



FOCUS on Field Epidemiology

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Hypothesis-Generating Interviews

The Lone Epidemiologist surveyed the scene, squinting in the late afternoon sun, oblivious to the tumbleweed rolling across the dusty road. The town was quiet, too quiet. The door to the saloon creaked gently in the breeze, but no sounds of drunken merriment or fist fighting could be heard inside. The barbershop, too, was empty, and no one trailed in or out of the post office to check on the day's mail. The Lone Epidemiologist pulled his pencil out of its holster and his paper pad out of his back pocket, and raced toward the town clinic. He burst into the dark room in a cloud of dust and sunlight, causing the feverish patrons within to shield their eyes. "All right," he shouted into the room. "Someone in here caused this outbreak, and I'm going to find out who it is!" He swaggered around the room and finally came across a skinny, middle-aged man with a shifty look about him. "It was you!" declared the Lone Epidemiologist. Pencil and pad in hand, he took down the man's demographic and exposure information and carried him off to the health department lockup.

While the Lone Epidemiologist lacks scientific expertise and people skills, he has the right idea about one thing: when searching for the cause of an outbreak, talking to case-patients and asking for information about them is often a useful way to get ideas about the cause of the outbreak.

Once an outbreak has been identi-

fied and confirmed, one of the first things to do is organize preliminary descriptive data about the case-patients and use this data and other information to generate a hypothesis about the cause of the outbreak (See previous FOCUS issues). Once you have a hypothesis, an analytic study can be developed to test the hypothesis.

Hypothesis-generating interviews are not designed to determine with certainty the source of an outbreak and the questionnaires reflect this. A hypothesis-generating questionnaire has a different design than does a hypothesis-testing questionnaire. To get measures of association such as odds ratios or risk ratios, you must conduct an analytic study that is designed to test your hypothesis which includes the use of a standardized well structured questionnaire. Skipping the hypothesis generating step of an outbreak investigation and going straight to a poorly designed analytic study will jeopardize the investigation and the ability to implicate a risk factor or exposure.

Common strategies for generating hypotheses about the cause of an outbreak include conducting a literature review and reviewing line-listing information. However, often a more structured approach is necessary.¹ Structured hypothesis-generating questionnaires and focused interviewing are useful when there is no obvious hypothesis for the cause of the outbreak. Questionnaires are an efficient, relatively



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inexpensive, and uniform way of gathering data.² In-depth interviews allow for closer interactions with case-patients and provide an opportunity to gather substantial information about aspects of their lives which may have contributed to their getting sick. This FOCUS issue discusses conducting hypothesis-generating interviews to gather information during the initial stages of an outbreak investigation.

Why use hypothesis-generating interviews?

When an outbreak occurs, one of the first tasks is to interview case-patients and health care providers. These interviews give initial clues to possible sources of exposure. In addition, the information from these initial interviews can be used to develop another, more detailed questionnaire for testing the hypothesis generated through initial interviews.

Interviews with case-patients help identify signs and symptoms of the disease. Clinical description can also help give clues to the transmission route by indicating the organ system affected.

In addition, interviews can help develop or refine the case definition, which can aid in deciding who to include or not include as the investigation proceeds.

From hypothesis-generating interviews, you can develop a demographic profile that helps identify the population at risk. Are the majority of the cases children, adults, women, men, from a particular ethnic group, or part of a specific church or sports team?

By finding commonalities among the case-patients, you can begin to develop a list of possible exposures. For example, case-patients may have all been to the same swimming pool, they may have all eaten strawberry cheesecake, or they may have all worked on the same farm.

Who do we interview?

The first source of information is case-patients. This group will provide most of the information on potential sources of exposure. If a case-patient is unavailable, ask a family member or friend. When the case-patient is a child, you may need to interview a parent or guardian.

