Scioly Summer Study Session 2020
DISEASE DETECTIVES ANSWER KEY

Written by poonicle, ABRHS Scioly

Directions:

1. Time limit: 50 minutes
2. Show work for calculation questions.
3. Based on the 2019-2020 event description.

Score: 249/249

PART I: CHEATSHEET CHEATS (Basics) — 58 points

Write in the word that fits the definition. (23 points)

Reservoir	1. any person, animal, plant, soil or substance in which an infectious agent normally lives and multiplies.
Pathogenicity	2. ability of agent to cause disease after infection.
Efficacy	3. ability of intervention or program to produce intended or expected results under ideal conditions.
Infectivity	4. capacity to cause infection in susceptible host.
Virulence	5. ability of infectious agent to cause severe disease.
Active Immunity	6. the immunity that results from the production of antibodies by the immune system in response to the presence of an antigen.
Zoonosis	7. infectious disease that is transmissible from animals to humans .
Nosocomial	8. (of a disease) originating in a hospital.
Latency period	9. the time from exposure to a causal agent to onset of symptoms of a (usually noninfectious) disease.
Incubation period	10. the time interval from exposure to an infectious agent to the onset of symptoms of an infectious disease.
Effectiveness	11. Ability of a program to produce intended or expected results in the field.
Morbidity	12. disease; any departure, subjective or objective, from a state of physiological or psychological health and well-being.
Case	13. an instance of a particular disease, injury, or other health conditions that meets selected criteria .
Cluster	14. an aggregation of cases of a disease, injury, or other health condition in a circumscribed area during a particular period without regard to whether the number of cases is more than expected.
Quarantine	15. the separation of well persons who have been exposed or are suspected to have been exposed to a communicable disease, to monitor for illness and to prevent potential transmission of infection to susceptible persons during the incubation period.

Mortality	16. death.
Active Surveillance	17. public health surveillance in which the health agency solicits reports.
Endemic	18. the constant presence of an agent or health condition within a given geographic area or population; can also refer to the usual prevalence of an agent or condition.
Vector	19. a living intermediary that carries an agent from a reservoir to a susceptible host.
Fomite	20. inanimate object that can be a vehicle for transmission of infectious agent.
Epidemiology	21. the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.
Surveillance	22. the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice.
Herd immunity	23. the resistance to the spread of a contagious disease within a population that results if a sufficiently high proportion of individuals are immune to the disease, especially through vaccination.

24. Identify and define all parts of the epidemiological triad. Why is it important, and how is it used in epidemiology? (4 points)

Host - organism harboring the disease.
Agent - pathogen that causes the disease.
Environment - those external factors that cause or allow disease transmission.
Important because all three components are necessary in order for an outbreak to occur. The goal of an epidemiologist is to break the connection of one side of the triad.

25. Explain the difference between bias and confounding. (3 points)

Bias is a systematic error that results in an incorrect estimate of the risk associated with an exposure, whereas confounding is an incorrect interpretation of the risk

26. Explain the difference between incidence and prevalence. (3 points)

Incidence is the number of new cases during a specified time period, whereas prevalence is the total number of cases during a time period.

27. Explain the differences between outbreak, epidemic, and pandemic. (4 points)
An outbreak is the occurrence of more cases of disease, injury, or other health condition than expected in a given area or among a specific group of persons during a specific period. An epidemic is an outbreak over a wider region, whereas a pandemic is an epidemic that has spread to several continents or countries.

28. Explain the differences between primary, secondary, and tertiary prevention. (5 points)
Primary prevention - prevention of disease through the control of exposure to risk factors
Secondary prevention - the application of available measures to detect early departures from health and to introduce appropriate treatment and interventions.
Tertiary prevention - the application of measures to reduce or eliminate long-term impairments and disabilities, minimising suffering caused by existing departures from good health and to promote the patient's adjustments to his/her condition.
All try to prevent, delay, or otherwise make the symptoms of the disease better, but each method is implemented during different stages in the process of a disease.

