



The University of Southern Queensland

## Course specification

<b>Description: Epidemiology, Surveillance and Statistical Methods</b>						
Subject	Cat-nbr	Class	Term	Mode	Units	Campus
BIO	5095	44307	2, 2005	EXT	1.00	Toowoomba

<b>Academic group:</b>	FOSCI
<b>Academic org:</b>	FOS002
<b>Student contribution band:</b>	2
<b>ASCED code:</b>	061311

### STAFFING

Examiner: Paul Fahey  
Moderator: Michael Kotiw

### REQUISITES

Pre-requisite: BIO3092

### RATIONALE

This course provides an understanding of the fundamentals of epidemiology, surveillance procedures and an introduction to statistical analysis. Students will acquire a sound foundation in investigative methods as relevant to outbreaks of infectious diseases.

### SYNOPSIS

The course provides an introduction to the fundamental principles of epidemiology. Surveillance techniques and methods for investigating outbreaks of infectious diseases are described. The course provides an introduction to statistical analysis and methods for organising, analysing and presenting epidemiological data. Methods for estimating and comparing means and proportions with some emphasis on the use of the t- and chi-squared procedures is provided.

### OBJECTIVES

On successful completion of this course students will be able to:

1. define and outline the basic principles of epidemiology, surveillance and statistical analysis. Describe the application of these methods to infection control;
2. understand and apply the basic principals of surveillance;
3. collate and present surveillance data in a logical and informative fashion;
4. correctly identify and communicate outbreaks and trends in surveillance data;
5. describe the general concepts of association and causation;
6. apply various models of epidemiological study design including observational studies, analytical studies and experiments;
7. use appropriate graphs and statistics to summarise data;

8. describe when statistical inference is needed in data analysis and the strengths and limitations of this technique;
9. describe what a confidence interval is used for and appropriately interpret the results;
10. describe what a hypothesis test is used for and appropriately interpret the results;
11. describe the need for probability distributions and list the circumstances appropriate for the following distributions: Normal, t, Binomial, Poisson and Chi-Square;
12. critically appraise published papers and comment on the likely validity of results and relevance to your institution.

## TOPICS

Description	Weighting (%)
1. Introduction - decision making and the scientific method; essential definitions and basic concepts of epidemiology (person, place & time, human populations and ethics, causation and association); essential definitions and basic concepts of surveillance (outcome and process measures, sentinel events and rate-based measures, the search for variation, triggering action); essential definitions and basic concepts of statistical analyses (research question, population, variables, data, statistics, sampling, statistical inference); common and complementary elements between epidemiology, surveillance and statistical analysis (relationships to the scientific method and to decision making); relevance of epidemiology, surveillance and statistical methods to infection control practitioners.	10.00
2. Surveillance systems - what to measure (reliability and validity, bias, rate-based or sentinel events; the data collection form (computer or paper, clarity of design, coding of responses); the data set (individuals, data records, variables, categorical and quantitative variables, format on the computer); summarising the frequency distribution of a single variable (frequency tables, bar charts, histograms, median and range, mean and standard deviation); summarising the relationship between two variables (two way tables, scatterplot, correlation); data checking and cleaning (range checks, logic checks, outliers).	18.00
3. Outbreaks and trends over time - measurement issues (incidence or prevalence, counts or rates, lurking variables and confounding); graphical summaries (run charts, adding the historical knowledge; sampling variation (population and sampling, distribution of sample statistics); some probability rules (8 in a row on one side of the average, other patterns to look out for); some probability distributions (Binomial, Poisson, Normal); control chart (p and np charts, c charts, x-bar and s charts).	18.00
4. Epidemiological investigation - sampling (sampling methods, randomisation and probability, bias); data collection (retrospective, prospective or cross sectional); descriptive studies (definition, main types, applications, advantages and disadvantages); analytic studies (definition, main types,	18.00

