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Animal and Plant Health Inspection Service

Veterinary Services

National Animal Health Monitoring System

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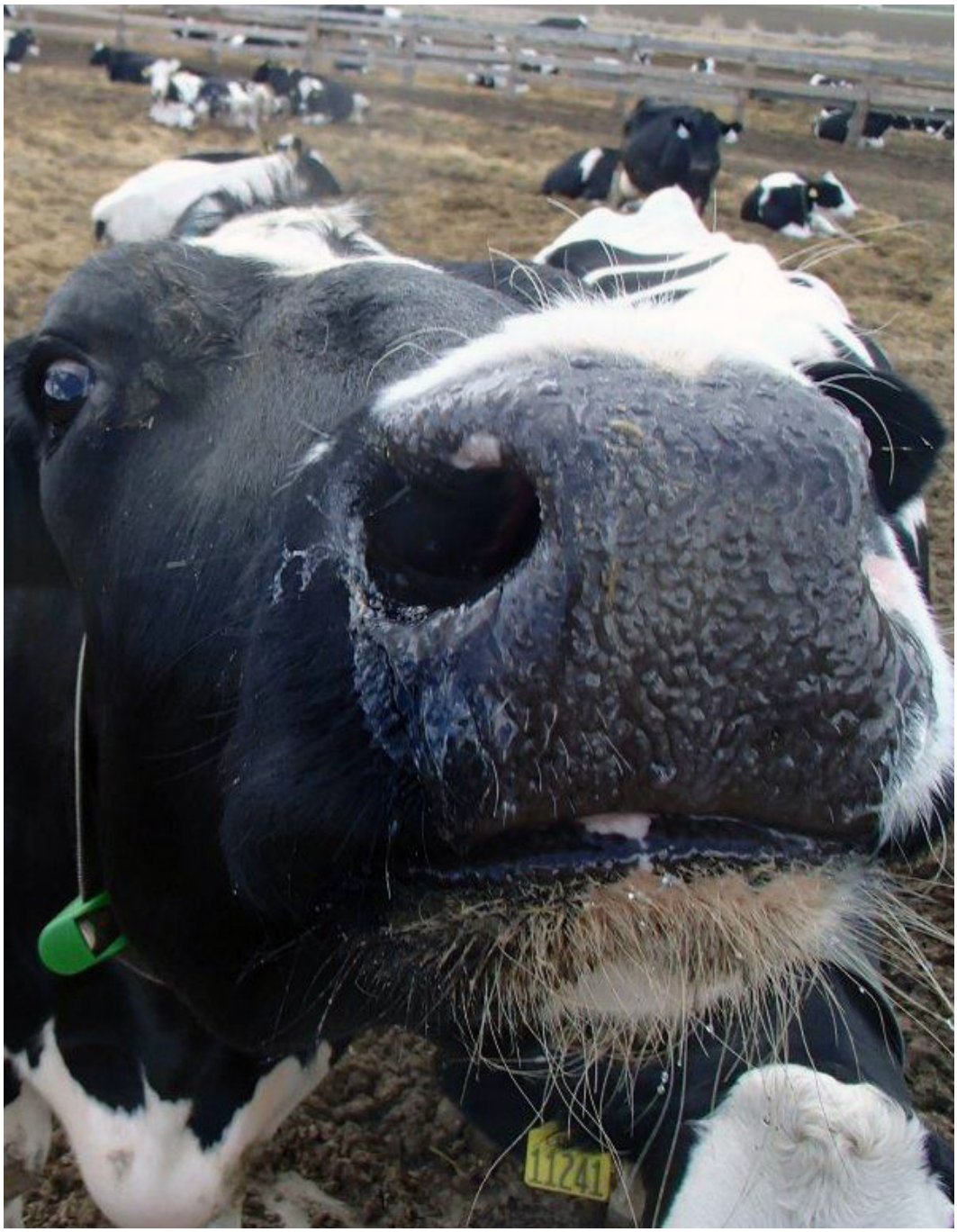
Report 3

Table of Contents

Dairy 2014

Health and Management Practices on U.S. Dairy Operations, 2014



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Items of Note

Disease in dairy cows

In 2013, the most common clinical diseases in cows reported by producers were mastitis (24.8 percent of cows), any degree of lameness (16.8 percent), infertility (8.2 percent), and metritis (6.9 percent). While these diseases affected the highest percentages of cows, the majority of affected cows remained in the herd (were not sold or did not die), with the exception of cows affected by infertility, which were sold or removed from the herd. Other diseases or health problems such as hemorrhagic bowel syndrome (HBS) and bovine leukosis affected a low percentage of cows (<0.4 percent) but resulted in the majority of those cows either dying or being sold or removed from the herd.

All operations permanently removed at least one cow in 2013 (excludes cows that died). About one-third of cows (33.8 percent) were permanently removed. Cows are removed or sold for a variety of reasons, including health problems, low production, and as replacements for other operations. There is overlap between the first two reasons, since it is common for health problems to result in decreased production. Of cows permanently removed from the operation, producers reported that 16.5 percent were removed because of mastitis, 21.2 percent because of infertility, and 21.1 percent because of poor production.

Overall, 80.3 percent of operations had at least one preweaned calf death, 66.6 percent had at least one weaned calf death, and 91.1 percent had at least one cow death in 2013. In total, 1.9 percent of weaned heifers were euthanized or died without assistance. Diarrhea or other digestive problems were responsible for more than one-half of preweaned heifer deaths (56.4 percent), and respiratory problems accounted for almost one-fourth (24.0 percent) of preweaned heifer deaths. The majority of weaned heifer deaths (58.9 percent) were due to respiratory problems. As reported by producers, about 25 percent of cows that died in 2013 were downers (nonambulatory). Mastitis, injuries, and unknown reasons each accounted for slightly more than 10 percent of cow deaths (13.2, 11.0, and 11.9 percent, respectively).

Disbudding/dehorning

Heifer calves were disbudded or dehorned on 94.3 percent of operations. Of these operations, 69.9 percent budded/dehorned calves with a hot iron and 16.4 percent used caustic paste. More than one-half of dehorned calves (54.6 percent) were disbudded/dehorned with a hot iron, while about one-third of calves (32.5 percent) were disbudded/dehorned using caustic paste. Disbudding/dehorning methods commonly differ by age of the calf at the time of dehorning. For instance, caustic paste is a method of disbudding/dehorning that can be used on day-old calves, while saws, wire, or Barnes dehorners are used on older calves that have prominent horn growth. Hot-iron disbudding/dehorning

was used on heifer calves at an operation average of 7.1 weeks of age. Analgesics/anesthetics were used by 28.2 percent of operations that dehorned heifer calves. Among the 69.9 percent of operations that a used hot-iron for dehorning, 30.0 percent used analgesics/anesthetics. The owner/operator dehorned the majority of calves on 53.4 percent of operations that dehorned calves.

Tail docking

About one-half of all operations (49.5 percent) had any cows with docked tails. About one-third of operations (31.7 percent) tail-docked any cows in 2013 and one-third of cows (33.3 percent) had docked tails. Almost all operations that docked tails (97.0 percent) used a band. Almost one-half of operations that docked tails in 2013 (45.9 percent) docked tails when cows were 2 years old or older. More than one-third of cows (38.8 percent) were tail-docked at less than 2 months of age. A low percentage of operations (1.1 percent) routinely used analgesia or anesthesia when docking tails, and only 5.1 percent of tail-docked cows received analgesia or anesthesia during the procedure.

Breeding practices

Breeding methods on dairies include natural service (bulls), artificial insemination (AI), or a combination of the two. Breeding methods commonly differ for heifers and cows. First-service breeding methods are usually different from second and higher services. The highest percentage of operations (89.3 percent) used AI for breeding. AI was used exclusively on 43.7 percent of operations. Timed AI programs were used to manage heifer and cow reproduction on 34.9 and 55.5 percent of operations, respectively. For operations that used a timed AI program, more than two-thirds (68.6 percent) had used the program for 9 years or more. Less than 10 percent of operations (8.6 percent) used electronic heat monitoring systems to detect estrus.

Most operations used AI to natural estrus for first-service breeding for the majority of heifers (59.4 percent) or cows (51.5 percent). A higher percentage of operations used AI to induced estrus for first-service breeding in cows than in heifers. For second or greater services, the highest percentages of operations used natural breeding (38.4 percent) or AI to natural estrus (33.0 percent) in the majority of heifers. Natural service was used for second or greater services on the majority of cows on 22.7 percent of operations, and AI to natural estrus was used on 29.1 percent. A higher percentage of operations used natural service for second or greater services for heifers than for cows. A higher percentage of operations used timed AI after induced estrus for second or greater services in cows than in heifers.

Less than 10 percent of operations (8.9 percent) transplanted either fresh or frozen embryos into heifers in 2013. Fresh or frozen embryos were implanted into cows on 6.9 percent of operations. A higher percentage of operations used sexed semen in heifers

than in cows (41.1 and 18.6 percent, respectively).

AI after detected estrus resulted in at least one pregnancy on 87.1 percent of operations. A similar percentage of operations had at least one pregnancy from natural service (54.0 percent) or timed AI without detected estrus (49.1 percent). Less than 10 percent of operations had pregnancies via embryo transfer. On average, AI after detected estrus accounted for 55.5 percent of pregnancies conceived, natural service accounted for 25.4 percent, and timed AI without detected estrus accounted for 18.2 percent.

To determine pregnancy status, the majority of operations (70.6 percent) used rectal palpation. Ultrasound was used by 44.1 percent of operations, and abdominal palpation (ballottement/bumping) was used by 22.6 percent. About one-third of operations (34.9 percent) performed pregnancy exams monthly. Similar percentages of operations performed exams every 2 weeks or every other month (19.4 and 18.6 percent, respectively). In general, as herd size increased so did the frequency of pregnancy exams. On operations that used rectal palpation or ultrasound to determine pregnancy status, 89.8 percent had a private veterinarian conduct the exams. On average, pregnancy status was determined within 53.0 days of breeding when using rectal palpation and 35.4 days when using ultrasound.

Disease familiarity

Producers reported being fairly knowledgeable about Johne's disease (55.3 percent of operations), followed by *Leptospira hardjo bovis* (29.7 percent), bovine viral diarrhea (BVD) (24.8 percent), and *Mycoplasma* mastitis (22.1 percent).

Biosecurity and visitors

More than 95 percent of operations had visits from milk-truck drivers, veterinarians, or feed-delivery personnel. About one-half of operations (49.4 percent) had visits from a renderer. A lower percentage of small operations than large operations had visits from a nutritionist, rendering truck or driver, drug supplier, visitors/tour groups, or university extension personnel. In 2013, operations had an average of 294.4 visits from milk-truck drivers, making them the most frequent visitors to most dairy operations. Operations had an average of 26.7 visits by veterinarians, or about 1 visit every other week. Operations had an average of 89.1 and 73.5 visits by feed-delivery personnel or visitors/tour groups, respectively. Although milk-truck drivers accounted for the highest number of visits in 2013, only 5.4 percent of operations reported that milk-truck drivers had animal contact during the visits. More than two-thirds of operations had visits by nutritionists, contract haulers, visitors/tour groups, university/extension personnel, and "others" that involved animal contact. A higher percentage of operations (27.2 percent) used disposable or clean boots for visitors than used footbaths (2.4 percent).

Foreign animal disease preparedness

Signs indicating no entry without permission were present on 14.2 percent of operations. More than 80 percent of operations (81.5 percent) could, if necessary, move all traffic entering or exiting the operation through a controlled, single access point. About two-thirds of operations (67.7 percent) could secure the single access point with a locked gate, and almost three-fourths could assign someone to regulate traffic at the access point. A wash station could be located close to the access point on 63.2 percent of operations. Of operations that have (or could have) implemented access-point strategies, 83.3 percent would be able to continue moving milk within a day's notice.

Nearly one-fourth of operations (23.6 percent) had a truck-washing station or could construct one within 1 day. More than one-half of operations (55.9 percent) would need a week or more to construct a washing station. Most items needed to construct a truck-washing station (water, fuel/power, disinfectant, and power washer) were either already available or available within a day's notice on more than 90 percent of operations. Some operations indicated that they could not obtain disinfectant sprayers, personal protective equipment, and portable footbaths within 1 day.

Information resources contacted

Nearly all operations (94.8 percent) would very likely consult their private veterinarian for general information about a foreign animal disease, should an outbreak occur. Operations were very likely to consult a State Veterinarian's office and/or the USDA for general disease information on 30.5 and 28.1 percent of operations, respectively. Almost all operations (98.6 percent) would contact their private veterinarian if they had an animal suspected of having a foreign animal disease. The State Veterinarian's office would be contacted by 40.8 percent of operations.

Antimicrobial use

Ionophores, the most common antimicrobial used in feeds, were fed to weaned heifers by 50.5 percent of operations, accounting for 62.7 percent of all weaned heifers. Ionophores were also fed to pregnant heifers by 40.8 percent of operations, accounting for 49.2 percent of all pregnant heifers.

Antimicrobials that require a withdrawal period were administered to cattle on 91.3 percent of operations. A lower percentage of operations administered antimicrobials to weaned heifers than to preweaned heifers or cows.

Preweaned heifers

Of operations that administered any antimicrobials, digestive and respiratory disease were the most common diseases affecting preweaned heifers (21.1 and 12.0 percent, respectively). Overall, 16.0 and 11.4 percent of heifers were treated for digestive and respiratory disease, respectively. The highest percentages of preweaned heifers treated for diarrhea were on operations that used third-generation cephalosporins (27.6 percent

of heifers) or trimethoprim/sulfa (18.7 percent) as their primary antimicrobials. About one-third of preweaned heifers treated for respiratory disease were on operations that used florfenicol (35.6 percent) or macrolides (31.7 percent) as their primary antimicrobials.

Weaned heifers

For operations that administered any antimicrobials, respiratory disease was the disease affecting the highest percentage of weaned heifers: 5.1 percent of weaned heifers were affected by respiratory disease and 4.7 percent were treated with antimicrobials for respiratory disease. For operations that administered any antimicrobials, 50.9 percent treated weaned heifers with antimicrobials for respiratory disease. Almost one-third of weaned heifers treated for respiratory disease were on operations that primarily used florfenicol (31.5 percent of heifers) or macrolides (29.1 percent) to treat the disease.

Cows

The majorities of cows affected with mastitis (85.6 percent) or respiratory disease (95.0 percent) were treated with antimicrobials. Less than one-fourth of cows with lameness or digestive disease (24.8 and 21.5 percent, respectively) were treated with antimicrobials. Cephalosporins were used as the primary antimicrobials for treating mastitis on 63.2 percent of operations: first-generation cephalosporins were used by 29.8 percent of operations and third-generation cephalosporins by 33.4 percent. Over one-half of operations treated some cows with antimicrobials for respiratory disease (54.1 percent), reproductive disease (58.8 percent), and lameness (61.0 percent). Third-generation cephalosporins were the primary antimicrobials used for respiratory disease on 31.7 percent of operations. Of the 21.7 percent of cows treated for mastitis with antimicrobials, 50.5 percent were on operations that used third-generation cephalosporins as their primary antimicrobials. About one-fourth of cows treated for mastitis (24.6 percent) were on operations that used lincosamides as their primary antimicrobial. For treating respiratory disease, diarrhea, and lameness, third-generation cephalosporins were used as the primary antimicrobials for more than one-half the cows treated for these diseases.

Treatment decisions

On 40.6 percent of operations, mastitis treatments were guided by cultures and antimicrobial sensitivity testing. With the exception of mastitis, less than 6 percent of operations performed culture and antimicrobial sensitivity testing to guide treatments. Producers on nearly all operations (99.0 percent) relied on their previous experience when determining what drugs to use, and 96.2 percent consulted a veterinarian or a drug label created by a veterinarian. Producers on 69.9 percent of operations consulted the manufacturer label when making drug-related decisions.

Personnel

Almost all operations (99.2 percent) had at least one full-time person (paid or unpaid,

including family members) and more than 80 percent had part-time personnel (83.3 percent). The operation average was 5.1 full-time personnel and 1.8 part-time personnel.

Almost three-fourths of operations (74.8 percent) performed at least some personnel training in 2013. More than one-half of operations trained employees in calf raising/feeding, milking, animal handling, feeding cows, and personnel safety. On more than one-half of operations, the owner was the primary person responsible for training personnel, and the herdsman was the primary person on 10 to 25 percent of operations, depending on the procedure. Veterinarians were involved in training farm personnel on more than 10 percent of operations for euthanasia (17.9 percent), surgical procedures (22.3 percent), and calving assistance (12.0 percent).

Table of Contents

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- Life Technologies
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- Dr. Craig McConnel, Washington State University
- Dr. Jennifer Walker, Dean Foods Co.
- Dr. Daniel Weary, University of British Columbia

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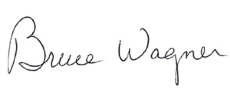

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Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory unit of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service. NAHMS is designed to help meet the Nation's animal health information needs and has collected data on dairy health and management practices through four previous studies:

The 1991–92 National Dairy Heifer Evaluation Project (NDHEP) provided the first national information on the health and management of U.S. dairy cattle. Just months after the study's first results were released in 1993, cases of acute bovine viral diarrhea surfaced in the United States following a 1993 outbreak in Canada. Information from NDHEP on vaccination and biosecurity practices helped officials address the risk of disease spread and target educational efforts on vaccination protocols. In addition, an outbreak of human illness related to *Escherichia coli* O157:H7 was reported in 1993 in the Pacific Northwest. NDHEP data on the prevalence of *E. coli* O157:H7 in dairy cattle helped officials define public risks as well as research needs. This baseline picture of the industry also helped identify additional research and educational efforts in various production areas, such as feed management and weaning practices.

Dairy 1996 helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antimicrobial use and Johne's disease, as well as digital dermatitis, bovine leukosis virus, and potential foodborne pathogens such as *E. coli*, *Salmonella*, and *Campylobacter*.

Dairy 2002 described management strategies that help prevent and reduce the occurrence of Johne's disease and identified management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. Additionally, Dairy 2002 examined levels of participation in quality assurance programs, the incidence of digital dermatitis, animal-waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP 1991–92 and Dairy 1996 studies.

Dairy 2007 evaluated cow comfort using an on-farm assessment tool, evaluated passive transfer (maternal antibody) and growth in preweaned heifer calves, and estimated the prevalence of multiple diseases, including bovine viral diarrhea virus, contagious mastitis pathogens, *Mycobacterium avium* spp. *paratuberculosis*, and food safety pathogens such as *Salmonella* and *Listeria*. The implementation of biosecurity practices was also evaluated, as has been done in every NAHMS dairy study. Additionally, industry changes since the NDHEP 1991, Dairy 1996, and Dairy 2002 studies were examined.

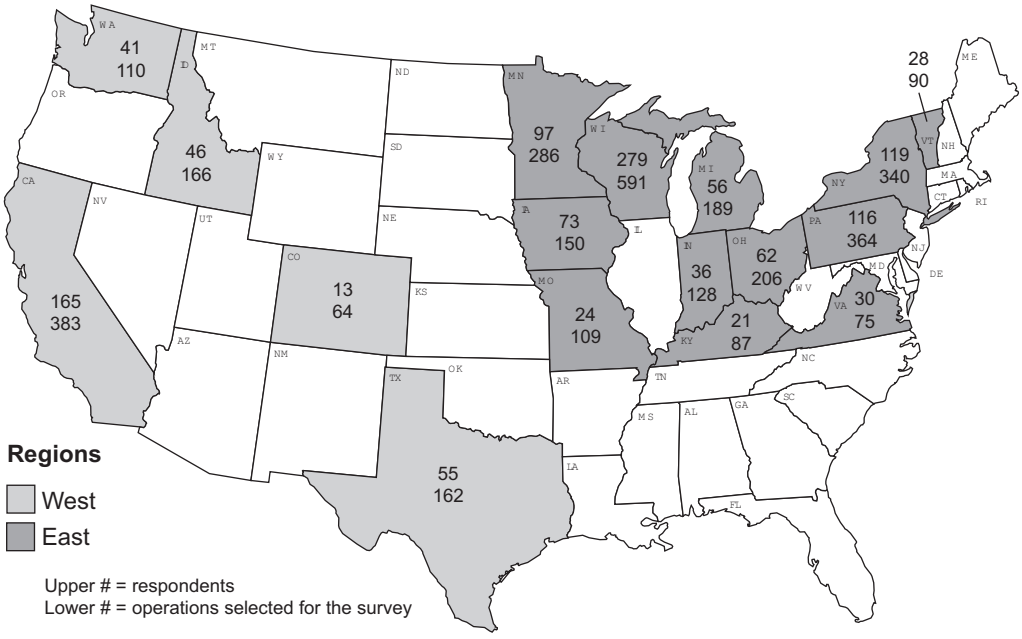
Dairy 2014 was conducted in 17 of the Nation's major dairy States (see map on next page) and provides valuable information to participants, stakeholders, and the industry as a whole. Data in the study represent 80.5 percent of U.S. dairy operations and 81.3 percent of U.S. dairy cows. Results are presented in a variety of publications,

including the following reports:

- “Dairy Cattle Management Practices in the United States, 2014” contains national information collected from 1,261 dairy operations with 1 or more dairy cows participating in the NAHMS Dairy 2014 study.
- “Milk Quality, Milking Procedures, and Mastitis on U.S. Dairy Operations, 2014,” contains information from 265 operations with 30 or more dairy cows, a subset of the 1,261 operations described above.
- “Health and Management Practices on U.S. Dairy Operations, 2014” is the third in a series of reports from the NAHMS Dairy 2014 study. The majority of this report presents national information from 265 operations with 30 or more dairy cows. State and Federal veterinary medical officers and animal health technicians conducted questionnaire interviews with producers and collected biological samples for analysis from March 6 through July 28, 2014.

All NAHMS Dairy reports are available at: http://www.aphis.usda.gov/nahms

NAHMS Dairy 2014 Participating States



Methods used, definitions for phase I and phase II of the study, and the number of respondents can be found in the Methodology section of this report on page 185.

Terms Used in This Report

Anestrus: Refers to cows that do not display estrus. It is during estrus that cows show interest in mating and are sexually receptive.

Antibiotics: Substances produced by microorganisms that kill or inhibit the growth of other microorganisms.

Antimicrobial: Any substance that kills or inhibits the growth of microorganisms.

Breeding programs:

Ovsynch: A series of injections that synchronizes ovulation in cows, eliminating the need for estrus detection. The protocol calls for two injections of a gonadotropin-releasing hormone (GnRH) analogue, separated by a single administration of prostaglandin (PGF2α).

Presynch: A series of two PGF2α injections that synchronizes the estrous cycle of cows to better respond to the Ovsynch protocol.

Resynch: A single GnRH injection given to cows 7 days prior to pregnancy examination. Cows not pregnant are administered PGF2α at the time of examination, GnRH 48 hours later, and timed AI 8 to 18 hours later.

Cow: Female dairy bovine that has calved at least once.

Cystic ovaries: A cause of reproductive failure in cows involving a follicular or luteal cyst. Cows with cystic ovaries are generally in anestrus.

Heifer: Female dairy bovine that has not yet calved.

Herd size: Herd size is based on an operation's January 1, 2014, dairy cow inventory. Small operations had 30 to 99 head; medium operations had 100 to 499 head; and large operations had 500 or more head.

Operation: Premises with at least 30 dairy cows on January 1, 2014.

Operation average: The average value for all operations. A single value for each operation is summed over all operations reporting divided by the number of operations reporting. For example, the operation average number of permanently removed cows per shipment in 2013 is calculated by summing reported average cows per shipment for each operation divided by the number of operations.

Polled: An animal that does not grow horns.

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. When estimates are reported as “higher” or “lower,” a statistical difference is implied by nonoverlapping confidence intervals but not tested. Not all nonoverlapping confidence intervals are mentioned in the text of this report. 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 (—).

Regions:

West: California, Colorado, Idaho, Texas, Washington.

East: Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, Wisconsin.

Sample profile: Information that describes characteristics of the operations from which Dairy 2014 data were collected.

Superovulation: A process used during embryo transfer to ovulate multiple ova at one time.

Section I: Population Estimates

Note: Data in all tables refer to calendar year 2013, unless otherwise noted.

Where appropriate, column or row totals are shown as 100.0 to aid in interpretation; however, estimates might not sum to 100.0 due to rounding.

A. Disease, Removals, and Deaths

1. Disease occurrence

Many health problems can affect cows. In 2013, for example, 99.7 percent of operations had at least one case of producer-identified clinical mastitis in cows; 90.7 percent reported any digestive problems; and 97.9 percent reported any reproductive problems.

These differences can be explained in part by the differences in herd sizes and regions. For instance, 55.5 percent of large operations reported having cows with cancer eye compared with only 0.8 percent of small operations. This finding is not surprising, since large operations have more cattle and, therefore, are more likely to have at least one cow with cancer eye. The same is true for operations in the West region, where the average herd size is nearly six times larger than the average herd size in the East region: 73.7 percent of operations in the West region reported having cattle with cancer eye compared with just 4.3 percent of operations in the East region.

A.1.a. Percentage of operations by producer-identified health problem(s) in cows, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Producer-identified health problem[1]	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Cancer eye	0.8	(0.7)	4.3	(2.8)	55.5	(5.0)	73.7	(7.7)	4.3	(1.3)	11.2	(1.7)
Clinical mastitis	100.0	(—)	98.8	(1.2)	100.0	(—)	100.0	(—)	99.6	(0.4)	99.7	(0.3)
Digestive problems												
Bloat	9.3	(4.0)	17.6	(5.1)	51.8	(5.8)	71.3	(7.4)	13.6	(2.9)	19.0	(2.9)
Bloody gut (HBS)	0.0	(—)	13.6	(4.9)	58.1	(5.8)	56.3	(8.9)	9.6	(1.9)	14.0	(2.1)
DA (displaced abomasum)	56.5	(6.4)	84.4	(4.1)	87.8	(3.4)	74.9	(7.0)	69.7	(4.2)	70.1	(3.8)
Diarrhea less than 48 h	46.9	(6.5)	42.2	(6.5)	71.4	(4.1)	71.7	(8.0)	47.3	(4.4)	49.7	(4.1)
Diarrhea greater than 48 h	22.8	(5.2)	35.8	(6.1)	65.7	(4.9)	67.0	(8.8)	30.5	(3.8)	33.9	(3.6)
Other digestive	16.2	(4.8)	27.0	(5.9)	44.5	(6.2)	43.4	(9.5)	22.2	(3.5)	24.2	(3.3)
Any digestive	87.3	(4.2)	92.1	(2.5)	98.8	(0.8)	94.4	(3.3)	90.3	(2.6)	90.7	(2.4)
Downers (nonambulatory)	55.1	(6.5)	81.5	(4.4)	97.0	(1.6)	91.6	(4.5)	67.7	(4.3)	70.1	(3.9)
Injuries (e.g., slip/fall)	46.2	(6.4)	76.9	(5.7)	98.0	(1.2)	98.5	(1.1)	60.5	(4.5)	64.2	(4.2)
Lameness	84.7	(4.9)	92.8	(2.7)	100.0	(—)	100.0	(—)	88.6	(3.0)	89.7	(2.8)
Lymphoma (bovine leukosis)	6.0	(3.0)	20.3	(5.4)	40.1	(6.3)	34.9	(9.1)	14.2	(2.7)	16.2	(2.7)

continued→

A.1.a. (cont'd.) Percentage of operations by producer-identified health problem(s) in cows, and by herd size and region:

Percent Operations

	Herd size (number of cows)			**Region**		
	Small (30–99)	**Medium** (100–499)	**Large** (500+)	**West**	**East**	**All operations**
Producer-identified health problem[1]	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**
Metabolic problems						
Ketosis	64.3 (6.4)	68.5 (6.1)	82.5 (4.7)	64.8 (8.8)	69.1 (4.3)	68.7 (3.9)
Milk fever (hypocalcemia)	70.1 (6.1)	79.2 (5.3)	96.0 (1.6)	96.2 (2.5)	75.1 (4.0)	77.2 (3.7)
Other metabolic	7.9 (3.7)	8.5 (3.5)	21.8 (5.1)	22.5 (8.6)	9.1 (2.5)	10.4 (2.4)
Any metabolic	82.1 (5.0)	82.0 (5.1)	97.6 (1.3)	96.2 (2.5)	83.5 (3.4)	84.7 (3.1)
Respiratory	42.0 (6.4)	72.4 (5.7)	96.9 (1.5)	90.6 (4.2)	57.3 (4.4)	60.5 (4.1)
Reproductive problems						
Dystocia[2]	52.3 (6.4)	76.7 (5.7)	99.3 (0.7)	88.3 (7.2)	65.3 (4.5)	67.6 (4.1)
Cesarean section	3.0 (2.3)	13.4 (5.1)	19.9 (3.5)	8.3 (3.8)	9.3 (2.3)	9.2 (2.1)
Infertility	82.0 (4.7)	96.8 (1.8)	95.2 (2.1)	94.1 (3.4)	88.1 (2.9)	88.7 (2.6)
Metritis	43.0 (6.4)	75.9 (5.4)	90.1 (3.9)	90.6 (3.9)	57.4 (4.5)	60.8 (4.1)
Retained placenta	64.5 (6.4)	78.5 (5.3)	86.6 (4.2)	91.7 (3.2)	70.4 (4.3)	72.5 (3.9)
Other reproductive	26.4 (5.6)	34.1 (6.1)	39.4 (6.0)	28.4 (8.6)	31.2 (4.0)	30.9 (3.7)
Any reproductive	95.9 (2.1)	100.0 (—)	100.0 (—)	100.0 (—)	97.6 (1.2)	97.9 (1.1)
Other disease	9.4 (3.5)	12.0 (3.7)	29.2 (5.8)	90.6 (4.2)	57.3 (4.4)	13.6 (2.4)

[1]Producer reported and not necessarily verified.

[2]Excludes Cesarean section cases.

Mastitis and lameness affected the highest percentages of cows in 2013 (24.8 and 16.8 percent, respectively). The percentages of cows affected by any specific disease were similar across herd sizes and regions. A lower percentage of cows on medium operations (16.4 percent) were affected by mastitis compared with cows on large operations (26.9 percent). A higher percentage of cows on small operations than on large operations had diarrhea for less than 48 hours (10.4 and 2.2 percent, respectively). Similarly, a higher percentage of cows on small operations than on large operations had milk fever (4.5 and 2.2 percent, respectively). Alternatively, a higher percentage of cows on large operations (8.0 percent) had metritis than cows on small and medium operations (3.5 and 4.5 percent, respectively). The percentages of cows affected by three of the listed diseases differed by region: a higher percentage of cows in the West region had cancer eye than cows in the East region, and a higher percentage of cows in the East region than in the West region had a displaced abomasum or ketosis.

A.1.b. Percentage of cows affected by the following producer-identified health problem(s), and by herd size and region:

Percent Cows[1]

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Producer-identified health problem[2]	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Cancer eye	0.0	(0.0)	0.0	(0.0)	0.3	(0.0)	0.5	(0.1)	0.1	(0.0)	0.2	(0.0)
Clinical mastitis	25.6	(3.4)	16.4	(1.6)	26.9	(3.2)	29.9	(4.8)	20.9	(1.6)	24.8	(2.4)
Digestive problems												
Bloat	0.2	(0.1)	0.2	(0.1)	0.3	(0.1)	0.4	(0.1)	0.2	(0.0)	0.3	(0.0)
Bloody gut (HBS)	0.0	(—)	0.1	(0.0)	0.4	(0.1)	0.4	(0.1)	0.3	(0.1)	0.3	(0.1)
Displaced abomasum (DA)	2.8	(0.5)	3.4	(0.5)	1.8	(0.3)	0.6	(0.1)	3.2	(0.2)	2.2	(0.2)
Diarrhea less than 48 h	10.4	(2.4)	3.5	(1.1)	2.2	(0.4)	1.8	(0.4)	4.1	(0.8)	3.2	(0.5)
Diarrhea greater than 48 h	1.4	(0.5)	2.1	(1.2)	0.9	(0.2)	0.9	(0.3)	1.3	(0.4)	1.1	(0.3)
Other digestive	0.8	(0.4)	0.5	(0.2)	0.6	(0.2)	0.7	(0.2)	0.6	(0.2)	0.6	(0.1)
Downers (nonambulatory)	1.9	(0.3)	2.0	(0.3)	2.3	(0.4)	1.6	(0.4)	2.6	(0.4)	2.2	(0.3)
Injuries (e.g., slip/fall)	2.3	(0.5)	2.1	(0.3)	2.2	(0.5)	1.6	(0.3)	2.6	(0.5)	2.2	(0.3)
Lameness	13.0	(1.7)	13.4	(1.8)	18.0	(2.0)	16.7	(2.7)	16.9	(1.9)	16.8	(1.6)
Lymphoma (bovine leukosis)	0.1	(0.1)	0.2	(0.0)	0.1	(0.0)	0.2	(0.1)	0.1	(0.0)	0.1	(0.0)

continued→

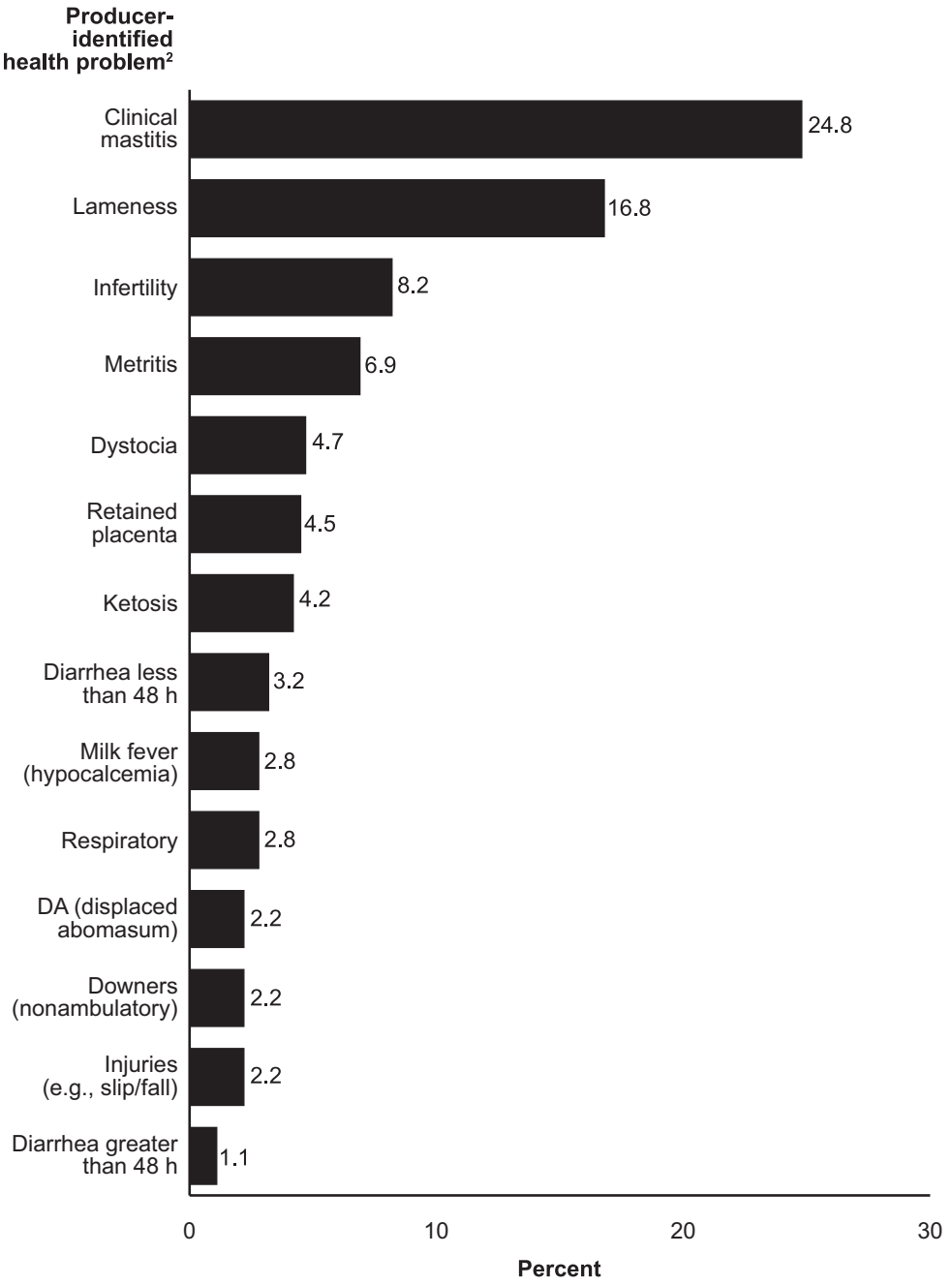
A.1.b. (cont'd.) Percentage of cows affected by the following producer-identified health problem(s), and by herd size and region:

Percent Cows[1]

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Producer-identified health problem[2]	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Metabolic problems												
Ketosis	6.0	(1.1)	5.7	(1.5)	3.6	(0.6)	1.0	(0.3)	6.2	(0.6)	4.2	(0.5)
Milk fever (hypocalcemia)	4.5	(0.5)	4.0	(0.7)	2.2	(0.2)	2.2	(0.3)	3.1	(0.2)	2.8	(0.2)
Other metabolic	0.3	(0.1)	0.2	(0.1)	0.3	(0.1)	0.1	(0.1)	0.4	(0.1)	0.3	(0.1)
Respiratory	2.7	(0.6)	2.6	(0.3)	2.8	(0.5)	2.4	(0.9)	3.0	(0.3)	2.8	(0.5)
Reproductive problems												
Dystocia	3.6	(0.6)	3.9	(0.8)	5.1	(0.9)	5.9	(1.4)	4.0	(0.6)	4.7	(0.7)
Cesarean section	0.1	(0.0)	0.1	(0.0)	0.0	(0.0)	0.0	(0.0)	0.1	(0.0)	<0.1	(0.0)
Infertility	9.3	(1.2)	8.9	(0.8)	7.8	(0.7)	7.4	(1.0)	8.6	(0.6)	8.2	(0.5)
Metritis	3.5	(0.8)	4.5	(0.7)	8.0	(1.0)	7.1	(1.5)	6.9	(0.8)	6.9	(0.8)
Retained placenta	5.1	(0.7)	5.3	(0.6)	4.2	(0.5)	3.4	(0.6)	5.1	(0.4)	4.5	(0.4)
Other reproductive	1.3	(0.4)	1.9	(1.0)	1.3	(0.5)	1.2	(0.9)	1.5	(0.4)	1.4	(0.4)
Other disease	0.3	(0.1)	0.2	(0.1)	0.8	(0.4)	0.3	(0.3)	0.8	(0.5)	0.6	(0.3)

[1]As a percentage of January 1, 2014, dairy cow inventory.
[2]Producer reported and not necessarily verified.

Percentage of cows[1] affected by the following producer-identified health problem(s)



[1]As a percentage of January 1, 2014, dairy cow inventory.
[2]Producer reported and not necessarily verified. For health problems affecting more than 1 percent of cows.

Cows affected by a disease either die, recover and/or remain in the herd, or are sold/removed from the herd. In general, the more prevalent the disease (i.e., the highest percentage of cows affected) the more likely affected cows will remain in the herd; cows affected with a rare disease do not usually fare as well. For example, mastitis affected the highest percentage of cows (24.8 percent) in 2013, but 72.9 percent of these animals remained in the herd. In contrast, lymphoma affected a very low percentage of cows (0.1 percent) and only 4.0 percent of these animals remained in the herd.

Mastitis and lameness affected the highest percentages of cows in 2013 (24.8 and 16.8 percent, respectively); more than 70 percent of cows with either of these diseases remained in the herd. Conversely, less than 2.5 percent of cows had hemorrhagic bowel syndrome (HBS), an “other” disease, or were nonambulatory, yet more than 40 percent of cows affected with any one of these disease were euthanized or died without assistance. More than 90 percent of cows affected by ketosis, milk fever, metritis, retained placenta, or diarrhea for less than 48 hours remained in the herd.

A.1.c. For cows affected by the following producer-identified health problem(s) in 2013, percentage of cows by outcome:

	Percent Cows								
			Outcome[2]						
	Affected[1]		Remained in the herd		Sold/ removed		Died		
Producer-identified health problem	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Cancer eye	0.2	(0.0)	36.6	(8.1)	36.2	(6.6)	27.2	(8.4)	100.0
Clinical mastitis	24.8	(2.4)	72.9	(2.3)	24.0	(2.1)	3.1	(0.4)	100.0
Digestive problems									
Bloat	0.3	(0.0)	54.5	(5.9)	16.2	(3.4)	29.3	(4.7)	100.0
Bloody gut (HBS)	0.3	(0.1)	20.6	(6.1)	36.1	(6.0)	43.2	(7.1)	100.0
DA (displaced abomasum)	2.2	(0.2)	74.3	(2.3)	20.0	(2.1)	5.8	(0.7)	100.0
Diarrhea less than 48 h	3.2	(0.5)	97.8	(0.7)	1.7	(0.5)	0.5	(0.3)	100.0
Diarrhea greater than 48 h	1.1	(0.3)	66.2	(7.8)	29.0	(6.9)	4.7	(1.7)	100.0
Other digestive	0.6	(0.1)	61.6	(6.8)	25.7	(6.6)	12.7	(3.1)	100.0
Downers (nonambulatory)	2.2	(0.3)	22.4	(2.5)	19.1	(6.5)	58.5	(7.5)	100.0
Injuries (e.g., slip/fall)	2.2	(0.3)	31.3	(3.1)	41.9	(3.1)	26.9	(2.4)	100.0
Lameness	16.8	(1.6)	84.2	(1.5)	14.7	(1.5)	1.1	(0.2)	100.0
Lymphoma (bovine leukosis)	0.1	(0.0)	4.0	(2.5)	84.8	(5.5)	11.2	(4.6)	100.0

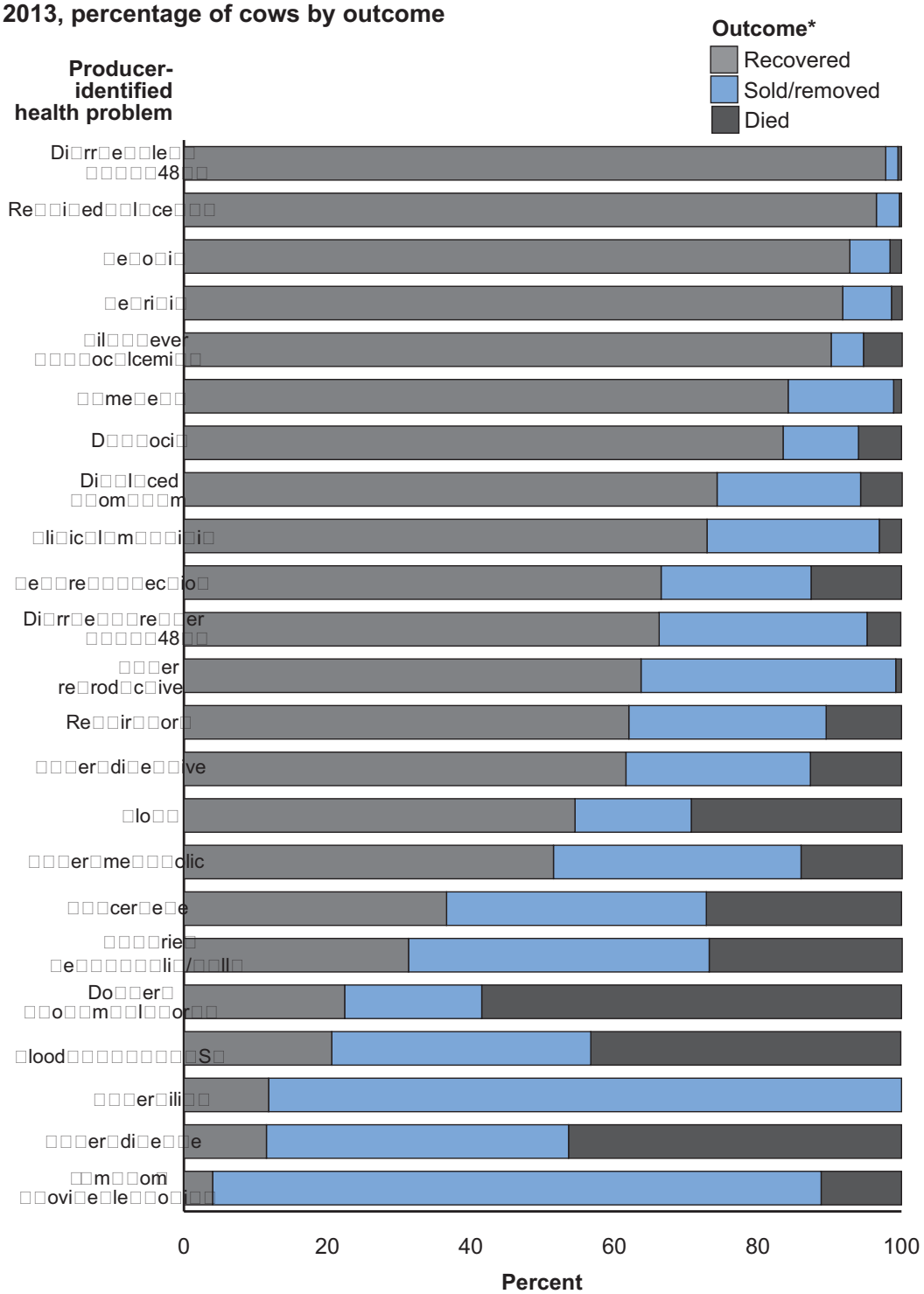
continued →

A.1.c. (cont'd.) For cows affected by the following producer-identified health problem(s) in 2013, percentage cows by outcome:

	Percent Cows								
			Outcome[2]						
	Affected[1]		Remained in the herd		Sold/ removed		Died		
Producer-identified health problem	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Metabolic problems									
Ketosis	4.2	(0.5)	92.8	(1.3)	5.6	(1.1)	1.6	(0.4)	100.0
Milk fever (hypocalcemia)	2.8	(0.2)	90.2	(1.6)	4.5	(1.3)	5.4	(0.8)	100.0
Other metabolic	0.3	(0.1)	51.5	(10.9)	34.5	(9.6)	14.1	(4.4)	100.0
Respiratory	2.8	(0.4)	62.0	(4.2)	27.5	(3.6)	10.5	(1.3)	100.0
Reproductive problems									
Dystocia	4.7	(0.7)	83.5	(2.8)	10.5	(2.4)	6.0	(1.2)	100.0
Cesarean section	<0.1	(0.0)	66.5	(9.4)	20.9	(7.8)	12.6	(7.3)	100.0
Infertility	8.2	(0.5)	11.8	(2.7)	88.2	(2.7)	0.0	(0.0)	100.0
Metritis	6.9	(0.8)	91.8	(1.9)	6.8	(1.9)	1.5	(0.6)	100.0
Retained placenta	4.5	(0.4)	96.5	(1.5)	3.2	(1.5)	0.3	(0.1)	100.0
Other reproductive	1.4	(0.4)	63.7	(7.1)	35.5	(7.1)	0.8	(0.4)	100.0
Other disease	0.6	(0.3)	11.5	(8.5)	42.1	(7.3)	46.4	(14.5)	100.0

[1]From table A.1.b, as a percentage of January 1, 2014, dairy cow inventory.
[2]As a percentage of affected cows.