29. Define index case. (2 points)
The first documented patient in the onset of an epidemiological investigation

Identify the bias associated with or that could result from each scenario. (14 points)

Berksonian Bias	30. In a study conducted by Eric Sun, both the cases and controls are selected from the ABRHS Scioly Hospital.
Response Bias	31. A survey conducted by state officers records email addresses (not anonymous) and asks questions such as "Who is your favorite state officer?" and "Who did you eat dinner with at MIT Invitationals?"
Recall Bias	32. Eric Sun is more likely to remember the things he messed up on while "bombing" Microbe Mission (3rd place MIT Invites) than Disease Detectives (1st place Yale Invites).
Attrition Bias	33. During a clinical trial conducted by Poonam, Ricky, Wendy, Alicia, and Peter all left the study mid-way. They cited reasons such as losing interest in Science Olympiad, "senior sliding", and death.
Hawthorne Effect	34. Antonio announces to the state team that he will be monitoring their behavior with the cameras he 3D-printed. The state team starts to troll less.
Simpson's Paradox	35. Some teachers are worried about the gender imbalance among the academic teams; it appears that there are way more boys than girls! As it turns out, girls are more likely to participate in Science Olympiad (where an original batch of around 60-80 kids gets cut down to 20), whereas boys are

	more likely to participate in Speech and Debate (where everyone gets to compete in tournaments).
Interviewer Bias	36. Allen knows that Jonny contracted Ebola as an STD before he interviews Jonny about possible exposures.

PART II: SHAKE SHACK SHENANIGANS (Case Study I) — 54 points
At MIT Invitationals on January 25th, 2020, some members of the Scioly team went to Shake Shack, presumably so that the captain could buy them fries. However, they did not actually eat fries at Shake Shack. Interestingly enough, 15 out of the 26 people who went to Shake Shack reported symptoms of immense abdominal cramps and watery diarrhea up to 16 hours after eating. Public health officials began to investigate this outbreak. Of the people who reported the symptoms, 14 of them ate chicken and 5 of them drank a milkshake. Of the people who didn't report these symptoms, 1 of them ate chicken and 10 of them drank milkshakes as well.

As a member of the Disease Detectives, you must help public health officials in Cambridge with this investigation.

1. List the 10 steps of an outbreak investigation. (8 points)

1. Prepare for fieldwork
2. Establish existence of an outbreak
3. Verify the diagnosis
4. Define and identify cases
5. Describe data in terms of person, place, time
6. Perform descriptive epidemiology/develop hypotheses
7. Evaluate hypotheses
8. Refine hypothesis and perform additional studies as necessary
9. Implement control and prevention measures
10. Communicate findings

2. Why should we confirm the existence of an outbreak before beginning the investigation? (3 point)
To save resources and time, decrease public concern, etc. Accept all reasonable answers.

3. What are the components of a case definition? (2 points)
Person, place, time, clinical information

4. At this stage in an outbreak investigation, is it better to have a loose or strict case definition? Explain why. (3 points)
Loose case definition; it’s better to identify every case than potentially miss cases, in order to have proper planning.

5. Write a case definition for this outbreak, including all the components listed above. (3 points)
Persons who ate at Shake Shack on or after January 25th, 2020, reporting symptoms of immense abdominal cramps and watery diarrhea.

6. What type of study is this, shown by the way the data was collected by the Disease Detectives? (1 points)
Case-control

7. What are the pros and cons of this type of study? List three of each. (6 points)
Pros: cheaper to conduct, easier to conduct, good for rare diseases, good for long latency periods
Cons: difficult to establish causal relationship, more prone to bias, bad for rare exposures
Accept other reasonable answers.