Depending on the size of the outbreak, select 8 to 10 case-patients with differing demographic characteristics. Focus attention on case-patients with clinical presentations and cases that occur around the middle of the outbreak. Keep in mind, however, that unusual cases can

also provide important clues.

- For example, during the 1984-1985 Minnesota outbreak of thyrotoxicosis from ground beef, a case-patient identified late in the investigation provided important clues that tied the investigation together. Most cases clustered around Luverne, Minn; however, a young woman from Sioux Falls who became ill frequently shopped for groceries in the town of Valley Springs. Investigators then found that the Valley Springs grocery store obtained its beef trimmings from a plant near Luverne.³

Always bear in mind that outliers may belong to a different epidemic, with different modes of transmission and exposure routes.

In addition, never rule out the possibility that the epidemic may be greater than initially envisioned.

- For example, in the summer of 1997, two independent investigations of *Salmonella* outbreaks, one in Virginia and the other in Michigan, implicated alfalfa sprouts. Trace-back investigations found that the source of both outbreaks was contaminated seeds harvested in Idaho.⁴

Interviewing health care providers is also useful. In some small communities, health care providers, lab workers, and clinical staff know the patients and their families; they know their behaviors and the places they visit. They may also be able to promptly pinpoint an outbreak to a certain geographic area such as a neighborhood.⁵

What do we ask?

You can start by looking at existing hypothesis-generating resources such as the standard questionnaire from The Foodborne Outbreak Surveillance and Response Unit of the CDC (found at http://www.cdc.gov/foodborneoutbreaks/standard_questionnaire.htm). Questionnaires like this can serve as a template and guide, but each outbreak is unique and questions should be carefully selected to meet the needs of the investigation at hand. It is also useful to contact others who have investigated similar outbreaks to request the hypothesis-generating questionnaires they used. Then you can adapt them to your particular setting.

A questionnaire should always ask for **basic demographic information** such as name, sex, age, occupation, and contact information (home and workplace). **Clinical details** include signs and symptoms of disease, date of on-

set, and duration. Ask about professional health care, laboratory exams, and hospitalization, and ask whether other household members have similar symptoms. Also ask about specific **activities**, such as attendance at social gatherings, contact with animals, leisure activities, and hobbies (e.g., swimming, hiking). Details on **food consumption** should include restaurant exposures and food purchasing information. In general, ask about exposures that could potentially cause or predispose the case-patient to illness.

Known or suspected agent

When considering a known or suspect agent, review the literature on previous investigations and basic science. This review should identify likely exposures to the agent, known reservoirs, and modes of transmission, all of which are important to ask the case-patient about. Using information about the known incubation period and date of onset, ask about activities that occurred during a specific period. However, keep your mind open to uncommon exposures and vehicles of transmission. During the Michigan and Virginia outbreaks described above, the exposure (consumption of alfalfa sprouts) was rather uncommon; Salmonellosis is usually due to undercooked beef.

- For example, if Norovirus Gastroenteritis is suspected, ask about common exposures such as consumption of salads, sandwiches, and bakery products. Also ask about consumption of oysters and use of recreational waters and wells, which may be potential causes of the disease.

Unknown agent

If the responsible agent is unknown, the interview should be broader and the questions less specific. Focus on activities and on clinical signs and symptoms that could help pinpoint the source of exposure, reservoir, mode of transmission, and incubation period of potential causative agents.

- For example, if symptoms include fever, chills, headache, cough, and muscle aches, ask about exposures known to cause Legionnaires' Disease, Pontiac Fever, pneumonia, influenza, severe acute respiratory syndrome (SARS), and other respiratory illnesses. However, if there are also gastrointestinal symptoms, you might suspect Q fever.

When and where do we conduct the interviews?

Hypothesis-generating interviews are done early in the investigation. Usually, case-patients are interviewed in their homes or in a health care setting. If several case-patients need to be brought together in order to identify common exposures,⁵ a suitable setting is needed such as the local health department.

