0)	20.7	(3.3)
No concentrate fed	6.4	(2.6)	7.0	(4.1)	3.9	(2.7)	6.3	(1.9)
Total	100.0		100.0		100.0		100.0	

Percentage of operations that stored concentrate feed in rodent-proof containers, by size of operation



The percentage of operations that stored feed concentrate in rodent-proof containers did not differ substantially by region.

A.2. Percentage of operations that stored feed concentrate in rodent-proof containers, by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Feed stored in rodent-proof containers?	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	69.7	(8.2)	68.6	(7.2)	70.4	(7.8)	84.9	(5.3)
No	18.0	(7.7)	29.9	(7.1)	21.8	(6.6)	8.6	(3.0)
No concentrate fed	12.3	(4.7)	1.5	(1.5)	7.8	(5.2)	6.6	(4.6)
Total	100.0		100.0		100.0		100.0	

The use of feed concentrate often depends on how equids are used, the function of the operation, and/or the ages of the equids on the operation. Regardless of the operation's primary function, the percentage of operations that stored feed concentrate in rodent-proof containers did not differ substantially.

A.3. Percentage of operations that stored feed concentrate in rodent-proof containers, by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Feed stored in rodent-proof containers?	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	69.5	(6.8)	82.7	(6.7)	64.3	(7.3)	81.9	(4.7)
No	25.0	(6.3)	17.3	(6.7)	25.9	(6.8)	14.0	(4.1)
No concentrate fed	5.5	(3.3)	0.0	(—)	9.8	(4.0)	4.1	(2.6)
Total	100.0		100.0		100.0		100.0	

Surface water, such as ponds, rivers, streams, or cisterns, presents a risk of disease exposure to equids because it is difficult to control the quality of water from these sources compared with wells or municipal water sources. Overall, more than one-half of operations (56.0 percent) always or sometimes allowed equids access to surface water. Equid access to surface water did not differ substantially by size of operation.

A.4. Percentage of operations on which equids had access to surface water (e.g., pond, irrigation ditch, stream/creek), by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Access	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Always	25.0	(4.7)	29.3	(7.6)	31.9	(7.8)	26.9	(3.6)
Sometimes	27.2	(5.1)	31.8	(7.1)	33.7	(7.8)	29.1	(3.8)
Never	47.8	(5.7)	38.9	(7.9)	34.4	(7.0)	44.0	(4.2)
Total	100.0		100.0		100.0		100.0	

The location of an operation can impact equid access to surface water, as operations in regions with higher annual rainfall might be more likely to have streams or ponds on their property than operations in more arid regions. The percentage of operations on which equids had access to surface water was not substantially different by region.

A.5. Percentage of operations on which equids had access to surface water (e.g., pond, irrigation ditch, stream/creek), by region:

Percent Operations

Region

	West		**South Central**		**Northeast**		**Southeast**	
Access	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Always	15.7	(5.6)	31.1	(7.3)	20.0	(7.3)	37.1	(7.2)
Sometimes	30.4	(9.2)	31.0	(7.0)	31.1	(7.8)	23.2	(6.2)
Never	53.9	(9.5)	37.9	(8.4)	48.9	(8.2)	39.6	(7.2)
Total	100.0		100.0		100.0		100.0	

The percentage of operations that always or sometimes allowed equids access to surface water did not differ substantially by primary function of operation.

A.6. Percentage of operations on which equids had access to surface water (e.g., pond, irrigation ditch, stream/creek), by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Access	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Always	19.6	(6.0)	32.8	(14.0)	22.1	(5.9)	31.7	(6.1)
Sometimes	31.9	(7.3)	18.5	(8.3)	43.2	(7.4)	15.9	(4.4)
Never	48.5	(7.7)	48.7	(13.0)	34.6	(7.5)	52.4	(6.7)
Total	100.0		100.0		100.0		100.0	

Placing equids in pens or on pastures with equids other than their herdmates increases the risk of disease transmission. Three-fourths of operations (75.5 percent) housed equids in consistent groups or in individual housing to keep them separate from other individual or groups of equids. The percentage of operations that housed equids in this manner did not differ substantially by operation size, region, or primary function of operation.

A.7. Percentage of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids, by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		Medium (10–19)		Large (20 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
76.2	(4.9)	76.7	(7.0)	69.4	(7.5)	75.5	(3.7)

A.8. Percentage of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids, by region:

Percent Operations							
Region							
West		South Central		Northeast		Southeast	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
83.4	(6.3)	72.8	(7.2)	77.0	(7.1)	71.2	(7.3)

A.9. Percentage of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
82.4	(5.9)	73.6	(13.8)	76.0	(6.0)	74.5	(6.2)

For the 75.5 percent of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids, 64.6 percent let any individual or groups of equids share a common water source. The more equids that drink from the same source, the greater the risk of disease transmission, especially if the equids are of different origins or disease status.

A.10. For the 75.5 percent of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids (table A.7), percentage of operations on which any individual or group of equids shared a common water source, by size of operation:

Percent Operations

Size of Operation (number of equids)

Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
67.8	(6.2)	56.2	(9.1)	65.3	(9.3)	64.6	(4.8)

The percentage of operations on which any individual or group of equids shared a common water source ranged from 53.9 percent in the South Central region to 78.6 percent in the Northeast region.

A.11. For 75.5 percent of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids (table A.7), percentage of operations on which any individual or group of equids shared a common water source, by region:

Percent Operations

Region

West		**South Central**		**Northeast**		**Southeast**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
76.9	(7.8)	53.9	(9.7)	78.6	(8.3)	54.1	(8.2)

The percentage of operations on which any individual or group of equids shared a common water source ranged from 53.4 percent of breeding farms to 78.0 percent of boarding/training/riding stables.

A.12. For 75.5 percent of operations that housed individual or groups of equids in a way that kept them separate from other individual or groups of equids (table A.7), percentage of operations on which any individual or group of equids shared a common water source, by primary function of operation:

Percent Operations							
Primary Function							
Equine/ boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
78.0	(6.5)	53.4	(13.0)	70.2	(8.6)	56.6	(7.8)

B. Cleanliness/ Maintenance of Equine Areas

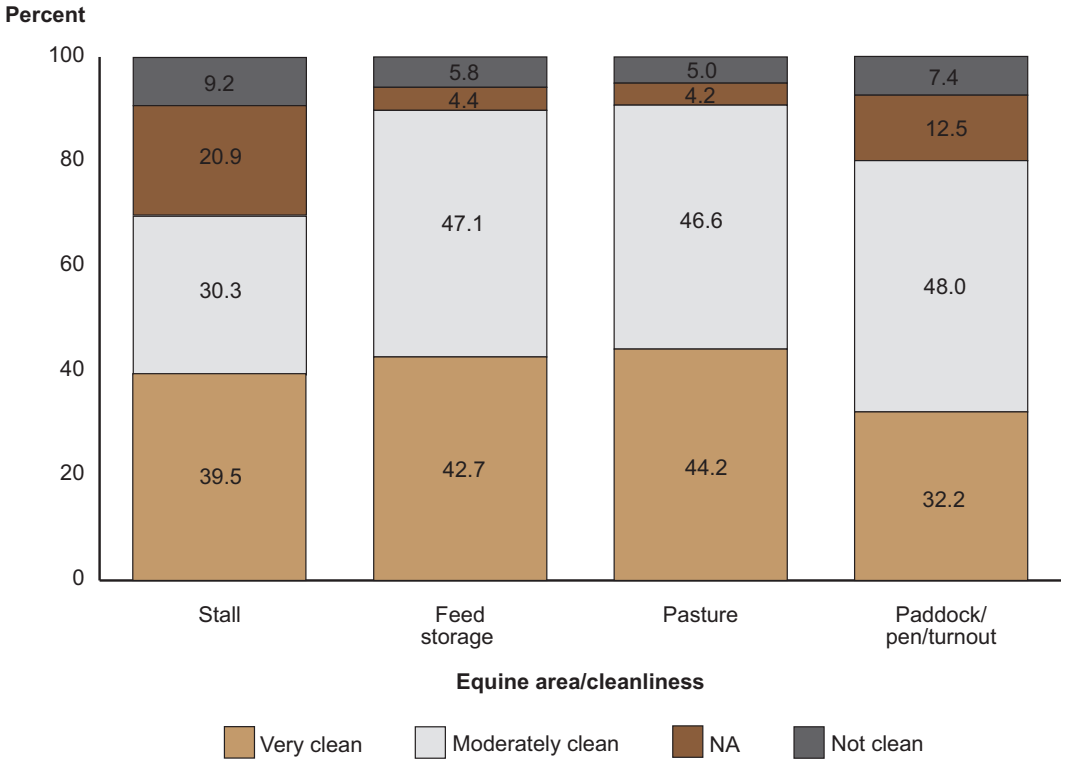
Veterinary medical officers (VMOs) and animal health technicians (AHTs) who conducted the biosecurity assessment were provided training and a manual containing examples and illustrations on how to assess the cleanliness of equine areas. In addition, VMOs/AHTs were instructed to assess cleanliness and fly activity based on their experience on other equine operations in their geographic area. VMOs/AHTs were also instructed to assess pasture maintenance based on weed control, harrowing, manure removal, and trimming tall grass. Untidy feed storage areas can attract rodents and other wildlife that carry disease agents and contaminate feed and equine housing areas.

Overall, feed storage areas were rated as moderately or very clean on 89.8 percent of operations; 4.4 percent of operations did not have a feed storage area to assess. Manure and urine in stalls, pasture, and paddock/pen/turnouts can increase the number of insect vectors and disease agents in the environment. Less than 10 percent of all operations had stalls, feed storage areas, pastures, or paddock/turnout areas assessed as not clean.

B.1. Percentage of operations by cleanliness of the following equine areas, and by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Equine area/ cleanliness	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Stall								
Very clean	43.8	(5.6)	27.2	(6.1)	42.5	(7.9)	39.5	(4.1)
Moderately clean	28.6	(5.2)	32.4	(7.5)	35.1	(8.2)	30.3	(4.0)
Not clean	9.3	(3.3)	10.0	(4.7)	7.3	(3.0)	9.2	(2.5)
No stall	18.4	(4.2)	30.3	(8.0)	15.1	(4.7)	20.9	(3.4)
Total	100.0		100.0		100.0		100.0	
Feed storage								
Very clean	41.2	(5.6)	44.8	(8.0)	46.8	(7.9)	42.7	(4.2)
Moderately clean	52.7	(5.8)	35.5	(7.4)	41.3	(7.8)	47.1	(4.3)
Not clean	2.6	(2.0)	12.5	(6.1)	8.7	(3.4)	5.8	(2.1)
No feed storage area	3.5	(2.0)	7.2	(3.4)	3.2	(2.4)	4.4	(1.5)
Total	100.0		100.0		100.0		100.0	
Pasture								
Very clean	46.9	(5.7)	39.6	(7.9)	39.6	(8.0)	44.2	(4.2)
Moderately clean	43.8	(5.6)	52.6	(8.0)	48.9	(7.9)	46.6	(4.1)
Not clean	6.2	(2.8)	1.8	(1.3)	5.4	(2.9)	5.0	(1.9)
No pasture	3.1	(1.5)	6.0	(4.8)	6.1	(2.8)	4.2	(1.5)
Total	100.0		100.0		100.0		100.0	
Paddock/pen/turnout								
Very clean	33.2	(5.4)	28.4	(7.4)	34.7	(8.0)	32.2	(4.0)
Moderately clean	46.7	(5.7)	52.4	(8.2)	45.3	(7.8)	48.0	(4.3)
Not clean	6.7	(2.8)	8.0	(4.9)	10.4	(3.6)	7.4	(2.2)
No paddock/ pen/turnout	13.5	(4.1)	11.2	(4.9)	9.7	(5.1)	12.5	(2.9)
Total	100.0		100.0		100.0		100.0	

Percentage of operations by cleanliness of the following equine areas



Photograph courtesy of Stacy Gardner.

Although the percentage of operations that had very clean stalls varied by region, much of the difference was due to whether or not an operation actually had stalls. For example, 69.7 percent of operations in the South Central region had stalls compared with 92.4 percent in the Northeast region.

