
Options for teaching Biometry Online

This report focuses on current teaching practice of Post-Graduate Biometry at the University of Sydney.

Definitions

Biometry is the application of statistics in the agricultural / biological arena, so e.g. animal production, animal breeding & genetics, ecology, etc.

Biostatistics is, or originates from medical statistics. It is the term used by people working in (human) epidemiology and public health. So people who work in veterinary epidemiology and public health typically would call this area biostatistics.

At the basic level, there is no real difference as the techniques are the same, although often different examples are used to illustrate the techniques but as the level increases, differences in teaching tend to emerge.

Purpose

The research for this report will cover online post-graduate courses in Biometry, Biostatistics and Statistics with the purpose of providing the information needed for the Faculty of Veterinary Science to decide if they need to offer their own course in Biometry or if there is another suitable course they can direct students to. The report will go on to describe best practice and pitfalls when teaching online courses in this field. From this benchmarking process, recommendations will be made on how the Biometry staff can provide an optimum course to the students within the current staffing and technological restraints.

Target Audience

The target audience for this Biometry course is postgraduate course work students. PhD or Research Masters don't need formal courses but many will want to do it. PhD students may need to be screened for their statistical background and depending on their project, required to undertake the course in Biometry.

(Extracts from email written by
Peter Thompson, 19/04/09)

Research

Current Postgraduate Biostatistics and Statistics Courses at the University of Sydney

The course information displayed is applicable to currently available courses: April 09.

Graduate Certificate in Biostatistics

This course provides advanced biostatistical training for a diverse range of students by distance learning. This course is offered by *distance* through the faculty of medicine. In the medicine handbook, Biostatistics is on page 63 UOS. (Need to do **4 UOS** @ 6 points each. PR= prerequisites

- [Mathematics Background for Biostatistics \(BSTA5001\)](#)
 - [Probability and Distribution Theory \(BSTA5023\)](#) PR: BSTA5001
 - [Principles of Statistical Inference \(BSTA5002\)](#) PR: BSTA5023
- [Epidemiology for Biostatisticians \(BSTA5011\)](#)
- [Epidemiology Methods and Uses \(PUBH5010\)](#)
 - [Clinical Biostatistics \(BSTA5005\)](#) PR: BSTA5001 and (BSTA5011 or PUBH5010)
 - [Design of Experiments and RCTs \(BSTA5006\)](#) PR: BSTA5001 and (BSTA5011 or PUBH5010)
- [Linear Models \(BSTA5007\)](#) PR: BSTA5002 and (BSTA5011 or PUBH5010)
 - [Survival Analysis \(BSTA5009\)](#) PR: BSTA5007
- [Advanced Clinical Trials \(BSTA5015\)](#) PR: BSTA5006, BSTA5007
- [Health Indicators and Health Surveys \(BSTA5003\)](#)
- [Data Management & Statistical Computing \(BSTA5004\)](#)
- [Categorical Data and GLMs \(BSTA5008\)](#)
 - [Longitudinal and Correlated Data \(BSTA5012\)](#) PR: BSTA5008
 - [Bioinformatics and Statistical Genetics \(BSTA5013\)](#) PR: BSTA5008
- [Introductory Analysis of Linked Data \(PUBH5215\)](#)
PR: [PUBH5018 Introductory Biostatistics](#) and
([PUBH5010](#) or [Epidemiology for Biostatisticians \(BSTA5011\)](#)) and
([PUBH5211](#) or [Data Management & Statistical Computing \(BSTA5004\)](#))
[more...](#)

Information on prerequisite Units

PUBH5018 Introductory Biostatistics: This provides the necessary background for Navneet's course. But again the application is mostly epi / PH, and doesn't cover sufficient material to cover the range of necessary topics (e.g. ANOVA.)

