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Monitoring  
System

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# Layers 2013

## Part I: Reference of Health and Management Practices on Table-Egg Farms in the United States, 2013



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

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## Items of Note

The Layers 2013 study questionnaire was administered to table-egg farms with 3,000 or more laying hens that had registered with the Food and Drug Administration (FDA) in compliance with the FDA egg safety rule. This study was conducted to describe management practices on table-egg farms and, in particular, practices relevant to the control and prevention of *Salmonella* serotype Enteritidis on these farms.

Cage-free and organic egg production are growing trends in the United States. The percentage of farms with any cage-free housing ranged from 37.1 percent of farms in the Southeast region to 55.6 percent in the Central region. Cage-free housing accounted for 22.3 percent of all layer houses. Overall, 27.6 percent of farms had at least one certified organic house, accounting for 12.6 percent of all houses. The percentage of farms that were certified as organic ranged from 20.1 percent in the Southeast region to 37.0 percent in the Central region. Nearly two-thirds of small farms (fewer than 30,000 laying hens) were certified organic compared with less than 2 percent of large farms (100,000 or more laying hens).

The highest percentage of farms in the Northeast and Southeast regions used high-rise housing (pit at ground level with house above) to handle manure. Of farms in the Central region, the highest percentage used raised slats over the floor to handle manure, while farms in the West region used a variety of manure-handling methods. The majority of medium (30,000 to 99,999 laying hens) and large (100,000 or more laying hens) farms used high-rise housing as their primary manure-handling method (61.1 and 62.0 percent of farms, respectively), while the majority of small farms used raised slats over floor (62.9 percent of farms).

Overall, 37.1 percent of farms routinely molted their flocks. The percentage of farms that routinely molted their flocks increased as farm size increased. The percentage of farms that routinely molted flocks ranged from 25.6 percent in the Central region to 67.4 percent in the West region. When farms did molt flocks, the most common procedure was to feed an alternative diet rather than restrict or withhold feed.

A small percentage of farms (10.5 percent) administered antibiotics to birds during the laying cycle. A lower percentage of small farms than large farms administered antibiotics (4.2 and 16.1 percent, respectively). When antibiotics were given to laying hens, the highest percentage of farms used bacitracin methylene disalicylate (BMD) and chlortetracycline. For farms that gave antibiotics to laying hens, 74.8 percent gave antibiotics for disease treatment, and the antibiotics were usually administered in the feed.

About 3 of 10 farms had problems with *E. coli* peritonitis in the last completed flock, although the problems were generally mild. Overall, 13.0 percent of farms had problems with focal duodenal necrosis (FDN). Problems with FDN were not observed in the West region.

Overall, 5.2 percent of hens in the last completed flock died by 60 weeks of age, and a total of 10.1 percent died, regardless of age. About half of farms (49.0 percent) had a 60-week mortality of less than 4 percent. Sixty-week mortality did not vary substantially by farm size.

Overall, 29.9 percent of farms produced 90 or more eggs per 100 hens per day during May 2013. The percentage of farms that produced 90 or more eggs per 100 hens per day ranged from 7.7 percent in the Southeast region to 42.3 percent in the Northeast region. A lower percentage of large farms (12.6 percent) produced 90 or more eggs per 100 hens per day compared with small and medium farms (41.7 and 45.1 percent, respectively).

About one of four farms in the Central region (22.6 percent) produced eggs for breaking (or hard cooking) only compared with less than 10 percent of farms in the other regions. These farms are only subject to the refrigeration requirements of the FDA egg safety rule and are not required to test for *Salmonella* Enteritidis. Over half of eggs produced in the Central region (58.6 percent) were for breaking, whereas the vast majority of eggs produced in the other regions were for table use. Less than 1 percent of eggs produced on small farms were for breaking compared with over 20 percent of eggs on medium and large farms (21.0 and 29.8 percent, respectively).

About one of five small farms gathered eggs by hand, whereas nearly all large farms gathered eggs by belt with automated packing. Hand-gathering accounted for less than 1 percent of eggs produced during May 2013.

The percentage of farms that processed eggs on-farm ranged from 16.4 percent in the Northeast region to 42.2 percent in the Southeast region. The majority of large farms processed eggs on-farm (61.8 percent), whereas nearly all small and medium farms processed eggs off-farm. About 4 of 10 farms that processed eggs on-farm also processed eggs from other farms (side loading). Overall, about one of four farms processed eggs on-farm.

Over 75 percent of farms required employees and crews to use footbaths (77.8 and 83.6 percent, respectively). A higher percentage of farms required crews to change boots and clothing than required employees to do the same. The majority of farms did not allow employees and crews to own poultry or birds. The majority of farms required employees or crews to avoid other poultry for at least 24 hours before coming on the farm.

Mice were the biggest ongoing rodent problem on 62.0 percent of farms, and rats were the biggest rodent problem on 8.3 percent of farms; 29.7 percent of farms had no problem with rodents. When farms had rodent problems, they usually ranked the problems as low (minor impact on building or feed efficiency). The percentage of farms with any problem with mice (low, moderate, or high) ranged from 44.4 percent in the West region to 82.0 percent in the Southeast region. The percentage of farms with any problem with rats (low, moderate, or high) ranged from 18.2 percent in the Northeast region to 57.1 percent in the Southeast region. The severity of rodent problems did not vary substantially by farm size. Nearly all farms monitored rodents using a rodent index as part of their rodent control program. About 9 of 10 farms typically had a rodent index of 0 to 10 (low) during the previous 12 months. No farm's rodent index exceeded 26 or more (high).

Layer houses were empty of birds between flocks for 20.6 days, on average. More than 80 percent of farms emptied feeders and feed hoppers; flushed water lines; dry cleaned cages, walls, or ceilings; and cleaned fans, ventilation systems, or cool cells after every flock.



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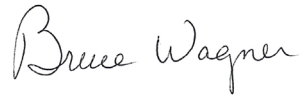
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The Layers 2013 study was a cooperative effort among animal- and human-health officials, university researchers, and poultry industry leaders and producers. We would like to thank our reviewers for providing valuable expertise and guidance through their comments. All participants are to be commended, particularly the poultry producers whose voluntary efforts made the Layers 2013 study possible.

A handwritten signature in cursive script that reads "Bruce Wagner".

Dr. Bruce A. Wagner  
Director  
National Animal Health Monitoring System

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**Contacts for further information:**

Questions or comments on data analysis: Dr. Lindsey Garber (970) 494-7000

Information on reprints or other reports: Ms. Abby Zehr (970) 494-7000

**Feedback**

Feedback, comments, and suggestions regarding Layers 2013 study reports are welcomed. You may submit feedback via online survey at: <http://www.aphis.usda.gov/nahms> (Click on “FEEDBACK on NAHMS reports.”)

## Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service. NAHMS is designed to help meet the Nation's animal-health information needs.

**Layers '99** was NAHMS' first national study of U.S. poultry and provided baseline health and management information for the table-egg industry. Layers '99 estimated the prevalence and associated risk factors of *Salmonella* Enteritidis in U.S. layer flocks.

**Poultry 2004** was NAHMS' second study of the U.S. poultry industry. This study provided information on bird health and movement, and on biosecurity practices used in backyard flocks, gamefowl breeder flocks, and live-poultry markets.

**The 2007 Small Enterprise Chicken study** was NAHMS' third study of the U.S. poultry industry. This study focused on biosecurity practices and bird movement on operations with 1,000 to 19,999 chickens.

**Poultry 2010** was NAHMS' fourth study of the U.S. poultry industry. This study addressed four topics: 1) structure of commercial poultry industries, 2) farm-level practices on primary breeder and multiplier flocks, 3) prevalence of and risk factors associated with clostridial dermatitis on turkey grower farms, and 4) management of urban chicken flocks in Miami, Denver, Los Angeles, and New York City.

**Layers 2013** is NAHMS' fifth study of the U.S. poultry industry. This study updates baseline health and management information for the table-egg industry, estimates the prevalence of *Salmonella* Enteritidis in U.S. layer flocks, and describes management practices relevant to *Salmonella* Enteritidis.

"Part I: Reference of Health and Management Practices on Table-Egg Farms in the United States, 2013" is the first in a series of reports containing information from the Layers 2013 study. This report focuses on health and management practices and contains information from table-egg farms in 19 States. These States accounted for 76.4 percent of egg farms with 3,200 or more layers,<sup>1</sup> 87.1 percent of hens on farms with 30,000 or more hens,<sup>2</sup> and 77.8 percent of table eggs produced in the United States.<sup>2</sup>

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

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<sup>1</sup> NASS 2007 Census of Agriculture (includes table eggs and eggs for hatching).

<sup>2</sup> NASS Chickens and Eggs report, January 2009.

## Terms Used in This Report

**Certified organic-egg operation:** An operation certified by an accredited certifying agent as utilizing a system of organic production in compliance with the USDA National Organic Program. On organic-egg operations, laying hens must have access to the outdoors and be raised cage-free, fed certified organic feed, and must not be given antibiotics.

**Crew:** Workers not employed by a single premises but who work temporarily at one or more premises, e.g., vaccination crews and catching crews.

### Eggs:

**Shell eggs:** Raw whole eggs contained in shell.

**Eggs for breaking:** Eggs sent to a breaking plant where they are separated from the shell to make liquid whole egg or yolk and liquid egg white. The liquid egg products are ultimately heat treated, e.g., pasteurized.

**Farm size:** Size groupings based on the number of layers 20 weeks of age or older on the farm at maximum capacity. For this report, farm sizes were categorized as small (fewer than 30,000 birds); medium (30,000 to 99,999 birds), and large (100,000 birds or more).

**Flock:** A group of birds of similar age (may vary several weeks from the median age of the flock) considered as a production unit. A flock usually fills only one layer house, but it may take up more or less than one house.

**Last completed flock:** The most recent flock that completed its production cycle and was then removed from the farm.

**Layer:** A female chicken that produces eggs.

**Molt:** The period when birds are taken out of production (usually around 65 weeks of age) until they return to their approximate 18-week weight. After a rest period, birds are returned to production for another laying cycle.

**Population estimates:** Data from survey respondents are weighted to reflect the probability of selection during sampling and account for survey nonresponse. Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate, plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. An estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). An estimate of 3.4 gives a standard error of 0.3 and 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 (—).

**Prebiotic:** Nondigestible feed ingredients that can increase the health-promoting attributes of bacteria already in the colon.

**Probiotic:** Product that contains live microbes intended to confer a health benefit on the host.

**Pullet:** A chicken less than 20 weeks of age. A pullet placed in the laying house is called a layer.

**Regions:**

**Northeast:** Indiana, Michigan, Ohio, Pennsylvania, New England (Connecticut, Maine, Massachusetts, New Hampshire, Vermont)

**Southeast:** Alabama, Florida, Georgia, North Carolina

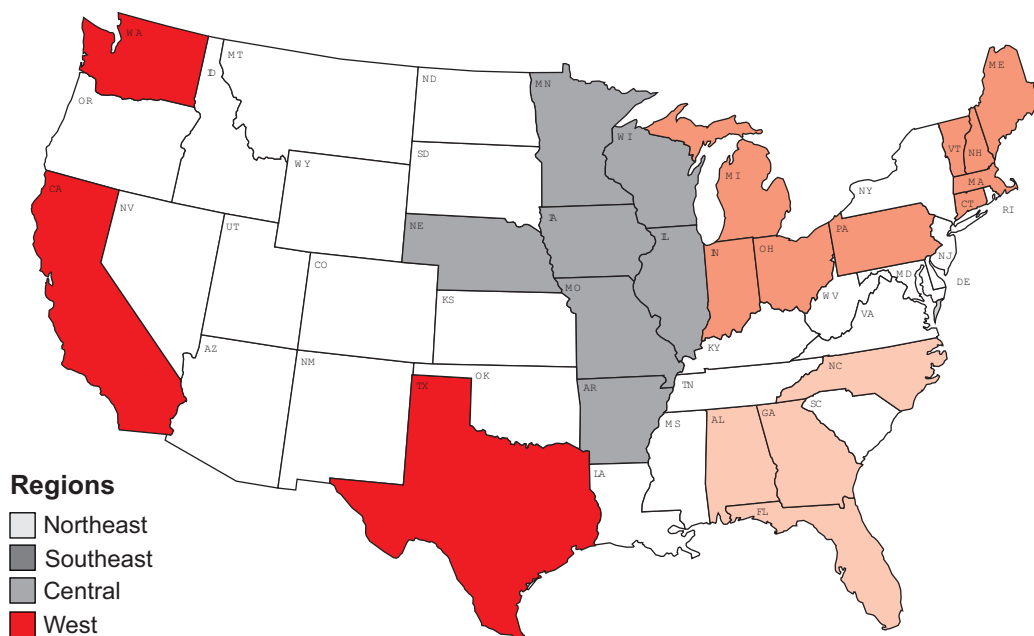
**Central:** Arkansas, Illinois, Iowa, Minnesota, Missouri, Nebraska, Wisconsin

**West:** California, Texas, Washington

**Rodent index:** Number of mice caught per 12 traps per 7 days.

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**Layers 2013 study States\***




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\*New England States (CT, MA, ME, NH, VT) were considered one State for study analyses.



## Section I: Population Estimates

### A. Production and Marketing Arrangement

Over half the farms in the West region were company-owned, while the majority of farms in the other regions were contract farms in which either the company or the producer owned the birds.

A.1. Percentage of farms by production and marketing arrangement, and by region:

Arrangement	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Company-owned farm	14.4	(3.0)	37.5	(4.0)	24.2	(3.1)	53.7	(5.4)	24.0	(1.9)
Contract farm—company owns birds and markets eggs	58.1	(5.3)	57.6	(3.9)	22.8	(3.3)	20.3	(4.2)	43.1	(3.0)
Contract farm—producer owns birds, company markets eggs	6.3	(4.0)	0.0	(—)	29.7	(4.1)	0.0	(—)	11.8	(2.3)
Independent producer—producer owns birds and markets eggs	20.4	(5.9)	4.9	(0.3)	14.7	(4.4)	14.2	(3.8)	16.7	(3.3)
Farmer-owned cooperative	0.8	(0.4)	0.0	(—)	8.6	(2.4)	11.9	(3.8)	4.4	(0.9)
Total	100.0		100.0		100.0		100.0		100.0	

Over half of large farms were company-owned, while the majority of small and medium farms were contract farms in which the company owned the birds and marketed the eggs.

A.2. Percentage of farms by production and marketing arrangement, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Arrangement</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Company-owned farm	1.5	(0.4)	11.3	(2.7)	52.4	(5.2)
Contract farm—company owns birds and markets eggs	57.1	(4.1)	51.5	(6.8)	25.2	(4.3)
Contract farm—producer owns birds, company markets eggs	20.3	(3.0)	12.9	(8.8)	2.9	(1.3)
Independent producer—producer owns birds and markets eggs	15.1	(4.5)	18.1	(9.5)	17.5	(4.3)
Farmer-owned cooperative	5.9	(1.6)	6.2	(2.3)	2.1	(1.0)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>		<b>100.0</b>	



**B. Housing****1. Number of layer houses**

About half the farms had only one layer house, and one of five farms had six or more houses.

B.1. Percentage of farms by number of layer houses on-site:

Percent Farms								
Number of Layer Houses								
1		2		3–5		6 or more		Total
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	
46.5	(2.7)	20.8	(3.0)	12.7	(1.2)	20.0	(1.9)	100.0

**2. Layer house characteristics**

Overall, 6.2 percent of farms had at least 1 layer house that could hold 200,000 or more birds. Layer houses with a capacity of 200,000 or more birds accounted for 7.1 percent of houses. Only 0.5 percent of houses held fewer than 1,000 birds.

B.2.a. Percentage of farms and percentage of layer houses by maximum capacity of houses (number of birds):

Maximum capacity (number birds)	Percent farms	Std. error	Percent houses	Std. error
Fewer than 1,000	0.2	(0.1)	0.5	(0.3)
1,000–29,999	51.9	(2.4)	28.1	(2.7)
30,000–99,999	37.2	(2.9)	38.1	(4.2)
100,000–199,999	21.4	(2.7)	26.3	(3.3)
200,000 or more	6.2	(0.8)	7.1	(1.4)
Total			100.0	

Over half the layer houses were 20 years old or older.

B.2.b. Percentage of layer houses by age of house (yr):

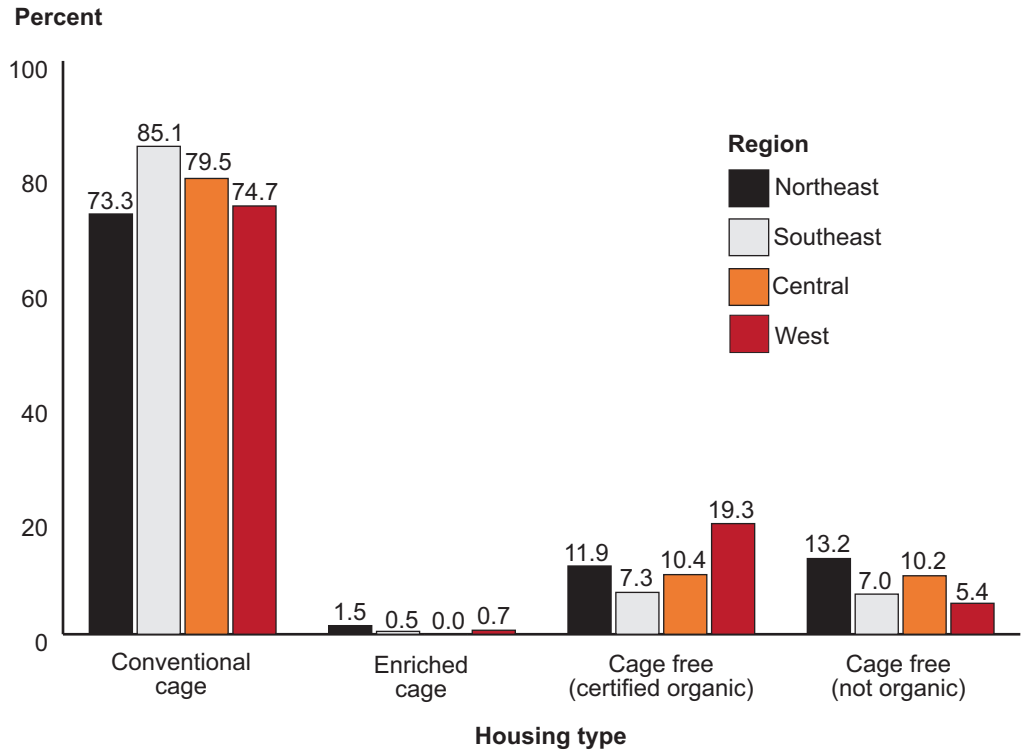
<b>Percent Layer Houses</b>								
<b>Age of House (yr)</b>								
<b>Less than 5</b>		<b>5–9</b>		<b>10–19</b>		<b>20 or more</b>		
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Total</b>
10.1	(1.2)	10.8	(1.4)	27.8	(2.4)	51.3	(3.3)	100.0

Enriched cages, which provide perch, scratch, and nesting areas, were used on less than 2 percent of farms. The percentage of farms with any cage-free housing ranged from 37.1 percent of farms in the Southeast region to 55.6 percent of farms in the Central region. Slightly less than one-fourth of all layer houses (22.3 percent) used cage-free housing. Overall, 27.6 percent of farms had at least one cage-free (certified organic) house, and 12.6 percent of houses were cage-free (certified organic).

