Specimen exam questions MSc/BSc

These questions have been written to give an idea of the kind of questions that are likely to be asked in the exam. They are all based on the course as taught and all topics covered in these questions *may* be included in your examination. However additional topics, covered in lecture or seminars may be included in your exam which are not included here.

Each question should take 30 minutes and up to 25 marks will be awarded.

BSc students will have shorter questions which should take 15 minutes, but will be similar in style to those below.

Question 1

A recent study used Hospital Episode Statistics to investigate whether a fall in tonsillectomy rates was accompanied by a rise in hospital admission for acute throat infections.
Data was collected from all hospitals in England. Age-standardised admission rates for acute throat infection increased by 76% from 107.3 (95% CI 105.3 to 109.2) to 188.4 (95% CI 185.9 to 191.0) admissions per 100 000 children. Age-standardised tonsillectomy rates declined from 367.4 (95% CI 363.8 to 371.0) in 1999/2000 to 293.6 (95% CI 290.4 to 296.8) in 2009/2010.

a. Give two advantages and two disadvantages of using Hospital Episode Statistics were used here? (4 marks)

b. What is meant by age-standardised and why is it used? (5 marks)

c. Can we conclude from the information above that reducing the tonsillectomy rate has caused more children to have severe throat infections? Give reasons for your answer (5marks).

d. What do the 95% confidence intervals tell us about the rates of tonsillectomy. (5 marks)

e. Describe the trends in the graph and use the data to support the hypothesis that that lower tonsillectomy rates do not lead to higher hospital admission. (6 marks).

Figure 1 tonsillectomy rates by age group

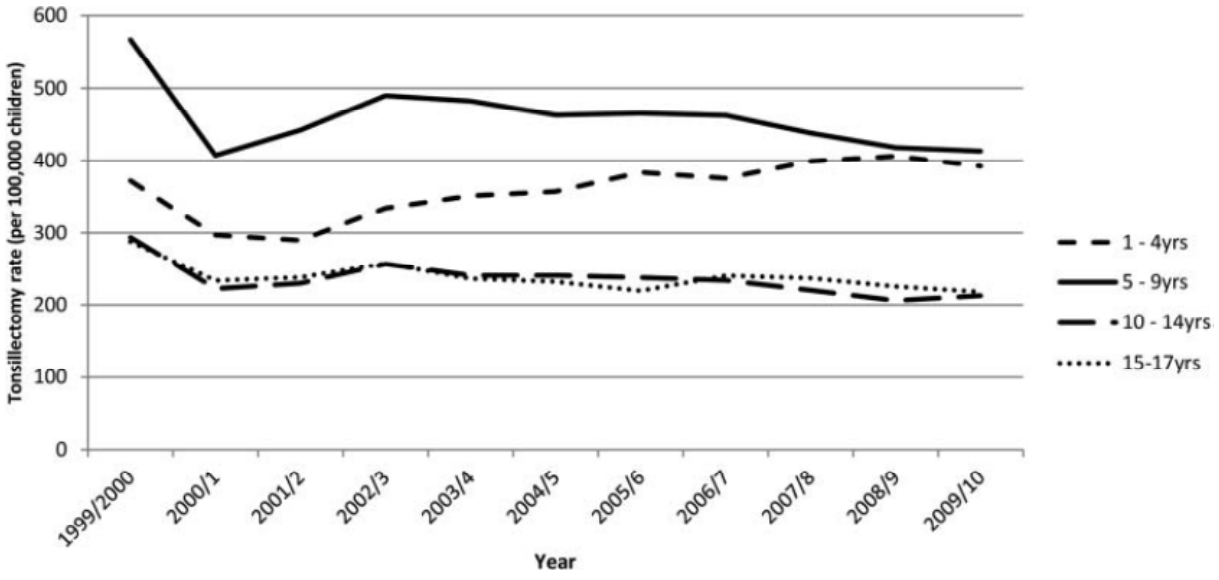
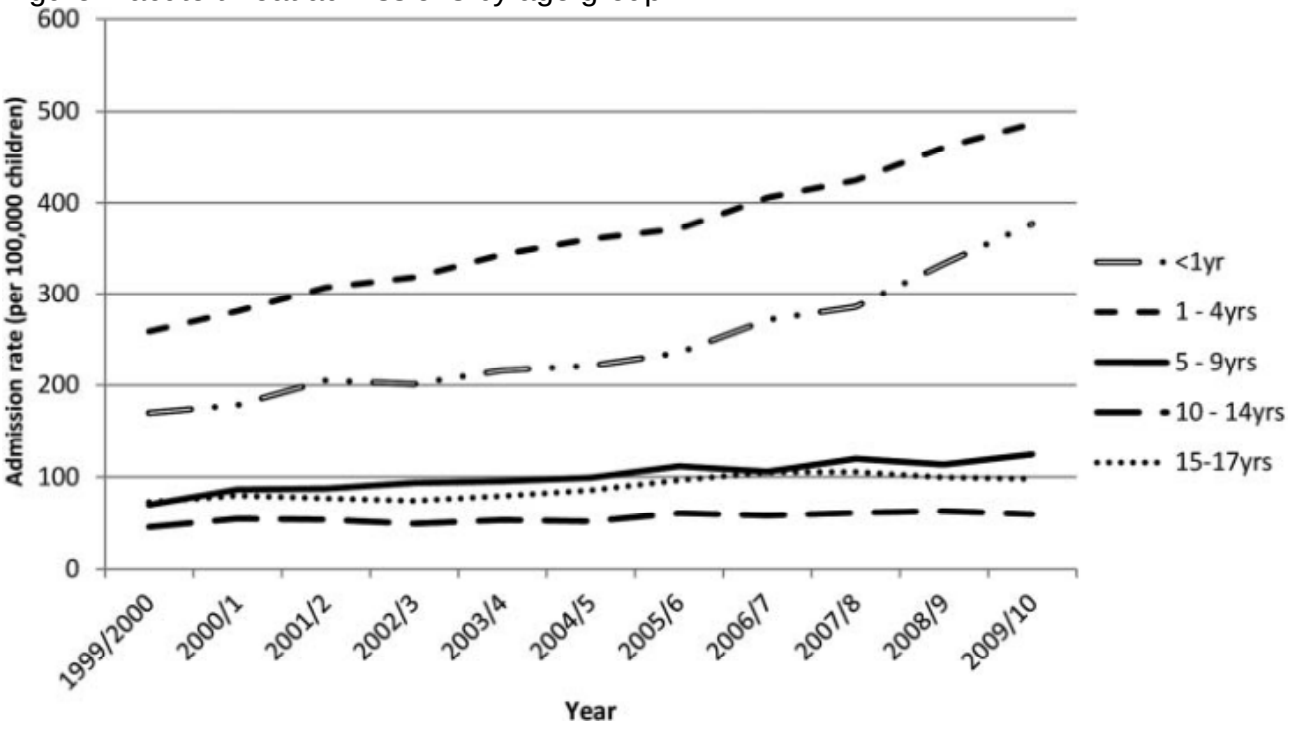


