



2018 State of the U.S. Artisan/Specialty Cheese Industry Food Safety Report

The American Cheese Society
commissioned the
University of Missouri
to conduct this study.

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Acknowledgements

This project would not have been possible without the participation of cheesemakers. For both the 2016 and 2018 surveys, more than 200 cheesemakers took the time to respond to survey questions so that everyone in the artisan, farmstead, and specialty cheese industry can improve and continue to grow both their businesses and the broader industry. The data provided by the cheesemaker-respondents (hereinafter referred to as “cheesemakers”) have been used to identify trends and insights about the artisan, farmstead, and specialty cheese industry.

The project was also made possible through the support of the American Cheese Education Foundation.

Researchers from the University of Missouri collected and analyzed the 2018 survey data used to develop this food safety report. University of Connecticut researchers developed and conducted the 2016 survey and analyzed the data.

Executive Summary

This report presents a summary of food safety-related findings identified through survey responses provided by U.S. artisan, farmstead, and specialty cheesemakers.

Key findings from the 2018 survey include:

- 75% of cheesemakers used pasteurized milk to make cheese; half used unpasteurized milk with no heat treatment; and 17% used unpasteurized milk with some heat treatment.
- Cheesemakers most commonly noted aging cheese from 60 days to 89 days with 59% noting that they age cheese for this time range. Cheesemakers were less likely to age cheese for longer than nine months.
- 81.5% of cheesemakers reported having a current food safety plan in place at the time when they responded to the survey. This is a significant increase from the 2016 report. At that time, just 59% of participating cheesemakers reported operating with a food safety plan.
- Cheesemakers who are ACS members are more likely to have a written food safety plan in place. In 2016, 72% of members indicated they had a plan compared with 89% in 2018. Just 37% of cheesemakers who weren't ACS members reported having a written food safety plan in place in 2016; however, 70% of non-members said they had a plan in 2018.
- Cheesemakers who didn't have a food safety plan were more likely to operate smaller cheesemaking businesses; approximately 25% of cheesemakers producing less than 20,001 pounds of cheese per year did not have a food safety plan.
- The majority of cheesemakers' food safety plans included sanitation, standard operating procedures, and good manufacturing practices. Other top components included in their plans were chemical use, traceability, product recall, and employee health and hygiene. It was much less common that cheesemakers included a crisis management component in their plans.
- 59% of cheesemakers reported that they conducted microbial testing. This is down from the 2016 report in which 71% indicated that they conducted microbial testing.
- ACS members were more likely to conduct microbial testing than non-members, indicating such testing at a rate of 58% compared with 27% for non-members.
- Use of pathogen testing increased from 2016 to 2018. In 2018, 45% of cheesemakers reported that they conducted pathogen testing, compared with 39% of cheesemakers in 2016.
- 63% of cheesemakers reported that they had previously had an FDA audit or inspection. 37% reported that they had never been audited or inspected. This is consistent with results reported in 2016.
- Of the cheesemakers surveyed, 59% strongly disagreed or somewhat disagreed that information regarding FDA's regulatory requirements is easy to understand.

Introduction

Survey Background

The inaugural State of the U.S. Artisan/Specialty Cheese Industry survey was conducted in 2016 to provide much-needed information about the artisan, farmstead, and specialty cheese industry in order to support cheesemakers and their businesses. The second survey, conducted in 2018, shares the latest insights about this unique segment of the cheese industry. The American Cheese Education Foundation supported both the 2016 and 2018 surveys.

Who We Are

The American Cheese Society (ACS) is the leader in promoting and supporting American cheeses, providing the cheese industry with educational resources and networking opportunities, while encouraging the highest standards of cheesemaking focused on safety and sustainability.

Definitions

There are no legal or regulatory distinctions of “artisan,” “farmstead,” or “specialty” cheeses. The following definitions are used by the American Cheese Society:

Artisan Cheese

“Artisan” or “artisanal” implies that a cheese is produced primarily by hand in small batches with particular attention paid to the tradition of the cheesemaker’s art, and thus using as little mechanization as possible.

Farmstead Cheese

In order for a cheese to be classified as “farmstead,” the cheese must be made only from milk produced by the cheesemaker’s own herd or flock and produced on the farm where the animals are raised.

Specialty Cheese

Specialty cheese is defined as cheese made in limited quantities with particular attention paid to natural flavor and texture profiles.

Commodity Cheese

Cheese that’s produced in large volume using industrial manufacturing techniques such as milk standardization, mechanization, and automation and that’s often used in private labeling, food service, mass retail, or institutional settings. Responses from commodity cheesemakers were included in the data analysis if those cheesemakers also produced artisan, farmstead, or specialty cheese.

Cheesemaker

Any producer of cheese in the United States whose production meets the above definition(s).

About the Survey

The first artisan, farmstead, and specialty cheese industry survey was conducted in 2016 by researchers at the University of Connecticut. A total of 897 cheesemakers were invited to participate, and 216

participant responses were analyzed. The results of this first study were published in 2017 and emphasized the value of gathering operational data in order to better describe the scope and scale of the growing American artisan, farmstead, and specialty cheese industry.

The American Cheese Society engaged researchers at the University of Missouri to conduct a second study in 2018. Nearly 1,000 U.S. artisan, farmstead and specialty cheesemakers were invited to participate in the survey. Responses from 209 participants were received. Responses from five participants were excluded from the analysis as those five producers exclusively made commodity cheese. Thus, the final sample included 204 participants. The response rate was deemed statistically reliable with 95.5% confidence. Participation in the 2016 and the 2018 studies was voluntary. In 2018, participation requests were made by university researchers; ACS; state and local cheese guilds; and during the ACS Annual Conference in July 2018, where ACS and University of Missouri personnel promoted the survey.

The 2018 survey included 18 questions specifically related to food safety. Not all questions were answered by all participants. In some cases, questions weren't relevant for a particular participant based on his or her previous answers to a question, or participants may have chosen not to answer some questions.

In some cases, this report shares multiyear data collected in the 2016 and 2018 surveys. To answer some survey questions, cheesemakers recorded information about their operations in the 2015 and 2017 calendar years, while to answer other questions, cheesemakers provided responses to reflect their current attitudes and experiences. As a result, the multiyear data presented in the report may be labeled as 2015 and 2017, or 2016 and 2018, depending on the structure of the question and time period that the data represent.

Benefits of Participation

All respondents were entered into a drawing to win one of four \$100 Amazon gift cards.

Goals and Processes

The U.S. artisan, farmstead, and specialty cheese industry is growing, and consumers have increasing interest in these unique cheese products. However, challenges such as maintaining profitability in light of rising costs are also present.

Statistical significance was an essential part of this study. Only relationships among variables that were found to be of statistical significance — and not due to chance — are highlighted in this report.

Allowing Fair Comparisons

Due to the differences among the businesses that participated in this study, it is important to discuss how data were compared. Throughout this report, cheesemakers who produced no more than 750,000 pounds of cheese in 2017 may be referenced in order to compare their characteristics. Cheesemakers who produced more than 750,000 pounds accounted for 5% of all respondents. Including their responses in the comparisons meant that some averages were high and did not provide a true picture of the majority (95%) of cheesemakers. This report denotes instances where averages for all cheesemakers may have

skewed the analysis, and in such cases, the discussion focuses on cheesemakers who produced no more than 750,000 pounds of cheese.

Confidentiality

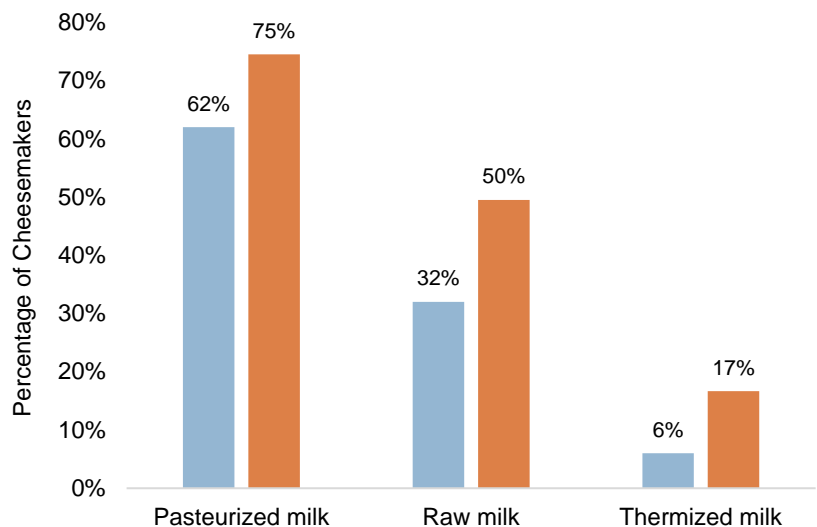
This food safety report contains results obtained from aggregated data. Thereby, it protects the confidentiality of all cheesemakers participating in the survey. All raw data provided to ACS by the University of Missouri lack any information that could be used to identify a single producer.