B.2.c. Percentage of farms and percentage of layer houses by housing type and by region:

Housing type	Percent									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Farms										
Conventional cage	55.2	(3.1)	62.9	(2.8)	45.1	(2.7)	66.5	(4.6)	54.3	(1.8)
Enriched cage	1.6	(0.4)	2.9	(2.1)	0.0	(—)	1.5	(0.9)	1.2	(0.3)
Any caged housing (conventional or enriched)	55.2	(3.1)	62.9	(2.8)	45.1	(2.7)	68.0	(4.6)	54.4	(1.8)
Cage free (certified organic)	23.9	(3.9)	20.1	(2.8)	37.0	(1.9)	25.0	(4.6)	27.6	(2.1)
Cage free (not organic)	23.4	(4.3)	17.0	(1.7)	19.6	(2.9)	19.5	(4.1)	21.3	(2.4)
Any cage-free housing	47.1	(3.2)	37.1	(2.8)	55.6	(2.7)	43.3	(4.8)	48.3	(1.9)
Houses										
Conventional cage	73.3	(2.9)	85.1	(1.7)	79.5	(3.4)	74.7	(5.5)	76.9	(2.0)
Enriched cage	1.5	(0.4)	0.5	(0.4)	0.0	(—)	0.7	(0.4)	0.7	(0.2)
Cage free (certified organic)	11.9	(1.9)	7.3	(1.1)	10.4	(1.6)	19.3	(5.3)	12.6	(1.5)
Cage free (not organic)	13.2	(2.7)	7.0	(1.0)	10.2	(2.3)	5.4	(1.8)	9.7	(1.2)
Total	100.0		100.0		100.0		100.0		100.0	

**Percentage of layer houses by housing type and by region**

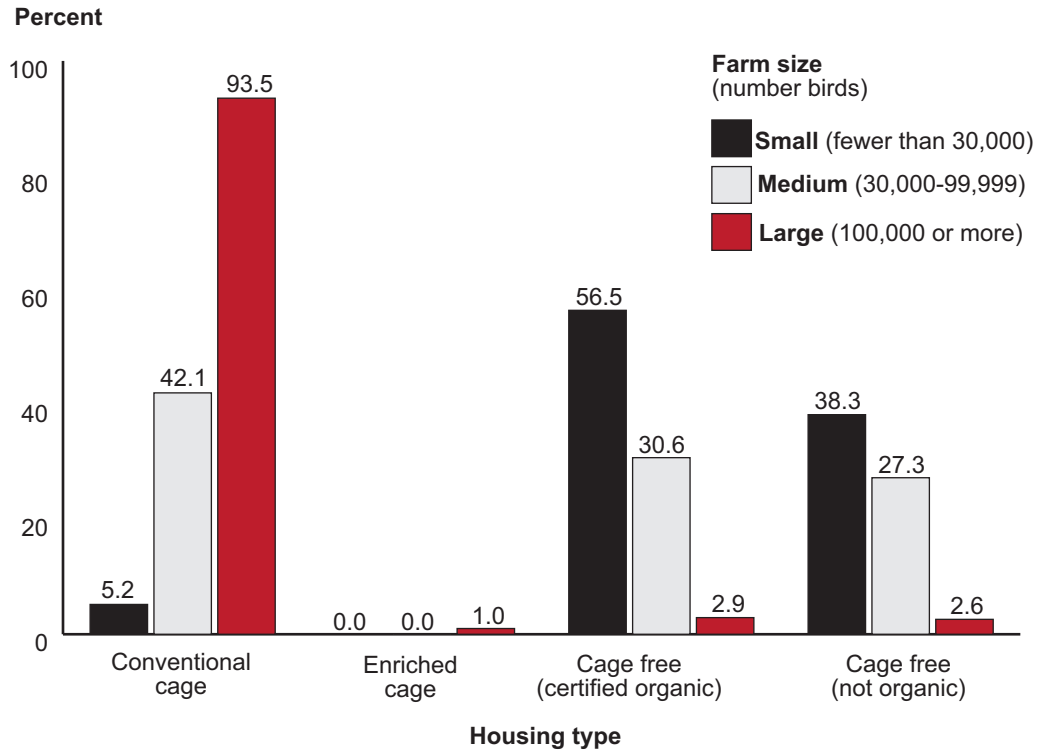


About three-fifths of small farms (61.0 percent) were certified organic compared with less than 2 percent of large farms.

B.2.d. Percentage of farms and percentage of layer houses by housing type and by farm size:

<b>Percent</b>						
<b>Farm Size (number birds)</b>						
<b>Housing type</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
<b>Farms</b>						
Conventional cage	5.1	(2.8)	64.7	(6.0)	95.8	(1.3)
Enriched cage	0.0	(—)	0.0	(—)	3.0	(0.8)
Any caged housing	5.1	(2.8)	64.7	(6.0)	96.3	(1.3)
Cage free (certified organic)	61.0	(5.1)	15.6	(3.2)	1.8	(0.5)
Cage free (not organic)	35.2	(5.0)	24.4	(5.8)	6.4	(1.5)
Any cage-free housing	95.4	(2.7)	40.0	(6.3)	7.6	(1.6)
<b>Houses</b>						
Conventional cage	5.2	(2.3)	42.1	(6.9)	93.5	(1.5)
Enriched cage	0.0	(—)	0.0	(—)	1.0	(0.2)
Cage free (certified organic)	56.5	(4.9)	30.6	(6.0)	2.9	(1.3)
Cage free (not organic)	38.3	(4.9)	27.3	(6.3)	2.6	(0.7)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>		<b>100.0</b>	

**Percentage of layer houses by housing type and by farm size**



On most farms, all layer houses had doors that were locked most of the time.

B.2.e. Percentage of farms that locked all, some, or none of the layer house doors most of the time:

Percent Farms						
All doors locked		Some doors locked		No doors locked		Total
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	
71.8	(3.1)	1.1	(0.4)	27.1	(3.1)	100.0

### 3. Outdoor access

The Central region had the highest percentage of farms in which at least some birds had outdoor access (41.0 percent).

B.3.a. Percentage of farms in which all, some, or none of the layer houses had outdoor access for birds, by region:

Houses with outdoor access	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
All	24.5	(3.9)	20.1	(2.8)	40.0	(1.5)	22.2	(4.6)	28.4	(2.1)
Some	0.0	(—)	0.0	(—)	1.0	(0.4)	2.8	(1.2)	0.7	(0.2)
None	75.5	(3.9)	79.9	(2.8)	60.0	(1.5)	75.0	(4.6)	70.9	(2.1)
Total	100.0		100.0		100.0		100.0		100.0	

The percentage of farms with outdoor access for birds decreased as farm size increased.

B.3.b. Percentage of farms in which all, some, or none of the layer houses had outdoor access for birds, by farm size:

Houses with outdoor access	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
All	64.1	(5.0)	14.7	(3.2)	1.4	(0.5)
Some	0.8	(0.3)	0.9	(0.5)	0.4	(0.2)
None	35.1	(5.0)	84.3	(3.2)	98.2	(0.5)
Total	100.0		100.0		100.0	

Nearly all farms in which birds had outside access were certified organic operations.

B.3.c. For farms that provided birds outside access, percentage of farms that were certified organic operations:

<b>Percent Farms</b>	<b>Std. error</b>
94.9	(1.6)



**C. Pullets****1. Pullet source**

The percentage of farms in which pullets were raised on-farm ranged from 0.7 percent in the Northeast region to 26.2 percent in the West region.

C.1.a. Percentage of farms in which pullets were raised on-farm, by region:

<b>Percent Farms</b>									
<b>Region</b>									
<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
0.7	(0.3)	17.7	(3.8)	1.5	(1.3)	26.2	(3.9)	5.4	(0.7)

About 1 of 10 large farms raised pullets on-farm.

C.1.b. Percentage of farms in which pullets were raised on-farm, by farm size:

<b>Percent Farms</b>					
<b>Farm Size (number birds)</b>					
<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
3.1	(1.4)	0.5	(0.1)	10.2	(1.4)

**Note:** The remaining tables in this section (C) refer to pullets from the most recently placed layer flock.

For the most recently placed layer flock, about one-third of farms in the Southeast region obtained pullets from more than one farm site.

C.1.c. Percentage of farms by number of different source-farms used to populate the most recently placed layer flock, and by region:

Number* source- farms	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
1	80.9	(3.8)	67.4	(4.4)	89.4	(2.6)	88.9	(3.2)	83.3	(2.1)
2	15.7	(3.8)	20.5	(4.2)	10.6	(2.6)	7.1	(2.5)	13.5	(2.1)
3 or more	3.4	(0.8)	12.1	(3.4)	0.0	(—)	4.0	(2.1)	3.2	(0.6)
Total	100.0		100.0		100.0		100.0		100.0	

\*Pullets raised on the same site as layers were counted as coming from one source-farm.

Nearly all small farms obtained pullets for the most recently placed flock from a single source-farm.

C.1.d. Percentage of farms by number of different source-farms used to populate the most recently placed layer flock, and by farm size:

Number* source-farms	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
1	96.5	(1.4)	80.0	(5.1)	72.0	(4.3)
2	3.5	(1.4)	18.1	(5.1)	21.0	(4.2)
3 or more	0.0	(—)	1.9	(0.6)	7.0	(1.4)
Total	100.0		100.0		100.0	

\*Pullets raised on the same site as layers were counted as coming from one source-farm.

The majority of farms obtained pullets from a different source-farm belonging to the same company (72.7 percent of farms).

C.1.e. Percentage of farms by source-farm used to populate the most recently placed layer flock, and by region:

<b>Percent Farms</b>										
<b>Region</b>										
	<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
<b>Source farm</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Different company	18.3	(5.2)	13.5	(2.7)	37.4	(5.6)	21.8	(5.4)	24.0	(3.2)
Different farm, same company	82.5	(5.2)	78.1	(3.8)	61.0	(5.6)	57.7	(5.1)	72.7	(3.1)
Raised on this farm	0.7	(0.3)	14.6	(3.8)	1.5	(1.4)	20.5	(4.6)	4.6	(0.8)

Regardless of farm size, the majority of farms obtained pullets from a different source-farm belonging to the same company .

C.1.f. Percentage of farms by source-farm used to populate the most recently placed layer flock, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
<b>Source farm</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Different company	33.7	(5.7)	25.4	(9.1)	13.9	(2.8)
Different farm site, same company	63.0	(5.8)	76.0	(9.0)	80.2	(2.7)
Raised on this farm	3.2	(1.5)	0.5	(0.1)	8.0	(1.5)

## 2. Pullet rearing

About half the farms placed floor-reared pullets. However, only 8.7 percent of pullets placed were floor reared, likely because very few large farms, where the majority of birds reside, placed floor-reared pullets.

C.2.a. Percentage of **farms** by rearing location of pullets in the most recently placed layer flock, and by farm size:

Percent Farms								
Farm Size (number birds)								
Rearing location	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All farms	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
All cage reared	5.2	(2.8)	56.8	(6.5)	87.6	(1.8)	48.9	(2.2)
All floor reared	94.8	(2.8)	39.5	(6.2)	10.6	(1.7)	49.6	(2.2)
Both cage and floor reared	0.0	—	3.7	(1.8)	1.8	(0.7)	1.5	(0.5)
Total	100.0		100.0		100.0		100.0	

C.2.b. Percentage of **pullets** by rearing location of the most recently placed layer flock, and by farm size:

Percent Pullets*								
Farm Size (number birds)								
Rearing location	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All farms	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Cage reared	6.8	(3.7)	62.6	(7.5)	94.2	(1.8)	91.3	(1.7)
Floor reared	93.2	(3.7)	37.4	(7.5)	5.8	(1.8)	8.7	(1.7)
Total	100.0		100.0		100.0		100.0	

\*Weighted by farm maximum hen capacity.

### 3. Prebiotics and probiotics

About half of farms reported that pullets had received a prebiotic or probiotic product; 14.4 percent of farms did not know if their pullets had received these products.

C.3.a. Percentage of farms by whether pullets in the most recently placed layer flock were given a prebiotic or probiotic product, and by region:

Percent Farms										
Region										
	Northeast		Southeast		Central		West		All	
Product was given	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	59.2	(5.7)	20.0	(3.7)	50.8	(5.3)	33.2	(4.7)	50.2	(3.3)
No	31.0	(5.5)	73.2	(4.3)	26.3	(5.1)	49.1	(5.2)	35.4	(3.2)
Don't know	9.7	(2.7)	6.8	(2.3)	22.9	(4.1)	17.7	(4.6)	14.4	(1.9)
Total	100.0		100.0		100.0		100.0		100.0	

The percentage of farms in which pullets had received a prebiotic or probiotic product did not differ substantially by farm size, considering the standard errors.

C.3.b. Percentage of farms by whether pullets in the most recently placed layer flock were given a prebiotic or probiotic product, and by farm size:

Percent Farms						
Farm Size (number birds)						
	Small (Fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
Product was given	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	60.2	(5.5)	38.3	(6.5)	46.7	(4.8)
No	24.0	(4.7)	47.2	(7.2)	40.4	(4.8)
Don't know	15.8	(3.4)	14.5	(4.1)	13.0	(2.5)
Total	100.0		100.0		100.0	

## D. Layer Management

### 1. Drinking water

About 9 of 10 farms used well water as their primary source of drinking water for layers. Municipal water was used by 8.9 percent of farms. Less than 1 percent of all farms used surface water.

D.1.a. Percentage of farms by primary source of drinking water for layers, and by region:

Water source	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Municipal	4.3	(0.7)	5.3	(2.1)	17.1	(3.0)	10.5	(2.8)	8.9	(1.0)
Well	94.9	(1.0)	90.4	(3.2)	80.2	(3.1)	89.5	(2.8)	89.5	(1.1)
Surface (e.g., pond)	0.8	(0.7)	4.3	(2.4)	0.0	(—)	0.0	(—)	0.7	(0.4)
Other	0.0	(—)	0.0	(—)	2.6	(1.6)	0.0	(—)	0.8	(0.5)
Total	100.0		100.0		100.0		100.0		100.0	

Less than 2 percent of small farms and no medium or large farms used surface water as their primary source of drinking water for layers.

D.1.b. Percentage of farms by primary source of drinking water for layers, and by farm size:

Water source	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Municipal	7.6	(1.6)	7.6	(1.6)	10.9	(2.0)
Well	90.5	(1.9)	92.4	(1.6)	87.2	(2.1)
Surface (e.g., pond)	1.9	(1.0)	0.0	(—)	0.0	(—)
Other	0.0	(—)	0.0	(—)	1.9	(1.1)
Total	100.0		100.0		100.0	

About 4 of 10 farms that used a nonmunicipal water source chlorinated the water on-farm. In the “other” category, the highest percentage of farms used peroxide to treat water.

D.1.c. Percentage of farms by water treatment performed on-farm, and by primary source of drinking water for layers:

<b>Water treatment</b>	<b>Percent Farms</b>					
	<b>Water Source</b>					
	<b>Municipal</b>		<b>Nonmunicipal</b>		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Chlorination	2.6	(1.9)	39.6	(3.5)	36.3	(3.3)
Acidifiers	0.0	(—)	15.5	(2.5)	14.1	(2.2)
Iodine	0.0	(—)	4.0	(1.3)	3.7	(1.2)
Filters	68.6	(5.5)	83.1	(2.1)	81.8	(2.0)
Other	4.3	(3.6)	15.9	(3.1)	14.9	(2.9)

Over 90 percent of all farms used nipple drinkers. About one-third of farms in the West region used cup drinkers.

D.1.d. Percentage of farms by type of water delivery system used in layer houses, and by region:

Percent Farms										
Region										
	Northeast		Southeast		Central		West		All	
<b>Delivery system</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Nipple drinker	98.2	(1.7)	96.7	(0.9)	96.3	(1.5)	59.6	(5.3)	92.7	(1.2)
Cup drinker	3.0	(1.7)	0.0	(—)	2.0	(0.9)	32.2	(5.2)	6.1	(1.1)
Bell drinker	0.0	(—)	9.6	(1.4)	3.3	(1.4)	13.4	(2.6)	3.4	(0.5)
Troughs	0.0	(—)	0.0	(—)	1.5	(1.3)	0.0	(—)	0.4	(0.4)
Other	0.2	(0.0)	0.0	(—)	0.0	(—)	0.0	(—)	0.1	(0.0)

A large majority of farms used nipple drinkers, regardless of farm size.

D.1.e. Percentage of farms by type of water delivery system used in layer houses, and by farm size:

Percent Farms						
Farm Size (number birds)						
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
<b>Delivery system</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Nipple drinker	94.1	(1.3)	86.3	(4.7)	94.6	(1.2)
Cup drinker	1.9	(0.6)	11.7	(4.7)	7.2	(1.3)
Bell drinker	6.3	(1.2)	3.6	(1.2)	0.6	(0.5)
Troughs	1.1	(1.0)	0.0	(—)	0.0	(—)
Other	0.0	(—)	0.5	(0.1)	0.0	(—)



**2. Feed**

The percentage of farms that had an on-farm feed mill to provide feed for layers ranged from 5.5 percent in the Southeast region to 25.8 percent in the Central region.

D.2.a. Percentage of farms that had an on-farm feed mill to provide feed for layers, by region:

<b>Percent Farms</b>									
<b>Region</b>									
<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
14.1	(4.8)	5.5	(2.2)	25.8	(5.3)	16.3	(4.2)	17.1	(2.9)

The percentage of farms that had an on-farm feed mill to provide feed for layers did not differ substantially by farm size, considering the standard errors.

