United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

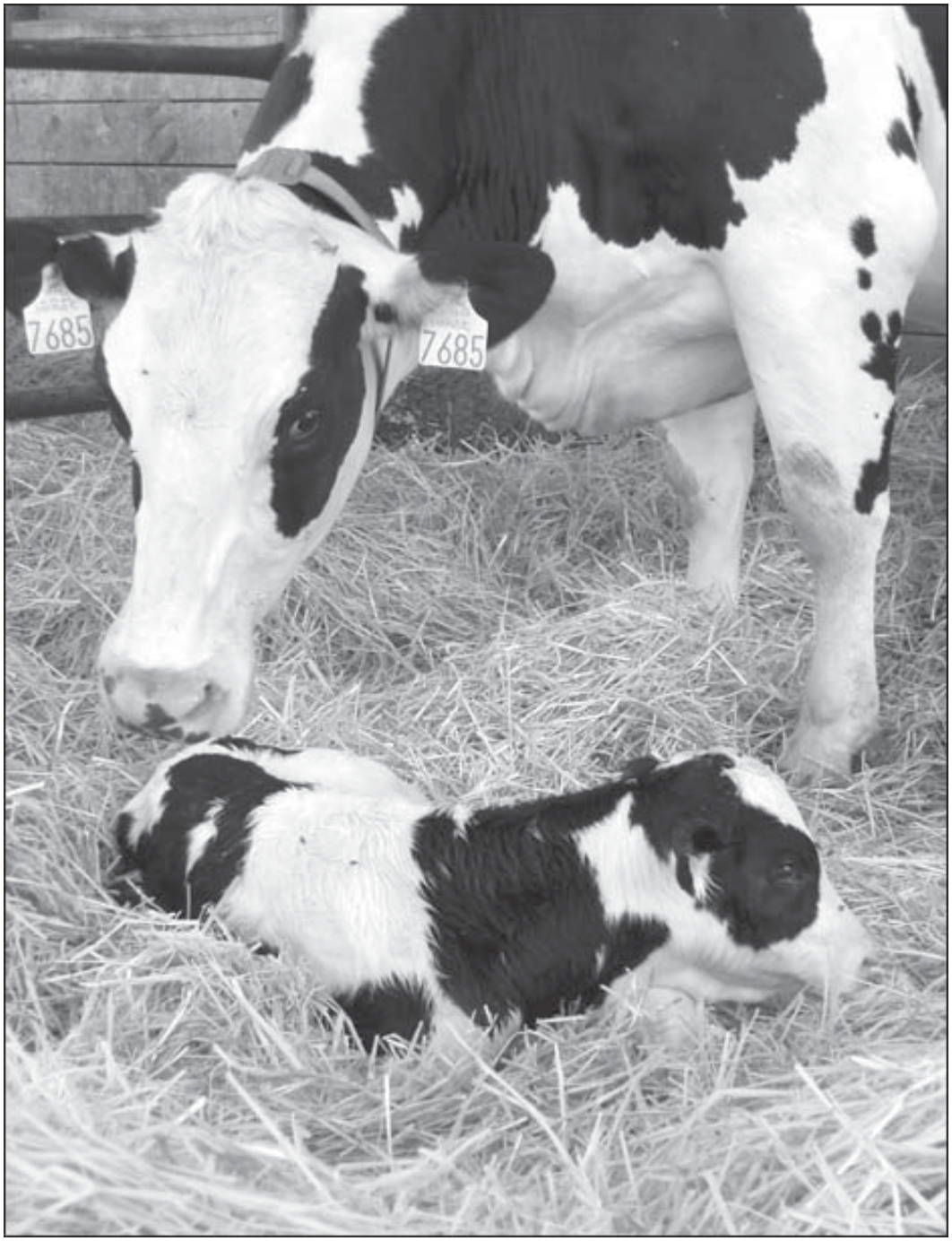
Veterinary
Services

National
Animal Health
Monitoring
System

February 2009

Dairy 2007

Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007



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#N494.0209

Cover photo courtesy of
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Acknowledgments

This study was a cooperative effort between two U.S. Department of Agriculture (USDA) agencies: the National Agricultural Statistics Service (NASS) and the Animal and Plant Health Inspection Service (APHIS).

Thank you to the NASS enumerators, State and Federal veterinary medical officers (VMOs), and animal health technicians (AHTs) who visited the operations and collected the data for the Dairy 2007 study. Their hard work and dedication to USDA's National Animal Health Monitoring System (NAHMS) were invaluable. The roles of the producers, area veterinarians in charge (AVICs), NAHMS coordinators, VMOs, AHTs, and NASS enumerators were critical in providing quality data for Dairy 2007 reports. Thanks also to the personnel at the Centers for Epidemiology and Animal Health for their efforts in generating and distributing valuable reports from Dairy 2007 data.

Additional biological sampling and testing were afforded by the generous contributions of collaborators for the Dairy 2007 study, including the following:

- USDA:APHIS, National Veterinary Services Laboratory;
- USDA:ARS, Beltsville Agricultural Research Center;
- USDA:ARS, Russell Research Center;
- Antel BioSystems, Inc.;
- Cornell University Animal Health Diagnostic Laboratory;
- Quality Milk Production Services;
- Tetracore, Inc.;
- University of Pennsylvania, New Bolton Center;
- University of Wisconsin, Madison; and
- Wisconsin Veterinary Diagnostic Laboratory.

All participants are to be commended, particularly the producers whose voluntary efforts made the Dairy 2007 study possible.

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Director
Centers for Epidemiology and Animal Health

Suggested bibliographic citation for this report:
USDA. 2009. Dairy 2007, Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007
USDA:APHIS:VS, CEAH. Fort Collins, CO
#N494.0209

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Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the Animal and Plant Health Inspection Service (APHIS), a branch of the United States Department of Agriculture (USDA). Designed to help meet the animal health information needs of a variety of stakeholders, NAHMS has collected data on dairy health and management practices through three 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 (BVD) 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. When an outbreak of human illness related to *Escherichia coli* O157:H7 was reported in 1993 in the Pacific Northwest, 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 needs in various production areas, such as feed management and weaning age.

Information from the NAHMS Dairy 1996 Study helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antibiotic use; Johne's disease; digital dermatitis; bovine leukosis virus (BLV); and potential foodborne pathogens, including *E. coli*, *Salmonella*, and *Campylobacter.*

Two major goals of the Dairy 2002 Study were to describe management strategies that prevent and reduce Johne's disease and to determine management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. The study was designed also to describe levels of participation in quality assurance programs, the incidence of digital dermatitis, animal-waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP in 1991 and Dairy 1996.

The Dairy 2007 Study was conducted in 17 of the Nation's major dairy States (see map on next page) and provides valuable information to participants, stakeholders, and the industry as a whole. Dairy operations and cows in these States represent 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows. Results are presented in a variety of publications, including the following reports.

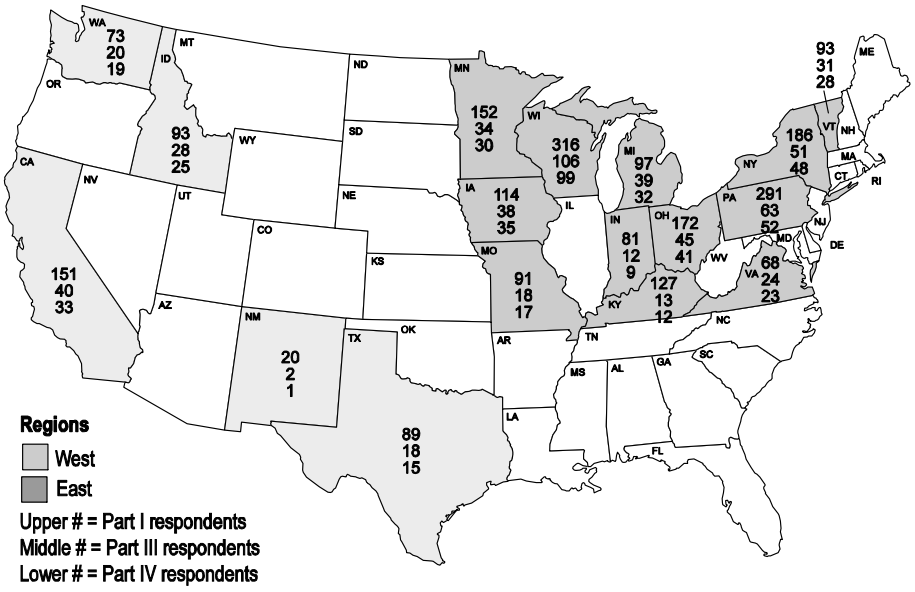
• Part 1: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (October 2007)—The first in a series of reports containing national information from the NAHMS Dairy 2007 Study, this report contains information collected from 2,194 dairy operations.

• Part II: Changes in the United States Dairy Industry, 1991–2007 (March 2008)—This report presents trends by providing national estimates of animal-health management practices for comparable populations from the NAHMS 1991–92 NDHEP, Dairy 1996, Dairy 2002, and Dairy 2007 studies.

• Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (September 2008)—This report presents national information from 582 operations with 30 or more dairy cows, a subset of the 2,194 operations described in Part I. State and Federal veterinary medical officers (VMOs) and animal health technicians (AHTs) conducted questionnaire interviews with producers and collected biological samples for analysis between February 26 and April 30, 2007.

• Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007—This report presents national information from 519 operations with 30 or more dairy cows, a subset of the 582 operations described in Part III. State and Federal VMOs and AHTs conducted questionnaire interviews with producers and collected biological samples for analysis between May 1 and August 31, 2007.

Dairy 2007 Participating States and Number of Respondents by State



Information on the methods used and number of respondents in the study can be found at the end of this report.

All Dairy 2007 Study reports, as well as reports from previous NAHMS dairy studies, are available online at http://www.aphis.usda.gov/nahms.

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Terms Used In This Report

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

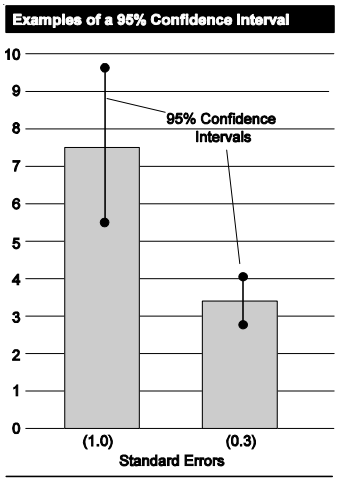
Estrous: Pertaining to estrus or in reference to the entire reproductive cycle (i.e., estrous cycle).

Estrus: Also referred to as “heat,” the period of time during the reproductive cycle when the female displays interest in mating and will stand to be mounted. Behavioral signs of estrus, in addition to standing to be mounted, include passage of clear mucus from the vulva and swelling of the vulva.

Heifer: Female dairy bovine that has not yet calved.

Herd size: Herd size is based on January 1, 2007, inventory. Small herds are those with fewer than 100 cows, medium herds are those with 100 to 499 cows, and large herds are those with 500 or more cows.

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, operation average voluntary waiting period (see table a. on p 5) is calculated by summing voluntary waiting period (in days) over all operations divided by the number of operations.



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. In the example to the left, 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). The second estimate of 3.4 shows a standard error of 0.3, which results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported (0.0). If there were no reports of the event, no standard error was reported (--).

Regions:

- **West:** California, Idaho, New Mexico, Texas, and Washington
- **East:** Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, and Wisconsin

Sample profile: Information that describes characteristics of the operations from which Dairy 2007 data were collected.

Section I: Population Estimates

A. Reproduction

1. Voluntary waiting period

The time between calving and subsequent rebreeding is referred to as the voluntary waiting period. This period of time allows uterine involution, including the clearing of material and bacteria associated with parturition and return of the uterus to its prepregnancy size. Normally, uterine involution occurs within 20 to 30 days of parturition. In addition, it has been reported that 20 to 30 percent of cows are not cycling at 60 days in milk. Increasing the voluntary waiting period may increase fertility but can also result in increased days open.

The operation average voluntary waiting period was 54.8 days. The length of the voluntary waiting period did not differ by herd size.

a. Operation average number of days after calving cows were declared eligible to be bred (elective or voluntary waiting period) during the previous 12 months, and by herd size:

Operation Average Number Days

Herd Size (Number of Cows)

Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Avg.	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**
55.2	(1.2)	53.4	(1.3)	56.1	(1.9)	54.8	(0.9)

More than one-half of dairy operations (53.5 percent) waited an average of 51 to 60 days after calving to start breeding cows during the previous 12 months. The low percentage of operations (2.3 percent) with a voluntary waiting period of 0 to 20 days likely housed bulls with all lactating cows. More than 9 of 10 operations (92.3 percent) declared cows eligible to be bred by 70 days after calving.

b. Percentage of operations by number of days after calving cows were declared eligible to be bred (elective or voluntary waiting period) during the previous 12 months:

Number of Days	Percent Operations	Standard Error
0 to 20	2.3	(0.9)
21 to 30	6.0	(1.4)
31 to 40	4.9	(1.2)
41 to 50	21.5	(2.3)
51 to 60	53.5	(2.8)
61 to 70	4.1	(1.0)
71 or more	7.7	(1.6)
Total	100.0	

2. Estrus (heat) detection

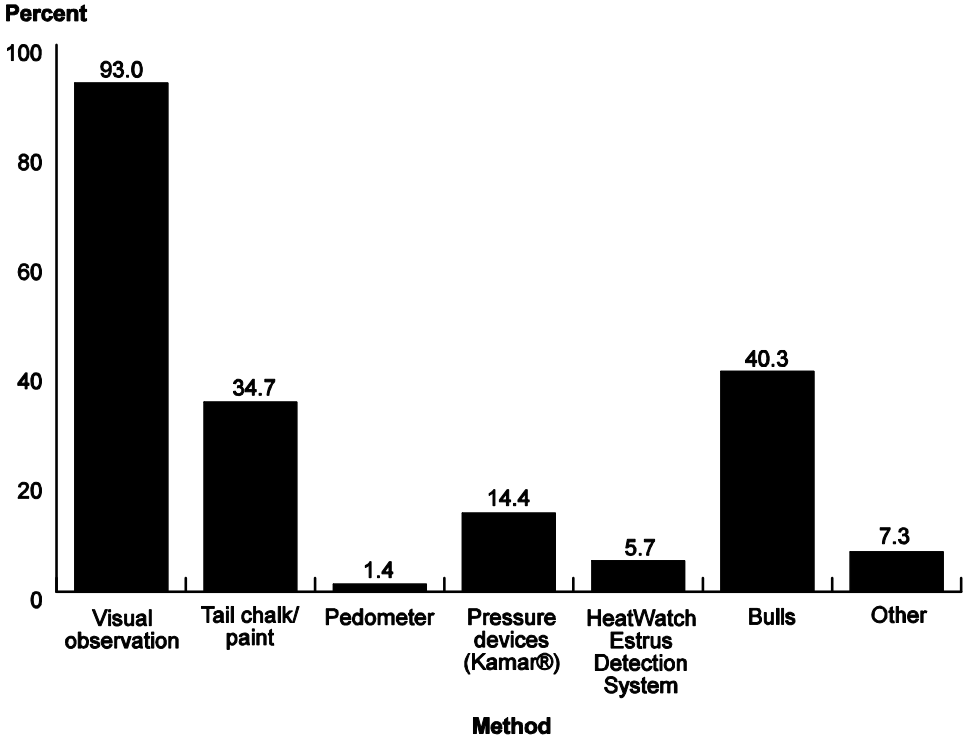
Detecting estrus is important in artificial insemination programs that do not rely exclusively on timed insemination. Research has shown that the duration and intensity of estrus in dairy cows have declined over time. Additionally, cows that spend a majority of time on concrete flooring have less-intense estrus. Recently developed methods to monitor estrus include electronic pedometers that measure increased activity, which is typical of cows in estrus, and electronic systems such as HeatWatch®, a device glued to the tailhead that detects the pressure of a mounting animal and transmits information about mounting activity.

The most common method used to detect estrus on operations during the previous 12 months was visual observation, with 93.0 percent of all operations using this practice. Bulls or tail chalk/paint were used to detect estrus by 40.3 and 34.7 percent of operations, respectively. Electronic methods of detection—pedometers and HeatWatch—were used by a low percentage of operations (1.4 and 5.7 percent, respectively). Visual observation to detect estrus was used by a higher percentage of small and medium operations (93.5 and 95.5 percent, respectively) than large operations (77.7 percent) during the previous 12 months. A higher percentage of large operations used tail chalk/paint or pedometers (66.0 and 9.2 percent, respectively) than did small and medium operations. Although 51.7 percent of operations had bulls for breeding purposes (reported on p 72 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007), only 40.3 percent of operations used bulls to detect estrus. These operations may have housed bulls separately from cows and used other methods to detect estrus.

a. Percentage of operations by method used to detect estrus (heat) during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Visual observation	93.5	(1.8)	95.5	(1.3)	77.7	(6.0)	93.0	(1.3)
Tail chalk/paint	31.2	(3.6)	36.4	(4.1)	66.0	(6.0)	34.7	(2.7)
Pedometer	0.6	(0.4)	1.5	(0.7)	9.2	(3.0)	1.4	(0.4)
Pressure devices (Kamar®)	15.6	(2.8)	12.2	(2.8)	10.3	(4.0)	14.4	(2.1)
HeatWatch Estrus Detection System	5.2	(1.7)	7.4	(2.3)	4.8	(2.4)	5.7	(1.3)
Bulls	38.4	(4.0)	44.1	(4.5)	46.2	(6.1)	40.3	(3.0)
Other	5.9	(1.9)	10.1	(2.9)	10.9	(3.7)	7.3	(1.5)

Percentage of Operations by Method Used to Detect Estrus (Heat) During the Previous 12 Months



The only regional differences in estrus-detection methods were for visual observation and tail chalk/paint. Visual observation was used by a lower percentage of operations in the West region (73.0 percent) than in the East region (94.9 percent). The percentage of operations that used tail chalk/paint in the West region was almost twice that of the East region (61.6 and 32.1 percent, respectively).

b. Percentage of operations by method used to detect estrus (heat) during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Visual observation	73.0	(5.6)	94.9	(1.4)
Tail chalk/paint	61.6	(5.1)	32.1	(2.9)
Pedometer	0.9	(0.6)	1.4	(0.4)
Pressure devices (Kamar)	12.2	(4.2)	14.7	(2.2)
HeatWatch Estrus Detection System	4.4	(2.1)	5.8	(1.4)
Bulls	45.5	(6.1)	39.8	(3.2)
Other	7.3	(2.7)	7.3	(1.6)

Visual observation for estrus is generally accomplished by one of two methods. Either the owner/employees casually watch females for signs of estrus while performing other tasks around the dairy, or one or more people are designated to watch females for a specified length of time during a set number of times per day. The recommended minimum amount of time for visual observation of estrus is 30 minutes three times daily.

About 6 of 10 operations (59.7 percent) that used visual observation for estrus detection had a specific person observe cows for estrus, and the percentage did not differ by herd size or region.

c. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a designated person(s) specifically responsible for visually observing estrus, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
61.2	(4.1)	53.6	(4.7)	69.1	(6.6)	59.7	(3.1)

d. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a designated person(s) specifically responsible for visually observing estrus, by region:

Percent Operations			
Region			
West		**East**	
Percent	**Standard Error**	**Percent**	**Standard Error**
71.2	(6.2)	58.8	(3.3)

For operations that used visual observation for estrus detection, 37.9 percent had a set number of times per day and duration each time for observing estrus. No herd size or regional differences were observed.

e. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a set number of times per day and duration each time for observing estrus, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
35.5	(4.0)	42.9	(4.6)	45.4	(6.8)	37.9	(3.0)

f. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a set number of times per day and duration each time for observing estrus, by region:

Percent Operations			
Region			
West		**East**	
Percent	**Standard Error**	**Percent**	**Standard Error**
48.2	(6.8)	37.1	(3.2)

For operations with a set number of times per day and duration each time for visually detecting estrus, one-half (50.3 percent) observed cows twice daily, while 31.1 percent observed cows three or more times daily.

g. For the 37.9 percent of operations with a set number of times per day and duration each time for observing estrus (heat), percentage of operations by number of times cows were visually observed for estrus:

Times Per Day	**Percent Operations**	**Standard Error**
1	18.6	(3.5)
2	50.3	(4.6)
3	15.3	(3.0)
4 or more	15.8	(3.2)
Total	100.0	

For operations with a set number of times per day and duration each time for visually observing cows for estrus, about one-third of operations (35.6 percent) observed cows for 11 to 20 minutes each time cows were observed. Overall, more than one-half of operations reported visually observing cows for estrus 20 minutes or less at each visual observation period.

h. For the 37.9 percent of operations with a set number of times per day and duration each time for observing estrus (heat), percentage of operations by duration each time cows were visually observed for estrus:

Duration Each Time (Minutes)	**Percent Operations**	**Standard Error**
10 or less	27.1	(4.1)
11 to 20	35.6	(4.4)
21 to 30	16.1	(3.5)
31 to 40	0.4	(0.2)
41 or more	20.8	(3.8)
Total	100.0	

For operations with a set number of times per day to observe cows for estrus, the operation average number of minutes per day that cows were observed was 62.5 minutes. Although the time spent visually observing estrus appears different by herd size, the differences were not significant.

i. For the 37.9 percent of operations with a set number of times per day and duration each time for observing for estrus (heat), operation average total duration per day in minutes that cows were visually observed for estrus, and by herd size:

Operation Average Number Minutes							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Avg.	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**
61.1	(7.4)	60.7	(6.1)	85.9	(11.4)	62.5	(5.2)

Of operations visually observing cows for estrus a set number of times per day, approximately one-third of operations (30.3 percent) observed estrus for 21 to 40 minutes per day. Approximately 20 percent of operations observed for estrus 20 minutes or less, 41 to 60 minutes, or 81 or more minutes per day.

j. For the 37.9 percent of operations with a set number of times per day and duration each time for observing for estrus (heat), percentage of operations by total duration per day in minutes that cows were visually observed for estrus:

Duration Per Day (Minutes)	**Percent Operations**	**Standard Error**
20 or less	22.9	(3.9)
21 to 40	30.3	(4.3)
41 to 60	23.6	(4.0)
61 to 80	2.2	(1.5)
81 or more	21.0	(3.6)
Total	100.0	

3. Breeding practices

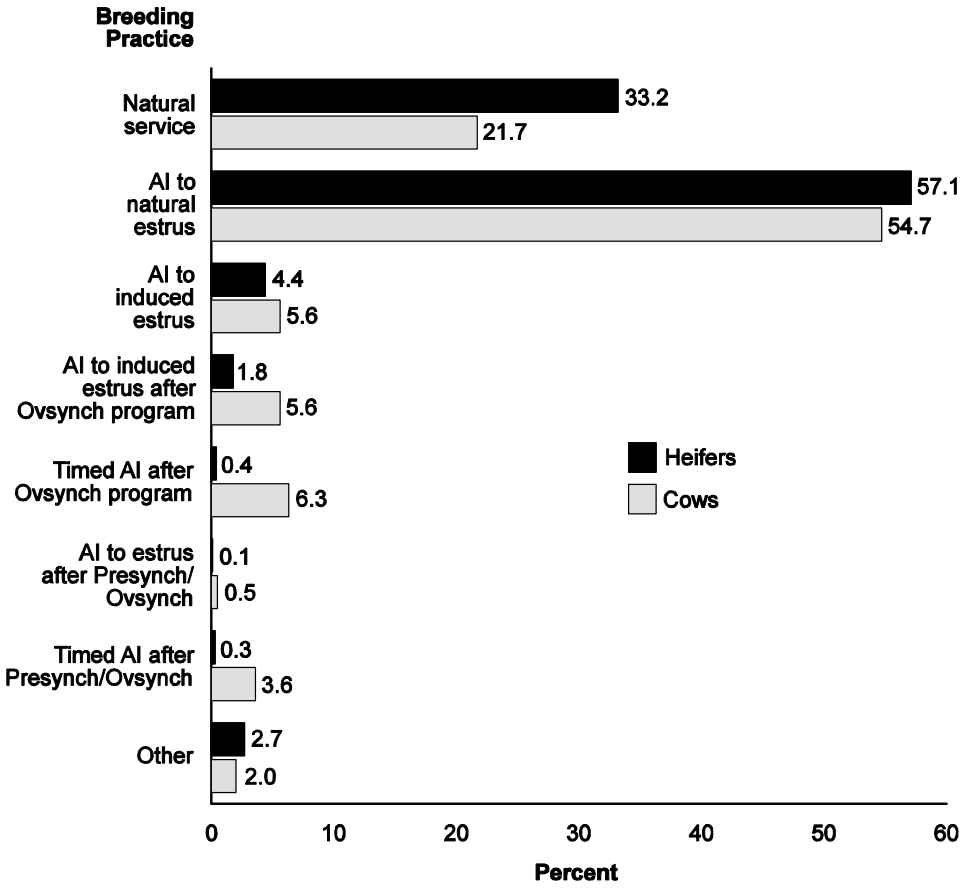
Advances in technology and increases in knowledge of cattle reproductive biology have enabled development of new methods of breeding cattle. Better understanding of dairy cattle reproduction has led to the induction of estrus and, more recently, the induction of ovulation. These two advances have allowed operations to breed cows and heifers at specific times rather than waiting for the cows to show natural estrus. One protocol, popularly known as Ovsynch, uses prostaglandins and gonadotropin-releasing hormone (GnRH) in combination to manipulate ovulation for timed artificial insemination (timed AI). The Presynch protocol involves the administration of prostaglandins to regress the corpus luteum, synchronize the timing of estrus, and/or prepare for a timed breeding program such as Ovsynch. The implementation of an additional Ovsynch protocol for the second or greater service is termed Resynch.

More than one-half of operations surveyed used artificial insemination (AI) to natural estrus for first service for the majority of heifers and cows (57.1 and 54.7 percent, respectively) during the previous 12 months. Natural service was used for the first service by one-third of operations (33.2 percent) for heifers and one-fifth of operations (21.7 percent) for cows. Timed-AI programs (timed AI after the Ovsynch protocol or after Presynch/Ovsynch) were used more frequently for first service of cows than heifers.

a. Percentage of operations by ***first-service*** breeding practice used for the majority of heifers and cows during the previous 12 months:

	Percent Operations			
	Heifers		Cows	
Breeding Practice	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Natural service (bull-bred)	33.2	(3.0)	21.7	(2.7)
AI to natural estrus (no injections given to induce estrus)	57.1	(3.0)	54.7	(3.0)
AI to induced estrus (prostaglandin injections only)	4.4	(1.0)	5.6	(1.3)
AI to induced estrus after Ovsynch program (prostaglandin and GnRH injections)	1.8	(0.8)	5.6	(1.3)
Timed AI after Ovsynch program (prostaglandin and GnRH injections)	0.4	(0.2)	6.3	(1.4)
AI to estrus after Presynch/Ovsynch	0.1	(0.1)	0.5	(0.2)
Timed AI after Presynch/Ovsynch	0.3	(0.2)	3.6	(0.8)
Other	2.7	(0.8)	2.0	(0.6)
Total	100.0		100.0	

Percentage of Operations by First-service Breeding Practice Used for the Majority of Heifers and Cows During the Previous 12 Months

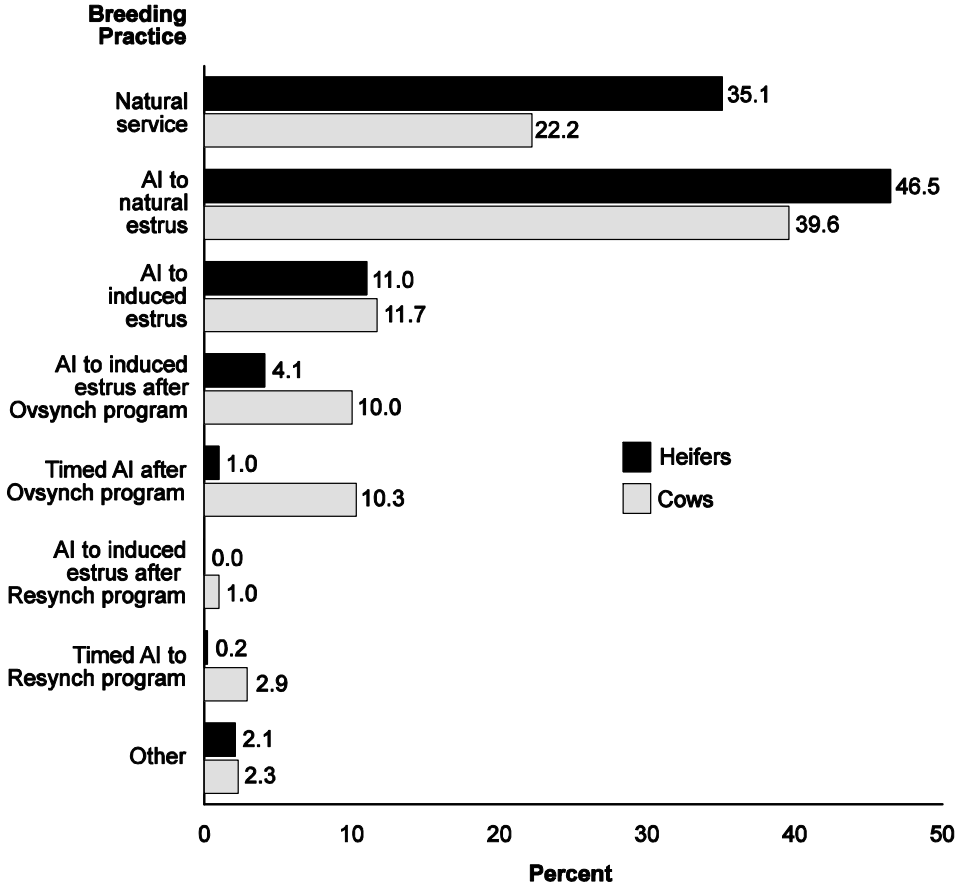


For the second or greater service, AI to natural estrus was used to breed the majority of heifers on 46.5 percent of operations and the majority of cows on 39.6 percent of operations during the previous 12 months. Bulls were used for the second or greater service for heifers on 35.1 percent of operations and for cows on 22.2 percent of operations. A higher percentage of operations used timed AI after Ovsynch or Resynch or AI to induced estrus after Resynch for the second or greater service in cows than in heifers. (The Resynch program is Ovsynch's first GnRH started 1 week prior to, or at, pregnancy diagnosis followed by prostaglandin and second GnRH injection.)

b. Percentage of operations by breeding practice used for the ***second or greater service*** for the majority of heifers and cows during the previous 12 months:

	Percent Operations			
	Heifers		**Cows**	
Breeding Practice	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Natural service (bull-bred)	35.1	(2.9)	22.2	(2.6)
AI to natural estrus (no injections given to induce estrus)	46.5	(3.0)	39.6	(3.0)
AI to induced estrus (prostaglandin injections only)	11.0	(2.0)	11.7	(2.0)
AI to induced estrus after Ovsynch program (prostaglandin and GnRH injections)	4.1	(1.2)	10.0	(1.8)
Timed AI after Ovsynch program (prostaglandin and GnRH injections)	1.0	(0.4)	10.3	(1.8)
AI to induced estrus after Resynch program (Ovsynch's 1st GnRH started 1 week prior to, or at, pregnancy diagnosis)	0.0	(--)	1.0	(0.4)
Timed AI to Resynch program (Ovsynch's 1st GnRH started 1 week prior to, or at, pregnancy diagnosis)	0.2	(0.1)	2.9	(0.9)
Other	2.1	(0.7)	2.3	(0.8)
Total	100.0		100.0	

Percentage of Operations by Breeding Practice Used for Second or Greater Service for the Majority of Heifers and Cows During the Previous 12 Months



More than one-half of operations (57.6 percent) used timed-AI programs for at least some cows during the previous 12 months and about one-fourth (25.4 percent) used timed-AI programs for at least some heifers. Timed-AI programs were used for either heifers or cows on 58.2 percent of operations. A higher percentage of medium operations used timed AI for cows (69.7 percent) and either heifers or cows (70.8 percent) compared with small operations (52.8 and 53.2 percent, respectively).

c. Percentage of operations that used timed-AI programs to manage reproduction in heifers, cows, or either heifers or cows during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Cattle Class	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Heifers	22.7	(3.3)	33.3	(4.2)	24.7	(5.2)	25.4	(2.5)
Cows	52.8	(4.0)	69.7	(3.8)	62.9	(6.2)	57.6	(2.9)
Either heifers or cows	53.2	(4.0)	70.8	(3.8)	62.9	(6.2)	58.2	(2.9)

Timed-AI programs for cows and either heifers or cows were used on a higher percentage of operations in the East region (59.9 and 60.3 percent) compared with 34.3 and 35.6 percent, respectively, in the West region.

d. Percentage of operations that used timed-AI programs to manage reproduction in heifers, cows, or either heifers or cows during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		**East**	
Cattle Class	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Heifers	14.2	(3.7)	26.5	(2.7)
Cows	34.3	(4.8)	59.9	(3.2)
Either heifers or cows	35.6	(4.9)	60.3	(3.2)

About 4 of 10 operations (43.9 percent) that used timed-AI programs for either heifers or cows during the previous 12 months had been using timed AI for 7 years or more. More than one-third of operations (33.9 percent) had been using timed AI for 9 years or more.

e. For the 58.2 percent of operations that used timed-AI programs during the previous 12 months, percentage of operations by number of years timed-AI programs have been used:

Number of Years	Percent Operations	Standard Error
Fewer than 2.0	8.0	(2.2)
2.0 to 2.9	9.3	(2.3)
3.0 to 4.9	21.7	(3.2)
5.0 to 6.9	17.1	(2.8)
7.0 to 8.9	10.0	(2.3)
9.0 or more	33.9	(3.7)
Total	100.0	

Almost one-half of operations (48.8 percent) using timed-AI programs during the previous 12 months reported that timed AI was used only occasionally to catch up on nonpregnant cows. “Other” reasons best described use of timed AI on 5.6 percent of operations, and these included controlling only first-service, anestrus cows in addition to all reasons provided.

f. For the 58.2 percent of operations that used timed-AI programs during the previous 12 months, percentage of operations by reason that best describes why timed AI was used:

Reason	Percent Operations	Standard Error
To control all first and subsequent services	27.7	(3.2)
To control only second and greater services	17.9	(3.0)
Only occasionally to catch up on nonpregnant cows	48.8	(3.9)
Other	5.6	(1.4)
Total	100.0	

A controlled internal drug release (CIDR) insert has been approved for dairy cows and heifers since 2003. The product contains progesterone and is inserted vaginally to synchronize estrus in cattle. The CIDR insert is removed after 7 days, and estrus in nonpregnant cows is usually observed 3 to 4 days later.