B.2. Percentage of operations by cleanliness of the following equine areas, and by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Equine area/ cleanliness	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stall								
Very clean	38.5	(9.5)	21.7	(6.9)	64.8	(7.6)	42.9	(7.3)
Moderately clean	35.3	(8.7)	33.2	(8.2)	21.5	(6.5)	30.0	(6.4)
Not clean	2.6	(2.0)	14.9	(5.2)	6.1	(5.4)	9.6	(5.0)
No stall	23.6	(8.0)	30.3	(7.3)	7.6	(3.2)	17.4	(6.0)
Total	100.0		100.0		100.0		100.0	
Feed storage								
Very clean	43.0	(9.6)	41.3	(7.9)	45.9	(8.4)	41.6	(7.2)
Moderately clean	44.7	(9.4)	48.7	(8.2)	47.3	(8.7)	46.7	(7.3)
Not clean	4.7	(4.7)	10.0	(4.9)	1.1	(0.8)	4.8	(2.8)
No feed storage area	7.6	(4.1)	0.0	(—)	5.8	(2.9)	6.9	(4.7)
Total	100.0		100.0		100.0		100.0	
Pasture								
Very clean	27.9	(8.0)	47.3	(8.1)	57.5	(8.0)	41.5	(7.3)
Moderately clean	58.9	(8.7)	41.9	(7.9)	37.0	(7.8)	51.8	(7.3)
Not clean	3.5	(3.5)	7.3	(4.2)	1.4	(1.0)	6.4	(4.0)
No pasture	9.7	(4.2)	3.5	(3.4)	4.1	(2.4)	0.4	(0.4)
Total	100.0		100.0		100.0		100.0	
Paddock/pen/turnout								
Very clean	25.0	(7.4)	28.0	(8.0)	42.9	(8.4)	34.5	(7.0)
Moderately clean	64.4	(8.9)	43.8	(8.2)	35.4	(8.0)	51.6	(7.3)
Not clean	8.9	(5.5)	13.5	(5.1)	1.4	(1.0)	2.8	(2.5)
No paddock/ pen/turnout	1.8	(1.8)	14.7	(5.9)	20.3	(7.4)	11.2	(4.8)
Total	100.0		100.0		100.0		100.0	

The percentages of operations in which stalls, feed storage areas, pastures, or paddocks/pens/turnouts were assessed as not clean did not substantially differ by primary function of operation.

B.3. Percentage of operations by cleanliness of the following equine areas, and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Equine area/ cleanliness	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stall								
Very clean	56.1	(7.7)	69.2	(10.4)	25.2	(6.4)	43.3	(6.8)
Moderately clean	24.5	(6.3)	23.1	(9.3)	35.9	(7.4)	27.4	(6.0)
Not clean	2.3	(1.6)	4.2	(2.6)	12.6	(5.1)	8.3	(3.5)
No stall	17.1	(6.3)	3.5	(3.5)	26.4	(6.4)	21.0	(5.5)
Total	100.0		100.0		100.0		100.0	
Feed storage								
Very clean	54.4	(7.7)	33.4	(11.4)	35.8	(7.1)	48.9	(6.6)
Moderately clean	36.0	(7.4)	57.4	(12.4)	51.2	(7.6)	43.4	(6.7)
Not clean	5.8	(3.3)	5.7	(3.1)	6.7	(4.3)	4.6	(2.8)
No feed storage area	3.8	(2.9)	3.5	(3.5)	6.3	(3.4)	3.2	(1.6)
Total	100.0		100.0		100.0		100.0	
Pasture								
Very clean	39.5	(7.5)	55.9	(12.7)	42.4	(7.5)	45.2	(6.7)
Moderately clean	45.0	(7.7)	41.7	(12.5)	45.0	(7.4)	48.8	(6.7)
Not clean	4.2	(2.9)	2.4	(1.8)	8.1	(4.1)	3.1	(2.3)
No pasture	11.3	(4.4)	0.0	(—)	4.5	(3.2)	2.9	(2.0)
Total	100.0		100.0		100.0		100.0	
Paddock/pen/turnout								
Very clean	37.3	(7.3)	32.9	(11.3)	24.0	(6.7)	38.8	(6.7)
Moderately clean	51.0	(7.7)	43.1	(13.4)	54.1	(7.6)	40.8	(6.6)
Not clean	9.2	(5.2)	11.6	(7.5)	6.4	(3.7)	7.4	(3.6)
No paddock/ pen/turnout	2.4	(2.4)	12.4	(9.0)	15.5	(5.2)	12.9	(4.9)
Total	100.0		100.0		100.0		100.0	

Pasture maintenance is an important component of biosecurity. Disease agents can exist in manure, and manure accumulation in pastures can increase the risk of oral-fecal transmission of disease between equids. Depending on the stocking density and the size of the pasture, it can be difficult for animals to avoid manure while grazing. Additionally, pastures overgrown with weeds provide little nutritional forage for equids and can harbor unwanted pests.

Overall, 85.7 percent of operations that had an equine pasture kept it moderately or well maintained. The percentage of operations by level of pasture maintenance was similar across operation sizes.

B.4. For the 95.8 percent of operations that had an equine pasture (table B.1), percentage of operations by level of pasture maintenance,* and by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Maintenance level	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Well maintained	39.5	(5.6)	38.4	(8.2)	37.6	(7.9)	39.0	(4.2)
Moderately well maintained	47.6	(5.9)	45.1	(7.9)	45.2	(8.2)	46.7	(4.4)
Not well maintained	12.9	(4.0)	16.5	(6.5)	17.2	(7.2)	14.3	(3.1)
Total	100.0		100.0		100.0		100.0	

*Includes weed control, harrowing, manure removal, and trimming tall grass.

The percentages of operations by pasture maintenance levels were similar across regions.

B.5. For the 95.8 percent of operations that had an equine pasture (table B.1), percentage of operations by level of pasture maintenance,* and by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Maintenance level	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Well maintained	27.3	(7.9)	44.0	(8.2)	43.2	(8.6)	37.5	(7.4)
Moderately well maintained	48.3	(10.3)	43.7	(8.5)	46.4	(8.9)	49.8	(7.3)
Not well maintained	24.4	(9.4)	12.2	(5.0)	10.4	(5.2)	12.7	(5.6)
Total	100.0		100.0		100.0		100.0	

*Includes weed control, harrowing, manure removal, and trimming tall grass.

Photograph courtesy of Josie Traub-Dargatz.

For operations that had pastures, the percentage that had well-maintained pastures ranged from 23.2 percent of farm or ranch operations to 54.5 percent of breeding farms.

B.6. For the 95.8 percent of operations that had an equine pasture (table B.1), percentage of operations by level of pasture maintenance,* and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Maintenance level	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Well maintained	51.1	(8.3)	54.5	(12.6)	23.2	(6.3)	48.2	(6.8)
Moderately well maintained	38.2	(8.0)	41.4	(12.2)	58.1	(7.7)	38.0	(6.7)
Not well maintained	10.7	(5.9)	4.2	(2.6)	18.7	(6.3)	13.9	(4.5)
Total	100.0		100.0		100.0		100.0	

*Includes weed control, harrowing, manure removal, and trimming tall grass.

Flies can spread disease when biting/feeding and through physical contact with an equid's eye or mouth area. Overall, just over one-fourth of operations had high or moderate fly activity in equine housing areas (27.8 percent) and on equine pastures (27.5 percent). Data for this assessment were collected from May 1 through October 15, 2016, a period when fly activity is typically high.

B.7. Percentage of operations by level of fly activity in housing areas and pastures, and by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Level of fly activity in/on . . .	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Equine housing areas (barn, paddock, pen, turnout)								
High	4.4	(2.4)	6.7	(3.8)	4.6	(4.4)	5.0	(1.8)
Moderate	26.3	(5.3)	13.3	(5.8)	23.9	(7.0)	22.8	(3.8)
Low	50.3	(5.8)	64.2	(7.7)	54.3	(8.0)	54.2	(4.3)
None	15.1	(3.8)	11.3	(5.2)	12.2	(4.2)	13.8	(2.7)
NA	3.9	(2.0)	4.6	(2.3)	5.0	(2.9)	4.2	(1.4)
Total	100.0		100.0		100.0		100.0	
Equine pastures								
High	4.3	(2.5)	5.6	(3.7)	6.6	(4.8)	4.9	(1.9)
Moderate	26.1	(5.4)	13.6	(4.9)	23.2	(6.8)	22.6	(3.8)
Low	53.0	(5.9)	59.0	(7.9)	46.0	(7.9)	53.7	(4.4)
None	13.4	(3.3)	15.8	(5.4)	18.1	(7.1)	14.5	(2.7)
NA	3.2	(1.5)	6.0	(4.8)	6.1	(2.8)	4.3	(1.6)
Total	100.0		100.0		100.0		100.0	

The percentage of operations that had high or moderate fly activity in equine housing areas ranged from 18.1 percent in the West region to 37.8 percent in the South Central region.

The percentage of operations with high or moderate fly activity on pastures ranged from 19.6 percent in the Southeast region to 34.0 percent in the Northeast region.

B.8. Percentage of operations by level of fly activity in equine areas, and by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Level of fly activity in/on . . .	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Equine housing areas (barn, paddock, pen, turnout)								
High	5.0	(3.5)	7.9	(4.4)	4.6	(3.2)	1.1	(0.9)
Moderate	13.1	(6.2)	29.9	(8.1)	26.1	(7.7)	17.8	(5.6)
Low	59.3	(9.5)	49.5	(8.5)	52.3	(8.4)	58.5	(7.2)
None	22.6	(7.8)	9.6	(4.2)	14.5	(5.9)	11.4	(4.5)
NA	0.0	(—)	3.1	(2.1)	2.6	(1.7)	11.2	(4.8)
Total	100.0		100.0		100.0		100.0	
Equine pastures								
High	0.0	(—)	8.3	(4.6)	5.7	(3.4)	3.6	(3.5)
Moderate	28.4	(9.1)	19.9	(7.3)	28.3	(8.0)	16.0	(5.0)
Low	48.8	(9.9)	55.4	(8.6)	40.1	(8.5)	68.2	(6.6)
None	12.8	(5.6)	12.7	(4.7)	21.8	(7.0)	11.9	(4.0)
NA	10.0	(4.3)	3.7	(3.6)	4.2	(2.5)	0.4	(0.4)
Total	100.0		100.0		100.0		100.0	

The percentage of operations with high or moderate fly activity in equine housing areas ranged from 26.3 percent of operations with equids for personal use to 44.5 percent of breeding farms. The percentage of operations by fly activity on equine pastures did not differ substantially across primary function of the operation.

B.9. Percentage of operations by level of fly activity in equine areas, and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Level of fly activity in/on . . .	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Equine housing areas (barn, paddock, pen, turnout)								
High	1.0	(0.9)	7.2	(5.9)	4.6	(3.4)	6.3	(3.0)
Moderate	21.8	(6.0)	37.3	(14.2)	24.3	(6.6)	20.0	(6.0)
Low	61.3	(7.3)	28.2	(9.6)	57.1	(7.6)	52.7	(6.8)
None	13.5	(4.9)	23.9	(10.9)	9.8	(4.4)	16.0	(4.8)
NA	2.4	(2.4)	3.5	(3.5)	4.3	(2.4)	5.0	(2.5)
Total	100.0		100.0		100.0		100.0	
Equine pastures								
High	3.0	(2.2)	0.0	(—)	4.7	(3.4)	6.8	(3.4)
Moderate	13.2	(4.7)	24.5	(10.3)	25.2	(6.7)	23.4	(6.2)
Low	57.6	(7.4)	52.7	(13.3)	55.3	(7.7)	49.4	(7.0)
None	14.9	(5.0)	22.7	(11.3)	10.2	(4.0)	17.4	(4.8)
NA	11.3	(4.4)	0.0	(—)	4.6	(3.3)	3.0	(2.0)
Total	100.0		100.0		100.0		100.0	

Stored manure should be kept away from equine housing areas to protect equids from pathogens found in manure and from insect vectors attracted to manure piles. About one-third of all operations (37.6 percent) did not store manure on the operation, and another one-third (32.0 percent) stored manure in loose piles near equine housing areas. The location of manure storage did not differ substantially by size of operation.

B.10. Percentage of operations by manure storage area(s), and by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Manure storage	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Near equine housing area and in a loose pile	27.4	(4.9)	37.4	(7.7)	45.3	(8.4)	32.0	(3.9)
Near equine housing area and contained in dumpster or plastic bin or concrete pit/ bunker, etc.	9.8	(3.3)	5.8	(3.7)	16.3	(5.7)	9.5	(2.4)
Distant from equine housing area	14.5	(3.8)	17.2	(5.2)	16.8	(4.9)	15.4	(2.8)
Near equine exercise area and in a loose pile	8.6	(3.0)	9.1	(4.4)	11.8	(4.4)	9.1	(2.3)
Near equine exercise area and contained in dumpster or plastic bin, concrete pit/ bunker, etc.	4.3	(2.4)	0.4	(0.4)	0.8	(0.8)	2.9	(1.5)
Could have run-off into equine housing area	3.0	(2.0)	13.3	(6.2)	8.1	(3.2)	6.1	(2.1)
No manure storage on operation	40.8	(5.8)	34.5	(7.7)	26.3	(6.2)	37.6	(4.2)

The percentage of operations that did not store manure on the operation was higher in the South Central and Southeast regions (48.9 and 49.2 percent, respectively) than in the Northeast region (16.5 percent). Information regarding manure disposal methods was not collected.