8. Create contingency tables for the two possible exposures mentioned. (6 points)

Chicken	Disease	No Disease
Exposure	14 A	1 B
No Exposure	1 C	10 D

Milkshake	Disease	No Disease
Exposure	5 A	10 B
No Exposure	10 C	1 D

9. Calculate the appropriate measure of risk for both exposures. Show work and formulas. (6 points)

OR of Chicken = $\frac{a \cdot d}{b \cdot c} = \frac{14 \cdot 10}{1 \cdot 1} = 140$

OR of Milkshake = $\frac{a \cdot d}{b \cdot c} = \frac{5 \cdot 1}{10 \cdot 10} = 0.05$

10. Why is this measure of risk appropriate for this type of epidemiological study? (3 points)
The odds ratio is an approximation of relative risk. Because we start off with cases and controls, we cannot calculate incidence or relative risk. Therefore, the odds ratio is the best measure of risk.

11. Which food most likely caused the outbreak? Why? Support your answer with evidence. (3 points)
The odds of contracting illness from chicken is 140. This is obviously much higher than the protective value of 0.05… Thus, the chicken most likely caused the outbreak.

12. What is the criteria for establishing causality called, and who is it named after? List all nine criteria. (10 points)

Named after Bradford Hill, Hill's Criteria for Causation

- Strength
- Consistency
- Specificity
- Temporality
- Biological gradient
- Plausibility
- Coherence
- Experiment
- Analogy

PART III: ANTON_EGO'S BIRTHDAY SURPRISE (Case Study II) — 49 points

Anton_Ego never remembered his birthday, and honestly disliked celebrating it… So, on June 8th, 2020, his friends threw him a surprise birthday party! It was a whole lot of fun, with many people present. However, after the party, some guests reported symptoms of diarrhea, fever, abdominal cramps, and vomiting. Local public health officials collected data on the outbreak based on exposure.

1. Here is the data collected. Fill in the missing values. (10 points)

Cucumbers	Disease	No Disease	Total	Attack Rate	Eggs	Disease	No Disease	Total	Attack Rate
Exposed	22	35	57	0.39	Exposed	43	3	46	0.93
Not Exposed	22	9	31	0.71	Not Exposed	1	41	42	0.02
Total	44	44	88		Total	44	44	88	

Nuts	Disease	No Disease	Total	Attack Rate	GPC	Disease	No Disease	Total	Attack Rate
Exposed	19	13	32	0.59	Exposed	43	43	86	0.50
Not Exposed	25	31	56	0.45	Not Exposed	1	1	2	1
Total	44	44	88		Total	44	44	88	

2. What type of epidemiological study is this? (1 point)

Cohort

3. What are the pros and cons of this study? List three of each. (6 points)

Pros: most accurate observational study, direct measure of incidence, good for rare exposure
Cons: time consuming, expensive, susceptible to selection bias
Accept other reasonable answers.

4. Calculate the appropriate measure of risk for all exposures. Show work and formulas. (12 points)

RR(Cucumbers) = AR(exposed)/AR(non-exposed) = 0.39/0.71 = 0.55
RR(Eggs) = AR(exposed)/AR(non-exposed) = 0.93/0.02 = 46.5
RR(Nuts) = AR(exposed)/AR(non-exposed) = 0.59/0.45 = 1.31

RR(GPC) = AR(exposed)/AR(non-exposed) = 1/1 = 1

5. Which food most likely caused the outbreak? Why? Support your answer with evidence. (3 points)
The eggs most likely caused the outbreak, as they had a relative risk of 46.5… this was much higher than all of the other exposures, which had relative risks close to 1 or so.

6. What are Koch's Postulates used for? (1 point)
Established to identify the causative agent of a particular disease.

7. List Koch's Postulates. (4 points)
1. The microorganism must be found in abundance in all organisms suffering from the disease, but should not be found in healthy organisms.
2. The microorganism must be isolated from a diseased organism and grown in pure culture.
3. The cultured microorganism should cause disease when introduced into a healthy organism.
4. The microorganism must be reisolated from the inoculated, diseased experimental host and identified as being identical to the original specific causative agent.