Approximately one-third of operations (32.4 percent) used a CIDR insert during the previous 12 months. No significant differences were observed in the use of inserts by herd size or region.

g. Percentage of operations that used a CIDR insert during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
28.6	(3.5)	41.1	(4.5)	39.7	(5.5)	32.4	(2.7)

h. Percentage of operations that used a CIDR insert during the previous 12 months, by region:

Percent Operations			
Region			
West		**East**	
Percent	**Standard Error**	**Percent**	**Standard Error**
19.5	(4.2)	33.7	(2.9)

For operations that reported using a CIDR insert during the previous 12 months, nearly two-thirds of operations (65.7 percent) used inserts for anestrous females. A majority of the operations that noted “Other” as the reason for using a CIDR insert used them for problem breeders.

i. For the 32.4 percent of operations that used a CIDR insert during the previous 12 months, percentage of operations by reason(s) used:

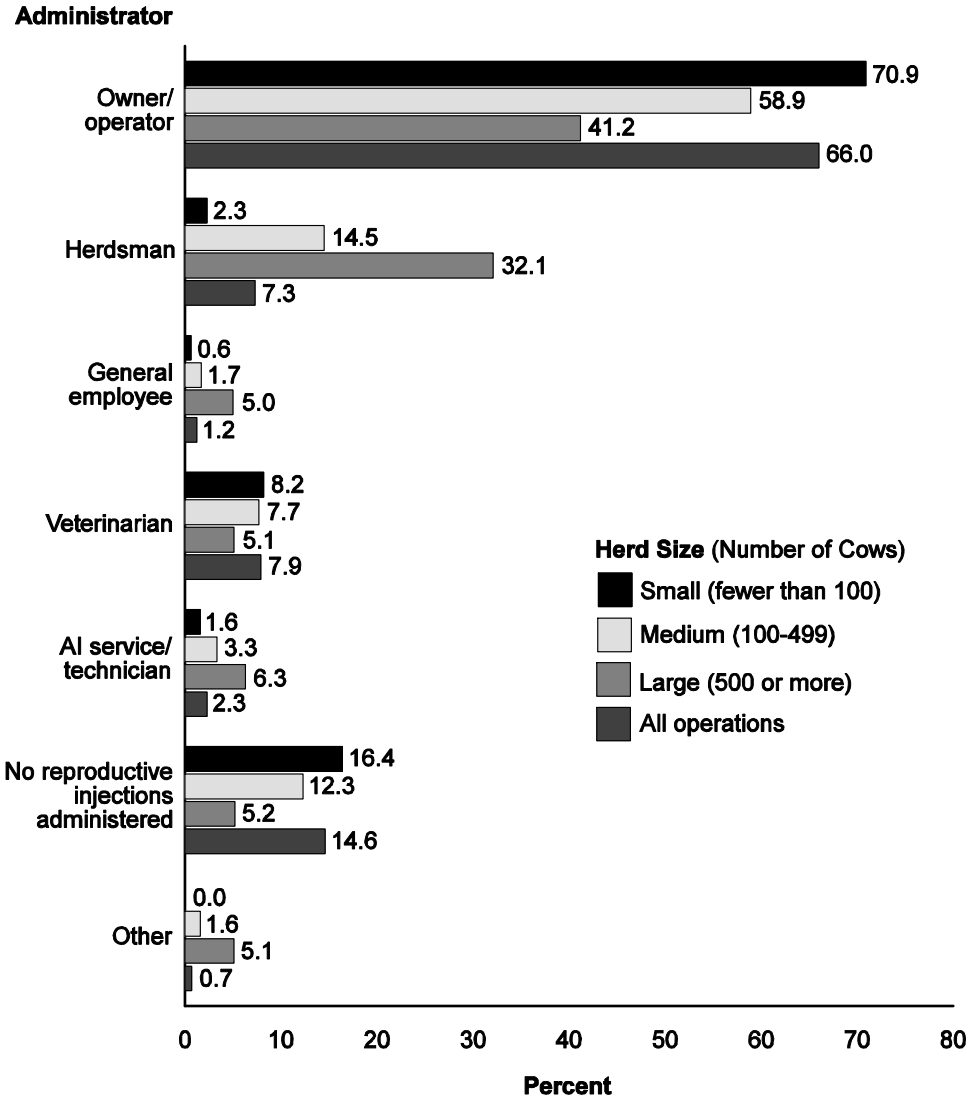
Reason	Percent Operations	Standard Error
As part of a herd synchronization program	34.3	(4.4)
Specifically for animals identified as anestrous	65.7	(4.4)
Specifically for animals identified as cystic	43.5	(4.7)
Postbreeding	15.0	(3.8)
Other	10.9	(3.1)

The owner/operator administered the majority of reproductive injections to cattle on two-thirds (66.0 percent) of all operations during the previous 12 months. For 70.9 percent of small operations and 58.9 percent of medium operations, the owner/operator gave the majority of reproductive injections. For large herds, the owner/operator gave the majority of reproductive injections on 41.2 percent of operations, with the herdsman giving the majority of reproductive injections on 32.1 percent of operations. The herdsman gave the majority of reproductive injections for fewer small operations (2.3 percent) than medium or large operations (14.5 and 32.1 percent, respectively). Reproductive injections were not administered on 16.4 percent of small operations, 12.3 percent of medium operations, and 5.2 percent of large operations.

j. Percentage of operations by person who administered the majority of reproductive injections during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Administrator	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Owner/operator	70.9	(3.7)	58.9	(4.4)	41.2	(6.2)	66.0	(2.8)
Herdsman	2.3	(1.1)	14.5	(3.0)	32.1	(5.2)	7.3	(1.1)
General employee	0.6	(0.5)	1.7	(0.8)	5.0	(2.6)	1.2	(0.4)
Veterinarian	8.2	(2.5)	7.7	(2.4)	5.1	(2.9)	7.9	(1.8)
AI service/ technician	1.6	(1.2)	3.3	(1.6)	6.3	(3.1)	2.3	(0.9)
No reproductive injections administered	16.4	(2.8)	12.3	(3.0)	5.2	(3.2)	14.6	(2.1)
Other	0.0	(--)	1.6	(1.1)	5.1	(2.8)	0.7	(0.3)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Person Who Administered the Majority of Reproductive Injections During the Previous 12 Months, and by Herd Size



The only regional difference in the administration of reproductive injections during the previous 12 months was observed for the owner/operator. The owner/operator gave the majority of reproductive injections on a lower percentage of operations in the West region (37.3 percent) than in the East region (68.7 percent).

k. Percentage of operations by person who administered the majority of reproductive injections during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Administrator	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Owner/operator	37.3	(5.2)	68.7	(3.0)
Herdsman	12.4	(2.8)	6.8	(1.2)
General employee	3.1	(1.9)	1.0	(0.4)
Veterinarian	10.0	(3.6)	7.7	(1.9)
AI service/technician	8.3	(3.2)	1.7	(1.0)
No reproductive injections administered	25.6	(4.4)	13.6	(2.3)
Other	3.3	(2.1)	0.5	(0.3)
Total	100.0		100.0	

Embryo transfer (ET) can be used to obtain more offspring from cattle with superior genetics. In addition, for cattle with heat stress, ET has been shown to achieve higher pregnancy rates than routine AI. Embryos can be collected from donor cattle and then either transplanted immediately into recipient cattle or frozen for transplantation at a later date. Superovulated embryos result from eggs that are fertilized in the uterus of the dam. When the fertilization step occurs in the laboratory, the embryos are referred to as *in vitro* produced.

About 1 of 10 operations (11.5 percent) transplanted embryos into any heifers or cows during the previous 12 months. A similar percentage of each embryo type (fresh or frozen) was transplanted in heifers and cows. Fresh embryos were transplanted into heifers and/or cows on 8.2 percent of operations, while frozen embryos were transplanted into heifers and/or cows on 7.7 percent of operations.

l. Percentage of operations that transplanted fresh or frozen embryos, or either type, into heifers or cows, or either heifers or cows, during the previous 12 months:

	Percent Operations					
	Embryo Type					
	Fresh		**Frozen**		**Either**	
Cattle Class	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Heifers	7.1	(1.7)	5.2	(1.2)	8.9	(1.8)
Cows	6.1	(1.6)	4.3	(1.2)	8.6	(1.9)
Either heifers or cows	8.2	(1.8)	7.7	(1.5)	11.5	(2.0)

More than one-half of operations (54.9 percent) had cattle pregnancies conceived through natural service (bull breeding). Almost 9 of 10 operations (88.4 percent) had pregnancies conceived via AI, and about 1 of 10 operations (9.9 percent) had pregnancies via ET. A higher percentage of large operations (71.8 percent) used natural service compared with small operations (51.2 percent).

m. Percentage of operations with cattle pregnancies conceived during the previous 12 months by breeding method, and by herd size:

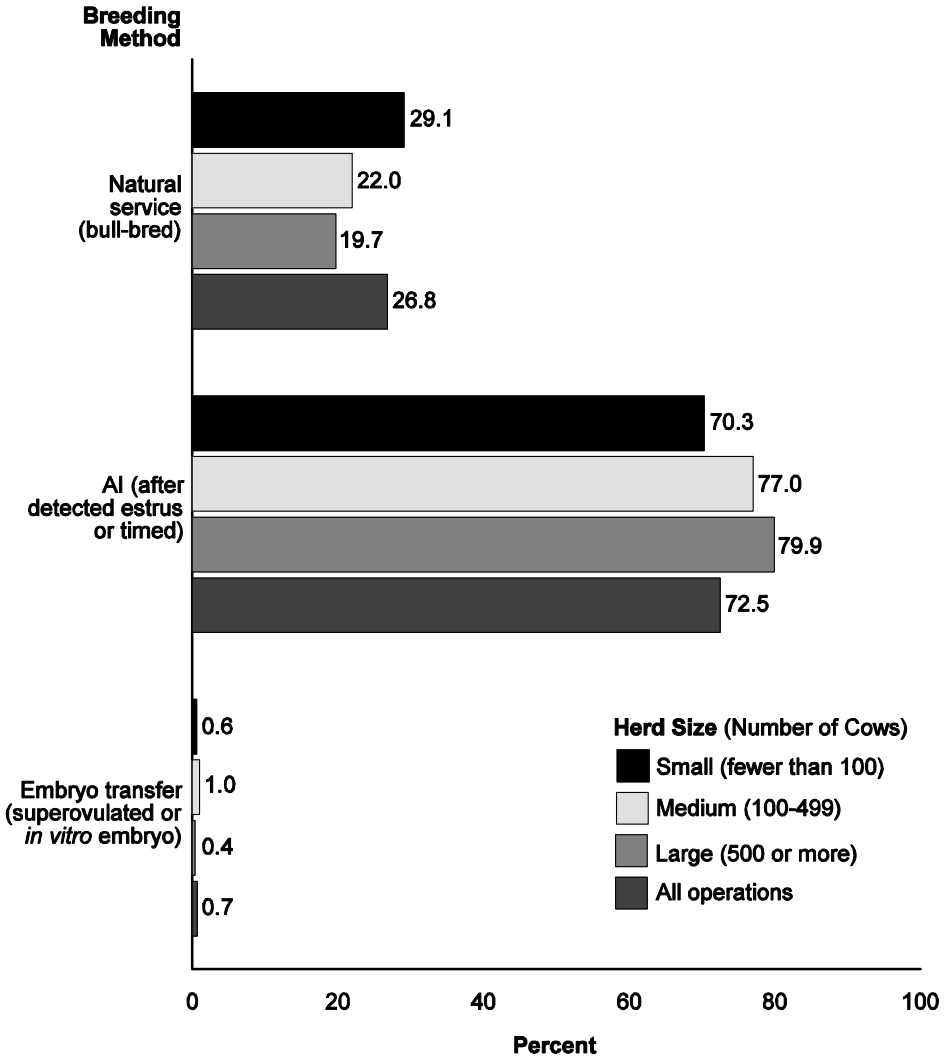
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Breeding Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Natural service (bull-bred)	51.2	(4.0)	60.9	(4.3)	71.8	(4.6)	54.9	(3.0)
AI (after detected estrus or timed)	86.4	(2.8)	93.7	(1.7)	89.6	(4.1)	88.4	(2.0)
Embryo transfer (superovulated or *in vitro* embryo)	8.5	(2.6)	13.0	(3.2)	12.7	(4.0)	9.9	(2.0)

On average, 72.5 percent of pregnancies were conceived by AI—either after detected estrus or timed—during the previous 12 months. About one-fourth of pregnancies (26.8 percent) were conceived through natural service. Less than 1 percent of pregnancies resulted from embryo transfer. No herd size differences were noted.

n. Operation average percentage of cattle pregnancies conceived during the previous 12 months by breeding method, and by herd size:

	Operation Average Percent Pregnancies							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Breeding Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Natural service (bull-bred)	29.1	(3.3)	22.0	(2.8)	19.7	(4.0)	26.8	(2.4)
AI (after detected estrus or timed)	70.3	(3.2)	77.0	(2.8)	79.9	(3.9)	72.5	(2.4)
Embryo transfer (superovulated or *in vitro* embryo)	0.6	(0.2)	1.0	(0.4)	0.4	(0.2)	0.7	(0.2)
Total	100.0		100.0		100.0		100.0	

Operation Average Percentage of Cattle Pregnancies Conceived During the Previous 12 Months by Breeding Method, and by Herd Size



There were no differences in operation average percent pregnancies by breeding method between the West and East regions.

o. Operation average percentage of cattle pregnancies conceived during the previous 12 months by breeding method, by region:

	Operation Average Percent Pregnancies			
	Region			
	West		East	
Breeding Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Natural service (bull-bred)	28.6	(4.5)	26.6	(2.6)
AI (after detected estrus or timed)	71.2	(4.5)	72.7	(2.6)
Embryo transfer (superovulated or *in vitro* embryo)	0.2	(0.1)	0.7	(0.2)
Total	100.0		100.0	

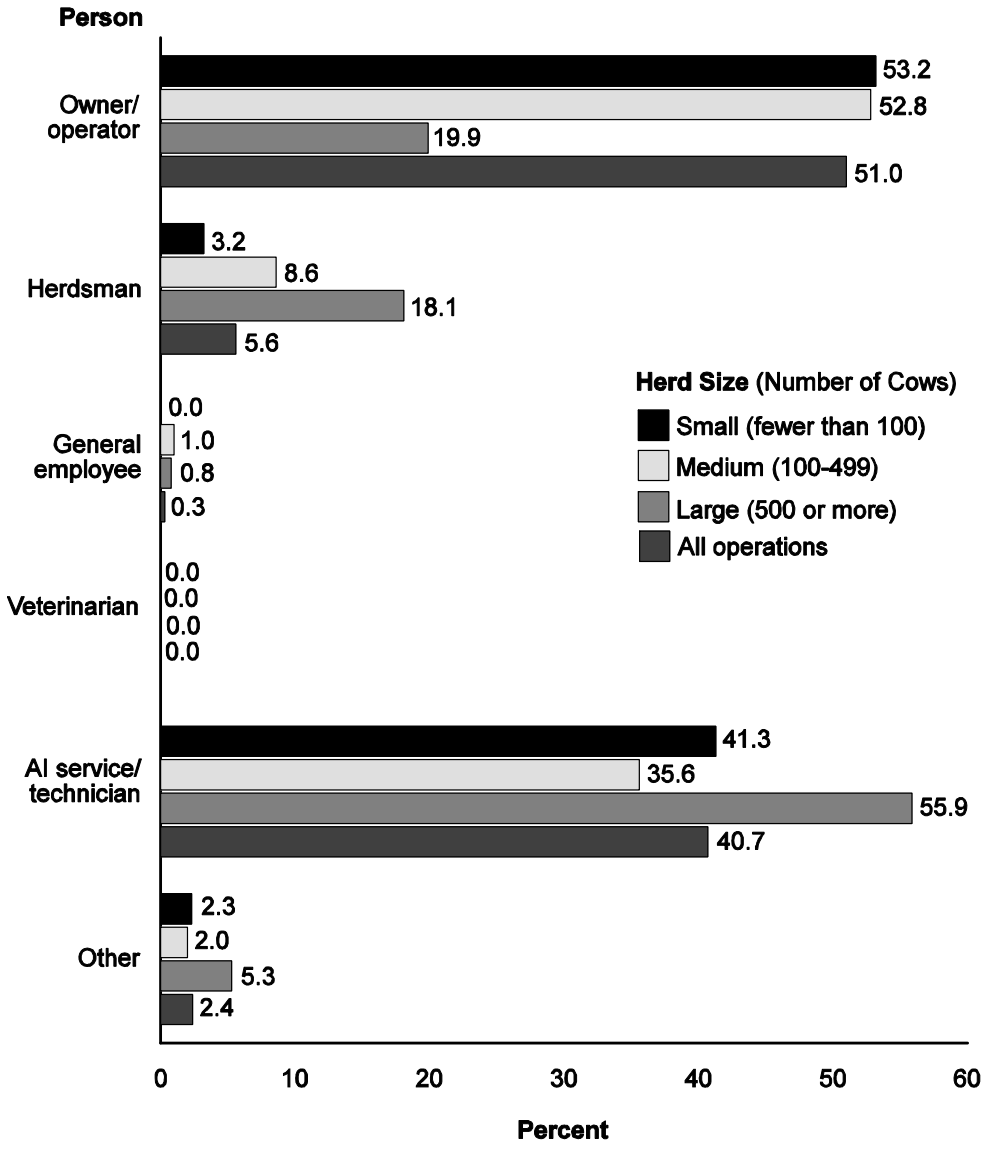
4. AI personnel and services

On operations with any pregnancies conceived through AI during the previous 12 months, the owner/operator performed the majority of AI services on 51.0 percent of operations, while an AI service/technician performed the majority of these services on 40.7 percent of operations. An AI service/technician performed the majority of AI services on more than one-half of large operations (55.9 percent). The owner/operator performed the majority of AI services on a lower percentage of large operations (19.9 percent) than small or medium operations (53.2 and 52.8 percent, respectively). A herdsman performed the majority of AI services on a higher percentage of large operations (18.1 percent) than small operations (3.2 percent).

a. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of operations by person who performed the majority of AI services, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Person	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Owner/ operator	53.2	(4.4)	52.8	(4.7)	19.9	(5.2)	51.0	(3.2)
Herdsman	3.2	(1.3)	8.6	(1.9)	18.1	(3.8)	5.6	(1.0)
General employee	0.0	(--)	1.0	(0.7)	0.8	(0.3)	0.3	(0.2)
Veterinarian	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
AI service/ technician	41.3	(4.4)	35.6	(4.6)	55.9	(6.5)	40.7	(3.2)
Other	2.3	(1.5)	2.0	(1.2)	5.3	(3.1)	2.4	(1.0)
Total	100.0		100.0		100.0		100.0	

For the 88.4 Percent of Operations with Cattle Pregnancies Conceived Through AI During the Previous 12 Months, Percentage of Operations by Person Who Performed the Majority of AI Services, and by Herd Size



A herdsman performed the majority of AI services on a higher percentage of operations in the West region (15.8 percent) than in the East region (4.7 percent).

b. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of operations by person who performed the majority of AI services, by region:

	Percent Operations			
	Region			
	West		East	
Person	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Owner/operator	39.1	(6.2)	52.0	(3.4)
Herdsman	15.8	(3.6)	4.7	(1.1)
General employee	0.0	(--)	0.3	(0.2)
Veterinarian	0.0	(--)	0.0	(--)
AI service/technician	39.2	(6.1)	40.9	(3.4)
Other	5.9	(3.2)	2.1	(1.1)
Total	100.0		100.0	

On almost all operations (95.9 percent) that had pregnancies conceived through AI during the previous 12 months, the person responsible for the majority of AI services had been formally trained via lecture and/or laboratory exercises in performing AI.

c. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of operations on which the person responsible for the majority of AI services was formally trained:

Percent Operations	Standard Error
95.9	(1.2)

Although it has been possible to sex and sort semen since the 1980s, the use of sexed semen is still not a common practice. The sorting process is extremely slow, can damage the semen, and greatly reduces the overall semen counts. Consequently, compared with unsexed semen, sexed semen costs more and contains fewer viable sperm per straw, leading to a lower conception rate. Because heifers are generally more fertile, it is recommended that sexed semen be used only in virgin heifers.

About 1 of 10 heifers (11.4 percent) that eventually entered the milking herd were inseminated with sexed semen, compared with 3.5 percent of cows.

d. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of heifers and of cows that were inseminated with sexed semen during that time:

Percent Heifers[1]	Std. Error	Percent Cows[2]	Std. Error
11.4	(2.4)	3.5	(2.3)

[1]As a percentage of dairy heifers that entered the milking herd in 2006.
[2]As a percentage of cows on the operation at the time of VS Initial Visit interview.

For operations with pregnancies conceived through AI during the previous 12 months, approximately two-thirds of operations (70.9 percent) attempted AI breeding three to six times before designating nonpregnant cows for a different strategy.

e. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, and for cows in which AI was unsuccessful, percentage of operations by typical maximum number of times AI was attempted before these cows were designated for a different strategy (e.g., moved to a bull pen, sold, etc.):

Number AI Attempts	Percent Operations	Standard Error
1 or 2	10.8	(2.2)
3 or 4	33.2	(3.0)
5 or 6	37.7	(3.2)
7 or more	18.3	(2.1)
Total	100.0	

5. Pregnancy diagnosis

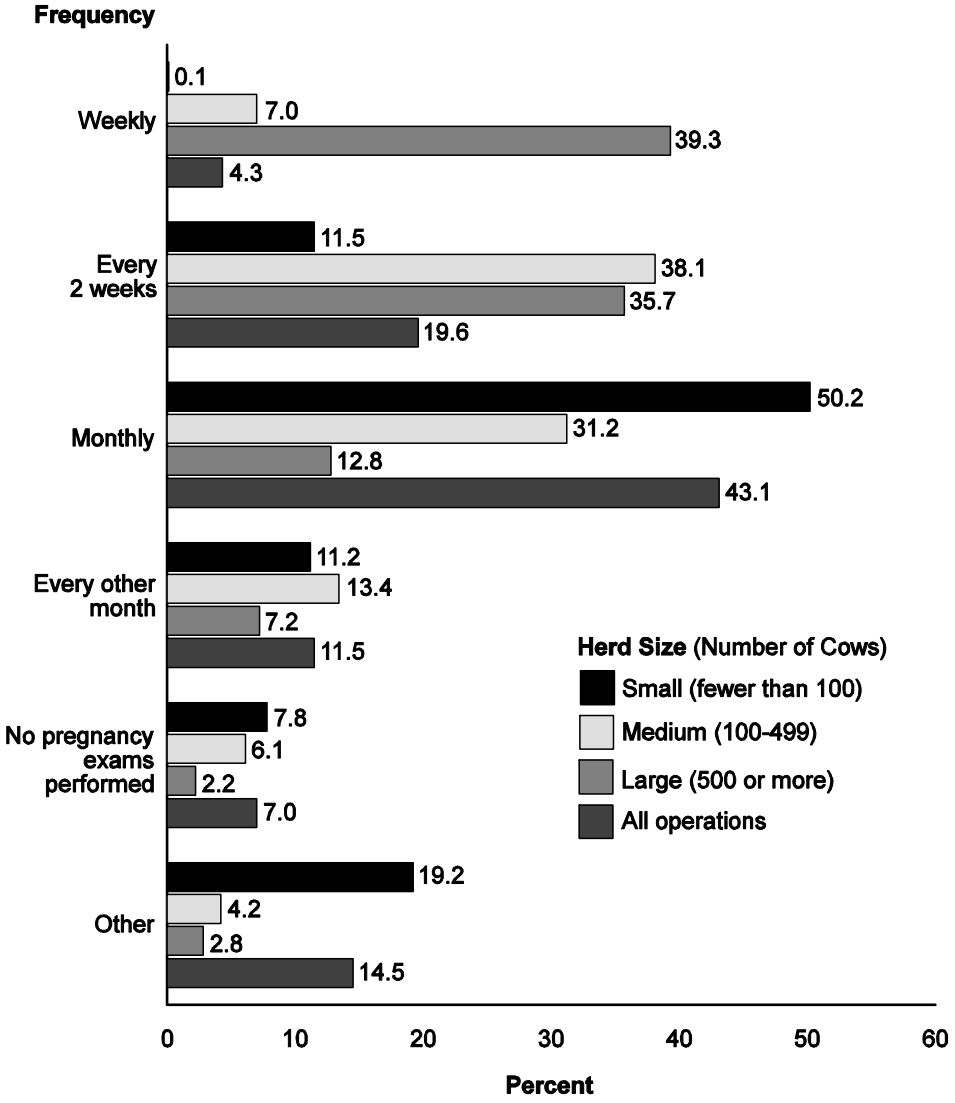
Pregnancy exams are important in evaluating the reproductive status of heifers and cows. The biggest advantage of performing pregnancy exams is identifying animals that are not pregnant so that they can be managed for rebreeding in a short period of time. Additional benefits of pregnancy exams include identification of uterine or ovarian disease, diagnosis of twins, and estimation of conception dates for animals in herds with unobserved natural service.

More than 9 of 10 operations (93.0 percent) had some pregnancy exams performed during the previous 12 months. Two-thirds of all operations (67.0 percent) performed pregnancy exams at least monthly during the previous 12 months. Most small operations (50.2 percent) performed exams on a monthly basis, while most medium operations performed exams every 2 weeks (38.1 percent) or monthly (31.2 percent). Most large operations performed exams weekly (39.3 percent) or every 2 weeks (35.7 percent). The increased frequency of exams with larger herd size might be related to the number of cows that need to be examined. On 7.0 percent of operations, no pregnancy exams were performed. Operations listing “Other” frequencies reported examining cows from 3 months of gestation to once annually.

a. Percentage of operations by frequency with which pregnancy exams were performed during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Frequency	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Weekly	0.1	(0.1)	7.0	(1.9)	39.3	(5.1)	4.3	(0.6)
Every 2 weeks	11.5	(2.5)	38.1	(4.2)	35.7	(5.9)	19.6	(2.1)
Monthly	50.2	(4.0)	31.2	(4.2)	12.8	(4.1)	43.1	(3.0)
Every other month	11.2	(2.7)	13.4	(3.4)	7.2	(3.3)	11.5	(2.0)
No pregnancy exams performed	7.8	(2.1)	6.1	(2.3)	2.2	(2.1)	7.0	(1.5)
Other	19.2	(3.2)	4.2	(1.3)	2.8	(2.2)	14.5	(2.2)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Frequency with Which Pregnancy Exams Were Performed During the Previous 12 Months, and by Herd Size



A higher percentage of operations in the East region (44.9 percent) performed monthly pregnancy exams than in the West region (25.0 percent).

b. Percentage of operations by frequency with which pregnancy exams were performed during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Frequency	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Weekly	10.8	(3.1)	3.7	(0.6)
Every 2 weeks	32.6	(5.1)	18.4	(2.2)
Monthly	25.0	(4.9)	44.9	(3.3)
Every other month	11.7	(3.4)	11.4	(2.2)
No pregnancy exams performed	10.2	(4.1)	6.7	(1.6)
Other	9.7	(3.7)	14.9	(2.4)
Total	100.0		100.0	

Almost 9 of 10 operations (89.5 percent) used a private veterinarian to perform the majority of pregnancy exams during the previous 12 months. A higher percentage of small operations (91.3 percent) used a private veterinarian than large operations (76.0 percent). Pregnancy exams were performed by nonveterinarian employees on a higher percentage of large operations (10.3 percent) than small or medium operations (0.4 and 0.0 percent, respectively).

c. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by person who performed the majority of exams, and by herd size:

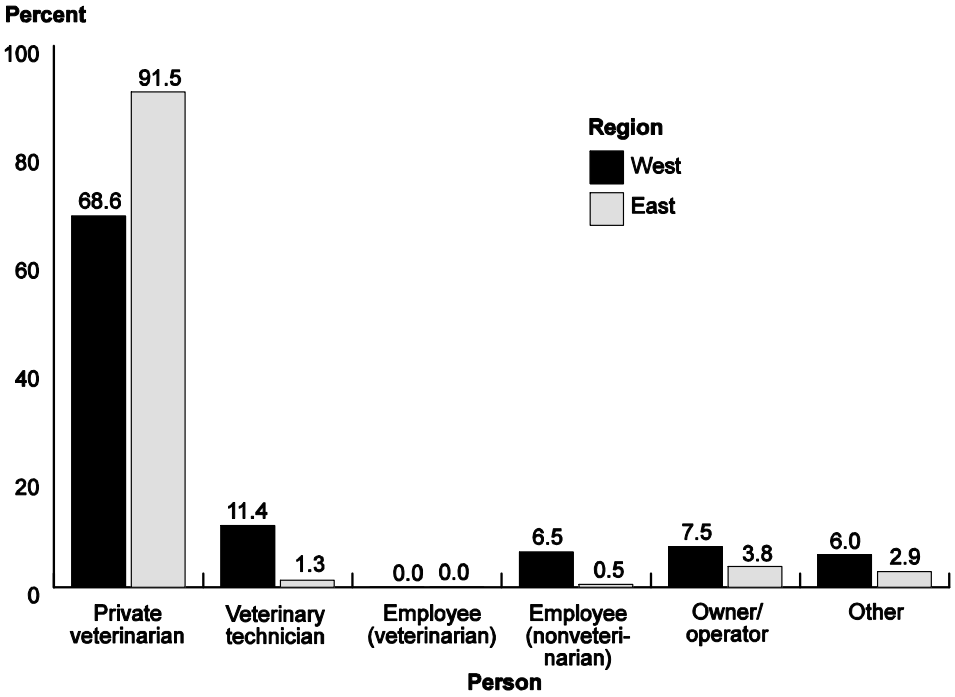
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Person	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Private veterinarian	91.3	(2.2)	88.2	(2.6)	76.0	(5.3)	89.5	(1.7)
Veterinary technician	1.6	(0.8)	2.4	(1.0)	7.5	(2.8)	2.2	(0.6)
Employee (veterinarian)	0.0	(--)	0.0	(--)	0.1	(0.1)	0.0	(0.0)
Employee (nonveterinarian)	0.4	(0.4)	0.0	(--)	10.3	(4.2)	1.0	(0.4)
Owner/operator	3.8	(1.2)	5.2	(1.6)	3.3	(1.9)	4.1	(0.9)
Other	2.9	(1.7)	4.2	(1.8)	2.8	(1.9)	3.2	(1.2)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the East region (91.5 percent) used a private veterinarian for pregnancy exams compared with operations in the West region (68.6 percent). In the West region, a higher percentage of operations (11.4 percent) used a veterinary technician to perform pregnancy exams than in the East region (1.3 percent).

d. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by person who performed the majority of exams, by region:

	Percent Operations			
	Region			
	West		East	
Person	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Private veterinarian	68.6	(5.3)	91.5	(1.7)
Veterinary technician	11.4	(3.5)	1.3	(0.6)
Employee (veterinarian)	0.0	(--)	0.0	(0.0)
Employee (nonveterinarian)	6.5	(3.1)	0.5	(0.3)
Owner/operator	7.5	(2.7)	3.8	(0.9)
Other	6.0	(3.0)	2.9	(1.3)
Total	100.0		100.0	

For the 93.0 Percent of Operations that had Pregnancy Exams Performed During the Previous 12 Months, Percentage of Operations by Person Who Performed the Majority of Exams, by Region



The primary method used to restrain cows for pregnancy diagnosis on most small operations was tie stall/stanchion (80.7 percent of operations). The majority of large operations used headlocks (83.0 percent) for cow restraint.

e. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by primary method used to restrain cows for pregnancy diagnosis, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Headlocks at the feed bunk	6.5	(1.9)	30.0	(3.7)	83.0	(4.4)	17.5	(1.7)
Palpation rail	0.6	(0.6)	10.3	(2.8)	6.0	(1.8)	3.4	(0.8)
Tie stall/ stanchion	80.7	(2.7)	18.2	(4.1)	1.8	(1.8)	59.7	(2.5)
Chute	3.0	(1.0)	10.0	(2.8)	1.2	(0.7)	4.7	(1.0)
Parlor	5.4	(1.2)	11.1	(2.4)	5.6	(3.2)	6.8	(1.0)
Loose in freestalls	0.4	(0.3)	14.3	(3.5)	0.5	(0.2)	3.9	(0.9)
Other	3.4	(1.4)	6.1	(2.3)	1.9	(1.9)	4.0	(1.1)
Total	100.0		100.0		100.0		100.0	

Similar to the differences observed by herd size, a higher percentage of operations in the West region restrained cows for pregnancy diagnosis using headlocks at the feed bunk (71.7 percent) than operations in the East region (12.5 percent). Tie stalls/stanchions were used to restrain cows by 65.0 percent of operations in the East region compared with 2.5 percent in the West region.

f. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by primary method used to restrain cows for pregnancy diagnosis, by region:

	Percent Operations			
	Region			
	West		East	
Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Headlocks at the feed bunk	71.7	(5.5)	12.5	(1.8)
Palpation rail	2.4	(1.3)	3.5	(0.9)
Tie stall/stanchion	2.5	(1.8)	65.0	(2.6)
Chute	7.0	(2.4)	4.4	(1.0)
Parlor	13.6	(4.9)	6.2	(1.0)
Loose in freestalls	1.3	(1.3)	4.2	(1.0)
Other	1.5	(1.5)	4.2	(1.2)
Total	100.0		100.0	

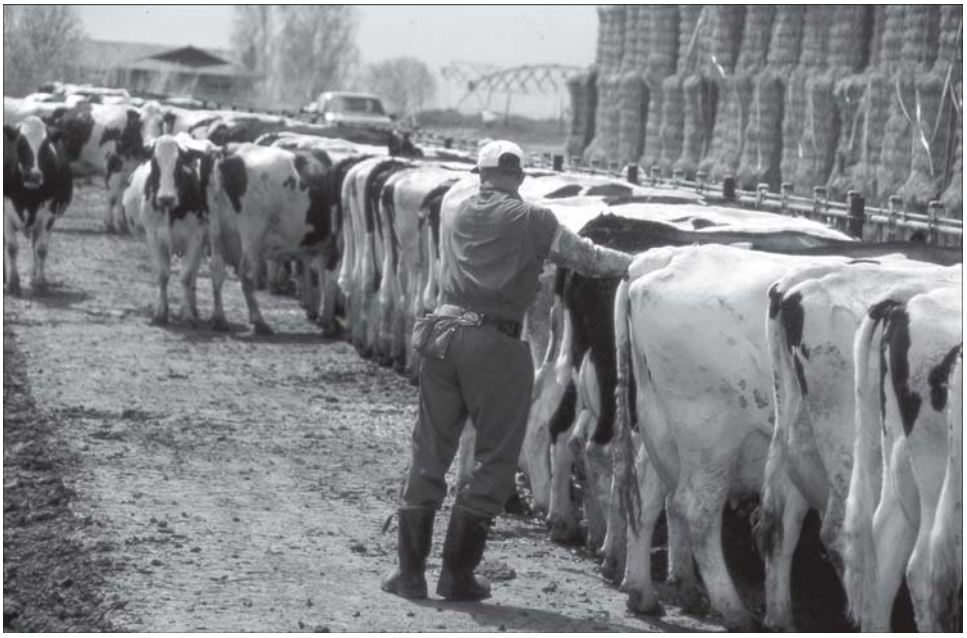


Photo courtesy of “Dairy Herd Management”/“Bovine Veterinarian”

The majority of operations (85.7 percent) routinely used rectal palpation to perform pregnancy exams. More than one-fourth of operations (27.4 percent) routinely used ultrasound to determine pregnancy status. Blood tests were not frequently used. There were no differences by herd size.

g. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by method used routinely to determine pregnancy status, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Rectal palpation	84.6	(3.2)	88.5	(3.2)	86.5	(3.9)	85.7	(2.4)
Ultrasound	26.3	(3.7)	30.0	(4.3)	28.3	(5.4)	27.4	(2.8)
Blood test	4.5	(1.7)	2.3	(1.5)	7.4	(3.2)	4.1	(1.2)
Milk progesterone	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Other	0.7	(0.5)	0.6	(0.6)	0.0	(0.0)	0.6	(0.3)

Rectal palpation was used to detect pregnancy on 96.3 percent of operations in the West region, compared with 84.7 percent in the East region. A higher percentage of operations in the East region (28.6 percent) used ultrasound for pregnancy exams than in the West region (14.0 percent).

h. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by method used routinely to determine pregnancy status, by region:

	Percent Operations			
	Region			
	West		East	
Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Rectal palpation	96.3	(2.3)	84.7	(2.6)
Ultrasound	14.0	(4.0)	28.6	(3.0)
Blood test	2.6	(1.9)	4.3	(1.3)
Milk progesterone	0.0	(--)	0.0	(--)
Other	0.0	(--)	0.7	(0.4)

6. Ultrasound

Of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, more than three-fourths (77.4 percent) began using ultrasound for routine pregnancy diagnosis prior to 2006. Almost one-third of operations (29.6) reported using ultrasound for routine pregnancy exams in 2003 or earlier.

a. For the 27.4 percent of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, percentage of operations by year in which routine ultrasound diagnosis of pregnancy was first performed:

Year	Percent Operations	Standard Error	Cumulative Percent
2002 and before	16.4	(4.2)	16.4
2003	13.2	(4.5)	29.6
2004	14.9	(4.3)	44.5
2005	32.9	(6.0)	77.4
2006	14.9	(3.6)	92.3
2007	7.7	(2.6)	100.0
Total	100.0		