B.11. Percentage of operations by manure storage area(s), and by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Manure storage	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Near equine housing area and in a loose pile	40.6	(8.8)	25.9	(7.5)	45.1	(8.1)	21.1	(5.9)
Near equine housing area and contained in dumpster or plastic bin or concrete pit/ bunker, etc.	10.8	(7.1)	7.7	(4.0)	13.9	(5.2)	7.0	(2.8)
Distant from equine housing area	23.0	(7.0)	7.6	(3.5)	18.7	(6.6)	17.3	(5.5)
Near equine exercise area and in a loose pile	15.4	(6.7)	4.7	(3.0)	16.3	(6.2)	3.2	(1.7)
Near equine exercise area and contained in dumpster or plastic bin, concrete pit/ bunker, etc.	0.0	(—)	2.0	(1.5)	10.1	(6.3)	0.0	(—)
Could have run-off into equine housing area	11.3	(4.9)	9.9	(5.2)	1.0	(0.7)	0.9	(0.7)
No manure storage on operation	28.0	(9.4)	48.9	(8.3)	16.5	(6.0)	49.2	(7.3)

A higher percentage of boarding/training/riding stables (17.6 percent) and residences with equids for personal use (12.7 percent) stored manure in a container near equine housing areas than breeding farms (0.7 percent).

B.12. Percentage of operations by manure storage area(s), and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Manure storage	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Near equine housing area and in a loose pile	42.8	(7.9)	35.6	(13.8)	28.9	(6.4)	31.5	(6.4)
Near equine housing area and contained in dumpster or plastic bin or concrete pit/ bunker, etc.	17.6	(5.6)	0.7	(0.7)	6.2	(3.4)	12.7	(4.6)
Distant from equine housing area	17.8	(5.6)	17.7	(7.3)	9.1	(3.7)	19.2	(5.2)
Near equine exercise area and in a loose pile	10.1	(4.3)	7.8	(6.1)	6.1	(3.5)	11.2	(4.1)
Near equine exercise area and contained in dumpster or plastic bin, concrete pit/ bunker, etc.	2.7	(2.0)	15.4	(10.1)	3.4	(3.3)	0.2	(0.2)
Could have run-off into equine housing area	7.0	(3.2)	1.5	(1.5)	9.4	(4.6)	4.0	(2.5)
No manure storage on operation	20.4	(5.9)	32.8	(11.5)	46.2	(7.6)	35.3	(6.4)

Photograph courtesy of Stacy Gardner.

C. Equine Health Records and Written Biosecurity Protocols

Determining the vaccination, deworming, and medical history of an equid is difficult without written health records. Overall, 54.4 percent of operations kept equine health records (handwritten or computerized) adequate enough to assess an equid's health, and 29.2 percent had no health records. The percentage of operations that kept health records was similar across operation sizes.

C.1. Percentage of operations that kept equine health records (handwritten or computerized) that were adequate enough to assess their equids' health, by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		Medium (10–19)		Large (20 or more)		All operations	
Health records adequate?	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Yes	56.9	(5.6)	49.3	(8.0)	52.1	(8.1)	54.4	(4.2)
No	16.5	(4.6)	16.1	(6.1)	16.2	(6.9)	16.3	(3.3)
No records	26.7	(4.9)	34.6	(7.9)	31.7	(7.6)	29.2	(3.9)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the South Central region (65.5 percent) than in the West region (30.8 percent) kept adequate equine health records. In the West region, 45.0 percent of operations did not keep any equine health records.

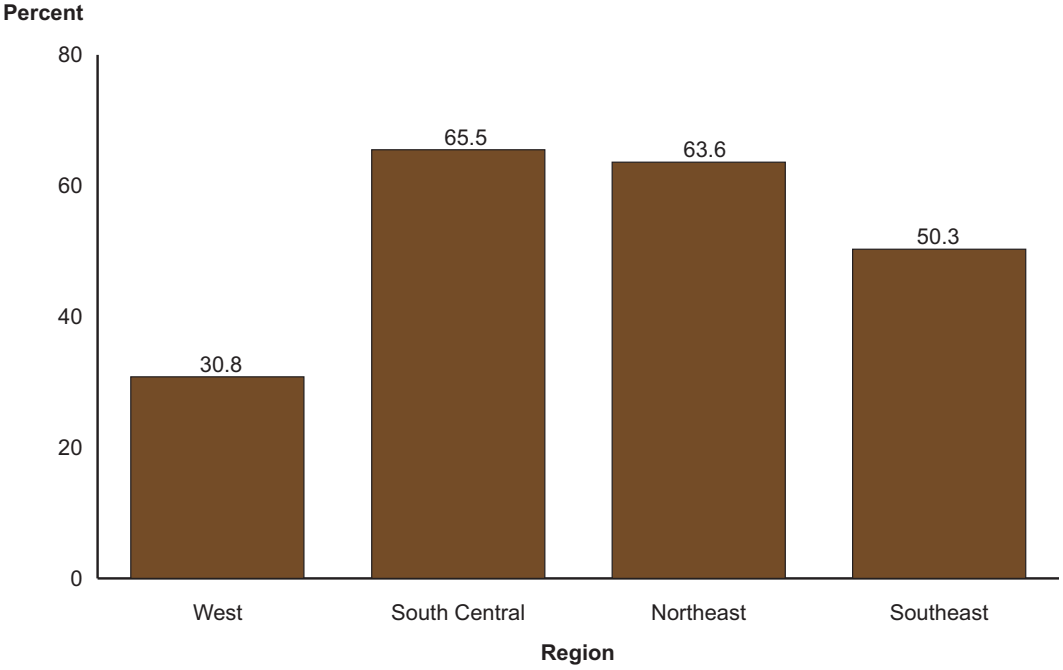
C.2. Percentage of operations that kept equine health records (handwritten or computerized) that were adequate enough to assess their equids' health, by region:

Percent Operations

Region

	West		South Central		Northeast		Southeast	
Health records adequate?	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Yes	30.8	(8.1)	65.5	(7.9)	63.6	(8.3)	50.3	(7.4)
No	24.2	(8.2)	11.0	(5.7)	15.8	(6.9)	17.8	(6.3)
No records	45.0	(9.6)	23.5	(6.8)	20.6	(6.8)	31.9	(7.3)
Total	100.0		100.0		100.0		100.0	

Percentage of operations that kept equine health records (handwritten or computerized) that were adequate enough to assess their equids' health, by region



The percentage of operations that had equine health records that were adequate enough to assess their equids' health ranged from 43.9 percent of farm or ranch operations to 77.8 percent of breeding farms. A lower percentage of breeding farms than farm or ranch operations kept no records (9.2 and 38.8 percent, respectively).

C.3. Percentage of operations that had equine health records (handwritten or computerized) that were adequate enough to assess their equids' health, by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Health records adequate?	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	69.3	(7.2)	77.8	(10.3)	43.9	(7.7)	55.6	(6.7)
No	7.6	(4.0)	13.0	(8.7)	17.3	(5.4)	19.3	(5.9)
No records	23.1	(6.8)	9.2	(6.2)	38.8	(7.5)	25.1	(5.5)
Total	100.0		100.0		100.0		100.0	

Having written cleaning protocols is necessary to ensure that protocols are understood and followed correctly. Only 6.5 percent of all operations had a written protocol for daily cleaning of the facility.

C.4. Percentage of operations that had a written protocol (viewable during the assessment) regarding daily cleaning of the facility, by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		Medium (10–19)		Large (20 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
4.9	(2.4)	4.4	(3.4)	20.2	(6.4)	6.5	(1.9)

The percentage of operations that had a written protocol regarding daily cleaning of the facility was not substantially different by region.

C.5. Percentage of operations that had a written protocol (viewable during the assessment) regarding daily cleaning of the facility, by region:

Percent Operations							
Region							
West		South Central		Northeast		Southeast	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
5.3	(3.0)	2.8	(2.4)	13.8	(6.3)	6.4	(3.4)

The percentage of operations that had a written protocol for daily cleaning of the facility was not substantially different by primary function of operation.

C.6. Percentage of operations that had a written protocol (viewable during the assessment) regarding daily cleaning of the facility, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
15.6	(5.2)	3.3	(2.4)	5.6	(3.7)	5.4	(2.8)

Diagnosis and treatment for sick equids might be delayed if operation personnel do not know when to contact a veterinarian, and any delay in diagnosis and treatment could increase the severity of disease and the likelihood of its spread. Overall, 11.6 percent of operations had a written protocol regarding when to contact a veterinarian.

C.7. Percentage of operations that had a written protocol (viewable during the assessment) regarding when to contact a veterinarian, by size of operation:

Percent Operations

Size of Operation (number of equids)

Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
10.3	(3.4)	12.6	(6.1)	16.8	(4.8)	11.6	(2.7)

The percentage of operations that had a written protocol regarding when to contact a veterinarian was not substantially different by region.

C.8. Percentage of operations that had a written protocol (viewable during the assessment) regarding when to contact a veterinarian, by region:

Percent Operations

Region

West		**South Central**		**Northeast**		**Southeast**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
8.3	(5.0)	7.6	(4.5)	25.3	(7.8)	7.6	(2.9)

A higher percentage of boarding/training/riding stables (31.1 percent) had a written protocol regarding when to contact a veterinarian compared with breeding farms (3.3 percent) and farm or ranch operations (6.5 percent).

C.9. Percentage of operations that had a written protocol (viewable during the assessment) regarding when to contact a veterinarian, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
31.1	(7.0)	3.3	(2.4)	6.5	(4.1)	13.2	(4.9)

Written protocols regarding biosecurity and/or infection control help ensure that all personnel are familiar with the protocols. Overall, only 1.8 percent of operations had a written protocol for biosecurity or other aspects of infection control.

C.10. Percentage of operations that had a written biosecurity/infection-control protocol that was viewable during the assessment, by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		Medium (10–19)		Large (20 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
0.7	(0.6)	3.7	(3.3)	3.6	(2.1)	1.8	(0.9)

The percentage of operations that had a written protocol regarding biosecurity or other aspects of infection control was similar across regions.

C.11. Percentage of operations that had a written biosecurity/infection-control protocol that was viewable during the assessment, by region:

Percent Operations							
Region							
West		South Central		Northeast		Southeast	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
1.4	(1.0)	2.7	(2.4)	1.1	(0.8)	1.6	(1.6)

The risk of introducing an infectious disease to an operation can vary by an operation's primary function. For example, equids on boarding/training/riding stable operations might be more likely than equids on farm or ranch operations to travel to different equine venues for competition or other events, increasing their possibility of being exposed to infectious diseases. The percentage of operations by primary function that had a written protocol for biosecurity or other aspects of infection control that was viewable during the assessment was not substantially different by primary function of operation.

C.12. Percentage of operations that had a written biosecurity/infection-control protocol that was viewable during the assessment, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
6.0	(3.5)	1.9	(1.9)	0.4	(0.4)	2.1	(2.0)

Visitors can bring disease agents to an operation via vehicle tires, boots, clothing, or hands. Requiring that visitors use a sign-in sheet when they arrive can ensure that there is no unwanted traffic on the operation, improve compliance with the operation's disease control plan, and provide owners with a history of past visitors, which could be crucial should a disease outbreak occur. Overall, 7.3 percent of operations had a sign-in sheet or written policy for visitors that was viewable during the assessment. Percentages were not substantially different by size of operation.

C.13. Percentage of operations that had a sign-in sheet or written policy for visitors that was viewable during the assessment, by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
5.7	(2.6)	8.9	(4.2)	12.4	(4.7)	7.3	(2.0)

The percentage of operations that had a sign-in sheet or written policy for visitors that was viewable during the assessment was not substantially different across regions.

C.14. Percentage of operations that had a sign-in sheet or written policy for visitors that was viewable during the assessment, by region:

Percent Operations							
Region							
West		**South Central**		**Northeast**		**Southeast**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
8.7	(5.4)	4.4	(2.7)	11.4	(5.6)	6.4	(2.6)

The primary function of an operation can impact the number of visitors it receives. For example, equids at a boarding/training/riding stable could be owned by multiple people who do not live at the operation. Thus, the operation could have different people traveling to and from the operation on a daily basis. Operations with more visitors could benefit by having a sign-in sheet or written policy to track the flow of human and vehicle traffic. The percentage of operations that had a sign-in sheet or written policy for visitors that was viewable during the assessment was not substantially different by primary function of operation.

