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Report 1

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Dairy 2014

Dairy Cattle Management Practices in the United States, 2014

USDA–APHIS–VS–CEAH–NAHMS
NRRC Building B, M.S. 2E7
2150 Centre Avenue
Fort Collins, CO 80526–8117
970.494.7000
http://www.aphis.usda.gov/nahms

#692.0216

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Items of Note

The Dairy 2014 study was conducted in 17 of the Nation's major dairy States (see map on p 2) and provides valuable information to study participants, stakeholders, and the dairy industry as a whole. Data collected for the study represented 76.7 percent of U.S. dairy operations and 80.3 percent of U.S. dairy cows at the time of the study interview. Estimates in this report refer to calendar year 2013.

Operation types and productivity

Conventional dairy operations (see operation type in Terms Used in This Report, p 3) made up the majority of all operations (58.8 percent), and the percentage of conventional operations increased as herd size increased. Of very small operations, 47.8 percent were a combination of conventional and grazing operations; overall, more than one-fourth of operations were a combination of conventional and grazing operations.

A percentage change in operation size was calculated based on an operation's number of cows from 5 years ago and their January 1, 2014, cow inventory. Additionally, producers were asked to estimate how many cows they expected to be milking in 5 years. Compared with 5 years ago, very small operations reported a 24.3 percent reduction in herd size and small operations reported a 5.4 percent reduction. Conversely, medium and large operations had a 12.4 and 23.6 percent increase in herd size, respectively. The operation average percentage change in herd size 5 years from now is expected to increase in all herd size categories, with an overall increase of 25.7 percent.

Overall rolling herd average (RHA) milk production was 19,932 lb/cow. RHA milk production was highest for conventional operations (21,862 lb/cow) and for a combination of conventional and grazing/other operations (17,815 lb/cow). RHA milk production for grazing and organic operations was similar (14,513 and 14,758 lb/cow, respectively).

The overall operation average age of cows at first calving was 25.0 months. Operation average days dry was 57.1 days, while the calving interval was 13.1 months.

Overall, 88.4 percent of operations milked the majority of cows two times per day. More than 80 percent of very small, small, and medium operations milked the majority of cows two times per day. The majority of large operations (56.8 percent) milked cows three times per day.

Record-keeping systems

A record-keeping system was used to track individual animals by 95.0 percent of all operations and 100.0 percent of large operations. More than 70 percent of very small, small, and medium operations used handwritten records. Almost all large operations (94.0 percent) used an on-farm computer record-keeping system. Excluding very small operations, approximately 20 percent of operations used an off-farm computer record-

keeping system. Almost all cows (99.1 percent) were housed on operations that used a record-keeping system.

Almost half of all operations that used a computer to keep records (46.6 percent) entered official identification numbers (IDs) into the computer. A higher percentage of large operations (58.1 percent) entered official IDs into computer record-keeping systems compared with small operations (37.6 percent). Almost three-fourths of operations that used a computer (74.0 percent) performed at least some data entry electronically (e.g., handheld computer, smartphone). Interestingly, the percentage of operations that used electronic data entry decreased as herd size increased. However, the percentage of data entry done electronically ranged from 11.2 percent of small operations to 29.4 percent of large operations.

Overall, 56.3 percent of operations participated in the Dairy Herd Information Association (DHIA); participation increased as herd size increased. There were no regional differences in the percentage of operations enrolled in DHIA.

The highest percentage of operations (85.7 percent) used a record-keeping system to monitor breeding history and genetic improvements. More than 90 percent of large operations used a record-keeping system to track or monitor parameters, with the exception of antibiotic withdrawal times.

Herd and individual-animal identification

Almost half of all operations (45.4 percent) used/had a herd ID, and two-thirds of cattle (68.4 percent) had a herd ID. Almost twice the percentage of large operations had herd IDs compared with small operations (75.8 and 38.0 percent, respectively).

Individual-animal ID is an important component of record keeping. Almost all operations (94.9 percent) had some form of individual-animal ID. Bangle ear tags were used as unofficial ID by 80.2 percent of operations and on 79.8 percent of cows. Although electronic IDs were used as unofficial ID by only 8.2 percent of operations, 24.6 percent of cows had some form of electronic ID. Brucellosis tags were the most common official individual-animal ID used (31.9 percent of operations and 42.2 percent of cows). Electronic ear tags with the 840 prefix were used by only 6.2 percent of operations but were placed on 20.3 percent of cows, suggesting greater use on large operations.

The highest percentage of operations (76.2 percent) used bangle ear tags as their primary unofficial ID. Brucellosis tags were the primary official ID on more than 40 percent of operations, regardless of herd size. Silver (brite) metal tags were used as primary official ID by almost one-third of operations (31.5 percent).

USDA Animal Disease Traceability Program

The USDA's Animal Disease Traceability Program enables APHIS to trace livestock across State lines during disease investigations. The program targets identification of individual animals, and allows officials to trace an animal's origin. Almost 70 percent of operations had not heard of the program or only recognized its name. A higher percentage of large operations (15.7 percent) than small operations (5.3 percent) were fairly knowledgeable about the program.

Breed and registration

Holsteins continue to be the predominant dairy breed. Holsteins were housed on 89.6 percent of operations and represented 86.0 percent of all U.S. dairy cows. Jerseys were housed on almost 30 percent of operations but represented less than 8 percent of dairy cows.

Overall, 28.1 percent of operations had at least some registered cows. The percentage of registered cows generally decreased as herd size increased; 18.2 percent of cows on small operations were registered compared with 10.4 percent of cows on large operations. Overall, 12.6 percent of all cows were registered with a breed association.

Use of technology

Overall, 47.5 percent of operations had accessed the Internet for dairy information during 2013. Internet use generally increased as herd size increased, with 31.6 percent of very small operations accessing the Internet for dairy information compared with 89.7 percent of large operations.

Quality assurance programs

Quality assurance programs are designed to improve product quality through assessments and monitoring. Almost half of all operations (45.9 percent) participated in any quality assurance program; 55.2 percent of medium operations and 75.6 percent of large operations participated in a program.

Herd additions

Almost 30 percent of operations (28.6 percent) introduced new cattle to the operation during 2013. Within each cattle class, the percentage of operations that brought on cattle was similar across herd sizes. Pregnant dairy heifers and lactating dairy cows were introduced onto farms by 11.4 and 11.9 percent of operations, respectively.

Biosecurity recommendations include quarantining new arrivals for 30 to 60 days to allow for testing and observing animals for any infectious disease. Only 9.6 percent of operations quarantined any new additions on arrival. Lactating cattle are difficult to quarantine because they need to be milked, and most operations do not have separate

housing and milking facilities for new additions. On operations that did quarantine added cattle, 29.3 percent of new arrivals were quarantined for an average of 20.9 days.

Information on the herd of origin of new animals was required on 27.3 percent of operations. A lower percentage of small operations (24.7 percent) required herd-of-origin information compared with large operations (42.0 percent). Overall, 22.7 percent of operations that added cattle to the operation required or performed individual-animal testing before adding cattle to the operation. A higher percentage of large operations (70.6 percent) required or administered vaccines to new additions compared with small and medium operations (23.1 and 42.0 percent, respectively). Overall, 39.1 percent of operations vaccinated new additions.

The majority of operations that added new cattle (60.2 percent) obtained the cattle directly from other dairy operations. Markets/auctions were sources of new cattle for 28.4 percent of operations that added cattle. The percentage of operations that obtained new additions was similar across herd sizes for each source.

Source of heifer inventory

The percentage of operations in which dairy heifers were born and raised on-site ranged from 62.4 percent of large operations to 97.0 percent of small operations. Overall, 91.8 percent of operations raised some heifers on-site. On almost half of large operations (46.4 percent) heifers were born on-site but raised off-site. An off-site rearing facility was used for at least some calves by 12.4 percent of operations.

Calf sales and rearing

The majority of operations (90.2 percent) sold bull and steer calves, while only one-fourth of operations (26.4 percent) sold heifer calves. There were no differences across herd sizes in the percentage of operations that sold heifer calves.

Heifer calves were raised off-site with retained ownership on 11.7 percent of operations, while bull and steer calves were raised off-site on 1.8 percent of operations. The percentage of operations that raised heifer calves off-site ranged from 5.5 percent of small operations to 44.3 percent of large operations. A slightly higher percentage of large operations raised bull calves off-site with retained ownership (5.6 percent) compared with small and medium operations (1.3 percent each). The percentage of operations in the West region that raised heifer calves off-site was more than three times the percentage of operations that raised heifers off-site in the East region (30.6 and 9.8 percent, respectively).

Heifer rearing and movement

For small and medium operations that sent heifers off-site to be raised, the majority (84.9 and 59.0 percent, respectively) sent heifers that were weaned but not pregnant

to the off-site raising facility, while most large operations (62.8 percent) sent heifers as preweaned calves. Overall, 55.7 percent of operations sent heifers to rearing facilities as weaned calves, and 69.6 percent of operations primarily brought back pregnant heifers.

Across herd sizes, more than 50 percent of operations that sent heifers to an off-site rearing facility sent the heifers to a single facility in which heifers had contact with cattle from other operations.

Bull/steer rearing and movement

The majority of small and medium operations (68.3 and 57.7 percent, respectively) sold bull/steer calves through an auction. Approximately one-third of large operations (32.5 percent) sold bull/steer calves to a calf ranch or heifer raiser and did not bring them back to the operation; 37.7 percent sold bull/steer calves through an auction. Almost two-thirds of all operations (61.8 percent) sold bull/steer calves through an auction.

Calving area

The use of a multiple-animal calving area/pen increased as herd size increased. Overall, 58.7 percent of operations had some cows calve in a group calving pen. A higher percentage of small operations (34.1 percent) had some cows calve in an individual pen cleaned between each calving compared with medium and large operations (20.0 and 21.6 percent, respectively). A similar percentage of operations across herd sizes used individual calving pens that were cleaned after two or more calvings.

Cows that test positive for *Mycobacterium avium* subspecies *paratuberculosis*—the causative agent of Johne's disease—are likely to shed the bacteria in feces or in colostrum around the time of calving. Test-positive cows about to calve should be managed in a separate area away from test-negative cows. Of the 74.4 percent of operations that reported testing for Johne's disease, 7.3 percent allowed test-positive cows in the calving area.

The length of time cows spend in the calving area after calving is related to how soon calves are removed from their dam. Research suggests that removing calves from their dam as soon as possible minimizes the bonding process, which reduces the stress that separation has on calves and dams. About one-fourth of operations (24.2 percent) removed cows from the calving area within an hour of calving. More than half of all operations (57.5 percent) removed cows from the calving area from 1.1 to 14.0 hours after calving.

Births and stillbirths

Calves born dead or that die within 48 hours of birth are frequently referred to as stillbirths. Overall, 94.4 percent of calves born were alive at 48 hours and 5.6 percent were stillborn. A higher percentage of calves born on small and medium operations

(6.8 and 6.4 percent, respectively) were stillborn compared with calves born on large operations (5.1 percent). Slightly more than 50 percent of calves alive at 48 hours were heifer calves.

Colostrum management

Recommendations regarding colostrum include feeding colostrum at 10-percent of body weight (approximately 1 gallon). There are multiple recommendations on how soon following birth calves should get their first feeding of colostrum and how much colostrum they should get. In general, the sooner calves get colostrum—and the higher the amount of colostrum fed at first feeding—the better the transfer of immunity.

The operation average age of heifer calves at the first feeding of colostrum was 3.6 hours. Large operations fed colostrum sooner following birth (2.1 hours) than small and medium operations (3.8 and 3.9 hours, respectively).

The majority of small and medium operations (74.2 and 58.3 percent, respectively) fed 2 quarts or less of colostrum at first feeding, while almost half of large operations (48.4 percent) fed 4 quarts or more at first feeding. Only 21.8 percent of all operations fed 4 quarts or more at first feeding. The majority of all operations fed an additional 2 quarts or more of colostrum in the first 24 hours. The amount of colostrum fed to heifer calves in the first 24 hours increased as herd size increased. The majority of small operations (51.1 percent) fed 4 quarts in the first 24 hours, while the majority of large operations (56.2 percent) fed 6 quarts or more. Almost 90 percent of operations (87.5 percent) fed 4 quarts or more of colostrum during the first 24 hours.

Monitoring and measuring serum total protein in calves 1 to 7 days of age is the easiest way to determine how well the colostrum management program is working. Total protein can be determined on-farm using a refractometer. A commonly recommended goal is for 90 percent of calves sampled to have total protein values greater than or equal to 5.2 g/dL, or for 80 percent of calves to have total protein values greater than or equal to 5.5 g/dL. More than one-third of large operations (38.3 percent) routinely monitored serum proteins. Less than 10 percent of all operations (6.2 percent) routinely monitored serum proteins to evaluate their colostrum management program. More than one-third of heifer calves (35.3 percent) were on operations that routinely monitored serum proteins.

Preweaned heifers

Primarily, preweaned heifer calves are individually housed to reduce the spread of disease and to monitor feed intake. The majority of operations housed preweaned heifer calves individually. Individual outside hutch or pen was used by 37.9 percent of operations, while individual inside unheated hutch or pen was used by 25.1 percent.

The use of nonmedicated milk replacer increased as herd size increased. Medium operations represented the highest percentages of operations that fed medicated

milk replacer or any milk replacer (49.2 and 63.9 percent, respectively). Slightly more than one-third of all operations (37.6 percent) fed at least some calves medicated milk replacer. Milk-replacer medications used by the highest percentage of operations were lasalocid (12.7 percent), decoquinate (11.5 percent), and a combination of neomycin and oxytetracycline (9.0 percent). Medications in milk replacer were not reported for 8.0 percent of operations.

The use of unpasteurized milk (saleable or nonsaleable/waste) decreased as herd size increased, ranging from 72.9 percent of very small operations to 26.3 percent of large operations. Overall, 55.7 percent of operations fed at least some calves unpasteurized milk. Pasteurized milk was fed on a higher percentage of large operations (43.8 percent) than very small, small, or medium operations (5.1, 1.5, and 9.9 percent, respectively). Acidified milk was fed on 1.7 percent of operations, with no differences across herd sizes.

A higher percentage of very small, small, and medium operations (91.6, 97.2, and 93.9 percent, respectively) fed preweaned heifers twice a day compared with large operations (84.4 percent). A higher percentage of large operations fed preweaned heifers three times a day compared with the other herd sizes. The majority of preweaned heifers (88.9 percent) were fed twice daily, while 6.8 percent of preweaned heifers were fed three times daily.

The majority of all operations (57.7 percent) fed preweaned heifers 2 quarts of milk or milk replacer at each feeding, while 22.0 percent fed 4 quarts or more at each feeding. The percentage of operations by the amount of milk or milk replacer fed at each feeding was similar for very small, small, and medium operations. More than half of all operations (53.3 percent) fed 4 to 5 quarts per calf, per day, while more than half of preweaned heifers (54.5 percent) were fed 6 or more quarts per day.

The main weaning criterion that should be used to determine when calves are ready to wean is that they are consuming 2.0 pounds of starter daily, which can occur as early as 6 to 8 weeks of age. Other criteria used include reaching a specified age or weight. The overall operation average weaning age for preweaned heifers was 9.0 weeks. Very small operations weaned heifers at an older age (11.6 weeks) compared with the other herd sizes. The majority of small and large operations (51.4 and 54.8 percent, respectively) weaned heifers based on reaching a target age. About one-fifth of operations (21.5 percent) weaned their heifers if they were eating at least the recommended 2 pounds of starter for 3 consecutive days. A higher percentage of medium operations than large operations (26.1 and 14.9 percent, respectively) weaned based on starter intake.

The percentage of operations that vaccinated preweaned heifers against any disease increased as herd size increased, ranging from 37.0 percent of small operations to 81.3 percent of large operations. Overall, 49.3 percent of operations vaccinated heifers

against any disease. The most common vaccines administered to preweaned heifers were infectious bovine rhinotracheitis (34.0 percent of operations), parainfluenza type-3 (32.8 percent), and bovine respiratory syncytial virus (28.2 percent).

Bovine viral diarrhea (BVD) virus causes a variety of clinical signs in cattle, including diarrhea, fever, and abortion. Calves born with BVD infection are termed persistently infected (PI), since they never eliminate the infection and can shed large amounts of virus. Most BVD-control programs are centered on finding and eliminating PI calves. Overall, 4.7 percent of operations, representing 22.2 percent of heifer calves, routinely tested heifer calves for BVD. The percentage of operations that routinely tested heifer calves for BVD increased as herd size increased, ranging from 1.0 percent of small operations to 26.0 percent of large operations.

Weaned and pregnant heifers

A broad range of housing types were used for weaned heifers. The two most common types were open/dry lot with barn or shed (21.9 percent of operations) and multiple-animal inside area/barn (32.7 percent). Housing weaned heifers in tie stalls or stanchions decreased as herd size increased. A higher percentage of large operations than the other herd sizes used open/dry lot housing without barn or shed to house weaned heifers. The primary housing types for pregnant heifers were open/dry lot with barn or shed (27.8 percent of operations), freestall with access to open/dry lot (18.5 percent), multiple-animal inside area/barn (15.0 percent), and pasture (12.6 percent).

A lower percentage of small operations (65.2 percent) vaccinated weaned heifers against any disease compared with medium and large operations (85.0 and 89.9 percent, respectively). The four diseases vaccinated against by the highest percentages of operations were infectious bovine rhinotracheitis (64.1 percent), BVD (63.8 percent), parainfluenza type 3 (58.4 percent), and bovine respiratory syncytial virus (56.8 percent). Overall, 61.1 percent of operations administered vaccines to pregnant heifers. More than 40 percent of operations vaccinated pregnant heifers against five different diseases: infectious bovine rhinotracheitis (47.0 percent), BVD (46.9 percent), parainfluenza type 3 (44.7 percent), bovine respiratory syncytial virus (44.1 percent), and leptospirosis (41.5 percent). The percentages of operations that vaccinated against rotavirus, *Salmonella*, *E. coli,* and clostridia increased as herd size increased.

Cow housing

Overall, tie stall or stanchion was the primary housing type used for lactating cows on 38.9 percent of operations. One-fifth of operations (20.0 percent) housed lactating cows in freestalls with no outside access. The majority of large operations (51.5 percent) housed lactating cows in freestalls with no outside access. Pasture access for lactating and dry cows decreased as herd size increased. Overall, 59.5 percent of operations allowed pasture access for lactating cows and 72.3 percent allowed pasture access

for dry cows. The percentages of lactating and dry cows that had access to pasture decreased as herd size increased. Overall, 19.9 percent of lactating cows and 34.0 percent of dry cows had some pasture access.

When dairy cows are heat-stressed they eat less, produce less milk, and are not as fertile. The majority of all operations (82.6 percent) used a covered structure or building to provide lactating cows shelter from the sun. Sprinkler or mister use for lactating cows increased as herd size increased, and 25.2 percent of all operations used sprinklers or misters. A lower percentage of small operations than medium and large operations used fans to cool lactating cows, and a higher percentage used tunnel ventilation. Of all operations, 72.5 percent provided dry cows with a covered structure/building and 51.8 percent provided shade.

Sprinkler or mister use for dry cows increased as herd size increased, and 10.7 percent of all operations used sprinklers or misters. About half of all operations (49.7 percent) provided fans for dry cows, and a higher percentage of large operations than small and medium operations provided fans.

Milking facilities

Parlors were used to milk cows on 79.4 percent of medium operations and 99.8 percent of large operations. Milking facilities for very small and small operations were similar, with the highest percentages of these operations using tie stalls or stanchion barns. A slightly higher percentage of all operations milked cows in a tie stall or stanchion barn than in a parlor (52.6 and 45.8 percent, respectively). Overall, 86.6 percent of cows were milked in a parlor and 13.1 percent were milked in a tie stall or stanchion barn. The majority of cows on very small and small operations were milked in a tie stall or stanchion barn, while the majority of cows on medium and large operations were milked in a parlor.

Cow nutrition

For all operations, 92.0 percent fed lactating or dry cows alfalfa hay/haylage; 89.4 percent fed corn silage; 76.9 percent fed soybeans—whole, meal, or hulls; and 90.3 percent fed corn—whole, meal, cracked, or flaked. The percentages of operations that fed lactating or dry cows clover, soybeans, or oats generally decreased as herd size increased, while the percentages of operations that fed cottonseed, wet brewers/distillers grains, canola, wheat, straw, or blood meal generally increased as herd size increased.

The use of an independent nutritionist to balance rations increased as herd size increased, while the percentage of operations in which the operator/owner balanced rations decreased as herd size increased. A higher percentage of small and medium operations used a feed company nutritionist to balance rations (41.0 and 48.4 percent, respectively) compared with large operations (30.5 percent).

Water tanks or troughs were used to provide drinking water for cows on more than three-fourths of operations, regardless of herd size. In addition to water tanks or troughs, 73.6 percent of small operations provided water via a cup/bowl waterer. The percentages of operations that used a cup/bowl waterer or a lake, pond, stream, or river as a water source for cows decreased as herd size increased. The majority of operations (93.6 percent) sourced water from a well. Ground water and municipal water were used by similar percentages of operations across herd sizes. Surface water was used by a higher percentage of very small and small operations than medium and large operations.

Breeding bulls

About half of all operations (51.5 percent) had bulls used for breeding dairy cows. Beef bulls were used for breeding dairy cattle on 5.5 percent of operations, while dairy bulls were used on 48.1 percent of operations. A lower percentage of small operations used dairy bulls or any bulls (45.8 and 48.2 percent, respectively) compared with large operations (61.6 and 62.8 percent, respectively).

Cow vaccination and adverse reactions

The percentage of operations that administered vaccines to cows increased as herd size increased. Overall, 73.8 percent of operations administered any vaccine to cows. More than half of operations administered vaccines against BVD (68.0 percent), infectious bovine rhinotracheitis (60.2 percent), parainfluenza type 3 (55.8 percent), bovine respiratory syncytial virus (54.8 percent), or leptospirosis (51.5 percent).

Adverse reactions to injections--which can include a lump or swelling at an injection site, hives, abortion, collapse, or death--can occur following the administration of preventive or therapeutic products. Overall, 9.9 percent of operations had at least one incident in which a dairy cow had an adverse reaction to any injection. Vaccines were the injection type that caused an adverse reaction on the highest percentage of all operations (7.6 percent). Most operations (52.3 percent) reported adverse reactions to a veterinarian. Less than 1 percent of operations reported adverse reactions to the USDA or FDA. Almost half of operations (47.2 percent) did not report an adverse reaction to any person or agency.

Recombinant bovine somatotropin

Recombinant bovine somatotropin (rbST) can increase milk production by 15 percent, but some cooperatives and/or processors have restricted its use within their supply chain. The percentage of operations and the percentage of cows for which rbST was used increased as herd size increased. Overall, 9.7 percent of operations used rbST, and 14.7 percent of all cows received rbST during the most recent lactation.

Management of nonambulatory cows

For this study, nonambulatory cows were defined as cows unable to rise for at least 24 hours. In 2003, nonambulatory cattle were banned from entering the food supply after the first case of bovine spongiform encephalopathy (BSE) was discovered in the United States. The percentage of operations with at least one nonambulatory cow during 2013 ranged from 38.8 percent of very small operations to 98.4 percent of large operations. Overall, 76.5 percent of operations had at least one nonambulatory cow. On large operations, 2.1 percent of cows became nonambulatory. Overall, 2.6 percent of cows became nonambulatory during 2013. In total, 30.0 percent of nonambulatory cows recovered, 49.7 percent were euthanized, 2.5 percent were slaughtered for home consumption, and 17.7 percent died.

Permanent removals, death, and euthanasia

Overall, 28.4 percent of cows were permanently removed from operations during 2013. A lower percentage of cows were permanently removed on small and medium operations (26.0 and 26.3 percent, respectively) than on large operations (29.7 percent). A similar percentage of cows died across herd sizes. Overall, producers reported that 4.8 percent of cows died in 2013. Of operations that euthanized cows, 91.7 percent used a gunshot.

Use of veterinarians

A few studies have indicated that veterinarians are not always located in areas where livestock operations exist, which has led to the conclusion that there is a shortage of veterinarians specializing in food animals. In contrast, other studies indicate that there is a veterinarian distribution problem in which some areas do not have enough livestock operations to support a veterinarian. No operations reported that a veterinarian was available but was not knowledgeable about dairy cattle. Of the 6.2 percent of operations that did not use a veterinarian, 66.1 percent reported that a veterinarian was not needed on the operation. Only 3.1 percent of operations that did not use a veterinarian reported that there was no local veterinarian.

Of operations that used a veterinarian, 91.3 percent used their veterinarian for emergency services, 85.7 percent for reproductive management, 85.1 percent for disease diagnosis and treatment, and 84.6 percent for drug sales. Producers were asked to select the top three services provided by their veterinarian. Overall, the top three producer-reported services were reproductive management (71.0 percent of operations), emergency services (51.2 percent), and disease diagnosis and treatment (44.9 percent).

Source of drugs

Most operations (76.1 percent) obtained prescription drugs directly from the operation's veterinarian. Nonprescription drugs were primarily obtained directly from a veterinarian on 31.9 percent of operations and directly from a farm/ranch/feed store on 38.2 percent of operations.

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Acknowledgments

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External review of this report was conducted by:

- Ms. Abby Bauer, "Hoard's Dairyman"
- Dr. Tom Earleywine, Land O'Lakes Animal Milk Products
- Dr. Frank Garry, Colorado State University
- Dr. Sandra Godden, University of Minnesota
- Dr. Jamie Jonker, National Milk Producers Federation
- Dr. Marina (Nina) von Keyserlingk, University of British Columbia
- Mr. Michael Klamm, National Agricultural Statistics Service
- Mr. Mike Miller, National Agricultural Statistics Service
- Dr. Sunny Geiser-Novotny, USDA–APHIS–VS
- Ms. Amanda Smith, "Hoard's Dairyman"
- Dr. Scott Wells, University of Minnesota

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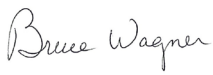

Dr. Bruce Wagner
Director
Center for Epidemiology and Animal Health

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Contacts for further information:
Questions or comments on data analysis: Dr. Jason Lombard (970) 494–7000
Information on reprints or other reports: Ms. Abby Zehr (970) 494–7000

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For questions about this report or additional copies, please contact:

USDA–APHIS–VS–CEAH
NRRC Building B, M.S. 2E7
2150 Centre Avenue
Fort Collins, CO 80526-8117
970–494–7000

Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory division of the U.S. Department of Agriculture's 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 five previous studies:

The NAHMS 1991–92 National Dairy Heifer Evaluation Project (NDHEP) provided the dairy industry's first national information on the health and management of dairy cattle in the United States. 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. NDHEP information on producer vaccination and biosecurity practices helped officials address the risk of disease spread and target educational efforts on vaccination protocols. Also in 1993, an outbreak of human illness was reported in the Pacific Northwest, this time related to *Escherichia coli* 0157:H7. NDHEP data on the bacteria's prevalence 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 age.

The NAHMS Dairy '96 study helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antibiotic usage and Johne's disease, as well as digital dermatitis, bovine leukosis virus, and potential foodborne pathogens, including *E. coli*, *Salmonella*, and *Campylobacter*.

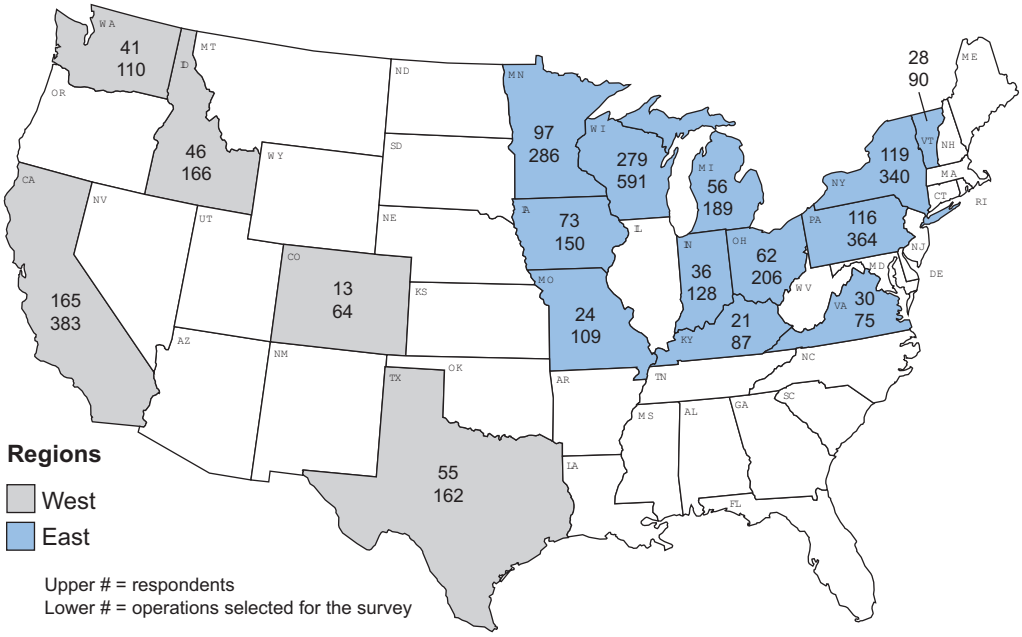
The Dairy 2002 study described management strategies that prevent and reduce Johne's disease and determine management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. Additionally, levels of participation in quality assurance programs, the incidence of digital dermatitis, a profile of animal-waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP in 1991 and Dairy '96 were examined.

The Dairy 2007 study evaluated cow comfort using an on-farm assessment tool, evaluated passive transfer and growth of preweaned heifer calves, and estimated the prevalence of multiple diseases, including bovine viral diarrhea, contagious mastitis pathogens, *Mycobacterium avium* subspecies *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, Dairy '96, and Dairy 2002 were examined.

The Dairy 2014 study was conducted in 17 of the Nation's major dairy States (see map) and provides valuable information to participants, stakeholders, and the industry as a whole. Data in the study represented 76.7 percent of U.S. dairy operations and 80.3 percent of U.S. dairy cows at the time of the interview. Results are presented in a variety of publications, including this report:

- "Dairy Cattle Management Practices in the United States, 2014" is the first in a series of reports containing national information from the NAHMS Dairy 2014 study and contains information collected from 1,261 dairy operations.

NAHMS Dairy 2014 Participating States



The methods used and the number of respondents in the study can be found at the end of this report. Study objectives and related outputs are available in appendix III.

Terms Used in This Report

Age at first calving: The time between birth and first calving. The recommended age of heifers at first calving is 20 to 24 months.

Annual milk production: The total amount of milk produced during the year by all cows on an operation.

Calving interval: The time from one calving to the next, which depends on how quickly a cow conceives after calving.

Close-up cows: Cows that are approximately 2 to 4 weeks from calving.

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

Cow average: The average value for all cows: the reported value for each operation multiplied by the number of cows on that operation is summed over all operations and divided by the number of cows on all operations. This way, results are adjusted for the number of cows on each operation. For instance, on p 10 the rolling herd average milk production (lb/cow) is multiplied by the number of cows for each operation. This product is then summed over all operations and divided by the sum of cows over all operations. The result is the operation average rolling herd average milk production for all cows.

Dairy Herd Information Association (DHIA): An organization with programs and objectives intended to improve the production and profitability of dairy farming. DHIA also aids farmers in keeping milk production and management records.

Dry period: The period from the end of one lactation to the beginning of a new lactation. A 60-day dry period is commonly recommended.

Feed line: A term for describing the physical placement of feed based on housing characteristics.

Forward contracting: An agreement in which the dairy operation is obligated to purchase feed in the future at a set price, regardless of the market price of feed at the time of purchase. Forward contacting is a way to lock in feed prices to more accurately budget expenses and possibly save on the purchase price.

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. Very small operations had fewer than 30 head; small operations had 30 to 99 head; medium operations had 100 to 499 head; and large operations had 500 or more head. Very small operations were administered an abbreviated questionnaire with a subset of the questions administered to operations with 30 or more cows.

Housing types:

Dry lot: An open dirt lot with no vegetative cover used for housing cows in arid climates.

Freestall: Housing consisting of resting cubicles or “beds” in which dairy cows are free to enter and leave at will.

Multiple-animal area: Housing other than freestall or dry lot where cows are able to move from one area to another, such as in a bedded pack barn.

Pasture: An area with vegetation suitable for grazing.

Stanchion: Housing in which a cow is restrained to a particular stall in a device with two rails that close around the cow’s neck after she enters the stall. Cows are not able to enter and leave the stalls at will.

Tie stall: Housing in which a cow is restrained to a particular stall by a neck collar attached to the stall by a chain. Cows are not able to enter and leave the stalls at will.

Identification:

Animal identification number (AIN): Official, numbered ID issued by the USDA.

Herd identification (ID): Refers to an ID used for the same or all animals in a herd. The ID designates the animals as belonging to a specific operation.

Individual-animal identification: Unique identification for each animal.

Official: ID used for purposes such as transfer of ownership or movement across State lines. Types of official identification include official eartags (e.g., brucellosis vaccination eartags) including radio frequency identification tags, registered brands, and tattoos.

Unofficial: Identification used to manage animals on an operation. Unofficial IDs include eartags, leg bands, collars, brands, and names.

Location-identification number (LID): A number system used to uniquely identify premises that house livestock. These numbers are issued by the State or Tribal authority.

Premises-identification numbers (PIN): An alternate to the LID number system used to uniquely identify premises that house livestock. These numbers are issued by the USDA.

Radio frequency identification (RFID): Any electronic ID system comprising a transponder containing a microantenna that, when read at a specific radio frequency, emits a signal containing a unique electronic code.

Milk urea nitrogen (MUN): An individual or group milk test used to determine if rations are properly balanced for protein and energy.

Operation: Premises with at least one dairy cow 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 days dry during 2013 (p 14) is calculated by summing reported average days dry for each operation divided by the number of operations.

Operation type:

Conventional: An operation in which the majority of forage consumed is not harvested by cows.

Grazing: An operation in which the majority of forage consumed is harvested by cows during the growing season.

Combination: An operation that uses both conventional and grazing practices.

Organic: A farm that meets USDA organic standards.

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 being ‘higher’ or ‘lower’, a statistical difference is implied but not tested. Not all statistically different estimates 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 (—).

Recombinant bovine somatotropin (rbST): A protein hormone naturally produced by a cow’s pituitary gland. rbST is synthesized for use in dairy cows and is a major regulator of milk production. rbST increases milk production by about 15 percent.

Regions:

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

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

Rolling herd average milk production: The average amount of milk produced per cow, per year (or per lactation) on an operation.

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

USDA Animal Disease Traceability Program: Regulations for the interstate movement of livestock. The purpose of the program is to improve the ability of APHIS and States to trace livestock when disease is found. Most of the program targets identification of animals, allowing traceback to the operation of origin.

More information can be found at: https://www.aphis.usda.gov/wps/portal/aphis/ourfocus/animalhealth?1dmy&urile=wcm%3apath%3a%2FAPHIS_Content_Library%2FSA_Our_Focus%2FSA_Animal_Health%2FSA_Traceability

Section I: Population Estimates

Note: Data in all tables refer to calendar year 2013.

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

A. Dairy Herd Information and Management Practices

1. Operation type and productivity

Producers were asked to identify their operations by type, i.e., conventional, grazing, combination, or organic. On conventional operations, the majority of forage was harvested and "delivered" to cows; on grazing operations, the majority of forage was harvested by cows; combination operations used both conventional and grazing practices; and organic operations had to meet USDA organic standards. The majority of operations (58.8 percent) were conventional, and the percentage of conventional operations increased as herd size increased. A combination of conventional and grazing was the most common operation type for very small operations (47.8 percent), and overall more than one-fourth of operations were of this type.

A.1.a. Percentage of operations by operation type and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Conventional	17.7	(4.6)	55.3	(2.5)	77.3	(2.4)	93.8	(1.1)	58.8	(1.7)
Grazing	22.6	(5.1)	5.1	(1.1)	2.8	(1.0)	0.7	(0.3)	6.7	(1.0)
Combination of conventional and grazing	47.8	(6.3)	31.1	(2.3)	13.1	(2.0)	3.2	(0.8)	26.5	(1.6)
Organic	8.5	(3.6)	8.5	(1.5)	6.5	(1.5)	2.3	(0.7)	7.4	(1.0)
Other	3.3	(2.4)	0.0	(—)	0.3	(0.3)	0.0	(—)	0.6	(0.4)
Total	100.0		100.0		100.0		100.0		100.0	

There were no regional differences in the percentages of operations by operation type.

A.1.b. Percentage of operations by operation type and by region:

	Percent Operations			
	Region			
	West		East	
Operation type	**Percent**	**Std. error**	**Percent**	**Std. error**
Conventional	66.8	(3.9)	58.0	(1.8)
Grazing	5.1	(1.7)	6.9	(1.1)
Combination of conventional and grazing	19.3	(3.9)	27.2	(1.7)
Organic	7.0	(2.5)	7.5	(1.1)
Other	1.9	(1.8)	0.4	(0.4)
Total	100.0		100.0	

A percentage change in operation size was calculated based on the operation's reported number of cows from 5 years ago and its January 1, 2014, cow inventory. Producers were asked to estimate how many cows they expected to be milking in 5 years. Compared with 5 years ago, very small operations reported a 24.3 percent reduction in the number of cows and small operations reported a 5.4 percent reduction. Conversely, medium and large operations had a 12.4 and 23.6 percent increase in the number of cows in 2014, respectively, compared with 5 years ago. The operation average percentage change in herd size 5 years from now was expected to increase in all herd size categories, with an overall increase of 25.7 percent.

A.1.c. Operation average percentage change in the number of cows milked on the operation in 2014 versus 5 years ago, and number of cows expected in 5 years, by herd size:

	Operation Average Percent Change									
	Herd Size (number of cows)									
	Very small (fewer than 30)		Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Time frame	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
2014 vs. 5 years ago[1]	-24.3	(7.6)	-5.4	(2.4)	12.4	(2.9)	23.6	(4.6)	-0.3	(1.8)
5 years from 2014[2]	92.6	(39.2)	13.0	(4.0)	20.8	(3.6)	29.7	(4.8)	25.7	(5.1)

[1]As a percentage of January 1, 2014, inventory; (Jan 1, 2014-5 yr ago)/5 yr ago.

[2]As a percentage of January 1, 2014, inventory; (5 yr from 2014- Jan 1, 2014)/Jan 1, 2014.

Among operation types, conventional operations had 6.7 percent more cows in 2014 than 5 years ago and expected to have 14.9 percent more cows in 5 years than in 2014. The other operation types had fewer cows in 2014 than 5 years ago (range 7.0 to 28.1 percent) but expected to have more cows in 5 years (range 31.7 to 122.0 percent).

A.1.d. Operation average percentage change in number of cows milked on the operation in 2014 versus 5 years ago, and number expected in 5 years, by operation type:

	Operation Average Percent Change							
	Operation Type							
	Conventional		Grazing		Combination[1]		Organic	
Time frame	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
2014 vs. 5 years ago[2]	6.7	(2.2)	-28.1	(7.2)	-7.0	(4.1)	-12.3	(6.4)
5 years from 2014[3]	14.9	(3.5)	122.0	(78.8)	31.7	(9.1)	37.4	(15.7)

[1]Includes combination of conventional and grazing/other.

[2]As a percentage of January 1, 2014, inventory; (Jan 1, 2014-5 yr ago)/5 yr ago.

[3]As a percentage of January 1, 2014, inventory; (5 yr from 2014– Jan 1, 2014)/Jan 1, 2014.

Rolling herd average (RHA) milk production is the amount of milk (lb/cow) produced by the average cow. Overall RHA milk production was 19,932 lb/cow. RHA milk production was highest for conventional operations (21,862 lb/cow) and for a combination of conventional and grazing/other operations (17,815 lb/cow). RHA milk production for grazing and organic operations was similar (14,513 and 14,758 lb/cow, respectively). RHA milk production generally increased for all operation types as herd size increased.

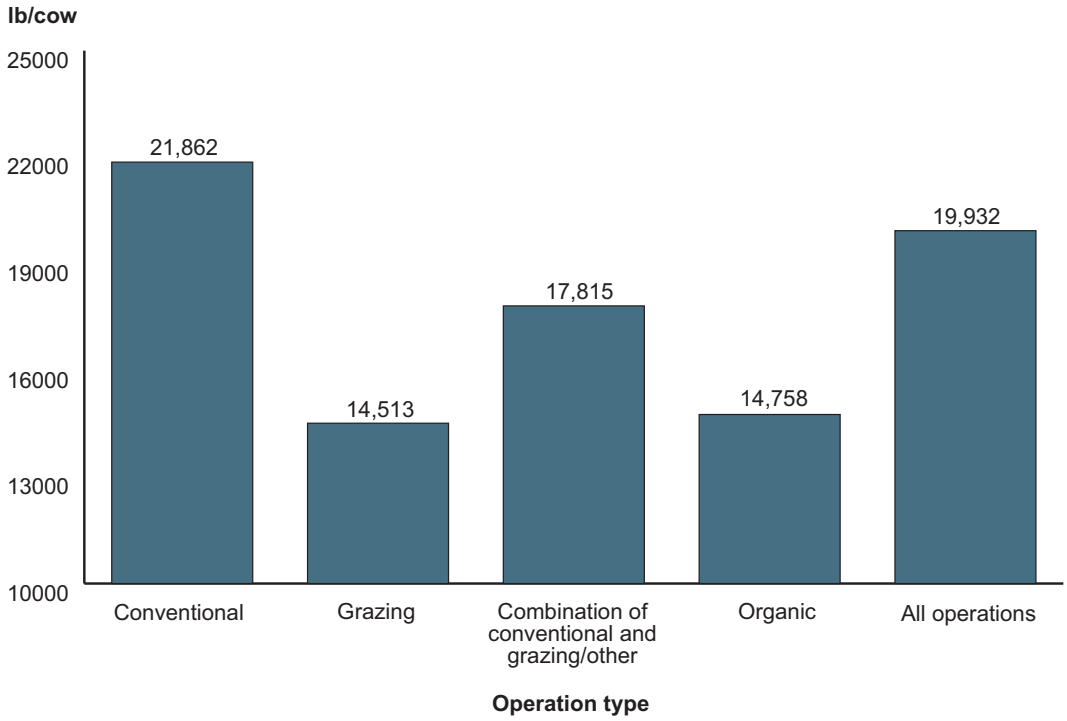
A.1.e. Operation average RHA milk production (lb/cow) by operation type and by herd size:

Operation Average RHA Milk Production (lb/cow)

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**
Conventional	20,340	(1,337)	20,254	(313)	22,624	(276)	25,493	(150)	21,862	(188)
Grazing	9,677	(1,289)	16,450	(1,058)	17,265	(1,964)	21,971	(2,187)	14,513	(983)
Combination of conventional and grazing/other	15,768	(821)	18,155	(430)	19,655	(488)	22,990	(1,349)	17,815	(351)
Organic	10,357	(1,245)	14,889	(812)	16,691	(1,102)	20,015	(1,137)	14,758	(709)
All operations	15,405	(792)	18,990	(248)	21,706	(247)	25,273	(153)	19,932	(183)

Operation average RHA milk production



Only 3.5 percent of very small operations had RHA milk production of 25,000 lb/cow or more compared with 58.3 percent of large operations.

A.1.f. Percentage of operations by average RHA milk production (lb/cow), and by herd size:

Percent Operations

Herd Size (number of cows)

Average RHA milk production (lb/cow)	**Very small** (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 15,000	43.2	(7.1)	16.9	(1.9)	6.9	(1.5)	0.2	(0.1)	15.6	(1.4)
15,000–19,999	30.5	(7.1)	38.1	(2.6)	21.2	(2.4)	6.4	(1.2)	29.5	(1.7)
20,000–24,999	22.8	(6.6)	35.9	(2.5)	48.4	(2.8)	35.0	(2.2)	37.6	(1.7)
25,000 or more	3.5	(3.4)	9.1	(1.6)	23.5	(2.3)	58.3	(2.3)	17.3	(1.1)
Total	100.0		100.0		100.0		100.0		100.0	

Daily milk production per operation is influenced by the number of cows milked and the amount of milk produced per cow. It is expected that smaller operations will have lower daily production than large operations. The majority of very small and small operations (96.7 and 61.1 percent, respectively) produced less than 3,000 pounds of milk on January 1, 2014, while 64.7 percent of large operations produced more than 50,000 pounds.

A.1.g. Percentage of operations by January 1, 2014, milk production (pounds), and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Daily milk production (lb)*	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 3,000	96.7	(2.2)	61.1	(2.5)	2.7	(1.2)	0.0	(—)	45.1	(1.6)
3,000–9,999	3.3	(2.2)	38.9	(2.5)	56.0	(2.8)	0.0	(—)	34.7	(1.6)
10,000–24,999	0.0	(—)	0.0	(—)	34.6	(2.6)	1.2	(0.4)	8.9	(0.7)
25,000–49,000	0.0	(—)	0.0	(—)	6.6	(1.3)	34.1	(2.3)	5.0	(0.4)
50,000 or more	0.0	(—)	0.0	(—)	0.0	(—)	64.7	(2.3)	6.2	(0.3)
Total	100.0		100.0		100.0		100.0		100.0	

*On January 1, 2014.

Days dry (or dry period) refers to the period from cessation of one lactation to the beginning of the next. Factors affecting days dry include the accuracy of the conception date, the variation in gestation length, and the management decisions relative to when cows are dried off. The recommended length for a dry period is 60 days.

Overall, operation average days dry was 57.1 days. Operation average days dry did not differ across herd sizes. Small and large organic operations had a slightly higher average days dry (63.8 and 61.6 days, respectively) compared with small and large conventional operations (56.5 and 56.6 days, respectively).

A.1.h. Operation average days dry, by operation type and by herd size:

Operation Average Days Dry

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Conventional	56.5	(0.6)	55.6	(0.5)	56.6	(0.4)	56.2	(0.4)
Grazing	60.0	(2.5)	61.0	(4.7)	61.6	(0.8)	60.3	(2.2)
Combination of conventional and grazing/other	57.5	(0.9)	57.2	(1.6)	58.8	(1.2)	57.5	(0.7)
Organic	63.8	(2.1)	58.7	(2.5)	61.6	(1.2)	62.5	(1.7)
All operations	57.7	(0.5)	56.2	(0.5)	56.8	(0.3)	57.1	(0.3)

Average days dry was 60 to 69 days on the majority of operations (53.3 percent). A higher percentage of small operations (9.1 percent) reported an average days dry of 70 or more days compared with large operations (3.6 percent).

A.1.i. Percentage of operations by average number of days dairy cows were dry, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Average days dry	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 40	2.7	(0.8)	2.9	(1.0)	0.8	(0.7)	2.5	(0.6)
40–49	12.5	(1.7)	13.5	(1.8)	11.8	(1.6)	12.7	(1.2)
50–59	19.1	(2.0)	29.5	(2.6)	36.3	(2.3)	24.1	(1.5)
60–69	56.7	(2.6)	48.6	(2.8)	47.5	(2.2)	53.3	(1.8)
70 or more	9.1	(1.5)	5.5	(1.4)	3.6	(0.8)	7.4	(1.0)
Total	100.0		100.0		100.0		100.0	

Operation average calving interval refers to the period from one calving to the next for the average cow. Calving interval is affected by how long it takes a cow to conceive and gestation length. Ideally, cows should calve every 12 months. The overall calving interval was 13.1 months.

A.1.j. Operation average calving interval (months), by operation type and by herd size:

Operation Average Calving Interval (mo)

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Conventional	13.3	(0.1)	13.1	(0.1)	13.0	(0.0)	13.2	(0.1)
Grazing	13.1	(0.2)	13.1	(0.3)	12.4	(0.5)	13.1	(0.2)
Combination of conventional and grazing/other	13.1	(0.1)	12.9	(0.2)	13.4	(0.2)	13.0	(0.1)
Organic	12.6	(0.2)	13.2	(0.3)	13.2	(0.2)	12.8	(0.2)
All operations	13.2	(0.1)	13.0	(0.1)	13.0	(0.0)	13.1	(0.0)

A lower percentage of small operations (35.7 percent) had an average calving interval of 13 months compared with large operations (55.7 percent). A higher percentage of small operations (2.8 percent) had average calving intervals of 16 or more months compared with large operations (0.7 percent).

A.1.k. Percentage of operations by average calving interval (months), and by herd size:

Percent Operations

Herd Size (number of cows)

Average calving interval (mo)	**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 12	5.9	(1.2)	8.3	(1.6)	3.2	(0.8)	6.3	(0.8)
12	22.7	(2.2)	18.8	(2.2)	17.2	(1.8)	20.9	(1.5)
13	35.7	(2.5)	41.5	(2.7)	55.7	(2.3)	39.6	(1.7)
14	25.8	(2.3)	24.4	(2.5)	21.0	(1.9)	24.9	(1.6)
15	7.0	(1.3)	5.0	(1.2)	2.2	(0.6)	5.9	(0.9)
16 or more	2.8	(0.9)	2.0	(0.8)	0.7	(0.3)	2.4	(0.6)
Total	100.0		100.0		100.0		100.0	

Age at first calving is determined by how quickly heifers mature and conceive. The recommended age at first calving is 20 to 24 months. Overall, age at first calving was 25.0 months. Age at first calving decreased as herd size increased on conventional operations, a combination of conventional and grazing/other operations, and all operations.

