Practical 8: Case-control studies

Objectives:

At the end of this practical, students should be able to:

- To describe the study hypothesis
- To identify the source and definition of cases
- To describe and explain the selection of controls
- To consider possible biases in the exposure measurement
- To calculate an exposure odds ratio
- To identify the differences between hospital-based and population-based case-control studies

Study 1: Childhood asthma

New cases of asthma were identified as they were first diagnosed at Kuopio University Hospital in Finland during 1996-2000 (Pekkanen et al, 2007). In Finland, a paediatrician is required to diagnose asthma in children. At the time of the study, Kuopio University Hospital was the only health facility providing paediatric care for the study area, as there were no private or primary care paediatricians in the area.

Children aged 12–84 months who were referred to the hospital after at least the second doctor-diagnosed attack of wheezing within one year, or who were diagnosed as having asthma at the hospital's allergy unit, were eligible as cases. Children were excluded if they had an earlier asthma diagnosis or had ever been on regular medication because of asthma.

The study centre used hospital records to identify cases. For each case, the study centre randomly drew two controls from the Finnish Population Register. The controls were matched to each case on year of birth, sex and municipality. Both cases and controls were required to have lived ≥2 years or ≥75% of their lifetime in their current home. Controls reporting asthma were excluded.

The main exposure of interest was moisture damage in the house where the participating child was living. After recruitment into the study, a trained building engineer visited each participant's home and assessed the home for moisture damage. Questionnaires on health and risk factors of asthma were mailed to the parents of all participants before the home visit. The engineer collected these questionnaires during the home visit.

Question 1: What was the study hypothesis?

Question 2:

a. What was the source of the cases?
b. What name do we give to this type of case?
c. Why did the investigators only include newly diagnosed cases?
d. Do you think there could have been any bias in the case selection? If so, what type?

Question 3:

a. How were the controls selected?

b. Why do you think the investigators used this type of control rather than controls recruited from the same hospital as the cases?

c. What information would you need to assess how representative the controls were?

Assessment of exposure: The home inspections were carried out by two trained building engineers according to a standard protocol. The residences were inspected for signs of excess moisture (*e.g.* water leaks or condensation, moisture stains, visible mould, colour changes on building materials and detached surface materials). The odds ratio for the association between asthma and the presence of visible mould in the living areas 2.6 (95% CI = 1.2-5.9).

Question 4:

a. Why do you think the investigators used building engineers to measure the exposure?

b. What biases might have arisen in the assessment of exposure?

c. How had the investigators tried to make the exposure measurement as valid as possible? How might they have improved their exposure measurement still further?

d. Interpret the OR for the association between the presence of visible mould in the living areas and asthma.

Study 2: HIV and male circumcision

A population-based case-control study was conducted in rural Tanzania in 1993 to identify risk factors for HIV (Quigley et al, 1997). A baseline cross-sectional survey was conducted across the region and all people were screened for HIV. The case-control study was nested in the cross-sectional study. All of those people who were HIV-positive were recruited as cases, and 2-3 controls without HIV were selected for every case. Interviewers returned to these individuals and conducted a structured interview, which included questions on sociodemographic characteristics, sexual attitudes, sexual practices, and circumcision status. Most people did not want to know their HIV status, and so were not informed whether they were positive or negative.

Question 5:

Circumcised	**HIV+ (Cases)**	**HIV- (Controls**
Yes	48	121
No	101	272

a. Calculate and interpret the unadjusted (crude) odds ratio for the association between being circumcised and HIV.

The authors reported that the OR - after adjusting for age, occupation, marital status, sexual history and sexually transmitted infections - was **0.65.**

b. Explain why the authors adjusted for occupation.

Question 6: Recall bias can be a problem in case-control studies. Do you think recall bias may have influenced the results for the association between circumcision and HIV status?

Question 7 (Optional: to do in your own time): What other considerations relating to circumcision would you like to discuss, before deciding if the observed association is causal i.e. that there is a direct protective effect of circumcision status on HIV?

References:

Pekkanen J, Hyvärinen A, Haverinen-Shaughnessy U, Korppi M, Putus T, Nevalainen A. Moisture damage and childhood asthma: a population-based incident case-control study. *Eur Respir J*. 2007;29:509-15.

Quigley M, Munguti K, Grosskurth H, Todd J, Mosha F, Senkoro K, Newell J, Mayaud P, ka-Gina G, Klokke A, Mabey D, Gavyole A, Hayes R. Sexual behaviour patterns and other risk factors for HIV infection in rural Tanzania: a case-control study. *AIDS*. 1997;11:237-48.