For operations that routinely used ultrasound to evaluate pregnancy status during the previous 12 months, almost all operations (99.6 percent) reported that the ultrasound equipment was owned by the veterinarian. No herd size or regional differences were observed for ownership of the ultrasound machine used for pregnancy diagnosis.

b. For the 27.4 percent of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, percentage of operations by owner of the ultrasound equipment used for the majority of pregnancy diagnoses:

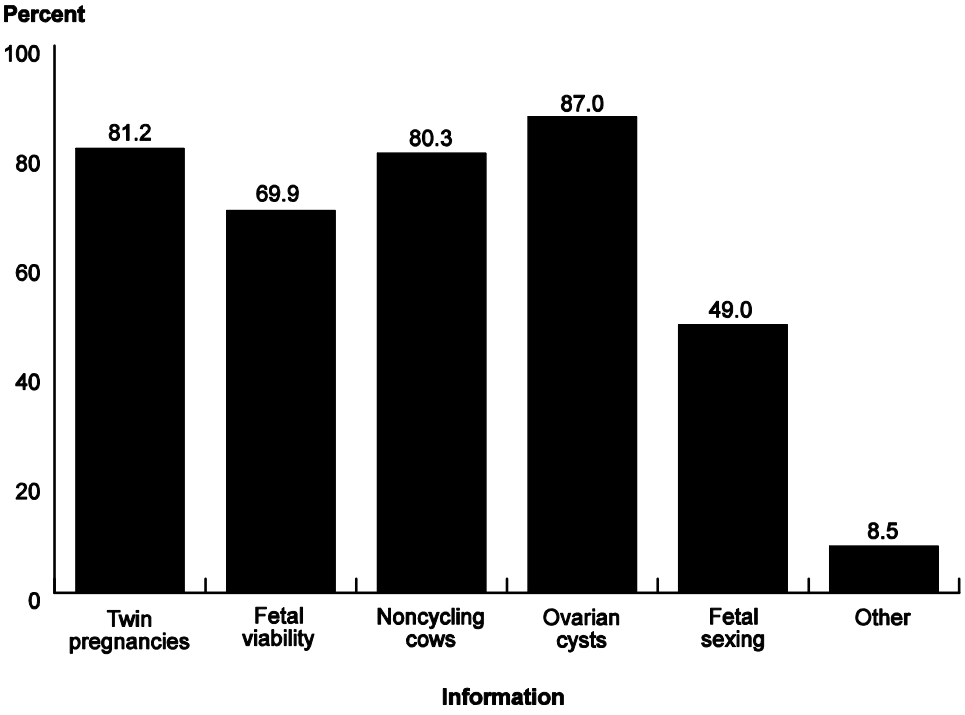
Owner	Percent Operations	Standard Error
Veterinarian	99.6	(0.2)
Dairy operation	0.2	(0.1)
Other	0.2	(0.1)
Total	100.0	

Ultrasound was often used to provide additional information during pregnancy exams. More than two-thirds of operations that routinely used ultrasound for pregnancy diagnosis during the previous 12 months collected and evaluated information on ovarian cysts (87.0 percent), twin pregnancies (81.2 percent), noncycling cows (80.3 percent), and fetal viability (69.9 percent). One-half the operations (49.0 percent) used ultrasound to determine the sex of the fetus.

c. For the 27.4 percent of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, percentage of operations by additional information collected/evaluated during ultrasound exams:

Information	Percent Operations	Standard Error
Twin pregnancies	81.2	(4.8)
Fetal viability	69.9	(5.6)
Noncycling (no heat) cows	80.3	(4.6)
Ovarian cysts	87.0	(4.2)
Fetal sexing	49.0	(5.9)
Other	8.5	(3.5)

For the 27.4 Percent of Operations that Routinely Used Ultrasound to Determine Pregnancy Status During the Previous 12 Months, Percentage of Operations by Additional Information Collected/Evaluated During Ultrasound Exams



7. Producer use of reproductive parameters

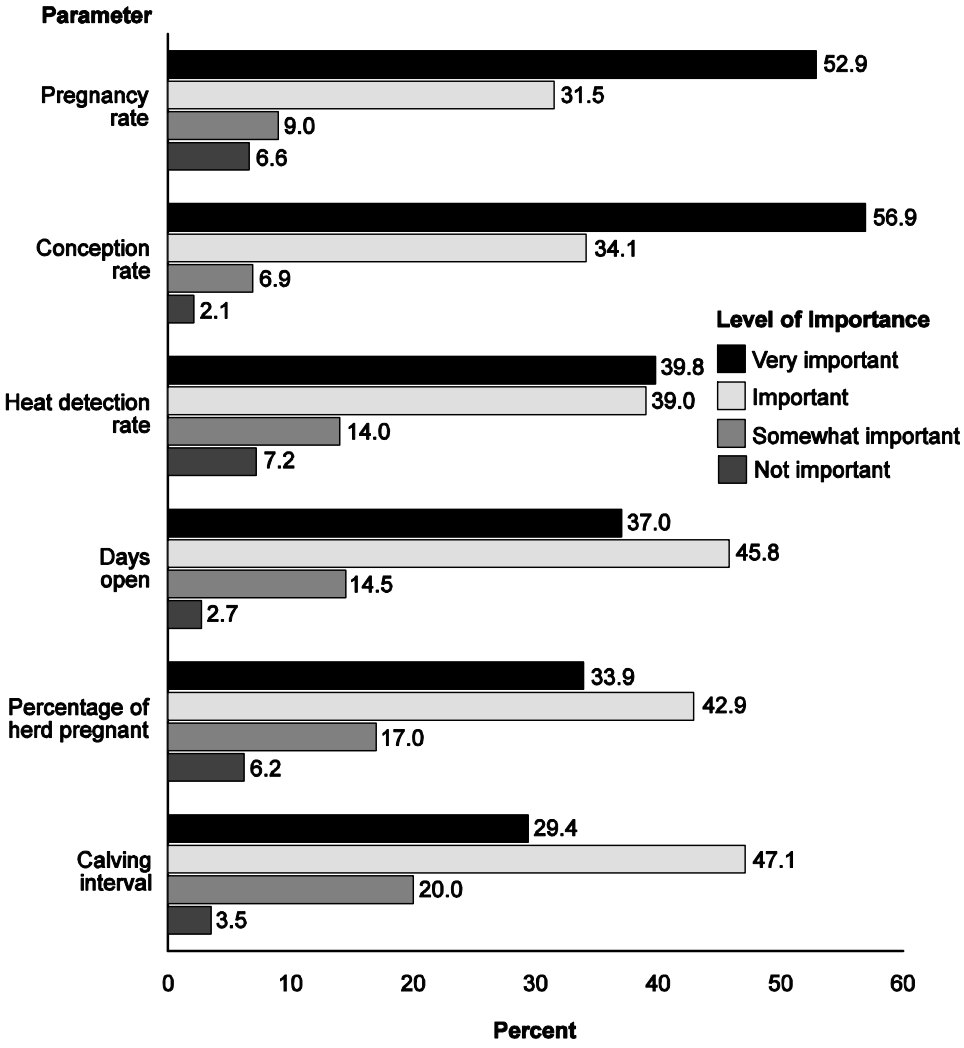
The parameters used to evaluate reproductive performance are interrelated and evolving. Pregnancy rate is calculated as the product of the conception rate times the heat detection rate. Conception rate is calculated by dividing the percentage of cows determined to be pregnant by those that were either naturally or artificially bred. Heat detection rate is the number of cows detected in estrus divided by the number of cows eligible to be bred within a 21-day period. Mean days open is typically the average number of days between calving and conception, but may also include the interval from calving to most recent service or current days in milk for cows that have gone beyond the voluntary waiting period and not been bred. The percentage of herd pregnant is typically reported for a given point in time. Calving interval is calculated by taking the mean number of months from one calving to the next calving for each cow in the herd.

For each reproductive performance parameter, less than 8 percent of operations reported that the parameter was not important. The majority of operations reported that conception rate and pregnancy rate were very important in evaluating the reproductive performance of the herd (56.9 and 52.9 percent of operations, respectively).

a. Percentage of operations by level of importance of reproductive parameters used in evaluating reproductive performance of the herd:

	Percent Operations								
	Level of Importance								
	Very Important		Important		Somewhat Important		Not Important		
Parameter	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Total
Pregnancy rate	52.9	(3.0)	31.5	(2.9)	9.0	(1.7)	6.6	(1.4)	100.0
Conception rate	56.9	(3.0)	34.1	(2.9)	6.9	(1.6)	2.1	(0.8)	100.0
Heat detection rate	39.8	(2.9)	39.0	(3.0)	14.0	(2.0)	7.2	(1.5)	100.0
Days open	37.0	(2.8)	45.8	(3.0)	14.5	(2.1)	2.7	(0.9)	100.0
Percentage of herd pregnant	33.9	(2.8)	42.9	(3.0)	17.0	(2.1)	6.2	(1.4)	100.0
Calving interval	29.4	(2.6)	47.1	(3.0)	20.0	(2.5)	3.5	(1.0)	100.0

Percentage of Operations by Level of Importance of Reproductive Parameters Used in Evaluating Reproductive Performance of the Herd



The highest percentage of operations (91.0 percent) considered conception rate to be important or very important in evaluating reproductive performance of the herd. For large operations, a higher percentage considered pregnancy rate, heat detection rate, and percentage of herd pregnant to be important or very important compared with small operations. There were no regional differences in the percentage of operations that considered reproductive parameters important or very important.

b. Percentage of operations that considered the following reproductive parameters to be important or very important in evaluating reproductive performance of the herd, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Parameter	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Pregnancy rate	81.0	(3.0)	90.4	(2.3)	96.7	(1.9)	84.4	(2.1)
Conception rate	90.3	(2.4)	92.0	(2.2)	94.2	(3.3)	91.0	(1.7)
Heat detection rate	76.3	(3.3)	82.5	(3.3)	90.4	(3.2)	78.8	(2.4)
Days open	80.3	(3.1)	88.1	(2.7)	88.4	(3.8)	82.8	(2.2)
Percentage of herd pregnant	74.4	(3.3)	79.7	(3.2)	91.0	(3.1)	76.8	(2.4)
Calving interval	75.7	(3.4)	77.8	(3.9)	80.3	(4.9)	76.5	(2.6)

B. Calving Practices

1. Guidelines

Many factors contribute to calving difficulty and the need to intervene and assist with the calving process. For heifers, an important factor is the relationship of the calf size to the heifer size. In cows, dystocias are often related to multiple fetuses or malposition of the fetus. Guidelines for when and how to assist with calving are available and are slightly different for heifers and cows. Intervening too early or too late in the calving process can cause injury or death to the dam, the calf, or both.

Approximately 6 of 10 operations had guidelines on when to intervene during calving for heifers (60.7 percent), cows (60.5 percent), or both (60.5 percent). There were no differences in the percentage of operations with calving guidelines by herd size or region.

a. Percentage of operations with general guidelines (e.g., standard operating procedures or established protocols) on when to intervene during calving for heifers, cows, or both, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Cattle Class	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Heifers	62.3	(3.8)	56.9	(4.6)	57.4	(6.5)	60.7	(2.9)
Cows	62.3	(3.8)	56.3	(4.6)	57.5	(6.5)	60.5	(2.9)
Both	62.3	(3.8)	56.3	(4.6)	57.4	(6.5)	60.5	(2.9)

b. Percentage of operations with general guidelines (e.g., standard operating procedures or established protocols) on when to intervene during calving for heifers, cows, or both, by region:

	Percent Operations			
	Region			
	West		East	
Cattle Class	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Heifers	54.9	(6.2)	61.2	(3.1)
Cows	54.9	(6.2)	61.1	(3.1)
Both	54.9	(6.2)	61.1	(3.1)

For operations with guidelines for both heifers and cows, about one-half of operations (51.7 percent) used different guidelines for heifers and cows.

c. For the 60.5 percent of operations with guidelines for intervening during calving for both heifers and cows, percentage of operations that used different guidelines for heifers and cows:

Percent Operations	Standard Error
51.7	(3.9)

2. Calving personnel and training

For all operations, the average number of calving personnel (people with any work duties in the calving area, including employees and family members) was 2.4. The average number of calving personnel increased as herd size increased.

a. Average number of calving personnel, and by herd size:

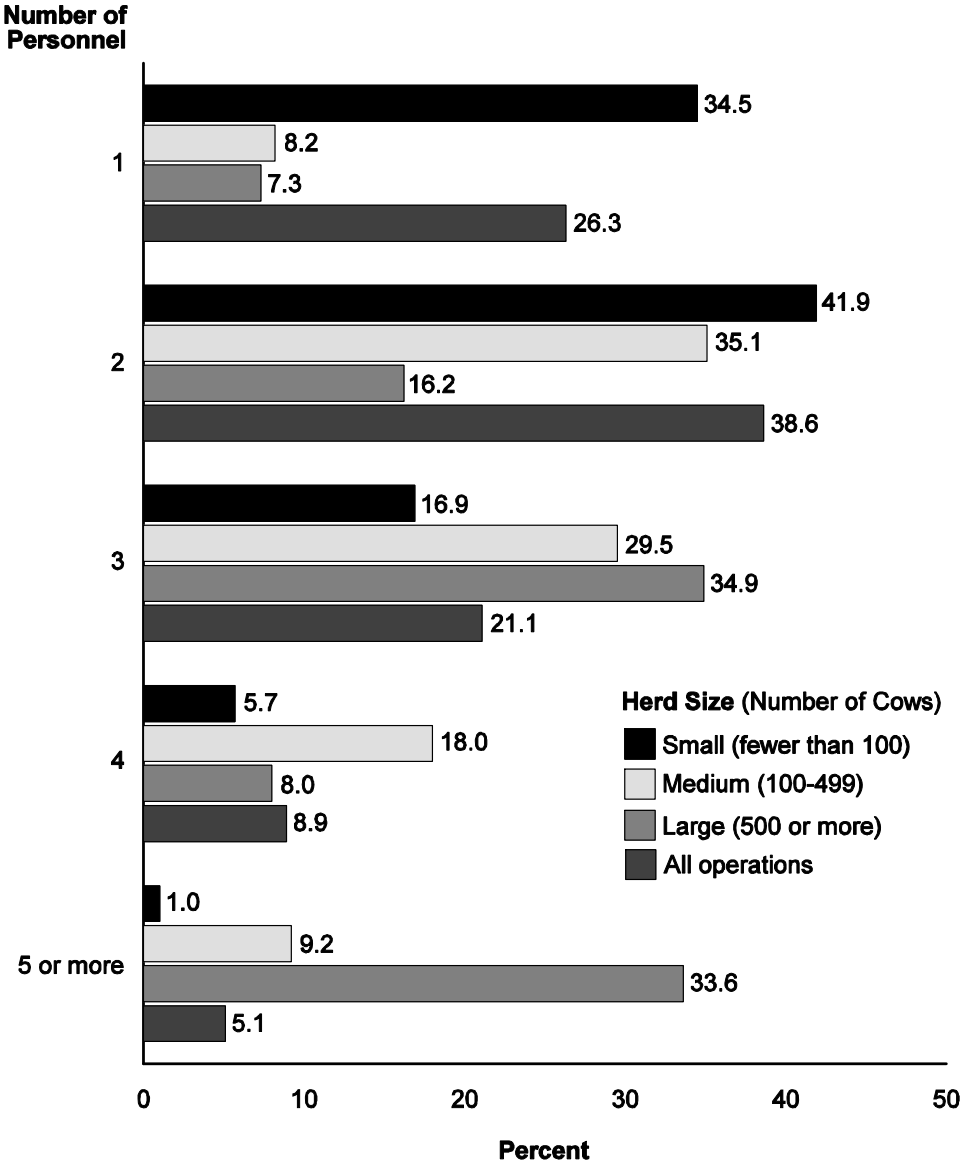
Average Number of Calving Personnel							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Avg.	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**
2.0	(0.1)	3.0	(0.1)	4.1	(0.3)	2.4	(0.1)

The majority of small operations (76.4 percent) had one or two calving personnel, compared with two or three people for medium operations (64.6 percent) and three or more people for large operations (76.5 percent).

b. Percentage of operations by number of calving personnel, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Number of Calving Personnel	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
1	34.5	(3.9)	8.2	(2.3)	7.3	(3.7)	26.3	(2.8)
2	41.9	(4.0)	35.1	(4.3)	16.2	(4.7)	38.6	(3.0)
3	16.9	(3.1)	29.5	(4.2)	34.9	(6.4)	21.1	(2.4)
4	5.7	(1.6)	18.0	(3.5)	8.0	(3.3)	8.9	(1.5)
5 or more	1.0	(0.7)	9.2	(2.4)	33.6	(5.5)	5.1	(0.9)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Number of Calving Personnel, and by Herd Size



The West region had a higher percentage of operations with five or more people in the calving area (16.6 percent) than the East region (4.0 percent).

c. Percentage of operations by number of calving personnel, by region:

	Percent Operations			
	Region			
	West		East	
Number of Calving Personnel	Percent	Std. Error	Percent	Std. Error
1	15.7	(4.8)	27.3	(3.1)
2	35.1	(5.9)	38.9	(3.2)
3	27.4	(5.1)	20.6	(2.6)
4	5.2	(2.5)	9.2	(1.6)
5 or more	16.6	(3.9)	4.0	(0.9)
Total	100.0		100.0	

More than 90 percent of operations (91.9 percent) provided training in calving intervention for owners/employees of the operation. Most operations (90.4 percent) used on-the-job training in calving intervention. Approximately one of four operations (27.0 percent) provided training through discussion/lecture. Some operations used more than one method to train owners/employees in calving intervention.

d. Percentage of operations by training methods in calving intervention used for owners/employees of the operation:

Training Method	Percent Operations	Standard Error
Video	2.4	(0.7)
Discussion/lecture	27.0	(2.7)
On-the-job	90.4	(1.8)
Other	6.1	(1.5)
Any	91.9	(1.7)

3. Calving difficulty scoring

Recording and monitoring calving difficulty scores can help producers select sires and make decisions about retaining replacement heifers. The most common scoring system for the degree of calving difficulty is based on 5 points: 1 point = no problem, 2 = slight problem, 3 = needed assistance, 4 = needed considerable force, and 5 = extreme difficulty/surgical procedure. Studies have shown that a higher percentage of heifers require assistance than cows.

More than one-third of operations (38.5 percent) reported having a system for scoring calving difficulty. A higher percentage of large operations (57.9 percent) than small operations (35.2 percent) had a scoring system.

a. Percentage of operations with a system for scoring calving difficulty, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
35.2	(3.8)	42.6	(4.3)	57.9	(6.1)	38.5	(2.9)

There was no difference by region in the percentage of operations with a system for scoring calving difficulty.

b. Percentage of operations with a system for scoring calving difficulty, by region:

Percent Operations			
Region			
West		**East**	
Percent	**Standard Error**	**Percent**	**Standard Error**
35.4	(5.1)	38.8	(3.1)

Of the operations with a system for scoring calving difficulty, almost all (91.6 percent) record the score for assisted births.

c. For the 38.5 percent of operations with a system for scoring calving difficulty, percentage of operations that record the calving difficulty score for assisted births:

Percent Operations	Standard Error
91.6	(3.0)

4. Observation close to calving

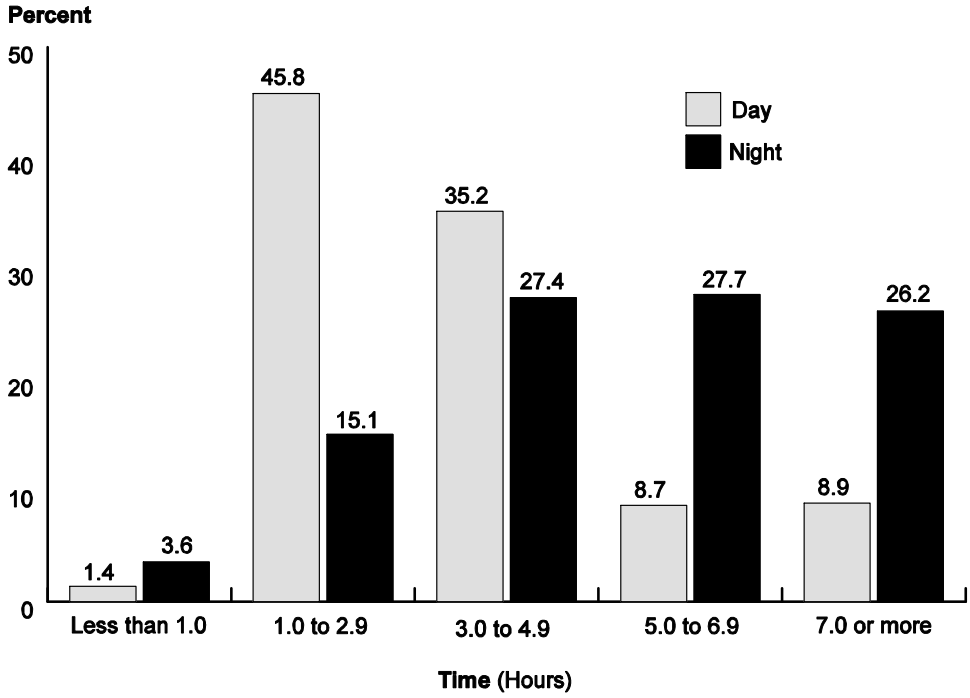
Ideally, heifers and cows close to calving would be observed at all times in case they need assistance, but this is not practical or even possible for many operations. The literature suggests, however, that no more than 3 hours should pass between observation periods.

As one would expect, females close to calving were observed more frequently during the day than at night. About one-half of operations (47.2 percent) allowed less than 3 hours, on average, to pass between observations during the day, with 17.6 percent of operations allowing 5 hours or more between observation periods. During the night, 18.7 percent of operations allowed less than 3 hours to pass between observations, and 53.9 percent of operations let 5 hours or more pass between observation periods.

a. Percentage of operations by average time between observation periods of cattle close to calving, by time of day:

	Percent Operations			
	Day		Night	
Time (Hours)	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Less than 1.0	1.4	(0.6)	3.6	(1.3)
1.0 to 2.9	45.8	(3.0)	15.1	(2.1)
3.0 to 4.9	35.2	(2.9)	27.4	(2.8)
5.0 to 6.9	8.7	(1.8)	27.7	(2.7)
7.0 or more	8.9	(1.8)	26.2	(2.6)
Total	100.0		100.0	

Percentage of Operations by Average Time Between Observation Periods of Cattle Close to Calving, by Time of Day



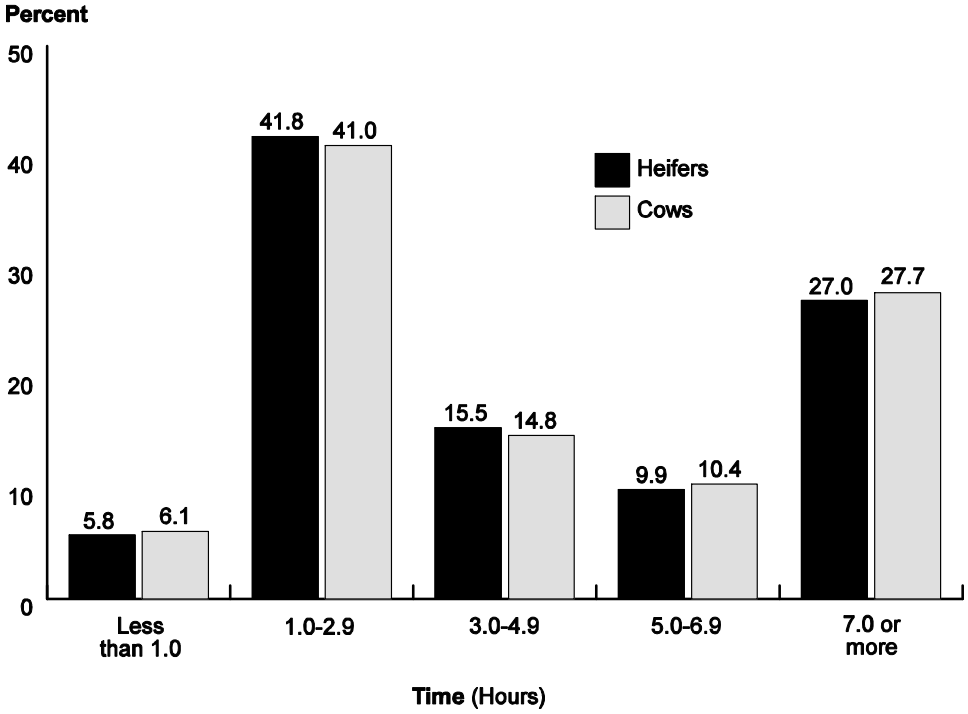
Although the normal calving process is classified into three stages, the process is continuous and proceeds gradually from one stage to the next. Stage 1 is characterized by cervical dilation and uterine contractions that usually are not evident as abdominal contractions. Cattle during this stage may be restless/off feed because of the discomfort of the uterine contractions. Stage 1 usually lasts 2 to 6 hours but may be longer in heifers. During stage 2 of labor, uterine contractions continue and abdominal contractions become evident. Stage 2 ends in the delivery of the fetus(es) and usually takes less than 2 hours for mature cows but up to 4 hours for heifers. In stage 3, the fetal membranes (placenta) are expelled as a result of continued uterine contractions. The duration of stage 3 can be minutes to multiple days, if the placenta is retained.

The majority of operations (63.1 percent for heifers and 61.9 percent for cows) reported that they would examine or assist an animal before 5 hours elapsed if she shows signs of stage 1 labor without subsequent straining. More than one-fourth of operations (27.0 percent for heifers and 27.7 percent for cows) would wait 7 hours or more to examine or assist an animal that exhibits signs of stage 1 labor without subsequent straining.

b. Percentage of operations by length of time producers would wait to examine or assist an animal when calving is imminent and the heifer or cow is restless/off feed but not observed to be straining:

	Percent Operations			
	Heifers		**Cows**	
Time (Hours)	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Less than 1.0	5.8	(1.2)	6.1	(1.3)
1.0 to 2.9	41.8	(2.9)	41.0	(2.8)
3.0 to 4.9	15.5	(2.0)	14.8	(1.9)
5.0 to 6.9	9.9	(1.9)	10.4	(2.1)
7.0 or more	27.0	(2.8)	27.7	(2.8)
Total	100.0		100.0	

Percentage of Operations by Length of Time Producers Would Wait to Examine or Assist an Animal When Calving is Imminent and the Heifer or Cow is Restless/Off Feed but not Observed to be Straining



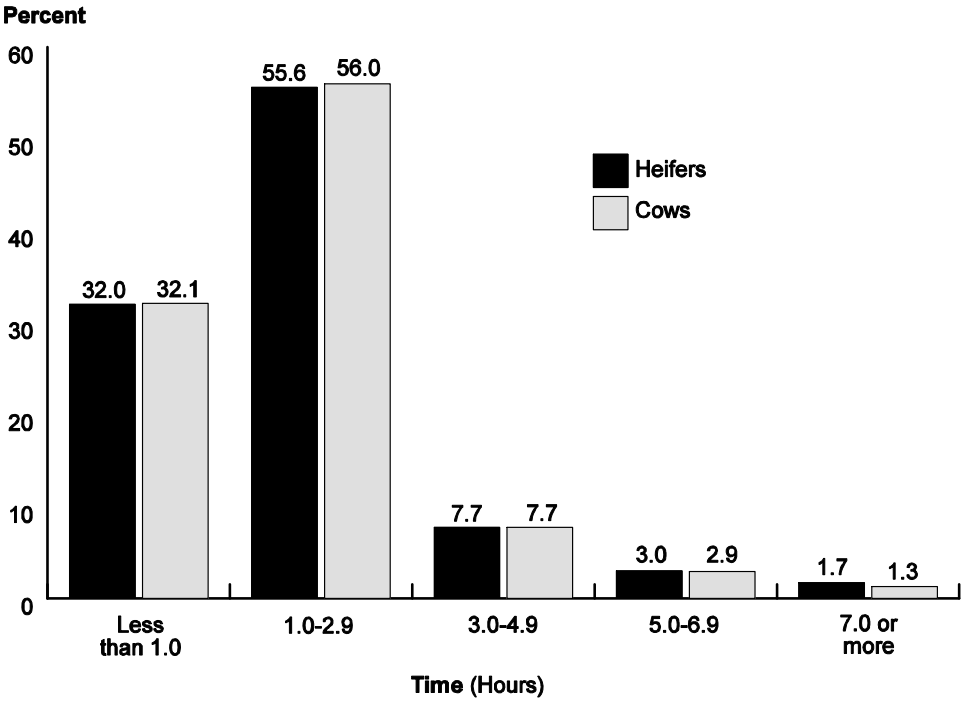
Abdominal contractions and straining typically mark the beginning of stage 2 labor. Once straining is observed, the animal should be assessed if she is not making good progress in delivery within 2 to 3 hours for heifers and 1 hour for cows.

Almost 9 of 10 operations reported that they wait less than 3 hours to assist heifers or cows that are observed to be straining but are not progressing in delivery of the calf (87.6 and 88.1 percent, respectively). Less than 2 percent of operations reported that they wait 7 or more hours before attending to heifers or cows that are straining but not progressing in delivery.

c. Percentage of operations by length of time producers would wait to examine or assist a heifer or cow that has begun to strain but is not progressing in delivery of the calf:

	Percent Operations			
	Heifers		**Cows**	
Time (Hours)	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Less than 1.0	32.0	(2.9)	32.1	(2.9)
1.0 to 2.9	55.6	(3.0)	56.0	(3.0)
3.0 to 4.9	7.7	(1.5)	7.7	(1.5)
5.0 to 6.9	3.0	(1.2)	2.9	(1.3)
7.0 or more	1.7	(0.9)	1.3	(0.8)
Total	100.0		100.0	

Percentage of Operations by Length of Time Producers Would Wait to Examine or Assist a Heifer or Cow that has Begun to Strain but is not Progressing in Delivery of the Calf



About 95 percent of operations reported that they examine or assist heifers and cows within 3 hours of the water bag appearing at the vulva. Almost one-half of operations would assist heifers and cows within 1 hour of the water bag appearing at the vulva.

d. Percentage of operations by length of time producers would wait before examining or assisting a heifer or cow once the water bag appears at the vulva:

	Percent Operations			
	Heifers		Cows	
Time (Hours)	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Less than 1.0	48.4	(2.8)	49.2	(2.8)
1.0 to 2.9	46.2	(2.8)	46.4	(2.8)
3.0 to 4.9	4.1	(1.1)	3.5	(1.0)
5.0 to 6.9	0.6	(0.5)	0.0	(--)
7.0 or more	0.7	(0.5)	0.9	(0.5)
Total	100.0		100.0	

5. Intervention

Implementation of the practices listed below is generally recommended when a dystocia or difficult calving necessitates intervention. More than 50 percent of all operations reported that they generally implemented recommended practices, except for calling a veterinarian to assist (12.9 percent) and tying or holding the tail out of the way (32.4 percent). A higher percentage of small operations (14.6 percent) than large operations (3.6 percent) would generally call a veterinarian to assist. A higher percentage of large operations would restrain the cow in a head catch or similar equipment; this might reflect the loose housing systems (such as freestall or drylot) more common on large operations, compared with the tie stall and stanchion facilities more common on small operations. A higher percentage of large operations than small operations would typically wash the perineum area with soap and water (74.8 and 48.8 percent, respectively); wear obstetrical gloves (87.1 and 62.5 percent, respectively); or use a lubricant (82.2 and 50.4 percent, respectively) while assisting with delivery.

a. Percentage of operations by practice generally implemented once a decision is made to intervene in calving, and by herd size:

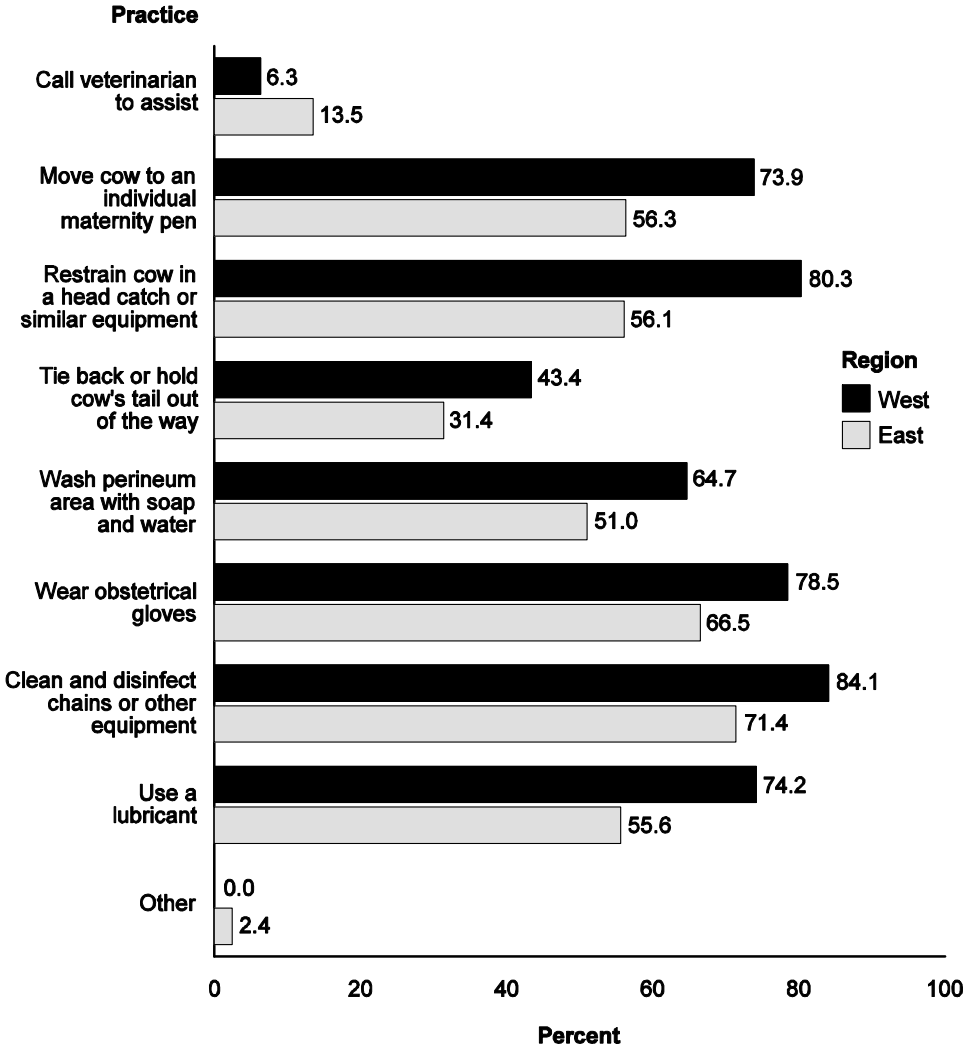
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Practice	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Call veterinarian to assist	14.6	(3.1)	10.6	(2.9)	3.6	(2.1)	12.9	(2.3)
Move cow to an individual maternity pen	54.4	(4.0)	64.4	(4.1)	69.0	(5.5)	57.8	(2.9)
Restrain cow in a head catch or similar equipment	55.1	(4.0)	58.4	(4.3)	91.7	(2.4)	58.3	(2.9)
Tie back or hold cow's tail out of the way	30.3	(3.7)	36.0	(4.3)	41.2	(6.3)	32.4	(2.8)
Wash perineum area with soap and water	48.8	(4.1)	55.9	(4.5)	74.8	(5.4)	52.2	(3.0)
Wear obstetrical gloves	62.5	(4.0)	76.2	(3.5)	87.1	(4.3)	67.5	(2.9)
Clean and disinfect chains or other equipment prior to use in the vagina or uterus	70.4	(3.7)	75.2	(4.0)	85.7	(4.5)	72.6	(2.7)
Use a lubricant	50.4	(4.1)	69.5	(4.1)	82.2	(5.1)	57.2	(3.0)
Other	3.0	(1.4)	0.3	(0.3)	0.3	(0.3)	2.2	(0.9)

The use of three recommended practices for calving interventions differed by region. A higher percentage of operations in the West region than in the East region would generally move the cow to an individual maternity pen (73.9 and 56.3 percent, respectively), restrain the cow in a head catch or similar equipment (80.3 and 56.1 percent, respectively), or use a lubricant (74.2 and 55.6 percent, respectively).

b. Percentage of operations by practice generally implemented once a decision is made to intervene in calving, by region:

	Percent Operations			
	Region			
	West		East	
Practice	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Call veterinarian to assist	6.3	(2.4)	13.5	(2.5)
Move cow to an individual maternity pen	73.9	(5.1)	56.3	(3.2)
Restrain cow in a head catch or similar equipment	80.3	(3.7)	56.1	(3.2)
Tie back or hold cow's tail out of the way	43.4	(5.6)	31.4	(3.0)
Wash perineum area with soap and water	64.7	(5.8)	51.0	(3.3)
Wear obstetrical gloves	78.5	(5.0)	66.5	(3.1)
Clean and disinfect chains or other equipment prior to use in the vagina or uterus	84.1	(4.3)	71.4	(2.9)
Use a lubricant	74.2	(5.2)	55.6	(3.2)
Other	0.0	(--)	2.4	(1.0)

Percentage of Operations by Practice Generally Implemented Once a Decision is Made to Intervene in Calving, by Region



Although the dam provides the best lubricant, during difficult deliveries additional lubricant can be helpful in delivering a healthy calf, as well as in protecting the dam from trauma. With the exception of water used alone, all the lubricants listed below may be helpful. The best choice is a commercial obstetrical lubricant mixed with water and used generously.

