



Australian and New Zealand College of Veterinary Scientists

Membership Examination

June 2015

Veterinary Epidemiology Paper 1

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

Answer **ALL EIGHT (8)** questions

Answer **EIGHT** questions each worth 15 markstotal 120 marks

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Paper 1: Veterinary Epidemiology

Answer all eight (8) questions

1. Nominate a zoonotic disease which is endemic in either Australia or New Zealand. (3 marks)

For this disease:

- a) Identify the important features of the epidemiology in human and animal populations that are critical for its control and prevention. (6 marks)
- b) Explain how the features in 1 a) relate to control and management strategies that may be implemented in both human and animal populations. (6 marks)

2. Sensitivity analysis is commonly used during the development of epidemiological simulation modelling:

- a) Define simulation modelling. (4 marks)
- b) Define sensitivity analysis. (4 marks)
- c) Explain why sensitivity analysis is used in simulation modelling. (7 marks)

3. Answer **all** parts of this question:

- a) Explain the difference between parametric and non-parametric data. (3 marks)
- b) Give **two (2)** examples of appropriate statistical tests for **each** of these types of data and the relevant assumptions that apply. (8 marks)
- c) Specify the potential problems which may be associated with applying tests suitable for parametric data to non-parametric data. (4 marks)

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4. Cohort studies are observational studies which can provide some evidence of causation:
- Define what is meant by a cohort study. (2 marks)
 - Outline the essential design features of such a study. (3 marks)
 - Explain the measures of association that can be evaluated from a cohort study **and** describe how these can be interpreted. (6 marks)
 - Justify why this study design is more suited to establishing causation than other designs. (4 marks)
5. Choosing an appropriate sample size is an essential component of surveying a population of animals for a disease:
- Explain the determinants of estimating sample size in this situation. (5 marks)
 - Describe the differences in how these determinants affect sample size when estimating disease prevalence within a population compared to detecting the presence of a disease. (10 marks)
6. The basic reproduction rate (R_0) is an important descriptor of an infectious disease outbreak:
- Define R_0 . (2 marks)
 - Explain how the value of R_0 can impact the progression of the outbreak. (4 marks)
 - Explain **three (3)** ways in which R_0 can be estimated. (9 marks)

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7. A survey has been undertaken to detect the prevalence of Babe's disease in commercial pigs in a particular region of Australia. The sensitivity (Se) and specificity (Sp) of the test for Babe's disease is 95% and 99% respectively. If 50 out of a sample of 1,000 pigs test positive:
- a) Calculate the apparent prevalence (AP) and true prevalence (TP) of Babe's disease in this population of pigs. (6 marks)
 - b) Explain the effect of varying test sensitivity and test specificity on estimates of TP. (4 marks)
 - c) Interpret what TP means in terms of the probability of disease in an individual animal from that population. (5 marks)

The following formula may be useful:

$$TP = \frac{AP + Sp - 1}{Se + Sp - 1}$$

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8. A (fictitious) cross-sectional study investigating the relationship between the feeding of liver treats (LT) to dogs and the occurrence of anterior cruciate ligament rupture (ACR) produced the following data:

	ACR +ve	ACR -ve	Total	Rate of ACR
LT +ve	20	1500	1520	13.16 per 1000
LT -ve	6	3200	3206	1.87 per 1000
Total	26	4700	4726	5.50 per 1000
Proportion LT +ve	0.77	0.32	0.32	

Using this data, calculate the following measures of association and, for **each** one, provide an explanatory interpretation of the result:

- i. relative risk (3 marks)
- ii. odds ratio (3 marks)
- iii. attributable risk (4 marks)
- iv. population attributable risk. (5 marks)

End of paper



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Paper 2

Perusal time: **Fifteen (15)** minutes

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Answer **ALL THREE (3)** questions

Question 3 requires review of excerpts from the journal article provided.

Answer **THREE** questions each worth 40 marks.....total 120 marks

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Paper 2: Veterinary Epidemiology

Answer all three (3) questions

1. You have been approached by a companion animal society to investigate the occurrence of diabetes in urban pet populations. Obesity, genetic factors and pancreatic inflammation have previously been identified as risk factors for developing this disease. Funds are limited so you decide to conduct an online survey which you present on the website of the national pet owners association. The website contains discussion boards where owners of sick animals can exchange their experiences with different diseases and treatments.

Answer **all** parts of this question:

- a) A total of 985 people responded to your questionnaire. A total of 205 people reported that they currently owned a dog with diabetes. On the other hand 780 reported that they currently did not own a dog with diabetes. No-one in your study population reported owning more than one dog.

Calculate the appropriate measure of frequency for diabetes in the study population, including the 95% confidence interval. Interpret the confidence interval in words. (10 marks)

You may find the following formula useful:

$$SE = \sqrt{p(1-p)/N} \text{ where } p = \text{a proportion and } N = \text{sample size}$$

$$95\% \text{ CI} = \theta \pm Z_{\alpha}(SE) \text{ where } \theta = \text{the observed proportion and } Z_{\alpha} = 1.96$$

- b) If you compared the prevalence and incidence of diabetes in the above described population what would you observe? Explain why the relationship between these two measures of frequency may be different for other diseases (e.g. an infectious disease with high mortality and short duration of illness). [No calculation is required]. (4 marks)
- c) The survey also collected information on various exposures. Of the 205 dogs with diabetes, 103 were on a diet primarily consisting of low-quality 'dog sausage' purchased at local supermarkets. Of the 780 dogs without diabetes, 190 were being fed a low-quality 'dog sausage' diet. The remaining dogs (both those with and without diabetes) consumed either a veterinary prescription diet or another quality dog food.

Calculate an appropriate measure of association between diabetes and the consumption of low-quality 'dog sausage' and interpret your quantitative finding in words. Provide an alternative explanation to the observed association being causal. (10 marks)

Question 1 continued over page

Question 1 continued

- d) A nationwide survey of veterinary practices has recently estimated the prevalence of diabetes to be between one in 100 and one in 500. How could such a difference between this survey and your survey be explained? (8 marks)
- e) How would you improve the design of this survey? (8 marks)

2. Veterinary authorities are often asked to evaluate the feasibility of wide scale control or eradication of an existing animal health problem. Using **two (2)** examples of endemic diseases in Australia or New Zealand for which control or eradication programmes might be justifiable, discuss the factors that should be considered when deciding on the feasibility of a control or eradication programme. (40 marks)
3. Scientific journals rely on peer-review to assess the validity of publications submitted. Epidemiologists are commonly approached to review aspects of the description and analysis of epidemiological data. You have been asked to review the attached excerpts from a publication from the Australian Veterinary Journal: *‘A case-control study to identify farm factors affecting fertility of dairy herds: univariate description of factors’.

You have been asked to focus your assessment on the description of the study population and the analysis of breeding policies. **The relevant text and tables have been reproduced in the attached document.** (*See Webster et al 1997 AVJ, to review this article.)

Answer **all** parts of this question:

- a) Explain the advantages and disadvantages of using a case-control study design in this example. (10 marks)
- b) Describe **three (3)** different types of data used in this publication. Suggest for **each** data type an appropriate method of graphical or diagrammatic presentation. (8 marks)
- c) Name **two (2)** different types of analysis used in this publication. Review how the analysis was conducted and indicate, with reasons, whether you consider the analysis valid. (12 marks)
- d) Make recommendations regarding what further analyses could have been used **and** how this may have improved the outputs from this work. (10 marks)

End of paper