For cows affected by the following producer-identified health problem(s) in 2013, percentage of cows by outcome



2. Permanently removed cows

All operations permanently removed at least one cow in 2013 (excluding cows that died, data not shown). About one-third of cows (33.8 percent) were permanently removed. There were no differences by herd size or region in the percentages of cows removed.

A.2.a. Percentage of cows permanently removed in 2013 (excluding cows that died), by herd size and by region:

Percent Cows*

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
27.8	(1.6)	30.8	(1.4)	35.1	(2.1)	36.7	(3.3)	31.4	(1.2)	33.8	(1.7)

*As a percentage of January 1, 2014, dairy cow inventory.

Cows are removed or sold for a variety of reasons, including health problems, low production, and as replacements for other operations. There is overlap between the first two reasons, since it is common for health problems to result in decreased production. Removal reasons were producer reported, and specific health problems were not necessarily verified.

Of cows permanently removed from the operation, 16.5 percent were removed because of mastitis, 21.2 percent because of infertility, and 21.1 percent because of poor production. About 10 percent of cows removed (9.5 percent) were sold as replacements to other operations. In general, the percentage of cows removed was similar across herd sizes. The only regional differences were that a lower percentage of cows sold/removed in the West region than in the East region were removed due to lameness and ketosis.

A.2.b. For the 33.8 percent of cows permanently removed from the operation in 2013 (table A.2.a), percentage of cows by producer-reported reason for removal, and by herd size and region:

Percent Cows Removed[1]

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Producer-reported reason for removal[2]	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Cancer eye	0.0	(—)	0.1	(0.1)	0.3	(0.1)	0.4	(0.1)	0.1	(0.1)	0.2	(0.1)
Clinical mastitis	21.1	(2.1)	17.6	(1.5)	15.7	(1.8)	13.7	(2.1)	18.6	(1.3)	16.5	(1.4)
Digestive problems												
Bloat	0.0	(—)	0.1	(0.1)	0.2	(0.0)	0.2	(0.1)	0.1	(0.0)	0.1	(0.0)
Bloody gut (HBS)	NA		0.1	(0.1)	0.2	(0.0)	0.5	(0.2)	0.3	(0.1)	0.4	(0.1)
DA (displaced abomasum)	1.7	(0.6)	3.0	(0.6)	1.1	(0.2)	0.6	(0.2)	2.0	(0.2)	1.4	(0.2)
Diarrhea less than 48 hr	0.0	(—)	0.2	(0.1)	0.2	(0.1)	0.1	(0.1)	0.2	(0.1)	0.2	(0.1)
Diarrhea greater than 48 hr	0.8	(0.4)	1.8	(0.5)	0.8	(0.2)	0.6	(0.2)	1.2	(0.3)	1.0	(0.2)
Other digestive	0.8	(0.4)	0.1	(0.1)	0.6	(0.2)	0.5	(0.3)	0.5	(0.2)	0.5	(0.2)
Downers (nonambulatory)	0.2	(0.1)	1.4	(0.6)	1.5	(0.8)	0.3	(0.1)	2.1	(0.9)	1.4	(0.6)
Injuries (e.g., slip/fall)	1.5	(0.6)	3.0	(0.7)	3.1	(0.7)	2.2	(0.7)	3.5	(0.7)	2.9	(0.5)
Lameness	6.6	(1.5)	9.7	(1.3)	6.7	(0.8)	4.7	(1.1)	9.1	(0.7)	7.2	(0.7)
Lymphoma(bovine leukosis)	0.2	(0.2)	0.3	(0.1)	0.4	(0.1)	0.5	(0.2)	0.2	(0.1)	0.4	(0.1)

continued→

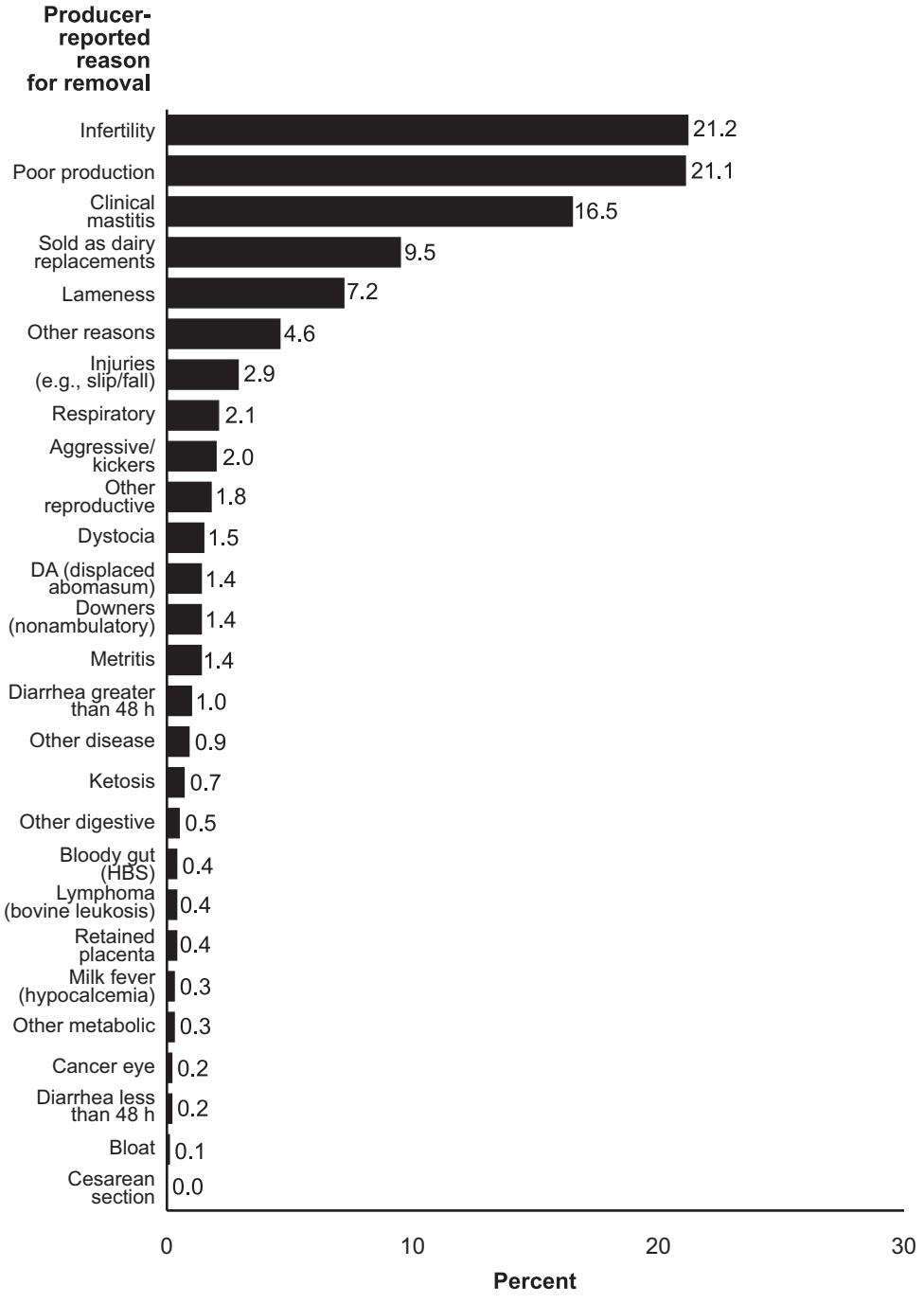
A.2.b. (cont'd.) For the 33.8 percent of cows permanently removed from the operation in 2013 (table A.2.a), percentage of cows by producer-reported reason for removal, and by herd size and region:

Percent Cows Removed[1]

	Herd size (number of cows)			**Region**		
	Small (30–99)	**Medium** (100–499)	**Large** (500+)	**West**	**East**	**All operations**
Producer-reported reason for removal[2]	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**
Metabolic problems						
Ketosis	0.7 (0.4)	0.5 (0.2)	0.8 (0.2)	0.3 (0.1)	1.1 (0.2)	0.7 (0.2)
Milk fever (hypocalcemia)	0.2 (0.2)	0.1 (0.1)	0.4 (0.1)	0.2 (0.1)	0.4 (0.2)	0.3 (0.1)
Other metabolic	0.5 (0.4)	0.6 (0.5)	0.2 (0.1)	0.1 (0.1)	0.4 (0.2)	0.3 (0.1)
Respiratory	1.3 (0.5)	2.0 (0.6)	2.2 (0.4)	1.6 (0.5)	2.4 (0.3)	2.1 (0.3)
Reproductive problems						
Dystocia	0.9 (0.4)	1.4 (0.4)	1.6 (0.5)	1.3 (0.7)	1.7 (0.4)	1.5 (0.4)
Cesarean section	0.0 (—)	0.1 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Infertility	23.0 (3.1)	26.3 (2.3)	19.8 (2.8)	18.3 (4.1)	23.3 (1.8)	21.2 (2.2)
Metritis	0.1 (0.1)	0.9 (0.4)	1.7 (0.5)	0.4 (0.2)	2.2 (0.7)	1.4 (0.4)
Retained placenta	0.0 (—)	0.1 (0.1)	0.6 (0.3)	0.2 (0.1)	0.6 (0.3)	0.4 (0.2)
Other reproductive	3.9 (1.3)	1.6 (0.5)	1.6 (0.8)	1.8 (1.2)	1.8 (0.5)	1.8 (0.6)
Other disease	0.3 (0.2)	0.5 (0.3)	1.0 (0.4)	0.4 (0.3)	1.2 (0.4)	0.9 (0.3)
Aggressive/kickers	1.6 (0.6)	0.8 (0.3)	2.3 (1.9)	3.8 (3.4)	0.7 (0.2)	2.0 (1.5)
Poor production	22.3 (3.7)	16.5 (2.2)	21.9 (3.3)	24.7 (4.6)	18.3 (2.2)	21.1 (2.6)
Sold as dairy replacements	6.8 (3.0)	6.1 (2.8)	10.6 (4.6)	16.1 (6.9)	4.6 (1.3)	9.5 (3.5)
Other reasons	5.4 (2.6)	5.0 (1.6)	4.4 (2.0)	6.4 (3.4)	3.2 (0.8)	4.6 (1.6)
Total	100.0	100.0	100.0	100.0	100.0	100.0

[1]As a percentage of cows removed or sold in 2013.
[2]Producer reported and not necessarily verified.

For the 33.8 percent of cows permanently removed from the operation in 2013, percentage of cows by producer-reported reason for removal



Cows removed in early lactation are more likely to have had a serious health problem or very low milk production than cows removed later in lactation. Almost one-half of the cows permanently removed (49.3 percent) were removed in late lactation. Infertility and poor production were top reasons for removal, and these conditions are more commonly identified in late lactation. About one-fifth of cows removed (20.1 percent) were removed in early lactation, and a similar percentage of removed cows (24.1 percent) were removed during midlactation. Less than 10 percent of removals were dry cows. There were no differences by herd size or region in the percentages of cows removed during each lactation stage.

A.2.c. For the 33.8 percent of cows permanently removed from the operation (table A.2.a), percentage of cows by lactation stage at removal, and by herd size and region:

Percent Cows Removed

	Herd size (number of cows)											
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**Region** **West**		**East**		**All operations**	
Lactation stage	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Early (less than 50 d in milk)	14.5	(2.1)	16.7	(2.1)	21.2	(3.8)	15.5	(3.9)	24.2	(3.2)	20.1	(3.0)
Mid (50–199 d in milk)	27.0	(4.1)	26.3	(3.6)	23.2	(1.0)	23.4	(1.5)	24.4	(1.4)	24.0	(1.0)
Late (200 d or more in milk)	52.4	(4.7)	55.0	(4.0)	48.0	(4.8)	52.3	(7.1)	46.6	(2.8)	49.3	(3.8)
Dry cows	6.1	(2.8)	1.9	(0.5)	7.6	(3.9)	8.8	(6.4)	4.8	(0.8)	6.7	(3.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Of cows permanently removed, the highest percentage (51.9 percent) were in their second to fourth lactation when removed. About one-fourth of cows removed were in their first lactation, and another one-fourth were in their fifth or higher lactations. First-lactation cows were less likely to be permanently removed than later lactation cows; 32.6 percent of all adult cows were in their first lactation (see Dairy 2014, Report 1), but only 22.2 percent of removed cows were first-lactation cows.

Cows removed in the first lactation represent a substantial loss to producers. For example, when first-lactation cows are removed from the herd, the costs associated with raising them are lost, as are the genetic improvements generally associated with these cows. In contrast, cows removed in later lactations have usually produced enough milk to cover rearing costs and are more likely to have passed on their genetic potential to multiple offspring.

A.2.d. For the 33.8 percent of cows permanently removed from the operation in 2013 (table A.2.a), percentage of cows by lactation category at removal, and by herd size and region:

Percent Cows Removed

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Lactation category	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
First	15.5	(2.1)	17.9	(1.9)	23.6	(3.7)	18.0	(4.3)	26.4	(3.4)	22.2	(3.0)
2nd–4th	55.2	(4.4)	49.1	(4.0)	52.1	(3.8)	54.7	(4.8)	49.1	(3.2)	51.9	(3.1)
5th or higher	29.4	(4.3)	33.0	(3.5)	24.4	(1.9)	27.3	(3.0)	24.5	(1.6)	25.9	(1.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

More than 90 percent of operations permanently removed cows by sending them to a market, auction, or stockyard. Overall, 36.6 percent of operations sent cows directly to a packer or slaughter plant, while 14.4 percent sent cows directly to another dairy. The percentages of cows removed by destination were similar across herd size and region. There was, however, a trend toward a lower percentage of small operations sending cows directly to a packer or slaughter plant compared with large operations (28.6 and 52.2 percent, respectively).

A.2.e. Percentage of operations by destination of permanently removed cows, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Directly to another dairy	14.0	(4.7)	9.5	(3.2)	23.9	(4.8)	11.7	(4.3)	14.7	(3.0)	14.4	(2.8)
To a market, auction, or stockyard	92.6	(3.6)	91.6	(2.8)	91.8	(3.2)	92.9	(3.3)	92.1	(2.3)	92.1	(2.1)
Directly to a packer or slaughter plant	28.6	(6.0)	41.3	(6.4)	52.2	(5.8)	49.4	(8.5)	35.1	(4.2)	36.6	(3.8)
Other	0.0	(—)	1.9	(1.3)	2.4	(1.3)	5.2	(3.2)	0.5	(0.4)	1.0	(0.5)

Almost 60 percent of permanently removed cows (58.3 percent) were sent to a market or auction, while one-third of cows (33.5 percent) were sent directly to a packer or slaughter plant. Less than 10 percent of removed cows (7.3 percent) were sent to another dairy. A higher percentage of cows on small operations (82.3 percent) were sent to a market or auction than cows on large operations (53.7 percent). Conversely, a lower percentage of cows on small operations were sent directly to a packer or slaughter plant than were cows on large operations (10.6 and 37.7 percent, respectively).

A.2.f. For the 33.8 percent of cows permanently removed in 2013 (table A.2.a), percentage of cows by destination, herd size, and region:

Percent Cows Removed

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Directly to another dairy	7.1	(3.0)	4.0	(2.1)	7.9	(3.7)	9.2	(5.9)	5.4	(1.1)	7.3	(2.9)
Market, auction, or stockyard	82.3	(4.3)	71.3	(5.9)	53.7	(8.5)	51.2	(10.7)	65.0	(9.2)	58.3	(7.2)
Directly to a packer or slaughter plant	10.6	(3.6)	21.5	(5.4)	37.7	(9.0)	38.1	(11.9)	29.0	(8.9)	33.5	(7.5)
Other	0.0	(—)	3.2	(2.4)	0.7	(0.4)	1.5	(0.9)	0.6	(0.4)	1.0	(0.5)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

In 2013, a higher average number of shipments went to a market, auction, or stockyard (17.5) than to a packer or slaughter plant (6.2). The average number of shipments to these destinations and the average number of shipments to all destinations increased as herd size increased. Small operations averaged about one shipment per month (11.5 shipments/year), while large operations averaged more than five shipments per month (66.4 shipments/year).

A higher average number of shipments in the West region (28.3) than in the East region (16.3) went to a market, auction, or stockyard. The West region also had a higher average number of shipments sent to a packer or slaughter plant (24.1 shipments/year) than the East region (4.3 shipments/year). For all operations, the average number of shipments was two per month (24.4 shipments/year).

A.2.g. Average number of shipments of permanently removed cows in 2013, by destination, herd size, and region:

Average Number of Shipments

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Destination	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Directly to another dairy	0.5	(0.2)	0.2	(0.1)	1.8	(0.7)	1.4	(1.0)	0.5	(0.1)	0.6	(0.2)
Market, auction, or stockyard	9.8	(0.9)	17.2	(1.7)	41.1	(3.5)	28.3	(4.2)	16.3	(1.0)	17.5	(1.0)
Directly to a packer or slaughter plant	1.3	(0.4)	5.2	(1.4)	23.0	(4.3)	24.1	(5.7)	4.3	(0.8)	6.2	(1.0)
Other	0.0	(—)	0.2	(0.2)	0.5	(0.3)	1.1	(0.6)	0.0	(0.0)	0.1	(0.1)
Total	11.5	(0.9)	22.9	(1.8)	66.4	(4.7)	54.9	(7.2)	21.1	(1.2)	24.4	(1.4)

As herd size increased, the average per-shipment numbers of cows sent to a market, auction or stockyard, or directly to a packer increased. The average number of cows per shipment was higher in the West region than in the East region for all destinations. Overall, shipments to another dairy averaged more cows per shipment (6.9) than shipments to packer of slaughter plant (3.8) or to a market, auction or stockyard (3.0).

A.2.h. For operations that permanently removed cows to the following destinations in 2013 (table A.2.e), operation average number of cows per shipment, by herd size and by region:

Operation Average Number Cows per Shipment

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Destination	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Directly to another dairy	2.3	(0.6)	9.6	(1.9)	13.5	(2.5)	19.7	(5.5)	6.0	(1.1)	6.9	(1.2)
Market, auction, or stockyard	1.4	(0.1)	3.3	(0.7)	7.4	(0.6)	8.8	(0.9)	2.4	(0.3)	3.0	(0.3)
Directly to a packer or slaughter plant	1.2	(0.2)	2.1	(0.2)	10.2	(2.3)	11.0	(3.4)	2.6	(0.4)	3.8	(0.8)

The highest percentage of shipments sent to a market, auction, or stockyard (63.4 percent) traveled an average of 10 to 49 miles.

A.2.i. Percentage of shipments by operation average distance that permanently removed cows were shipped, and by destination:

	Percent Shipments					
	Destination					
	Directly to another dairy*		Market, auction, or stockyard		Directly to packer or slaughter plant	
Average distance (miles)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1–9	*		14.3	(3.1)	7.7	(3.2)
10–49	*		63.4	(4.2)	42.8	(8.0)
50–249	*		22.2	(3.6)	38.3	(7.8)
250 or more	*		0.1	(0.1)	11.2	(7.0)
Total			100.0		100.0	

*Too few to report.

There were no differences by herd size, region, or destination in the percentages of operations that shipped permanently removed cows across State lines (data not shown). A higher percentage of operations shipped cows to a packer or slaughter plant located in another State (29.9 percent) than to a market, auction, or stockyard in another State (10.6 percent).

A.2.j. For operations that permanently removed cows to the following destinations in 2013 (table A.2.e), percentage of operations that shipped cows across State lines:

Destination	Percent operations	Std. error
Directly to another dairy	24.2	(8.8)
Market, auction, or stockyard	10.6	(2.9)
Directly to a packer or slaughter plant	29.9	(5.9)

Cows sold directly to another dairy are usually dairy replacements, which are more valuable than cows sold to a market, auction, or stockyard; or to a packer or slaughter plant. For example, per-head prices for the last cow/group sold in 2013 were nearly twice as much for cows sold as replacements to another dairy ($1,543) than for cows sold to a market, auction, or stockyard ($929), or to a packer or slaughter plant ($839).

A.2.k. For cows permanently removed from the operation to the following destinations in 2013 (table A.2.e), operation average price per head for the last cow/group sold, by herd size and by region:

Operation Average Price per Head ($)

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Destination	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Directly to another dairy	1,429	(170)	1,716	(146)	1,642	(96)	1,750	(157)	1,524	(113)	1,543	(105)
To a market, auction, or stockyard	879	(40)	1,006	(34)	947	(46)	952	(48)	926	(28)	929	(25)
Directly to a packer or slaughter plant	711	(73)	936	(62)	883	(88)	899	(98)	828	(49)	839	(45)
Other	*		*		*		*		*		1,164	(169)

*Too few to report.

3. Deaths

As was the case with producer-reported health conditions, the probability of having at least one cow death increased as operation size increased. Overall, 80.3 percent of operations had at least one preweaned calf death, 66.6 percent had at least one weaned calf death, and 91.1 percent had at least one cow death.

A lower percentage of small operations had deaths in each cattle class compared with medium and large operations. A higher percentage of operations in the West region than in the East region had deaths in each cattle class.

A.3.a. Percentage of operations that had any deaths* in the following cattle classes in 2013, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned	66.7	(6.4)	97.2	(1.6)	97.1	(2.1)	95.5	(3.8)	79.2	(4.1)	80.3	(3.8)
Weaned	50.2	(6.5)	80.6	(5.0)	96.6	(2.0)	91.5	(4.7)	64.4	(4.4)	66.6	(4.1)
Cows	84.2	(5.0)	97.9	(1.5)	100.0	(—)	100.0	(—)	90.1	(3.0)	91.1	(2.7)

*Deaths refer to cattle that were euthanized and cattle that died without assistance.

In total, 1.9 percent of weaned heifers were euthanized or died without assistance in 2013 compared with 5.6 percent of cows and 6.4 percent of preweaned heifers. There were no differences by herd size or region in percentages of total deaths in preweaned heifers, weaned heifers, or cows.

The majority of deaths in preweaned and weaned heifers were not due to euthanasia, while about 40 percent of cow deaths (2.4 percent/5.6 percent were the result of euthanasia. Euthanasia is considered the most humane choice when an animal's prognosis is poor and slaughter is not an option.

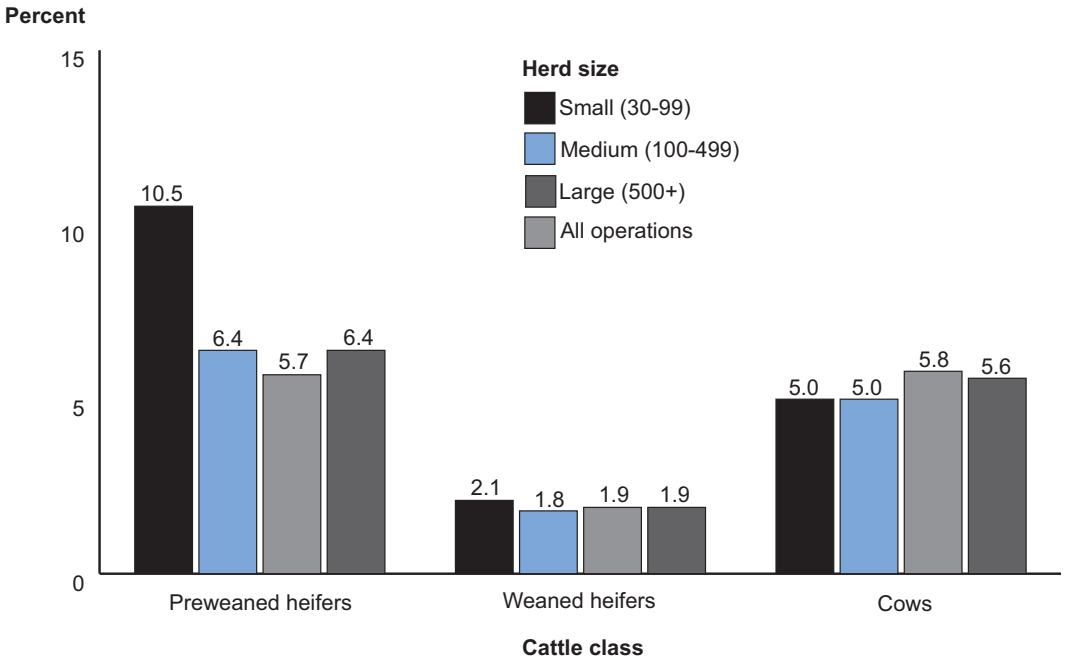
A.3.b. Percentage of preweaned heifers, weaned heifers, and cows that were euthanized or died without assistance, by herd size and by region:

Percent Heifers and Cows

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Outcome	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned heifers[1]												
Died without assistance	10.2	(1.7)	6.1	(0.6)	5.3	(0.9)	7.5	(1.2)	5.4	(0.8)	6.0	(0.7)
Euthanized	0.3	(0.2)	0.3	(0.1)	0.4	(0.1)	0.4	(0.1)	0.4	(0.1)	0.4	(0.1)
Total deaths	10.5	(1.7)	6.4	(0.7)	5.7	(1.0)	7.9	(1.2)	5.8	(0.9)	6.4	(0.8)
Weaned heifers[2]												
Died without assistance	2.0	(0.3)	1.6	(0.2)	1.7	(0.3)	1.9	(0.3)	1.6	(0.2)	1.7	(0.2)
Euthanized	0.1	(0.1)	0.2	(0.1)	0.2	(0.0)	0.2	(0.0)	0.2	(0.0)	0.2	(0.0)
Total deaths	2.1	(0.3)	1.8	(0.2)	1.9	(0.3)	2.1	(0.3)	1.8	(0.3)	1.9	(0.2)
Cows[3]												
Died without assistance	2.8	(0.4)	2.6	(0.3)	3.4	(0.2)	3.0	(0.3)	3.4	(0.3)	3.2	(0.2)
Euthanized	2.2	(0.3)	2.4	(0.3)	2.4	(0.4)	1.9	(0.5)	2.8	(0.3)	2.4	(0.3)
Total deaths	5.0	(0.4)	5.0	(0.4)	5.8	(0.5)	4.9	(0.4)	6.2	(0.5)	5.6	(0.4)

[1]As a percentage of heifers born alive in 2013.
[2]As a percentage of January 1, 2014, weaned heifer inventory.
[3]As a percentage of January 1, 2014, dairy cow inventory.

Percentage of preweaned heifers, weaned heifers, and cows that were euthanized or died unassisted, by herd size



Almost half of cow deaths (48.3 percent) occurred during early lactation, which coincides with the period of highest disease incidence. A similar percentage of cow deaths occurred in mid or late lactation (25.6 and 21.0 percent, respectively). Dry cows accounted for the lowest percentage of cow deaths (5.1 percent). The percentages of cow deaths that occurred in each lactation stage did not differ across herd sizes or regions.

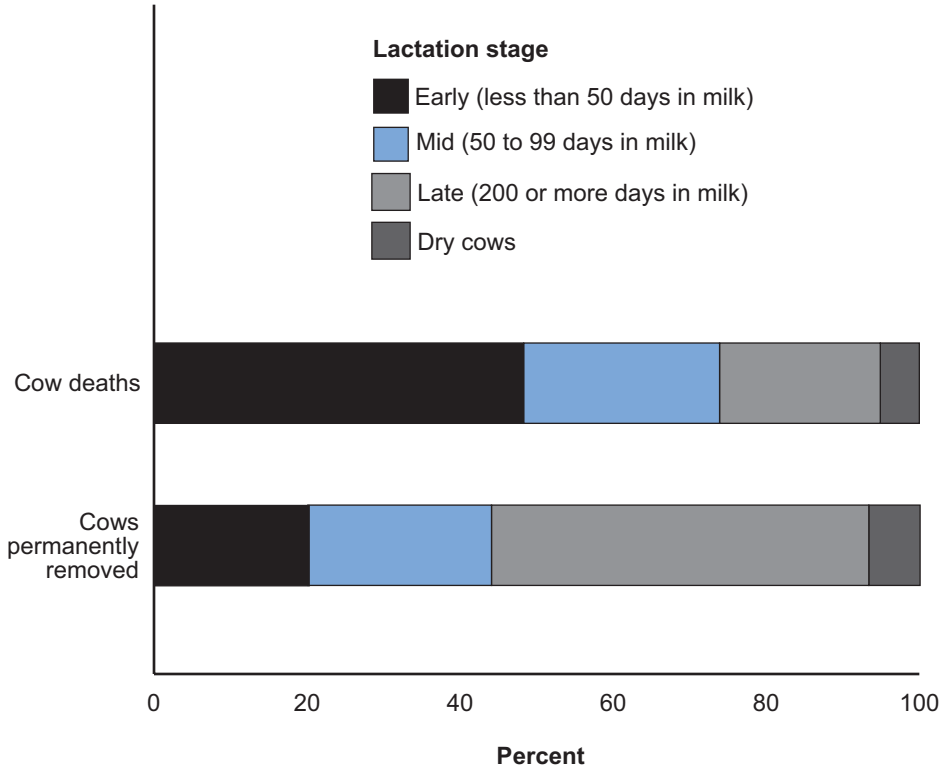
A.3.c. For the 5.6 percent of cows that were euthanized or died without assistance in 2013 (table A.3.b), percentage of cow deaths by stage of lactation, herd size, and region:

Percent Cow Deaths

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Lactation stage	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Early (less than 50 d in milk)	49.4	(6.3)	50.7	(4.0)	47.8	(7.2)	38.4	(7.1)	54.5	(6.6)	48.3	(5.6)
Mid (50–199 d in milk)	24.3	(4.9)	29.9	(4.4)	25.0	(2.8)	28.4	(2.6)	23.8	(3.1)	25.6	(2.3)
Late (200 d or more in milk)	19.4	(5.1)	15.7	(2.1)	22.1	(4.0)	28.7	(5.1)	16.2	(2.7)	21.0	(3.1)
Dry cows	6.9	(2.6)	3.8	(1.0)	5.1	(1.3)	4.5	(1.4)	5.5	(1.5)	5.1	(1.0)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Deaths refer to cattle that were euthanized and cattle that died unassisted.

For the 5.6 percent of cows that were euthanized or died unassisted, and for the 33.8 percent of cows permanently removed (excluding deaths) in 2013, percentage of cows by lactation stage



More than one-half of the cows that were euthanized or died without assistance (52.8 percent) were in their second to fourth lactation, which was expected given that the majority of cows would be in that lactation category. About one-fourth of cow deaths (23.5 percent) were first-lactation cows and another one-fourth (23.8 percent) were fifth- or higher-lactation cows. The percentages of cow deaths were similar across herd sizes and regions for each lactation category.

A.3.d. For the 5.6 percent of cows that were euthanized or died without assistance in 2013 (table A.3.b), percentage of cow deaths by lactation category, herd size, and region:

Percent Cow Deaths*

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Lactation category	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
First	18.9	(3.3)	15.7	(2.1)	25.3	(4.4)	18.1	(4.0)	27.0	(4.7)	23.5	(3.7)
2nd–4th	60.8	(4.3)	53.7	(4.6)	51.8	(4.2)	58.2	(4.0)	49.1	(4.3)	52.8	(3.5)
5th or higher	20.3	(4.1)	30.6	(4.6)	22.9	(2.1)	23.6	(2.9)	23.9	(2.4)	23.8	(1.8)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Deaths refer to cattle that were euthanized and cattle that died without assistance.

Producers reported that 5.6 percent of preweaned heifer deaths, 11.4 percent of weaned heifer deaths (table A.3.g), and 11.9 percent of cow deaths (table A.3.h) were due to unknown causes. Necropsy is the primary method used to determine cause of death. The percentage of operations that performed necropsies on heifers (11.3 percent) was about one-half the percentage of operations that performed necropsies on cows (22.2 percent). A lower percentage of small and medium operations performed necropsies on heifers (4.0 and 6.3 percent, respectively) compared with large operations (39.4 percent). The percentage of operations that performed necropsies on cows increased as herd size increased (6.6 to 55.4 percent). No regional differences were observed.

A.3.e. For operations with at least one death in the following cattle classes, percentage of operations that performed any necropsies to determine cause of death, by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	4.0	(2.3)	6.3	(2.6)	39.4	(5.8)	18.7	(6.5)	10.5	(1.9)	11.3	(1.9)
Cows	6.6	(3.1)	25.7	(5.5)	55.4	(5.9)	28.6	(7.0)	21.4	(3.0)	22.2	(2.8)

The percentages of dead heifers and cows that were necropsied were essentially the same (4.6 and 4.7 percent, respectively). A lower percentage of dead heifers were necropsied on small operations (0.7 percent) than on large operations (6.2 percent). No regional differences in the percentage of dead heifers necropsied were identified, and there were no regional or herd size differences in the percentages of dead cows that were necropsied.

A.3.f. For operations with at least one death in the following cattle classes, percentage of dead heifers and cows that were necropsied to determine cause of death, by herd size and by region:

Percent Deaths Necropsied

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	0.7	(0.4)	3.0	(1.4)	6.2	(1.9)	5.4	(3.2)	4.2	(0.8)	4.6	(1.3)
Cows	4.2	(3.6)	3.4	(0.9)	5.0	(0.9)	2.8	(1.0)	5.9	(1.0)	4.7	(0.7)

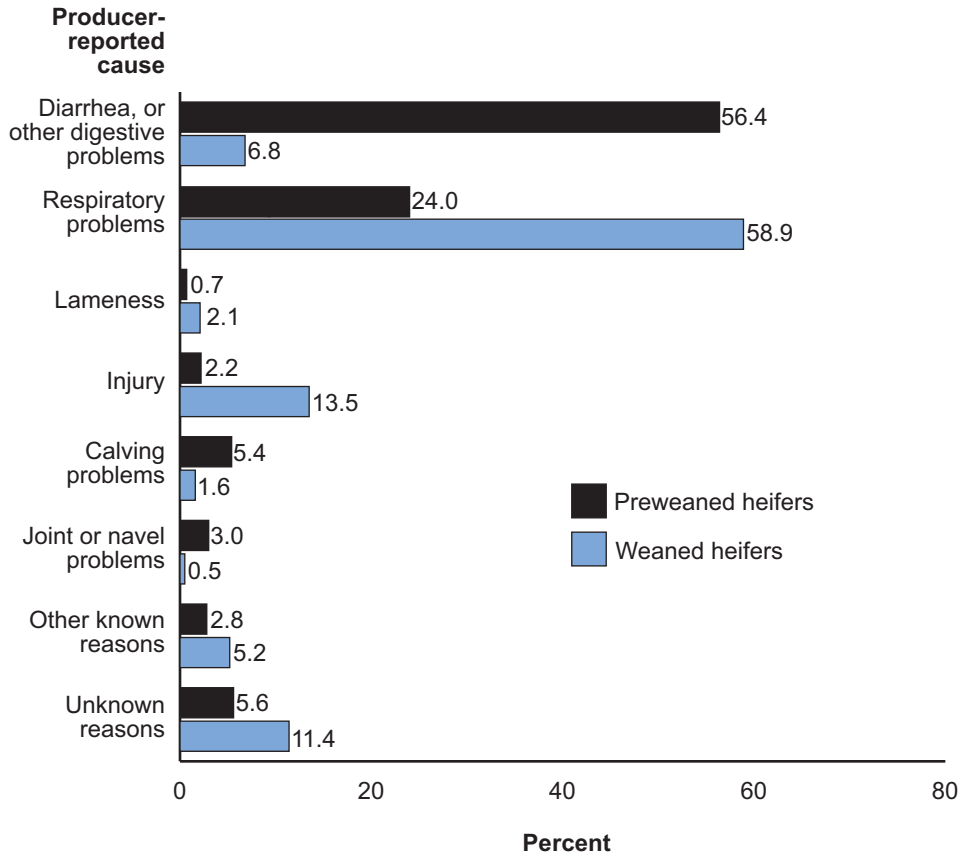
Diarrhea or other digestive problems were responsible for more than one-half of preweaned heifer deaths (56.4 percent), and respiratory problems accounted for almost one-fourth (24.0 percent) of preweaned heifer deaths. In contrast, the majority of weaned heifer deaths (58.9 percent) were due to respiratory problems.

A.3.g. Percentage of preweaned and weaned heifer deaths, by producer-reported cause:

	Percent Heifer Deaths*			
	Preweaned Heifers		Weaned Heifers	
Producer-reported cause	**Percent**	**Std. error**	**Percent**	**Std. error**
Diarrhea, or other digestive problems	56.4	(3.3)	6.8	(1.5)
Respiratory problems	24.0	(2.2)	58.9	(4.2)
Lameness	0.7	(0.2)	2.1	(0.7)
Injury	2.2	(0.6)	13.5	(1.9)
Calving problems	5.4	(1.6)	1.6	(0.6)
Joint or navel problems	3.0	(0.7)	0.5	(0.2)
Other known reasons	2.8	(0.8)	5.2	(1.5)
Unknown reasons	5.6	(1.2)	11.4	(2.3)
Total	100.0		100.0	

*Deaths refer to cattle that were euthanized and cattle that died without assistance.

Percentage of preweaned and weaned heifer deaths,* by producer-reported cause



*Deaths refer to cattle that were euthanized or died unassisted.

As reported by producers, about 25 percent of cow deaths were downers (nonambulatory). Mastitis, injuries, and unknown reasons each accounted for slightly more than 10 percent of cow deaths (13.2, 11.0, and 11.9 percent, respectively). Respiratory disease accounted for a lower percentage of cow deaths on small operations (0.9 percent) than on large operations (4.9 percent). Cancer eye accounted for a higher percentage of cow deaths in the West region (3.1 percent) than in the East region (0.3 percent).

A.3.h. For the 5.6 percent of cows that were euthanized or died without assistance in 2013 (table A.3.b), percentage of deaths by producer-reported cause, herd size, and region:

Percent Cow Deaths*

	Herd size (number of cows)					
	Small (30–99)	**Medium** (100–499)	**Large** (500+)	**Region**		**All operations**
				West	**East**	
Producer-reported cause	**Pct. Std. error**	**Pct. Std. error**	**Pct. Std. error**	**Pct. Std. error**	**Pct. Std. error**	**Pct. Std. error**
Cancer eye	0.0 (—)	0.1 (0.1)	1.6 (0.5)	3.1 (1.1)	0.3 (0.1)	1.2 (0.4)
Clinical mastitis	11.3 (2.3)	12.7 (1.8)	13.5 (1.2)	13.3 (2.2)	13.1 (1.0)	13.2 (1.0)
Digestive						
Bloat	0.0 (—)	1.7 (0.8)	1.6 (0.4)	3.2 (1.0)	0.7 (0.2)	1.5 (0.3)
Bloody gut (HBS)	NA	1.5 (0.6)	3.3 (0.6)	3.5 (1.0)	2.4 (0.4)	2.7 (0.4)
DA (displaced abomasum)	3.3 (1.7)	5.0 (1.3)	2.0 (0.3)	1.3 (0.5)	3.1 (0.6)	2.5 (0.4)
Diarrhea less than 48 h	0.0 (—)	0.0 (—)	0.6 (0.3)	0.5 (0.3)	0.4 (0.2)	0.4 (0.2)
Diarrhea greater than 48 h	0.6 (0.4)	0.1 (0.1)	1.3 (0.4)	1.4 (0.7)	0.9 (0.3)	1.1 (0.3)
Other digestive	2.9 (1.7)	4.0 (1.6)	1.2 (0.4)	1.2 (0.5)	2.0 (0.7)	1.7 (0.5)
Downers (nonambulatory)	32.8 (4.9)	24.6 (3.6)	24.4 (3.1)	28.0 (4.5)	23.8 (2.8)	25.2 (2.6)
Injuries (e.g., slip/fall)	17.6 (4.2)	12.8 (2.7)	9.9 (1.2)	7.7 (1.5)	12.6 (1.1)	11.0 (1.0)
Lameness	2.5 (1.3)	1.6 (0.8)	3.9 (0.8)	2.8 (1.0)	3.8 (0.8)	3.5 (0.7)
Lymphoma (bovine leukosis)	0.7 (0.7)	1.1 (0.6)	0.1 (0.0)	0.0 (0.0)	0.4 (0.2)	0.3 (0.1)

continued→

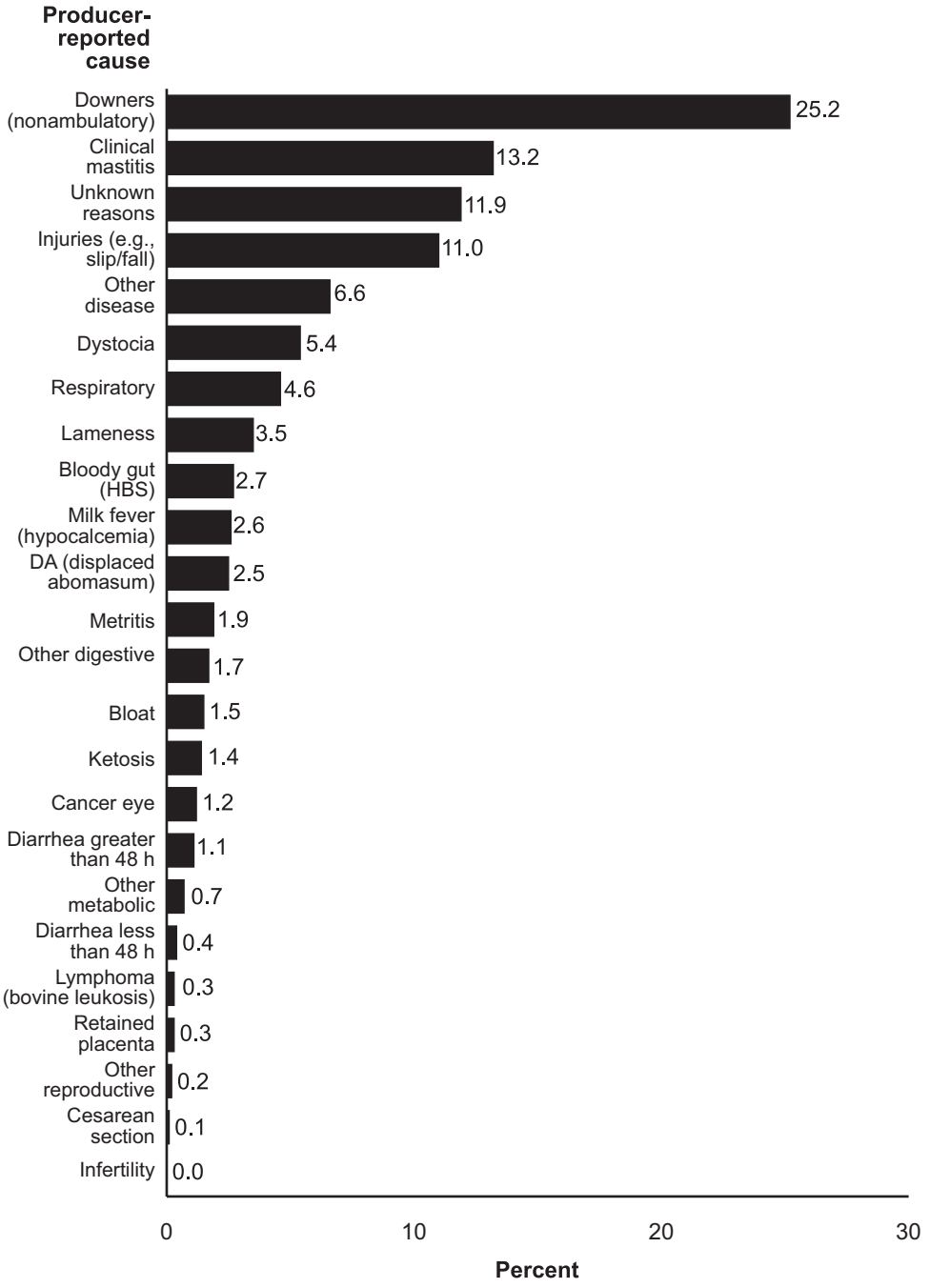
A.3.h. (cont'd.) For the 5.6 percent of cows that were euthanized or died without assistance in 2013 (table A.3.b), percentage of deaths by producer-reported cause, herd size, and region:

Percent Cow Deaths*

	Herd size (number of cows)			**Region**		
	Small (30–99)	**Medium** (100–499)	**Large** (500+)	**West**	**East**	**All operations**
Producer-reported cause	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**	**Std. Pct. error**
Metabolic						
Ketosis	0.2 (0.2)	1.4 (0.9)	1.5 (0.4)	1.1 (0.6)	1.5 (0.4)	1.4 (0.3)
Milk fever (hypocalcemia)	3.7 (1.5)	3.4 (1.2)	2.3 (0.4)	1.5 (0.4)	3.1 (0.6)	2.6 (0.4)
Other metabolic	1.6 (1.2)	0.3 (0.3)	0.7 (0.2)	0.1 (0.1)	1.0 (0.4)	0.7 (0.2)
Respiratory	0.9 (0.6)	5.0 (1.6)	4.9 (0.6)	4.0 (0.9)	4.9 (0.6)	4.6 (0.5)
Reproductive						
Dystocia	6.0 (1.6)	5.3 (1.5)	5.4 (1.0)	5.5 (1.5)	5.4 (0.9)	5.4 (0.8)
Cesarean section	0.8 (0.8)	0.3 (0.2)	0.0 (0.0)	0.0 (0.0)	0.2 (0.1)	0.1 (0.1)
Infertility	0.0 (—)	0.0 (0.0)	0.0 (0.0)	0.0 (—)	0.0 (0.0)	0.0 (0.0)
Metritis	0.0 (—)	1.2 (0.7)	2.2 (0.8)	1.4 (0.7)	2.1 (0.9)	1.9 (0.7)
Retained placenta	0.0 (—)	0.2 (0.2)	0.3 (0.1)	0.2 (0.1)	0.3 (0.2)	0.3 (0.1)
Other reproductive	1.3 (0.9)	0.0 (—)	0.2 (0.1)	0.2 (0.1)	0.2 (0.1)	0.2 (0.1)
Other disease	3.8 (2.4)	0.5 (0.4)	8.1 (4.3)	3.2 (2.3)	8.3 (4.8)	6.6 (3.5)
Unknown reasons	10.1 (3.1)	17.4 (5.3)	11.1 (2.6)	16.7 (4.8)	9.6 (1.9)	11.9 (2.2)
Total	100.0	100.0	100.0	100.0	100.0	100.0

*As a percentage of cow deaths in 2013.