More than 50 percent of operations that reported generally using a lubricant during calving intervention used a commercial lubricant (57.5 percent), soap (56.2 percent), or water with other lubricant (51.8 percent). Less than 10 percent of operations used mineral oil, shortening, or water only as a lubricant.

c. For the 57.2 percent of operations that generally use a lubricant during calving intervention, percentage of operations by type of lubricant used:

Lubricant	Percent Operations	Standard Error
Mineral oil	8.4	(1.8)
Soap	56.2	(3.6)
Water with other lubricant	51.8	(3.8)
Water only	2.0	(1.1)
Commercial obstetrical lubricant (e.g., J-Lube)	57.5	(3.8)
Shortening (e.g., Crisco)	2.4	(1.1)
Other	1.0	(0.5)

Any instrument that is used to assist with a difficult delivery should be easy to sanitize, especially instruments that are used inside the vagina and uterus to deliver calves. Most operations (71.1 percent) used stainless-steel OB chains for pulling calves; these chains are easy to sanitize and are recommended for use. Almost 50 percent of operations (49.6 percent) used twine, while 22.1 percent used rope to pull calves. Stainless-steel OB chains were used on a higher percentage of medium and large operations compared with small operations. Alternatively, twine was used on a higher percentage of small operations than medium or large operations.

d. Percentage of operations by type of equipment used for pulling calves (direct contact with calf), and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Equipment Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Stainless-steel OB chains	65.5	(3.8)	81.5	(3.7)	90.6	(3.5)	71.1	(2.8)
Twine	56.5	(4.0)	37.7	(4.4)	21.5	(5.4)	49.6	(3.0)
Rope	23.2	(3.5)	19.4	(3.5)	21.4	(5.3)	22.1	(2.6)
Other	3.1	(1.3)	1.7	(0.7)	8.1	(3.5)	3.1	(0.9)
Any	99.4	(0.6)	100.0	(0.0)	100.0	(0.0)	99.6	(0.4)

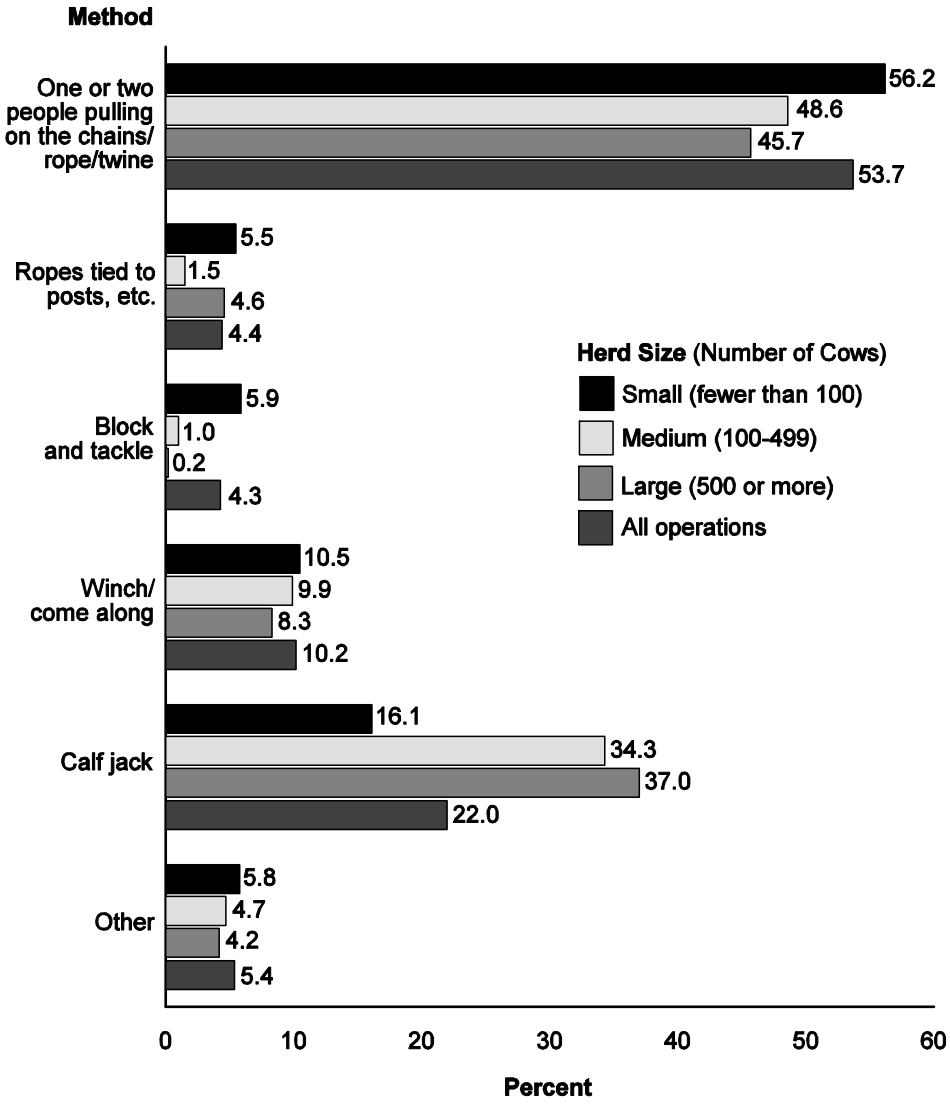
The amount of pressure exerted on the calf during an assisted delivery can cause injury or death to the cow and calf. Studies have reported that two strong people can exert a force of 400 to 600 lb while delivering a calf, whereas a calf jack can exert 2,000 lb of force. If two people cannot deliver a calf manually, then an alternative delivery method, such as a C-section for live calves or a fetotomy for dead calves, is usually recommended.

More than one-half of operations (53.7 percent) reported that one or two people pulling on the chains, rope, or twine was the method most commonly used to apply traction to deliver the calf. About one of five operations (22.0 percent) reported using a calf jack to apply traction. A block and tackle was used by a higher percentage of small operations compared with large operations (5.9 and 0.2 percent, respectively). A higher percentage of medium and large operations used a calf jack (34.3 and 37.0 percent, respectively) compared with small operations (16.1 percent).

e. Percentage of operations by method most commonly used to apply traction to deliver the calf, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
One or two people pulling on the chains/rope/twine	56.2	(4.0)	48.6	(4.4)	45.7	(6.3)	53.7	(3.0)
Ropes tied to posts, etc.	5.5	(2.1)	1.5	(0.8)	4.6	(2.4)	4.4	(1.4)
Block and tackle	5.9	(1.8)	1.0	(0.9)	0.2	(0.2)	4.3	(1.3)
Winch/come along	10.5	(2.7)	9.9	(2.6)	8.3	(3.3)	10.2	(2.0)
Calf jack	16.1	(2.8)	34.3	(4.1)	37.0	(5.9)	22.0	(2.2)
Other	5.8	(1.8)	4.7	(1.7)	4.2	(3.7)	5.4	(1.3)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Method Most Commonly Used to Apply Traction to Deliver the Calf, and by Herd Size



To reduce the possibility of injury to the dam during calving intervention, traction should be applied when the dam is straining. More than three in four operations (77.3 percent) reported that traction is generally applied in conjunction with the dam straining, while 22.7 percent reported that traction is generally applied continuously.

f. Percentage of operations by best description of how traction is generally applied during calving intervention:

Traction Application	Percent Operations	Standard Error
In conjunction with dam straining	77.3	(2.5)
Continuously	22.7	(2.5)
Total	100.0	

6. Veterinary assistance

Although 12.9 percent of operations would call a veterinarian to assist once a decision is made to intervene during a difficult calving (see table 5a. on p 61), almost all operations, regardless of herd size or region, would ever seek veterinary assistance for difficult calvings.

a. Percentage of operations that ever seek veterinary assistance for difficult deliveries, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
95.5	(1.5)	95.0	(1.5)	86.8	(4.4)	94.8	(1.1)

b. Percentage of operations that ever seek veterinary assistance for difficult deliveries, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
86.6	(3.9)	95.6	(1.2)

More than 90 percent of operations that ever seek veterinary assistance for difficult deliveries reported they would seek assistance to help correct the calf's position for delivery (93.5 percent), while 85.6 percent of operations would seek veterinary assistance after applying traction for a specific amount of time with no evidence of progress.

c. For the 94.8 percent of operations that ever seek veterinary assistance for difficult deliveries, percentage of operations that would seek assistance for the following situations:

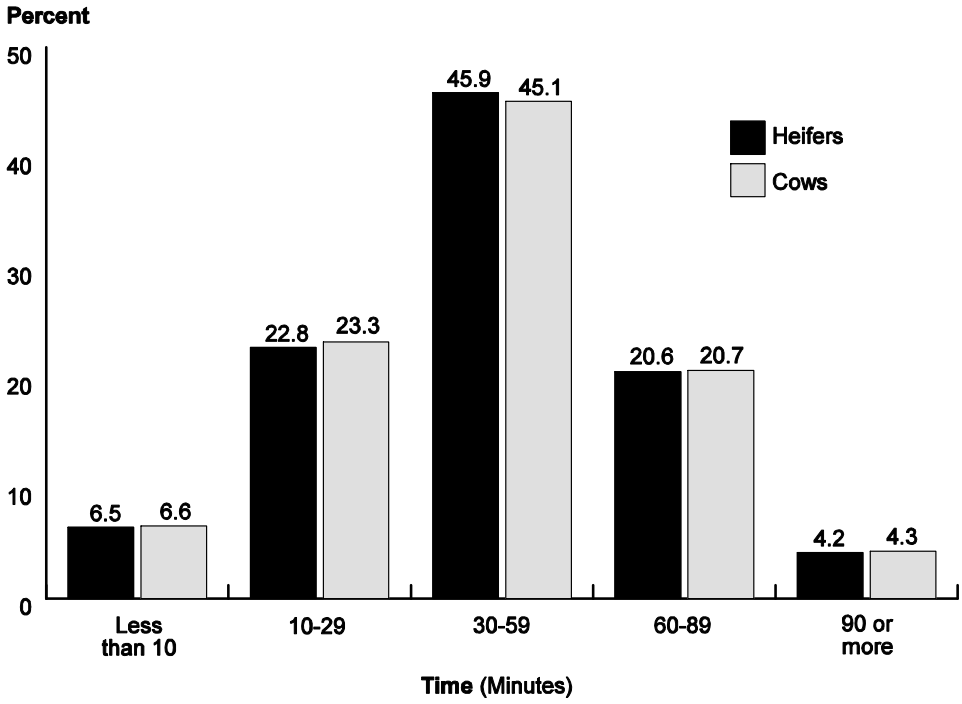
Situation	Percent Operations	Standard Error
Unable to correctly position calf for delivery	93.5	(1.4)
Applied traction for a specific amount of time without progress	85.6	(2.2)

The best chance of ending up with a live calf and a healthy dam after a difficult calving requires that the method being used be reassessed if no progress is made within 15 to 20 minutes. Longer intervention times, without veterinary assistance, can lead to death of the calf and possibly of the dam. The length of time operations intervened before calling for assistance was about the same for both heifers and cows. About 30 percent of operations reported that they would call for veterinary assistance within 30 minutes of intervening in a calving. The highest single percentage of operations would seek assistance within 30 to 59 minutes of intervening for both heifers and cows. About one-fourth of operations (24.8 percent for heifers and 25.0 percent for cows) would work to relieve the dystocia for 1 hour or more before calling for veterinary assistance.

d. For the 94.8 percent of operations that ever seek veterinary assistance for difficult deliveries, percentage of operations by length of time from beginning intervention during calving until calling for veterinary assistance, for heifers and for cows:

	Percent Operations			
	Heifers		**Cows**	
Time (Minutes)	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Less than 10	6.5	(1.5)	6.6	(1.5)
10 to 29	22.8	(2.7)	23.3	(2.7)
30 to 59	45.9	(3.2)	45.1	(3.2)
60 to 89	20.6	(2.5)	20.7	(2.5)
90 or more	4.2	(1.1)	4.3	(1.1)
Total	100.0		100.0	

For the 94.8 Percent of Operations that Ever Seek Veterinary Assistance for Difficult Deliveries, Percentage of Operations by Length of Time from Beginning Intervention During Calving Until Calling for Veterinary Assistance, for Heifers and for Cows



Heifers generally require more assistance than cows at calving because of their immature frame size. A higher percentage of cows (79.4 percent) than heifers (69.0 percent) calved unassisted during the previous 12 months. A higher percentage of heifers than cows experienced severe dystocia (6.8 percent of heifers and 3.5 percent of cows) or mild dystocia (11.8 percent of heifers and 7.3 percent of cows).

e. Percentage of heifers and cows that calved during the previous 12 months, by calving difficulty:

Calving Difficulty	Percent Heifers[1]	Std. Error	Percent Cows[2]	Std. Error
Severe dystocia (surgical or mechanical extraction)	6.8	(0.7)	3.5	(0.3)
Mild dystocia	11.8	(0.8)	7.3	(0.5)
No dystocia, but assistance provided anyway	12.4	(1.0)	9.8	(0.9)
No assistance	69.0	(1.4)	79.4	(1.3)
Total	100.0		100.0	

[1]As a percentage of dairy cow replacements entering the milking herd in 2006.
[2]As a percentage of cows on the operation at the time of VS Initial Visit interview.

7. Stillbirths

NOTE: Stillbirths were reported on p 61 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007. The stillbirth estimates in Part I are slightly lower (6.5 percent of all calves) than those reported below.

Stillbirths are usually defined as calves that are born dead or die within 48 hours of birth. Analysis of DHIA records indicates that the percentage of calves that are stillborn has increased since the 1980s.

All medium and large operations (100.0 percent) had at least one stillborn calf during the previous 12 months, and almost all small operations (94.7 percent) had at least one stillborn calf. For all operations, 96.3 percent had one or more stillborn calves. Overall, 8.1 percent of calves were stillborn during the previous 12 months, with no difference in percentage of stillbirths by herd size.

a. Percentage of operations with stillborn calves and percentage of calves that were stillborn (including calves that were born dead or died within 48 hours of birth) during the previous 12 months, and by herd size:

	Percent							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Population	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Operations	94.7	(1.8)	100.0	(0.0)	100.0	(0.0)	96.3	(1.3)
Calves*	8.9	(0.4)	8.6	(0.4)	7.2	(0.5)	8.1	(0.3)

*Number of calves stillborn x 100 / number of calves born during 2006.

A higher percentage of operations in the West region (100.0 percent) had at least one stillbirth compared with operations in the East region (96.0 percent), although the difference was small. The West region had a lower percentage of stillborn calves than the East region, however (6.6 and 8.9 percent, respectively).

b. Percentage of operations with stillborn calves and percentage of calves that were stillborn (including calves that were born dead or died within 48 hours of birth) during the previous 12 months, by region:

	Percent			
	Region			
	West		**East**	
Population	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Operations	100.0	(0.0)	96.0	(1.4)
Calves*	6.6	(0.5)	8.9	(0.3)

*Number of calves stillborn x 100 / number of calves born during 2006.

The majority of stillborn calves were born dead (78.6 percent), while the remaining 21.4 percent were born alive but died within 48 hours of birth.

c. For the 8.1 percent of calves that were stillborn during the previous 12 months, percentage of stillborn calves by time of death:

Time of Death	Percent Calves*	Standard Error
Born dead	78.6	(1.4)
Born alive, but died within 48 hr	21.4	(1.4)
Total	100.0	

*As a percentage of stillborn calves.

8. Assistance for compromised calves

Calves that experience a dystocia are more likely to be stillborn. Calves that experience a dystocia but are born alive can be given assistance, such as supplemental oxygen, that increases their chances of survival. Depending on the environmental conditions, all the procedures listed below, with the exception of hanging the calf upside down, are considered beneficial to the health of the calf. Hanging the calf upside down, which was once promoted to assist in removing fluid from the calf's lungs, might actually be harmful for two reasons: most of the liquid comes from the abomasum and not the lungs, making the calf more susceptible to dehydration, and hanging the calf upside down increases pressure on the chest, making it more difficult for the calf to breathe. Calves that experience dystocia are likely to have low levels of oxygen in their blood (hypoxia), and their blood pH is frequently acidic (acidosis) instead of neutral. These impairments lead to other problems, such as decreased ability to nurse and decreased absorption of IgG, and can negatively affect temperature regulation. In many cases, the administration of oxygen to calves after dystocia may have the single largest impact on calf survival.

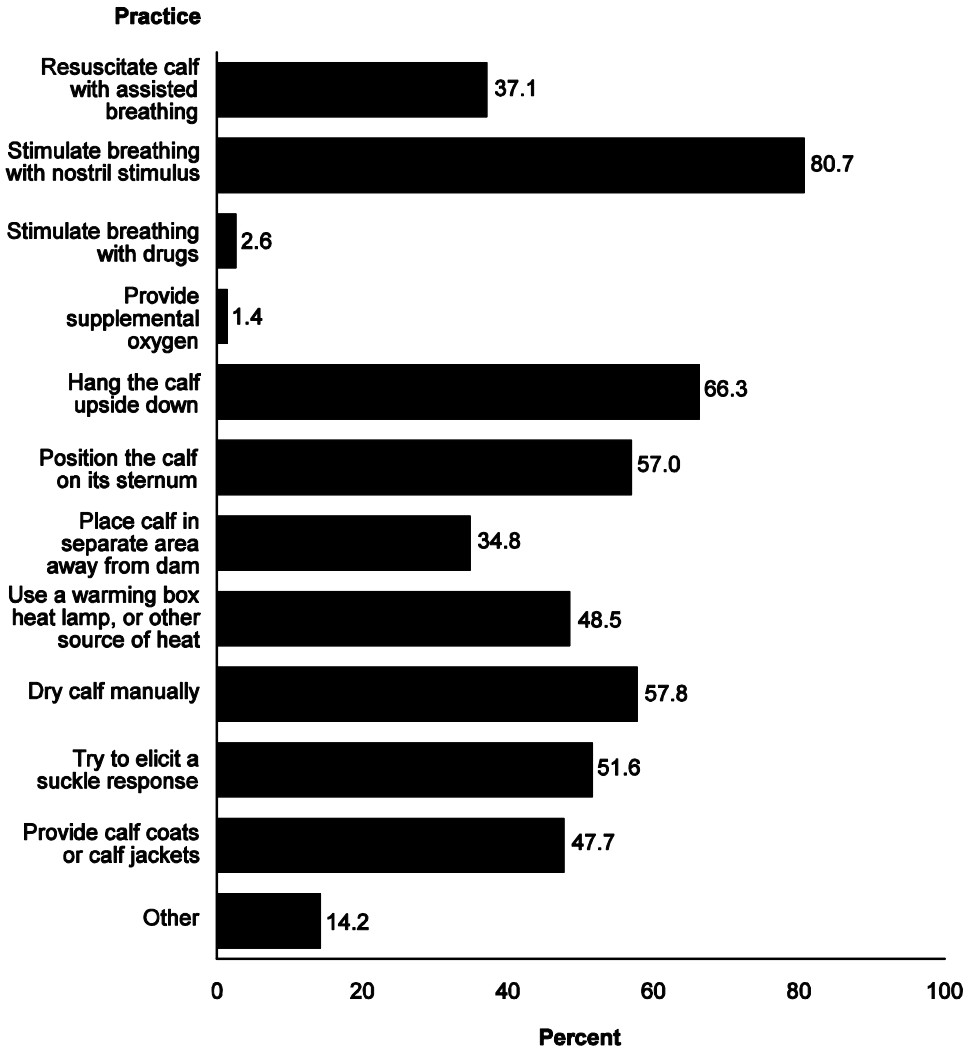
On 80.7 percent of operations, a calf that experienced a difficult birth would receive nostril stimulation to initiate breathing. Hanging the calf upside down would be performed on 66.3 percent of operations. Three of the practices that are simple to perform and do not require special equipment or materials—positioning the calf on its sternum, drying the calf manually with towels or a hair dryer, and trying to elicit a suckle response—were performed by at least one-half of operations. Few operations (1.4 percent) would provide supplemental oxygen. "Other" practices (14.2 percent of operations) would include allowing the dam to lick/stimulate the calf and feeding colostrum.

Use of some practices varied with the size of the operation. Almost two-thirds of large operations (62.5 percent) resuscitated the calf via assisted breathing, compared with slightly more than one-third of small and medium operations (35.0 and 36.6 percent, respectively). A higher percentage of small and medium operations (61.5 and 55.6 percent, respectively) than large operations (27.4 percent) dried the calf manually with towels, hair dryer, etc. Additionally, a higher percentage of small and medium operations (45.8 and 58.5 percent, respectively) provided calf coats or calf jackets compared with large operations (26.6 percent).

a. Percentage of operations by practice generally done within 1 hour after delivery for a calf that experienced a difficult birth, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Practice	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Resuscitate calf with assisted breathing	35.0	(3.9)	36.6	(4.3)	62.5	(5.9)	37.1	(2.9)
Stimulate breathing with nostril stimulus	77.3	(3.4)	88.3	(2.7)	87.7	(4.2)	80.7	(2.5)
Stimulate breathing with drugs (Dopram, etc.)	0.6	(0.5)	6.7	(2.4)	7.9	(3.4)	2.6	(0.7)
Provide supplemental oxygen	0.0	(--)	5.2	(2.2)	2.3	(2.1)	1.4	(0.6)
Hang the calf upside down	66.3	(3.8)	66.2	(4.3)	67.0	(6.0)	66.3	(2.8)
Position the calf on its sternum	54.3	(4.0)	63.4	(4.4)	61.2	(6.2)	57.0	(3.0)
Place the calf in separate area away from the dam	32.6	(3.8)	39.1	(4.5)	41.5	(6.0)	34.8	(2.9)
Use a warming box, heat lamp, or other source of heat during cold weather	45.7	(4.1)	59.3	(4.4)	36.6	(5.0)	48.5	(3.0)
Dry calf manually with towels, hair dryer, etc.	61.5	(3.8)	55.6	(4.5)	27.4	(5.3)	57.8	(2.8)
Try to elicit a suckle response	53.9	(4.0)	48.6	(4.4)	39.2	(6.4)	51.6	(3.0)
Provide calf coats or calf jackets after calf is dry	45.8	(4.1)	58.5	(4.3)	26.6	(4.9)	47.7	(3.0)
Other	16.9	(3.2)	7.7	(2.8)	10.7	(4.1)	14.2	(2.4)

Percentage of Operations by Practice Generally Done Within 1 Hour After Delivery for a Calf that Experienced a Difficult Birth



A higher percentage of operations in the West region (54.3 percent) generally resuscitated calves that experienced a difficult birth with assisted breathing compared with operations in the East region (35.5 percent). Alternatively, a higher percentage of operations in the East region dried calves manually with towels, hair dryer, etc. (60.1 percent) or provided calf coats or jackets after the calf was dry (50.5 percent), compared with 34.5 and 18.7 percent of operations in the West region, respectively.

b. Percentage of operations by practice generally done within 1 hour after delivery for a calf that experienced a difficult birth, by region:

	Percent Operations			
	Region			
	West		East	
Practice	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Resuscitate calf with assisted breathing	54.3	(5.4)	35.5	(3.1)
Stimulate breathing with nostril stimulus	84.1	(4.1)	80.4	(2.7)
Stimulate breathing with drugs (Dopram, etc.)	2.5	(1.4)	2.6	(0.8)
Provide supplemental oxygen	3.3	(2.0)	1.3	(0.6)
Hang the calf upside down	67.0	(5.9)	66.3	(3.1)
Position the calf on its sternum	60.2	(6.0)	56.7	(3.2)
Place the calf in separate area away from the dam	34.6	(5.9)	34.8	(3.1)
Use a warming box, heat lamp, or other source of heat during cold weather	38.7	(5.5)	49.4	(3.3)
Dry calf manually with towels, hair dryer, etc.	34.5	(5.5)	60.1	(3.0)
Try to elicit a suckle response	37.6	(5.7)	53.0	(3.2)
Provide calf coats or calf jackets after calf is dry	18.7	(4.4)	50.5	(3.3)
Other	6.5	(2.7)	15.0	(2.6)

C. Surgical Procedures

1. Dehorning

Removing the horns of dairy cattle reduces the risk of injury to other cattle and to people. The two major approaches for removing horns are breeding programs to produce animals without horns and manual removal. Cattle born without horns, referred to as polled, were previously suspected of having decreased productivity compared with horned cattle. It now appears that the tremendous amount of genetic selection, primarily for milk production, that has occurred in horned dairy breeds has made them appear superior in terms of productivity. With the same intensity of selection of polled cattle, productivity might not be a concern. Disbudding refers to removal of the horn bud in young cattle, whereas dehorning refers to removal of the horns of cattle. In the European Union, it is illegal to disbud or dehorn calves more than 14 days old without using a local anesthetic.

The Animal Welfare Committee of the American Veterinary Medical Association (AVMA) states the following: “Because castration and dehorning cause pain and discomfort, the AVMA recommends the use of procedures and practices that reduce or eliminate these effects, including the use of approved or AMDUCA-permissible clinically effective medications whenever possible.” AVMA also states that dehorning should be done at the youngest age possible and “disbudding is the preferred method of dehorning calves. Local anesthetic should be considered for other dehorning procedures.”

Overall, 94 percent of operations routinely dehorned heifer calves while they were on the operation during the previous 12 months. A lower percentage of large operations (64.3 percent) dehorned heifer calves than small or medium operations (97.3 and 92.6 percent, respectively). More than 95 percent of operations in the East region (95.6 percent) routinely dehorned heifer calves, compared with 77.6 percent of operations in the West region. Herd-size and regional differences are likely related to large operations moving calves to heifer-raising facilities when calves are still too young for disbudding/dehorning.

a. Percentage of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
97.3	(1.6)	92.6	(2.8)	64.3	(6.3)	94.0	(1.4)

b. Percentage of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
77.6	(4.6)	95.6	(1.4)

For operations that routinely dehorned heifer calves during the previous 12 months, more than two-thirds (69.1 percent) used a hot iron; 28.2 percent used a tube, spoon, or gouge; and 16.3 percent used saws, wire, or Barnes dehorners. For operations that used a hot iron to dehorn calves, 13.8 percent used analgesics or anesthetics when dehorning calves. More than 90 percent of operations (94.0 percent) dehorned calves, and 17.7 percent of these operations used analgesics or anesthetics during the dehorning procedure.

c. Percentage of operations by dehorning method, and corresponding percentage of operations using that method that used analgesics/anesthetics:

Method	Percent Operations	Std. Error	Percent Operations that Used Analgesics/ Anesthetics	Std. Error
Hot iron	69.1	(2.8)	13.8	(2.6)
Caustic paste	9.2	(1.8)	14.2	(5.8)
Tube, spoon, or gouge	28.2	(2.9)	21.5	(5.1)
Saws, wire, or Barnes	16.3	(2.3)	21.5	(6.7)
Other	1.7	(0.9)	17.1	(16.5)
Any	94.0	(1.4)	17.7	(2.3)

Photo courtesy of “Dairy Herd Management”/“Bovine Veterinarian”

The majority of heifer calves on operations that routinely dehorned calves were dehorned by hot iron (67.5 percent of calves) at an average age of 7.6 weeks. Caustic paste was used on 12.2 percent of calves at 2.7 weeks of age. A similar percentage was observed for the tube, spoon, or gouge method, but the average age increased to 16.9 weeks. Saws, wire, or Barnes dehorners were used on 7.1 percent of heifer calves at an average age of 23.5 weeks.

d. For the 94.0 percent of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, percentage of calves dehorned and average age at dehorning, by method used to dehorn calves:

Method	**Percent Heifers***	**Std. Error**	**Average Age** (Weeks)	**Std. Error**
Hot iron	67.5	(3.1)	7.6	(0.4)
Caustic paste	12.2	(2.6)	2.7	(0.3)
Tube, spoon, or gouge	13.0	(1.7)	16.9	(1.2)
Saws, wire, or Barnes	7.1	(1.1)	23.5	(2.6)
Other	0.2	(0.1)	32.7	(6.9)
Total	100.0			

*Dairy heifer calves weaned during the previous 12 months.

Of the dehorning equipment used on operations, tubes, spoons, gouges, saws, wire, and Barnes dehorners commonly cause bleeding. More than 4 of 10 operations (42.0 percent) used dehorning equipment that causes bleeding. A higher percentage of small and medium operations (42.9 and 43.5 percent, respectively) used dehorning equipment that causes bleeding compared with large operations (18.9 percent).

e. For the 94.0 percent of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, percentage of operations that dehorned heifer calves with equipment that can cause bleeding, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
42.9	(4.0)	43.5	(4.6)	18.9	(5.7)	42.0	(3.1)

Disinfection of dehorning equipment that causes bleeding reduces the possibility of transmitting diseases such as bovine leukosis virus. Approximately one-half of operations (46.4 percent) disinfected dehorning equipment for each calf.

f. For the 42.0 percent of operations that routinely dehorned heifer calves with equipment that can cause bleeding, percentage of operations that chemically disinfected surgical dehorning equipment for each calf:

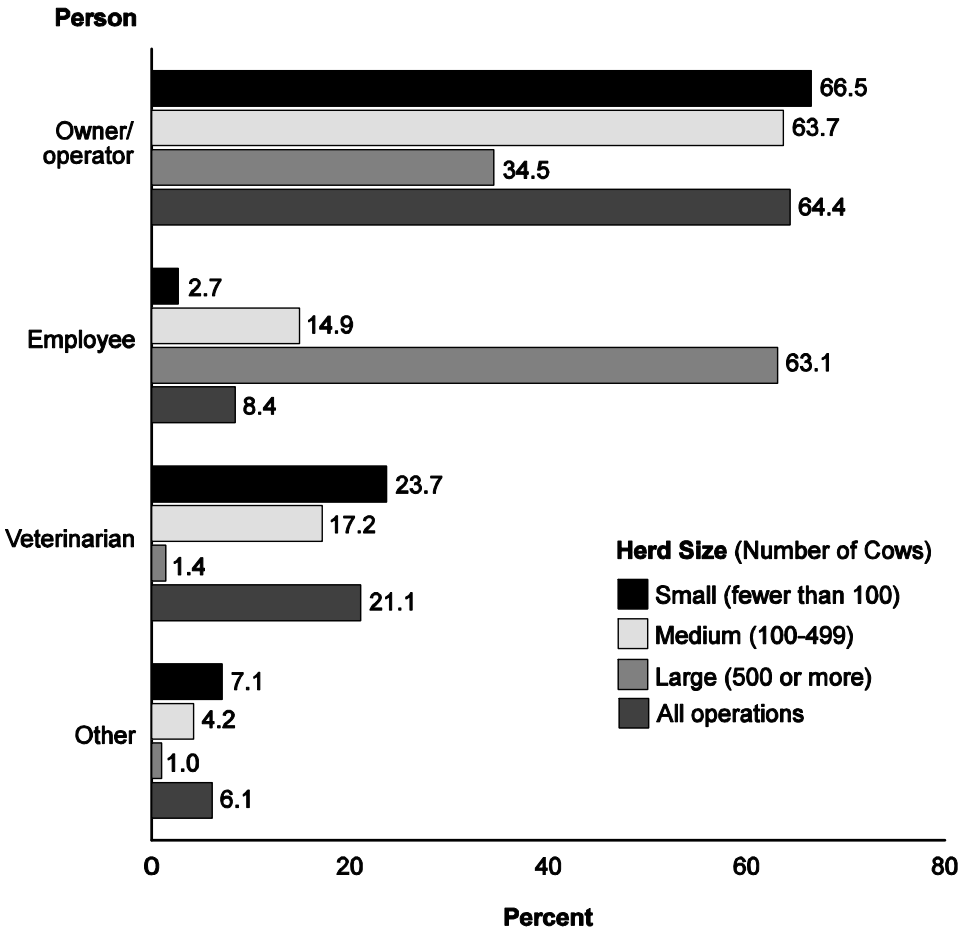
Percent Operations	Standard Error
46.4	(4.9)

On almost two-thirds of operations (64.4 percent), the owner/operator was identified as dehorning the majority of calves. The person who dehorned the majority of calves differed with operation size, however, with the owner/operator dehorning the majority of heifer calves on about two-thirds of small and medium operations (66.5 percent and 63.7 percent, respectively) but only about one-third of large operations (34.5 percent). An employee dehorned the majority of calves on 63.1 percent of large operations, compared with 2.7 percent of small operations and 14.9 percent of medium operations. Veterinarians performed the majority of dehorning on 23.7 percent of small operations, 17.2 percent of medium operations, and 1.4 percent of large operations.

g. For the 94.0 percent of operations that routinely dehorned heifer calves during the previous 12 months, percentage of operations by person who dehorned the majority of heifer calves on the operation, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Person	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Owner/operator	66.5	(3.8)	63.7	(4.2)	34.5	(7.5)	64.4	(2.9)
Employee	2.7	(1.1)	14.9	(2.9)	63.1	(7.4)	8.4	(1.1)
Veterinarian	23.7	(3.4)	17.2	(3.4)	1.4	(0.5)	21.1	(2.6)
Other	7.1	(2.2)	4.2	(1.8)	1.0	(0.6)	6.1	(1.6)
Total	100.0		100.0		100.0		100.0	

For the 94.0 Percent of Operations that Routinely Dehorned Heifer Calves During the Previous 12 Months, Percentage of Operations by Person Who Dehorned the Majority of Heifer Calves on the Operation, and by Herd Size



Employees dehorned the majority of heifer calves on a higher percentage of operations in the West region (33.4 percent) than in the East region (6.4 percent).

h. For the 94.0 percent of operations that routinely dehorned heifer calves during the previous 12 months, percentage of operations by person who dehorned the majority of heifer calves on the operation, by region:

	Percent Operations			
	Region			
	West		East	
Person	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Owner/operator	55.1	(6.8)	65.2	(3.1)
Employee	33.4	(5.5)	6.4	(1.1)
Veterinarian	11.5	(4.6)	21.8	(2.8)
Other	0.0	(--)	6.6	(1.8)
Total	100.0		100.0	

2. Extra teat removal

Extra teats on dairy cows can interfere with milking and lead to mastitis, and they are not acceptable in show cattle. As with dehorning, removal of extra teats should be done at an early age to facilitate a quick recovery.

