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**Applied Biostatistics**

## **Exercise: Odds ratio and relative risk**

### **Question 1**

The following is the abstract of a paper (Illi *et al.*, 2001):

**Objective:** To investigate the association between early childhood infections and subsequent development of asthma.

**Design:** Longitudinal birth cohort study.

**Setting:** Five children's hospitals in five German cities.

**Participants:** 1314 children born in 1990 followed from birth to the age of 7 years.

**Main outcome measures:** Asthma and asthmatic symptoms assessed longitudinally by parental questionnaires; atopic sensitisation assessed longitudinally by determination of IgE concentrations to various allergens; bronchial hyperreactivity assessed by bronchial histamine challenge at age 7 years.

**Results:** Compared with children with 1 episode of runny nose before the age of 1 year, those with 2 episodes were less likely to have a doctor's diagnosis of asthma at 7 years old (odds ratio 0.52 (95% confidence interval 0.29 to 0.92)) or to have wheeze at 7 years old (0.60 (0.38 to 0.94)), and were less likely to be atopic before the age of 5 years. Similarly, having 1 viral infection of the herpes type in the first 3 years of life was inversely associated with asthma at age 7 (odds ratio 0.48 (0.26 to 0.89)). Repeated lower respiratory tract infections in the first 3 years of life showed a positive association with wheeze up to the age of 7 years (odds ratio 3.37 (1.92 to 5.92) for 4 infections *v* 3 infections).

**Conclusion:** Repeated viral infections other than lower respiratory tract infections early in life may reduce the risk of developing asthma up to school age.

- a) What is meant by odds ratio 0.52 for runny nose and asthma and what does it tell us?
- b) What is meant by 95% confidence interval 0.29 to 0.92 and what further information does this provide?
- c) What is meant by odds ratio 3.37 (1.92 to 5.92) for lower respiratory tract infections and wheeze?
- d) On a less statistical point, what is wrong with the way the conclusion is phrased?

## **Question 2**

The following is the abstract of a published paper, :

Papers

Measuring exposure to injury risk in schoolchildren aged 11-14 (Towner *et al.*, 1994):

**Objective :** To apply a measure of exposure to injury risk for schoolchildren aged 11-14 across a population and to examine how risk factors vary with sex, age, and affluence.

**Design :** Self completion questionnaire survey administered in schools in May 1990.

**Setting :** 24 schools in Newcastle upon Tyne.

**Subjects :** 5334 pupils aged 11-14, of whom 4637 (87%) completed the questionnaire.

**Results :** Boys were exposed to greater risk than girls in journeys to places to play outdoors: they took longer trips and were more likely to ride bicycles (relative risk 5.30 (95% confidence interval 4.23 to 6.64) and less likely to travel by public transport or car. Younger pupils (aged 11-12) were less exposed to traffic during journeys to and from school: their journeys were shorter, they were less likely to walk (trip to school, relative risk 0.88 (0.83 to 0.94), and they were more likely to travel by car (trip to school, relative risk 1.33 (1.13 to 1.56)) or school bus (1.33 (1.10 to 1.62)). Poorer children were exposed to greater risk than affluent children (from families that owned a car and a telephone): they were less likely to travel to school by car (relative risk 0.26 (0.20 to 0.33)) or to be accompanied by an adult (0.39 (0.32 to 0.48)).

**Conclusion :** Injury risk data can provide useful information on child injury prevention and can be used to identify priorities and target resources for injury prevention on a citywide scale or for an individual school.

- a) What is meant by 'relative risk 5.30'?
- b) What would the relative risk of riding bicycles be if boys and girls were equally likely to report riding bikes?
- c) Is there good evidence that younger children were less likely to walk to school than were older children?
- d) Is there good evidence that children from poorer families were more likely to be accompanied by an adult than were children from more affluent families?
- e) Why must fewer than 20% of girls have reported riding bicycles? (N.B. the question was actually about their last journey to play, not whether they ever use them.)

## **References**

Illi S, von Mutius E, Lau S, Bergmann R, Niggemann B, Sommerfeld C, Wahn U. (2001) Early childhood infectious diseases and the development of asthma up to school age: a birth cohort study. *British Medical Journal* **322**, 390-395.

Towner EML, Jarvis SN, Walsh SSM, Aynsley-Green A. (1994) Measuring exposure to injury risk in schoolchildren aged 11-14. *British Medical Journal* **308**, 449-452.