D.2.b. Percentage of farms that had an on-farm feed mill to provide feed for layers, by farm size:

<b>Percent Farms</b>					
<b>Farm Size (number birds)</b>					
<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
9.6	(3.2)	19.2	(7.5)	23.2	(4.6)

Only 6.3 percent of contract farms had an on-farm feed mill, compared with about 30 percent of company-owned farms and other farms.

D.2.c. Percentage of farms that had an on-farm feed mill to provide feed for layers, by marketing arrangement:

<b>Percent Farms</b>					
<b>Marketing Arrangement</b>					
<b>Company-owned farm</b>		<b>Contract farm</b>		<b>Other</b>	
<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
29.9	(5.4)	6.3	(3.9)	30.5	(8.4)

For 83.5 percent of farms, the feed truck that delivered feed to the farm also delivered feed to other farms. This percentage includes trucks that transported feed from an on-farm feed mill to the layer houses and delivered feed to other farms.

D.2.d. Percentage of farms in which the truck that delivered feed to the farm also delivered feed to other farms, by region:

<b>Percent Farms</b>									
<b>Region</b>									
<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
90.0	(4.8)	86.3	(3.5)	75.8	(4.7)	73.2	(4.1)	83.5	(2.9)

A higher percentage of small farms than large farms (92.8 and 71.6 percent, respectively) used feed trucks that delivered feed to other farms.

D.2.e. Percentage of farms in which the truck that delivered feed to the farm also delivered feed to other farms, by farm size:

<b>Percent Farms</b>					
<b>Farm Size (number birds)</b>					
<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
92.8	(3.0)	89.2	(9.1)	71.6	(4.6)

For nearly all contract farms, the truck that delivered feed to the farm also delivered feed to other farms.

D.2.f. Percentage of farms on which the truck that delivered feed to the farm also delivered feed to other farms, by marketing arrangement:

<b>Percent Farms</b>					
<b>Marketing Arrangement</b>					
<b>Company-owned farm</b>		<b>Contract farm</b>		<b>Other</b>	
<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
66.8	(5.2)	95.7	(2.0)	76.3	(8.4)

### 3. Manure management

In the Northeast and Southeast regions, the highest percentage of farms used high-rise housing (pit at ground level with house above) to handle manure. In the Central region, the highest percentage of farms used raised slats over floor to handle manure, while farms in the West regions used a variety of methods.

D.3.a. Percentage of farms by primary manure-handling method, and by region:

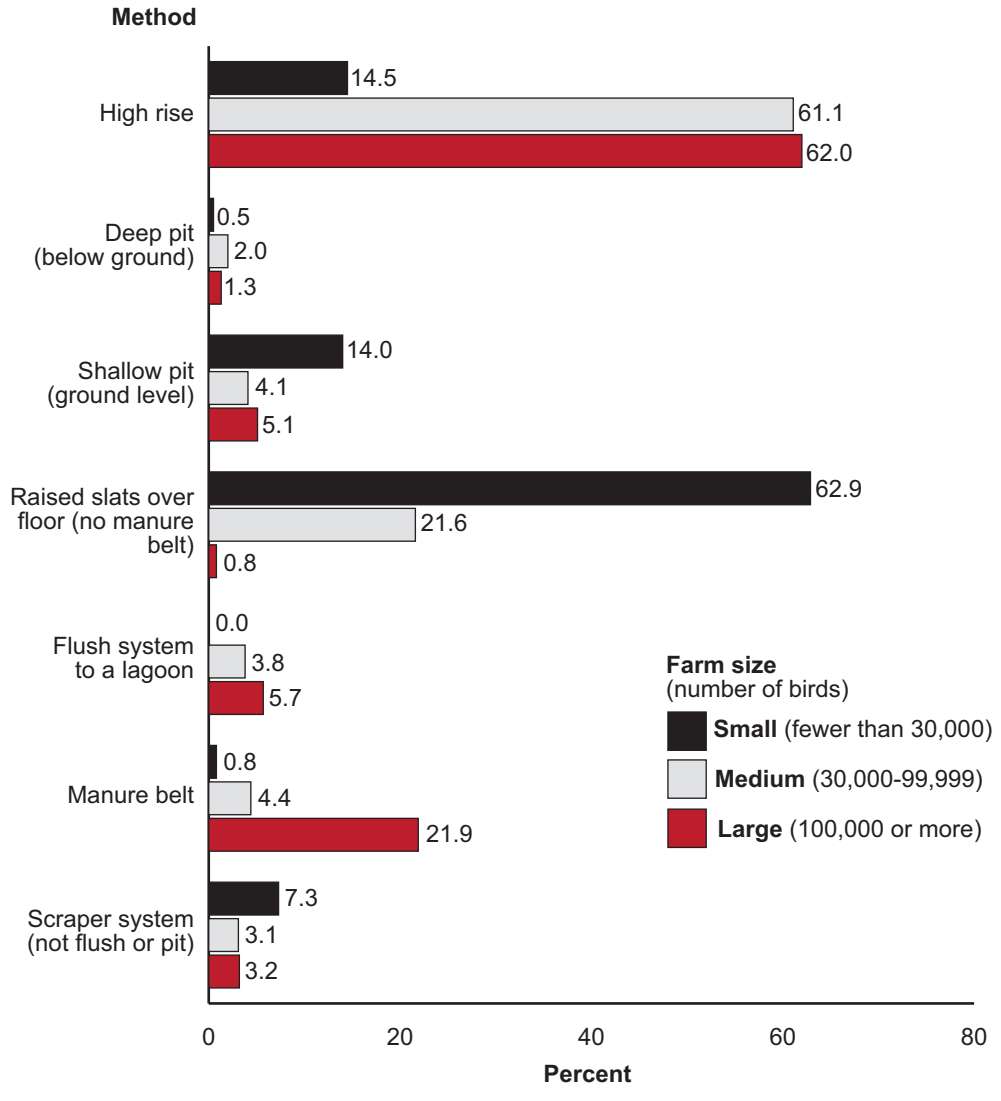
Manure-handling method	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
High rise	60.9	(4.1)	42.4	(4.4)	27.0	(3.3)	12.4	(3.9)	43.6	(2.3)
Deep pit (below ground)	0.2	(0.0)	0.0	(—)	0.7	(0.6)	6.8	(3.2)	1.2	(0.4)
Shallow pit (ground level)	9.1	(2.5)	11.0	(2.6)	4.6	(0.8)	11.9	(3.6)	8.3	(1.4)
Raised slats over floor (no manure belt)	21.7	(3.9)	28.6	(2.1)	44.0	(2.8)	23.0	(4.3)	28.9	(2.2)
Flush system to a lagoon	0.0	(—)	12.1	(3.2)	0.8	(0.2)	15.4	(4.0)	3.1	(0.6)
Manure belt	4.9	(1.8)	6.0	(3.0)	18.3	(3.9)	15.3	(4.0)	10.2	(1.6)
Scraper system (not flush or pit)	3.1	(2.1)	0.0	(—)	4.6	(1.6)	15.0	(3.6)	4.7	(1.2)
Total	100.0		100.0		100.0		100.0		100.0	

The majority of medium and large farms used high-rise housing as their primary manure-handling method. The majority of small farms used raised slats over floor.

D.3.b. Percentage of farms by primary manure-handling method, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Manure-handling method</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
High rise	14.5	(4.5)	61.1	(5.8)	62.0	(3.5)
Deep pit (below ground)	0.5	(0.2)	2.0	(1.7)	1.3	(0.6)
Shallow pit (ground level)	14.0	(3.3)	4.1	(1.9)	5.1	(0.9)
Raised slats over floor (no manure belt)	62.9	(4.9)	21.6	(3.8)	0.8	(0.3)
Flush system to a lagoon	0.0	(—)	3.8	(1.8)	5.7	(1.1)
Manure belt	0.8	(0.3)	4.4	(4.0)	21.9	(3.2)
Scraper system (not flush or pit)	7.3	(3.0)	3.1	(1.2)	3.2	(0.9)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>		<b>100.0</b>	

**Percentage of farms by primary manure-handling method, and by farm size**



About half the farms stored manure on-farm, most commonly in a building.

D.3.c. Percentage of farms by on-farm manure-storage methods, and by region:

Percent Farms										
Region										
	Northeast		Southeast		Central		West		All	
Manure-storage method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
In a building	38.6	(5.6)	49.8	(4.2)	35.9	(3.7)	21.7	(4.4)	36.5	(3.1)
In an open structure (e.g., lean-to)	2.7	(2.0)	12.5	(1.5)	1.6	(0.2)	7.3	(3.4)	3.7	(1.1)
Outside	12.7	(3.5)	12.0	(2.6)	19.7	(3.9)	26.7	(5.0)	16.5	(2.2)
Any on-farm storage	51.1	(5.8)	71.8	(3.7)	56.8	(5.2)	49.2	(5.2)	54.1	(3.4)

Outside manure storage was used by a higher percentage of small farms than medium and large farms.

D.3.d. Percentage of farms by on-farm manure-storage method, and by farm size:

Percent Farms						
Farm Size (number birds)						
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
Manure-storage method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
In a building	16.6	(4.3)	44.8	(9.5)	51.4	(3.7)
In an open structure (e.g., lean-to)	4.5	(2.6)	3.4	(1.7)	3.1	(0.7)
Outside	30.9	(5.2)	5.8	(2.0)	8.2	(1.4)
Any on-farm storage	49.2	(5.8)	52.1	(9.6)	59.9	(3.4)

About half of farms that stored manure on-farm stored it in a location attached to a layer house. Farms that used pit methods may have considered the pit as a storage location when answering this question.

D.3.e. For farms that stored manure on-farm, percentage of farms by minimum distance from the manure storage area to the nearest layer house:

Percent Farms								
Minimum Distance (ft)								
0*		Less than 100		100–199		200 or more		Total
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	
48.0	(4.9)	36.7	(4.9)	5.8	(1.1)	9.5	(2.3)	100.0

\*Attached to layer house.

#### 4. Molting

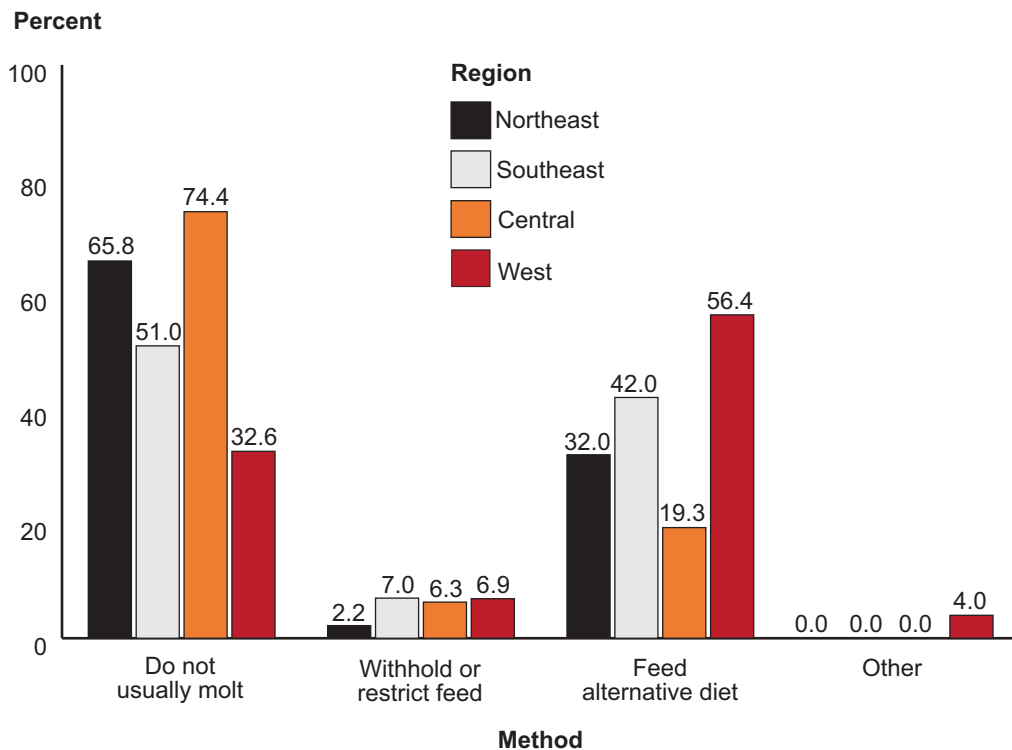
The percentage of farms that did not routinely molt their flock ranged from 32.6 percent in the West region to 74.4 percent in the Central region. When farms did molt their flock, the most frequently used procedure was to feed an alternative diet, rather than restrict or withhold feed.

D.4.a. Percentage of farms by routine molting method used, and by region:

Percent Farms										
Region										
Molting method	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Do not usually molt	65.8	(4.9)	51.0	(3.5)	74.4	(3.2)	32.6	(5.0)	62.9	(2.7)
Withhold or restrict feed	2.2	(2.1)	7.0	(2.8)	6.3	(2.8)	6.9	(2.3)	4.5	(1.4)
Feed alternative diet	32.0	(4.5)	42.0	(4.1)	19.3	(3.1)	56.4	(5.2)	32.1	(2.5)
Other	0.0	(—)	0.0	(—)	0.0	(—)	4.0	(2.1)	0.5	(0.3)
Total	100.0		100.0		100.0		100.0		100.0	



**Percentage of farms by routine molting method used, and by region**

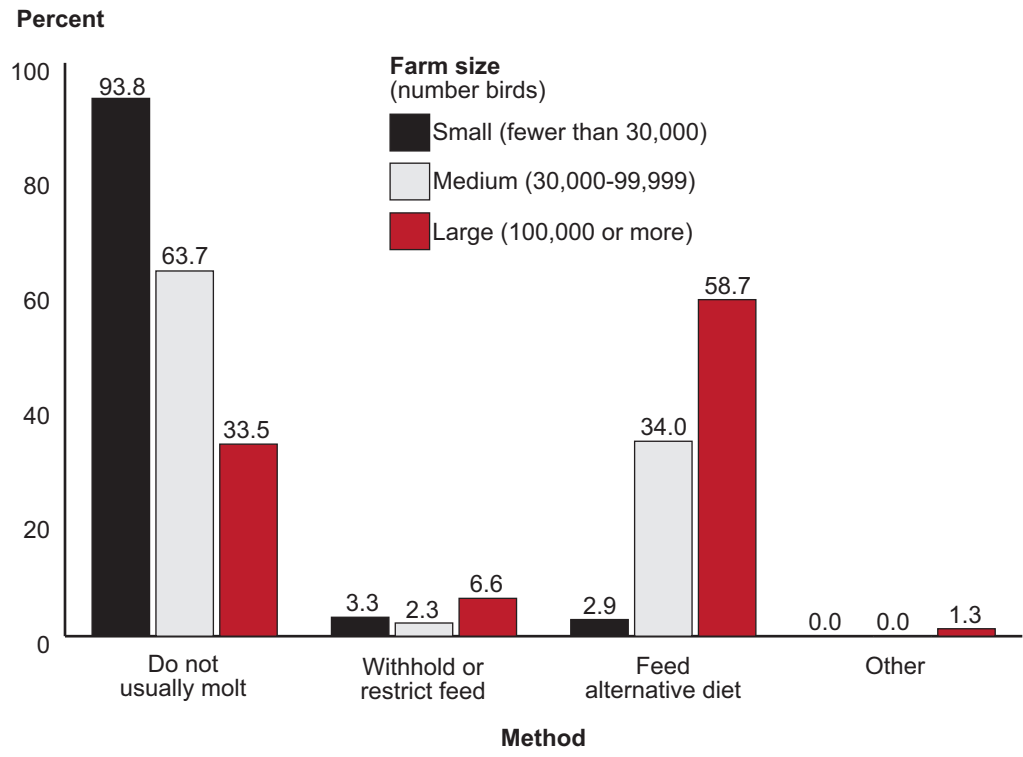


The percentage of farms that routinely molted their flocks increased as farm size increased.

D.4.b. Percentage of farms by routine molting method used, and by farm size:

Percent Farms						
Farm Size (number birds)						
Molting method	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Do not usually molt	93.8	(2.8)	63.7	(7.1)	33.5	(3.2)
Withhold or restrict feed	3.3	(2.6)	2.3	(1.1)	6.6	(2.2)
Feed alternative diet	2.9	(1.1)	34.0	(6.9)	58.7	(3.5)
Other	0.0	(—)	0.0	(—)	1.3	(0.7)
Total	100.0		100.0		100.0	

Percentage of farms by routine molting method used, and by farm size



## 5. Dead-bird disposal

Composting was a common method of dead-bird disposal in all regions except the Southeast. The majority of farms in the Southeast region (59.2 percent) buried dead birds. Incineration was used to dispose of dead birds by over one-third of farms in the West region (36.0 percent).

D.5.a. Percentage of farms by primary method of dead-bird (daily mortality) disposal, and by region:

Disposal Method	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Composting	50.9	(5.5)	7.8	(2.2)	42.6	(4.7)	35.8	(5.2)	43.1	(3.2)
Incineration	3.7	(0.9)	6.5	(2.3)	15.1	(4.2)	36.0	(5.2)	11.3	(1.5)
Burial/covered deep pit	7.0	(3.2)	59.2	(4.2)	6.2	(3.6)	0.0	(—)	10.2	(2.0)
Rendering	14.7	(1.0)	17.7	(3.8)	20.4	(3.3)	17.8	(2.7)	17.0	(1.2)
Landfill	19.7	(4.7)	8.9	(2.4)	13.3	(3.1)	2.1	(1.6)	14.8	(2.5)
Other	4.0	(3.9)	0.0	(—)	2.3	(1.5)	8.4	(3.5)	3.7	(2.1)
Total	100.0		100.0		100.0		100.0		100.0	

Compared with small and medium farms, a lower percentage of large farms used composting and a higher percentage used rendering to dispose of dead birds.

D.5.b. Percentage of farms by primary method of dead-bird (daily mortality) disposal, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Disposal method</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Composting	58.3	(5.3)	50.8	(9.7)	24.7	(2.8)
Incineration	7.9	(2.8)	13.5	(3.1)	13.3	(2.2)
Burial/covered deep pit	15.3	(4.6)	13.4	(4.3)	3.6	(0.7)
Rendering	1.7	(1.1)	4.7	(2.5)	37.7	(3.0)
Landfill	14.5	(3.1)	14.6	(9.1)	15.1	(2.6)
Other	2.2	(1.2)	3.0	(1.8)	5.6	(4.6)
Total	100.0		100.0		100.0	

## E. Layer Health Management

### 1. Prebiotics and probiotics

The percentage of farms that fed a prebiotic or probiotic product to layers ranged from 20.8 percent in the Southeast region to 53.6 percent in the Northeast region.