A.1.l. Operation average age of heifers at first calving (months), by operation type and by herd size:

	Operation Average Age at First Calving (mo)							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Conventional	25.4	(0.2)	24.6	(0.1)	23.4	(0.1)	24.8	(0.1)
Grazing	26.0	(0.6)	24.8	(0.8)	24.3	(1.0)	25.7	(0.5)
Combination of conventional and grazing/other	25.4	(0.3)	24.9	(0.3)	23.6	(0.3)	25.3	(0.2)
Organic	25.8	(0.5)	26.4	(0.7)	25.2	(0.6)	25.9	(0.4)
All operations	25.4	(0.1)	24.8	(0.1)	23.4	(0.1)	25.0	(0.1)

On more than half of operations (55.3 percent), the average age at first calving was 24 months or less; however, these operations accounted for 77.0 percent of all heifers, reflecting the younger average age at first calving on large operations.

A.1.m. Percentage of operations and percentage of heifers, by average age of heifers at first calving (months):

Average age at first calving (mo)	**Percent operations***	**Std. error**	**Percent heifers**	**Std. error**
Less than 24	19.0	(1.3)	41.6	(2.1)
24	36.3	(1.7)	35.4	(2.1)
25	12.6	(1.2)	9.1	(0.9)
26	13.9	(1.3)	6.4	(0.7)
27–29	11.2	(1.2)	5.1	(0.6)
30 or more	6.9	(0.9)	2.5	(0.4)
Total	100.0		100.0	

*Excludes very small operations (<30 cows).

Increasing milking frequency can increase overall milk production. Overall, 88.4 percent of operations milked the majority of cows two times per day. More than 80 percent of very small, small, and medium operations milked the majority of cows two times per day. The majority of large operations (56.8 percent) milked cows three times per day.

A.1.n. Percentage of operations by number of times per day the majority of cows were milked, and by herd size:

	Percent Operations									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Times per day	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1	8.4	(3.9)	0.1	(0.1)	0.2	(0.2)	0.0	(—)	1.3	(0.6)
2	91.6	(3.9)	97.9	(0.7)	84.4	(1.9)	43.0	(1.9)	88.4	(0.9)
3	0.0	(—)	2.0	(0.7)	15.1	(1.9)	56.8	(1.9)	10.2	(0.7)
More than 3	0.0	(—)	0.0	(—)	0.2	(0.2)	0.2	(0.2)	0.1	(0.1)
Total	100.0		100.0		100.0		100.0		100.0	

A higher percentage of operations in the East region than in the West region (89.4 and 77.9 percent, respectively) milked cows two times per day. Alternatively, a higher percentage of operations in the West region than in the East region (18.8 and 9.4 percent, respectively) milked cows three times per day.

A.1.o. Percentage of operations by number of times per day the majority of cows were milked, and by region:

	Percent Operations			
	Region			
	West		East	
Times per day	Percent	Std. error	Percent	Std. error
1	3.0	(2.1)	1.2	(0.6)
2	77.9	(2.6)	89.4	(0.9)
3	18.8	(1.9)	9.4	(0.7)
More than 3	0.2	(0.2)	0.1	(0.1)
Total	100.0		100.0	

Operation average RHA milk production increased from 7,183 lb/cow for operations milking once per day to 25,784 lb/cow for operations milking three times per day.

A.1.p. Operation average RHA milk production (lb/cow) by number of milkings per day, and by herd size:

Operation Average RHA Milk Production (lb/cow)

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Times per day	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
1	*		*		*				7,183	(207)
2	15,692	(761)	18,887	(245)	21,057	(260)	23,928	(209)	19,290	(189)
3			24,492	(1,986)	25,332	(478)	26,342	(209)	25,784	(287)
More than 3					*		*		*	
All	15,405	(792)	18,990	(248)	21,706	(247)	25,273	(153)	19,932	(183)

*Too few to report.

Producer-reported prices paid for dairy herd replacements were similar across operation types. Interestingly, prices paid for replacements were similar for organic operations and for the other operation types. This finding was not expected, primarily because organic-certified cattle generally have higher feed costs compared with nonorganic cattle. The reported price paid for a milk cow on the combination of conventional and grazing/other operation type ($1,373) was lower than that reported for conventional operations ($1,472).

A.1.q. Operation average price paid per head ($), by cattle type and by operation type:

Operation Average Price Paid per Head ($)[1]

Operation Type

	Conventional		Grazing		Combination[2]		Organic		All operations	
Cattle type	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Dairy replacement heifers (500 lb or more)	906	(14)	897	(91)	868	(29)	839	(54)	892	(12)
Springing dairy heifers	1,424	(13)	1,403	(66)	1,352	(24)	1,376	(53)	1,404	(11)
Milk cows	1,472	(14)	1,403	(58)	1,373	(25)	1,511	(55)	1,450	(12)

[1]Excludes very small operations (<30 cows).
[2]Includes combination of conventional and grazing/other.

Prices paid for dairy replacement heifers in the West region were higher per head ($1,015) than prices paid in the East region ($881). Conversely, per-head prices paid for milk cows were lower in the West region ($1,297) than in the East region ($1,467).

A.1.r. Operation average price paid per head ($), by cattle type and by region:

Operation Average Price Paid per Head ($)*

Region

	West		East	
Cattle type	**Average**	**Std. error**	**Average**	**Std. error**
Dairy replacement heifers (500 lb or more)	1,015	(23)	881	(13)
Springing dairy heifers	1,419	(19)	1,403	(12)
Milk cows	1,297	(26)	1,467	(13)

*Excludes very small operations (<30 cows).

2. Record-keeping systems

On dairy operations, record-keeping systems are used to keep track of different types of data, including information on individual-cow health and production, the use of antibiotics, and overall herd production.

A record-keeping system was used to track individual animals by 95.0 percent of all operations and 100.0 percent of large operations. More than 70 percent of very small, small, and medium operations used handwritten records. Almost all large operations (94.0 percent) used an on-farm computer record-keeping system. Excluding very small operations, approximately 20 percent of operations used an off-farm computer record-keeping system.

A.2.a. Percentage of operations by type of record-keeping system used for individual animals, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
System	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Handwritten records, such as a ledger or notebook	77.0	(5.4)	84.2	(1.9)	73.6	(2.4)	41.9	(2.3)	76.5	(1.4)
Any computer record system	20.1	(5.4)	29.7	(2.4)	60.8	(2.7)	98.0	(0.8)	42.6*	(1.6)
Off-farm computer record system	5.3	(2.6)	16.6	(2.0)	22.4	(2.3)	21.4	(2.1)	16.9	(1.2)
On-farm computer record system	14.9	(4.9)	14.9	(1.8)	48.2	(2.8)	94.0	(1.4)	30.8	(1.4)
Other	5.2	(3.1)	2.7	(0.8)	3.8	(1.0)	1.0	(0.5)	3.2	(0.7)
Any	86.0	(4.3)	94.2	(1.2)	99.7	(0.2)	100.0	(—)	95.0	(0.8)

*When very small operations are excluded, this estimate is 46.5 percent (SE=1.7) which is used as the denominator for table A.2.c, A.2.d, and A.2.e below.

Almost all cows (99.1 percent) were housed on operations that used a record-keeping system. As observed with the percentage of operations, the percentage of cows for which records were kept by hand decreased as herd size increased, while the percentage of cows for which records were kept on any computer record-keeping system increased as herd size increased.

A.2.b. Percentage of cows by type of record-keeping system used for individual animals, and by herd size:

Percent Cows

Herd Size (number of cows)

System	**Very small** (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Handwritten records, such as a ledger or notebook	91.5	(3.2)	82.3	(2.1)	68.2	(2.8)	37.9	(2.9)	50.9	(2.0)
Any computer record system	22.0	(7.2)	33.2	(2.6)	68.0	(2.6)	98.9	(0.4)	82.7	(0.8)
Off-farm computer record system	9.7	(5.2)	18.3	(2.2)	22.8	(2.6)	19.9	(2.5)	20.2	(1.8)
On-farm computer record system	12.2	(5.5)	16.9	(2.1)	56.8	(2.9)	96.9	(0.7)	76.7	(1.0)
Other	3.4	(2.7)	2.7	(0.8)	3.1	(0.9)	0.9	(0.5)	1.6	(0.4)
Any	96.4	(1.7)	94.2	(1.2)	99.6	(0.3)	100.0	(—)	99.1	(0.2)

Keeping records using commercial computer software generally makes record keeping easier and allows for comparison of parameters across herds using the same system.

Of operations that used a computer record-keeping system, more than 20 percent used DairyComp 305, PCDART, or DHI Plus. The use of DairyComp 305 increased as herd size increased; two-thirds of large operations (67.6 percent) used DairyComp 305. PCDART was used by a higher percentage of medium operations than large operations (29.4 and 14.4 percent, respectively). DHI-Plus was used by a higher percentage of small and medium operations (36.8 and 22.1 percent, respectively) than large operations (9.9 percent). “Other” primary computer record-keeping systems included commercial software for milking systems and homemade programs.

A.2.c. For the 46.5 percent of operations that used any computer record-keeping system (table A.2.a), percentage of operations by primary system used, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary system	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
DairyComp 305	12.0	(3.0)	24.3	(2.8)	67.6	(2.0)	29.8	(1.8)
PCDART	18.1	(3.7)	29.4	(3.0)	14.4	(1.6)	21.5	(1.9)
DHI-Plus	36.8	(4.7)	22.1	(3.0)	9.9	(1.2)	24.9	(2.2)
DairyPlan	1.3	(0.9)	3.0	(1.1)	2.4	(0.7)	2.2	(0.6)
DairyQuest	1.0	(1.0)	3.3	(1.4)	2.0	(0.5)	2.1	(0.7)
Other	30.9	(4.4)	17.9	(2.6)	3.8	(0.9)	19.6	(2.0)
Total	100.0		100.0		100.0		100.0	

Official identification (ID) is important for tracking individual animals when they are moved and during disease investigations. If official IDs are recorded in computer systems, information on individual animals can be retrieved quickly.

Almost half of all operations that used a computer to keep records (46.6 percent) entered official IDs into the computer. A higher percentage of large operations (58.1 percent) entered official IDs into a computer record-keeping system compared with small operations (37.6 percent).

A.2.d. For the 46.5 percent of operations that used any computer record-keeping system (table A.2.a), percentage of operations that entered official IDs (e.g., brucellosis tags, AIN tags) for individual animals into the computer, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
37.6	(4.7)	48.4	(3.5)	58.1	(2.4)	46.6	(2.3)

Almost three-fourths of operations that used a computer (74.0 percent) performed at least some data entry electronically (e.g., handheld computer, smartphone). Interestingly, the percentage of operations that used electronic data entry decreased as herd size increased. However, the percentage of data entry done electronically ranged from 11.2 percent on small operations to 29.4 percent on large operations.

A.2.e. For the 46.5 percent of operations that used any computer record-keeping system (table A.2.a), percentage of operations that performed at least some electronic data entry, and percentage of data entry on these operations done electronically, by herd size:

Percent

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	85.8	(3.4)	71.0	(3.3)	59.8	(2.3)	74.0	(1.9)
Data entry	11.2	(3.0)	19.4	(2.6)	29.4	(1.9)	18.6	(1.6)

Formerly the Dairy Herd Improvement Association, the National Dairy Herd Information Association (DHIA) has three main objectives: (1) promote the accuracy, credibility, and uniformity of DHIA records; (2) represent the DHIA system on issues involving other national and international organizations; and (3) organize industry activities that benefit members of the national DHIA.

Within any given herd size and across operation types, similar percentages of operations participated in the DHIA program. Overall, 56.3 of all operations participated in DHIA; participation increased as herd size increased. There were no regional differences in the percentage of operations enrolled in DHIA (data not shown).

A.2.f. Percentage of operations that participated in the Dairy Herd Information Association, by operation type and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Conventional	59.4	(3.4)	62.6	(3.1)	72.3	(2.2)	62.5	(2.0)
Grazing	31.3	(11.3)	56.5	(16.3)	*		37.9	(9.6)
Combination of conventional and grazing/other	41.2	(4.6)	59.4	(7.7)	81.6	(8.3)	45.0	(4.0)
Organic	30.6	(8.5)	66.3	(11.1)	56.5	(16.1)	40.0	(7.1)
Any	50.1	(2.5)	62.7	(2.7)	72.4	(2.1)	56.3	(1.7)

*Too few to report.

The highest percentage of operations (85.7 percent) used a record-keeping system to monitor breeding history and genetic improvements. The percentage of operations that used a record-keeping system to track each of the parameters in the following table increased as herd size increased. A record-keeping system for tracking antibiotic withdrawal times was used by less than two-thirds of all operations (64.1 percent). More than 90 percent of large operations used a record-keeping system to track or monitor parameters, with the exception of antibiotic withdrawal times.

A.2.g. Percentage of operations that used a record-keeping system for individual dairy animals to track or monitor the following parameters, by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Milk production	57.6	(2.5)	71.2	(2.6)	94.0	(1.4)	65.6	(1.7)
Animal health (e.g., mastitis, lameness events, vaccinations, etc.)	64.1	(2.5)	81.2	(2.2)	94.5	(1.2)	72.5	(1.6)
Antibiotic withdrawal times	57.5	(2.6)	68.8	(2.5)	86.9	(1.7)	64.1	(1.7)
Breeding history and genetic improvements	82.0	(2.0)	89.1	(1.7)	96.9	(1.0)	85.7	(1.3)
Cull cow sales	71.6	(2.3)	85.5	(2.0)	94.5	(1.3)	78.2	(1.5)
Other	1.0	(0.5)	2.7	(0.9)	4.6	(0.9)	1.9	(0.4)

3. Herd identification

Herd identification (ID) is any form of ID—including brands and ear tags with the farm name—that allows for the tracing of an animal to a specific herd. Almost half of all operations (45.4 percent) and two-thirds of cattle (68.4 percent) used/had a herd ID. Almost twice the percentage of large operations had herd IDs compared with small operations (75.8 and 38.0 percent, respectively).

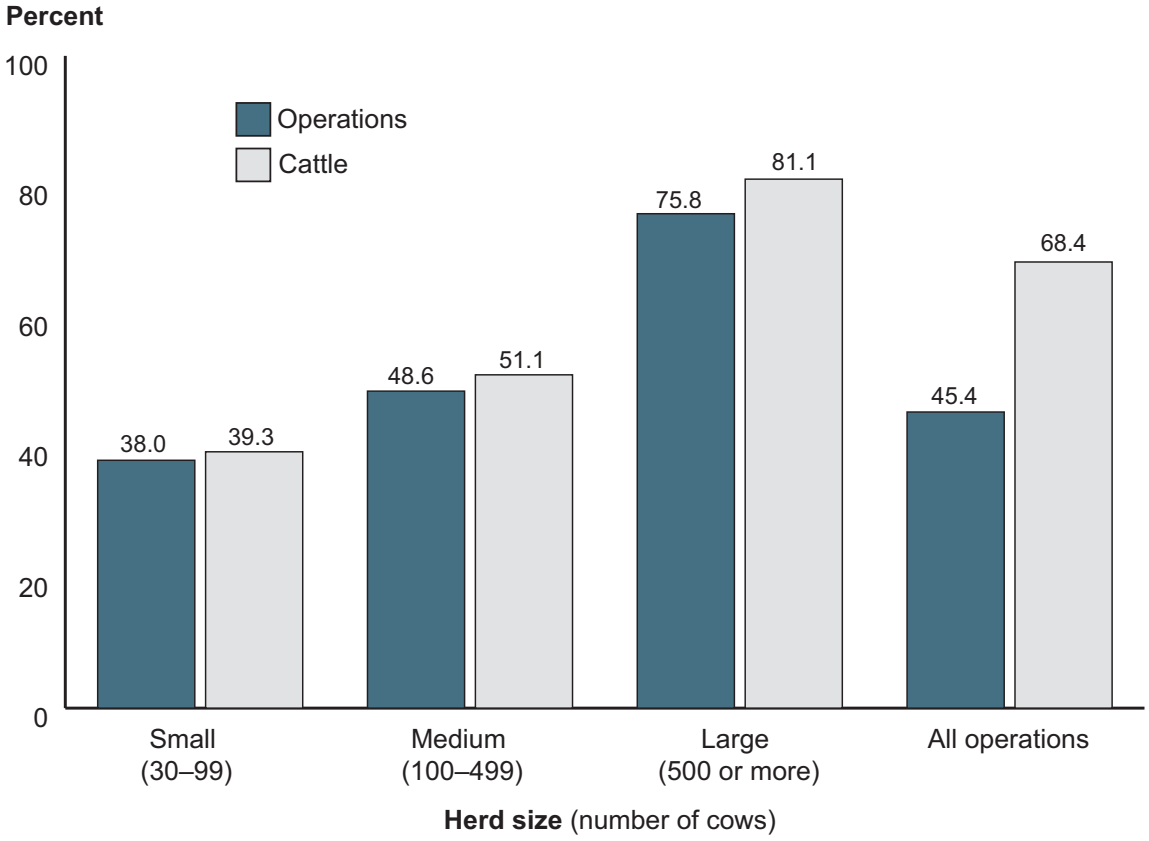
A.3.a. Percentage of operations and percentage of dairy cattle that used/had herd ID, by herd size:

Percent

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	38.0	(2.5)	48.6	(2.8)	75.8	(2.2)	45.4	(1.7)
Cattle	39.3	(2.7)	51.1	(3.0)	81.1	(2.0)	68.4	(1.5)

Percentage of operations and percentage of dairy cattle that used/had herd ID, by herd size



Herd ID was used by approximately twice the percentage of operations in the West region compared with operations in the East region (80.5 and 41.9 percent, respectively).

A.3.b. Percentage of operations that had herd ID, by region:

Percent Operations*			
Region			
West		East	
Percent	Std. error	Percent	Std. error
80.5	(3.2)	41.9	(1.9)

*Excludes very small operations (<30 cows).

Bangle tags for herd ID were used by the highest percentage of all operations (31.9 percent).

A.3.c. Percentage of operations by type of herd ID used on at least some cattle, and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Herd ID type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Hot iron brand	0.2	(0.1)	3.5	(0.8)	24.7	(1.6)	3.9	(0.3)
Cold iron (freeze brand)	0.7	(0.4)	1.1	(0.5)	1.8	(0.5)	0.9	(0.3)
Tattoo	7.7	(1.4)	7.0	(1.3)	11.4	(1.3)	7.9	(0.9)
Bangle tag	26.5	(2.3)	35.7	(2.6)	50.6	(2.4)	31.9	(1.6)
RFID tag	3.6	(0.9)	12.0	(1.8)	30.9	(2.1)	9.1	(0.8)
Other	5.6	(1.2)	5.4	(1.2)	2.8	(0.8)	5.2	(0.8)
Any	38.0	(2.5)	48.6	(2.8)	75.8	(2.2)	45.4	(1.7)

4. Individual-animal identification

Individual-animal identification (ID) is an important component of record keeping. Almost all operations (94.9 percent) used some form of individual-animal ID. Bangle ear tags were used as unofficial ID by 80.2 percent of operations and on 79.8 percent of cows. Although electronic IDs were used as unofficial ID by only 8.2 percent of operations, 24.6 percent of cows had some form of electronic ID.

Brucellosis tags were the most common official individual-animal ID used (31.9 percent of operations and 42.2 percent of cows). Electronic ear tags with the 840 prefix were used by only 6.2 percent of operations but were placed on 20.3 percent of cows, suggesting greater use on large operations.

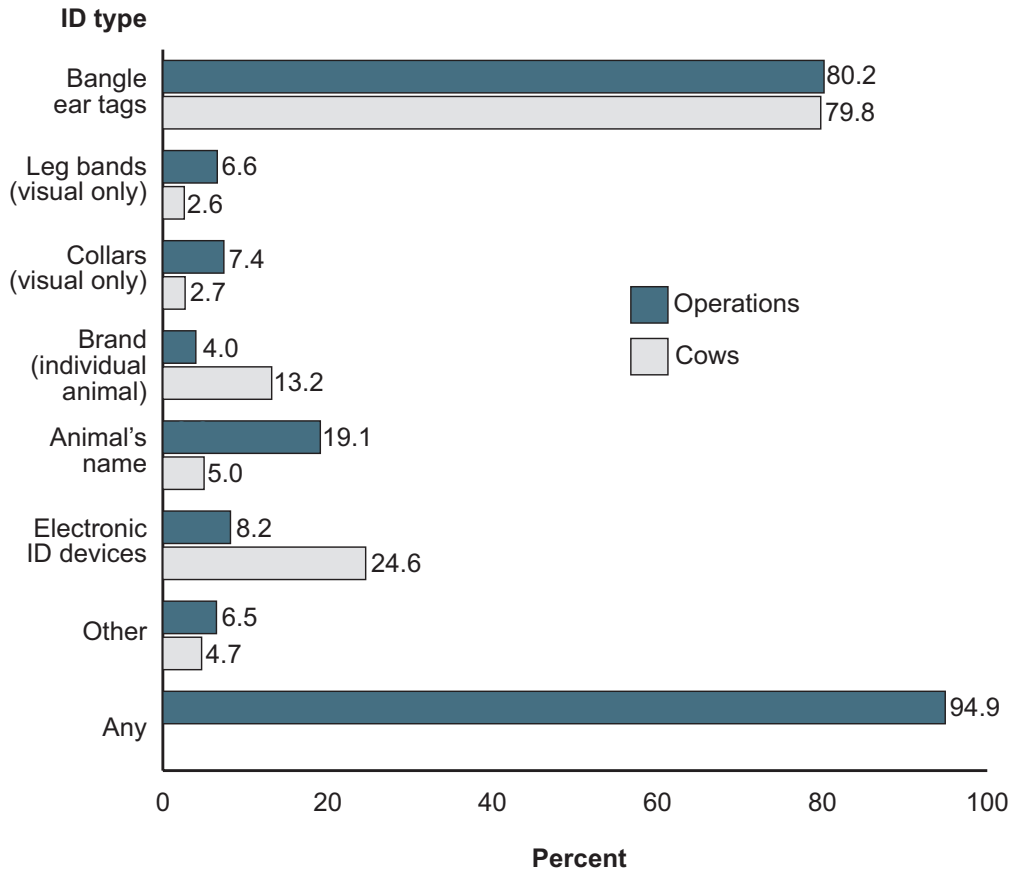
A.4.a. Percentage of operations and percentage of cows, by type of individual-animal ID used on at least some cows:

ID type	Percent operations[1]	Std. error	Percent cows	Std. error
Unofficial				
Bangle ear tags	80.2	(1.4)	79.8	(1.9)
Leg bands (visual only)	6.6	(0.8)	2.6	(0.4)
Collars (visual only)	7.4	(1.0)	2.7	(0.4)
Brand (individual animal)	4.0	(0.5)	13.2	(1.5)
Animal's name	19.1	(1.5)	5.0	(0.5)
Electronic ID devices	8.2	(0.8)	24.6	(1.9)
Other	6.5	(0.9)	4.7	(0.8)
Any	94.9	(0.8)		
Official				
Brucellosis (Bang's) orange metal vaccination ear tag	31.9	(1.5)	42.2	(1.9)
Silver (brite) metal ear tag	22.5	(1.4)	16.5	(1.5)
AIN visual only ear tag with 840 prefix	2.3	(0.5)	2.0	(0.5)
Visual only ear tag with USA prefix[2]	5.0	(0.7)	5.0	(1.0)
AIN RFID (electronic) ear tag with 840 prefix	6.2	(0.7)	20.3	(2.0)
900 series RFID (electronic ear tag)[2]	2.8	(0.5)	8.0	(1.6)
Other	2.9	(0.6)	3.2	(0.6)
Any	60.5	(1.7)		

[1]Excludes very small operations (<30 cows).

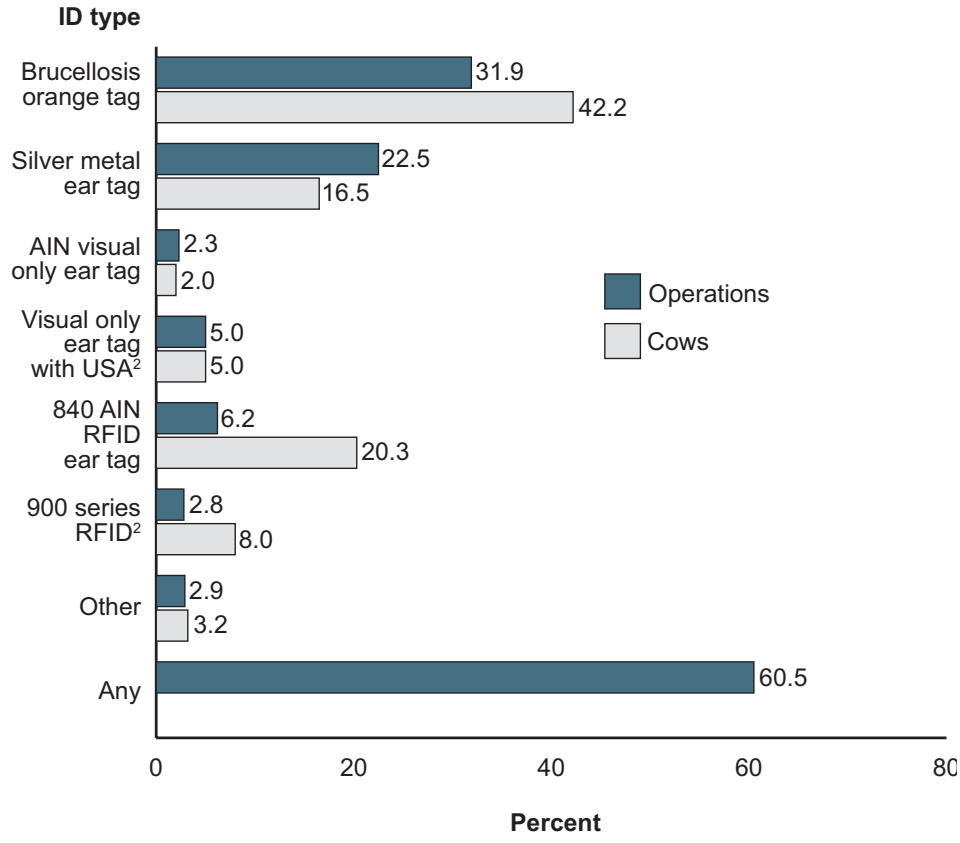
[2]Ear tags with USA and 900 series prefix have ben discontinued and were not considered an official form of identification after March 11. 2015.

Percentage of operations* and percentage of cows, by type of unofficial individual-animal ID used on at least some cows



*Excludes very small operations (<30 cows).

Percentage of operations[1] and percentage of cows, by type of official individual-animal ID used on at least some cows



[1]Excludes very small operations (<30 cows).
[2]Ear tags with USA and 900 series prefix have been discontinued and were not considered an official form of identification after March 1, 2015.

The highest percentage of operations (76.2 percent) used bangle ear tags as their primary unofficial ID. Brucellosis tags were the primary official ID on more than 40 percent of operations, regardless of herd size. Silver (brite) metal tags were used as primary official ID by almost one-third of operations (31.5 percent).

A.4.b. For the 94.9 percent of operations that used any **unofficial** individual-animal ID, and for the 60.5 percent of operations that used any **official** individual-animal ID (table A.4.a), percentage of operations by **primary** ID method used for management and record-keeping purposes, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary ID type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Unofficial								
Bangle ear tags	70.4	(2.4)	86.9	(2.0)	79.1	(1.9)	76.2	(1.6)
Leg bands (visual only)	0.0	(—)	0.3	(0.3)	0.2	(0.2)	0.1	(0.1)
Collars (visual only)	6.7	(1.3)	3.4	(1.0)	0.7	(0.4)	5.1	(0.9)
Brand (individual animal)	1.4	(0.6)	1.6	(0.8)	2.1	(0.6)	1.5	(0.4)
Animal's name	15.5	(2.0)	3.2	(1.1)	0.4	(0.3)	10.3	(1.2)
Electronic ID devices	1.3	(0.6)	3.0	(1.0)	15.9	(1.7)	3.4	(0.5)
Other	4.7	(1.1)	1.6	(0.8)	1.5	(0.6)	3.4	(0.7)
Total	100.0		100.0		100.0		100.0	
Official								
Brucellosis (Bang's) orange metal vaccination ear tag	46.0	(3.5)	45.0	(3.3)	40.8	(2.4)	44.9	(2.1)
Silver (brite) metal ear tag	37.6	(3.5)	29.4	(3.2)	15.4	(2.1)	31.5	(2.1)
AIN visual only ear tag with 840 prefix	1.9	(1.1)	1.4	(0.8)	2.5	(0.9)	1.8	(0.6)
Visual only ear tag with USA prefix*	7.4	(2.0)	6.1	(1.5)	7.0	(1.3)	6.9	(1.1)
AIN RFID (electronic) ear tag with 840 prefix	1.9	(1.0)	10.3	(2.0)	24.2	(2.4)	8.1	(1.0)
900 series RFID (electronic ear tag)*	1.6	(0.9)	3.9	(1.4)	4.9	(1.2)	2.9	(0.7)
Other	3.6	(1.4)	4.0	(1.3)	5.1	(1.4)	4.0	(0.9)
Total	100.0		100.0		100.0		100.0	

*Ear tags with USA and 900 series prefix have ben discontinued and were not considered an official form of identification after March 11. 2015.

Reusing individual-animal ID numbers can be a problem when cattle leave the operation and are involved in a disease investigation. Obtaining accurate information on IDs that have been reused can be difficult, especially in computer systems in which the animal that initially had the ID is removed from the record. Ideally, unofficial IDs would be unique for each animal and not reused within a herd. A total of 22.4 percent of large operations and 13.3 percent of all operations reused the unofficial ID numbers of cattle that were sold or died.

A.4.c. Percentage of operations that reused the unofficial ID numbers of cattle that were sold or died, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
12.5	(1.7)	11.5	(1.9)	22.4	(1.9)	13.3	(1.2)

5. USDA Animal Disease Traceability Program

The USDA's Animal Disease Traceability Program improves the ability of APHIS to trace livestock during disease investigations. Most of the program targets identification of individual animals, allowing officials to trace an animal's origin.

Premises ID numbers (PIN) and location ID numbers (LID) are used to uniquely identify premises that house livestock. PINs are obtained through the APHIS-PIN allocator and assigned to premises by each State. LIDs are administered through a State's or Tribe's internal system. Approximately 40 percent of operations had been assigned a PIN, while only 10.0 percent of operations had been assigned an LID. Almost all operations that reported having an LID also reported having a PIN. A higher percentage of operations in the East region (43.9 percent) had PINs assigned compared with operations in the West region (18.9 percent).

A.5.a. Percentage of operations assigned a unique ID number by a State animal health agency as part of the Animal Disease Traceability Program, by ID type, herd size, and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
ID type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Premises ID number (PIN)[1]	40.3	(2.2)	43.6	(2.5)	43.8	(2.1)	18.9	(2.2)	43.9	(1.6)	41.7	(1.5)
Location ID number (LID)[2]	7.6	(1.4)	12.4	(1.8)	16.9	(1.7)	10.1	(1.6)	10.0	(1.1)	10.0	(1.0)
Either PIN or LID	40.6	(2.2)	43.6	(2.5)	44.4	(2.1)	19.4	(2.2)	44.1	(1.6)	41.9	(1.5)

[1]23.8 percent (SE=1.4) of operations did not know if they had a PIN.
[2]41.8 percent (SE=1.7) of operations did not know if they had a LID.

Almost 70 percent of operations had not heard of the USDA Animal Disease Traceability Program or only recognized its name. A higher percentage of large operations (15.7 percent) than small operations (5.3 percent) were fairly knowledgeable about the program.

Familiarity with the Animal Disease Traceability Program was similar between regions, although a slightly higher percentage of operations in the East region than in the West region recognized the name but not much else (39.7 and 28.6 percent, respectively).

A.5.b. Percentage of operations by familiarity with the USDA Animal Disease Traceability Program, and by herd size and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Familiarity	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Fairly knowledge-able	5.3	(1.1)	9.0	(1.6)	15.7	(1.6)	9.9	(1.7)	7.3	(0.9)	7.5	(0.8)
Know some basics	20.6	(2.1)	25.1	(2.4)	28.7	(2.2)	30.1	(3.4)	22.1	(1.6)	22.8	(1.5)
Recognize the name, but not much else	41.8	(2.6)	35.2	(2.7)	31.4	(2.2)	28.6	(3.1)	39.7	(1.9)	38.7	(1.7)
Have not heard of it	32.4	(2.4)	30.7	(2.6)	24.2	(1.9)	31.5	(2.5)	30.9	(1.8)	31.0	(1.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

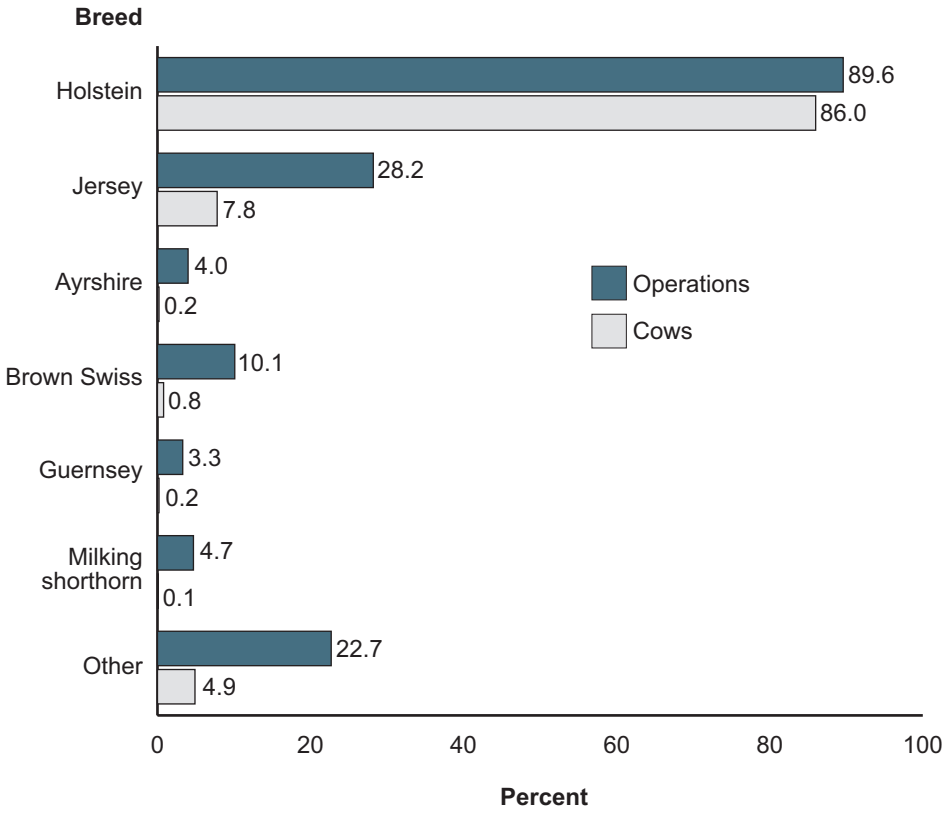
6. Breed and registration

Holsteins continue to be the predominant dairy breed. Holsteins were housed on 89.6 percent of operations and represented 86.0 percent of all dairy cows. Jerseys were housed on almost 30 percent of operations but represented less than 8 percent of cows. Other breeds, which were mostly Holstein and/or Jersey crosses, were housed on 22.7 percent of operations and represented 4.9 percent of all dairy cows.

A.6.a. Percentage of operations and percentage of cows, by breed:

Breed	Percent operations	Std. error	Percent cows	Std. error
Holstein	89.6	(1.2)	86.0	(1.4)
Jersey	28.2	(1.6)	7.8	(1.2)
Ayrshire	4.0	(0.7)	0.2	(0.1)
Brown Swiss	10.1	(1.0)	0.8	(0.1)
Guernsey	3.3	(0.7)	0.2	(0.1)
Milking shorthorn	4.7	(0.9)	0.1	(0.0)
Other	22.7	(1.5)	4.9	(0.6)
Total			100.0	

Percentage of operations and percentage of cows, by breed



The percentage of operations that had registered cows was similar across herd sizes. Overall, 28.1 percent of operations had at least some registered cows. The percentage of registered cows generally decreased as herd size increased; 18.2 percent of cows on small operations were registered compared with 10.4 percent of cows on large operations. Overall, 12.6 percent of all cows were registered with a breed association.

A.6.b. Percentage of operations that had cows registered with a breed association and percentage of cows registered, by herd size:

Percent

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	27.6	(5.6)	28.3	(2.3)	29.9	(2.6)	23.0	(2.1)	28.1	(1.6)
Cows	20.6	(5.7)	18.2	(2.0)	15.4	(1.9)	10.4	(1.7)	12.6	(1.2)

The majority of operations (71.9 percent) did not have registered cows. On 20.0 percent of very small operations and 12.3 percent of small operations, 100.0 percent of cows were registered, while only 4.3 percent of large operations had 100.0 percent of their cows registered.

A.6.c. Percentage of operations by percentage of cows registered with a breed association, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Percent cows registered	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	72.4	(5.6)	71.7	(2.3)	70.1	(2.6)	77.0	(2.1)	71.9	(1.6)
0.1–9.9	1.4	(1.3)	5.6	(1.2)	7.9	(1.6)	5.2	(1.2)	5.5	(0.8)
10.0–49.9	2.4	(1.7)	5.3	(1.2)	6.0	(1.3)	7.4	(1.4)	5.2	(0.7)
50.0–74.9	1.2	(1.2)	2.3	(0.8)	4.0	(1.1)	3.2	(1.0)	2.7	(0.5)
75.0–99.9	2.6	(2.6)	2.9	(0.8)	5.7	(1.3)	2.9	(0.7)	3.5	(0.7)
100.0	20.0	(5.3)	12.3	(1.7)	6.4	(1.4)	4.3	(0.8)	11.2	(1.2)
Total	100.0		100.0		100.0		100.0		100.0	

7. Use of technology

Overall, 47.5 percent of operations had accessed the Internet for dairy information during 2013. Internet use generally increased as herd size increased, with 31.6 percent of very small operations accessing the Internet compared with 89.7 percent of large operations. Within each herd-size category, the percentage of operations that accessed the Internet was similar across operation types.

A.7.a. Percentage of operations that accessed the Internet for dairy information during 2013, by operation type and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Conventional	40.8	(13.7)	35.6	(3.4)	64.8	(3.1)	89.5	(1.4)	53.6	(2.1)
Grazing	33.3	(12.4)	30.7	(10.5)	72.9	(14.2)	*		37.0	(7.7)
Combination of conventional and grazing/ other	26.5	(8.7)	34.1	(4.3)	67.6	(7.2)	100.0	(—)	37.0	(3.7)
Organic	39.9	(22.3)	33.6	(8.6)	62.5	(11.0)	78.4	(17.0)	42.3	(7.0)
All operations	31.6	(6.0)	35.1	(2.5)	65.7	(2.6)	89.7	(1.4)	47.5	(1.7)

*Too few to report.

A higher percentage of conventional, organic, and all operations in the West region accessed the Internet compared with the same operation types in the East region.

A.7.b. Percentage of operations that accessed the Internet for dairy information during 2013, by operation type and by region:

	Percent Operations			
	Region			
	West		East	
Operation type	**Percent**	**Std. error**	**Percent**	**Std. error**
Conventional	84.9	(2.2)	50.2	(2.3)
Grazing	40.6	(16.1)	36.7	(8.2)
Combination of conventional and grazing/other	42.0	(10.6)	36.6	(3.9)
Organic	76.4	(13.0)	39.2	(7.4)
All operations	72.9	(3.8)	45.1	(1.8)

In general, the percentage of operations that used computers for dairy-related purposes increased as herd size increased. Managing reproductive records using a computer was practiced on almost all large operations (96.0 percent) and more than one-third of all operations (37.3 percent).

A.7.c. Percentage of operations that used computers for the following purposes, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Purpose	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Recording daily milk weights for individual cows	6.8	(1.3)	26.4	(2.4)	59.3	(2.3)	18.3	(1.1)
Managing reproductive records	17.8	(2.0)	54.7	(2.8)	96.0	(1.0)	37.3	(1.5)
Continuing education, online courses	4.3	(1.0)	12.4	(1.9)	35.1	(2.2)	10.1	(0.9)
Communicating with vendors	15.4	(1.9)	36.5	(2.6)	71.7	(2.1)	27.9	(1.4)
Online purchasing of items and equipment for the dairy operation	19.1	(2.0)	42.5	(2.7)	62.2	(2.2)	30.8	(1.5)
Any	30.1	(2.4)	67.4	(2.6)	96.4	(0.9)	48.4	(1.7)

Numerous devices and applications that make accessing and transferring information more efficient are available to dairy producers. The use of all devices listed in the following table increased as herd size increased. Overall, a smartphone was used by the highest percentage of operations (12.7 percent).

A higher percentage of operations in the West region used at least one of the following devices compared with the East region. These differences likely reflect herd size differences between regions.

A.7.d. Percentage of operations that used the following devices, by herd size and by region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Device	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Handheld computers	1.5	(0.6)	4.4	(1.1)	31.3	(2.1)	23.8	(2.0)	3.9	(0.6)	5.7	(0.6)
Smartphone	6.5	(1.2)	14.4	(1.9)	42.0	(2.3)	35.2	(2.5)	10.5	(1.0)	12.7	(1.0)
Wands for reading RFID tags	0.0	(—)	2.0	(0.9)	19.6	(1.7)	15.3	(1.5)	1.5	(0.3)	2.8	(0.3)
Any of the above	7.7	(1.4)	18.4	(2.1)	54.4	(2.4)	44.0	(2.5)	13.3	(1.1)	16.1	(1.1)

8. Quality assurance programs

Quality assurance programs are designed to improve product quality through assessments and monitoring. Almost half of all operations (45.9 percent) participated in any quality assurance program; 55.2 percent of medium operations and 75.6 percent of large operations participated in a program. With the exception of "other" programs, a higher percentage of large operations participated in each of the quality assurance programs listed in the table below compared with the other herd sizes.

A.8.a. Percentage of operations that participated in the following types of quality assurance programs, by herd size:

	Percent Operations									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Quality assurance program	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
State sponsored	2.6	(2.6)	4.9	(1.1)	13.7	(1.9)	31.7	(1.9)	9.3	(0.9)
Milk cooperative/ processor sponsored	17.1	(5.1)	32.8	(2.4)	41.9	(2.7)	58.2	(2.3)	35.2	(1.6)
National industry sponsored	2.7	(1.9)	6.6	(1.2)	11.7	(1.8)	25.8	(2.0)	9.1	(0.9)
Other	5.8	(3.1)	3.7	(1.0)	4.4	(1.2)	2.5	(0.7)	4.0	(0.7)
Any	22.2	(5.5)	42.5	(2.5)	55.2	(2.8)	75.6	(1.9)	45.9	(1.7)

A higher percentage of operations in the West region (66.8 percent) participated in a quality assurance program than operations in the East region (43.9 percent).

A.8.b. Percentage of operations that participated in the following types of quality assurance programs, by region:

	Percent Operations			
	Region			
	West		East	
Quality assurance program	**Percent**	**Std. error**	**Percent**	**Std. error**
State sponsored	32.2	(2.8)	7.1	(0.9)
Milk cooperative/ processor sponsored	53.8	(3.9)	33.4	(1.7)
National industry sponsored	20.4	(2.6)	8.1	(0.9)
Other	2.0	(0.8)	4.2	(0.8)
Any	66.8	(4.1)	43.9	(1.8)

B. Biosecurity, Movement, and Off-site Rearing

1. Physical contact with other animals

Cats, dogs, horses, and chickens were present on 83.8, 70.5, 25.4, and 22.1 percent of operations, respectively. A higher percentage of operations in the East region than the West region had cats, pigs, or sheep on the operation. Overall, 89.4 percent of operations had other domestic or feral animals on the operation. Cats and dogs were present on 41.1 and 33.8 percent, respectively, of adjacent operations. Overall, 50.3 percent of operations reported that domestic or feral animals were on adjacent operations.

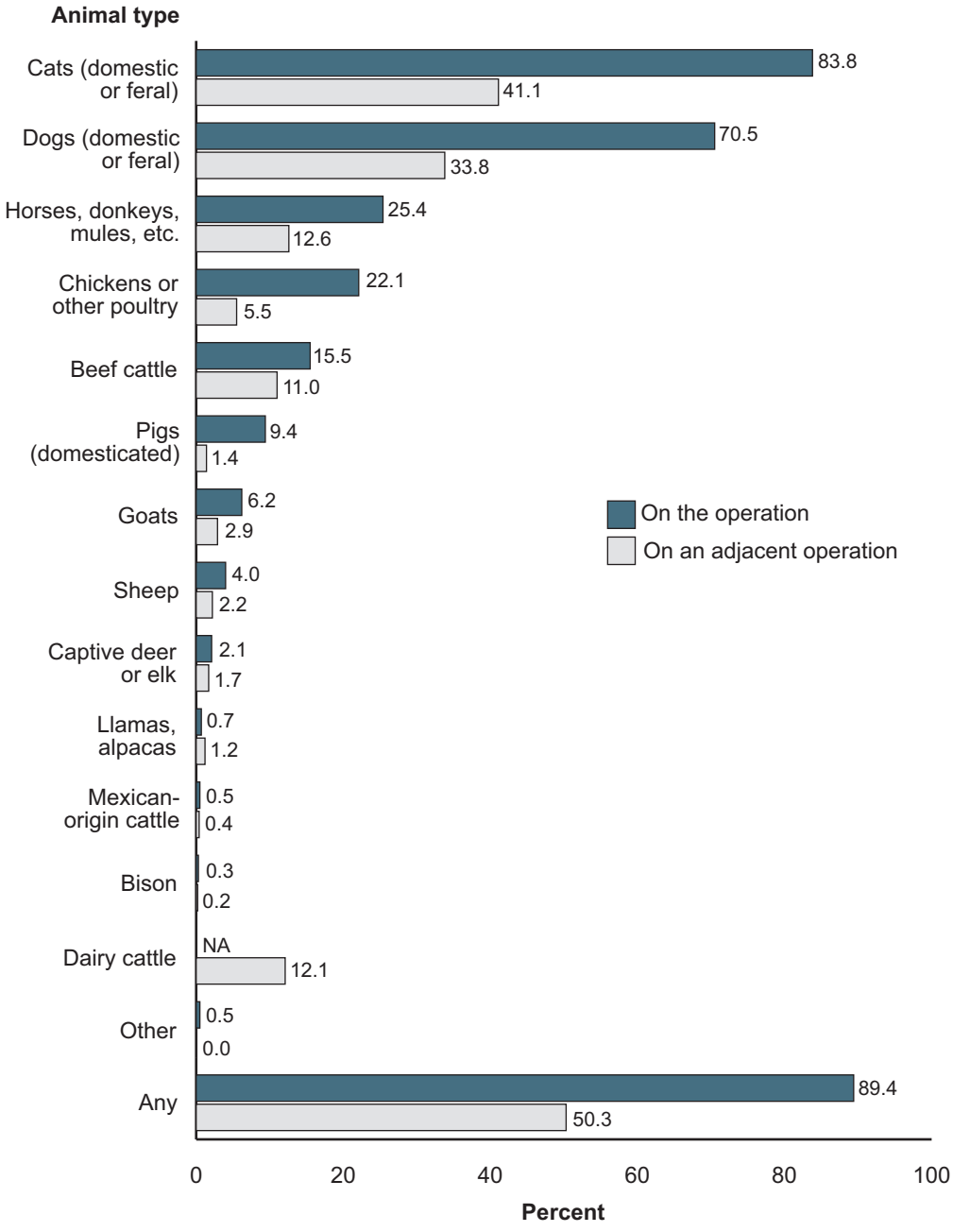
B.1.a. Percentage of operations in which dairy cattle could have had fence-line contact with the following animals on the operation or on an adjacent operation, by region:

Percent Operations

Region

	On the operation						On an adjacent operation					
	West		East		All operations		West		East		All operations	
Animal type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Cats (domestic or feral)	64.4	(3.0)	85.7	(1.3)	83.8	(1.2)	40.7	(4.0)	41.1	(1.8)	41.1	(1.7)
Dogs (domestic or feral)	68.8	(3.4)	70.7	(1.7)	70.5	(1.6)	39.2	(3.9)	33.3	(1.8)	33.8	(1.6)
Horses, donkeys, mules, etc.	19.4	(3.4)	26.0	(1.7)	25.4	(1.6)	13.5	(3.4)	12.5	(1.3)	12.6	(1.2)
Chickens or other poultry	14.6	(3.4)	22.8	(1.7)	22.1	(1.6)	7.9	(3.0)	5.2	(0.9)	5.5	(0.9)
Beef cattle	15.3	(3.5)	15.5	(1.4)	15.5	(1.3)	16.3	(3.5)	10.5	(1.1)	11.0	(1.1)
Pigs (domestic)	3.6	(1.1)	10.0	(1.3)	9.4	(1.2)	1.7	(0.9)	1.3	(0.4)	1.4	(0.4)
Goats	5.1	(2.0)	6.3	(1.0)	6.2	(0.9)	4.0	(2.0)	2.8	(0.7)	2.9	(0.6)
Sheep	0.2	(0.2)	4.3	(0.8)	4.0	(0.8)	2.8	(1.7)	2.2	(0.6)	2.2	(0.5)
Captive deer or elk	2.8	(2.2)	2.0	(0.6)	2.1	(0.6)	0.1	(0.1)	1.9	(0.6)	1.7	(0.6)
Llamas, alpacas	0.2	(0.2)	0.8	(0.4)	0.7	(0.3)	0.2	(0.2)	1.3	(0.4)	1.2	(0.4)
Mexican-origin cattle	0.6	(0.3)	0.5	(0.3)	0.5	(0.3)	0.1	(0.1)	0.4	(0.3)	0.4	(0.3)
Bison	0.8	(0.6)	0.2	(0.2)	0.3	(0.2)	0.0	(—)	0.2	(0.2)	0.2	(0.2)
Dairy cattle							15.5	(2.7)	11.8	(1.2)	12.1	(1.2)
Other	0.0	(—)	0.5	(0.3)	0.5	(0.3)	0.0	(—)	0.0	(—)	0.0	(—)
Any	81.1	(2.6)	90.2	(1.1)	89.4	(1.1)	52.7	(3.7)	50.1	(1.9)	50.3	(1.7)

Percentage of operations in which dairy cattle could have had fence-line contact with the following animals on the operation or on an adjacent operation



The majority of operations (62.8 percent) reported seeing deer or signs of deer on the operation monthly or more frequently. Alternatively, feral pigs or signs of feral pigs were never observed on 95.9 percent of operations but were observed monthly or more often on 1.7 percent of operations.