8. What causality criteria do Koch's postulates satisfy? (1 point)
Biological plausibility

9. People reported symptoms from 8pm to 11pm. The incubation period of this certain strain of foodborne illness is 3-9 hours. Find the most likely period of exposure for this outbreak. Show work. (5 points)
2pm to 5pm (Subtract 3 from 8pm and 9 from 11pm)

10. List four ways to prevent foodborne illness while preparing food. (4 points)
- Wash hands and surfaces often
- Separate raw meats from other foods; avoid cross-contamination
- Cook at the appropriate temperature
- Chill food at proper temperatures

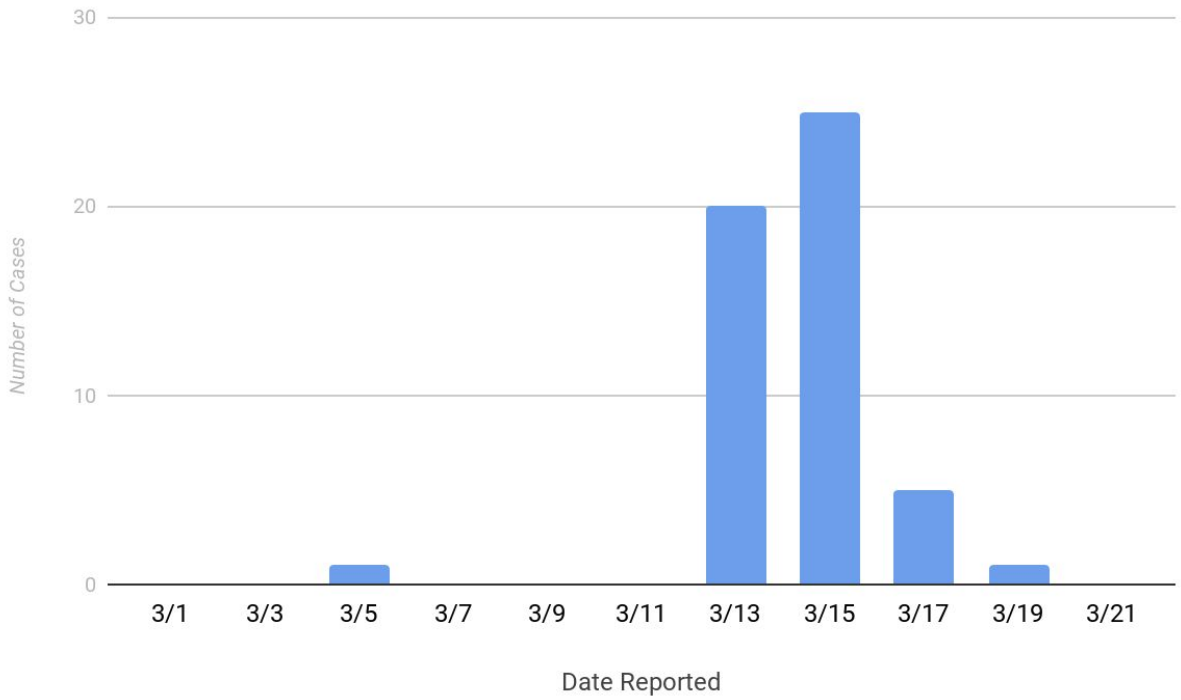
11. What temperatures should beef and poultry be cooked at? (2 points)
Poultry = 165 degrees Fahrenheit, Beef = 145 degrees Fahrenheit

PART IV: TRIVIUM AND QUADRIVIUM (Extras) — 71 points

The following table indicates the number of cases that were reported every 2 days during an outbreak of an unknown disease in a small community. No cases were reported before 3/1 or after 3/23.