For the 5.6 percent of cows that were euthanized or died without assistance in 2013, percentage of deaths by producer-reported cause



4. Carcass disposal methods

Disposal methods for dead cattle can vary according to local and State regulations. For instance, leaving a carcass for scavengers is illegal in Wisconsin but not in some other States. Carcasses in Minnesota must be disposed of within 72 hours and in Texas within 24 hours.

Burying, rendering, and composting were the primary carcass-disposal methods used by the highest percentages of operations. About one-fourth of operations used at least one of these methods for disposing of preweaned-heifer carcasses. A higher percentage of small and medium operations (33.9 and 28.9 percent, respectively) than large operations (6.5 percent) buried preweaned-heifer carcasses. The opposite was true for rendering: a higher percentage of large operations (52.3 percent) than small and medium operations (18.7 and 25.8 percent, respectively) rendered preweaned-heifer carcasses. Preweaned-heifer carcasses were left for wildlife on a higher percentage of small operations (25.1 percent) than medium or large operations (5.1 and 0.0 percent, respectively). Composting marked the only regional difference in methods used to dispose of preweaned-heifer carcasses. A lower percentage of operations in the West region composted carcasses compared with the East region (13.6 and 30.9 percent, respectively).

A.4.a. For the 80.3 percent of operations that had any preweaned heifer deaths in 2013, (table A.3.a), percentage of operations by primary method used to dispose of preweaned-heifer carcasses, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**						
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Primary method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bury	33.9	(7.4)	28.9	(6.1)	6.5	(2.7)	36.4	(10.6)	26.5	(4.4)	27.3	(4.2)
Burn/incinerate	0.7	(0.7)	3.2	(1.8)	2.8	(2.1)	4.4	(4.2)	1.7	(0.8)	1.9	(0.8)
Render	18.7	(5.8)	25.8	(5.7)	52.3	(5.0)	37.5	(9.4)	26.2	(3.8)	27.2	(3.5)
Compost	21.6	(5.9)	37.0	(6.7)	34.1	(4.7)	13.6	(4.1)	30.9	(4.2)	29.4	(3.9)
Landfill	0.0	(—)	0.0	(—)	3.6	(2.3)	4.7	(4.5)	0.2	(0.2)	0.6	(0.4)
Left for wildlife	25.1	(6.5)	5.1	(2.6)	0.0	(—)	3.4	(3.2)	14.3	(3.5)	13.4	(3.3)
Other	0.0	(—)	0.0	(—)	0.7	(0.7)	0.0	(—)	0.1	(0.1)	0.1	(0.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Methods used to dispose of dead weaned heifers were similar to those used for dead preweaned heifers. A higher percentage of small operations than large operations (36.3 and 6.0 percent, respectively) buried weaned heifer carcasses. Rendering was used by a higher percentage of large operations (64.0 percent) than small operations (23.4 percent). Almost 20 percent of small operations (17.8 percent) left carcasses for wildlife.

A.4.b. For the 66.6 percent of operations that had any weaned heifer deaths in 2013 (table A.3.a), percentage of operations by primary method used to dispose of weaned-heifer carcasses, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Primary method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bury	36.3	(9.1)	23.2	(6.3)	6.0	(2.5)	30.9	(9.7)	23.8	(5.1)	24.6	(4.6)
Burn/incinerate	0.9	(0.9)	2.7	(1.9)	2.5	(1.9)	3.8	(3.7)	1.7	(0.9)	1.9	(0.9)
Render	23.4	(7.8)	43.5	(7.0)	64.0	(4.8)	55.3	(9.6)	38.0	(4.8)	40.0	(4.4)
Compost	20.5	(6.8)	27.7	(7.2)	22.9	(4.1)	6.0	(2.6)	26.0	(4.5)	23.7	(4.0)
Landfill	0.0	(—)	2.0	(1.4)	3.3	(2.1)	4.1	(4.0)	1.1	(0.6)	1.5	(0.7)
Left for wildlife	17.8	(6.2)	0.8	(0.8)	0.0	(—)	0.0	(—)	8.6	(2.9)	7.6	(2.6)
Other	1.2	(1.1)	0.0	(—)	1.3	(0.9)	0.0	(—)	0.9	(0.6)	0.8	(0.5)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

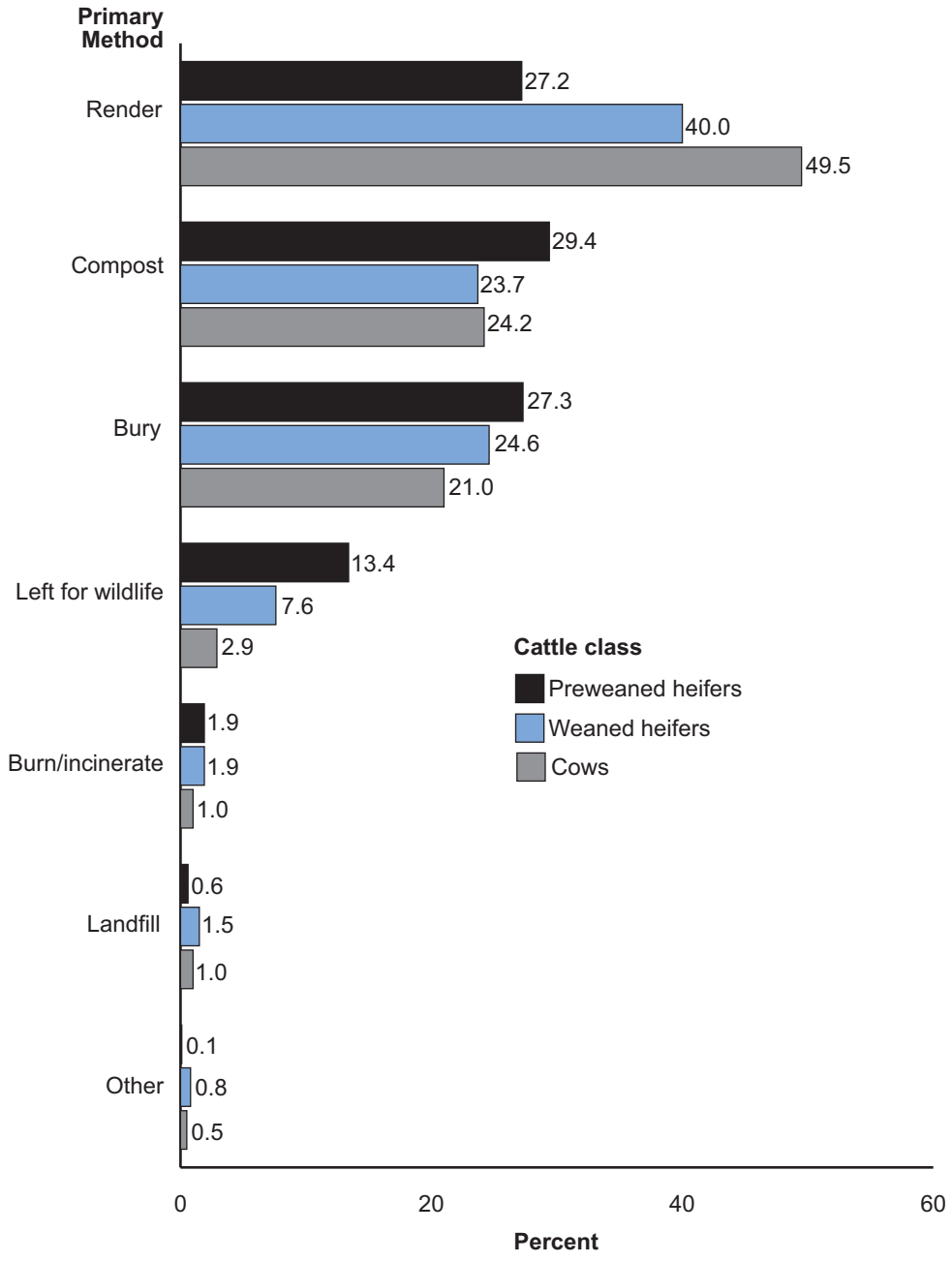
Primary methods for disposing of cow carcasses differed from the primary methods used for heifer carcasses. Almost one-half of operations (49.5 percent) used rendering as the primary cow disposal method, while about one-fourth buried (21.0 percent) or composted (24.2 percent) cow carcasses. Burying cow carcasses was the primary disposal method on a higher percentage of small and medium operations than large operations. Rendering was used by a higher percentage of large operations compared with small or medium operations. The regional difference in composting observed in preweaned and weaned heifer disposal was also observed in cow disposal. Less than 4 percent of operations in the West region (3.2 percent) composted cows compared with about one-fourth of operations in the East region (26.8 percent).

A.4.c. For the 91.1 percent of operations that had any cow deaths in 2013 (table A.3.a), percentage of operations by primary method used to dispose of cow carcasses, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Primary method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bury	29.7	(6.7)	18.6	(4.7)	2.9	(1.5)	25.2	(7.9)	20.4	(4.1)	21.0	(3.7)
Burn/incinerate	0.5	(0.5)	1.0	(0.9)	2.1	(1.6)	2.8	(2.7)	0.7	(0.5)	1.0	(0.5)
Render	42.2	(6.8)	47.5	(6.1)	71.3	(4.2)	65.4	(8.3)	47.5	(4.3)	49.5	(4.0)
Compost	22.0	(6.1)	29.7	(6.2)	20.3	(3.7)	3.2	(1.6)	26.8	(4.1)	24.2	(3.7)
Landfill	0.0	(—)	1.4	(0.9)	2.7	(1.8)	3.0	(2.9)	0.7	(0.3)	1.0	(0.5)
Left for wildlife	4.8	(2.4)	1.9	(1.9)	0.0	(—)	0.0	(—)	3.3	(1.5)	2.9	(1.3)
Other	0.8	(0.7)	0.0	(—)	0.5	(0.5)	0.4	(0.3)	0.5	(0.4)	0.5	(0.3)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

For operations that had any deaths in the following classes of cattle in 2013, percentage of operations by primary method used to dispose of carcasses



B. Hoof Health

1. Lameness detection

Lameness is a leading animal welfare concern for dairy producers. Prompt detection and appropriate treatment improve the probability that an animal will recover. Most operations (97.7 percent) reported lameness in bred heifers and/or cows. Lameness in cows was reported on a higher percentage of operations (89.7 percent) than lameness in bred heifers (55.2 percent). The percentage of operations with lameness in bred heifers ranged from 38.8 percent of small operations to 90.4 percent of large operations. Lameness in both bred heifers and cows was reported on a higher percentage of operations in the West region than in the East region.

B.1.a. Percentage of operations with at least one reported case of lameness in bred heifers or cows in 2013, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bred heifers	38.8	(6.3)	65.1	(6.5)	90.4	(3.4)	81.1	(6.5)	52.4	(4.4)	55.2	(4.1)
Cows	84.7	(4.9)	92.8	(2.7)	100.0	(—)	100.0	(—)	88.6	(3.0)	89.7	(2.8)
Either	96.3	(2.3)	98.8	(1.2)	100.0	(—)	100.0	(—)	97.4	(1.4)	97.7	(1.3)

In 2013, 3.2 percent of bred heifers and 16.8 percent of cows were reported to be lame at some point in the year. There were no differences by herd size in the percentages of lame bred heifers or cows. A lower percentage of bred heifers in the West region than in the East region (1.5 and 4.5 percent, respectively) were lame.

B.1.b. Operation average percentage of lame bred heifers and cows in 2013, by herd size and by region:

Operation Average Percent Lame Cattle*

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bred heifers	2.5	(0.7)	6.6	(2.7)	2.6	(0.4)	1.5	(0.2)	4.5	(0.9)	3.2	(0.5)
Cows	13.0	(1.7)	13.4	(1.8)	18.0	(2.0)	16.7	(2.7)	16.9	(1.9)	16.8	(1.6)

*As a percentage of January 1, 2014, inventory.

On the majority of operations (56.2 percent) between 0.1 and 9.9 percent of bred heifers and/or cows were reported to be lame at some point in 2013, and on about one-third of operations (31.9 percent) between 10.0 and 24.9 percent of bred heifers and/or cows were lame. A higher percentage of large operations (18.4 percent) than small operations (3.8 percent) reported that 25.0 percent or more of their bred heifers or cows were lame.

B.1.c. Percentage of operations by percentage of lame bred heifers and/or cows in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Percent lame	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	3.7	(2.3)	1.2	(1.2)	0.0	(—)	0.0	(—)	2.6	(1.4)	2.3	(1.3)
0.1–9.9	60.2	(6.4)	50.5	(6.5)	53.3	(6.2)	61.7	(8.4)	55.6	(4.4)	56.2	(4.1)
10.0–24.9	32.3	(6.2)	33.4	(6.1)	28.3	(5.3)	27.5	(7.6)	32.4	(4.2)	31.9	(3.9)
25.0 or more	3.8	(2.0)	14.9	(5.0)	18.4	(4.9)	10.8	(4.7)	9.4	(2.2)	9.5	(2.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Two of the most common infectious causes of lameness are digital dermatitis (hairy heel warts) and footrot. Digital dermatitis is caused by *Treponema*-like organisms from the spirochete family. These bacteria typically produce proliferative lesions around the heels, which is why the disease is commonly referred to as hairy heel warts. Once an operation has cattle infected with digital dermatitis, the infection is difficult to eliminate from the herd. *Fusobacterium necrophorus* and *Bacteroides melaninogenicus* are common causes of footrot.

Producers on about one-third of operations reported that they had heifers with digital dermatitis or footrot (31.1 and 31.3 percent, respectively) in 2013. The percentage of operations with at least one case of either disease generally increased as herd size increased. A higher percentage of operations in the West region than in the East region had either condition in cattle.

In 2013, 75.5 percent of operations reported at least one case of digital dermatitis and 69.5 percent reported at least one case of footrot. A lower percentage of small operations had either lameness condition in cattle compared with medium and large operations. Footrot was reported by a higher percentage of operations in the West region (96.8 percent) than in the East region (66.6 percent). The percentage of operations with digital dermatitis or footrot in either cows or bred heifers was very similar to the percentage reported for cows.

B.1.d. Percentage of operations that reported at least one case of digital dermatitis and/or footrot in bred heifers or cows in 2013, by cause of lameness, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cause of lameness	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bred heifers												
Digital dermatitis (hairy heel warts)	7.2	(3.0)	46.2	(6.6)	79.8	(4.3)	57.9	(9.3)	28.3	(3.3)	31.1	(3.2)
Footrot	15.1	(4.9)	42.4	(6.6)	63.0	(5.1)	70.0	(7.8)	27.1	(3.7)	31.3	(3.6)
Cows												
Digital dermatitis (hairy heel warts)	60.1	(6.3)	91.5	(4.0)	95.0	(2.2)	78.7	(7.9)	75.2	(3.9)	75.5	(3.6)
Footrot	54.0	(6.6)	82.4	(4.4)	94.1	(2.4)	96.8	(3.1)	66.6	(4.3)	69.5	(3.9)
Either												
Digital dermatitis (hairy heel warts)	60.3	(6.3)	91.5	(4.0)	95.7	(2.1)	79.8	(8.0)	75.3	(3.9)	75.7	(3.6)
Footrot	56.0	(6.6)	84.6	(4.2)	94.1	(2.4)	96.9	(3.0)	68.5	(4.2)	71.3	(3.9)

Digital dermatitis accounted for 70.9 percent of producer-reported lameness cases in bred heifers, and footrot accounted for 16.7 percent of cases. There were no percentage differences by herd size or by region. In cows, digital dermatitis and footrot accounted for 36.0 and 16.9 percent of lameness cases, respectively.

B.1.e. For lame cows and bred heifers (table B.1.b), percentage of lameness cases caused by digital dermatitis or footrot, and by herd size and region:

Percent Lameness Cases

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cause of lameness	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bred heifers												
Digital dermatitis (hairy heel warts)	35.1	(17.1)	79.0	(5.8)	70.9	(4.0)	66.1	(10.1)	72.1	(4.0)	70.9	(3.8)
Footrot	20.2	(8.9)	16.5	(4.4)	16.4	(3.6)	16.3	(6.5)	16.8	(2.9)	16.7	(2.7)
Cows												
Digital dermatitis (hairy heel warts)	43.2	(5.9)	55.5	(6.1)	31.1	(5.9)	30.4	(8.2)	40.1	(6.5)	36.0	(5.1)
Footrot	13.8	(2.8)	28.7	(9.5)	14.5	(3.0)	16.1	(4.2)	17.5	(4.2)	16.9	(3.0)

Owners identified lame cows on nearly all operations (95.8 percent), and milkers identified lame cows on nearly two-thirds of operations (64.2 percent). Owners were responsible for identifying lame cows on a lower percentage of large operations than on small or medium operations. Herdsman and breeders were responsible for identifying lame cows on a higher percentage of large operations than on small or medium operations.

Owners identified lame cows on a higher percentage of operations in the East region than in the West region, and herdsmen were responsible for identifying lame cows on a higher percentage of operations in the West region than in the East region. More than one of the personnel types listed in the following table might have been responsible for identifying lame cows.

B.1.f. Percentage of operations by personnel responsible for identifying lame cows, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Owner	99.2	(0.7)	97.4	(1.5)	82.8	(3.8)	78.4	(6.4)	97.7	(0.7)	95.8	(0.9)
Milkers	53.0	(6.4)	72.7	(5.6)	83.0	(3.7)	76.6	(6.6)	62.8	(4.2)	64.2	(3.9)
Herdsman	22.0	(5.5)	52.9	(6.5)	93.4	(2.6)	79.7	(6.4)	39.6	(4.1)	43.7	(3.8)
Breeders	8.6	(3.8)	15.7	(4.1)	49.1	(5.3)	34.4	(8.4)	16.0	(2.7)	17.9	(2.7)
Specific health personnel (e.g., herd health, hospital crew)	10.1	(4.2)	2.0	(1.4)	20.6	(4.3)	20.4	(6.1)	8.2	(2.5)	9.5	(2.4)
Other	3.2	(2.6)	3.4	(1.9)	9.6	(3.1)	4.5	(2.8)	4.4	(1.7)	4.4	(1.6)

Prompt detection and treatment of lameness improves the probability of a cure. Ideally, lame cows should receive treatment within a day or two. More than 50 percent of operations (53.1 percent) treated lame cows within a day of being identified as lame.

B.1.g. Percentage of operations by how soon after being identified as lame cows generally received treatment, and by herd size and region:

Percent Operations

	Herd size (number of cows)											
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**Region** **West**		**Region** **East**		**All operations**	
Treated within a...	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Few hours	15.5	(5.4)	5.1	(2.0)	10.1	(3.2)	14.8	(5.4)	10.9	(3.2)	11.3	(2.9)
A day	49.8	(6.8)	35.5	(6.2)	29.8	(5.0)	34.6	(7.7)	42.6	(4.5)	41.8	(4.2)
A week	29.1	(5.6)	43.2	(6.4)	55.8	(5.6)	50.6	(8.7)	36.8	(4.0)	38.3	(3.8)
A month	5.6	(2.6)	16.1	(5.1)	4.4	(1.7)	0.0	(—)	9.6	(2.4)	8.6	(2.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

2. Footbath use for cows

Footbaths are used to help prevent and treat the infectious causes of lameness. The majority of operations (56.9 percent) did not use a footbath for cows in 2013. Almost one-third of operations (30.6 percent) used footbaths throughout the year, and 12.5 percent of operations used footbaths either seasonally or occasionally. The use of footbaths throughout the year increased as herd size increased. More than 80 percent of small operations (83.1 percent) did not use any footbaths compared with 93.0 percent of operations that did use them in 2013.

About three-fifths of operations in the West region (60.5 percent) used footbaths throughout the year, while 60.2 percent of operations in the East region did not use a footbath.

B.2.a. Percentage of operations by footbath use in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Footbath use	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Throughout the year	8.9	(3.4)	38.3	(6.1)	82.0	(5.7)	60.5	(8.9)	27.2	(3.2)	30.6	(3.1)
Seasonally/ occasionally	8.0	(2.9)	21.2	(5.0)	11.0	(5.3)	11.4	(7.6)	12.6	(2.5)	12.5	(2.4)
Any use	16.9	(4.3)	59.4	(6.4)	93.0	(2.8)	71.9	(8.2)	39.8	(3.8)	43.1	(3.6)
No use	83.1	(4.3)	40.6	(6.4)	7.0	(2.8)	28.1	(8.2)	60.2	(3.8)	56.9	(3.6)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

More than three-fourths of operations that used footbaths (80.9 percent) used them weekly or more frequently. Of operations that used a footbath, 25.8 percent did so daily. A lower percentage of small operations (8.5 percent) used daily footbaths than large operations (37.4 percent).

B.2.b. For the 43.1 percent of operations that used footbaths (table B.2.a), percentage of operations by frequency footbaths were used, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Frequency of footbath use	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Daily for all cows	8.5	(8.1)	23.8	(6.4)	37.4	(6.2)	35.6	(10.3)	23.8	(4.4)	25.8	(4.1)
Less than daily but at least weekly for all cows	44.0	(13.6)	56.6	(7.5)	59.5	(6.2)	62.0	(10.2)	53.7	(5.5)	55.1	(4.8)
Less than weekly but at least monthly for all cows	24.5	(12.5)	14.4	(5.1)	3.2	(1.7)	2.4	(1.7)	14.2	(4.2)	12.2	(3.5)
Intermittently for specific cows (e.g., lame pen only)	6.5	(5.0)	1.9	(1.9)	0.0	(—)	0.0	(—)	2.6	(1.5)	2.1	(1.3)
Other	16.6	(9.5)	3.2	(2.3)	0.0	(—)	0.0	(—)	5.7	(2.7)	4.7	(2.2)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

More than one-half of cows on operations that used footbaths (53.1 percent) were on operations that used a footbath less than daily but at least weekly, while 41.8 percent of cows were on operations that used a footbath daily. A lower percentage of cows on small operations (8.3 percent) were on operations that used footbaths daily compared with cows on large operations (45.7 percent).

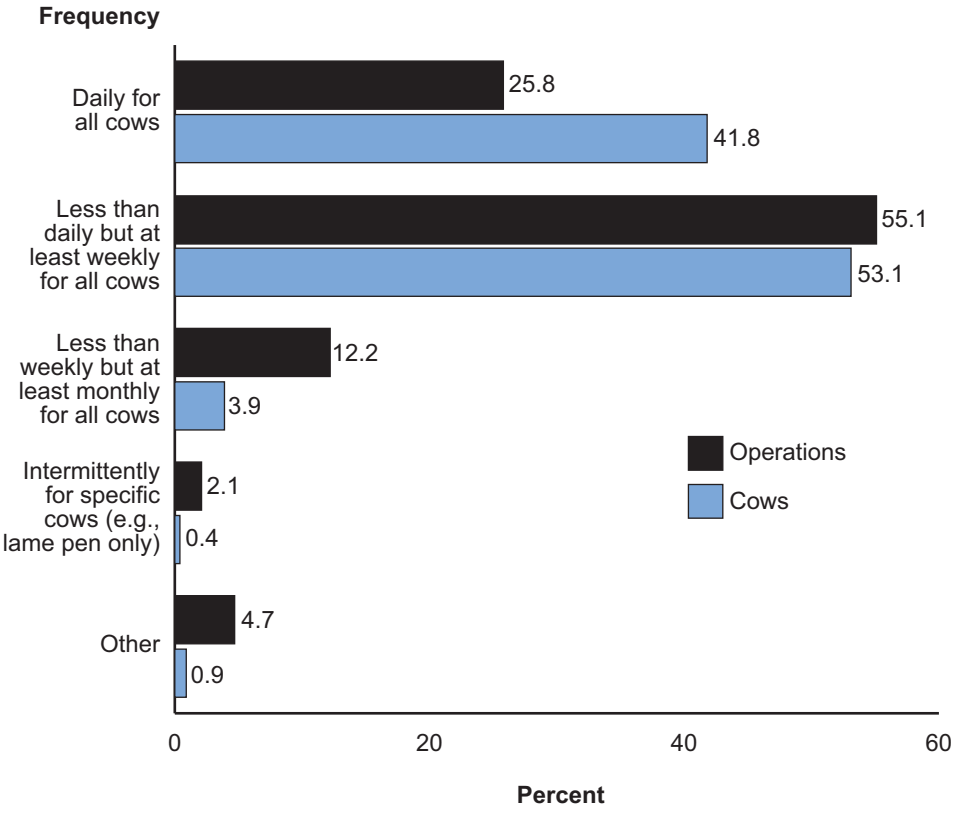
B.2.c. For the 43.1 percent of operations that used footbaths (table B.2.a), percentage of cows by frequency footbaths were used, and by herd size and region:

Percent Cows*

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Footbath frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Daily for all cows	8.3	(8.0)	19.9	(5.6)	45.7	(9.1)	44.9	(13.1)	38.8	(9.8)	41.8	(8.2)
Less than daily but at least weekly for all cows	35.9	(13.4)	59.4	(7.7)	52.5	(8.9)	54.0	(13.0)	52.2	(8.9)	53.1	(7.8)
Less than weekly but at least monthly for all cows	27.0	(13.2)	14.9	(5.6)	1.8	(1.1)	1.0	(0.8)	6.6	(2.3)	3.9	(1.3)
Intermittently for specific cows (e.g., lame pen only)	5.5	(3.9)	2.2	(2.2)	0.0	(—)	0.0	(—)	0.7	(0.6)	0.4	(0.3)
Other	23.3	(13.6)	3.7	(2.8)	0.0	(—)	0.0	(—)	1.7	(0.9)	0.9	(0.5)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*As a percentage of January 1, 2014, inventory.

For the 43.1 percent of operations that used footbaths, percentage of operations and percentage of cows on those operations by frequency footbaths were used



Copper sulfate was the footbath medication used by 80.9 percent of operations that used footbaths. All small operations that used footbaths (100.0 percent) used copper sulfate compared with 80.0 percent of medium operations and 71.5 percent of large operations. A lower percentage of operations in the West region used copper sulfate compared with operations in the East region (59.3 and 85.3 percent, respectively). Formalin or formaldehyde was used in footbaths on a higher percentage of medium and large operations than on small operations.

B.2.d. For the 43.1 percent of operations that used footbaths (table B.2.a), percentage of operations by medication most commonly used in footbaths, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Footbath medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Copper sulfate	100.0	(—)	80.0	(6.3)	71.5	(4.8)	59.3	(9.3)	85.3	(3.6)	80.9	(3.4)
Formalin/ formaldehyde	0.0	(—)	11.8	(4.8)	18.7	(4.2)	27.7	(8.1)	8.8	(2.7)	12.0	(2.6)
Oxytetracycline	0.0	(—)	0.0	(—)	1.7	(1.6)	3.8	(3.7)	0.0	(—)	0.6	(0.6)
Hydrogen peroxide	0.0	(—)	2.1	(2.1)	0.0	(—)	0.0	(—)	1.1	(1.1)	0.9	(0.9)
Other*	0.0	(—)	6.1	(4.4)	8.1	(2.9)	9.2	(5.1)	4.8	(2.3)	5.6	(2.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Zinc sulfate represented the majority of “other” footbath medications.

The number of cows that can go through a footbath before it should be drained, cleaned, and replenished with medication (i.e., recharging) depends on the medications used and cleanliness of the cows going through the footbath. A two-stage footbath in which the first footbath is used for cleaning and the second footbath for medication can increase the number of cows that can use the footbath before it has to be recharged. Medications such as copper sulfate are rapidly neutralized by organic material such as manure and need to be recharged sooner than footbaths containing formalin.

Of operations that used footbaths, 28.7 percent recharged footbaths after 100 to 199 cows had passed through, 22.9 percent recharged footbaths after 200 to 299 cows, and 24.1 percent recharged after 400 or more cows. A higher percentage of small operations (49.7 percent) recharged footbaths after 100 to 199 cows compared with large operations (14.1 percent). A higher percentage of medium and large operations than small operations recharged footbaths after 400 or more cows had passed through.

B.2.e. For the 43.1 percent of operations that used footbaths (table B.2.a), percentage of operations by number of cows that went through the footbath before it was drained, cleaned, and replenished with medication, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number of cows	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1–99	13.2	(9.1)	3.6	(2.6)	1.6	(1.6)	3.7	(3.5)	5.1	(2.6)	4.8	(2.3)
100–199	49.7	(13.7)	31.6	(7.4)	14.1	(3.6)	11.5	(5.9)	32.2	(5.4)	28.7	(4.7)
200–299	17.1	(8.3)	28.4	(6.5)	20.0	(4.9)	13.9	(5.8)	24.8	(4.4)	22.9	(3.7)
300–399	20.0	(10.9)	13.9	(5.8)	25.3	(5.4)	30.5	(8.5)	17.2	(4.3)	19.4	(3.9)
400 or more	0.0	(—)	22.6	(6.5)	39.0	(6.2)	40.5	(10.1)	20.8	(4.1)	24.1	(3.9)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

3. Hoof trimming

Hoof trimming is an important component of managing and preventing lameness. A good hoof trimmer can identify the major causes of lameness and recommend appropriate control measures. Almost 90 percent of operations (88.6 percent) performed some hoof trimming in 2013. A lower percentage of small operations (80.0 percent) trimmed hooves compared with medium and large operations (97.3 and 98.6 percent, respectively).

B.3.a. Percentage of operations that had cows' hooves trimmed in 2013, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
80.0	(5.1)	97.3	(1.6)	98.6	(1.3)	95.2	(3.2)	87.8	(3.0)	88.6	(2.7)

About one-third of operations trimmed hooves once or twice per lactation (34.5 and 29.8 percent, respectively). Cows received hoof trims twice per lactation on a lower percentage of small operations (20.0 percent) than large operations (46.1 percent). Hooves were not trimmed in 2013 on a higher percentage of small operations than medium or large operations.

B.3.b. Percentage of operations by how frequently cows' hooves were trimmed in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Twice per lactation	20.0	(5.2)	37.0	(6.3)	46.1	(4.8)	18.5	(7.4)	31.1	(3.8)	29.8	(3.5)
Once per lactation	30.8	(6.3)	40.1	(6.4)	35.4	(5.1)	49.8	(8.6)	32.7	(4.2)	34.5	(3.9)
Only when lame or in visible need of a trim	28.4	(6.1)	15.9	(4.3)	12.4	(3.7)	26.9	(7.4)	21.1	(3.9)	21.7	(3.5)
Other	0.8	(0.8)	4.4	(2.8)	4.7	(1.9)	0.0	(—)	2.9	(1.1)	2.6	(1.0)
Hooves not trimmed in 2013	20.0	(5.0)	2.7	(1.6)	1.4	(1.3)	4.8	(3.2)	12.2	(3.0)	11.4	(2.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

A professional hoof trimmer trimmed the majority of hooves on 80.2 percent of operations that had hooves trimmed, and the owner or operation personnel trimmed hooves on 13.9 percent.

B.3.c. For the 88.6 percent of operations that had cows' hooves trimmed (table B.3.a), percentage of operations by personnel who trimmed the majority of hooves, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Professional hoof trimmer (not operation personnel)	71.1	(6.9)	90.4	(3.8)	85.2	(3.9)	76.0	(7.1)	80.7	(4.1)	80.2	(3.7)
Owner or operation personnel	17.8	(6.0)	7.7	(3.3)	14.8	(3.9)	24.0	(7.1)	12.7	(3.5)	13.9	(3.2)
Veterinarian (not operation personnel)	11.1	(4.7)	1.9	(1.9)	0.0	(—)	0.0	(—)	6.6	(2.7)	5.9	(2.4)
Other	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Of operations that trimmed hooves in 2013, 80.2 percent had a professional hoof trimmer visit to evaluate lame cows or to perform routine hoof trimming, and 32.4 percent of operations had a veterinarian visit for the same reasons. Veterinarians visited a lower percentage of large operations than small or medium operations to evaluate lame cows or to perform routine hoof trimming. They also visited a lower percentage of operations in the West region than in the East region.

B.3.d. For the 88.6 percent of operations that had cows' hooves trimmed (table B.3.a), percentage of operations that had the following personnel visit to evaluate lame cows or to perform routine hoof trimming, by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Professional hoof trimmer	72.0	(6.9)	86.6	(5.0)	89.2	(3.4)	87.5	(5.2)	79.3	(4.2)	80.2	(3.8)
Veterinarian	37.7	(7.3)	37.1	(7.0)	7.4	(2.8)	4.8	(3.4)	35.1	(4.8)	32.4	(4.4)
Other	0.0	(—)	0.0	(—)	5.5	(2.7)	3.9	(3.8)	0.6	(0.3)	0.9	(0.5)

On average, professional hoof trimmers made 10.5 visits in 2013 to evaluate lame cows or to perform routine hoof trimming. The average number of visits by professional hoof trimmers increased as herd size increased. The West region had a higher average number of professional hoof trimmer visits (31.2) than the East region (7.9). On average, veterinarians made 1.3 visits in 2013 evaluate lame cows or for hoof trimming. Veterinarian visits were lower for large operations and operations in the West region, compared with small and medium operations and operations in the East region.

B.3.e. For the 88.6 percent of operations that had cows' hooves trimmed (table B.3.a), average number of visits made in 2013 to evaluate lame cows or for routine hoof trimming, by personnel who made the visit, herd size, and region:

Average Number of Visits

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Personnel	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Professional hoof trimmer	1.8	(0.3)	7.7	(0.9)	36.2	(3.1)	31.2	(4.7)	7.9	(0.8)	10.5	(1.0)
Veterinarian	1.4	(0.4)	1.6	(0.4)	0.2	(0.1)	0.2	(0.1)	1.4	(0.3)	1.3	(0.3)
Other	0.0	(—)	0.0	(—)	3.1	(2.1)	0.0	(0.0)	0.6	(0.4)	0.5	(0.4)

C. Surgical Procedures

1. Disbudding/dehorning

Removing the horns of dairy cattle reduces the risk of injury to other cattle and to people. The major approaches for removing horns are manual removal and breeding programs designed to produce animals without horns (polled). Researchers have also prevented horn growth in cattle through gene editing, in which the gene coding for horn growth is replaced by genes from a polled animal. Disbudding refers to the removal of horn buds in very young cattle before the buds attach to the skull (usually by 8 weeks of age), whereas dehorning refers to the removal of horns after they have attached to the skull. Sometimes the terms disbudding and dehorning are used interchangeably.

The Animal Welfare Committee of the American Veterinary Medical Association (AVMA) states the following: “Because castration and dehorning cause pain and discomfort, the AVMA recommends the use of procedures and practices that reduce or eliminate these effects. Procedures and practices include genetic selection, when appropriate, and the use of approved or clinically effective medications permissible via the Animal Medicinal Drug Use Clarification Act of 1994. Studies indicate that preoperative use of nonsteroidal anti-inflammatory agents and local anesthetics reduce the pain and distress associated with castration and dehorning.” The AVMA also recommends that dehorning be done at the earliest age possible and “disbudding is the preferred method of dehorning calves. Local anesthetic and nonsteroidal anti-inflammatory drugs (NSAIDs) should be considered for other dehorning procedures.” The American Association of Bovine Practitioners also recommends dehorning “at the youngest age prudent within the management scheme” and “before the horn base grows larger than 1-inch in diameter.” Additionally, “calves benefit from the mitigation of both the pain associated with the procedure itself and during the recovery and healing period.” In order to reduce the stress of disbudding/dehorning, “producers should be encouraged to incorporate, or at least begin to incorporate, polled genetics into their herds.”

Heifer calves were disbudded/dehorned on 94.3 percent of operations. A lower percentage of large operations (77.0 percent) routinely disbudded/dehorned heifer calves compared with small (99.3 percent) and medium operations (95.7 percent). A lower percentage of operations in the West region (68.8 percent) routinely disbudded/dehorned calves compared with operations in the East region (97.2 percent). Herd-size and regional differences are likely related to large operations moving calves to heifer-raising facilities when calves were still too young for some methods of disbudding/dehorning.

C.1.a. Percentage of operations that routinely disbudded/dehorned heifer calves while calves were on the operation, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
99.3	(0.7)	95.7	(2.1)	77.0	(5.4)	68.8	(8.6)	97.2	(0.9)	94.3	(1.3)

More than two-thirds of operations (69.9 percent) disbudded/dehorned at least one calf using a hot iron. A similar percentage of operations disbudded/dehorned using caustic paste (16.4 percent), tube, spoon, or gouge (13.2 percent), or saws, wire, or Barnes dehorner (16.3 percent). Caustic paste was used on a higher percentage of large operations (28.2 percent) compared with small operations (9.9 percent). Alternatively, a higher percentage of small operations (22.3 percent) used saws, wires, or Barnes dehorners than large operations (5.7 percent). Tubes, spoons, or gouge dehorners were used on a higher percentage of medium operations (16.5 percent) than large operations (3.5 percent). The only regional difference noted in disbudding/dehorning methods was that a lower percentage of operations in the West region than in the East region used a hot iron for disbudding/dehorning (45.2 and 72.7 percent, respectively). Operations could have used more than one method.

C.1.b. Percentage of operations by disbudding/dehorning method(s) used, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Hot iron (Buddex, electric, Portasol)	74.2	(5.2)	71.7	(5.7)	54.4	(5.2)	45.2	(8.4)	72.7	(3.6)	69.9	(3.4)
Caustic paste	9.9	(4.1)	20.6	(5.1)	28.2	(4.2)	18.3	(5.8)	16.1	(2.9)	16.4	(2.7)
Tube, spoon, or gouge	14.7	(4.0)	16.5	(4.3)	3.5	(1.8)	12.1	(7.2)	13.4	(2.6)	13.2	(2.5)
Saws, wire, or Barnes	22.3	(5.2)	12.0	(4.8)	5.7	(2.6)	7.8	(4.2)	17.2	(3.4)	16.3	(3.1)
Other	1.1	(1.1)	0.0	(—)	1.6	(1.1)	1.1	(1.1)	0.8	(0.6)	0.8	(0.6)

More than one-half of dehorned calves (54.6 percent) were disbudded/dehorned with a hot iron, while about one-third of calves (32.5 percent) were disbudded/dehorned using caustic paste. Hot-iron disbudding/dehorning was the primary method used on small and medium operations (63.4 and 64.9 percent, respectively). A similar percentage of heifer calves on large operations were disbudded/dehorned using a hot iron or caustic paste (49.8 and 42.4 percent, respectively). A tube, spoon, or gouge was used on a lower percentage of heifer calves on large operations than on small or medium operations. A hot iron was used to disbud/dehorn a lower percentage of heifer calves in the West region (33.1 percent) than in the East region (63.5 percent).

C.1.c. For the 94.3 percent of operations that disbudded/dehorned heifer calves (table C.1.a), percentage of heifer calves by disbudding/dehorning method, and by herd size and region:

Percent Heifer Calves*

	Herd size (number of cows)											
	Small (30–99)		Medium (100–499)		Large (500+)		Region				All operations	
							West		East			
Method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Hot iron (Buddex, electric, Portasol)	63.4	(5.5)	64.9	(6.3)	49.8	(7.3)	33.1	(9.1)	63.5	(5.7)	54.6	(5.3)
Caustic paste	7.3	(3.9)	15.0	(4.8)	42.4	(7.6)	46.6	(11.5)	26.7	(5.9)	32.5	(5.6)
Tube, spoon, or gouge	8.4	(2.6)	10.7	(4.0)	1.0	(0.7)	5.2	(2.8)	3.4	(0.7)	3.9	(1.0)
Saws, wire, or Barnes	16.4	(4.3)	9.3	(4.9)	5.7	(3.5)	12.7	(8.0)	5.6	(1.7)	7.7	(2.6)
Other	2.0	(2.0)	0.0	(—)	1.0	(1.0)	2.3	(2.3)	0.3	(0.3)	0.9	(0.7)

*As a percentage of preweaned and weaned heifer inventory on January 1, 2014. Totals don't add to 100.0 percent because some operations that dehorned heifers didn't dehorn all calves.

Disbudding/dehorning methods commonly differ by age of the calf at the time of the procedure. For instance, caustic paste is a method of disbudding/dehorning that can be used on day-old calves, while saws, wires, or Barnes dehorners are used on older calves that have prominent horn growth. Hot-iron disbudding/dehorning was used on heifer calves at an operation average of 7.1 weeks of age. The operation average age at disbudding/dehorning using a hot iron was higher in the West region than in the East region (10.7 and 6.8 weeks, respectively) [data not shown]. Caustic paste was used for disbudding/dehorning at the lowest operation average age of 2.3 weeks. The operation average age of calves when using tubes, spoons, or gouge dehorning was 13.5 weeks.

C.1.d. For the 94.3 percent of operations that disbudded/dehorned heifer calves (table C.1.a), percentage of calves by dehorning method used, and operation average age of calves when performing the selected method:

Method	Percent calves[1]	Std. error	Average age (wk)	Std. error
Hot iron	54.6	(5.3)	7.1	(0.4)
Caustic paste	32.5	(5.6)	2.3	(0.4)
Tube, spoon, or gouge	3.9	(1.0)	13.5	(1.3)
Saws, wire, or Barnes	7.7	(2.6)	21.8	(3.0)
Other	0.9	(0.7)	[2]	
Average age	NA		8.8	(0.7)

[1]As a percentage of preweaned and weaned heifer inventory on January 1, 2014.
[2]Too few to report.

Analgesics/anesthetics reduce pain during disbudding/dehorning and were used by 28.2 percent of operations that disbudded/dehorned heifer calves. The highest percentage of operations used a hot iron (69.9 percent), and 30.0 percent of these operations used analgesics/anesthetics.

C.1.e. Percentage of operations that disbudded/dehorned heifer calves, and percentage of these operations that gave heifer calves analgesics/anesthetics when disbudding/dehorning, by method used:

Method	Percent operations	Std. error	Percent operations that used analgesics/ anesthetics	Std. error
Hot iron	69.9	(3.4)	30.0	(4.6)
Caustic paste	16.4	(2.7)	5.6	(4.1)
Tube, spoon, or gouge	13.2	(2.5)	21.4	(7.9)
Saws, wire, or Barnes	16.3	(3.1)	16.2	(7.7)
Other	0.8	(0.6)	6.3	(6.4)
Any	94.3	(1.3)	28.2	(3.8)

Tubes, spoons, gouges, saws, wire, and Barnes dehorners commonly cause bleeding. About one-third of operations that disbudded/dehorned heifer calves (31.5 percent) used a method that can cause bleeding. A higher percentage of small operations (37.0 percent) than large operations (14.0 percent) used a dehorning method that commonly causes bleeding.

