

Gastronomic Gastroenteritis at *The Fat Duck*



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Introduction

For a restaurant to earn a Michelin star is one of the highest honours in global cuisine. The more stars earned, the more innovative and renowned the restaurant and the associated chef. The Fat Duck in Berkshire, Wales in U.K. has three Michelin stars and is considered one of the best restaurants in the world. It serves an estimated 1750 patrons every month. The head chef, Heston Blumenthal, is known for his ground-breaking innovation in the area of “molecular gastronomy,” which fuses molecular laboratory techniques into cooking practice (Smith et al., 2012).

It is January 2009 and you have waited months to get a reservation at this restaurant. You and your dinner party choose the 16 course tasting menu for the equivalent of \$240 per person. The cost is higher if a patron chooses matching wine pairings. You enjoy bite after bite of fascinating delicacies, including 1) a green tea and lime mousse that was frozen by the addition of liquid nitrogen, 2) oysters with passion fruit jelly and lavender, and 3) roast foie gras “benzaldehyde,” which uses cryogenically frozen goose livers cooked in a vacuum bag in a controlled temperature water bath. You leave the restaurant feeling enlightened and awed by the brilliance of the chef and the smug satisfaction that you have eaten at what is considered one of the best restaurants in the world.

About two days later, you start to feel ill. You experience nausea, and start vomiting. You are beset by abdominal pain, diarrhoea and flu-like symptoms, which last about three days. You ask yourself, “Could it have been the meal? Surely not at that restaurant and at that price!” You visit your physician who suggests that it’s gastroenteritis, but does not diagnose the cause since she/he does not suggest that a cell culture or blood panel be performed. You recover after a few days, but your grandmother who was visiting you also acquires a similar illness during that time and requires hospitalization for dehydration. Since she did not join you for dinner, you decide you caught this “bug” elsewhere. On February 25, 2009 the local public health unit receives a report that four people became sick after eating at The Fat Duck.



Reflection: How would you react as a diner in this situation?



The Investigation

Now you will switch roles. You are the chief outbreak epidemiologist who has been assigned to investigate this report. In the following case, you and your infection control team (ICT) will uncover the scope of food poisoning outbreak at The Fat Duck, uncover the mode of transmission and ultimately identify the source of the infection using the principles of outbreak investigation. At the end you will have solved one of the biggest restaurant associated outbreaks of gastroenteritis ever reported (Smith et al., 2012).

Note: The sections of this case build on information uncovered in previous sections. Your instructor will provide the segments as the case unfolds.

Part II – Uncovering the Extent of the Problem

Background Reading: “Patterns of disease development in a population: the epidemic curve,” *AFMC Primer on Population Health*.

<https://sciencecases.lib.buffalo.edu/files/Supplemental/UploadFolder/gastroenteritis_reading2.pdf>

Your ICT now needs to uncover the extent of the problem and determine how many people have been affected. This means you have to apply some descriptive epidemiology. In essence, you will need to develop a case description for this outbreak (consider person, place and time) and come up with a way to identify cases among diners so that you can uncover the full extent of the outbreak.

Questions

8. Use the information provided in the previous sections. How would you define the study population? Develop a case description.

9. How would you find new cases? Would you take a different approach to finding cases between staff and diners?

Your instructor will provide the next section after you have answered the questions above.

Infection Control Team Uses Survey for Case Finding

Once the case definition is developed, your ICT decides to uncover more cases by conducting an online survey. The survey is emailed to diners and their contacts that had complained of feeling symptoms. The goal of the survey according to the HPA report (Smith et al, 2009) was to:

- “1. Describe the illness among diners at The Fat Duck restaurant.
2. Describe the pattern of illness over time.
3. Assess evidence for secondary spread.” (HPA report)

The survey comprised an eight page questionnaire that asked details about: date eaten at restaurant, timing of onset of symptoms after eating, length of illness, nature of symptoms, which foods were eaten/not eaten, laboratory tests undertaken at the advice of a physician, and whether other people in household got sick (secondary transmission).

Some results from the survey were analyzed and are shown below in Table 1 and Figure 1. Figure 2 shows an epidemic curve that was generated from survey data and describes the number of cases over time.

Table 1. Symptoms reported by survey responders who were defined as cases (n= 240). Six cases of secondary transmission were reported (not shown; Smith et al, 2009).