Milk Type

In 2017, 75% of cheesemakers used pasteurized milk to make cheese; half used unpasteurized milk with no heat treatment (hereafter referred to as “raw”); and 17% used unpasteurized milk with some heat treatment (hereafter referred to as “thermized”). Some cheesemakers used more than one type of milk in their cheese production. For example, of the cheesemakers who used pasteurized milk, 48% also used some form of unpasteurized milk.

Of the cheesemakers who used unpasteurized milk with no heat treatment, 32% used only this type of milk, meaning they didn’t use any pasteurized or thermized milk. Among cheesemakers who used at least some thermized milk, 42% of the milk they used for cheesemaking was thermized. This indicates that this group of cheesemakers also produced cheese with pasteurized milk or raw milk.

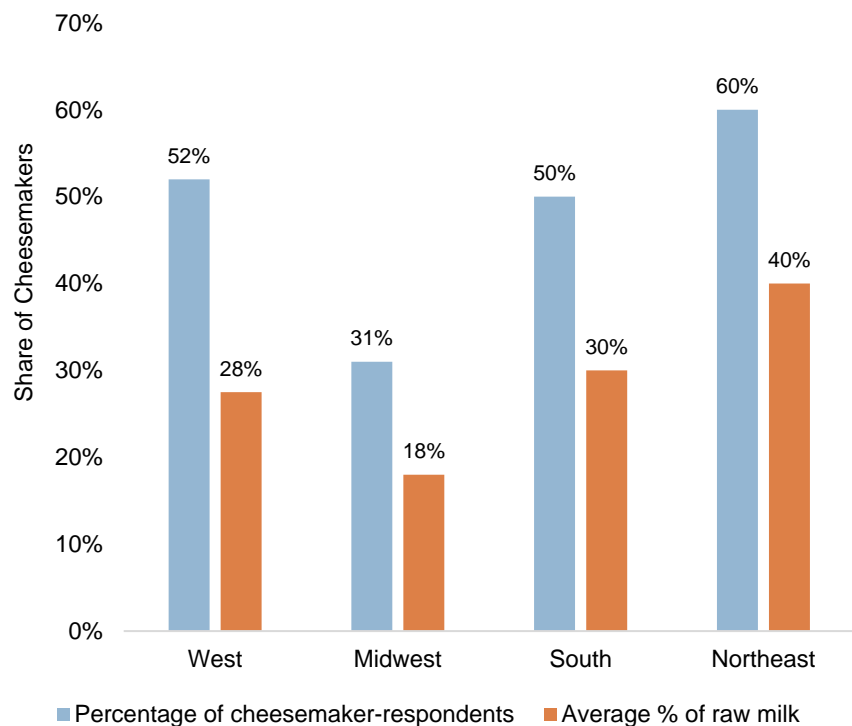
Exhibit 2.1 — Share of Cheesemakers Using Raw vs. Pasteurized Milk, 2017



There was no statistical relationship between the number of years a cheesemaker had been in business and the type of milk being used. Likewise, there was no statistical relationship between business structure (e.g., LLC, sole proprietorship) and type of milk, nor was there a relationship between production volume and type of milk.

Cheesemakers using raw milk were more likely to be located in the Northeast than in any other region. In addition, cheesemakers in the Northeast used a higher percentage of raw milk in their cheesemaking than did cheesemakers in other regions.

Exhibit 2.2 — Geographical Location of Cheesemakers Using Raw Milk, 2017, N=101

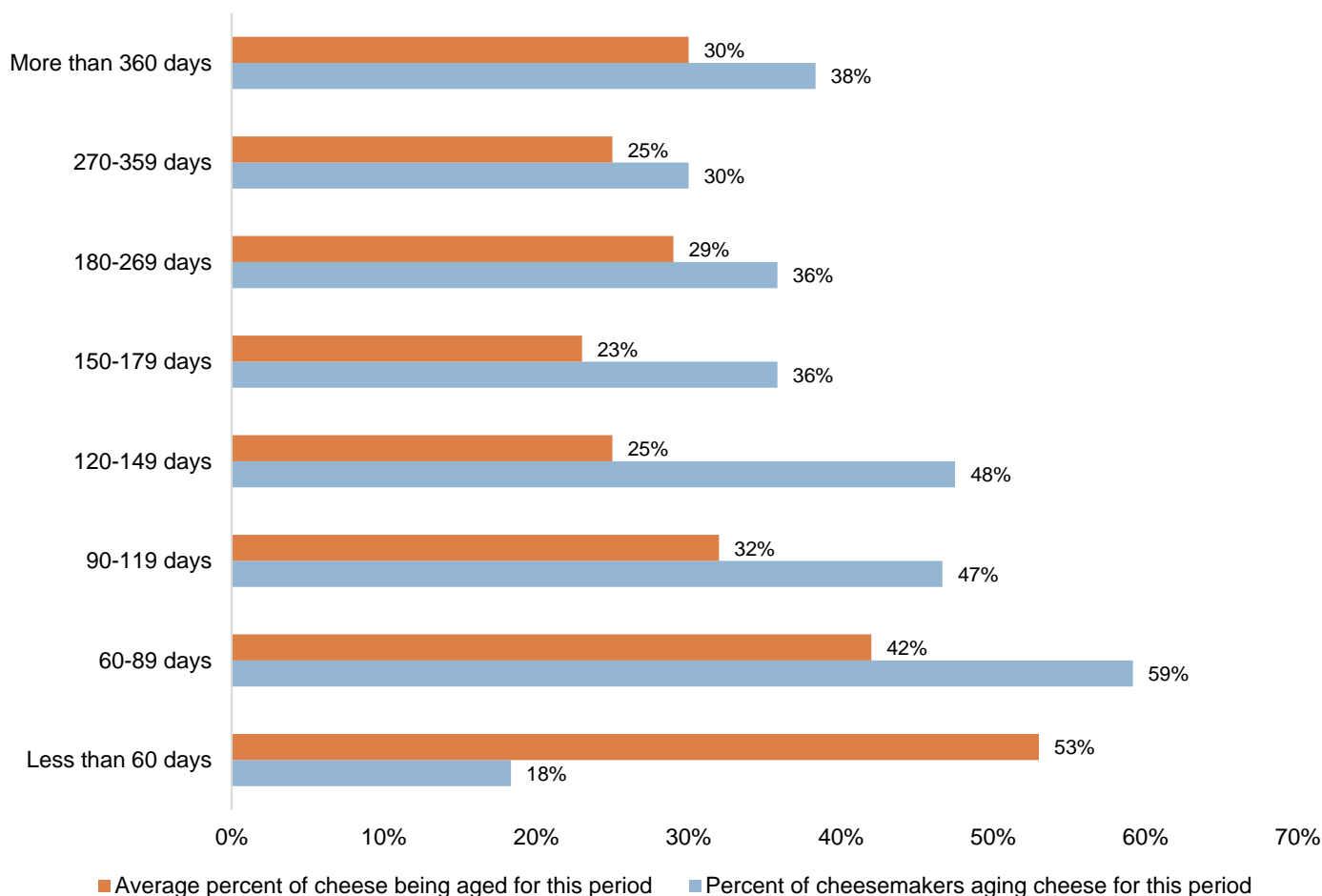


Most commonly, cheesemakers noted aging cheese from 60 days to 89 days; 59% of cheesemakers noted aging cheese for this length of time as indicated by the blue bars in Exhibit 3.1. Cheesemakers were less likely to age cheese for longer than nine months. Three in 10 said they aged some cheese for 270 days to 359 days, and 38% noted aging cheese for more than 360 days.