C.1.f. For the 94.3 percent of operations that routinely disbudded/dehorned heifer calves (table C.1.a), percentage of operations that disbudded/dehorned calves with equipment that typically causes bleeding, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
37.0	(6.1)	29.8	(5.9)	14.0	(3.9)	30.6	(10.2)	31.5	(4.1)	31.5	(3.8)

For operations that used a disbudding/dehorning method that typically causes bleeding, almost half of (47.9 percent) chemically disinfected the equipment between each animal.

C.1.g. For operations that routinely used disbudding/dehorning equipment that typically causes bleeding,* percentage of operations that chemically disinfected the equipment between each calf:

Percent operations	**Std. error**
47.9	(7.3)

*94.3 percent from table C.1.a x 31.5 percent from table C.1.f = 29.7 percent.

On the majority of operations that disbudded/dehorned calves (53.4 percent), the owner/operator disbudded/dehorned the majority of calves. Similar percentages of operations had either an employee or a veterinarian disbud/dehorn calves (20.4 and 21.7 percent, respectively). Owners or operators disbudded/dehorned calves on a higher percentage of small operations (63.3 percent) than large operations (27.4 percent), and on a lower percentage of operations in the West region than in the East region (28.2 and 55.4 percent, respectively). Employees disbudded/dehorned the majority of calves on a higher percentage of large operations than small or medium operations. A higher percentage of small and medium operations than large operations used a veterinarian to disbud/dehorn calves.

C.1.h. For the 94.3 percent of operations that disbudded/dehorned heifer calves (table C.1.a), percentage of operations by person who dehorned the majority of calves, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Person	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Owner/ operator	63.3	(6.5)	47.9	(6.7)	27.4	(6.0)	28.2	(8.3)	55.4	(4.4)	53.4	(4.2)
Employee	8.2	(3.8)	19.7	(4.5)	68.8	(6.2)	59.7	(9.9)	17.3	(2.8)	20.4	(2.8)
Veterinarian	24.2	(6.0)	26.1	(6.0)	3.1	(1.8)	12.1	(9.4)	22.5	(4.0)	21.7	(3.8)
Other	4.3	(2.4)	6.4	(3.0)	0.7	(0.7)	0.0	(—)	4.8	(1.8)	4.4	(1.6)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

For operations on which a veterinarian disbudded/dehorned the majority of calves, 62.7 percent used anesthetics or analgesia during the procedure compared with 14.9 percent of operations on which the owner/operator disbudded/dehorned the majority of calves.

C.1.i. For the 94.3 percent of operations that disbudded/dehorned heifer calves (table C.1.a), percentage of operations that used anesthetics/analgesia during the procedure, by person who dehorned the majority of calves:

Person	Percent operations	Std. error
Owner/operator	14.9	(3.7)
Employee	29.2	(7.0)
Veterinarian	62.7	(9.2)

Incorporating polled bulls into the breeding program is a way to eliminate the need for disbudding/dehorning of calves. About one-fourth of operations (24.9 percent) used polled bulls for breeding in 2013. There were no herd size or regional differences in the percentages of operations that used polled bulls.

C.1.j. Percentage of operations that used polled bulls for breeding, by herd size and region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
21.3	(4.8)	31.2	(6.1)	24.6	(5.0)	21.0	(6.5)	25.3	(3.6)	24.9	(3.3)

2. Extra teat removal

Extra teats on cows interfere with milking and increase the likelihood of mastitis. Almost one-half of operations (46.7 percent) routinely removed extra teats.

C.2.a. Percentage of operations that routinely removed extra teats in 2013, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
41.6	(6.4)	50.1	(6.2)	56.1	(6.1)	60.8	(8.6)	45.1	(4.3)	46.7	(4.0)

Extra teats should be removed as soon as possible following birth, to reduce stress and ensure a quick recovery. Overall, 44.1 percent operations that routinely removed extra teats generally removed them when calves were less than 12 weeks old; 24.6 percent of operations removed extra teats when calves were from 12 to 17.9 weeks old. A higher percentage of small operations (55.9 percent) removed extra teats on calves less than 12 weeks old compared with large operations (23.2 percent). A lower percentage of operations in the West region than in the East region removed extra teats on calves less than 12 weeks old (10.8 and 49.1 percent, respectively). Conversely, a higher percentage of operations in the West region than in the East region removed extra teats on calves aged 18 weeks or more (68.5 and 25.6 percent, respectively).

C.2.b. For the 46.7 percent of operations that routinely removed extra teats in 2013 (table C.2.a), percentage of operations by age of calves when extra teats were removed, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Age (wk)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 12	55.9	(9.8)	40.7	(9.1)	23.2	(6.3)	10.8	(6.2)	49.1	(6.4)	44.1	(5.8)
12.0–17.9	23.1	(8.7)	21.6	(8.3)	32.8	(6.1)	20.6	(7.3)	25.2	(5.6)	24.6	(5.0)
18.0–23.9	5.9	(3.3)	15.1	(6.0)	24.3	(6.5)	43.2	(11.1)	8.1	(2.4)	12.8	(3.0)
24.0–29.9	13.2	(6.4)	9.4	(4.1)	8.3	(3.3)	14.4	(6.8)	10.4	(3.7)	10.9	(3.4)
30.0 or more	2.0	(1.9)	13.2	(7.3)	11.4	(4.5)	10.9	(6.3)	7.1	(3.1)	7.6	(2.8)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Overall, 10.8 percent of operations gave heifer calves analgesics or used anesthesia when removing extra teats. No herd size or regional differences were noted.

C.2.c. For the 46.7 percent of operations that routinely removed extra teats (table C.2.a), percentage of operations that gave calves analgesics or anesthesia during the procedure, by herd size and region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
10.6	(7.4)	14.7	(6.2)	5.4	(3.2)	5.8	(4.8)	11.6	(4.6)	10.8	(4.0)

3. Tail docking

Tail docking has been a contentious issue in the U.S. dairy industry for many years, partly because the majority of research does not support its use for improved hygiene or animal health. The Farmers Assuring Responsible Management (FARM) program, created by the National Milk Producers Federation with support from Dairy Management Inc., called for discontinuing all tail docking by January 1, 2017, with no new tail-docked animals entering herds after that date. The FARM program is voluntary, available to all dairy farmers, and establishes on-farm best management practices. The program includes second-party evaluations and third-party verification, ensuring its integrity. Since January 1, 2017, dairy operations participating in the program that continue to dock tails will be placed on a mandatory corrective-action plan. If upon re-evaluation it is found that these dairies are still docking tails, they might be suspended from the FARM program, which might result in difficulties marketing their milk. This industry effort should greatly reduce or eliminate tail docking on U.S. dairy operations.

In 2013, about one-half of all operations (49.5 percent) had any cows with docked tails. A higher percentage of operations in the East region (52.0 percent) had any tail-docked cows than operations in the West region (25.8 percent). About one-third of operations (31.7 percent) tail-docked any cows in 2013. A higher percentage of operations in the East region than in the West region (34.4 and 8.3 percent, respectively) docked tails in 2013.

Overall, one-third of cows (33.3 percent) had docked tails. More than one-half of cows in the East region (51.5 percent) had docked tails compared with less than one-tenth of cows in the West region (9.4 percent).

No differences by herd size were noted in the estimates presented in the following table. The difference in the percentage of operations with tail-docked cows (49.5 percent) and the percentage of operations that docked tails in 2013 (31.7 percent) might be due to multiple factors. For example, operations might have discontinued docking tails but still had older animals with docked tails; they might have purchased tail-docked cows; or might have had cattle tail-docked on another operation, such as a heifer-raising facility.

C.3.a. Percentage of operations with tail-docked cows, percentage of operations that docked tails in 2013, and percentage of cows with docked tails, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Percentage of...	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations with tail-docked cows	41.4	(6.4)	60.2	(6.6)	56.5	(5.1)	25.8	(8.0)	52.0	(4.4)	49.5	(4.1)
Operations that tail-docked cows in 2013	24.5	(5.1)	39.4	(6.2)	40.4	(4.9)	8.3	(3.6)	34.4	(3.8)	31.7	(3.4)
Cows with docked tails	25.7	(5.5)	41.7	(6.0)	32.3	(4.6)	9.4	(3.6)	51.5	(3.2)	33.3	(3.7)

A higher percentage of operations in the West region (74.2 percent) had no cows with docked tails compared with operations in the East region (48.0 percent). On 25.8 percent of operations in the East region, 76.0 percent or more cows had docked tails compared with only 4.7 percent of operations in the West region.

C.3.b. Percentage of operations by percentage of cows with docked tails, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Percent cows	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	58.6	(6.4)	39.8	(6.6)	43.5	(5.1)	74.2	(8.0)	48.0	(4.4)	50.5	(4.1)
0.1–24.9	17.6	(4.9)	17.3	(5.3)	8.5	(2.7)	13.8	(7.7)	16.2	(3.4)	16.0	(3.1)
25.0–75.9	4.1	(2.3)	17.6	(4.5)	13.8	(4.1)	7.4	(3.7)	10.0	(2.2)	9.7	(2.0)
76.0–99.9	2.4	(1.4)	11.5	(4.1)	17.7	(4.3)	1.0	(0.9)	8.4	(1.8)	7.7	(1.6)
100.0	17.4	(4.9)	13.7	(4.0)	16.5	(3.1)	3.7	(2.0)	17.4	(3.3)	16.1	(3.0)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Almost all operations that docked tails (97.0 percent) used a band to do so, and these operations accounted for 95.9 percent of tail-docked cows.

C.3.c. For the 31.7 percent of operations that docked tails in 2013 (table C.3.a), percentage of operations and percentage of tail-docked cows on the operations, by procedure most commonly used to dock tails:

Procedure	Percent operations	Std. error	Percent tail-docked cows*	Std. error
Band	97.0	(1.6)	95.9	(1.8)
Surgical removal with blades or shears	0.6	(0.5)	2.1	(1.4)
Other	2.4	(1.5)	2.0	(1.2)
Total	100.0		100.0	

*As a percentage of cows with docked tails.

Almost one-half of operations that docked tails in 2013 (45.9 percent) docked tails when cows were aged 2 years or more. More than one-third of cows (38.8 percent) were tail-docked at less than 2 months of age.

C.3.d. For the 31.7 percent of operations that docked tails in 2013 (table C.3.b), percentage of operations and percentage of tail-docked cows on the operations, by age at which the majority of cattle were tail-docked:

Age	Percent operations	Std. error	Percent tail-docked cows*	Std. error
<2 mo	31.4	(5.4)	38.8	(6.2)
2 mo–<6 mo	8.2	(2.5)	14.2	(4.1)
6 mo–<2 yr	14.5	(4.2)	21.5	(4.4)
2 yr or older	45.9	(6.2)	25.5	(5.9)
Total	100.0		100.0	

*As a percentage of cows with docked tails.

A low percentage of operations (1.1 percent) routinely used analgesia or anesthesia when docking tails, and 5.1 percent of tail-docked cows received analgesia or anesthesia during the procedure.

C.3.e. For the 31.7 percent of operations that docked tails in 2013 (table C.3.b), percentage of operations that routinely used analgesia or anesthesia during the procedure, and percentage of tail-docked cows that routinely received analgesia or anesthesia during the procedure:

Parameter	Percent	Std. error
Operations	1.1	(0.6)
Cows*	5.1	(2.8)

*As a percentage of cows with docked tails.

4. Castration

Dairy bull calves are commonly castrated because as steers they are generally less aggressive, smaller in stature, and produce superior meat. As with the other surgical procedures mentioned previously, castration should be performed at the earliest age possible. Overall, 35.5 percent of operations routinely castrated bull calves.

C.4.a. Percentage of operations that routinely castrated bull calves on the operation in 2013, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
38.7	(6.2)	37.3	(6.6)	22.6	(4.8)	30.2	(8.2)	36.0	(4.2)	35.5	(3.9)

There were no differences by herd size or region in the percentages of operations by method used to castrate bull calves (data not shown). On average, bull calves were 7.5 weeks old when castrated. Of operations that routinely castrated bull calves, 72.5 percent used a band and 20.2 percent used a knife. Calves castrated via band were, on average, 6.4 weeks old; and calves castrated via knife were, on average, 11.0 weeks old.

Overall, 4.0 percent of operations used analgesia or anesthesia when castrating calves. There were no differences by herd size or region in the percentage of operations that routinely used analgesics or anesthesia when castrating calves (data not shown). Only calves castrated with a band received analgesics or anesthesia.

C.4.b. For the 35.5 percent of operations that routinely castrated bull calves (table C.4.a), percentage of operations by method most commonly used to castrate calves, operation average age at castration, and percentage of operations that routinely used analgesics or anesthesia when castrating calves, by castration method:

Method	**Percent operations that castrated**	**Std. error**	**Operation average age** (wk)	**Std. error**	**Percent operations analgesia/ anesthesia**	**Std. error**
Band	72.5	(6.4)	6.4	(0.6)	5.6	(3.1)
Knife	20.2	(5.9)	11.0	(1.4)	0.0	(—)
Burdizzo	7.3	(3.8)	8.7	(0.7)	0.0	(—)
Total/average for all methods	100.0		7.5	(0.6)	4.0	(2.3)

D. Reproduction

1. Breeding practices

Breeding methods on dairies include natural service (bulls), artificial insemination (AI), or a combination of the two. The highest percentage of operations (89.3 percent) used any AI method for breeding (AI only or AI and natural service). AI was used exclusively on 43.7 percent of operations. A lower percentage of operations in the West region than in the East region (16.8 and 46.8 percent, respectively) used AI exclusively.

Overall, 56.3 percent of operations used any natural service for breeding (natural service only or natural service and AI). A higher percentage of operations in the West region (83.2 percent) used any natural service than operations in the East region (53.2 percent). Natural service was used exclusively on 10.7 percent of operations. Almost one-half of operations (45.5 percent) used both AI and natural service. A lower percentage of small operations used both breeding methods compared with large operations (36.7 and 67.1 percent, respectively). Both breeding methods were used on a higher percentage of operations in the West region (77.6 percent) than in the East region (41.9 percent).

D.1.a. Percentage of operations by breeding method used in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Breeding method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
AI only	50.2	(6.5)	40.0	(6.2)	30.7	(4.8)	16.8	(5.2)	46.8	(4.4)	43.7	(4.0)
Natural service only (bull bred)	13.0	(4.8)	11.7	(3.5)	2.2	(1.3)	5.7	(3.4)	11.3	(3.0)	10.7	(2.8)
AI and natural service	36.7	(6.1)	48.4	(6.7)	67.1	(4.9)	77.6	(6.1)	41.9	(4.3)	45.5	(4.0)
Any AI	87.0	(4.8)	88.3	(3.5)	97.8	(1.3)	94.3	(3.4)	88.7	(3.0)	89.3	(2.8)
Any natural service	49.8	(6.5)	60.0	(6.2)	69.3	(4.8)	83.2	(5.2)	53.2	(4.4)	56.3	(4.0)

Although the dairy industry has used AI since the 1930s and estrus synchronization since the 1970s, it was not until the late 1990s that ovulation could be synchronized. Synchronizing ovulation allows for timed AI, which enables dairy producers to set aside specific days for reproductive management.

Timed AI programs were used to manage heifer and cow reproduction on 34.9 and 55.5 percent of operations, respectively. A lower percentage of small operations used timed AI programs for cows (45.1 percent) or either heifers or cows (45.9 percent) compared with large operations (70.9 and 71.2 percent, respectively). Timed AI programs for heifer reproduction were used by a higher percentage of operations in the East region (37.4 percent) than in the West region (12.5 percent).

D.1.b. Percentage of operations that used timed AI programs to manage reproduction, by cattle type, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	33.7	(6.2)	35.7	(6.0)	37.0	(5.2)	12.5	(4.8)	37.4	(4.2)	34.9	(3.8)
Cows	45.1	(6.5)	64.4	(5.9)	70.9	(5.4)	39.8	(8.0)	57.2	(4.3)	55.5	(4.0)
Either	45.9	(6.5)	64.4	(5.9)	71.2	(5.4)	40.3	(8.0)	57.7	(4.3)	55.9	(4.0)

For operations that used a timed AI program, more than two-thirds (68.6 percent) had used the program for 9 years or more. There were no differences by herd size or by region in the percentage of operations by the number of years a timed AI program was used.

D.1.c. For the 55.9 percent of operations that used a timed AI program in 2013 (table D.1.b), percentage of operations by number of years timed AI programs had been used, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Years used	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 3.0	3.3	(3.3)	2.0	(2.0)	3.2	(2.0)	1.3	(1.3)	3.0	(0.3)	2.9	(1.6)
3.0–5.9	22.5	(8.3)	18.1	(5.6)	13.4	(5.4)	11.9	(7.0)	19.4	(4.5)	18.8	(4.2)
6.0–8.9	7.0	(4.3)	15.7	(7.5)	6.2	(2.9)	10.7	(7.1)	9.6	(3.5)	9.7	(3.3)
9.0 or more	67.2	(9.2)	64.2	(8.3)	77.2	(6.2)	76.0	(9.5)	68.0	(5.4)	68.6	(5.0)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

On average, timed AI programs were used 11.1 years.

D.1.d. For the 55.9 percent of operations that used a timed AI program in 2013 (table D.1.b), average number of years timed-AI programs had been used, by herd size and by region:

Average Number of Years

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
10.3	(1.0)	11.6	(1.0)	12.0	(0.7)	11.6	(1.2)	11.1	(0.6)	11.1	(0.6)

For operations that do not use timed AI programs or natural (bull) breeding, the ability to detect estrus is important to the reproductive program. In addition to visually detecting estrus, these operations also used other estrus-detection systems, such as electronic activity pedometers, or pressure-sensitive devices glued to the tail-head. Cow activity increases with estrus and this increased activity is captured with pedometers. Pressure-sensing devices are triggered when cows are mounted.

Less than 10 percent of operations (8.6 percent) used electronic heat-monitoring systems to detect estrus. A lower percentage of small operations (1.4 percent) used electronic heat-monitoring systems compared with medium and large operations (12.6 and 22.9 percent, respectively).

D.1.e. Percentage of operations that used any electronic heat-monitoring system to detect estrus in 2013, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1.4	(1.4)	12.6	(3.9)	22.9	(4.8)	10.8	(4.6)	8.3	(1.8)	8.6	(1.7)

To synchronize estrus, a controlled internal-drug-release insert containing progesterone can be inserted vaginally. The insert is removed after 7 days, and estrus in nonpregnant cows is usually observed 3 to 4 days later.

Eazi-breed™ CIDR® inserts were used by 34.6 percent of operations. A lower percentage of operations in the West region used these inserts than operations in the East region (14.5 and 36.8 percent, respectively).

D.1.f. Percentage of operations that used an Eazi-breed CIDR insert as part of their breeding program, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
27.8	(6.0)	40.4	(6.3)	44.6	(5.2)	14.5	(4.4)	36.8	(4.2)	34.6	(3.8)

Of operations that used an Eazi-breed CIDR inserts, 70.1 percent used the inserts specifically for animals identified as in anestrus. Almost one-half of operations (49.3 percent) used these inserts specifically for animals with cystic ovaries. A lower percentage of small operations (36.9 percent) used inserts for cystic cows compared with large operations (75.0 percent). These inserts were used as part of estrus synchronization program on a higher percentage of operations in the West region than in the East region (72.0 and 30.5 percent, respectively).

D.1.g. For the 34.6 percent of operations that used an Eazi-breed CIDR insert (table D.1.f), percentage of operations by how it was used, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Use	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Specifically for animals identified as in anestrus	76.9	(9.8)	64.6	(10.2)	65.9	(8.4)	73.1	(16.3)	70.0	(6.2)	70.1	(5.9)
Specifically for animals identified as cystic	36.9	(11.9)	47.5	(10.4)	75.0	(5.5)	74.9	(15.6)	48.1	(6.9)	49.3	(6.7)
As part of a herd-synchronization program	14.6	(8.4)	49.6	(10.7)	38.8	(8.3)	72.0	(13.1)	30.5	(6.3)	32.3	(6.2)
Postbreeding	4.9	(4.8)	13.4	(7.5)	4.6	(2.3)	3.6	(3.5)	8.0	(3.6)	7.8	(3.4)
Other	5.2	(5.1)	12.7	(7.0)	5.9	(2.8)	7.4	(7.1)	8.0	(3.5)	8.0	(3.4)

Most operations used AI to natural estrus for first-service breeding for the majority of heifers (59.4 percent) or cows (51.5 percent). A higher percentage of operations used AI to induced estrus after an Ovsynch program and AI to estrus after a Presynch/Ovsynch program for cows than for heifers. Timed AI after a Presynch/Ovsynch program was not used by any operations as the first-service breeding practice for heifers.

D.1.h. Percentage of operations by **first-service** breeding practice used for the majority of heifers and cows in 2013:

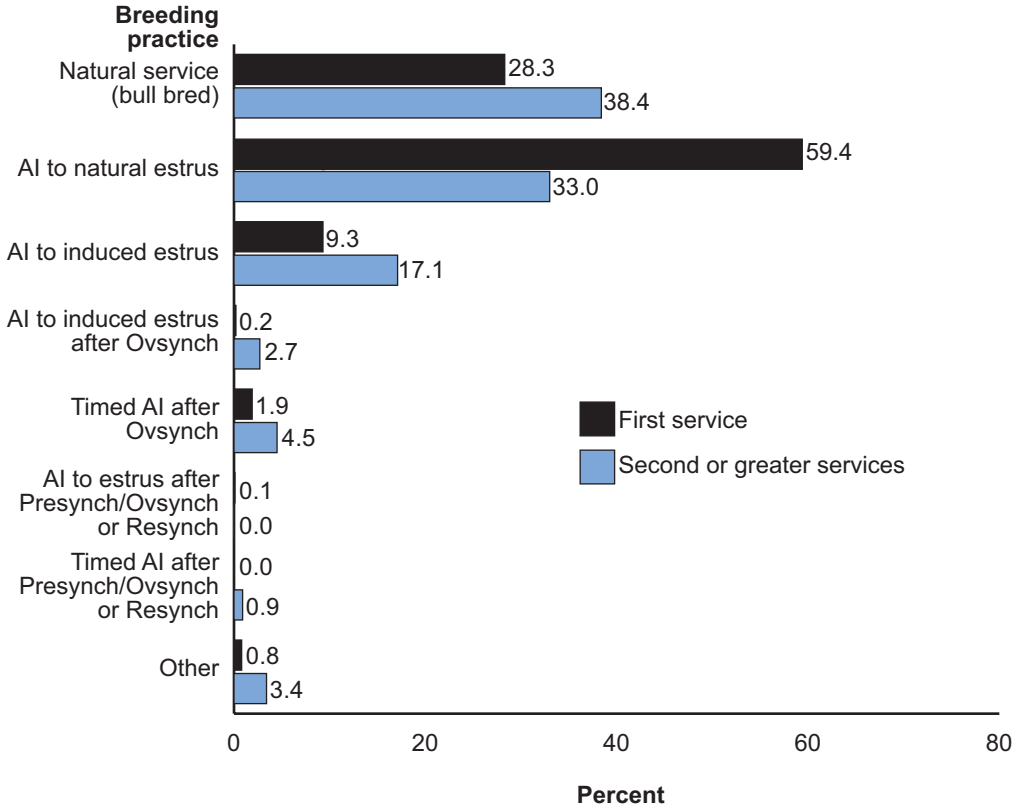
	Percent Operations			
	Cattle class			
	Heifers		Cows	
First-service breeding practice	**Percent**	**Std. error**	**Percent**	**Std. error**
Natural service (bull bred)	28.3	(3.8)	16.3	(3.3)
AI to natural estrus (no injections given to induce estrus)	59.4	(4.0)	51.5	(4.0)
AI to induced estrus (prostaglandin injections only)	9.3	(2.4)	12.6	(2.4)
AI to induced estrus after Ovsynch program (prostaglandin and GnRH injections)	0.2	(0.2)	3.0	(1.1)
Timed AI after Ovsynch program	1.9	(0.9)	4.9	(1.5)
AI to estrus after Presynch/Ovsynch program	0.1	(0.1)	3.7	(1.4)
Timed AI after Presynch/Ovsynch program	0.0	(—)	7.4	(1.6)
Other	0.8	(0.5)	0.6	(0.5)
Total	100.0		100.0	

For second or greater services, the highest percentages of operations used natural breeding (38.4 percent) or AI to natural estrus (33.0 percent) for the majority of heifers. Natural service was used for second or greater services on the majority of cows on 22.7 percent of operations, and AI to natural estrus was used on 29.1 percent of operations. A higher percentage of operations used natural service for second or greater services for heifers than for cows. A higher percentage of operations used timed AI after an Ovsynch program, AI to induced estrus after a Resynch program, or timed AI to a Resynch program for second or greater service in cows than for heifers.

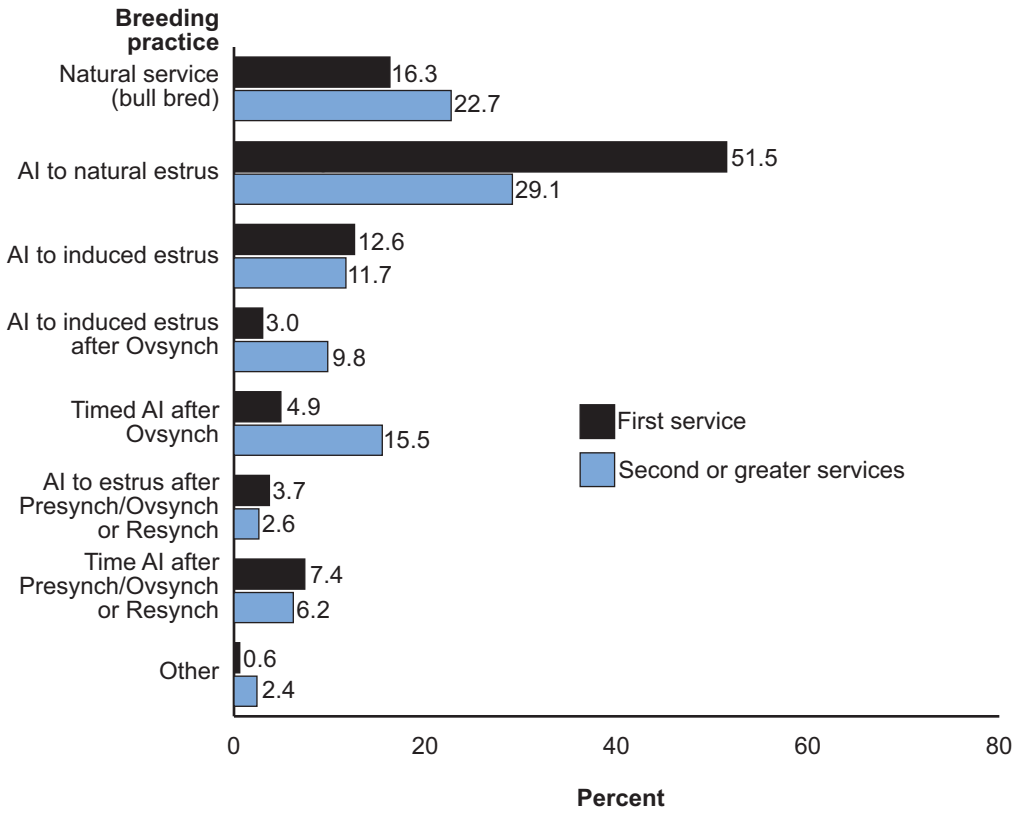
D.1.i. Percentage of operations by second or greater service breeding practice used for the majority of heifers and cows:

	Percent Operations			
	Cattle class			
	Heifers		Cows	
Second or greater service breeding practice	Percent	Std. error	Percent	Std. error
Natural service (bull bred)	38.4	(4.0)	22.7	(3.6)
AI to natural estrus (no injections given to induce estrus)	33.0	(3.8)	29.1	(3.7)
AI to induced estrus (prostaglandin injections only)	17.1	(3.1)	11.7	(2.8)
AI to induced estrus after Ovsynch program (prostaglandin and GnRH injections)	2.7	(1.5)	9.8	(2.4)
Timed AI after Ovsynch program	4.5	(1.9)	15.5	(2.7)
AI to induced estrus after Resynch program	0.0	(—)	2.6	(1.0)
Timed AI to Resynch program	0.9	(0.8)	6.2	(1.6)
Other	3.4	(1.4)	2.4	(1.3)
Total	100.0		100.0	

Percentage of operations by breeding practice used for the majority of *heifers* during first service and during second or greater services



Percentage of operations by breeding practice used for the majority of *cows* during first service and during second or greater services



Less than 10 percent of operations (8.9 percent) transplanted either fresh or frozen embryos into heifers in 2013. Fresh or frozen embryos were implanted in cows on 6.9 percent of operations. A higher percentage of operations used sexed semen in heifers than in cows (41.1 and 18.6 percent, respectively). There were no differences by herd size or region in the percentages of operations that used reproductive technologies for heifers or cows.

D.1.j. Percentage of operations that used the following reproductive technologies, by cattle class, herd size, and region:

Percent Operations

	Herd size (number of cows)						Region					
	Small (30–99)		Medium (100–499)		Large (500+)		West		East		All operations	
Technology	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Heifers												
Fresh embryos	3.7	(2.5)	8.9	(4.3)	11.0	(3.0)	6.8	(4.0)	6.5	(2.1)	6.5	(2.0)
Frozen embryos	5.0	(2.8)	5.8	(2.9)	8.5	(2.5)	3.8	(2.9)	6.1	(2.0)	5.9	(1.8)
Any embryos	5.0	(2.8)	13.7	(4.8)	12.4	(3.1)	6.8	(4.0)	9.2	(2.4)	8.9	(2.2)
Sexed semen	34.2	(6.2)	48.0	(6.5)	50.1	(5.8)	40.4	(8.9)	41.2	(4.3)	41.1	(4.0)
Cows												
Fresh embryos	1.9	(1.9)	4.4	(2.6)	6.8	(2.0)	1.1	(1.1)	3.8	(1.5)	3.5	(1.3)
Frozen embryos	5.3	(2.8)	4.9	(2.7)	6.2	(1.8)	0.0	(—)	6.0	(1.9)	5.4	(1.7)
Any embryos	5.3	(2.8)	8.4	(3.5)	9.4	(2.2)	1.1	(1.1)	7.6	(2.1)	6.9	(1.9)
Sexed semen	16.2	(4.4)	21.8	(5.3)	19.9	(4.9)	19.2	(6.2)	18.5	(3.2)	18.6	(2.9)

Fresh or frozen embryos were implanted in 2.6 percent of heifers and 0.4 percent of cows. About one-third of heifers (32.5 percent) were bred using sexed semen compared with only 3.4 percent of cows. There were no differences by herd size or region in the use of reproductive technologies for heifers or cows.

D.1.k. Percentage of heifers and cows that were bred using the following reproductive technologies, by herd size and by region:

Percent Heifers and Cows*

	Herd size (number of cows)					
	Small (30–99)	Medium (100–499)	Large (500+)	Region		All operations
				West	East	
Technology	Pct. Std. error	Pct. Std. error	Pct. Std. error	Pct. Std. error	Pct. Std. error	Pct. Std. error
Heifers						
Fresh embryos	2.1 (1.5)	0.9 (0.4)	1.8 (0.7)	0.5 (0.4)	2.6 (1.0)	1.7 (0.6)
Frozen embryos	2.3 (1.6)	0.7 (0.4)	0.7 (0.3)	0.3 (0.2)	1.3 (0.5)	0.8 (0.3)
Total embryos	4.5 (3.0)	1.6 (0.6)	2.6 (1.0)	0.8 (0.5)	4.0 (1.4)	2.6 (0.8)
Sexed semen	24.2 (5.2)	21.3 (4.4)	35.4 (9.6)	40.1 (15.8)	26.5 (2.6)	32.5 (7.8)
Cows						
Fresh embryos	0.3 (0.3)	0.1 (0.1)	0.2 (0.1)	0.0 (0.0)	0.4 (0.1)	0.2 (0.1)
Frozen embryos	0.5 (0.4)	0.1 (0.1)	0.2 (0.1)	0.0 (—)	0.3 (0.1)	0.2 (0.1)
Total embryos	0.8 (0.8)	0.2 (0.1)	0.4 (0.2)	0.0 (0.0)	0.7 (0.3)	0.4 (0.2)
Sexed semen	5.2 (2.2)	2.0 (0.8)	3.5 (2.1)	4.5 (3.5)	2.5 (0.8)	3.4 (1.7)

*As a percentage of weaned, pregnant heifer and cow inventories on January 1, 2014.

AI used after detected estrus resulted in at least one pregnancy on 87.1 percent of operations. A similar percentage of operations had at least one pregnancy from natural service (54.0 percent) or timed AI without detected estrus (49.1 percent). About 10-percent of operations had pregnancies resulting from embryo transfer. A higher percentage of operations in the West region than in the East region (76.7 and 51.4 percent, respectively) had pregnancies from natural service. Timed AI without detected estrus was responsible for pregnancies on a higher percentage of large operations (69.1 percent) than small operations (36.5 percent).

D.1.l. Percentage of operations with any pregnancies conceived, by breeding method and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Breeding method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
AI after detected estrus (natural or induced)	85.5	(4.8)	84.9	(4.6)	95.4	(1.6)	90.8	(3.8)	86.7	(3.2)	87.1	(2.9)
Natural service (bull bred)	48.2	(6.4)	60.0	(6.2)	61.0	(5.2)	76.7	(6.1)	51.4	(4.4)	54.0	(4.0)
Timed AI without detected estrus	36.5	(6.3)	59.9	(6.2)	69.1	(5.4)	38.9	(8.0)	50.3	(4.4)	49.1	(4.0)
Embryo transfer using superovulated embryo	5.3	(2.8)	9.9	(3.7)	10.4	(3.0)	5.9	(4.0)	7.8	(2.1)	7.6	(2.0)
Embryo transfer using in-vitro-produced embryo	1.8	(1.8)	6.0	(4.2)	4.4	(1.7)	0.0	(—)	3.9	(1.8)	3.5	(1.6)

On average, AI after detected estrus accounted for 55.5 percent of pregnancies conceived, natural service accounted for 25.4 percent, and timed AI without detected estrus accounted for 18.2 percent. AI after detected estrus accounted for a higher percentage of pregnancies in the West region than in the East region (70.3 and 53.9 percent, respectively). Natural service accounted for a lower percentage of pregnancies on large operations than on small or medium operations. Timed AI without detected estrus accounted for a higher percentage of pregnancies on large operations than on small operations (28.9 and 11.9 percent, respectively).

D.1.m. Operation average percentage of pregnancies conceived, by breeding method, herd size, and region:

Operation Average Percent Pregnancies

	Herd size (number of cows)											
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**Region** **West**		**East**		**All operations**	
Breeding method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
AI after detected estrus (natural or induced)	56.4	(5.0)	51.9	(3.8)	58.9	(2.9)	70.3	(4.1)	53.9	(3.2)	55.5	(2.9)
Natural service (bull bred)	30.5	(5.4)	24.7	(3.7)	11.3	(2.1)	18.3	(3.8)	26.2	(3.5)	25.4	(3.1)
Timed AI without detected estrus	11.9	(3.1)	23.0	(3.4)	28.9	(2.7)	11.2	(2.6)	18.9	(2.2)	18.2	(2.0)
Embryo transfer using superovulated embryo	1.0	(0.8)	0.3	(0.1)	0.7	(0.3)	0.2	(0.2)	0.8	(0.5)	0.7	(0.4)
Embryo transfer using in-vitro-produced embryo	0.2	(0.2)	0.1	(0.1)	0.1	(0.1)	0.0	(0.0)	0.2	(0.1)	0.2	(0.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

2. AI personnel and services

The owner/operator or AI service technician performed the majority of AI services on a similar percentage of operations (45.0 and 42.5 percent, respectively). The owner/operator performed the majority of AI services on a higher percentage of small and medium operations than on large operations. The herdsman performed the majority of AI services on 9.0 percent of operations, and the percentage of operations on which the herdsman performed AI increased as herd size increased. Similarly, the percentage of operations on which a general employee performed the majority of AI services was higher on large operations than on small operations (11.6 and 0.0 percent, respectively). A higher percentage of operations in the West region than in the East region (18.1 and 0.8 percent, respectively) had a general employee perform the majority of AI services.

D.2.a. For the 89.3 percent of operations that performed any AI services in 2013 (table D.1.a), percentage of operations by personnel who performed the majority of AI services, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**				**All operations**	
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**			
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Owner/operator	56.1	(6.9)	45.7	(6.9)	15.2	(4.5)	26.5	(8.6)	47.3	(4.6)	45.0	(4.2)
AI service technician	42.9	(6.9)	41.4	(7.0)	43.4	(5.2)	35.9	(8.8)	43.3	(4.6)	42.5	(4.2)
Herdsman	0.0	(—)	10.7	(3.5)	29.9	(5.3)	19.5	(6.1)	7.7	(1.6)	9.0	(1.6)
General employee	0.0	(—)	1.5	(1.4)	11.6	(3.5)	18.1	(6.2)	0.8	(0.5)	2.7	(0.8)
Other	1.0	(1.0)	0.8	(0.8)	0.0	(—)	0.0	(—)	0.8	(0.6)	0.7	(0.6)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

The person responsible for performing the majority of AI services had been formally trained to do so on 96.8 percent of operations that performed any AI.

D.2.b. For the 89.3 percent of operations that performed any AI in 2013 (table D.1.a), percentage of operations on which the person responsible for performing the majority of AI services had been formally trained to do so, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
96.2	(2.2)	98.0	(1.4)	96.5	(2.4)	92.8	(4.5)	97.2	(1.3)	96.8	(1.3)

About three-fourths of operations (75.8 percent) performed AI one to four times before using a bull for natural service. AI was performed only one to two times before natural service on 63.5 percent of small operations, 2.2 percent of medium operations, and 19.4 percent of large operations. Overall, 24.2 percent of operations performed AI more than four times on individual cows before resorting to natural service.

D.2.c. For the 45.5 percent of operations that used both AI and natural service (table D.1.a), percentage of operations by number of times AI was performed on individual cows before a bull was used for natural service, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number times	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1–2	63.5	(11.3)	2.2	(2.2)	19.4	(6.1)	16.0	(7.3)	35.7	(7.7)	31.3	(6.4)
3–4	36.5	(11.3)	68.0	(12.1)	31.8	(7.2)	39.9	(11.3)	45.8	(7.6)	44.5	(6.4)
5–6	0.0	(—)	26.0	(12.1)	44.4	(8.7)	37.9	(11.7)	17.0	(5.8)	21.7	(5.3)
7 or more	0.0	(—)	3.8	(3.7)	4.4	(3.3)	6.1	(4.7)	1.5	(1.5)	2.5	(1.5)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

3. Pregnancy detection

Reproductive efficiency is important for supplying the next generation of cows and for increasing milk production. Rectal palpation is the traditional means of pregnancy detection in cattle, but ultrasound and blood and milk testing are becoming more prominent pregnancy detection methods.

Nearly all operations (98.8 percent) used some method to determine pregnancy status. The majority of operations (70.6 percent) used rectal palpation. Ultrasound was used by 44.1 percent of operations, and abdominal palpation was used by 22.6 percent. A lower percentage of operations in the West region than in the East region used ultrasound (19.1 and 46.9 percent, respectively). A higher percentage of small operations (32.0 percent) used abdominal palpation (ballottement/bumping) than large operations (9.4 percent). Less than 10-percent of operations used a milk or blood test to determine pregnancy status.

D.3.a. Percentage of operations by method(s) routinely used to determine pregnancy status, and by herd size and region:

Percent Operations

	Herd size (number of cows)											
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**Region**				**All operations**	
							West		**East**			
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Rectal palpation	69.7	(5.6)	69.8	(5.6)	74.7	(4.9)	83.5	(5.8)	69.2	(3.8)	70.6	(3.5)
Ultrasound	34.4	(6.0)	58.9	(6.5)	47.7	(5.4)	19.1	(5.7)	46.9	(4.3)	44.1	(3.9)
Either rectal palpation or ultrasound	88.7	(3.3)	93.1	(2.9)	97.9	(1.4)	94.8	(3.2)	91.3	(2.1)	91.7	(1.9)
Abdominal palpation (ballottement/ bumping)	32.0	(5.9)	14.1	(5.1)	9.4	(3.1)	12.9	(7.1)	23.7	(3.8)	22.6	(3.5)
Milk progesterone	7.4	(3.0)	8.9	(3.6)	3.7	(2.3)	7.2	(6.7)	7.2	(2.0)	7.2	(2.0)
Blood test	3.0	(1.7)	6.4	(2.9)	8.1	(2.7)	1.1	(1.1)	5.4	(1.5)	4.9	(1.4)
Other	0.2	(0.2)	0.9	(0.9)	0.0	(—)	1.1	(1.0)	0.3	(0.3)	0.4	(0.3)
Any method	97.7	(1.9)	100.0	(—)	100.0	(—)	100.0	(—)	98.7	(1.1)	98.8	(1.0)
None	2.3	(1.9)	0.0	(—)	0.0	(—)	0.0	(—)	1.3	(1.1)	1.2	(1.0)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

To determine pregnancy status, 47.6 percent of all operations used rectal palpation only, and 21.0 percent used ultrasound only. There were no differences by herd size in the percentage of operations that used either rectal palpation or ultrasound. A higher percentage of operations in the West region than in the East region only used rectal palpation (75.8 and 44.4 percent, respectively). A lower percentage of operations in the West region (7.7 percent) used both rectal palpation and an ultrasound compared with operations in the East region (24.8 percent).

D.3.b. Percentage of operations that routinely used rectal palpation and/or ultrasound to determine pregnancy status, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Rectal palpation only	54.3	(6.4)	34.3	(6.3)	50.2	(5.4)	75.8	(6.4)	44.4	(4.4)	47.6	(4.0)
Ultrasound only	19.0	(4.9)	23.3	(5.1)	23.2	(4.7)	11.3	(4.9)	22.1	(3.4)	21.0	(3.1)
Both rectal palpation and ultrasound	15.5	(4.7)	35.6	(6.4)	24.4	(4.7)	7.7	(3.2)	24.8	(3.7)	23.1	(3.3)
Either rectal palpation or ultrasound	88.7	(3.3)	93.1	(2.9)	97.9	(1.4)	94.8	(3.2)	91.3	(2.1)	91.7	(1.9)

The frequency with which pregnancy exams are conducted usually depends on the breeding program and the method used to determine pregnancy status. For instance, in a timed AI program, cows are routinely examined for pregnancy within 30 to 45 days of insemination, which allows producers to identify and rebreed nonpregnant cows.

About one-third of operations (34.9 percent) performed monthly pregnancy exams. Similar percentages of operations performed exams every 2 weeks or every other month (19.4 and 18.6 percent, respectively). In general, as herd size increased so did the frequency of pregnancy exams. Weekly pregnancy exams were performed on a higher percentage of large operations than small or medium operations. Weekly pregnancy exams were performed on a higher percentage of operations in the West region than in the East region. A lower percentage of small operations (9.0 percent) performed exams every 2 weeks compared with medium or large operations (31.6, and 29.7 percent, respectively). A lower percentage of operations in the West region than in the East region (1.1 and 20.5 percent, respectively) performed exams every other month.