C.15. Percentage of operations that had a sign-in sheet or written policy for visitors that was viewable during the assessment, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
16.5	(5.9)	1.9	(1.9)	3.5	(2.7)	8.1	(3.6)

D. Management of New Equine Arrivals to the Operation

New arrivals should be isolated immediately to prevent exposing resident equids to infectious disease agents that new arrivals might have been exposed to before coming to the operation. Overall, 64.8 percent of operations had an area separate from resident equids where new arrivals or contagious disease cases could be kept; 12.7 percent of operations did not have an isolation area for new arrivals or contagious disease cases.

D.1. Percentage of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids:

	Percent operations	Std. error
Yes	64.8	(4.1)
No	12.7	(2.8)
No new arrivals	22.5	(3.8)
Total	100.0	

For operations with new arrivals, 83.6 percent had an isolation area that was separate from areas used by resident equids.

D.2. For the 77.5 percent of operations that had new arrivals (table D.1), percentage of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, by size of operation:

Percent Operations

Size of Operation (number of equids)

Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
92.0	(3.6)	71.3	(8.3)	70.2	(7.9)	83.6	(3.5)

The percentage of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids was not substantially different by region.

D.3. For the 77.5 percent of operations that had new arrivals (table D.1), percentage of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, by region:

Percent Operations							
Region							
West		South Central		Northeast		Southeast	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
86.7	(7.7)	73.8	(8.1)	87.6	(6.2)	89.6	(3.6)

The percentage of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids was not substantially different by primary function of operation.

D.4. For the 77.5 percent of operation that had new arrivals (table D.1), percentage of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
76.8	(6.9)	87.0	(7.4)	81.3	(6.3)	87.1	(6.0)

To effectively control disease, isolation areas must be built and located in a way that prevents direct contact (e.g., nose-to-nose) or indirect contact (e.g., sharing water source) with other equids. Infectious agents can spread via airborne droplets or through insect transmission, so it is important that sick equids are kept in an airspace separate from healthy equids.

For operations that had a separate area for new arrivals and contagious disease cases, 61.3 percent had an area in a secluded barn, pen, or run that ensured no possible direct contact between isolated equids and resident equids. Conversely, on 16.8 percent of operations, the separate area was in a pen or run that allowed nose-to-nose contact between isolated and resident equids. Additionally, 24.1 percent of operations had a stall in the main barn, which may or may not have allowed nose-to-nose contact. The percentages of operations by type of separate areas were not substantially different by size of operation.

D.5. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations by type(s) of separate area, and by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Type of area*	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Stall in main barn	24.6	(5.8)	18.6	(6.6)	31.5	(8.8)	24.1	(4.2)
Stall apart from main barn	15.7	(5.0)	15.8	(6.7)	7.4	(3.6)	14.8	(3.7)
Pen or run next to resident equids (could have nose-to-nose contact)	14.0	(4.3)	25.9	(8.3)	15.2	(5.9)	16.8	(3.5)
Pen or run next to resident equids (could share water source)	4.9	(2.8)	3.0	(2.4)	4.6	(2.7)	4.5	(2.0)
Secluded barn, pen, or run with no possible direct contact with resident equids	60.5	(6.7)	60.3	(9.3)	67.3	(8.8)	61.3	(5.0)
Other	1.4	(1.4)	3.6	(2.6)	2.6	(2.6)	2.1	(1.2)

*Operations may have had more than one type.

For operations that had an area for new arrivals and contagious disease cases that was separate from areas used by resident equids, a higher percentage in the Northeast and Southeast regions (35.1 and 32.4 percent, respectively) than in the South Central region (5.5 percent) had a separate area in a stall in the main barn.

D.6. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations by type(s) of separate area, and by region:

Percent Operations

	Region							
	West		South Central		Northeast		Southeast	
Type of area*	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stall in main barn	25.4	(9.0)	5.5	(3.7)	35.1	(9.7)	32.4	(8.5)
Stall apart from main barn	15.3	(7.5)	19.1	(9.8)	14.1	(5.9)	10.3	(3.9)
Pen or run next to resident equids (could have nose-to-nose contact)	20.9	(7.4)	18.3	(8.6)	15.5	(6.4)	12.8	(4.9)
Pen or run next to resident equids (could share water source)	3.9	(3.2)	9.5	(6.0)	4.1	(3.4)	0.0	(—)
Secluded barn, pen, or run with no possible direct contact with resident equids	60.1	(9.9)	70.9	(11.1)	55.5	(10.0)	57.2	(8.5)
Other	0.0	(—)	0.0	(—)	3.3	(2.4)	5.0	(3.8)

*Operations may have more than one type.

For operations that had an area for new arrivals and contagious disease cases that was separate from areas used by resident equids, about one-fourth of boarding /training/ riding stables (24.9 percent), farm or ranch operations (26.3 percent), or residences with equids for personal use (25.2 percent) had a separate area in a stall in the main barn. No breeding farms had a separate area in the main barn.

D.7. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations by type(s) of separate area, and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Type of area*	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stall in main barn	24.9	(7.2)	0.0	(—)	26.3	(8.3)	25.2	(6.8)
Stall apart from main barn	12.8	(4.7)	20.9	(11.5)	7.8	(4.3)	20.0	(7.6)
Pen or run next to resident equids (could have nose-to-nose contact)	14.5	(5.6)	4.0	(4.0)	23.4	(7.6)	15.6	(4.9)
Pen or run next to resident equids (could share water source)	4.3	(2.5)	0.0	(—)	6.1	(4.5)	4.4	(2.6)
Secluded barn, pen, or run with no possible direct contact with resident equids	74.6	(7.3)	81.5	(9.3)	61.5	(9.0)	52.2	(8.5)
Other	5.2	(3.6)	4.7	(4.7)	2.5	(2.5)	0.0	(—)

*Operations may have more than one type.

Even if a separate isolation area is available, the distance from other equids might not be adequate to control the spread of certain disease agents, since infectious agents can spread through indirect contact or airborne droplets. The farther the isolation area is from the resident equine population, the more effective it will be in controlling airborne spread of infectious agents such as equine influenza. For operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, 32.9 percent had isolation areas more than 150 feet from resident equids.

Some operations with a separate isolation area reported that their area was 0 feet from resident equids, meaning that the area was likely a stall or pen from which direct contact between equids could occur. This distance would not meet the criterion for an effective isolation area for preventing the spread of most contagious agents. For operations that had a separate isolation area, 20.7 percent had isolation areas 0 feet from resident equids. The percentages of operations by distance from separate isolation area to resident equids were not substantially different by size of operation.

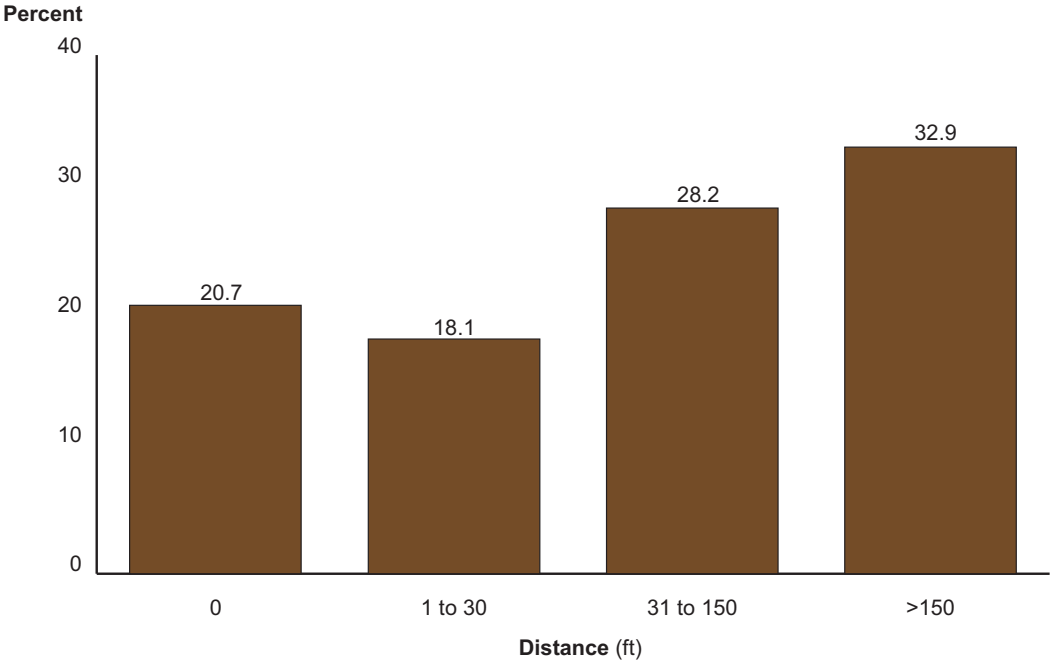
D.8. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations by distance between isolation area and resident equids, and by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Distance (ft)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	19.2	(5.3)	26.1	(8.4)	19.1	(6.6)	20.7	(4.0)
1–30	13.3	(3.8)	24.1	(9.3)	34.5	(9.7)	18.1	(3.6)
31–150	28.4	(6.2)	34.3	(8.9)	15.6	(6.0)	28.2	(4.6)
>150	39.1	(7.0)	15.5	(7.0)	30.8	(7.9)	32.9	(5.1)
Total	100.0		100.0		100.0		100.0	

For operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, percentage of operations by distance between isolation area and resident equids



For operations that had an area separate from resident equids where new arrivals or contagious disease cases could be kept, the percentage of operations by distance from resident equids to the separate isolation area did not differ substantially by region.

D.9. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations by distance from isolation area and resident equids, and by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Distance (ft)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	20.9	(7.4)	23.4	(9.2)	26.0	(9.4)	12.9	(4.9)
1–30	16.6	(7.0)	10.9	(7.6)	22.1	(7.0)	23.6	(7.1)
31–150	31.8	(9.5)	23.8	(10.1)	17.8	(6.6)	39.4	(9.0)
>150	30.8	(10.0)	41.9	(11.9)	34.1	(10.1)	24.1	(7.8)
Total	100.0		100.0		100.0		100.0	

Only 4.0 percent of breeding farms located their isolation area within 0 feet of resident equids. Foals and pregnant broodmares might be immunosuppressed due to their physiological state or an incomplete vaccination series. Therefore, breeding farms might be more aware than other operation types of the importance of preventing direct contact between isolated equids and resident equids.

D.10. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations by distance from isolation area and resident equids, and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Distance (ft)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	18.4	(6.3)	4.0	(4.0)	32.5	(8.7)	15.6	(4.9)
1–30	38.4	(8.4)	19.9	(11.0)	8.4	(4.2)	20.8	(7.1)
31–150	19.8	(8.1)	25.3	(12.1)	25.6	(7.7)	34.5	(8.4)
>150	23.4	(7.9)	50.8	(15.1)	33.5	(9.7)	29.1	(7.9)
Total	100.0		100.0		100.0		100.0	

For operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, over 80 percent had isolation areas that were adequate to prevent nose-to-nose contact (82.2 percent), sharing tack (80.2 percent), and sharing water buckets/source (85.1 percent). On over one-half of these operations, the separate isolation area was adequate for preventing personnel movement between the isolation area and resident equids (58.0 percent) or aerosol spread (53.8 percent).

D.11. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations in which the isolation area was adequate for preventing disease transmission by the following means, and by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Isolation adequate to prevent . . .	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Nose-to-nose contact	83.3	(4.6)	76.2	(8.2)	87.2	(7.2)	82.2	(3.7)
Sharing tack	79.8	(5.0)	76.8	(8.8)	89.6	(4.8)	80.2	(3.9)
Sharing water buckets/source	86.1	(4.3)	82.6	(7.5)	83.4	(7.8)	85.1	(3.4)
Personnel movement*	61.8	(6.4)	51.9	(9.8)	47.6	(9.3)	58.0	(5.0)
Aerosol spread	54.5	(6.9)	54.5	(9.6)	48.1	(9.1)	53.8	(5.1)

*Prevents personnel from walking through isolation area to get supplies, specific personnel designated to work in isolation area.

For the operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids, the percentages of operations in which the isolation area was adequate for preventing disease transmission by nose-to-nose contact, sharing tack, sharing water buckets/source, personnel movement, or aerosol spread were not substantially different by region.