E.1.a. Percentage of farms in which the last completed layer flock was given a prebiotic or probiotic product, by region:

Given product?	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	53.6	(5.8)	20.8	(3.9)	34.5	(5.1)	29.8	(3.7)	42.5	(3.4)
No	44.0	(5.8)	75.3	(3.9)	55.0	(6.0)	70.2	(3.7)	53.0	(3.5)
Don't know	2.4	(0.9)	4.0	(0.9)	10.5	(3.7)	0.0	(—)	4.6	(1.2)
Total	100.0		100.0		100.0		100.0		100.0	

A higher percentage of small farms than large farms fed a prebiotic or probiotic product to layers (51.3 and 32.9 percent, respectively).

E.1.b. Percentage of farms in which the last completed layer flock was given a prebiotic or probiotic product, by farm size:

Given product?	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Yes	51.3	(5.8)	45.0	(9.8)	32.9	(3.0)
No	45.1	(6.2)	51.2	(9.8)	61.3	(3.2)
Don't know	3.7	(2.3)	3.7	(2.0)	5.9	(1.6)
Total	100.0		100.0		100.0	

**2. Antibiotics**

A low percentage of farms (10.5 percent) administered antibiotics to birds during the laying cycle.

E.2.a. Percentage of farms in which the last completed layer flock was given any antibiotic at any time during the laying cycle, by region:

<b>Percent Farms</b>									
<b>Region</b>									
<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
12.3	(3.0)	6.2	(3.0)	12.6	(3.2)	1.6	(1.1)	10.5	(1.8)

A lower percentage of small farms than large farms administered antibiotics to birds during the laying cycle (4.2 and 16.1 percent, respectively).

E.2.b. Percentage of farms in which the last completed layer flock was given any antibiotic at any time during the laying cycle, by farm size:

<b>Percent Farms</b>					
<b>Farm Size (number birds)</b>					
<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
4.2	(2.7)	11.3	(5.2)	16.1	(2.7)

When antibiotics were given to laying hens, the highest percentage of farms gave bacitracin methylene disalicylate (BMD) and chlortetracycline.

E.2.c. Percentage of farms by antibiotic given to the last completed flock:

<b>Antibiotic given</b>	<b>Percent farms</b>	<b>Std. error</b>
Bacitracin methylene disalicylate (BMD)	5.5	(1.4)
Bacitracin zinc	1.0	(0.7)
Tylosin (Tylan®)	1.3	(0.5)
Chlortetracycline (Aureomycin)	4.4	(1.2)
Other	0.2	(0.1)

Disease treatment was the reason for giving birds antibiotics on 7.7 percent of farms. Antibiotics were usually administered in feed.

E.2.d. Percentage of farms by route of administration of antibiotics given to the last completed flock, and by reason for giving antibiotics:

	<b>Percent farms</b>	<b>Std. error</b>
<b>Route administered*</b>		
Feed	9.7	(1.8)
Water	0.5	(0.2)
<b>Reason</b>		
Improve egg production/ feed efficiency	1.4	(0.9)
Disease treatment	7.7	(1.5)
Disease prevention	2.5	(0.8)

\*May be less than the total percentage of farms that gave an antibiotic (10.5 percent) due to item nonresponse.

When given to laying hens, antibiotics were given an average of 16.5 days for disease treatment and an average of 15.3 days for disease prevention.

E.2.e. For farms that administered antibiotics to the last completed flock, average number of days antibiotics were given, by reason :

<b>Reason</b>	<b>Average days</b>	<b>Std. error</b>
Disease treatment	16.5	(1.8)
Disease prevention	15.3	(4.1)



## F. Morbidity and Mortality

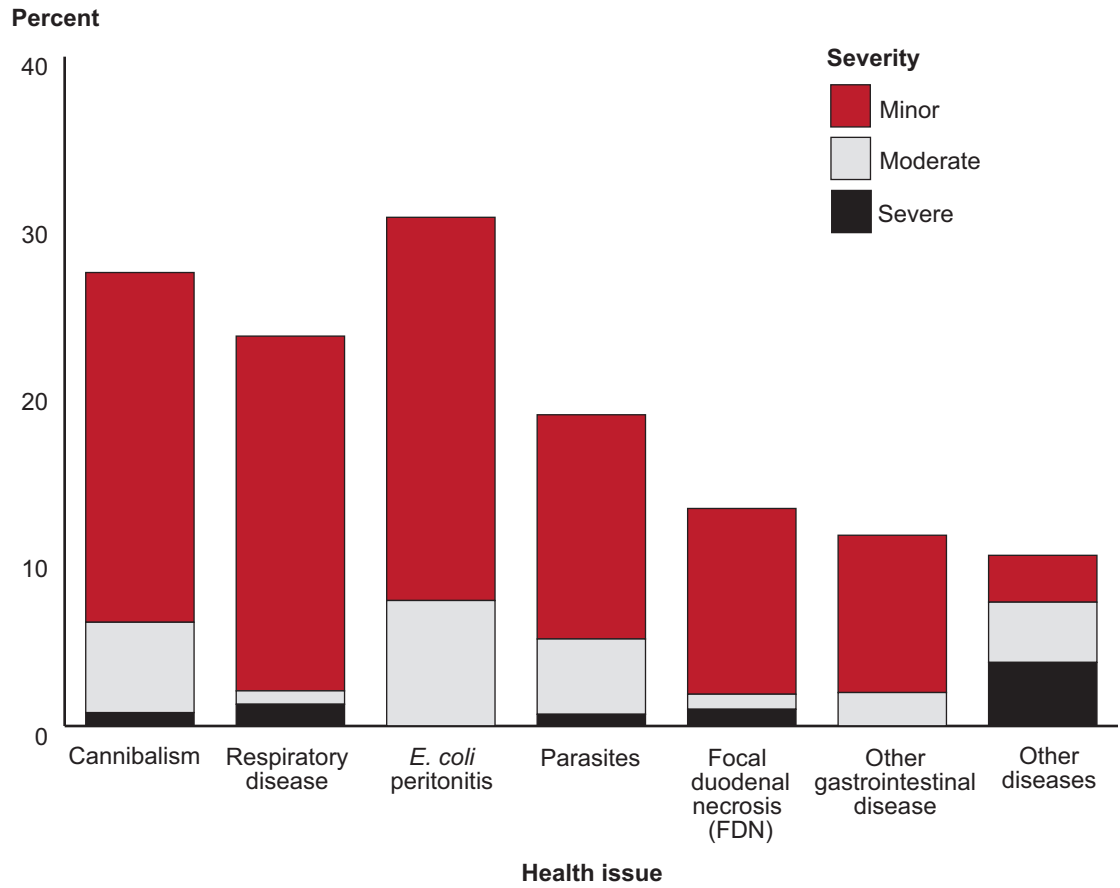
### 1. Morbidity

About 3 of 10 farms had health issues in their last completed flock due to *E. coli* peritonitis, although the issues were generally considered minor. About one of eight farms (13.0 percent) had health issues with focal duodenal necrosis (FDN). Heat stress was the most common “other” health issue.

F.1.a. Percentage of farms by severity of the following health issues in the last completed flock:

Health issue	Percent Farms								Total
	Severity of Problem								
	Severe		Moderate		Minor		No problem		
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	
Cannibalism	0.8	(0.4)	5.4	(1.3)	20.9	(2.3)	72.9	(2.5)	100.0
Respiratory disease	1.3	(0.3)	0.8	(0.3)	21.2	(2.7)	76.7	(2.7)	100.0
<i>E. coli</i> peritonitis	0.0	(—)	7.5	(1.4)	22.9	(2.5)	69.6	(2.9)	100.0
Parasites	0.7	(0.4)	4.5	(1.3)	13.4	(1.9)	81.4	(2.3)	100.0
Focal duodenal necrosis (FDN)	1.0	(0.4)	0.9	(0.3)	11.1	(2.6)	87.0	(2.6)	100.0
Other gastrointestinal disease	0.0	(—)	2.0	(0.6)	9.4	(1.7)	88.6	(1.8)	100.0
Other	3.8	(0.8)	3.6	(1.3)	2.8	(1.0)	89.8	(1.8)	100.0

**Percentage of farms by severity of the following health issues in the last completed flock**



The Northeast region had the lowest percentage of farms that had problems with cannibalism (16.4 percent). Problems with FDN were not observed in the West region.

F.1.b. Percentage of farms in which the last completed flock had a problem (minor, moderate, or severe) with the following health issues, by region:

Health issue	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Cannibalism	16.4	(3.0)	30.5	(4.0)	40.1	(5.9)	37.8	(5.6)	27.1	(2.5)
Respiratory disease	18.5	(3.8)	21.6	(3.9)	31.2	(6.1)	25.5	(4.1)	23.3	(2.7)
<i>E. coli</i> peritonitis	28.7	(4.0)	27.8	(3.9)	38.3	(6.5)	21.6	(4.9)	30.4	(2.9)
Parasites	14.2	(3.6)	12.1	(4.0)	21.5	(4.4)	33.7	(4.9)	18.6	(2.3)
Focal duodenal necrosis (FDN)	16.1	(4.7)	7.5	(3.0)	14.8	(4.1)	0.0	(—)	13.0	(2.6)
Other gastrointestinal disease	10.7	(2.6)	8.8	(3.3)	9.9	(3.8)	19.1	(3.7)	11.4	(1.8)
Other	5.6	(2.0)	11.2	(2.5)	13.1	(4.5)	21.6	(5.2)	10.2	(1.8)

A lower percentage of medium farms had respiratory problems in their last completed flock compared with small and large farms.

F.1.c. Percentage of farms in which the last completed flock had a problem (minor, moderate, or severe) with the following health issues, by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Health issue</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Cannibalism	30.7	(5.3)	25.7	(4.9)	24.4	(2.8)
Respiratory disease	26.2	(6.1)	7.4	(2.2)	28.2	(3.2)
<i>E. coli</i> peritonitis	35.6	(6.2)	20.3	(4.0)	30.5	(3.3)
Parasites	27.2	(5.4)	10.3	(2.9)	14.7	(2.2)
Focal duodenal necrosis (FDN)	13.8	(4.7)	7.1	(4.6)	15.0	(4.2)
Other gastrointestinal disease	10.6	(3.0)	14.7	(5.5)	10.6	(2.0)
Other diseases	5.0	(2.9)	17.5	(5.8)	11.5	(2.1)

## 2. Mortality

About 5 percent of hens in the last completed flock died by 60 weeks of age; in total, about 10 percent of hens died, regardless of age.

F.2.a. Percentage of hens placed in the last completed flock that died at or before 60 weeks of age and percentage of hens that died in total:

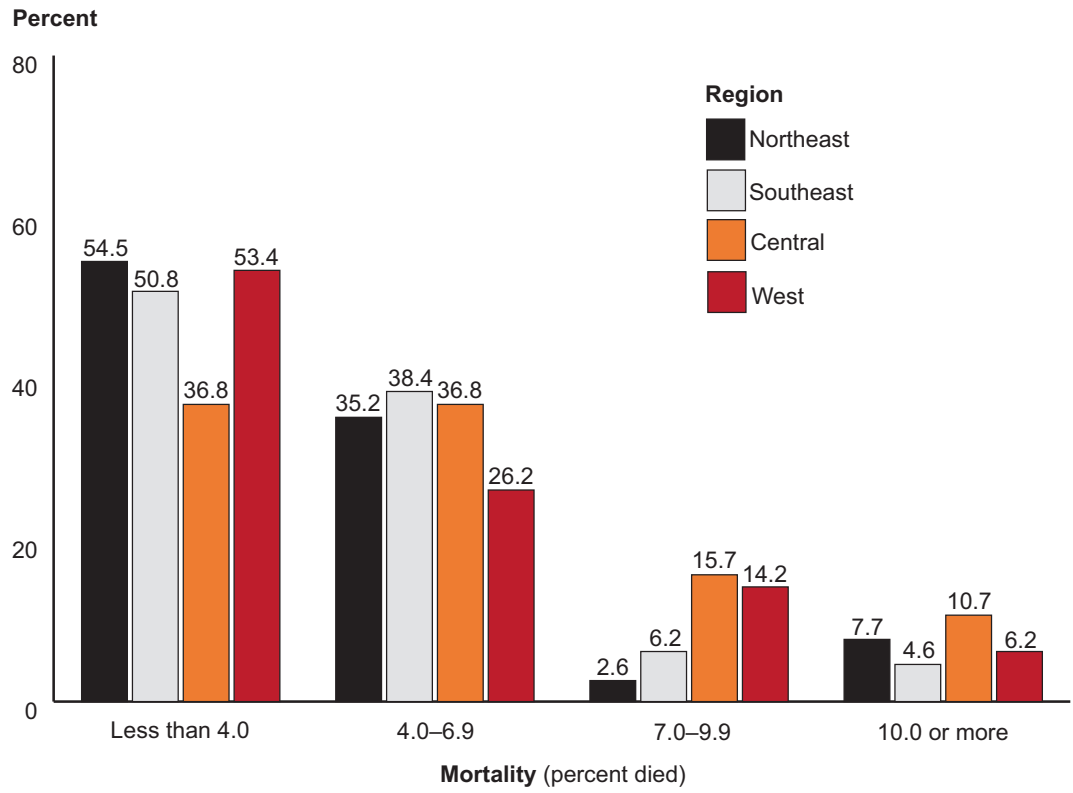
<b>Percent hens that died at or before 60 weeks</b>	<b>Std. error</b>	<b>Percent hens that died in total</b>	<b>Std. error</b>
5.2	(0.3)	10.1	(0.5)

About half of farms had a 60-week mortality of less than 4 percent. Over 20 percent of farms in the Central and West regions had a 60-week mortality of 7 percent or higher.

F.2.b. Percentage of farms by 60-week mortality for the last completed flock, and by region:

	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
60-week mortality (percent died)	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Less than 4.0	54.5	(5.8)	50.8	(4.6)	36.8	(4.2)	53.4	(6.5)	49.0	(3.4)
4.0–6.9	35.2	(5.5)	38.4	(4.9)	36.8	(6.1)	26.2	(5.3)	34.9	(3.4)
7.0–9.9	2.6	(0.8)	6.2	(2.4)	15.7	(4.7)	14.2	(5.1)	8.0	(1.6)
10.0 or more	7.7	(2.6)	4.6	(2.4)	10.7	(4.5)	6.2	(2.6)	8.1	(1.9)
Total	100.0		100.0		100.0		100.0		100.0	

Percentage of farms by 60-week mortality for the last completed flock, and by region



The 60-week mortality did not vary substantially by farm size.

F.2.c. Percentage of farms by 60-week mortality for the last completed flock, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>60-week mortality (percent died)</b>	<b>Small (fewer than 30,000)</b>		<b>Medium (30,000–99,999)</b>		<b>Large (100,000 or more)</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Less than 4.0	55.2	(5.6)	48.4	(8.7)	43.6	(4.1)
4.0–6.9	28.5	(5.8)	38.7	(9.3)	39.0	(3.7)
7.0–9.9	6.2	(2.9)	7.5	(3.0)	9.9	(2.2)
10.0 or more	10.1	(4.4)	5.3	(2.6)	7.5	(1.7)
Total	100.0		100.0		100.0	

**G. Egg Handling      1. Egg production per 100 hens**

The percentage of farms that produced 90 or more eggs per 100 hens per day during May 2013 ranged from 7.7 percent in the Southeast region to 42.3 percent in the Northeast region.

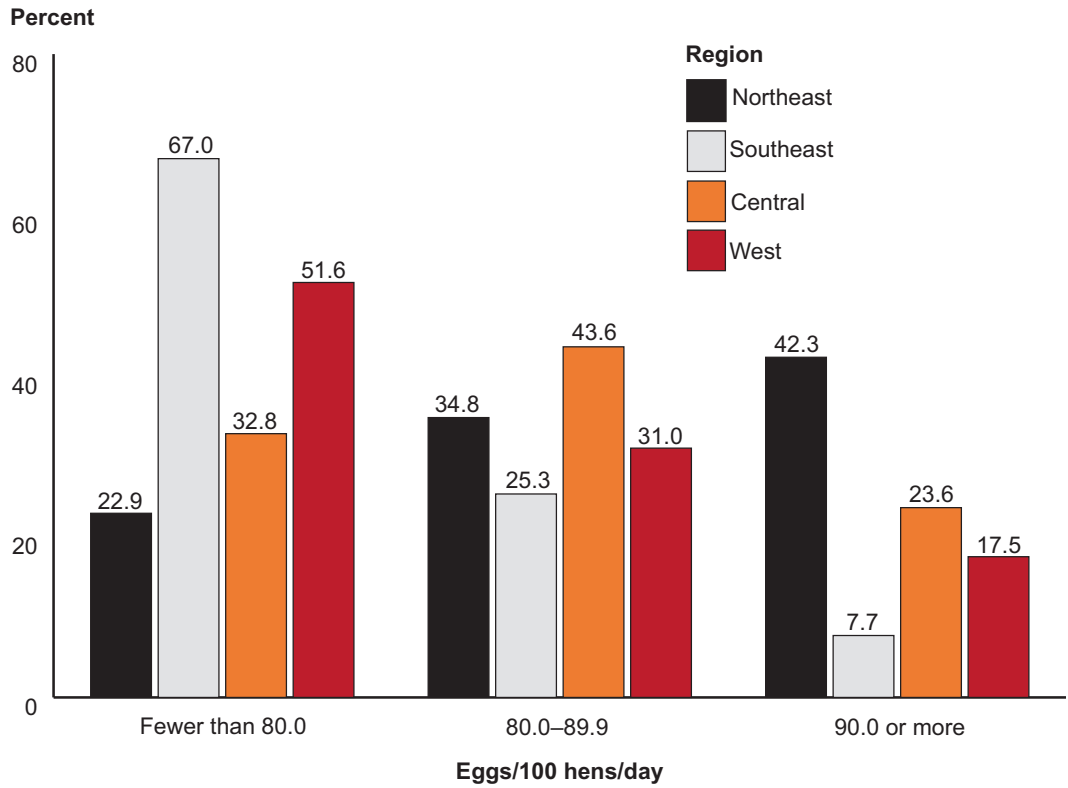
G.1.a. Percentage of farms by egg production per 100 hens\* per day during May 2013, and by region:

Number eggs/ 100 hens/day	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Fewer than 80.0	22.9	(3.9)	67.0	(4.7)	32.8	(3.5)	51.6	(5.1)	34.0	(2.3)
80.0–89.9	34.8	(5.6)	25.3	(4.6)	43.6	(4.5)	31.0	(5.2)	36.1	(3.1)
90.0 or more	42.3	(6.4)	7.7	(3.2)	23.6	(3.6)	17.5	(4.1)	29.9	(3.4)
Total	100.0		100.0		100.0		100.0		100.0	

\*June 1, 2013, inventory of hens 20 weeks or older.