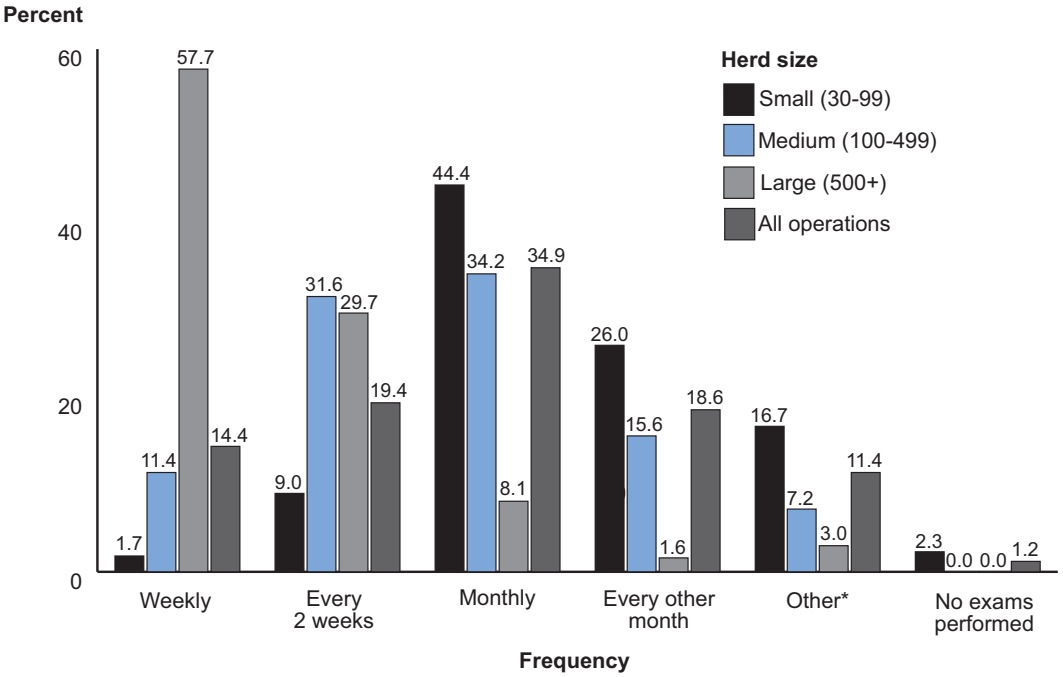
D.3.c. Percentage of operations by frequency that pregnancy exams were performed, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Weekly	1.7	(1.3)	11.4	(3.7)	57.7	(5.7)	33.2	(8.4)	12.3	(1.8)	14.4	(1.9)
Every 2 weeks	9.0	(3.4)	31.6	(5.8)	29.7	(5.3)	33.9	(7.5)	17.8	(2.9)	19.4	(2.8)
Monthly	44.4	(6.3)	34.2	(6.0)	8.1	(3.3)	24.1	(8.0)	36.2	(4.2)	34.9	(3.9)
Every other month	26.0	(5.7)	15.6	(4.8)	1.6	(1.1)	1.1	(1.1)	20.5	(3.7)	18.6	(3.3)
Other*	16.7	(5.1)	7.2	(3.9)	3.0	(2.0)	7.7	(4.1)	11.8	(3.3)	11.4	(3.0)
No exams performed	2.3	(1.9)	0.0	(—)	0.0	(—)	0.0	(—)	1.3	(1.1)	1.2	(1.0)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Included once, twice, and three times a year (less than once every other month).

Percentage of operations by frequency that pregnancy exams were performed, and by herd size



*Included once, twice, and three times a year (less than once every other month).

On operations that used rectal palpation or ultrasound to determine pregnancy status, 89.8 percent had a private veterinarian conduct the exams. A higher percentage of medium operations (93.7 percent) used a private veterinarian than large operations (78.7 percent) to determine pregnancy status. A higher percentage of large operations (9.8 percent) used an employee (nonveterinarian) to determine pregnancy status compared with small or medium operations (0.0 and 0.9 percent, respectively).

D.3.d. For the 91.7 percent of operations that routinely performed pregnancy exams via rectal palpation or ultrasound (table D.3.a), percentage of operations by person who performed the majority of exams, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Person	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Private veterinarian	91.6	(3.3)	93.7	(2.4)	78.7	(5.0)	80.0	(6.4)	90.9	(2.2)	89.8	(2.1)
Veterinary technician	5.8	(2.9)	2.9	(1.7)	3.1	(2.5)	0.9	(0.9)	4.8	(1.8)	4.4	(1.6)
Owner/operator	1.8	(1.5)	1.0	(1.0)	5.0	(2.5)	1.1	(1.1)	2.3	(1.1)	2.2	(1.0)
Employee—nonveterinarian	0.0	(—)	0.9	(0.9)	9.8	(3.5)	6.7	(3.5)	1.6	(0.7)	2.1	(0.7)
Employee—veterinarian	0.0	(—)	0.6	(0.6)	1.6	(0.9)	1.2	(1.1)	0.4	(0.2)	0.5	(0.3)
Other*	0.9	(0.8)	0.9	(0.9)	1.8	(1.7)	10.0	(5.3)	0.0	(—)	1.1	(0.6)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Included AI technician and contractor.

In general, pregnancy status can be determined earlier by using ultrasound than it can by using rectal palpation. On average, pregnancy status was determined within 53.0 days of breeding when using rectal palpation and 35.4 days when using ultrasound.

D.3.e. For the 91.7 percent of operations that used rectal palpation or ultrasound to determine pregnancy status (table D.3.a), operation average number of days after breeding that status was determined, by method used to determine pregnancy, herd size, and region:

Operation Average Number of Days

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Method	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Rectal palpation only	57.5	(6.0)	49.6	(4.9)	42.6	(2.9)	46.8	(4.0)	54.2	(4.5)	53.0	(3.8)
Ultrasound only	38.3	(3.2)	33.1	(1.0)	32.3	(0.6)	32.6	(0.9)	35.6	(1.7)	35.4	(1.7)
Both rectal palpation and ultrasound	54.1	(10.1)	49.2	(10.9)	39.2	(4.4)	35.0	(1.8)	49.6	(6.5)	49.1	(6.3)
Either rectal palpation or ultrasound	52.8	(4.3)	45.3	(4.7)	39.3	(1.9)	44.1	(3.3)	48.4	(2.9)	47.9	(2.6)

Rectal palpation only was performed at 34 or fewer days after breeding on 16.0 percent of operations. Ultrasound only was performed at 34 or fewer days on 56.0 percent of operations. In contrast, a higher percentage of operations that used rectal palpation only at 45 days or more than operations that used ultrasound only (44.5 and 8.7 percent, respectively).

D.3.f. For the 91.7 percent of operations that used either rectal palpation or ultrasound to determine pregnancy status (table D.3.a), percentage of operations by method used to determine status, and by average number of days after breeding diagnosis method was performed:

	Percent Operations							
	Pregnancy Diagnosis Method							
	Rectal palpation only		Ultrasound only		Both rectal palpation and ultrasound		Either rectal palpation or ultrasound	
Average number days	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Fewer than 30	0.0	(—)	7.0	(2.9)	11.9	(5.4)	4.7	(1.6)
30–34	16.0	(5.0)	49.0	(8.0)	22.6	(5.6)	25.3	(3.6)
35–39	25.4	(5.1)	21.9	(8.0)	23.1	(6.7)	24.0	(3.4)
40–44	14.1	(3.9)	13.4	(5.9)	8.1	(3.6)	12.4	(2.6)
45–49	9.9	(3.9)	0.0	(—)	8.8	(3.9)	7.3	(2.3)
50–54	5.0	(3.0)	0.0	(—)	9.1	(6.9)	4.9	(2.4)
55 or more	29.6	(6.0)	8.7	(5.7)	16.4	(6.8)	21.4	(3.8)
Total	100.0		100.0		100.0		100.0	

For operations that used ultrasound for pregnancy exams, 22.9 percent had used this method for at least 7 years (2007 or earlier).

D.3.g. For the 44.1 percent of operations that used ultrasound to determine pregnancy status (table D.3.a), percentage of operations by year ultrasound was first used for routine pregnancy diagnosis:

Year	Percent operations	Std. error
2007 or earlier	22.9	(4.3)
2008	6.5	(2.6)
2009	15.3	(4.2)
2010	13.5	(4.0)
2011	13.7	(4.5)
2012	16.7	(4.5)
2013	11.5	(3.8)
Total	100.0	

Veterinarians owned the ultrasound equipment used for pregnancy diagnosis on 97.1 percent of operations. No small or medium operations owned ultrasound equipment.

D.3.h. For the 44.1 percent of operations that used ultrasound to determine pregnancy status (table D.3.a.), percentage of operations by owner of ultrasound equipment used for the majority of pregnancy diagnoses, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**				All operations	
	Small (30–99)		Medium (100–499)		Large (500+)		West		East			
Owner	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Veterinarian	100.0	(—)	100.0	(—)	84.5	(7.1)	97.3	(2.7)	97.0	(1.5)	97.1	(1.4)
Dairy operation	0.0	(—)	0.0	(—)	13.6	(6.9)	2.7	(2.7)	2.6	(1.4)	2.6	(1.4)
Other	0.0	(—)	0.0	(—)	1.9	(1.8)	0.0	(—)	0.4	(0.4)	0.4	(0.3)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

In addition to determining pregnancy status, ultrasound was used by more than 75 percent of operations to identify twin pregnancies, observe ovarian structures, evaluate noncycling cows, or assess fetal viability. There were no herd size or regional differences in the percentages of operations by additional information collected or evaluated using ultrasound (data not shown).

D.3.i. For the 44.1 percent of operations that used ultrasound to determine pregnancy status (table D.3.a), percentage of operations by information other than pregnancy status collected/evaluated during ultrasound exams:

Additional information collected/evaluated during ultrasound	Percent operations	Std. error
Twin pregnancies	93.2	(2.2)
Ovarian structures (e.g., cysts, CL, follicles)	89.5	(3.8)
Noncycling (no heat) cows	86.5	(4.0)
Assessment of fetal viability	79.3	(4.8)
Fetal sexing	45.0	(5.8)
Other	4.3	(2.5)
Any	99.1	(0.7)

E. Injection Practices

1. Number of injections

Note: To calculate the number of injections, the average number of injections a cow typically received on each operation was applied to every cow on that operation.

Dairy cows receive injections for a variety of reasons, including vaccination, reproductive management, disease treatment (e.g., antimicrobial injections), and production enhancement using bovine somatotropin (bST).

Producers were asked to report the number of injections of any kind that cows typically received in 2013. Overall, cows got an average of 13.5 injections in 2013, just over one per month. The operation average number of injections per cow was lower on medium operations (8.3 injections/yr) than on large operations (15.7 injections/yr).

E.1.a. Operation average number of injections cows typically received in 2013, by herd size and by region:

Operation Average Number of Injections

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
15.7	(10.8)	8.3	(0.9)	15.7	(1.2)	9.3	(0.9)	14.0	(6.3)	13.5	(5.7)

Almost one-half of operations (44.8 percent) typically administered one to four injections per cow in 2013. Slightly less than one-third of operations (29.1 percent) administered 5 to 9 injections in 2013, and 16.7 percent administered 10 to 24 injections. The percentage of operations that administered one to four injections per cow decreased as herd size increased. A lower percentage of small operations administered 10 or more injections per cow than medium or large operations. A lower percentage of small operations (1.9 percent) administered 25 to 49 injections per cow than large operations (14.4 percent). The only regional difference noted was that a lower percentage of operations in the West region than in the East region administered one to four injections per cow (13.6 and 48.3 percent, respectively).

E.1.b. Percentage of operations by number of injections of any kind that individual cows typically received in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**				**All operations**	
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**			
Typical number of injections	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
None	2.3	(1.9)	0.8	(0.8)	0.0	(—)	0.0	(—)	1.6	(1.1)	1.5	(1.0)
1–4	64.8	(6.3)	33.6	(6.2)	4.4	(2.1)	13.6	(5.4)	48.3	(4.4)	44.8	(4.1)
5–9	24.5	(5.7)	34.5	(6.4)	33.5	(6.2)	50.3	(8.8)	26.7	(4.0)	29.1	(3.7)
10–24	3.8	(2.2)	23.8	(5.7)	43.1	(5.8)	32.2	(7.5)	14.9	(2.6)	16.7	(2.5)
25–49	1.9	(1.9)	7.2	(2.8)	14.4	(3.2)	3.8	(2.8)	5.9	(1.6)	5.7	(1.4)
50 or more	2.6	(2.0)	0.0	(—)	4.6	(1.9)	0.0	(—)	2.4	(1.2)	2.2	(1.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

In 2013, operations that administered 5 to 9 injections accounted for 33.6 percent of cows, and operations that administered 10 to 24 injections accounted for 40.9 percent of cows. The percentage of cows on operations that administered one to four injections per cow decreased as herd size increased. Small operations that administered 10 or more injections to individual cows in 2013 accounted for 8.1 percent of all cows, compared with 35.6 percent of cows on medium operations and 62.2 percent on large operations.

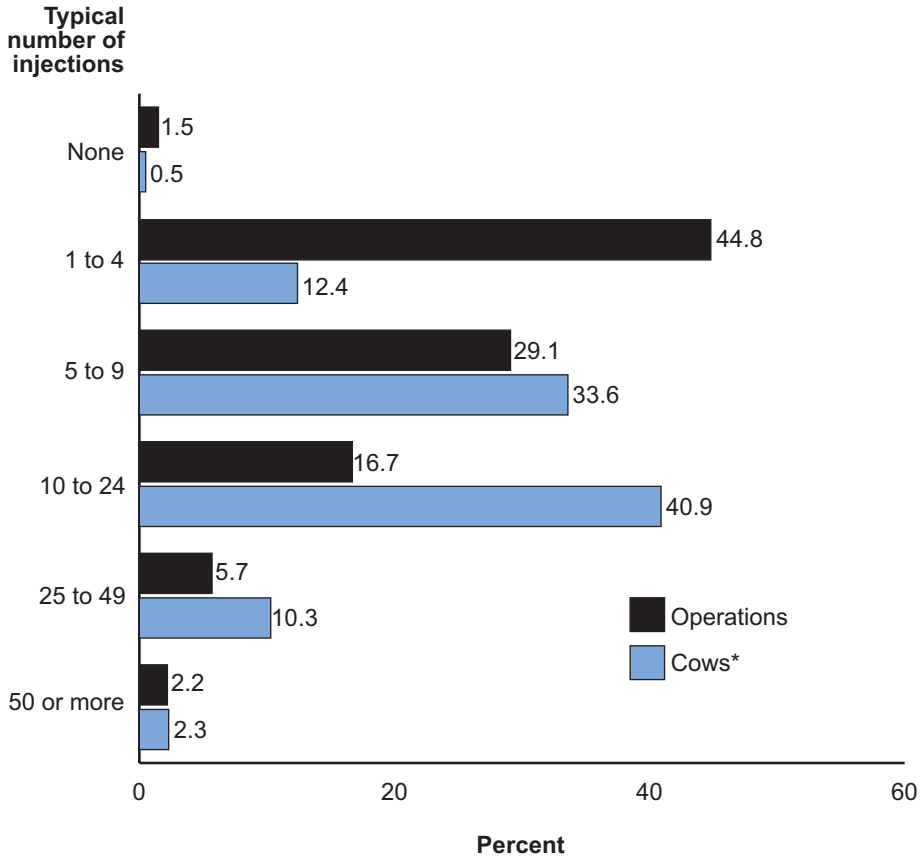
E.1.c. Percentage of cows by number of injections of any kind typically administered to individual cows in 2013, and by herd size and region:

Percent Cows*

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number injections	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
None	2.6	(2.2)	2.1	(2.1)	0.0	(—)	0.0	(—)	1.0	(0.7)	0.5	(0.4)
1–4	63.3	(6.5)	25.3	(5.2)	4.2	(2.7)	6.8	(4.6)	17.0	(2.5)	12.4	(2.5)
5–9	26.1	(5.9)	37.0	(6.7)	33.7	(8.7)	47.1	(11.9)	22.4	(4.7)	33.6	(6.7)
10–24	4.3	(2.6)	26.7	(6.2)	47.8	(8.4)	40.7	(10.9)	41.0	(7.6)	40.9	(6.5)
25–49	1.8	(1.8)	8.9	(3.6)	11.6	(3.5)	5.3	(4.7)	14.5	(3.0)	10.3	(2.7)
50 or more	2.0	(1.6)	0.0	(—)	2.8	(1.2)	0.0	(—)	4.2	(1.6)	2.3	(0.9)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*As a percentage of January 1, 2014, dairy cow inventory.

Percentage of operations and percentage of cows on these operations by number of injections cows typically received in 2013



*As a percentage of January 1, 2014, dairy cow inventory.

Ideally, a new needle would be used for each injection, as using a single needle on multiple animals can lead to the transmission of disease such as leukosis (BLV). Also, needles used for multiple injections can become dull, barbed, bent, or break, which might lead to tissue damage, and infection. The Dairy Animal Care and Quality Assurance Certification program recommends "to change needles at a maximum of every 10 head to prevent using a dull needle." Unfortunately, using a needle for two head can transfer BLV.

About one-tenth of operations (9.5 percent) used a new needle for every injection, and a similar percentage (8.0 percent) gave 31 or more injections per needle. More than one-half of operations (51.1 percent) administered 2 to 10 injections per needle. A higher percentage of operations in the East region than in the West region (10.4 and 1.8 percent, respectively) used a new needle for every injection.

E.1.d. Percentage of operations by number of injections farm personnel usually gave before changing needles, and by herd size and region:

Percent Operations

	Herd size (number of cows)											
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number injections	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
New needle for every injection	9.2	(3.6)	8.1	(3.6)	12.7	(3.3)	1.8	(1.7)	10.4	(2.5)	9.5	(2.2)
2–10	52.3	(6.5)	50.6	(6.6)	48.1	(5.7)	36.2	(7.8)	52.8	(4.4)	51.1	(4.1)
11–20	20.1	(4.7)	22.1	(5.2)	27.4	(5.7)	40.8	(9.1)	19.8	(3.2)	22.0	(3.1)
21–30	6.0	(2.6)	5.0	(2.2)	6.8	(2.5)	12.5	(4.9)	5.1	(1.7)	5.8	(1.6)
31 or more	7.0	(3.0)	11.7	(5.5)	5.1	(2.4)	8.8	(4.2)	8.0	(2.5)	8.0	(2.3)
No injections by farm personnel	5.4	(3.5)	2.5	(1.5)	0.0	(—)	0.0	(—)	4.0	(2.1)	3.6	(1.9)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

The percentage of cows by number of injections given per needle was similar to the percentage of operations by number of injections given per needle (table E.1.d). A higher percentage of cows in the East region (13.3 percent) were on operations that used a new needle for every injection compared with cows in the West region (0.6 percent).

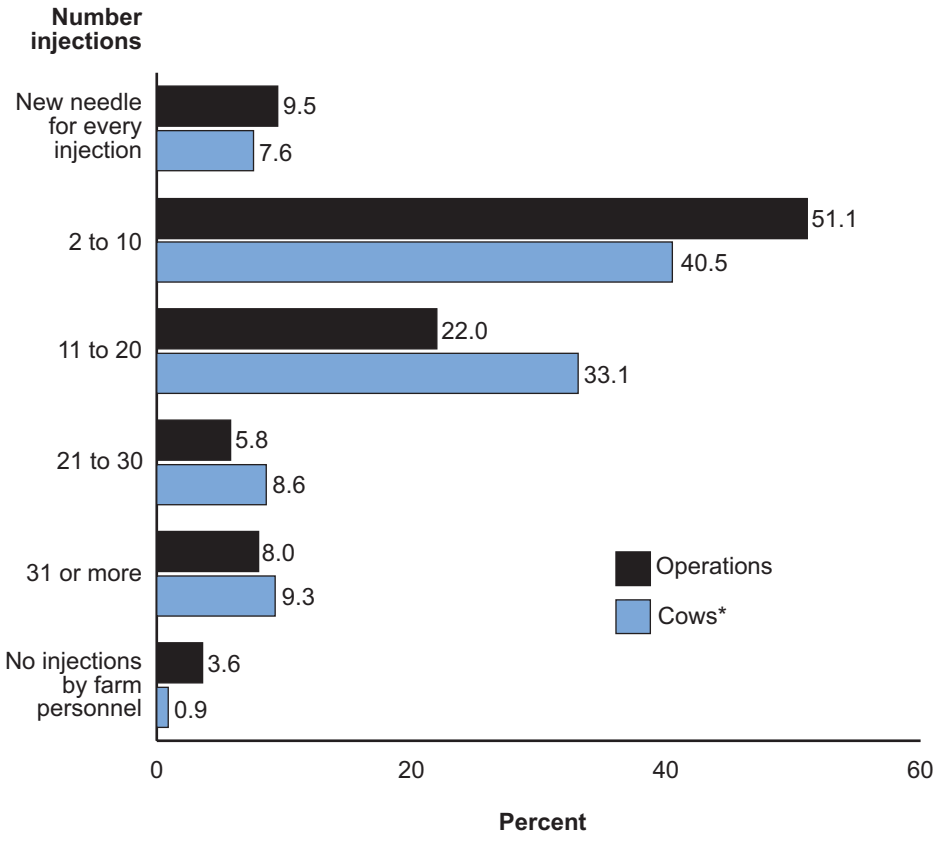
E.1.e. Percentage of cows by number of injections farm personnel usually gave before changing needles, and by herd size and region:

Percent Cows*

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number injections	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
New needle for every injection	9.7	(3.7)	7.0	(3.1)	7.5	(2.0)	0.6	(0.6)	13.3	(2.9)	7.6	(1.6)
2–10	50.3	(6.5)	54.5	(6.6)	36.6	(7.4)	31.3	(9.4)	48.0	(7.5)	40.5	(6.0)
11–20	21.5	(5.1)	23.4	(5.7)	36.4	(9.7)	37.9	(12.5)	29.2	(9.3)	33.1	(7.7)
21–30	6.6	(3.2)	4.9	(2.4)	9.6	(3.9)	13.4	(6.3)	4.8	(2.0)	8.6	(3.0)
31 or more	7.1	(3.3)	7.1	(3.6)	9.9	(5.1)	16.8	(8.7)	3.1	(1.2)	9.3	(4.0)
No injections by farm personnel	4.8	(3.1)	3.1	(2.2)	0.0	(—)	0.0	(—)	1.6	(0.8)	0.9	(0.4)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*As a percentage of January 1, 2014, dairy cow inventory.

Percentage of operations and percentage of cows by number of injections farm personnel usually gave before changing needles



*As a percentage of January 1, 2014, dairy cow inventory.

2. Injection route and location

Using the proper route and location (body site) when giving injections helps ensure product efficacy and carcass quality at slaughter. There are three primary injection routes: intramuscular (IM), subcutaneous (SQ), and intravenous (IV). Most operations administered IM injections (95.8 percent), while about two-thirds administered SQ or IV injections (68.8 and 67.4 percent, respectively). A lower percentage of small operations administered SQ (58.0 percent) or IV injections (56.6 percent) compared with large operations (89.5 and 80.5 percent, respectively).

E.2.a. For the 98.5 percent of operations that administered injections (table E.1.b), percentage of operations by injection route, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Injection route	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Intramuscular (IM)	95.8	(2.1)	95.0	(2.6)	97.3	(1.2)	94.0	(2.8)	96.0	(1.5)	95.8	(1.3)
Subcutaneous (SQ)	58.0	(6.6)	75.1	(5.5)	89.5	(3.5)	78.8	(6.9)	67.6	(4.3)	68.8	(4.0)
Intravenous (IV)	56.6	(6.5)	78.5	(5.5)	80.5	(4.2)	74.2	(7.1)	66.7	(4.3)	67.4	(3.9)

Approximately two-thirds of all injections (68.6 percent) were given intramuscularly, and one-fourth of injections (25.2 percent) were administered subcutaneously. A higher percentage of injections given on small operations than on large operations were administered intramuscularly (75.1 and 55.1 percent, respectively). Alternatively, a higher percentage of injections given on large operations than small operations were administered subcutaneously (39.4 and 19.4 percent, respectively).

E.2.b. For the 98.5 percent of operations that administered injections (table E.1.b), operation average percentage of injections, by injection route, herd size, and region:

Operation Average Percent Injections

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Injection route	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Intramuscular (IM)	75.1	(3.3)	65.3	(3.6)	55.1	(3.0)	60.2	(4.5)	69.6	(2.4)	68.6	(2.2)
Subcutaneous (SQ)	19.4	(3.1)	26.9	(3.4)	39.4	(2.7)	34.5	(4.3)	24.1	(2.2)	25.2	(2.0)
Intravenous (IV)	5.5	(1.0)	7.8	(1.3)	5.5	(0.9)	5.4	(1.1)	6.3	(0.7)	6.2	(0.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

The highest percentages of IM injections were administered for vaccination (39.3 percent) and reproductive purposes (30.9 percent). About one-fifth of all IM injections (18.7 percent) contained antimicrobials. A lower percentage of IM injections on small operations than on large operations were given for reproductive purposes, which was the only notable difference across herd sizes.

E.2.c. For the 94.4 percent of operations* that administered IM injections, operation average percentage of IM injections administered for the following purposes, by herd size and by region:

Operation Average Percent IM Injections

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Purpose	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Vaccination	40.6	(5.1)	40.3	(3.3)	33.9	(2.9)	34.7	(4.7)	39.8	(3.2)	39.3	(2.9)
Reproductive injection	25.3	(4.0)	34.4	(3.3)	41.9	(3.3)	31.5	(4.5)	30.8	(2.6)	30.9	(2.4)
Antimicrobial injection	21.9	(3.5)	15.2	(2.3)	14.8	(2.5)	22.1	(4.0)	18.3	(2.2)	18.7	(2.0)
Production enhancement	7.3	(2.9)	7.0	(1.6)	9.1	(2.3)	11.3	(3.5)	7.1	(1.8)	7.5	(1.7)
Other	5.0	(2.3)	3.1	(2.4)	0.3	(0.2)	0.5	(0.4)	4.0	(1.6)	3.6	(1.4)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*98.5 percent (table E.1.b) x 95.8 percent (table E.2.a.) = 94.4 percent.

The neck area is the recommended location for administering IM injections, since administering injections in the hips, hind legs, or shoulders can damage the more expensive cuts of meat these areas produce. Nevertheless, more than one-half of IM injections given for all purposes were administered in the hind legs, while the lowest percentage of IM injections given for all purposes were administered in the shoulders.

E.2.d. For the 94.4 percent of operations* that administered IM injections, operation average percentage of IM injections, by location administered and by purpose of injection:

Operation Average Percent IM Injections

Purpose

	Antimicrobials		Production enhancement		Reproduction		Vaccination	
Location	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Hind leg	51.2	(4.6)	65.5	(6.0)	65.1	(4.5)	53.5	(4.5)
Neck	26.6	(4.0)	11.6	(4.0)	16.4	(3.5)	22.0	(3.3)
Upper hip	15.5	(3.3)	20.3	(5.1)	16.8	(3.5)	17.4	(3.5)
Shoulder	6.7	(2.9)	2.6	(1.7)	1.7	(0.9)	7.1	(2.1)
Total	100.0		100.0		100.0		100.0	

*98.5 percent (table E.1.b) x 95.8 percent (table E.2.a) = 94.4 percent.

For the 98.5 percent of operations that administered injections, 89.5 percent administered IM injections to heifers, and 95.3 percent administered IM injections to cows. About two-thirds of operations administered SQ injections to heifers or cows and IV injections to cows. For heifers and cows, a lower percentage of small operations administered SQ or IV injections compared with large operations.

E.2.e. For the 98.5 percent of operations that administered injections (table E.1.b), percentage of operations that administered injections to heifers or cows, by injection route, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Route	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers												
Intramuscular (IM)	89.2	(4.3)	88.0	(4.3)	92.6	(2.4)	88.7	(4.2)	89.5	(2.9)	89.5	(2.6)
Subcutaneous (SQ)	52.2	(6.6)	62.1	(6.6)	85.5	(3.9)	74.9	(7.2)	59.7	(4.5)	61.3	(4.1)
Intravenous (IV)	30.4	(6.2)	43.1	(6.5)	63.9	(5.0)	56.8	(8.5)	38.5	(4.2)	40.4	(3.9)
Any	92.7	(4.0)	92.1	(3.8)	95.9	(2.1)	95.7	(3.0)	92.8	(2.6)	93.1	(2.4)
Cows												
Intramuscular (IM)	95.8	(2.0)	93.1	(2.9)	97.3	(1.2)	91.5	(3.7)	95.7	(1.5)	95.3	(1.4)
Subcutaneous (SQ)	58.4	(6.5)	73.4	(5.5)	89.6	(3.5)	76.6	(7.1)	67.5	(4.3)	68.5	(4.0)
Intravenous (IV)	55.7	(6.5)	77.8	(5.5)	80.4	(4.2)	74.3	(7.1)	66.0	(4.3)	66.9	(3.9)
Any	100.0	(—)	98.1	(1.3)	100.0	(—)	97.4	(2.6)	99.7	(0.3)	99.4	(0.4)

Headlock/fence line stanchion was used to administer the single highest percentage of IM, SQ, and IV injections given to heifers. Injection routes for heifers did not differ by primary cattle-handling facility.

E.2.f. For the 91.7 percent of operations* that administered injections to **heifers**, percentage of operations by primary cattle-handling facility used to give injections and by injection route:

	Percent Operations					
	Injection Route—Heifers					
	Intramuscular (IM)		Subcutaneous (SQ)		Intravenous (IV)	
Primary cattle-handling facility	Pct.	Std. Error	Pct.	Std. error	Pct.	Std. error
Stanchion/tie stall	16.0	(3.3)	15.6	(4.0)	20.2	(5.6)
Headlock/fence line stanchion	52.0	(4.3)	56.7	(4.8)	48.0	(6.1)
Chute/headgate	16.5	(3.3)	18.5	(3.9)	25.6	(5.1)
Loose in freestalls	9.5	(2.4)	5.7	(2.0)	3.1	(1.6)
Palpation rail	2.1	(1.1)	1.7	(0.9)	1.4	(1.2)
Parlor	3.9	(2.1)	1.8	(1.4)	1.7	(1.7)
Total	100.0		100.0		100.0	

*98.5 percent (table E.1.b) x 93.1 percent (table E.2.e).

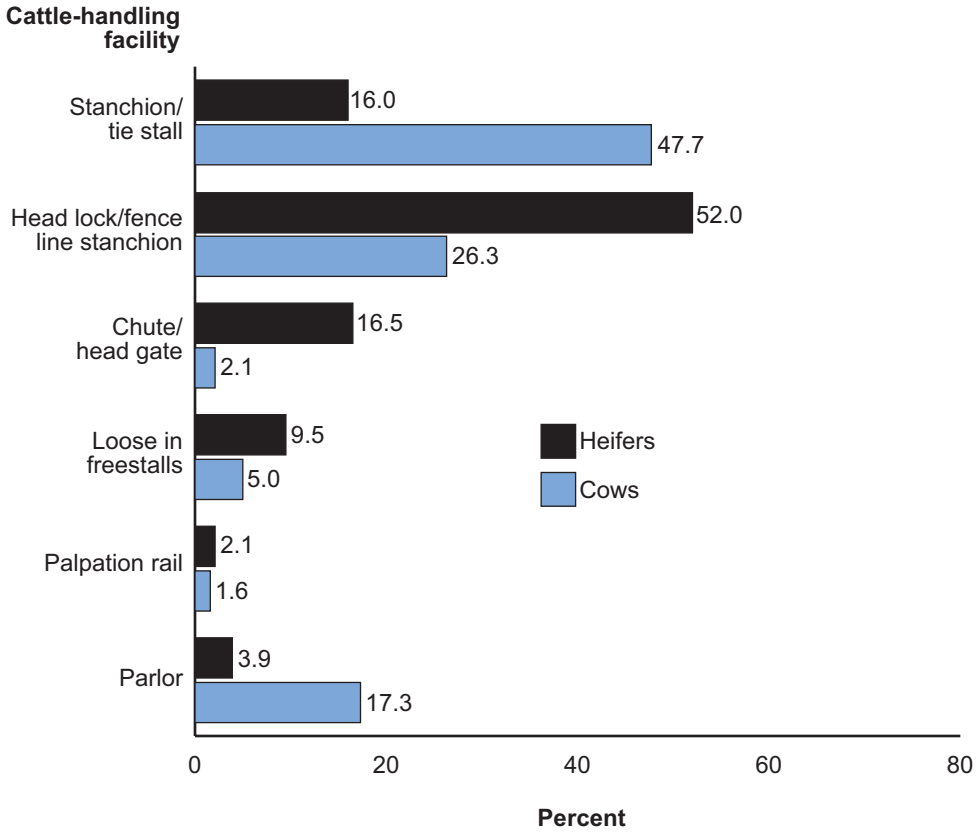
A total of 47.7 percent of operations placed cows in a stanchion/tie stall when administering IM injections. Stanchion/tie stall and headlock/fence line stanchion were the primary cattle-handling facilities used for IM, SQ, and IV injections for cows. About one-sixth of operations used a parlor as the primary cattle-handling facility for IM or SQ injections.

E.2.g. For the 97.9 percent of operations* that administered injections to **cows**, percentage of operations by primary cattle-handling facility used to give injections, and by injection route:

	Percent Operations					
	Injection Route—Cows					
	Intramuscular (IM)		Subcutaneous (SQ)		Intravenous (IV)	
Primary cattle-handling facility	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stanchion/tie stall	47.7	(4.0)	41.6	(4.6)	43.0	(4.8)
Headlock/fence line stanchion	26.3	(3.0)	33.0	(3.7)	27.1	(3.6)
Chute/headgate	2.1	(0.9)	5.1	(1.7)	16.2	(2.9)
Loose in freestalls	5.0	(1.6)	0.6	(0.4)	6.3	(2.3)
Palpation rail	1.6	(0.6)	3.0	(0.9)	1.0	(0.7)
Parlor	17.3	(3.1)	16.7	(3.4)	6.4	(2.1)
Total	100.0		100.0		100.0	

*98.5 percent (table E.1.b) x 99.4 percent (table E.2.a).

Percentage of operations by the primary cattle-handling facility used to give intramuscular injections to heifers[1] and cows[2]



[1]For the 91.7 percent of operations that administered injections to heifers.

[2]For the 97.9 percent of operations that administered injections to cows.

F. Disease Preparedness

1. Disease familiarity

The more familiar producers are with the various animal diseases that affect dairy cattle the better they will be able to recognize the clinical signs of a newly introduced disease and, with assistance from their veterinarian, can begin steps to reduce the spread of disease on the operation and to neighboring operations.

Producers reported being fairly knowledgeable about Johne's disease (55.3 percent of operations), followed by *Leptospira hardjo bovis* (29.7 percent), BVD (24.8 percent), and *Mycoplasma* mastitis (22.1 percent). Educational forums focused on Johne's disease have been available to producers for more than 20 years, and educational forums for BVD have been available for at least the last 10 years. Respondents on more than three-fourths of operations had never heard of rinderpest (87.1 percent of operations), heartwater (85.5 percent), or vesicular stomatitis (82.8 percent). These findings are not surprising since rinderpest and heartwater are not present in the United States and vesicular stomatitis is intermittently present, mainly in the southern and western parts of the country. Only 12.7 percent of producers reported that they were fairly knowledgeable or knew some basics about screwworm.

F.1.a. Percentage of operations by producer familiarity with the following diseases:

	Percent Operations								
	Disease Familiarity								
	Fairly know-ledgeable		Knew some basics		Recognized the name, not much else		Never heard of it		
Disease	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Anthrax	3.5	(1.5)	19.0	(2.9)	65.9	(3.7)	11.7	(2.7)	100.0
Bluetongue	2.1	(1.0)	9.1	(2.1)	55.8	(4.0)	33.0	(3.7)	100.0
Bovine spongiform encephalopathy (BSE)	15.1	(2.8)	49.4	(4.0)	33.3	(3.8)	2.2	(1.2)	100.0
Bovine tuberculosis (TB)	11.9	(2.2)	44.9	(4.0)	40.0	(4.0)	3.2	(1.9)	100.0
Bovine viral diarrhea (BVD)	24.8	(3.3)	55.6	(4.0)	18.7	(3.1)	0.9	(0.5)	100.0
Foot-and-mouth disease (FMD)	10.9	(2.3)	41.0	(4.0)	46.8	(4.0)	1.3	(0.8)	100.0
Heartwater	1.2	(0.9)	1.0	(0.8)	12.3	(2.6)	85.5	(2.8)	100.0
Hemorrhagic bowel syndrome (HBS)	12.5	(2.3)	26.0	(3.3)	22.5	(3.4)	38.9	(4.1)	100.0
Johne’s disease	55.3	(3.9)	34.7	(3.9)	9.6	(2.4)	0.4	(0.4)	100.0
Leptospira hardjo bovis	29.7	(3.7)	40.6	(4.0)	20.8	(3.2)	8.9	(2.3)	100.0
Mycoplasma mastitis	22.1	(2.9)	42.6	(4.0)	27.9	(3.7)	7.5	(2.0)	100.0
Rinderpest	1.2	(0.9)	1.7	(0.9)	9.9	(2.5)	87.1	(2.7)	100.0
Screwworm	2.6	(1.1)	10.1	(2.7)	40.9	(4.0)	46.4	(4.0)	100.0
Vesicular stomatitis (VS)	1.6	(0.9)	3.3	(1.3)	12.3	(2.3)	82.8	(2.7)	100.0

Producers on more than one-half of operations reported that they were fairly knowledgeable or knew some basics about BSE, bovine TB, BVD, FMD, Johne's disease, *Leptospira hardjo bovis*, and *Mycoplasma* mastitis. Producers on a higher percentage of large operations than small operations knew at least some basics about anthrax, bluetongue, bovine TB, FMD, HBS, and *Mycoplasma* mastitis. Producers on a higher percentage of operations in the West region than in the East region knew at least some basics about FMD, *Mycoplasma* mastitis, and vesicular stomatitis.

F.1.b. Percentage of operations on which producers were fairly knowledgeable or knew some basics about the following diseases, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Anthrax	16.8	(4.5)	19.4	(5.2)	44.5	(5.3)	33.0	(8.5)	21.3	(3.3)	22.5	(3.1)
Bluetongue	4.2	(2.4)	14.6	(4.7)	26.2	(5.7)	23.4	(8.2)	9.8	(2.3)	11.2	(2.2)
Bovine spongiform encephalopathy (BSE)	60.4	(6.3)	62.1	(6.2)	80.9	(4.2)	75.9	(6.6)	63.2	(4.2)	64.5	(3.9)
Bovine tuberculosis (TB)	50.3	(6.4)	54.6	(6.4)	79.8	(4.2)	71.1	(8.1)	55.2	(4.4)	56.8	(4.0)
Bovine viral diarrhea (BVD)	78.5	(5.0)	79.5	(5.5)	87.4	(3.9)	79.8	(6.5)	80.4	(3.4)	80.4	(3.2)
Foot-and-mouth disease (FMD)	47.1	(6.4)	48.5	(6.5)	71.9	(4.6)	72.2	(6.9)	49.6	(4.3)	51.9	(4.0)
Heartwater	0.0	(—)	2.9	(2.8)	7.6	(4.7)	8.5	(7.3)	1.5	(1.0)	2.2	(1.2)
Hemorrhagic bowel syndrome (HBS)	21.1	(5.4)	52.7	(6.3)	66.1	(5.7)	48.1	(8.5)	37.5	(4.0)	38.5	(3.7)
Johne's disease	87.5	(4.0)	92.9	(3.6)	92.4	(3.6)	87.2	(5.5)	90.3	(2.6)	90.0	(2.4)
Leptospira hardjo bovis	67.6	(5.9)	70.3	(6.1)	78.5	(4.5)	73.5	(7.2)	70.0	(4.0)	70.3	(3.7)
Mycoplasma mastitis	51.0	(6.4)	71.8	(5.9)	93.0	(3.3)	83.2	(5.8)	62.6	(4.2)	64.7	(3.9)
Rinderpest	0.0	(—)	2.9	(2.8)	11.7	(5.1)	12.3	(7.6)	1.9	(1.1)	2.9	(1.3)
Screwworm	10.5	(4.3)	13.8	(4.9)	17.0	(5.2)	15.2	(7.6)	12.4	(3.1)	12.7	(2.9)
Vesicular stomatitis (VS)	1.8	(1.8)	4.9	(3.1)	14.1	(5.1)	22.4	(8.0)	2.9	(1.5)	4.9	(1.6)

2. Biosecurity and visitors

Dairy operations have many different types and numbers of visitors throughout the year. Since many visitors frequent multiple dairy operations, biosecurity procedures are important to prevent the spread of disease from operation to operation. Implementing biosecurity practices, such as requiring visitors to wear clean boots and coveralls, reduces the spread of disease from operation to operation.

More than 95 percent of operations had visits from milk-truck drivers, veterinarians, or feed-delivery personnel. About one-half of operations (49.4 percent) had visits from a renderer. A lower percentage of small operations than large operations had visits from a nutritionist, renderer, drug supplier, visitors/tour groups, or university extension personnel.

A lower percentage of operations in the West region than in the East region had visits from neighbors (50.6 and 78.1 percent, respectively), and a higher percentage of operations in the West region than the East region had visits from drug suppliers (80.0 and 44.2 percent, respectively).

F.2.a. Percentage of operations by type(s) of visitors on the operation in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Visitor	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Milk-truck driver	99.3	(0.7)	100.0	(—)	99.6	(0.4)	100.0	(—)	99.5	(0.4)	99.6	(0.4)
Veterinarian	98.5	(1.1)	100.0	(—)	99.4	(0.6)	98.9	(1.1)	99.1	(0.7)	99.1	(0.6)
Feed-delivery personnel	97.8	(1.5)	95.2	(2.1)	98.8	(0.8)	95.9	(2.8)	97.3	(1.1)	97.2	(1.0)
Nutritionist	75.7	(5.8)	96.0	(1.9)	93.8	(2.6)	79.4	(6.5)	85.6	(3.6)	85.0	(3.3)
Contract hauler driver or vehicle	79.7	(5.0)	64.5	(6.0)	80.9	(4.4)	78.9	(7.5)	75.0	(3.6)	75.4	(3.3)
Neighbor	82.4	(5.4)	69.7	(6.6)	63.8	(5.3)	50.6	(8.6)	78.1	(3.9)	75.3	(3.6)
Rendering truck or driver	41.7	(6.2)	48.6	(5.9)	73.6	(4.0)	68.2	(8.1)	47.3	(4.1)	49.4	(3.8)
Drug supplier	42.5	(6.4)	32.5	(5.8)	90.0	(2.5)	80.0	(7.6)	44.2	(4.2)	47.9	(3.9)
Visitors/tour group	27.1	(6.0)	34.3	(5.9)	63.8	(5.3)	43.1	(8.3)	34.8	(4.0)	35.7	(3.7)
University/ extension personnel	21.1	(5.4)	31.5	(5.5)	49.0	(5.1)	25.4	(8.2)	29.5	(3.7)	29.1	(3.4)
Other*	14.9	(4.2)	18.1	(5.4)	11.6	(2.7)	8.2	(2.7)	16.1	(3.1)	15.3	(2.8)
Any	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)

*Included AI technicians, hoof trimmers, DHIA personnel, and inspectors.

In 2013, operations had an average of 294.4 visits from milk-truck drivers, making them the most frequent visitors to most dairy operations. Operations had an average of 26.7 visits by veterinarians, or about one visit every other week. Operations had an average of 89.1 and 73.5 visits by feed-delivery personnel or visitors/tour groups, respectively. For operations with visits from milk-truck drivers, veterinarians, feed-delivery personnel, or renderers, the average number of visits increased as herd size increased. Compared with small and medium operations, large operations had a higher number of visits from nutritionists, contract haulers, and drug suppliers.

The average numbers of visits by milk-truck drivers, feed-delivery personnel, contract haulers, renderers, and drug suppliers was higher on operations in the West region than in the East region.

F.2.b. For operations that had the following visitor(s) in 2013, operation average number of visits, by herd size and by region:

Operation Average Number of Visits

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Visitor	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Milk-truck driver	193.4	(9.1)	283.9	(14.1)	612.8	(48.6)	659.4	(88.6)	253.2	(9.0)	294.4	(14.6)
Veterinarian	15.9	(1.5)	28.5	(2.1)	55.6	(8.2)	36.3	(4.5)	25.6	(2.0)	26.7	(1.8)
Feed-delivery personnel	24.8	(2.5)	38.9	(3.0)	362.2	(52.0)	482.8	(91.8)	45.4	(2.7)	89.1	(12.2)
Nutritionist	19.2	(2.4)	22.6	(2.3)	33.7	(2.5)	26.8	(3.2)	22.8	(1.6)	23.2	(1.5)
Contract hauler driver or vehicle	19.5	(1.7)	23.1	(1.9)	177.7	(28.8)	207.7	(46.6)	31.7	(3.2)	50.4	(6.1)
Neighbor	49.4	(14.5)	56.7	(30.8)	34.6	(6.9)	27.4	(10.8)	51.0	(13.0)	49.4	(12.1)
Rendering truck or driver	3.2	(0.5)	11.4	(1.6)	107.4	(14.7)	160.3	(26.1)	11.4	(1.1)	32.3	(5.0)
Drug supplier	15.1	(1.3)	13.1	(1.3)	64.1	(15.3)	96.6	(28.9)	17.5	(1.3)	30.8	(5.5)
Visitors/tour group	76.4	(43.2)	80.0	(67.2)	63.7	(50.9)	9.9	(3.2)	82.4	(34.5)	73.5	(30.5)
University/ extension personnel	2.7	(0.6)	2.8	(0.4)	8.4	(3.8)	4.5	(1.6)	4.4	(1.2)	4.4	(1.1)
Other*	11.1	(4.2)	40.8	(24.8)	100.2	(36.7)	191.8	(71.9)	25.8	(11.0)	33.7	(11.2)

*Included AI technicians, foot trimmers, DHIA personnel, and inspectors.

Although milk-truck drivers accounted for the highest number of visits in 2013, only 5.4 percent of operations reported that milk-truck drivers had animal contact during the visits. More than two-thirds of operations had visits by veterinarians, nutritionists, contract haulers, visitors/tour groups, university/extension personnel, and "others" that involved animal contact. A higher percentage of small operations than large operations (9.1 and 0.8 percent, respectively) had visits from feed-delivery personnel that involved animal contact. A higher percentage of small operations (93.4 percent) had visitors/tour groups that had animal contact than medium or large operations (45.4 and 58.6 percent, respectively).

Animal contact by milk-truck drivers, feed-delivery personnel, or drug suppliers was reported on a lower percentage of operations in the West region than in the East region.