The orange bars in Exhibit 3.1 indicate the average share of cheese that cheesemakers age for a certain number of days. For example, though only 18% of cheesemakers reported aging cheese for less than 60 days, on average, in 2017, those cheesemakers who did age cheese for that period of time tended to age more than half of their cheese (53% on average) for less than 60 days. Although more than a third of all cheesemakers reported aging cheese for 150 days to 179 days, those cheesemakers indicated that they aged just 23% of their cheese on average for this many days. Among the cheesemakers who reported aging cheese for more than 360 days, they tended to age, on average, 30% of their cheese for this amount of time.

There was no statistical relationship between aging time and production volume, geographic region, or profitability.

Exhibit 3.1 — Share of Cheesemakers Aging Cheese by Days and Share of Total Cheese Production Aged, 2017, N=120



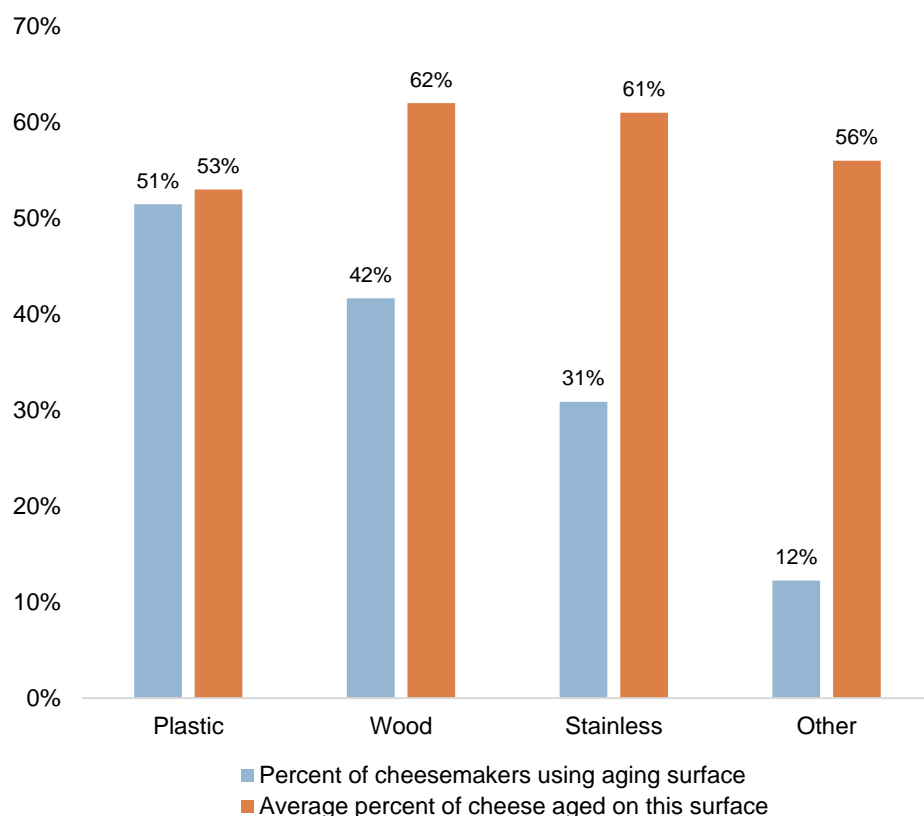
In Exhibit 3.2, the blue bars indicate the share of cheesemakers who reported using each surface for aging cheese in 2017. The orange bars indicate the average share of cheese that each group of cheesemakers reported aging on each surface. For example, cheesemakers most commonly (51%) aged cheese on plastic surfaces in 2017. The cheesemakers who reported using plastic surfaces to age cheese tended to age, on average, just more than half (53%) of the cheese that they produced on plastic. In contrast, only a third (31%) of cheesemakers reported using stainless surfaces to age cheese; however, cheesemakers using stainless as an aging surface tended to age 61% of the cheese that they made on average on stainless surfaces. In 2017, wood was used as an aging surface by 42% of cheesemakers, and 12% reported that they used some other type of surface for aging cheese.

Cheesemakers that aged cheese on wood reported that they aged, on average, 62% of the cheese they produced in 2017 on this surface. This is the same figure as cheesemakers reported in 2015, when an average 62% of the cheese produced by cheesemakers aging cheese on wood was aged on this surface.

There was an increase in the share of cheese aged on plastic between 2015 and 2017. In 2015, cheesemakers who used plastic to age cheese reportedly aged 49% (on average) of their cheese on this surface. In 2017, cheesemakers using plastic surfaces to age cheese chose to age more of their cheese on average on this surface as this figure increased to 53% for 2017.

There was also an increase in the proportion of cheese aged on stainless surfaces. Those who aged any cheese on stainless surfaces reported that, on average, 61% of the cheese they produced in 2017 was aged this way, compared with 51% of the cheese they produced in 2015.

Exhibit 3.2 — Proportion of Cheesemakers and Cheese Aged by Aging Surface, 2017, N=204

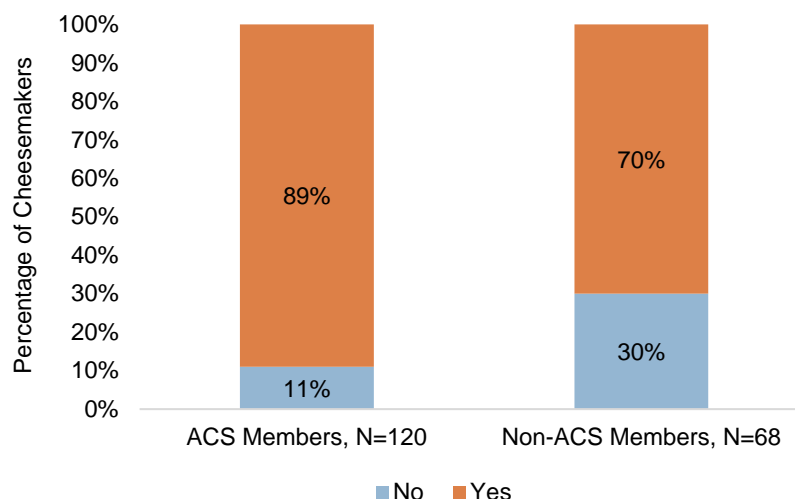


Food Safety Plan

In 2018, 81.5% of cheesemakers reported having a current food safety plan (FSP) when they responded to the survey. This is a significant increase from the 2016 report. At the time, just 59% of participating cheesemakers reported operating with an FSP.

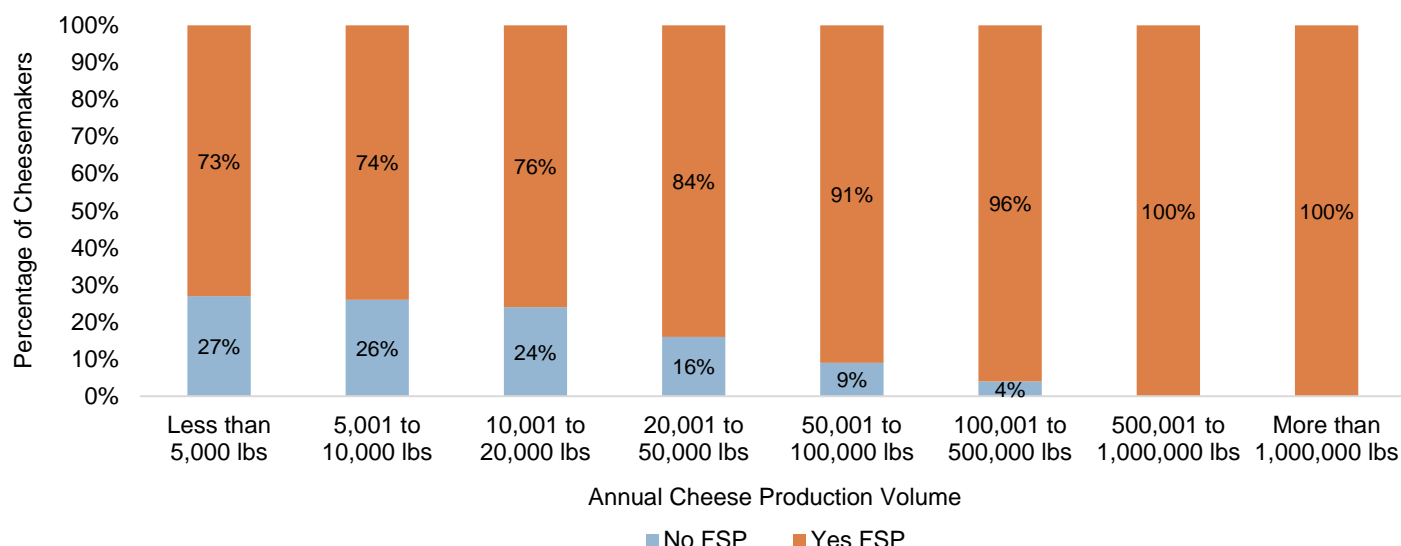
Cheesemakers who are ACS members are more likely to have a written food safety plan in place. See Exhibit 4.1. In 2018, 89% of ACS members indicated they had such a plan compared with 70% of non-members. In 2016, 72% of ACS members indicated having a written food safety plan in place compared with 37% of non-members. Please note that effective Sept. 17, 2018, all producers, including very small producers as defined by the U.S. Food and Drug Administration, are required to have an FSP in place. This survey was conducted prior to that deadline.