Symptom	Number reporting
Diarrhoea (three or more in 24 hours)	197
Nausea	188
Vomiting	175
Loose stools (one or two in 24 hours)	68
Headache	103
Fever	102
Abdominal pain	155
Muscle ache/flu-like symptoms	114
Weight loss	75
Blood in stool	5

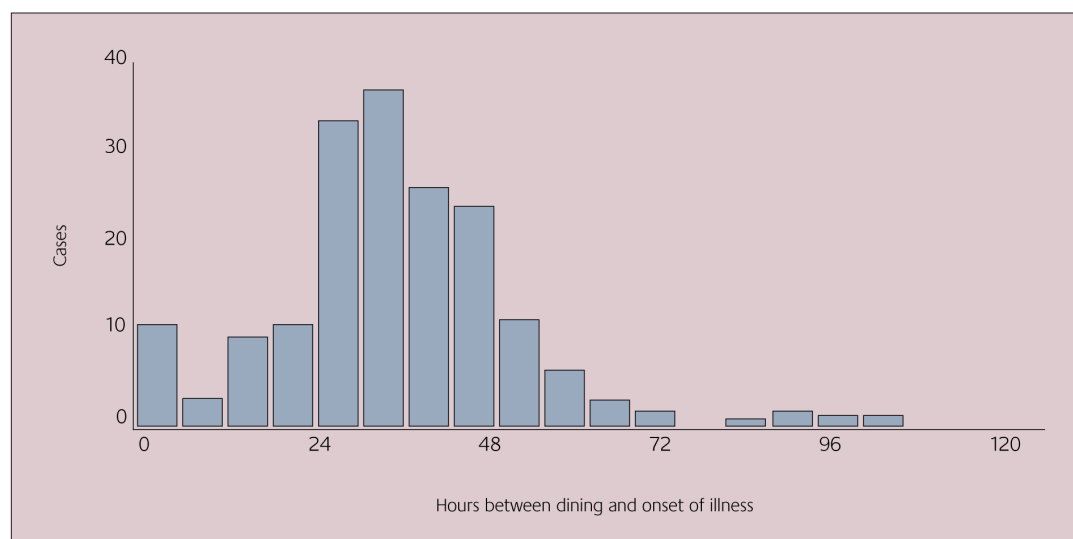


Figure 1. Time observed between eating and onset of symptoms (Smith et al, 2009).

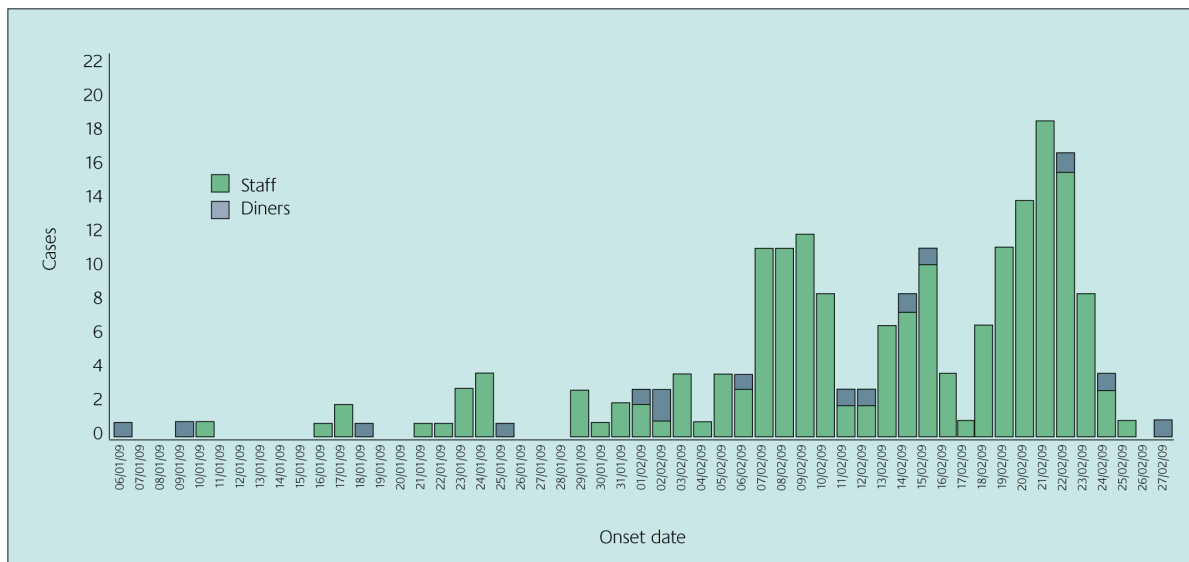


Figure 2. Epidemic curve for gastroenteritis outbreak at The Fat Duck restaurant (Smith et al, 2009).

Questions

- A survey tool was used to uncover the extent of the outbreak. How would your ICT distribute a survey? Who would you target as survey recipients?
- Using the data shown in Figure 1, estimate the median incubation time of the illness including a maximum and minimum range.
- The survey reported six cases of secondary transmission. Define secondary transmission. How do you think the grandmother of the diner in the introduction got sick? What can this tell you about the agent and its mode of transmission?
- Think back to the pathogenic or etiological agents you listed in Question 5. Can you identify some agents that might have this incubation time?
- What does the epidemic curve shown in Figure 2 tell you about transmission, incubation, agent and source? What kind of epidemic curve is this? Does it show point source, continuous source, intermittent source or propagated spread? Defend your answer.