B.1.b. Percentage of operations by frequency wild animals or signs of wild animals were observed on the operation:

	Percent Operations						
	Frequency						
	Never		Less than once a month		Monthly or more often		
Wild animal type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Deer	11.9	(0.9)	25.2	(1.6)	62.8	(1.7)	100.0
Coyotes, foxes	16.0	(1.3)	41.6	(1.7)	42.3	(1.7)	100.0
Raccoons	17.8	(1.3)	40.8	(1.7)	41.5	(1.7)	100.0
Opossums	30.0	(1.5)	42.8	(1.7)	27.2	(1.6)	100.0
Skunks	19.0	(1.4)	53.8	(1.7)	27.1	(1.6)	100.0
Feral pigs	95.9	(0.7)	2.4	(0.6)	1.7	(0.4)	100.0
Other	96.0	(0.9)	1.5	(0.5)	2.5	(0.7)	100.0

The percentage of operations that never saw deer in cattle-housing areas, pastures, or lots increased as herd size increased. More than 20 percent of small operations, but only 5.2 percent of large operations, observed deer in cattle-housing areas at least daily or weekly.

B.1.c. Percentage of operations in which deer were observed in cattle-housing areas, pastures, or lots, by frequency observed and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency observed	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Never	42.0	(6.4)	30.9	(2.4)	42.0	(2.7)	76.8	(2.1)	39.7	(1.7)
Less than once a month	27.5	(5.7)	29.4	(2.4)	27.4	(2.5)	11.1	(1.6)	26.9	(1.6)
Monthly	14.3	(4.4)	18.4	(2.0)	13.4	(1.9)	6.9	(1.3)	15.4	(1.3)
Daily or weekly	16.2	(4.5)	21.3	(2.1)	17.3	(2.1)	5.2	(1.1)	18.0	(1.4)
Total	100.0		100.0		100.0		100.0		100.0	

2. Herd additions

Overall, 28.6 percent of operations introduced new cattle to the operation during 2013. Within each cattle type, the percentage of operations that brought on cattle was similar across herd sizes. Pregnant dairy heifers and lactating dairy cows were brought on by 11.4 and 11.9 percent of operations, respectively.

There were no regional differences in the percentages of operations that brought on specific cattle types.

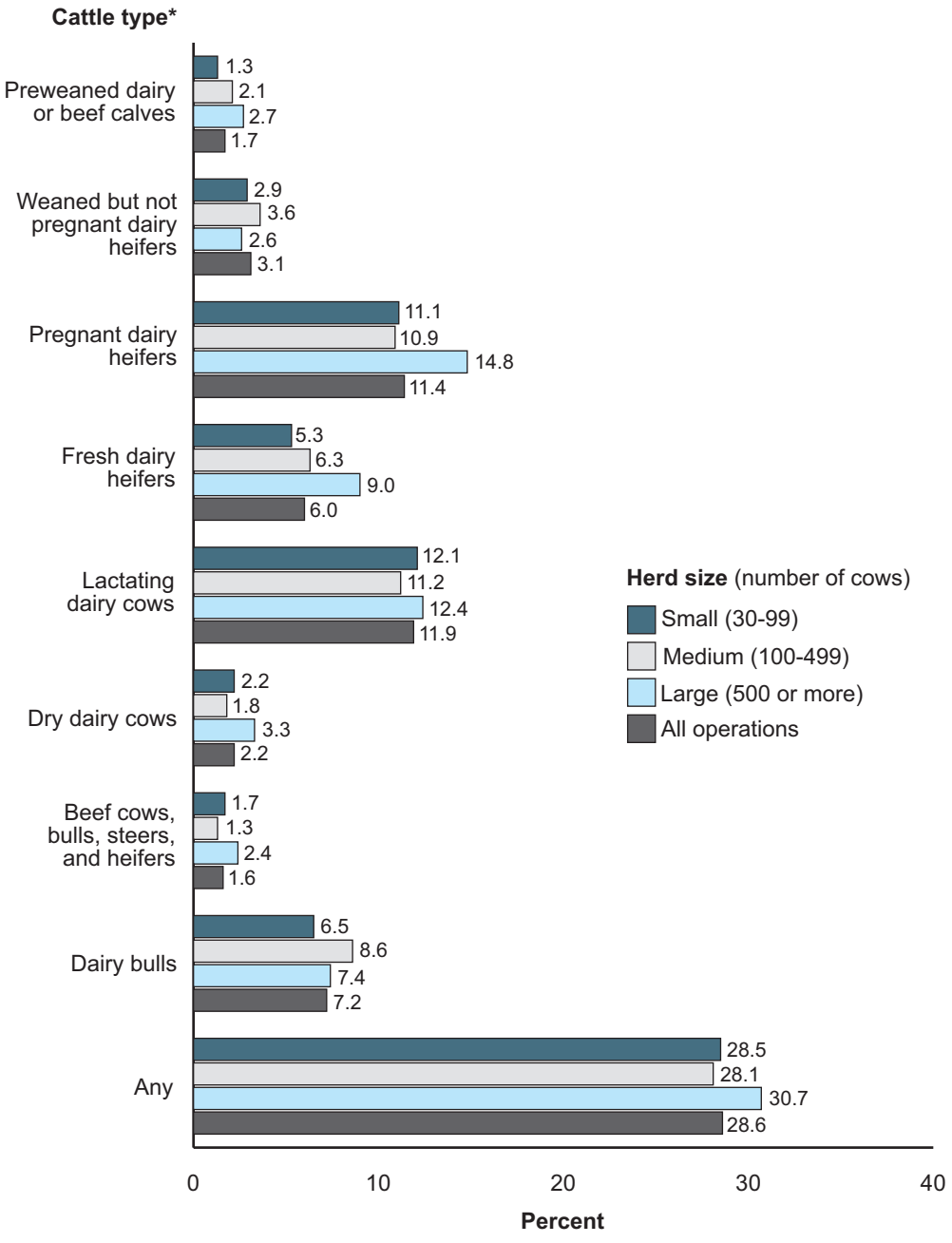
B.2.a. Percentage of operations that brought the following types of cattle onto the operation during 2013, by herd size:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Cattle type*	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned dairy or beef calves	1.3	(0.6)	2.1	(0.8)	2.7	(1.2)	1.8	(1.0)	1.7	(0.5)	1.7	(0.4)
Weaned but not pregnant dairy heifers	2.9	(0.8)	3.6	(1.0)	2.6	(0.7)	3.1	(1.0)	3.1	(0.6)	3.1	(0.6)
Pregnant dairy heifers	11.1	(1.6)	10.9	(1.7)	14.8	(1.7)	12.9	(1.9)	11.3	(1.2)	11.4	(1.1)
Fresh dairy heifers	5.3	(1.2)	6.3	(1.3)	9.0	(1.6)	4.2	(1.2)	6.2	(0.9)	6.0	(0.8)
Lactating dairy cows	12.1	(1.7)	11.2	(1.7)	12.4	(1.7)	7.4	(1.4)	12.3	(1.3)	11.9	(1.2)
Dry dairy cows	2.2	(0.8)	1.8	(0.7)	3.3	(1.0)	1.4	(0.5)	2.3	(0.6)	2.2	(0.5)
Beef cows, bulls, steers, and heifers	1.7	(0.7)	1.3	(0.7)	2.4	(0.9)	3.8	(1.9)	1.4	(0.5)	1.6	(0.5)
Dairy bulls	6.5	(1.2)	8.6	(1.4)	7.4	(1.3)	6.4	(1.3)	7.3	(0.9)	7.2	(0.9)
Any	28.5	(2.3)	28.1	(2.5)	30.7	(2.3)	29.5	(3.4)	28.5	(1.7)	28.6	(1.6)

*Purchased, leased, or borrowed.

Percentage of operations that brought the following types of cattle onto the operation during 2013, by herd size



*Purchased, leased, or borrowed

The second column in the following table, which is a repeat of estimates presented in table B.2.a, was included to allow for easier interpretation of the estimates in the rest of the table.

The percentage of cow inventory added was similar for each cattle type across herd sizes. Dry cows represented the lowest percentage of cows added (3.8 percent).

B.2.b. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of January 1, 2014, cow inventory brought on, by cattle type and by herd size:

			Percent Cow Inventory **Herd Size** (number of cows)							
	Percent operations by cattle class added*		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Cattle type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Pregnant dairy heifers	11.4	(1.1)	9.9	(1.5)	7.2	(1.2)	13.0	(2.0)	11.6	(1.4)
Fresh dairy heifers	6.0	(0.8)	9.9	(1.9)	6.4	(1.1)	10.7	(2.4)	9.7	(1.7)
Lactating dairy cows	11.9	(1.2)	11.2	(2.3)	13.1	(2.4)	14.3	(2.9)	13.6	(2.0)
Dry dairy cows	2.2	(0.5)	7.9	(3.9)	5.3	(1.3)	3.2	(1.0)	3.8	(0.9)

*From table B.2.a.

Some biosecurity recommendations include quarantining new arrivals for 30 to 60 days to allow for testing and observing animals for any sign of infectious disease. Only 9.6 percent of operations quarantined any new additions on arrival. Lactating cattle are difficult to quarantine because they need to be milked, and most operations do not have separate housing and milking facilities for new additions. On operations that did quarantine added cattle, 29.3 percent of new arrivals were quarantined for an average of 20.9 days.

B.2.c. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of operations that quarantined the following types of cattle on arrival, percentage of arriving cattle quarantined, and operation average number of days quarantined:

Cattle type	Percent operations that quarantined arrivals	Std. error	Percent arriving cattle quarantined	Std. error	Operation average days quarantined	Std. error
Preweaned dairy or beef calves	7.5	(5.6)	28.2	(16.4)	*	
Weaned but not pregnant dairy heifers	14.7	(6.3)	33.5	(15.8)	25.9	(3.2)
Pregnant dairy heifers	11.7	(2.9)	33.6	(8.5)	14.2	(3.4)
Fresh dairy heifers	4.7	(1.9)	26.3	(11.3)	26.6	(6.2)
Lactating dairy cows	4.0	(1.1)	26.8	(8.3)	14.1	(2.0)
Dry dairy cows	5.5	(2.5)	44.4	(16.2)	16.5	(4.6)
Beef cows, bulls, steers, and heifers	15.6	(10.1)	0.9	(0.8)	*	
Dairy bulls	8.7	(3.0)	37.1	(9.7)	20.4	(5.3)
Any cattle	9.6	(1.6)	29.3	(5.6)	20.9	(2.9)

[1]Excludes very small operations (<30 cows).
*Too few to report.

In most cases, information about an individual animal's herd of origin can be just as important as testing the animal. Information on the herd of origin of new animals was required on 27.3 percent of operations. A lower percentage of small operations (24.7 percent) required herd-of-origin information compared with large operations (42.0 percent).

B.2.d. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of operations by information on herd of origin normally required by the operation, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Herd-of-origin information required	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
BVD status	11.1	(3.1)	16.4	(4.1)	29.2	(4.2)	14.8	(2.3)
Johne's disease status	11.4	(3.1)	12.9	(3.4)	20.1	(3.6)	12.9	(2.1)
Bulk-tank milk somatic cell count	12.7	(3.3)	11.0	(3.0)	28.8	(4.4)	14.1	(2.2)
Bulk-tank milk culture, to screen for contagious mastitis pathogens	3.3	(1.7)	9.0	(2.7)	26.1	(4.4)	7.6	(1.4)
Other	2.3	(1.6)	3.2	(1.8)	4.2	(1.6)	2.8	(1.1)
Any information	24.7	(4.2)	26.4	(4.6)	42.0	(4.6)	27.3	(2.9)

Overall, 22.7 percent of operations that added cattle to the operation required or performed individual-animal testing before adding cattle to the operation. A higher percentage of large operations required or performed individual-animal testing (50.9 percent) compared with small or medium operations (14.9 and 30.0 percent, respectively).

B.2.e. For the 28.6 percent of operations that brought cattle onto the operation (table B.2.a), percentage of operations that normally required or performed individual-animal testing for any disease before adding cattle to the operation, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
16.8	(11.0)	14.9	(3.4)	30.0	(5.1)	50.9	(4.5)	22.7	(2.7)

Of operations that tested new additions, more than 45 percent tested new additions for persistent infection with bovine viral diarrhea (BVD), Johne's disease, tuberculosis, brucellosis, or contagious mastitis pathogens.

B.2.f. For the 22.7 percent of operations that tested new additions (table B.2.e), percentage of operations in which new additions were tested for the following diseases, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Test	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine viral diarrhea (BVD-PI)	47.4	(12.8)	58.2	(10.3)	64.9	(5.6)	55.9	(6.3)
Mycobacterium avium subspecies *paratuberculosis* (Johne's disease)	74.6	(10.9)	41.8	(10.2)	50.1	(5.9)	56.5	(6.1)
Brucellosis	55.3	(12.5)	49.0	(10.6)	39.0	(5.9)	48.8	(6.3)
Tuberculosis	57.0	(12.7)	49.3	(10.4)	52.4	(6.0)	53.1	(6.3)
Contagious mastitis pathogens*	40.0	(14.9)	40.8	(12.2)	66.9	(5.9)	48.0	(7.2)
Bovine leukosis virus (BLV)	20.5	(10.4)	22.7	(8.1)	16.1	(3.9)	20.1	(5.0)
Bluetongue	14.3	(9.2)	8.9	(5.0)	10.1	(3.1)	11.3	(4.0)
Other	0.0	(—)	3.7	(3.6)	5.3	(2.3)	2.7	(1.4)

*Excludes operations that did not purchase lactating cows.

A higher percentage of large operations (70.6 percent) required or administered vaccines for new additions compared with small and medium operations (23.1 and 42.0 percent, respectively). Overall, 39.1 percent of operations vaccinated new additions.

B.2.g. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of operations that normally required or administered vaccines against any disease before adding cattle to the operation, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
73.1	(10.4)	23.1	(4.0)	42.0	(5.2)	70.6	(4.3)	39.1	(3.2)

The majority of operations vaccinated new additions for BVD, IBR, and leptospirosis (82.7, 83.9, and 73.2 percent, respectively). A lower percentage of small operations (20.1 percent) vaccinated new arrivals against *Salmonella* compared with large operations (70.8 percent).

B.2.h. For the 39.1 percent of operations that administered vaccines to new additions (table B.2.g), percentage of operations that normally required cattle be vaccinated against the following diseases before being added to the operation, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Brucellosis*	36.6	(9.4)	70.8	(7.6)	50.0	(5.5)	51.0	(5.2)
Bovine viral diarrhea (BVD)	82.9	(7.5)	82.4	(5.9)	82.7	(4.3)	82.7	(3.8)
Infectious bovine rhinotracheitis (IBR)	79.9	(8.6)	87.8	(4.9)	84.8	(3.3)	83.9	(3.9)
Lepto (leptospirosis)	59.2	(10.3)	78.5	(6.4)	87.6	(4.0)	73.2	(5.0)
Salmonella	20.1	(8.2)	50.6	(8.1)	70.8	(4.9)	44.1	(5.0)
Neospora	10.1	(5.7)	24.2	(7.3)	32.9	(5.2)	21.0	(3.8)

*Excludes operations that didn't purchase cattle of the appropriate age to vaccinate.

There were no regional differences within each cattle class in the operation average price paid for cattle. With the exception of preweaned heifers, the average price paid ranged from $1,281 to $1,517 per head.

B.2.i. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), operation average price paid per head at the last purchase, by cattle class and by region:

Operation Average Price Paid per Head ($)[1]

	Region					
	West		East		All operations	
Cattle class	Avg.	Std. error	Avg.	Std. error	Avg.	Std. error
Preweaned dairy or beef calves	*		172	(54)	203	(58)
Weaned but not pregnant dairy heifers	1,038	(129)	1,423	(225)	1,382	(202)
Pregnant dairy heifers	1,437	(50)	1,391	(51)	1,396	(46)
Fresh dairy heifers	1,363	(76)	1,484	(57)	1,475	(53)
Lactating dairy cows	1,413	(59)	1,524	(63)	1,517	(60)
Dry dairy cows	1,330	(68)	1,343	(106)	1,343	(101)
Dairy bulls	1,188	(60)	1,288	(82)	1,281	(76)

[1]Excludes very small operations (<30 cows).
*Too few to report.

The majority of operations that added new cattle (60.2 percent) obtained the cattle directly from other dairy operations. Markets/auctions were sources of new cattle for 28.4 percent of operations that added cattle. The percentage of operations that obtained new additions was similar across herd sizes for each source.

A higher percentage of operations in the East region obtained cattle from other dairy operations compared with operations in the West region (61.9 and 41.3 percent, respectively). The percentages of operations that obtained new additions were similar between regions for all other sources.

B.2.j. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of operations by source of new cattle, and by herd size and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Another dairy operation	58.2	(4.8)	63.6	(5.0)	61.6	(4.6)	41.3	(5.7)	61.9	(3.5)	60.2	(3.3)
Heifer-rearing operation (not natural additions)	10.4	(3.0)	7.5	(2.7)	11.5	(2.4)	8.9	(3.1)	9.8	(2.1)	9.7	(2.0)
Market/ auction	30.8	(4.5)	24.1	(4.5)	26.4	(4.4)	37.6	(5.7)	27.5	(3.3)	28.4	(3.0)
Livestock dealer	13.6	(3.4)	13.1	(3.4)	12.4	(2.8)	13.1	(3.5)	13.3	(2.5)	13.3	(2.3)
Beef cow-calf operation	2.4	(1.4)	2.0	(1.9)	1.8	(1.0)	8.1	(6.1)	1.7	(0.9)	2.2	(1.0)
Other	4.8	(2.0)	6.6	(2.6)	2.4	(0.9)	5.3	(2.5)	5.0	(1.5)	5.0	(1.4)

Of operations that added cattle, similar percentages within each cattle class and between regions received cattle from another State. Overall, 13.4 percent of operations received cattle from another State.

B.2.k. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of operations that received cattle from another State, by cattle class and by region:

Percent Operations[1]

Region

	West		East		All operations	
Cattle class	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Preweaned dairy or beef calves	*		2.2	(2.1)	3.0	(2.1)
Weaned but not pregnant dairy heifers	8.2	(7.3)	37.1	(10.0)	34.5	(9.2)
Pregnant dairy heifers	29.3	(6.9)	8.7	(2.4)	10.7	(2.3)
Fresh dairy heifers	22.9	(9.3)	13.8	(4.6)	14.3	(4.4)
Lactating dairy cows	20.1	(6.7)	8.2	(2.6)	8.8	(2.5)
Dry dairy cows	*		13.2	(7.5)	15.0	(7.2)
Beef cows, bulls, steers, and heifers	6.1	(6.0)	7.1	(5.5)	6.9	(4.4)
Dairy bulls	3.9	(3.6)	9.5	(3.5)	9.1	(3.2)
Any	18.3	(3.9)	12.9	(2.1)	13.4	(1.9)

[1]Excludes very small operations (<30 cows).
*Too few to report.

A shipment was defined as a group of animals moved at one time, regardless of the number of vehicles required to move them. The operation average number of shipments in 2013 from all sources increased as herd size increased. Almost half of shipments from all sources were from other dairy operations, which were the source of cattle for 60.2 percent of operations (table B.2.j).

Shipments received from auctions/markets represented the only regional difference in the average number of shipments received per operation. Operations in the West region received an average of 3.6 shipments from markets/auctions in 2013, while operations in the East region received an average of 0.7 shipments from markets/auctions. Overall, the West region received more shipments than the East region (7.6 and 3.4 shipments, respectively).

B.2.l. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), operation average number of shipments received in 2013, by source of cattle, herd size, and region:

Operation Average Number of Shipments

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Source	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Another dairy operation	1.1	(0.1)	2.4	(0.6)	3.5	(0.7)	1.6	(0.3)	1.8	(0.2)	1.7	(0.2)
Heifer-rearing operation (not natural additions)	0.2	(0.1)	0.7	(0.3)	1.2	(0.4)	1.2	(0.7)	0.4	(0.1)	0.5	(0.1)
Market/ auction	0.6	(0.1)	0.9	(0.3)	2.5	(0.8)	3.6	(1.1)	0.7	(0.1)	0.9	(0.1)
Livestock dealer	0.3	(0.1)	0.4	(0.2)	1.5	(0.5)	1.0	(0.4)	0.4	(0.1)	0.5	(0.1)
Beef cow-calf operation	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.1	(0.1)	0.0	(0.0)	0.0	(0.0)
Other	0.1	(0.0)	0.1	(0.0)	0.1	(0.1)	0.1	(0.1)	0.1	(0.0)	0.1	(0.0)
All	2.4	(0.2)	4.5	(0.8)	8.8	(1.1)	7.6	(1.7)	3.4	(0.3)	3.7	(0.3)

Cattle shipments received by the majority of operations originated within an average of 50 miles of the operation, regardless of source. About one-third of operations that purchased cattle from other dairy operations (34.9 percent) purchased cattle within 9 miles of the operation.

B.2.m. For the 28.6 percent of operations that brought cattle onto the operation (table B.2.a), percentage of operations by average distance (miles) animals were transported to the operation, and by source:

Percent Operations*

	Source									
	Another dairy operation		Heifer-rearing operation		Market/ auction		Livestock dealer		Other	
Average distance (mi)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
9 or less	34.9	(4.1)	14.1	(8.0)	9.8	(4.0)	9.6	(5.9)	54.9	(14.4)
10–49	37.4	(4.2)	61.3	(9.7)	49.4	(6.3)	60.7	(9.0)	13.8	(7.5)
50–99	13.2	(2.7)	7.9	(3.8)	28.1	(5.7)	16.0	(6.5)	14.6	(12.9)
100–249	8.5	(2.1)	14.4	(5.3)	10.6	(3.7)	8.6	(5.3)	15.5	(10.2)
250–499	3.5	(1.4)	0.4	(0.3)	0.0	(—)	3.6	(2.4)	1.2	(1.1)
500 or more	2.5	(1.1)	1.8	(1.4)	2.1	(2.0)	1.5	(0.8)	0.0	(—)
Total	100.0		100.0		100.0		100.0		100.0	

*Excludes very small operations (<30 cows).

A higher percentage of operations in the West region than in the East region (31.9 and 9.0 percent, respectively) received cattle from out-of-State dairy operations. Overall, 11.1 percent of operations received cattle shipped across State lines.

B.2.n. For the 28.6 percent of operations that brought cattle onto the operation during 2013 (table B.2.a), percentage of operations that received cattle shipped across State lines, by source and by region:

Percent Operations[1]

Region

	West		East		All operations	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Another dairy operation	31.9	(7.5)	9.0	(2.0)	10.3	(2.0)
Heifer-rearing operation (not natural additions)	39.5	(16.8)	9.0	(4.2)	11.4	(4.2)
Market/auction	0.0	(—)	14.0	(4.5)	12.4	(4.0)
Livestock dealer	22.4	(9.6)	7.9	(3.8)	9.1	(3.6)
Beef cow-calf operation	*		*		4.1	(4.1)
Other	13.1	(11.7)	1.1	(0.9)	2.2	(1.4)
All sources	17.6	(3.9)	10.4	(1.8)	11.1[2]	(1.7)

[1]Excludes very small operations (<30 cows).
[2]Estimate differs from table B.2.k due to item nonresponse.
*Too few to report.

Cattle that leave the operation and return after attending shows or other places where they have contact with cattle from other operations can be a source of disease introduction. As with new additions, these cattle ideally would be up-to-date on vaccinations before leaving the operation and would be quarantined on return. There were no differences across herd sizes in the percentage of operations in which any cattle left the operation and returned.

B.2.o. Percentage of operations in which any cattle left the operation (excluding calves raised off-site) and returned, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
14.8	(1.8)	21.3	(2.3)	14.7	(1.6)	16.7	(1.3)

3. Source of heifer inventory

The percentage of operations in which dairy heifers on hand on January 1, 2014, were born and raised on-site ranged from 62.4 percent of large operations to 97.0 percent of small operations. Overall, 91.8 percent of operations raised some heifers on-site. Almost half of large operations (46.4 percent) had heifers born on-site but raised off-site. An off-site rearing facility was used for at least some heifers by 12.4 percent of operations. Operations in which heifers were born on the operation but raised off-site could have retained ownership of the heifers or sold them and brought them back.

B.3.a. Percentage of operations by source of dairy replacement heifers on-hand on January 1, 2014, and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Born and raised on-site	97.0	(0.9)	92.3	(1.4)	62.4	(2.2)	91.8	(0.7)
Born on-site but raised off-site	5.9	(1.2)	12.8	(1.8)	46.4	(2.3)	12.4*	(0.9)
Born off-site	6.0	(1.2)	8.3	(1.5)	8.6	(1.5)	7.0	(0.9)

*This estimate is slightly different from the 12.1 percent reported in table B.5.a due to differences in heifers on hand versus all heifers in 2013.

The percentage of dairy heifers raised on-site decreased as herd size increased. Overall, the majority of dairy heifers (72.8 percent) were born and raised on-site. About one-fourth of heifers (25.7 percent) were born on-site but raised off-site. Less than 2 percent of heifers across herd sizes and overall were born off-site.

B.3.b. Percentage of dairy replacement heifers by source of heifers on-hand on January 1, 2014, and by herd size:

Percent Heifers

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Born and raised on-site	96.1	(0.9)	90.1	(1.7)	59.9	(3.0)	72.8	(1.9)
Born on-site but raised off-site	2.8	(0.8)	8.5	(1.6)	38.4	(3.0)	25.7	(1.9)
Born off-site	1.2	(0.3)	1.4	(0.6)	1.7	(0.4)	1.5	(0.3)
Total	100.0		100.0		100.0		100.0	

Almost one-third of the adult-cow inventory (32.6 percent) consisted of first-lactation heifers born on-site and added during 2013. A higher percentage of heifers were added to the milking string on large operations (34.2 percent) than on very small or small operations (24.5 and 27.9 percent, respectively).

B.3.c. Percentage of first-lactation heifers born on-site and added to the milking string, as a percentage of January 1, 2014, cow inventory, by herd size:

Percent Heifers

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
24.5	(2.4)	27.9	(0.6)	31.3	(0.9)	34.2	(0.9)	32.6	(0.6)

4. Calf sales and rearing

Note: For the following tables, a heifer-raising facilitiy was defined as an operation that raised dairy heifer calves for at least one operation other than its own during 2014. A calf-rearing facility at a different location than the dairy but belonging to and managed by the dairy was not considered a heifer-rearing facility or an off-site rearing facility.

The majority of operations (90.2 percent) sold bull and steer calves, while only one-fourth of operations (26.4 percent) sold heifer calves. There were no differences across herd sizes in the percentage of operations that sold heifer calves.

B.4.a. Percentage of operations that sold dairy calves, by calf type and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Calf type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	28.8	(2.4)	21.8	(2.3)	25.5	(1.9)	26.4	(1.6)
Bulls and steers	90.6	(1.4)	87.4	(1.9)	95.5	(0.8)	90.2	(1.0)
Either	90.9	(1.4)	87.7	(1.9)	95.5	(0.8)	90.5	(1.0)

Heifers calves were raised off-site with retained ownership on 11.7 percent of operations, while bull and steer calves were raised off-site on 1.8 percent of operations. The percentage of operations that raised heifer calves off-site ranged from 5.5 percent of small operations to 44.3 percent of large operations. A slightly higher percentage of large operations raised bull calves off-site with retained ownership (5.6 percent) compared with small and medium operations (1.3 percent each).

The percentage of operations in the West region that raised heifer calves off-site was more than three times the percentage of operations that raised heifers off-site in the East region (30.6 and 9.8 percent, respectively).

B.4.b. Percentage of operations that raised dairy calves off-site with retained ownership, by calf type, herd size, and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Calf type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	5.5	(1.2)	11.9	(1.7)	44.3	(2.3)	30.6	(2.4)	9.8	(1.0)	11.7	(0.9)
Bulls and steers	1.3	(0.6)	1.3	(0.7)	5.6	(1.2)	2.4	(0.7)	1.7	(0.5)	1.8	(0.4)
Either	5.8	(1.2)	13.0	(1.8)	44.3	(2.3)	30.6	(2.4)	10.4	(1.0)	12.2	(0.9)

A higher percentage of large operations (96.6 percent) sold dairy calves or raised them off-site with retained ownership compared with medium and small operations (88.8 and 90.9 percent, respectively).

The West region had a slightly higher percentage of operations that raised dairy calves off-site with retained ownership or sold any calves than the East region.

B.4.c. Percentage of operations that sold dairy calves or raised them off-site with retained ownership, by calf type, herd size, and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Calf type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	32.3	(2.4)	30.8	(2.6)	59.7	(2.3)	45.2	(3.4)	33.9	(1.8)	34.9	(1.7)
Bulls and steers	90.6	(1.4)	88.5	(1.8)	96.0	(0.8)	95.2	(1.2)	90.2	(1.1)	90.6	(1.0)
Either	90.9	(1.4)	88.8	(1.7)	96.6	(0.7)	95.4	(1.2)	90.5	(1.1)	90.9	(1.0)

The percentage of heifer calves sold or raised off-site was lower on small and medium operations (13.4 and 17.7 percent, respectively) than on large operations (57.6 percent). A higher percentage of bull/steer calves on large operations were sold or raised off-site compared with bull/steer calves on small and medium operations. A higher percentage of heifer calves were sold or raised off-site in the West region than in the East region.

B.4.d. Percentage of dairy calves sold or raised off-site with retained ownership, by calf type, herd size, and region:

Percent Calves

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Calf type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	13.4	(1.6)	17.7	(2.6)	57.6	(3.2)	51.9	(3.7)	36.3	(2.7)	42.7	(2.2)
Bulls and steers	77.9	(1.8)	77.8	(2.1)	93.6	(4.4)	96.7	(6.7)	81.9	(1.3)	87.8	(2.8)

5. Heifer rearing and movement

Note: For the following tables, a heifer-raising facilitiy was defined as an operation that raised dairy heifer calves for at least one operation other than its own during 2014. A calf-rearing facility at a different location than the dairy but belonging to and managed by the dairy was not considered a heifer-rearing facility or a off-site rearing facility.

Heifers were raised on-site on a higher percentage of small and medium operations (67.7 and 69.2 percent, respectively) than on large operations (40.3 percent). The percentage of operations that raised heifers off-site with retained ownership increased as herd size increased. The percentage of operations that sold heifers through an auction was higher for small operations (21.1 percent) than for medium and large operations (12.3 and 10.4 percent, respectively).

B.5.a. Percentage of operations by heifer rearing arrangement of heifers and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer rearing arrangement	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
All heifers raised on-site	67.7	(2.4)	69.2	(2.6)	40.3	(2.3)	65.1	(1.7)
Raised off-site or sold and brought back	5.5	(1.2)	12.5	(1.8)	46.5	(2.3)	12.1	(0.9)
Raised off-site with retained ownership	5.5	(1.2)	11.9	(1.7)	44.3	(2.3)	11.7	(0.9)
Sold and then brought back	0.0	(—)	0.8	(0.4)	2.3	(0.8)	0.5	(0.2)
Sold to a calf ranch or heifer raiser and not brought back	3.4	(0.9)	4.5	(1.2)	5.1	(0.9)	4.0	(0.6)
Sold through auction	21.1	(2.2)	12.3	(1.9)	10.4	(1.3)	17.4	(1.4)
Sold through a dealer	2.3	(0.8)	1.7	(0.5)	6.2	(1.1)	2.5	(0.5)
Sold directly to another dairy	3.9	(1.0)	2.7	(0.9)	3.9	(1.1)	3.5	(0.7)
Other	1.5	(0.6)	2.5	(0.8)	1.7	(0.6)	1.8	(0.4)

The majority of heifers leaving small operations (31.3 percent) went to an off-site rearing facility with retained ownership or were sold through an auction (42.3 percent). The majority of heifers leaving medium and large operations were raised off-site with retained ownership (75.3 and 87.7 percent of heifers, respectively).

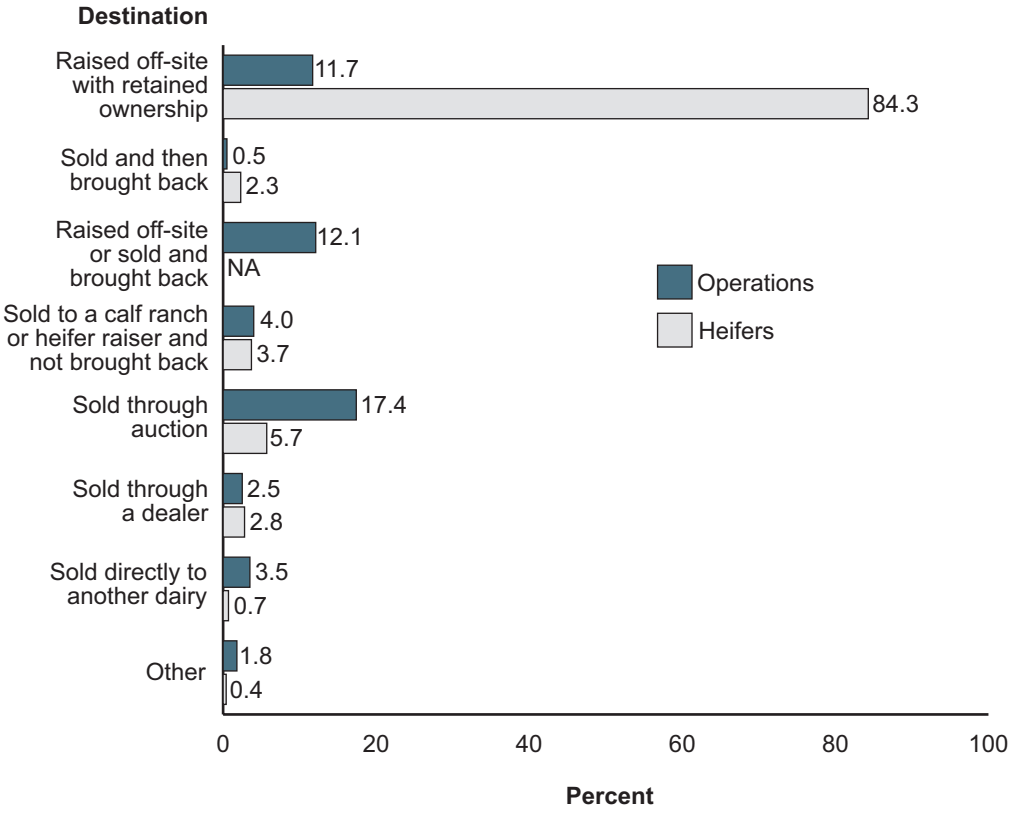
B.5.b. For the 42.7 percent of heifer calves sold or raised off-site with retained ownership (table B.4.d), percentage of heifer calves by destination of calves and by herd size:

Percent Heifer Calves

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Raised off-site with retained ownership	31.3	(6.4)	75.3	(5.0)	87.7	(2.3)	84.3	(2.1)
Sold and then brought back	0.0	(—)	2.6	(1.3)	2.4	(1.0)	2.3	(0.8)
Sold to a calf ranch or heifer raiser and not brought back	13.2	(4.5)	5.7	(2.4)	3.0	(1.0)	3.7	(1.0)
Sold through auction	42.3	(5.9)	12.9	(3.0)	3.2	(1.4)	5.7	(1.3)
Sold through a dealer	4.4	(1.8)	1.1	(0.5)	2.9	(1.0)	2.8	(0.9)
Sold directly to another dairy	6.9	(2.5)	1.1	(0.5)	0.4	(0.2)	0.7	(0.2)
Other	1.9	(1.1)	1.4	(0.8)	0.3	(0.1)	0.4	(0.1)
Total	100.0		100.0		100.0		100.0	

For the 42.7 percent of heifer calves sold or raised off-site with retained ownership, percentage operations and percentage of heifer calves, by destination of calves and by herd size



For small and medium operations that sent heifers off-site to be raised, the majority (84.9 and 59.0 percent, respectively) sent weaned but not pregnant heifers to the off-site rearing facility, while most large operations (62.8 percent) sent heifers as preweaned calves. Overall, 55.7 percent of operations sent heifers to rearing facilities as weaned calves.

B.5.c. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by class of the majority of heifers that left the operation, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned	10.6	(6.2)	34.9	(7.0)	62.8	(3.4)	40.2	(3.6)
Weaned but not pregnant	84.9	(6.9)	59.0	(7.4)	35.0	(3.4)	55.7	(3.8)
Pregnant	4.6	(3.2)	6.2	(4.6)	2.2	(1.0)	4.0	(1.7)
Total	100.0		100.0		100.0		100.0	

The average age of preweaned heifers that left the operation to be raised off-site was similar across herd sizes. Weaned calves were sent to off-site rearing at an earlier age on large operations than on small operations (158.3 and 255.4 days, respectively). Overall, the average age was 200.3 days. Pregnant heifers were sent at an average of 400.6 days of age.

B.5.d. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), operation average age of heifers (days) that left the operation, by heifer class and by herd size:

Operation Average Age (days)

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer class	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Preweaned	5.1	(1.2)	5.5	(1.2)	6.8	(2.1)	6.4	(1.4)
Weaned but not pregnant	255.4	(32.0)	164.7	(19.0)	158.3	(10.0)	200.3	(16.0)
Pregnant	*		487.1	(23.6)	405.8	(6.6)	400.6	(65.6)

*Too few to report.

A higher percentage of large operations than medium operations supplied waste milk to the off-site rearing facility.

B.5.e. For the 4.9 percent of operations that sent any preweaned heifers to an off-site rearing facility with retained ownership or that sold any preweaned heifers and brought them back,[1] percentage of operations that supplied waste milk to the off-site rearing facility, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
*		4.5	(4.3)	38.4	(4.1)	26.6	(3.5)

[1]12.1 x 40.2% (tables B.5.a, B.5.c).
*Too few to report.

Overall, 66.8 percent of operations that sent preweaned heifers to an an off-site rearing facility sent them to a facility that pasteurized all milk fed to heifers. The majority of medium and large operations sent preweaned heifers to off-site rearing facilities that fed only pasteurized milk.

B.5.f. For the 4.9 percent of operations that sent any preweaned heifers to an off-site rearing facility with retained ownership or that sold any preweaned heifers and brought them back,[1] percentage of operations that sent heifers to an off-site rearing facility that pasteurized all milk fed to heifers, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
*		56.2	(14.2)	75.5	(4.3)	66.8	(5.8)

[1]12.1 x 40.2% (tables B.5.a, B.5.c).
*Too few to report.

Raising heifers off-site and bringing them back to the operation may increase the likelihood of disease introduction, especially if the heifers are returning from a rearing facility where cattle from multiple operations are commingled. Ideally, an off-site heifer-rearing facility would ensure that heifers be housed only with heifers from the same dairy. If cattle from multiple operations are housed at the rearing facility, heifers should not be allowed contact with heifers or cattle from other operations.

Across herd sizes, more than 50 percent of operations that sent heifers to an off-site rearing facility sent the heifers to a single facility in which heifers had contact with cattle from other operations.

B.5.g. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by type of arrangement with the off-site rearing facility, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Arrangement	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Single rearing facility; no contact with cattle from other operations	36.5	(10.6)	35.8	(7.4)	18.7	(2.5)	28.7	(3.9)
Multiple rearing facilities; no contact with cattle from other operations	5.0	(4.8)	4.1	(2.8)	10.0	(2.1)	6.8	(1.8)
Single rearing facility; contact with cattle from other operations	53.4	(11.0)	51.0	(7.7)	56.1	(3.5)	53.8	(4.1)
Multiple rearing facilities; contact with cattle from other operations	5.1	(4.9)	9.2	(4.4)	15.2	(2.6)	10.6	(2.2)
Total	100.0		100.0		100.0		100.0	

Of operations that sent heifers to an off-site rearing facility, 84.6 percent sent heifers to an off-site facility within 50 miles of the operation. A higher percentage of small operations than large operations (42.0 and 11.2 percent, respectively) sent heifers to an off-site rearing within 5 miles of the operation. A higher percentage of large operations (12.3 percent) sent heifers 100 miles or more to the off-site rearing facility compared with small and medium operations (0.0 and 2.3 percent, respectively).

A higher percentage of operations in the East region than in the West region (42.2 and 20.8 percent, respectively) sent heifers to a rearing facility within 5 to 19 miles of the operation. Conversely, a higher percentage of operations in the West region than the East region (37.9 and 20.9 percent, respectively) sent heifers to a rearing facility within 20 to 49 miles of the operation.

B.5.h. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by distance (miles) dairy heifers were transported to the off-site rearing facility, and by herd size and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Distance (mi)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 5	42.0	(10.9)	20.3	(5.8)	11.2	(2.2)	18.7	(4.1)	23.7	(4.8)	22.5	(3.8)
5–19	36.2	(10.6)	49.1	(7.5)	29.1	(3.0)	20.8	(3.5)	42.2	(5.1)	37.2	(4.0)
20–49	15.4	(8.0)	21.3	(6.5)	33.8	(3.5)	37.9	(4.4)	20.9	(4.2)	24.9	(3.4)
50–99	6.4	(4.3)	7.0	(3.6)	13.5	(2.6)	12.3	(3.1)	8.7	(2.4)	9.6	(2.0)
100 or more	0.0	(—)	2.3	(2.2)	12.3	(2.0)	10.3	(2.3)	4.5	(1.3)	5.8	(1.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Of small and medium operations that sent heifers to an off-site rearing facility, the majority sent weaned heifers to a rearing facility, while the majority of large operations sent preweaned heifers (table B.5.c). Weaned heifers of various ages are usually shipped at the same time, which results in a relarively large number of animals being transported with relatively few shipments. Conversely, preweaned heifers are often sent to an off-site rearing facility daily to ensure that all milk feeding is done at the rearing facility, resulting in more shipments of fewer animals.

The frequency of heifer movements off the operation increased as herd size increased. The majority of small and medium operations (94.9 and 60.3 percent, respectively) had fewer than 2.0 shipments per month, while more than two-fifths of large operations (41.8 percent) shipped heifers off-site 20.0 or more times per month.

B.5.i. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by frequency dairy heifers were first transported off the operation, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency (times per month)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Fewer than 2.0	94.9	(3.6)	60.3	(7.4)	19.2	(3.1)	52.4	(3.9)
2.0–9.9	5.1	(3.6)	28.5	(6.9)	34.4	(3.4)	24.5	(3.0)
10.0–19.9	0.0	(—)	4.9	(3.3)	4.6	(1.3)	3.4	(1.1)
20.0 or more	0.0	(—)	6.2	(3.2)	41.8	(3.1)	19.6	(2.1)
Total	100.0		100.0		100.0		100.0	

The frequency of heifer movements from the rearing facility back to the dairy operation increased as herd size increased. The majority of small and medium operations that sent heifers to an off-site rearing facility (98.0 and 69.2 percent, respectively) received fewer than two heifer shipments per month from rearing facilities. The majority of large operations (65.7 percent) received 2.0 to 9.9 shipments of heifers per month.

B.5.j. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by frequency heifers returned to the operation from the rearing facility, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency (times per month)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Fewer than 2.0	98.0	(1.9)	69.2	(7.1)	32.7	(3.4)	61.6	(3.6)
2.0–9.9	2.0	(1.9)	30.8	(7.1)	65.7	(3.4)	37.8	(3.5)
10.0–19.9	0.0	(—)	0.0	(—)	0.5	(0.5)	0.2	(0.2)
20.0 or more	0.0	(—)	0.0	(—)	1.0	(0.6)	0.4	(0.3)
Total	100.0		100.0		100.0		100.0	

Of operations that sent heifers to an off-site rearing facility, 69.6 percent primarily brought back pregnant heifers.

B.5.k. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by class of the majority of dairy heifers returned to the operation, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Weaned but not pregnant	20.9	(8.8)	24.1	(6.3)	38.2	(3.1)	29.3	(3.4)
Pregnant	79.1	(8.8)	75.9	(6.3)	59.4	(3.2)	69.6	(3.4)
Recently fresh	0.0	(—)	0.0	(—)	2.4	(1.0)	1.1	(0.4)
Total	100.0		100.0		100.0		100.0	

Weaned heifers brought back to small operations were, on average, older (13.2 months) than weaned heifers brought back to medium and large operations (8.2 and 5.3 months, respectively). Pregnant heifers were brought back to operations at an average age of 21.5 months.

B.5.I. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), operation average age (months) of heifers when returning to the operation, by heifer class and by herd size:

Operation Average Age (mo)

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer class	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Weaned but not pregnant	13.2	(1.2)	8.2	(1.1)	5.3	(0.3)	7.5	(0.7)
Pregnant	22.9	(0.6)	20.7	(0.7)	21.2	(0.2)	21.5	(0.3)
Recently fresh	NA		NA		23.4	(0.6)	23.4	(0.6)

Transport vehicles used to haul heifers or any cattle should be cleaned between shipments to reduce potential disease transmission. Calves' immature immune system puts them at a high risk for acquiring disease. Exposure to cattle from other operations or to cattle feces from previous shipments during transport increases calves' disease risk.

The highest percentages of small operations either cleaned most transport vehicles on an as-needed basis or did not know how often transport vehicles were cleaned (48.3 and 46.0 percent, respectively). For medium operations, transport vehicles were cleaned after every shipment on 20.3 percent of operations and as needed on 50.0 percent. More than 40 percent of large operations cleaned transport vehicles after every shipment.

B.5.m. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations by frequency that heifer transport vehicles were washed/rinsed before transporting heifers off or back to the operation, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Transported off operation								
After every shipment	0.0	(—)	20.3	(6.3)	43.7	(3.4)	25.0	(2.8)
After two or three shipments	0.0	(—)	2.6	(2.5)	8.9	(1.8)	4.6	(1.1)
After more than three shipments	0.0	(—)	1.6	(1.5)	3.8	(2.0)	2.1	(1.0)
As needed	48.3	(11.2)	50.0	(7.6)	22.7	(3.2)	37.9	(4.0)
Other	5.8	(5.5)	2.4	(2.3)	2.8	(1.0)	3.5	(1.7)
Unknown	46.0	(11.3)	23.1	(6.3)	18.0	(2.7)	27.0	(4.0)
Total	100.0		100.0		100.0		100.0	
Trasported back to operation								
After every shipment	0.0	(—)	20.3	(6.3)	40.3	(3.4)	23.4	(2.8)
After two or three shipments	0.0	(—)	2.6	(2.5)	8.2	(1.8)	4.3	(1.1)
After more than three shipments	0.0	(—)	1.6	(1.5)	3.3	(2.0)	1.9	(1.0)
As needed	44.9	(11.1)	50.0	(7.6)	24.0	(3.2)	37.6	(4.0)
Other	5.8	(5.5)	2.4	(2.3)	3.8	(1.2)	3.9	(1.7)
Unknown	49.4	(11.3)	23.1	(6.3)	20.5	(2.8)	28.9	(4.0)
Total	100.0		100.0		100.0		100.0	

Disinfecting transport vehicles during cleaning provides a higher level of protection against disease transmission than simply washing or rinsing the vehicles. A higher percentage of large operations than medium and small operations disinfected transport vehicles at the time of cleaning. Overall, about one-third of operations disinfected transport vehicles at the time of cleaning.

B.5.n. For the 12.1 percent of operations that sent any heifers to an off-site rearing facility with retained ownership or that sold heifers and brought them back (table B.5.a), percentage of operations that disinfected vehicles during cleaning and before transporting heifers off or back to the operation, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
When transporting…	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Off the operation	13.8	(8.9)	27.3	(7.2)	58.4	(3.8)	37.1	(3.9)
Back to the operation	13.8	(8.9)	29.1	(7.3)	54.7	(3.8)	36.2	(3.9)

Less than 9 percent of all operations had any heifer shipments that crossed State lines.

B.5.o. Percentage of operations in which any shipments of heifer calves crossed State lines, by destination of calves and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Raised off-site with retained ownership	0.0	(—)	0.3	(0.3)	4.2	(1.1)	0.5	(0.1)
Sold and then brought back	0.0	(—)	0.0	(—)	1.1	(0.7)	0.1	(0.1)
Sold to a calf ranch or heifer raiser and not brought back	0.0	(—)	0.0	(—)	1.0	(0.4)	0.1	(0.0)
Sold through auction	0.8	(0.5)	1.0	(0.5)	1.5	(0.5)	0.9	(0.3)
Sold through a dealer	0.1	(0.1)	0.5	(0.3)	0.6	(0.3)	0.3	(0.1)
Sold directly to another dairy	0.0	(—)	0.3	(0.3)	0.9	(0.4)	0.2	(0.1)
Other	0.0	(—)	0.2	(0.2)	0.3	(0.2)	0.1	(0.1)
Any	1.0	(0.5)	2.0	(0.7)	8.1	(1.4)	2.1	(0.4)

For each destination, there were no regional differences in the percentages of operations in which any heifer shipments crossed State lines.

