UNIVERSITY COLLEGE LONDON

University of London

EXAMINATION FOR INTERNAL STUDENTS

For the following qualifications :-

M.Res.

M.Res. Health Services Research & Policy: Evidence Based Medicine with Epidemiology and Population Health

COURSE CODE	:	**HSRP0003**
DATE	:	**06-JUN-02**
TIME	:	**10.00**
TIME ALLOWED	:	**3 hours**

TURN OVER

Paper II. Epidemiology (HSRP0003) and statistics (HSRP0002)

Answer FOUR questions only: Three questions from Section I
and
One question from Section II

Use a separate answer book for each question

Calculator : - Students are permitted to take in and use their own electronic calculator for Paper II. The College has approved the following models for use in examinations: Casio FX83WA (battery powered), Casio FX85WA (solar powered). Examiners must check the model and students must write the model used on their script.

WHERE APPROPRIATE, REFERENCE CAN BE MADE TO THE SERVICE AND CONDITIONS OF ANY NAMED COUNTRY WITH WHICH THE CANDIDATE IS FAMILIAR

Please write legibly

Section I (Answer three questions only)

1. Chlamydia trachomatis is a common sexually transmitted infection. If untreated the infection can lead to pelvic inflammatory disease and infertility. Up to 70% of women with the infection may have no symptoms. It is estimated that about 1 in 20 young women may have undiagnosed infection in the UK.

   890 women aged 18 to 35 years attending general practice for a cervical smear agreed to be tested for chlamydia trachomatis. They also completed a brief questionnaire requesting demographic details, history of urogenital symptoms, and information on sexual behaviour in the past five years. The table below explores risk factors for chlamydia infection.

QUESTION CONTINUED ON THE NEXT PAGE

Risk factor	*% of women with positive result*	*Odds ratio (95% confidence interval)*
Age group		
< 20	10.6	8.6 (2.3 – 32.8)
21-25	3.8	2.9 (0.8 – 11.0)
26-30	0.9	0.7 (0.1 – 3.3)
31+	1.4	1
Marital status		
Married	0.6	0.2 (0.02 – 1.5)
Cohabiting	3.1	1.0 (0.4 – 2.5)
Single	3.1	1
Number of partners in past year		
0 or 1	1.7	1
2 or more	4.9	2.9 (1.2 – 7.2)
Current genitourinary symptoms		
No	2.4	1
Yes	3.2	1.3 (0.5 – 3.0)

i. What type of study is this? 5 marks

ii. Briefly describe the main advantages and disadvantages of this design. 15 marks

iii. Describe the associations between risk factors and chlamydia infection shown in the table above. What can we conclude about the risk factors for chlamydia infection? 15 marks

iv. It has been proposed that all women between 18 and 35 in the UK should be routinely screened for chlamydia. What factors influence whether it would be appropriate to screen for chlamydia in young women? Justify your arguments. 15 marks

2. Aspirin has been shown to reduce the risk of coronary heart disease. However, aspirin use can also increase risk of intracerebral haemorrhage. There is concern that this may offset the benefits of aspirin treatment, particularly when used in low-risk settings such as for the primary prevention of coronary heart disease.

   To address this issue a case-control study was used to explore the use of aspirin among cases of intracerebral haemorrhage (verified by computed tomography and postmortem examination) and age and sex matched controls.

   i. What is the principal hypothesis under study here? What is the exposure and the outcome of interest? 5 marks

   ii. Describe the main strengths and weaknesses of a case-control study, highlighting why this type of study was used to investigate this question. 15 marks

   Controls were individually matched by age ($\pm$ 5 years) and sex. They were identified by visiting houses in the street in which the case lived at the time of their stroke, until a household with a matching individual, free of cerebrovascular disease, was identified.