**Percentage of farms by egg production per 100 hens\* per day during May 2013, and by region**



\*June 1, 2013, inventory of hens 20 weeks or older.

A lower percentage of large farms (12.6 percent) produced 90 or more eggs per 100 hens per day during May 2013 compared with small and medium farms (41.7 and 45.1 percent, respectively).

G.1.b. Percentage of farms by egg production per 100 hens\* per day during May 2013, and by farm size:

Number eggs/ 100 hens/day	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Fewer than 80.0	21.1	(3.8)	30.2	(6.7)	47.1	(3.1)
80.0–89.9	37.2	(4.6)	24.7	(5.7)	40.4	(5.0)
90.0 or more	41.7	(4.9)	45.1	(8.9)	12.6	(4.3)
Total	100.0		100.0		100.0	

\*June 1, 2013, inventory of hens 20 weeks or older.

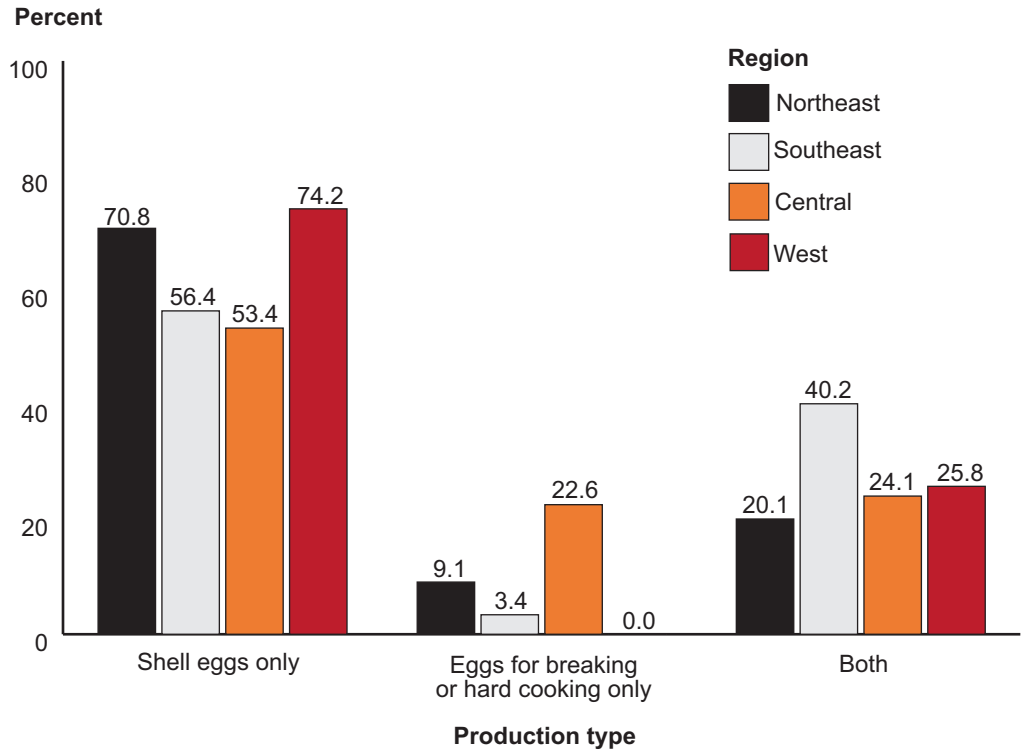
## 2. Type of egg production

About one of four farms in the Central region (22.6 percent) produced eggs for breaking or hard cooking exclusively, compared with less than 10 percent of farms in the other regions. Farms that produce eggs for breaking are only subject to the refrigeration requirements of the FDA egg safety rule and are not required to test for *Salmonella* Enteritidis.

G.2.a. Percentage of farms by type of egg production during May 2013, and by region:

Production type	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Shell eggs only	70.8	(4.7)	56.4	(3.7)	53.4	(4.4)	74.2	(4.0)	64.9	(2.8)
Eggs for breaking or hard cooking only	9.1	(2.6)	3.4	(0.9)	22.6	(3.5)	0.0	(—)	11.4	(1.7)
Both	20.1	(4.0)	40.2	(3.7)	24.1	(5.0)	25.8	(4.0)	23.7	(2.5)
Total	100.0		100.0		100.0		100.0		100.0	

Percentage of farms by type of egg production during May 2013, and by region



Small and medium farms predominately produced shell eggs only. The percentage of farms that produced eggs for breaking or hard cooking increased as farm size increased.

G.2.b. Percentage of farms by type of egg production during May 2013, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Production type</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Shell eggs only	84.6	(3.9)	64.7	(6.8)	45.4	(4.4)
Eggs for breaking or hard cooking only	3.2	(2.7)	15.8	(3.4)	17.5	(2.8)
Both	12.2	(2.9)	19.5	(5.8)	37.2	(4.7)
Total	100.0		100.0		100.0	

Over half of eggs produced in the Central region were for breaking or hard cooking, whereas the vast majority of eggs produced in the other regions were shell eggs.

G.2.c. Percentage of eggs produced during May 2013, by type of egg production and by region:

<b>Percent Eggs</b>										
<b>Region</b>										
<b>Production type</b>	<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Shell eggs	87.4	(2.2)	98.2	(0.4)	41.4	(9.1)	99.0	(0.3)	71.3	(5.5)
Eggs for breaking or hard cooking	12.6	(2.2)	1.8	(0.4)	58.6	(9.1)	1.0	(0.3)	28.7	(5.5)
Total	100.0		100.0		100.0		100.0		100.0	

Less than 1 percent of eggs produced on small farms were for breaking or hard cooking compared with more than 20 percent of eggs on medium and large farms.

G.2.d. Percentage of eggs produced during May 2013, by type of egg production and by farm size:

<b>Percent Eggs</b>						
<b>Farm Size (number birds)</b>						
<b>Production type</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Shell eggs	99.4	(0.1)	79.0	(6.0)	70.2	(5.9)
Eggs for breaking or hard cooking	0.6	(0.1)	21.0	(6.0)	29.8	(5.9)
Total	100.0		100.0		100.0	

### 3. Egg gathering

The majority of farms (76.0 percent) gathered eggs by belt with automated packing. The percentage of farms that hand-gathered eggs ranged from 4.9 percent of farms in the Northeast region to 23.7 percent of farms in the West region. Some farms gathered eggs using more than one method.

G.3.a. Percentage of farms by method of gathering eggs during May 2013, and by region:

<b>Percent Farms</b>										
<b>Region</b>										
<b>Gathering method*</b>	<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Hand	4.9	(2.3)	8.4	(1.4)	15.4	(4.3)	23.7	(4.6)	10.6	(1.8)
Belt with packing by hand	18.8	(4.2)	30.4	(2.8)	18.7	(4.2)	26.4	(4.8)	20.7	(2.5)
Belt with automated packing	84.0	(3.8)	62.4	(2.8)	71.2	(4.6)	64.2	(4.8)	76.0	(2.4)

\*Farms may have used more than one method of gathering eggs.

About one of five small farms gathered eggs by hand, whereas nearly all large farms gathered eggs by belt with automated packing.

G.3.b. Percentage of farms by method of gathering eggs during May 2013, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Gathering method*</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Hand	20.7	(4.3)	4.0	(1.9)	4.2	(1.3)
Belt with packing by hand	38.5	(5.7)	20.1	(4.9)	3.3	(1.3)
Belt with automated packing	51.0	(5.8)	85.2	(2.9)	95.8	(1.4)

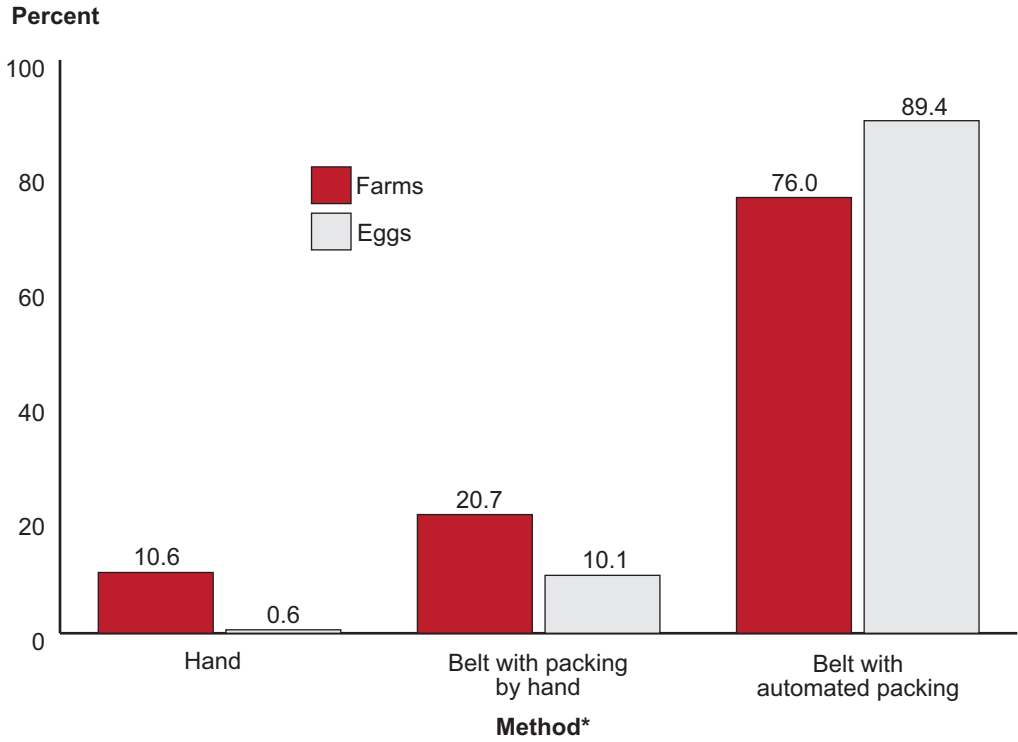
\*Farms may have used more than one method of gathering eggs.

Less than 1 percent of eggs produced during May 2013 were gathered by hand.

G.3.c. Percentage of eggs produced during May 2013, by method of gathering eggs and by region:

<b>Percent Eggs</b>										
<b>Region</b>										
<b>Gathering method</b>	<b>Northeast</b>		<b>Southeast</b>		<b>Central</b>		<b>West</b>		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Hand	0.0	(0.0)	0.5	(0.1)	0.2	(0.1)	3.0	(1.4)	0.6	(0.2)
Belt with packing by hand	1.6	(0.4)	1.7	(0.3)	19.9	(11.6)	5.9	(2.0)	10.1	(5.3)
Belt with automated packing	98.4	(0.4)	97.8	(0.3)	79.9	(11.6)	91.0	(2.5)	89.4	(5.3)
Total	100.0		100.0		100.0		100.0		100.0	

**Percentage of farms and percentage of eggs by method of gathering eggs produced during May 2013**



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\*Farms may have used more than one method of gathering eggs.



A higher percentage of eggs were hand-gathered on small farms (8.2 percent) than on medium and large farms (1.3 and 0.3 percent, respectively). Conversely, a higher percentage of eggs on medium and large farms (86.3 and 90.3 percent, respectively) were gathered by belt with automated packing compared with small farms (55.3 percent).

G.3.d. Percentage of eggs produced during May 2013, by method of gathering eggs and by farm size:

<b>Percent Eggs</b>						
<b>Farm Size (number birds)</b>						
<b>Gathering method</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Hand	8.2	(2.2)	1.3	(0.6)	0.3	(0.2)
Belt with packing by hand	36.5	(5.8)	12.4	(3.4)	9.3	(5.7)
Belt with automated packing	55.3	(6.3)	86.3	(3.6)	90.3	(5.7)
Total	100.0		100.0		100.0	

**4. Egg processing**

**Note:** The remaining tables in this section (G) refer to farms that produced shell eggs (88.6 percent of farms, table G.2.a).

The percentage of farms that processed eggs on-farm ranged from 16.4 percent in the Northeast region to 42.2 percent in the Southeast region.

G.4.a. Percentage of farms by primary location used for shell-egg processing (washing, grading, and packing into cartons), and by region:

Primary location	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
On-farm	16.4	(1.1)	42.2	(4.3)	31.0	(4.4)	34.1	(4.0)	24.8	(1.5)
Off-farm	83.6	(1.1)	57.8	(4.3)	69.0	(4.4)	65.9	(4.0)	75.2	(1.5)
Total	100.0		100.0		100.0		100.0		100.0	

The majority of large farms processed eggs on-farm, whereas nearly all small and medium farms processed eggs off-farm.

G.4.b. Percentage of farms by primary location used for shell-egg processing (washing, grading, and packing into cartons), and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Primary location</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
On-farm	1.9	(0.5)	0.6	(0.1)	61.8	(4.4)
Off-farm	98.1	(0.5)	99.4	(0.1)	38.2	(4.4)
Total	100.0		100.0		100.0	

About 4 of 10 farms that processed eggs on-farm also processed eggs from other farms.

G.4.c. For farms that processed eggs on-farm, percentage of farms that processed eggs from other farms (side loading):

<b>Percent farms</b>	<b>Std. error</b>
39.2	(3.6)

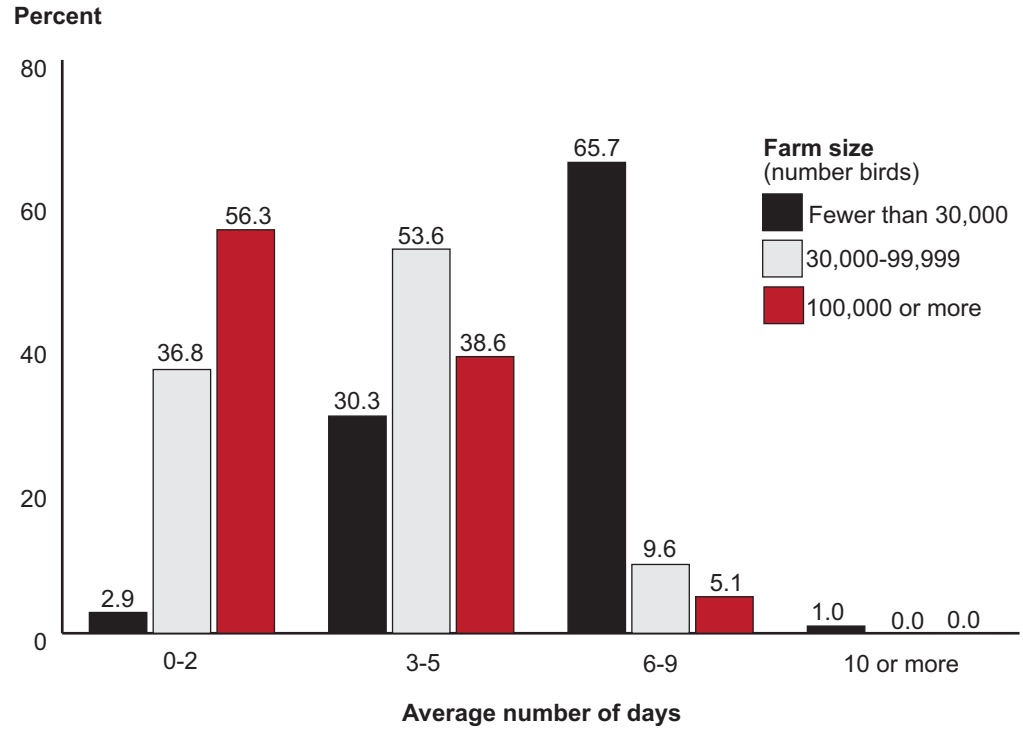
On farms that processed eggs off-farm, eggs were picked up within 2 days on the majority of large farms and every 6 to 9 days on the majority of small farms.

Distance to the egg processing plant also differed by farm size. For farms that processed eggs off-farm, about one of three small farms transported eggs 100 or more miles for processing, whereas the majority of large and medium farms transported eggs 10 to 99 miles.