B.5.p. Percentage of operations in which any shipments of heifer calves crossed State lines, by destination of calves and by region:

	Percent Operations*			
	Region			
	West		East	
Destination	**Percent**	**Std. error**	**Percent**	**Std. error**
Raised off-site with retained ownership	0.7	(0.4)	0.5	(0.2)
Sold and then brought back	0.3	(0.2)	0.1	(0.1)
Sold to a calf ranch or heifer raiser and not brought back	0.3	(0.2)	0.1	(0.0)
Sold through auction	1.4	(0.8)	0.9	(0.3)
Sold through a dealer	0.3	(0.2)	0.3	(0.1)
Sold directly to another dairy	0.2	(0.1)	0.2	(0.1)
Other	0.0	(—)	0.1	(0.1)
Any	2.7	(0.9)	2.0	(0.4)

*Excludes very small operations (<30 cows).

6. Bull/steer rearing and movement

Note: For the following tables, a heifer-raising facilitiy was defined as an operation that raised dairy heifer calves for at least one operation other than its own during 2014. A calf-rearing facility at a different location than the dairy but belonging to and managed by the dairy was not considered a heifer-rearing facility or a off-site rearing facility.

The majority of small and medium operations (68.3 and 57.7 percent, respectively) sold bull/steer calves through an auction. Approximately one-third of large operations (32.5 percent) sold bull/steer calves to a calf ranch or heifer raiser and did not bring them back to the operation, and 37.7 percent sold bull/steer calves through an auction. Almost two-thirds of all operations (61.8 percent) sold bull/steer calves through an auction.

B.6.a. Percentage of operations by destination of bull/steer calves, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
All bulls/steers raised on-site	9.4	(1.4)	11.5	(1.8)	4.0	(0.8)	9.4	(1.0)
Raised off-site with retained ownership	1.3	(0.6)	1.4	(0.7)	5.6	(1.2)	1.8	(0.4)
Sold to a calf ranch or heifer raiser and not brought back	8.8	(1.4)	18.5	(2.1)	32.5	(2.0)	14.3	(1.1)
Sold through auction	68.3	(2.3)	57.7	(2.7)	37.7	(2.2)	61.8	(1.6)
Sold through a dealer	10.9	(1.6)	11.7	(1.7)	22.6	(1.9)	12.4	(1.1)
Sold directly to another dairy	4.0	(1.0)	3.6	(1.1)	2.2	(0.6)	3.6	(0.7)
Other	9.0	(1.4)	9.2	(1.6)	8.1	(1.2)	8.9	(1.0)

Bull/steer calves were raised on-site, sold through an auction, or sold directly to another dairy on a higher percentage of operations in the East region than in the West region. Alternatively, a higher percentage of operations in the West region than in the East region sold bull/steer calves to a calf ranch or heifer raiser and did not bring them back, or sold them through a dealer.

B.6.b. Percentage of operations by destination of bull/steer calves, and by region:

	Percent Operations*			
	Region			
	West		East	
Destination	**Percent**	**Std. error**	**Percent**	**Std. error**
All bulls/steers raised on-site	4.8	(1.2)	9.8	(1.1)
Raised off-site with retained ownership	2.4	(0.7)	1.7	(0.5)
Sold to a calf ranch or heifer raiser and not brought back	41.2	(3.3)	11.7	(1.1)
Sold through auction	29.1	(3.4)	65.0	(1.7)
Sold through a dealer	23.2	(2.3)	11.4	(1.1)
Sold directly to another dairy	1.1	(0.4)	3.9	(0.7)
Other	8.2	(2.5)	9.0	(1.0)

*Excludes very small operations (<30 cows).

On small and medium operations, the highest percentage of bull/steer calves (68.3 and 59.2 percent, respectively) were sold through an auction. As observed at the operation level, about one-third of bull/steer calves on large operations (38.8 percent) were sold to a calf ranch or heifer raiser and not brought back, or were sold through auction (30.2 percent).

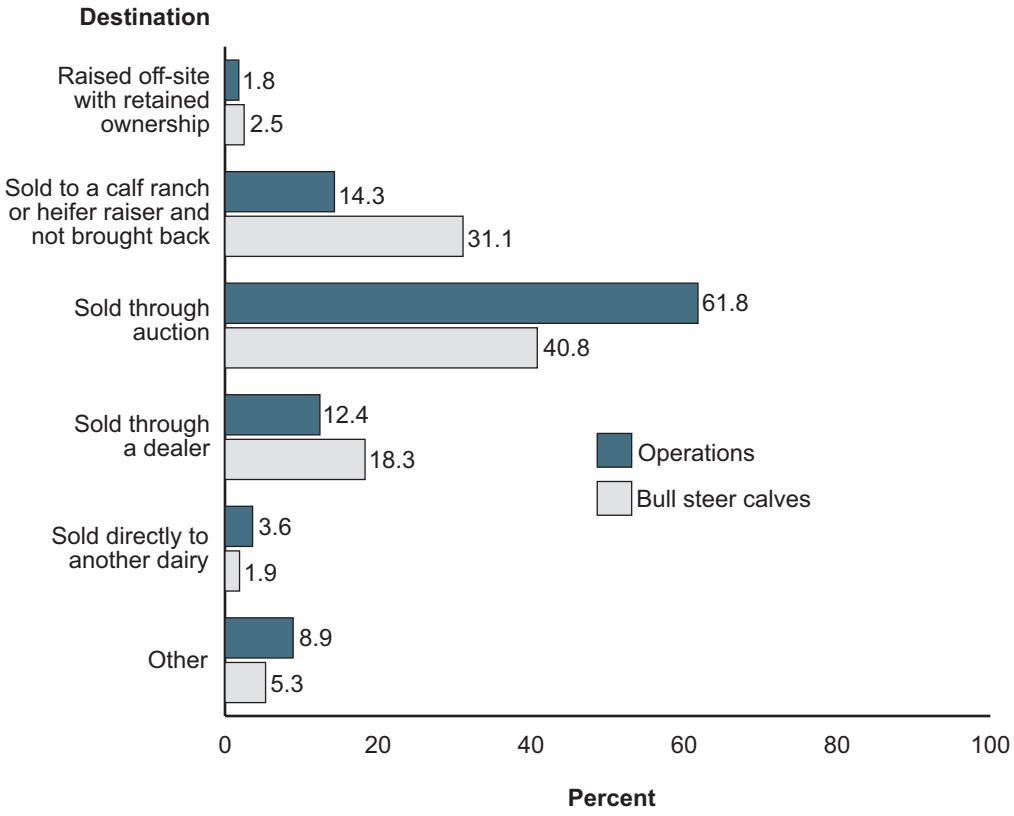
B.6.c. For the 90.6 percent of operations that raised bulls/steer calves off-site with retained ownership or that sold bull steer calves (table B.4.c), percentage of bull/steer calves by destination of calves and by herd size:

Percent Bull/Steer Calves

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Raised off-site with retained ownership	0.5	(0.4)	0.6	(0.3)	3.4	(2.2)	2.5	(1.5)
Sold to a calf ranch or heifer raiser and not brought back to the operation	9.2	(1.7)	18.9	(2.5)	38.8	(3.6)	31.1	(2.4)
Sold through auction	68.3	(2.5)	59.2	(3.0)	30.2	(4.0)	40.8	(2.7)
Sold through a dealer	10.9	(1.7)	12.7	(2.1)	21.3	(2.7)	18.3	(1.9)
Sold directly to another dairy	3.4	(1.1)	2.9	(1.0)	1.4	(0.5)	1.9	(0.4)
Other	7.7	(1.5)	5.7	(1.2)	4.8	(1.0)	5.3	(0.8)
Total	100.0		100.0		100.0		100.0	

For the 90.6 percent of operations that raised bulls/steer calves off-site with retained ownership or that sold bull/steer calves, percentage of operations and percentage of bull/steer calves, by destination of calves



A higher percentage of large operations (5.9 percent) had bull/steer calves return from an off-site raising facility compared with small and medium operations (0.0 and 1.4 percent, respectively).

B.6.d. For the 1.8 percent of operations that sent any bull/steer calves to an off-site rearing facility with retained ownership (table B.4.b), percentage of operations in which any bull/steer calves returned to the operation, by herd size:

Percent Operations							
Herd Size (number of cows)							
Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	1.4	(0.7)	5.9	(1.3)	1.2	(0.3)

Operations that sold bull/steer calves through an auction represented the highest percentage of operations in which any shipments of bull/steer calves crossed State lines. Overall, 7.1 percent of operations had at least one shipment of bull/steer calves that crossed State lines.

B.6.e. Percentage of operations in which any shipments of bull/steer calves crossed State lines, by destination and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Raised off-site with retained ownership	0.0	(—)	0.0	(—)	0.4	(0.3)	0.0	(0.0)
Sold to a calf ranch or heifer raiser and not brought back	0.0	(—)	1.2	(0.7)	3.5	(0.8)	0.7	(0.2)
Sold through auction	3.5	(1.0)	5.0	(1.2)	3.2	(1.0)	3.9	(0.7)
Sold through a dealer	1.0	(0.5)	1.7	(0.6)	2.7	(0.7)	1.4	(0.4)
Sold directly to another dairy	0.1	(0.1)	0.9	(0.5)	0.2	(0.2)	0.3	(0.2)
Other	0.8	(0.5)	1.0	(0.6)	0.9	(0.4)	0.9	(0.3)
Any	5.4	(1.2)	9.1	(1.6)	10.7	(1.5)	7.1	(0.8)

The only regional difference in shipments of bull/steer calves crossing State lines was observed for operations that sold to a calf ranch or heifer raiser, which occurred on 2.5 percent of operations in the West region and 0.6 percent of operations in the East region.

B.6.f. Percentage of operations in which any shipments of bull/steer calves crossed State lines, by destination and by region:

	Percent Operations*			
	Region			
	West		East	
Destination	**Percent**	**Std. error**	**Percent**	**Std. error**
Raised off-site with retained ownership	0.0	(—)	0.1	(0.0)
Sold to a calf ranch or heifer raiser and not brought back	2.5	(0.7)	0.6	(0.2)
Sold through auction	3.5	(1.3)	3.9	(0.7)
Sold through a dealer	1.3	(0.5)	1.4	(0.4)
Sold directly to another dairy	0.0	(—)	0.4	(0.2)
Other	0.3	(0.2)	0.9	(0.4)
Any	7.5	(1.6)	7.0	(0.9)

*Excludes very small operations (<30 cows).

C. Preweaned Heifer Management

1. Calving area

An ideal calving area is quiet, clean, dry, and provides areas where cows can separate from each other. An individual-animal area/pen can provide these standards, but a multiple-animal area/pen can also be designed to allow cows to segregate themselves in a quiet area. The use of a multiple-animal calving area/pen increased as herd size increased. Overall, 58.7 percent of operations had some cows calve in a group calving pen. A higher percentage of small operations (34.1 percent) had some cows calve in an individual pen cleaned between each calving compared with medium and large operations (20.0 and 21.6 percent, respectively). A similar percentage of operations across herd sizes used individual calving pens that were cleaned after two or more calvings.

C.1.a. Percentage of operations by area used for calving, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Calving area	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Multiple-animal area/pen (group calving)	50.2	(2.6)	69.1	(2.7)	77.1	(2.0)	58.7	(1.8)
Individual-animal area/pen cleaned between each calving	34.1	(2.5)	20.0	(2.3)	21.6	(1.8)	28.6	(1.7)
Individual-animal area/pen cleaned after two or more calvings	20.6	(2.1)	20.8	(2.3)	15.0	(1.7)	20.0	(1.5)
Other	31.9	(2.5)	12.0	(1.9)	1.3	(0.4)	22.7	(1.6)

The majority of calvings on medium and large operations (64.4 and 69.3 percent, respectively) occurred in a multiple-animal calving area.

C.1.b. Percentage of calvings by area used for calving, and by herd size:

Percent Calvings

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Calving area	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Multiple-animal area/pen (group calving)	40.5	(2.6)	64.4	(2.8)	69.3	(2.8)	64.3	(1.9)
Individual-animal area/pen cleaned between each calving	24.5	(2.2)	13.8	(1.9)	17.5	(2.2)	17.6	(1.5)
Individual-animal area/pen cleaned after two or more calvings	14.7	(1.8)	15.4	(2.2)	12.7	(2.3)	13.5	(1.6)
Other	20.3	(2.0)	6.3	(1.2)	0.6	(0.3)	4.5	(0.4)
Total	100.0		100.0		100.0		100.0	

A “usual calving area” was defined as an area where cows are moved to calve. For this study, calving in a stanchion or tie stall did not constitute a usual calving area.

The percentage of operations with a usual calving area increased as herd size increased; 69.4 percent of all operations had a calving area.

A higher percentage of operations in the West region (80.3 percent) had a usual calving area compared with operations in the East region (68.3 percent).

C.1.c. Percentage of operations that used a usual calving area, by herd size and region:

Percent Operations

Herd Size (number of cows)						**Region**					
Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
59.4	(2.5)	80.0	(2.3)	94.7	(1.2)	80.3	(3.3)	68.3	(1.8)	69.4	(1.7)

Cows should calve in a clean area and not be exposed to sick cows, which can increase the potential for disease transmission to the dam and the calf.

A lower percentage of large operations (29.6 percent) than small and medium operations (43.1 and 42.6 percent, respectively) allowed sick or lame cows into the usual calving area. A higher percentage of operations allowed lame cows in the usual calving area than allowed sick cows in the usual calving area.

C.1.d. For the 69.4 percent of operations with a usual calving area (table C.1.c), percentage of operations by type of cows allowed in the usual calving area, and by herd size:

Percent Operations

	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Cow type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Sick	28.1	(3.0)	25.3	(2.7)	13.2	(1.8)	24.9	(1.8)
Lame	35.1	(3.2)	40.7	(3.0)	28.9	(2.3)	36.0	(2.0)
Either of the above	43.1	(3.3)	42.6	(3.0)	29.6	(2.3)	40.9	(2.0)

Cows that test positive for *Mycobacterium avium* subspecies *paratuberculosis*—the causative agent of Johne's disease—are likely to shed the bacteria in feces or colostrum around the time of calving. Test-positive cows about to calve should be managed in a separate area away from test-negative cows. There was no difference by herd size in the percentage of operations that tested for Johne's disease; overall, 74.4 percent of all operations tested for Johne's disease.

C.1.e. Percentage of operations that tested cows for Johne's disease, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
70.4	(3.0)	77.9	(2.6)	80.0	(1.8)	74.4	(1.8)

Of the 74.4 percent of operations that tested for Johne's disease, 7.3 percent allowed test-positive cows to enter the usual calving area.

C.1.f. For the 74.4 percent of operations that tested for Johne's disease (table C.1.e), percentage of operations in which cows that tested positive for Johne's disease were allowed in the usual calving area, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
5.1	(1.8)	9.7	(2.0)	8.8	(1.7)	7.3	(1.2)

Cows should be moved into the calving area as close to calving as possible, without interrupting the calving process. Studies suggest that cows should be moved before abdominal contractions begin (late stage 1 labor) to prevent delaying the delivery of the calf.

Overall, 41.9 percent of operations placed cows in the usual calving area 1 day or less before calving. A lower percentage of small operations (8.0 percent) than large operations (16.5 percent) placed cows in the usual calving area for 14.1 or more days before calving.

C.1.g. For the 69.4 percent of operations with a usual calving area (table C.1.c), percentage of operations by length of time (days) cows were in the usual calving area/pen **before** calving, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Time (d)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1.0 or less	46.2	(3.4)	37.0	(3.1)	37.7	(2.3)	41.9	(2.1)
1.1–3.0	21.2	(2.8)	17.3	(2.5)	13.7	(1.7)	18.7	(1.7)
3.1–14.0	24.6	(3.0)	31.7	(2.9)	32.1	(2.3)	28.1	(1.8)
14.1 or more	8.0	(1.8)	14.0	(2.3)	16.5	(1.6)	11.3	(1.2)
Total	100.0		100.0		100.0		100.0	

The length of time cows spend in the calving area after calving is often related to how soon calves are removed from their dam. Research suggests that removing calves from their dam as soon as possible minimizes the bonding process, which reduces the stress that separation has on calves and dams. About one-fourth of operations (24.2 percent) removed cows from the calving area within an hour of calving. More than half of all operations (57.5 percent) removed cows from the calving area from 1.1 to 14.0 hours after calving.

C.1.h. For the 69.4 percent of operations with a usual calving area (table C.1.c), percentage of operations by length of time (hours) cows spent in the usual calving area/pen **after** calving, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Time (h)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 0.25	10.2	(2.0)	8.8	(1.7)	8.9	(1.3)	9.5	(1.2)
0.25–1.0	11.5	(2.2)	15.4	(2.3)	24.1	(2.0)	14.7	(1.4)
1.1–3.0	12.1	(2.3)	17.5	(2.4)	16.4	(1.9)	14.6	(1.4)
3.1–14.0	46.0	(3.4)	40.0	(3.1)	38.9	(2.3)	42.9	(2.1)
14.1 or more	20.2	(2.8)	18.3	(2.4)	11.7	(1.7)	18.3	(1.7)
Total	100.0		100.0		100.0		100.0	

2. Births and stillbirths

Calves born dead or that die within 48 hours of birth are frequently referred to as stillbirths. Overall, 94.4 percent of calves were born and alive at 48 hours, and 5.6 percent were stillborn. A higher percentage of calves born on small and medium operations (6.8 and 6.4 percent, respectively) were stillborn compared with calves born on large operations (5.1 percent). Slightly more than 50 percent of calves born and alive at 48 hours were heifer calves (data not shown).

C.2.a. Calves born alive and dead, as a percentage of calves born, by herd size:

	Percent Calves							
	Herd Size (number of cows)							
	Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Calf status	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Born and still alive at 48 h	93.2	(0.3)	93.6	(0.2)	94.9	(0.2)	94.4	(0.1)
Stillborn (born dead or died within 48 h of birth)	6.8	(0.3)	6.4	(0.2)	5.1	(0.2)	5.6	(0.1)
Total	100.0		100.0		100.0		100.0	

To decrease the risk of disease transmission, newborn calves should be quickly removed from their dam following birth and placed in a warm and dry environment. Newborn calves that experienced a difficult delivery or that were born in extremely cold temperatures are better able to survive if they are stimulated, dried, fed colostrum, and provided a warm environment immediately following birth.

The majority of all operations (56.2 percent) separated calves from their dam within 6 hours of birth.

C.2.b. Percentage of operations by length of time (hours) following birth that calves were separated from their dam, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Time (h)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 0.5	0.0	(—)	5.1	(1.2)	3.2	(0.9)	12.8	(1.6)	4.8	(0.7)
0.5–0.9	0.0	(—)	4.7	(1.1)	8.0	(1.5)	11.7	(1.5)	5.8	(0.7)
1.0–5.9	39.2	(7.2)	42.4	(2.6)	49.5	(2.7)	58.9	(2.3)	45.6	(1.7)
6.0–11.9	21.3	(6.5)	15.1	(1.8)	15.1	(1.9)	10.4	(1.4)	15.3	(1.3)
12.0 or more	39.5	(7.7)	32.8	(2.4)	24.2	(2.4)	6.1	(1.0)	28.5	(1.7)
Total	100.0		100.0		100.0		100.0		100.0	

The majority of calves on small, medium, large and all operations were removed from their dam within 6 hours of birth.

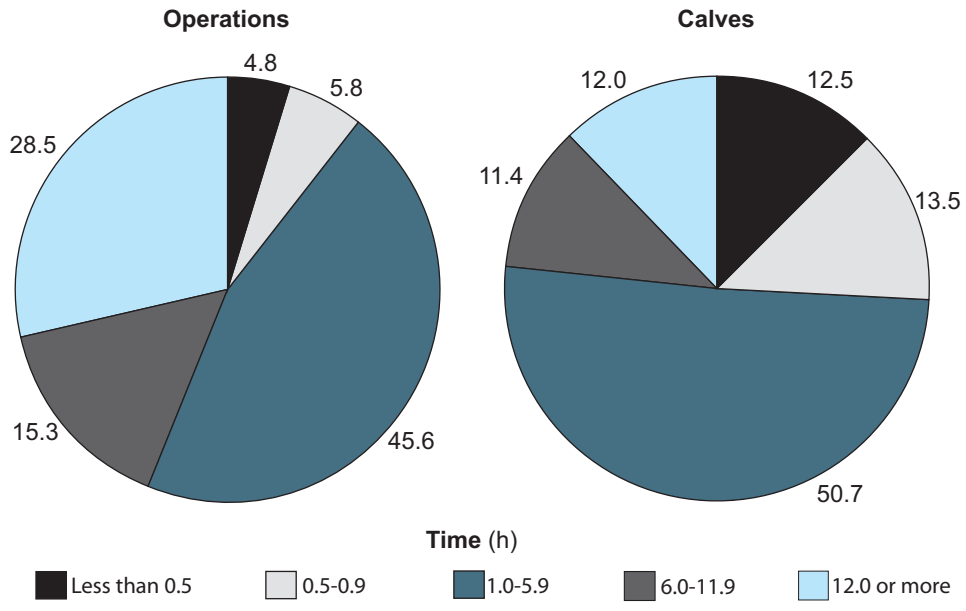
C.2.c. Percentage of heifer calves by length of time following birth that calves were separated from their dam, and by herd size:

Percent Heifer Calves

Herd Size (number of cows)

Time (h)	**Very small** (fewer than 30) Pct.	Std. error	**Small** (30–99) Pct.	Std. error	**Medium** (100–499) Pct.	Std. error	**Large** (500 or more) Pct.	Std. error	**All operations** Pct.	Std. error
Less than 0.5	0.0	(—)	5.4	(1.3)	3.8	(1.4)	17.3	(2.5)	12.5	(1.7)
0.5–0.9	0.0	(—)	4.1	(1.1)	11.0	(2.3)	16.6	(2.7)	13.5	(1.8)
1.0–5.9	40.0	(9.0)	43.7	(2.8)	48.9	(3.1)	53.0	(3.1)	50.7	(2.1)
6.0–11.9	27.4	(9.5)	15.6	(2.1)	15.0	(2.2)	8.9	(1.5)	11.4	(1.1)
12.0 or more	32.6	(8.9)	31.2	(2.6)	21.2	(2.5)	4.3	(0.9)	12.0	(0.9)
Total	100.0		100.0		100.0		100.0		100.0	

Percentage of operations and percentage of heifer calves by length of time (hours) following birth that calves were separated from their dam



3. Colostrum management

Colostrum management is critical to decreasing illness and death in calves. Colostrum should be fed within a few hours of birth. The sooner colostrum is fed following birth, the better the transfer of immunity to calves.

The operation average age of heifer calves at the first feeding of colostrum was 3.6 hours. Large operations fed colostrum sooner following birth (2.1 hours) compared with small and medium operations (3.8 and 3.9 hours, respectively).

C.3.a. Operation average number of hours following birth that the majority of heifer calves got their first feeding of colostrum, by herd size:

Operation Average Hours

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
3.8	(0.2)	3.9	(0.2)	2.1	(0.1)	3.6	(0.1)

Hand-feeding calves colostrum—rather than allowing calves to suckle their dam—enables producers to more closely monitor the timing, amount, and quality of the colostrum fed.

The majority of very small (56.0 percent), medium (54.0 percent), large (81.9 percent), and all operations (53.2 percent) fed colostrum to heifer calves by hand only. Calves received colostrum solely from suckling their dam on a lower percentage of small, medium, and large operations (5.3, 4.3, and 1.2 percent, respectively) than very small operations (16.8 percent). Overall, 93.7 percent of operations hand-fed colostrum to at least some calves. On operations with 30 or more cows, 95.4 percent of operations hand-fed colostrum to at least some calves, which is the denominator used in tables C.3.d, C.3.g, C.3.i, and C.3.k.

C.3.b. Percentage of operations by method used to feed heifer calves colostrum, and by herd size:

	Percent Operations											
	Herd Size (number of cows)										Operations with 30 or more cows	
	Very small (fewer than 30)		Small (30–99)		Medium (100–499)		Large (500 or more)		All operations			
Method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Hand-feeding only	56.0	(6.3)	46.7	(2.6)	54.0	(2.8)	81.9	(1.8)	53.2	(1.8)	52.7	(1.8)
Both hand-feeding and suckling dam	27.3	(5.5)	48.0	(2.6)	41.6	(2.8)	16.8	(1.8)	40.5	(1.7)	42.7	(1.8)
Suckling dam only	16.8	(4.9)	5.3	(1.1)	4.3	(1.1)	1.2	(0.6)	6.3	(0.9)	4.6	(0.7)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

The percentage of heifer calves given colostrum solely by hand increased as herd size increased, with the exception of very small operations. Most heifer calves (97.3 percent) were fed at least some colostrum by hand.

On operations with 30 or more cows, 97.4 percent of heifer calves were hand-fed colostrum, which is the denominator used in tables C.3.e and C.3.h.

C.3.c. Percentage of heifer calves by method used to feed heifer calves colostrum, and by herd size:

	Percent Heifer Calves **Herd Size** (number of cows)											
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**		**Operations with 30 or more cows**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Hand-feeding only	76.3	(5.9)	62.1	(2.6)	71.8	(2.5)	89.4	(1.5)	81.6	(1.2)	81.6	(1.2)
Both hand-feeding and suckling dam	13.5	(5.1)	30.5	(2.4)	23.1	(2.4)	9.9	(1.5)	15.7	(1.2)	15.8	(1.2)
Suckling dam only	10.2	(3.4)	7.4	(1.3)	5.1	(1.0)	0.7	(0.3)	2.7	(0.3)	2.6	(0.3)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

Common recommendations are to feed a calf colostrum from only one cow, or to pasteurize or “heat treat” colostrum originating from more than one cow, i.e., pooled colostrum. Feeding pooled, unpasteurized colostrum can spread disease to multiple calves.

The majority of operations (88.6 percent) fed at least some calves unpasteurized colostrum from an individual cow. Pooled colostrum (unpasteurized and pasteurized), and commercial colostrum replacer, were fed on a higher percentage of medium and large operations than on small operations.

C.3.d. For the 95.4 percent of operations that hand-fed some colostrum (table C.3.b), percentage of operations by source of colostrum and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Colostrum source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Individual-cow colostrum (unpasteurized)	95.7	(1.0)	86.7	(1.8)	56.1	(2.2)	88.6	(0.8)
Individual-cow colostrum (pasteurized)	1.0	(0.5)	3.7	(1.0)	8.1	(1.3)	2.6	(0.4)
Pooled cow colostrum (unpasteurized)	10.6	(1.6)	23.3	(2.3)	29.6	(2.0)	16.4	(1.2)
Pooled cow colostrum (pasteurized)	0.5	(0.3)	3.7	(1.0)	16.4	(1.5)	3.2	(0.4)
Commercial colostrum replacer	15.3	(1.9)	24.9	(2.4)	24.4	(2.1)	19.1	(1.3)
Other	1.7	(0.7)	0.6	(0.4)	1.1	(0.5)	1.3	(0.4)

The majority of heifer calves (55.1 percent) were fed unpasteurized individual-cow colostrum. Similar to what was observed at the operation level in the previous table, the percentage of heifers fed pooled colostrum—unpasteurized or pasteurized—increased as herd size increased.

C.3.e. For the 97.4 percent of heifer calves that were hand-fed some colostrum (table C.3.c), percentage of heifer calves by source of colostrum and by herd size:

Percent Heifer Calves

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Colostrum source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Individual-cow colostrum (unpasteurized)	93.4	(1.2)	74.2	(2.6)	40.2	(2.7)	55.1	(1.9)
Individual-cow colostrum (pasteurized)	0.8	(0.5)	4.5	(1.3)	7.0	(1.6)	5.5	(1.0)
Pooled cow colostrum (unpasteurized)	5.3	(1.3)	13.6	(2.0)	31.9	(2.7)	24.1	(1.9)
Pooled cow colostrum (pasteurized)	0.3	(0.3)	4.8	(1.4)	21.3	(2.5)	14.7	(1.7)
Commercial colostrum replacer	4.7	(1.1)	10.8	(2.1)	8.9	(1.4)	8.7	(1.0)
Other	0.6	(0.4)	1.5	(1.1)	0.5	(0.2)	0.7	(0.3)

Colostrum was fed by bottle on 87.4 percent of operations that hand-fed colostrum. In general, the use of a bottle generally decreased as herd size increased, and the use of an esophageal feeder increased as herd size increased.

C.3.f. For the 93.7 percent of operations that hand-fed colostrum (table C.3.b), percentage of operations by method used to give newborn heifer calves their first feeding of colostrum, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Colostrum feeding method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bottle	93.8	(2.9)	90.5	(1.5)	83.9	(2.1)	72.4	(2.0)	87.4	(1.0)
Esophageal feeder	1.5	(1.5)	4.1	(1.0)	11.8	(1.8)	27.1	(2.0)	8.1	(0.8)
Bucket	4.7	(2.6)	5.3	(1.2)	4.3	(1.2)	0.5	(0.4)	4.5	(0.8)
Total	100.0		100.0		100.0		100.0		100.0	

Newborn calves should be fed approximately 1 gallon (10 percent of body weight) of colostrum in the first 24 hours following birth. In general, the sooner calves are fed colostrum—and the more colostrum they are fed—the better the transfer of immunity to the calves.

The majority of small and medium operations (74.2 and 58.3 percent, respectively) fed 2 quarts or less of colostrum at first feeding, while almost half of large operations (48.4 percent) fed 4 quarts or more at first feeding. Only 21.8 percent of all operations fed 4 quarts or more at first feeding. The majority of all operations across herd sizes fed an additional 2 quarts or more of colostrum in the first 24 hours.

The amount of colostrum fed to heifer calves in the first 24 hours following birth increased as herd size increased. The majority of small operations (51.1 percent) fed 4 quarts in the first 24 hours, while the majority of large operations (56.2 percent) fed 6 quarts or more. Almost 90 percent of operations (87.5 percent) fed 4 quarts or more of colostrum during the first 24 hours.

C.3.g. For the 95.4 percent of operations that hand-fed colostrum (table C.3.b), percentage of operations by amount of first-milking colostrum (quarts) normally fed to heifer calves in the first 24 hours following birth, and by herd size:

Percent Operations

Herd Size (number of cows)

Amount (qt)	**Small** (30–99) Pct.	Std. error	**Medium** (100–499) Pct.	Std. error	**Large** (500 or more) Pct.	Std. error	**All operations** Pct.	Std. error
At first feeding								
1 or less	15.3	(1.9)	9.8	(1.7)	6.4	(1.0)	12.6	(1.2)
2	58.9	(2.6)	48.5	(2.8)	33.8	(2.2)	53.0	(1.8)
3	12.4	(1.8)	13.2	(1.9)	11.3	(1.4)	12.5	(1.2)
4 or more	13.4	(1.8)	28.5	(2.5)	48.4	(2.3)	21.8	(1.3)
Total	100.0		100.0		100.0		100.0	
In all subsequent feedings in the first 24 h								
1 or less	8.8	(1.5)	10.8	(1.7)	14.4	(1.5)	10.0	(1.1)
2	66.1	(2.5)	60.0	(2.8)	47.3	(2.4)	62.1	(1.7)
3	10.0	(1.6)	8.4	(1.5)	10.8	(1.4)	9.7	(1.1)
4 or more	15.1	(1.9)	20.8	(2.3)	27.5	(2.2)	18.2	(1.3)
Total	100.0		100.0		100.0		100.0	
Total in the first 24 h								
Less than 4	13.7	(1.8)	11.9	(1.9)	8.3	(1.2)	12.5	(1.2)
4	51.1	(2.7)	40.9	(2.8)	30.4	(2.2)	45.8	(1.8)
5	8.4	(1.5)	7.1	(1.4)	5.1	(1.0)	7.6	(1.0)
6 or more	26.8	(2.4)	40.1	(2.8)	56.2	(2.4)	34.1	(1.7)
Total	100.0		100.0		100.0		100.0	

The percentage of heifer calves by the amount of colostrum fed was similar to the percentage of operations by the amount of colostrum fed (table C.3.g); however, the higher number of heifer calves on large operations increased the percentage of heifer calves on all operations that were fed specific amounts of colostrum. For instance, 21.8 percent of operations, representing 42.0 of heifer calves, fed heifer calves 4 quarts or more at first feeding.

Overall, 90.8 percent of heifer calves on operations that hand-fed colostrum received 4 quarts or more of colostrum during the first 24 hours following birth.

C.3.h. For the 97.4 percent of heifer calves that were hand-fed some colostrum (table C.3.c), percentage of heifer calves by amount of first-milking colostrum (quarts) normally fed in the first 24 hours following birth, and by herd size:

	Percent Heifer Calves							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Amount (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
At first feeding								
1 or less	13.7	(2.0)	7.8	(1.5)	7.0	(1.4)	8.1	(1.0)
2	59.7	(2.9)	44.5	(3.2)	30.8	(2.8)	37.6	(2.0)
3	12.0	(1.9)	13.8	(2.2)	11.9	(1.9)	12.3	(1.4)
4 or more	14.6	(2.1)	33.9	(3.2)	50.3	(3.0)	42.0	(2.1)
Total	100.0		100.0		100.0		100.0	
In all subsequent feedings in the first 24 h								
1 or less	7.5	(1.5)	12.5	(2.3)	15.4	(2.1)	13.7	(1.5)
2	69.4	(2.6)	56.2	(3.3)	47.5	(3.1)	52.3	(2.2)
3	9.3	(1.6)	7.7	(1.6)	12.1	(1.9)	10.8	(1.3)
4 or more	13.9	(1.9)	23.7	(2.9)	25.0	(2.7)	23.2	(1.9)
Total	100.0		100.0		100.0		100.0	
Total in the first 24 h								
Less than 4	12.3	(1.9)	10.5	(1.8)	8.1	(1.4)	9.2	(1.0)
4	53.4	(2.9)	39.0	(3.2)	30.6	(2.9)	35.5	(2.1)
5	8.1	(1.6)	6.8	(1.6)	5.7	(1.3)	6.3	(0.9)
6 or more	26.2	(2.5)	43.7	(3.3)	55.6	(3.1)	49.0	(2.2)
Total	100.0		100.0		100.0		100.0	

Storing colostrum helps ensure that enough is available for all calves. Bacteria proliferate in colostrum so it should not be stored without refrigeration for more than 1 to 2 hours. Colostrum not used within 48 hours should be frozen. The percentage of operations that stored colostrum increased as herd size increased. Overall, 49.3 percent of operations stored colostrum.

C.3.i. For the 95.4 percent of operations that hand-fed colostrum (table C.3.b), percentage of operations that stored excess colostrum, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
36.6	(2.5)	60.5	(2.8)	86.0	(1.7)	49.3	(1.7)

Of operations that stored colostrum, 73.0 percent stored it in a freezer. About three-fourths of small and medium operations and about half of large operations stored colostrum in a freezer. A higher percentage of large operations (40.3 percent) stored colostrum in a refrigerator than small and medium operations (11.7 and 20.8 percent, respectively). These differences are likely associated with the number of calves born.

C.3.j. For the 49.3 percent of operations that stored colostrum (table C.3.i), percentage of operations by primary method used to store colostrum, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Primary method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Stored without refrigeration	8.4	(2.5)	3.9	(1.5)	3.9	(1.2)	5.9	(1.2)
Stored in a refrigerator	11.7	(2.8)	20.8	(2.9)	40.3	(2.4)	20.7	(1.7)
Stored in a freezer	79.4	(3.5)	74.9	(3.1)	55.3	(2.4)	73.0	(2.0)
Other	0.4	(0.4)	0.3	(0.3)	0.4	(0.4)	0.4	(0.2)
Total	100.0		100.0		100.0		100.0	

The quality of colostrum can be measured using multiple methods. Although direct measurement of colostral immunoglobulin G (IgG) by a laboratory is the most accurate method, it is not practical on-farm. Of the currently available on-farm methods of measuring colostral IgG, the Brix refractometer is the most accurate. The volume of first-milking colostrum is not an accurate indicator of colostrum quality.

Colostrometer use increased as herd size increased; overall, 11.4 percent of all operations used a colostrometer. Visual appearance was used by the majority of operations that estimated colostrum quality (45.1 percent of all operations). The use of the Brix refractometer increased as herd size increased, ranging from 0.3 percent of small operations to 22.2 percent of large operations. More than half of medium operations (57.0 percent) and more than three-fourths of large operations (83.6 percent) evaluated colostrum quality using any methods listed in the following table.

C.3.k. For the 95.4 percent of operations that hand-fed colostrum (table C.3.b), percentage of operations by method used to estimate colostrum immunoglobulin (IgG) levels or the quality of colostrum, and by herd size:

Percent Operations*

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Colostrometer	2.3	(0.8)	15.7	(2.2)	47.1	(2.3)	11.4	(0.9)
Visual appearance	43.0	(2.7)	46.1	(2.9)	53.4	(2.3)	45.1	(1.8)
Brix refractometer	0.3	(0.2)	4.6	(1.1)	22.2	(1.8)	4.1	(0.4)
Volume of first milking colostrum (lb)	10.4	(1.7)	16.5	(2.1)	14.9	(1.7)	12.7	(1.2)
Other	0.0	(—)	0.7	(0.5)	0.5	(0.2)	0.2	(0.1)
Any	45.5	(2.7)	57.0	(2.8)	83.6	(1.9)	53.3	(1.8)

*Operations with 30 or more cows.

Monitoring and measuring serum total protein in calves 1 to 7 days of age is the easiest way to determine how well a colostrum management program is working. Total protein can be determined on-farm using a refractometer. Commonly recommended goals are for 90 percent of calves sampled to have total protein values greater than or equal to 5.2 g/dL or for 80 percent of calves to have total protein values greater than or equal to 5.5 g/dL.

More than one-third of large operations (38.3 percent) routinely monitored serum proteins. Less than 10 percent of all operations (6.2 percent) routinely monitored serum proteins to evaluate their colostrum management program. More than one-third of heifer calves (35.3 percent) were on operations that routinely monitored serum proteins.

C.3.I. Percentage of operations that routinely monitored serum proteins as a measure of the passive transfer status of newborn heifer calves, and percentage of heifer calves on those operations, by herd size:

Percent

Herd Size (number of cows)

Parameter	**Very small** (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	4.9	(2.8)	1.2	(0.6)	5.5	(1.2)	38.3	(2.3)	6.2	(0.6)
Heifer calves	3.6	(2.6)	1.0	(0.6)	6.8	(1.7)	53.9	(3.0)	35.3	(2.1)

4. Housing

Preweaned heifers were housed on-site on 96.8 percent of all operations. A lower percentage of large operations raised preweaned heifers on-site compared with medium, small, and very small operations.

C.4.a. Percentage of operations that reared or housed preweaned heifers on-site, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
97.3	(1.9)	98.8	(0.5)	98.3	(0.6)	81.4	(1.6)	96.8	(0.4)

Primarily, preweaned heifer calves are housed individually to reduce the spread of disease (via direct contact and suckling) and to monitor feed intake. Recent research, however, suggests that calves fed appropriate amounts of milk and housed in small groups (as opposed to individual housing) may benefit from socialization.

The majority of operations across herd sizes housed preweaned heifer calves individually. Individual outside hutch or pen was used by 37.9 percent of operations, while individual inside unheated hutch or pen was used by 25.1 percent. Multiple-animal inside area/barn was used on 14.7 percent of operations.

C.4.b. Percentage of operations by primary housing type used for preweaned heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary housing type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Individual outside hutch/ pen	21.3	(5.0)	36.5	(2.5)	47.5	(2.7)	45.3	(2.3)	37.9	(1.6)
Individual inside hutch/pen, warm (heated) calf barn	3.2	(1.9)	6.7	(1.2)	9.0	(1.5)	6.4	(1.3)	6.7	(0.8)
Individual inside hutch/pen, cold (unheated) calf barn	32.1	(6.2)	22.9	(2.2)	28.2	(2.4)	18.2	(1.9)	25.1	(1.6)
Tie stall or stanchion	9.7	(3.4)	7.1	(1.3)	0.6	(0.4)	0.3	(0.3)	5.2	(0.8)
Pasture	6.4	(3.2)	1.1	(0.5)	0.3	(0.3)	0.1	(0.1)	1.6	(0.5)
Freestall with no access to open/ dry lot	2.7	(1.9)	1.2	(0.6)	0.5	(0.3)	1.9	(0.9)	1.3	(0.4)
Freestall with access to open/ dry lot	2.3	(2.3)	1.6	(0.7)	2.0	(0.8)	0.8	(0.4)	1.7	(0.5)
Open/dry lot without barn or shed*	0.0	(—)	0.3	(0.3)	0.0	(—)	1.4	(0.5)	0.3	(0.2)
Open/dry lot with barn or shed	6.7	(3.8)	2.1	(0.8)	1.1	(0.7)	0.1	(0.1)	2.3	(0.7)
Multiple-animal inside area/barn	13.0	(4.5)	19.4	(2.1)	9.3	(1.7)	6.8	(1.1)	14.7	(1.3)
Not housed on operation	2.7	(1.9)	1.2	(0.5)	1.7	(0.6)	18.6	(1.6)	3.2	(0.4)
Total	100.0		100.0		100.0		100.0		100.0	

*With or without shade structures.

A higher percentage of operations in the West region than in the East region housed preweaned heifers in an individual outside hutch/pen (50.1 and 36.8 percent, respectively) or did not house preweaned heifers on the operation (18.8 and 1.8 percent, respectively). Alternatively, a higher percentage of operations in the East region than in the West region housed preweaned heifers in a tie stall or stanchion (5.6 and 0.7 percent, respectively) or housed preweaned heifers in a multiple-animal inside area/barn (16.0 and 0.9 percent, respectively).

C.4.c. Percentage of operations by primary housing type used for preweaned heifers, and by region:

	Percent Operations			
	Region			
	West		East	
Primary housing type	**Percent**	**Std. error**	**Percent**	**Std. error**
Individual outside hutch/pen	50.1	(3.1)	36.8	(1.8)
Individual inside hutch/pen, warm (heated) calf barn	4.2	(1.4)	7.0	(0.9)
Individual inside hutch/pen, cold (unheated) calf barn	19.5	(3.2)	25.6	(1.7)
Tie stall or stanchion	0.7	(0.4)	5.6	(0.9)
Pasture	1.9	(1.9)	1.5	(0.6)
Freestall with no access to open/dry lot	1.1	(0.7)	1.3	(0.5)
Freestall with access to open/dry lot	1.1	(0.6)	1.8	(0.6)
Open/dry lot without barn or shed*	1.4	(0.5)	0.2	(0.2)
Open/dry lot with barn or shed	0.3	(0.2)	2.5	(0.8)
Multiple-animal inside area/barn	0.9	(0.5)	16.0	(1.4)
Not housed on operation	18.8	(1.9)	1.8	(0.4)
Total	100.0		100.0	

*With or without shade structures.

Young animals are more susceptible than adult animals to extreme weather conditions. Increasing the amount of milk fed and providing wind breaks and/or extra bedding to preweaned heifers help them maintain normal body temperatures during winter.

Most operations that housed preweaned heifers in individual outside hutches (94.0 percent) provided extra bedding and/or a windbreak during winter. There were no regional differences in the percentage of operations that provided extra bedding and/or a windbreak during winter for preweaned heifers housed in individual outside hutch/pen (data not shown).

C.4.d. For the 37.9 percent of operations that housed preweaned heifers in an individual outside hutch/pen (table C.4.b), percentage of operations that provided extra bedding and/or a wind break during winter, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
100.0	(—)	92.8	(2.2)	94.1	(2.0)	94.7	(1.4)	94.0	(1.3)

5. Nutrition

Note: The following tables include estimates from the 96.8 percent operations that housed preweaned heifer calves (table C.4.b).

Nutrition for preweaned dairy calves continues to evolve. Rumen development was studied extensively from the 1950s to the 1970s, and the primary approach at that time was to minimize the cost and amount of milk/milk replacer fed and to wean early. Recent research has shown that preweaned calves are efficient at converting milk to body mass. A higher plane of nutrition may improve the immune response, decreasing illness, death, and the time to achieve breeding size. Milk replacer has been fed to calves since at least the 1950s and is still fed today; however, the formulation in terms of percentage protein and percentage fat for some milk replacer has changed from the traditional 20:20 formulation. Newer milk replacer contains increased protein (to make it more similar to milk) and stable or decreased fat content. Whole milk, whether from cows in a drug-withdrawal period or cows transitioning from producing colostrum to milk, has been fed to calves for a long time. Pasteurizing milk fed to calves is a relatively recent practice and continues to gain in popularity. With the implementation of ad-lib feeding systems, acidification of milk is becoming more popular. Adding acids, such as citric acid, to milk lowers the pH and inhibits/decreases bacterial growth, allowing the milk to be kept without refrigeration for 1 to 3 days.

The use of nonmedicated milk replacer increased as herd size increased. Medium operations represented the highest percentages of operations that fed medicated milk replacer or any milk replacer (49.2 and 63.9 percent, respectively). Slightly more than one-third of all operations (37.6 percent) fed at least some calves medicated milk replacer. The use of unpasteurized milk (saleable or nonsaleable/waste) decreased as herd size increased, ranging from 72.9 percent of very small operations to 26.3 percent of large operations. Overall, 55.7 percent of operations fed at least some calves unpasteurized milk. Pasteurized milk was fed on a higher percentage of large operations (43.8 percent) than very small, small, or medium operations (5.1, 1.5, and 9.9 percent, respectively). Acidified milk was fed on 1.7 percent of operations, with no differences across herd sizes. Both milk and milk replacer were fed on 14.4 percent of operations.

C.5.a. Percentage of operations by type of liquid diet fed to preweaned heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Liquid diet	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Any milk replacer	24.9	(5.7)	50.3	(2.6)	63.9	(2.8)	48.3	(2.8)	49.9	(1.8)
Nonmedicated milk replacer	10.4	(4.0)	15.0	(1.9)	20.6	(2.3)	24.3	(2.4)	16.4	(1.3)
Medicated milk replacer	16.6	(4.9)	38.5	(2.6)	49.2	(2.8)	33.5	(2.6)	37.6	(1.7)
Unpasteurized milk*	72.9	(6.1)	60.8	(2.6)	44.2	(2.8)	26.3	(2.4)	55.7	(1.8)
Pasteurized milk*	5.1	(3.5)	1.5	(0.6)	9.9	(1.6)	43.8	(2.8)	7.4	(0.8)
Acidified milk*	2.7	(2.7)	0.8	(0.5)	2.8	(1.0)	2.5	(0.8)	1.7	(0.5)
Combination of milk* and milk replacer	8.9	(4.0)	12.9	(1.8)	18.9	(2.2)	20.2	(2.2)	14.4	(1.2)
Other	5.3	(3.6)	0.9	(0.5)	0.3	(0.2)	1.4	(0.7)	1.4	(0.6)

*Saleable or nonsaleable/waste.

A lower percentage of operations in the West region fed preweaned heifers medicated milk replacer or any milk replacer (22.8 and 35.0 percent, respectively) compared with operations in the East region (38.7 and 51.0 percent, respectively). Pasteurized milk (saleable or nonsaleable/waste) was fed by a higher percentage of operations in the West region than in the East region (23.1 and 6.2 percent, respectively).

C.5.b. Percentage of operations by type of liquid diet fed to preweaned heifers, and by region:

	Percent Operations			
	Region			
	West		East	
Liquid diet	**Percent**	**Std. error**	**Percent**	**Std. error**
Any milk replacer	35.0	(4.1)	51.0	(1.9)
Nonmedicated milk replacer	22.0	(3.6)	16.0	(1.4)
Medicated milk replacer	22.8	(3.5)	38.7	(1.8)
Unpasteurized milk*	62.6	(3.3)	55.2	(1.9)
Pasteurized milk*	23.1	(2.5)	6.2	(0.8)
Acidified milk*	1.5	(1.0)	1.7	(0.6)
Combination of milk* and milk replacer	20.4	(3.4)	14.0	(1.3)
Other	0.0	(—)	1.5	(0.6)

*Saleable or nonsaleable/waste.

Medicated milk replacer was fed to a lower percentage of preweaned heifers on very small and large operations (21.1 and 35.3 percent, respectively) than on medium operations (50.0 percent). Overall, 40.4 percent of preweaned heifers received medicated milk replacer, and 53.0 percent received any milk replacer. The percentage of preweaned heifers that received unpasteurized milk (saleable or nonsaleable/waste) decreased as herd size increased, while the percentage of calves fed pasteurized milk increased as herd size increased. About one-third of calves received unpasteurized (33.2 percent) or pasteurized (35.8 percent) milk at some time during the preweaning period. Acidified milk was fed to a similar percentage of calves across herd sizes. Both milk and milk replacer were fed to 23.7 percent of heifer calves.

