

## Meeting 1: Overview of epidemiology, causation

### Reading

- Dohoo Chapter 1.1-1.4 (history and overview); 1.5-1.10 (causation)
- Thrusfield 2<sup>nd</sup> or 3<sup>rd</sup> Edn, Chapter 1 and 2 (history and overview); Chapter 3 (causation)
- <http://www.epidemiolog.net/evolving/HistoricalPerspective.pdf>

### Presentations

1. The meaning and scope of epidemiology
2. Judgement criteria for assessing causality (discuss how they have changed with history)
3. Causal models (indirect and direct causes, necessary and sufficient causes, causal webs, path analysis)
4. John Snow – a brief history of his work. What judgment criteria did he use in his work with cholera (see Eyler JM. 2001. The changing assessment of John Snow's and William Farr's cholera studies. *Soz Preventiv Med*, 46(4): 225-232. Available: <http://www.epidemiology.ch/history/papers/eyler-paper-1.pdf>)

### Exercises

1. Judgement criteria for causality

There have been several outbreaks in cattle of a severe hepatopathy with high incidence and sometimes, high case fatality rate. The hepatic damage is apparently quite distinctive histologically. There is some speculation that the disease is due to ingestion of a weed known as Rough Dog's-Tail (*Cynosurus echinatus*).

List the judgement criteria for causality.

The following pieces of information have progressively accumulated. Which judgement criterion does each piece contribute to? How useful is each piece of information for determining causality?

- i. In the first fully investigated Victorian outbreak, Rough Dog's-Tail (RDT) was available and eaten by cattle in the affected mob.
- ii. In 2 subsequent outbreaks in Victoria, RDT has been available to cattle although it has not always comprised a large proportion of available pasture.
- iii. In a series of 10 Tasmanian outbreaks, cattle and sheep in all outbreaks have had access to RDT.
- iv. The hepatopathy has only been reported in areas where RDT exists.
- v. The frequency of diagnosis of the hepatopathy has increased as the habitat of RDT has expanded.
- vi. In a case-control study, apparently toxic paddocks were substantially more likely to contain RDT than apparently safe paddocks (OR = 5.1).

- vii. In a 4 year cohort study, paddocks containing RDT were more likely to result in outbreaks than paddocks not containing RDT (RR = 3.6)
  - viii. In the same cohort study, the proportion of available pasture that was RDT in each paddock was categorised as nil, 1-50% and > 50%. The risk of an outbreak was greater in heavily infested paddocks (RR = 2.1 and 4.9 for 1-50% and > 50%, respectively).
  - ix. Chemical analysis of RDT has revealed low levels of a known hepatotoxin in some samples.
  - x. Feeding RDT to rats caused a mild hepatic disease.
  - xi. (Note: Pieces i to iv are actual observations. The remaining pieces are hypothetical.)
2. Draw a hypothetical causal web for a multifactorial disease or production deficit that you are familiar with.
  3. Read the paper 'Cancer incidence and mortality and proximity to TV towers' and discuss how it addresses the criteria for causation. The paper can be found at: <http://www.mja.com.au/public/issues/contents165.html#2Dec>. After you have done this read the article (at the same site) 'Cancer and TV towers: association but not causation'. Discuss this article with other group members.

### Example examination questions

1. Briefly describe the essential features and application of path models for causation (2003 written)
2. Write brief notes to demonstrate your understanding on the criteria for judging causal relationships in epidemiological studies (2002 written)
3. Using examples write brief notes on establishing a causal relationship (2001 written)
4. Using examples write brief notes on necessary and sufficient cause (2000 written)

### Additional reading/resources

- <http://www.epidemiology.ch/history/epi-hist.htm> (many articles on the history of epidemiology)
- Austin Bradford Hill (1965) The Environment and Disease: Association or Causation? Proceedings of the Royal Society of Medicine, 58: 295-300. Available: <http://www.edwardtufte.com/tufte/hill>
- Chesterton RN, Pfeiffer DU, Morris RS and Tanner CM (1989) Environmental and behavioural factors affecting the prevalence of foot lameness in New Zealand dairy herds – a case-control study. NZ Vet J, 37: 135-142.
- <http://www.ph.ucla.edu/epi/snow.html> a site dedicated to John Snow