G.4.d. For farms that processed eggs off-farm, percentage of farms by on-farm egg-management characteristics, and by farm size:

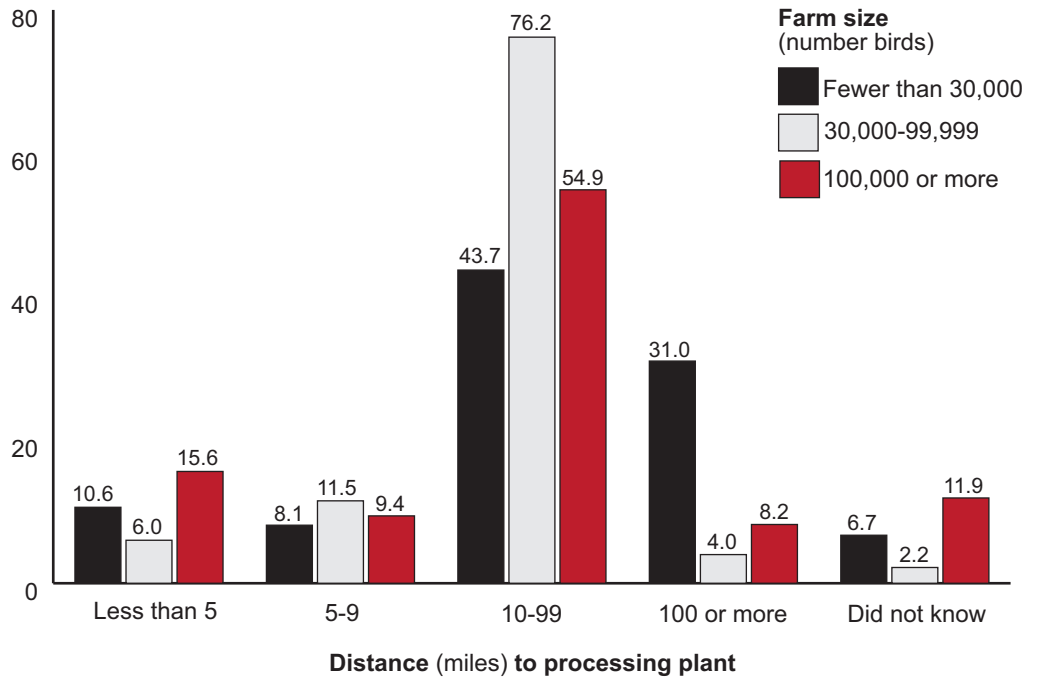
Egg-management characteristic	Percent Farms							
	Farm Size (number birds)							
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Average number of days between egg pickups								
0–2	2.9	(1.3)	36.8	(10.4)	56.3	(9.5)	22.9	(3.4)
3–5	30.3	(5.1)	53.6	(11.1)	38.6	(10.1)	38.3	(4.4)
6–9	65.7	(5.1)	9.6	(5.4)	5.1	(2.2)	38.3	(3.2)
10 or more	1.0	(0.5)	0.0	(—)	0.0	(—)	0.5	(0.3)
Total	100.0		100.0		100.0		100.0	
Usual temperature for egg storage on-farm (°F)								
Less than 50°	100.0	(—)	92.0	(3.0)	93.6	(2.4)	96.6	(0.9)
50–59°	0.0	(—)	1.4	(1.0)	0.0	(—)	0.4	(0.3)
60° or more	0.0	(—)	2.6	(2.2)	1.2	(0.8)	0.9	(0.6)
Did not know	0.0	(—)	4.0	(2.4)	5.2	(2.3)	2.1	(0.8)
Total	100.0		100.0		100.0		100.0	
Usual percent humidity for egg storage on-farm								
Less than 50	0.0	(—)	2.7	(2.3)	1.4	(0.9)	1.0	(0.6)
50–74	11.6	(2.3)	24.7	(6.0)	12.1	(3.4)	15.0	(2.0)
75 or higher	11.2	(4.5)	37.1	(12.2)	18.6	(13.5)	19.3	(4.4)
Did not know	77.3	(5.0)	35.5	(12.1)	67.8	(11.6)	64.7	(4.7)
Total	100.0		100.0		100.0		100.0	
Distance (miles) to processing plant where the majority of eggs were processed								
Less than 5	10.6	(4.8)	6.0	(1.9)	15.6	(3.9)	10.3	(2.6)
5–9	8.1	(3.1)	11.5	(3.4)	9.4	(2.9)	9.3	(1.9)
10–99	43.7	(5.4)	76.2	(5.2)	54.9	(8.2)	54.8	(3.3)
100 or more	31.0	(5.3)	4.0	(2.8)	8.2	(3.5)	19.1	(3.0)
Did not know	6.7	(3.9)	2.2	(1.9)	11.9	(3.8)	6.5	(2.2)
Total	100.0		100.0		100.0		100.0	

**For farms that processed eggs off-farm, percentage of farms by average number of days between egg pickups, and by farm size**



**For farms that processed eggs off-farm, percentage of farms by distance to processing plant where the majority of eggs were processed, and by farm size**

Percent



About one of four small farms washed eggs on-farm before sending them to the processor. These farms might be washing dirty eggs only. Large farms rarely washed eggs before sending them to processing.

G.4.e. For farms that processed eggs off-farm, percentage of farms that washed eggs on-farm before sending them to the processor, by farm size:

<b>Percent Farms</b>							
<b>Farm Size (number birds)</b>							
<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)		<b>All</b>	
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
27.5	(5.9)	11.2	(10.4)	5.6	(2.4)	18.6	(4.4)

About 4 of 10 farms washed eggs at a temperature of less than 80°F. Eggs should be washed at a temperature at least 20° warmer than the eggs.

G.4.f. For farms that washed eggs before sending them to the processor, percentage of farms by temperature that eggs were washed:

<b>Temperature (°F)</b>	<b>Percent farms</b>	<b>Std. error</b>
Less than 80	41.6	(14.1)
80–99	17.9	(8.2)
100 or above	40.5	(15.1)
Total	100.0	

On farms that processed eggs off-farm, flats containing eggs were placed on racks or pallets for transport to the egg-processing facility. Nearly all farms used reusable plastic flats that were cleaned and disinfected prior to reusing. The majority of farms cleaned and disinfected racks and pallets before reusing them.

G.4.g. For farms that processed eggs off-farm, percentage of farms by management of egg flats, racks, and pallets, and by farm size:

Percent Farms								
Farm Size (number birds)								
Management	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Type of flats primarily used for storage and transport of shell eggs processed off-farm								
Disposable fiber	0.5	(0.3)	2.4	(2.0)	1.0	(0.5)	1.1	(0.6)
Reusable plastic, cleaned and disinfected	99.5	(0.3)	97.1	(2.0)	97.1	(1.6)	98.4	(0.6)
Reusable plastic, NOT cleaned and disinfected	0.0	(—)	0.6	(0.1)	2.0	(1.5)	0.6	(0.3)
Total	100.0		100.0		100.0		100.0	
Egg racks or pallets usually returned to the same farm								
Yes	10.7	(4.7)	41.0	(8.1)	42.0	(7.7)	25.3	(3.3)
Before reusing at the farm, racks or pallets were. . .								
Cleaned only	3.6	(0.9)	30.6	(11.3)	24.4	(5.1)	15.4	(3.6)
Disinfected only	0.0	(—)	0.0	(—)	1.2	(0.7)	0.3	(0.2)
Cleaned and disinfected	65.5	(5.6)	40.9	(11.2)	43.8	(9.4)	54.1	(4.6)
Neither cleaned nor disinfected	31.0	(5.6)	28.6	(6.3)	30.6	(6.1)	30.2	(3.4)
Total	100.0		100.0		100.0		100.0	



## H. Employee and Visitor Biosecurity

### 1. Employees and crews

Over three-fourths of farms required employees and crews to use footbaths (77.8 and 83.6 percent, respectively). Changing boots and clothing were required for crews by the majority of farms, whereas less than half of farms required employees to change boots and clothing. The majority of farms did not allow employees and crews to own poultry or birds. The majority of farms required employees or crews to avoid other poultry for at least 24 hours before coming on the farm. Producers on some farms did not know if crews were allowed to own birds or if they were required to avoid poultry or birds for 24 hours (24.6 and 10.3 percent of farms, respectively).

H.1.a. Percentage of farms in which the following precautions were required for employees and company or contract crews who worked in the layer houses:

Precaution required	Percent Farms			
	Employees		Crews <sup>1</sup>	
	Percent	Std. error	Percent	Std. error
Different personnel for different houses <sup>2</sup>	24.1	(2.5)	22.6	(2.5)
Shower	5.7	(2.1)	10.5	(2.8)
Hand sanitizer	55.0	(3.3)	50.9	(3.4)
Footbaths	77.8	(3.4)	83.6	(2.8)
Change boots or use shoe covers	42.4	(3.4)	69.7	(3.4)
Change clothes/coveralls	33.6	(3.0)	71.5	(2.7)
Not be around other poultry for at least 24 hr (e.g., other farms, markets, slaughter plants) before coming on this farm	76.9	(3.2)	64.1 <sup>3</sup>	(3.4)
Cannot own their own poultry or birds	87.5	(3.0)	67.0 <sup>4</sup>	(2.9)

<sup>1</sup>For farms that had crews (e.g., vaccination crews, catching crews).

<sup>2</sup>For farms with more than one house.

<sup>3</sup>10.3 percent did not know.

<sup>4</sup>24.6 percent did not know.

For farms that used footbaths, approximately half used liquid and half used dry powder.

H.1.b. For farms that used footbaths, percentage of farms by type of footbath used:

<b>Footbath type</b>	<b>Percent farms</b>	<b>Std. error</b>
Liquid	43.5	(2.9)
Dry powder	53.9	(3.0)
Other	2.6	(1.4)
Total	100.0	

Half of farms that used liquid footbaths changed the disinfectant daily, while the majority of farms that used dry powder footbaths changed the disinfectant every 10 days or longer.

H.1.c. For farms that used footbaths, percentage of farms by length of time footbath disinfectant was typically used before being changed, and by footbath type:

	<b>Percent Farms</b>			
	<b>Footbath Type</b>			
	<b>Liquid</b>		<b>Dry powder</b>	
<b>Time (days)</b>	<b>Percent</b>	<b>Std. error</b>	<b>Percent</b>	<b>Std. error</b>
1	49.1	(6.0)	0.4	(0.3)
2–9	48.6	(6.1)	19.4	(2.9)
10 or more	2.3	(1.2)	80.2	(2.9)
Total	100.0		100.0	

## 2. Farm access

In the West region, the highest percentage of operations used locked, gated entrances and fencing to limit vehicle access. “Other” barriers to restrict visitors included security cameras and guards.

H.2.a. Percentage of farms by barriers used to restrict or limit visitor or vehicle access to the farm, and by region:

Barrier	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Locked, gated entrance	2.4	(0.4)	35.2	(4.6)	16.8	(4.4)	68.5	(5.3)	17.1	(1.6)
Gated entrance (unlocked)	0.0	(—)	0.0	(—)	4.2	(1.8)	6.5	(2.0)	2.0	(0.6)
Fencing that limits vehicle access	11.3	(3.0)	48.1	(4.4)	19.0	(3.1)	82.5	(4.8)	25.5	(1.9)
Signs posted (e.g., no trespassing)	97.1	(2.1)	98.7	(0.1)	94.1	(1.7)	100.0	(—)	96.7	(1.2)
Other	1.3	(0.2)	4.4	(2.3)	14.2	(3.3)	11.5	(3.2)	6.6	(1.1)

A higher percentage of large farms than small farms used locked, gated entrances and fencing to limit vehicle access.

H.2.b. Percentage of farms by barriers used to restrict or limit visitor or vehicle access to the farm, and by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Barrier</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Locked, gated entrance	5.9	(2.5)	15.8	(3.2)	29.1	(3.0)
Gated entrance (unlocked)	4.5	(1.4)	1.1	(0.8)	0.0	(—)
Fencing that limits vehicle access	18.8	(3.9)	22.5	(3.7)	33.5	(3.1)
Signs posted (e.g., no trespassing)	93.1	(2.9)	97.8	(1.1)	99.6	(0.2)
Other	0.4	(0.2)	1.4	(0.6)	15.3	(2.7)

### 3. Visitors

A higher percentage of large farms than small farms required vehicle biosecurity measures for visitors.

H.3.a. Percentage of farms by vehicle biosecurity requirements for business and nonbusiness visitors to the farm, and by farm size:

Requirement for vehicles	Percent Farms							
	Farm Size (number birds)							
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Business visitors (e.g., consultants, repairmen)								
Have vehicle tires cleaned or disinfected upon entering	6.3	(1.3)	10.5	(2.6)	14.4	(2.3)	10.5	(1.1)
Park in a restricted area away from layer housing	35.8	(5.1)	49.6	(6.7)	53.8	(3.7)	45.9	(3.1)
Use a vehicle that has not been on another poultry farm that day	13.1	(3.0)	38.6	(9.4)	43.9	(3.7)	30.8	(2.8)
Do other vehicle biosecurity measures	0.4	(0.2)	10.1	(4.5)	9.3	(1.8)	6.0	(1.1)
Nonbusiness visitors (e.g., neighbors, school field trips)								
Have vehicle tires cleaned or disinfected upon entering	3.8	(1.4)	0.6	(0.1)	9.4	(2.2)	5.5	(1.1)
Park in a restricted area away from layer housing	26.0	(5.3)	43.0	(7.5)	52.4	(4.0)	40.3	(3.3)
Use a vehicle that has not been on another poultry farm that day	16.2	(3.6)	43.9	(7.9)	37.7	(3.7)	30.6	(3.1)
Do other vehicle biosecurity measures	8.8	(3.0)	0.9	(0.5)	5.6	(1.7)	6.0	(1.4)

Over half of farms (58.1 percent) did not allow nonbusiness visitors inside the layer houses. The majority of farms (87.8 percent) required business visitors to sign in.

H.3.b. Percentage of farms by biosecurity policy for business and nonbusiness visitors inside the layer houses, and by farm size:

Percent Farms								
Farm Size (number birds)								
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
Policy for visitors	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
<b>Business visitors</b>								
Visitors NOT allowed inside the layer houses	4.3	(0.8)	8.3	(2.8)	8.9	(1.8)	6.9	(0.9)
Visitors allowed in layer houses but required to sign in	92.2	(2.4)	88.3	(3.5)	83.3	(4.0)	87.8	(2.0)
Visitors allowed in layer houses and NOT required to sign in	3.5	(2.2)	3.5	(2.1)	7.8	(3.5)	5.3	(1.7)
Total	100.0		100.0		100.0		100.0	
<b>Nonbusiness visitors</b>								
Visitors NOT allowed inside the layer houses	51.2	(5.8)	74.5	(9.9)	56.6	(4.0)	58.1	(3.3)
Visitors allowed in layer houses but required to sign in	38.5	(5.0)	25.5	(9.9)	34.8	(5.5)	34.4	(3.4)
Visitors allowed in layer houses and NOT required to sign in	10.3	(3.1)	0.0	(—)	8.6	(3.7)	7.6	(1.9)
Total	100.0		100.0		100.0		100.0	

Showers were rarely required for visitors. The highest percentages of farms required business visitors to use footbaths, change boots or use shoe covers, or change clothes (82.1, 85.8, and 81.3 percent, respectively); 60.2 percent of farms required that business visitors not own birds or poultry. An additional 17.3 percent did not know if business visitors were prohibited from owning birds or poultry (data not shown).

H.3.c. For farms in which business or nonbusiness visitors entered the layer houses, percentage of farms by biosecurity requirements for visitors, and by farm size:

Requirement for visitors	Percent Farms							
	Farm Size (number birds)							
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Business visitors								
Shower	1.6	(0.5)	2.3	(1.1)	3.3	(1.4)	2.4	(0.6)
Use hand sanitizer	55.1	(5.8)	38.0	(9.6)	51.3	(4.1)	50.0	(3.5)
Use footbaths	78.6	(5.1)	86.0	(5.6)	83.5	(4.7)	82.1	(2.9)
Change boots or use shoe covers	85.2	(5.0)	94.9	(2.3)	81.5	(4.7)	85.8	(2.7)
Change clothes/coveralls	77.3	(5.1)	87.3	(5.1)	81.9	(4.7)	81.3	(2.9)
Not be around other poultry at least 24 hr (e.g., other farms, markets, slaughter plants) before coming on this farm	35.0	(4.6)	55.6	(7.2)	81.9	(6.1)	58.0	(2.8)
Cannot own their own poultry or birds	46.4	(5.3)	74.6	(10.2)	66.1	(5.7)	60.2	(3.6)
Nonbusiness visitors								
Shower	0.0	(—)	0.0	(—)	2.1	(1.8)	0.9	(0.7)
Use hand sanitizer	42.0	(7.9)	51.7	(15.5)	44.8	(6.0)	44.7	(5.4)
Use footbaths	64.9	(8.2)	72.1	(12.8)	82.1	(8.0)	73.0	(5.2)
Change boots or use shoe covers	58.5	(8.2)	71.8	(13.3)	64.5	(10.6)	63.1	(6.4)
Change clothes/coveralls	49.1	(8.2)	64.4	(13.9)	62.3	(10.5)	56.9	(6.3)
Not be around other poultry at least 24 hr (e.g., other farms, markets, slaughter plants) before coming on this farm	41.6	(5.7)	74.8	(12.7)	79.1	(11.3)	62.2	(5.9)
Cannot own their own poultry or birds	29.0	(5.3)	74.5	(12.3)	57.4	(10.1)	48.1	(5.9)

**I. Animals****1. Domestic animals on-farm**

Broilers, other poultry, and other domestic birds were rarely found on layer farms. In each region, about one-fourth of farms had cattle. Dogs were present on about one-third of farms. The presence of cats ranged from 2.9 percent of farms in the Southeast region to 40.5 percent in the Central region.

I.1.a. Percentage of farms in which the following domestic animals were present on the farm, by region:

Domestic animal	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Broilers	0.0	(—)	0.0	(—)	4.8	(1.9)	0.0	(—)	1.4	(0.6)
Other poultry <sup>1</sup>	0.0	(—)	0.0	(—)	1.0	(0.4)	0.0	(—)	0.3	(0.1)
Other domestic birds <sup>2</sup>	2.1	(2.0)	0.0	(—)	0.0	(—)	1.6	(0.7)	1.2	(1.0)
Cattle	24.0	(4.0)	29.1	(3.9)	27.7	(5.0)	27.0	(4.8)	25.9	(2.6)
Horses or other equids	16.5	(3.7)	1.2	(0.1)	28.1	(3.9)	1.6	(0.7)	16.8	(2.2)
Sheep or goats	13.5	(5.1)	0.0	(—)	12.1	(4.1)	5.4	(2.1)	11.0	(2.8)
Pigs	5.7	(2.4)	0.0	(—)	8.5	(3.4)	3.1	(1.3)	5.7	(1.6)
Cats	33.1	(4.1)	2.9	(1.1)	40.5	(5.9)	22.7	(5.0)	31.5	(2.8)
Dogs	34.1	(5.5)	11.1	(2.9)	49.9	(3.4)	29.8	(4.8)	36.4	(3.0)
Other domestic animals	4.6	(2.7)	0.0	(—)	0.0	(—)	0.0	(—)	2.3	(1.3)

<sup>1</sup>Including pet and exhibition poultry.

<sup>2</sup>E.g., ratites, peacocks.



Domestic animals were found on a higher percentage of small farms than large farms.

I.1.b. Percentage of farms in which the following domestic animals were present on the farm, by farm size:

Domestic animal	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Broilers	3.7	(1.4)	0.0	(—)	0.0	(—)
Other poultry <sup>1</sup>	0.8	(0.3)	0.0	(—)	0.0	(—)
Other domestic birds <sup>2</sup>	3.2	(2.6)	0.0	(—)	0.0	(—)
Cattle	50.4	(6.0)	12.9	(3.1)	9.2	(1.5)
Horses or other equids	40.7	(5.2)	1.8	(1.1)	1.7	(0.9)
Sheep or goats	18.2	(5.2)	3.0	(1.5)	8.2	(4.5)
Pigs	11.8	(3.9)	4.6	(2.2)	0.5	(0.4)
Cats	45.3	(6.1)	33.8	(7.8)	17.3	(4.7)
Dogs	59.5	(4.9)	29.8	(8.9)	17.7	(4.6)
Other domestic animals	5.5	(3.5)	0.0	(—)	0.4	(0.3)

<sup>1</sup>Including pet and exhibition poultry.

<sup>2</sup>E.g., ratites, peacocks.