C.5.c. Percentage of preweaned heifers by type of liquid diet fed to preweaned heifers, and by herd size:

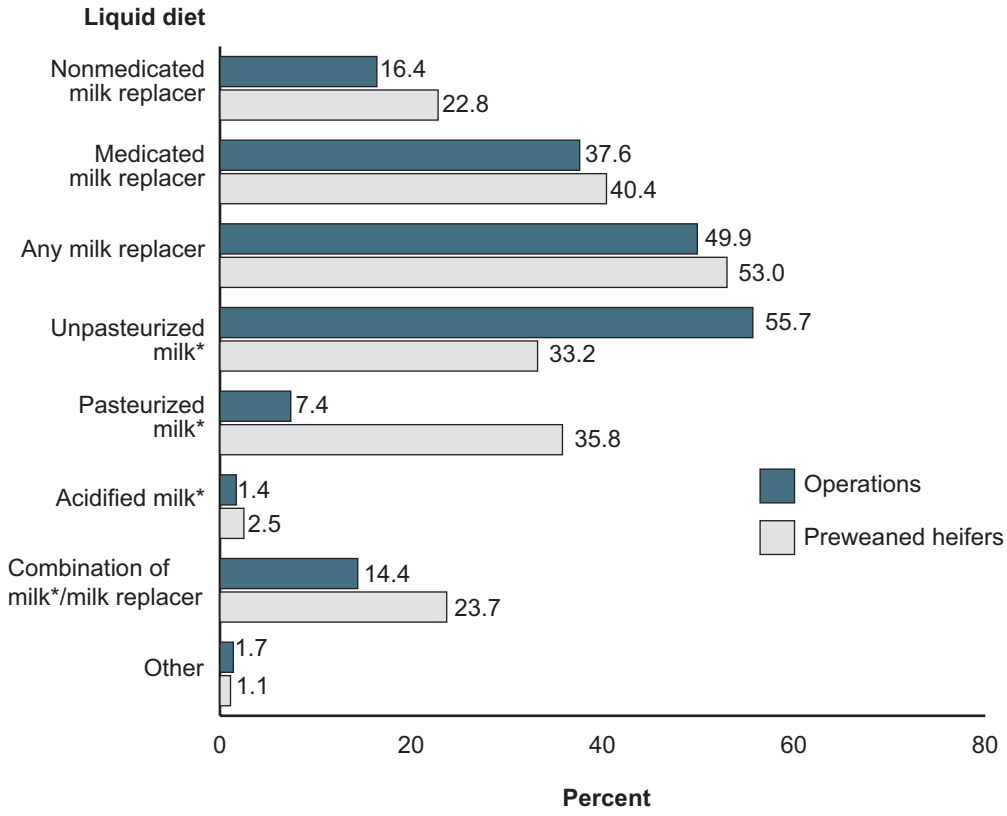
Percent Preweaned Heifers

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Liquid diet	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Any milk replacer	29.7	(7.4)	54.6	(2.9)	64.3	(3.1)	47.7	(3.7)	53.0	(2.3)
Nonmedicated milk replacer	11.5	(4.9)	15.7	(2.1)	20.3	(2.5)	26.5	(3.3)	22.8	(2.0)
Medicated milk replacer	21.1	(7.0)	43.2	(2.9)	50.0	(3.2)	35.3	(3.6)	40.4	(2.2)
Unpasteurized milk*	71.1	(7.6)	56.8	(2.9)	38.9	(3.0)	21.8	(2.7)	33.2	(1.8)
Pasteurized milk*	6.1	(4.5)	2.3	(1.0)	14.9	(2.4)	57.4	(3.5)	35.8	(2.4)
Acidified milk*	3.9	(3.9)	0.9	(0.6)	2.6	(1.0)	2.9	(1.2)	2.5	(0.7)
Combination of milk* and milk replacer	8.2	(4.7)	14.1	(2.1)	19.3	(2.6)	29.3	(3.7)	23.7	(2.2)
Other	4.4	(3.9)	1.0	(0.5)	0.4	(0.3)	1.4	(0.7)	1.1	(0.4)

*Saleable or nonsaleable/waste.

Percentage of operations and percentage of preweaned heifers by type of liquid diet fed to preweaned heifers



*Saleable or nonsaleable/waste.

A higher percentage of preweaned heifers in the West region than in the East region were fed pasteurized saleable or nonsaleable waste milk or a combination of milk and milk replacer.

C.5.d. Percentage of preweaned heifers by type of liquid diet fed, and by region:

	Percent Preweaned Heifers			
	Region			
	West		East	
Liquid diet	**Percent**	**Std. error**	**Percent**	**Std. error**
Any milk replacer	46.8	(5.0)	55.9	(2.3)
Nonmedicated milk replacer	27.1	(4.3)	20.7	(2.1)
Medicated milk replacer	32.9	(4.7)	43.8	(2.4)
Unpasteurized milk*	36.2	(4.2)	31.8	(1.9)
Pasteurized milk*	51.7	(4.9)	28.3	(2.5)
Acidified milk*	0.6	(0.4)	3.3	(1.0)
Combination of milk* and milk replacer	34.5	(4.9)	18.6	(2.3)
Other	0.0	(—)	1.6	(0.6)

*Saleable or nonsaleable/waste.

Whole milk has a higher percentage of protein than most formulations of milk replacer (about 27 and 20 percent protein, respectively). Even though the current recommendation for the percentage of protein in milk replacer is 20 to 28 percent, 20 percent might not always be sufficient, depending on the feeding rate.

The majority of small, medium, and large operations that fed preweaned heifers any milk replacer fed a milk replacer with 20 percent protein; overall, 58.7 percent of operations used this formulation. A lower percentage of small and medium operations (6.6 and 9.4 percent, respectively) fed a formulation with 25 to 29 percent protein compared with large operations (23.0 percent).

C.5.e. For the 49.9 percent of operations that fed any milk replacer (table C.5.a), percentage of operations by percentage of protein in the milk replacer fed to the majority of preweaned heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Percent protein	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
10–19	8.7	(8.4)	0.0	(—)	0.0	(—)	0.0	(—)	0.5	(0.5)
20	47.4	(15.7)	60.7	(3.8)	58.8	(3.6)	51.5	(4.5)	58.7	(2.5)
21–24	25.8	(13.1)	30.7	(3.6)	31.8	(3.4)	25.6	(3.9)	30.5	(2.4)
25–29	18.1	(11.7)	6.6	(2.0)	9.4	(2.1)	23.0	(3.5)	9.3	(1.5)
30 or more	0.0	(—)	1.9	(1.1)	0.0	(—)	0.0	(—)	1.0	(0.6)
Total	100.0		100.0		100.0		100.0		100.0	

Whole milk has a higher percentage of fat than most formulations of milk replacer (about 30 and 20 percent fat, respectively). Higher fat intake may be beneficial in winter but may hinder starter intake in summer.

The majority of operations across herd sizes fed a milk replacer with 20 percent fat, and 81.7 percent of all operations that fed milk replacer fed a 20-percent fat formulation. A higher percentage of large operations (16.4 percent) fed a milk replacer with 10 to 19 percent fat compared with small and medium operations (4.8 and 4.9 percent, respectively).

C.5.f. For the 49.9 percent of operations that fed any milk replacer (table C.5.a), percentage of operations by percentage of fat in the milk replacer fed to the majority of preweaned heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Percent fat	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
10–19	0.0	(—)	4.8	(1.8)	4.9	(1.5)	16.4	(3.5)	5.4	(1.1)
20	71.8	(14.2)	81.5	(3.0)	86.7	(2.4)	65.2	(4.5)	81.7	(2.0)
21-24	9.5	(9.1)	10.3	(2.4)	6.9	(1.9)	16.2	(3.6)	9.5	(1.5)
25–29	18.7	(12.1)	1.5	(0.8)	0.9	(0.6)	2.3	(1.2)	2.2	(0.8)
30 or more	0.0	(—)	1.9	(1.1)	0.5	(0.5)	0.0	(—)	1.2	(0.6)
Total	100.0		100.0		100.0		100.0		100.0	

Overall, 37.6 percent of operations fed medicated milk replacer. Milk replacer medications used by the highest percentage of operations were lasalocid (12.7 percent), decoquinate (11.5 percent), and neomycin and oxytetracycline (9.0 percent). Medications in milk replacer were not reported for 8.0 percent of operations.

C.5.g. Percentage of operations by milk-replacer medications used for any preweaned heifers, and by herd size:

Percent Operations

	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Milk-replacer medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Chlortetracycline (CTC)	0.0	(—)	2.2	(0.8)	1.6	(0.7)	1.2	(0.5)	1.6	(0.4)
Oxytetracycline (OTC)	0.0	(—)	5.6	(1.3)	7.3	(1.5)	1.5	(0.7)	4.9	(0.8)
Neomycin and oxytetracycline (NT, Neo-Terramycin®, Neo-Oxy)	0.0	(—)	8.2	(1.5)	15.0	(2.1)	10.7	(1.6)	9.0	(1.0)
Decoquinate (Deccox®)	3.0	(3.0)	12.3	(1.8)	15.7	(2.1)	7.7	(1.3)	11.5	(1.2)
Lasalocid (Bovatec®)	6.3	(3.7)	11.6	(1.8)	19.0	(2.3)	10.9	(1.9)	12.7	(1.2)
Monensin (Rumensin®)	0.0	(—)	0.9	(0.5)	3.2	(1.0)	4.9	(1.1)	1.7	(0.4)
Other	0.8	(0.8)	0.8	(0.5)	2.3	(0.8)	2.2	(1.1)	1.3	(0.3)
Not reported	10.3	(4.0)	8.9	(1.4)	5.9	(1.3)	4.8	(1.0)	8.0	(1.0)
Any	16.6	(4.9)	38.5	(2.6)	49.2	(2.8)	33.5	(2.6)	37.6	(1.7)

A lower percentage of operations in the West region than in the East region fed milk replacer with oxytetracycline (1.0 and. 5.2 percent, respectively), decoquinate (4.6 and 12.0 percent), lasalocid (3.6 and 13.4 percent), or any medication (22.8 and 38.7 percent).

C.5.h. Percentage of operations by milk-replacer medication used for any preweaned heifers, and by region:

	Percent Operations			
	Region			
	West		East	
Milk-replacer medication	**Percent**	**Std. error**	**Percent**	**Std. error**
Chlortetracycline (CTC)	1.2	(0.6)	1.7	(0.5)
Oxytetracycline (OTC)	1.0	(0.8)	5.2	(0.8)
Neomycin and oxytetracycline (NT, Neo-Terramycin®, Neo-Oxy)	7.2	(1.6)	9.1	(1.0)
Decoquinate (Deccox®)	4.6	(1.3)	12.0	(1.3)
Lasalocid (Bovatec®)	3.6	(1.3)	13.4	(1.3)
Monensin (Rumensin®)	2.9	(0.9)	1.6	(0.4)
Other	3.6	(1.9)	1.1	(0.3)
Not reported	7.9	(2.5)	8.0	(1.1)
Any	22.8	(3.5)	38.7	(1.8)

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The percentage of preweaned heifers fed specific medications in milk replacer were similar to the percentage of operations that fed preweaned heifers specific medications in milk replacer (table C.5.g). The highest percentage of calves were fed neomycin and oxytetracycline (11.0 percent), lasalocid (10.5 percent), and decoquinate (8.9 percent). A higher percentage of preweaned heifers on medium operations were fed decoquinate or lasalocid compared with preweaned heifers on large operations.

C.5.i. Percentage of preweaned heifers by milk-replacer medications used for any calves, and by herd size:

	Percent Preweaned Heifers									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Milk-replacer medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Chlortetracycline (CTC)	0.0	(—)	3.1	(1.3)	1.0	(0.5)	1.9	(1.1)	1.8	(0.7)
Oxytetracycline (OTC)	0.0	(—)	5.6	(1.5)	5.4	(1.5)	0.9	(0.4)	2.8	(0.5)
Neomycin and oxytetracycline (NT, Neo-Terramycin®, Neo-Oxy)	0.0	(—)	8.6	(1.7)	12.1	(2.0)	11.5	(2.9)	11.0	(1.7)
Decoquinate (Deccox®)	4.5	(4.5)	13.4	(2.1)	13.4	(2.3)	5.5	(1.2)	8.9	(1.0)
Lasalocid (Bovatec®)	7.1	(4.9)	10.7	(1.9)	17.5	(2.5)	7.3	(1.6)	10.5	(1.2)
Monensin (Rumensin®)	0.0	(—)	0.6	(0.5)	2.5	(1.0)	5.1	(1.5)	3.6	(0.9)
Other	0.1	(0.1)	0.8	(0.5)	2.2	(0.8)	1.9	(1.1)	1.8	(0.6)
Not reported	13.5	(6.0)	8.5	(1.6)	4.2	(1.0)	3.8	(1.1)	4.8	(0.7)

A lower percentage of preweaned heifers in the West region were fed decoquinate or lasalocid (4.5 and 2.9 percent, respectively) compared with heifers in the East region (10.9 and 14.0 percent, respectively).

C.5.j. Percentage of preweaned heifers by milk-replacer medications used, and by region:

	Percent Preweaned Heifers			
	Region			
	West		East	
Milk-replacer medication	**Percent**	**Std. error**	**Percent**	**Std. error**
Chlortetracycline (CTC)	3.0	(1.9)	1.3	(0.4)
Oxytetracycline (OTC)	0.0	(0.0)	4.1	(0.8)
Neomycin and oxytetracycline (NT, Neo-Terramycin®, Neo-Oxy)	10.7	(3.9)	11.1	(1.8)
Decoquinate (Deccox®)	4.5	(1.5)	10.9	(1.3)
Lasalocid (Bovatec®)	2.9	(1.2)	14.0	(1.6)
Monensin (Rumensin®)	5.8	(2.1)	2.6	(0.8)
Other	2.6	(1.8)	1.4	(0.5)
Not reported	5.3	(1.8)	4.6	(0.7)

The majority of operations across herd sizes fed milk or milk replacer using a bottle or bucket; many operations used both. Frequently, preweaned heifers are started on milk using bottles and then transitioned to buckets. Some feeding systems allow multiple calves to feed at the same time; a trough or mob feeder was used on 6.0 percent of operations, and an in-line milk feeding system was used on 1.3 percent of operations.

The only regional difference in the methods of providing milk to calves was that a lower percentage of operations in the West region (49.3 percent) used buckets for feeding compared with operations in the East region (74.1 percent).

C.5.k. Percentage of operations by method used to feed milk or milk replacer to preweaned heifers, and by herd size and region:

Percent Operations

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bottle	79.5	(2.1)	73.5	(2.5)	73.9	(2.6)	82.2	(3.7)	76.8	(1.6)	77.2	(1.5)
Bucket	73.4	(2.2)	73.9	(2.4)	60.0	(2.5)	49.3	(3.1)	74.1	(1.7)	72.3	(1.6)
Trough or mob feeder (e.g., milk bar)	5.5	(1.2)	7.1	(1.6)	6.3	(1.2)	3.9	(1.1)	6.2	(0.9)	6.0	(0.9)
In-line milk feeding system (free choice)	0.4	(0.4)	2.8	(0.9)	3.3	(0.9)	0.4	(0.3)	1.4	(0.4)	1.3	(0.3)
Other	0.3	(0.3)	0.7	(0.4)	2.1	(0.7)	0.2	(0.2)	0.6	(0.3)	0.6	(0.2)

The percentage of heifer calves by method used to feed milk or milk replacer was similar to the percentage of operations in the preceding table. A higher percentage of preweaned heifers on small and medium operations (71.9 and 68.5 percent, respectively) were fed with a bucket compared with heifers on large operations (49.9 percent).

A higher percentage of preweaned heifers in the West region (72.1 percent) received milk via a bottle compared with heifers in the East region (58.2 percent), while a lower percentage of calves in the West region than the East region were fed milk or milk replacer using other methods.

C.5.l. Percentage of preweaned heifers by method used to feed milk or milk replacer, and by herd size and region:

Percent Preweaned Heifers

	Herd Size (number of cows)						**Region**					
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**West**		**East**		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bottle	70.3	(2.4)	60.3	(2.9)	61.4	(3.3)	72.1	(4.0)	58.2	(2.4)	62.7	(2.1)
Bucket	71.9	(2.2)	68.5	(2.8)	49.9	(3.2)	32.9	(3.9)	71.0	(2.1)	58.8	(2.0)
Trough or mob feeder (e.g., milk bar)	4.7	(1.2)	3.6	(1.0)	2.9	(0.9)	1.4	(0.6)	4.4	(0.8)	3.4	(0.6)
In-line milk feeding system (free choice)	0.0	(0.0)	4.1	(1.5)	3.2	(1.2)	0.0	(0.0)	4.3	(1.2)	2.9	(0.8)
Other	0.2	(0.2)	0.3	(0.2)	1.3	(0.6)	0.9	(0.8)	0.8	(0.3)	0.8	(0.3)

Research shows numerous health benefits to feeding calves milk replacer three times daily, as opposed to twice daily. A higher percentage of very small, small, and medium operations (91.6, 97.2, and 93.9 percent, respectively) fed preweaned heifers twice a day compared with large operations (84.4 percent). A higher percentage of large operations fed preweaned heifers three times a day compared with the other herd sizes.

C.5.m. Percentage of operations by frequency that milk or milk replacer was fed to preweaned heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency (times per day)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1	2.6	(2.6)	0.6	(0.4)	0.3	(0.3)	0.3	(0.3)	0.8	(0.4)
2	91.6	(3.7)	97.2	(0.9)	93.9	(1.2)	84.4	(2.0)	94.6	(0.8)
3	2.9	(2.0)	1.9	(0.7)	3.0	(0.9)	9.4	(1.7)	2.9	(0.5)
Free choice	2.9	(2.0)	0.3	(0.3)	2.4	(0.8)	3.8	(1.0)	1.5	(0.4)
Other	0.0	(—)	0.0	(—)	0.4	(0.3)	2.1	(0.8)	0.3	(0.1)
Total	100.0		100.0		100.0		100.0		100.0	

The majority of preweaned heifers (88.9 percent) were fed twice daily; only 6.8 percent were fed three times daily.

C.5.n. Percentage of preweaned heifers by frequency that milk or milk replacer was fed, and by herd size:

Percent Preweaned Heifers

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency (times per day)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1	0.5	(0.5)	0.2	(0.2)	0.2	(0.2)	0.5	(0.4)	0.3	(0.2)
2	96.8	(1.9)	97.2	(1.0)	92.4	(1.8)	84.4	(2.5)	88.9	(1.5)
3	2.0	(1.8)	2.3	(0.9)	3.4	(1.2)	10.0	(2.1)	6.8	(1.2)
Free choice	0.7	(0.6)	0.3	(0.3)	3.2	(1.2)	3.5	(1.2)	2.8	(0.8)
Other	0.0	(—)	0.0	(—)	0.8	(0.6)	1.6	(0.7)	1.1	(0.4)
Total	100.0		100.0		100.0		100.0		100.0	

The majority of all operations (57.7 percent) fed preweaned heifers 2 quarts of milk or milk replacer at each feeding, while 22.0 percent fed 4 quarts or more. The percentages of operations by the amount of milk or milk replacer fed at each feeding were similar for very small, small, and medium operations.

C.5.o. Percentage of operations by amount of milk or milk replacer (quarts) routinely fed to preweaned heifers at each feeding, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Amount fed (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
2 or less	64.9	(6.3)	58.5	(2.6)	56.7	(2.8)	41.5	(2.7)	57.7	(1.8)
More than 2 but less than 4	14.6	(4.8)	21.2	(2.2)	20.7	(2.2)	23.3	(2.3)	20.3	(1.5)
4 or more	20.5	(5.0)	20.2	(2.1)	22.6	(2.4)	35.2	(2.8)	22.0	(1.5)
Total	100.0		100.0		100.0		100.0		100.0	

The percentage of preweaned heifers that received 2 quarts or less of milk at each feeding decreased as herd size increased, while the percentage of heifers receiving 4 quarts or more increased as herd size increased.

C.5.p. Percentage of preweaned heifers by amount of milk or milk replacer (quarts) fed at each feeding, and by herd size:

Percent Preweaned Heifers

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Amount fed (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
2 or less	63.9	(8.3)	58.8	(2.8)	51.8	(3.3)	39.4	(3.6)	46.5	(2.2)
More than 2 but less than 4	21.6	(7.8)	21.9	(2.4)	23.1	(2.8)	24.0	(3.0)	23.4	(1.9)
4 or more	14.5	(4.6)	19.3	(2.3)	25.1	(2.9)	36.6	(3.8)	30.2	(2.3)
Total	100.0		100.0		100.0		100.0		100.0	

Traditionally, preweaned heifers have been fed 4 quarts of milk or milk replacer daily. When allowed to feed at will, however, preweaned calves consumed twice as much—8 to 10 quarts daily.

The majority of very small, small, and medium operations fed 4 to 5 quarts of milk or milk replacer per calf, per day. A higher percentage of large operations fed 8 to 9 quarts per day compared with the other herd sizes. Less than 10 percent of operations fed 10 quarts or more per day. More than half of operations (53.3 percent) fed 4 to 5 quarts per calf, per day, and more than half of preweaned heifers (54.5 percent) were fed 6 or more quarts per day.

C.5.q. Percentage of operations by amount of milk or milk replacer (quarts) fed per preweaned heifer per day, and by herd size:

Percent Operations*

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Amount fed (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 4	5.4	(3.2)	2.5	(0.8)	2.9	(0.8)	3.8	(1.0)	3.1	(0.7)
4–5	55.7	(6.9)	54.9	(2.6)	53.9	(2.8)	34.7	(2.6)	53.3	(1.8)
6–7	17.4	(5.3)	21.9	(2.2)	21.4	(2.3)	24.5	(2.3)	21.3	(1.5)
8–9	13.1	(4.6)	15.5	(1.9)	16.0	(2.1)	27.6	(2.7)	16.2	(1.3)
10 or more	8.4	(3.2)	5.2	(1.1)	5.8	(1.3)	9.4	(1.9)	6.1	(0.8)
Total	100.0		100.0		100.0		100.0		100.0	

*Excludes operations that reported “other” feeding frequency in table C.5.m.

More than half of preweaned heifers (54.5 percent) were fed 6 quarts or more of milk per day. The majority of heifer calves on very small, small, and medium operations received 5 quarts or less of milk or milk replacer per day.

C.5.r. Percentage of preweaned heifers by amount of milk or milk replacer (quarts) fed per day, and by herd size:

	Percent Preweaned Heifers*									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Amount fed (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 4	2.8	(2.3)	2.0	(0.7)	3.6	(1.3)	3.2	(1.0)	3.1	(0.7)
4–5	58.7	(8.8)	55.3	(2.8)	48.4	(3.2)	34.6	(3.6)	42.3	(2.2)
6–7	23.9	(8.0)	23.0	(2.5)	24.2	(2.9)	23.5	(3.0)	23.6	(1.9)
8–9	8.4	(3.6)	14.6	(2.0)	18.4	(2.6)	27.2	(3.4)	22.3	(2.0)
10 or more	6.2	(2.8)	5.1	(1.2)	5.4	(1.3)	11.5	(3.0)	8.6	(1.7)
Total	100.0		100.0		100.0		100.0		100.0	

*Excludes the 1.1 percent of preweaned heifers from operations that reported “other” feeding frequency in table C.5.n.

As calves grow, their nutrient requirements increase. There were no differences across herd sizes in the percentage of operations that modified liquid feeding amounts based on age or size of the calf with 61.1 percent of all operations making diet modifications.

C.5.s. Percentage of operations that modified the amount of milk or milk replacer fed depending on the age or size of the calf, and by herd size:

Percent Operations							
Herd Size (number of cows)							
Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
61.4	(2.6)	59.1	(2.9)	65.7	(2.8)	61.1	(1.8)

Cleaning and disinfecting milk-feeding equipment helps decrease calf-to-calf disease transmission. Ideally, feeding equipment should be cleaned and disinfected between each calf.

The majority of small and medium operations either rinsed milk-feeding equipment with water after each feeding, or rinsed and disinfected after each feeding. Overall, 42.8 percent of operations rinsed and disinfected milk-feeding equipment after each feeding. A higher percentage of large operations (63.2 percent) rinsed and disinfected milk-feeding equipment after each feeding compared with small and medium operations (37.7 and 47.4 percent, respectively).

C.5.t. Percentage of operations by primary method used to clean milk feeding equipment, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Rinsed with water after each feeding	46.4	(2.6)	37.9	(2.8)	15.1	(2.0)	41.1	(1.8)
Rinsed with water once a day	1.5	(0.6)	2.8	(0.9)	6.1	(1.7)	2.3	(0.5)
Rinsed and disinfected after each feeding	37.7	(2.5)	47.4	(2.8)	63.2	(2.7)	42.8	(1.8)
Rinsed and disinfected once a day	7.9	(1.4)	6.1	(1.3)	10.2	(1.6)	7.5	(1.0)
Rinsed and disinfected less often than once a day	3.7	(1.0)	4.2	(1.2)	2.5	(0.8)	3.7	(0.7)
Rinsed and disinfected after the dairy heifers were weaned and moved	1.8	(0.7)	1.7	(0.7)	2.0	(1.1)	1.8	(0.5)
Other	1.0	(0.5)	0.1	(0.1)	0.9	(0.4)	0.7	(0.3)
Total	100.0		100.0		100.0		100.0	

Current recommendations for providing water, starter, and hay to calves have been published in the Bovine Alliance in Management and Nutrition publication “A Guide to Dairy Calf Feeding and Management.” This publication recommends that calves have fresh water starting at 1 day of age. Starter grain should be introduced by 4 days of age, and calves should be consuming 1.5 to 2.0 pounds of starter per day before weaning.

Small operations first offered water to preweaned heifers at 20.0 days of age, while preweaned heifers on large operations received their first water at 7.8 days of age. Overall, water was first offered to preweaned heifers at 17.3 days of age. Similar percentages were observed for average days to starter grain or other concentrate feeds. Very small operations offered preweaned heifers starter at 17.6 days of age compared with 6.3 days for large operations. Days to when hay was first offered increased as herd size increased, with very small operations offering hay at 29.9 days and large operations offering hay at 58.1 days.

C.5.u. Operation average age of heifers when first offered the following diets (days), by herd size:

	Operation Average Age (d)									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Diet	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Water	15.6	(2.5)	20.0	(1.1)	15.4	(1.1)	7.8	(1.0)	17.3	(0.7)
Starter grain or other concentrates	17.6	(3.4)	10.9	(0.7)	8.0	(0.4)	6.3	(0.3)	10.8	(0.6)
Hay or other roughages	29.9	(4.8)	31.5	(1.5)	43.1	(1.7)	58.1	(1.7)	36.0	(1.2)

6. Weaning

Calves should be weaned as soon as they are consuming 2.0 pounds of starter daily, which can occur when calves are only 6 to 8 weeks of age. Other criteria used include calves reaching a specified age or weight.

The overall operation average weaning age for preweaned heifers was 9.0 weeks. Very small operations weaned heifers at an older age (11.6 weeks) compared with the other herd sizes.

C.6.a. Operation average age of heifers at weaning (weeks), by herd size:

Operation Average Age (wk)									
Herd Size (number of cows)									
Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
11.6	(0.9)	8.7	(0.2)	8.3	(0.1)	8.9	(0.1)	9.0	(0.2)

Approximately one-third of operations (34.1 percent) weaned heifers at 9 weeks of age. Few operations weaned at 4 weeks or less, but almost one-fifth of operations (18.9 percent) weaned at 13 weeks or more.

C.6.b. Percentage of operations by operation average weaning age (weeks) of heifers, and by herd size:

	Percent Operations									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Operation average weaning age (wk)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
4 or less	3.9	(2.8)	1.9	(0.7)	1.3	(0.8)	0.6	(0.4)	1.9	(0.6)
5	0.0	(—)	2.4	(0.8)	0.9	(0.5)	0.4	(0.2)	1.5	(0.5)
6	4.1	(2.8)	3.2	(0.9)	5.8	(1.4)	3.9	(1.3)	4.0	(0.7)
7	16.9	(5.1)	18.6	(2.1)	19.7	(2.2)	10.0	(1.5)	18.0	(1.4)
8	4.2	(3.1)	9.5	(1.6)	9.4	(1.6)	16.1	(2.1)	9.2	(1.0)
9	22.0	(5.8)	35.4	(2.5)	38.5	(2.8)	32.7	(2.7)	34.1	(1.7)
10	0.0	(—)	3.5	(1.0)	2.7	(1.0)	6.8	(1.6)	3.0	(0.6)
11	7.3	(2.9)	6.4	(1.3)	9.0	(1.6)	11.4	(1.7)	7.6	(0.9)
12	4.2	(2.4)	0.7	(0.5)	2.1	(0.9)	3.2	(0.9)	1.7	(0.5)
13 or more	37.4	(6.7)	18.4	(2.0)	10.7	(1.6)	15.0	(1.9)	18.9	(1.5)
Total	100.0		100.0		100.0		100.0		100.0	

The majority of small and large operations (51.4 and 54.8 percent, respectively) weaned heifers based on a target age. About one-fifth of operations (21.5 percent) weaned their heifers when they were eating at least the recommended 2 pounds of starter for 3 consecutive days. A higher percentage of medium operations than large operations weaned based on starter intake (26.1 and 14.9 percent, respectively).

C.6.c. Percentage of operations by primary factor used to determine when to wean heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary factor	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Consumed at least 2 lb of starter for 3 consecutive days	20.1	(2.0)	26.1	(2.5)	14.9	(1.9)	21.5	(1.5)
Reached the target weaning age	51.4	(2.6)	46.4	(2.8)	54.8	(2.8)	50.2	(1.8)
Reached the target weaning weight	21.6	(2.1)	21.3	(2.3)	19.9	(2.2)	21.3	(1.5)
Needed the space for other preweaned calves	3.0	(0.9)	5.2	(1.3)	6.6	(1.5)	4.0	(0.7)
Other	3.9	(1.0)	1.1	(0.5)	3.8	(1.1)	3.0	(0.7)
Total	100.0		100.0		100.0		100.0	

7. Vaccines and other preventive practices

The percentage of operations that vaccinated preweaned heifers against any disease increased as herd size increased, ranging from 37.0 percent of small operations to 81.3 percent of large operations. Overall, 49.3 percent of operations vaccinated heifers against any disease. The most common vaccines administered to preweaned heifers were infectious bovine rhinotracheitis (34.0 percent of operations), parainfluenza type-3 (32.8 percent), and bovine respiratory syncytial virus (28.2 percent).

C.7.a. Percentage of operations that vaccinated preweaned heifers against the following diseases during 2013, by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Infectious bovine rhinotracheitis (IBR)	24.8	(2.3)	45.0	(2.9)	64.0	(2.8)	34.0	(1.7)
Parainfluenza type 3 (PI3)	23.7	(2.2)	44.2	(2.9)	59.8	(2.9)	32.8	(1.7)
Bovine respiratory syncytial virus (BRSV)	19.7	(2.1)	39.4	(2.9)	52.3	(2.9)	28.2	(1.6)
Bovine viral diarrhea (BVD)	15.9	(1.9)	23.8	(2.5)	38.2	(2.7)	20.1	(1.4)
Rotavirus	9.1	(1.4)	19.1	(2.2)	24.6	(2.5)	13.4	(1.1)
Clostridia	8.3	(1.4)	18.5	(2.2)	26.7	(2.3)	12.8	(1.1)
Leptospirosis	9.1	(1.5)	17.0	(2.2)	20.8	(2.3)	12.4	(1.2)
E. coli	8.3	(1.4)	16.5	(2.2)	12.0	(1.6)	11.0	(1.1)
Histophilus somni[1]	1.7	(0.7)	5.8	(1.3)	6.9	(1.6)	3.4	(0.6)
Mannheimia haemolytica	0.9	(0.5)	6.8	(1.4)	8.2	(1.4)	3.2	(0.5)
Salmonella	0.7	(0.4)	5.0	(1.3)	6.7	(1.5)	2.5	(0.5)
Mycobacterium avium subspecies *paratuberculosis* (MAP)[2]	0.6	(0.4)	2.3	(0.8)	1.5	(0.6)	1.2	(0.3)
Brucellosis	0.5	(0.3)	0.2	(0.2)	0.2	(0.2)	0.4	(0.2)
Rabies	0.0	(—)	0.2	(0.2)	0.3	(0.3)	0.1	(0.1)
Any disease	37.0	(2.5)	64.7	(2.8)	81.3	(2.4)	49.3	(1.7)

[1]Formerly *Haemophilus somnus*.

[2]Some States do not allow MAP vaccination due to interference with bovine TB testing.

A higher percentage of operations in the West region (77.1 percent) vaccinated preweaned heifers for any disease compared with operations in the East region (47.2 percent).

C.7.b. Percentage of operations that vaccinated preweaned heifers against the following diseases during 2013, by region:

	Percent Operations[1]			
	Region			
	West		East	
Disease	**Percent**	**Std. error**	**Percent**	**Std. error**
Infectious bovine rhinotracheitis (IBR)	55.2	(4.7)	32.6	(1.8)
Parainfluenza Type 3 (PI3)	51.3	(4.7)	31.5	(1.7)
Bovine respiratory syncytial virus (BRSV)	40.8	(4.6)	27.4	(1.7)
Bovine viral diarrhea (BVD)	39.5	(4.6)	18.8	(1.5)
Rotavirus	15.1	(2.2)	13.2	(1.2)
Clostridia	25.1	(3.9)	12.0	(1.1)
Leptospirosis	24.7	(4.3)	11.6	(1.2)
E. coli	7.1	(1.8)	11.3	(1.2)
Histophilus somni[2]	11.9	(3.7)	2.8	(0.6)
Mannheimia haemolytica	8.9	(3.1)	2.9	(0.5)
Salmonella	5.8	(1.7)	2.2	(0.5)
Mycobacterium avium subspecies *paratuberculosis* (MAP)[3]	0.0	(—)	1.2	(0.3)
Brucellosis	1.2	(0.9)	0.3	(0.2)
Rabies	0.0	(—)	0.1	(0.1)
Any	77.1	(4.0)	47.2	(1.8)

[1]Excludes very small operations (<30 cows).
[2]Formerly *Haemophilus somnus.*
[3]Some States do not allow MAP vaccination due to interference with bovine TB testing.

Bovine viral diarrhea (BVD) virus causes a variety of clinical signs in cattle, including diarrhea, fever, and abortion. Calves born with BVD infection are termed persistently infected (PI), since they never eliminate the infection and can shed large amounts of virus. Most BVD control programs are centered on finding and eliminating PI calves.

Overall, 4.7 percent of operations, representing 22.2 percent of heifer calves, routinely tested heifer calves for BVD. The percentage of operations that routinely tested heifer calves for BVD increased as herd size increased, ranging from 1.0 percent of small operations to 26.0 percent of large operations. Large operations accounted for the highest percentage of heifer calves on operations that routinely tested for BVD (32.6 percent).

C.7.c. Percentage of operations that routinely tested calves for BVD, and percentage of heifer calves on those operations, by herd size:

Percent

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	3.8	(2.1)	1.0	(0.5)	4.6	(1.2)	26.0	(2.0)	4.7	(0.5)
Heifer calves	3.0	(2.6)	1.5	(0.9)	6.2	(1.8)	32.6	(2.9)	22.2	(2.0)

Of operations that tested heifer calves for BVD, 48.7 percent tested individual ear notches. A higher percentage of large operations (60.0 percent) than medium operations (25.5 percent) tested individual ear notches.

C.7.d. For the 4.7 percent of operations that routinely tested heifer calves for BVD (table C.7.c), percentage of operations by testing method used and by herd size:

Percent Operations

Herd Size (number of cows)

Method	Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Individual ear notch	*		25.5	(11.1)	60.0	(4.6)	48.7	(5.3)
Pooled ear notch	0.0	(—)	28.5	(11.7)	23.6	(4.3)	21.9	(4.3)
Individual blood sample	*		37.4	(13.5)	8.8	(2.5)	22.6	(5.8)
Pooled blood samples	0.0	(—)	24.6	(11.1)	11.5	(2.9)	13.5	(3.6)
Other	0.0	(—)	13.5	(12.0)	3.5	(1.7)	5.7	(3.6)

*Too few to report.

D. Weaned and Pregnant Heifer Management

1. Housing

The majority of operations housed weaned and pregnant heifers during 2013. A lower percentage of large operations housed weaned heifers compared with the other herd sizes.

D.1.a. Percentage of operations that housed or reared weaned or pregnant heifers on the operation, by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Weaned	96.5	(2.1)	98.1	(0.7)	98.1	(0.7)	90.5	(1.3)	97.1	(0.5)
Pregnant	93.7	(3.3)	99.0	(0.5)	99.7	(0.3)	98.5	(0.5)	98.4	(0.5)
Either	97.9	(1.5)	99.6	(0.3)	99.7	(0.3)	98.9	(0.4)	99.3	(0.3)

A broad range of housing types was used for weaned heifers. The two most common were open/dry lot with barn or shed (21.9 percent of operations) and multiple-animal inside area/barn (32.7 percent). Housing weaned heifers in tie stalls or stanchions decreased as herd size increased. Large operations accounted for the highest percentage of operations that housed weaned heifers in an open/dry lot without barn or shed.

D.1.b. Percentage of operations by primary housing type used for **weaned** heifers, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary housing type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Individual outside hutch/ pen	1.4	(1.4)	1.5	(0.6)	0.6	(0.4)	2.9	(0.7)	1.4	(0.4)
Individual inside hutch/pen, warm	0.0	(—)	1.7	(0.7)	3.0	(0.9)	1.2	(0.4)	1.7	(0.4)
Individual inside hutch/pen, cold	17.7	(5.3)	9.9	(1.6)	6.9	(1.4)	3.0	(0.7)	9.6	(1.2)
Tie stall or stanchion	13.1	(3.8)	6.5	(1.2)	1.8	(0.8)	0.0	(—)	5.7	(0.9)
Pasture	12.3	(4.0)	4.4	(1.0)	7.1	(1.4)	1.9	(0.8)	6.0	(0.9)
Freestall with no access to open/dry lot	4.0	(2.2)	4.9	(1.2)	5.7	(1.2)	10.5	(1.7)	5.5	(0.8)
Freestall with access to open/ dry lot	5.6	(2.9)	7.2	(1.3)	5.8	(1.3)	11.4	(1.4)	7.0	(0.9)
Open/dry lot without barn or shed*	3.9	(2.9)	4.7	(1.1)	4.8	(1.2)	14.5	(1.5)	5.6	(0.8)
Open/dry lot with barn or shed	18.9	(5.2)	21.3	(2.1)	24.5	(2.3)	22.8	(1.9)	21.9	(1.4)
Multiple animal inside area/barn	19.7	(4.9)	35.8	(2.5)	37.9	(2.7)	22.3	(1.9)	32.7	(1.6)
Not housed on operation	3.5	(2.1)	1.9	(0.7)	1.9	(0.7)	9.5	(1.3)	2.9	(0.5)
Total	100.0		100.0		100.0		100.0		100.0	

*With or without shade structures.

The primary housing used for pregnant heifers were open/dry lot with barn or shed (27.8 percent of operations), freestall with access to open/dry lot (18.5 percent), multiple-animal inside area/barn (15.0 percent), and pasture (12.6 percent).

D.1.c. Percentage of operations by primary housing type used for **pregnant** heifers, and by herd size:

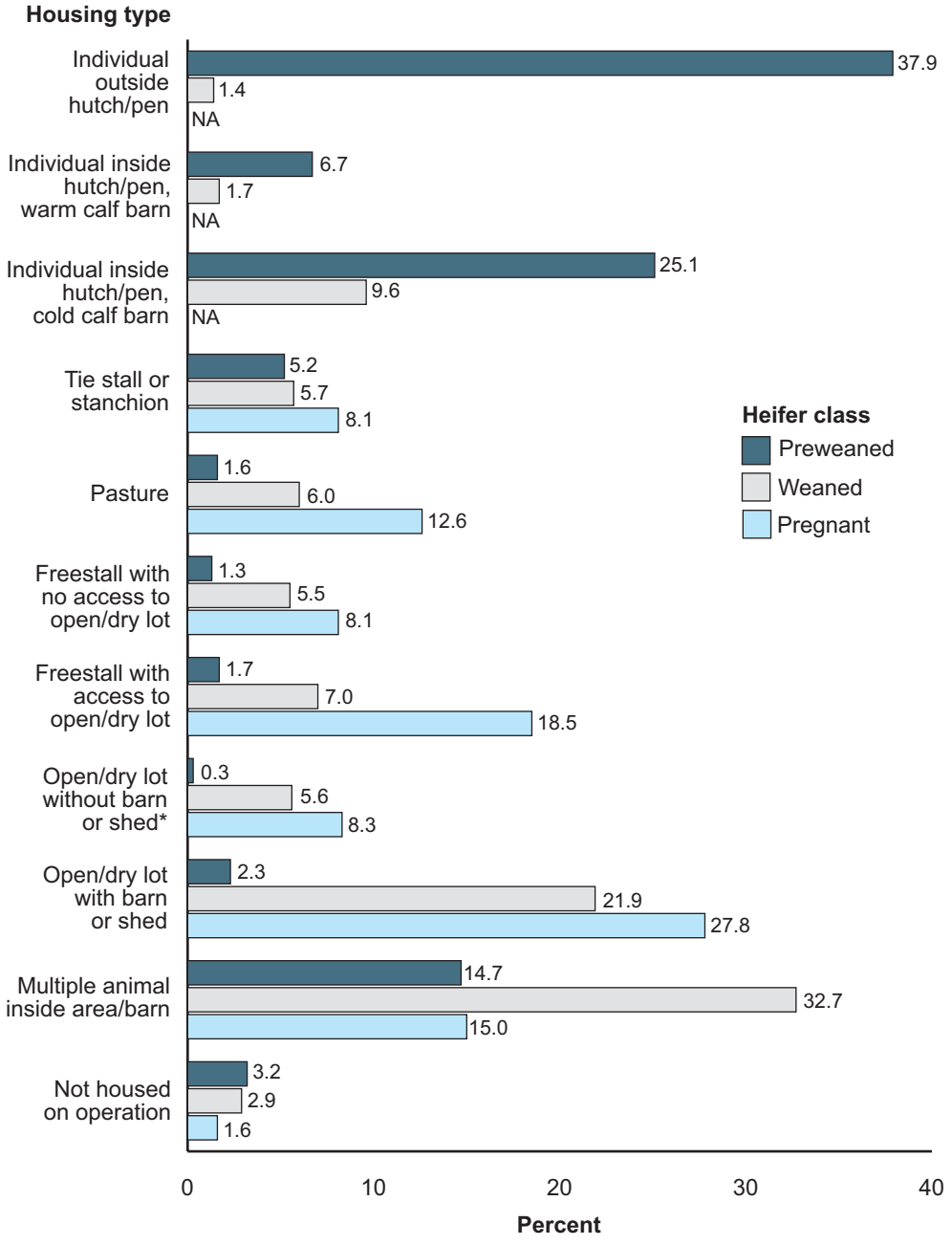
Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary housing type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Tie stall or stanchion	21.2	(5.1)	9.7	(1.6)	0.9	(0.5)	0.0	(—)	8.1	(1.1)
Pasture	17.5	(4.9)	11.8	(1.5)	14.1	(1.9)	6.4	(1.3)	12.6	(1.1)
Freestall with no access to open/dry lot	0.0	(—)	5.2	(1.2)	11.3	(1.7)	25.7	(1.8)	8.1	(0.8)
Freestall with access to open/dry lot	14.1	(5.1)	18.6	(2.1)	19.5	(2.2)	21.3	(1.8)	18.5	(1.4)
Open/dry lot without barn or shed*	4.6	(2.6)	6.3	(1.3)	9.7	(1.5)	20.7	(1.6)	8.3	(0.8)
Open/dry lot with barn or shed	23.0	(5.8)	29.5	(2.3)	30.2	(2.5)	18.8	(1.9)	27.8	(1.6)
Multiple animal inside area/barn	13.3	(4.6)	17.8	(2.0)	14.0	(2.0)	5.6	(1.1)	15.0	(1.3)
Not housed on operation	6.3	(3.3)	1.0	(0.5)	0.3	(0.3)	1.5	(0.5)	1.6	(0.5)
Total	100.0		100.0		100.0		100.0		100.0	

*With or without shade structures.

Percentage of operations by primary housing type used for preweaned, weaned, and pregnant heifers



*With or without shade structures.

The percentage of operations that allowed weaned or pregnant heifers on pasture decreased as herd size increased. More than three-fourths of very small operations allowed heifers on pasture compared with less than one-third of large operations. Overall, 58.0 percent of operations allowed weaned heifers on pasture, and 74.1 percent allowed pregnant heifers on pasture.

D.1.d. For operations that housed weaned and/or pregnant heifers (97.1 and 98.4 percent, respectively) [table D.1.a], percentage of operations that allowed heifers on pasture, by heifer class and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Heifer class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Weaned	77.0	(5.4)	65.7	(2.5)	44.8	(2.8)	20.1	(2.1)	58.0	(1.7)
Pregnant	85.9	(4.8)	83.3	(1.9)	65.3	(2.6)	30.3	(2.3)	74.1	(1.4)

2. Vaccination and other preventive practices

A lower percentage of small operations (65.2 percent) vaccinated weaned heifers against any disease compared with medium and large operations (85.0 and 89.9 percent, respectively). The four vaccines administered by the highest percentages of operations were infectious bovine rhinotracheitis (64.1 percent), BVD (63.8 percent), parainfluenza type 3 (58.4 percent), and bovine respiratory syncytial virus (56.8 percent).

D.2.a. Percentage of operations that vaccinated **weaned** heifers against the following diseases, by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Infectious bovine rhinotracheitis (IBR)	55.0	(2.7)	77.2	(2.6)	81.8	(2.1)	64.1	(1.8)
Bovine viral diarrhea (BVD)	55.4	(2.7)	76.1	(2.6)	80.1	(2.1)	63.8	(1.8)
Parainfluenza Type 3 (PI3)	50.1	(2.7)	70.4	(2.8)	74.8	(2.3)	58.4	(1.8)
Bovine respiratory syncytial virus (BRSV)	49.0	(2.7)	68.5	(2.8)	70.6	(2.4)	56.8	(1.8)
Leptospirosis	39.1	(2.6)	50.2	(2.9)	49.1	(2.6)	43.3	(1.8)
Clostridia	10.6	(1.5)	23.4	(2.3)	55.0	(2.6)	18.7	(1.2)
Histophilus somni[1]	4.5	(1.0)	10.7	(1.8)	13.6	(1.8)	7.2	(0.8)
Brucellosis	5.6	(1.2)	8.3	(1.6)	5.7	(1.1)	6.4	(0.9)
Mannheimia haemolytica	4.3	(1.0)	8.6	(1.6)	8.5	(1.4)	5.9	(0.8)
Salmonella	1.2	(0.5)	2.5	(0.9)	7.4	(1.4)	2.2	(0.4)
E. coli	1.5	(0.6)	2.0	(0.7)	5.6	(1.1)	2.0	(0.4)
Rotavirus	0.2	(0.2)	1.3	(0.6)	2.9	(0.8)	0.8	(0.2)
Rabies	0.3	(0.3)	0.4	(0.4)	0.5	(0.5)	0.4	(0.2)
Mycobacterium avium subspecies *paratuberculosis* (MAP)[2]	0.3	(0.3)	0.0	(—)	0.0	(—)	0.2	(0.2)
Any	65.2	(2.5)	85.0	(2.1)	89.9	(1.7)	73.5	(1.7)

[1]Formerly *Haemophilus somnus.*

[2]Some States do not allow MAP vaccination due to interference with bovine TB testing.

A higher percentage of operations in the West region than in the East region administered vaccines to weaned heifers (88.4 and 72.1 percent, respectively); however, most vaccines were administered by similar percentages of operations in each region. The one notable exception was vaccination against clostridia: 52.3 percent of operations in the West region administered clostridia vaccinations compared with 15.7 percent in the East region.

D.2.b. Percentage of operations that vaccinated **weaned** heifers against the following diseases, by region:

	Percent Operations[1]			
	Region			
	West		East	
Disease	**Percent**	**Std. error**	**Percent**	**Std. error**
Infectious bovine rhinotracheitis (IBR)	73.5	(3.8)	63.3	(1.9)
Bovine viral diarrhea (BVD)	72.5	(3.6)	63.1	(1.9)
Parainfluenza Type 3 (PI3)	68.3	(3.9)	57.6	(2.0)
Bovine respiratory syncytial virus (BRSV)	61.0	(3.9)	56.5	(2.0)
Leptospirosis	46.3	(3.9)	43.1	(2.0)
Clostridia	52.3	(3.9)	15.7	(1.2)
Histophilus somni[2]	14.7	(3.1)	6.6	(0.9)
Brucellosis	7.4	(2.5)	6.3	(0.9)
Mannheimia haemolytica	6.8	(2.6)	5.9	(0.8)
Salmonella	3.8	(0.8)	2.0	(0.5)
E. coli	5.3	(1.2)	1.8	(0.5)
Rotavirus	2.2	(0.7)	0.6	(0.2)
Rabies	0.0	(—)	0.4	(0.2)
Mycobacterium avium subspecies *paratuberculosis* (MAP)[3]	0.0	(—)	0.2	(0.2)
Any	88.4	(2.6)	72.1	(1.8)

[1]Excludes very small operations (<30 cows).
[2]Formerly *Haemophilus somnus.*
[3]Some States do not allow MAP vaccination due to interference with bovine TB testing.

Overall, 61.1 percent of operations administered vaccines to pregnant heifers. More than 40 percent of operations administered five different vaccines to pregnant heifers: infectious bovine rhinotracheitis (47.0 percent), BVD (46.9 percent), parainfluenza type 3 (44.7 percent), bovine respiratory syncytial virus (44.1 percent), and leptospirosis (41.5 percent). The percentages of operations that vaccinated against rotavirus, *Salmonella*, *E. coli,* and clostridia vaccines, increased as herd size increased.

D.2.c. Percentage of operations that vaccinated **pregnant** heifers against the following diseases, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Infectious bovine rhinotracheitis (IBR)	40.6	(2.6)	56.7	(2.9)	57.4	(2.5)	47.0	(1.8)
Bovine viral diarrhea (BVD)	41.3	(2.6)	55.3	(2.9)	56.2	(2.5)	46.9	(1.8)
Parainfluenza Type 3 (PI3)	38.9	(2.6)	53.5	(2.9)	54.2	(2.5)	44.7	(1.8)
Bovine respiratory syncytial virus (BRSV)	38.8	(2.6)	52.5	(2.9)	52.0	(2.5)	44.1	(1.8)
Leptospirosis	36.5	(2.5)	48.0	(2.9)	52.6	(2.5)	41.5	(1.8)
Clostridia	6.3	(1.2)	21.3	(2.3)	52.1	(2.5)	15.4	(1.0)
E. coli	6.1	(1.2)	18.3	(2.2)	46.5	(2.4)	13.9	(1.0)
Rotavirus	2.2	(0.7)	10.2	(1.7)	28.1	(2.3)	7.3	(0.7)
*Histophilus somni**	5.3	(1.2)	8.6	(1.6)	8.4	(1.3)	6.6	(0.8)
Salmonella	1.7	(0.7)	8.8	(1.5)	24.3	(2.1)	6.1	(0.7)
Mannheimia haemolytica	2.1	(0.7)	4.8	(1.1)	3.9	(0.9)	3.0	(0.6)
Rabies	0.0	(—)	0.4	(0.4)	0.0	(—)	0.1	(0.1)
Any	51.3	(2.6)	71.4	(2.6)	87.1	(1.7)	61.1	(1.7)

*Formerly *Haemophilus somnus.*

A higher percentage of operations in the West region than in the East region vaccinated pregnant heifers against any disease (82.8 and 59.0 percent, respectively). Similarly, a higher percentages of operations in the West region than in the East region vaccinated for rotavirus, *Salmonella*, *E. coli,* and clostridia.