D.12. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations in which the isolation area was adequate to prevent disease transmission by the following means, and by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Isolation adequate to prevent . . .	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Nose-to-nose contact	72.9	(8.5)	85.4	(8.3)	83.0	(6.9)	86.3	(5.0)
Sharing tack	68.4	(9.2)	76.7	(9.3)	89.2	(5.6)	86.4	(4.9)
Sharing water buckets/source	71.5	(9.0)	85.3	(7.8)	89.3	(5.5)	93.0	(3.0)
Personnel movement*	55.5	(9.5)	66.2	(10.9)	52.9	(9.9)	56.1	(8.8)
Aerosol spread	45.7	(10.4)	66.3	(10.9)	45.4	(9.9)	55.4	(8.7)

*Prevents personnel from walking through isolation area to get supplies, specific personnel designated to work in isolation area.

A higher percentage of breeding farms (87.3 percent) than boarding/training/riding stables (45.1 percent) had a separate isolation area adequate for preventing personnel movement between the isolation area and resident equids.

D.13. For the 64.8 percent of operations that had an isolation area for new arrivals and contagious disease cases that was separate from areas used by resident equids (table D.1), percentage of operations in which the isolation area was adequate for preventing disease transmission by the following means, and by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Isolation adequate to prevent…	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Nose-to-nose contact	93.6	(3.8)	95.2	(4.1)	74.0	(7.9)	81.8	(5.3)
Sharing tack	93.5	(3.4)	95.1	(4.2)	72.8	(7.7)	78.6	(6.4)
Sharing water buckets/source	85.6	(7.1)	95.1	(4.2)	86.5	(5.9)	79.7	(6.2)
Personnel movement*	45.1	(8.8)	87.3	(8.0)	56.0	(9.0)	55.2	(8.4)
Aerosol spread	52.8	(8.9)	48.1	(14.9)	54.6	(9.2)	52.8	(8.5)

*Prevents personnel from walking through isolation area to get supplies, specific personnel designated to work in isolation area.

E. Infection Control and Hygiene Management

A written policy for managing contagious disease cases helps ensure that all operation personnel are aware of the steps to be taken in the event of a suspected contagious disease incident. Without a written policy, isolating contagious cases might not be implemented in a timely manner, increasing the risk of disease transmission between equids. Overall, 3.2 percent of operations had a viewable written policy for managing equids that develop a suspected contagious disease, and this percentage was not substantially different by size of operation.

E.1. Percentage of operations that had a written policy (viewable during the assessment) for managing equids with a suspected contagious disease, by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1.9	(1.3)	4.3	(3.5)	8.2	(4.8)	3.2	(1.3)

The percentage of operations that had a viewable written policy for managing equids with a suspected contagious disease was similar by region.

E.2. Percentage of operations that had a written policy (viewable during the assessment) for managing equids with a suspected contagious disease, by region:

Percent Operations							
Region							
West		**South Central**		**Northeast**		**Southeast**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
5.0	(3.6)	2.5	(2.5)	2.5	(2.4)	3.4	(1.9)

Having a viewable written disease policy may be more beneficial to operations in which multiple people are responsible for or own the resident equids. However, only 8.4 percent of equine boarding/training/riding stables and no breeding farms had a viewable written policy for managing equids that develop suspected contagious disease.

E.3. Percentage of operations that had a written policy (viewable during the assessment) for managing equids that develop suspected contagious disease, by primary function of operation:

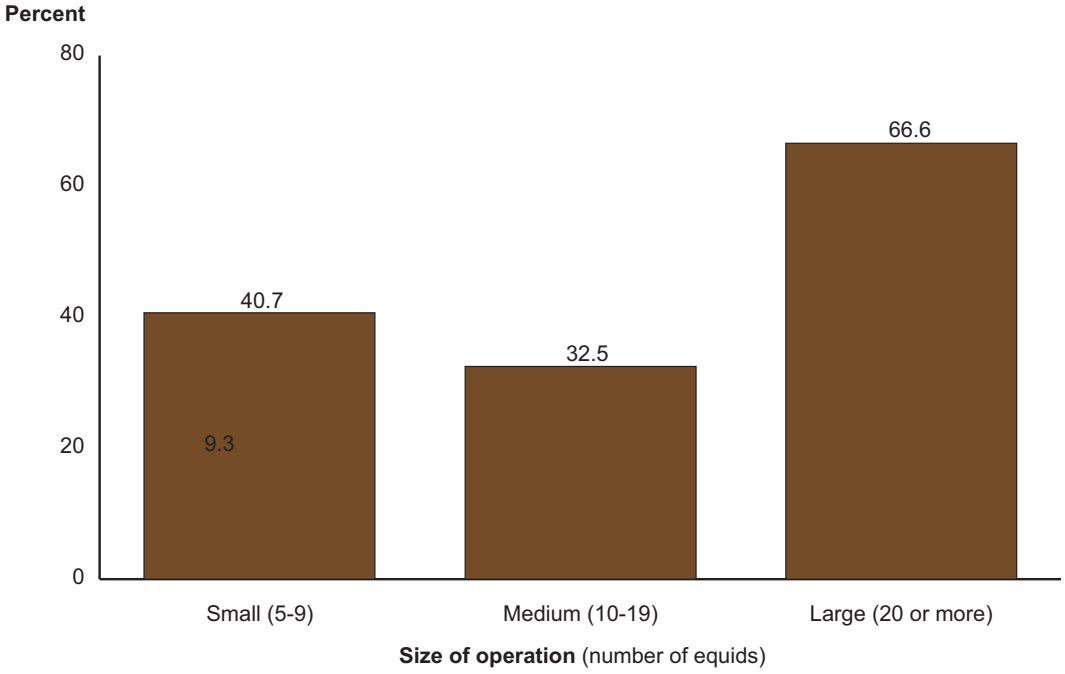
Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		**Equine breeding farm**		**Farm or ranch**		**Residence with equids for personal use**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
8.4	(4.1)	0.0		1.9	(1.5)	3.8	(2.7)

Properly disinfecting hands after touching sick or contagious equids is important for controlling disease transmission and for keeping personnel who work with the equids healthy. Overall, 41.7 percent of operations had adequate hand hygiene options available in the equine housing area. A higher percentage of large operations (66.6 percent) than small or medium operations (40.7 and 32.5 percent, respectively) had adequate hand hygiene options.

E.4. Percentage of operations that had adequate hand hygiene options (hand washing with soap and hand drying materials/hand sanitizer) available in the equine housing area, by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
40.7	(5.4)	32.5	(7.1)	66.6	(6.5)	41.7	(4.0)

Percentage of operations that had adequate hand hygiene options (hand washing with soap and hand drying materials/hand sanitizer) available in the equine housing area, by size of operation



The percentage of operations that had adequate hand hygiene options in the equine housing area was higher in the Northeast region (62.5 percent) and in the Southeast region (57.8 percent) than in the West region (14.7 percent).

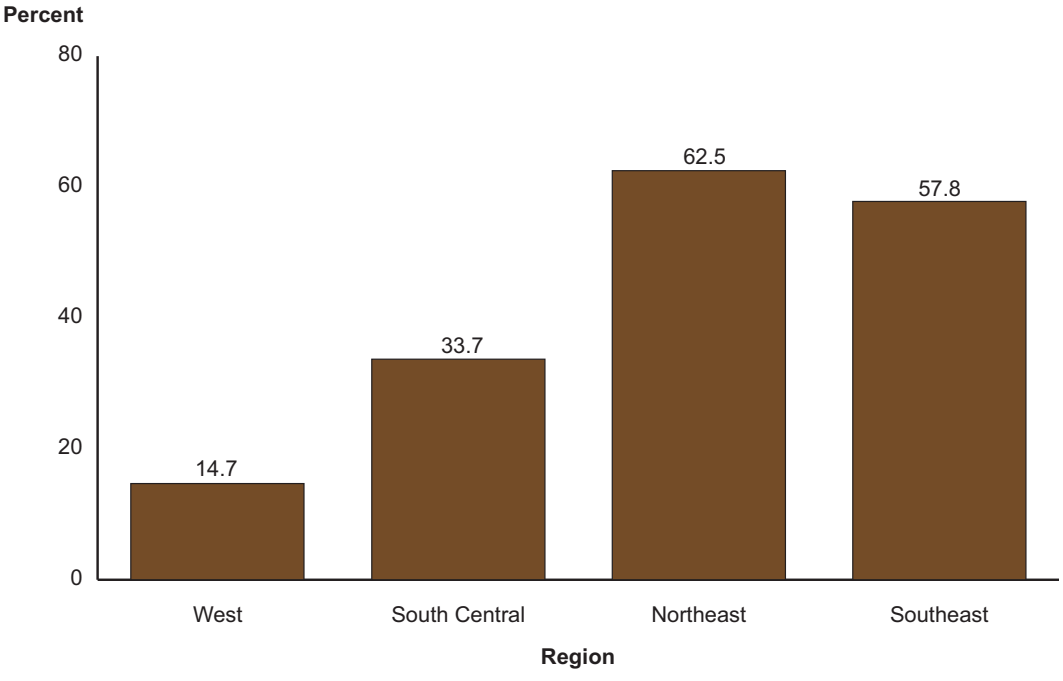
E.5. Percentage of operations that had adequate hand hygiene options (hand washing with soap and hand drying materials/hand sanitizer) available in the equine housing area, by region:

Percent Operations

Region

West		South Central		Northeast		Southeast	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
14.7	(6.3)	33.7	(7.5)	62.5	(8.2)	57.8	(7.3)

Percentage of operations that had adequate hand hygiene options (hand washing with soap and hand drying materials/hand sanitizer) available in the equine housing area, by region



The percentages of operations that had adequate hand hygiene options (hand washing with soap and hand drying materials/hand sanitizer) were not substantially different by primary function of operation.

E.6. Percentage of operations that had adequate hand hygiene options (hand washing with soap and hand drying materials/hand sanitizer) available in the equine housing area, by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
60.3	(7.7)	56.3	(13.3)	34.8	(7.0)	39.2	(6.5)

An operation not prepared for a contagious disease incident can put all equids on the operation at risk. A prepared operation is able to immediately implement barrier precautions such as disposable gloves, footwear covers, coveralls, footbath materials, disinfectant, and physical barriers that restrict human traffic. Overall, more than one-half of operations had disposable gloves (55.9 percent) or disinfectant (51.6 percent) available in the event of contagious disease occurrence. A higher percentage of large operations (83.3 percent) than small or medium operations (51.6 and 53.9 percent, respectively) had disposable gloves available. Disinfectant was available on a higher percentage of large operations (74.8 percent) than small operations (49.0 percent). Overall, footwear covers were available on 17.6 percent of operations.

E.7. Percentage of operations that had the following biosecurity response items available, by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Biosecurity response items	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Disposable gloves	51.6	(5.7)	53.9	(8.0)	83.3	(5.0)	55.9	(4.2)
Footwear covers	16.2	(4.0)	21.2	(6.8)	17.9	(5.6)	17.6	(3.1)
Coveralls	21.1	(4.6)	26.4	(7.3)	24.8	(6.4)	22.8	(3.5)
Footbath materials	24.4	(4.6)	16.8	(4.7)	25.2	(6.9)	22.6	(3.2)
Disinfectant	49.0	(5.7)	47.3	(7.8)	74.8	(7.1)	51.6	(4.2)
Equipment to set up a physical barrier to restrict human traffic	35.0	(5.1)	53.4	(8.0)	50.1	(8.3)	41.3	(4.1)
Other	4.5	(2.5)	8.3	(4.2)	8.8	(4.8)	5.9	(2.0)

Disposable gloves were available on a higher percentage of operations in the Northeast region than in the South Central region (75.9 and 40.9 percent, respectively). A higher percentage of operations in the Northeast and Southeast regions (34.4 and 30.9 percent, respectively) than in the South Central region (9.3 percent) had footbath materials. Likewise, a higher percentage of operations in the Northeast and Southeast regions (63.9 and 70.5 percent, respectively) had disinfectant available than in the South Central region (31.3 percent). In the West region, 16.3 percent of operations had "other" biosecurity response items available, which included isolation area, tire spray station, gated facility, camera, separate set of tools, and trailer.