Date	3/1	3/3	3/5	3/7	3/9	3/11	3/13	3/15	3/17	3/19	3/21	3/23
Number of Cases	0	0	1	0	0	0	20	25	5	1	0	0

1. Graph this data as a histogram. Be sure to include units and label axes. (8 points)



2. What is the epidemiological term for this histogram? (1 point)

Epi curve

3. What type of outbreak (propagated, common-source, etc.) was this, based on the histogram you created? (2 points)

Point-source

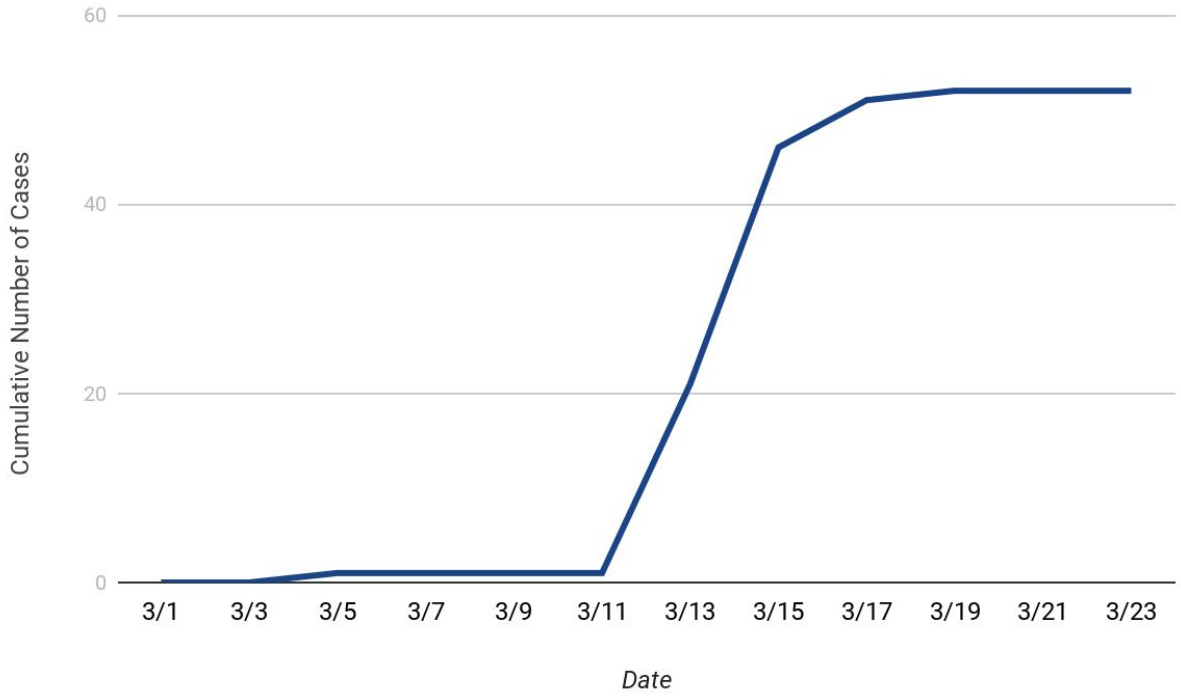
4. What type of illness most likely caused this outbreak based on the data presented, and why? (3 points)

Foodborne illnesses usually cause point-source outbreaks…

5. Fill in the table below with the cumulative number of reported cases during the outbreak. (6 points)

Date	3/1	3/3	3/5	3/7	3/9	3/11	3/13	3/15	3/17	3/19	3/21	3/23
Number of Cases	0	0	1	1	1	1	21	46	51	52	52	52

6. Create a cumulative distribution graph based on this outbreak. (8 points)



7. The ABRHS Scioly Labs are deciding whether to implement a new screening technology (PEST) for The Troll Disease or not. Below is the data they compiled.

	Troll Disease	No Troll Disease
Test Positive	157 TP	40 FP
Test Negative	3 FN	234 TN

8. Define specificity. (2 points)

The ability of the test to correctly identify those without the disease.