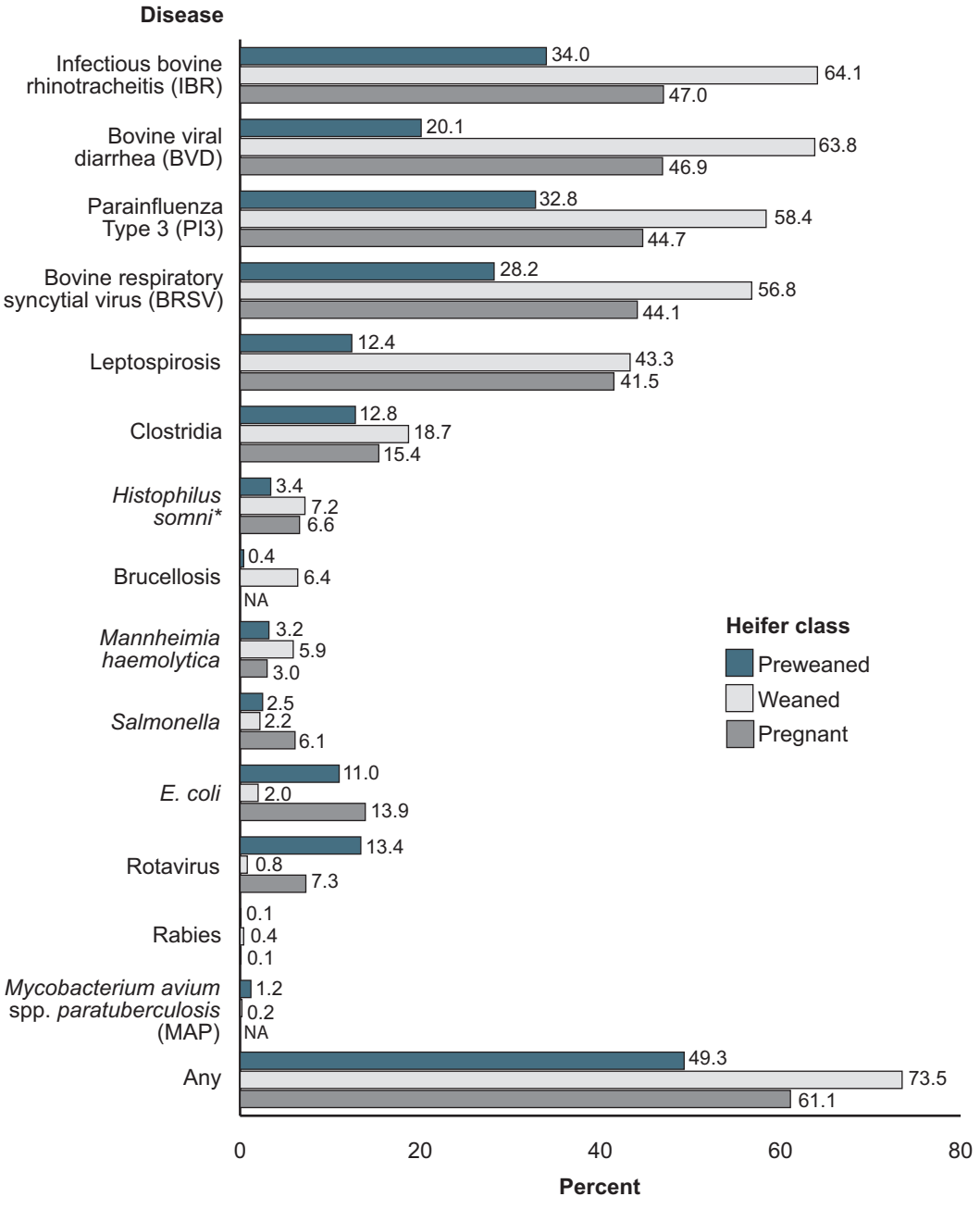
D.2.d. Percentage of operations that vaccinated **pregnant** heifers against the following diseases, by region:

	Percent Operations[1]			
	Region			
	West		East	
Disease	**Percent**	**Std. error**	**Percent**	**Std. error**
Infectious bovine rhinotracheitis (IBR)	53.4	(3.8)	46.4	(1.9)
Bovine viral diarrhea (BVD)	55.6	(3.8)	46.1	(1.9)
Parainfluenza Type 3 (PI3)	49.5	(3.8)	44.3	(1.9)
Bovine respiratory syncytial virus (BRSV)	46.5	(3.7)	43.9	(1.9)
Leptospirosis	48.0	(3.5)	40.9	(1.9)
Clostridia	40.0	(3.6)	13.2	(1.1)
E. coli	28.6	(3.4)	12.5	(1.1)
Rotavirus	15.4	(2.8)	6.5	(0.7)
Histophilus somni[2]	8.9	(2.4)	6.4	(0.9)
Salmonella	13.4	(1.9)	5.5	(0.7)
Mannheimia haemolytica	1.8	(0.8)	3.2	(0.6)
Rabies	0.0	(—)	0.1	(0.1)
Any	82.8	(2.5)	59.0	(1.9)

[1]Excludes very small operations (<30 cows).

[2]Formerly *Haemophilus somnus.*

Percentage of operations that administered vaccines to heifers, by disease vaccinated against and by heifer class



*Formerly *Haemophilus somnus*.

All very small operations (100.0 percent) used at least one of the following preventive practices for heifers, compared with about 9 of 10 operations in the other herd sizes. Overall, dewormers were used by 69.1 percent of operations. A higher percentage of small and medium operations (73.4 and 70.8 percent, respectively) used a dewormer compared with large operations (51.2 percent). This difference in dewormer use might be due to the relatively small percentage of large operations that allowed heifers on pasture. More than 50 percent of all operations used ionophores in feed (51.9 percent), administered vitamin A-D-E (61.3 percent), or administered selenium (59.0 percent).

D.2.e. For 99.3 percent of operations that housed heifers (table D.1.a), percentage of operations that normally used the following preventive (not treatment) practices for heifers, by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dewormers	62.0	(6.2)	73.4	(2.3)	70.8	(2.5)	51.2	(2.2)	69.1	(1.6)
Rumensin®, Bovatec® in feed (ionophores)	30.3	(6.3)	46.2	(2.6)	67.7	(2.5)	72.4	(2.2)	51.9	(1.8)
Vitamin A-D-E (injectable or feed additive)	43.9	(6.6)	61.0	(2.5)	68.8	(2.6)	68.1	(2.3)	61.3	(1.8)
Selenium (injectable or feed additive)	42.2	(6.6)	61.9	(2.5)	60.8	(2.8)	62.9	(2.3)	59.0	(1.8)
Probiotics	21.8	(5.7)	20.4	(2.1)	23.3	(2.4)	38.3	(2.3)	23.0	(1.5)
Anionic salts	25.4	(6.1)	15.9	(1.9)	22.1	(2.3)	36.3	(2.3)	20.7	(1.4)
Any	100.0	(—)	93.3	(1.3)	94.4	(1.3)	94.8	(1.1)	94.5	(0.8)

E. Cow Management

1. Housing

The type of housing used for cows is typically related to herd size and, to some extent, geographic location. Dry cows were housed in an open/dry lot with barn or shed on 22.7 percent of operations, in a freestall with access to open/dry lot on 20.3 percent, and in a tie stall or stanchion on 18.2 percent. A higher percentage of very small and small operations housed dry cows in a tie stall or stanchion compared with medium and large operations. A lower percentage of very small and small operations housed dry cows in freestall housing with no access to open/dry lot, compared with medium and large operations.

E.1.a. Percentage of operations by primary housing type used for **dry** cows, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary housing type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Tie stall or stanchion	32.6	(6.0)	24.8	(2.2)	4.3	(1.2)	0.0	(—)	18.2	(1.5)
Pasture	17.7	(5.1)	10.5	(1.5)	12.6	(1.7)	3.2	(0.9)	11.3	(1.1)
Freestall with no access to open/ dry lot	3.8	(2.2)	3.9	(1.0)	14.1	(1.9)	35.1	(2.1)	9.5	(0.8)
Freestall with access to open/ dry lot	12.3	(5.0)	18.8	(2.0)	27.5	(2.5)	20.1	(1.9)	20.3	(1.4)
Open/dry lot without barn or shed*	2.9	(2.0)	3.9	(0.9)	9.1	(1.4)	19.0	(1.5)	6.5	(0.7)
Open/dry lot with barn or shed	18.6	(5.1)	23.6	(2.1)	24.7	(2.4)	18.1	(1.5)	22.7	(1.4)
Multiple animal inside area/barn	10.5	(4.1)	14.3	(1.9)	7.5	(1.5)	4.2	(1.1)	11.1	(1.2)
Not housed on operation	1.5	(1.5)	0.3	(0.3)	0.2	(0.2)	0.2	(0.2)	0.4	(0.3)
Total	100.0		100.0		100.0		100.0		100.0	

*With or without shade structures.

No operations in the West region housed dry cows in a tie stall or stanchion compared with 20.0 percent of operations in the East region. A freestall with access to an open/dry lot was the primary housing type used for dry cows on a higher percentage of operations in the East region than in the West region (20.9 and 13.7 percent, respectively). An open/dry lot without barn or shed was used to house dry cows on a higher percentage of operations in the West region than in the East region (30.4 and 4.3 percent, respectively). A higher percentage of operations in the East region than in the West region housed dry cows in a multiple-animal inside area/barn (12.0 and 1.4 percent, respectively).

E.1.b. Percentage of operations by primary housing type used for **dry** cows, and by region:

	Percent Operations			
	Region			
	West		East	
Primary housing type	**Percent**	**Std. error**	**Percent**	**Std. error**
Tie stall or stanchion	0.0	(—)	20.0	(1.6)
Pasture	18.2	(3.5)	10.6	(1.2)
Freestall with no access to open/dry lot	8.4	(1.7)	9.6	(0.9)
Freestall with access to open/dry lot	13.7	(1.8)	20.9	(1.5)
Open/dry lot without barn or shed*	30.4	(2.8)	4.3	(0.7)
Open/dry lot with barn or shed	27.4	(3.3)	22.2	(1.5)
Multiple animal inside area/barn	1.4	(0.8)	12.0	(1.3)
Not housed on operation	0.6	(0.6)	0.4	(0.3)
Total	100.0		100.0	

*With or without shade structures.

The percentage of operations that used separate maternity housing increased as herd size increased, ranging from 33.1 percent of very small operations to 90.5 percent of large operations; 60.7 percent of all operations had maternity housing separate from housing for lactating cows.

E.1.c. Percentage of operations in which maternity housing was separate from housing used for lactating cows, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
33.1	(6.1)	54.1	(2.5)	78.9	(2.4)	90.5	(1.5)	60.7	(1.7)

A higher percentage of operations in the West region (84.6 percent) used separate maternity housing compared with operations in the East region (58.5 percent).

E.1.d. Percentage of operations in which maternity housing was separate from housing used for lactating cows, by region:

Percent Operations

Region

West		**East**	
Percent	**Std. error**	**Percent**	**Std. error**
84.6	(3.4)	58.5	(1.8)

Overall, 48.9 percent of operations had separate housing for close-up cows. The percentage of operations that housed close-up cows separately from other dry cows increased as herd size increased.

E.1.e. Percentage of operations that housed close-up cows separately from other dry cows, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
26.8	(5.7)	40.1	(2.5)	65.1	(2.7)	87.7	(1.8)	48.9	(1.7)

Overall, a tie stall or stanchion was the primary housing type used for lactating cows on 38.9 percent of operations. One-fifth of operations (20.0 percent) housed lactating cows in a freestall with no outside access. The majority of large operations (51.5 percent) housed lactating cows in a freestall with no outside access.

E.1.f. Percentage of operations by primary housing type used for **lactating** cows, and by herd size:

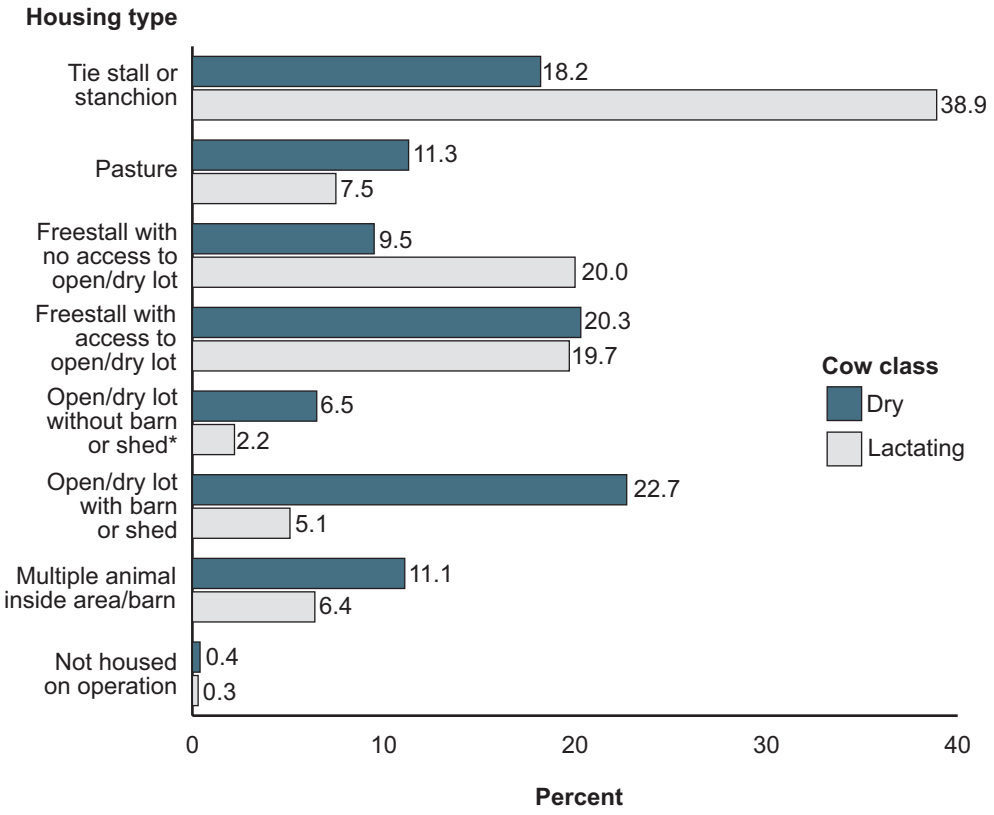
Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary housing type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Tie stall or stanchion	42.6	(6.5)	58.1	(2.4)	12.1	(1.9)	1.2	(0.7)	38.9	(1.7)
Pasture	17.6	(5.0)	5.8	(1.1)	8.0	(1.6)	1.5	(0.6)	7.5	(1.0)
Freestall with no access to open/dry lot	6.3	(3.0)	8.1	(1.4)	39.4	(2.6)	51.5	(1.8)	20.0	(1.1)
Freestall with access to open/dry lot	12.3	(4.8)	16.2	(1.9)	28.7	(2.5)	24.9	(1.6)	19.7	(1.3)
Open/dry lot without barn or shed*	1.4	(1.3)	1.2	(0.5)	2.3	(0.9)	8.4	(1.0)	2.2	(0.4)
Open/dry lot with barn or shed	7.0	(3.5)	4.4	(1.0)	4.3	(1.2)	8.6	(1.1)	5.1	(0.7)
Multiple animal inside area/barn	10.7	(4.1)	6.3	(1.3)	5.2	(1.3)	3.9	(1.1)	6.4	(0.9)
Not housed on operation	2.1	(1.5)	0.0	(—)	0.0	(—)	0.0	(—)	0.3	(0.2)
Total	100.0		100.0		100.0		100.0		100.0	

*With or without shade structures.

Percentage of operations by primary housing type used for dry and lactating cows



*With or without shade structures.

A tie stall or stanchion was used for lactating cows by a lower percentage of operations in the West region than in the East region (3.2 and 42.2 percent, respectively). A higher percentage of operations in the West region than in the East region housed lactating cows in a freestall with outside access or in an open/dry lot with or without barn or shed (15.3 and 6.8 percent, respectively). A higher percentage of operations in the East region than in the West region housed lactating cows in a freestall with no access to an open/dry lot.

E.1.g. Percentage of operations by primary housing type used for **lactating** cows, and by region:

	Percent Operations			
	Region			
	West		East	
Primary housing type	**Percent**	**Std. error**	**Percent**	**Std. error**
Tie stall or stanchion	3.2	(2.4)	42.2	(1.8)
Pasture	15.3	(3.6)	6.8	(1.0)
Freestall with no access to open/dry lot	13.9	(1.8)	20.5	(1.2)
Freestall with access to open/dry lot	34.8	(3.2)	18.3	(1.4)
Open/dry lot without barn or shed*	14.3	(2.4)	1.1	(0.4)
Open/dry lot with barn or shed	15.7	(2.6)	4.1	(0.8)
Multiple animal inside area/barn	1.6	(0.8)	6.8	(1.0)
Not housed on operation	1.2	(1.2)	0.2	(0.2)
Total	100.0		100.0	

*With or without shade structures.

Pasture access for lactating and dry cows decreased as herd size increased. Overall, 59.5 percent of operations allowed pasture access for lactating cows and 72.3 percent allowed pasture access for dry cows.

E.1.h. Percentage of operations that allowed lactating or dry cows on pasture, by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Cow class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Lactating	82.7	(4.6)	72.7	(2.3)	39.7	(2.7)	5.2	(1.0)	59.5	(1.5)
Dry	86.8	(4.3)	83.1	(1.9)	61.5	(2.6)	21.0	(1.9)	72.3	(1.4)

The percentage of lactating and dry cows that had access to pasture decreased as herd size increased: 19.9 percent of lactating cows and 34.0 percent of dry cows had at least some pasture access.

E.1.i. Percentage of lactating and dry cows on operations that allowed cattle access to pasture, by herd size:

Percent Cows

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Cow class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Lactating	80.2	(6.5)	69.7	(2.5)	32.0	(2.5)	4.5	(1.5)	19.9	(1.1)
Dry	87.2	(6.1)	82.4	(2.0)	56.0	(2.9)	15.8	(2.1)	34.0	(1.6)

Lactating cows did not have outdoor access during summer on 19.2 percent of all operations or during winter on 34.9 percent. The majority of very small and small operations (81.0 and 67.3 percent, respectively) allowed lactating cows access to pasture during summer; these percentages decreased during winter (29.4 and 7.9 percent, respectively). Alternatively, the percentage of very small and small operations that allowed access to an open/dry lot or barnyard increased from 7.5 and 17.2 percent, respectively, in summer to 29.5 and 50.5 percent, respectively, in winter. The primary outside area for lactating cows on large operations during summer and winter was an open/dry lot or barnyard (39.7 and 38.2 percent, respectively).

E.1.j. Percentage of operations by primary outside area that **lactating** cows routinely had access to during the summer and winter, and by herd size:

	Percent Operations									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary outside area*	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Summer										
Pasture	81.0	(4.7)	67.3	(2.4)	32.4	(2.6)	3.9	(1.0)	54.6	(1.6)
Concrete alleyway or pen	3.8	(2.1)	3.0	(0.8)	11.6	(1.8)	9.4	(1.3)	5.8	(0.7)
Open/dry lot or barnyard	7.5	(3.4)	17.2	(1.8)	23.9	(2.3)	39.7	(1.6)	19.6	(1.2)
No outside access	6.6	(2.8)	12.2	(1.7)	30.4	(2.5)	46.4	(1.9)	19.2	(1.2)
Other	1.2	(1.2)	0.2	(0.2)	1.7	(0.7)	0.6	(0.3)	0.8	(0.3)
Total	100.0		100.0		100.0		100.0		100.0	
Winter										
Pasture	29.4	(6.1)	7.9	(1.2)	9.3	(1.6)	1.5	(0.7)	10.7	(1.2)
Concrete alleyway or pen	7.6	(3.5)	8.8	(1.5)	16.6	(2.1)	10.0	(1.3)	10.7	(1.1)
Open/dry lot or barnyard	29.5	(5.2)	50.5	(2.6)	30.2	(2.5)	38.2	(1.6)	41.2	(1.7)
No outside access	31.4	(6.2)	29.8	(2.4)	41.9	(2.7)	48.8	(1.8)	34.9	(1.7)
Other	2.1	(1.5)	3.0	(0.9)	2.0	(0.8)	1.5	(0.6)	2.4	(0.6)
Total	100.0		100.0		100.0		100.0		100.0	

*Areas without permanent roof structures but may have permanent shade structure.

A relatively low percentage of all operations (9.4 percent) did not provide outside access to dry cows during summer; during winter, 24.3 percent of all operations did not provide outside access to dry cows. Pasture was the primary outside area for dry cows during summer on 65.3 percent of operations and during winter on 16.1 percent. The percentage of operations in which dry cows had outside access to an open/dry lot or barnyard increased from 20.9 percent in summer to 48.6 percent in winter. The percentage of operations that placed dry cows on pasture decreased as herd size increased during summer and winter. In summer, the percentages of operations that placed dry cows on an open/dry lot or barnyard or that provided no outside access increased as herd size increased.

E.1.k. For the 99.4 percent of operations that housed dry cows (table E.1.a), percentage of operations by primary outside area that **dry** cows routinely had access to during summer and winter, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary outside area*	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Summer										
Pasture	87.3	(4.2)	75.9	(2.2)	51.1	(2.7)	12.8	(1.7)	65.3	(1.5)
Concrete alleyway or pen	1.2	(1.2)	3.1	(0.9)	7.4	(1.5)	4.5	(0.9)	4.0	(0.6)
Open/dry lot or barnyard	7.6	(3.5)	15.5	(1.8)	27.6	(2.4)	52.0	(2.0)	20.9	(1.2)
No outside access	3.9	(2.2)	5.5	(1.2)	12.5	(1.8)	30.7	(2.0)	9.4	(0.9)
Other	0.0	(—)	0.0	(—)	1.4	(0.6)	0.0	(—)	0.3	(0.2)
Total	100.0		100.0		100.0		100.0		100.0	
Winter										
Pasture	33.6	(6.4)	13.3	(1.6)	16.4	(1.9)	4.5	(0.8)	16.1	(1.3)
Concrete alleyway or pen	6.3	(3.4)	7.9	(1.4)	13.1	(1.9)	5.5	(1.0)	8.8	(1.0)
Open/dry lot or barnyard	33.1	(5.8)	53.4	(2.5)	46.0	(2.7)	52.6	(2.0)	48.6	(1.7)
No outside access	23.3	(5.5)	23.5	(2.2)	21.6	(2.2)	37.0	(2.0)	24.3	(1.5)
Other	3.6	(2.8)	1.9	(0.7)	2.8	(1.0)	0.4	(0.2)	2.3	(0.6)
Total	100.0		100.0		100.0		100.0		100.0	

*Areas without permanent roof structures but may have permanent shade structure.

Straw and/or hay, sawdust/wood products, sand, and rubber mats were used as bedding for lactating cows on the highest percentages of operations (47.1, 34.1, 26.0, and 23.5 percent, respectively). The majority of all operations (54.2 percent) used straw and/or hay for dry-cow bedding. The percentage of cows bedded on composted or dried manure was much higher than the percentage of operations that used these bedding materials, suggesting these materials were mainly used on large operations.

E.1.l. Percentage of operations and percentage of cows by bedding type used for lactating and dry cows:

	Percent Operations*				Percent Cows			
	Lactating cows		Dry cows		Lactating cows		Dry cows	
Bedding type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Composted manure	4.3	(0.5)	3.6	(0.5)	20.4	(1.9)	16.3	(1.8)
Corn cobs and stalks	11.4	(1.2)	23.9	(1.4)	6.3	(1.0)	12.6	(1.1)
Dried manure	5.6	(0.5)	5.5	(0.5)	26.4	(1.8)	26.3	(1.8)
Mattresses	15.9	(1.3)	7.6	(1.0)	12.7	(1.1)	6.8	(0.9)
Rubber mats	23.5	(1.6)	11.6	(1.2)	12.5	(1.3)	6.7	(1.1)
Sand	26.0	(1.4)	17.3	(1.2)	34.6	(1.8)	26.3	(1.6)
Sawdust/ wood products	34.1	(1.6)	23.7	(1.5)	20.6	(1.4)	16.7	(1.3)
Shredded newspaper	2.1	(0.6)	1.6	(0.5)	1.0	(0.3)	1.1	(0.3)
Straw and/or hay	47.1	(1.7)	54.2	(1.7)	27.3	(1.6)	35.3	(1.8)
Waterbeds	2.1	(0.5)	0.7	(0.3)	2.4	(0.5)	0.8	(0.3)
Other	3.8	(0.6)	3.1	(0.6)	8.4	(1.2)	7.4	(1.2)
None—housed only on dirt/pasture	4.7	(0.6)	8.6	(0.8)	4.0	(0.7)	8.8	(1.2)

*Excludes very small operations (<30 cows).

The percentages of operations by primary bedding types used for lactating and dry cows were similar to the percentages of operations by all bedding types reported in the previous table. The top three primary bedding types used for lactating cows by the highest percentages of operations were straw and/or hay (29.7 percent), sand (21.9 percent), and sawdust/wood products (21.9 percent). The top three primary bedding types used for dry cows on the highest percentages of operations were straw and/or hay (37.9 percent), corn cobs and stalks (15.6 percent), and sand (14.6 percent). The top three bedding types used for the highest percentages of lactating and dry cows were sand, dried manure, and straw and/or hay.

E.1.m. Percentage of operations and percentage of cows by **primary** bedding type used for lactating and dry cows:

	Percent Operations*				Percent Cows			
	Lactating cows		Dry cows		Lactating cows		Dry cows	
Primary bedding type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Composted manure	2.0	(0.2)	1.8	(0.3)	11.5	(1.5)	8.0	(1.2)
Corn cobs and stalks	3.7	(0.7)	15.6	(1.2)	1.3	(0.3)	7.7	(1.0)
Dried manure	3.9	(0.4)	4.0	(0.4)	21.2	(1.7)	21.8	(1.7)
Mattresses	5.0	(0.8)	2.3	(0.6)	2.8	(0.4)	1.5	(0.3)
Rubber mats	6.1	(0.9)	3.2	(0.7)	2.1	(0.4)	1.2	(0.4)
Sand	21.9	(1.3)	14.6	(1.1)	30.1	(1.7)	22.2	(1.5)
Sawdust/ wood products	21.9	(1.4)	12.7	(1.2)	11.3	(0.8)	7.6	(0.7)
Shredded newspaper	0.2	(0.1)	0.1	(0.1)	0.1	(0.1)	0.0	(0.0)
Straw and/or hay	29.7	(1.6)	37.9	(1.7)	13.7	(1.1)	20.2	(1.4)
Waterbeds	1.0	(0.3)	0.4	(0.2)	1.0	(0.3)	0.4	(0.2)
Other	1.6	(0.4)	0.9	(0.3)	2.4	(0.7)	1.9	(0.7)
None—housed only on dirt/pasture	3.0	(0.5)	6.6	(0.7)	2.6	(0.5)	7.4	(1.2)
Total	100.0		100.0		100.0		100.0	

*Excludes very small operations (<30 cows).

Straw and sawdust were the primary bedding types used on the highest percentages of operations that housed lactating cows in a tie stall or stanchion, on pasture, and in an open/dry lot with a barn. Sand was used as bedding for lactating cows on 55.1 percent of operations with freestalls and no outside access and on 32.1 percent of operations with freestalls and outside access. On operations that housed lactating cows in an open/dry lot without barn, straw and dried manure were the primary bedding types used on 33.7 and 17.1 percent of operations, respectively.

E.1.n. Percentage of operations by primary bedding type used for **lactating** cows, and by primary housing type:

Percent Operations*

Primary Housing Type

	Tie stall or stanchion		Pasture		Freestall–no outside access		Freestall–with outside access		Open/dry lot–without barn		Open/dry lot–with barn		Other	
Primary bedding type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Composted manure	0.0	(—)	0.0	(—)	4.2	(0.8)	4.3	(0.8)	5.4	(2.1)	0.5	(0.4)	0.9	(0.6)
Corn cobs and stalks	4.3	(1.3)	0.0	(—)	1.4	(0.9)	2.3	(1.1)	10.6	(6.4)	9.9	(4.3)	9.7	(5.1)
Dried manure	0.0	(—)	0.0	(—)	3.9	(0.9)	7.8	(0.9)	17.1	(4.4)	16.7	(4.1)	3.6	(3.5)
Mattresses	6.9	(1.6)	2.5	(2.5)	6.8	(1.6)	1.6	(0.9)	0.0	(—)	0.5	(0.5)	6.3	(4.3)
Rubber mats	11.2	(2.0)	1.6	(1.6)	3.7	(1.5)	2.2	(1.0)	0.0	(—)	4.9	(3.4)	4.7	(3.4)
Sand	3.6	(1.2)	5.2	(2.4)	55.1	(2.9)	32.1	(3.4)	0.6	(0.5)	3.1	(1.9)	17.8	(5.3)
Sawdust/ wood products	25.2	(2.8)	10.9	(4.7)	15.8	(2.1)	22.4	(3.1)	7.0	(4.2)	25.7	(6.8)	35.7	(7.1)
Shredded newspaper	0.3	(0.3)	0.0	(—)	0.0	(—)	0.4	(0.4)	0.0	(—)	0.0	(—)	0.0	(—)
Straw and/ or hay	46.6	(3.2)	38.9	(7.2)	6.0	(1.5)	22.8	(3.4)	33.7	(8.8)	33.3	(7.2)	19.7	(6.6)
Waterbeds	0.3	(0.3)	1.4	(1.4)	1.2	(0.6)	2.2	(1.3)	0.0	(—)	0.0	(—)	1.7	(1.7)
Other	1.6	(0.9)	0.4	(0.4)	1.8	(0.8)	1.9	(1.0)	4.2	(1.9)	2.6	(1.8)	0.0	(—)
None/housed only on dirt/ pasture	0.0	(—)	38.9	(6.5)	0.0	(—)	0.0	(—)	21.4	(7.8)	2.8	(1.5)	0.0	(—)
Total	100.0		100.0		100.0		100.0		100.0		100.0		100.0	

*Excludes very small operations (<30 cows).

For operations that housed dry cows in a tie stall or stanchion, 56.8 percent used straw/and or hay as the primary bedding type for dry cows and 20.4 percent used sawdust/wood products. Straw/hay and no bedding were the primary bedding types used for dry cows on pasture operations (36.6 and 39.6 percent, respectively). Sand was used for dry cows on 56.3 percent of operations with freestalls and no outside access and on 28.1 percent of operations with freestalls and outside access. In addition to sand, straw and/or hay and sawdust/wood products were also primary bedding types used for dry cows on 32.4 and 18.3 percent of operations, respectively, in which dry cows were housed in freestalls with no outside access. Operations with open/dry lots without barns used a variety of different primary bedding types for dry cows, including straw (33.9 percent of operations), dried manure (16.6 percent), corn cobs and stalks (17.1 percent), and no bedding/dirt (19.5 percent). Operations with open/dry lots with barns primarily used straw/hay and corn cobs and stalks (38.7 and 36.8 percent, respectively) for dry-cow bedding.

E.1.o. Percentage of operations by primary bedding type used for **dry** cows, and by primary housing type:

Percent Operations*

	Primary Housing Type											
	Tie stall or stanchion		Pasture		Freestall–no outside access		Freestall–with outside access		Open/dry lot–without barn		Open/dry lot–with barn		Other	
Primary bedding type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Composted manure	0.5	(0.5)	0.3	(0.2)	5.5	(1.2)	2.1	(0.9)	5.2	(1.5)	0.9	(0.3)	0.4	(0.3)
Corn cobs and stalks	2.1	(1.3)	10.7	(3.9)	2.8	(1.6)	5.6	(1.6)	17.1	(4.4)	36.8	(3.4)	23.0	(5.0)
Dried manure	0.0	(—)	0.2	(0.2)	5.3	(1.5)	3.7	(0.6)	16.6	(3.2)	5.3	(0.8)	1.9	(1.8)
Mattresses	7.7	(2.8)	0.0	(—)	3.7	(1.6)	2.6	(1.0)	0.0	(—)	0.0	(—)	1.6	(1.3)
Rubber mats	9.1	(2.9)	0.0	(—)	2.6	(1.9)	4.6	(1.7)	0.0	(—)	0.8	(0.8)	2.4	(1.7)
Sand	3.4	(1.9)	4.5	(2.2)	56.3	(4.3)	28.1	(3.3)	3.3	(1.7)	3.7	(1.0)	5.9	(2.4)
Sawdust/ wood products	20.4	(4.0)	8.0	(2.8)	11.5	(2.6)	18.3	(2.9)	3.0	(1.7)	7.6	(2.1)	14.0	(3.8)
Shredded newspaper	0.0	(—)	0.0	(—)	0.0	(—)	0.4	(0.4)	0.0	(—)	0.0	(—)	0.0	(—)
Straw and/ or hay	56.8	(4.9)	36.6	(5.4)	10.9	(3.2)	32.4	(3.7)	33.9	(5.3)	38.7	(3.5)	49.0	(5.9)
Waterbeds	0.0	(—)	0.0	(—)	0.9	(0.9)	1.2	(1.0)	0.0	(—)	0.0	(—)	0.0	(—)
Other	0.0	(—)	0.1	(0.1)	0.4	(0.3)	0.6	(0.5)	1.4	(0.6)	1.9	(1.1)	1.9	(1.8)
None/ housed only on dirt/ pasture	0.0	(—)	39.6	(5.1)	0.0	(—)	0.3	(0.3)	19.5	(4.6)	4.3	(1.2)	0.0	(—)
Total	100.0		100.0		100.0		100.0		100.0		100.0		100.0	

*Excludes very small operations (<30 cows).

Concrete was the predominant flooring type on the majority of operations, regardless of herd size. Grooved/textured concrete was the predominant flooring type on 69.7 and 61.2 percent of medium and large operations, respectively, and used on 47.9 percent of all operations. Rubber mats over concrete was used by 30.3 percent of small operations, and dirt was the predominant flooring surface on 27.3 percent of large operations.

E.1.p. Percentage of operations by predominant flooring type lactating cows stood or walked on when not being milked, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Predominant flooring type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Concrete—grooved/textured	34.4	(2.5)	69.7	(2.6)	61.2	(1.8)	47.9	(1.7)
Concrete—slatted	1.4	(0.5)	4.2	(1.1)	1.0	(0.4)	2.2	(0.5)
Concrete—smooth	16.5	(1.9)	5.4	(1.4)	1.5	(0.5)	11.5	(1.2)
Rubber mats over concrete	30.3	(2.4)	8.2	(1.6)	6.3	(1.1)	21.0	(1.5)
Pasture	9.5	(1.5)	6.1	(1.4)	2.2	(0.7)	7.6	(1.0)
Dirt	6.4	(1.2)	4.2	(1.0)	27.3	(1.5)	8.1	(0.8)
Other	1.6	(0.7)	2.2	(0.9)	0.5	(0.3)	1.6	(0.5)
Total	100.0		100.0		100.0		100.0	

Rubber belting installed in alleyways and feed areas reduces the time cows spend walking or standing on concrete. With the exception of the “other” area, a much higher percentage of large operations than medium and small operations used rubber belting in all areas listed in the following table.

E.1.q. Percentage of operations that used rubber belting in the following areas, by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Area	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Adjacent to feed bunk	3.5	(1.0)	6.1	(1.3)	25.8	(1.9)	6.8	(0.7)
Freestall alleyways	5.2	(1.2)	3.4	(0.9)	22.7	(1.9)	6.6	(0.8)
Walkway to parlor	2.6	(0.8)	8.0	(1.5)	32.3	(2.1)	7.5	(0.7)
Holding pen	3.4	(0.9)	8.0	(1.5)	24.3	(1.9)	7.1	(0.7)
Other	11.1	(1.7)	7.2	(1.5)	9.5	(1.3)	9.8	(1.1)

Surface moisture or wet flooring can impact hoof health and cow cleanliness. The surface moisture of the ground or flooring for the majority of small operations was reported to be usually dry in both summer and winter (80.1 and 69.8 percent of operations, respectively). Of large operations, 40.8 percent reported that flooring was usually dry in summer and 22.8 percent reported floors were usually dry in winter. A lower percentage of large operations reported that surface moisture was wet about half the time in summer compared with winter (21.9 and 33.7 percent, respectively).

E.1.r. Percentage of operations by surface moisture of the ground or flooring that lactating cows stood on most of the time in summer and winter, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Surface moisture	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Summer								
Usually dry	80.1	(2.0)	44.9	(2.7)	40.8	(2.0)	65.4	(1.5)
Wet about half the time	14.8	(1.8)	27.6	(2.5)	21.9	(1.9)	19.3	(1.3)
Almost always wet, but no standing water	5.1	(1.1)	26.7	(2.4)	37.3	(2.1)	15.0	(1.0)
Usually standing water or slurry	0.0	(—)	0.8	(0.5)	0.0	(—)	0.2	(0.1)
Total	100.0		100.0		100.0		100.0	
Winter								
Usually dry	69.8	(2.3)	34.3	(2.7)	22.8	(1.8)	54.2	(1.6)
Wet about half the time	18.8	(1.9)	32.7	(2.6)	33.7	(2.1)	24.5	(1.4)
Almost always wet, but no standing water	11.5	(1.6)	32.2	(2.5)	43.3	(2.2)	21.1	(1.2)
Usually standing water or slurry	0.0	(—)	0.8	(0.5)	0.2	(0.2)	0.3	(0.1)
Total	100.0		100.0		100.0		100.0	

When dairy cows are heat-stressed they eat less, produce less milk, and are not as fertile. The majority of all operations (82.6 percent) used a covered structure or building to provide lactating cows shelter from the sun. Sprinkler or mister use for lactating cows increased as herd size increased: 25.2 percent of all operations used sprinklers or

misters. A lower percentage of small operations than medium and large operations used fans to cool lactating cows, and a higher percentage used tunnel ventilation.

Of all operations, 72.5 percent provided dry cows with a covered structure/building, and 51.8 percent provided shade. Sprinkler or mister use for dry cows increased as herd size increased: 10.7 percent of all operations used sprinklers or misters. About half of all operations (49.7 percent) provided fans for dry cows, and a higher percentage of large operations than small and medium operations provided fans.

E.1.s. Percentage of operations by cooling method used for lactating or dry cows during summer, and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Cow cooling method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Lactating cows								
Covered structure/ building (e.g., barn, shed)	80.6	(2.0)	85.9	(1.9)	84.5	(1.6)	82.6	(1.3)
Shade (other than covered structure/ building)	46.4	(2.6)	33.5	(2.7)	41.1	(1.9)	42.0	(1.7)
Sprinklers or misters	11.4	(1.6)	34.4	(2.6)	74.9	(2.1)	25.2	(1.3)
Fans	70.8	(2.3)	82.2	(1.9)	84.8	(1.6)	75.7	(1.5)
Tunnel ventilation	23.6	(2.2)	14.1	(2.0)	14.7	(1.6)	19.8	(1.5)
Other	1.8	(0.7)	1.9	(0.7)	1.6	(0.5)	1.8	(0.5)
Any	98.1	(0.7)	99.6	(0.2)	99.2	(0.3)	98.7	(0.4)
Dry cows								
Covered structure/ building (e.g., barn, shed)	70.9	(2.3)	74.8	(2.3)	74.6	(1.8)	72.5	(1.5)
Shade (other than covered structure/ building)	56.1	(2.6)	46.5	(2.8)	42.7	(2.0)	51.8	(1.8)
Sprinklers or misters	4.8	(1.1)	9.2	(1.5)	45.8	(2.1)	10.7	(0.8)
Fans	46.4	(2.5)	51.2	(2.7)	62.8	(2.0)	49.7	(1.7)
Tunnel ventilation	14.1	(1.9)	4.7	(1.2)	10.3	(1.4)	10.9	(1.2)
Other	0.8	(0.5)	2.1	(0.7)	1.1	(0.4)	1.2	(0.4)
Any	94.9	(1.1)	95.5	(1.1)	92.3	(1.1)	94.8	(0.7)

Higher percentages of operations in the West region than in the East region provided lactating cows with shade or sprinklers/misters in summer. Conversely, a higher percentage of operations in the East region than in the West region provided fans or tunnel ventilation. Similar percentage differences were observed in cooling methods provided for dry cows, with the exception of the percentage of operations that used shade, which did not differ between the West and East regions.

E.1.t. Percentage of operations by cooling method used for lactating or dry cows during summer, and by region:

	Percent Operations*			
	Region			
	West		East	
Cow cooling method	**Percent**	**Std. error**	**Percent**	**Std. error**
Lactating cows				
Covered structure/building (e.g., barn, shed)	75.1	(2.9)	83.3	(1.4)
Shade (other than covered structure/building)	62.1	(3.4)	40.1	(1.9)
Sprinklers or misters	64.6	(3.3)	21.3	(1.3)
Fans	58.5	(2.7)	77.4	(1.6)
Tunnel ventilation	7.0	(1.3)	21.1	(1.6)
Other	1.7	(1.0)	1.8	(0.5)
Any	96.9	(1.0)	98.9	(0.4)
Dry cows				
Covered structure/building (e.g., barn, shed)	57.3	(3.1)	73.9	(1.7)
Shade (other than covered structure/building)	57.9	(3.2)	51.2	(1.9)
Sprinklers or misters	43.5	(2.4)	7.5	(0.9)
Fans	33.8	(2.5)	51.2	(1.9)
Tunnel ventilation	3.8	(0.9)	11.6	(1.3)
Other	1.7	(1.0)	1.2	(0.4)
Any	82.1	(2.8)	96.0	(0.8)

*Excludes very small operations (<30 cows).

2. Milking facility

Parlors were used to milk cows on 79.4 percent of medium operations and 99.8 percent of large operations. The percentages of very small and small operations by type of milking facility used was similar, with the highest percentages of these operations using a tie stall or stanchion barn to milk cows. A slightly higher percentage of all operations milked cows in a tie stall or stanchion barn than in a parlor (52.6 and 45.8 percent, respectively). Robotic milking facilities were captured in "Other."

E.2.a. Percentage of operations by primary milking facility used, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary milking facility	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Parlor	17.7	(5.2)	27.3	(2.1)	79.4	(2.4)	99.8	(0.2)	45.8	(1.5)
Tie stall or stanchion barn	73.7	(5.9)	72.7	(2.1)	19.3	(2.3)	0.2	(0.2)	52.6	(1.5)
Other	8.6	(3.5)	0.0	(—)	1.3	(0.6)	0.0	(—)	1.6	(0.5)
Total	100.0		100.0		100.0		100.0		100.0	

Overall, 86.6 percent of cows were milked in a parlor and 13.1 percent were milked in a tie stall or stanchion barn. The majority of cows on very small and small operations (73.1 and 70.5 percent, respectively), were milked in a tie stall or stanchion barn, while the majority of cows on medium and large operations (85.8 and 99.9 percent, respectively) were milked in a parlor.

E.2.b. Percentage of cows by primary milking facility used, and by herd size:

Percent Cows

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary milking facility	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Parlor	25.7	(8.1)	29.5	(2.2)	85.8	(1.8)	99.9	(0.1))	86.6	(0.6)
Tie stall or stanchion barn	73.1	(8.1)	70.5	(2.2)	13.1	(1.7)	0.1	(0.1)	13.1	(0.6)
Other	1.2	(0.6)	0.0	(—)	1.1	(0.5)	0.0	(—)	0.3	(0.1)
Total	100.0		100.0		100.0		100.0		100.0	

The operation average RHA milk production increased as herd size increased for both primary milking facilities.

E.2.c. Operation average RHA milk production (lb/cow) by primary milking facility and by herd size:

Operation Average RHA Milk Production (lb/cow)

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary milking facility	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**	**lb/ cow**	**Std. error**
Parlor	18,725	(1,957)	18,329	(445)	21,891	(287)	25,276	(154)	21,417	(224)
Tie stall or stanchion barn	14,608	(849)	19,233	(300)	20,884	(495)	*		18,597	(283)
All	15,405	(792)	18,990	(248)	21,706	(247)	25,273	(153)	19,932	(183)

*Too few to report.

As expected, as herd size increased so did the average annual milk production. The amount of milk annually produced by operations that used a parlor as their primary milking facility was about seven times the amount produced by operations that used a tie stall or stanchion milking facility (104,491 and 14,296 cwt, respectively).

E.2.d. Average annual milk production (cwt) by primary milking facility used, and by herd size:

Average Annual Milk Production (cwt)

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary milking facility	**CWT**	**Std. error**	**CWT**	**Std. error**	**CWT**	**Std. error**	**CWT**	**Std. error**	**CWT**	**Std. error**
Parlor	4,050	(1,106)	20,654	(8,988)	50,307	(9,459)	353,399	(20,493)	104,491	(7,214)
Tie stall or stanchion barn	3,812	(1,286)	15,799	(4,096)	22,907	(1,185)	*		14,296	(2,983)
All	3,553	(976)	17,082	(3,843)	44,974	(7,495)	352,858	(20,438)	55,956	(3,585)

*Too few to report.

The parlors used by the highest percentages of operations were herringbone and parallel (45.7 and 29.9 percent, respectively). The use of herringbone parlors decreased as herd size increased, while the use of parallel and rotary parlors increased as herd size increased.

E.2.e. For the 45.8 percent of operations that used a milking parlor (table E.2.a), percentage of operations by primary milking parlor used and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary milking parlor	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Herringbone (fishbone)	53.9	(4.6)	46.6	(3.0)	31.8	(2.1)	45.7	(2.1)
Parallel (side by side)	20.2	(3.8)	28.5	(2.7)	46.9	(2.3)	29.9	(1.8)
Parabone	7.5	(2.4)	9.4	(1.7)	6.1	(1.3)	8.0	(1.1)
Flat barn	8.5	(2.9)	5.7	(1.3)	5.7	(1.1)	6.6	(1.1)
Side opening (tandem)	7.5	(2.3)	2.5	(1.0)	1.1	(0.4)	3.8	(0.9)
Swing	1.2	(0.9)	5.0	(1.4)	0.4	(0.3)	2.8	(0.7)
Rotary (carousel)	0.0	(—)	0.9	(0.6)	7.0	(1.1)	2.0	(0.4)
Other	1.2	(0.7)	1.3	(0.6)	1.1	(0.4)	1.3	(0.4)
Total	100.0		100.0		100.0		100.0	

The majority of cows on all operations were milked in a parallel or herringbone parlor (44.7 and 30.7 percent of cows, respectively). On large operations, rotary parlors were used to milk 14.1 percent of all cows, but only 7.0 percent of large operations used rotary parlors, suggesting that operations with inventories considerably larger than 500 cows used rotary parlors.

E.2.f. For the 86.6 percent of cows that were milked in a parlor (table E.2.b), percentage of cows by primary milking parlor used, and by herd size:

Percent Cows

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary milking parlor	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Parallel (side by side)	20.3	(4.1)	32.7	(3.1)	49.5	(2.9)	44.7	(2.3)
Herringbone (fishbone)	55.5	(4.8)	45.3	(3.2)	25.1	(2.2)	30.7	(1.9)
Rotary (carousel)	0.0	(—)	1.0	(0.7)	14.1	(2.6)	10.7	(2.0)
Parabone	7.8	(2.5)	7.5	(1.5)	4.9	(1.1)	5.6	(0.9)
Flat barn	7.3	(2.7)	6.2	(1.5)	3.1	(0.7)	4.0	(0.6)
Swing	1.1	(0.8)	4.3	(1.3)	0.3	(0.2)	1.2	(0.3)
Side opening (tandem)	6.4	(2.0)	1.9	(0.8)	0.6	(0.2)	1.1	(0.3)
Other	1.6	(1.0)	1.1	(0.5)	2.5	(1.5)	2.1	(1.1)
Total	100.0		100.0		100.0		100.0	

3. Nutrition

For all operations, 92.0 percent fed lactating or dry cows alfalfa hay/haylage; 89.4 percent fed corn silage; 76.9 percent fed soybeans—whole, meal, or hulls; and 90.3 percent fed corn—whole, meal, cracked, or flaked. The percentages of operations that fed lactating or dry cows clover, soybeans, or oats generally decreased as herd size increased, while the percentages of operations that fed cottonseed, wet brewers/distillers grains, canola, wheat, straw, or blood meal generally increased as herd size increased.