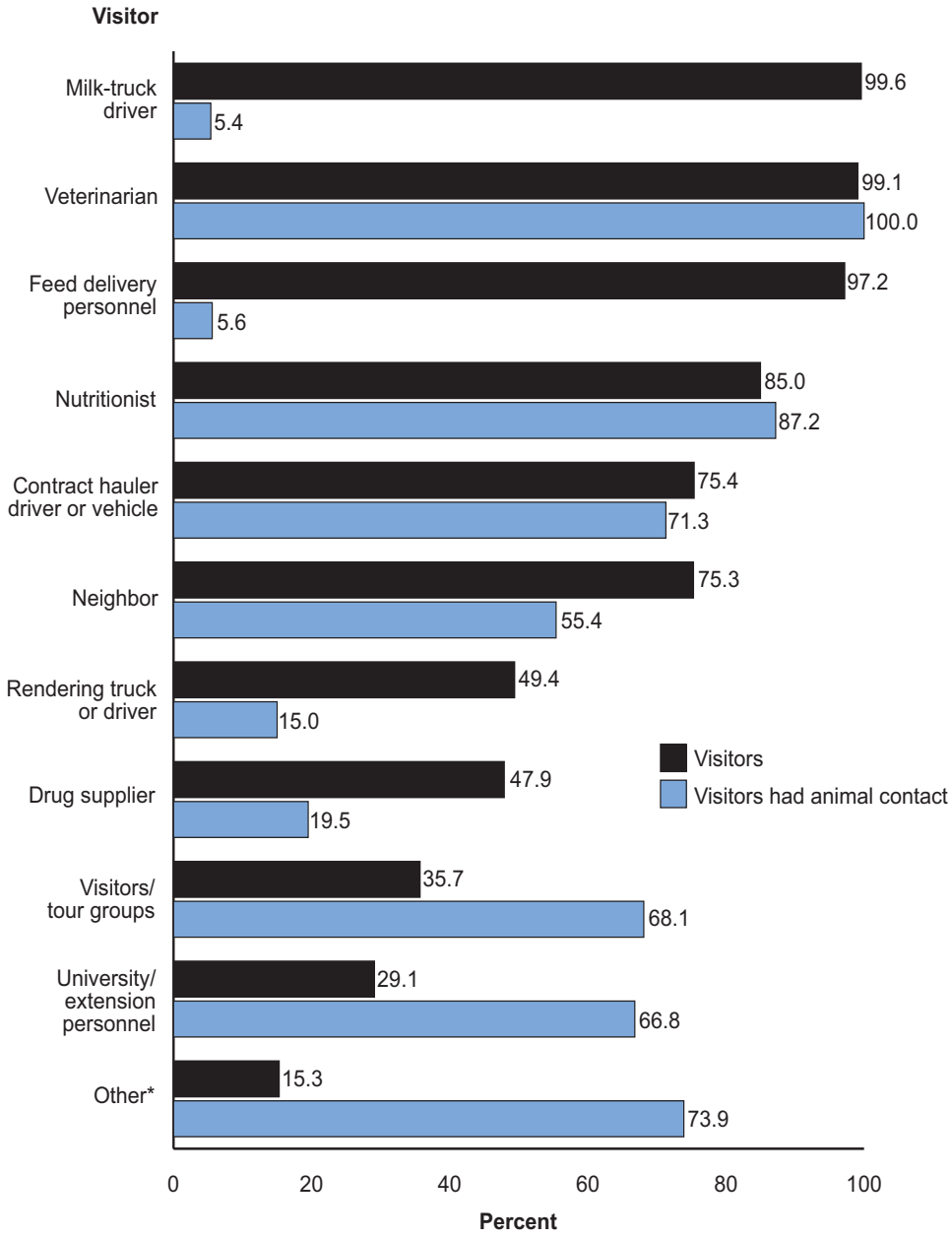
F.2.c. For operations that had the following visitor(s) in 2013, percentage of operations on which visitors had animal contact, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Visitor	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Milk-truck driver	9.0	(3.5)	1.1	(1.1)	2.5	(1.2)	0.0	(—)	6.1	(2.1)	5.4	(1.9)
Veterinarian	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)
Feed-delivery personnel	9.1	(3.5)	2.3	(1.6)	0.8	(0.5)	0.6	(0.5)	6.1	(2.1)	5.6	(1.9)
Nutritionist	86.7	(4.7)	81.7	(4.7)	97.8	(1.0)	91.9	(4.1)	86.7	(3.0)	87.2	(2.7)
Contract hauler driver or vehicle	79.4	(6.3)	56.5	(8.0)	67.4	(5.4)	74.8	(7.4)	70.8	(4.6)	71.3	(4.2)
Neighbor	63.5	(6.8)	44.0	(7.0)	46.2	(6.8)	32.4	(10.7)	57.1	(4.7)	55.4	(4.5)
Rendering truck or driver	15.8	(6.6)	9.9	(5.2)	19.2	(5.0)	18.2	(7.4)	14.4	(4.0)	15.0	(3.6)
Drug supplier	29.5	(9.4)	15.4	(7.5)	8.4	(3.9)	0.0	(—)	23.5	(5.8)	19.5	(4.8)
Visitors/tour group	93.4	(4.7)	45.4	(9.6)	58.6	(7.1)	63.2	(11.3)	68.8	(5.6)	68.1	(5.1)
University/ extension personnel	56.1	(14.9)	74.6	(8.5)	72.3	(6.1)	81.2	(11.9)	65.4	(7.0)	66.8	(6.5)
Other*	74.0	(13.3)	77.1	(12.3)	65.0	(11.9)	47.8	(16.8)	75.4	(8.7)	73.9	(8.3)
Any visitor	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)

*Included AI technicians, foot trimmers, DHIA personnel, and inspectors.

Percentage of operations by type(s) of visitors on the operation in 2013 and, for operations that had visitors, percentage of operations on which visitors had animal contact



*Included AI technicians, foot trimmers, DHIA personnel, and inspectors.

In order to evaluate the possible risks presented by visitors, the operation average number of visits that involved animal contact was calculated for each operation, with the assumption that if any visits involved animal contact, then all visits invloved animal contact. If an operation had no visits by the visitor, or if visitors had no animal contact, no animal contact visits were recorded.

For all operations, contract haulers had the highest operation average number of animal contact visits per year (29.2), followed by veterinarians (26.6) and neighbors (21.8). Neighbors had the highest animal contact visits on small and medium operations, while contract haulers accounted for the highest number of visits on large operations. The highest overall animal contact visits was for contract haulers in the West region at 147.9.

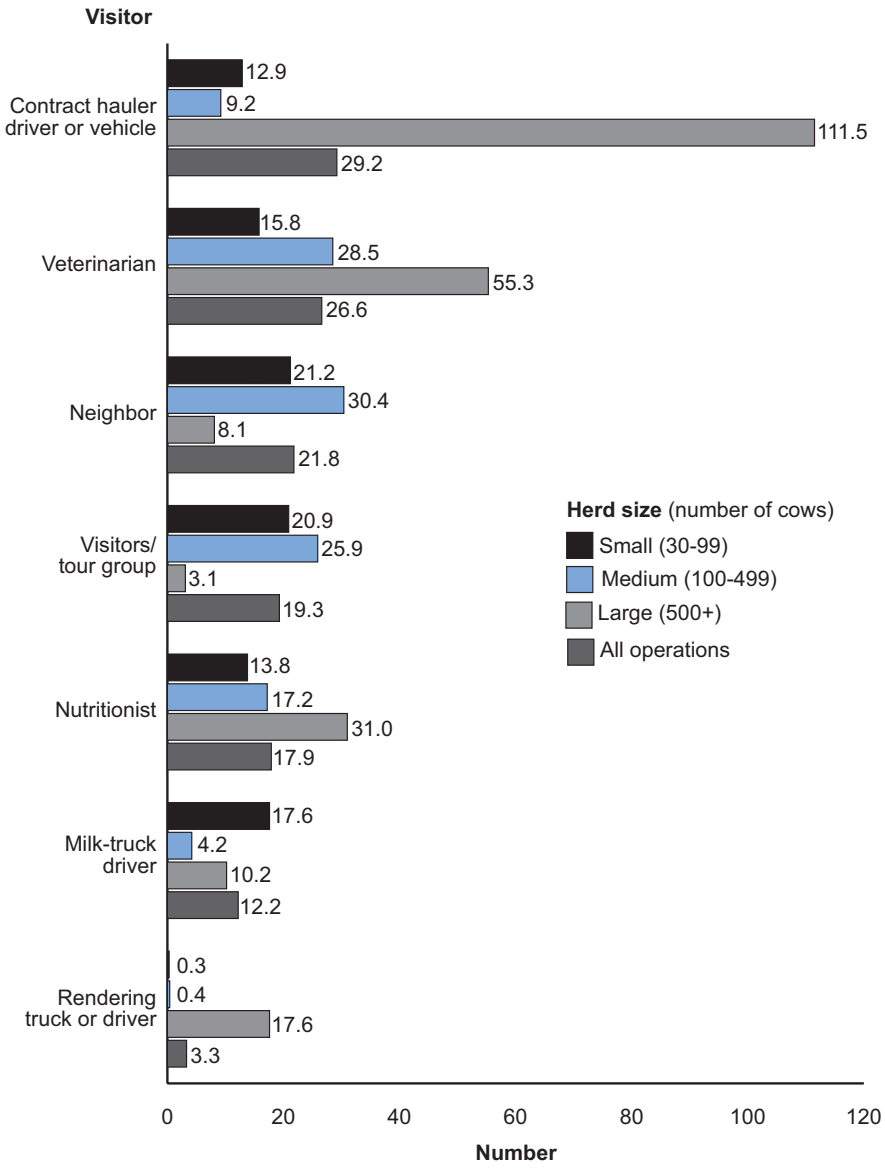
F.2.d Operation average number of animal contact visits in 2013, by type of visitor, herd size and region:

Operation Average Number of Animal Contact Visits

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Visitor	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Contract hauler driver or vehicle	12.9	(1.8)	9.2	(1.7)	111.5	(21.7)	147.9	(38.0)	15.8	(1.9)	29.2	(4.3)
Veterinarian	15.8	(1.5)	28.5	(2.1)	55.3	(8.2)	35.9	(4.5)	25.6	(2.0)	26.6	(1.8)
Neighbor	21.2	(5.4)	30.4	(21.4)	8.1	(2.6)	0.8	(0.4)	24.1	(8.0)	21.8	(7.2)
Visitors/tour group	20.9	(13.3)	25.9	(24.3)	3.1	(0.9)	1.2	(0.4)	21.3	(11.2)	19.3	(10.1)
Nutritionist	13.8	(2.3)	17.2	(1.8)	31.0	(2.4)	19.1	(2.8)	17.7	(1.5)	17.9	(1.4)
Milk-truck driver	17.6	(7.3)	4.2	(4.1)	10.2	(5.1)	0.0	(—)	13.6	(4.6)	12.2	(4.1)
Rendering truck or driver	0.3	(0.2)	0.4	(0.2)	17.6	(7.5)	25.3	(12.8)	0.9	(0.3)	3.3	(1.3)
Drug supplier	2.5	(0.9)	0.4	(0.3)	1.4	(0.9)	0.0	(—)	1.9	(0.6)	1.7	(0.5)
Feed-delivery personnel	1.3	(0.5)	1.3	(1.1)	0.2	(0.2)	0.0[1]	(—)	1.2	(0.5)	1.1	(0.4)
University/extension personnel	0.3	(0.1)	0.6	(0.2)	3.6	(1.8)	1.0	(0.5)	0.9	(0.4)	0.9	(0.3)
Other[2]	1.5	(0.8)	6.6	(5.6)	11.2	(4.7)	13.3	(7.0)	3.8	(2.0)	4.7	(1.9)

[1]One operation reported feed-delivery personnel having animal contact but didn't report how many visits per year, so an annual animal contact visit could not be calculated.
[2]Included AI technicians, foot trimmers, DHIA personnel, and inspectors.

Operation average number of animal contact visits in 2013, by type of visitor, herd size, and region



About one-third of operations (31.5 percent) had guidelines restricting access to animal areas.

F.2.e. Percentage of operations that had guidelines to determine who was allowed in aimal areas, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
28.3	(5.7)	27.4	(5.2)	48.2	(5.8)	39.5	(8.7)	30.6	(3.9)	31.5	(3.6)

A higher percentage of operations used disposable or clean boots for visitors (27.2 percent) than used footbaths (2.4 percent). Disposable or clean boots were used by a lower percentage of small and medium operations (17.8 and 28.7 percent, respectively) than large operations (51.8 percent).

F.2.f. Percentage of operations that used the following biosecurity practice(s) for visitors in animal areas, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Biosecurity practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Disposable or clean boots	17.8	(5.1)	28.7	(5.6)	51.8	(5.1)	20.3	(6.7)	27.9	(3.6)	27.2	(3.3)
Footbaths	0.0	(—)	5.1	(2.3)	4.5	(1.9)	0.0	(—)	2.6	(0.9)	2.4	(0.8)

The highest percentages of operations used rodent control (92.2 percent) or insect control (86.2 percent). About one-half of operations controlled access to cattle feed by other livestock and wildlife, limited cattle contact with other animals, or had a closed herd. A lower percentage of small operations than large operations limited cattle contact with other animals (45.8 and 73.0 percent, respectively), which was the only difference noted across herd sizes.

There were no regional differences in the percentages of operations by specific biosecurity practice.

F.2.g. Percentage of operations that used the following biosecurity practice(s), by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Biosecurity practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Rodent control (e.g., cats, traps, chemical/bait)	93.4	(3.0)	90.1	(3.6)	92.0	(2.4)	87.3	(4.3)	92.7	(2.1)	92.2	(2.0)
Insect control (e.g., sprays, foggers, treated ear tags, biological control, products administered to animals)	85.3	(4.7)	84.5	(4.2)	91.7	(2.7)	84.2	(5.3)	86.4	(3.1)	86.2	(2.8)
Controlled access to cattle feed by other livestock and wildlife (e.g., elk, deer, raccoons)	51.1	(6.5)	60.8	(6.2)	60.8	(5.7)	56.4	(8.3)	55.7	(4.4)	55.7	(4.0)
Limited cattle contact with other animals (e.g., livestock, elk, deer)	45.8	(6.5)	57.9	(6.5)	73.0	(4.8)	60.8	(8.1)	53.4	(4.4)	54.2	(4.0)
Closed herd (all replacements including bulls were from the operation; no purchases and no contact with cattle from other operations)	51.4	(6.3)	46.2	(6.6)	36.6	(5.7)	35.5	(9.0)	48.6	(4.3)	47.2	(4.0)
Bird control (e.g., traps, noise, chemical/bait)	37.8	(6.3)	33.1	(6.2)	49.0	(5.1)	42.3	(8.7)	38.0	(4.2)	38.4	(3.9)
Any restrictions on vehicles entering animal area	29.0	(5.7)	44.7	(6.2)	40.9	(5.3)	24.2	(6.4)	37.2	(4.0)	35.8	(3.7)

3. Equipment

Using the same equipment to handle manure and cattle feed might contaminate feed with bacteria that can cause disease in cattle. Separate equipment is recommended for handling manure and feed; however, if using separate equipment is not an option, equipment should be thoroughly cleaned and disinfected after handling manure and before handling feed.

About one-third of operations (35.5 percent) routinely used the same equipment to handle manure and feed, and a similar percentage of operations (36.9 percent) never used the same equipment to handle manure and feed. A higher percentage of small operations (44.0 percent) routinely used the same equipment compared with large operations (20.6 percent); a lower percentage of small operations than large operations (18.0 and 48.8 percent, respectively) sometimes used the same equipment for handling manure and feed.

F.3.a. Percentage of operations by frequency the same equipment was used to handle manure and cattle feed, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Routinely	44.0	(6.6)	29.5	(6.3)	20.6	(4.2)	33.5	(7.7)	35.8	(4.5)	35.5	(4.1)
Sometimes	18.0	(4.6)	31.7	(6.1)	48.8	(5.1)	38.2	(9.0)	26.4	(3.5)	27.6	(3.3)
Never	38.0	(6.1)	38.8	(5.8)	30.6	(4.5)	28.3	(7.2)	37.9	(4.1)	36.9	(3.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Slightly more than one-half of operations that routinely or sometimes used the same equipment to handle manure and cattle feed (55.3 percent) washed the equipment with water or steam only. Separate buckets were used for handling manure and feed on 33.2 percent of operations. A higher percentage of medium operations than large operations (50.0 and 16.4 percent, respectively) used separate buckets for handling manure and feed. Equipment was washed with water or steam only on a higher percentage of operations in the West region (92.8 percent) than in the East region (50.4 percent). Separate equipment was not used in the West region but was used by 37.6 percent of operations in the East region.

F.3.b. For the 63.1 percent of operations that routinely or sometimes used the same equipment to handle manure and cattle feed (table F.3.a), percentage of operations by procedure used to clean the equipment, and by herd size and region:

Percent Operations

	Herd size (number of cows)											
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Procedure	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Wash equipment with water or steam only	54.3	(8.4)	43.3	(8.8)	75.7	(4.9)	92.8	(3.7)	50.4	(5.7)	55.3	(5.2)
Chemically disinfect only	0.0	(—)	0.0	(—)	0.9	(0.9)	1.5	(1.5)	0.0	(—)	0.2	(0.2)
Wash equipment and chemically disinfect	7.2	(5.1)	0.0	(—)	3.5	(—)	2.5	(2.4)	4.7	(3.1)	4.4	(2.7)
Separate bucket used for each, but no cleaning of tires/equipment	30.2	(7.4)	50.0	(9.0)	16.4	(4.2)	0.0	(—)	37.6	(5.4)	33.2	(4.8)
Other	0.0	(—)	3.6	(3.5)	0.0	(—)	0.0	(—)	1.2	(1.2)	1.0	(1.0)
No procedures used	8.3	(5.7)	3.1	(3.0)	3.5	(2.0)	3.2	(2.2)	6.2	(3.5)	5.8	(3.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Less than one-third of operations (28.3 percent) shared heavy equipment with other livestock operations.

F.3.c. Percentage of operations that shared any heavy equipment with other livestock operations, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
28.2	(5.9)	24.3	(5.1)	35.3	(4.7)	17.2	(5.8)	29.5	(3.9)	28.3	(3.5)

Most operations (71.7 percent) never shared heavy equipment with other livestock operations. Overall, 12.4 percent of operations shared heavy equipment six or more times in 2013. A lower percentage of operations in the West region than in the East region shared heavy equipment six or more times (1.7 and 13.6 percent, respectively).

F.3.d. Percentage of operations by number of times operation shared heavy equipment with other livestock operations in 2013, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number times	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
None	71.8	(5.9)	75.7	(5.1)	64.7	(4.7)	82.8	(5.8)	70.5	(3.9)	71.7	(3.5)
1–2	4.9	(2.6)	8.5	(3.3)	10.0	(3.0)	9.3	(4.6)	6.6	(1.9)	6.9	(1.8)
3–5	9.6	(3.9)	3.6	(1.8)	16.4	(3.0)	6.2	(3.7)	9.3	(2.4)	9.0	(2.2)
6 or more	13.7	(4.6)	12.1	(3.9)	8.9	(2.8)	1.7	(1.2)	13.6	(3.0)	12.4	(2.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

For operations that shared heavy equipment with other livestock operations, almost two-thirds (58.9 percent) did not clean the equipment before using it on their own operation. About one-third of operations (32.5 percent) washed equipment with water or steam only before using it on their operation.

F.3.e. For the 28.3 percent of operations that shared any heavy equipment with other livestock operations (table F.3.c), percentage of operations by procedure used for cleaning shared equipment before using it on their operation:

Procedure	Percent operations	Std. error
Wash equipment with water or steam only	32.5	(7.1)
Chemically disinfect only	1.2	(1.2)
Wash equipment and chemically disinfect	0.0	(—)
Other	7.4	(4.0)
None	58.9	(7.4)
Total	100.0	

4. Johne's disease

Johne's disease is caused by *Mycobacterium avium* subspecies *paratuberculosis*. Most cattle with Johne's disease are thought to be infected within the first few months of life but do not normally show any clinical signs until 2 years of age or older. To control the disease, a voluntary Johne's disease control program was instituted in the early 2000s; however, Federal funding for the program has since been discontinued; however, some States still have a voluntary program.

Approximately one-third of operations (34.9 percent) participated in a Johne's disease control or certification program in or prior to 2013. A similar percentage of operations participated in a program developed specifically for their operation (18.7 percent) or did not participate in 2013 but had done so previously (17.8 percent).

A higher percentage of operations in the East region than in the West region participated in a Johne's disease program specifically developed for their operation, a State-sponsored program, or any program.

F.4.a. Percentage of operations that participated in any Johne's disease control or certification program in or before 2013, by type of program, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Program	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Developed specifically for the operation	13.9	(4.7)	22.7	(4.8)	26.1	(4.4)	2.2	(1.3)	20.5	(3.3)	18.7	(3.0)
Not in 2013, but had previously participated in a control program	16.7	(4.9)	18.9	(4.5)	19.4	(3.3)	8.0	(2.9)	18.9	(3.2)	17.8	(2.9)
State-sponsored	5.8	(2.6)	12.0	(3.8)	11.7	(2.0)	0.0	(—)	9.7	(2.1)	8.7	(1.8)
Other	4.7	(2.4)	4.0	(3.0)	0.7	(0.7)	0.0	(—)	4.2	(1.7)	3.8	(1.6)
Any	27.3	(5.7)	45.4	(6.2)	39.1	(4.9)	10.2	(3.2)	37.7	(4.0)	34.9	(3.6)

Some Johne's disease control programs include testing individual animals to identify those shedding *Mycobacterium avium* subspecies *paratuberculosis.* A total of 16.4 percent of operations tested cows for Johne's disease. A lower percentage of operations in the West region (1.2 percent) tested for Johne's disease compared with operations in the East region (18.1 percent).

F.4.b. Percentage of operations that tested for Johne's disease in 2013, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
15.2	(4.9)	18.6	(4.8)	16.5	(3.0)	1.2	(1.1)	18.1	(3.3)	16.4	(3.0)

Cow colostrum contaminated with *Mycobacterium avium* subspecies *paratuberculosis* might be a source of infection for calves. It is recommended that colostrum from infected cows not be fed to calves. Of operations that tested for Johne's disease, 12.4 percent fed colostrum from test-positive cows to calves.

F.4.c. For the 16.4 percent of operations that tested for Johne's disease (table F.4.b), percentage of operations that fed calves colostrum from test-positive cows:

Percent operations	**Std. error**
12.4	(9.3)

5. Foreign animal disease preparedness

There are multiple reasons for operations to keep visitor records, including tracking incoming cattle, feed, and supplies. Visitors, including delivery vehicles/personnel, might introduce and spread disease among operations. In the case of a disease outbreak, visitor records would be important for evaluating sources of disease and determining where the disease might have spread. Signs at an operation's entry points might keep unauthorized traffic from coming onto the operation.

Signs indicating no entry without permission were present on 14.2 percent of operations. A lower percentage of small and medium operations had no entry signs compared with large operations. Only 1.6 percent of operations kept visitor records.

A higher percentage of operations in the West region than in the East region (38.1 and 11.5 percent, respectively) had entrance signs indicating no entry without permission.

F.5.a. Percentage of operations that used entrance signs to limit visitors and percentage of operations that kept visitor records, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Sign at entrance to the operation indicating no entry without permission	9.9	(4.0)	10.3	(3.4)	33.5	(5.4)	38.1	(8.0)	11.5	(2.6)	14.2	(2.5)
Kept records	0.0	(—)	3.0	(2.5)	3.9	(1.8)	2.1	(1.4)	1.5	(0.9)	1.6	(0.8)

Business continuity during a foreign animal disease outbreak is important to sustaining animal agriculture. To keep milk moving during an outbreak, the Secure Milk Supply Plan was created in collaboration with the dairy industry, State and Federal government officials, and three universities: Iowa State University; University of California, Davis; and the University of Minnesota. The Secure Milk Supply plan strives to ensure that during a foreign animal disease outbreak, milk will be transported with no or negligible risk of moving the disease with it. People and vehicles moving from areas affected by disease can spread disease to other operations, making it important to implement excellent biosecurity practices at the farm gate. Any movement on or off the operation should be strictly controlled, and disinfection practices must be performed. The strategies listed in the following table are critical when moving milk from dairy operations during a foreign animal disease outbreak.

More than 80 percent of operations (81.5 percent) could, if necessary, move all traffic entering or exiting the operation through a controlled single access point. About two-thirds of operations (67.7 percent) could secure the single access point with a locked gate, and almost three-fourths could assign someone to regulate traffic at the access point. A wash station could be located close to the access point on 63.2 percent of operations. A lower percentage of medium operations than large operations (48.9 and 74.1 percent, respectively) had an area that could be used as a wash station.

F.5.b. Percentage of operations that have implemented or could implement the following strategies during a foreign animal disease outbreak, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Strategy	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
All traffic would have to enter and exit the operation through a single, controlled access point	81.8	(4.8)	77.9	(5.1)	87.0	(3.2)	83.1	(5.7)	81.4	(3.3)	81.5	(3.0)
Access point(s) secured by a locked gate	71.7	(5.7)	58.0	(6.5)	72.6	(5.8)	60.6	(9.0)	68.5	(4.0)	67.7	(3.7)
Someone assigned to regulate all traffic on and off the operation	66.8	(6.1)	73.0	(5.2)	87.8	(4.6)	85.4	(7.6)	71.0	(4.0)	72.5	(3.6)
Area close to the access point that could be used as a wash station	67.6	(5.9)	48.9	(6.6)	74.1	(4.9)	76.9	(6.3)	61.6	(4.2)	63.2	(3.8)

Of operations that have (or could have) implemented access-point strategies for entering and exiting the operation, 83.3 percent would be able to continue moving milk within a 1-day notice of the requirement to implement disease prevention strategies, including those mentioned above. There were no differences by herd size or by region in the percentages of operations by number of days strategies could be implemented.

F.5.c. For the 81.5 percent of operations that have (or could have) a strategy in which all traffic would have to enter and exit through a single access point (table F.5.b), percentage of operations by number of days it would take the operation to implement a strategy, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number days	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Within 1	83.7	(5.3)	85.9	(4.5)	78.1	(6.5)	72.5	(9.7)	84.5	(3.5)	83.3	(3.3)
2–6	14.6	(5.1)	6.7	(3.0)	13.4	(5.5)	16.3	(9.3)	11.6	(3.2)	12.1	(3.0)
7 or more	1.8	(1.8)	7.4	(3.5)	8.4	(4.2)	11.2	(5.5)	3.9	(1.7)	4.6	(1.6)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

It is not always possible or practical to have a truck-washing station on every operation. Some States consider the use of a commercial truck wash to be part of the Secure Milk Supply Plan. Overall, 10.3 percent of operations had a commercial truck wash in close proximity that might be used during a foreign animal disease outbreak.

F.5.d. Percentage of operations that had a commercial truck wash* in close proximity, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
8.0	(3.1)	7.0	(3.3)	22.8	(5.4)	24.2	(8.4)	8.7	(2.2)	10.3	(2.2)

*Trucks leaving the operation could be washed before driving past other livestock operations.

Constructing a truck-washing station is likely one of the most difficult and time-consuming aspects of the Secure Milk Supply Plan. Nearly one-fourth of operations (23.6 percent) already had a truck-washing station or could construct one within 1 day. More than one-half of operations (55.9 percent) would need a week or more to construct the washing station.

F.5.e. Percentage of operations by number of days it would take to construct a truck-washing station (temporary or permanent) with a gravel or concrete pad and access to water and power, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Number days	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Within 1	23.4	(5.4)	17.8	(4.8)	33.1	(5.5)	28.5	(7.3)	23.0	(3.6)	23.6	(3.3)
2–6	18.8	(5.2)	21.1	(5.3)	25.0	(4.9)	25.4	(8.0)	20.0	(3.5)	20.6	(3.3)
7 or more	57.8	(6.5)	61.0	(6.4)	41.9	(6.2)	46.2	(9.0)	57.0	(4.4)	55.9	(4.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Most items needed to construct a truck-washing station (water, fuel/power, disinfectant, and power washer) were either already available or available within a day's notice on more than 90 percent of operations. Some operations indicated that they could not obtain disinfectant sprayers, personal protective equipment, and portable footbaths within 1 day.

F.5.f. Percentage of operations by items used for a truck-washing station already on the operation or available within a day's notice, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Items	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Water source	100.0	(—)	100.0	(—)	99.2	(0.5)	99.5	(0.5)	99.9	(0.1)	99.9	(0.1)
Fuel/power source	99.2	(0.8)	100.0	(—)	98.7	(0.7)	98.6	(1.0)	99.5	(0.5)	99.4	(0.4)
Disinfectant (bleach, etc.)	94.8	(2.7)	97.1	(1.6)	99.7	(0.3)	97.3	(2.1)	96.2	(1.6)	96.3	(1.5)
Power washer	91.4	(3.3)	97.3	(2.0)	99.7	(0.3)	97.0	(2.4)	94.4	(2.0)	94.6	(1.8)
Disinfectant sprayer	66.9	(6.3)	81.5	(4.7)	90.9	(3.6)	94.5	(2.6)	73.4	(4.2)	75.5	(3.8)
Boots, gloves, coveralls, eye wear for truck washing (personal protective equipment)	69.6	(6.2)	74.4	(6.0)	89.8	(3.9)	88.1	(4.4)	73.1	(4.2)	74.6	(3.8)
Portable footbath	55.3	(6.5)	70.4	(5.7)	75.4	(5.5)	77.6	(7.9)	61.7	(4.3)	63.4	(4.0)

6. Foreign animal disease information and resources

Nearly all operations (94.8 percent) would very likely consult their private veterinarian for general information about a foreign animal disease, should an outbreak occur. Less than 40 percent of operations would be very likely to use any of the other sources listed in the following table. Operations were very likely to consult a State Veterinarian's office and/or the USDA for general disease information on 30.5 and 28.1 percent of operations, respectively.

F.6.a. Percentage of operations by likelihood of using the following information sources if an outbreak of foreign animal disease (e.g., foot-and-mouth disease) occurred in the United States:

	Percent Operations						
	Likelihood of Using Source						
	Very		Somewhat		Not		
Information source	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Private veterinarian	94.8	(1.8)	4.1	(1.5)	1.1	(0.9)	100.0
Internet	39.3	(3.8)	20.4	(3.1)	40.3	(4.0)	100.0
Magazines	33.0	(3.8)	46.4	(4.1)	20.6	(3.0)	100.0
Dairy organization or cooperative	32.6	(3.6)	38.6	(4.0)	28.8	(3.8)	100.0
Other dairy producers	31.0	(3.8)	42.1	(4.0)	26.9	(3.5)	100.0
State Veterinarian's office	30.5	(3.5)	23.0	(3.3)	46.5	(4.1)	100.0
U.S. Department of Agriculture	28.1	(3.5)	34.4	(3.9)	37.4	(4.0)	100.0
Extension agent	26.6	(3.6)	35.1	(3.9)	38.3	(3.8)	100.0
Television/newspapers	17.8	(3.0)	40.1	(4.0)	42.1	(3.9)	100.0

Compared with large operations, a lower percentage of small operations were very likely to use the Internet or the State Veterinarian's office for general information during an outbreak of foreign animal disease.

A higher percentage of operations in the West region than in the East region were very likely to use the Internet for general information, and a higher percentage of operations in the East region than in the West region would likely use extension agents.

F.6.b. Percentage of operations that were very likely to use the following information sources if an outbreak of foreign animal disease (e.g., foot-and-mouth disease) occurred in the United States, by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Information source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Private veterinarian	93.0	(2.8)	97.1	(2.8)	96.2	(2.3)	100.0	(—)	94.2	(1.9)	94.8	(1.8)
Internet	32.4	(6.2)	39.3	(5.9)	60.1	(5.7)	67.8	(8.3)	36.1	(4.1)	39.3	(3.8)
Magazines	32.5	(6.1)	33.0	(6.2)	34.6	(5.6)	34.4	(8.6)	32.9	(4.2)	33.0	(3.8)
Dairy organization or cooperative	28.3	(5.6)	29.1	(5.5)	51.1	(5.9)	54.2	(8.7)	30.1	(3.9)	32.6	(3.6)
Other dairy producers	33.0	(6.2)	25.7	(5.8)	33.9	(5.6)	27.4	(6.9)	31.4	(4.2)	31.0	(3.8)
State Veterinarian's office	21.2	(5.1)	37.2	(6.1)	46.6	(5.8)	45.2	(8.7)	28.8	(3.7)	30.5	(3.5)
U.S. Department of Agriculture	23.4	(5.3)	32.2	(6.0)	35.1	(5.8)	34.7	(8.5)	27.4	(3.7)	28.1	(3.5)
Extension agent	28.9	(6.0)	25.6	(5.7)	21.8	(4.0)	10.3	(4.1)	28.5	(4.0)	26.6	(3.6)
Television/ newspapers	14.8	(4.6)	20.3	(4.8)	22.5	(5.5)	26.1	(8.5)	16.9	(3.2)	17.8	(3.0)
Any source above	97.1	(2.0)	100.0	(—)	100.0	(—)	100.0	(—)	98.3	(1.2)	98.5	(1.0)

Almost all operations (98.6 percent) would contact their private veterinarian if they had an animal suspected of having a foreign animal disease. The State Veterinarian's office would be contacted by 40.8 percent of operations. There were no herd size or regional differences in percentages of operations that would contact a specific resource.

F.6.c. Percentage of operations by resources that would be contacted if an animal on the operation was suspected of having a foreign animal disease (e.g., foot-and-mouth disease), and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Resource	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Private veterinarian	99.0	(1.0)	100.0	(—)	95.1	(3.3)	99.4	(0.5)	98.5	(0.9)	98.6	(0.8)
State Veterinarian's office	36.4	(6.2)	39.9	(6.0)	55.6	(5.5)	51.3	(8.6)	39.6	(4.2)	40.8	(3.9)
U.S. Department of Agriculture	30.3	(6.1)	30.4	(5.7)	38.1	(5.4)	36.5	(8.6)	31.2	(4.0)	31.7	(3.7)
Feed company or milk cooperative representative	28.7	(5.8)	25.7	(5.0)	42.4	(6.1)	38.1	(8.6)	29.3	(3.9)	30.2	(3.6)
Extension agent/ university	16.9	(4.7)	12.3	(3.4)	21.7	(4.3)	15.6	(5.3)	16.4	(3.1)	16.4	(2.8)
Any resource above	99.0	(1.0)	100.0	(—)	96.8	(3.1)	100.0	(—)	98.8	(0.8)	98.9	(0.7)

A newly introduced disease might present multiple clinical signs in affected animals. A decrease in milk production is one of the first signs of a disease problem. On average, producers would contact a veterinarian when total daily milk production decreased by 17.1 percent. Small operations would contact a veterinarian when total daily milk production decreased by 20.3 percent, and large operations would contact a veterinarian when total daily milk production decreased by 11.2 percent.

Large operations in the West region would contact a veterinarian when total daily milk production decreased by 10.6 percent, and large operations in the East region would do so when milk production decreased by 17.8 percent

F.6.d. Operation average percentage decrease in total daily milk production that would have to occur before a veterinarian would be contacted to assist with a potential disease problem in the herd, by herd size and by region:

Operation Average Percent Decrease

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct/**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
20.3	(2.1)	15.0	(1.2)	11.2	(0.8)	10.6	(1.0)	17.8	(1.3)	17.1	(1.2)

On average, producers would contact a veterinarian if 2.8 percent of their cows died within a week or if 9.5 percent of their cows became lame within a week. In general, the percentage of cows affected before a veterinarian was contacted decreased as herd size increased, which was expected since a single cow on a small operation represents a higher percentage of cow inventory than a single cow on large operations. For all potential problems listed in the following table, operations in the West region would contact a veterinarian at a lower percentage of affected cows compared with operations in the East region.

F.6.e Operation average percentage of milk cows that would have to be affected with the following problem(s) within a week before a veterinarian would be contacted, by herd size and by region:

Operation Average Percent Cows*

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Potential problem	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Milk cows dying	3.8	(0.3)	2.3	(0.3)	0.9	(0.2)	1.5	(0.4)	3.0	(0.2)	2.8	(0.2)
Milk cows aborting	6.1	(0.8)	3.4	(0.5)	1.5	(0.4)	2.1	(0.7)	4.7	(0.5)	4.5	(0.5)
Milk cows with excessive drooling	6.3	(0.7)	4.5	(0.6)	1.8	(0.3)	2.5	(0.6)	5.3	(0.5)	5.0	(0.4)
Milk cows exhibiting fever	7.0	(0.8)	4.9	(0.7)	2.7	(0.4)	2.8	(0.5)	5.9	(0.5)	5.6	(0.5)
Milk cows showing lameness	11.7	(1.3)	8.2	(1.4)	5.0	(0.8)	4.7	(0.9)	10.1	(0.9)	9.5	(0.8)

*As a percentage of January 1, 2014, dairy cow inventory.

G. Drug Use and Residue Avoidance

During the past several years, regulations regarding antimicrobial drug use in the U.S. livestock industry have undergone several changes. These changes were meant to promote the judicious use of antimicrobials. Judicious use refers to using the best drug at the appropriate time and at the labeled dose and route of administration for the recommended duration. To address the judicious-use goal, the U.S. Food and Drug Administration's (FDA) Center for Veterinary Medicine (CVM) released multiple Guidance-for-Industry documents that outline the changes affecting the U.S. livestock industry. For example, Guidance #152, published in 2003, categorizes antimicrobial drugs by their importance to human medical therapy: critically important, highly important, important, and not medically important (appendix 4).

Some drugs used in animal feed, such as ionophores, are not considered medically important to humans and, therefore, are not affected by the regulations, unless they are fed in combination with a medically important drug. Guidance #209, published in 2012 and effective as of January 1, 2017, calls for eliminating over-the-counter availability of medically important antimicrobials used in animal feed or water or for production purposes (i.e., growth promotion and feed efficiency). Guidance #213, published in 2013, outlines the process by which drug companies can remove the production use claim on their labels. The last change, which took effect on January 1, 2017, is the modification of the FDA–CVM Veterinary Feed Directive (VFD). This modification places control of medically important drugs used in livestock feed or water under the direct supervision of veterinarians.

1. Medications used in feed or water

In 2013, medications in feed or water were used to prevent disease or promote growth in weaned heifers on 58.1 percent of operations and in pregnant heifers on 43.6 percent. A lower percentage of small operations than large operations used medications in feed or water for disease prevention or growth promotion in weaned heifers. A higher percentage of operations in the East region than in the West region used medications in feed or water for pregnant heifers (46.4 and 17.2 percent, respectively).

G.1.a. Percentage of operations that used medications in feed or water for any weaned or pregnant heifers to prevent disease or promote growth in 2013, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Heifer type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Weaned	51.0	(6.5)	59.0	(6.5)	78.5	(5.9)	60.3	(9.2)	57.9	(4.4)	58.1	(4.1)
Pregnant	39.7	(6.7)	46.4	(6.6)	49.8	(6.0)	17.2	(5.6)	46.4	(4.5)	43.6	(4.1)
Either	51.0	(6.5)	60.1	(6.5)	78.7	(5.8)	60.4	(9.1)	58.3	(4.4)	58.6	(4.1)

On 58.1 percent of operations, weaned heifers received at least some medication in feed or water to prevent disease or promote growth. Ionophores, which are not approved for use in water, were used in weaned-heifer feed on 50.5 percent of operations and represented the medication used by the highest percentage of operations for weaned heifers. Coccodiostats were used by 15.2 percent of operations. Medically important antimicrobials (chlortetracycline, oxytetracycline, sulfamethazine, and neomycin) were each used on less than 15 percent of operations. About one-fourth of operations (25.3 percent) used any medically important anitmicrobials. A lower percentage of small operations fed coccidiostats (11.1 percent) or oxytetracyclines (0.0 percent) compared with large operations (30.8 and 12.3 percent, respectively). Any medication in feed or water for weaned heifers was used on a lower percentage of small than large operations (51.0 and 78.5 percent, respectively).

G.1.b. Percentage of operations that used medications in feed or water for any **weaned heifers** to prevent disease or promote growth, by medication(s) used, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (Rumensin®, Bovatec®, Cattlyst®)	45.2	(6.5)	53.1	(6.6)	62.5	(6.2)	39.3	(8.2)	51.8	(4.4)	50.5	(4.1)
Coccidiostats (Corid®, Deccox®)	11.1	(4.0)	13.8	(4.1)	30.8	(5.7)	22.9	(6.8)	14.4	(2.9)	15.2	(2.7)
Chlortetracycline (Aureomycin® Crumbles)	9.0	(3.8)	10.5	(3.6)	26.9	(5.3)	5.6	(3.5)	13.3	(2.7)	12.5	(2.5)
Chlortetracycline and sulfamethazine (Aureo S 700® Crumbles)	10.3	(4.2)	9.3	(4.3)	23.2	(4.7)	6.4	(2.2)	12.9	(3.0)	12.2	(2.7)
Oxytetracycline (OTC Crumbles®, Terramycin®)	0.0	(—)	4.5	(2.2)	12.3	(3.8)	13.4	(5.5)	2.4	(0.9)	3.5	(1.0)
Neomycin-oxytetracycline (Neo-erramycin®)	0.0	(—)	1.2	(1.2)	4.8	(3.4)	1.1	(1.1)	1.2	(0.7)	1.2	(0.7)
Sulfamethazine	0.2	(0.2)	0.0	(—)	3.1	(1.7)	5.7	(3.1)	0.1	(0.1)	0.6	(0.3)
Neomycin sulfate	0.0	(—)	0.0	(—)	0.2	(0.2)	0.0	(—)	0.0	(0.0)	0.0	(0.0)
Other	0.0	(—)	0.0	(—)	1.1	(1.0)	1.8	(1.8)	0.0	(—)	0.2	(0.2)
Any medication	51.0	(6.5)	59.0	(6.5)	78.5	(5.8)	60.3	(9.1)	57.9	(4.4)	58.1	(4.1)
Any medically important medication*	19.5	(5.4)	22.0	(5.4)	48.9	(6.0)	26.8	(7.0)	25.1	(3.7)	25.3	(3.4)

*See Appendix IV.

Almost two-thirds of weaned heifers (62.7 percent) received ionophores in feed in 2013, and 18.5 percent received coccidiostats. Less than 9 percent of weaned heifers received each medically important antimicrobial in feed or water. There were no herd-size differences in the percentage of heifers that received medication in feed or water. A lower percentage of weaned heifers in the West region than in the East region were fed chlortetracycline and sulfamethazine in combination (1.4 and 8.1 percent, respectively).

G.1.c. Percentage of **weaned heifers** by medication(s) received in feed or water to prevent disease or promote growth, and by herd size and region:

Percent Weaned Heifers

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (Rumensin®, Bovatec®, Cattlyst®)	46.6	(6.4)	53.2	(7.2)	67.3	(10.3)	53.2	(14.3)	70.1	(4.6)	62.7	(7.4)
Coccidiostats (Corid®, Deccox®)	10.0	(4.3)	10.3	(3.7)	21.7	(7.4)	20.3	(10.6)	17.1	(4.7)	18.5	(5.3)
Chlortetracycline (Aureomycin® Crumbles)	7.0	(3.5)	6.7	(3.2)	9.4	(3.1)	5.5	(4.0)	11.2	(2.3)	8.7	(2.3)
Chlortetracycline and sulfamethazine (Aureo S 700® Crumbles)	6.6	(3.2)	4.8	(3.1)	5.0	(1.2)	1.4	(0.8)	8.1	(1.5)	5.1	(1.1)
Oxytetracycline (OTC Crumbles®, Terramycin®)	0.0	(—)	1.7	(1.0)	8.7	(4.3)	12.9	(7.3)	1.6	(0.6)	6.6	(3.1)
Neomycin-oxytetracycline (Neo-erramycin®)	0.0	(—)	0.0	(0.0)	1.4	(1.0)	1.4	(1.4)	0.7	(0.7)	1.0	(0.7)
Sulfamethazine	0.1	(0.1)	0.0	(—)	0.3	(0.2)	0.4	(0.3)	0.1	(0.1)	0.2	(0.2)
Neomycin sulfate	0.0	(—)	0.0	(—)	0.0	(0.0)	0.0	(—)	0.0	(0.0)	0.0	(0.0)
Other	0.0	(—)	0.0	(—)	0.5	(0.5)	0.8	(0.9)	0.0	(—)	0.4	(0.4)

Pregnant heifers received medications in feed or water on 43.6 percent of operations. Only 4.2 percent of operations used any medically important medications in pregnant heifers. There were no differences by herd size in the percentages of operations by medication used. Ionophores were fed to pregnant heifers on a lower percentage of operations in the West region than in the East region (15.2 and 43.6 percent, respectively). A lower percentage of operations in the West region used any medication compared with operations in the East region (17.2 and 46.4 percent, respectively).

