Student Exercises: Answer Key

Exercise 1

During the previous year, nine residents of a community died from the same type of cancer. List some reasons that might justify an investigation.

> One reason to investigate is simply to determine how many cases you would expect in the community. In a large community, for instance, nine cases of a common cancer (e.g., lung, breast, or colon cancer) would not be unusual. In a very small community, nine cases of even a common cancer may seem unusual. If the particular cancer is rare, then nine cases even in a large community may be unusual.
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> If the number of cases turns out to be high for that community, we might pursue the investigation further. Our motive might be research—perhaps we will identify a new risk factor (workers exposed to a particular chemical) or predisposition (people with a particular genetic marker) for the cancer. Control and prevention may also be a justification. If we find a risk factor, control and prevention measures could be developed. Alternatively, if the cancer is generally treatable when found early and a screening test is available, then we might try to determine not why these people developed the disease, but why they died from it. For instance, if the problem were cancer of the cervix, detectable by Pap smear and generally treatable if caught early, we might find (1) problems with access to health care, or (2) physicians not following the recommendations to screen women at the appropriate intervals, or (3) laboratory error in reading or reporting the test results. We could then develop measures to correct the problems we found (public screening clinics, education of physicians, or laboratory quality assurance).
>
> If new staff need to gain experience on a cluster investigation, training may be a reason to investigate. If there is public concern, it may generate political pressure. Perhaps one of the people affected is a member of the mayor's family. A health department must respond to such concerns, but does not usually need to conduct a full-blown investigation. Finally, legal concerns may prompt an investigation, especially if a particular site in the community is implicated.

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Exercise 2

During August, a county health department received reports of 12 new cases of tuberculosis and 12 new cases of aseptic meningitis. Tuberculosis does not have a striking seasonal distribution; however, aseptic meningitis, which is caused primarily by a viral infection, is highly seasonal, and peaks from August–October. What additional information is needed to determine whether either of these groups of cases is an outbreak?

> You need to know how many cases of each of these diseases usually occurs in this county during August. Because tuberculosis is not seasonal, the number of cases could be compared with (a) the numbers reported during the preceding

several months and (b) the numbers reported during August of the preceding few years. However, since aseptic meningitis is seasonal and peaks from August–October, the number of cases during August is expected to be higher than the number reported during the preceding several months, so you would need to compare with the numbers reported during August of the preceding few years.

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Exercise 3

Review the six case report forms in the Appendix and create a line listing based on the information.

The choice of information to include in a line listing is somewhat arbitrary. The following categories are often included:

Identifying information

- Identification number or case number, usually in the left-most column
- Names or initials as a cross-check

Clinical information

- Physician diagnosis
- Was diagnosis confirmed? If so, how?
- Symptoms
- Laboratory results
- Was the patient hospitalized? Did the patient die?

Descriptive epidemiology—time

- Date of onset
- Time of onset

Descriptive epidemiology—person

- Age
- Sex
- Occupation, if relevant, or other seemingly relevant characteristics

Descriptive epidemiology—place

- Street, city, or county
- Worksite, school, day care center, etc., if relevant

Risk factors and possible causes

- Specific to disease and outbreak setting

Here is one way that a line listing might be drawn up from the six case report forms on the Cleveland-McKay wedding outbreak:

ID #	Initials	Date of Onset	Diagnosis	How Confirmed	Age	Sex	County	Physician	Cleveland-McKay Wedding
1	KR	7/23	probable trichinosis	Not done	29	M	Columbia	Goodman	Yes
2	DM	7/27	trichinosis	Biopsy	33	M	Columbia	Baker	Yes

3	JG	8/14	probable trichinosis	Not done	26	M	Columbia	Gibbs	Yes
4	RD	7/25	trichinosis	Serologia	45	M	King	Webster	Yes
5	NT	8/4	trichinosis	Not done	27	F	Columbia	Stanley	Yes
6	AM	8/11	R/O trichinosis	Pending	54	F	Clayton	Mason	Yes

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Exercise 4

You are called to help investigate a cluster of 17 men who developed leukemia in a community. Some of them worked as electrical repair men, and others were ham radio operators. Which study design would you choose to investigate a possible association between exposure to electromagnetic fields and leukemia?

> Because the total population at risk is not well defined, you would use a case-control study. You would begin by enrolling the 17 people already identified with leukemia as the case group. You would also need to determine what group might serve as an appropriate comparison, or control, group. Neighbors might be used for the control group, for example. In your case-control study, you would determine whether each case-patient and each control had been exposed to electromagnetic fields (however you defined that exposure). Finally, you would compare the exposures of case-patients and controls.

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Exercise 5

The manager of a grocery store has reported a rash illness among the store's workers. What type of study would you use to determine the source of the outbreak? Why? What is the appropriate measure of association? After reviewing the table in the Appendix showing the data on exposure to celery for these workers, calculate the measure of association and interpret your results.

> You would use a cohort study because the outbreak is small and confined. The appropriate measure of association for a cohort study is relative risk, which is calculated in this case as the attack rate for workers exposed to celery divided by the attack rate for those who were not exposed.
>
> The attack rate for exposed workers is 25 / 56, or 44.6%. The attack rate for workers who were not exposed is 5 / 70, or 7.1%. Thus, the relative risk for exposure to celery is 44.6 / 7.1, or 6.3. This means that workers who were exposed to celery were 6.3 times more likely to develop the rash illness than those who were not exposed, and it is therefore likely that celery was the source of the outbreak. However, before you could draw this conclusion, you would need to compare the relative risk for celery with that for other vegetables and fruits to see if the implication is stronger for any of them.
>
> Then, to test the likelihood of your findings, you would need to calculate a test of statistical significance such as chi-square for the item with the highest relative risk and look up the corresponding p-value in a table of p-values. If the p-value was below .05, your findings would be considered statistically significant.

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