Figure 2 acute throat admissions by age group



Question 2
A new rapid HIV ELISA test has been developed for use in sub-Saharan Africa. It is

estimated that this test has a sensitivity of 95% and a specificity of 96% based on the western blot assay as the gold standard.

(a) Explain what the sensitivity and specificity of the HIV ELISA test would mean in this context of screening for HIV in sub-Saharan Africa. (2 marks)

(b) Set up a 2x2 table to present the results for the following information: In a population of pregnant women in Zimbabwe presenting for routine antenatal care, the overall HIV prevalence is estimated to be 40% assuming that you test 1000 individuals. (4 marks)

(c) Calculate the positive and negative predictive values of the HIV ELISA test in this population and explain what they mean. (4 marks)

(d) In a rural population of elderly people in Zimbabwe, the overall HIV prevalence is 0.2%. Discuss what this means for screening test results in terms of sensitivity, specificity, PPV and NPV. (5 marks)

(e) What criteria need to be taken into account when deciding whether a screening programme is justified? (5 marks)

Question 3

A group of Iranian researchers wanted to study the association between drinking very hot tea and cancer of the oesophagus (gullet) in a province of Iran with one of the highest incidence rates of oesophageal cancer in the world. They recruited 300 people with proven oesophageal cancer (cases) and a comparison group of 571 "controls" without cancer who were matched with the "cases" for age, sex and place of residence. All study participants drank tea. The researchers found 63 of the cases and 19 of the controls drank very hot tea. The odds ratio for drinking hot tea was 7.7 95% confidence interval 4.4 to 13.9.

(a) What kind of study is this and why has it been used.? (5 marks)

(b) How would you interpret the odds ratio and its confidence interval? (5 marks)

(c) What is matching and why is it used? (5 marks)

(d) Using conditional logistic regression (a statistical technique that takes into account the matching) the adjusted odds ratio for drinking very hot tea was 8.16 (95% CI 3.93 to 16.91) in the cases compared to the controls. Why did they carry out this analysis and suggest one or more factors which might have been used for adjustment? (5 marks)

(e) Do you think these results prove drinking very hot tea causes oesophageal cancer? Explain your answer. (5 marks)

Question 4. The following results are from a trial of the effectiveness of a falls-prevention programme for elderly people living in their own homes.

626 subjects were randomised either to an intervention group, who were given education and advice on the prevention of falls, or to a control group, who received routine care and followed up for one year. Of the 310 patients in the intervention group, 54 (17.4%) fell at least once in the following year, while 71 (22.5%) out of the 316 patients in the control group fell at least once.

a) The 95% confidence interval for the difference in the proportions who fell (control minus intervention) was from -1.2% to 11.3%. What is the interpretation of this interval? (5 marks)

b) Risk difference is one measure of effectiveness. List two other commonly used measures that could be used? (2 marks)

c) From the confidence interval in (d), what can you predict, if anything, about the P-value from this test? (3 marks)

d) Suggest ways in which the outcomes data could be collected on falls and what other outcomes might be measured.(4 marks)

e) What is the role of 'blinding' in a randomised control trial and discuss whether or not blinding is appropriate in this trial? (5 marks)

f) 800 patients were originally randomised but outcome data was only available on 626. What effect will this have on the interpretation on the results and what additional information should be reported? (5 marks)