G.1.d. Percentage of operations that used medications in feed or water for any **pregnant heifers** to prevent disease or promote growth, by medication(s) used, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (Rumensin®, Bovatec®, Cattlyst®)	36.8	(6.6)	43.4	(6.6)	48.3	(6.0)	15.2	(5.3)	43.6	(4.5)	40.8	(4.1)
Chlortetracycline and sulfamethazine (Aureo S 700® Crumbles)	2.9	(2.8)	1.2	(1.2)	4.3	(3.4)	0.6	(0.6)	2.8	(1.8)	2.6	(1.6)
Chlortetracycline (Aureomycin® Crumbles)	0.0	(—)	3.4	(2.6)	5.5	(3.6)	0.0	(—)	2.2	(1.2)	2.0	(1.0)
Coccidiostats (Corid®, Deccox®)	2.1	(2.1)	1.2	(1.2)	2.8	(1.7)	0.0	(—)	2.1	(1.3)	1.9	(1.2)
Neomycin-oxytetracycline (Neo-erramycin®)	0.0	(—)	0.0	(—)	4.3	(3.5)	0.0	(—)	0.8	(0.7)	0.7	(0.6)
Oxytetracycline (OTC Crumbles®, Terramycin®)	0.0	(—)	0.0	(—)	1.5	(1.0)	0.0	(—)	0.3	(0.2)	0.3	(0.2)
Neomycin sulfate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Sulfamethazine	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Other	0.0	(—)	0.0	(—)	1.1	(1.1)	2.0	(2.0)	0.0	(—)	0.2	(0.2)
Any medication	39.7	(6.7)	46.4	(6.6)	49.8	(6.0)	17.2	(5.6)	46.4	(4.5)	43.6	(4.1)
Any medically important medication*	2.9	(2.8)	4.6	(2.9)	7.6	(3.7)	0.6	(0.6)	4.6	(2.0)	4.2	(1.8)

*See Appendix IV.

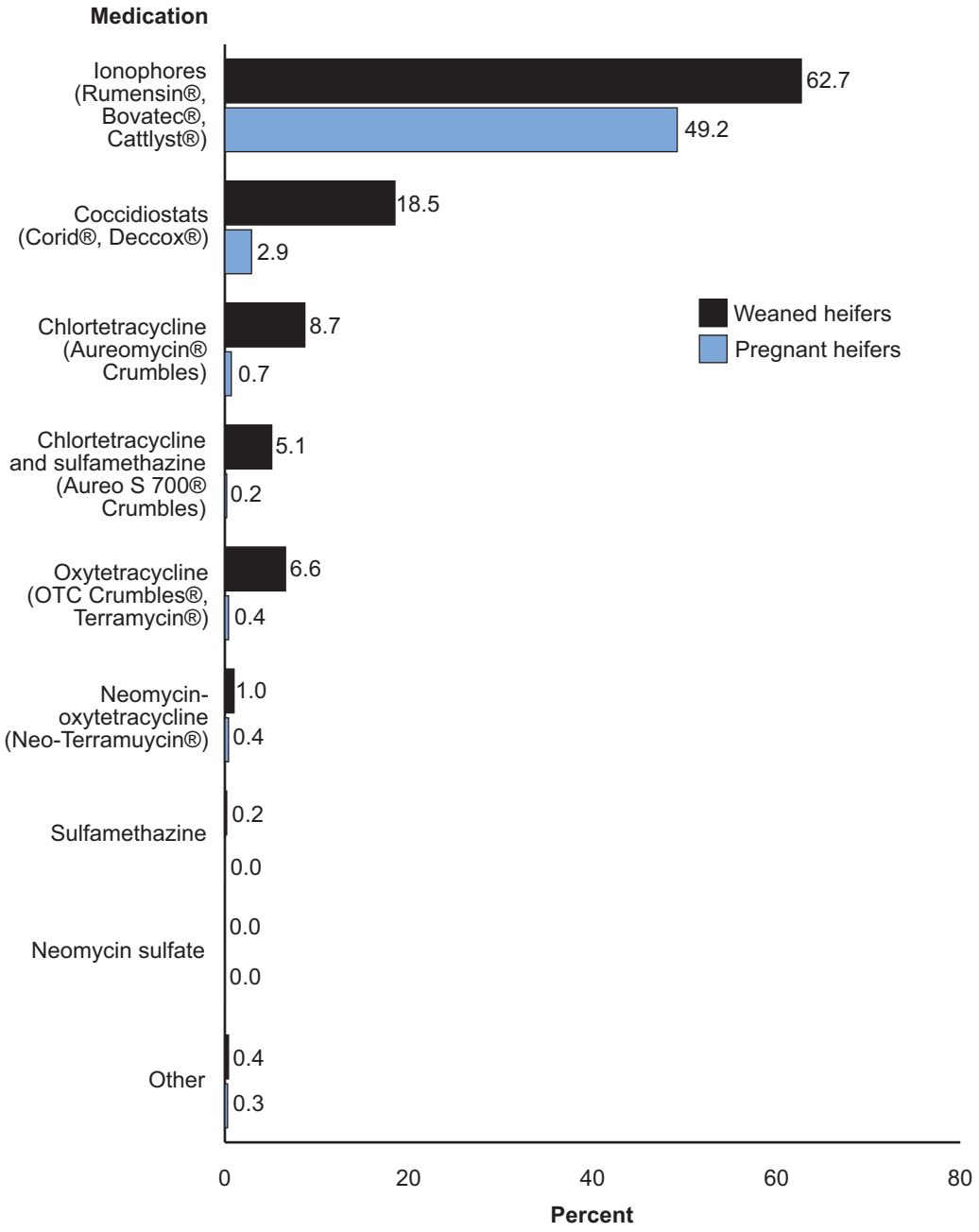
Almost one-half of pregnant heifers (49.2 percent) were fed ionophores in feed or water. A lower percentage of pregnant heifers were fed ionophores in the West region than in the East region (18.6 and 71.4 percent, respectively). Less than 3 percent of pregnant heifers received each of the medications other than ionophores in feed or water.

G.1.e. Percentage of **pregnant heifers** by medication(s) received in feed or water to prevent disease or promote growth, and by herd size and region:

Percent Pregnant Heifers

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (Rumensin®, Bovatec®, Cattlyst®)	43.6	(6.8)	45.5	(7.0)	50.5	(12.6)	18.6	(9.2)	71.4	(7.9)	49.2	(9.7)
Chlortetracycline and sulfamethazine (Aureo S 700® Crumbles)	0.2	(0.2)	0.1	(0.1)	0.2	(0.1)	0.2	(0.2)	0.2	(0.1)	0.2	(0.1)
Chlortetracycline (Aureomycin® Crumbles)	0.0	(—)	2.3	(2.0)	0.5	(0.4)	0.0	(—)	1.3	(0.8)	0.7	(0.4)
Coccidiostats (Corid®, Deccox®)	2.8	(2.7)	1.0	(1.0)	3.3	(2.2)	0.0	(—)	5.1	(2.9)	2.9	(1.7)
Neomycin-oxytetracycline (Neo-terramycin®)	0.0	(—)	0.0	(—)	0.5	(0.4)	0.0	(—)	0.6	(0.5)	0.4	(0.3)
Oxytetracycline (OTC Crumbles®, Terramycin®)	0.0	(—)	0.0	(—)	0.5	(0.4)	0.0	(—)	0.6	(0.5)	0.4	(0.3)
Neomycin sulfate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Sulfamethazine	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Other	0.0	(—)	0.0	(—)	0.3	(0.4)	0.6	(0.7)	0.0	(—)	0.3	(0.3)

Percentage of weaned heifers and percentage of pregnant heifers by medication(s) received in feed or water to prevent disease or promote growth



A higher percentage of operations normally fed ionophores to heifers than to cows (55.3 and 39.9 percent, respectively). A lower percentage of small operations fed ionophores to either heifers or cows compared with medium and large operations.

G.1.f. Percentage of operations that normally fed ionophores, by cattle class, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifer	46.2	(2.6)	67.7	(2.5)	72.4	(2.2)	49.3	(2.8)	55.9	(1.9)	55.3	(1.8)
Cow	27.7	(2.3)	56.2	(2.7)	62.7	(2.2)	40.3	(3.2)	39.9	(1.8)	39.9	(1.6)

The percentage of cattle on operations that normally fed ionophores was higher for heifers than for cows (70.7 and 58.2 percent, respectively). A lower percentage of heifers and cows on small operations were fed ionophores than heifers and cows on medium or large operations. Similarly, a lower percentage of heifers and cows in the West region than in the East region were on operations that fed ionophores.

G.1.g. Percentage of cattle on operations that normally fed ionophores, by cattle class, herd size, and region:

Percent Cattle

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifer	52.2	(2.7)	70.8	(2.5)	74.9	(2.4)	65.7	(3.3)	74.5	(1.6)	70.7	(1.7)
Cow	31.6	(2.6)	60.2	(2.8)	63.3	(2.7)	50.6	(3.7)	63.9	(1.8)	58.2	(1.9)

2. General antimicrobial use

More than 90 percent of operations administered drugs—not necessarily antimicrobials—that required a milk or meat withdrawal period. A lower percentage of small operations (87.3 percent) administered drugs with a milk or meat withdrawal period compared with large operations (99.0 percent).

G.2.a. Percentage of operations that administered at least one drug to heifers or cows that required a milk or meat withdrawal period, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
87.3	(4.0)	95.6	(2.0)	99.0	(1.0)	98.2	(1.7)	91.2	(2.5)	91.9	(2.2)

Antimicrobials were administered to cattle on 91.3 percent of operations. A lower percentage of operations administered antimicrobials to weaned heifers than to preweaned heifers or cows.

G.2.b. Percentage of operations that administered antimicrobials to the following cattle classes in 2013, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Cattle class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned heifers	74.8	(5.7)	90.9	(2.9)	80.0	(4.5)	70.2	(7.4)	81.8	(3.5)	80.7	(3.3)
Heifers weaned but not yet calved	43.7	(6.5)	61.5	(6.2)	80.6	(4.9)	75.4	(6.7)	53.3	(4.5)	55.4	(4.1)
Cows	84.9	(4.4)	90.7	(3.6)	96.1	(1.9)	92.1	(4.0)	88.2	(2.8)	88.6	(2.6)
Any	86.3	(4.2)	95.6	(2.0)	99.0	(1.0)	98.2	(1.7)	90.5	(2.5)	91.3	(2.3)

3. Antimicrobial use—preweaned heifers

Among operations that administered any antimicrobials, digestive and respiratory disease were the most common diseases affecting preweaned heifers (21.1 and 12.0 percent, respectively). Overall, 16.0 and 11.4 percent of heifers were treated for digestive and respiratory disease, respectively. The percentage of affected preweaned heifers treated with antimicrobials was higher for those with respiratory disease (94.8 percent) than for those with digestive disease (75.9 percent).

G.3.a. For the 91.3 percent of operations that administered any antimicrobials in 2013 (table G.2.b), percentage of preweaned heifers affected by and treated with antimicrobials for the following diseases or disorders, and percentage of affected preweaned heifers treated with antimicrobials:

	Percent Preweaned Heifers*					
	Affected		Treated		Percent of affected that were treated	
Disease/disorder	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Diarrhea or other digestive	21.1	(2.0)	16.0	(2.0)	75.9	(4.5)
Respiratory	12.0	(1.4)	11.4	(1.3)	94.8	(2.9)
Navel infection	1.7	(0.3)	1.5	(0.2)	91.0	(4.7)
Other	0.1	(0.1)	0.1	(0.0)	65.8	(16.4)

*As a percentage of dairy heifer calves born alive in 2013.

The highest percentages of operations administered antimicrobials to preweaned heifers to treat diarrhea/digestive disease (64.1 percent) and respiratory disease (62.0 percent). The top three primary antimicrobials used to treat digestive disease were tetracyclines (10.7 percent of operations), third-generation cephalosporins (8.9 percent), and trimethoprim/sulfa (8.5 percent). Macrolides and florfenicol were the two primary antimicrobials used to treat respiratory disease in preweaned heifers (18.2 and 15.1 percent of operations, respectively). Penicillin was the primary antimicrobial used to treat navel infections on 18.7 percent of operations.

G.3.b. Percentage of operations by primary antimicrobial used to treat affected preweaned heifers, and by disease or disorder:

	Percent Operations							
	Disease/Disorder							
	Diarrhea/ digestive		Respiratory		Navel infection		Other	
Primary antimicrobial used	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminoglycoside	7.3	(2.3)	0.0	(—)	0.0	(—)	0.0	(—)
Beta-lactam–first-generation cephalosporins	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Beta-lactam–third-generation cephalosporins	8.9	(2.1)	5.9	(1.7)	1.6	(0.8)	0.1	(0.1)
Beta-lactam–penicillins	7.5	(2.2)	8.1	(2.6)	18.7	(2.8)	0.9	(0.5)
Florfenicol	1.5	(0.7)	15.1	(2.9)	2.9	(1.6)	0.0	(—)
Fluoroquinolone	5.7	(1.4)	6.6	(1.7)	0.5	(0.3)	0.0	(—)
Macrolide	0.9	(0.8)	18.2	(2.8)	1.8	(1.1)	0.4	(0.4)
Sulfonamide	6.6	(2.3)	1.0	(0.8)	0.0	(—)	0.1	(0.1)
Tetracycline	10.7	(2.9)	6.1	(1.9)	2.0	(1.0)	1.0	(0.6)
Trimethoprim/sulfa	8.5	(2.0)	0.5	(0.4)	0.0	(—)	0.0	(—)
Other/unknown	6.4	(1.9)	0.4	(0.3)	1.2	(0.7)	2.0	(0.7)
Any antimicrobial above	64.1	(3.9)	62.0	(4.1)	28.7	(3.4)	4.3	(1.1)
Disease but no treatment or no disease or disorder*	35.9	(3.9)	38.0	(4.1)	71.3	(3.4)	95.7	(1.1)
Total	100.0		100.0		100.0		100.0	

*Due to questionnaire design, it was not possible to distinguish between operations without disease and those that had disease but did not treat with antimicrobials.

The highest percentages of preweaned heifers treated for diarrhea were on operations that used third-generation cephalosporins (27.6 percent of heifers) and trimethoprim/sulfa (18.7 percent) as their primary antimicrobials for treating diarrhea. About one-third of preweaned heifers treated for respiratory disease were on operations that used florfenicol (35.6 percent) or macrolides (31.7 percent) as their primary antimicrobials for treating respiratory disease. More than one-half of preweaned heifers treated for navel infection (58.1 percent) were on operations that used penicillin as their primary antimicrobial for navel infection.

G.3.c. For preweaned heifers treated with antimicrobials for the following diseases/disorders (table G.3.a), percentage of preweaned heifers by primary antimicrobial used:

	Percent Preweaned Heifers					
	Disease/Disorder					
	Diarrhea/ digestive		Respiratory		Navel infection	
Primary antimicrobial used	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminoglycoside	14.7	(7.2)	0.0	(—)	0.0	(—)
Beta-lactam–first-generation cephalosporins	0.0	(—)	0.0	(—)	0.0	(—)
Beta-lactam–third- generation cephalosporins	27.6	(9.0)	10.3	(5.1)	17.4	(8.1)
Beta-lactam–penicillins	5.2	(2.1)	9.1	(3.5)	58.1	(8.5)
Florfenicol	2.1	(1.1)	35.6	(9.0)	12.2	(6.3)
Fluoroquinolone	7.6	(2.4)	7.2	(2.4)	3.2	(2.3)
Macrolide	1.0	(1.0)	31.7	(6.4)	2.2	(1.5)
Sulfonamide	8.6	(3.1)	0.9	(0.6)	0.0	(—)
Tetracycline	11.2	(4.4)	2.7	(1.1)	4.0	(1.9)
Trimethoprim/sulfa	18.7	(7.8)	0.1	(0.1)	0.0	(—)
Other/unknown	3.2	(1.7)	2.4	(2.2)	2.7	(2.4)
Total	100.0		100.0		100.0	

4. Antimicrobial use—weaned heifers

Respiratory disease affected 5.1 percent of heifers on operations that administered any antimicrobials in 2013, and 4.7 percent of weaned heifers were treated with antimicrobials for respiratory disease. Overall, 91.8 percent of weaned heifers with respiratory disease were treated with antimicrobials.

G.4.a. For the 91.3 percent of operations that administered any antimicrobials in 2013 (table G.2.b), percentage of weaned heifers affected by and treated with antimicrobials for the following diseases or disorders, and percentage of affected weaned heifers treated with antimicrobials:

	Percent Weaned Heifers*					
	Affected		Treated		Percent of affected treated	
Disease/disorder	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Respiratory	5.1	(0.6)	4.7	(0.5)	91.8	(3.2)
Diarrhea or other digestive	1.0	(0.3)	0.5	(0.3)	52.7	(18.2)
Other	0.8	(0.3)	0.8	(0.3)	92.4	(3.6)

*As a percentage of weaned and pregnant heifer inventories on January 1, 2014.

For operations that administered any antimicrobials, 50.9 percent treated weaned heifers with antimicrobials for respiratory disease. The three primary antimicrobials used to treat weaned heifers for respiratory disease by the majority of operations were florfenicols (14.1 percent of operations), macrolides (14.1 percent), and tetracyclines (8.4 percent). Less than 10 percent of operations (8.1 percent) treated weaned heifers for diarrhea or other digestive disease. Penicillin and tetracyclines were the two primary antimicrobials used to treat diarrhea in weaned heifers on 1.5 and 1.5 percent of operations, respectively.

G.4.b. Percentage of operations by primary antimicrobial used to treat affected weaned heifers, and by disease or disorder:

	Percent Operations					
	Disease/Disorder					
	Respiratory		Diarrhea/ digestive		Other	
Primary antimicrobial	Pct.	Std. error	Pct.	Std. error	Pct.	Std. Error
Aminoglycoside	0.0	(—)	0.1	(0.1)	0.0	(—)
Beta-lactam–first-generation cephalosporins	0.0	(—)	0.0	(—)	0.0	(—)
Beta-lactam–third-generation cephalosporins	4.9	(1.5)	0.5	(0.4)	1.0	(0.8)
Beta-lactam–penicillins	3.5	(1.3)	1.5	(0.9)	3.1	(1.3)
Florfenicol	14.1	(2.6)	0.1	(0.1)	0.0	(—)
Fluoroquinolone	2.8	(1.1)	0.5	(0.4)	0.0	(—)
Macrolide	14.1	(2.6)	0.0	(—)	0.2	(0.2)
Sulfonamide	0.0	(—)	0.5	(0.3)	0.0	(—)
Tetracycline	8.4	(2.0)	1.5	(1.1)	3.0	(1.3)
Trimethoprim/sulfa	0.2	(0.2)	0.3	(0.3)	0.0	(—)
Other/unknown	2.8	(1.4)	3.0	(1.1)	4.0	(1.9)
Any antimicrobial above	50.9	(4.1)	8.1	(1.9)	11.4	(2.6)
Disease but no treatment or no disease or disorder*	49.1	(4.1)	91.9	(1.9)	88.6	(2.6)
Total	100.0		100.0		100.0	

*Due to questionnaire design, it was not possible to distinguish between operations without disease and operations that had disease but did not treat with antimicrobials.

Almost one-third of weaned heifers treated for respiratory disease were on operations that primarily used florfenicol or macrolides to treat the disease. This finding is similar to what was reported for respiratory disease in preweaned heifers. About two-thirds of weaned heifers (65.8 percent) were on operations that used sulfonamides as their primary antimicrobial for diarrhea, although only 0.5 percent of all weaned heifers were treated for diarrhea, which is the reason for the large standard errors.

G.4.c. For weaned heifers treated with antimicrobials for the following diseases/disorders (table G.4.a), percentage of weaned heifers by primary antimicrobial used on the operation:

	Percent Weaned Heifers					
	Disease/Disorder					
	Respiratory		Diarrhea/ digestive		Other	
Primary antimicrobial	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminoglycoside	0.0	(—)	0.1	(0.2)	0.0	(—)
Beta-lactam–first-generation cephalosporins	0.0	(—)	0.0	(—)	0.0	(—)
Beta-lactam–third-generation cephalosporins	13.4	(7.2)	7.2	(9.5)	3.8	(3.2)
Beta-lactam–penicillins	4.4	(2.5)	10.1	(7.6)	20.8	(12.3)
Florfenicol	31.5	(8.2)	1.5	(1.5)	0.0	(—)
Fluoroquinolone	3.7	(1.7)	7.3	(6.3)	0.0	(—)
Macrolide	29.1	(5.9)	0.0	(—)	19.7	(17.3)
Sulfonamide	0.0	(—)	65.8	(25.0)	0.0	(—)
Tetracycline	14.7	(4.7)	1.7	(1.9)	52.9	(19.5)
Trimethoprim/sulfa	0.4	(0.3)	3.5	(4.8)	0.0	(—)
Other/unknown	2.8	(1.6)	2.9	(2.7)	2.8	(2.9)
Total	100.0		100.0		100.0	

5. Antimicrobial use—cows

The majority of cows affected with mastitis and respiratory disease were treated with antimicrobials (85.6 and 95.0 percent, respectively). Less than one-fourth of cows with lameness and digestive disease (24.8 and 21.5 percent, respectively) were treated with antimicrobials.

G.5.a. For the 91.3 percent of operations that administered any antimicrobials in 2013 (table G.2.b), percentage of cows affected by the following diseases or disorders, percentage treated with antimicrobials, and percentage of affected cows treated:

	Percent Cows*					
	Affected[2]		Treated		Percent of affected treated	
Disease or disorder	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Mastitis	25.7	(2.5)	22.0	(2.4)	85.6	(4.2)
Reproductive	14.7	(1.7)	7.7	(1.0)	52.8	(5.1)
Lameness	14.7	(1.5)	3.6	(0.4)	24.8	(3.3)
Respiratory	2.8	(0.5)	2.6	(0.5)	95.0	(2.1)
Diarrhea or other digestive	5.1	(0.6)	1.1	(0.3)	21.5	(5.0)
Other	0.7	(0.4)	0.5	(0.4)	75.5	(16.0)

*As a percentage of January 1, 2014, dairy cow inventory.

The majority of operations (86.7 percent) treated some cows with antimicrobials for mastitis. Cephalosporins were used as the primary antimicrobial for mastitis treatment on 63.2 percent of operations: first-generation cephalosporins were used by 29.8 percent of operations and third-generation cephalosporins by 33.4 percent. Over one-half of operations treated some cows with antimicrobials for reproductive disease (58.8 percent), lameness (61.0 percent), and respiratory disease (54.1 percent). The third-generation cephalosporins were the primary antimicrobials used for respiratory disease on 31.7 percent of operations, for reproductive disease on 24.3 percent, and for lameness on 37.4 percent. Penicillins were used by more than 10 percent of operations for mastitis, reproductive disease, and respiratory disease. Tetracyclines were used as the primary antimicrobial for reproductive disease by 13.3 percent of operations and by 11.4 percent of operations to treat lameness.

G.5.b. Percentage of operations by primary antimicrobial used to treat affected cows, and by disease or disorder:

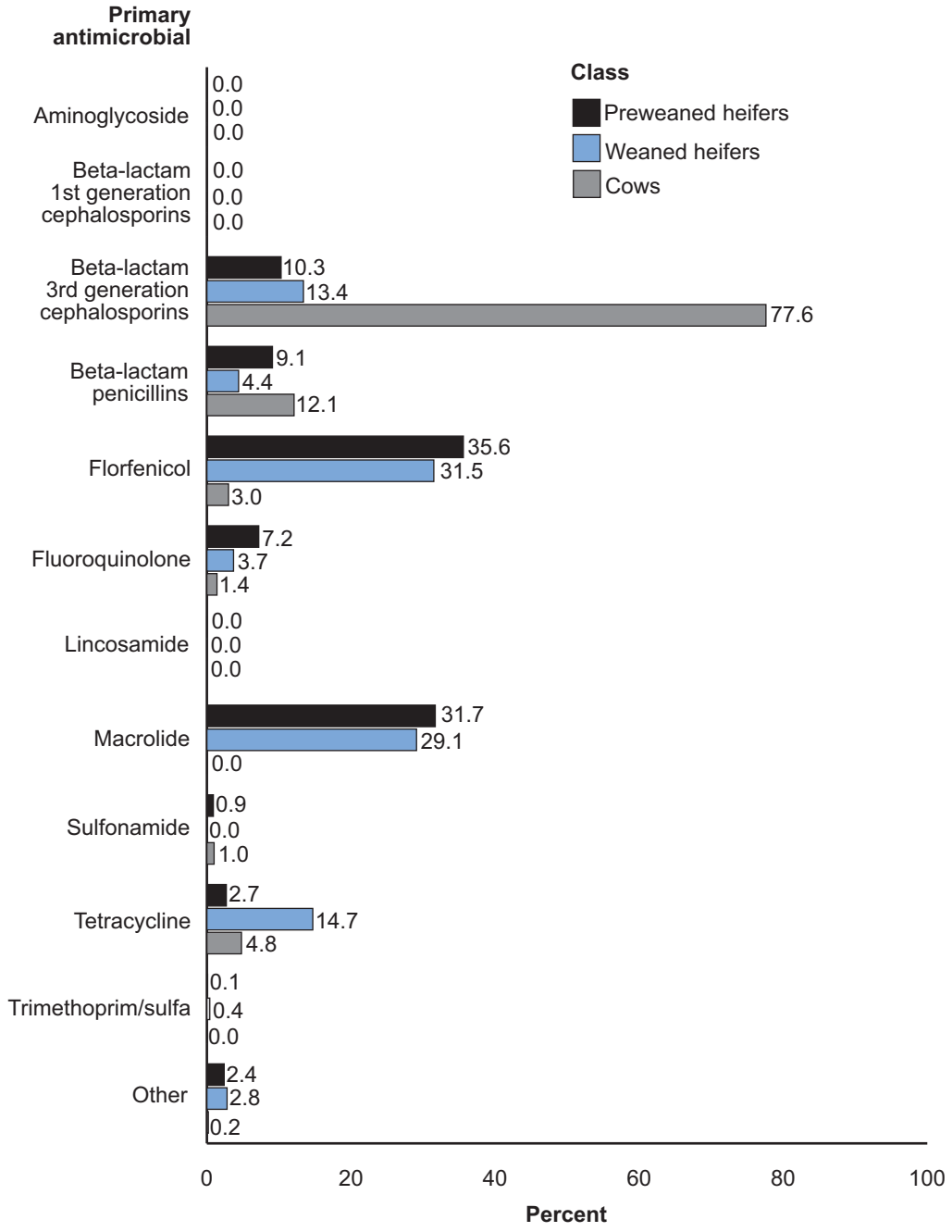
	Percent Operations											
	Disease/Disorder											
	Mastitis		Repro-ductive		Lameness		Respiratory		Diarrhea/ digestive		Other	
Primary antimicrobial	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminoglycoside	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.7	(0.7)	0.0	(—)
Beta-lactam–first-generation cephalosporins	29.8	(4.1)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Beta-lactam–third-generation cephalosporins	33.4	(3.7)	24.3	(3.2)	37.4	(3.8)	31.7	(3.5)	4.5	(1.0)	1.1	(0.6)
Beta-lactam–penicillins	10.9	(2.6)	16.6	(3.2)	8.5	(2.1)	10.7	(2.7)	6.3	(1.8)	2.6	(1.5)
Florfenicol	0.0	(—)	0.0	(—)	0.0	(—)	3.0	(1.2)	0.0	(—)	0.0	(—)
Fluoro-quinolone	0.0	(—)	0.0	(—)	0.0	(—)	0.3	(0.3)	0.1	(0.1)	0.0	(—)
Lincosamide	6.0	(1.8)										
Macrolide	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Sulfonamide	1.2	(0.9)	0.0	(—)	1.2	(0.5)	0.7	(0.7)	1.0	(0.8)	0.0	(—)
Tetracycline	1.5	(0.8)	13.3	(2.7)	11.4	(2.7)	5.8	(1.8)	0.1	(0.1)	1.5	(0.9)
Trimethoprim/sulfa	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Other/unknown	3.9	(1.5)	4.6	(1.8)	2.4	(1.1)	2.0	(1.2)	6.2	(1.5)	3.3	(1.2)
Any antimicrobial above	86.7	(2.7)	58.8	(4.0)	61.0	(4.1)	54.1	(4.1)	19.1	(2.6)	8.4	(2.1)
Disease but no treatment or no disease or disorder*	13.3	(2.7)	41.2	(4.0)	39.0	(4.1)	45.9	(4.1)	80.9	(2.6)	91.6	(2.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Of the 22.0 percent of cows treated for mastitis with antimicrobials (table G.5.a), 50.5 percent were on operations that used third-generation cephalosporins as their primary antimicrobial. About one-fourth of cows treated for mastitis (24.6 percent) were on operations that used lincosamides as their primary antimicrobial for mastitis treatment. For treating respiratory disease, diarrhea, and lameness, third-generation cephalosporins were used as the primary antimicrobial used for more than half the cows treated for these diseases.

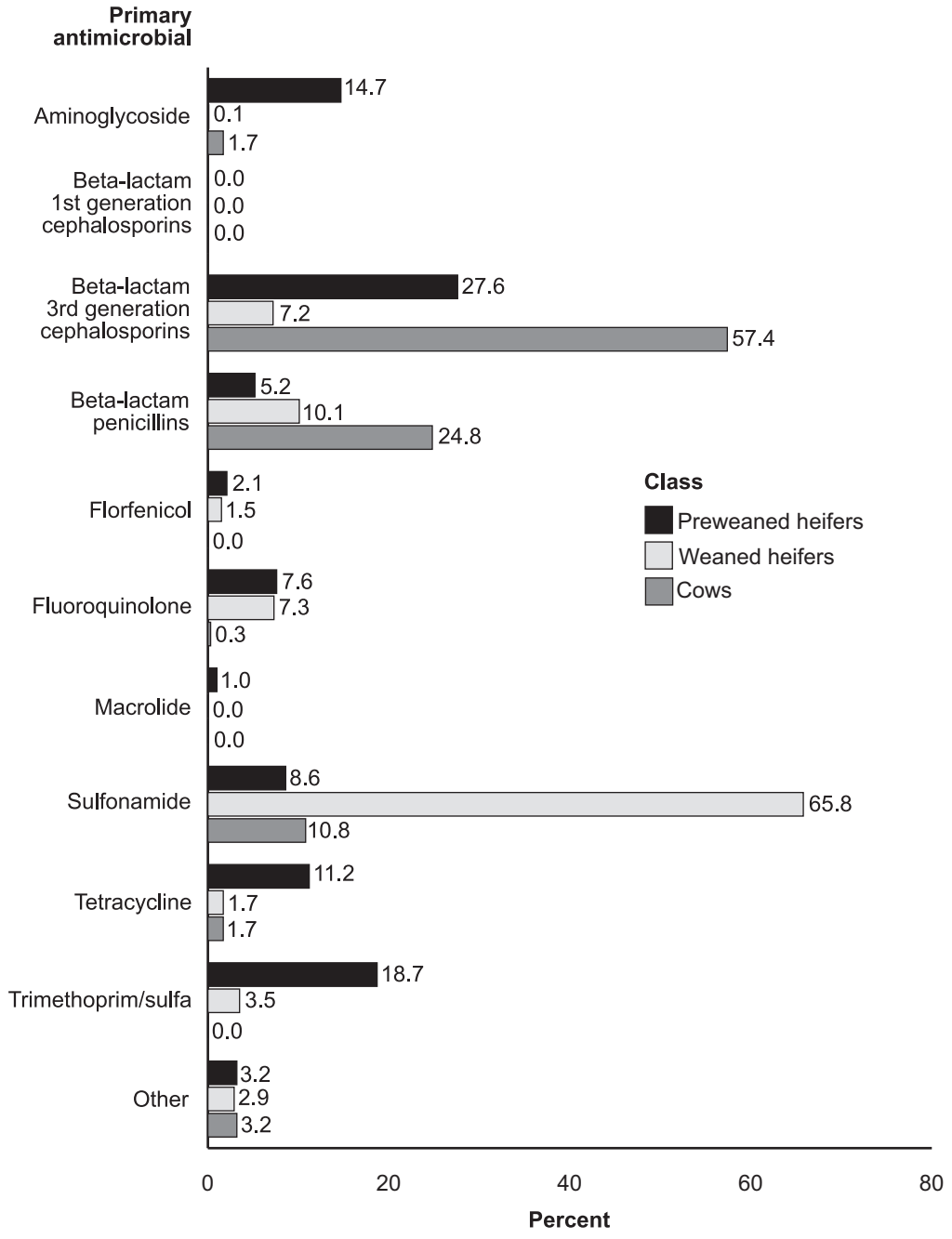
G.5.c. For cows treated with antimicrobials for the following diseases/disorders (table G.5.a), percentage of cows by primary antimicrobial used:

	Percent Cows					
	Disease/Disorder					
	Mastitis	Repro-ductive	Lameness	Respiratory	Diarrhea/ digestive	Other
Primary antimicrobial	Pct. Std. error	Pct. Std. error	Pct. Std. error	Pct. Std. error	Pct. Std. error	Pct. Std. error
Aminoglycoside	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)	1.7 (1.3)	0.0 (—)
Beta-lactam–first-generation generation cephalosporins	15.1 (4.6)	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)
Beta-lactam–third-generation cephalosporins	50.5 (9.6)	45.6 (8.5)	58.7 (7.8)	77.6 (6.0)	57.4 (13.5)	16.6 (15.1)
Beta-lactam–penicillins	8.7 (3.0)	41.7 (9.7)	8.6 (2.5)	12.1 (4.1)	24.8 (7.2)	7.9 (6.2)
Florfenicol	0.0 (—)	0.0 (—)	0.0 (—)	3.0 (1.4)	0.0 (—)	0.0 (—)
Fluoro-quinolone	0.0 (—)	0.0 (—)	0.0 (—)	1.4 (1.4)	0.3 (0.3)	0.0 (—)
Lincosamide	24.6 (11.5)					
Macrolide	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)
Sulfonamide	0.2 (0.2)	0.0 (—)	9.9 (6.3)	1.0 (1.0)	10.8 (8.9)	0.0 (—)
Tetracycline	0.2 (0.2)	10.7 (3.8)	20.5 (6.9)	4.8 (1.9)	1.7 (1.7)	75.5 (19.8)
Trimethoprim/sulfa	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)	0.0 (—)
Other/unknown	0.7 (0.4)	2.0 (1.3)	2.4 (2.1)	0.2 (0.2)	3.2 (1.8)	0.0 (—)
Total	100.0	100.0	100.0	100.0	100.0	100.0

For cattle treated for respiratory disease, percentage of cattle by class and by primary antimicrobial used for treatment



For cattle treated for diarrhea/digestive disease, percentage of cattle by class and by primary antimicrobial used for treatment



6. Prevention of drug residues

Drugs approved for livestock have labels that outline what species can be treated, indications for use, dose, frequency, and milk and/or meat withdrawal times. Using drugs in a manner not in accordance with approved labeling, yet that meets the conditions set forth by the Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA) and FDA regulations, is termed “extra-label use.” Extra-label use includes using a drug in species not on the label, for a different indication, at a different dose or frequency, and via a different route of administration. Producers can use drugs in an extra-label fashion only when prescribed by a veterinarian.

Owners on about one-half of operations (46.2 percent) reported using drugs in an extra-label fashion. Based on the drugs that producers reported using for specific conditions, however, almost twice the producer-reported percentage used drugs in an extra-label fashion (83.1 percent). There were no differences across herd size or region in the use of antimicrobials in an extra-label fashion.

G.6.a. Percentage of operations that used any antimicrobials in an extra-label fashion, by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Producer-reported extra-label use	42.4	(7.2)	44.7	(6.8)	59.6	(4.6)	65.6	(7.4)	44.0	(4.7)	46.2	(4.3)
Derived based on reported specific drug used/condition treated	79.3	(6.2)	85.6	(4.8)	89.0	(4.2)	91.6	(4.4)	82.1	(3.9)	83.1	(3.6)

Keeping treatment records for individual cows provides a history of what drugs were given and when they were administered; this information is used to determine appropriate withdrawal periods. When drug residues are found in milk or tissues, producers must provide records on any drugs given that require a withdrawal period.

Producers on 60.9 percent of operations reported keeping written or computerized records. A lower percentage of small operations (49.6 percent) and medium operations (61.0 percent) kept records for each treated cow compared with large operations (90.9 percent). A higher percentage of operations in the West region than in the East region kept treatment records for individual cows (97.0 and 56.5 percent, respectively).

G.6.b. For the 91.9 percent of operations that treated heifers or cows with at least one drug that required a milk or meat withdrawal period (table G.2.a), percentage of operations that kept written or computerized records for each cow that received any drug that required a withdrawal period, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
49.6	(7.0)	61.0	(6.3)	90.9	(4.3)	97.0	(2.9)	56.5	(4.6)	60.9	(4.2)

Marking treated cows so that milkers can easily identify them and exclude their milk from the bulk tank is one of the most important methods of ensuring that milk from treated cows does not enter the tank.

On the majority of medium, large, and all operations (76.7, 71.0, and 59.5 percent, respectively), leg bands were used to identify cows treated with a drug requiring a withdrawal period. Treated cows were not marked on 11.9 percent of operations.

G.6.c. For the 91.9 percent of operations that treated heifers or cows with at least one drug that required a milk or meat withdrawal period (table G.2.a), percentage of operations by method used to identify treated cows, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Leg band	44.1	(7.1)	76.7	(5.8)	71.0	(5.6)	60.1	(8.8)	59.4	(4.6)	59.5	(4.2)
Chalk or other physical markings	40.4	(7.0)	8.6	(3.0)	12.5	(5.0)	27.5	(8.6)	24.7	(4.2)	25.0	(3.9)
Not marked	13.2	(5.0)	8.0	(4.0)	14.8	(3.7)	8.2	(3.7)	12.3	(3.2)	11.9	(2.9)
Other	2.3	(2.1)	6.7	(4.2)	1.7	(1.7)	4.1	(3.1)	3.5	(1.9)	3.6	(1.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

To prevent residues in milk or meat, the majority of operations either evaluated treatment records or tested individual milk samples before marketing milk (77.4 and 69.1 percent, respectively). A higher percentage of operations in the West region than in the East region (97.3 and 75.0 percent, respectively) evaluated treatment records, and a higher percentage of operations in the East region than in the West region tested individual milk samples before marketing milk (75.6 and 15.3 percent, respectively). The end of a drug withdrawal period was determined by computer-generated dates by a higher percentage of large operations than medium or small operations and by a higher percentage of operations in the West region than in the East region.

G.6.d. For the 91.9 percent of operations that treated heifers or cows with at least one drug that required a milk or meat withdrawal period (table G.2.a), percentage of operations by practice(s) used to determine when treated cows could return to the milking string or be sold for beef, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Treatment records were evaluated	65.9	(6.6)	82.6	(5.0)	99.1	(0.9)	97.3	(2.6)	75.0	(4.2)	77.4	(3.8)
Individual milk samples were tested before marketing milk	72.8	(6.3)	75.8	(5.6)	47.8	(5.4)	15.3	(4.4)	75.6	(4.0)	69.1	(3.8)
Computer-generated dates for end of withdrawal period	1.6	(1.6)	10.7	(3.4)	62.8	(5.3)	63.6	(8.5)	10.2	(1.8)	16.0	(2.1)
Individual urine samples were tested before marketing for beef	4.6	(3.3)	15.1	(5.3)	5.6	(1.9)	0.6	(0.5)	9.0	(2.7)	8.1	(2.4)
Individual serum samples were tested before marketing for beef	0.0	(—)	0.0	(—)	0.8	(0.6)	0.0	(—)	0.2	(0.1)	0.1	(0.1)
Other	5.3	(3.9)	3.0	(1.7)	2.1	(1.2)	2.7	(2.6)	4.1	(2.2)	4.0	(2.0)
Any	97.7	(1.7)	96.6	(2.6)	100.0	(—)	100.0	(—)	97.5	(1.3)	97.8	(1.2)

More than 90 percent of operations administered at least one drug that required a milk withdrawal period. A lower percentage of small operations (86.5 percent) administered drugs with a milk withdrawal period compared with large operations (99.0 percent).

G.6.e. Percentage of operations that administered at least one drug that required a milk withdrawal period, by herd size and region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
86.5	(4.1)	92.1	(2.7)	99.0	(1.0)	93.2	(3.7)	90.0	(2.5)	90.4	(2.3)

To ensure that drug residues do not end up in the bulk tank, nearly all small and medium operations (90.4 and 88.2 percent, respectively) used a bucket to collect milk from treated cows. In total, 95.4 percent of large operations housed treated dry cows separately from lactating cows; 72.3 percent milked treated cows at the end of milking; 69.8 percent milked cows into the pipeline, but diverted the milk from the bulk tank; and 89.3 percent housed treated lactating cows separately from nontreated cows.

G.6.f. For the 90.4 percent of operations that treated cows with any drugs that required a milk withdrawal period (table G.6.e), percentage of operations by how cows treated with drugs that required a milk withdrawal were managed, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Management	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Milk from treated cows was collected in a bucket	90.4	(4.2)	88.2	(5.2)	25.6	(5.0)	32.9	(8.3)	82.6	(3.2)	77.5	(3.1)
Treated dry cows were housed separately from lactating cows	47.2	(7.0)	76.0	(5.7)	95.4	(1.6)	84.9	(7.5)	62.9	(4.6)	65.2	(4.2)
Treated cows were milked at the end of milking/ after the nontreated cows	57.7	(6.9)	25.1	(5.9)	72.3	(5.1)	67.5	(8.6)	48.4	(4.7)	50.4	(4.2)
Milk from treated cows was milked into the pipeline but the pipeline was diverted from bulk tank	21.5	(5.8)	15.4	(5.4)	69.8	(5.5)	65.9	(8.7)	24.4	(3.9)	28.8	(3.7)
Treated lactating cows were housed separately from nontreated cows	5.0	(2.7)	11.4	(3.8)	89.3	(3.9)	79.7	(8.1)	16.4	(2.4)	23.0	(2.6)
Milk from untreated individual quarters of treated cows entered the bulk tank	14.0	(5.1)	7.1	(4.3)	1.5	(1.1)	0.0	(—)	10.6	(3.2)	9.5	(2.9)
Treated cows were milked in a separate parlor*	3.3	(3.2)	1.5	(1.5)	18.3	(4.0)	15.8	(5.7)	5.3	(1.8)	6.9	(1.8)

*Excludes operations without a parlor.

7. Treatment decisions

Performing cultures and determining a disease organism's sensitivity to antimicrobials is important when dealing with disease conditions that do not respond to initial antimicrobial therapy. On 40.6 percent of operations, mastitis treatments were guided by cultures and antimicrobial sensitivity testing. With the exception of mastitis, less than 6 percent of operations performed culture and antimicrobial sensitivity testing to guide treatments. For all diseases, there were very few differences in the percentage of operations that performed culture and sensitivity testomg across herd sizes or regions.

G.7.a. For operations that administered any antimicrobials to cows for the following diseases (table G.5.a), percentage of operations that used cultures and antimicrobial-sensitivity testing to guide treatments, by disease, herd size, and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Mastitis	38.0	(7.2)	43.7	(7.0)	42.2	(5.6)	26.4	(7.6)	42.2	(4.7)	40.6	(4.3)
Respiratory disease	7.3	(5.0)	1.0	(1.0)	8.1	(3.2)	6.0	(3.6)	5.1	(2.3)	5.2	(2.0)
Diarrhea or other digestive disease	0.0	(—)	3.7	(3.6)	7.6	(2.7)	3.1	(2.1)	4.0	(1.9)	3.9	(1.6)
Reproductive disease	0.0	(—)	0.0	(—)	4.0	(2.2)	4.8	(3.7)	0.4	(0.3)	1.0	(0.6)
Lameness	0.0	(—)	0.0	(—)	1.3	(0.8)	2.2	(1.5)	0.0	(—)	0.3	(0.2)

Dairy producers can consult several sources to obtain information on drugs used to treat specific conditions in their cows. Producers on nearly all operations (99.0 percent) relied on their previous experience when determining what drugs to use, and 96.2 percent consulted a veterinarian or a drug label created by a veterinarian. Producers on 69.9 percent of operations consulted the manufacturer label when making drug-related decisions. The percentage of operations on which producers consulted a drug company representative increased as herd size increased. A lower percentage of small operations searched the Internet to determine what drugs to use (2.1 percent) or reviewed the Food Animal Residue Avoidance Databank Web site (0.0 percent) compared with large operations (17.1 and 8.6 percent, respectively).

A higher percentage of operations in the West region than in the East region consulted a drug company representative to determine what drugs to use to treat cattle (36.1 and 14.0 percent, respectively).