About one-half of operations (50.3 percent) routinely removed extra teats from heifer calves during the previous 12 months. The percentage of operations that removed extra teats did not differ by herd size.

a. Percentage of operations that routinely removed extra teats from heifer calves during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
46.4	(4.0)	57.1	(4.4)	66.4	(6.2)	50.3	(3.0)

About one-fifth of operations (20.3 percent) that routinely removed extra teats from heifer calves removed the teats when the heifers were less than 12.0 weeks old, while one-third (32.2 percent) removed teats at 12.0 to 17.9 weeks of age. About 20 percent of operations removed extra teats from animals in each of the next two age categories (18.0 to 23.9 weeks and 24.0 to 29.9 weeks).

b. For the 50.3 percent of operations that routinely removed extra teats from heifer calves during the previous 12 months, percentage of operations by age at which extra teats were removed:

Age (Weeks)	**Percent Operations**	**Standard Error**
Less than 12.0	20.3	(3.4)
12.0 to 17.9	32.2	(3.8)
18.0 to 23.9	20.1	(3.4)
24.0 to 29.9	18.6	(3.5)
30.0 or more	8.8	(1.9)
Total	100.0	

One of 10 operations (10.6 percent) routinely used analgesia or anesthesia during extra teat removal, which is similar to usage for dehorning.

c. For the 50.3 percent of operations that routinely removed extra teats from heifer calves during the previous 12 months, percentage of operations that used analgesics or anesthesia while removing extra teats:

Percent Operations	**Standard Error**
10.6	(3.0)

3. Tail docking

Tail docking was initially promoted to reduce the incidence of leptospirosis in milking personnel in New Zealand, but subsequent research demonstrated leptospiral titers of milkers had no relationship with tail docking. Tail docking is currently prohibited and must not be performed as a routine management procedure in the European Union.

The AVMA is opposed to tail docking, and the American Association of Bovine Practitioners (AABP) states the following: “The AABP is not aware of sufficient scientific evidence in the literature to support tail docking in cattle. If it is deemed necessary for proper care and management of production animals in certain conditions, veterinarians should counsel clients on proper procedures, benefits and risks.”

Almost half of operations (48.6 percent) had one or more tail-docked cows. A higher percentage of operations in the West region (81.3 percent) had no tail-docked cows than in the East region (48.5 percent of operations). On about one of seven operations (14.6 percent), all cows had a docked tail.

a. Percentage of operations by percentage of tail-docked cows, and by region:

	Percent Operations					
	Region					
	West		East		All Operations	
Percent Cows	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0	81.3	(4.3)	48.5	(3.2)	51.4	(2.9)
0.1 to 24.9	0.7	(0.7)	11.8	(2.0)	10.8	(1.9)
25.0 to 75.9	9.6	(3.7)	8.8	(1.7)	8.9	(1.6)
76.0 to 99.9	5.5	(1.9)	15.1	(2.4)	14.3	(2.2)
100.0	2.9	(1.5)	15.8	(2.2)	14.6	(2.0)
Total	100.0		100.0		100.0	

Overall, about 4 of 10 cows (38.8 percent) had a docked tail. A higher percentage of cows on medium operations (55.5 percent) than on small or large operations (27.1 and 34.5 percent, respectively) had a docked tail.

b. Percentage of tail-docked cows, and by herd size:

Percent Tail-Docked Cows*							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
27.1	(3.2)	55.5	(3.6)	34.5	(4.3)	38.8	(2.4)

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

The majority of operations that had tail-docked cows most commonly used a band to dock tails (87.2 percent); these operations represented 90.4 percent of tail-docked cows. About 1 of 10 operations did not know what procedure was used, which suggests the cattle were purchased with the tail already docked.

c. For the 48.6 percent of operations with tail-docked cows, percentage of operations (and percentage of tail-docked cows on those operations) by procedure most commonly used to dock tails:

Procedure	Percent Operations	Standard Error	Percent Tail-Docked Cows*	Standard Error
Band	87.2	(2.9)	90.4	(2.9)
Surgical removal	2.0	(1.0)	5.2	(2.4)
Hot knife	0.0	(--)	0.0	(--)
Other	1.9	(0.9)	2.7	(1.2)
Unknown procedure	8.9	(2.7)	1.7	(1.2)
Total	100.0		100.0	

*Number of cows with the tail docked as a percentage of cows on the operation at the time of VS Initial Visit interview.

For operations with tail-docked cows, 61.0 percent of operations (accounting for 38.0 percent of tail-docked cows) performed tail-docking on the majority of animals when they were at least 2 years old. The tail was docked on almost 3 of 10 cows (28.1 percent) at less than 2 months of age. About 10 percent of operations docked tails when cattle were less than 2 months of age (10.2 percent) or from 2 months to less than 6 months old (10.5 percent).

d. For the 48.6 percent of operations with tail-docked cows, percentage of operations (and percentage of tail-docked cows on those operations) by age of the majority of cattle when the tail was docked:

Age	Percent Operations	Standard Error	Percent Tail-Docked Cows*	Standard Error
Less than 2 months	10.2	(2.0)	28.1	(5.0)
2 months to less than 6 months	10.5	(2.6)	17.1	(3.4)
6 months to less than 2 years	9.5	(2.0)	16.3	(3.5)
2 years or older	61.0	(4.0)	38.0	(4.9)
Unknown	8.8	(2.7)	0.5	(0.2)
Total	100.0		100.0	

*Number of cows with the tail docked as a percentage of cows on the operation at the time of VS Initial Visit interview.

The majority of operations (90.3 percent) did not routinely use analgesics or anesthetics for tail docking, compared with 1.1 percent that routinely used analgesics or anesthetics. Operations that routinely used analgesics or anesthetics represented 0.9 percent of tail-docked cows.

e. For the 48.6 percent of operations with tail-docked cows, percentage of operations (and percentage of tail-docked cows on those operations) by routine use of analgesia or anesthesia:

Analgesia or Anesthesia Use	Percent Operations	Standard Error	Percent Tail-Docked Cows*	Standard Error
Yes	1.1	(0.6)	0.9	(0.6)
Don’t know	8.6	(2.6)	1.3	(0.6)
No	90.3	(2.7)	97.8	(0.9)
Total	100.0		100.0	

*Number of cows with the tail docked as a percentage of cows on the operation at the time of VS Initial Visit interview.

4. Castration

Castration is considered necessary in the management of cattle. As with other surgical procedures of cattle, castration should be done at the youngest age possible. In the European Union, it is illegal to castrate calves over 6 months of age without using a local anesthetic. The AVMA recommends the preoperative use of nonsteroidal anti-inflammatory agents and the administration of local anesthetics to minimize pain associated with castration.

About two-fifths of operations (40.5 percent) routinely castrated bull calves on the operation during the previous 12 months. Because many dairy operations do not keep bull calves for more than a day or two, it is likely that many operations do not have bull calves long enough to castrate them. A higher percentage of small operations (45.7 percent) routinely castrated bull calves compared with large operations (16.9 percent).

a. Percentage of operations that routinely castrated bull calves while on the operation during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
45.7	(3.9)	32.0	(4.1)	16.9	(4.1)	40.5	(2.9)

Bands were used most commonly to castrate calves on 60.8 percent of operations, with 26.9 percent of operations using a knife and 12.2 percent using a burdizzo most commonly. Calves were castrated at an operation average age of 8.9 weeks, and 3.2 percent of operations that castrated calves routinely used analgesics or anesthesia.

b. For the 40.5 percent of operations that routinely castrated bull calves during the previous 12 months, percentage of operations by method most commonly used to castrate bull calves:

Method	**Percent Operations**	**Standard Error**
Burdizzo	12.2	(3.2)
Knife	26.9	(4.6)
Band	60.8	(4.9)
Other	0.1	(0.1)
Total	100.0	

c. For the 40.5 percent of operations that routinely castrated bull calves during the previous 12 months, operation average age of calves at castration:

Operation Average Age (Weeks)	**Standard Error**
8.9	(0.6)

d. For the 40.5 percent of operations that routinely castrated bull calves during the previous 12 months, percentage of operations that routinely used analgesics or anesthesia for castration:

Percent Operations	**Standard Error**
3.2	(1.7)

D. Hoof Health

1. Lameness

Lameness in dairy cattle can result from many causes, including infectious agents, such as *Fusobacterium necrophorus* and *Bacteroides melaninogenicus,* which cause foot rot; digital dermatitis (hairy heel warts), which is most likely caused by spirochetes; excessive intake of rapidly fermentable carbohydrates, leading to rumen acidosis and subsequent laminitis; and trauma. Lameness was the second leading health problem in dairy cows, affecting 14.0 percent of cows in 2006 (reported on p 84 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007).

Note: For the purposes of this report, an animal could have had more than one case of lameness (gait abnormality) if the animal recovered and became lame again during the previous 12 months.

Approximately 1 of 10 bred heifers (11.4 percent) and 1 of 4 cows (23.9 percent) were lame at least once during the previous 12 months. There were no herd-size differences in the operation average percent of bred heifers that were lame, but medium operations had a higher percentage of cows with lameness (30.8 percent) than small operations (21.1 percent).

a. Operation average percentage of lameness cases by cattle class during the previous 12 months, and by herd size:

	Operation Average Percent Lameness Cases							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Cattle Class	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Bred Heifers[1]	12.4	(3.5)	8.3	(1.2)	12.1	(2.8)	11.4	(2.5)
Cows[2]	21.1	(1.4)	30.8	(3.1)	28.4	(2.9)	23.9	(1.3)

[1]Number of cases as a percentage of dairy cow replacements entering the milking herd in 2006.
[2]Number of cases as a percentage of cows on the operation at the time of VS Initial Visit interview.

Lameness is much more common in cows than in heifers. While 3.6 percent of operations had no cases of lameness in cows, 41.3 percent of operations had no cases of lameness in heifers. Fewer than 1 of 20 operations (2.8 percent) had lameness cases in 50.0 percent or more bred heifers, while 12.0 percent of operations had lameness cases in 50.0 percent or more cows.

b. Percentage of operations by percentage of lameness cases occurring by cattle class on the operation during the previous 12 months:

	Percent Operations			
	Cattle Class			
	Bred Heifers		Cows	
Percent Lameness Cases in Bred Heifers[1] or Cows[2]	**Percent**	**Std. Error**	**Percent**	**Std. Error**
0	41.3	(3.1)	3.6	(1.1)
0.1 to 24.9	49.6	(3.0)	63.9	(2.7)
25.0 to 49.9	6.3	(1.7)	20.5	(2.3)
50.0 or more	2.8	(1.0)	12.0	(1.8)
Total	100.0		100.0	

[1]Number of cases as a percentage of dairy cow replacements entering the milking herd in 2006.
[2]Number of cases as a percentage of cows on the operation at the time of VS Initial Visit interview.

About 3 of 10 operations (28.7 percent) had at least 1 case of digital dermatitis in bred heifers while 70.2 percent of operations had at least 1 case in cows. A lower percentage of small operations had any digital dermatitis in bred heifers compared with medium and large operations. A higher percentage of large operations (95.0 percent) had any digital dermatitis in cows compared with medium and small operations (79.1 and 64.9 percent, respectively).

c. Percentage of operations with at least one case of digital dermatitis (hairy heel warts) in bred heifers or cows in the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Cattle Class	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Bred heifers	22.4	(3.2)	40.3	(4.6)	57.4	(6.7)	28.7	(2.6)
Cows	64.9	(3.9)	79.1	(3.8)	95.0	(2.4)	70.2	(2.9)

Digital dermatitis caused 61.8 percent of lameness cases in bred heifers and 49.1 percent of lameness cases in cows during the previous 12 months.

d. Percentage of cases of lameness due to digital dermatitis (hairy heel warts) in bred heifers and cows during the previous 12 months:

Percent Cases			
Bred Heifers[1]		**Cows[2]**	
Percent	**Standard Error**	**Percent**	**Standard Error**
61.8	(5.5)	49.1	(2.8)

[1]Number of cases as a percentage of dairy cow replacements entering the milking herd in 2006.
[2]Number of cases as a percentage of cows on the operation at the time of VS Initial Visit interview.

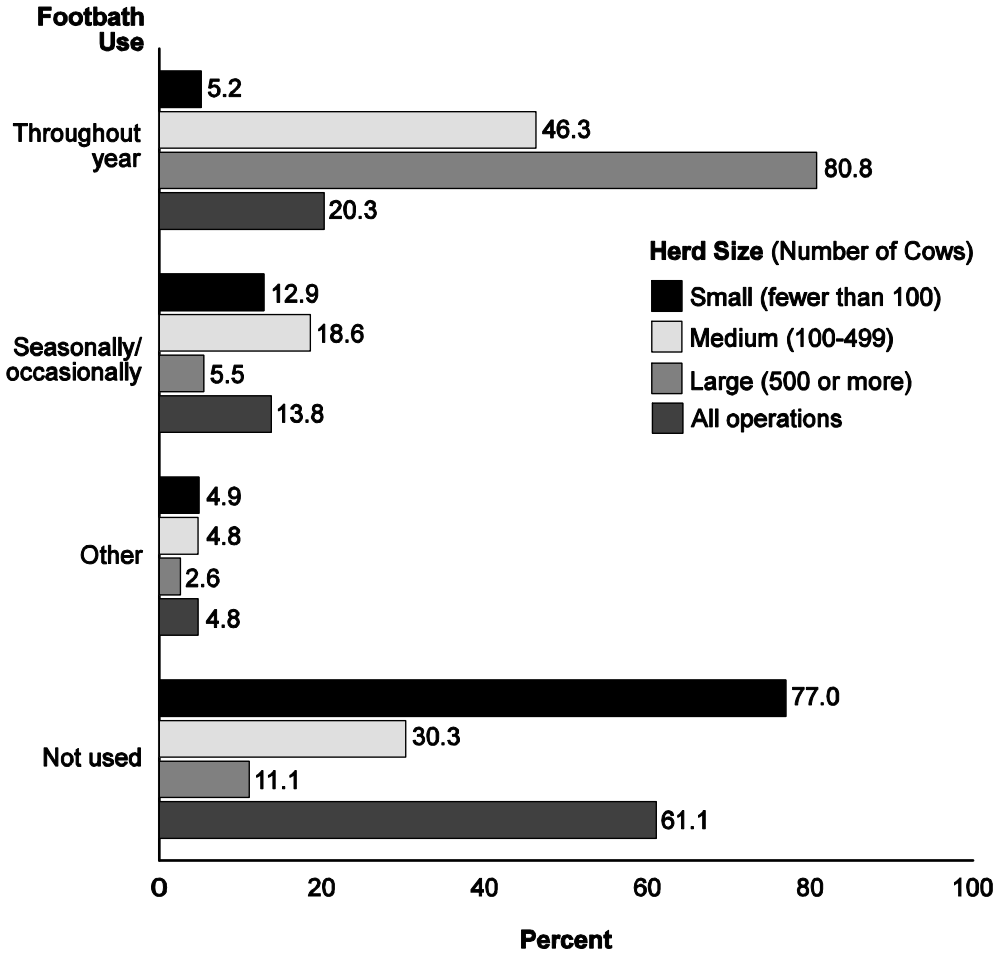
2. Footbath use

Footbaths are used to medicate the feet of cattle and aid in preventing lameness. The majority of operations (61.1 percent) used no footbaths during the previous 12 months. Of the 38.9 percent of operations that used footbaths, 20.3 percent of operations used a footbath throughout the year. Use of a footbath throughout the year increased as operation size increased, from 5.2 percent of small operations to 46.3 percent of medium operations and 80.8 percent of large operations. Conversely, the percentage of operations that did not use a footbath decreased as operation size increased, from 77.0 percent of small operations to 11.1 percent of large operations.

a. Percentage of operations by use of a footbath for cows during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Footbath Use	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Throughout year	5.2	(1.5)	46.3	(4.2)	80.8	(5.1)	20.3	(1.7)
Seasonally/ occasionally	12.9	(2.5)	18.6	(3.7)	5.5	(2.4)	13.8	(1.9)
Other	4.9	(2.1)	4.8	(2.1)	2.6	(2.2)	4.8	(1.5)
Not used	77.0	(3.3)	30.3	(3.9)	11.1	(4.2)	61.1	(2.6)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Use of a Footbath for Cows During the Previous 12 Months, and by Herd Size



A higher percentage of operations in the West region than in the East region (49.7 and 17.4 percent, respectively) used a footbath throughout the year. A higher percentage of operations in the East region used footbaths occasionally or not at all (14.9 and 62.8 percent, respectively) compared with the West region (3.1 and 43.4 percent, respectively).

b. Percentage of operations by use of a footbath for cows during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Footbath Use	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Throughout year	49.7	(5.2)	17.4	(1.8)
Seasonally/ occasionally	3.1	(1.4)	14.9	(2.1)
Other	3.8	(2.1)	4.9	(1.7)
Not used	43.4	(5.0)	62.8	(2.8)
Total	100.0		100.0	

Photo courtesy of “Dairy Herd Management”/ “Bovine Veterinarian”

For operations that used footbaths, almost 8 of 10 cows (78.0 percent) were on operations that used footbaths throughout the year. Of cows on medium and large operations, the majority were on operations that used a footbath throughout the year (73.2 and 87.0 percent of cows, respectively). Almost 6 of 10 cows (57.0 percent) on small operations were on operations that used a footbath seasonally or occasionally.

c. For the 38.9 percent of operations that used footbaths during the previous 12 months, percentage of cows on those operations by footbath use, and by herd size:

	Percent Cows*							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Footbath Use	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Throughout year	29.1	(7.3)	73.2	(4.5)	87.0	(7.1)	78.0	(4.5)
Seasonally/ occasionally	57.0	(8.8)	21.5	(4.3)	10.6	(6.9)	17.7	(4.3)
Other	13.9	(5.9)	5.3	(2.3)	2.4	(2.2)	4.3	(1.6)
Total	100.0		100.0		100.0		100.0	

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

For operations that used footbaths, the majority (66.6 percent) used copper sulfate most commonly as the footbath medication; these operations accounted for the majority of cows (63.6 percent). Footbath medications specified for the "Other" category, which represented 11.6 percent of operations and 18.0 percent of cows, were primarily a combination of the medications listed in the table.

d. For the 38.9 percent of operations that used footbaths during the previous 12 months, percentage of operations (and percentage of cows on those operations) by the footbath medication used most commonly:

Footbath Medication	Percent Operations	Standard Error	Percent Cows*	Standard Error
Copper sulfate	66.6	(3.9)	63.6	(4.7)
Formalin/formaldehyde	10.9	(2.0)	16.4	(3.4)
Oxytetracycline	10.9	(3.3)	2.0	(0.6)
Hydrogen peroxide	0.0	(--)	0.0	(--)
Other	11.6	(2.3)	18.0	(4.1)
Total	100.0		100.0	

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

3. Hoof trimming

Routine hoof trimming is important in identifying hoof disorders and maintaining proper hoof health. More than 80 percent of operations performed at least some hoof trimming, with a higher percentage of large operations and medium operations (99.4 and 95.6 percent, respectively) performing some trimming than small operations (79.4 percent).

a. Percentage of operations that trimmed any hooves during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
79.4	(3.4)	95.6	(1.7)	99.4	(0.6)	84.8	(2.4)

More than one-third of operations (38.2 percent) trimmed the hooves of all cows during the previous 12 months, while 15.2 percent of operations did not perform any hoof trimming.

b. Percentage of operations by percentage of cows that had their hooves trimmed at least once during the previous 12 months:

Percent Cows	Percent Operations	Standard Error
0	15.2	(2.4)
0.1 to 33.9	18.3	(2.4)
34.0 to 66.9	10.2	(1.7)
67.0 to 99.9	18.1	(2.2)
100.0	38.2	(2.9)
Total	100.0	

About three-fourths of operations (76.7 percent) used a professional hoof trimmer to do the majority of trimming. The owner or the operation's personnel performed the hoof trimming on 17.2 percent of operations.

c. For the 84.8 percent of operations that had cows' hooves trimmed during the previous 12 months, percentage of operations by the person who trimmed the majority of the hooves, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Person	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Professional hoof trimmer (not the operation's personnel)	72.3	(4.0)	85.9	(3.1)	80.3	(4.7)	76.7	(2.8)
Veterinarian (not the operation's personnel)	8.2	(2.7)	0.5	(0.3)	0.2	(0.2)	5.5	(1.8)
Owner or the operation's personnel	19.0	(3.5)	12.9	(3.1)	18.3	(4.6)	17.2	(2.4)
Other	0.5	(0.5)	0.7	(0.6)	1.2	(1.1)	0.6	(0.4)
Total	100.0		100.0		100.0		100.0	

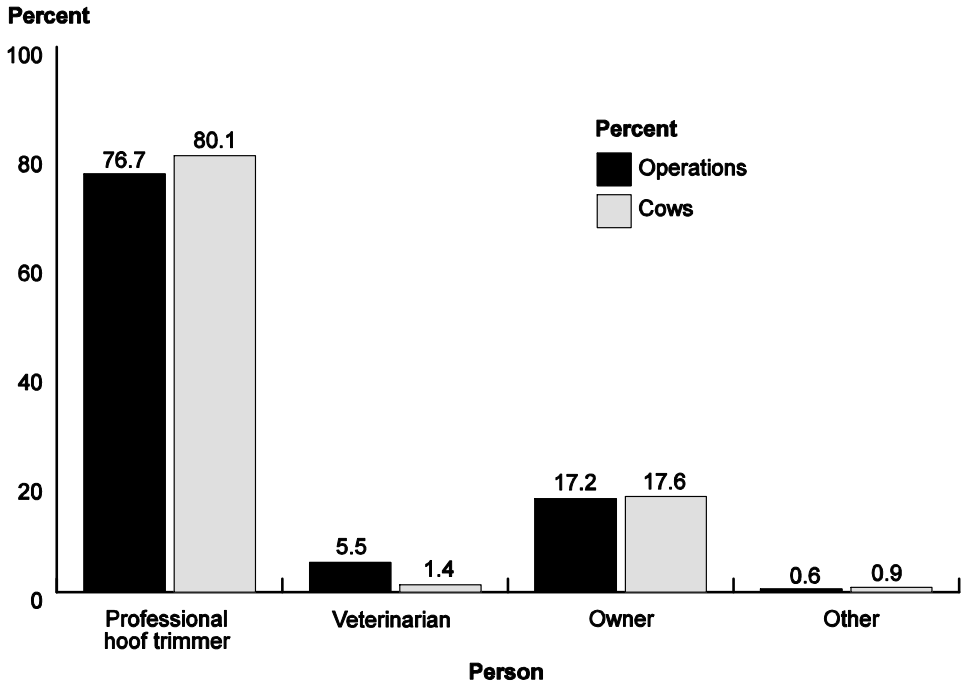
The majority of cows (80.1 percent) were on operations where cows' hooves were trimmed by a professional hoof trimmer during the previous 12 months. Almost 2 of 10 cows (17.6 percent) were on operations where the owner or the operation's personnel trimmed the majority of hooves. Veterinarians trimmed the hooves on 5.7 percent of cows on small operations compared with less than 1 percent of cows on medium or large operations.

d. For the 84.8 percent of operations that had cows' hooves trimmed during the previous 12 months, percentage of cows on those operations by the person who trimmed the majority of the hooves, and by herd size:

	Percent Cows*							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Person	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Professional hoof trimmer (not the operation's personnel)	74.7	(3.8)	85.2	(3.1)	79.3	(5.8)	80.1	(3.2)
Veterinarian (not the operation's personnel)	5.7	(2.0)	0.5	(0.4)	0.2	(0.2)	1.4	(0.4)
Owner or the operation's personnel	19.1	(3.4)	13.2	(3.1)	19.6	(5.8)	17.6	(3.1)
Other	0.5	(0.5)	1.1	(1.1)	0.9	(0.9)	0.9	(0.5)
Total	100.0		100.0		100.0		100.0	

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

For the 84.8 Percent of Operations that had Cows' Hooves Trimmed During the Previous 12 Months, Percentage of Operations and Percentage of Cows on Those Operations by the Person Who Trimmed the Majority of the Hooves



Professional hoof trimmers made an average of 7.1 visits during the previous 12 months to operations to trim hooves or evaluate lame cows, while veterinarians made 1.1 visits. The number of visits made by professional hoof trimmers increased from 2.0 visits for small operations to 9.0 for medium and 44.5 visits for large operations.

e. For the 82.2 percent of operations visited by a professional hoof trimmer or veterinarian to trim hooves (as part of a routine trimming program) or to evaluate lame cows, operation average number of visits during the previous 12 months, and by herd size:

	Operation Average Number Visits							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Professional	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**	**Avg.**	**Std. Error**
Hoof trimmer	2.0	(0.2)	9.0	(0.5)	44.5	(4.0)	7.1	(0.5)
Veterinarian	1.3	(0.3)	0.7	(0.2)	0.2	(0.2)	1.1	(0.2)

E. Hemorrhagic Bowel Syndrome

1. Signs

Hemorrhagic bowel syndrome (HBS) is a fatal intestinal disease of milking cows and is characterized by sudden onset of bloody feces, with or without intestinal obstruction. Sudden death without prior signs is common. Both medical and surgical treatments have been relatively unsuccessful. A bloody bowel accompanied by a blood clot that obstructs the intestine may be observed at necropsy.

Results of the Dairy 2002 study suggest that management practices implemented to achieve high milk production, such as increased consumption of a high energy diet, might increase the risk of cattle developing HBS.

Overall, one-fifth of operations (19.7 percent) had at least one cow with signs of HBS on the operation during the previous 5 years. The percentage of operations that had at least one apparent HBS case increased with herd size, from 12.8 percent of small operations to 48.4 percent of large operations. In the West region, 33.2 percent of operations had at least one cow with signs of HBS during the previous 5 years, compared with 18.5 percent of operations in the East region.

a. Percentage of operations that had at least one cow with signs consistent with HBS on the operation during the previous 5 years, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
12.8	(2.6)	31.7	(4.1)	48.4	(6.2)	19.7	(2.1)

b. Percentage of operations that had at least one cow with signs consistent with HBS on the operation during the previous 5 years, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
33.2	(5.1)	18.5	(2.3)

For 19.3 percent of operations that had observed a cow with HBS signs during the previous 5 years, the first case occurred prior to 2000.

c. For the 19.7 percent of operations that had at least one cow with signs consistent with HBS during the previous 5 years, percentage of operations by year first suspected case of HBS occurred:

Year	Percent Operations	Standard Error
1999 or before	19.3	(5.7)
2000-01	13.9	(3.8)
2002-03	25.6	(5.0)
2004-05	22.0	(5.3)
2006-07*	19.2	(4.7)
Total	100.0	

*Through day of VS Second Visit interview.

For operations that had at least one cow with clinical signs consistent with HBS, less than 1 percent of cows (0.8 percent) had clinical signs during the previous 12 months, with no differences by herd size. The percentage of cows with signs consistent with HBS on all operations was 0.3 percent or less, depending on herd size.

d. For the 19.7 percent of operations that had at least one cow with signs consistent with HBS during the previous 5 years and for all operations, operation average percentage of cows that had signs of HBS during the previous 12 months, and by herd size:

	Operation Average Percent Cows*							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Population	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Operations with HBS	0.9	(0.3)	0.9	(0.3)	0.5	(0.1)	0.8	(0.2)
All Operations	0.1	(0.0)	0.3	(0.1)	0.2	(0.0)	0.2	(0.0)

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

There were no regional differences in the operation average percentage of cows displaying clinical signs consistent with HBS.

e. For the 19.7 percent of operations that had at least one cow with signs consistent with HBS during the previous 5 years, operation average percentage of cows that had signs of HBS during the previous 12 months, by region:

Operation Average Percent Cows*			
Region			
West		**East**	
Percent	**Standard Error**	**Percent**	**Standard Error**
0.4	(0.1)	0.9	(0.2)

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

2. Preventive measures

Almost one-third of operations that had cows with signs consistent with HBS during the previous 5 years (31.1 percent) had implemented preventive measures during that time specifically to reduce or eliminate HBS. There were no differences in the implementation of preventive measures by herd size or region.

a. For the 19.7 percent of operations that had at least one cow with signs of HBS during the previous 5 years, percentage of operations that implemented preventive measures during that time specifically to reduce or eliminate HBS, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
23.5	(8.5)	34.0	(6.6)	45.7	(7.9)	31.1	(4.9)

Even though the cause of HBS is unknown, multiple preventive measures are recommended based on current knowledge. With the exception of vaccination with an autogenous *Clostridium* type A vaccine, all other preventive measures listed were implemented by about 40 to 50 percent of operations that implemented some type of measure.

b. For the 31.1 percent of operations that implemented preventive measures for HBS within the previous 5 years, percentage of operations by measure used specifically to reduce or eliminate HBS:

Preventive Measure	Percent Operations	Standard Error
Vaccination with a commercial *Clostridium* type A vaccine	43.8	(8.0)
Vaccination with an autogenous *Clostridium* type A vaccine	13.5	(5.3)
Vaccination with a 7-way clostridial vaccine	50.5	(8.2)
Incorporated a feed additive (e.g., Omnigen AF®)	41.7	(8.0)
Changed feed ingredients/composition of ration	50.4	(8.4)
Changed forage management (chop size, source, etc.)	40.7	(8.1)

Of the operations that implemented preventive measures specifically to reduce or eliminate HBS, 60.1 percent perceived a great reduction (75 to 100 percent decrease) in HBS cases. An additional 20.1 percent of operations believed they had moderate reduction (50 to 74 percent decrease) in HBS cases, while 3.1 percent of operations experienced no reduction in HBS cases.

c. For the 31.1 percent of operations that implemented preventive measures for HBS within the previous 5 years, percentage of operations by perceived benefit from using the measures:

Perceived Benefit	Percent Operations	Standard Error
Great reduction in HBS cases (75-100 percent)	60.1	(8.1)
Moderate reduction in HBS cases (50-74 percent)	20.1	(6.7)
Reduction in HBS cases (25-49 percent)	11.6	(4.5)
Slight reduction in HBS cases (1-24 percent)	5.1	(2.5)
No reduction in HBS cases	3.1	(2.0)
Total	100.0	

F. Treatment Practices

1. General

Injections for dairy cows can be administered for a variety of reasons, including preventive measures, such as vaccination; treatment of disease (e.g., antibiotic injections); manipulation of the estrous cycle for improvements in breeding; and production enhancement using bovine somatotropin (bST).

Producers were asked to report the number of injections of any kind a dairy cow typically received during the previous 12 months. For all operations, the operation average number of injections typically received by a cow was 13.8, or an average of slightly more than 1 injection per month. The number of injections per cow increased as herd size increased, with cows on small operations receiving 6.4 injections and cows on large operations receiving 17.3 injections.

a. Operation average number of injections per cow during the previous 12 months, and by herd size:

Operation Average Number Injections

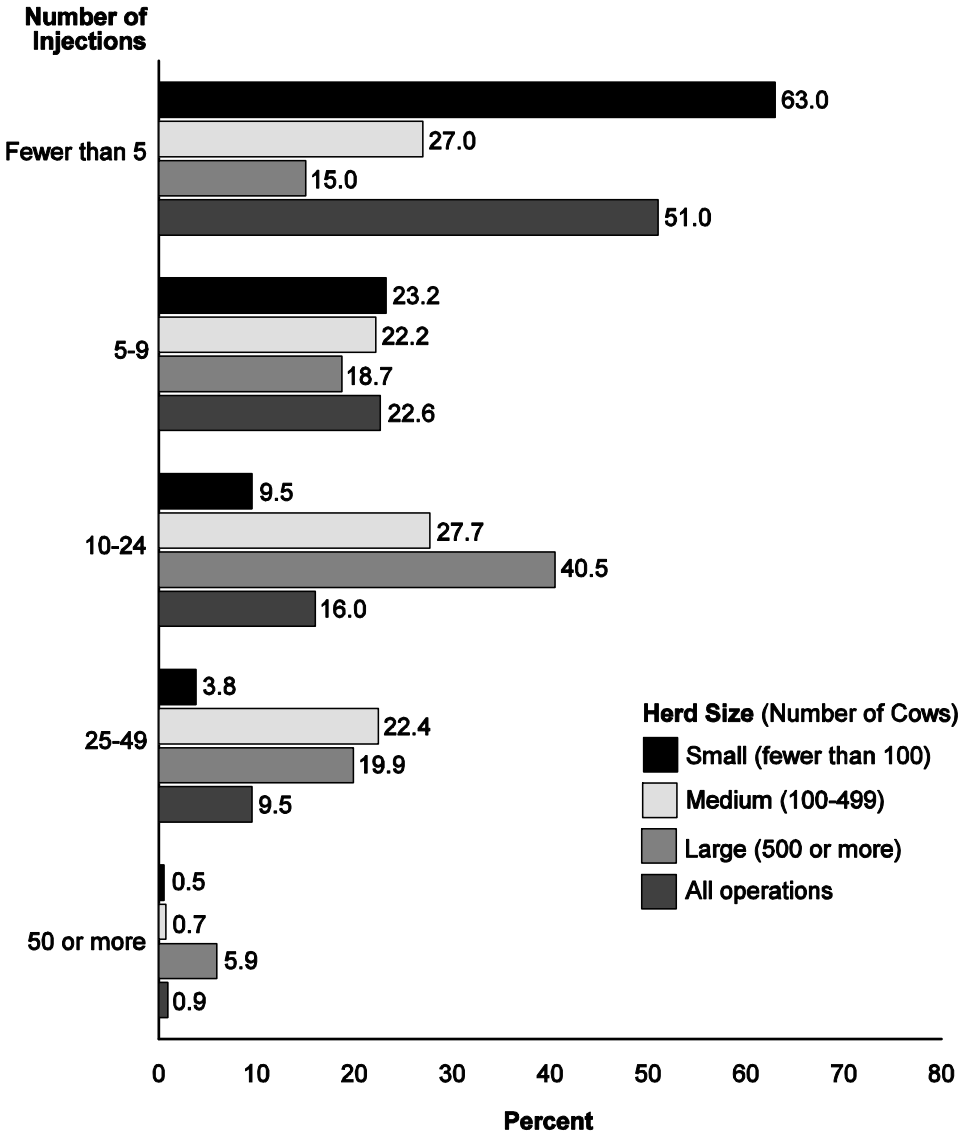
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
No.	**Std. Error**	**No.**	**Std. Error**	**No.**	**Std. Error**	**No.**	**Std. Error**
6.4	(0.7)	14.4	(1.0)	17.3	(1.6)	13.8	(0.8)

On about one-half of operations (51.0 percent), cows received fewer than five injections during the previous 12 months. In general, the number of injections a cow received increased with herd size; 63.0 percent of small operations gave fewer than five injections, compared with 27.0 percent of medium operations and 15.0 percent of large operations. About two-fifths of large operations (40.5 percent) gave 10 to 24 injections per cow during the previous 12 months, compared with 9.5 percent of small operations.

b. Percentage of operations by number of injections a cow typically received during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Number of Injections	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Fewer than 5	63.0	(3.9)	27.0	(4.1)	15.0	(4.7)	51.0	(2.9)
5 to 9	23.2	(3.5)	22.2	(3.5)	18.7	(4.8)	22.6	(2.6)
10 to 24	9.5	(2.2)	27.7	(4.0)	40.5	(6.4)	16.0	(1.9)
25 to 49	3.8	(1.3)	22.4	(3.7)	19.9	(4.3)	9.5	(1.4)
50 or more	0.5	(0.5)	0.7	(0.5)	5.9	(3.2)	0.9	(0.4)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Number of Injections a Cow Typically Received During the Previous 12 Months, and by Herd Size



A higher percentage of operations in the East region (52.7 percent) administered fewer than five injections to cows during the previous 12 months, compared with 32.9 percent of operations in the West region.

c. Percentage of operations by number of injections a cow typically received during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Number of Injections	Percent	Std. Error	Percent	Std. Error
Fewer than 5	32.9	(5.6)	52.7	(3.2)
5 to 9	28.4	(5.4)	22.1	(2.7)
10 to 24	33.1	(5.5)	14.4	(2.0)
25 to 49	4.0	(1.9)	9.9	(1.5)
50 or more	1.6	(1.3)	0.9	(0.5)
Total	100.0		100.0	

Overall, 80.1 percent of cows were on operations that typically gave cows fewer than 25 injections during the previous 12 months, with 26.2 percent receiving fewer than 5 injections, 24.7 percent receiving 5 to 9 injections, and 29.2 percent receiving 10 to 24 injections. For small operations, the majority of cows were on operations on which cows typically received fewer than five injections (60.8 percent), compared with 21.0 percent of cows on medium operations and 11.7 percent of cows on large operations. In contrast, a higher percentage of cows on medium operations and on large operations (55.0 and 62.6 percent, respectively) typically received 10 or more injections than cows on small operations (15.4 percent).

d. Percentage of cows on operations by number of injections a cow typically received during the previous 12 months, and by herd size:

	Percent Cows*							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Number of Injections	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Fewer than 5	60.8	(3.9)	21.0	(3.4)	11.7	(4.3)	26.2	(2.7)
5 to 9	23.8	(3.5)	24.0	(3.7)	25.7	(7.5)	24.7	(3.8)
10 to 24	9.9	(2.2)	30.9	(4.3)	38.0	(7.1)	29.2	(3.6)
25 to 49	5.0	(1.7)	23.4	(3.7)	19.5	(4.5)	17.2	(2.4)
50 or more	0.5	(0.5)	0.7	(0.4)	5.1	(2.6)	2.7	(1.2)
Total	100.0		100.0		100.0		100.0	

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

Almost 9 of 10 injections (89.1 percent) given to dairy cows were administered by farm personnel, with no differences observed by herd size.

e. Operation average percentage of injections administered by farm personnel, and by herd size:

Operation Average Percent Injections

Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
87.8	(1.9)	91.7	(1.7)	92.8	(1.9)	89.1	(1.4)

Photo courtesy of “Dairy Herd Management”/ “Bovine Veterinarian”

2. Injection route, purpose, and location

Note: The average number of injections a cow typically received for each operation was applied to every cow on that operation to calculate the number of injections by route, purpose, and location of administration.