Exhibit 4.1 — Businesses Operating with a Food Safety Plan in 2018 by ACS Membership



There is a statistically significant relationship between the likelihood that a business has an FSP and their production volume. Cheesemakers who didn't have a food safety plan were more likely to have smaller businesses. Roughly one-quarter of the businesses producing less than 5,000 pounds of cheese annually reported that they didn't have a current FSP at the time they participated in the survey. Again, this is a marked improvement compared with 2016, when 62% of such small businesses reported not having an FSP. All cheesemakers producing more than 500,000 pounds had a current FSP in 2018 when they responded to the survey. See Exhibit 4.2.

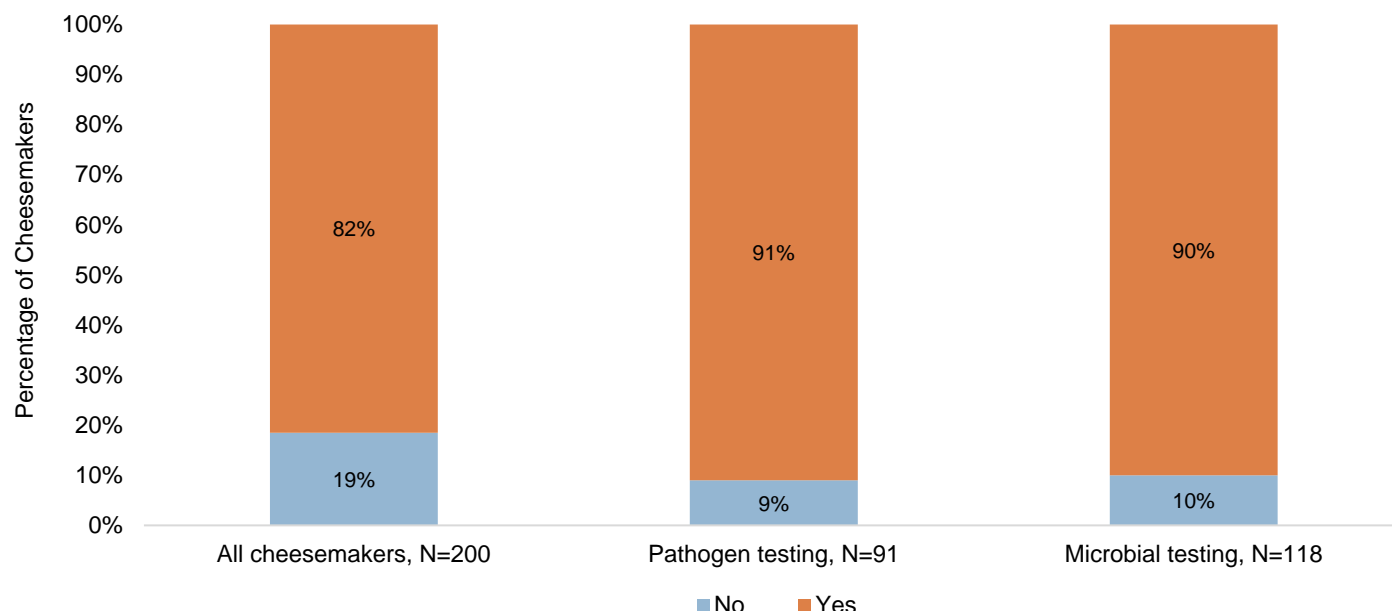
Exhibit 4.2 — Businesses Operating with a Food Safety Plan in 2018 by 2017 Annual Cheese Production Volume, N=200



Of the businesses that reported not having an FSP when they participated in the 2018 survey, 81% indicated they plan to implement one in the next 12 months.

Cheesemakers who reported conducting pathogen or microbial testing were also significantly more likely to have an FSP when they responded to the survey in 2018. See Exhibit 4.3.

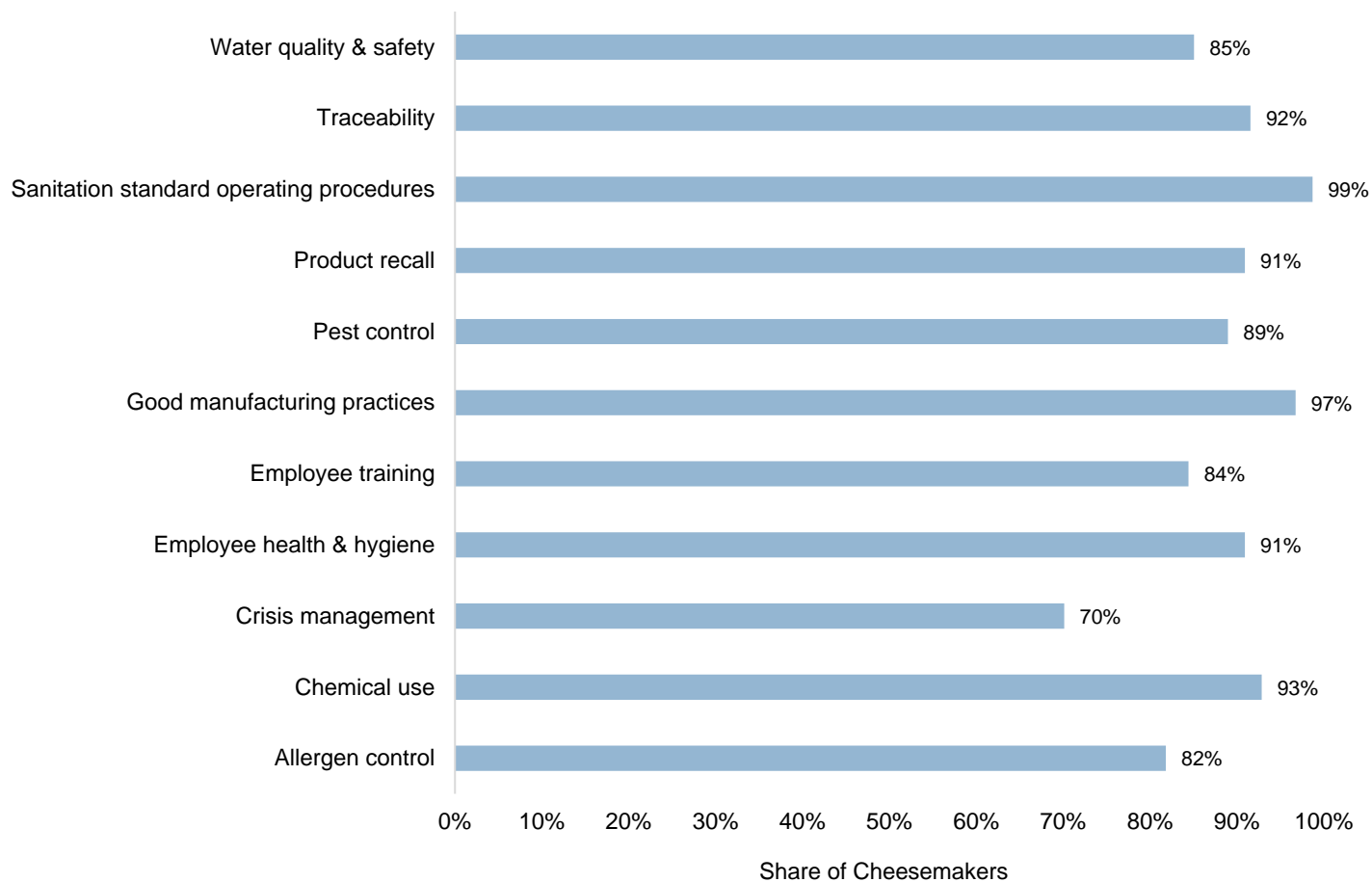
Exhibit 4.3 — Businesses Operating With a Food Safety Plan in 2018 by Other Significant Characteristics Reported for 2017



Cheesemakers were also asked about the review and documentation of their FSPs. The majority of cheesemakers – 87% - reported reviewing their food safety plans at least every 12 months. In 2015, 28% to 43% of cheesemakers reported annually reviewing their food safety programs and plans; the range reflects that cheesemakers reviewed some FSP components more often than other components. No statistically significant relationship was found between the regularity of reviewing FSPs and annual cheese production volume. The number of employees working for a cheesemaker also had no significant impact on how often businesses review their FSPs.