E.8. Percentage of operations that had the listed biosecurity response items available, by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Biosecurity response items	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Disposable gloves	52.2	(9.8)	40.9	(7.8)	75.9	(6.9)	62.5	(7.1)
Footwear covers	12.9	(4.1)	14.9	(5.9)	24.9	(7.6)	18.9	(6.0)
Coveralls	26.2	(7.7)	19.0	(5.9)	18.0	(6.8)	30.0	(7.4)
Footbath materials	22.9	(7.2)	9.3	(3.8)	34.4	(8.1)	30.9	(6.7)
Disinfectant	51.1	(9.6)	31.3	(6.6)	63.9	(8.4)	70.5	(6.5)
Equipment to set up a physical barrier to restrict human traffic	48.8	(9.6)	24.6	(6.8)	50.2	(8.5)	51.4	(7.5)
Other	16.3	(7.3)	1.3	(1.0)	9.5	(4.8)	0.2	(0.2)

The percentage of operations with disposable gloves available ranged from 43.6 percent of farm or ranch operations to 86.2 percent of breeding farms. A higher percentage of boarding/training/riding stables had disinfectant available (72.2 percent) than farm or ranch operations (41.5 percent).

E.9. Percentage of operations that had the listed biosecurity response items available, by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Biosecurity response items	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Disposable gloves	74.0	(6.8)	86.2	(7.0)	43.6	(7.4)	55.2	(6.8)
Footwear covers	18.2	(5.6)	27.2	(11.3)	12.9	(5.0)	19.2	(5.4)
Coveralls	18.5	(5.7)	20.8	(9.1)	21.9	(6.0)	23.3	(5.9)
Footbath materials	33.2	(7.6)	27.0	(11.0)	15.4	(5.1)	26.1	(5.5)
Disinfectant	72.2	(7.1)	64.0	(13.6)	41.5	(7.2)	51.7	(6.7)
Equipment to set up a physical barrier to restrict human traffic	52.5	(7.9)	33.7	(11.4)	35.4	(7.0)	44.7	(6.7)
Other	13.2	(5.8)	1.4	(1.4)	8.6	(4.4)	2.6	(1.8)

F. Optimal Operation Biosecurity Measures

Maintaining adequate biosecurity for an operation is multifactorial. When assessing the biosecurity of an operation, grouping certain operational management practices together can provide a better picture of an operation's biosecurity. Utilizing several key management practices such as storing feed concentrate in rodent-proof containers, prohibiting access to surface water, and keeping equine areas clean can improve the biosecurity of an operation. Overall, 21.9 percent of operations practiced optimal management of feed storage, surface water exposure, cleanliness of the operation, and fly activity.

F.1. Percentage of operations that used the following optimal management practice(s), by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Optimal practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Stored feed concentrate in rodent-proof containers	85.5	(4.0)	74.8	(7.1)	55.2	(8.0)	79.3	(3.3)
Equids never had access to surface water	47.8	(5.7)	38.9	(7.9)	34.4	(7.0)	44.0	(4.2)
Kept equids separate	76.2	(4.9)	76.7	(7.0)	69.4	(7.5)	75.5	(3.7)
Very or moderately clean stall	90.7	(3.3)	90.0	(4.7)	92.7	(3.0)	90.8	(2.5)
Very or moderately clean feed storage area	97.4	(2.0)	87.5	(6.1)	91.3	(3.4)	94.2	(2.1)
Very or moderately clean pasture	93.8	(2.8)	98.2	(1.3)	94.6	(2.9)	95.0	(1.9)
Very or moderately clean paddock/ pen/turnout	93.3	(2.8)	92.0	(4.9)	89.6	(3.6)	92.6	(2.2)
Low or no fly activity in equine housing area (barn, paddock, pen, turnout)	69.3	(5.5)	80.0	(6.6)	71.5	(7.6)	72.2	(4.0)
Optimal feed storage, water exposure, and cleanliness[2]	23.1	(4.8)	22.4	(6.5)	14.1	(4.5)	21.9	(3.5)

[1]Individuals or groups of equids housed in a way to maintain them separately from other groups/individual equids.

[2]Includes only operations that practiced all of the above.

The percentage of operations that optimally managed feed storage, water exposure, and the cleanliness of facilities was not substantially different by region.

F.2. Percentage of operations that used the following optimal management practice(s), by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Optimal practice	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stored feed concentrate in rodent-proof containers	82.0	(7.7)	70.1	(7.1)	78.2	(6.6)	91.4	(3.0)
Equids never had access to surface water	53.9	(9.5)	37.9	(8.4)	48.9	(8.2)	39.6	(7.2)
Kept equids separate[1]	83.4	(6.3)	72.8	(7.2)	77.0	(7.1)	71.2	(7.3)
Very or moderately clean stall	97.4	(2.0)	85.1	(5.2)	93.9	(5.4)	90.4	(5.0)
Very or moderately clean feed storage area	95.3	(4.7)	90.0	(4.9)	98.9	(0.8)	95.2	(2.8)
Very or moderately clean pasture	96.5	(3.5)	92.7	(4.2)	98.6	(1.0)	93.6	(4.0)
Very or moderately clean paddock/ pen/turnout	91.1	(5.5)	86.5	(5.1)	98.6	(1.0)	97.2	(2.5)
Low or no fly activity in equine housing area (barn, paddock, pen, turnout)	81.9	(6.7)	62.3	(8.4)	69.4	(8.0)	81.0	(5.6)
Optimal feed storage, water exposure, and cleanliness[2]	34.3	(8.8)	14.1	(6.7)	21.4	(6.4)	22.9	(5.7)

[1]Individuals or groups of equids housed in a way to maintain them separately from other groups/individual equids.

[2] Includes only operations that practiced all of the above.

The percentages of operations by optimal management practices used were not substantially different by primary function of operation.

F.3. Percentage of operations that used the following optimal management practice(s), by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Optimal practice	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stored feed concentrate in rodent-proof containers	75.0	(6.3)	82.7	(6.7)	74.1	(6.8)	86.0	(4.1)
Equids never had access to surface water	48.5	(7.7)	48.7	(13.0)	34.6	(7.5)	52.4	(6.7)
Kept equids separate[1]	82.4	(5.9)	73.6	(13.8)	76.0	(6.0)	74.5	(6.2)
Very or moderately clean stall	97.7	(1.6)	95.8	(2.6)	87.4	(5.1)	91.7	(3.5)
Very or moderately clean feed storage area	94.2	(3.3)	94.3	(3.1)	93.3	(4.3)	95.4	(2.8)
Very or moderately clean pasture	95.8	(2.9)	97.6	(1.8)	91.9	(4.1)	96.9	(2.3)
Very or moderately clean paddock/ pen/turnout	90.8	(5.2)	88.4	(7.5)	93.6	(3.7)	92.6	(3.6)
Low or no fly activity in equine housing area (barn, paddock, pen, turnout)	77.2	(6.1)	55.6	(13.7)	71.1	(7.0)	73.7	(6.3)
Optimal feed storage, water exposure, and cleanliness[2]	33.8	(7.5)	23.5	(10.5)	19.3	(6.5)	21.3	(5.4)

[1]Individuals or groups of equids housed in a way to maintain them separately from other groups/individual equids.

[2] Includes only operations that practiced all of the above.

A well-maintained pasture has minimal weeds and manure as well as low fly activity. On the majority of operations that had a pasture, the pasture was moderately or well maintained and the fly activity was nonexistent or low. The percentages of operations by pasture maintenance and fly activity were similar across operation sizes. Note that data for this report was completed on a single day from May 1 to October 15, 2016, and that fly activity varies seasonally.

F.4. For the 95.8 percent of operations that had an equine pasture (table B.1), percentage of operations by maintenance level of pasture, fly activity, and by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pasture	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Moderately or well maintained	87.1	(4.0)	83.5	(6.5)	82.8	(7.2)	85.7	(3.1)
Low or no fly activity	68.6	(5.8)	79.6	(6.3)	68.2	(8.0)	71.3	(4.2)

The percentages of operations by pasture maintenance and fly activity were similar across regions. The VMOs' assessments of fly activity was based on their knowledge of operations in their geographic location.

F.5. For the 95.8 percent of operations that had an equine pasture (table B.1), percentage of operations by maintenance level of pasture, fly activity, by region:

Percent Operations

Region

	West		**South Central**		**Northeast**		**Southeast**	
Pasture	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Moderately or well maintained	75.6	(9.4)	87.8	(5.0)	89.6	(5.2)	87.3	(5.6)
Low or no fly activity	68.4	(10.0)	70.8	(8.3)	64.6	(8.6)	80.3	(5.9)

The percentages of operations by pasture maintenance and fly activity were similar across primary function of operations.

F.6. For the 95.8 percent of operations that had an equine pasture (table B.1), percentage of operations by maintenance level of pasture, fly activity, and primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pasture	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Moderately or well maintained	89.3	(5.9)	95.8	(2.6)	81.3	(6.3)	86.1	(4.5)
Low or no fly activity	81.7	(5.8)	75.5	(10.3)	68.6	(7.4)	68.9	(6.7)

Optimally, manure should either not be stored onsite or should be stored away from equine exercise or housing areas, and run-off from manure piles should not flow into housing areas. Overall, 51.3 percent of operations practiced optimal manure management. The percentages of operations by manure management practices were similar across operation sizes.

F.7. Percentage of operations that used the following optimal manure management practice(s), by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Optimal practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Manure storage area is not near equine exercise area	87.1	(3.8)	90.5	(4.4)	87.4	(4.5)	88.0	(2.7)
Manure storage area is not near equine housing area	14.5	(3.8)	17.2	(5.2)	16.8	(4.9)	15.4	(2.8)
Manure pile could not have run-off into equine housing area	97.0	(2.0)	86.7	(6.2)	91.9	(3.2)	93.9	(2.1)
No manure storage on operation	40.8	(5.8)	34.5	(7.7)	26.3	(6.2)	37.6	(4.2)
Optimal manure management*	53.0	(5.8)	51.7	(8.1)	41.6	(7.5)	51.3	(4.2)

*Includes operations that used all the three manure storage practices above or operations that did not store manure onsite.

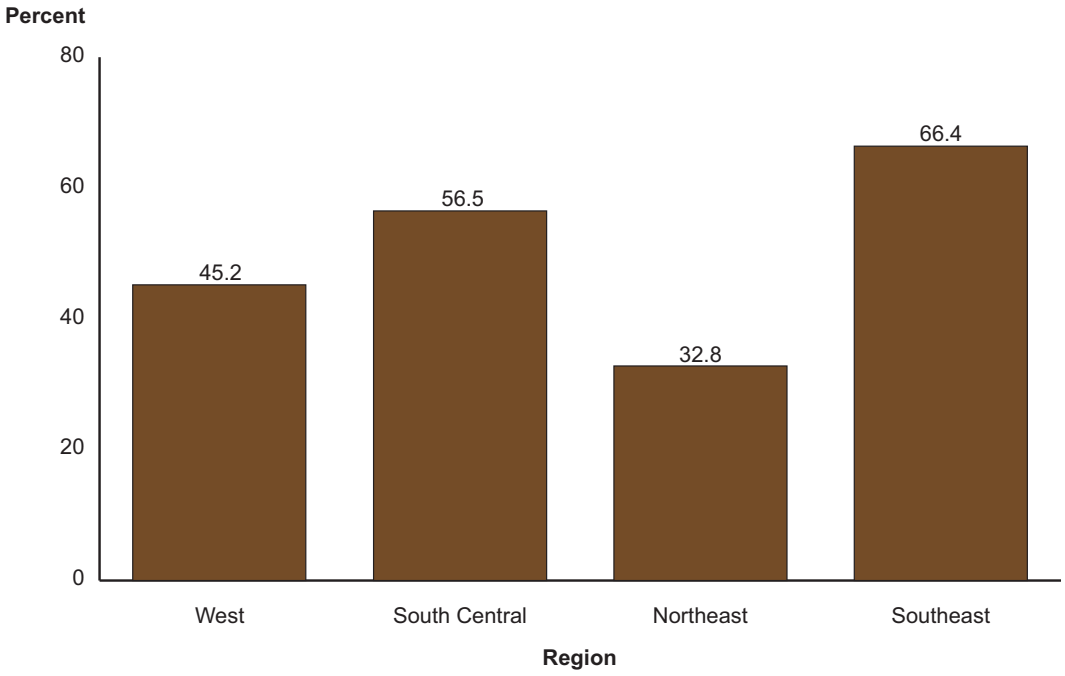
The percentage of operations that used optimal manure management ranged from 32.8 percent of operations in the Northeast region to 66.4 percent of operations in the Southeast region.

F.8. Percentage of operations that used the following optimal manure management practice(s), by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Optimal practice	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Manure storage area is not near equine exercise area	84.6	(6.7)	93.2	(3.3)	73.6	(8.0)	96.8	(1.7)
Manure storage area is not near equine housing area	23.0	(7.0)	7.6	(3.5)	18.7	(6.6)	17.3	(5.5)
Manure pile could not have run-off into equine housing area	88.7	(4.9)	90.1	(5.2)	99.0	(0.7)	99.1	(0.7)
No manure storage on operation	28.0	(9.4)	48.9	(8.3)	16.5	(6.0)	49.2	(7.3)
Optimal manure management*	45.2	(9.4)	56.5	(8.2)	32.8	(7.9)	66.4	(7.0)

*Includes operations that used all the three manure storage practices above or operations that did not store manure onsite.