If an outbreak is challenging, it may be necessary to try unusual approaches such as going through the case-patients' pantry or refrigerator^{1,5} or going to the grocery store with the persons who shop for case-patients.¹

- In an epidemic of listeriosis in Canada in 1981, coleslaw obtained from the refrigerator of one case-patient tested positive for *L monocytogenes*. The serotype was the same as the epidemic strain and the strain isolated from the patient's blood. The cabbage used in the coleslaw preparation was traced back to a farm where two sheep had died from listeriosis.⁶
- In an outbreak of listeriosis in Massachusetts in the summer of 1983, case-patients seemed to be more likely than controls to use a particular food store chain. Investigators accompanied some of the persons who did the shopping for households with case-patients to the food store where they normally shopped, and they recorded the shoppers' purchases. The store brand pasteurized whole milk and 2% milk were the only items purchased by all case-households. Two case control studies then showed an association between milk consumption and listeriosis.⁷

How do we conduct the interviews?

Hypothesis-generating interviews are usually done face to face. However, some circumstances may necessitate conducting the interview by telephone.

Useful resource on structured interviews:

- United States General Accounting Office, Program Evaluation and Methodology Division. Using structured interviewing techniques. Washington, D.C. 1991 http://www.gao.gov/policy/10_1_5.pdf. Accessed October 15, 2004

The language used in the interview should depend on the age, level of education, and other characteristics of the case-patients. Questions should be worded in a way that is culturally sensitive and mindful that some topic areas are uncomfortable. Jargon and abbreviations should always be avoided. Use of memory aids such as calendars and receipts may help the case-patients remember details. Record the information gathered in a standardized form.

Combine closed-ended and open-ended questions. Closed-ended questions are easier to standardize, tabulate, and analyze, but they may not provide exhaustive information.² Open-ended questions impose fewer limits, which allows respondents to express themselves freely, but they are more difficult to code and analyze.²

Ideally, one person should conduct all the interviews; this makes it easier to identify any commonalities or peculiar findings. The interviewer should have sufficient background knowledge of the disease (and the potential etiologic agent if one is suspected), as well as good interviewing and people skills. The interviewer must be professional but friendly, and should exhibit concern for the well-being of the case-patient.

At the time of the interview, identify yourself and give your credentials, and the organization you work with. Explain the purpose of the interview, being careful not to make comments that could bias responses, and tell the case-patient how long the interview will take. Questioning should be systematic but flexible to allow the case-patient to provide comments that may give additional insights into the cause of the outbreak.

Once the interview is completed, provide contact information, thank the interviewee for participating, and acknowledge his or her contribution to the investigation.

An upcoming issue of FOCUS will discuss interviewing techniques in greater detail and give helpful strategies for conducting interviews.

Conclusion

Hypothesis-generating interviews increase the efficiency of outbreak investigations by helping to confirm the existence of an outbreak, providing insights about potential causative agents, and identifying potential sources of exposure and modes of transmission. Based on the information provided through hypothesis-generating interviews, investigators can create case definitions, construct epi-curves, and proceed to test the hypotheses through analytic studies.

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Tips for great interviews:

Get enough background information.

Review the literature.

Enhance your interviewing and people skills.

Act friendly but professional.

Take memory aids with you.

Introduce yourself and your institution.

Notify the person of the purpose and length of the interview.

Talk without using jargon or abbreviations.

Express yourself in a culturally sensitive manner.

Record information in a standardized format.

Vary between closed-ended and open-ended questions.

Identify commonalities or peculiar events or characteristics.

Encourage comments that may provide additional insights.

Word your acknowledgements for their contributions to the investigation.

Start coding and tabulating gathered information at once.

Glossary:

Structured interview: An interview that follows a standardized format.

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UPCOMING TOPICS!

- Designing Questionnaires for Outbreaks
- Interviewing Techniques for Epi Studies
- Introduction to Forensic Epidemiology
- Differences between Public Health and Law Enforcement Investigations

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