The majority of FSPs included sanitation standard operating procedures and good manufacturing practices. Other top components included in plans were chemical use, traceability, product recall, and employee health and hygiene. Exhibit 4.4 presents the share of cheesemakers who named having certain components in their FSPs. Much less commonly did cheesemakers include a crisis management component in their plans. There was no statistically significant relationship between the absence of the crisis management component and annual cheese production volume. Years in business also had no impact on the likelihood of whether or not a crisis management component was included in FSPs .

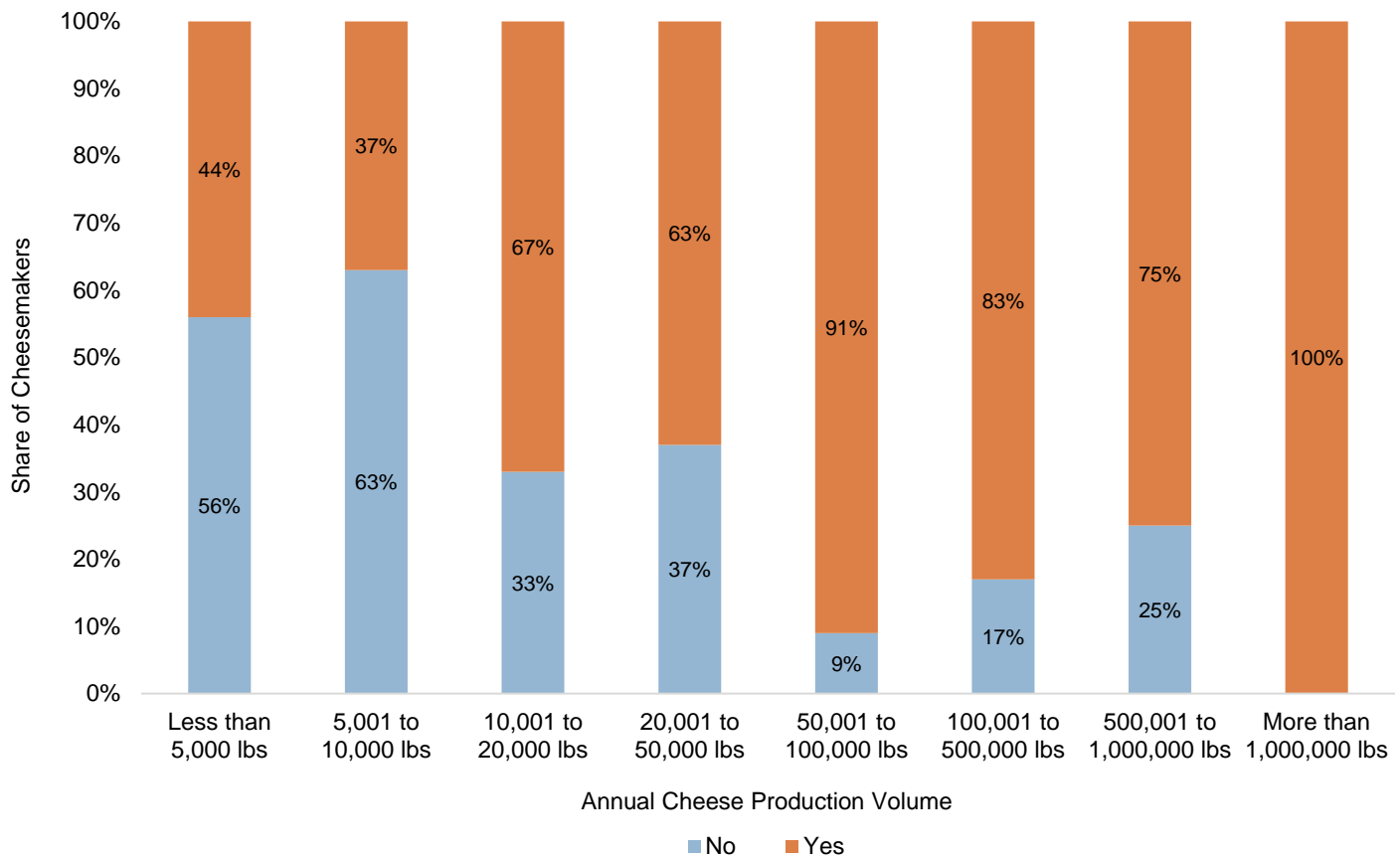
Exhibit 4.4 — Share of Cheesemakers with Specific Components Included in Their Food Safety Plans, 2018, N=154



Milk Testing

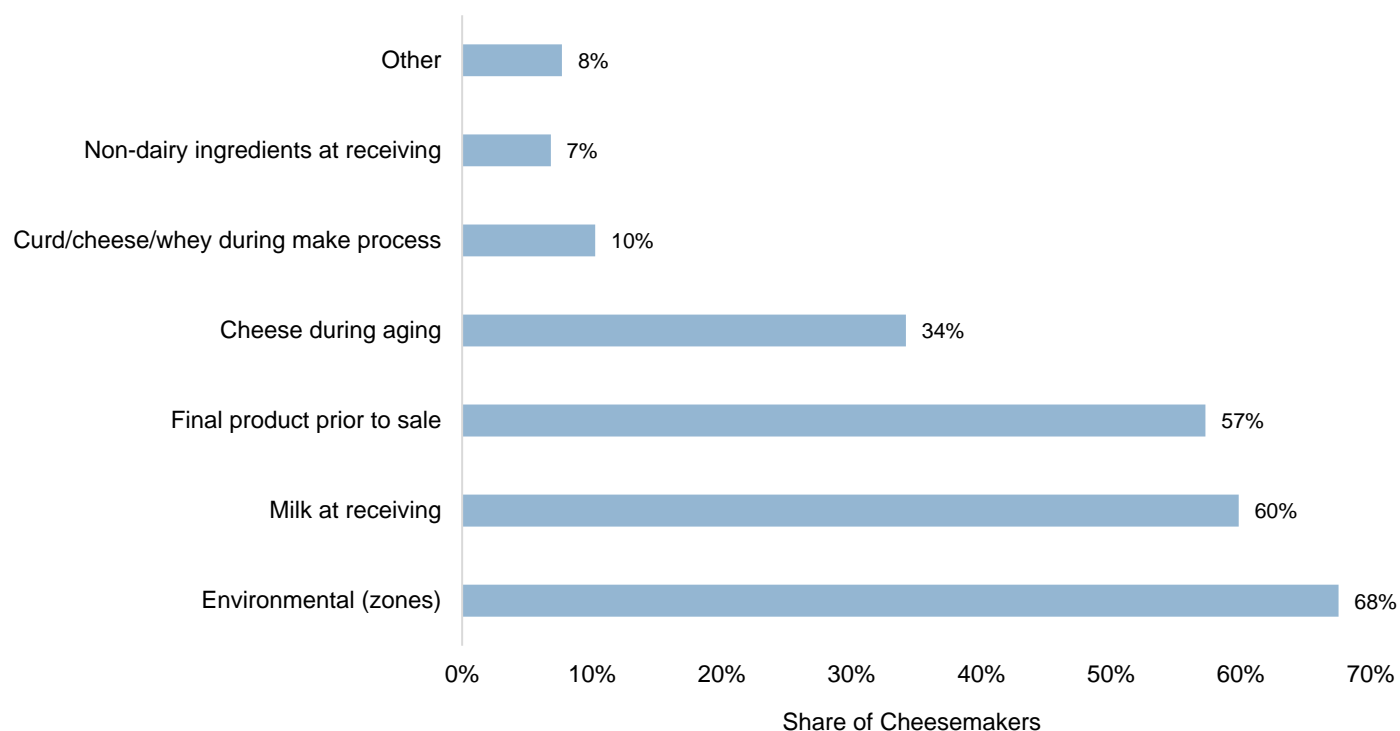
In 2018, 59% of cheesemakers reported that they conducted microbial testing. This is down from the 2016 report where 71% indicated conducting microbial testing. Among ACS members, 73% reported conducting microbial testing in 2018. Of all cheesemakers who conducted microbial testing, 71% also reported conducting pathogen testing. The percentage of cheesemakers conducting microbial testing increased with annual cheese production volume. See Exhibit 5.1.