G.7.b. For the 91.3 percent of operations that administered any antimicrobials to cattle (table G.2.b), percentage of operations by resource(s) used to determine what drugs to use for treating cattle, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Resource	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Previous experience with drug	100.0	(—)	98.4	(1.2)	97.7	(1.1)	94.9	(3.0)	99.6	(0.3)	99.0	(0.4)
Consulting with veterinarian or the drug label created by the veterinarian	94.6	(3.1)	98.2	(1.2)	97.2	(1.9)	92.7	(4.1)	96.7	(1.7)	96.2	(1.6)
Reviewing the manufacturer drug label	74.9	(5.6)	60.3	(6.6)	72.8	(4.6)	54.3	(8.7)	71.8	(4.0)	69.9	(3.7)
Asking friend/ other producers	39.4	(7.0)	44.8	(6.7)	42.3	(6.2)	38.3	(8.8)	42.1	(4.6)	41.6	(4.2)
Reviewing promotional materials and advertisements from drug companies	22.5	(6.5)	27.1	(6.2)	25.7	(4.9)	24.6	(8.0)	24.6	(4.2)	24.6	(3.9)
Consulting drug company representatives	1.9	(1.5)	16.7	(4.5)	54.3	(6.1)	36.1	(7.9)	14.0	(2.2)	16.5	(2.2)
Asking State/ county services/ extension agent	5.2	(2.7)	9.8	(3.1)	7.7	(4.8)	8.1	(7.5)	7.0	(1.9)	7.1	(1.9)
Searching the Internet (e.g., drug company Web sites, producer blogs)	2.1	(1.5)	7.0	(2.8)	17.1	(4.3)	9.6	(4.3)	6.1	(1.6)	6.5	(1.5)
Reviewing the FARAD Web site	0.0	(—)	1.2	(1.2)	8.6	(3.2)	9.5	(4.3)	1.1	(0.6)	2.0	(0.7)
Other	4.7	(3.4)	2.5	(1.8)	0.9	(0.9)	0.0	(—)	3.7	(2.0)	3.3	(1.8)

On over 40 percent of operations, producers consulted a veterinarian or the drug label created by a veterinarian to guide each of the treatment decisions in the following table.

G.7.c. For the 91.3 percent of operations that administered any antimicrobials to cattle (table G.2.b), percentage of operations by primary resource used for the following treatment decisions:

Percent Operations

Treatment Decision

	What drug to use		Dose		Route of administration		Withdrawal time	
Primary resource	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Previous experience with drug	44.0	(4.2)	18.2	(3.5)	26.6	(3.9)	15.5	(3.3)
Consulting with veterinarian or the drug label created by the veterinarian	55.1	(4.2)	56.3	(4.3)	47.3	(4.2)	40.3	(4.1)
Reviewing the manufacturer drug label	0.0	(—)	24.9	(3.9)	25.3	(3.8)	43.1	(4.2)
Asking friend/ other producers	0.3	(0.3)	0.0	(—)	0.0	(—)	0.0	(—)
Reviewing promotional materials and advertisements from drug companies	0.2	(0.2)	0.6	(0.4)	0.2	(0.2)	0.2	(0.2)
Consulting drug company representatives	0.3	(0.3)	0.0	(—)	0.0	(—)	0.3	(0.3)
Asking State/county services/extension agent	0.0	(—)	0.0	(—)	0.0	(—)	0.0	
Searching the Internet (e.g., drug company Web sites, producer blogs)	0.0	(—)	0.0	(—)	0.6	(0.6)	0.6	(0.6)
Reviewing the FARAD Web site	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Other	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Total	100.0		100.0		100.0		100.0	

H. Personnel

1. Number of personnel

Almost all operations (99.2 percent) had at least one full-time person (paid or unpaid, including family members), and 83.3 percent of operations had part-time personnel. Large operations had a lower percentage of part-time personnel (62.5 percent) compared with small operations (87.4 percent) and medium operations (88.8 percent). A lower percentage of operations in the West region than in the East region had part-time personnel (46.6 and 87.6 percent, respectively).

H.1.a. Percentage of operations that had paid or unpaid personnel with duties directly related to the operation in 2013, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Full time	99.0	(1.0)	99.1	(0.9)	100.0	(—)	97.4	(2.6)	99.4	(0.6)	99.2	(0.6)
Part time	87.4	(4.1)	88.8	(3.8)	62.5	(5.3)	46.6	(8.5)	87.6	(2.7)	83.3	(2.7)
Total	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)	100.0	(—)

Overall, dairies had an operation average of 5.1 full-time personnel and 1.8 part-time personnel. The average number of full-time personnel increased as herd size increased. The operation average number of personnel in the West region (14.1) was higher than in the East region (4.1). The number of full- and part-time personnel per 100 cows decreased as herd size increased. On average, there were 2.7 full-time personnel per 100 cows and 2.1 part-time personnel per 100 cows.

H.1.b. Operation average number of paid and unpaid personnel that had duties directly related to the operation and number of personnel per 100 cows, by herd size and by region:

Operation Average Number of Personnel

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Personnel	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Full time	1.8	(0.1)	3.6	(0.2)	17.3	(1.4)	14.1	(1.7)	4.1	(0.3)	5.1	(0.4)
Part time	1.7	(0.1)	2.2	(0.2)	1.7	(0.2)	1.2	(0.3)	1.9	(0.1)	1.8	(0.1)
Full time per 100 cows	3.4	(0.3)	2.1	(0.1)	1.4	(0.1)	1.3	(0.1)	2.8	(0.2)	2.7	(0.2)
Part time per 100 cows	3.2	(0.3)	1.3	(0.1)	0.2	(0.0)	0.4	(0.1)	2.3	(0.2)	2.1	(0.2)

2. Personnel training

Personnel training is important for many reasons. For instance, new employees need to be trained on operational procedures, and all personnel need to be trained when operations adopt new procedures. Procedural drift, or movement away from standard operating procedures, is a frequent issue and can be addressed through routine training programs. In general, the larger the number of personnel the more frequently training should occur. Almost three-fourths of operations (74.8 percent) performed at least some personnel training in 2013. More than one-half of operations trained personnel in calf raising/feeding, milking, animal handling, feeding cows, and personnel safety. A higher percentage of large operations performed training than small operations. In general, a higher percentage of operations in the West region than in the East region trained personnel on the listed procedures.

H.2.a. Percentage of operations that trained personnel in the following procedures, by herd size and by region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Procedure	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Calf raising/ feeding	55.8	(6.6)	56.5	(6.2)	83.0	(5.3)	76.7	(7.6)	58.8	(4.4)	60.2	(4.1)
Milking	46.1	(6.4)	63.7	(6.4)	93.7	(2.8)	87.9	(5.1)	56.6	(4.3)	59.8	(4.0)
Animal handling/ movement of cattle	44.1	(6.3)	61.8	(6.3)	82.0	(5.1)	79.9	(6.3)	53.4	(4.3)	56.0	(4.0)
Feeding cows (e.g., loading, mixing)	50.3	(6.5)	51.6	(6.2)	73.7	(4.7)	67.6	(7.7)	53.3	(4.3)	54.8	(4.0)
Personnel safety	43.9	(6.4)	43.0	(5.9)	80.4	(4.9)	73.1	(8.0)	47.5	(4.3)	50.1	(4.0)
Calving	30.5	(5.9)	45.9	(6.1)	81.2	(4.2)	73.6	(7.1)	40.7	(4.1)	44.0	(3.8)
Handling of nonambulatory animals	19.7	(4.9)	30.6	(5.6)	79.0	(4.1)	70.8	(7.1)	29.2	(3.5)	33.4	(3.4)
Surgical procedures (e.g., dehorning, tail docking, castration)	24.8	(5.8)	24.0	(5.4)	58.1	(6.6)	55.2	(9.6)	27.6	(3.9)	29.8	(3.7)
Euthanasia	8.7	(3.6)	24.6	(6.5)	41.0	(6.4)	52.4	(9.6)	16.0	(3.1)	20.0	(3.2)
Any procedure above	66.6	(6.0)	75.2	(5.9)	98.3	(1.7)	94.5	(3.5)	72.6	(4.0)	74.8	(3.6)

On more than 50-percent of operations, the owner was the primary person responsible for training personnel, and the herdsman was the primary person on 10- to 25-percent of operations, depending on the procedure. Veterinarians were involved in training personnel on more than 10-percent of operations for euthanasia (17.9 percent), surgical procedures (22.3 percent), and calving (12.0 percent).

H.2.b. For operations that trained personnel in the following procedures (table H.2.a), percentage of operations by primary person responsible for training:

Percent Operations

Primary Person Responsible

	Owner		Manager/ herdsman		Other employees		Veteri-narian		University/ extension personnel		Other		
Procedure	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Total**
Calf raising/ feeding	54.0	(5.4)	16.6	(3.2)	15.7	(5.1)	9.4	(3.4)	2.1	(1.3)	2.2	(1.3)	100.0
Milking	62.0	(4.5)	18.6	(2.9)	15.2	(4.0)	1.6	(0.8)	0.7	(0.7)	2.0	(0.7)	100.0
Animal handling/ move-ment of cattle	66.8	(4.3)	18.3	(3.0)	10.2	(3.5)	1.7	(0.8)	1.0	(0.8)	2.1	(0.9)	100.0
Feeding cows (e.g., loading, mixing)	65.1	(5.2)	14.7	(3.3)	10.7	(4.1)	2.6	(2.5)	1.4	(1.0)	5.5	(2.3)	100.0
Personnel safety	75.1	(4.4)	12.7	(2.8)	7.8	(3.6)	0.0	(—)	0.2	(0.2)	4.2	(1.3)	100.0
Calving	59.3	(5.4)	20.2	(3.8)	6.7	(3.6)	12.0	(3.9)	0.0	(—)	1.9	(1.5)	100.0
Handling of nonambulatory animals	66.8	(5.4)	23.0	(4.4)	5.3	(4.0)	5.0	(1.8)	0.0	(—)	0.0	(—)	100.0
Surgical procedures (e.g., dehorning, tail docking, castration)	57.3	(6.9)	19.2	(4.9)	1.2	(0.8)	22.3	(5.7)	0.0	(—)	0.0	(—)	100.0
Euthanasia	55.1	(8.5)	20.1	(6.1)	0.4	(0.4)	17.9	(5.7)	6.6	(6.2)	0.0	(—)	100.0

A lower percentage of small operations than large operations provided any training on proper milking procedures (46.1 and 93.7 percent, respectively). Overall, 59.8 percent of operations trained milkers. About one-fifth of large operations (21.3 percent) provided training for all milkers more than four times per year. A higher percentage of operations in the West region than in the East region trained milkers (87.9 and 56.6 percent, respectively). The highest percentages of operations that trained milkers trained them only when they were new employees (28.1 percent) or trained all milkers one to two times per year (17.8 percent).

H.2.c. Percentage of operations by how frequently milkers were trained, and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Trained as new personnel only	21.6	(5.1)	40.6	(6.0)	25.8	(4.6)	36.2	(8.5)	27.2	(3.6)	28.1	(3.3)
1 to 2 times per year for all milkers	15.1	(4.8)	15.7	(4.3)	29.2	(5.3)	22.1	(6.2)	17.3	(3.2)	17.8	(3.0)
3 to 4 times per year for all milkers	0.0	(—)	2.3	(1.6)	15.4	(5.0)	12.6	(7.6)	2.4	(0.7)	3.4	(1.1)
More than 4 times per year for all milkers	5.9	(3.5)	0.9	(0.9)	21.3	(5.0)	11.7	(5.1)	6.6	(2.2)	7.1	(2.1)
Other	3.5	(1.8)	4.2	(2.1)	2.0	(1.6)	5.2	(3.6)	3.2	(1.3)	3.4	(1.2)
Any	46.1	(6.4)	63.7	(6.4)	93.7	(2.8)	87.9	(5.1)	56.6	(4.3)	59.8	(4.0)
None	53.9	(6.4)	36.3	(6.4)	6.3	(2.8)	12.1	(5.1)	43.4	(4.3)	40.2	(4.0)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Milkers were trained on the job on more than 90 percent of operations that trained milkers. A higher percentage of large operations than medium or small operations used video/Web-based training or discussion/lecture to train milkers.

H.2.d. For the 59.8 percent of operations that trained milkers (table H.2.c), percentage of operations by milker-training method(s), and by herd size and region:

Percent Operations

	Herd size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
On-the-job training	98.3	(1.7)	98.7	(1.3)	93.7	(2.6)	91.2	(4.9)	98.2	(0.9)	97.1	(1.1)
Discussion/ lecture	19.6	(6.6)	34.3	(7.0)	78.1	(4.6)	64.9	(9.1)	36.3	(4.7)	40.7	(4.4)
Video/Web-based training	3.2	(3.1)	4.1	(2.9)	33.5	(5.5)	29.7	(7.7)	8.8	(2.2)	12.0	(2.3)

3. Employees and biosecurity

Overall, 70.9 percent of operations had employees in 2013. The percentage of operations with employees increased as herd size increased. A higher percentage of operations in the West region than in the East region had employees (94.9 and 68.4 percent, respectively).

H.3.a. Percentage of operations that had employees in 2013, by herd size and region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
55.5	(6.3)	80.9	(5.1)	100.0	(—)	94.9	(4.1)	68.4	(4.0)	70.9	(3.7)

Foreign travel by employees or anyone who visits a dairy operation presents a risk for introducing disease to the operation. Although foot-and-mouth disease is the most concerning, other diseases such as bovine tuberculosis could also be transmitted from people to cattle. Overall, 11.9 percent of operations had foreign-travel guidelines for employees.

H.3.b. For the 70.9 percent of operations with employees (table H.3.a), percentage of operations that had guidelines regarding foreign travel by employees, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
14.1	(7.4)	7.4	(3.5)	14.7	(3.8)	6.7	(3.5)	12.7	(3.9)	11.9	(3.4)

Less than 20 percent of operations (17.1 percent) had written standard operating procedures (SOPs) for practices other than milking. A lower percentage of small operations (9.5 percent) had written SOPs for practices other than milking than large operations (50.3 percent).

H.3.c. Percentage of operations that had written SOPs for practices other than milking, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
9.5	(4.0)	10.9	(3.7)	50.3	(5.9)	33.0	(8.5)	15.3	(2.8)	17.1	(2.7)

Most operations with SOPs (90.5 percent) trained employees on how to perform SOPs.

H.3.d. For operations with employees and SOPs, percentage of operations that trained employees on how to perform SOPs, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
83.6	(13.1)	100.0	(—)	90.0	(5.3)	92.3	(7.4)	90.1	(4.8)	90.5	(4.1)

About 10-percent of operations with employees (9.8 percent) had restrictions regarding employee ownership of livestock outside the operation.

H.3.e. For the 70.9 percent of operations with employees (table H.3.a), percentage of operations that had restrictions regarding employee ownership of livestock outside the operation, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
13.6	(6.2)	7.5	(3.9)	6.5	(2.4)	4.4	(2.8)	10.6	(3.4)	9.8	(2.9)

4. Consumption of raw milk

Raw milk can contain disease-causing organisms such as *Brucella, Mycobacterium, Listeria, Salmonella,* or *Campylobacter*. Each year, many people across the United States become ill from consuming contaminated raw milk. Almost two-thirds of operations (64.7 percent) had dairy personnel that consumed raw milk. A higher percentage of small and medium operations (78.0 and 63.6 percent, respectively) had personnel who consumed raw milk compared with large operations (26.5 percent). A lower percentage of operations in the West region than in the East region had personnel who consumed raw milk (36.1 and 67.8 percent, respectively).

H.4.a. Percentage of operations on which dairy personnel consumed raw milk, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
78.0	(5.0)	63.6	(6.2)	26.5	(4.6)	36.1	(8.6)	67.8	(3.7)	64.7	(3.5)

Overall, 16.0 percent of operations sold raw milk to people other than operation personnel. As was observed with personnel that consumed raw milk, a higher percentage of small operations than medium or large operations sold raw milk. A lower percentage of operations in the West region than in the East regions sold raw milk for human consumption (3.0 and 17.5 percent, respectively).

H.4.b. Percentage of operations that sold any raw milk to people other than dairy personnel, by herd size and by region:

Percent Operations

Herd size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500+)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
25.3	(6.0)	7.9	(3.9)	2.1	(1.7)	3.0	(2.9)	17.5	(3.8)	16.0	(3.5)

Section II: Methodology

A. Needs Assessment

NAHMS develops study objectives by exploring existing literature and contacting industry members about their information needs and priorities during a needs assessment phase. The objective of the needs assessment for the NAHMS Dairy 2014 study was to collect information from U.S. dairy producers and other dairy specialists about what they perceived to be the most important dairy health and productivity issues in the United States. A driving force of the needs assessment was the desire of NAHMS to receive as much input as possible from a variety of producers, as well as from industry experts and representatives, State and Federal government personnel, veterinarians, extension specialists, university personnel, and dairy organizations. Input was collected via focus groups and through a needs assessment survey.

The needs assessment survey was designed to ascertain the top three management issues, diseases/disorders, and producer incentives. The survey, created in SurveyMonkey®, was available online from late October through the end of December 2012. The survey was promoted via industry-related electronic newsletters, magazines, and Web sites. Organizations/magazines promoting the study included Vance Publishing's "Dairy Herd Management, Dairy Alert," "Dairy Today," "Hoard's Dairyman," NMC, "Journal of the American Veterinary Medical Association," and the American Association of Bovine Practitioners. Email messages promoting the study—and asking for input and providing a link to the online Web site—were also sent to cooperative members of the National Milk Producers Federation and to State and Federal personnel; 218 people completed the online survey.

Respondents to the needs assessment represented the following affiliations:

- Veterinarians/consultants—28 percent of respondents
- Federal or State government personnel—26 percent
- University/extension personnel—16 percent
- Dairy producers—11 percent
- Allied industry personnel—7 percent
- Nutritionists—5 percent
- Other—7 percent

After the needs assessment survey was completed, a focus-group session was held on January 7, 2013, with the goal of setting objectives for the study. The group represented academia, industry, and government. These objectives are on p 201 of this report.

B. Sampling and Estimation

1. State selection

The preliminary selection of States to be included in the study was done in February 2013 using data from the USDA's National Agricultural Statistics Service (NASS) February 1, 2013, "Cattle Report." A goal for NAHMS national studies is to include States that account for at least 70 percent of the animal production class of interest and operations with those animals in the United States. In this case, the production class of interest was milking cows. The initial review identified 17 States representing 81.3 percent of the U.S. milk cow inventory and 80.5 percent of operations with milk cows (dairy herds). The States were California, Colorado, Idaho, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Texas, Vermont, Virginia, Washington, and Wisconsin.

2. Operation selection

The list sampling frame was provided by NASS. Within each State a stratified random sample was selected in which strata were defined by size categories. The size indicator was the number of milk cows for each operation. Producers on the NASS list frame in the 17 participating States who had reported 1 or more milk cows on January 1, 2013, were eligible to be included in the sample for contact in January 2014. Among producers reporting fewer than 30 cows, 500 operations were selected (for phase Ia). For operations reporting 30 or more cows, 3,000 operations were selected for contact (phase Ib); overall, 3,500 operations were selected for the study.

Operations with 30 or more cows that participated in phase Ib were invited to participate in data collection for phase II. Of the 1,191 operations with 30 or more cows that completed the NASS questionnaire, a total of 527 operations agreed via written consent to be contacted by veterinary medical officers to determine whether to complete phase II.

3. Population inferences

a. Phases Ia and Ib: General dairy management questionnaire

Inferences cover the population of dairy producers with at least 1 milk cow in the 17 participating States. These States accounted for 81.3 percent of milk cows (7,519,600 head) and 80.5 percent of operations (51,596) with milk cows in the United States (2012 Census of Agriculture). See appendix II for respective data on individual States. All respondent data were statistically weighted to reflect the population from which the sample was selected. The inverse of the probability of selection for each operation was the initial selection weight. This selection weight was adjusted for nonresponse within each State and size group to allow for inferences back to the original population

from which the sample was selected. Operations with 500 cows or more and organic operations were overrepresented in the sample to ensure valid estimates could be generated for these operations.

b. Phase II: Veterinary Services visit

Inferences cover the population of dairy producers with 30 or more milk cows in the 17 participating States. For operations eligible for phase II data collection (those that completed phase 1b and had 30 or more cows), weights were adjusted by State and size categories to account for operations that did not want to continue to phase II. The 17 participating States represented 81.4 percent of U.S. dairy cows on operations with 30 or more cows and 87.8 percent of U.S. dairy operations with 30 or more cows (appendix II).

C. Data Collection

1. Phases Ia and Ib: General dairy management questionnaire

All data were collected from January 1 through 31, 2014. Producers with fewer than 30 cows were mailed an abbreviated questionnaire. Producers that did not respond to the mailed questionnaire were contacted for a telephone interview. Telephone interviews were conducted via computer-assisted interview software from a single NASS phone center. The questionnaire took approximately 30 minutes to complete. For operations with 30 or more cows, NASS enumerators administered the general dairy management questionnaire via an in-person interview, which took an average of 1.5 hours to complete. All data were entered into a SAS data set.

2. Phase II: Veterinary Services visit

From March 6 to July 28, 2014, Federal and State veterinary medical officers (VMOs) and/or animal health technicians (AHTs) collected data from producers during an in-person interview that lasted approximately 2 hours.

D. Data Analysis

1. Phases Ia and Ib: General dairy management questionnaire

a. Validation

NASS State and regional personnel performed initial data validation and edits at the local level. Individual State data files were combined and sent to NAHMS national staff, which performed final data validation on the entire data set.

b. Estimation

Estimation was done with SUDAAN® software (RTI, version 11.0.1). SUDAAN uses a Taylor series expansion to estimate appropriate variances, which account for the stratified sample design.

2. Phase II: Veterinary Services visit

a. Validation

Data collectors sent completed VS questionnaires to their respective State NAHMS Coordinators who reviewed the questionnaire responses for accuracy. Individual questionnaires were then submitted to NAHMS national staff, who performed data entry and data validation on the entire data set.

b. Estimation

Estimation was done with SUDAAN software (RTI, version 11.0.1). SUDAAN uses a Taylor series expansion to estimate appropriate variances, which account for the stratified sample design.

E. Sample Evaluation

The purpose of this section is to provide respondent and nonrespondent information. Historically, the term "response rate" was used as a catch-all parameter, but there are many ways to define and calculate response rates. Therefore, the table below presents an evaluation based on a number of measurement parameters, which are identified with an "x" in categories that contribute to the measurement.

1. Phase Ia: General dairy management questionnaire—fewer than 30 cows

A total of 500 operations were selected for the survey. Of these operations, 14.0 percent completed the questionnaire.

			Measurement parameter	
Response category	**Number operations**	**Percent operations**	**Usable[1]**	**Complete[2]**
Completed survey	70[3]	14.0	x	x
Refused survey or inaccessible	430	86.0		
Total	500	100.0	70	70
Percent of total operations			14.0	14.0
Percent of total operations weighted[4]			13.2	13.2

[1]Useable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).
[2]Survey complete operation—respondent provided answers to all or nearly all questions.
[3] One operation with more than 300 cows was recategorized as a medium-sized operation for data analysis.
[4] Weighted response—the rate was calculated using the initial selection weights.

2. Phase Ib: General dairy management questionnaire—30 or more cows

A total of 3,000 operations were selected for the study. Of these operations, 2,605 (86.8 percent) were contacted. There were 1,580 operations that provided usable inventory information (52.7 percent of the total selected and 60.7 percent of those contacted). Overall, there were 1,191 operations (39.7 percent) that provided complete information for the questionnaire. Of the 1,191 operations that provided complete information and were eligible to participate in the VMO phase of the study, 527 (44.2 percent) consented to be contacted for consideration/discussion about further participation.

			Measurement parameter		
Response category	**Number operations**	**Percent operations**	**Contacts**	**Usable[1]**	**Complete[2]**
Survey completed and VMO consent	527	17.6	x	x	x
Survey completed, refused VMO consent	664	22.1	x	x	x
No dairy cows on January 1, 2014	320	10.7	x	x	
Out of business	69	2.3	x	x	
Out of scope (research farm, university, prison, etc.)	8	0.3			
Survey refused	1,025	34.2	x		
Office hold (NASS elected not to contact)	113	3.8			
Inaccessible	274	9.1			
Total	3,000	100.0	2,605	1,580	1,191
Percent of total operations			86.8	52.7	39.7
Percent of total operations weighted[3]			87.3	57.0	38.5

[1]Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

[2]Survey complete operation—respondent provided answers to all or nearly all questions.

[3]Weighted response—the rate was calculated using the initial selection weights.

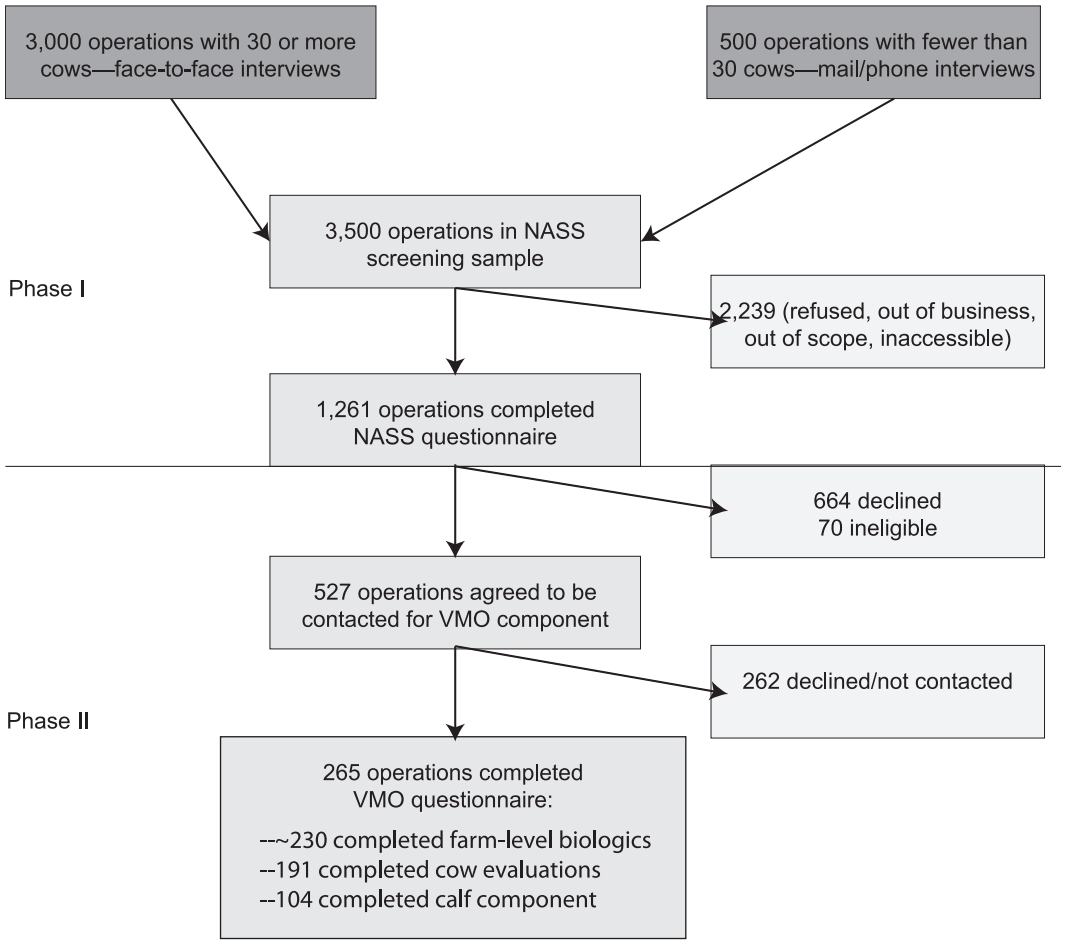
3. Phase II: Veterinary Services visit—30 or more cows

During phase I, 527 operations agreed to be contacted by a VMO for phase II. Of these, 265 (50.3 percent) agreed to continue in phase II of the study and completed the Veterinary Services visit questionnaire; 245 (46.5 percent) refused to participate. Approximately 3 percent of the 527 operations were not contacted, and 0.4 percent were ineligible because they had no dairy cows at the time they were contacted by Veterinary Services during phase II.

			Measurement parameter		
Response category	Number operations	Percent operations	Contacts	Usable[1]	Complete[2]
Survey completed	265	50.3	x	x	x
Survey refused	245	46.5	x		
Not contacted	15	2.8			
Ineligible[3]	2	0.4	x	x	x
Total	527	100.0	512	267	265
Percent of total operations			97.1	50.7	50.3
Percent of total operations weighted[4]			98.6	74.3	74.1

[1]Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).
[2]Survey complete operation—respondent provided answers to all or nearly all questions.
[3]Ineligible—no dairy cows at time of interview, which occurred from May 6 to July 28, 2014.
[4]Weighted response—the rate was calculated using turnover weights.

Flowchart of respondents



Appendix I: Sample Profile

A. Responding Operations Phases Ia and Ib

1. Number of responding operations, by herd size and by region

	Number of Responding Operations				
	Herd Size (number of cows)				
Region[1]	**Very small** (fewer than 30)	**Small** (30–99)	**Medium** (100–499)	**Large** (500 or more)	**All operations**
West	5	12	47	256	320
East	64	385	296	196	941
Total	69[2]	397	343	452	1,261

[1]Regions:
West: California, Colorado, Idaho, Texas, Washington.
East: Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, Wisconsin.
[2]One operation from Phase Ia with more than 300 cows was recategorized into the medium herd size category.

B. Responding Operations Phase II: Veterinary Services Visit

1. Number of responding operations, by herd size and by region

	Number of responding operations			
	Herd Size (number of cows)			
Region*	**Small** (30–99)	**Medium** (100–499)	**Large** (500 or more)	**All operations**
West	4	4	42	50
East	71	72	72	215
Total	75	76	114	265

*Regions:
West: California, Colorado, Idaho, Texas, Washington.
East: Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, Wisconsin.

Appendix II: U.S. Milk Cow Population and Operations

A. Number of milk cows, number of operations, and average herd size for participating States

Region	State	Number of milk cows (thousand head)		Number of operations		Average herd size	
		Milk cows on operations with 1 or more head[1]	Milk cows on operations with 30 or more head[2]	Operations with 1 or more head[1]	Operations with 30 or more head[2]	Operations with 1 or more head	Operations with 30 or more head
West	California	1,815.7	1,814.1	1,931	1,436	940.3	1,263.3
	Colorado	130.7	129.6	517	115	252.8	1,127.0
	Idaho	578.8	577.5	934	540	619.7	1,069.4
	Texas	434.9	431.9	985	512	441.5	843.6
	Washington	267.0	265.4	798	353	334.6	751.8
	Total	3,227.1	3,218.5	5,165	2,956	624.8	1,088.8
East	Indiana	174.1	161.7	2,401	1,010	72.5	160.1
	Iowa	204.8	199.4	1,810	1,230	113.1	162.1
	Kentucky	71.8	67.0	1,564	746	45.9	89.8
	Michigan	376.3	369.2	2,409	1,500	156.2	246.1
	Minnesota	463.3	448.6	4,746	3,720	97.6	120.6
	Missouri	93.0	99.8	2,451	960	37.9	104.0
	New York	610.7	594.6	5,427	3,968	112.5	149.8
	Ohio	267.9	246.4	4,008	2,084	66.8	118.2
	Pennsylvania	532.3	515.3	7,829	6,025	68.0	85.5
	Vermont	134.1	131.7	1,075	769	124.7	171.3
	Virginia	94.1	91.2	1,168	628	80.6	145.2
	Wisconsin	1,270.1	1,241.5	11,543	9,541	110.0	130.1
	Total	4,292.5	4166.4	46,431	32,181	92.4	129.5
Total (17 States)		7,519.6	7,384.9	51,596	35,137	145.7	210.2
Percentage of U.S.		81.3	81.4	80.5	87.8		
Total U.S. (50 States)		9,252.3	9,067.8	64,098	40,017	144.3	226.6

[1]Source: NASS 2012 Census of Agriculture.

[2]Source: NASS 2012 Census of Agriculture Special Tabulation.

B. Percentage of operations, inventory, and milk production, by herd size:

	Percent		
Herd size (number of cows)	**Operations**	**Inventory**	**Milk production**
Very small (1–29)	32.4	1.6	1.0
Small (30–100)	41.7	15.6	12.7
Medium (100–499)	20.2	24.3	23.3
Large (500 or more)	5.7	58.5	63.0
Total	100.0	100.0	100.0

Source: "Farms, Land in Farms, and Livestock Operations 2012 Summary," February 2013.
http://usda.mannlib.cornell.edu/usda/nass/FarmLandIn/2010s/2013/FarmLandIn-02-19-2013.pdf

Appendix III: Antimicrobial Products

Antimicrobial class	Product name	Active ingredient
Aminoglycoside	Adspec®	Spectinomycin
	AmTech Neomycin Oral Solution	Neomycin
	Biosol® Liquid	Neomycin sulfate
	BioDry®	Novobiocin
	Gentamicin	Gentamicin
	Neomed 325 Soluble Powder	Neomycin sulfate
	Neomix Ag® 325 Soluble Powder	Neomycin sulfate
	Neomix® 325 Soluble Powder	Neomycin sulfate
	Neomycin 325 Soluble Powder	Neomycin sulfate
	Neomycin Oral Solution	Neomycin sulfate
	Neo-Sol 50	Neomycin sulfate
	Strep Sol 25 percent	Streptomycin sulfate
	Streptomycin Oral Solution	Streptomycin
Beta-lactam–first-^{t} generation cephalosporin	Cefa-Lak®/ToDAY Intramammary Infusion	Cephapirin (sodium)
	Cefa-Dri®/ToMORROW Infusion	Cephapirin (sodium)
Beta-lactam–third-generation cephalosporin	Excede™ Sterile Suspension	Ceftiofur crystalline free acid
	Excenel® RTU	Ceftiofur hydrochloride
	Naxcel®	Ceftiofur sodium
	SPECTRAMAST® DC Intramammary Infusion	Ceftiofur hydrochloride
	SPECTRAMAST ® LC Intramammary Infusion	Ceftiofur hydrochloride

Antimicrobial class	Product name	Active ingredient
Beta-lactam–penicillin	Agri-Cillin™	Penicillin G Procaine
	Amoxi-Bol®	Amoxicillin
	Amoxi-Inject ®	Amoxicillin
	Amoxi-Mast® Intramammary Infusion	Amoxicillin
	Aquacillin™	Penicillin G Procaine
	Aqua-Mast Intramammary Infusion	Penicillin G (procaine)
	Combi-Pen™-48	Penicillin G (benzathine)
	Crysticillin 300 AS Vet.	Penicillin G Procaine
	Dariclox® Intramammary Infusion	Cloxacillin (sodium)
	Dry-Clox®	Cloxacillin (benzathine)
	Duo-Pen®	Penicillin G benzathin; procaine
	Durapen™	Penicillin G benzathin; procaine
	Hanford's/US Vet Masti-Clear Intramammary Infusion	Penicillin G (procaine)
	Hanford's/US Vet/Han-Pen G/Ultrapen	Penicillin G Procaine
	Hanford's/US Vet/Han-Pen-B/Ultrapen B	Penicillin G (benzathine)
	Hetacin®K Intramammary Infusion	Hetacillin (potassium)
	Microcillin	Penicillin G Procaine
	Norocillin	Penicillin G (procaine)
	Orbenin-DC®	Cloxacillin (benzathine)
	Pen-G Max™	Penicillin G (procaine)
	Penicillin G Procaine	Penicillin G Procaine
	PFI-Pen G®	Penicillin G Procaine
	Polyflex®	Ampicillin
	Princillin Bolus	Ampicillin trihydrate
	Pro-Pen-G™ Injection	Penicillin G Procaine
Florfenicol	Nuflor Gold™	Florfenicol
	Nuflor® Injectable Solution	Florfenicol
	Resflor Gold®	Florfenicol and Flunixin meglumine
Fluoroquinolone	Baytril 100 injection	Enrofloxacin
Lincosamide	Pirsue Intramammary Infusion	Pirlimycin

Antimicrobial class	Product name	Active ingredient
Macrolide	Draxxin™	Tulathromycin
	Gallimycin®-100 Injection	Erythromycin
	Gallimycin®-36 Intramammary Infusion	Erythromycin
	Micotil® 300 Injection	Tilmicosin phosphate
	Tylan Injection 50/200 Tylosin Injection	Tylosin
	Tylosin Injection	Tylosin
	Zactran	gamithromycin
	Zuprevo 18 percent	Tildipirosin
Other	AlbaDry® Plus Suspension	Penicillin G (procaine)/ Novobiocin
	AS700	Chlortetracycline/sulfamethazine
	CORID 20 percent Soluble Powder	Amprolium
	CORID 9.6 percent Oral Solution	Amprolium
	Deccox-M	Decoquinate
	Linco-Spectin® Sterile Solution	Lincomycin / Spectinomycin
	Quartermaster® Dry Cow Treatment	Penicillin G (procaine)/ Dihydrostreptomycin
Sulfonamide	20 percent SQX Solution	Sulfaquinoxaline
	Albon® Bolus	Sulfadimethoxine
	Albon® Concentrated Sol.12.5 percent	Sulfadimethoxine
	Albon® Injection 40 percent	Sulfadimethoxine
	Albon® SR Bolus	Sulfadimethoxine
	Di-Methox & 12.5 percent Oral Solution	Sulfadimethoxine
	Di-Methox Injection 40 percent	Sulfadimethoxine
	Di-Methox Soluble Powder	Sulfadimethoxine
	Liquid Sul-Q-Nox	Sulfaquinoxaline (sodium)
	SDM Injection 40 percent	Sulfadimethoxine
	SDM Solution	Sulfadimethoxine
	Sulfadimethoxine 12.5 percent Oral Solution	Sulfadimethoxine
	Sulfadimethoxine Inj. 40 percent	Sulfadimethoxine
	Sulfadimethoxine Soluble Powder	Sulfadimethoxine
	Sulfa-Nox Concentrate	Sulfaquinoxaline
	Sulfa-Nox Liquid	Sulfaquinoxaline (sodium)
	Sulfaquinoxaline Sodium Solution 20 percent	Sulfaquinoxaline (sodium)
	SulfaSure™ SR Cattle/Calf Bolus	Sulfamethazine
	Sulmet® Drinking Water Solution 12.5 percent	Sulfamethazine (sodium)
	Sulmet® Oblets®	Sulfamethazine
	Sulmet® Soluble Powder	Sulfamethazine (sodium)
	Sustain III® Cattle Bolus	Sulfamethazine
	Vetisulid Injection	Sulfachlorpyridazine (sodium)
	Vetisulid® Powder	Sulfachlorpyridazine (sodium)

Antimicrobial class	Product name	Active ingredient
Tetracycline	Agrimycin™ 100	Oxytetracycline hydrochloride
	Agrimycin™ 200	Oxytetracycline hydrochloride
	AmTech Oxytetracycline HCL Solution Powder - 343	Oxytetracycline
	Aureomycin® Soluble Powder	Chlortetracycline hydrochloride
	Aureomycin® Soluble Powder Concentrate	Chlortetracycline hydrochloride
	Bio-Mycin® 200	Oxytetracycline
	Bio-Mycin® C	Oxytetracycline hydrochloride
	Chlortetracycline Soluble Powder Concentrate	Chlortetracycline hydrochloride
	CLTC 100 MR	Chlortetracycline calcium
	Duramycin-100	Oxytetracycline hydrochloride
	Duramycin-200	Oxytetracycline hydrochloride
	Liquamycin® LA-200®	Oxytetracycline
	Maxim-200®	Oxytetracycline
	Maxim™-100	Oxytetracycline hydrochloride
	Noromycin® 300-LA	Oxytetracycline
	Oxy 500 and 1000 Calf Bolus	Oxytetracycline hydrochloride
	Oxybiotic™ 200	Oxytetracycline
	Oxycure™ 100	Oxytetracycline hydrochloride
	Oxy-Mycin™ 100	Oxytetracycline hydrochloride
	Oxy-Mycin™ 200	Oxytetracycline hydrochloride
	Oxytet 100	Oxytetracycline hydrochloride
	Oxytetracycline HCL Soluble Powder	Oxytetracycline hydrochloride
	Oxytetracycline HCL Soluble Powder 343	Oxytetracycline hydrochloride
	Oxytetracycline Injection 200	Oxytetracycline
	Oxy-Tet™ 100	Oxytetracycline hydrochloride
	Panmycin® 500 Bolus	Tetracycline hydrochloride
	Pennchlor™ 64 Soluble Powder	Chlortetracycline hydrochloride
	Pennox™ 200 Injectable	Oxytetracycline
	Pennox™ 343 Soluble Powder	Oxytetracycline hydrochloride
	Polyotic® Soluble Powder	Tetracycline hydrochloride
	Promycin™ 100	Oxytetracycline hydrochloride
	Solu/Tet Soluble Powder	Tetracycline hydrochloride
	Terramycin® 343 Soluble Powder	Oxytetracycline hydrochloride
	Terramycin® Scours Tablets	Oxytetracycline hydrochloride
	Terramycin® Soluble Powder	Oxytetracycline hydrochloride
	Terra-Vet 100	Oxytetracycline hydrochloride
	Tet-324	Tetracycline hydrochloride
	Tetra-Bac 324	Tetracycline hydrochloride
	Tetracycline HCL Soluble Powder-324	Tetracycline hydrochloride
	Tetradure™ 300	Oxytetracycline

Antimicrobial class	Product name	Active ingredient
Trimethoprim/sulfa	Bactrim® tablets	Trimethoprim/sulfamethoxazole
	SMZ/TMP Tablets	Trimethoprim/sulfamethoxazole
	TMP-sulfa	Trimethoprim sulfamethoxazole
	Tribrissin® tablets	Trimethoprim/sulfamethoxazole
	Uniprim Powder	Trimethoprim/sulfadiazine

Appendix IV: FDA Categories of Antimicrobials Mentioned in This Report

There are four categories of antimicrobials with respect to their use in human medicine as determined by the FDA: not medically important, important, highly important, and critically important. The table below shows the ranking of the drug classes mentioned in this report.

Category	Drug/drug classes
Not medically important	Bambermycin
	Ionophores (i.e., lasalocid and monensin)
	Bacitracin
	Fenbendazole
	Decoquinate
	Amprolium
Important	Beta lactam– first-generation cephalosporins (e.g., Cephapirin)
Highly important	Beta lactam–natural penicillins (e.g., Penicillin G)
	Aminopenicillins (e.g., Ampicillin, Amoxicillin)
	Aminoglycosides (e.g., spectinomycin, neomycin, gentamicin)
	Lincosamides (e.g., Lincomycin)
	Tetracyclines (e.g., chlortetracycline, oxytetracycline)
	Phenicols (e.g., florfenicol)
Critically important	Beta lactam– third-generation cephalosporins (e.g., ceftiofur)
	Fluoroquinolones (e.g., enrofloxicin, Danofloxacin)
	Macrolides (e.g., tilmicosin, tylosin, erythromycin, tulathromycin, tildipirosin)
	Sulfonamides (e.g., sulfamethoxazole, trimethoprim/sulfamethoxazole

https://www.fda.gov/downloads/AnimalVeterinary/GuidanceComplianceEnforcement/GuidanceforIndustry/UCM052519.pdf

Appendix V: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices

- "Changes in Milking Procedures on U.S. Dairy Operations," info sheet
- "Nutrient Management Practices on U.S. Dairy Operations, 2014"
- "Changes in the U.S. Dairy Cattle Industry 1991–2014"

2. Describe management practices and production measures related to animal welfare

- "Dairy Cattle Management Practices in the United States, 2014
- "Cattle Welfare on U.S. Dairy Operations, 2014," interpretive report
- "Management of Nonambulatory Dairy Cows on U.S. Dairy Operations"

3. Estimate within-herd prevalence of lameness and evaluate housing and management factors associated with lameness

- "Associations Between Housing and Management Practices on the Prevalence of Lameness, Hock Lesions, and Thin Cows on U.S. Dairy Operations," info sheet

4. Evaluate heifer calf health from birth to weaning

- "Dairy Cattle Management Practices in the United States, 2014"
- "Colostrum Feeding and Management on U.S. Dairy Operations," 1991–2014, info sheet "Morbidity and Mortality of Preweaned Dairy Heifer Calves," info sheet
- "Evaluation of Colostrum Quality and Passive Transfer Status of Dairy Heifer Calves on U.S. Dairy Operations, 2014," info sheet
- "Prevalence of *Giardia* and *Cryptosporidium* in Preweaned Dairy Heifer Calves, 2014," info sheet
- "Evaluation of Average Daily Gain in Preweaned Dairy Heifer Calves, 2014," info sheet

5. Describe antimicrobial use and residue-prevention methods used to ensure milk and meat quality

- "Milk Quality, Milking Procedures and Mastitis on U.S. Dairy Operations, 2014"
- "Health and Management Practices on U.S. Dairy Operations, 2014"
- "Antimicrobial Use on U.S. Dairy Operations, 2002–14," info sheet

6. Estimate the prevalence and describe antimicrobial resistance patterns of select foodborne pathogens

- *"Listeria* and *Salmonella* in Bulk Tank Milk on U.S. Dairy Operations, 2002–14," info sheet
- "Prevalence of *Campylobacter* spp. in Bulk-tank Milk and Filters from U.S. Dairies, 2014," info sheet
- *"Salmonella* Dublin Antibodies in Bulk-tank Milk on U.S. Dairy Operations, 2014," info sheet
- *"Salmonella* and *Campylobacter* on U.S. Dairy Operations, 2002–14," info sheet

Additional informational sheets

- "Dairy Cattle Identification Practices in the United States, 2014," info sheet
- "Reproduction Practices on U.S. Dairy Operations, 2014," info sheet
- "Dairy Cattle Injection Practices in the United States, 2014," info sheet
- "Off-Site Heifer Raising on U.S. Dairy Operations, 2014," info sheet
- "Dry-off Procedures on U.S. Dairy Operations, 2014," info sheet