E.3.a. Percentage of operations by type of feed given to lactating or dry cows, and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Feed type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Alfalfa hay/haylage	90.7	(1.4)	93.1	(1.2)	96.0	(0.7)	92.0	(0.9)
Bakery byproducts	4.8	(1.1)	4.7	(1.2)	12.5	(1.6)	5.6	(0.8)
Barley	14.8	(1.8)	15.4	(1.9)	15.2	(1.5)	15.0	(1.2)
Beet pulp	5.2	(1.1)	8.5	(1.5)	15.3	(1.6)	7.3	(0.8)
Blood meal	3.9	(1.0)	17.3	(2.1)	29.0	(2.1)	10.6	(0.9)
Canola	8.6	(1.4)	23.3	(2.3)	68.8	(2.0)	19.6	(1.1)
Clover as forage or pasture	47.9	(2.6)	30.7	(2.6)	10.5	(1.5)	38.7	(1.7)
Corn silage	85.9	(1.7)	93.9	(1.2)	96.0	(1.0)	89.4	(1.1)
Corn—whole, meal, cracked, or flaked	89.1	(1.6)	92.0	(1.4)	92.2	(1.3)	90.3	(1.0)
Cottonseed—whole, meal, or hulls	18.5	(2.0)	33.3	(2.6)	56.2	(2.3)	27.0	(1.4)
Dry brewers/ distillers grains	36.2	(2.5)	46.3	(2.8)	45.5	(2.2)	40.2	(1.7)
Fat/tallow	12.9	(1.8)	30.7	(2.6)	30.4	(1.9)	20.1	(1.3)
Feather/poultry meal	0.0	(—)	1.8	(0.8)	5.4	(1.3)	1.1	(0.3)
Fish meal	0.9	(0.5)	6.0	(1.4)	5.2	(1.0)	2.9	(0.5)
Greenchop	16.0	(1.9)	8.2	(1.5)	13.7	(1.5)	13.5	(1.2)
Oats, excluding silage	27.0	(2.3)	17.3	(2.1)	13.4	(1.5)	22.7	(1.5)
Other silages	29.6	(2.4)	45.3	(2.7)	58.6	(2.3)	37.5	(1.6)
Porcine meat and bone meal	2.7	(0.8)	11.1	(1.7)	10.5	(1.4)	6.0	(0.7)
Sorghum	8.8	(1.4)	12.4	(1.9)	15.9	(1.7)	10.7	(1.0)
Soybeans—whole, meal, or hulls	79.3	(2.1)	78.5	(2.1)	59.4	(2.1)	76.9	(1.4)
Straw	13.3	(1.8)	28.9	(2.4)	64.3	(2.1)	23.5	(1.3)
Wet brewers/ distillers grains	5.9	(1.2)	14.0	(1.9)	30.5	(2.2)	11.0	(0.9)
Wheat, excluding silage	6.6	(1.2)	9.6	(1.6)	20.5	(1.8)	9.0	(0.9)
Other	9.1	(1.4)	12.3	(1.7)	15.5	(1.7)	10.7	(1.0)

All operations purchased at least some feed from an outside source: 95.6 percent purchased cottonseed—whole, meal, or hulls; 87.9 percent purchased soybeans—whole, meal, or hulls; 96.8 percent purchased canola; 69.9 percent purchased wheat, excluding silage; and 90.5 percent purchased beet pulp. A higher percentage of large operations than medium or small operations purchased alfalfa hay/haylage; corn—whole, meal, cracked, or flaked, barley; and straw from an outside source.

E.3.b. For operations that fed the following feed types, percentage of operations that purchased feed from an outside source, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Feed type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Alfalfa hay/haylage	31.3	(2.5)	30.1	(2.7)	61.4	(2.2)	34.5	(1.7)
Barley	54.8	(6.9)	47.6	(7.4)	77.2	(5.3)	55.2	(4.7)
Beet pulp	88.2	(7.9)	93.3	(4.5)	90.4	(4.8)	90.5	(3.8)
Canola	97.7	(1.8)	98.3	(1.2)	94.9	(1.5)	96.8	(0.9)
Clover as forage or pasture	7.4	(2.0)	6.0	(2.7)	17.3	(5.3)	7.4	(1.6)
Corn silage	11.6	(1.8)	8.8	(1.6)	31.7	(2.0)	13.2	(1.2)
Corn—whole, meal, cracked, or flaked	51.9	(2.7)	51.0	(2.8)	80.9	(2.1)	55.0	(1.8)
Cottonseed—whole, meal, or hulls	95.1	(2.2)	97.0	(1.4)	94.0	(1.3)	95.6	(1.1)
Greenchop	6.2	(3.0)	9.3	(5.2)	29.2	(5.1)	9.4	(2.4)
Oats, excluding silage	39.4	(5.0)	46.9	(6.9)	68.3	(5.6)	43.0	(3.9)
Other silages	6.2	(2.4)	12.3	(2.7)	27.6	(2.4)	12.1	(1.5)
Sorghum	23.4	(7.2)	16.0	(6.2)	30.5	(4.9)	22.0	(4.2)
Soybeans—whole, meal, or hulls	87.4	(2.0)	87.2	(2.1)	93.8	(1.6)	87.9	(1.4)
Straw	49.7	(7.2)	57.4	(5.1)	81.9	(2.3)	62.2	(3.2)
Wheat, excluding silage	66.0	(9.1)	72.6	(7.8)	73.3	(4.6)	69.9	(4.9)
Any	100.0		100.0		100.0		100.0	

All operations purchased some feed, but only 21.1 percent used forward contracting to lock in feed prices. The percentage of operations that used forward contracting increased as herd size increased.

E.3.c. Percent of operations that used forward contracting to purchase any feed, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
6.7	(1.3)	30.5	(2.6)	66.2	(2.2)	21.1	(1.2)

Feed management programs are used when mixing rations and to track feed inventory. Overall, 16.2 percent of operations used a feed management program. The use of a feed management program increased as herd size increased, with 9.9 percent of small, 15.3 percent of medium, and 52.3 percent of large operations using a program. The highest percentage of small operations (6.6 percent) used an “other” system, which was typically a homemade program. Similar percentages of large operations used the feed management programs EZfeed, TMR Tracker, or Feed Watch (15.8, 14.8, and 13.1 percent, respectively).

E.3.d. Percentage of operations by primary feed management program used, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Primary feed management program	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
EZfeed®	0.0	(—)	0.1	(0.1)	15.8	(1.5)	1.8	(0.2)
Feed Supervisor®	1.5	(0.6)	0.6	(0.4)	3.8	(0.8)	1.5	(0.4)
Feed Watch®	0.3	(0.3)	0.0	(—)	13.1	(1.4)	1.6	(0.2)
TMR Tracker™	1.3	(0.5)	6.5	(1.3)	14.8	(1.6)	4.3	(0.5)
dg precision FEEDING™ system	0.2	(0.2)	0.0	(—)	0.3	(0.3)	0.1	(0.1)
Other	6.6	(1.3)	8.1	(1.5)	4.5	(1.0)	6.8	(0.9)
Any program	9.9	(1.5)	15.3	(2.0)	52.3	(2.3)	16.2	(1.1)
Not used	90.1	(1.5)	84.7	(2.0)	47.7	(2.3)	83.8	(1.1)
Total	100.0		100.0		100.0		100.0	

The use of an independent nutritionist to balance rations increased as herd size increased, while the percentage of operations in which the operator/owner balanced rations decreased as herd size increased. A higher percentage of small and medium operations used a feed company nutritionist to balance rations (41.0 and 48.4 percent, respectively) compared with large operations (30.5 percent).

E.3.e. Percentage of operations by person primarily responsible for balancing rations fed to dairy cows, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Person primarily responsible	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Employee (not a veterinarian)	1.7	(0.6)	3.0	(0.8)	9.9	(1.2)	3.0	(0.5)
Independent nutritionist	17.5	(2.0)	28.8	(2.5)	50.0	(2.3)	24.5	(1.4)
Feed company nutritionist	41.0	(2.6)	48.4	(2.7)	30.5	(2.2)	42.0	(1.7)
Veterinarian	0.5	(0.4)	1.7	(0.7)	1.7	(0.5)	1.0	(0.3)
Operator/owner	39.3	(2.5)	17.9	(2.2)	7.9	(1.4)	29.6	(1.6)
Other	0.0	(—)	0.2	(0.2)	0.0	(—)	0.1	(0.1)
Total	100.0		100.0		100.0		100.0	

More than half of all operations (55.5 percent) fed a total mixed ration (TMR) to dairy cows. The percentage of operations that fed a TMR increased from very small to medium operations.

E.3.f. Percentage of operations that fed a total mixed ration (TMR), by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
19.7	(5.2)	43.4	(2.6)	88.0	(1.8)	89.1	(1.2)	55.5	(1.7)

Almost three-fourths of operations (73.8 percent) used forage test results to balance feed rations. A higher percentage of medium operations (93.5 percent) used forage test results than all other herd sizes.

E.3.g. Percentage of operations that used forage test results to balance feed rations, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
32.9	(6.0)	73.1	(2.3)	93.5	(1.2)	87.8	(1.2)	73.8	(1.6)

Testing milk urea nitrogen (MUN) is done to determine if rations are properly balanced for protein and energy. If MUN values are elevated, protein is likely being overfed, relative to the available energy in the diet.

A majority of medium and large operations (56.1 and 56.2 percent, respectively) routinely tested for MUN. A higher percentage of large operations (26.8 percent) than small and medium operations (13.2 and 17.4 percent, respectively) tested for MUN only when there was a problem.

E.3.h. Percentage of operations by use of milk urea nitrogen (MUN) testing to determine ration composition, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Use of MUN	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Routinely	42.9	(2.6)	56.1	(2.8)	56.2	(2.2)	48.2	(1.7)
Only if there was a problem	13.2	(1.8)	17.4	(2.1)	26.8	(2.1)	15.9	(1.3)
Never	43.9	(2.5)	26.4	(2.5)	16.9	(1.6)	35.8	(1.7)
Total	100.0		100.0		100.0		100.0	

The type of feed line used is generally related to housing type. About one-third of operations either used a tie stall (31.1 percent) or head locks/fence-line stanchion (26.2 percent) for the feed line. The percentage of operations with head locks/fence-line stanchion feed lines increased as herd size increased, while both tie stall and stanchion feed lines decreased as herd size increased.

E.3.i. Percentage of operations by feed line used for the majority of lactating cows, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Feed line	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Head locks/ fence-line stanchion	10.6	(1.6)	37.4	(2.6)	79.5	(1.9)	26.2	(1.3)
Tie stall	45.9	(2.5)	12.4	(2.0)	0.6	(0.3)	31.1	(1.6)
Stanchion	16.5	(1.9)	1.9	(0.9)	0.0	(—)	10.4	(1.2)
Post and rail	7.9	(1.3)	29.6	(2.6)	15.5	(1.7)	15.1	(1.1)
Elevated feed bunk in pen	14.9	(1.8)	14.7	(1.8)	3.4	(1.0)	13.6	(1.2)
Other	4.1	(1.0)	3.9	(1.0)	1.1	(0.5)	3.7	(0.6)
Total	100.0		100.0		100.0		100.0	

The majority of small and medium operations (71.2 and 69.7 percent, respectively) fed all lactating cows the same ration, while the majority of large operations (51.6 percent) fed individual cows or groups of cows based on production/stage of lactation.

E.3.j. Percentage of operations by feeding practice used for the majority of lactating cows, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Feeding practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
All lactating cows fed the same ration	71.2	(2.4)	69.7	(2.5)	37.0	(2.2)	66.9	(1.6)
Individual cows or groups of cows fed based on production/stage of lactation	26.4	(2.3)	24.2	(2.4)	51.6	(2.3)	28.6	(1.6)
Individual cows or groups of cows fed based on lactation number (e.g., first lactation cows fed separately)	2.4	(0.8)	5.7	(1.2)	11.3	(1.6)	4.4	(0.6)
Other	0.0	(—)	0.4	(0.3)	0.2	(0.2)	0.1	(0.1)
Total	100.0		100.0		100.0		100.0	

There were no regional differences in feeding practices for the majority of lactating cows.

E.3.k. Percentage of operations by feeding practice used for the majority of lactating cows, and by region:

	Percent Operations*			
	Region			
	West		East	
Feeding practices	Percent	Std. error	Percent	Std. error
All lactating cows fed the same ration	60.5	(2.6)	67.5	(1.7)
Individual cows or groups of cows fed based on production/ stage of lactation	35.8	(2.6)	27.9	(1.7)
Individual cows or groups of cows fed based on lactation number (e.g., first lactation cows fed separately)	3.5	(0.8)	4.4	(0.7)
Other	0.3	(0.2)	0.1	(0.1)
Total	100.0		100.0	

*Excludes very small operations (<30 cows).

Feeding young cattle the leftover feed (weigh backs) of older cattle could be a mode of disease transmission, since leftover feed can be contaminated with oral and nasal secretions. Ideally, leftover feed would only be fed to cattle leaving the operation for slaughter.

Overall, 43.2 percent of operations fed the leftover feed of older cattle to heifers on a daily or weekly basis, while 42.3 percent never fed leftover feed to heifers. The majority of very small operations (66.5 percent) never fed leftover feed, while the majority of large operations (59.5 percent) did feed heifers leftover feed on a daily or weekly basis.

E.3.l. Percentage of operations by how often the leftover feed (weigh backs) of older cattle was fed to heifers, and by herd size:

Percent Operations

	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Daily or weekly	17.7	(4.5)	46.3	(2.5)	45.2	(2.8)	59.5	(2.3)	43.2	(1.7)
About once a month	2.3	(2.2)	6.3	(1.2)	7.3	(1.5)	6.0	(1.0)	5.9	(0.8)
Less than once a month	13.6	(4.4)	7.9	(1.4)	9.0	(1.6)	3.1	(0.8)	8.5	(1.0)
Never	66.5	(6.0)	39.5	(2.5)	38.5	(2.7)	31.3	(2.2)	42.3	(1.7)
Total	100.0		100.0		100.0		100.0		100.0	

4. Water sources and quality

Water tanks or troughs were used to provide drinking water for cows on more than three-fourths of operations, regardless of herd size. In addition to water tanks or troughs, 73.6 percent of small operations provided water via a cup/bowl waterer. The percentage of operations that used a cup/bowl waterer or a lake, pond, stream, or river as a water source for cows decreased as herd size increased.

E.4.a. Percentage of operations in which cows ever drank from the following water sources, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Water source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Cup/bowl waterer	73.6	(2.0)	33.9	(2.7)	9.7	(1.2)	54.8	(1.5)
Water tank or trough (covered or uncovered)	79.0	(2.1)	89.6	(1.8)	96.9	(0.8)	84.1	(1.4)
Lake, pond, stream, river, etc.	30.9	(2.4)	15.4	(2.0)	2.1	(0.5)	23.1	(1.5)
Other	2.1	(0.7)	0.9	(0.5)	0.2	(0.2)	1.5	(0.5)

All operations cleaned cup/bowl waterers or water tank/troughs at least weekly (52 times per year). Large operations cleaned water tanks/troughs more frequently than small operations (97 and 52 times per year, respectively).

E.4.b. For operations that used the following waterers, average number of times per year waterers were drained and cleaned, by type of waterer and by herd size:

Average Times per Year

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Waterer type	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Cup/bowl waterer	83	(9)	52	(10)	104	(17)	77	(7)
Water tank or trough (covered or uncovered)	52	(6)	73	(7)	97	(6)	64	(4)
Other	18	(14)	6	(3)	365	(0)	22	(13)

The majority of operations (93.6 percent) sourced water from a well. Ground water and municipal water were used by similar percentages of operations across herd sizes. Surface water was used by a higher percentage of very small and small operations than medium and large operations.

E.4.c. Percentage of operations by water source and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Water source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ground water (well)	90.9	(3.4)	93.8	(1.1)	94.9	(1.1)	92.9	(1.2)	93.6	(0.8)
Surface water (ponds, lakes, streams)	36.8	(6.4)	30.2	(2.4)	16.3	(2.0)	6.9	(1.2)	25.4	(1.6)
Municipal water supply (treated water)	6.9	(3.1)	4.3	(0.9)	6.0	(1.1)	8.0	(1.2)	5.4	(0.7)

The only regional difference in water source was for surface water. A lower percentage of operations in the West region (11.2 percent) than in the East region (26.8 percent) used surface water as a water source.

E.4.d. Percentage of operations by water source and by region:

	Percent Operations			
	Region			
	West		East	
Water source	**Percent**	**Std. error**	**Percent**	**Std. error**
Ground water (well)	90.4	(2.7)	93.9	(0.8)
Surface water (ponds, lakes, streams)	11.2	(2.6)	26.8	(1.7)
Municipal water supply (treated water)	11.5	(2.7)	4.9	(0.7)

A similar percentage of cattle across herd sizes were given ground water (well); 91.2 percent of all cattle drank ground water.

E.4.e. Percentage of cattle by water source and by herd size:

	Percent Cattle									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Water source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ground water (well)	84.4	(5.8)	91.8	(1.2)	91.5	(1.6)	91.1	(1.5)	91.2	(1.0)
Surface water (ponds, lakes, streams)	18.6	(5.1)	15.5	(1.7)	8.0	(1.4)	4.8	(1.2)	7.2	(0.9)
Municipal water supply (treated water)	11.2	(5.6)	4.0	(1.0)	7.0	(1.5)	6.0	(1.2)	6.0	(0.8)

The use of surface water was the only regional difference in the percentages of cattle by water source. A lower percentage of cattle in the West region than the East region (2.0 and 11.0 percent, respectively) drank from surface water.

E.4.f. Percentage of cattle by water source and by region:

	Percent Cattle			
	Region			
	West		East	
Water source	**Percent**	**Std. error**	**Percent**	**Std. error**
Ground water (well)	93.3	(1.5)	89.6	(1.4)
Surface water (ponds, lakes, streams)	2.0	(0.5)	11.0	(1.4)
Municipal water supply (treated water)	6.4	(1.5)	5.8	(0.9)

Ground water can contain bacteria and minerals that can affect cow health and productivity. A lower percentage of very small operations (35.1 percent) tested the quality of water given to cattle compared with large operations (70.1 percent). There were no regional differences in the percentage of operations that tested water quality (data not shown).

E.4.g. Percentage of operations that tested the quality of water (e.g., for bacteria, minerals) given to cattle, by herd size:

Percent Operations									
Herd Size (number of cows)									
Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
35.1	(6.0)	61.0	(2.5)	62.2	(2.7)	70.1	(2.1)	58.3	(1.7)

Less than one-fourth of operations across herd sizes made changes to improve water quality based on testing. Of the operations that tested water quality, 15.5 percent made changes to improve water quality. Data were not collected on whether testing suggested that changes were required to improve water quality.

E.4.h. For the 58.3 percent of operations that tested water quality (table E.4.g), percentage of operations that made changes to improve water quality as a result of water testing, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
13.6	(2.3)	15.5	(2.5)	24.6	(2.2)	15.5	(1.5)

The percentages of operations that tested water quality were similar, regardless of water source.

E.4.i. For the 58.3 percent of operations that tested water quality (table E.4.g), percentage of operations that made changes to improve water quality as a result of water testing, by primary water source:

Percent Operations

Primary Water Source

Ground water (well)		**Surface water** (ponds, lakes, streams)		**Municipal water supply** (treated water)		**Mixed***		**All sources**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
15.4	(1.6)	9.6	(6.0)	12.8	(6.3)	17.4	(6.8)	15.5	(1.5)

*No clear primary—most cattle had access to more than one water source.

5. Breeding bulls

About half of all operations (51.5 percent) had bulls used for breeding dairy cows. Beef bulls were used for breeding dairy cattle on 5.5 percent of operations, while dairy bulls were used on 48.1 percent of operations. A lower percentage of small operations used dairy bulls or any bulls (45.8 and 48.2 percent, respectively) compared with large operations (61.6 and 62.8 percent, respectively).

E.5.a. Percentage of operations that had any bulls used for breeding dairy cows on January 1, 2014, by breed and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Bull breed	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Beef	13.5	(4.3)	4.0	(0.9)	5.1	(1.2)	2.8	(1.1)	5.5	(0.9)
Dairy	35.8	(6.1)	45.8	(2.6)	55.0	(2.7)	61.6	(2.1)	48.1	(1.8)
Any	45.1	(6.4)	48.2	(2.6)	57.6	(2.7)	62.8	(2.1)	51.5	(1.8)

More than 90 percent of bulls used for breeding dairy cows (92.5 percent) were dairy breeds.

E.5.b. Of all breeding bulls present on January 1, 2014, percentage of bulls that were dairy breeds:

Percent Bulls

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
71.7	(10.1)	91.1	(2.2)	92.7	(2.2)	95.7	(2.3)	92.5	(1.5)

6. Vaccinations and other preventive practices

The percentage of operations that administered vaccines to cows increased as herd size increased. Overall, 73.8 percent operations administered any vaccine to cows. More than half of operations administered vaccines against BVD (68.0 percent of operations), infectious bovine rhinotracheitis (60.2 percent), parainfluenza type 3 (55.8 percent), bovine respiratory syncytial virus (54.8 percent), or leptospirosis (51.5 percent).

E.6.a. Percentage of operations that vaccinated cows against the following diseases, by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine viral diarrhea (BVD)	33.8	(6.3)	66.4	(2.5)	83.2	(2.2)	90.1	(1.5)	68.0	(1.8)
Infectious bovine rhinotracheitis (IBR)	29.3	(6.0)	58.6	(2.6)	74.9	(2.5)	78.6	(2.0)	60.2	(1.8)
Parainfluenza Type 3 (PI3)	23.8	(5.7)	54.9	(2.6)	70.0	(2.7)	73.6	(2.2)	55.8	(1.8)
Bovine respiratory syncytial virus (BRSV)	25.1	(5.7)	53.1	(2.6)	69.6	(2.7)	71.7	(2.2)	54.8	(1.8)
Leptospirosis	27.8	(6.0)	50.7	(2.6)	62.0	(2.8)	65.7	(2.3)	51.5	(1.8)
E. coli	3.6	(2.1)	15.5	(1.9)	39.2	(2.8)	67.9	(2.2)	24.4	(1.3)
Clostridia	4.8	(2.9)	8.6	(1.4)	31.3	(2.6)	61.2	(2.4)	18.5	(1.1)
Rotavirus	2.5	(1.7)	4.1	(1.0)	18.3	(2.2)	36.3	(2.3)	10.3	(0.8)
Salmonella	2.8	(1.9)	3.6	(1.0)	13.4	(1.9)	33.3	(2.2)	8.6	(0.8)
*Histophilus somni**	2.8	(1.9)	6.6	(1.3)	12.1	(1.8)	14.9	(1.8)	8.2	(0.9)
Mannheimia haemolytica	0.0	(--)	2.6	(0.8)	4.9	(1.1)	8.0	(1.2)	3.5	(0.5)
Rabies	4.4	(2.4)	3.3	(0.9)	3.7	(1.0)	3.4	(0.9)	3.5	(0.7)
Any	41.4	(6.3)	71.0	(2.4)	89.6	(1.8)	97.2	(1.0)	73.8	(1.7)

*Formerly *Haemophilus somnus.*

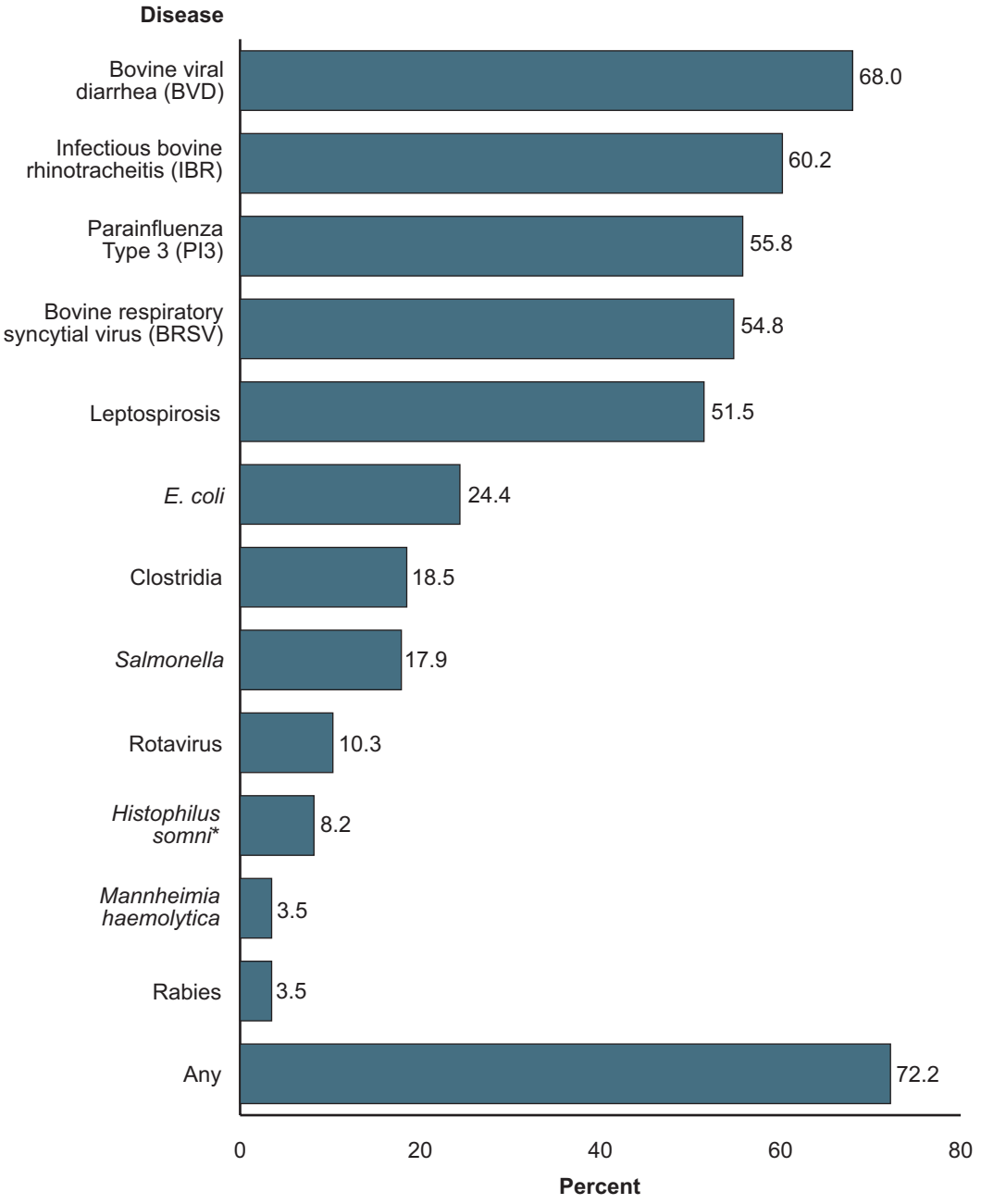
A higher percentage of operations in the West region vaccinated cows against *E. coli*, clostridia, *Salmonella*, or rotavirus compared with operations in the East region.

E.6.b. Percentage of operations that vaccinated cows against the following diseases, by region:

	Percent Operations			
	Region			
	West		East	
Disease	**Percent**	**Std. error**	**Percent**	**Std. error**
Bovine viral diarrhea (BVD)	75.3	(4.3)	67.3	(1.9)
Infectious bovine rhinotracheitis (IBR)	63.0	(4.2)	60.0	(1.9)
Parainfluenza Type 3 (PI3)	58.4	(4.1)	55.6	(1.9)
Bovine respiratory syncytial virus (BRSV)	55.1	(4.0)	54.8	(1.9)
Leptospirosis	58.6	(4.2)	50.9	(1.9)
E. coli	49.5	(3.8)	22.2	(1.4)
Clostridia	49.2	(3.9)	15.8	(1.2)
Rotavirus	23.7	(3.2)	9.1	(0.8)
Salmonella	17.8	(2.7)	7.8	(0.8)
*Histophilus somni**	14.3	(2.8)	7.6	(0.9)
Mannheimia haemolytica	2.6	(0.8)	3.6	(0.6)
Rabies	2.6	(0.8)	3.6	(0.7)
Any	86.3	(3.9)	72.6	(1.8)

*Formerly *Haemophilus somnus*.

Percentage of operations that vaccinated *cows* against the following diseases



*Formerly *Haemophilus somnus*.

A higher percentage of medium and large operations (64.3 and 65.7 percent, respectively) annually vaccinated all dairy cows against BVD compared with very small or small operations (31.4 and 49.4 percent, respectively).

E.6.c. Percentage of operations that annually vaccinated all dairy cows against BVD, by herd size:

Percent Operations

Herd Size (number of cows)

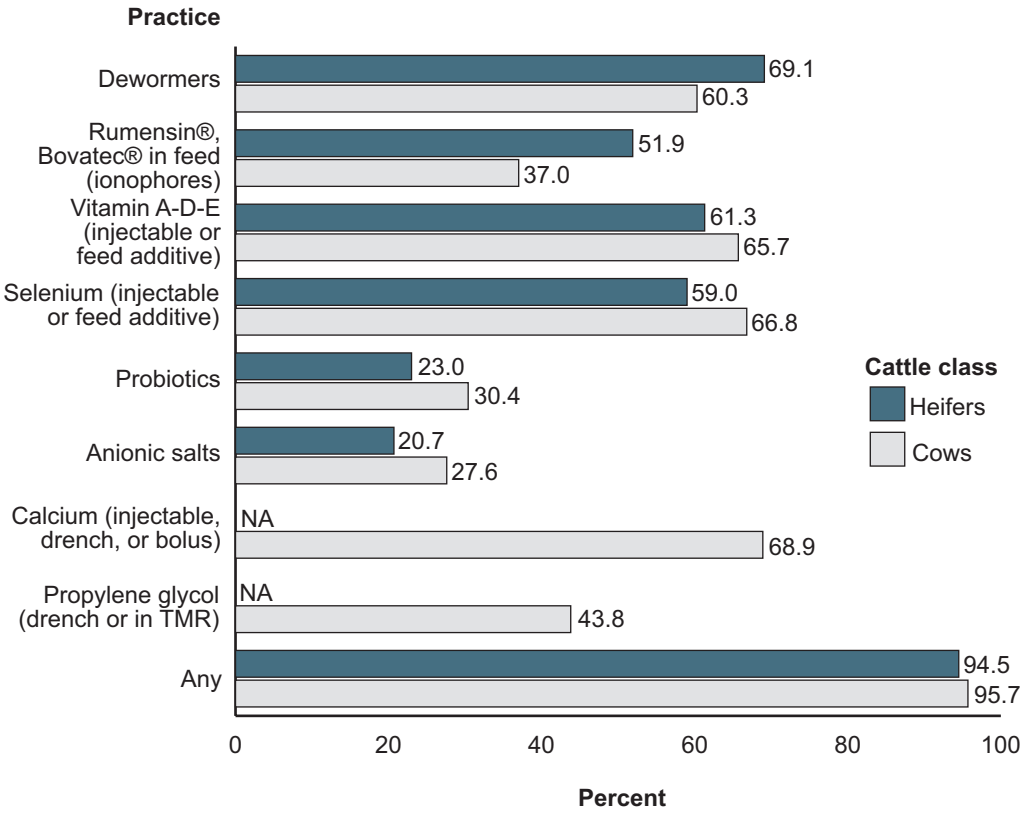
Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
31.4	(6.0)	49.4	(2.6)	64.3	(2.7)	65.7	(2.3)	51.9	(1.8)

A total of 95.7 percent of all operations used some type of preventive practice. A lower percentage of large operations used dewormers compared with small and medium operations. A lower percentage of very small and small operations used ionophores in feed (20.4 and 27.7 percent, respectively) than medium or large operations (56.2 and 62.7 percent, respectively). Probiotics were used by a higher percentage of large operations compared with the other operation sizes. The percentage of operations that used anionic salts to prevent hypocalcemia (milk fever) increased from small to large operations; 27.6 percent of all operations used anionic salts. Calcium was provided to cows on a lower percentage of very small and small operations than on large operations.

E.6.d. Percentage of operations that normally used the following preventive (not treatment) practices for cows, by herd size:

	Percent Operations									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Preventive practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dewormers	56.5	(6.2)	63.0	(2.5)	64.1	(2.6)	42.4	(2.2)	60.3	(1.7)
Rumensin, Bovatec in feed (ionophores)	20.4	(5.1)	27.7	(2.3)	56.2	(2.7)	62.7	(2.2)	37.0	(1.6)
Vitamin A-D-E (injectable or feed additive)	46.7	(6.2)	66.7	(2.4)	72.0	(2.4)	73.1	(2.1)	65.7	(1.7)
Selenium (Injectable or feed additive)	50.1	(6.4)	69.0	(2.4)	71.4	(2.5)	69.0	(2.1)	66.8	(1.7)
Probiotics	25.5	(5.6)	28.7	(2.4)	32.3	(2.6)	42.7	(2.3)	30.4	(1.6)
Anionic salts	25.0	(5.7)	21.3	(2.1)	31.9	(2.6)	54.5	(2.3)	27.6	(1.5)
Calcium (injectable, drench, or bolus)	47.6	(6.5)	69.3	(2.3)	76.5	(2.4)	80.0	(1.9)	68.9	(1.7)
Propylene glycol (drench or in TMR)	22.8	(5.3)	45.2	(2.6)	51.7	(2.8)	48.1	(2.3)	43.8	(1.7)
Any	100.0	(—)	94.0	(1.3)	96.9	(1.0)	96.8	(0.8)	95.7	(0.7)

Percentage of operations that normally used the following preventive (not treatment) practices for cows, by cattle class



7. Adverse reactions to injections

Adverse reactions to injections, which can include a lump or swelling at an injection site, hives, abortion, collapse, or death, can occur following the administration of preventive or therapeutic products. Overall, 9.9 percent of operations had at least one incident in which a dairy cow had an adverse reaction to any injection. Vaccines were the injection type that caused an adverse reaction on the highest percentage of all operations (7.6 percent).

E.7.a. Percentage of operations with at least one cow that experienced an adverse reaction to any injection, by injection type and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Injection type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Vaccine	5.0	(1.2)	9.0	(1.6)	18.0	(1.8)	7.6	(0.9)
Antibiotic	2.8	(0.8)	3.4	(1.0)	5.3	(1.0)	3.3	(0.6)
Vitamin	0.6	(0.4)	2.2	(0.8)	3.9	(1.1)	1.4	(0.4)
Other	0.0	(—)	0.6	(0.4)	0.0	(—)	0.2	(0.1)
Any	7.1	(1.3)	11.3	(1.8)	20.9	(1.9)	9.9	(1.0)

A lump or swelling at an injection site accounted for the highest percentage of operations in which at least one cow had an adverse reaction (76.2 percent).

E.7.b. For the 9.9 percent of operations with at least one cow that had an adverse reaction to an injection (table E.7.a), percentage of operations by the following clinical signs, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Clinical sign	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Lump or swelling in the location of injection	83.4	(7.5)	82.1	(5.9)	55.0	(5.4)	76.2	(4.1)
Decrease in milk production	29.0	(9.0)	12.8	(5.3)	29.2	(4.6)	23.6	(4.5)
Collapse	11.7	(6.3)	11.3	(4.8)	38.0	(5.2)	17.8	(3.5)
Hives	13.4	(7.1)	15.3	(6.5)	27.1	(5.0)	17.3	(3.9)
Respiratory distress	15.9	(7.2)	17.1	(5.9)	17.3	(3.7)	16.7	(3.8)
Abortion	6.1	(4.2)	17.8	(6.8)	25.3	(4.9)	14.6	(3.3)
Fever	11.7	(6.5)	8.0	(5.6)	19.6	(4.7)	12.3	(3.5)
Lethargy	4.9	(4.8)	10.1	(5.8)	16.6	(3.7)	9.4	(3.0)
Product didn’t work as expected (lack of efficacy)	8.0	(4.6)	5.4	(3.6)	7.8	(2.5)	7.1	(2.4)
Infertility	0.0	(—)	2.8	(2.7)	4.0	(1.8)	1.9	(1.0)
Other	0.0	(—)	2.8	(2.7)	8.9	(3.9)	3.0	(1.3)

Vaccines, veterinary drugs, and medicated feeds are regulated by two different governmental agencies. Vaccines and other biologics are regulated by the USDA's Centers for Veterinary Biologics (USDA–CVB). Veterinary drugs, medicated feeds, and animal devices are regulated by the Food and Drug Administration, Center for Veterinary Medicine (FDA–CVM). Both agencies strongly encourage producers that encounter any problems with veterinary products—including adverse reactions in animals—to contact the manufacturer and report the event before contacting either regulatory agency. Both agencies have Web sites where an adverse event can be reported:

USDA–CVB:
http://www.aphis.usda.gov/animal_health/vet_biologics/publications/Prod_USDA_AER.pdf

FDA–CVM:
http://www.fda.gov/AnimalVeterinary/SafetyHealth/ReportaProblem/default.htm

Most operations (52.3 percent) reported an adverse reaction to an injection to a veterinarian. Less than 1 percent of operations reported an adverse reaction to the USDA or FDA. Almost half of operations (47.2 percent) did not report an adverse reaction to any person or agency.

E.7.c. For the 9.9 percent of operations in which at least one cow had an adverse reaction to an injection (table E.7.a), percentage of operations that reported adverse reactions to the following entities, by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Entities	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
A veterinarian	44.8	(9.9)	64.4	(8.2)	48.9	(5.3)	52.3	(5.3)
The drug manufacturer	0.0	(—)	5.5	(3.7)	13.1	(2.9)	4.9	(1.5)
USDA's Center for Veterinary Biologics	0.0	(—)	0.0	(—)	1.1	(1.0)	0.3	(0.2)
FDA's Center for Veterinary Medicine	0.0	(—)	0.0	(—)	2.2	(1.4)	0.5	(0.3)
Other	0.0	(—)	1.7	(1.6)	0.0	(—)	0.6	(0.5)
Any	44.8	(9.9)	64.4	(8.2)	50.7	(5.4)	52.8	(5.3)

Overall, 35.3 percent of operations in which any cow had an adverse reaction to an injection had the cow(s) examined by a veterinarian.

E.7.d. For the 9.9 percent of operations in which at least one cow had an adverse reaction to an injection (table E.7.a), percentage of operations that had the cow(s) examined by a veterinarian, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
27.1	(8.7)	41.4	(8.6)	41.5	(5.3)	35.3	(5.0)

8. Recombinant bovine somatotropin (rbST)

Recombinant bovine somatotropin (rbST) can increase milk production 15 percent, but some cooperatives and/or processors have restricted its use within their supply chain. The percentage of operations and the percentage of cows in which rbST was used increased as herd size increased; overall, 9.7 percent of operations used rbST, and 14.7 percent of all cows received rbST during the most recent lactation.

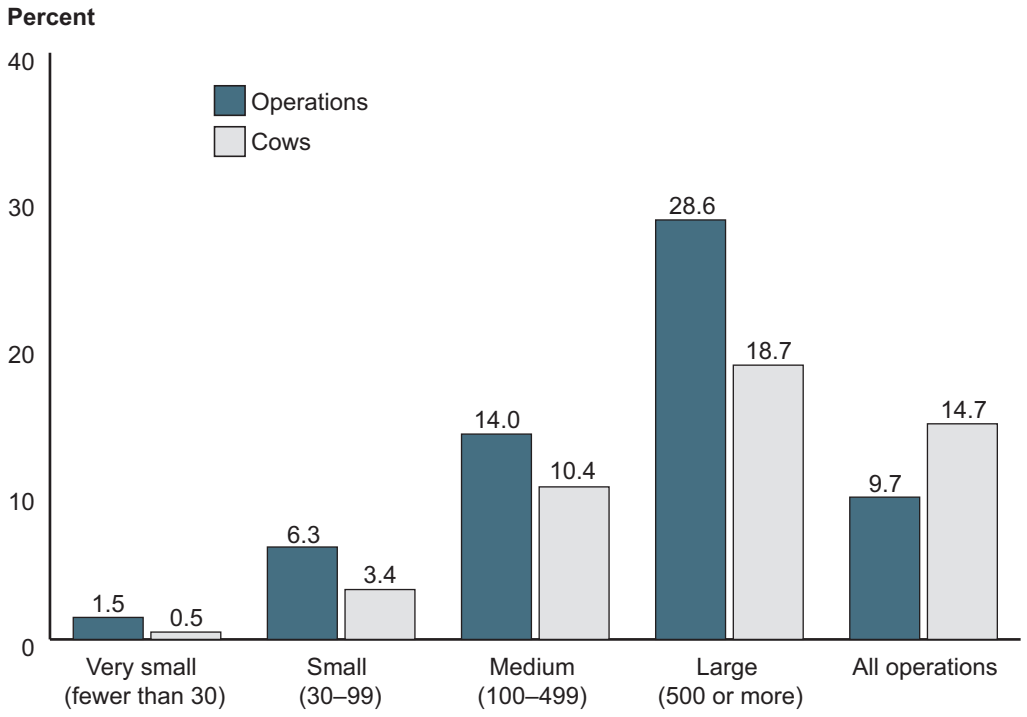
E.8.a. Percentage of operations and percentage of cows that used/received rbST during the most recent lactation, by herd size:

Percent

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	1.5	(1.5)	6.3	(1.3)	14.0	(1.8)	28.6	(1.9)	9.7	(0.8)
Cows	0.5	(0.5)	3.4	(0.9)	10.4	(1.7)	18.7	(1.6)	14.7	(1.1)

Percentage of operations and percentage of cows that used/received rbST during the most recent lactation, by herd size



Although a similar percentage of operations in both regions administered rbST, more than twice the percentage of cows in the East region (19.3 percent) received rbST compared with cows in the West region (8.5 percent).

E.8.b. Percentage of operations and percentage of cows that used/received rbST during the most recent lactation, by region:

	Percent			
	Region			
	West		**East**	
Parameter	**Percent**	**Std. error**	**Percent**	**Std. error**
Operations	10.1	(1.4)	9.6	(0.9)
Cows	8.5	(1.5)	19.3	(1.5)

Operations that used rbST had a higher operation average RHA milk production. For example, RHA milk production for herds that used rbST was 25,574 pounds compared with 19,328 pounds for those that did not use rbST. This difference in milk production, however, does not account for any other herd management practices and, therefore, should not be attributed solely to the use of rbST.

E.8.c. Operation average RHA milk production (lb/cow), by rbST use and by herd size:

	Operation Average RHA Milk Production (lb/cow)									
	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Used rbST	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Yes	*		23,439	(683)	26,525	(364)	27,217	(277)	25,574	(323)
No	15,431	(832)	18,677	(254)	20,929	(254)	24,496	(177)	19,328	(193)

*Too few to report.

9. Management of nonambulatory cows

For this study, nonambulatory cows were defined as cows unable to stand for at least 24 hours. In 2003, nonambulatory cattle were banned from entering the food supply after the first case of bovine spongiform encephalopathy (BSE) was discovered in the United States.

The percentage of operations with at least one nonambulatory cow in 2013 ranged from 38.8 percent of very small operations to 98.4 percent of large operations. Overall, 76.5 of operations had at least one nonambulatory cow. On large operations, 2.1 percent of cows became nonambulatory. Overall, 2.6 percent of cows became nonambulatory in 2013.

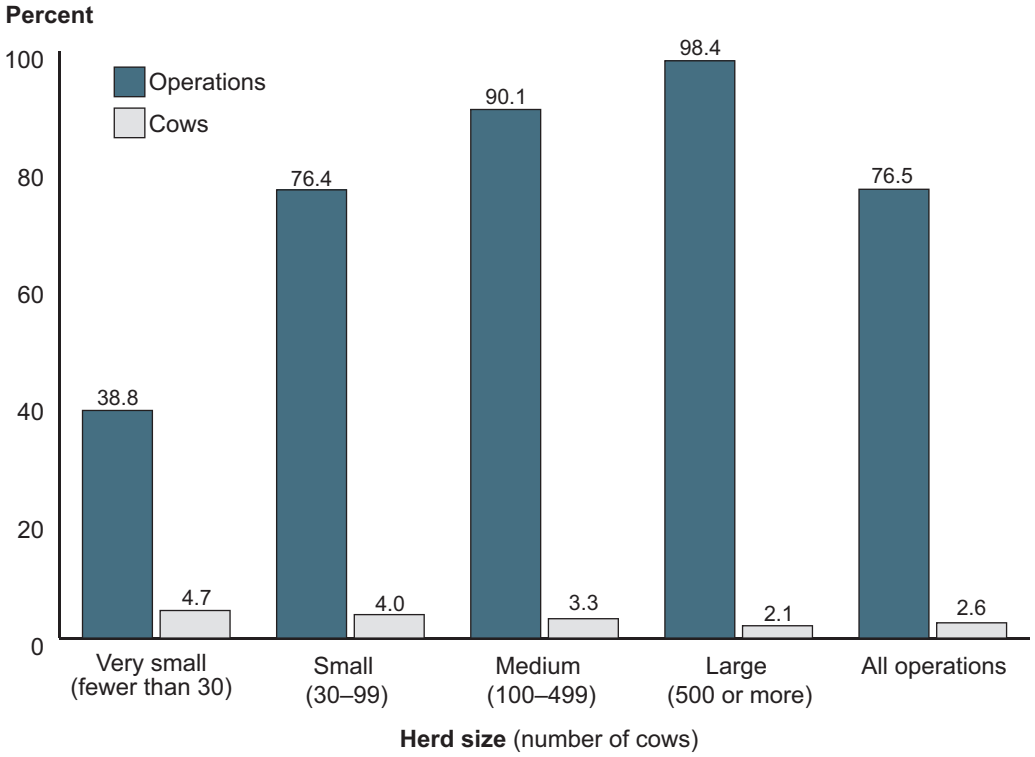
E.9.a. Percentage of operations with nonambulatory cows and percentage of cows that became nonambulatory in 2013, by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Parameter	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Operations	38.8	(6.3)	76.4	(2.2)	90.1	(1.8)	98.4	(0.5)	76.5	(1.6)
Cows	4.7	(1.1)	4.0	(0.2)	3.3	(0.2)	2.1	(0.1)	2.6	(0.1)

Percentage of operations with nonambulatory cows and percentage of cows that became nonambulatory in 2013, by herd size



A similar percentage of operations in both regions had at least one nonambulatory cow in 2013, but the West region had a lower percentage of nonambulatory cows than the East region (1.7 and 3.3 percent, respectively).

E.9.b. Percentage of operations with nonambulatory cows and percentage of cows that became nonambulatory in 2013, by region:

	Percent			
	Region			
	West		East	
Parameter	**Percent**	**Std. error**	**Percent**	**Std. error**
Operations	85.5	(4.0)	75.6	(1.7)
Cows	1.7	(0.1)	3.3	(0.1)

Overall, 22.6 percent of operations had written guidelines or procedures for handling nonambulatory cattle. A higher percentage of large operations (57.1 percent) had written guidelines or procedures compared with small and medium operations (15.5 and 24.1 percent, respectively).

E.9.c. Percentage of operations that had written guidelines or procedures for handling nonambulatory cattle, by herd size:

Percent Operations							
Herd Size (number of cows)							
Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
15.5	(1.9)	24.1	(2.4)	57.1	(2.3)	22.6	(1.4)

Cows can become nonambulatory for a variety of reasons including metabolic disease and trauma. The prognosis should impact whether the producer decides to immediately euthanize the cow or implement a treatment plan.

Note: The study questionnaire did not ask the reason a cow became nonambulatory or the location of the cow(s) at the time it became nonambulatory.

Most operations provided nonambulatory cows food, water, and shelter within 1 hour of recognizing them as nonambulatory. Approximately 15 percent of operations provided nonambulatory cows with food or water 5 hours or more after realizing they were nonambulatory.

E.9.d. For the 76.5 percent of operations with any nonambulatory cows (table E.9.a), percentage of operations by number of hours until cows were normally offered or provided the following after becoming nonambulatory:

	Percent Operations*					
	Food		Water		Shelter	
Number of hours	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
1 or less	60.6	(1.8)	62.6	(1.8)	65.5	(1.8)
2–4	20.7	(1.6)	20.4	(1.6)	14.6	(1.4)
5–7	5.8	(0.9)	5.0	(0.8)	2.3	(0.6)
8–12	4.5	(0.8)	4.6	(0.8)	2.5	(0.6)
More than 12	5.0	(0.8)	4.9	(0.8)	6.0	(0.9)
Not offered	3.4	(0.7)	2.6	(0.6)	9.1	(1.1)
Total	100.0		100.0		100.0	

*Excludes very small operations (<30 cows).

Of operations with any nonambulatory cows, 77.5 percent helped nonambulatory cows rise.

E.9.e. For the 76.5 percent of operations with any nonambulatory cows (table E.9.a), percentage of operations that helped nonambulatory cows rise (e.g., via a hoist or flotation tank), by herd size:

Percent Operations									
Herd Size (number of cows)									
Very small (fewer than 30)		Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
87.6	(7.0)	70.6	(2.7)	81.8	(2.2)	89.6	(1.6)	77.5	(1.7)

A higher percentage of operations in the West region (93.2 percent) helped nonambulatory cows rise than operations in the East region (75.9 percent).

E.9.f. For the 76.5 percent of operations with any nonambulatory cows (table E.9.a), percentage of operations that helped nonambulatory cows rise (e.g., via a hoist or flotation tank), by region:

Percent Operations			
Region			
West		East	
Percent	Std. error	Percent	Std. error
93.2	(1.4)	75.9	(1.8)

Similar percentages of nonambulatory cows across herd sizes recovered or were euthanized. Almost one-third of nonambulatory cows (30.0 percent) recovered, about half (49.7 percent) were euthanized, 2.5 percent were slaughtered for home consumption, and 17.7 percent died. A higher percentage of nonambulatory cows on small operations than large operations died (23.6 and 14.8 percent, respectively).