Exhibit 5.1 — Share of Cheesemakers Conducting Microbial Testing by Production Volume, 2018, N=117



Of the cheesemakers conducting microbial testing, the majority reported testing environmental (zones), 68%; milk at receiving, 60%; and the final product prior to sale, 57%. See Exhibit 5.2.

Exhibit 5.2 — Points at Which Microbial Testing is Conducted, 2018, N=117



Environmental (zones) were most likely to be tested monthly. See Exhibit 5.3. In 2018, 46% of cheesemakers reported that they tested every batch or lot of milk at receiving, and 35% reported testing final product by every batch or lot prior to sale or doing this monthly. Less frequent was the incidence of testing cheese during aging. Just 34% of cheesemakers reported testing during aging. This was most likely to be conducted monthly, 30%; followed by quarterly, 22%; or every batch or lot, 22%. One in 10 cheesemakers reported testing during the make process; 70% of these cheesemakers test every batch or lot. 7% reported testing non-dairy ingredients at receiving, and these were tested either every batch or lot, 33%; twice a month, 33%; or annually, 33%. Frequency of testing tended to increase with production volume, though some smaller-scale cheesemakers reported testing environmental (zones) at every batch or lot during the make process. Large-scale cheesemakers tended to test these points daily.

Exhibit 5.3 — Frequency of Microbial Testing by Cheesemakers, 2018, N=68

| | Every batch/lot | Daily | Weekly | Twice a month | Monthly | Quarterly | Annually |
|--------------------------------------|-----------------|-------|--------|---------------|---------|-----------|----------|
| Milk at receiving | 46% | 10% | 9% | 6% | 24% | 3% | 2% |
| Non-dairy ingredients at receiving | 33% | 0% | 0% | 33% | 0% | 0% | 33% |
| Curd/cheese/whey during make process | 70% | 10% | 0% | 0% | 0% | 10% | 10% |
| Cheese during aging | 22% | 0% | 9% | 9% | 30% | 22% | 9% |
| Final product prior to sale | 35% | 2% | 4% | 5% | 35% | 17% | 4% |
| Environmental (zones) | 2% | 2% | 19% | 8% | 40% | 24% | 6% |
| Other | 13% | 0% | 13% | 13% | 50% | 13% | 0% |

The Midwest had the highest percentage of cheesemakers who conducted microbial testing, and the South had the lowest percentage conducting microbial testing. In 2018, more than two-thirds of Midwest

cheesemakers conducted microbial testing compared with just 47% of the cheesemakers in the South region. See Exhibit 5.4.

In 2018, 45% of cheesemakers reported that they conducted pathogen testing. Unlike with microbial testing, this percentage is an increase relative to the percentage of cheesemakers who reported conducting pathogen testing in the 2016 report (39%). A higher proportion of ACS members reported conducting microbial testing, 58%, compared

with non-members, 27%. The most common bacterial targets for pathogen testing were *Listeria monocytogenes*, 91%; *Salmonella*, 67%; and pathogenic *E. coli*, 67%.

Of the cheesemakers testing for *Listeria monocytogenes*, the most common testing points were environmental (zones), 98%; cheese during aging, 94%; and the final product prior to sale, 93%. See Exhibit 5.5. It was uncommon for cheesemakers to report pathogen testing of nondairy ingredients; just 6% of cheesemakers conducted pathogen testing on non-dairy ingredients at receiving. Similarly, only 8% cheesemakers reported conducting pathogen testing of product during manufacture.

Exhibit 5.4 — Share of Cheesemakers Conducting Microbial Testing by Region, 2018

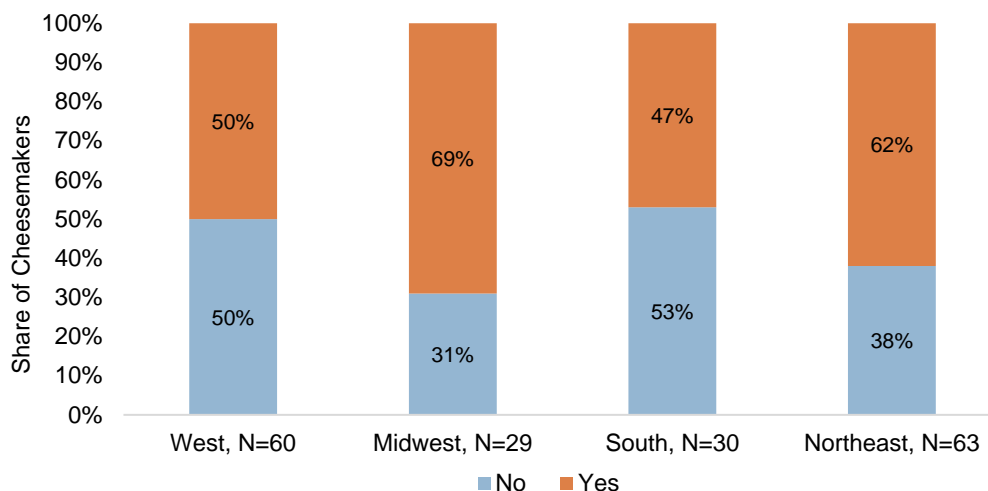
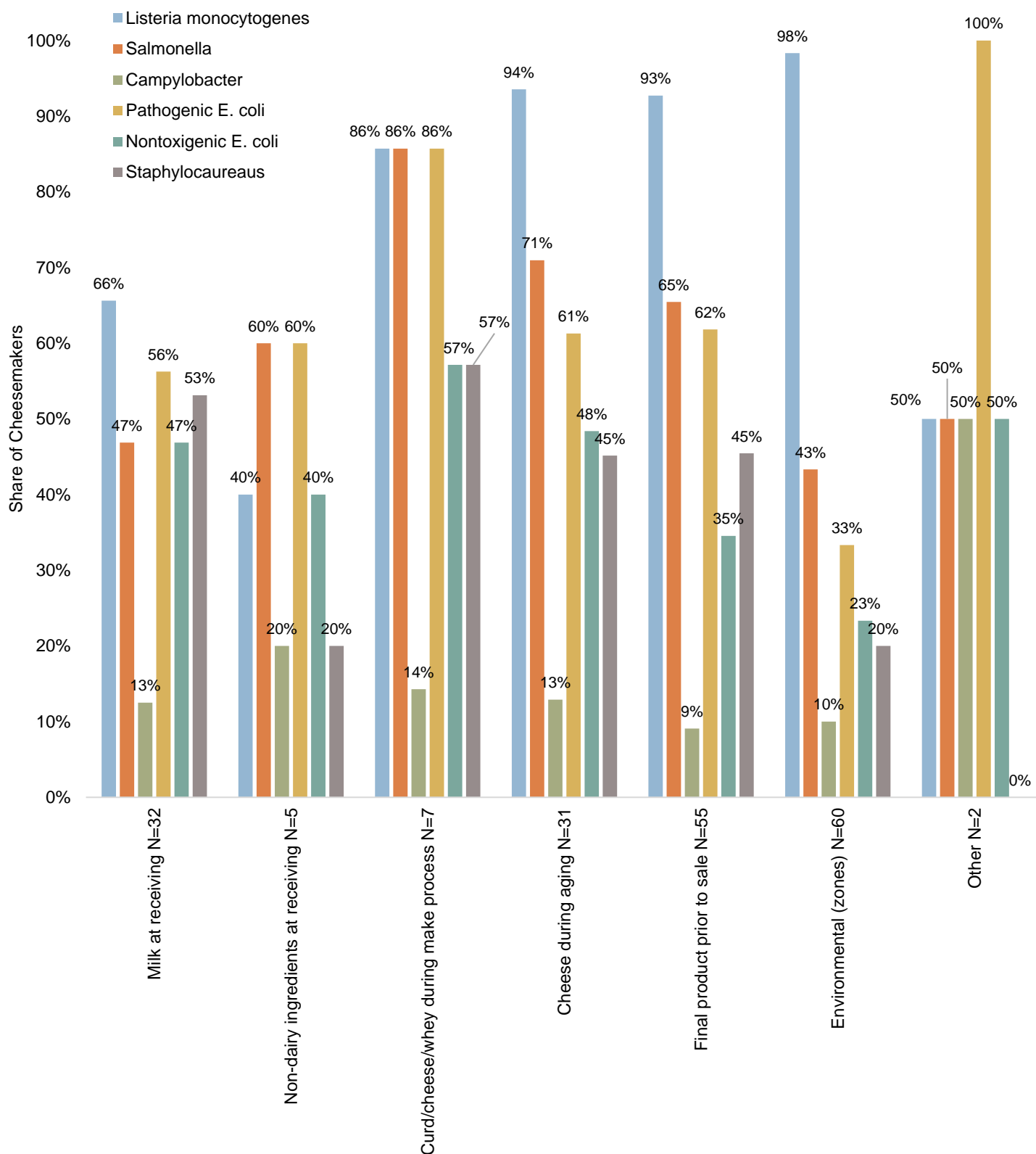