## 2. Nearest premises with poultry

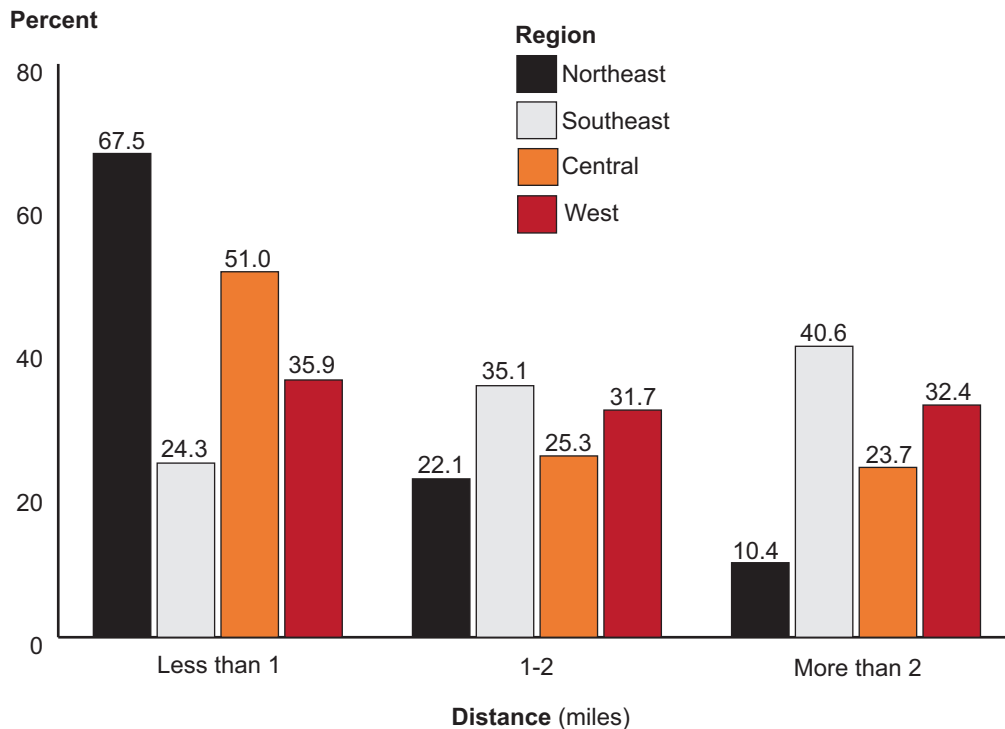
The percentage of farms located less than 1 mile from another premises with poultry ranged from 24.3 percent in the Southeast region to 67.5 percent in the Northeast region.

I.2. Percentage of farms by distance to the nearest premises with poultry,\* and by region:

Distance (miles)	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Less than 1	67.5	(4.8)	24.3	(4.1)	51.0	(5.2)	35.9	(5.1)	54.8	(2.9)
1–2	22.1	(4.3)	35.1	(4.2)	25.3	(4.9)	31.7	(4.0)	25.4	(2.7)
More than 2	10.4	(2.7)	40.6	(3.8)	23.7	(3.1)	32.4	(5.2)	19.8	(1.8)
Total	100.0		100.0		100.0		100.0		100.0	

\*Including backyard flocks, chickens, ducks, geese, turkeys, etc.

**Percentage of farms by distance to the nearest premises with poultry,\* and by region**



\*Including backyard flocks, chickens, ducks, geese, turkeys, etc.

### 3. Access to feed by other animals

Wild birds, cats, and dogs had access to feed before it was fed to layers on less than 1 percent of farms, while flies had access to feed on 20.7 percent of farms.

I.3.a. Percentage of farms in which the following animals had access to feed (e.g., feed in tanks, bins, feed lines) before it was fed to layers, by region:

Animal	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Rodents	15.2	(3.5)	5.3	(2.1)	14.0	(3.3)	1.8	(1.3)	12.4	(2.0)
Wild birds	0.0	(—)	0.0	(—)	2.3	(2.1)	0.0	(—)	0.7	(0.6)
Flies	22.7	(5.2)	6.5	(2.1)	25.6	(4.4)	9.9	(2.4)	20.7	(2.9)
Darkling beetles	20.2	(5.2)	5.3	(2.1)	15.0	(3.3)	5.2	(1.9)	15.6	(2.8)
Cats	0.0	(—)	0.0	(—)	2.3	(2.1)	0.0	(—)	0.7	(0.6)
Dogs	0.0	(—)	0.0	(—)	2.3	(2.1)	0.0	(—)	0.7	(0.6)

Rodents, flies, and darkling beetles had access to feed before it was fed to layers on a lower percentage of medium farms than large farms.

I.3.b. Percentage of farms in which the following animals had access to feed (e.g., feed in tanks, bins, feed lines) before it was fed to layers, by farm size:

<b>Percent Farms</b>						
<b>Farm Size (number birds)</b>						
<b>Animal</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Rodents	14.4	(4.4)	4.7	(1.5)	14.4	(2.5)
Wild birds	0.0	(—)	0.0	(—)	1.7	(1.5)
Flies	23.6	(4.9)	6.6	(1.7)	25.1	(4.4)
Darkling beetles	14.9	(4.5)	5.2	(1.5)	21.8	(4.5)
Cats	0.0	(—)	0.0	(—)	1.7	(1.5)
Dogs	0.0	(—)	0.0	(—)	1.7	(1.5)

## J. Rodent and Fly Control

### 1. Rodent problems

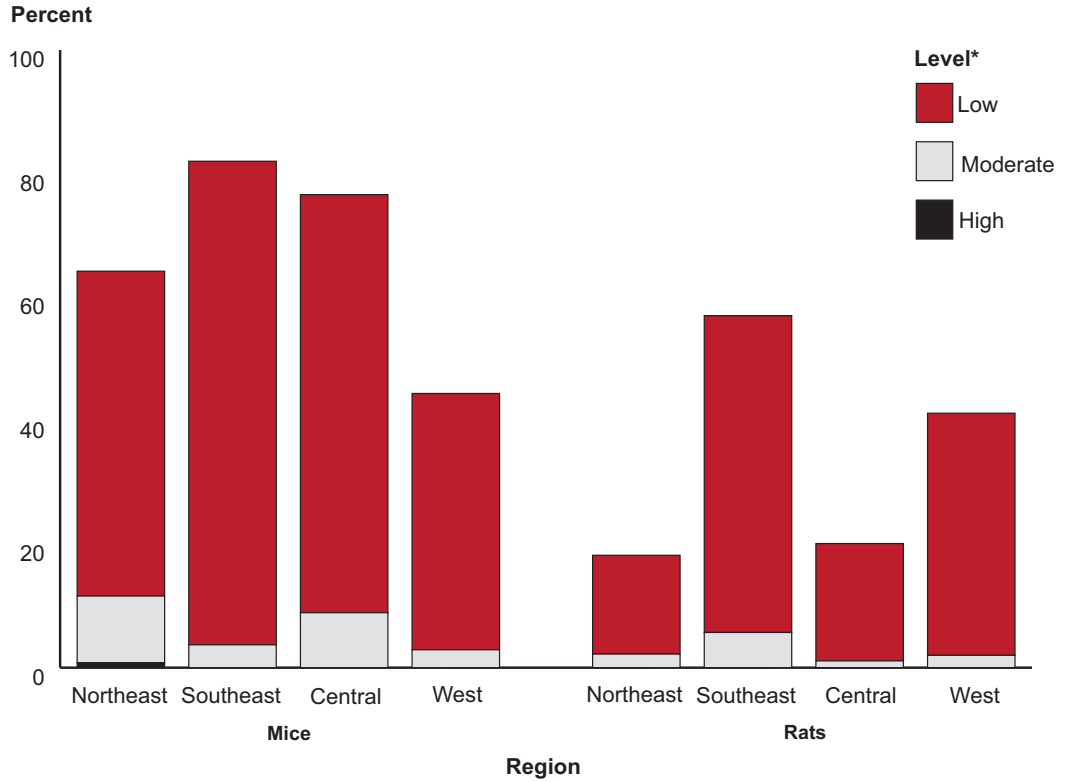
Overall, 66.8 percent of farms had any problems with mice and 24.9 percent had any problems with rats. Farms with rodent problems usually ranked the problem as low (minor impact on building or feed efficiency). The percentage of farms with a low-, moderate-, or high-level problem with mice ranged from 44.4 percent in the West region to 82.0 percent in the Southeast region. The percentage of farms with a low-, moderate-, or high-level problem with rats ranged from 18.2 percent in the Northeast region to 57.1 percent in the Southeast region.

J.1.a. Percentage of farms by level of ongoing problem caused by mice, rats, and other rodents inside the layer house(s) during the previous 12 months, and by region:

		Percent Farms									
		Region									
		Northeast		Southeast		Central		West		All	
Rodent	Level*	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Mice	High	0.8	(0.7)	0.0	(—)	0.0	(—)	0.0	(—)	0.4	(0.3)
	Moderate	10.8	(5.3)	3.7	(1.5)	8.9	(3.0)	2.9	(2.5)	8.6	(2.8)
	Low	52.6	(5.1)	78.3	(4.2)	67.7	(4.8)	41.5	(5.6)	57.8	(3.0)
	No problem	35.8	(5.8)	18.0	(4.2)	23.4	(4.2)	55.6	(5.1)	33.2	(3.2)
	Total	100.0		100.0		100.0		100.0		100.0	
Rats	High	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
	Moderate	2.2	(2.1)	5.8	(2.8)	1.1	(0.4)	2.0	(1.5)	2.1	(1.1)
	Low	16.0	(5.4)	51.3	(4.3)	19.0	(3.2)	39.2	(5.3)	22.8	(3.0)
	No problem	81.8	(5.7)	42.9	(4.5)	79.9	(3.2)	58.8	(5.3)	75.1	(3.1)
	Total	100.0		100.0		100.0		100.0		100.0	
Other rodents	High	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
	Moderate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
	Low	0.2	(0.0)	0.0	(—)	0.0	(—)	5.6	(2.3)	0.8	(0.3)
	No problem	99.8	(0.0)	100.0	(—)	100.0	(—)	94.4	(2.3)	99.2	(0.3)
	Total	100.0		100.0		100.0		100.0		100.0	

\*High (e.g., significant damage to building, significant impact on layer health or feed efficiency); moderate (e.g., moderate damage to building, moderate impact on layer health or feed efficiency); low (e.g., minor impact on building or feed efficiency).

**Percentage of farms by level of ongoing problem caused by mice and rats inside the layer house(s) during the previous 12 months, and by region**



\*High (e.g., significant damage to building, significant impact on layer health or feed efficiency); moderate (e.g., moderate damage to building, moderate impact on layer health or feed efficiency); low (e.g., minor impact on building or feed efficiency).

The severity of rodent problems did not vary substantially by farm size.

J.1.b. Percentage of farms by level of ongoing problem caused by mice, rats, and other rodents inside the layer house(s) during the previous 12 months, and by farm size:

<b>Percent Farms</b>							
<b>Farm Size (number birds)</b>							
		<b>Small</b>	<b>Medium</b>		<b>Large</b>		
		(fewer than 30,000)	(30,000–99,999)		(100,000 or more)		
<b>Rodent</b>	<b>Level*</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Mice	High	0.0	(—)	1.9	(1.6)	0.0	(—)
	Moderate	3.9	(2.6)	11.7	(8.9)	11.7	(4.3)
	Low	58.2	(5.5)	53.6	(7.3)	59.4	(5.5)
	No problem	37.9	(5.5)	32.8	(9.7)	28.9	(4.2)
	Total	100.0		100.0		100.0	
Rats	High	0.0	(—)	0.0	(—)	0.0	(—)
	Moderate	3.5	(2.6)	0.0	(—)	1.8	(0.8)
	Low	15.8	(3.2)	25.5	(8.9)	28.1	(4.6)
	No problem	80.7	(3.9)	74.5	(8.9)	70.0	(4.7)
	Total	100.0		100.0		100.0	
Other rodents	High	0.0	(—)	0.0	(—)	0.0	(—)
	Moderate	0.0	(—)	0.0	(—)	0.0	(—)
	Low	0.0	(—)	0.5	(0.1)	1.8	(0.7)
	No problem	100.0	(—)	99.5	(0.1)	98.2	(0.7)
	Total	100.0		100.0		100.0	

\*High (e.g., significant damage to building, significant impact on layer health or feed efficiency); moderate (e.g., moderate damage to building, moderate impact on layer health or feed efficiency); Low (e.g., minor impact on building or feed efficiency).



Mice were the biggest ongoing rodent problem on 62.0 percent of farms and rats were the biggest rodent problem on 8.3 percent of farms; 29.7 percent of farms had no problem with rodents. A higher percentage of farms in the Southeast region considered rats to be the biggest problem compared with the other regions.

J.1.c. Percentage of farms by rodent that caused the biggest ongoing problem inside the layer house(s) during the previous 12 months, and by region:

Rodent	Percent Farms									
	Region									
	Northeast		Southeast		Central		West		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Mice	62.0	(5.8)	62.1	(4.8)	71.1	(4.3)	40.8	(4.9)	62.0	(3.3)
Rats	4.3	(2.8)	33.0	(4.7)	5.5	(1.7)	14.6	(3.9)	8.3	(1.6)
No problem with rodents	33.6	(5.7)	4.9	(1.5)	23.4	(4.2)	44.6	(5.3)	29.7	(3.2)
Total	100.0		100.0		100.0		100.0		100.0	

The percentages of farms by the rodent that caused the biggest problem inside layer houses did not vary substantially by farm size.

J.1.d. Percentage of farms by rodent that caused the biggest ongoing problem inside the layer house(s) during the previous 12 months, and by farm size:

Rodent	Percent Farms					
	Farm Size (number birds)					
	Small (fewer than 30,000)		Medium (30,000–99,999)		Large (100,000 or more)	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Mice	55.8	(5.5)	67.2	(9.7)	65.4	(4.1)
Rats	10.1	(3.6)	0.0	(—)	10.9	(1.9)
No problem with rodents	34.1	(5.3)	32.8	(9.7)	23.7	(4.3)
Total	100.0		100.0		100.0	

**2. Rodent monitoring**

Nearly all farms monitored rodents via visual signs and mechanical traps. Bait consumption was the most common “Other” method of monitoring rodents.

J.2.a. Percentage of farms by method used to monitor rodents inside the layer house(s), and by farm size:

<b>Percent Farms</b>								
<b>Farm Size (number birds)</b>								
<b>Monitoring method</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Visual signs	83.9	(2.9)	96.9	(1.4)	94.1	(1.2)	90.7	(1.3)
Mechanical traps	93.1	(3.7)	94.8	(2.1)	100.0	(—)	96.3	(1.5)
Other	19.1	(4.9)	16.8	(5.3)	24.0	(4.6)	20.6	(3.1)

Rodent index measures the number of mice caught in 12 traps over a 7-day period. Nearly all farms monitored rodent index as part of their rodent control program.

J.2.b. Percentage of farms that monitored rodent index in the layer house(s) as part of their rodent control program, by farm size:

<b>Percent Farms</b>							
<b>Farm Size (number birds)</b>							
<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)		<b>All</b>	
<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
93.1	(2.8)	96.0	(1.9)	94.2	(1.4)	94.1	(1.3)

The desired rodent index is 0 to 10 mice, which is considered low; 11 to 25 mice is considered a moderate rodent index, and 26 or more mice is considered high. On about 9 of 10 farms, rodent index was typically low during the previous 12 months. No farms reported a typically high rodent index.

J.2.c. For farms that monitored rodent index, percentage of farms by typical rodent index in the layer houses during the previous 12 months, and by farm size:

Rodent index (number mice/ 12 traps/7 days)	Percent Farms							
	Farm Size (number birds)							
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
0–10 (low)	98.9	(0.6)	82.6	(9.3)	86.9	(4.3)	90.6	(2.7)
11–25 (moderate)	1.1	(0.6)	17.4	(9.3)	13.1	(4.3)	9.4	(2.7)
26 or more (high)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Total	100.0		100.0		100.0		100.0	

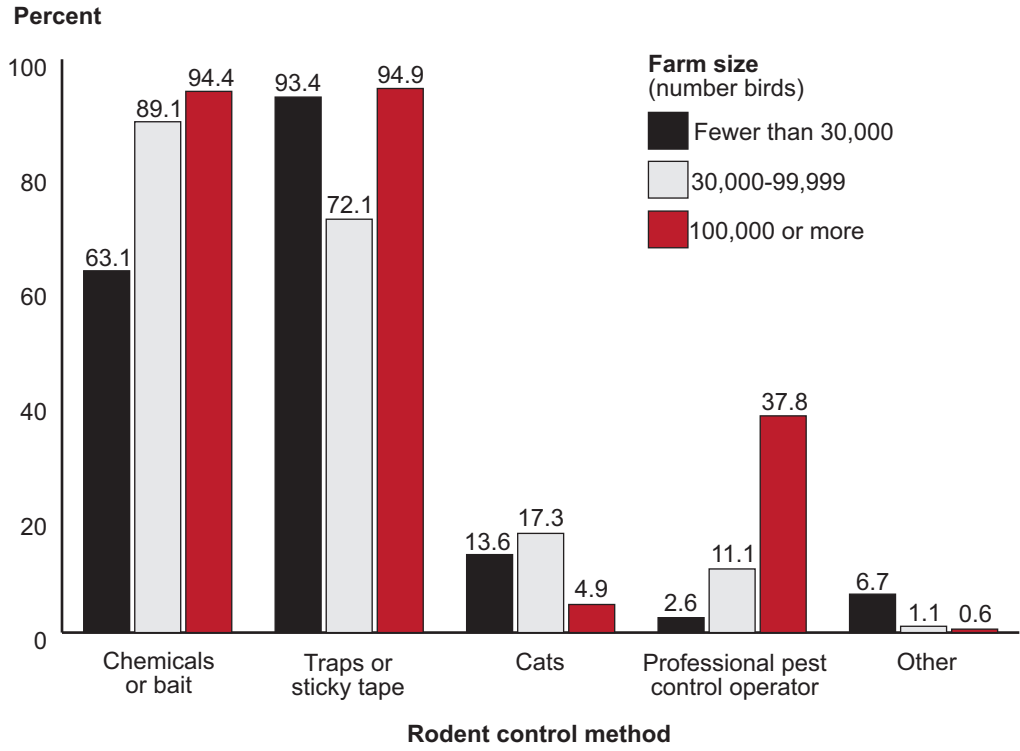
### 3. Rodent and fly control methods

The majority of farms used chemicals or bait, or traps or sticky tape for rodent control in the previous 12 months; 10.8 percent used cats. A higher percentage of large and medium farms used chemicals or bait and professional pest control operators compared with small farms.