   iii. Explain the purpose of matching. In this study, why were controls matched to cases by age and sex? 10 marks

   iv. Why did the researchers recruit the cases and their controls from the same street? 5 marks

   v. Potential confounders in this study are hypertension, serum cholesterol concentration, diabetes, previous cardiovascular disease, body mass index, exercise, alcohol intake and smoking. How would you have collected information on these confounders ? What problems might arise? 15 marks

3. It is hypothesised that severe anaemia in pregnancy is a risk factor for perinatal death (still birth or death within the first week of life). You are asked to design a case control study to investigate this.

i. Briefly define your cases and controls. 7.5 marks

ii. Define the exposure of interest. 7.5 marks

iii. Low socio-economic status is associated with both an increased risk of perinatal mortality and also an increased risk of anaemia in pregnancy.

a) What problems will arise in interpreting your data as a result of this? 5 marks

b) How would you deal with this in your study? 10 marks

iv. It is hypothesised that taking traditional herbs may affect the relationship between severe anaemia and perinatal mortality.

a) What is the plausibility of this? 5 marks

b) What problems may there be in obtaining information on this in interviewing mothers? 10 marks

c) How would you attempt to overcome these problems? 5 marks

4. For each of the following study scenarios, state which study design (case control, cohort, cross-sectional or ecological study) is, in general, best suited for addressing that scenario in an efficient manner. Briefly justify your choice:

i. Interest in a rare exposure. 6.25 marks

ii. Interest in a rare disease. 6.25 marks

iii. Long latency period between exposure and disease. 6.25 marks

iv. Interest in exposure specific incidence rates. 6.25 marks

v. Interest in understanding the time sequence of events. 6.25 marks

vi. Interest in comparing populations rather than individuals. 6.25 marks

vii. Interest in multiple exposures. 6.25 marks

vii. Interest in multiple outcomes (diseases). 6.25 marks

5. Epidemiology surveys in the UK have highlighted an alarming increase in obesity amongst the adult population.

i. Critically apply the WHO screening criteria to the problem of obesity in adults. 30 marks

ii. Outline a variety of public health measures that could be implemented to reduce obesity levels in the population. 20 marks

6. Births follow a seasonal pattern. Numbers of births by the season of birth in a hypothetical European country are given below:

Season		No. of Birth
Winter	(December – February)	25,000
Spring	(March – May)	30,000
Summer	(June – August)	25,000
Autumn	(September – November)	20,000

i. Calculate the observed/expected ratio births for each season, assuming that the seasons have identical number of days. What does it mean in terms of conceptions? 10 marks

This pattern has been interpreted as evidence that meteorological factors, such as light or temperature, influence fecundability (the biological ability of a woman to conceive), perhaps through an effect on female hormones or sperm quality.

ii. Are there alternative explanations for the observed seasonal pattern in births/conceptions? 20 marks

iii. What existing data/information would help you assess this hypothesis further? 10 marks

iv. What type of (new) study would test directly the hypothesis that meteorologic factors affect fecundability (the biological ability of a woman to conceive)? 10 marks

Section II (Answer one question only)

1. A psychologist investigated the effect of alcohol on reaction times using 10 male and 10 female subjects. Each subject was given two tests on different days, during which his or her reaction times were measured. Before each test the subject drank a glass of liquid. Some contained a fixed quantity of alcohol and the others contained a liquid with a similar taste but no alcohol. The order of presentation was randomised independently for each subject. The reaction times in tenths of a second are given in the table below.

MALES			FEMALES		
Subject No.	With Alcohol	Without Alcohol	Subject No.	With Alcohol	Without Alcohol
1	4.5	4.0	1	4.7	3.9
2	5.1	5.4	2	5.1	4.0
3	3.5	2.1	3	5.8	4.4
4	4.3	3.1	4	4.8	3.0
5	5.1	4.4	5	6.0	5.1
6	5.4	4.7	6	4.4	4.1
7	5.1	3.9	7	5.5	5.5
8	4.9	3.3	8	6.1	6.8
9	4.4	3.2	9	5.6	4.7
10	5.2	5.8	10	4.9	4.6

A statistical significance test was performed to compare the mean reaction times with and without alcohol for men only and the following results obtained.