9. Calculate the specificity of PEST. Show work and formulas. (2 points)

Specificity = TN/(TN + FP) = 234/274 = 0.8540

10. Define sensitivity. (2 points)
The ability of a test to correctly identify those with the disease

11. Calculate the sensitivity of PEST. Show work and formulas. (2 points)
Sensitivity = TP/(TP + FN) = 157/160 = 0.9813

12. What are the negative and positive predictive values for PEST? What do they indicate? Show work and formulas. (5 points)
NPV = TN/(TN + FN) = 234/237 = 0.9873
PPV = TP/(TP + FP) = 157/197 = 0.7970
They indicate that although the NPV is fairly accurate, more than 20% of the cases that tested as positive were not positive…

13. List two reasons why having too many false positives is bad for a screening test. (4 points)
- Causes distress/panic unnecessarily
- Wastes resources for treatment

Accept other reasonable answers

14. Should the ABRHS Scioly Labs use PEST to screen for The Troll Disease? Explain why or why not. Support your answer with evidence. (4 points)
No, the ABRHS Scioly Labs should not use PEST to screen for The Troll Disease, as the PPV is too low (0.7970). This means that people who test positive yet don't have the disease must suffer through unnecessary emotional distress, and it wastes resources for treatment. In addition, the low specificity is troubling as well (0.8540).

15. If the reproductive number of The Troll Disease is 8, then calculate the proportion of people that would have to be immunized in order for herd immunity to be effective. Show work. (5 points)
1 - (1/R) = 1 - 1/8 = 7/8 = 0.875

16. What are the top five germs that cause foodborne illnesses in the USA? (5 points)
Norovirus, Salmonella, Clostridium perfringens, Campylobacter and Staphylococcus aureus

17. Who was the scientist that developed the smallpox vaccine? (1 point)
Edward Jenner

Write in the pathogen that relates to or matches the description. (5 points)

Escherichia Coli	18. Mainly caused by undercooked hamburger; causes 73,000 cases each year in the US
Hepatitis A	19. Causes a type of severe liver disease; has an incubation period of 15-50 days
Salmonella	20. Reason behind implementing the “4-inch” law
Norovirus	21. Viral infection with a 24-48 hour incubation period
Botulism	22. Toxin poisoning that is caused by improper canning

Identify whether these illnesses are caused by bacteria, viruses, or protists. Circle the correct answer. (6 points)

23. Shigellosis - **Bacteria** Virus Protist

24. Hepatitis A - Bacteria **Virus** Protist

25. Ebola - Bacteria **Virus** Protist

26. HIV - Bacteria **Virus** Protist

27. Giardiasis - Bacteria Virus **Protist**

28. Toxoplasmosis - Bacteria Virus **Protist**

PART V: LITERACY AND COMPREHENSION (Newspaper Article) — 17 points
Read this article and answer the questions below.

Outbreak of Fluoroquinolone-Resistant *Campylobacter jejuni* Infections Associated with Raw Milk Consumption from a Herdshare Dairy — Colorado, 2016

Weekly / February 9, 2018 / 67(5);146–148
Alexis Burakoff, MD; Kerri Brown, MSPH; Joyce Knutsen; Christina Hopewell; Shannon Rowe, MPH; Christy Bennett; Alicia Cronquist, MPH
https://www.cdc.gov/mmwr/volumes/67/wr/mm6705a2.htm?s_cid=mm6705a2_w

In August 2016, a local public health agency (LPHA) notified the Colorado Department of Public Health and Environment (CDPHE) of two culture-confirmed cases of *Campylobacter* infection among persons who consumed raw (unpasteurized) milk from the same herdshare dairy. In Colorado, the sale of raw milk is illegal; however, herdshare programs, in which a member can purchase a share of a herd of cows or goats, are legal and are not regulated by state or local authorities. In coordination with LPHAs, CDPHE conducted an outbreak investigation that identified 12 confirmed and five probable cases of *Campylobacter jejuni* infection. Pulsed-field gel electrophoresis (PFGE) patterns for the 10 cases with available isolates were identical using the enzyme *Sma*. In addition, two milk samples (one from the dairy and one obtained from an ill shareholder) also tested positive for the outbreak strain. Five *C. jejuni* isolates sent to CDC for antimicrobial susceptibility testing were resistant to ciprofloxacin, tetracycline, and nalidixic acid (*1*). Although shareholders were notified of the outbreak and cautioned against drinking the milk on multiple occasions, milk distribution was not discontinued. Although its distribution is legal through herdshare programs, drinking raw milk is inherently risky (*2*). The role of public health in implementing control measures associated with a product that is known to be unsafe remains undefined.