Percentage of operations by optimal manure management,* and by region



*Includes operations that used all of the three manure storage practices or operations that did not store manure on site.

The percentage of operations that practiced optimal manure management did not differ substantially by primary function of operation.

F.9. Percentage of operations that used the following optimal manure management practice(s), by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Optimal practice	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Manure storage area is not near equine exercise area	87.2	(4.7)	76.8	(11.1)	90.4	(4.7)	88.5	(4.1)
Manure storage area is not near equine housing area	17.8	(5.6)	17.7	(7.3)	9.1	(3.7)	19.2	(5.2)
Manure pile could not have run-off into equine housing area	93.0	(3.2)	98.5	(1.6)	90.6	(4.6)	96.0	(2.5)
No manure storage on operation	20.4	(5.9)	32.8	(11.5)	46.2	(7.6)	35.3	(6.4)
Optimal manure management*	38.3	(7.3)	50.4	(13.2)	52.2	(7.5)	53.2	(6.6)

*Includes operations that used all the three manure storage practices above or operations that did not store manure onsite.

Having an isolation area to temporarily house new arrivals is important to biosecurity, since new arrivals can introduce disease to the resident equids. Overall, 77.5 percent of operations brought on any new arrivals and 64.8 percent had an isolation area for new arrivals. The percentage of operations that brought on new arrivals and the percentage that brought on new arrivals and had an isolation area were not substantially different by size of operation.

F.10. Percentage of operations that brought on new arrivals, and percentage of operations that brought on new arrivals and had an isolation area for housing them, by size of operation:

	Percent Operations							
	Size of Operation (number of equids)							
	Small (5–9)		Medium (10–19)		Large (20 or more)		All operations	
Operations with…	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
New arrivals	73.6	(5.1)	81.2	(7.0)	90.5	(5.9)	77.5	(3.8)
New arrivals and an isolation area	67.7	(5.3)	57.9	(8.3)	63.5	(8.2)	64.8	(4.1)

The percentage of operations that had new arrivals was not substantially different across regions. Likewise, the percentage of operations that had new arrivals and an isolation area was not substantially different across regions.

F.11. Percentage of operations that brought on new arrivals, and percentage of operations that brought on new arrivals and had an isolation area for housing them, by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Operations with…	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
New arrivals	84.5	(8.0)	69.9	(7.7)	80.0	(7.1)	80.0	(6.0)
New arrivals and an isolation area	73.3	(8.9)	51.6	(8.4)	70.1	(7.9)	71.7	(6.5)

A higher percentage of boarding/training/riding stables (95.5 percent) and breeding farms (95.4 percent) brought on new arrivals compared with operations with a primary function of residence with equids for personal use (68.6 percent). The percentage of operations that brought on new arrivals and had an isolation area was not substantially different by primary function of operation.

F.12. Percentage of operations that brought on new arrivals, and percentage of operations that brought on new arrivals and had an isolation area for housing them, by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Operations with…	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
New arrivals	95.5	(3.2)	95.4	(3.6)	77.3	(6.7)	68.6	(6.3)
New arrivals and a separate area	73.3	(7.0)	83.0	(7.9)	62.9	(7.5)	59.8	(6.8)

Not all isolation areas for new arrivals adequately prevent disease transmission between equids. Optimally, isolation areas should be located in a secluded barn, pen, or run and ensure that no possible direct contact with resident equids occurs. The AAEP recommends that these areas be located more than 150 feet from resident equids to prevent airborne transmission of disease and should be designed in a way that prevents nose-to-nose contact with resident equids. In addition, tack and water sources should not be shared between new arrivals and resident equids.

For the 64.8 percent of operations that brought on new arrivals and had an isolation area for housing them, 20.6 percent implemented optimal infection control practices related to temporarily separating new arrivals from resident equids. A higher percentage of small operations (28.1 percent) than medium operations (1.7 percent) implemented optimal infection control practices.

F.13. For the 64.8 percent of operations that brought on new arrivals and had an isolation area for housing them (table F. 10), percentage of operations that used the following optimal infection-control practice(s), by size of operation:

Percent Operations

Size of Operation (number of equids)

	Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Optimal practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
New arrivals placed in secluded barn, pen, or run with no possible direct contact with resident equids	60.5	(6.7)	60.3	(9.3)	67.3	(8.8)	61.3	(5.0)
Isolation area more than 150 ft from resident equids	39.1	(7.0)	15.5	(7.0)	30.8	(7.9)	32.9	(5.1)
Prevent nose-to-nose contact	83.3	(4.6)	76.2	(8.2)	87.2	(7.2)	82.2	(3.7)
No tack sharing	79.8	(5.0)	76.8	(8.8)	89.6	(4.8)	80.2	(3.9)
No water buckets/ water source sharing	86.1	(4.3)	82.6	(7.5)	83.4	(7.8)	85.1	(3.4)
Prevent personnel movement	61.8	(6.4)	51.9	(9.8)	47.6	(9.3)	58.0	(5.0)
No aerosol spread	54.5	(6.9)	54.5	(9.6)	48.1	(9.1)	53.8	(5.1)
Optimal infection control for new arrivals*	28.1	(6.8)	1.7	(1.4)	14.1	(6.4)	20.6	(4.8)

*Meets all of the above conditions.

For the 64.8 percent of operations that brought on new arrivals and had an isolation area, the percentages of operations by optical infection-control practices used were not substantially different by region.

F.14. For the 64.8 percent of operations that brought on new arrivals and had an isolation area for housing them (table F. 10), percentage of operations that used the following optimal infection-control practice(s), by region:

	Percent Operations							
	Region							
	West		South Central		Northeast		Southeast	
Optimal practice	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
New arrivals placed in secluded barn, pen, or run with no possible direct contact with resident equids	60.1	(9.9)	70.9	(11.1)	55.5	(10.0)	57.2	(8.5)
Isolation area more than 150 ft from resident equids	30.8	(10.0)	41.9	(11.9)	34.1	(10.1)	24.1	(7.8)
Prevent nose-to-nose contact	72.9	(8.5)	85.4	(8.3)	83.0	(6.9)	86.3	(5.0)
No tack sharing	68.4	(9.2)	76.7	(9.3)	89.2	(5.6)	86.4	(4.9)
No water buckets/ water source sharing	71.5	(9.0)	85.3	(7.8)	89.3	(5.5)	93.0	(3.0)
Prevent personnel movement	55.5	(9.5)	66.2	(10.9)	52.9	(9.9)	56.1	(8.8)
No aerosol spread	45.7	(10.4)	66.3	(10.9)	45.4	(9.9)	55.4	(8.7)
Optimal infection control for new arrivals*	15.7	(9.0)	30.7	(11.5)	22.3	(9.8)	12.7	(6.8)

*Meets all of the above conditions.

For the 64.8 percent of operations that brought on new arrivals and had an isolation area for housing them, the percentages of operations that used optimal infection-control practices were not substantially different by primary function of operation.

F.15. For the 64.8 percent of operations that brought on new arrivals and had an isolation area for housing them (table F. 10), percentage of operations that used the following optimal infection-control practice(s), by primary function of operation:

	Percent Operations							
	Primary Function							
	Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Optimal practice	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
New arrivals placed in secluded barn, pen, or run with no possible direct contact with resident equids	74.6	(7.3)	81.5	(9.3)	61.5	(9.0)	52.2	(8.5)
Isolation area more than 150 ft from resident equids	23.4	(7.9)	50.8	(15.1)	33.5	(9.7)	29.1	(7.9)
Prevent nose-to-nose contact	93.6	(3.8)	95.2	(4.1)	74.0	(7.9)	81.8	(5.3)
No tack sharing	93.5	(3.4)	95.1	(4.2)	72.8	(7.7)	78.6	(6.4)
No water buckets/ water source sharing	85.6	(7.1)	95.1	(4.2)	86.5	(5.9)	79.7	(6.2)
Prevent personnel movement	45.1	(8.8)	87.3	(8.0)	56.0	(9.0)	55.2	(8.4)
No aerosol spread	52.8	(8.9)	48.1	(14.9)	54.6	(9.2)	52.8	(8.5)
Optimal infection control for new arrivals*	7.7	(5.9)	19.5	(10.9)	28.0	(9.8)	17.5	(6.7)

*Meets all of the above conditions.

Operations must have available all biosecurity items listed in tables E.7., E.8., and E.9 to be considered as practicing optimal hygiene management. Overall, 3.2 percent of operations practiced optimal hygiene management. The percentage of operations that practiced optimal hygiene management was similar across operation sizes.

F.16. Percentage of operations that practiced optimal hygiene management,* by size of operation:

Percent Operations							
Size of Operation (number of equids)							
Small (5–9)		**Medium** (10–19)		**Large** (20 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
3.5	(2.4)	2.3	(1.5)	3.4	(2.6)	3.2	(1.6)

*Disposable gloves, footwear covers, coveralls, footbath materials, disinfectant, and equipment to promptly establish a physical barrier restricting human traffic.

The percentage of operations that practiced optimal hygiene management was not substantially different by region (less than 10 percent in each region).

F.17. Percentage of operations that practiced optimal hygiene management,* by region:

Percent Operations							
Region							
West		**South Central**		**Northeast**		**Southeast**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	0.3	(0.3)	8.8	(6.0)	4.9	(3.7)

*Disposable gloves, footwear covers, coveralls, footbath materials, disinfectant, and equipment to promptly establish a physical barrier restricting human traffic.

The percentage of operations that practiced optimal hygiene management was not substantially different by primary function of operation.

F.18. Percentage of operations that practiced optimal hygiene management,* by primary function of operation:

Percent Operations							
Primary Function							
Equine boarding/ training/ riding stable		Equine breeding farm		Farm or ranch		Residence with equids for personal use	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
4.7	(3.3)	6.1	(4.3)	3.4	(3.3)	2.2	(2.1)

*Disposable gloves, footwear covers, coveralls, footbath materials, disinfectant, and equipment to promptly establish a physical barrier restricting human traffic.

Section II: Methodology

A. Needs Assessment

Prior to each national study, NAHMS conducts a needs assessment to determine an industry's critical information gaps. For the Equine 2015 study, the needs assessment gathered input through multiple means, including literature reviews and equine health-related discussions held at various equine industry meetings. In addition, NAHMS conducted a survey. Responses were provided by 89 equine industry leaders and 2,435 individuals via an online questionnaire administered from November 2013 through January 2014. The needs assessment report is available on the NAHMS Web site: http://www.aphis.usda.gov/nahms

B. Sampling

1. State selection

The goal for NAHMS national studies is to include States that account for at least 70 percent of the animal and operation populations being studied. This method helps to ensure the representativeness of the sample and allows for generalization of the statistical inferences made using the sample data to the target population, while balancing the scientific aims with practical budget constraints.

A total of 28 States were selected for inclusion in the NAHMS Equine 2015 study based upon each State's contribution to the total number of U.S. equine farms, number of equids, and equine density (number of horses per square mile in the State). Twenty-one of the States were included due to high weighted averages of the number of equine operations and the number of equids in the State, while the remaining States were included based upon equine density and geographic coverage.

The 28 States represented 71.8 percent of all equids in the United States and 72.1 percent of all U.S. farms with equids (appendices II and III). The 28-State target population represented 71.6 percent of all equids on farms with 5 or more equids and 70.9 percent of farms with 5 or more equids in the United States (appendices II and III).

2. Operation selection

Equine operations were the primary sampling units for this study. The only time equine operations are directly captured by NASS is during the Census of Agriculture; thus, the NASS list frame of equine operations used for this study was based primarily on the 2012 Census of Agriculture. A farm is defined in the Census of Agriculture as being any place with $1,000 or more in sales of agriculture products during the year or having at least five equids. For the NAHMS Equine 2015 study, operations with 5 or more equids on the NASS list frame within the chosen 28 States were eligible for selection.

A stratified random sampling design was used and 3,997 operations were selected to be part of the sample. Stratification was based on State and size of operation from the 2012 Census of Agriculture (where "size" was defined as the number of resident equids—5 to 9, 10 to 19, and 20 or more). The total sample size was computed to achieve

prespecified precision criteria, while accounting for the estimated population size, design effect, and expected response rate at the 95-percent confidence level. The sample size was allocated to strata proportional to size based upon a weighted average number of equine operations and number of equids within the strata. This sampling design allowed for logistical efficiencies in administering the survey, prespecified precision for estimates, and oversampling of larger operations.

