Practical 1: Epidemiologic Measures I

Objectives

This practical is linked with Practical 2, which you will do next week.

At the end of Practical 1 students should be able to:

- **Understand the distinction between prevalence and incidence**
- **Understand the need for denominators when measuring disease frequency**
- **Calculate and interpret different measures of disease frequency (prevalence, prevalence odds, risk/incidence, incidence odds, rate)**

At the end of Practical 2 students should be able to:

- Calculate and interpret different measures of disease frequency (prevalence, prevalence odds, risk/incidence, incidence odds, rate).
- Calculate and interpret ratios and difference figures.

Question 1

1. A methadone clinic which serves people who use heroin sought to measure patient outcomes in 2016. As patients were registered at the clinic, they were followed up monthly and asked whether they had experienced a heroin overdose (i.e. use of drug leading to loss of consciousness) since their last visit.

Patient number	January	February	March	April	May	June	July	August	September	October	November	December	Outcome	Person-months
1										X			Lost to follow-up	
2												X	No overdose	
3					X								Overdose	
4										X			Lost to follow-up	
5									X				Overdose	
6											X		Lost to follow-up	

Grey boxes indicate the months where follow up occurred, with the last month of follow up marked with an X.

a. What was the incidence risk of heroin overdose for this clinic?

b. Calculate the (i) person-months at risk for each patient and (ii) the total person-months of observation in the study.

c. Calculate the incidence rate of heroin overdose in this study

d. For what reasons might a patient be lost to follow up? What are the implications of these lost patients?

Question 2

2. John Snow is considered one of the founders of modern epidemiology. He investigated several major outbreaks of cholera in London in the 1800s and provided evidence that access to a particular water source was associated with cholera deaths.

   In 1854, John Snow compared cholera deaths across areas of London supplied by different water providers (1). His findings are below.

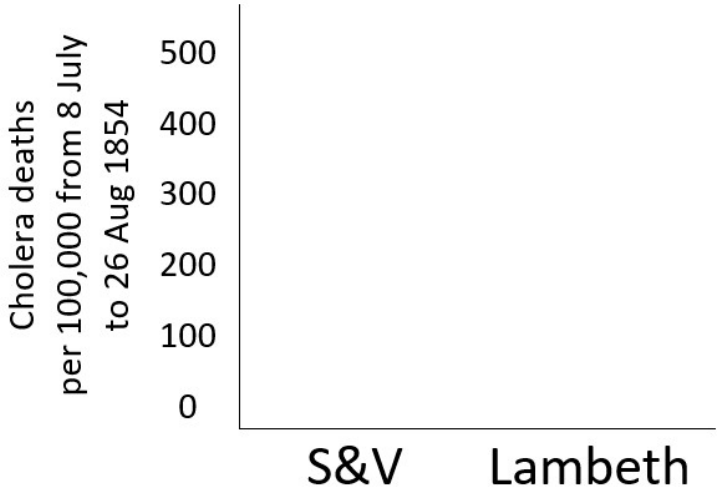
Local water provider	Population	Cholera deaths from 8 July to 26 Aug 1854	Incidence risk per 100,000 people
Southwark and Vauxhall Company (S&V)	167,654	844	
Lambeth Company	19,133	18	
Total			

   a. What are the comparison groups for John Snow's investigation?

   b. Complete the bottom row of the table and calculate an overall incidence risk of cholera deaths.

   c. Calculate the incidence risk of cholera deaths for each local water provider. Report this as deaths per 100,000 population.

d. Use the values from the table to complete the bar chart.



More about John Snow:

Watch Dr Ros Stanwell-Smith discussing John Snow here: http://www.londonlive.co.uk/news/2018-07-20/pump-reinstated-in-soho-to-remember-great-scientist,

Read more in the award-winning book "Ghost Map" by Steven Johnson, available in the LSHTM library: https://lshtm.primo.exlibrisgroup.com/permalink/44HYG_INST/1g4gmr9/alma991000315279703736

Read more here: https://www.lshtm.ac.uk/newsevents/news/2019/john-snow-memorial-pump-marking-historic-cholera-outbreak-reinstalled-its ;

Learn more about John Snow at the John Snow pub in Soho, where you can see a replica of the famous hand pump outside: 39 Broadwick St, London W1F 9QJ.