Investigation and Results

On August 23, 2016, El Paso County Public Health notified CDPHE of two culture-confirmed cases of *C. jejuni* infection; campylobacteriosis is a reportable disease in Colorado. Both patients reported drinking unpasteurized milk from the same herdshare dairy in Pueblo County. Since 2005, obtaining raw milk by joining a herdshare program has been legal for Colorado residents, but selling raw milk is illegal. By purchasing a share of a herd (cows or goats), shareholders are entitled to a portion of the raw milk.

Because the prevalence of consuming unpasteurized milk is low (2.4% in Colorado, 2006–2007 FoodNet Population Survey; 3.1%, 2009 Colorado Behavioral Risk Factor Surveillance System), two cases of enteric illness with a common exposure to raw milk are unlikely to occur by chance (*3*,*4*). In this outbreak, a confirmed case was defined as diarrheal illness with onset on or after August 1, 2016, in a person with known consumption of unpasteurized milk from the same herdshare dairy and

culture-confirmed *C. jejuni* infection. A probable case was defined as diarrhea onset on or after August 1, lasting 1 or more days, in a person with either known consumption of milk from the same herdshare dairy or with an epidemiologic link to a confirmed case.

Cases were identified through routine passive reporting with follow-up interviews, a Health Alert Network broadcast to area providers, and attempts to contact all shareholders. A public health order was issued to obtain a list of shareholders with their contact information after it was not provided by the dairy within 5 days of the initial request. CDPHE attempted to contact shareholders to inform them about the outbreak and assess possible illness. Up to three calls were made to each shareholder household. Epidemiologists contacted laboratories to request that isolates from potential outbreak-associated cases be forwarded to the state public health laboratory.

Among 91 (53%) of 171 shareholder households that responded to requests for follow-up interviews, representing 207 persons in five or more Colorado counties, 12 confirmed and five probable cases were identified (Figure). Among confirmed cases, patients ranged in age from 12 to 68 years (median = 58 years); nine were male. Duration of illness ranged from 3 to >10 days. One hospitalization occurred; there were no deaths. In addition to diarrhea, among the 12 confirmed cases, the majority of patients also experienced fever (10), abdominal pain or cramps (eight), headache (eight), and myalgia (seven); vomiting and bloody diarrhea were reported less frequently (in five and four persons, respectively).

Four milk samples were tested for *C. jejuni*; pathogen identification and PFGE were performed on available isolates from persons epidemiologically linked to the outbreak. *C. jejuni* with one of two outbreak PFGE patterns (PulseNet DBRS16.0008 using the enzyme *Sma* and PulseNet DBRK02.1272 or DBRK02.0028 using the enzyme *Kpn*) was confirmed in 10 isolates that were available at the public health laboratory and two of the four raw milk samples. The National Antimicrobial Resistance Monitoring System performed antimicrobial susceptibility tests on five representative isolates; all were resistant to ciprofloxacin, tetracycline, and nalidixic acid (*1*).

Public Health Response

Public health responses to this outbreak consisted of notifying shareholders about the outbreak on three occasions (Figure) and requiring the dairy to provide additional written notification about the outbreak at milk distribution points. A press release was issued by two LPHAs (Figure) in response to detecting at least one infection in a person who was not a shareholder but was given milk by shareholders. In addition, a number of shareholders reported sharing milk with nonshareholders who might have been unaware of the outbreak. Although milk sample results were positive for *C. jejuni*, CDPHE did not close the dairy or stop distribution of its milk because without pasteurization CDPHE could not create standards for safely reopening the dairy (*5*). Shareholders were, however, urged to discard raw milk distributed since August 1 and were reminded that Colorado statute prohibits redistribution of raw milk.