Exhibit 5.5 — Share of Cheesemakers Conducting Pathogen Testing at Specific Points, 2017

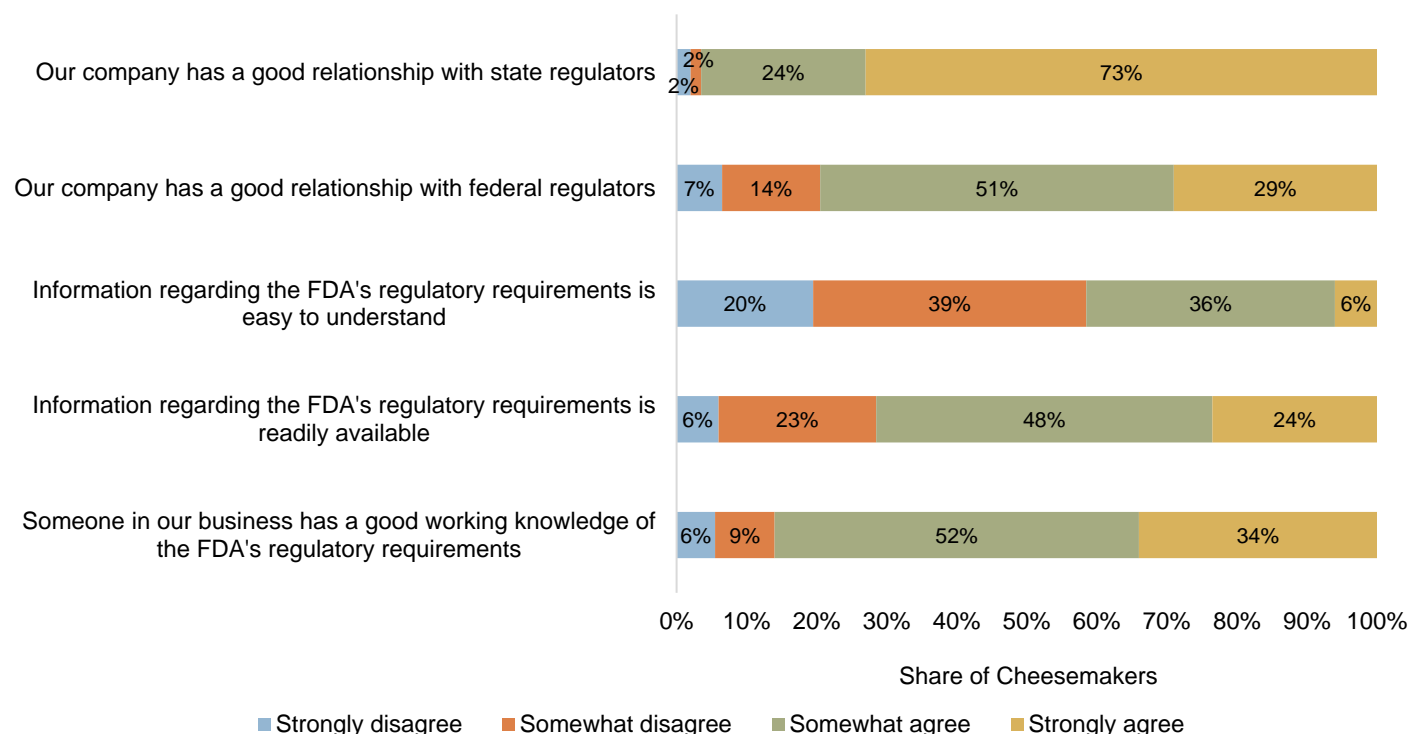


Regulatory Knowledge & Information

In 2018, the majority of cheesemakers agreed or strongly agreed that they had a good working knowledge of FDA requirements, a good relationship with federal and state regulators, and ready access to FDA regulatory information. See Exhibit 6.1 for details. Cheesemakers were less likely to agree that FDA regulatory requirements were easy to understand. This result is consistent with the finding published in the 2016 report.

There was no statistically significant relationship between production volume and likelihood of disagreeing or agreeing with each statement.

Exhibit 6.1 — Share of Cheesemakers Agreeing with Statements Regarding Regulatory Knowledge and Information, 2018, N=197



Whether or not a cheesemaker had a food safety plan (FSP) in place had a statistically significant impact on agreement or disagreement with the above statements. Cheesemakers with an FSP were more likely to agree with every statement. However, cheesemakers without an FSP were more likely to agree they had a good relationship with state regulators than those with an FSP.

Inspections & Audits

In 2018, 63% of cheesemakers reported that they had previously had an FDA audit or inspection, and 37% reported that they had never been audited or inspected. This is consistent with results reported in 2016, where 35% of participating businesses reported never having been inspected. In the 2018 survey, 54% of cheesemakers said they had been inspected in the past two years, compared with 57% of cheesemakers saying such in 2016.

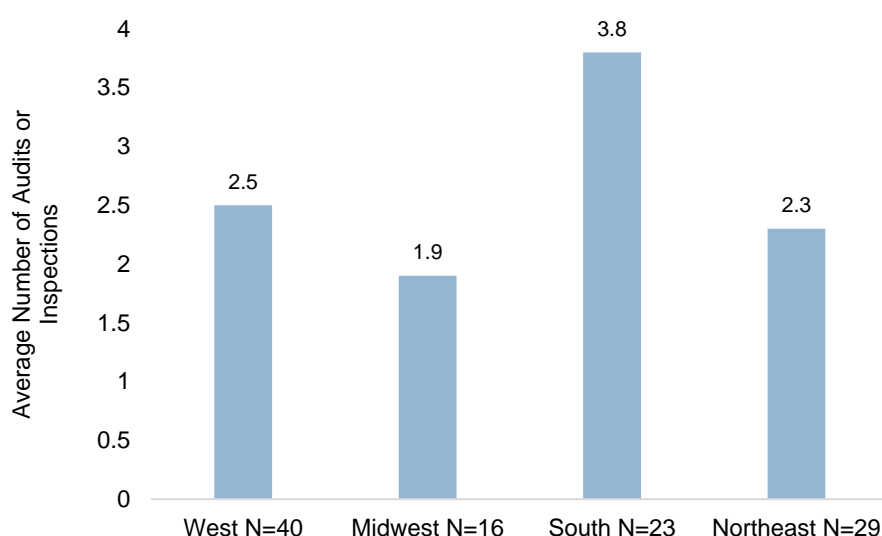
As production volume increases, the likelihood that cheesemakers have been audited more recently increases. However, there is no relationship between annual cheese production volume and the frequency of inspections. The average number of inspections reported by cheesemakers in the 2018 survey was 2.6 compared with 2.68 in the 2016 survey; these are averages of the number of inspections conducted during the five years preceding the survey. In 2018, 61% of cheesemakers reported having had two or fewer inspections in the past five years.

Cheesemakers in the South reported more audits or inspections in the past five years than those in the other three regions.

Cheesemakers in the Midwest reported the fewest audits or inspections. See Exhibit 7.1 for the average number of audits or inspections from the past five years reported by cheesemakers.