Watch the John Snow Society's annual Pumphandle Lecture, held every September at LSHTM: https://www.lshtm.ac.uk/newsevents/events/series/annual-lectures, followed by a visit to the John Snow pub.

Question 3

3. In 2019, the Government of Nepal and UNICEF completed the sixth round of the nationally representive Multiple Indicator Cluster Survey (MICS). The questionnaire for women aged 15-49 included measures on social practices relating to menstruation.

   Chhaupadi is a practice observed in Nepal whereby women, girls and people who are menstruating are required to spend their nights in a separate house. Often these houses are unprotected huts, which creates a risk of substantial harm, including death.

1_Nepal MICS Table
Nepal MICS 2019 Fir

Double click on the icon above to download the table (also available on Moodle)

a. Nationally, what is the estimated prevalence of women who had to stay in chhaupadi / chhapro / cowshed due to their last menstruation in the last 12 months?

b. Describe the prevalence of women who had to stay in chhaupadi / chhapro / cowshed across characteristics such as geographic region, age, education, disability, and wealth. Describe any patterns you observe.

c. Repeat Part B, but for the prevalence of women who had to stay away from religious work / temple visits. How do these patterns compare?

Question 4

4. In 2013, epidemiologists conducted a study of alcohol use in Sehore, a rural district of Madhya Pradesh state in India(3). They enrolled a random sample of 3220 adults from the district and reported the following:

Characteristic	Total n	n who drink alcohol	Prevalence of alcohol use	Prevalence odds of alcohol use
Age (years)				
18-29	905	139	0.154	0.181
30-49	1501	193		
>=50	814	100		
Gender				
Female	1444	9	0.006	0.006
Male	1776	423		

a. What is the estimated prevalence of alcohol use among adults in the district?

b. Calculate (to 3 decimal places) the prevalence and prevalence odds for each row.

Question 5

5. Sonkin et al (4) analysed the child mortality rate in UK for different modes of transport in 1985 and in 2003. Their findings are tabulated below.

Mode of transport	Mortality rate during use of transport (per 100 million passenger-miles): 1985	Mortality rate during use of transport (per 100 million passenger-miles): 2003
In car	0.4	0.1
On foot	10.8	2.7
On cycle	8.4	5.5

a. What are the (i) comparison groups and the (ii) outcome of interest?

b. What is the rationale for using “passenger-miles” as the denominator, rather than “# children who use [car/foot/cycle] for transport”? Can you suggest a better denominator?

Note that the analyses by Sonkin et al and Snow are both examples of ecologic studies. As such, the incidence and rate figures are not true incidence and rates. For this exercise though, we ask you to treat these analyses as if they were using individual-level data.

- Sonkin used data from a national survey to estimate the distance travelled by mode of travel for the denominators, and data from a separate register for mortality for the numerators. We don't actually know if the children who died were actually engaged in a given form of transport at the time of death, or how many passenger-miles each child travelled.

- Snow used 1851 census data for the population of each borough as the denominator, and a death registry from 1854 for cholera deaths for numerators. This same estimation method is used to calculate the "maternal mortality ratio" in the present day.

References

1. Snow J. On the mode of communication of cholera. 2nd ed. London, UK: John Churchill; 1855.

2. Central Bureau of Statistics. Nepal Multiple Indicator Cluster Survey 2019, Final Report. Kathmandu, Nepal: Central Bureau of Statistics and UNICEF Nepal; 2019. https://www.unicef.org/nepal/media/11081/file/Nepal%20MICS%202019%20Final%20Report.pdf

3. Rathod SD, Nadkarni A, Bhana A, Shidhaye R. Epidemiological features of alcohol use in rural India: a population-based cross-sectional study. BMJ Open. 2015 Dec;5(12):e009802.

4. Sonkin B, Edwards P, Roberts I, Green J. Walking, cycling and transport safety: an analysis of child road deaths. J R Soc Med. 2006 Aug 1;99(8):402–5.