There are three primary injection routes: intramuscular (IM), subcutaneous (SQ), and intravenous (IV). The selection and use of appropriate injection route and body location (or site) are important to both product efficacy and carcass quality at slaughter. In the 1990s, the National Cattlemen's Association (now the National Cattlemen's Beef Association, or NCBA) began conductin the Non-Fed Beef/Market Cow and Bull Quality Audits. Designed in part to evaluate the incidence of injection-site lesions, the audits include dairy cattle, which represent about 20 percent of all beef consumed in the United States. Injection-site lesions in the muscle cuts of the upper hip (sirloins and rounds) have decreased substantially since the first audits were conducted. In 2007, 11 percent of dairy cows had injection-site lesions, compared with 49 percent from 1998 to 2000. The 1999 audit estimated a loss of $1.46 per head due to trim loss associated with injection-site lesions. Although injection-site lesions are not a food-safety issue, the scar tissue affects meat quality. Scar tissue, which forms after IM injections, toughens muscle tissue, producing a product that may be unacceptable to consumers. Because muscle cuts of the upper hip (sirloins and rounds) are frequently marketed as whole cuts, injection lesions may not be noticed prior to retail sale. Producers are advised to follow Beef Quality Assurance guidelines and administer products labeled for IM injection in front of the shoulder—not in the hip or round.

Almost all operations (97.4 percent) administered IM injections during the previous 12 months. SQ and IV injections were administered on 69.1 and 70.3 percent of operations, respectively. A higher percentage of medium operations (84.6 percent) administered SQ injections compared with small operations (63.3 percent).

a. Percentage of operations that administered intramuscular (IM), subcutaneous (SQ), or intravenous (IV) injections, and by herd size:

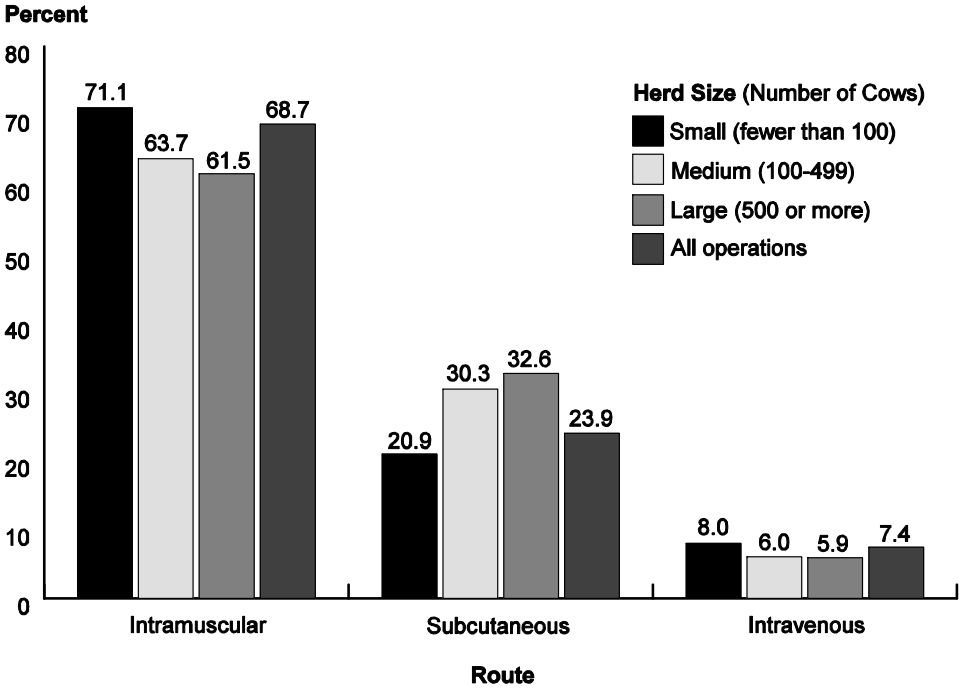
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Route	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Intramuscular	96.8	(1.1)	98.7	(0.8)	99.4	(0.6)	97.4	(0.8)
Subcutaneous	63.3	(4.0)	84.6	(3.2)	71.6	(6.0)	69.1	(2.9)
Intravenous	68.6	(3.8)	76.0	(3.6)	66.1	(6.3)	70.3	(2.8)

About two-thirds of injections (68.7 percent) were administered IM, compared with 23.9 percent administered SQ and 7.4 percent IV. There were no differences in injection route by herd size.

b. Operation average percentage of injections by injection route, and by herd size:

	Operation Average Percent Injections							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Route	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Intramuscular	71.1	(2.3)	63.7	(2.5)	61.5	(4.0)	68.7	(1.7)
Subcutaneous	20.9	(2.1)	30.3	(2.6)	32.6	(3.8)	23.9	(1.6)
Intravenous	8.0	(1.1)	6.0	(0.8)	5.9	(1.0)	7.4	(0.8)
Total	100.0		100.0		100.0		100.0	

Operation Average Percentage of Injections by Injection Route, and by Herd Size



Of IM injections administered on the operation, more than two-fifths (41.3 percent) were given for vaccination, while reproductive and antibiotic injections each accounted for about one-fourth of IM injections (27.3 and 23.1 percent, respectively).

c. For the 97.4 percent of operations that administered IM injections, operation average percentage of IM injections administered for the following purposes, and by herd size:

	Operation Average Percent IM Injections							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Purpose	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Antibiotic	24.7	(2.2)	18.9	(2.0)	22.3	(3.8)	23.1	(1.6)
Production enhancement (e.g., bST)	3.1	(1.3)	8.9	(2.1)	5.6	(1.4)	4.7	(1.1)
Reproduction	25.5	(2.1)	31.9	(2.8)	28.0	(2.4)	27.3	(1.6)
Vaccination	42.9	(2.8)	36.5	(2.8)	43.8	(3.2)	41.3	(2.1)
Other	3.8	(1.3)	3.8	(1.5)	0.3	(0.2)	3.6	(1.0)
Total	100.0		100.0		100.0		100.0	

The primary locations for IM injections were hind leg (45.3 percent) and neck (34.2 percent). A higher percentage of IM injections were administered in the neck on large operations (50.9 percent) compared with small or medium operations (11.8 and 16.5 percent, respectively). Conversely, a lower percentage of IM injections were administered in the hind leg on large operations (37.1 percent) than small operations (65.5 percent).

d. For the 97.4 percent of operations that administered IM injections, percentage of IM injections by location administered, and by herd size:

	Percent IM Injections							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Location	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Neck	11.8	(2.9)	16.5	(3.4)	50.9	(6.3)	34.2	(4.0)
Shoulder	3.3	(1.4)	3.0	(1.1)	1.3	(0.6)	2.1	(0.5)
Upper hip	16.3	(3.5)	17.4	(3.2)	8.3	(2.0)	12.4	(1.7)
Hind leg	65.5	(5.0)	50.2	(4.8)	37.1	(6.1)	45.3	(3.7)
Other	3.1	(1.4)	12.9	(4.6)	2.4	(1.1)	6.0	(1.8)
Total	100.0		100.0		100.0		100.0	

More than 4 of 10 production enhancement injections (41.4 percent) were given in “Other” locations. The most common production enhancement injection, bST (Posilac), is recommended to be given subcutaneously around the tailhead.

e. For the 97.4 percent of operations that administered IM injections, percentage of IM injections by location administered, by purpose of injection:

	Percent IM Injections									
	Purpose									
	Antibiotics		Production Enhance-ment		Repro-duction		Vaccination		Other	
Location	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Neck	41.6	(5.9)	20.5	(8.8)	28.3	(5.7)	47.5	(5.4)	5.3	(3.7)
Shoulder	2.9	(1.1)	8.7	(3.4)	1.6	(0.6)	1.4	(0.4)	0.3	(0.4)
Upper hip	14.5	(2.6)	8.6	(3.1)	11.7	(2.2)	12.5	(2.0)	19.7	(15.4)
Hind leg	39.9	(4.6)	20.8	(8.9)	58.1	(5.5)	37.6	(5.0)	73.3	(16.1)
Other	1.1	(0.6)	41.4	(9.4)	0.3	(0.2)	1.0	(0.3)	1.4	(1.2)
Total	100.0		100.0		100.0		100.0		100.0	

Almost all operations gave injections to heifers and cows (96.9 and 98.8 percent, respectively). More than 9 of 10 operations gave IM injections to heifers and cows (94.0 and 96.1 percent, respectively). Approximately 5 of 10 operations (51.6 percent) administered IV injections to heifers while 65.9 percent of operations administered IV injections to cows.

f. Percentage of operations that administered injections to heifers and cows during the previous 12 months, by injection route:

	Percent Operations							
	Injection Route							
	Intramuscular		Subcutaneous		Intravenous		Any	
Cattle Class	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers	94.0	(1.4)	62.2	(3.0)	51.6	(3.0)	96.9	(1.1)
Cows	96.1	(1.0)	66.8	(3.0)	65.9	(2.9)	98.8	(0.6)

Cattle-handling facilities present on an operation dictate where the majority of animals are handled. This is reflected in the similarity of facility type used across injection routes for both heifers and cows. To restrain heifers for IM injections, most operations primarily used lock-up (30.4 percent of operations), tie stall/ stanchion (28.8 percent), or chute/head gate (22.6 percent) facilities. These same types of facilities also were primarily used for SQ and IV injections for heifers. Less than 11 percent of operations gave any injections to heifers loose in freestalls, in a palpation rail, or in the parlor.

g. For the 96.9 percent of operations that administered IM, SQ, and/or IV injections to ***heifers***, percentage of operations by type of cattle-handling facility primarily used, by injection route:

	Percent Operations					
	Injection Route—Heifers					
	Intramuscular		Subcutaneous		Intravenous	
Cattle-handling Facility Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Tie stall/stanchion	28.8	(2.9)	24.2	(3.4)	36.3	(4.1)
Lock-up	30.4	(2.5)	36.4	(3.3)	31.6	(3.6)
Chute/head gate	22.6	(2.5)	23.4	(2.8)	20.1	(3.0)
Loose in freestall	10.2	(2.0)	7.5	(2.1)	5.7	(1.7)
Palpation rail	0.3	(0.1)	0.5	(0.2)	0.2	(0.2)
Parlor	5.5	(1.2)	4.3	(1.3)	2.4	(1.2)
Other	2.2	(1.1)	3.7	(1.7)	3.7	(1.6)
Total	100.0		100.0		100.0	

The majority of operations (59.0 percent) administered IM injections to cows in a tie stall/stanchion, while 17.4 percent of operations used the parlor and 12.4 percent used lock-ups. Tie stall/stanchion also was the primary facility used for administering SQ (52.4 percent of operations) or IV injections (64.0 percent of operations) to cows.

h. For the 98.8 percent of operations that administered IM, SQ, and/or IV injections to ***cows***, percentage of operations by type of cattle-handling facility primarily used, by injection route:

	Percent Operations					
	Injection Route—Cows					
	Intramuscular		Subcutaneous		Intravenous	
Cattle-handling Facility Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Tie stall/stanchion	59.0	(2.7)	52.4	(3.3)	64.0	(3.1)
Lock-up	12.4	(1.4)	17.0	(2.1)	11.5	(1.8)
Chute/head gate	5.3	(1.2)	7.6	(1.6)	11.9	(1.7)
Loose in freestall	4.1	(1.3)	2.7	(1.5)	4.7	(1.5)
Palpation rail	1.6	(0.5)	1.6	(0.5)	0.5	(0.2)
Parlor	17.4	(1.8)	18.5	(2.3)	5.0	(1.4)
Other	0.2	(0.2)	0.2	(0.2)	2.4	(1.0)
Total	100.0		100.0		100.0	

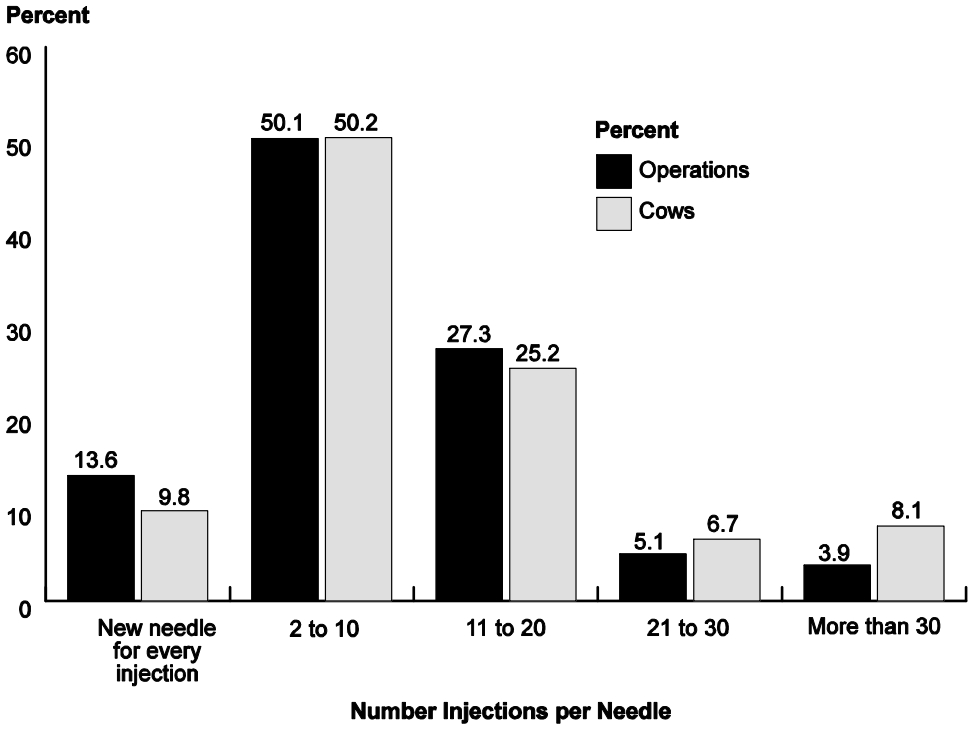
Using a new needle for each cow can decrease disease transmission and also reduce potential injury to the cow by minimizing the possibility of broken needles. About one of seven operations (13.6 percent) used a new needle for every injection during the previous 12 months; these operations represented 9.8 percent of all cows. The majority of operations (50.1 percent), representing 50.2 percent of cows, used each needle to give 2 to 10 injections. Approximately one-fourth of operations (27.3 percent), which represented 25.2 percent of cows, used each needle to give 11 to 20 injections. Although less than 4 percent of operations used needles for more than 30 injections, these operations represented 8.1 percent of cows, suggesting that this practice is more common on larger operations.

i. For the 98.8 percent of operations that administered IM, SQ, and/or IV injections to ***cows***, percentage of operations (and percentage of cows on those operations) by number of injections administered per needle by farm personnel during the previous 12 months:

Number Injections per Needle	Percent Operations	Standard Error	Percent Cows*	Standard Error
New needle for every injection	13.6	(2.2)	9.8	(1.6)
2 to 10	50.1	(3.0)	50.2	(4.0)
11 to 20	27.3	(2.8)	25.2	(3.2)
21 to 30	5.1	(1.1)	6.7	(1.9)
More than 30	3.9	(1.0)	8.1	(2.3)
Total	100.0		100.0	

*As a percentage of cows on the operation at the time of VS Initial Visit interview.

For the 98.8 Percent of Operations that Administered IM, SQ, and/or IV Injections to Cows, Percentage of Operations and Percentage of Cows* on Those Operations by Number of Injections Administered Per Needle by Farm Personnel During the Previous 12 Months



*As a percentage of cows on the operation at time of Initial VS interview.

3. Record keeping

Keeping a record of each treatment a cow receives is important to make sure that the appropriate length of therapy and withdrawal are followed. Overall, about three-fifths of operations (58.2 percent) reported keeping a written or computerized record for each cow that received a treatment requiring a withdrawal time. A higher percentage of large operations (94.4 percent) than small operations (51.7 percent) and medium operations (67.4 percent) reported keeping a written or computerized record of each treatment.

Percentage of operations that kept a written or computerized record for each cow that received a treatment requiring a withdrawal time before the cow could be sent to market, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
51.7	(4.0)	67.4	(4.2)	94.4	(2.4)	58.2	(3.0)

G. Nutrient Management

1. Housing facilities

Nutrient management systems are usually dependent on the type and design of cattle housing, land costs, ambient temperatures, precipitation amounts, and nutrient use. In general, the West region is more arid than the East region, with the East region having more cold weather and precipitation during the winter months.

Of the 92.3 percent of operations that housed weaned heifers, about one-third housed the heifers primarily in a multiple-animal inside area (34.6 percent), while one-fourth housed weaned heifers in a drylot/multiple-animal outside area (22.9 percent). A majority of small operations primarily housed weaned heifers in drylots/multiple-animal outside and multiple-animal inside areas (22.3 and 37.8 percent, respectively). More than 4 of 10 large operations primarily housed weaned heifers in a drylot/multiple-animal outside area (43.2 percent). The percentage of operations that did not house weaned heifers increased as herd size increased, with almost one-fourth of large operations not housing weaned heifers (24.8 percent).

a. Percentage of operations by primary housing facility/outside area used for ***weaned heifers*** during 2006, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Primary Housing Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Tie stall/ stanchion	6.7	(1.0)	4.6	(1.1)	0.5	(0.2)	5.9	(0.7)
Freestall	10.2	(1.1)	18.2	(1.8)	13.7	(2.2)	12.1	(0.9)
Individual pen/ hutch	6.3	(0.9)	3.0	(0.9)	1.9	(0.8)	5.3	(0.7)
Drylot/multiple-animal outside area	22.3	(1.4)	19.8	(1.8)	43.2	(2.7)	22.9	(1.1)
Multiple-animal inside area	37.8	(1.8)	29.8	(2.0)	10.1	(1.9)	34.6	(1.4)
Pasture	11.7	(1.1)	9.4	(1.2)	4.6	(1.0)	10.8	(0.9)
Not housed on operation	4.6	(0.7)	13.8	(1.6)	24.8	(2.4)	7.7	(0.7)
Other	0.4	(0.2)	1.4	(0.7)	1.2	(0.7)	0.7	(0.2)
Total	100.0		100.0		100.0		100.0	

Almost one-half of operations in the West region (46.2 percent) housed weaned heifers primarily in a drylot/multiple-animal outside area. Approximately 1 of 8 operations in the West housed weaned heifers in freestalls (12.7 percent), multiple-animal inside area (12.1 percent), or pasture (12.7 percent) or did not house weaned heifers on the operation (12.1 percent). About one-third of operations in the East region (36.4 percent) housed weaned heifers primarily in a multiple-animal inside area, while 20.9 percent of operations housed weaned heifers in a multiple-animal outside area.

b. Percentage of operations by primary housing facility/outside area used for ***weaned heifers*** during 2006, by region:

	Percent Operations			
	Region			
	West		**East**	
Primary Housing Type	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Tie stall/stanchion	0.4	(0.2)	6.4	(0.8)
Freestall	12.7	(2.0)	12.1	(0.9)
Individual pen/hutch	3.3	(1.2)	5.5	(0.7)
Drylot/multiple-animal outside area	46.2	(2.9)	20.9	(1.2)
Multiple-animal inside area	12.1	(1.9)	36.4	(1.5)
Pasture	12.7	(2.3)	10.7	(0.9)
Not housed on operation	12.1	(1.9)	7.3	(0.7)
Other	0.5	(0.3)	0.7	(0.2)
Total	100.0		100.0	

Almost one-half of operations (49.2 percent) housed lactating cows primarily in a tie stall/stanchion facility. About 1 of 3 operations (32.6 percent) housed cows in freestalls. The use of tie stall/stanchion facilities decreased from 63.0 percent for small operations to 0.7 percent for large operations. Alternatively, a higher percentage of medium and large operations housed lactating cows in freestalls (67.5 and 72.6 percent, respectively) compared with small operations (19.0 percent). Almost one-fourth of large operations housed lactating cows primarily in drylots/multiple-animal outside areas (24.2 percent).

c. Percentage of operations by primary housing facility/outside area used for ***lactating cows*** during 2006, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Primary Housing Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Tie stall/ stanchion	63.0	(1.6)	15.7	(1.9)	0.7	(0.3)	49.2	(1.3)
Freestall	19.0	(1.3)	67.5	(2.1)	72.6	(2.3)	32.6	(1.1)
Individual pen	0.1	(0.0)	0.3	(0.2)	0.2	(0.1)	0.1	(0.1)
Drylot/multiple-animal outside area	3.4	(0.6)	4.1	(0.7)	24.2	(2.3)	4.6	(0.5)
Multiple-animal inside area	3.5	(0.7)	3.3	(0.7)	0.8	(0.5)	3.4	(0.6)
Pasture	10.8	(1.1)	8.8	(1.2)	1.0	(0.3)	9.9	(0.8)
Other	0.2	(0.1)	0.3	(0.2)	0.5	(0.4)	0.2	(0.1)
Total	100.0		100.0		100.0		100.0	

Almost one-half of operations in the West region housed lactating cows primarily in freestall housing (49.7 percent), while 29.8 percent of operations housed cows in drylot/multiple-animal outside areas and 15.0 percent housed cows on pasture. The majority of operations in the East region housed lactating cows primarily in tie stall/stanchions (53.1 percent). A lower percentage of operations in the East region housed cows in freestalls (31.2 percent) compared with the West region. Pasture was the primary housing type for lactating cows on about 1 of 10 operations in the East region (9.4 percent).

d. Percentage of operations by primary housing facility/outside area used for ***lactating cows*** during 2006, by region:

	Percent Operations			
	Region			
	West		East	
Primary Housing Type	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Tie stall/stanchion	1.3	(0.5)	53.1	(1.4)
Freestall	49.7	(2.9)	31.2	(1.1)
Individual pen	0.8	(0.5)	0.1	(0.0)
Drylot/multiple-animal outside area	29.8	(2.6)	2.6	(0.5)
Multiple-animal inside area	2.6	(0.9)	3.4	(0.6)
Pasture	15.0	(2.7)	9.4	(0.9)
Other	0.8	(0.5)	0.2	(0.1)
Total	100.0		100.0	

2. Manure-handling methods

The method used to handle the majority of manure in weaned-heifer housing areas varied among operations. About one-fourth of operations (23.5 percent) used an alley scraper to handle the majority of manure, while 22.6 percent of operations used bedded pack (manure pack), 17.5 percent scraped the drylot, 15.4 percent left manure on pasture, and 14.6 percent used a gutter cleaner. A higher percentage of small and medium operations than large operations left manure from weaned-heifer housing areas on pasture or used a bedded pack. Compared with medium and small operations, a higher percentage of large operations scraped drylots. More than 1 of 10 large operations flushed the alley with recycled water (10.6 percent), which was higher than the percentage of small operations (0.0 percent). Alley scrapers were used on a higher percentage of medium operations (40.1 percent) compared with small operations (17.1 percent).

a. For the 92.3 percent of operations that housed weaned heifers, percentage of operations by method used to handle the majority of manure in ***weaned-heifer housing*** areas, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Handling Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Manure left on pasture	17.4	(2.8)	12.6	(3.0)	3.1	(1.7)	15.4	(2.1)
Drylot scraped	17.0	(3.1)	12.7	(2.9)	41.0	(6.3)	17.5	(2.3)
Gutter cleaner	19.3	(3.4)	4.4	(2.4)	0.0	(--)	14.6	(2.5)
Alley scraper (mechanical or tractor)	17.1	(3.1)	40.1	(4.6)	33.3	(6.4)	23.5	(2.5)
Alley flush with fresh water	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Alley flush with recycled water	0.0	(--)	1.2	(0.8)	10.6	(4.1)	0.9	(0.3)
Slotted floor	1.1	(0.7)	2.8	(1.5)	0.9	(0.7)	1.5	(0.6)
Bedded pack (manure pack)	23.0	(3.4)	25.4	(4.0)	7.2	(2.8)	22.6	(2.6)
Manure vacuum	0.0	(--)	0.1	(0.1)	0.0	(--)	0.0	(0.0)
Other	5.1	(2.0)	0.7	(0.7)	3.9	(2.2)	4.0	(1.4)
Total	100.0		100.0		100.0		100.0	

Because the West region has a higher percentage of large herds than the East region, differences in manure-handling methods in weaned-heifer housing areas by region were similar to differences by herd size. Almost one-half of operations in the West region (46.3 percent) scraped drylots, compared with 14.6 percent of operations in the East region. A similar percentage of operations in both regions used an alley scraper for handling the majority of manure—26.0 percent in the West region and 23.3 percent in the East region. About 1 in 10 operations in the West region (9.2 percent) flushed alleys with recycled water. A higher percentage of operations in the East region than in the West region used gutter cleaners or bedded packs.

b. For the 92.3 percent of operations that housed weaned heifers, percentage of operations by method used to handle the majority of manure in ***weaned-heifer housing*** areas, by region:

	Percent Operations			
	Region			
	West		**East**	
Handling Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Manure left on pasture	11.1	(3.1)	15.8	(2.3)
Drylot scraped	46.3	(5.5)	14.6	(2.5)
Gutter cleaner	0.0	(--)	16.0	(2.7)
Alley scraper (mechanical or tractor)	26.0	(5.2)	23.3	(2.7)
Alley flush with fresh water	0.0	(--)	0.0	(--)
Alley flush with recycled water	9.2	(3.3)	0.1	(0.1)
Slotted floor	0.0	(--)	1.7	(0.7)
Bedded pack (manure pack)	5.5	(2.6)	24.3	(2.8)
Manure vacuum	0.0	(--)	0.0	(0.0)
Other	1.9	(1.5)	4.2	(1.5)
Total	100.0		100.0	

Almost one-third of operations that housed weaned heifers primarily in a freestall/multiple-animal inside area (31.8 percent) used an alley scraper to handle the majority of manure in weaned-heifer housing areas. Bedded packs were used by 22.7 percent of operations that housed heifers primarily in freestall/multiple-animal inside areas. For operations that housed weaned heifers in a drylot/multiple-animal outside area, 33.8 percent scraped the drylot and 30.7 percent used a bedded pack to handle the majority of manure. Of operations that used pasture as the primary housing type for weaned heifers, 54.4 percent of operations left the majority of manure on the pasture and 19.5 percent used a bedded pack for the manure.

c. For the 92.3 percent of operations that housed weaned heifers, percentage of operations by method used to handle the majority of manure in ***weaned-heifer housing*** areas, by primary housing type for ***weaned heifers****:*

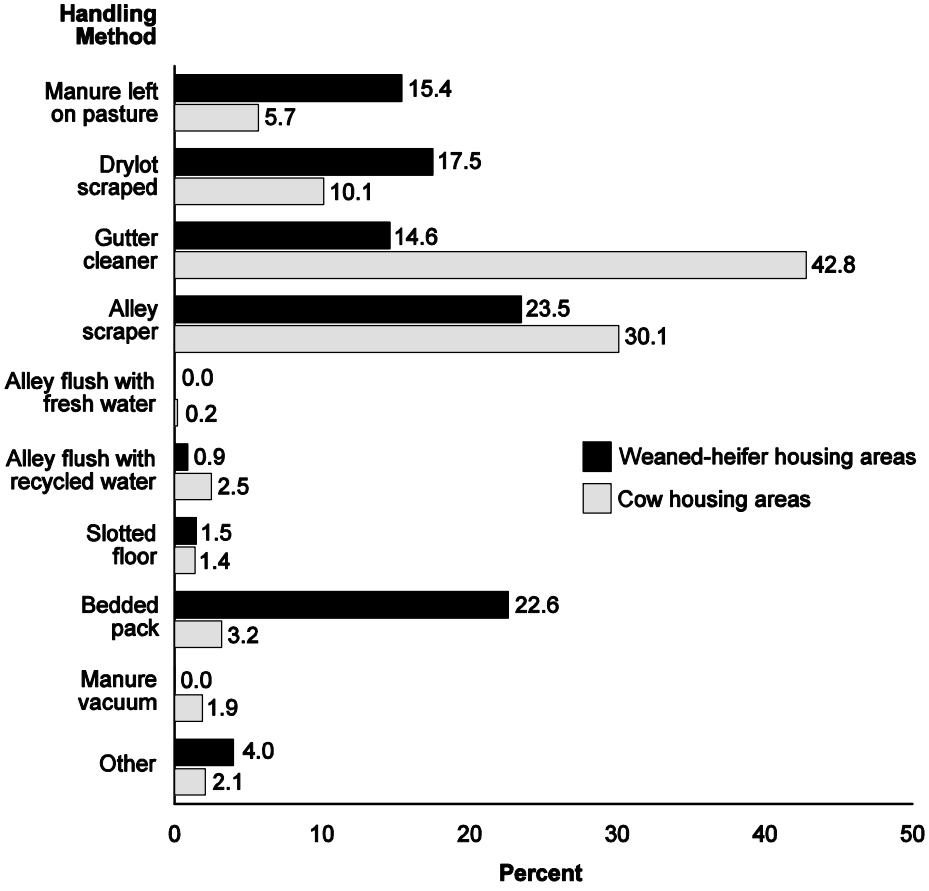
	Percent Operations					
	Primary Housing Type					
	Freestall/ Multiple-animal Inside Area		Drylot/ Multiple-animal Outside Area		Pasture	
Handling Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Manure left on pasture	10.5	(2.5)	14.2	(4.0)	54.4	(10.3)
Drylot scraped	14.0	(3.1)	33.8	(6.1)	3.6	(1.7)
Gutter cleaner	12.9	(3.3)	5.6	(2.5)	11.5	(9.4)
Alley scraper (mechanical or tractor)	31.8	(4.1)	13.0	(4.0)	9.0	(5.1)
Alley flush with fresh water	0.0	(--)	0.0	(--)	0.0	(--)
Alley flush with recycled water	0.6	(0.4)	2.1	(1.1)	0.0	(--)
Slotted floor	3.1	(1.3)	0.0	(--)	0.0	(--)
Bedded pack (manure pack)	22.7	(3.6)	30.7	(5.8)	19.5	(8.6)
Manure vacuum	0.1	(0.0)	0.0	(--)	0.0	(--)
Other	4.3	(2.1)	0.6	(0.5)	2.0	(2.0)
Total	100.0		100.0		100.0	

In areas used to house cows, more than two-fifths of operations (42.8 percent) used a gutter cleaner to handle the majority of manure, while 30.1 percent used an alley scraper. A higher percentage of small operations (58.5 percent) used a gutter cleaner to handle the majority of manure in cow housing areas, compared with 11.1 percent of medium operations and 0.0 percent of large operations. Because gutter cleaners are the primary manure-handling method for tie stall/ stanchion facilities, their increased use on small operations was expected (see table 1c on p 125). The majority of medium operations (64.1 percent) used an alley scraper to handle the majority of manure in cow housing areas. About 3 of 10 large operations used an alley scraper (33.5 percent), scraped drylots (30.1 percent), or flushed alleys with recycled water (27.4 percent).

d. Percentage of operations by method used to handle the majority of manure in ***cow housing*** areas, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Handling Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Manure left on pasture	6.0	(1.7)	6.2	(2.2)	0.6	(0.6)	5.7	(1.3)
Drylot scraped	8.7	(2.0)	8.7	(2.0)	30.1	(5.8)	10.1	(1.5)
Gutter cleaner	58.5	(3.9)	11.1	(3.3)	0.0	(--)	42.8	(3.0)
Alley scraper (mechanical or tractor)	17.2	(2.8)	64.1	(4.3)	33.5	(4.6)	30.1	(2.4)
Alley flush with fresh water	0.0	(--)	0.5	(0.4)	1.4	(1.3)	0.2	(0.1)
Alley flush with recycled water	0.0	(--)	2.9	(1.3)	27.4	(5.7)	2.5	(0.5)
Slotted floor	1.6	(0.9)	1.4	(1.0)	0.5	(0.2)	1.4	(0.6)
Bedded pack (manure pack)	3.4	(1.6)	3.4	(1.5)	0.0	(--)	3.2	(1.2)
Manure vacuum	2.5	(1.6)	0.3	(0.2)	1.5	(1.3)	1.9	(1.1)
Other	2.1	(1.1)	1.4	(1.1)	5.0	(2.6)	2.1	(0.8)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Method Used to Handle the Majority of Manure in Weaned-heifer* and Cow Housing Areas



*For operations that housed weaned heifers.