	Obs	Mean	Std. Dev.	95% CI
Alcohol	10	4.75	0.57	4.34, 5.16
No alcohol	10	3.99	1.12	3.18, 4.79

The mean difference in reaction time = 0.76
The 95%CI for the mean difference = 0.24 to 1.28, p-value = 0.0091

i. What type of statistical test was used to produce these results? 5 marks

ii. What are the assumptions underlying this test? 5 marks

QUESTION CONTINUED ON THE NEXT PAGE

iii. What is the null hypothesis for this test? 5 marks

iv. What do you conclude from the results of the test about the difference in reaction times with and without alcohol in males? 5 marks

v. How is the 95% confidence interval consistent with the results of the test? 5 marks

A statistical test was used to compare the mean difference in reaction times due to taking alcohol between males and females.

	Obs	Mean	Std. Dev.	95% CI
Males	10	4.75	0.57	4.34, 5.16
Females	10	5.29	0.59	4.87, 5.71

The difference in means = -0.54
The 95%CI for the difference in means = -1.09 to 0.007, p-value = 0.053

v. What type of statistical test was used to produce these results? 5 marks

vi. Briefly explain why a test different to that used for part (i) was used here. 5 marks

vii. What is the null hypothesis for this test? 5 marks

viii. What do you conclude from the results of the test about the difference in reaction times between males and females? 5 marks

ix. How is the 95% confidence interval for the difference in means consistent with the results of the test? 5 marks

2. A case-control study was undertaken to examine the association between breast cancer and alcohol consumption. Cases were women with breast cancer identified from three hospitals in the South of England. Controls were women attending the same hospital, not suffering from cancer or any alcohol related illness. Information were available on the status of alcohol consumption (ever versus never) and also the quantity of alcohol consumed per week. Data had also been collected on age, parity and menopausal status of the women.

i. What are the initial steps involved in the statistical analysis of these data before undertaking the main analysis? 10 marks

ii. Describe the method you will use to estimate the association of breast cancer with ever versus never consumption of alcohol. Explain your reasons. 10 marks

iii. What measure of association will you obtain from your chosen method? How will you use this estimated measure of association to decide whether alcohol consumption is protective or harmful for or has no effect on breast cancer? 10 marks

iv. How will you assess the precision of your estimate? 10 marks

v. What results from your main analysis will you present in a table? 10 marks

3. A researcher is investigating the link between age and infection with HIV virus in an African city. A random sample of 2000 adults from the population has been tested for the HIV virus and the exact age of each adult was recorded. Of the 794 people in <35 year age group, 116 were observed to be HIV positive, and of the 1206 people in the ≥35 year age group, 135 were found to be HIV positive.

i. Arrange the data in a 2x2 contingency table. 10 marks

A statistical significance test was conducted to examine the difference in the proportion of HIV positives in the two age groups and a p-value = 0.024 was obtained.

ii. What type of statistical test was used to produce these results? 5 marks

iii. What is the null hypothesis for this test? 5 marks

iv. What does a p-value = 0.024 mean? 10 marks

v. An odds ratio of 1.36 with a 95% CI 1.04 to 1.77 was obtained for HIV positivity with the age group ≥35 years as the baseline group. How would you interpret these results? 10 marks

Measurements of glucose concentration ($mmoll^{-1}$) in patients blood are available for White and South Asian men in a general practice. A linear regression analysis was performed to estimate the association between ethnicity and glucose concentration. The following results were obtained:

Predictor:	**Coefficient**	**P-value**
Constant	1.48	0.019
Ethnic group (comparing South Asian to White)	0.80	<0.001

vi. What are the interpretations of the regression coefficients for this example? 10 marks

END OF PAPER