Discussion

Raw milk from a herdshare dairy was the source of this outbreak of *C. jejuni* infections, and the investigation highlighted the difficulties inherent in addressing an outbreak related to unpasteurized milk from a herdshare dairy. During three previous herdshare-associated outbreaks in Colorado, public health authorities temporarily took action to stop milk distribution until a series of negative tests were obtained from the milk (Alicia Cronquist, CDPHE, personal communication, December 2017). However, because CDPHE could not ensure that unpasteurized milk would be safe in the future, the decision was made not to close the dairy during this outbreak. In addition, CDPHE's Division of Environmental Health and Sustainability chose not to make formal recommendations on the dairy's processes because no protocol improvements short of pasteurization could ensure the product's safety, even with improved sanitation (*5*).

All tested isolates' resistance to three antibiotics was concerning, particularly as fluoroquinolones are frequently used to treat *Campylobacter* infections in those cases where treatment is indicated. Treatment of antibiotic-resistant *Campylobacter* infections might be more difficult, of longer duration, and possibly lead to more severe illness than treatment of nonresistant *Campylobacter* infections (*6–8*). In 2015, approximately 25.3% of U.S. *C. jejuni* isolates were resistant to ciprofloxacin, an increase from 21.6% a decade earlier (*1*).

In collaboration with LPHAs, CDPHE is creating guidelines to address future outbreaks related to raw milk from herdshares. As more states legalize the sale or other distribution of unpasteurized milk, the number of associated outbreaks will likely increase (*9*,*10*). The role of public health in responding to raw milk–related outbreaks should be further defined. State-level guidelines might assist with this process.

Conflict of Interest

No conflicts of interest were reported.

1. What are the usual symptoms of Campylobacter jejuni? What foods does it usually occur in? (2 points)
Symptoms: diarrhea, cramps, fever, and vomiting. Foods: raw and undercooked poultry, unpasteurized milk, contaminated water.

2. Define what a reportable disease is. (2 points)
A disease that, by law, must be reported to public health authorities upon diagnosis

3. What is the prevalence of consuming raw milk in Colorado? (1 point)
2.4% in Colorado, 2006–2007 FoodNet Population Survey; 3.1%, 2009 Colorado Behavioral Risk Factor Surveillance System

4. Explain the difference between a confirmed case definition and a probable case definition. (3 points)
A probable case is a case that meets clinical case definition and has supportive laboratory results that are consistent with the diagnosis, yet do not meet the criteria for laboratory confirmation. A confirmed case has laboratory confirmation.

5. What was the confirmed case definition for this outbreak? (1 point)
Diarrheal illness with onset on or after August 1, 2016, in a person with known consumption of unpasteurized milk from the same herdshare dairy and culture-confirmed *C. jejuni* infection.

6. Define passive surveillance. (2 points)
Regular reporting of disease data by all institutions that see patients (or test specimens) and are part of a reporting network

7. Define active surveillance. (2 points)
Active surveillance is used when there is an indication that something unusual is occurring. Criteria are established for reporting disease (or its absence), risk factors or health events, but those maintaining the surveillance system initiate reporting.

8. Why do public health organizations often rely on passive surveillance as opposed to active surveillance? Why could this lead to inaccuracies? (2 points)
Passive surveillance is cheaper. Possibly could lead to inaccuracies because reporting is voluntary and may not give an accurate representation of disease occurrence.

9. What were the public health responses to this outbreak? (2 points)
Notifying shareholders about the outbreak on three occasions (Figure) and requiring the dairy to provide additional written notification about the outbreak at milk distribution points.