- applications, advantages and disadvantages); experiments (definition, main types, applications, advantages and disadvantages); determining relationships (association and causation, confounding and standardisation, rates and ratios, relative risk and odds ratios).
5. Statistical inference - the role of inference (estimating population parameters from sample statistics); random variation and statistical confidence; models of variation (Normal distribution, t-distribution, binomial distribution, and probability tables for each); confidence intervals (level of confidence, margin of error, components of the margin of error, interpretation); hypothesis tests (null hypothesis, alternate hypothesis, test statistic, degrees of freedom, p-value, interpretation); analyses of means (confidence intervals, sample size calculations and z-test, assumptions and interpretation); analysis of proportions (confidence intervals, sample size calculations and z-test, assumptions and interpretation); analysis of two way tables (Chi-Square test); non-parametric methods. 18.00
6. Critical appraisal of the literature - the structure of a journal paper (introduction, methods and materials, results, discussion and conclusion; what is the research question? what is the study type? what are the outcome variables and how are they measured? what are the explanatory variables and how are they measured? what is the source population and who are the study subjects? what important potential confounding factors are considered? are statistical tests/confidence intervals reported? Do they appear appropriate? did the authors answer the research question? Do their answers apply in your local setting? 18.00

### **TEXT and MATERIALS required to be PURCHASED or ACCESSED**

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at <http://bookshop.usq.edu.au> click 'Semester', then enter your 'Course Code' (no spaces).

### **REFERENCE MATERIALS**

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Scientific Calculator

Arias, KM 1999, *Quick Reference to Outbreak Investigation and Control in Health Care Facilities*, Jones and Bartlett, Sudbury.

Association for Professionals in Infection Control and Epidemiology Inc 1996, *APIC Infection Control and Applied Epidemiology: Principles and Practice*, Mosby, St Louis.

Hart, MK & Hart, RF 2002, *Statistical Process Control for Health Care*, Duxbury, Pacific Grove, Ca.

Kuzma, KW 1998, *Basic Statistics for the Health Science*, 3rd edn, Mayfield, Mountain View, Ca.

US Dept of Health and Human Services 1992, *CDC: Principles of Epidemiology*, 2nd edn, CDC Atlanta, Georgia, US.

Valanis, B 1992, *Epidemiology in Nursing and Healthcare*, 2nd edn, Appleton & Lange, Norwalk, Conn.

Wassertheil-Smoller, S 1995, *Biostatistics and Epidemiology*, 2nd edn, Springer-Verlag, New York.

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Directed Study	70.00
Examinations	3.00
Private Study	100.00

## ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
ASSIGNMENT 1	25.00	25.00	02 Sep 2005
ASSIGNMENT 2	25.00	25.00	14 Oct 2005
3 HR OPEN EXAM	50.00	50.00	END S2 (see note 1)

### NOTES

1. Examination dates will be available during the Semester. Please refer to the examination timetable when published.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:  
It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements for students to complete each assessment item satisfactorily:  
To complete each of the assignments satisfactorily, students must obtain at least 50% of the marks available for each assignment. To complete the examination satisfactorily, students must obtain at least 50% of the marks available for the examination.
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student for the assignment will apply for each working day late.
- 4 Requirements for student to be awarded a passing grade in the course:

To be assured of receiving a passing grade a student must achieve 50% of the marks available for each assessment item, achieve at least 50% in the examination and at least 50% of the available weighted marks for the summative assessment items.

- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks obtained for each of the summative assessment items in the course.
- 6 Examination information:  
In an Open Examination, candidates may have access to any material during the examination except the following: electronic communication devices, bulky materials, devices requiring mains power and material likely to disturb other students.
- 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held in the semester 3 examination period of the current academic year.
- 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/corporateservices/calendar/part5.htm> or in the current USQ Handbook.

## **ASSESSMENT NOTES**

- 9 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. Students must retain a copy of each item submitted for assessment. If requested by the Examiner, students will be required to provide a copy of assignments submitted for assessment purposes. Such copies should be despatched to USQ within 24 hours of receipt of a request being made. The examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.