The highest percentages of operations in the West region scraped drylots (38.2 percent), used an alley scraper (23.4 percent), or flushed alleys with recycled water (21.0 percent) to handle the majority of manure in cow housing areas. In the East region, gutter cleaners (47.0 percent of operations) and alley scrapers (30.7 percent) were the primary manure-handling methods in cow housing areas.

e. Percentage of operations by method used to handle the majority of manure in ***cow housing*** areas, by region:

	Percent Operations			
	Region			
	West		East	
Handling Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Manure left on pasture	6.1	(2.5)	5.6	(1.4)
Drylot scraped	38.2	(5.9)	7.3	(1.5)
Gutter cleaner	0.0	(0.0)	47.0	(3.2)
Alley scraper (mechanical or tractor)	23.4	(5.1)	30.7	(2.6)
Alley flush with fresh water	1.7	(1.2)	0.1	(0.1)
Alley flush with recycled water	21.0	(4.4)	0.7	(0.3)
Slotted floor	1.2	(1.2)	1.5	(0.7)
Bedded pack (manure pack)	2.8	(2.0)	3.2	(1.3)
Manure vacuum	1.5	(1.1)	1.9	(1.2)
Other	4.1	(2.1)	2.0	(0.9)
Total	100.0		100.0	

The percentage of operations by primary housing type for lactating cows and manure-handling methods was predictable because facility designs are usually associated with specific manure-handling methods. More than 8 of 10 tie stall/ stanchion operations (82.5 percent) used a gutter cleaner to handle the majority of manure in cow housing areas. The predominant manure-handling method used by 72.1 percent of freestall operations was an alley scraper, and 50.3 percent of operations that housed cows in a drylot/multiple-animal outside area scraped the drylot. Of operations that used pasture as the primary housing facility/outside area for lactating cows, 40.7 percent used gutter cleaners and 27.3 percent left manure on pasture as the handling method for the majority of manure. Those pasture operations that used gutter cleaners as the method for handling the majority of manure in cow housing areas likely house cattle indoors during a particular season or inclement weather.

f. Percentage of operations by method used to handle the majority of manure in ***cow housing*** areas, by primary housing type for ***lactating cows****:*

	Percent Operations							
	Primary Housing Type							
	Tie stall/ stanchion		Freestall		Drylot/ Multiple-animal Outside Area		Pasture	
Handling Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Manure left on pasture	2.7	(1.6)	1.4	(1.1)	12.4	(8.0)	27.3	(8.6)
Drylot scraped	3.1	(1.5)	11.6	(2.8)	50.3	(12.8)	11.6	(5.4)
Gutter cleaner	82.5	(3.8)	1.2	(0.8)	0.0	(--)	40.7	(11.6)
Alley scraper (mechanical or tractor)	4.3	(2.0)	72.1	(3.5)	2.1	(1.5)	11.4	(4.8)
Alley flush with fresh water	0.0	(--)	0.4	(0.3)	1.2	(1.2)	0.0	(--)
Alley flush with recycled water	0.0	(--)	6.2	(1.3)	1.4	(1.4)	2.2	(2.2)
Slotted floor	0.7	(0.7)	3.1	(1.5)	0.0	(--)	0.0	(--)
Bedded pack (manure pack)	0.0	(--)	1.3	(0.8)	32.6	(14.3)	6.8	(6.4)
Manure vacuum	3.7	(2.3)	0.5	(0.3)	0.0	(--)	0.0	(--)
Other	3.0	(1.5)	2.2	(1.1)	0.0	(--)	0.0	(--)
Total	100.0		100.0		100.0		100.0	

More than 75 percent of operations left manure on pasture or scraped a drylot as a manure-handling method for weaned-heifer and cow housing areas. Bedded packs were used in heifer areas on 60.6 percent of operations and in cow areas on 40.0 percent of operations. Alley scrapers were used by a similar percentage of operations for heifer (47.3 percent) and cow (54.9 percent) housing areas. Gutter cleaners were more frequently used in cow housing than in heifer housing (58.0 and 23.6 percent, respectively). Less than 10 percent of operations used alley flush with fresh or recycled water, slotted floor, or a manure vacuum for managing manure.

g. Percentage of operations by all manure-handling methods used in weaned-heifer and cow housing areas:

	Percent Operations			
	Weaned-heifer Housing Area*		Cow Housing Area	
Handling Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Manure left on pasture	88.5	(1.9)	85.3	(2.3)
Drylot scraped	75.3	(3.1)	82.5	(2.5)
Gutter cleaner	23.6	(2.8)	58.0	(2.5)
Alley scraper (mechanical or tractor)	47.3	(3.1)	54.9	(2.9)
Alley flush with fresh water	1.0	(0.4)	1.5	(0.4)
Alley flush with recycled water	3.5	(0.7)	5.0	(0.8)
Slotted floor	4.9	(1.2)	6.2	(1.2)
Bedded pack (manure pack)	60.6	(3.0)	40.0	(2.9)
Manure vacuum	0.6	(0.2)	1.5	(0.8)
Other	6.5	(1.7)	5.3	(1.5)

*For operations that housed weaned heifers.

3. Waste storage and treatment systems

To store or treat waste, more than one-half of operations used a manure pack inside a barn (56.1 percent), while more than 40 percent used a manure spreader to store manure (46.1 percent) or outside storage for solid manure not in drylot or pen (42.5 percent). A higher percentage of small and medium operations stored manure in a spreader (50.4 and 44.0 percent, respectively) or as a manure pack inside a barn (55.8 and 63.4 percent, respectively), compared with large operations (9.7 and 31.0 percent, respectively). Conversely, a lower

percentage of small operations stored manure untreated in an earthen basin (24.4 percent), compared with medium operations (45.7 percent), or in a treatment lagoon that was not mechanically aerated (3.2 percent), compared with medium and large operations (12.3 and 49.7 percent, respectively). A higher percentage of large operations (36.2 percent) used a solid separator than medium or small operations (3.2 and 0.3 percent, respectively).

a. Percentage of operations by waste storage and/or treatment system used, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
System	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Stored in manure spreader	50.4	(3.9)	44.0	(4.3)	9.7	(3.7)	46.1	(2.9)
Below-floor slurry or deep pit	8.5	(2.0)	18.3	(3.2)	18.8	(4.3)	11.6	(1.6)
Slurry stored in tank	9.6	(2.2)	21.6	(3.6)	11.7	(3.4)	12.7	(1.8)
Slurry or liquid manure stored in earthen basin and NOT treated	24.4	(3.3)	45.7	(4.2)	43.1	(6.2)	30.9	(2.6)
Treatment lagoon–NOT mechanically aerated	3.2	(0.9)	12.3	(2.7)	49.7	(6.2)	8.5	(1.1)
Treatment lagoon–mechanically aerated	1.0	(0.6)	0.6	(0.4)	18.7	(4.9)	2.1	(0.5)
Manure pack (inside barn)	55.8	(3.9)	63.4	(4.2)	31.0	(4.4)	56.1	(2.9)
Outside storage for solid manure NOT in drylot or pen	44.0	(4.0)	32.4	(3.9)	65.2	(5.9)	42.5	(3.0)
Outside storage for solid manure within drylot or pen	24.0	(3.4)	20.9	(3.6)	29.1	(5.5)	23.5	(2.5)
Storage of solid manure in a building without cattle access	2.7	(1.1)	9.2	(2.3)	8.6	(4.0)	4.7	(1.0)
Storage of solid manure with picket dam	3.1	(1.3)	3.1	(1.1)	3.9	(2.3)	3.2	(0.9)
Composted	11.3	(2.7)	6.6	(2.1)	26.4	(5.4)	11.1	(2.0)
Collection of methane/biogas	0.0	(--)	0.2	(0.2)	0.9	(0.5)	0.1	(0.0)
Solid separator	0.3	(0.3)	3.2	(1.0)	36.2	(6.1)	3.4	(0.5)
Other system	4.5	(1.7)	2.9	(1.5)	7.4	(2.9)	4.3	(1.2)

A higher percentage of operations in the West region compared with the East region stored or treated manure in a treatment lagoon, mechanically aerated or not; in outside storage, either within a drylot or pen or outside the pen; or with a solid separator system. A lower percentage of operations in the West region used a manure spreader (7.5 percent) or manure pack (12.4 percent) to store manure, compared with operations in the East region (49.9 and 60.4 percent, respectively).

b. Percentage of operations by waste storage and/or treatment system used, by region:

	Percent Operations			
	Region			
	West		East	
System	Pct.	Std. Error	Pct.	Std. Error
Stored in manure spreader	7.5	(2.5)	49.9	(3.1)
Below-floor slurry or deep pit	16.9	(3.8)	11.1	(1.7)
Slurry stored in tank	11.8	(3.9)	12.8	(2.0)
Slurry or liquid manure stored in earthen basin and NOT treated	44.1	(5.4)	29.7	(2.8)
Treatment lagoon–NOT mechanically aerated	49.5	(5.4)	4.5	(1.0)
Treatment lagoon–mechanically aerated	15.6	(4.0)	0.7	(0.4)
Manure pack (inside barn)	12.4	(3.3)	60.4	(3.1)
Outside storage for solid manure NOT in drylot or pen	65.5	(5.6)	40.2	(3.2)
Outside storage for solid manure within drylot or pen	43.1	(5.1)	21.6	(2.7)
Storage of solid manure in a building without cattle access	13.7	(4.0)	3.8	(1.0)
Storage of solid manure with picket dam	7.5	(3.0)	2.7	(1.0)
Composted	17.0	(3.9)	10.5	(2.1)
Collection of methane/biogas	0.5	(0.4)	0.1	(0.0)
Solid separator	28.8	(4.9)	0.9	(0.3)
Other system	4.0	(2.0)	4.3	(1.3)

Approximately 4 of 10 operations (42.0 percent) stored and/or treated only solid manure, while 58.0 percent stored and treated both solid and liquid manure. Storage and treatment of manure differed by herd size. The percentage of operations that stored and treated only solid manure decreased as herd size increased, from 52.4 percent of small operations to 0.2 percent of large operations.

c. Percentage of operations that stored and/or treated solid manure only or both solid and liquid manure, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Manure Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Solid only	52.4	(3.9)	24.5	(3.7)	0.2	(0.1)	42.0	(2.9)
Both solid and liquid	47.6	(3.9)	75.5	(3.7)	99.8	(0.1)	58.0	(2.9)
Total	100.0		100.0		100.0		100.0	

Almost all operations in the West region (96.0 percent) stored and/or treated both solid and liquid manure, compared with 54.3 percent of operations in the East region.

d. Percentage of operations that stored and/or treated solid manure only or both solid and liquid manure, by region:

	Percent Operations			
	Region			
	West		**East**	
Manure Type	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Solid only	4.0	(1.7)	45.7	(3.1)
Both solid and liquid	96.0	(1.7)	54.3	(3.1)
Total	100.0		100.0	

More than 4 of 10 operations (43.0 percent) used a manure spreader to store the majority of solid manure. About one-fifth of operations used a manure pack (19.6 percent) or outside storage not in drylot or pen (19.0 percent) as the storage or treatment system for the majority of solid manure. A higher percentage of small and medium operations (48.5 and 37.7 percent, respectively) than large operations (4.1 percent) stored solid manure in a manure spreader. A higher percentage of large operations used outside storage for solid manure either outside of (45.8 percent) or within a drylot or pen (22.0 percent) compared with medium (21.3 and 6.6 percent, respectively) or small operations (15.6 and 9.6 percent, respectively).

e. Percentage of operations by waste storage and/or treatment system used for the majority of ***solid*** manure, and by herd size:

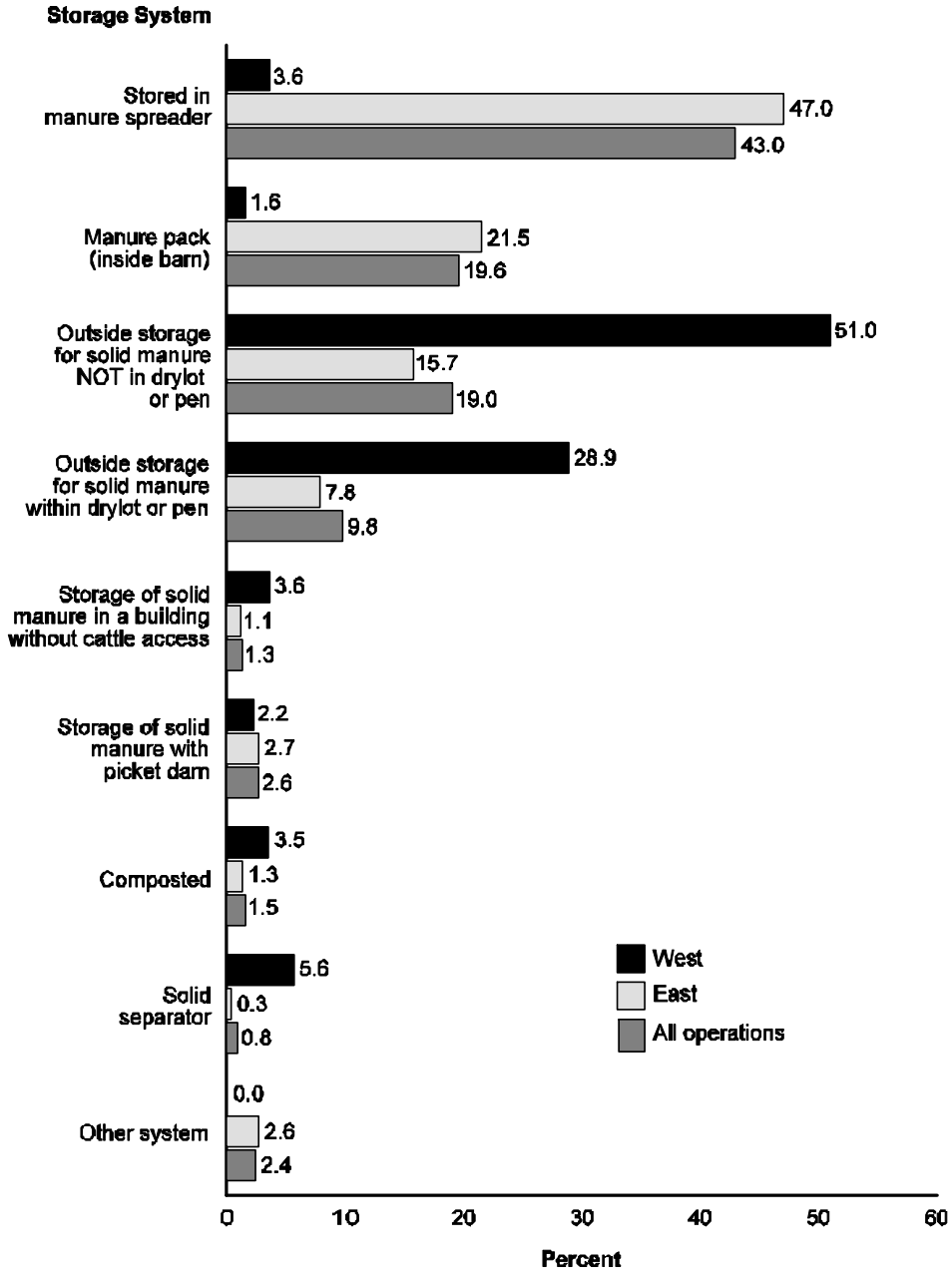
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
System	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Stored in manure spreader	48.5	(4.2)	37.7	(4.9)	4.1	(3.3)	43.0	(3.2)
Manure pack (inside barn)	18.1	(3.2)	27.2	(4.4)	9.6	(3.2)	19.6	(2.5)
Outside storage for solid manure NOT in drylot or pen	15.6	(2.7)	21.3	(3.6)	45.8	(7.1)	19.0	(2.1)
Outside storage for solid manure within drylot or pen	9.6	(2.2)	6.6	(2.1)	22.0	(5.7)	9.8	(1.7)
Storage of solid manure in a building without cattle access	0.8	(0.5)	3.1	(1.2)	0.7	(0.3)	1.3	(0.5)
Storage of solid manure with picket dam	3.5	(1.7)	0.0	(0.0)	2.9	(2.2)	2.6	(1.2)
Composted	1.0	(0.9)	1.9	(1.1)	6.0	(2.8)	1.5	(0.7)
Solid separator	0.0	(0.0)	1.2	(0.7)	7.7	(3.7)	0.8	(0.3)
Other system	2.9	(1.6)	1.0	(0.8)	1.2	(0.7)	2.4	(1.2)
Total	100.0		100.0		100.0		100.0	

More than one-half of operations in the West region (51.0 percent) stored solid manure outside but not in a drylot or pen. Almost 3 of 10 operations in the West region (28.9 percent) stored solid manure outside within a drylot or pen. In the East region, the majority of solid manure was stored in a manure spreader on 47.0 percent of operations and as a manure pack on 21.5 percent of operations.

f. Percentage of operations by waste storage and/or treatment system used for the majority of ***solid*** manure, by region:

	Percent Operations			
	Region			
	West		East	
System	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Stored in manure spreader	3.6	(2.0)	47.0	(3.4)
Manure pack (inside barn)	1.6	(1.6)	21.5	(2.7)
Outside storage for solid manure NOT in drylot or pen	51.0	(6.1)	15.7	(2.2)
Outside storage for solid manure within drylot or pen	28.9	(5.3)	7.8	(1.8)
Storage of solid manure in a building without cattle access	3.6	(1.9)	1.1	(0.5)
Storage of solid manure with picket dam	2.2	(1.6)	2.7	(1.3)
Composted	3.5	(2.1)	1.3	(0.8)
Solid separator	5.6	(2.7)	0.3	(0.2)
Other system	0.0	(0.0)	2.6	(1.3)
Total	100.0		100.0	

Percentage of Operations by Waste Storage and/or Treatment System Used for the Majority of Solid Manure, and by Region



Almost one-half of operations that stored and/or treated liquid or slurry manure stored the majority of manure in an earthen basin without treatment (49.4 percent). More than 10 percent of operations stored liquid or slurry manure in a tank (16.7 percent), in a below-floor slurry or deep pit (13.4 percent), or in a treatment lagoon that was not mechanically aerated (11.8 percent). Compared with large operations, a higher percentage of small operations used a below-floor slurry or deep pit. Compared with large operations, a higher percentage of small and medium operations stored slurry or liquid manure that was not treated in an earthen basin. A treatment lagoon—mechanically aerated or not—was used on a higher percentage of large operations compared with medium or small operations.

g. For the 58.0 percent of operations that stored and/or treated both solid and liquid manure, percentage of operations by waste storage and treatment system used for the majority of ***liquid or slurry*** manure, and by herd size:

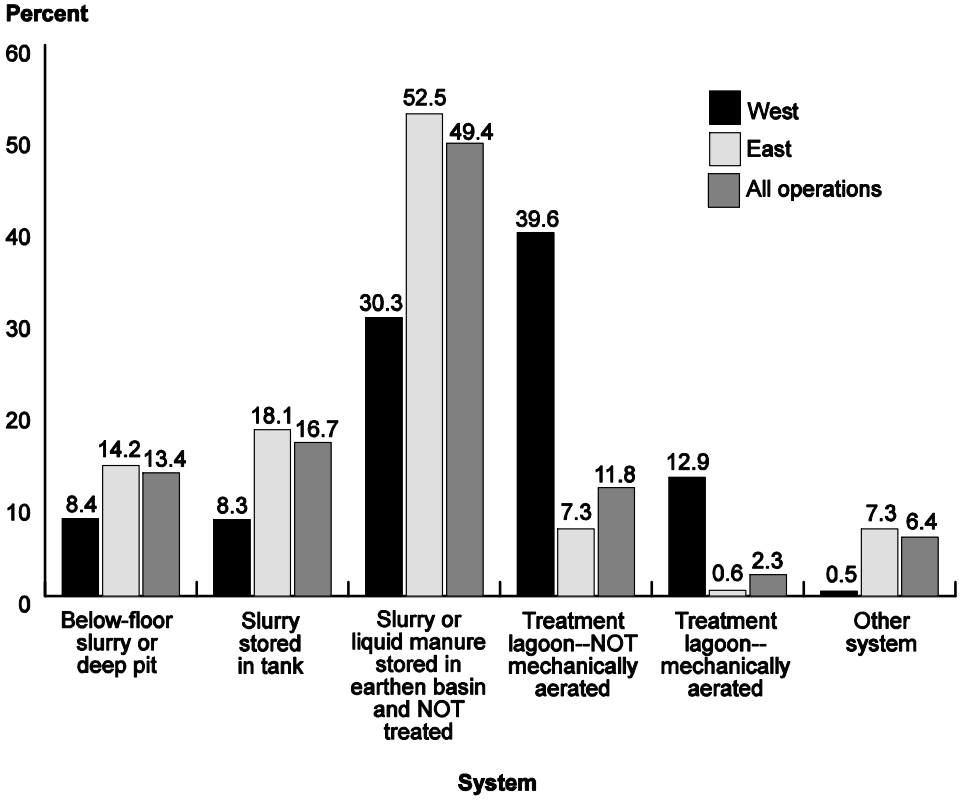
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
System	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Below-floor slurry or deep pit	16.6	(4.0)	11.2	(3.2)	3.0	(1.4)	13.4	(2.5)
Slurry stored in tank (either above or below ground)	17.3	(4.2)	18.4	(3.9)	7.5	(2.6)	16.7	(2.7)
Slurry or liquid manure stored in earthen basin and NOT treated	50.6	(5.5)	53.8	(5.0)	26.9	(5.1)	49.4	(3.6)
Treatment lagoon–NOT mechanically aerated	5.1	(1.6)	13.5	(3.5)	44.5	(6.6)	11.8	(1.7)
Treatment lagoon–mechanically aerated	1.1	(0.6)	0.5	(0.5)	15.4	(5.2)	2.3	(0.7)
Other system	9.3	(3.6)	2.6	(1.9)	2.7	(1.4)	6.4	(2.1)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region used treatment lagoons, either not mechanically aerated (39.6 percent of operations) or mechanically aerated (12.9 percent), for the majority of liquid or slurry manure, compared with operations in the East region (7.3 and 0.6 percent, respectively). More than one-half of operations in the East region (52.5 percent) stored the majority of liquid or slurry manure untreated in an earthen basin, compared with 30.3 percent of operations in the West region.

h. For the 58.0 percent of operations that stored and/or treated both solid and liquid manure, percentage of operations by waste storage and treatment system used for the majority of ***liquid or slurry*** manure, by region:

	Percent Operations			
	Region			
	West		**East**	
System	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Below-floor slurry or deep pit	8.4	(3.3)	14.2	(2.9)
Slurry stored in tank (either above or below ground)	8.3	(3.9)	18.1	(3.1)
Slurry or liquid manure stored in earthen basin and NOT treated	30.3	(4.5)	52.5	(4.1)
Treatment lagoon–NOT mechanically aerated	39.6	(5.6)	7.3	(1.7)
Treatment lagoon–mechanically aerated	12.9	(4.1)	0.6	(0.4)
Other system	0.5	(0.5)	7.3	(2.5)
Total	100.0		100.0	

For the 58.0 Percent of Operations that Stored and/or Treated Both Solid and Liquid Manure, Percentage of Operations by Waste Storage and Treatment System Used for the Majority of Liquid or Slurry Manure, and by Region



4. Maximum manure storage capacity

Producers were asked the following: “Assuming your facility was completely emptied of manure and was operating at full animal capacity, how many days could you operate and store manure before the manure had to be removed from the storage facility?” Overall, 27.7 percent of operations had fewer than 7 days of manure storage capacity and 59.5 percent had 90 days or more. Manure storage capacity tended to increase as herd size increased. For example, the percentage of operations that had 90 days or more of manure storage capacity ranged from 53.9 percent of small operations to 87.6 percent of large operations.

Percentage of operations by maximum manure storage capacity (in days), and by herd size (table revised 6/11/2009):

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Capacity (Days)	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Fewer than 7	32.6	(3.7)	21.7	(3.6)	0.2	(0.2)	27.7	(2.7)
7 to 29	8.2	(2.4)	4.1	(1.8)	6.3	(3.4)	7.1	(1.7)
30 to 59	2.4	(0.9)	4.0	(1.5)	2.9	(1.5)	2.9	(0.7)
60 to 89	2.9	(1.2)	2.6	(1.3)	3.0	(2.0)	2.8	(0.9)
90 to 179	10.8	(2.2)	16.7	(3.2)	15.7	(4.5)	12.6	(1.7)
180 to 364	26.4	(3.4)	37.4	(4.3)	32.3	(5.7)	29.5	(2.6)
365 or more	16.7	(3.0)	13.5	(3.0)	39.6	(6.3)	17.4	(2.2)
Total	100.0		100.0		100.0		100.0	

Photo courtesy of Dr. Jason Lombard

5. Manure use

Almost all operations applied manure—solid or liquid or both—to land either owned or rented (99.1 percent). A higher percentage of large operations sold manure or received other compensation, gave manure away, or used composted manure as bedding compared with small operations.

a. Percentage of operations by method of manure use, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Applied manure to land either owned or rented	99.5	(0.5)	99.6	(0.4)	93.8	(3.4)	99.1	(0.4)
Sold manure or received other compensation	4.9	(1.7)	7.2	(2.1)	28.9	(5.8)	7.1	(1.3)
Gave manure away	13.9	(2.7)	20.7	(3.5)	32.3	(5.5)	16.8	(2.0)
Used composted manure as bedding	3.5	(1.9)	1.7	(0.8)	35.7	(5.8)	5.1	(1.4)
Other	0.3	(0.3)	2.3	(1.1)	2.0	(1.8)	0.9	(0.4)

A higher percentage of operations in the West region sold manure or received other compensation (20.6 percent), gave manure away (44.8 percent), or used composted manure as bedding (26.4 percent) compared with operations in the East region.

b. Percentage of operations by method of manure use, by region:

	Percent Operations			
	Region			
	West		East	
Method	Percent	Std. Error	Percent	Std. Error
Applied manure to land either owned or rented	94.5	(2.7)	99.6	(0.4)
Sold manure or received other compensation	20.6	(4.5)	5.7	(1.4)
Gave manure away	44.8	(5.2)	14.0	(2.2)
Used composted manure as bedding	26.4	(4.5)	3.1	(1.4)
Other	4.6	(2.4)	0.5	(0.3)

For operations that used solid or liquid manure, the majority of manure, whether solid or liquid, was applied to land either rented or owned.

c. Percentage of operations by method of use for the majority of manure, by manure type:

	Percent Operations			
	Manure Type			
	Solid		Liquid or Slurry	
Method	Percent	Std. Error	Percent	Std. Error
Applied manure to land either owned or rented	97.4	(0.6)	98.6	(0.5)
Sold manure or received other compensation	0.8	(0.4)	0.3	(0.2)
Gave manure away	0.6	(0.3)	0.6	(0.3)
Used composted manure as bedding	0.7	(0.3)	0.0	(--)
Other	0.5	(0.2)	0.5	(0.3)
Total	100.0		100.0	

6. Manure application

More than 9 of 10 operations (91.5 percent) used a broadcast/solid spreader to apply manure to land. Surface application was used by 34.6 percent of small operations, 57.5 percent of medium operations, and 40.3 percent of large operations. More than one-half of large operations (56.5 percent) used irrigation/sprinkler to apply manure, compared with only 1.3 percent of small and 11.6 percent of medium operations.

a. For the 99.1 percent of operations that applied manure to land, percentage of operations by manure application method used, and by herd size:

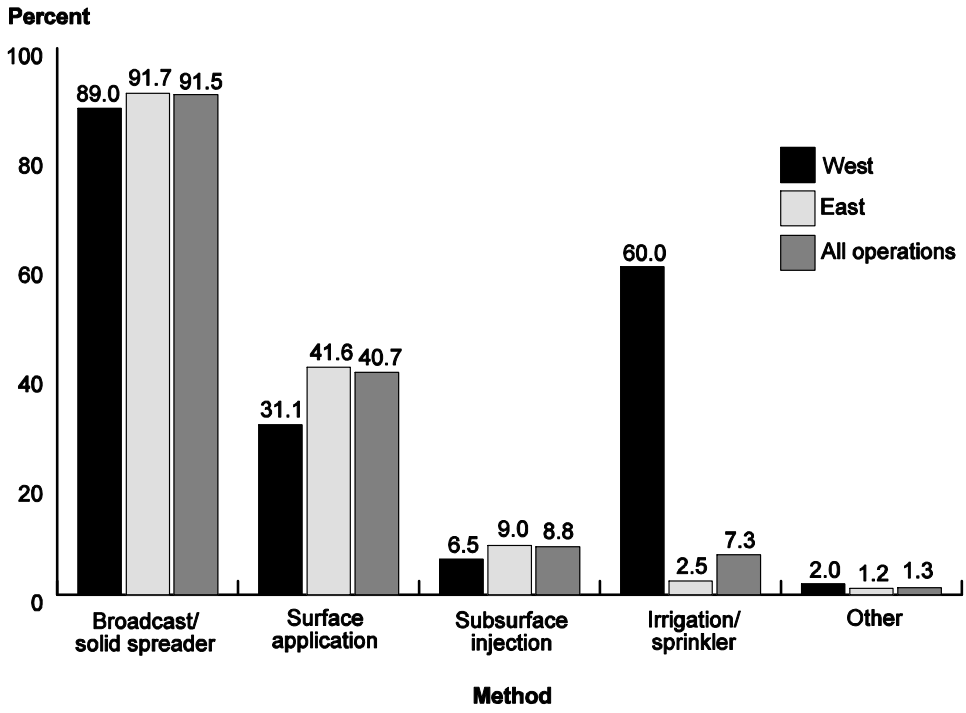
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Broadcast/ solid spreader	92.4	(2.2)	90.2	(2.8)	86.8	(4.2)	91.5	(1.7)
Surface application	34.6	(3.7)	57.5	(4.2)	40.3	(5.4)	40.7	(2.8)
Subsurface injection	5.5	(1.7)	16.4	(3.3)	14.3	(3.5)	8.8	(1.5)
Irrigation/ sprinkler	1.3	(0.5)	11.6	(2.1)	56.5	(6.3)	7.3	(0.8)
Other	1.0	(0.9)	1.7	(0.8)	2.4	(1.6)	1.3	(0.7)

A higher percentage of operations in the West region applied manure using irrigation/sprinkler compared with operations in the East region.

b. For the 99.1 percent of operations that applied manure to land, percentage of operations by manure application method used, by region:

	Percent Operations			
	Region			
	West		**East**	
Method	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Broadcast/solid spreader	89.0	(3.6)	91.7	(1.8)
Surface application	31.1	(5.8)	41.6	(3.1)
Subsurface injection	6.5	(2.5)	9.0	(1.6)
Irrigation/sprinkler	60.0	(5.1)	2.5	(0.5)
Other	2.0	(1.4)	1.2	(0.7)

For the 99.1 Percent of Operations that Applied Manure to Land, Percentage of Operations by Manure Application Method Used, and by Region



Overall, 22.0 percent of operations that applied manure to land always or almost always incorporated it into the soil within 24 hours of application, with 52.7 percent of large operations using this practice. Manure was sometimes incorporated within 24 hours on 42.0 percent of operations, and 36.0 percent of operations never incorporated manure into the soil.

c. For the 99.1 percent of operations that applied manure to land, percentage of operations by frequency that manure was incorporated into soil within 24 hours after application, including subsurface injection, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Frequency	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Always or almost always	18.5	(2.8)	24.1	(3.8)	52.7	(6.3)	22.0	(2.2)
Sometimes	43.2	(4.0)	41.4	(4.5)	31.3	(5.6)	42.0	(3.0)
Never	38.3	(4.0)	34.5	(4.1)	16.0	(5.0)	36.0	(2.9)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region (40.1 percent) always or almost always incorporated manure into the soil within 24 hours of application, compared with operations in the East region (20.3 percent). A higher percentage of operations in the East region (37.5 percent) than in the West region (19.4 percent) never incorporated manure into the soil.

d. For the 99.1 percent of operations that applied manure to land, percentage of operations by frequency that manure was incorporated into soil within 24 hours after application, including subsurface injection, by region:

	Percent Operations			
	Region			
	West		East	
Frequency	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Always or almost always	40.1	(5.3)	20.3	(2.4)
Sometimes	40.5	(5.2)	42.2	(3.2)
Never	19.4	(4.1)	37.5	(3.2)
Total	100.0		100.0	

Photo Courtesy of “Dairy Herd Management”/ “Bovine Veterinarian”

About one-fourth of operations analyzed manure for nitrogen, phosphorus, or potassium during the previous 12 months. A lower percentage of small operations analyzed manure (less than 18.0 percent) compared with medium or large operations (42.9 and 60.3 percent, respectively).

e. For the 99.1 percent of operations that applied manure to land, percentage of operations that analyzed manure for the following nutrients during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Nutrient	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Nitrogen	17.9	(3.0)	42.9	(4.4)	60.3	(6.0)	26.9	(2.4)
Phosphorus	17.3	(2.9)	42.9	(4.4)	60.3	(6.0)	26.4	(2.3)
Potassium	17.3	(2.9)	42.9	(4.4)	60.3	(6.0)	26.4	(2.3)

There were no regional differences in the percentage of operations that analyzed nutrient content of manure.

f. For the 99.1 percent of operations that applied manure to land, percentage of operations that analyzed manure for the following nutrients during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		**East**	
Nutrient	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Nitrogen	39.4	(5.0)	25.7	(2.5)
Phosphorus	39.4	(5.0)	25.2	(2.5)
Potassium	39.4	(5.0)	25.2	(2.5)

The criteria operations used most commonly to determine frequency and quantity of manure application were based on soil quality improvement (70.7 percent of operations) and manure volume/acreage available (70.3 percent of operations). About 50 percent of operations used crop requirement for nitrogen or phosphorous to determine application rate and frequency, even though only about one-fourth of operations reported analyzing manure for these nutrients during the previous 12 months (see table 6e. on p 151). The only herd-size difference was that a higher percentage of medium operations (61.6 percent) than small operations (44.3 percent) used the crop phosphorus requirement in determining manure application rates. Criteria used for determining how much or how frequently manure is applied to the land did not differ by region.

g. For the 99.1 percent of operations that applied manure to land, percentage of operations by criteria used to determine how much or how frequently manure is applied to the land, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Criteria	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Crop nitrogen requirement	52.9	(4.1)	65.2	(4.4)	58.6	(6.4)	56.3	(3.0)
Crop phosphorus requirement	44.3	(4.1)	61.6	(4.4)	52.9	(6.2)	49.2	(3.1)
Manure volume/acreage available	69.3	(3.8)	75.1	(3.9)	61.8	(6.5)	70.3	(2.8)
Soil quality improvement	73.1	(3.6)	65.5	(4.4)	65.5	(6.4)	70.7	(2.8)
Other	6.8	(2.1)	5.4	(2.3)	2.7	(1.3)	6.2	(1.5)

Manure was applied to land fewer than 100 feet from surface water on 24.4 percent of operations and 1,000 feet or more on 30.8 percent of operations. A higher percentage of operations in the West region applied manure 1,000 feet or more from surface water (52.1 percent) compared with 28.8 percent of operations in the East region. Alternatively, a higher percentage of operations in the East region applied manure 200 to 499 feet from surface water (21.8 percent) compared with the West region (4.5 percent).

h. For the 99.1 percent of operations that applied manure to land, percentage of operations by minimum distance (in feet) between location of manure application and surface water, such as a lake, pond, stream, or river, and by region:

	Percent Operations					
	Region					
	West		East		All Operations	
Distance (Feet)	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Fewer than 100	23.4	(4.7)	24.5	(2.7)	24.4	(2.5)
100 to 199	14.6	(3.8)	16.9	(2.3)	16.7	(2.2)
200 to 499	4.5	(2.3)	21.8	(2.7)	20.3	(2.5)
500 to 999	5.4	(2.4)	8.0	(1.8)	7.8	(1.7)
1,000 or more	52.1	(5.3)	28.8	(3.1)	30.8	(2.9)
Total	100.0		100.0		100.0	

More than 9 of 10 operations (94.2 percent) spread solid manure on land, whereas about two-thirds of operations (66.3 percent) applied liquid manure. The percentage of operations that applied liquid manure increased as herd size increased, from 56.9 percent of small operations to 94.6 percent of large operations.

i. Percentage of all operations that applied solid or liquid manure to land, and by herd size:

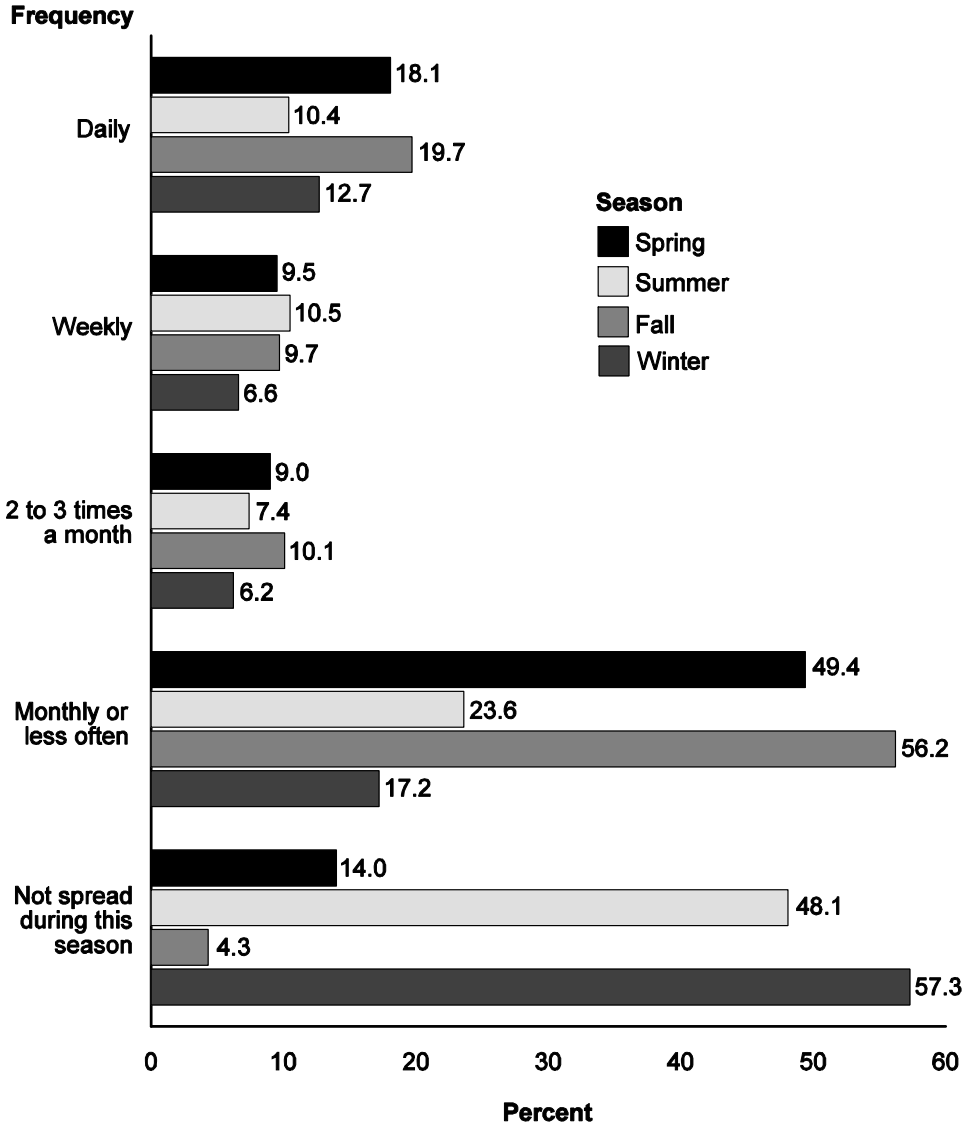
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Manure Type	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Solid	93.9	(2.2)	96.1	(1.8)	89.5	(4.0)	94.2	(1.6)
Liquid	56.9	(4.0)	84.8	(3.4)	94.6	(3.0)	66.3	(2.9)

Operations spread liquid or slurry manure more often during spring or fall than summer or winter. About 50 percent of operations did not apply liquid manure during the summer (48.1 percent) or winter (57.3 percent).

j. For the 66.3 percent of operations that applied ***liquid*** manure to land, percentage of operations by frequency that liquid manure was applied to owned or rented land, by season:

	Percent Operations							
	Season							
	Spring		**Summer**		**Fall**		**Winter**	
Frequency	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Daily	18.1	(2.7)	10.4	(2.1)	19.7	(2.8)	12.7	(2.4)
Weekly	9.5	(2.0)	10.5	(2.2)	9.7	(2.0)	6.6	(1.8)
2 to 3 times a month	9.0	(1.6)	7.4	(1.3)	10.1	(1.7)	6.2	(1.4)
Monthly or less often	49.4	(3.4)	23.6	(2.4)	56.2	(3.4)	17.2	(2.2)
Not spread during this season	14.0	(2.7)	48.1	(3.4)	4.3	(1.0)	57.3	(3.3)
Total	100.0		100.0		100.0		100.0	

For the 66.3 Percent of Operations that Applied Liquid Manure to Land, Percentage of Operations by Frequency that Liquid Manure was Applied to Owned or Rented Land, by Season

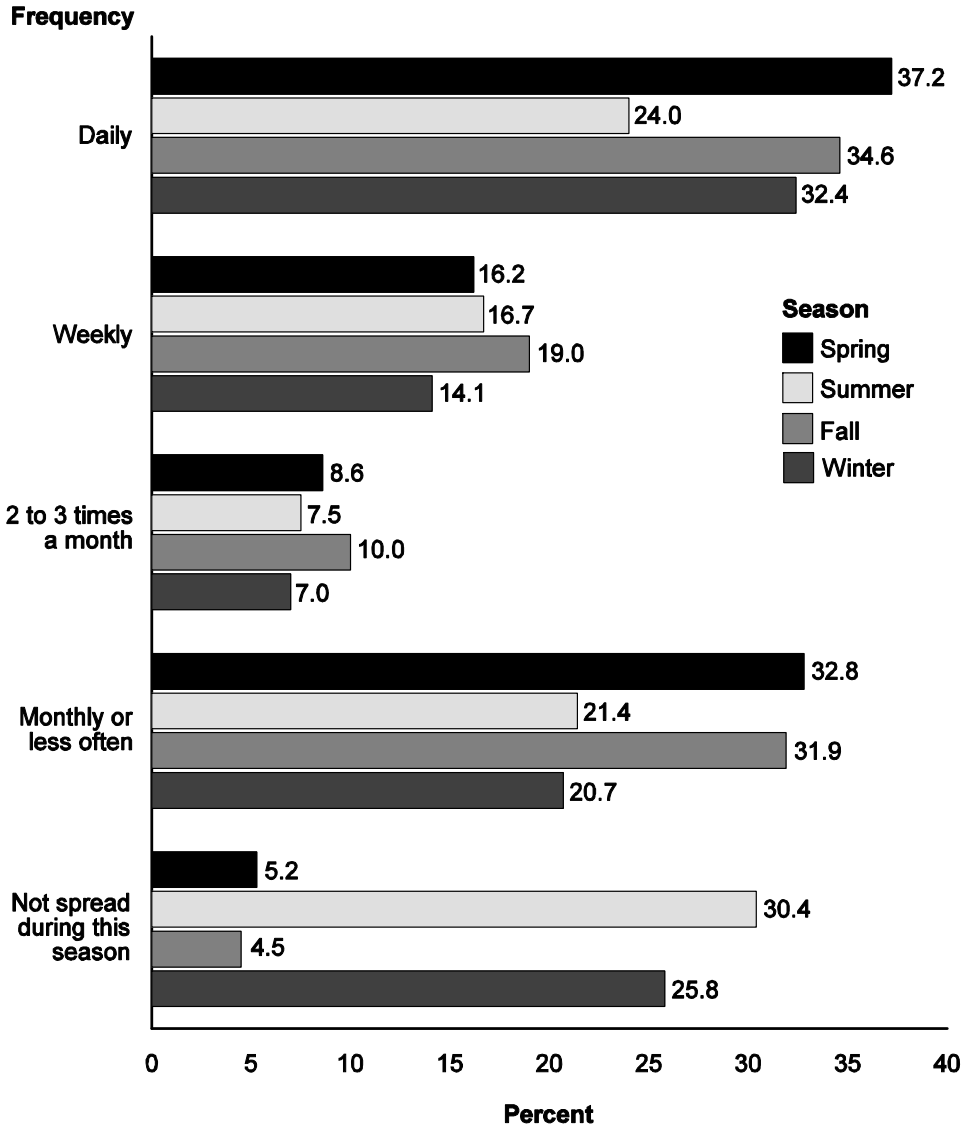


Operations also spread solid manure more commonly in spring or fall than summer or winter. During spring, 37.2 percent of operations spread solid manure on a daily basis. About 30 percent of operations did not spread solid manure in summer (30.4 percent) or winter (25.8 percent).

k. For the 94.2 percent of operations that applied ***solid*** manure to land, percentage of operations by frequency that solid manure was applied to owned or rented land, by season:

	Percent Operations							
	Season							
	Spring		Summer		Fall		Winter	
Frequency	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Daily	37.2	(3.0)	24.0	(2.7)	34.6	(3.0)	32.4	(2.9)
Weekly	16.2	(2.3)	16.7	(2.5)	19.0	(2.5)	14.1	(2.2)
2 to 3 times a month	8.6	(1.6)	7.5	(1.5)	10.0	(1.7)	7.0	(1.5)
Monthly or less often	32.8	(2.7)	21.4	(2.2)	31.9	(2.6)	20.7	(2.1)
Not spread during this season	5.2	(1.1)	30.4	(2.8)	4.5	(1.1)	25.8	(2.4)
Total	100.0		100.0		100.0		100.0	

For the 94.2 Percent of Operations that Applied Solid Manure to Land, Percentage of Operations by Frequency that Solid Manure was Applied to Owned or Rented Land, by Season



The practice of spreading manure on growing crops and then feeding those crops to livestock can spread disease from pathogens in the manure. Pathogens on dairy operations that potentially could be spread through grazing on manure-fertilized forages include *E. coli* O157:H7, *Salmonella* spp., and *Mycobacterium avium* subspecies *paratuberculosis* (MAP). Of these pathogens, MAP appears to be the most persistent, surviving for 6 months on pasture. Some methods and additives for ensiling forages appear to decrease the survival of MAP. The general recommendation is to avoid spreading manure on growing plants that will be grazed by cattle. In the case of MAP, to which young cattle appear to be more susceptible, grazing on fertilized pasture by cattle less than 1 year old is not recommended.

About one-half of operations (52.2 percent) applied manure to pasture or hay crops during the growing season. Almost two-thirds of all operations applied manure to any actively growing crops. Manure was applied to forage to be ensiled or any crops on 57.0 and 85.1 percent, respectively, of large operations.

l. Percentage of all operations that applied manure to actively growing plants by crop type, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Crop	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Pasture or hay	52.6	(4.0)	52.4	(4.4)	46.1	(6.1)	52.2	(2.9)
Forage to be ensiled	23.9	(3.3)	31.7	(3.9)	57.0	(6.3)	28.0	(2.5)
Other forage	10.9	(2.5)	16.9	(3.3)	26.1	(5.8)	13.4	(1.9)
Grain or oilseed	9.6	(2.2)	11.2	(2.5)	19.2	(5.0)	10.7	(1.7)
Other	5.3	(2.0)	0.1	(0.1)	3.1	(2.2)	3.9	(1.4)
Any	63.7	(3.9)	60.8	(4.4)	85.1	(4.2)	64.4	(2.9)

A higher percentage of operations in the West region applied manure to forage to be ensiled (47.9 percent), other forage crops (27.7 percent), or any crops (79.4 percent) compared with operations in the East region (26.1, 12.0, and 62.9 percent, respectively).

m. Percentage of all operations that applied manure to actively growing plants by crop type, by region:

	Percent Operations			
	Region			
	West		East	
Crop	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Pasture or hay	49.7	(5.0)	52.4	(3.2)
Forage to be ensiled	47.9	(5.3)	26.1	(2.7)
Other forage	27.7	(5.2)	12.0	(2.0)
Grain or oilseed	15.7	(4.1)	10.2	(1.8)
Other	2.1	(1.7)	4.0	(1.5)
Any	79.4	(4.1)	62.9	(3.1)

7. Written nutrient management plan

About one-third of small operations (35.1 percent) had a written plan addressing nutrient management compared with 62.1 percent of medium and 62.7 percent of large operations.

a. Percentage of operations that had a written nutrient management plan addressing topics such as land treatment practices or manure storage structures, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Pct.	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
35.1	(3.8)	62.1	(4.4)	62.7	(5.9)	43.6	(2.9)

A higher percentage of operations in the West region (67.7 percent) had a written nutrient management plan than in the East region (41.3 percent).

b. Percentage of operations that had a written nutrient management plan addressing topics such as land treatment practices or manure storage structures, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
67.7	(4.9)	41.3	(3.1)

Of the operations that had a written nutrient management plan, 9 of 10 operations (89.2 percent) developed the plan in cooperation with the USDA Natural Resource Conservation Service (NRCS) or a local conservation district. Compared with medium and large operations, a higher percentage of small operations (78.0 percent) developed a plan as part of a USDA voluntary cost-share program. A higher percentage of large operations developed a plan to help satisfy a State or local regulatory requirement (86.9 percent) compared with small operations (53.7 percent).

c. For the 43.6 percent of operations that had a written nutrient management plan, percentage of operations that developed or implemented the plan in cooperation with Federal, State, or local agencies or requirements, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Plan Was…	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Developed in cooperation with the USDA Natural Resource Conservation Service (NRCS) or a local conservation district	92.2	(3.2)	88.0	(3.4)	75.9	(6.2)	89.2	(2.2)
Implemented to help satisfy a State or local regulatory requirement	53.7	(6.6)	71.0	(5.0)	86.9	(6.7)	62.9	(4.2)
Part of USDA voluntary cost-share program	78.0	(4.7)	51.2	(5.3)	34.5	(6.6)	64.5	(3.6)

A higher percentage of operations in the West region (88.4 percent) than in the East region (58.9 percent) implemented a written nutrient management plan to help satisfy a State or local regulatory requirement. A higher percentage of operations in the East region developed a plan in cooperation with the USDA NRCS or a local conservation district (92.0 percent) or as part of a USDA voluntary cost-share program (71.3 percent) compared with operations in the West region (71.4 and 20.9 percent, respectively).

d. For the 43.6 percent of operations that had a written nutrient management plan, percentage of operations that developed or implemented the plan in cooperation with Federal, State, or local agencies or requirements, by region:

	Percent Operations			
	Region			
	West		East	
Plan Was…	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Developed in cooperation with the USDA Natural Resource Conservation Service (NRCS) or a local conservation district	71.4	(7.0)	92.0	(2.3)
Implemented to help satisfy a State or local regulatory requirement	88.4	(5.2)	58.9	(4.7)
Part of USDA voluntary cost-share program	20.9	(4.8)	71.3	(3.9)

8. Waste-management consultant

More than 20 percent of operations consulted with an agronomist/crop consultant (45.2 percent), NRCS personnel (32.8 percent), or a private nutrient management consultant (23.8 percent) about waste management on their operations during the previous 12 months. Almost two-thirds (63.9 percent) of operations contacted a waste management consultant during the previous 12 months. Compared with small operations, a higher percentage of large operations consulted with a private nutrient management consultant, State or local department of natural resources or department of agriculture, consulting nutritionist, or environmental engineering consultant. Any consultant was used on a higher percentage of medium operations (82.3 percent) than small operations (56.2 percent).

a. Percentage of operations that consulted with the following people about waste management for their operations during the previous 12 months, and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Consultant	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
University/extension personnel	15.0	(2.8)	24.2	(4.0)	29.4	(5.4)	18.2	(2.2)
Private nutrient management consultant	18.7	(3.0)	31.2	(4.1)	49.3	(6.1)	23.8	(2.4)
Natural Resource Conservation Service (NRCS) personnel	27.6	(3.4)	45.2	(4.2)	41.2	(5.9)	32.8	(2.6)
State or local department of natural resources personnel	4.1	(1.4)	14.4	(2.6)	31.2	(5.5)	8.4	(1.2)
State or local department of agriculture personnel	9.1	(2.1)	18.9	(3.4)	30.4	(5.2)	12.9	(1.7)
Agronomist/crop consultant	40.5	(3.9)	56.7	(4.4)	50.7	(5.8)	45.2	(2.9)
Consulting nutritionist	12.3	(2.5)	19.8	(3.6)	35.6	(6.0)	15.7	(2.0)
Environmental engineering consultant	3.4	(1.4)	10.6	(2.9)	30.7	(5.2)	7.0	(1.3)
Private veterinary practitioner	2.2	(0.9)	5.7	(1.8)	9.4	(3.8)	3.5	(0.8)
Other	1.2	(1.0)	1.2	(0.6)	0.3	(0.2)	1.2	(0.7)
Any	56.2	(3.9)	82.3	(3.5)	74.6	(5.6)	63.9	(2.8)

A higher percentage of operations in the West region consulted with State or local departments of natural resources (19.8 percent) or agriculture personnel (32.3 percent) compared with operations in the East region (7.3 and 11.0 percent, respectively). A higher percentage of operations in the East region consulted with an agronomist/crop consultant (46.7 percent) compared with the West region (28.8 percent).

b. Percentage of operations that consulted with the following people about waste management for their operations during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Consultant	**Percent**	**Std. Error**	**Percent**	**Std. Error**
University/extension personnel	16.0	(3.6)	18.4	(2.4)
Private nutrient management consultant	29.8	(4.9)	23.2	(2.5)
Natural Resource Conservation Service (NRCS) personnel	38.0	(5.1)	32.3	(2.8)
State or local department of natural resources personnel	19.8	(4.1)	7.3	(1.3)
State or local department of agriculture personnel	32.3	(5.3)	11.0	(1.8)
Agronomist/crop consultant	28.8	(4.8)	46.7	(3.1)
Consulting nutritionist	19.0	(4.5)	15.3	(2.1)
Environmental engineering consultant	14.2	(3.4)	6.3	(1.3)
Private veterinary practitioner	3.9	(2.2)	3.5	(0.8)
Other	1.0	(1.0)	1.2	(0.7)
Any	67.1	(6.0)	63.6	(3.1)

9. Knowledge of concentrated animal feeding operation classification

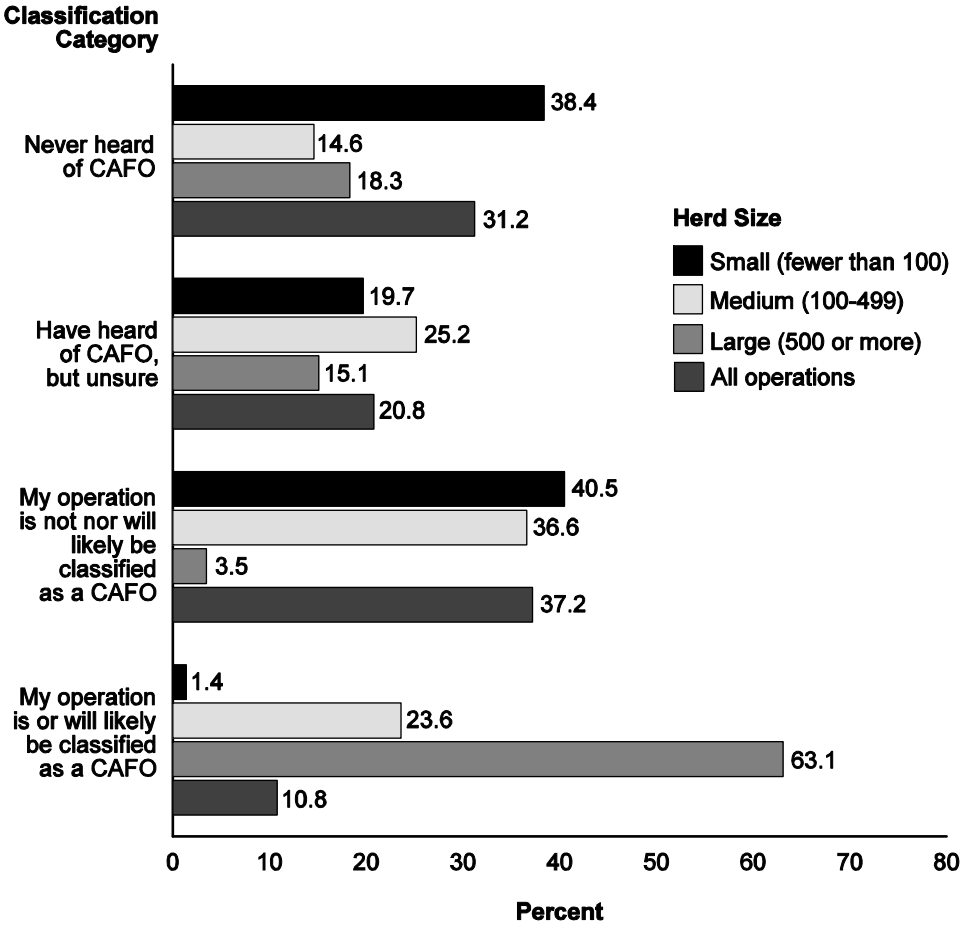
The Environmental Protection Agency (EPA) has guidelines to determine whether an operation should be classified as a concentrated animal feeding operation (CAFO). An operation with 200 to 699 mature cows can be designated a CAFO by the permitting authority or by regulatory definition if the operation meets one of the medium category discharge criteria. Large CAFOs have at least 700 mature cows, with no other criteria. Additionally, an operation that is not classified as a CAFO by size can be designated a CAFO by the permitting authority if the operation is a significant contributor of pollutants to surface water.

Producers were asked how their operation is or would be classified under current Federal EPA guidelines regarding CAFOs. A higher percentage of small and medium operations were not nor would likely be classified as CAFOs (40.5 and 36.6 percent, respectively) compared with large operations (3.5 percent). Almost two-thirds of large operations (63.1 percent) were or would likely be classified as CAFOs, compared with 23.6 percent of medium operations and 1.4 percent of small operations. Overall, 37.2 percent of operations were not considered to be CAFOs and 10.8 percent were considered to be CAFOs.

a. Percentage of operations by actual or perceived classification under current Federal EPA guidelines regarding concentrated animal feeding operations (CAFOs), and by herd size:

	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Classification Category	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Never heard of CAFO	38.4	(3.9)	14.6	(3.3)	18.3	(5.1)	31.2	(2.8)
Have heard of CAFO, but unsure	19.7	(3.5)	25.2	(4.1)	15.1	(4.9)	20.8	(2.7)
My operation is not nor will likely be classified as a CAFO	40.5	(3.7)	36.6	(4.2)	3.5	(1.4)	37.2	(2.8)
My operation is or will likely be classified as a CAFO	1.4	(0.8)	23.6	(3.7)	63.1	(6.3)	10.8	(1.3)
Total	100.0		100.0		100.0		100.0	

Percentage of Operations by Actual or Perceived Classification Under Current Federal EPA Guidelines Regarding Concentrated Animal Feeding Operations (CAFOs), and by Herd Size



A higher percentage of operations in the West region were or were likely to be classified as CAFOs than in the East region (35.2 and 8.5 percent, respectively).

b. Percentage of operations by actual or perceived classification under current Federal EPA guidelines regarding concentrated animal feeding operations (CAFOs), by region:

	Percent Operations			
	Region			
	West		East	
Classification Category	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Never heard of CAFO	21.8	(4.7)	32.1	(3.1)
Have heard of CAFO, but unsure	14.5	(4.0)	21.3	(2.9)
My operation is not nor will likely be classified as a CAFO	28.5	(4.4)	38.1	(3.0)
My operation is or will likely be classified as a CAFO	35.2	(4.8)	8.5	(1.3)
Total	100.0		100.0	

Section II: Methodology

A. Needs Assessment

NAHMS develops study objectives by exploring existing literature and contacting industry members and other stakeholders about their informational needs and priorities during a needs-assessment phase. The objective of the needs assessment for the NAHMS Dairy 2007 study was to conduct a national survey 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 researchers to receive as much input as possible from a variety of producers, industry experts and representatives, veterinarians, extension specialists, universities, and dairy organizations. Information was collected via focus groups and through a Needs-Assessment Survey.

Focus group teleconferences and meetings were held to help determine the focus of the study.

Teleconference, March 30, 2006
National Johne's Working Group

Meeting, Louisville, KY, April 2, 2006
National Johne's Working Group
National Institute for Animal Agriculture

Meeting, Louisville, KY, April 3, 2006
National Milk Producers Federation Animal Health Committee

Teleconference, December 15, 2006
Bovine Alliance on Management and Nutrition

In addition, a Needs-Assessment Survey was designed to ascertain the top three management issues, diseases/disorders, and producer incentives from producers, veterinarians, extension personnel, university researchers, and allied industry groups. The survey, created in SurveyMonkey, was available online from early February through late April 2006. The survey was promoted via 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. E-mail messages requesting input were also sent to cooperative members of the National Milk Producers Federation as well as State and Federal personnel. A total of 313 people completed the questionnaire.

Respondents to the needs assessment represented the following affiliations:

- University/extension personnel—23 percent of respondents,
- Producers—22 percent,
- Veterinarians/consultants—20 percent,
- Federal or State government personnel—15 percent,
- Nutritionists—8 percent,
- Allied industry personnel—8 percent, and
- Other—4 percent.

CEAH Focus Group meeting
Fort Collins, CO, May 18, 2006

Draft objectives for the Dairy 2007 study, based on input from teleconferences, face-to-face meetings, and the online survey, were developed prior to the focus group meeting. Attendees included producers, university/extension personnel, veterinarians, and government personnel. The day-long meeting culminated in the formulation of eight objectives for the study:

- Describe trends in dairy cattle health and management practices,
- Evaluate management factors related to cow comfort and removal rates,
- Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease-prevention practices,
- Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVDV),
- Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens,
- Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis* (Johne's disease),
- Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices, and
- Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns.

B. Sampling and Estimation

1. State selection

The preliminary selection of States to be included in the study was done in February 2006, using the National Agricultural Statistics Service (NASS) January 27, 2006, “Cattle Report.” A goal for NAHMS national studies is to include States that account for at least 70 percent of the animals and producer population in the United States. The initial review of States identified 16 major States representing 82.0 percent of the milk cow inventory and 79.3 percent of the operations with milk cows (dairy herds). The States were California, Idaho, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Mexico, New York, Ohio, Pennsylvania, Texas, Vermont, Washington, and Wisconsin.

A memo identifying these 16 States was provided in March 2006 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 in or excluded from the study. Virginia expressed interest in participating and was included, bringing the total number of States to 17.

2. Operation selection

The list sampling frame was provided by NASS. Within each State a stratified random sample was selected. The size indicator was the number of milk cows for each operation. NASS selected a sample of dairy producers in each State for making the January 1 cattle estimates. The list sample from the January 2006 survey was used as the screening sample. Among those producers reporting 1 or more milk cows on January 1, 2006, a total of 3,554 operations were selected in the sample for contact in January 2007 during Phase I. Operations with 30 or more dairy cows that had participated in Phase I were invited to participate in data collection for Phase II. A total of 1,077 operations agreed to be contacted by Veterinary Medical Officers (VMOs) to determine whether to complete Phase II.

3. Population inferences

a. Phase I: General Dairy Management Report

Inferences cover the population of dairy producers with at least 1 milk cow in the 17 participating States. As of January 1, 2007, these States accounted for 82.0 percent (7,432,000 head) of milk cows and 79.3 percent (62,110) of operations with milk cows in the United States. (See Appendix II for respective data on individual States.) All respondent data were statistically weighted to reflect the population from which they were 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.

b. Phase II: VS Initial and Second Visits

For operations eligible for Phase II data collection (those with 30 or more dairy cows), weights were adjusted to account for operations that did not want to continue to Phase II. In addition, weights were adjusted for nonresponse to the questionnaire in each visit. The 17-State target population of operations with 30 or more dairy cows represented 82.5 percent of dairy cows and 84.7 percent of dairy operations (Appendix II).

C. Data Collection

1. Phase I: General Dairy Management Report

From January 1 to 31, 2007, NASS enumerators administered the General Dairy Management Report questionnaire. The interview took slightly more than 1 hour.

2. Phase II: VS Initial Visit

From February 26 to April 30, 2007, Federal and State Veterinary Medical Officers (VMOs) and/or Animal Health Technicians (AHTs) collected data from producers during an interview that lasted approximately 2 hours.

3. Phase II: VS Second Visit

From May 1 to August 31, 2007, Federal and State VMOs and/or AHTs collected data from producers during an interview that lasted approximately 2 hours.

D. Data Analysis

1. Validation and estimation

a. Phase I: Validation—General Dairy Management Report

Initial data entry and validation for the General Dairy Management Report were performed in individual NASS State offices. Data were entered into a SAS data set. NAHMS national staff performed additional data validation on the entire data set after data from all States were combined.

b. Phase II: Validation—VS Initial and Second Visit Questionnaires

After completing the VS Initial and Second Visit questionnaires, data collectors sent them to their respective State NAHMS Coordinators, who reviewed the questionnaire responses for accuracy and sent them to NAHMS. Data entry and validation were completed by NAHMS staff using SAS.

E. Sample Evaluation

The purpose of this section is to provide various performance measurement parameters. Historically, the term “response rate” has been used as a catchall parameter, but there are many ways to define and calculate response rates. Therefore, the table below presents an evaluation based upon a number of measurement parameters, which are defined with an “x” in categories that contribute to the measurement.

1. Phase I: General Dairy Management Report (GDMR)

A total of 3,554 operations were selected for the survey. Of these operations, 3,304 (93.0 percent) were contacted. There were 2,519 operations that provided usable inventory information (70.9 percent of the total selected and 76.2 percent of those contacted). In addition, there were 2,194 operations (61.7 percent) that provided “complete” information for the questionnaire. Of operations that provided complete information and were eligible to participate in Phase II of the study (2,067 operations), 1,077 (52.1 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	1,077	30.3	x	x	x
Survey complete, refused VMO consent	990	27.9	x	x	x
Survey complete, ineligible[3] for VMO	127	3.6	x	x	x
No dairy cows on January 1, 2007	214	6.0	x	x	
Out of business	111	3.1	x	x	
Out of scope	6	0.2			
Refusal of GDMR	785	22.1	x		
Office hold (NASS elected not to contact)	126	3.5			
Inaccessible	118	3.3			
Total	3,554	100.0	3,304	2,519	2,194
Percent of total operations			93.0	70.9	61.7
Percent of total operations weighted[4]			94.0	74.1	59.6

[1]Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).
[2]Survey complete operation—respondent provided answers to all or nearly all questions.
[3]Ineligible—fewer than 30 head of milk cows on January 1, 2007.
[4]Weighted response—the rate was calculated using the initial selection weights.

2. Phase II: VS Initial Visit

There were 1,077 operations that agreed to be contacted by a VMO during Phase I. Of these 1,077 operations, 582 (54.0 percent) agreed to continue in Phase II of the study and completed the VS Initial Visit questionnaire; 380 (35.3 percent) refused to participate. Approximately 10 percent of the 1,077 operations were not contacted, and 0.4 percent were ineligible because they had no dairy cows at the time they were contacted.

			Measurement Parameter		
Response Category	**Number Operations**	**Percent Operations**	**Contacts**	**Usable[1]**	**Complete[2]**
Survey complete	582	54.0	x	x	x
Survey refused	380	35.3	x		
Not contacted	111	10.3			
Ineligible[3]	4	0.4	x	x	
Total	1,077	100.0	966	586	582
Percent of total operations			89.7	54.4	54.0
Percent of total operations weighted[4]			87.5	50.8	50.4

[1]Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).
[2]Survey complete operation—respondent provided answers to all or nearly all questions.
[3]Ineligible—no dairy cows at time of interview, which occurred from February 26 through April 30, 2007
[4]Weighted response—the rate was calculated using the turnover weights.

3. Phase II: VS Second Visit

Of the 582 operations that completed the VS Initial Visit Questionnaire, 519 (including one operation that did not complete the VS Initial Visit on time) completed the VS Second Visit questionnaire; 47 (8.1 percent) refused to participate. Approximately 3 percent of the 583 operations were not contacted, and 0.3 percent were ineligible because they had no dairy cows at the time of the VS Second Visit.

			Measurement Parameter		
Response Category	**Number Operations**	**Percent Operations**	**Contacts**	**Usable[1]**	**Complete[2]**
Survey complete	519	89.0	x	x	x
Survey refused	47	8.1	x		
Not contacted	15	2.6			
Ineligible[3]	2	0.3	x	x	
Total	583	100.0	568	521	519
Percent of total operations			97.4	89.4	89.0
Percent of total operations weighted[4]			98.1	90.6	90.3

[1]Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).
[2]Survey complete operation—respondent provided answers to all or nearly all questions.
[3]Ineligible—no dairy cows at time of interview, which occurred from May 1 through August 31, 2007.
[4]Weighted response—the rate was calculated using the turnover weights.

Appendix I: Sample Profile

A. Responding Operations

1. Number of responding operations, by herd size

	Number of Responding Operations		
Herd Size (Number of Cows)	**Phase I: General Dairy Management Report**	**Phase II: VS Initial Visit**	**Phase II: VS Second Visit**
Fewer than 100	1,028	233	211
100 to 499	691	215	188
500 or more	475	134	120
Total	2,194	582	519

2. Number of responding operations, by region

	Number of Responding Operations		
Region	**Phase I: General Dairy Management Report**	**Phase II: VS Initial Visit**	**Phase II: VS Second Visit**
West	426	108	93
East	1,768	474	426
Total	2,194	582	519

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

		Number of Milk Cows, January 1, 2007* (Thousand Head)		Number of Operations 2006*		Average Herd Size	
Region	**State**	**Milk cows on operations with 1 or more head**	**Milk cows on operations with 30 or more head**	**Operations with 1 or more head**	**Operations with 30 or more head**	**Operations with 1 or more head**	**Operations with 30 or more head**
West	California	1,790	1,788.2	2,200	1,920	813.6	931.4
	Idaho	502	501.0	800	620	627.5	808.1
	New Mexico	360	358.9	450	180	800.0	1,993.9
	Texas	347	344.2	1,300	660	266.9	521.5
	Washington	235	234.3	790	540	297.5	433.9
	Total	3,234	3,226.6	5,540	3,920	583.8	823.1
East	Indiana	166	154.4	2,100	1,150	79.0	134.3
	Iowa	210	203.7	2,400	1,870	87.5	108.9
	Kentucky	93	86.5	2,000	1,180	46.5	73.3
	Michigan	327	320.5	2,700	1,910	121.1	167.8
	Minnesota	455	441.3	5,400	4,800	84.3	91.9
	Missouri	114	108.3	2,600	1,400	43.8	77.4
	New York	628	612.3	6,400	5,100	98.1	120.1
	Ohio	274	252.1	4,300	2,400	63.7	105.0
	Pennsylvania	550	536.3	8,700	7,000	63.2	76.6
	Vermont	140	137.2	1,300	1,100	107.7	124.7
	Virginia	100	97.0	1,300	820	76.9	118.3
	Wisconsin	1,245	1,213.9	14,900	12,800	83.6	94.8
	Total	4,302	4,163.5	54,100	41,530	79.5	100.3
Total (17 States)		7,536	7,390.1	59,640	45,450	126.4	162.6
Percent of U.S.		82.5	82.5	79.5	84.7		
Total U.S. (50 States)		9,132.0	8,958.5	74,980	53,680	121.8	166.9

*Source: NASS Cattle report, February 1, 2008, and NASS Farms, Land in Farms, and Livestock Operations 2007 Summary report, February 1, 2008. 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.

Appendix III: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices
- Part II: Changes in the U.S. Dairy Cattle Industry 1991-2007, March 2008
- Part V: Changes in Dairy Cattle Health and Management in the United States, 1991-2007, expected spring 2009

2. Evaluate management factors related to cow comfort and removal rates
- Dairy Facilities and Cow Comfort on U.S. Dairy Operations, 2007, Interpretive Report, expected spring 2009

3. Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices
- Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
- Off-Site Heifer Raising on U.S. Dairy Operations, 2007, info sheet, November 2007
- Colostrum Feeding and Management on U.S. dairy Operations, 1991-2007, info sheet, March 2008
- **Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, January 2009**
- Calf Health and Management Practices on U.S. Dairy Operations, 2007, Interpretive Report, expected spring 2009
- Calving Management on U.S. Dairy Operations, 2007, info sheet, February 2009

4. Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD)
- Bovine Viral Diarrhea (BVD) Detection in Bulk Tank Milk and BVD Management Practices in the United States, 1996-2007, info sheet, October 2008

5. Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens
- Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008
- Milking Procedures on U.S. Dairy Operations, 2007, info sheet, September 2008

6. Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis*
- Johne's Disease on U.S. Dairies, 1991-2007 info sheet, April 2008

7. Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices

- Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
- Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008
- Biosecurity Practices on U.S. Dairy operations, 2002-07, Interpretive Report, expected spring 2009

8. Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns

- Antibiotic Use on U.S. Dairy Operations, 2002-07, info sheet, September 2008
- *Listeria* and *Salmonella* in Bulk Tank Milk on U.S. Dairy Operations, 2002-07, info sheet, expected spring 2009
- *Salmonella* and *Campylobacter* on U.S. Dairy Operations, 2002-07, info sheet, expected spring 2009
- Food Safety Pathogens Isolated from U.S. Dairy Operations, 2007, Interpretive Report, expected spring 2009

Additional informational sheets

- Dairy Cattle Identification Practices in the United States, 2007, info sheet, November 2007
- Reproduction Practices on U.S. Dairy Operations, 2007, info sheet, February 2009
- Bovine Leukosis Virus (BLV) on U.S. Dairy Operations, 2007, info sheet, September 2008
- Dairy Cattle Injection Practices in the United States, 2007, info sheet, February 2009
- Methicillin-Resistant *Staphylococcus aureus* (MRSA) Isolation from Bulk Tank Milk in the United States, 2007, info sheet, expected spring 2009