Part IV – Identifying the Source

Background Reading: “Observational studies,” *AFMC Primer on Population Health*.
<https://sciencecases.lib.buffalo.edu/files/Supplemental/UploadFolder/gastroenteritis_reading4.pdf>

Your ICT has successfully identified the agent and uncovered the extent of the outbreak. However, the source of the norovirus infection has yet to be determined. One challenge that your team faces is that much of the food was thrown out during the deep clean of the restaurant. The food that remained was negative for norovirus, and thus it is not known which food product was contaminated. Fortunately, your team can use analytical epidemiology to help track down the source of infection. You can use data collected in the survey to look back and identify possible sources.

Questions

22. What kind of study design would you use in this outbreak? Case control, cohort, or cross-sectional? Explain your reasoning.

23. What key pieces of information did the survey ask that will help your ICT determine the source?

Your instructor will provide the next section after you have answered the questions above.

Results from Case-Control Analysis

Recall that the survey identified cases and controls and asked very specific questions about which dishes had been eaten and not eaten. Your team uses this data to assess the most likely source of the viral infection.

Questions

24. Your ICT developed a case definition in Question 8. What would you define as a control for this investigation?
25. Build a 2×2 table and calculate an odds ratio for the following three dishes:
- *Oyster, passion fruit, and lavender*: of 228 cases, 200 ate the oyster, passion fruit, and lavender dish. 28 cases had not tried it. Of 71 controls, 21 people tasted the dish but 50 had not eaten it.

 - *Salmon poached in licorice gel*: 150 cases reported eating this dish while 78 cases did not try it. 38 controls reported eating this dish whereas 33 did not taste it.

 - *Parsnip cereal*: 100 cases tasted the dish, 128 did not. 30 controls ate the dish, whereas 41 did not try it.
26. Based on your understanding of odds ratios, which food item would you suspect as the source of the outbreak? How would you confirm this?

Your instructor will provide the next section after you have answered the questions above.

Results from Shellfish Supply Chain Sampling

The oyster supply chain was tested and was found to be positive for norovirus. In fact, multiple norovirus strains were identified. This is consistent with shellfish-based norovirus outbreaks since the shellfish can pick up multiple strains from the environment. The same strains of the virus present in the oysters were also found in staff and diners (Smith et al., 2012).

Question

27. Why are shellfish susceptible carriers for norovirus? Why is it likely that more than one type of virus is present?

Your instructor will provide the next section after you have answered the questions above.

Concluding Remarks

Shellfish are especially vulnerable to carrying norovirus because they are filter feeders and can accumulate norovirus particles of multiple strains in their gills (Goodgame, 2006). Thus, the likely source of the outbreak was identified as being vehicle transmission by oysters in most of the cases. It is likely that other routes of transmission also occurred (e.g., contact, direct and indirect) in the presence of poor hygiene practices. This is supported by the presence of coliform contamination of other food sources. The restaurant reopens and now cooks its seafood, and has enhanced its hygiene practices. Many happy diners continue to explore the innovative cuisine, for now...

Congratulations on successfully completing the case!

References Cited

- Goodgame, R. (2006). Norovirus gastroenteritis. *Current Gastroenterology Reports* 8(5): 401–408. <<http://doi.org/10.1007/s11894-006-0026-4>>.
- Smith, A. J., McCarthy, N., Saldana, L., Ihekweazu, C., McPhedran, K., Adak, G. K., ... O'Moore, E. (2012). A large foodborne outbreak of norovirus in diners at a restaurant in England between January and February 2009. *Epidemiology & Infection* 140:1695–1701. <<http://doi.org/10.1017/S0950268811002305>>.
- Smith, A., McCarthy, N., McPhedran, K., Saldana, L., Hosey, T., Foster, W., ... Bickler, G. (2009). *Foodborne illness at The Fat Duck restaurant. Report of an investigation of a foodborne outbreak of norovirus among diners at The Fat Duck restaurant, Bray, Berkshire in January and February 2009* (p. 47). Health Protection Agency.

Resources

The following resources form the background reading for the individual parts of the case and originate from the *AFMC Primer on Population Health*, The Association of Faculties of Medicine of Canada Public Health Educators' Network (2017), available in its entirety at <<https://afmc.ca/AFMCPrimer.pdf>>. The chapter and section number where the material appears in the *Primer* is indicated in parentheses below.

Reading 1: Detection and control of outbreaks (11.1)

Reading 2: Patterns of disease development in a population: the epidemic curve (7.4)

Reading 3: Modes and control of transmission (11.3)

Reading 4: Observational studies (5.7)

Internet references accessible as of March 15, 2018.