J.3.a. Percentage of farms by rodent control method used in layer houses during the previous 12 months, and by farm size:

Rodent control method	Percent Farms							
	Farm Size (number birds)							
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Chemicals or bait	63.1	(3.7)	89.1	(2.9)	94.4	(1.1)	81.1	(1.5)
Traps or sticky tape	93.4	(2.7)	72.1	(6.0)	94.9	(1.3)	89.6	(1.7)
Cats	13.6	(5.0)	17.3	(9.8)	4.9	(2.1)	10.8	(3.0)
Professional pest control operator	2.6	(0.8)	11.1	(3.1)	37.8	(4.8)	18.5	(2.0)
Other	6.7	(3.6)	1.1	(0.3)	0.6	(0.4)	3.1	(1.4)

**Percentage of farms by rodent control method used in the layer houses during the previous 12 months, and by farm size**



Baits/traps was the most common fly control method used inside layer houses (71.4 percent of farms). A higher percentage of medium and large farms used residual sprays, space spray/foggers, and larvicides compared with small farms.

J.3.b. Percentage of farms by fly control method used in the layer houses during the previous 12 months (other than manure removal), and by farm size:

<b>Percent Farms</b>								
<b>Farm Size (number birds)</b>								
<b>Fly control method</b>	<b>Small (fewer than 30,000)</b>		<b>Medium (30,000– 99,999)</b>		<b>Large (100,000 or more)</b>		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Residual spray (long acting)	10.0	(3.6)	49.6	(6.5)	64.4	(4.2)	40.0	(2.9)
Space spray/fogger	17.2	(3.9)	47.2	(7.4)	50.9	(3.9)	36.9	(2.9)
Baits/traps	61.6	(5.4)	75.3	(5.7)	79.1	(4.7)	71.4	(3.3)
Larvicide (spot treatment)	3.9	(1.0)	35.9	(9.5)	41.0	(3.4)	25.4	(2.5)
Larvicide in feed	17.0	(3.8)	39.7	(7.6)	35.2	(4.7)	29.0	(3.1)
Biological predators	26.8	(4.0)	31.4	(6.1)	31.3	(5.4)	29.6	(3.2)
Other	6.8	(2.9)	5.0	(4.1)	2.2	(0.9)	4.6	(1.5)

**K. Down Time Procedures**

Nearly all farms that had caged housing removed layers that had escaped from their cages at the end of production.

K.1. For farms that had caged housing for layers, percentage of farms that, at the end of production, removed layers that had escaped from their cages (e.g., down in the pit or on top of cages):

<b>Percent Farms</b>	<b>Std. error</b>
97.5	(0.9)

Between flocks, layer houses were usually empty of birds for an average of 20.6 days.

K.2. Average number of days layer houses were usually empty between flocks, by farm size:

<b>Average Days Empty</b>							
<b>Farm Size (number birds)</b>							
<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
<small>(fewer than 30,000)</small>		<small>(30,000–99,999)</small>		<small>(100,000 or more)</small>			
<b>Avg.</b>	<b>Std. error</b>	<b>Avg.</b>	<b>Std. error</b>	<b>Avg.</b>	<b>Std. error</b>	<b>Avg.</b>	<b>Std. error</b>
22.5	(1.9)	23.0	(3.6)	17.6	(2.9)	20.6	(1.6)

About two-thirds of small farms (63.6 percent) had a down time of 18 days or longer, whereas about half of large farms (45.7 percent) had a down time of 10 days or less .

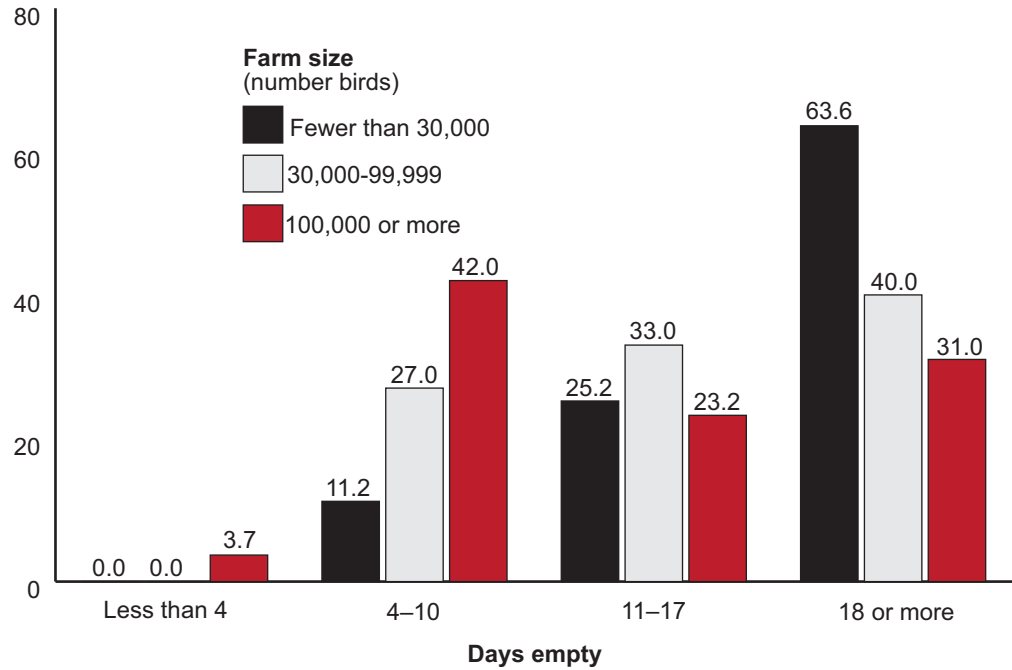
K.3. Percentage of farms by number of days layer houses were usually empty between flocks, and by farm size:

<b>Percent Farms</b>								
<b>Farm Size (number birds)</b>								
<b>Days empty</b>	<b>Small</b> (fewer than 30,000)		<b>Medium</b> (30,000–99,999)		<b>Large</b> (100,000 or more)		<b>All</b>	
	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>	<b>Pct.</b>	<b>Std. error</b>
Less than 4	0.0	(—)	0.0	(—)	3.7	(1.6)	1.5	(0.7)
4–10	11.2	(3.5)	27.0	(9.9)	42.0	(3.7)	26.9	(2.8)
11–17	25.2	(3.3)	33.0	(9.8)	23.2	(2.7)	25.9	(2.7)
18 or more	63.6	(4.2)	40.0	(6.4)	31.0	(4.1)	45.7	(3.0)
Total	100.0		100.0		100.0		100.0	



**Percentage of farms by number of days layer houses were usually empty between flocks, and by farm size**

Percent



More than 80 percent of farms emptied feeders and feed hoppers; flushed water lines; dry cleaned cages, walls, or ceilings; and cleaned fans, ventilation systems, or cool cells after every flock.

K.4. Percentage of farms by frequency that the following cleaning procedures were performed during down time:

Cleaning procedure*	Percent Farms						Total
	Frequency						
	After each flock		After two or more flocks		Never		
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	
Empty feeders	99.2	(0.6)	0.0	(—)	0.8	(0.6)	100.0
Wash feeders	43.0	(3.1)	12.3	(2.1)	44.6	(3.5)	100.0
Disinfect feeders	63.6	(3.0)	8.2	(2.1)	28.3	(3.2)	100.0
Empty feed hoppers	98.9	(0.6)	0.0	(—)	1.1	(0.6)	100.0
Wash feed hoppers	38.7	(2.9)	10.9	(2.2)	50.4	(3.6)	100.0
Disinfect feed hoppers	52.8	(2.9)	8.1	(2.1)	39.2	(3.5)	100.0
Empty water tanks	32.1	(4.4)	5.5	(1.9)	62.4	(5.0)	100.0
Wash water tanks	32.1	(4.4)	4.7	(1.8)	63.2	(4.9)	100.0
Disinfect water tanks	31.1	(4.3)	4.7	(1.8)	64.2	(4.8)	100.0
Flush water lines	89.7	(1.2)	3.2	(0.6)	7.1	(1.1)	100.0
Disinfect water lines	68.5	(3.1)	5.4	(0.9)	26.2	(3.0)	100.0
Bacterial culture water source	39.6	(3.4)	18.4	(2.2)	42.0	(3.1)	100.0
Wash egg belts or elevators	48.8	(3.1)	14.2	(2.4)	37.0	(3.8)	100.0
Disinfect egg belts or elevators	60.2	(3.6)	11.0	(2.4)	28.8	(3.1)	100.0
Dry clean (blow down) cages, walls, or ceilings	85.7	(2.3)	0.7	(0.4)	13.7	(2.3)	100.0
Wash cages, walls, or ceilings	50.7	(2.8)	17.5	(2.4)	31.8	(3.4)	100.0
Disinfect cages, walls, or ceilings	71.3	(3.2)	12.1	(2.4)	16.6	(2.3)	100.0
Fumigate cages, walls, or ceilings	37.0	(3.4)	13.0	(2.8)	50.0	(2.6)	100.0
Clean fans, ventilation system, or cool cells	90.3	(2.0)	4.3	(1.5)	5.4	(1.4)	100.0

\*For farms with the specified equipment.

For most of the listed cleaning procedures, a higher percentage of small farms than large farms performed the procedures after every flock.

K.5. Percentage of farms by cleaning procedure performed after every flock, and by farm size:

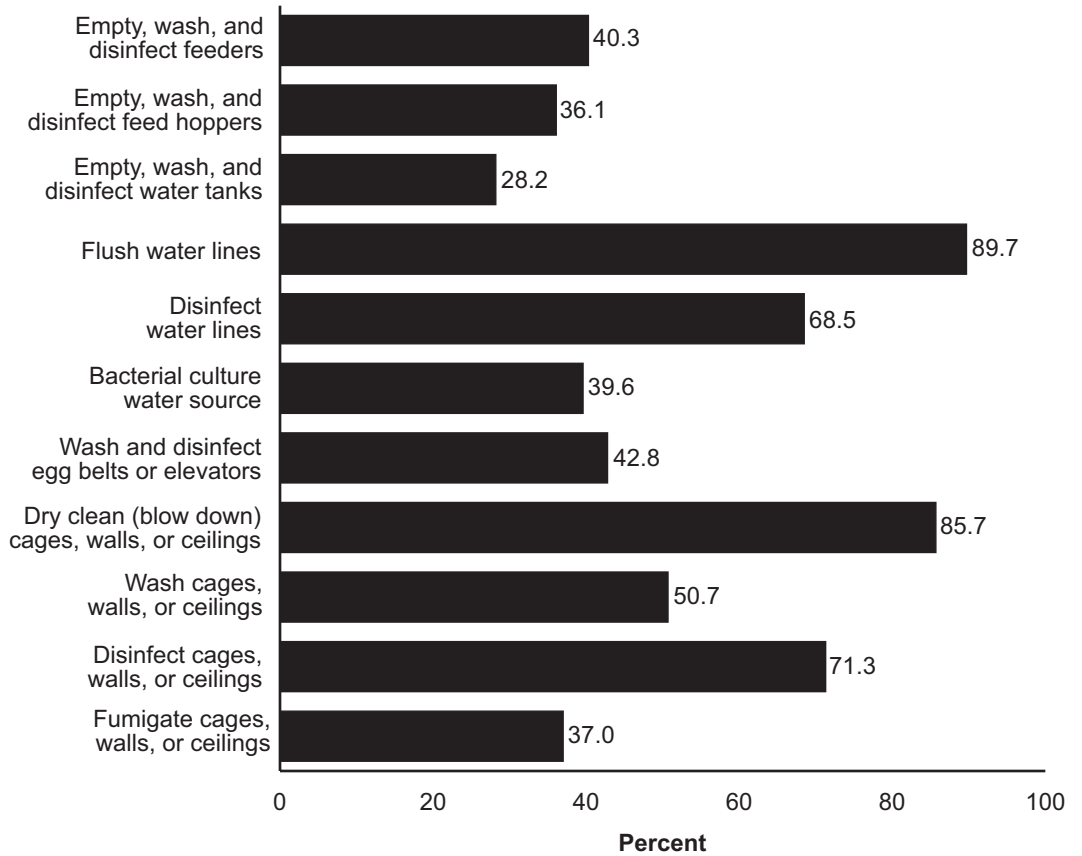
Cleaning procedure*	Percent Farms							
	Farm Size (number birds)							
	Small (fewer than 30,000)		Medium (30,000– 99,999)		Large (100,000 or more)		All	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Empty, wash, and disinfect feeders	60.4	(5.2)	27.6	(5.6)	27.9	(4.2)	40.3	(2.9)
Empty, wash, and disinfect feed hoppers	52.8	(5.6)	26.0	(4.6)	26.1	(4.2)	36.1	(2.9)
Empty, wash, and disinfect water tanks	44.5	(8.8)	30.1	(10.6)	12.6	(4.0)	28.2	(3.9)
Flush water lines	97.5	(1.3)	90.4	(4.3)	82.0	(1.9)	89.7	(1.2)
Disinfect water lines	82.7	(4.8)	64.4	(9.5)	57.1	(4.0)	68.5	(3.1)
Bacterial culture water source	53.2	(6.0)	36.4	(9.3)	28.4	(3.1)	39.6	(3.4)
Wash and disinfect egg belts or elevators	60.9	(5.8)	24.2	(4.3)	36.4	(4.7)	42.8	(3.0)
Dry clean (blow down) cages, walls, or ceilings	79.5	(4.3)	97.5	(0.4)	85.4	(3.9)	85.7	(2.3)
Wash cages, walls, or ceilings	73.2	(4.7)	28.1	(4.6)	40.5	(5.0)	50.7	(2.8)
Disinfect cages, walls, or ceilings	79.9	(3.1)	54.8	(7.3)	71.6	(4.8)	71.3	(3.2)
Fumigate cages, walls, or ceilings	40.4	(5.8)	42.6	(9.9)	31.0	(4.1)	37.0	(3.4)

\*For farms having the specified equipment.

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**Percentage of farms that performed the following procedures after every flock**

**Procedure\***



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\*For farms having the specified equipment.

## Section II: Methodology

### A. Needs Assessment

A *Salmonella* Enteritidis working group was formed to identify areas in which APHIS–VS should have a role in the prevention and control of *Salmonella* Enteritidis on table-egg farms. This working group identified a need to update the information from the NAHMS Layers '99 study as well as a need for a current estimate of the prevalence of *Salmonella* Enteritidis on table-egg farms.

### B. Sampling and Estimation

#### 1. State selection

The goal for NAHMS national studies is to include States that account for at least 70 percent of the animal and farm population in the United States. A total of 19 States were selected for inclusion in the study based upon each State's contribution to the total number of U.S. table-egg farms and the number of laying hens. For the purpose of sampling, Connecticut, Maine, Massachusetts, New Hampshire, and Vermont were considered as one State ("New England"). These 19 States accounted for 76.4 percent of egg farms with 3,200 or more layers,<sup>3</sup> 87.1 percent of hens on farms with 30,000 or more hens,<sup>4</sup> and 77.8 percent of table eggs produced.<sup>4</sup>

#### 2. Farm selection

The Food and Drug Administration (FDA) maintains a list of egg-producing operations with 3,000 or more laying hens that produce eggs for the table-egg market. A random sample of farms was selected from this list within 4 size strata (3,000 to 29,999, 30,000 to 49,999, 50,000 to 99,999, 100,000 or more laying hens) in each of the 19 selected States. All organic operations on the list were selected.

#### 3. Population inferences

Estimates infer to the population of farms with 3,000 or more table-egg layers registered with the FDA in 19 States. Data were weighted to reflect the population from which they were selected. The inverse of the probability of selection for each farm was the initial selection weight. This weight was adjusted for nonresponse within State and size stratum.

### C. Data Collection

Veterinary medical officers from USDA–VS contacted producers from June 1 to September 30, 2013. Questionnaires were completed via in-person interviews. Questions regarding pullet rearing, *Salmonella* Enteritidis testing, and vaccination were primarily answered by a company representative, while questions relating to day-to-day layer management were primarily answered by farm personnel.

<sup>3</sup> 2007 Census of Agriculture (includes table eggs and eggs for hatching).

<sup>4</sup> NASS Chickens and Eggs Report, January 2009.

**D. Data Analysis**      **1. Editing and estimation**

Data were entered into a SAS data set. Validation checks were performed to identify improperly entered data and relational checks. Summarization and estimation were performed using SUDAAN software.

**2. Response rates**

Of the 804 farms selected, 112 (13.9 percent) were ineligible (breeder farms, pullet farms, duplicate farms, etc.). Of the 692 eligible farms, 317 refused participation and 47 were unable to be contacted. Of the 645 farms that were contacted, 328 participated (50.9 percent).

<b>Response category</b>	<b>Number farms</b>
Selected	804
Eligible	692
Not contacted	47
Refusal	317
Participant	328

## Appendix I: Sample Profile

### A. Size

<b>Number of layers</b>	<b>Responding farms</b>
Fewer than 30,000	114
30,000–99,999	62
100,000 or more	152
Total	328

### B. Region

<b>Region</b>	<b>Responding farms</b>
Northeast	129
Southeast	50
Central	98
West	51
Total	328

## Appendix II: Number of Farms and Number of Layers

State	No. farms <sup>1,2</sup>	No. table-egg layers on hand Jan. 2013 (x1,000) <sup>3,4</sup>
Arkansas	542	3,744
Georgia	506	8,993
North Carolina	435	5,796
Alabama	426	1,468
Pennsylvania	267	23,488
Texas	182	15,021
Ohio	126	27,784
Iowa	104	51,278
Indiana	87	25,549
California	73	18,990
Missouri	62	6,435
Wisconsin	62	4,728
Minnesota	57	9,379
New England <sup>5</sup>	25	5,761
Florida	23	8,070
Nebraska	21	9,221
Illinois	17	3,930
Washington	16	6,464
Michigan	14	12,022
19-State total	3,045	248,121
U.S. total	3,986	284,575

<sup>1</sup>Farms with 3,200 or more layers, including table-egg layers and breeders.

<sup>2</sup>NASS 2007 Census of Agriculture.

<sup>3</sup>On farms with 30,000 or more table egg layers.

<sup>4</sup>NASS Chickens and Eggs report, March 2013.

<sup>5</sup>Connecticut and Maine.



## Appendix III: Study Objectives and Related Outputs

1. Update previously collected information on layer farm management practices relevant to *Salmonella* Enteritidis
  - “Part I: Reference of Health and Management Practices on Table-Egg Farms in the United States, 2013”
  - “Part III: Trends in Health and Management Practices on U.S. Table-Egg Farms, 1999–2013”
  - “Part IV: Reference of Organic Egg Production in the United States, 2013”
  
2. Estimate the prevalence of *Salmonella* Enteritidis on layer farms and investigate risk factors for *Salmonella* Enteritidis
  - “Part II: Control and Prevention of *Salmonella* Enteritidis on Table-Egg Farms in the United States, 2013





# Layers 2013 Part I

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