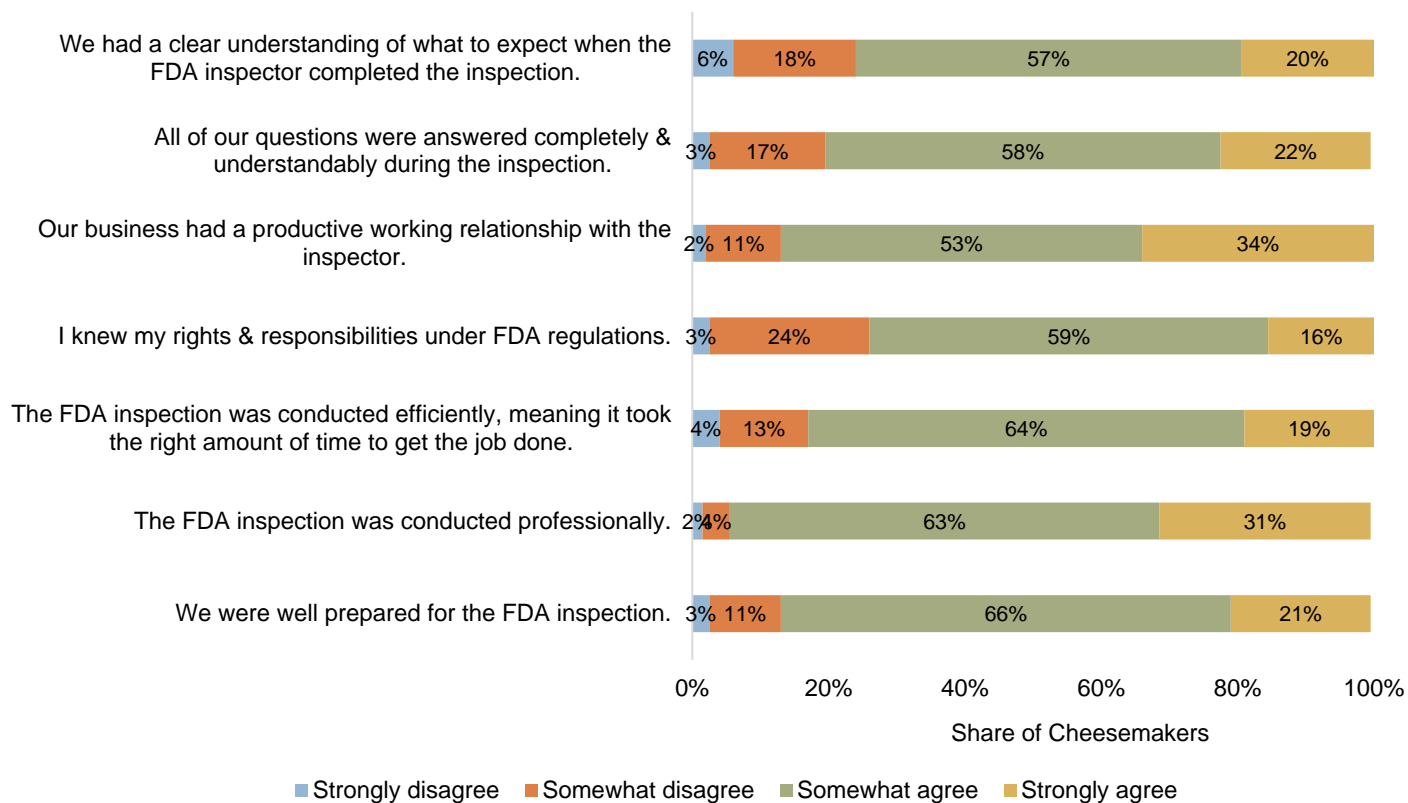
Inspections reported in the 2018 survey were fairly evenly split between those conducted by the state on behalf of the FDA, 43%, and those conducted by FDA inspectors, 48%. These data are consistent with the 2016 survey.

Exhibit 7.1 — Average Number of Audits or Inspections in the Past Five Years Reported by Cheesemakers by Region, 2018



In general, cheesemakers reported favorable opinions of FDA inspection experiences. Exhibit 7.2 shares cheesemaker responses to a variety of statements about their FDA inspections. As illustrated, areas where cheesemakers showed the most disagreement were in knowing their rights and responsibilities, having a clear idea of expectations, and having their questions answered completely and understandably.

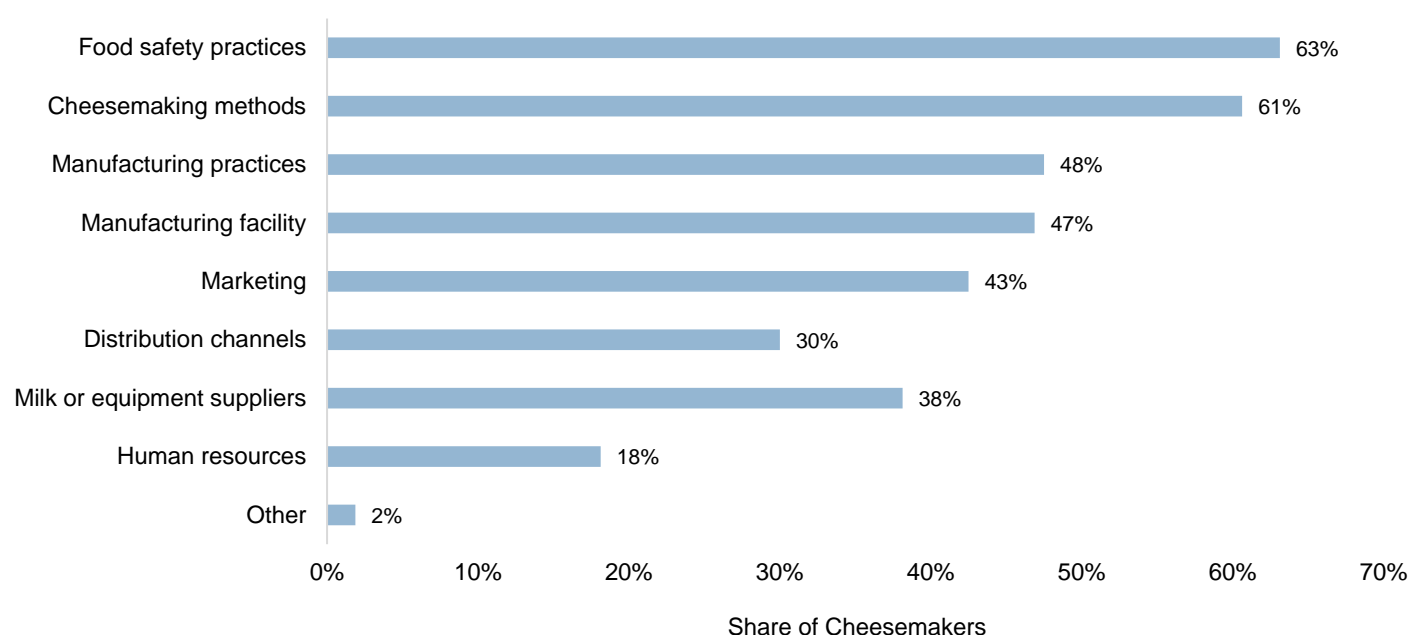
Exhibit 7.2 — Share of Cheesemakers Agreeing with Statements, N=122 Regarding Audits/Inspections, 2018



Sourcing of Advice

In 2018, cheesemakers were asked to indicate the areas of their business operations for which they sourced third-party advice in the past three years. Most commonly, cheesemakers reported seeking third-party advice regarding food safety practices, 63%, and cheesemaking methods, 61%. See Exhibit 8.1.

Exhibit 8.1 — Share of Cheesemakers Seeking Third-Party Advice, 2018, N=160



The likelihood that a cheesemaker would seek third-party advice regarding the manufacturing facility, manufacturing practices, or HR increased with annual cheese production volume. In contrast, the likelihood that a cheesemaker would seek third-party advice about cheesemaking practices or marketing increased as annual cheese production volume decreased. A statistically significant relationship was identified between average profit margin and seeking third party advice. Cheesemakers who sought advice regarding cheesemaking methods tended to have, on average, a profit margin that was 3 percentage points higher relative to that for cheesemakers who didn't seek this advice. Conversely, cheesemakers who sought advice regarding food safety practices or HR tended to have a profit margin that was 7 percentage points lower than that for cheesemakers who didn't seek this advice.

Of the cheesemakers who sought advice from a third party, another cheesemaker was most likely to be consulted regarding cheesemaking methods, milk or equipment suppliers, and distribution channels.

Cheesemakers in the Midwest were most likely to consult another cheesemaker regarding their manufacturing facility and marketing advice. Cheesemakers in the West and Northeast were most likely to consult another cheesemaker regarding cheesemaking methods.