E.9.g. For the 2.6 percent of cows that became nonambulatory (table E.9.a), percentage of cows by outcome and by herd size:

	Percent Cows							
	Herd Size (number of cows)							
	Small (30–99)		Medium (100–499)		Large (500 or more)		All operations	
Outcome	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Recovered	25.2	(2.4)	28.4	(1.9)	32.8	(2.7)	30.0	(1.6)
Were euthanized	46.7	(2.7)	49.1	(2.4)	51.1	(2.5)	49.7	(1.6)
Were slaughtered for home consumption	4.5	(0.8)	3.8	(0.6)	1.0	(0.3)	2.5	(0.3)
Died	23.6	(2.2)	18.6	(1.7)	14.8	(1.2)	17.7	(0.9)
Other	0.0	(—)	0.1	(0.1)	0.3	(0.3)	0.2	(0.1)
Total	100.0		100.0		100.0		100.0	

More than half of the operations that euthanized nonambulatory cows (59.1 percent) did so within 2 days after recognizing the cows as nonambulatory. A higher percentage of large operations than the other operation sizes euthanized nonambulatory cows within 1 day. A small percentage of operations (6.4 percent) waited more than 6 days before euthanizing nonambulatory cows.

E.9.h. For the 49.7 percent of nonambulatory cows that were euthanized (table E.9.g), percentage of operations by operation average number of days after being recognized as nonambulatory that cows were euthanized, by herd size:

Percent Operations

Herd Size (number of cows)

Operation average number (d)	**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1.0 or less	25.3	(3.2)	20.0	(2.6)	40.8	(2.4)	26.3	(1.9)
1.1–2.0	34.0	(3.5)	31.3	(3.0)	32.3	(2.2)	32.8	(2.0)
2.1–6.0	34.3	(3.5)	40.2	(3.2)	24.6	(2.1)	34.6	(2.0)
More than 6.0	6.4	(1.8)	8.5	(1.8)	2.3	(1.0)	6.4	(1.1)
Total	100.0		100.0		100.0		100.0	

10. Permanent removals, deaths, and euthanasia

With the exception of very small operations, almost all operations permanently removed (culled) at least one cow during 2013; 94.6 percent of all operations removed at least one cow. At least one cow died on 83.3 percent of operations, and the percentage increased as operation size increased from very small to medium.

E.10.a. Percentage of operations that permanently removed any cows or that had any cows die during 2013, by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Outcome	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Permanently removed	70.8	(5.7)	98.7	(0.5)	98.2	(1.0)	98.9	(0.4)	94.6	(1.0)
Died	45.8	(6.3)	84.1	(1.9)	97.4	(0.9)	99.1	(0.7)	83.3	(1.4)

Overall, 28.4 percent of cows were permanently removed from operations during 2013. A lower percentage of cows were permanently removed on small and medium operations (26.0 and 26.3 percent, respectively) than on large operations (29.7 percent). A similar percentage of cows died across herd sizes. Overall, producers reported 4.8 percent of cows died in 2013.

E.10.b. Percentage of cows that were permanently removed or died, by herd size:

Percent Cows

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Outcome	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Permanently removed	24.5	(3.9)	26.0	(0.8)	26.3	(0.9)	29.7	(0.7)	28.4	(0.5)
Died	5.7	(1.0)	4.9	(0.2)	4.7	(0.3)	4.8	(0.2)	4.8	(0.1)

The percentage of operations that euthanized any cows or heifers increased as herd size increased, ranging from 20.7 percent of very small operations to 96.8 percent of large operations.

E.10.c. Percentage of operations that euthanized any cows or heifers on the operation, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
20.7	(5.0)	56.4	(2.6)	78.9	(2.4)	96.8	(0.7)	60.6	(1.7)

Overall, 17.2 percent of operations that euthanized cattle had written guidelines or procedures for euthanizing cattle, which is substantially lower than the percentage of operations that euthanized any cattle (60.6 percent, table E.10.c). A lower percentage of small and medium operations (8.4 and 15.8 percent, respectively) had written guidelines or procedures for euthanizing cattle compared with large operations (48.5 percent).

E.10.d. For the 60.6 percent of operations that euthanized cattle (table E.10.c), percentage of operations that had written guidelines or procedures for euthanizing cattle, by herd size:

Percent Operations

Herd Size (number of cows)

Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
8.4	(2.0)	15.8	(2.2)	48.5	(2.5)	17.2	(1.3)

Guidelines for approved euthanasia methods for cattle are available from the American Association of Bovine Practitioners:
http://www.aabp.org/resources/AABP_Guidelines/Practical_Euthanasia_of_Cattle-September_2013.pdf

and the American Veterinary Medical Association:
https://www.avma.org/KB/Policies/Documents/euthanasia.pdf

Of operations that euthanized cows, 91.7 percent used a gunshot.

E.10.e. For the 60.6 percent of operations that euthanized any cattle (table E.10.c), percentage of operations by primary method of euthanasia, and by cattle type:

	Percent Operations*					
	Cattle Type					
	Preweaned heifers		Weaned heifers		Cows	
Primary euthanasia method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Gunshot	32.8	(1.8)	38.2	(1.9)	91.7	(1.1)
Captive bolt	0.3	(0.1)	0.5	(0.2)	1.4	(0.4)
Lethal injection	2.0	(0.5)	2.3	(0.6)	5.9	(1.0)
Other	0.3	(0.2)	0.4	(0.2)	0.5	(0.3)
This class of cattle not euthanized	60.6	(1.9)	54.8	(2.0)	0.5	(0.3)
Not housed on the operation	4.1	(0.7)	3.8	(0.7)	NA	
Total	100.0		100.0		100.0	

*Excludes very small operations (<30 cows).

Operation owners were responsible for euthanasia on 70.8 percent of all operations. The percentage of operations in which a manager or herdsperson performed euthanasia increased as herd size increased. Veterinarians were responsible for euthanasia on a higher percentage of large operations than small operations (19.6 and 7.7 percent, respectively). A rendering company was responsible for euthanizing cattle on 17.1 percent of operations.

E.10.f. For the 60.6 percent of operations that euthanized any cattle (table E.10.c), percentage of operations by personnel responsible for performing euthanasia, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Owner	75.0	(3.0)	70.4	(2.7)	58.6	(2.3)	70.8	(1.8)
Manager or herdsperson	3.3	(1.2)	14.0	(2.0)	52.9	(2.4)	14.9	(1.0)
Other employees	2.7	(1.1)	8.5	(1.7)	10.4	(1.3)	5.9	(0.8)
Veterinarian	7.7	(1.8)	13.0	(2.0)	19.6	(1.9)	11.4	(1.2)
Rendering company	17.2	(2.6)	18.6	(2.1)	13.6	(1.5)	17.1	(1.5)
University or extension agent	0.0	(—)	0.0	(—)	0.3	(0.2)	0.0	(0.0)
Other	1.7	(0.9)	2.0	(1.1)	0.5	(0.3)	1.6	(0.6)

F. Use of Veterinarians

1. Consultation

Veterinarians act as important consultants for dairy operations and are usually involved in management decisions, as they relate to cattle health. The percentage of operations that worked with or consulted a veterinarian increased as herd size increased; 100.0 percent of large operations worked with or consulted a veterinarian during 2013.

F.1.a. Percentage of operations that worked with or consulted a veterinarian, by herd size:

Percent Operations

Herd Size (number of cows)

Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
78.4	(5.2)	94.5	(1.2)	99.3	(0.4)	100.0	(—)	93.8	(1.0)

A few studies have indicated that veterinarians are not always located in areas where livestock operations exist, which has led to the conclusion that there is a shortage of veterinarians specializing in food animals. In contrast, other studies indicate that there is a veterinarian distribution problem in which some areas do not have enough livestock operations to support a veterinarian.

No operations reported that a veterinarian was available but was not knowledgeable about dairy cattle. Of the 6.2 percent of operations that did not use a veterinarian, 66.1 percent reported that a veterinarian was not needed on the operation. Only 3.1 percent of operations that did not use a veterinarian reported that there was no local veterinarian.

F.1.b. For the 6.2 percent of operations that did not use a veterinarian (table F.1.a), percentage of operations by reason for not using a veterinarian, and by herd size:

Percent Operations

Herd Size (number of cows)

	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Available but not knowledgeable about dairy cattle	0.0	(—)	0.0	(—)	0.0	(—)			0.0	(—)
Not available in the local area	0.0	(—)	4.9	(4.7)	30.7	(25.8)			3.1	(2.3)
Too expensive	31.9	(13.6)	21.6	(9.4)	0.0	(—)			26.3	(8.4)
Not needed on the operation	61.7	(13.8)	73.6	(10.0)	30.7	(25.8)			66.1	(8.7)
Other	6.4	(6.2)	0.0	(—)	38.6	(27.9)			4.5	(3.4)
Total	100.0		100.0		100.0				100.0	

The frequency of visits by a veterinarian increased as herd size increased. The majority of very small operations (78.9 percent) reported a veterinarian was on the operation less than monthly. The majority of small and medium operations (55.3 and 53.7 percent, respectively) were visited by a veterinarian on a monthly basis. Weekly visits by veterinarians were made on 66.5 percent of large operations.

F.1.c. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by frequency that a veterinarian was on the operation, and by herd size:

Percent Operations

	Herd Size (number of cows)									
	Very small (fewer than 30)		**Small** (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Daily	0.0	(—)	0.4	(0.3)	1.4	(0.6)	4.6	(0.9)	1.1	(0.2)
Weekly	0.0	(—)	7.2	(1.4)	24.5	(2.3)	66.5	(2.2)	16.9	(1.0)
Monthly	21.1	(5.9)	55.3	(2.6)	53.7	(2.8)	22.1	(2.0)	47.3	(1.8)
Less than monthly	78.9	(5.9)	37.1	(2.5)	20.4	(2.3)	6.8	(1.2)	34.8	(1.7)
Total	100.0		100.0		100.0		100.0		100.0	

The highest percentages of producers rated their veterinarian as excellent or very good in terms of availability (48.7 and 33.3 percent of operations, respectively), knowledge of dairy cattle (54.2 and 32.3 percent, respectively), and performing their work (52.2 and 34.8 percent, respectively).

F.1.d. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by producer rating of veterinarian in the following areas:

Percent Operations

Veterinarian Rating

	Excellent		Very good		Good		Adequate		Poor		
Area	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Availability	48.7	(1.8)	33.3	(1.7)	14.0	(1.3)	3.4	(0.7)	0.6	(0.3)	100.0
Knowledge of dairy cattle	54.2	(1.8)	32.3	(1.7)	11.7	(1.2)	1.5	(0.5)	0.3	(0.2)	100.0
Performing procedures/ tasks	52.2	(1.8)	34.8	(1.7)	11.3	(1.2)	1.6	(0.5)	0.1	(0.1)	100.0

2. Services provided

Of operations that used a veterinarian, 91.3 percent used their veterinarian for emergency services, 85.7 percent for reproductive management, 85.1 percent for disease diagnosis and treatment, and 84.6 percent used their veterinarian for drug sales. A higher percentage of small and medium operations (84.8 and 88.5 percent, respectively) obtained drugs from their veterinarian compared with large operations (73.5 percent). Veterinarians provided left displaced abomasum (LDA) surgery on a higher percentage of medium operations (78.6 percent) than on small or large operations (59.4 and 56.6 percent, respectively). Dehorning was performed on a lower percentage of large operations than small or medium operations. The percentage of operations in which veterinarians provided lameness management services was similar across herd sizes. For the rest of the services listed in the following table, the percentage of operations that used the services increased as herd size increased.

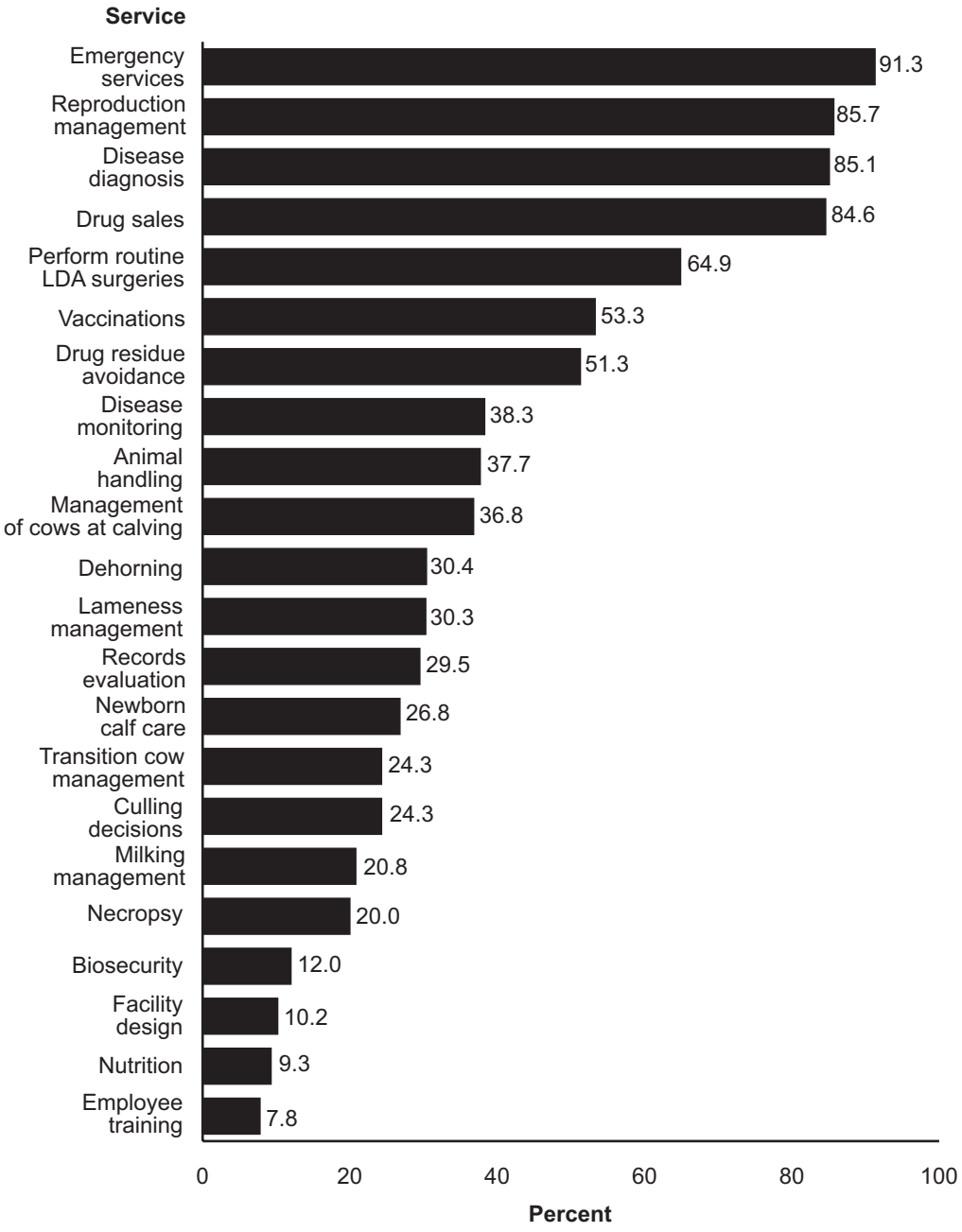
F.2.a. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by services provided by the operation's veterinarian, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Service	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Emergency services	92.1	(1.5)	92.2	(1.6)	85.6	(1.5)	91.3	(1.0)
Reproductive management	83.9	(1.9)	86.9	(1.9)	91.4	(1.2)	85.7	(1.2)
Disease diagnosis and/or treatment	85.0	(1.9)	87.6	(1.7)	79.3	(1.8)	85.1	(1.2)
Drug sales	84.8	(1.9)	88.5	(1.8)	73.5	(2.0)	84.6	(1.3)
Perform routine left displaced abomasum surgeries	59.4	(2.6)	78.6	(2.3)	56.6	(2.0)	64.9	(1.7)
Vaccinations	49.7	(2.6)	57.0	(2.7)	62.5	(2.2)	53.3	(1.7)
Milk and meat drug residue avoidance	47.8	(2.6)	54.2	(2.7)	61.1	(2.2)	51.3	(1.8)
Disease monitoring	28.4	(2.4)	48.3	(2.7)	62.7	(2.3)	38.3	(1.7)
Animal handling and welfare	34.3	(2.5)	41.0	(2.7)	46.6	(2.2)	37.7	(1.7)
Management of cows at calving	33.2	(2.5)	36.4	(2.6)	55.9	(2.3)	36.8	(1.7)
Dehorning	31.6	(2.5)	33.5	(2.7)	16.3	(1.7)	30.4	(1.7)
Lameness management	31.3	(2.5)	27.2	(2.5)	33.5	(2.1)	30.3	(1.6)
Records evaluation and consultation	21.3	(2.2)	34.4	(2.6)	58.3	(2.1)	29.5	(1.5)
Newborn calf care and colostrum management	19.1	(2.1)	31.6	(2.5)	52.6	(2.3)	26.8	(1.5)
Transition cow management	19.3	(2.1)	26.4	(2.4)	43.6	(2.2)	24.3	(1.5)
Input on culling decisions	20.4	(2.1)	26.6	(2.4)	37.9	(2.3)	24.3	(1.5)
Milking management	15.4	(2.0)	25.0	(2.4)	37.0	(2.2)	20.8	(1.4)
Necropsy of cattle	11.2	(1.7)	26.9	(2.3)	46.3	(2.2)	20.0	(1.2)
Biosecurity for new herd additions	7.8	(1.5)	14.0	(1.9)	28.1	(2.1)	12.0	(1.1)
Facility design	6.2	(1.3)	14.7	(2.0)	18.9	(1.8)	10.2	(1.0)
Nutrition	5.6	(1.2)	12.0	(1.8)	20.6	(1.9)	9.3	(0.9)
Employee training	2.2	(0.8)	8.7	(1.6)	33.8	(2.2)	7.8	(0.7)

For the 93.8 percent of operations that used a veterinarian, percentage of operations by services provided by the operation's veterinarian



Many of the services veterinarians provided differed by region. For example, a higher percentage of operations in the West region than in the East region had their veterinarian provide vaccinations, newborn calf care, biosecurity, nutrition, and employee training services. Alternatively, a higher percentage of operations in the East region than in the West region had their veterinarian provide emergency services, disease diagnosis and treatment, drug sales, LDA surgeries, drug-residue testing, animal handling and welfare services (e.g., euthanasia), and dehorning services.

F.2.b. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by **services** provided by the operation's veterinarian, and by region:

	Percent Operations*			
	Region			
	West		East	
Service	**Percent**	**Std. error**	**Percent**	**Std. error**
Emergency services	76.0	(3.1)	92.9	(1.1)
Reproductive management	78.7	(3.1)	86.4	(1.3)
Disease diagnosis and/or treatment	63.4	(3.1)	87.3	(1.3)
Drug sales	64.4	(3.3)	86.6	(1.3)
Perform routine LDA surgeries	33.0	(3.3)	68.1	(1.8)
Vaccinations	80.9	(2.7)	50.6	(1.9)
Milk and meat drug residue avoidance	41.4	(3.2)	52.3	(1.9)
Disease monitoring	44.6	(2.6)	37.7	(1.8)
Animal handling and welfare	26.3	(2.3)	38.9	(1.8)
Management of cows at calving	40.2	(3.2)	36.4	(1.8)
Dehorning	17.8	(2.9)	31.7	(1.8)
Lameness management	28.2	(3.0)	30.5	(1.8)
Records evaluation and consultation	30.6	(2.3)	29.4	(1.7)
Newborn calf care and colostrum management	36.4	(2.6)	25.8	(1.6)
Transition cow management	25.6	(2.3)	24.1	(1.6)
Input on culling decisions	23.4	(2.5)	24.4	(1.6)
Milking management	27.7	(2.3)	20.1	(1.5)
Necropsy of cattle	23.5	(2.1)	19.7	(1.3)
Biosecurity for new herd additions	21.7	(2.2)	11.1	(1.1)
Facility design	6.2	(1.1)	10.6	(1.1)
Nutrition	18.8	(2.7)	8.3	(1.0)
Employee training	17.7	(1.6)	6.8	(0.8)

*Excludes very small operations (<30 cows).

Producers were asked to select the top three services provided by their veterinarian. Overall, the top three producer-reported services were reproductive management (71.0 percent of operations), emergency services (51.2 percent), and disease diagnosis and treatment (44.9 percent). The percentage of operations in which emergency services was selected as one of three most important services provided by a veterinarian decreased as herd size increased. Producers on a higher percentage of small and medium operations than large operations selected disease diagnosis and treatment, LDA surgeries, lame cow management, and dehorning as among the three most important services provided by their veterinarian.

F.2.c. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by the three most important services provided by the operation's veterinarian, and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Service	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Reproductive management	69.6	(2.4)	71.9	(2.5)	75.5	(1.9)	71.0	(1.6)
Emergency services	57.9	(2.6)	45.1	(2.8)	34.1	(2.2)	51.2	(1.8)
Disease diagnosis and/or treatment	47.1	(2.7)	46.0	(2.7)	31.4	(2.2)	44.9	(1.8)
Perform routine LDA surgeries	27.5	(2.4)	34.7	(2.7)	18.9	(2)	28.7	(1.6)
Drug sales	30.1	(2.4)	29.2	(2.6)	16.7	(1.8)	28.2	(1.6)
Vaccinations	17.2	(1.9)	21.5	(2.2)	26.2	(1.9)	19.5	(1.3)
Management of cows at calving	9.5	(1.6)	9.6	(1.6)	13.3	(1.6)	10.0	(1.0)
Disease monitoring	4.8	(1.2)	6.4	(1.4)	15.3	(1.6)	6.5	(0.8)
Lameness management	7.6	(1.4)	4.5	(1.2)	1.9	(0.6)	6.0	(0.9)
Milk and meat drug residue avoidance	5.1	(1.2)	3.4	(1.0)	12.3	(1.5)	5.4	(0.8)
Dehorning	5.7	(1.2)	6.3	(1.4)	0.9	(0.4)	5.3	(0.8)
Newborn calf care and colostrum management	3.9	(1)	4.3	(1.1)	12.0	(1.5)	4.9	(0.7)
Transition cow management	2.1	(0.8)	2.6	(1)	8.6	(1.2)	3.0	(0.6)
Animal handling and welfare	3.1	(0.9)	2.0	(0.8)	3.6	(0.8)	2.8	(0.6)
Milking management	2.4	(0.9)	2.6	(0.9)	4.6	(0.9)	2.7	(0.6)
Nutrition	1.3	(0.5)	2.7	(0.9)	5.9	(1.1)	2.2	(0.4)
Records evaluation and consultation	1.7	(0.7)	1.3	(0.6)	5.8	(1)	2.1	(0.5)
Biosecurity for new herd additions	0.3	(0.3)	1.7	(0.6)	2.0	(0.6)	0.9	(0.3)
Employee training	0.3	(0.3)	0.0	(0)	4.5	(0.9)	0.7	(0.2)
Input on culling decisions	0.3	(0.3)	0.6	(0.5)	1.0	(0.4)	0.5	(0.2)
Necropsy of cattle	0.1	(0.1)	0.8	(0.5)	0.9	(0.4)	0.4	(0.2)
Facility design	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)

By region, the three most important veterinary services selected by producers were similar to the percentage of operations using the services (table F.2.b). Producers on a higher percentage of operations in the West region than in the East region selected vaccinations, disease monitoring, newborn calf care, and employee training as the most important veterinary services provided. A higher percentage of operations in the East region than in the West region selected emergency services, disease diagnosis and treatment, and performing LDA surgeries as the most important services provided.

F.2.d. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by the three most important services provided by the operation's veterinarian, and by region:

	Percent Operations*			
	Region			
	West		East	
Service	**Percent**	**Std. error**	**Percent**	**Std. error**
Reproductive management	63.7	(3.5)	71.7	(1.7)
Emergency services	37.2	(3.5)	52.7	(1.9)
Disease diagnosis and/or treatment	26.8	(2.5)	46.7	(1.9)
Perform routine LDA surgeries	11.1	(2.7)	30.4	(1.8)
Drug sales	24.4	(3.3)	28.6	(1.8)
Vaccinations	45.3	(3.3)	17.0	(1.4)
Management of cows at calving	13.9	(2.6)	9.6	(1.1)
Disease monitoring	12.7	(1.8)	5.8	(0.9)
Lameness management	3.7	(1.6)	6.2	(1.0)
Milk and meat drug residue avoidance	9.5	(1.5)	5.0	(0.8)
Dehorning	4.0	(2.0)	5.4	(0.9)
Newborn calf care and colostrum management	9.1	(1.4)	4.5	(0.7)
Transition cow management	5.3	(1.0)	2.8	(0.6)
Animal handling and welfare	3.0	(0.9)	2.8	(0.7)
Milking management	4.9	(1.1)	2.5	(0.6)
Nutrition	4.9	(1.1)	2.0	(0.4)
Records evaluation and consultation	2.7	(0.7)	2.0	(0.5)
Biosecurity for new herd additions	2.8	(0.9)	0.7	(0.3)
Employee training	2.9	(0.8)	0.5	(0.2)
Input on culling decisions	1.0	(0.4)	0.4	(0.2)
Necropsy of cattle	0.8	(0.6)	0.4	(0.2)
Facility design	0.0	(—)	0.0	(—)

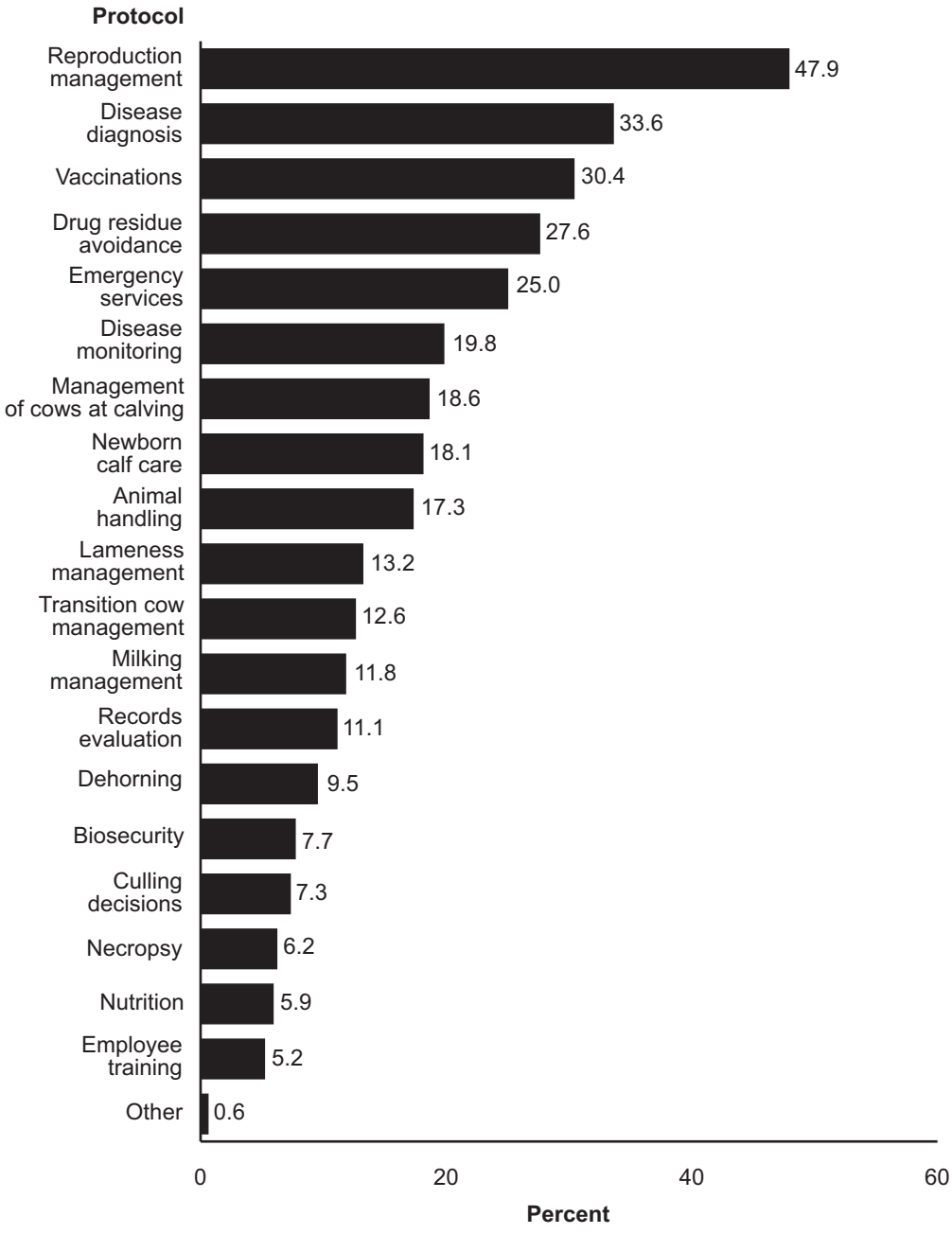
*Excludes very small operations (<30 cows).

In general, a lower percentage of operations used their veterinarian to design protocols than provide services. The highest percentages of operations (47.9 percent) had their veterinarian design protocols for reproductive management, followed by protocols for disease diagnosis and treatment (33.6 percent), vaccinations (30.4 percent), drug residues (27.6 percent), and emergency services (25.0 percent).

F.2.e. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by protocols designed by the operation's veterinarian, and by herd size:

	Percent Operations							
	Herd Size (number of cows)							
	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Protocol	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Reproductive management	41.3	(2.7)	52.0	(2.7)	70.1	(2.1)	47.9	(1.8)
Disease diagnosis and/or treatment	27.5	(2.4)	40.0	(2.7)	47.3	(2.3)	33.6	(1.6)
Vaccinations	23.7	(2.3)	36.3	(2.6)	48.9	(2.3)	30.4	(1.6)
Milk and meat drug residue avoidance	23.4	(2.3)	28.7	(2.4)	45.1	(2.2)	27.6	(1.5)
Emergency services	21.3	(2.2)	28.8	(2.4)	33.3	(2.2)	25.0	(1.5)
Disease monitoring	13.8	(1.9)	24.6	(2.4)	37.1	(2.2)	19.8	(1.3)
Management of cows at calving	12.5	(1.8)	22.7	(2.3)	38.5	(2.2)	18.6	(1.3)
Newborn calf care and colostrum management	10.8	(1.7)	23.8	(2.3)	39.8	(2.2)	18.1	(1.2)
Animal handling and welfare	12.6	(1.8)	19.4	(2.2)	35.3	(2.2)	17.3	(1.3)
Lameness management	11.4	(1.7)	13.1	(1.9)	22.3	(1.9)	13.2	(1.2)
Transition cow management	9.3	(1.6)	12.8	(1.9)	28.2	(2.0)	12.6	(1.1)
Milking management	8.3	(1.5)	12.4	(1.9)	27.2	(2.1)	11.8	(1.1)
Records evaluation and consultation	5.9	(1.3)	14.3	(1.9)	28.7	(2.1)	11.1	(1.0)
Dehorning	8.7	(1.5)	10.1	(1.7)	12.2	(1.5)	9.5	(1.0)
Biosecurity for new herd additions	4.6	(1.2)	8.8	(1.6)	20.4	(1.8)	7.7	(0.8)
Input on culling decisions	4.1	(1.0)	9.5	(1.6)	17.8	(1.9)	7.3	(0.8)
Necropsy of cattle	3.1	(0.9)	7.2	(1.4)	18.8	(1.7)	6.2	(0.7)
Nutrition	3.8	(1.0)	6.0	(1.4)	16.0	(1.8)	5.9	(0.7)
Employee training	1.7	(0.7)	4.9	(1.3)	23.7	(1.9)	5.2	(0.6)
Other	0.2	(0.2)	1.2	(0.7)	1.3	(0.5)	0.6	(0.3)

For the 93.8 percent of operations that used a veterinarian, percentage of operations by type of protocols designed by the operation's veterinarian



A higher percentage of operations in the West region than in the East region used their veterinarian to develop protocols for vaccinations, biosecurity, necropsy, nutrition, and employee training. For the rest of the protocols, similar percentages of operations in the West and East regions used their veterinarian to assist in protocol development.

F.2.f. For the 93.8 percent of operations that used a veterinarian (table F.1.a), percentage of operations by protocols designed by the operation's veterinarian, and by region:

	Percent Operations*			
	Region			
	West		East	
Protocol	**Percent**	**Std. error**	**Percent**	**Std. error**
Reproductive management	55.7	(2.7)	47.1	(1.9)
Disease diagnosis and/or treatment	33.6	(2.7)	33.6	(1.8)
Vaccinations	43.2	(2.8)	29.1	(1.7)
Milk and meat drug residue avoidance	26.1	(2.4)	27.7	(1.7)
Emergency services	23.9	(2.4)	25.1	(1.6)
Disease monitoring	22.7	(2.2)	19.5	(1.5)
Management of cows at calving	25.4	(3.0)	17.9	(1.4)
Newborn calf care and colostrum management	21.1	(2.0)	17.8	(1.3)
Animal handling and welfare	18.1	(2.1)	17.2	(1.4)
Lameness management	17.5	(2.2)	12.7	(1.3)
Transition cow management	16.8	(2.0)	12.2	(1.2)
Milking management	17.0	(1.8)	11.2	(1.2)
Records evaluation and consultation	15.3	(1.7)	10.7	(1.1)
Dehorning	8.5	(1.3)	9.6	(1.1)
Biosecurity for new herd additions	15.1	(1.9)	6.9	(0.9)
Input on culling decisions	12.5	(2.1)	6.8	(0.9)
Necropsy of cattle	10.3	(1.4)	5.7	(0.7)
Nutrition	10.9	(1.6)	5.4	(0.8)
Employee training	10.3	(1.3)	4.7	(0.7)
Other	1.1	(0.5)	0.6	(0.3)

*Excludes very small operations (<30 cows).

3. Drug sources

Most operations (76.1 percent) obtained prescription drugs directly from the operation's veterinarian, although the percentage of large operations that purchased directly from their veterinarian was about half that of small and medium operations. A higher percentage of large operations (39.8 percent) obtained prescription drugs from a drug distributor, as directed by the operation's herd veterinarian, compared with small and medium operations (6.8 and 10.4 percent, respectively).

F.3.a. Percentage of operations by source of the majority of purchased **prescription** drugs, and by herd size:

Percent Operations

Herd Size (number of cows)

Source	Small (30–99) Pct.	Small (30–99) Std. error	Medium (100–499) Pct.	Medium (100–499) Std. error	Large (500 or more) Pct.	Large (500 or more) Std. error	All operations Pct.	All operations Std. error
Directly from the operation's herd veterinarian	80.1	(2.1)	80.9	(2.2)	42.5	(2.3)	76.1	(1.4)
Mailed/delivered from a drug distributor, as directed by the operation's herd veterinarian	6.8	(1.3)	10.4	(1.7)	39.8	(2.2)	11.6	(1.0)
Mailed/delivered from a drug distributor, as directed by a veterinarian who was not the operation's regular herd veterinarian	3.1	(0.9)	3.3	(1.0)	8.0	(1.3)	3.7	(0.6)
Directly from a farm/ranch/feed store	1.8	(0.7)	1.7	(0.6)	6.2	(1.0)	2.2	(0.5)
Mailed/delivered from a drug distributor without a veterinarian's involvement	1.1	(0.5)	1.5	(0.7)	0.6	(0.3)	1.2	(0.4)
Other	0.1	(0.1)	0.1	(0.0)	2.1	(0.7)	0.3	(0.1)
No prescription veterinary drugs purchased	6.9	(1.3)	2.2	(0.9)	0.9	(0.5)	4.9	(0.8)
Total	100.0		100.0		100.0		100.0	

Nonprescription drugs were primarily obtained directly from a veterinarian on 31.9 percent of operations and directly from a farm/ranch/feed store on 38.2 percent. Obtaining nonprescription drugs from a drug distributor, as directed by the operation's herd veterinarian, increased as herd size increased, while the percentage of operations that obtained nonprescription drugs directly from a farm/ranch/feed store decreased as herd size increased.

F.3.b. Percentage of operations by source of the majority of purchased **nonprescription** drugs, and by herd size:

Percent Operations

Herd Size (number of cows)

	Small (30–99)		**Medium** (100–499)		**Large** (500 or more)		**All operations**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Directly from a farm/ranch/ feed store	44.1	(2.6)	33.4	(2.6)	19.4	(1.8)	38.2	(1.7)
Directly from the operation's herd veterinarian	32.0	(2.4)	34.3	(2.6)	24.5	(2.0)	31.9	(1.6)
Mailed/delivered from a drug distributor without a veterinarian's involvement	11.4	(1.7)	14.9	(2.0)	16.0	(1.6)	12.9	(1.2)
Mailed/delivered from a drug distributor, as directed by the operation's herd veterinarian	5.0	(1.1)	10.3	(1.6)	29.7	(2.1)	9.3	(0.9)
Mailed/delivered from a drug distributor, as directed by a veterinarian who was not the operation's regular herd veterinarian	2.8	(0.8)	4.3	(1.1)	7.4	(1.1)	3.7	(0.6)
Other	0.4	(0.3)	0.5	(0.3)	1.6	(0.7)	0.6	(0.2)
No nonprescription veterinary drugs purchased	4.3	(1.0)	2.2	(0.9)	1.4	(0.6)	3.3	(0.7)
Total	100.0		100.0		100.0		100.0	

Section II: Methodology

A. Needs Assessment

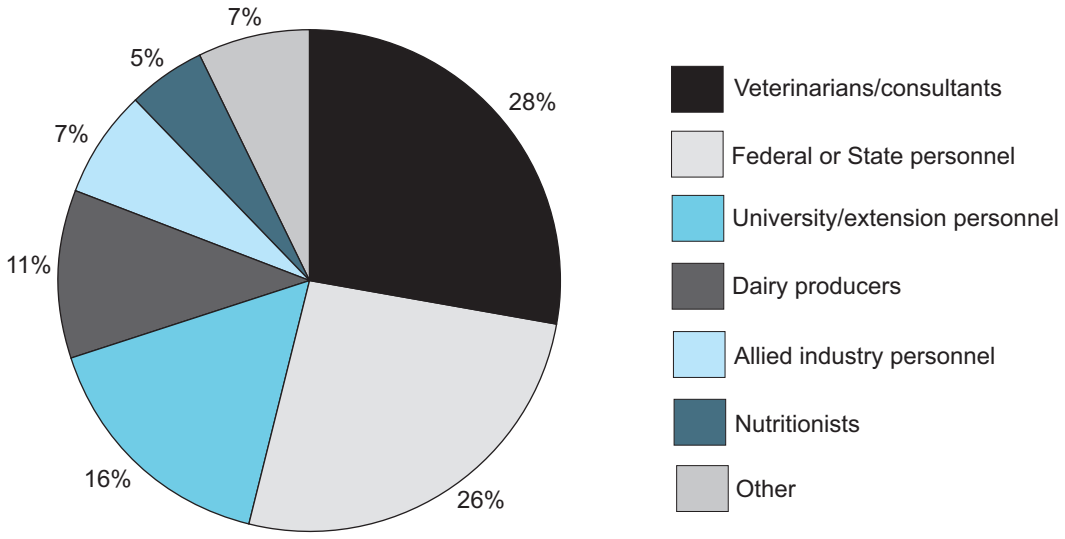
NAHMS develops study objectives by exploring existing literature and contacting industry members about their informational needs and priorities during a needs-assessment phase. The objective of the needs assessment for the NAHMS Dairy 2014 study was to collect information from U.S. dairy producers and other dairy specialists about what they perceived to be the most important dairy health and productivity issues. 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, veterinarians, extension specialists, university personnel, and dairy organizations. Information was collected via focus groups and through a needs-assessment survey.

In addition, the needs-assessment survey targeted producers, veterinarians, extension personnel, university researchers, and allied industry groups and 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 identification of the online site—were also sent to cooperative members of the National Milk Producers Federation and to State and Federal personnel. In total, 218 people completed the study questionnaire.

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.

Needs assessment survey respondents



A Dairy 2014 needs-assessment focus group session was held on January 7, 2013, with the goal of setting objectives for the study. These objectives are on p 245 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 animals and operations in the United States. The initial review identified 17 major States representing 80.3 percent of the U.S. milk cow inventory and 76.7 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.

A memo identifying these 17 States was provided in March 2013 to the USDA–APHIS–VS CEAH Director and, in turn, the VS Regional Directors. Each Regional Director sought input from the respective States about being included or excluded from the study.

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 States who had reported one 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, a total of 3,000 operations were selected for contact during Phase Ib, with a total of 3,500 operations selected for the study.

3. Population inferences

a. Phases Ia and Ib

Inferences cover the population of dairy producers with at least 1 milk cow in the 17 participating States. These States accounted for 80.3 percent (7,390,000 head) of milk cows and 76.7 percent (49,145) of operations 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.

C. Data Collection

1. Data collectors and data collection period

a. Phases Ia and Ib

All data were collected from January 1 through January 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.

D. Data Analysis

1. Phases Ia and Ib: Validation

Individual State data files were combined and sent to NAHMS national staff, which performed additional data validation on the entire data set

2. Phases Ia and Ib: Estimation.

Estimation was done with SUDAAN® software (RTI, version 11.0.1). SUDAAN uses a Taylor series expansion to estimate appropriate variances, which accounts 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 following table below presents an evaluation based on a number of measurement parameters, which are defined 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 operations with fewer than 30 cows. Of these operations, 14.0 percent completed the questionnaire.

			Measurement parameter		
Response category	Number perations	Percent operations	Contacts	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 for at least one site.
[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.

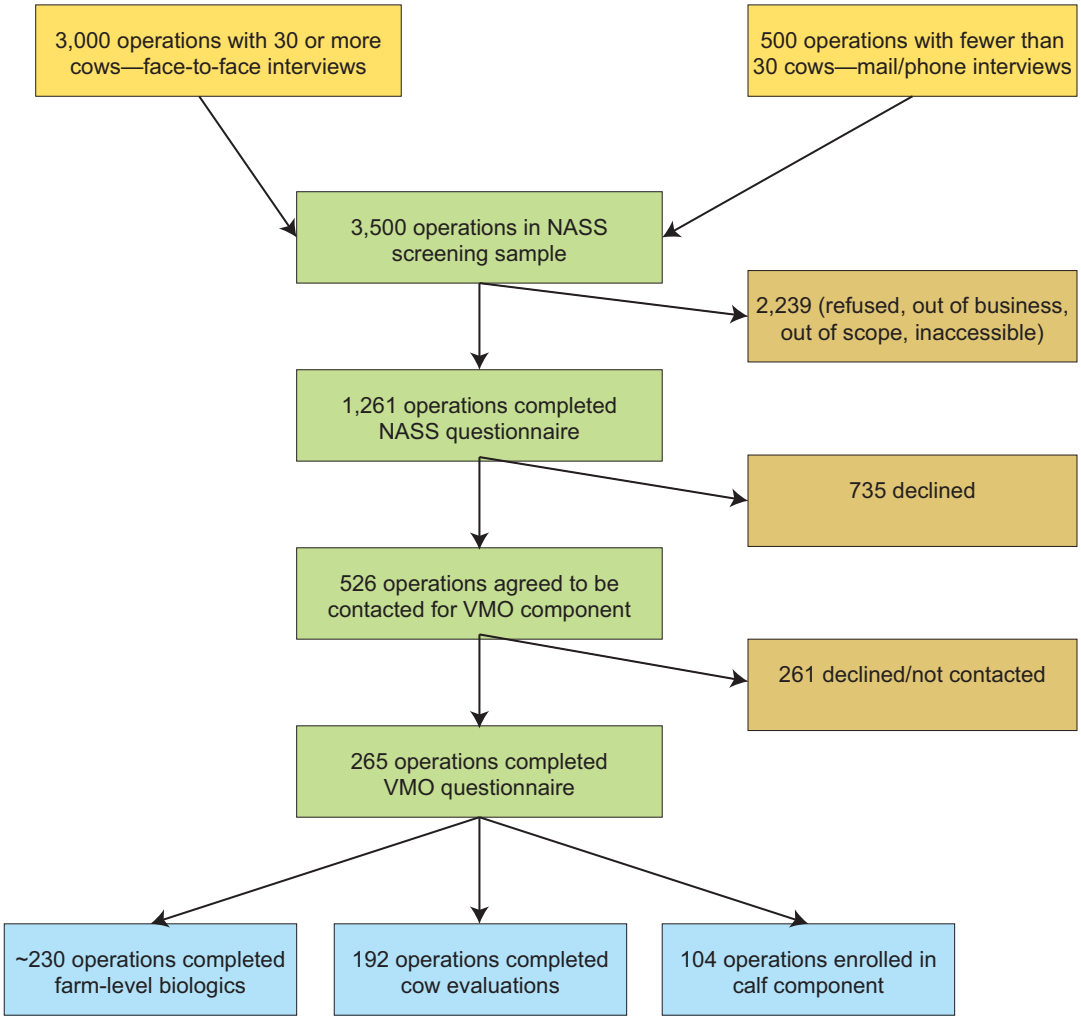
2. Phase Ib: General dairy management questionnaire—30 or more cows

A total of 3,000 operations were selected for the survey of operations with 30 or more cows. 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). In addition, 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, 526 (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 complete and VMO consent	526	17.5	x	x	x
Survey complete, refused VMO consent	665	22.2	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	8	0.3			
Refusal of GDMR	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]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] Weighted response—the rate was calculated using the initial selection weights.

Flowchart of Phase I 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.

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

Number of milk cows and number of operations

Region	State	Number of milk cows (thousand head)			Number of operations[2]	
		Milk cows on operations with 1 or more head[1]	Milk cows on operations with 1 or more head[2]	Milk cows on operations with 30 or more head[3]	Operations with 1 or more head[2]	Operations with 30 or more head[3]
West	California	1,780.0	1,815.7	1,814.1	1,931	1,436
	Colorado	140.0	130.7	129.6	517	115
	Idaho	565.0	578.8	577.5	934	540
	Texas	440.0	434.9	431.9	985	512
	Washington	266.0	267.0	265.4	798	353
	Total	3,191.0	3,227.1	3,218.5	5,165	2,956
East	Indiana	178.0	174.1	161.7	2,401	1,010
	Iowa	205.0	204.8	199.4	1,810	1,230
	Kentucky	68.0	71.8	67.0	1,564	746
	Michigan	381.0	376.3	369.2	2,409	1,500
	Minnesota	460.0	463.3	448.6	4,746	3,720
	New York	615.0	610.7	594.6	5,427	3,968
	Ohio	267.0	267.9	246.4	4,008	2,084
	Pennsylvania	530.0	532.3	515.3	7,829	6,025
	Vermont	132.0	134.1	131.7	1,075	769
	Virginia	93.0	94.1	91.2	1,168	628
	Wisconsin	1,270.0	1,270.1	1,241.5	11,543	9,541
	Total	4,199.0	4,199.5	4,066.6	43,980	31,221
Total (17 States)		7,390.0	7,426.6	7,285.1	49,145	34,177
Percentage of U.S.		80.3	80.3	80.3	76.7	85.4
Total U.S. (50 States)		9,208.6	9,252.3	9,067.8	64,098	40,017

[1]Source: NASS Cattle report, January 31, 2014. An operation is any place having one or more head of milk cows, excluding cows used to nurse calves, on hand at any time during the year.
[2]Source: NASS 2012 Census of Agriculture.
[3]Source: NASS 2012 Census of Agriculture Special Tabulation.

Appendix III: 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, expected spring 2016
    - "Nutrient Management Practices on U.S. Dairy Operations, 2014," expected fall 2016
    - "Changes in the U.S. Dairy Cattle Industry 1991–2014," expected summer 2016

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

    - **"Dairy Cattle Management Practices in the United States, 2014," February 2016**
    - "Cattle Welfare on U.S. Dairy Operations, 2014," interpretive report, expected summer 2016
    - "Management of Nonambulatory Dairy Cows on U.S. Dairy Operations," info sheet, expected spring 2016

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, expected spring 2016

4. Evaluate heifer calf health from birth to weaning

    - **"Dairy Cattle Management Practices in the United States, 2014," February 2016**
    - "Colostrum Feeding and Management on U.S. Dairy Operations," 1991–2014, info sheet, expected winter 2015–16
    - "Morbidity and Mortality of Preweaned Dairy Heifer Calves," info sheet, expected winter 2015–16
    - "Evaluation of Colostrum Quality and Passive Transfer Status of Dairy Heifer Calves on U.S. Dairy Operations, 2014," info sheet, expected winter 2015–16
    - "Prevalence of *Giardia* and *Cryptosporidium* in Preweaned Dairy Heifer Calves, 2014," info sheet, expected winter 2015–16
    - "Evaluation of Average Daily Gain in Preweaned Dairy Heifer Calves, 2014," info sheet, expected winter 2015–16

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

- "Milk Quality, Milking Procedures, and Mastitis on U.S. Dairy Operations, 2014," expected spring 2016
- "Health and Management Practices on U.S. Dairy Operations, 2014," expected summer 2016
- "Antibiotic Use on U.S. Dairy Operations, 2002–14," info sheet, expected spring 2016
- "Dry-off Procedures on U.S. Dairy Operations, 2014," info sheet, expected spring 2016

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, expected spring 2016
- "Prevalence of *Campylobacter* spp. in Bulk-tank Milk and Filters from U.S. Dairies, 2014," info sheet, expected spring 2016
- "*Salmonella* Dublin Antibodies in Bulk-tank Milk on U.S. Dairy Operations, 2014," info sheet, expected spring 2016
- "*Salmonella* and *Campylobacter* on U.S. Dairy Operations, 2002–14," info sheet, expected spring 2016

Additional informational sheets

- "Dairy Cattle Identification Practices in the United States, 2014," info sheet, expected winter 2015–16
- "Reproduction Practices on U.S. Dairy Operations, 2014," info sheet, expected spring 2016
- "Dairy Cattle Injection Practices in the United States, 2014," info sheet, expected spring 2016
- "Off-site Heifer Raising on U.S. Dairy Operations, 2014," info sheet, expected spring 2016

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