3. Population inferences

The reference population was composed of all places/operations in the NASS list frame with 5 or more equids that met the Census of Agriculture definition of a farm for the 28 States. Sample data were weighted to reflect the reference population from which they were selected. Weights were created and supplied by NASS and were checked by NAHMS staff to ensure that the sum of the weights approximated the population size. Phase II data were reweighted to allow for inference back to the original population. The inverse of the probability of selection (with probabilities being approximately proportional to stratum size) was used as the initial weight and then adjusted for nonresponse within State and operation size strata. Nonresponse is accounted for using an additional adjustment according to the proportion of nonrespondents within each stratum. Phase II weights were further adjusted for nonresponse to the biosecurity assessment according to the proportion of nonrespondents within each State and operation size stratum. Only these final biosecurity assessment weights were used to generate estimates in this report.

SUDAAN® software (RTI, version 11.0.1) was used to produce population estimates and their standard errors. The SUDAAN software allows estimation of standard errors for complex sampling designs using Taylor series linearization.

C. Data Collection

1. Phase I

From April through July 2015, NASS-trained enumerators administered the phase I questionnaire.

2. Data collectors and data collection period for phase II

From May 1 through October 15, 2016, veterinary medical officers (VMOs) and/or animal health technicians (AHTs) administered the phase II questionnaire. Operations agreeing to provide information for the phase II questionnaire were eligible to have a biosecurity assessment of the operation performed by the VMO/AHT.

D. Data Analysis and Estimation

Validation and estimation

After completing the phase II questionnaire, data collectors sent them to their respective State NAHMS Coordinators, who reviewed the questionnaire responses for accuracy. NAHMS staff independently reviewed the questionnaires prior to data entry and performed validation on the data set to identify any consistency and statistical issues. Consistency issues included logical inconsistencies within a survey and were identified using summaries of responses to check for invalid responses (e.g., a response of “3” for a 0/1 response variable); threshold checks (e.g., identifying invalid total sums of equine inventory); and if-then checks (e.g., if no equids were foals less than 6 months of age, should not report disease conditions for foals).

Statistical issues were identified by investigating summary measures of responses for variables, and extreme outliers were investigated by data analysts and subject-matter experts. Inconsistencies were identified using SAS® software, and hard copies of surveys were reviewed by data analysts and subject-matter experts. Identified inconsistencies were addressed using item-level imputation measures, if appropriate values could be logically deduced.

Summarization and estimation were performed using SUDAAN software, which accounts for the stratified sampling study design. Estimates were generated by one analyst and numbers and estimation code were reviewed by a second analyst to ensure accurate reporting of estimates.

E. Sample Evaluation

1. Phase I response rates

Of the 3,997 operations selected for participation, 569 were ineligible (no resident equids or out of scope). Of the 3,428 eligible operations, 66 were office holds (deliberately not contacted) and 748 were unable to be contacted. Of the 2,614 eligible operations that were contacted, 1,920 provided questionnaire data. Of those, 945 operations agreed to be contacted for the second phase of the study.

Response category	Number of operations	Percent operations	Contacts	Usable[1]	Complete[2]
No resident equids on May 1, 2015, not eligible	552	13.8	x	x	
Refused	694	17.4	x		
Completed NASS interview for baseline report, signed consent for phase II	945	23.6	x	x	x
Completed NASS interview for baseline report, refused consent for phase II	975	24.4	x	x	x
Out of scope—ineligible	17	0.4			
Office hold	66	1.7			
Inaccessible	748	18.7			
Total	3,997	100.0			
Percent of total operations			79.2	61.9	48.0
Percent of total operations weighted			80.0	63.6	48.4

[1]Provided inventory data.
[2]Provided equine health data.

2. Phase II response rates

Overall, 945 operations consented during the phase I visit to be contacted by a VMO/AHT for phase II. Of these, 329 completed (34.8 percent) and 51 partially completed (5.4 percent) (parasite section of questionnaire only) the phase II questionnaire; 267 (28.3 percent) refused to participate in phase II of the study. Approximately 28 percent of the 945 operations could not be contacted, and 1.2 percent had no resident equids at the time they were contacted by the VMO/AHT during phase II.

Response category	Number of operations	Percent operations	Contacts	Usable[1]	Complete[2]
Survey complete	329	34.8	x	x	x
Survey partial complete	51	5.4	x	x	
Out of business	19	2.0	x	x	
Refusal	267	28.3	x		
Inaccessible	268	28.4			
No resident equids	11	1.2	x	x	
Total	945	100.0	679	412	329
Percent of total operation			71.9	43.6	34.8
Percent of total operations weighted			71.8	44.3	33.8

[1]Provided inventory and/or status data.
[2]Provided equine health data.

3. Biosecurity assessment

The onsite biosecurity assessment was offered to study participants who completed the phase II questionnaire (n=329). A total of 223 (67.8 percent) of these operations participated in the assessment.

Appendix I: Sample Profile

A. Responding Operations

1. Size of operations

Number of resident equids[1]	Number of responding operations
5 to 9[2]	103
10 to 19	60
20 or more	60
Total	223

[1]An equid that spent or was expected to spend more time at the operation than on any other operation, whether or not it was present at the time of the interview. The operation was its home base.
[2]Includes operations that had five or more equids per NASS list frame but could have had fewer than five equids on May 1, 2015.

2. Regions

Region	Responding operations
West (AZ, CA, CO, MT, OR, WY)	45
South Central (AR, KS, MO, OK, TX)	55
Northeast (CT, DE, MA, MD, MI, NJ, NY, OH, PA, RI, WI)	53
Southeast (AL, FL, KY, NC, TN, VA)	70
Total	223

3. Type of operation

Primary function of operation	Responding operations
Equine boarding/training/riding stable	53
Equine breeding farm	28
Farm/ranch	59
Residence with equids for personal use	75
Other	8
Total	223

Appendix II: 2012 Census of Agriculture—U.S. Equine Populations

		2012 Census: Number of Equids on Farms[1]				
Region	**State**	**All**	**5–9**	**10–19**	**20 or more**	**5 or more[2]**
Northeast	CT	18,227	2,607	4,917	9,179	16,703
	DE	6,261	1,552	1,646	2,362	5,560
	MA	21,004	3,814	4,552	11,215	19,581
	MD	29,842	7,710	7,853	10,894	26,457
	MI	92,221	25,652	22,885	28,468	77,005
	NJ	28,639	6,085	6,049	13,097	25,231
	NY	93,600	19,901	22,685	39,933	82,519
	OH	121,055	34,492	33,794	33,306	101,592
	PA	129,460	36,443	37,115	37,972	111,530
	RI	2,518	474	768	947	2,189
	WI	109,226	32,030	27,269	25,948	85,247
	Total	652,053	170,760	169,533	213,321	553,614
South Central	AR	69,255	23,267	17,064	14,093	54,424
	KS	78,787	18,937	15,553	29,394	63,884
	MO	127,588	39,117	30,199	30,875	100,191
	OK	172,438	46,301	37,469	54,914	138,684
	TX	458,333	126,701	97,375	137,585	361,661
	Total	906,401	254,323	197,660	266,861	718,844
Southeast	AL	75,108	24,421	18,727	19,212	62,360
	FL	129,667	30,040	29,430	54,877	114,347
	KY	154,483	40,407	32,326	56,803	129,536
	NC	75,953	22,065	19,696	20,206	61,967
	TN	112,009	34,697	29,590	25,097	89,384
	VA	93,771	25,772	22,788	30,087	78,647
	Total	640,991	177,402	152,557	206,282	536,241
West	AZ	95,440	23,042	18,629	40,091	81,762
	CA	149,253	30,785	29,441	72,804	133,030
	CO	116,262	29,933	25,189	43,709	98,831
	MT	102,547	26,599	19,967	42,065	88,631
	OR	74,157	18,095	15,346	27,452	60,893
	WY	75,035	14,841	15,196	39,447	69,484
	Total	612,694	143,295	123,768	265,568	532,631
Total 28 States		2,812,139	745,780	643,518	952,032	2,341,330
28 States as a % of 50 States		71.8	70.9	70.7	72.8	71.6
Total U.S.		3,913,938	1,051,540	910,150	1,306,906	3,268,596

[1]Source: NASS, 2012 Census of Agriculture.

[2]Reference population.

Appendix III: 2012 Census of Agriculture—Number of Farms Reporting Equids

		2012 Census: Number of Farms Reporting Equids[1]				
Region	**State**	**All**	**5–9**	**10–19**	**20 or more**	**5 or more[2]**
Northeast	CT	1,698	412	359	279	1,050
	DE	713	249	127	66	442
	MA	1,849	586	340	343	1,269
	MD	3,373	1,196	596	278	2,070
	MI	12,666	4,006	1,775	833	6,614
	NJ	3,142	928	452	348	1,728
	NY	10,389	3,097	1,754	1,058	5,909
	OH	16,825	5,289	2,626	999	8,914
	PA	16,854	5,513	2,908	1,138	9,559
	RI	302	69	60	29	158
	WI	17,729	5,020	2,106	796	7,922
	Total	85,540	26,365	13,103	6,167	45,635
South Central	AR	11,531	3,654	1,339	458	5,451
	KS	11,031	2,994	1,238	612	4,844
	MO	20,634	6,170	2,359	821	9,350
	OK	25,099	7,279	2,920	1,147	11,346
	TX	71,518	19,892	7,589	3,421	30,902
	Total	139,813	39,989	15,445	6,459	61,893
Southeast	AL	10,908	3,819	1,462	550	5,831
	FL	14,522	4,666	2,272	1,265	8,203
	KY	20,248	6,345	2,528	1,318	10,191
	NC	11,274	3,482	1,523	614	5,619
	TN	17,673	5,409	2,295	712	8,416
	VA	12,870	4,010	1,760	906	6,676
	Total	87,495	27,731	11,840	5,365	44,936
West	AZ	11,428	3,662	1,472	690	5,824
	CA	15,275	4,832	2,268	1,539	8,639
	CO	14,437	4,675	1,950	1,123	7,748
	MT	12,087	4,179	1,581	982	6,742
	OR	9,940	2,844	1,184	570	4,598
	WY	6,251	2,318	1,169	690	4,177
	Total	69,418	22,510	9,624	5,594	37,728
Total 28 States		382,266	116,595	50,012	23,585	190,192
28 States as a % of 50 States		72.1	71.0	70.6	71.4	70.9
Total U.S.		530,030	164,328	70,793	33,031	268,152

[1]Source: NASS, 2012 Census of Agriculture.
[2]Reference population.

Appendix IV: Study Objectives and Related Outputs

1. Describe trends in equine care and health management for study years 1998, 2005, and 2015
    - “Changes in the U.S. Equine Industry, 1998–2015,” descriptive report
    - “Baseline Reference of Equine Health and Management, 2015,” descriptive report,
    - Information Sources and Providers of Equine Health Care, 2015, information sheet
    - Equine Biosecurity and Biocontainment Practices on U.S. Equine Operations, 2015, information sheet,
    - Equine Mortality in the United States, 2015, information sheet
    - End-of-life Planning for Equids in the United States, 2015, information sheet
    - Testing for Equine Infectious Anemia in the United States, 2015, information sheet
    - Equine Movement and Disposition of U.S. Equids, 2015, information sheet
    - Demographics of the U.S. Equine Population, information sheet
2. Estimate the occurrence of owner-reported lameness and describe practices associated with the management of lameness
    - Lameness Occurrence and Management, information sheet
3. Describe health and management practices associated with important equine infectious diseases
    - “U.S. Equine Management and select Equine Health Conditions in the United States, 2015,” descriptive report
4. Describe animal health related costs of equine ownership
    - “U.S. Equine Management and select Equine Health Conditions in the United States, 2015,” descriptive report
    - Cost of equine ownership in the United States, 2015
5. Evaluate control practices for gastrointestinal parasites
    - “U.S. Equine Management and select Equine Health Conditions in the United States, 2015,” descriptive report
    - Parasite Test Findings, information sheet
6. Evaluate equids for presence of ticks and describe tick-control practices used on equine operations
    - “U.S. Equine Management and select Equine Health Conditions in the United States, 2015,” descriptive report
    - Tick Occurrence and Identification on Equids, 2015, information sheet
7. Collect equine sera along with equine demographic information to create a serum bank for future studies.

Equine 2015 NAHMS reports, info sheets, questionnaires and instruction manual can be accessed on the NAHMS Web site: http://www.aphis.usda.gov/nahms