(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

SPECIAL/SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF MASTER OF SCIENCE IN STATISTICS

COURSE CODE: STA 852

COURSE TITLE: STATISTICAL METHODS FOR BIOSTATISTICS AND EPIDEMIOLOGY

DATE: 10/10/18 **TIME:** 8 AM - 11 AM

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other TWO Questions

TIME: 3 Hours

This Paper Consists of 6 Printed Pages. Please Turn Over.

Question 1

(a). (**I**). Give an example of a disease epidemic that can be modeled by the following basic epidemiological model:

(i). SI model (ii). SIR model (iii). SIRS model.

(**II**). Consider the SIR epidemic model. (6 marks)

(i). Sketch the appropriate compartmental diagram

(ii). Derive the system of ordinary Differential Equations assuming a pure epidemiological SIR model for a homogeneous population.

(iii). Describe the necessary modification(s) to the system of equations in b(ii) if the population is non-homogeneous.

(iv). Repeat b(iii) but now modify the system to incorporate demographic phenomena. (15 marks)

(b). In a Danish study of healthy mothers (Tetzchner*et al*, 1997), urinary incontinence and pudenda nerve terminal motor latency (PNTML) were recorded 12 weeks after delivery. PNTML was recorded as 'high' if it was in excess of the normal range for the relevant laboratory. Otherwise it is 'low'. Of the 17 women with 'high' PNTML, 6 were incontinent; of the women with low PNTML, 19 were incontinent and 110 were not.

(i). Calculate the relative risk for incontinence comparing high against low PNTML together with a 95% confidence interval.

(ii). Calculate the odd ratio for incontinence comparing high against low PNTML together with a 95% confidence interval.

(iii). Test the null hypothesis that PNTML has no effect on incontinence.

(iv). Calculate the attributable risk for incontinence that is ascribable to high PNTML together with 95% confidence interval. (15 marks)

Question 2

The table below shows data from a random sample of middle-aged men taken in Kuipoi Finland (Kuahenen et al, 1007). A beer binger is defined as someone who usually drinks six or more bottles of beer per drinking session. This was recorded at the outset of the study; mortality was recorded from death certificates over an average of 7.7 years follow up.

Cardiovascular death

Beer binger	**Yes**	**No**	**Total**
Yes	7	63	70
No	52	1519	1571
Total	59	1582	1641

(i). Estimate the risk of cardiovascular death for bingers and for non-bingers together with 95% confidence intervals.

(ii). Estimate the relative risk of cardiovascular death for bingers compared to non-bingers, together 95% confidence intervals.

(iii).Estimate the odds of cardiovascular death for bingers compared to non-bingers

(iv).Estimate the odds for cardiovascular death for bingers compared to non-bingers, together with a 95% confidence intervals

(v). Test the null hypothesis that beer binging has no relationship with cardiovascular death.

Question 4

In a cohort study of 34387 menopausal women in Iowa, intakes of certain vitamins were assessed in 1986 (Kushi*et al*, 1996). In the period up to the end of 1992, 879 of these women were newly diagnosed with breast cancer. The table below shows the data for two vitamins, classified according to ranked categories of intake.

Category of Intake	**Vitamin C**		**Vitamin E**	
	Events	**P Y[a]**	**Events**	**PY[a]**
1 (low)	507	124373	570	143777
2	217	57268	129	33590
3	76	19357	71	19536
4	55	17013	28	6942
5 (high)	24	7711	81	22176

*PY = woman-years (as reported: note that their sum differs by one between vitamins).

For each vitamin, calculate the relative rates (with 95% confidence intervals) taking the lower-consumption group as the base. Do your results suggest any beneficial

(or otherwise) effect of additional vitamin C or E intake? (20 marks)

Question 5

The pooling project studied risk factor for coronary heart disease amongst men in USA. The table below gives current smoking status at entry to study and whether or not the coronary symptoms at entry were excluded.

(a). (i). Classify the type of study implied.

(ii). List two advantages and two disadvantages of the study design.

(5 marks)

(b). Calculate (i). The overall risk of a coronary event.

(ii). The risk of a coronary event on a smoker

(iii). The risk of a coronary event on non-smokers

(iv). The relative risk

(v). The 95% confidence interval for the relative risk.

(v). the risk ratio

(vi). The 95% confidence interval for the odd ratio.

Smoking and Coronary events in the pooling project.

Smoking at entry?	**YES**	**NO**	**TOTAL**
YES	166	1176	1342
NO	50	513	563
TOTAL	**216**	**1689**	**1905**

(15 marks)