Master of Biostatistics

This course provides advanced biostatistical training for a diverse range of students by distance learning, to the level required for employment as a professional biostatistician. This comprises **9 UOS**: core units, one or two workplace projects and then electives. The UOS include all of the above plus the following:

- * [Workplace Project Portfolio Part A \(BSTA5020\)](#) PR BSTA5004 and BSTA5007
- * [Workplace Project Portfolio Part B \(BSTA5021\)](#) PR BSTA5004 and BSTA5007
- * [Workplace Project Portfolio Part C \(BSTA5022\)](#) PR BSTA5004 and BSTA5007

[more...](#)

Graduate Certificate in Veterinary Public Health

The program in Veterinary Public Health is a fully distance program, requiring no visits to Sydney. It is focused on the development of high-level technical skills and is designed for busy people, working full-time.

It includes:

[VETS7011 - Data Analysis for Policy Making](#) This appears to be very epi-focused, and wouldn't give the statistical skills they need for non-VPH work.

[VETS7021 - Data Analysis for Epidemiology Research](#) This provides a good range of statistical modelling background, but again the focus is in VPH / epi.

Graduate Diploma in Veterinary Public Health - Grad.Dip.V.P.H.

[Introductory Biostatistics \(PUBH5018\)](#)

[VETS7011 - Data Analysis for Policy Making](#) Navneet recently developed. Also, the same difficulty is there for the BCA, basically mainly for people working in epi/PH, but also, it is aimed at people training to be biostatisticians, rather than for people needing skills in this area,

Master of Surgery

The Master of Surgery (by coursework) aims to provide an understanding of the principles of applying the best available research evidence to patient care and the skills required for clinical research.

Core unit of study for this course

[PUBH5018 Introductory Biostatistics](#)

Secondary unit of study

[CEPI5310 Advanced Concepts in Statistics](#), Semester 1a,

PR [PUBH5211-Multiple Regression and Stats Computing](#) and

[PUBH5212 - Categorical Data Analysis](#)

more...http://www.usyd.edu.au/courses/?is_simple_search=1&page=1&contains_keywords=Biostatistics&is_international=&wanting_to_study=

Other Post Graduate Statistics Courses

[BACH5253 - Intermediate Statistics](#)

PR Graduate Courses

[BACH1143 Designing Health Research](#)

[BACH1145 Quantitative Health and Social Research](#)

[BACH5068 - Statistics for Clinical Research](#)

Fully Online courses

Unit of Study	Presence in CE6
Clinical Biostatistics (BSTA5005)	No
Advanced Clinical Trials (BSTA5015)	No
Introductory Analysis of Linked Data (PUBH5215)	Semester 2 intensive 2008
VETS7021 - Data Analysis for Epidemiology Research	Yes
PUBH5018 Introductory Biostatistics	Yes
PUBH5212 - Categorical Data Analysis	2008 Semester 2 Intensive. Blended course with f2f tutorials
BACH5068 - Statistics for Clinical Research	Yes

Course descriptions

PUBH5215 - Introductory Analysis of Linked Data

This unit introduces the topic of linked health data analysis at an introductory to intermediate level. It fills a gap in research training opportunities by combining the principles of health care epidemiology with hands-on practical exercises in the implementation of computing solutions. The modular structure of the unit provides students with a theoretical grounding in the classroom on each topic, followed by a training session on the corresponding computing solutions. Students use de-identified linked NSW data files on CD-ROM in the hands-on exercises. The computing component of the unit assumes a basic familiarity with computing syntax used in SAS and methods of basic statistical analysis of fixed-format data files. Contents include: an overview of the theory of data linkage methods and features of comprehensive data linkage systems, sufficient to know the sources and limitations of linked health data sets; design of linked data studies using epidemiological principles; construction of numerators and denominators used for the analysis of disease trends and health care utilisation and outcomes; assessment of the accuracy and reliability of data sources; data

linkage checking and quality assurance of the study process; basic statistical analyses of linked longitudinal health data; manipulation of large linked data files; writing syntax to prepare linked data files for analysis, derive exposure and outcome variables, relate numerators and denominators and produce results from statistical procedures at an introductory to intermediate level.

Unit coordinator: Professor Judy Simpson

Pre-requisites: PUBH5018 and (PUBH5010 or BSTA5011) and (PUBH5211 or BSTA5004)

UOS Outline found, not much in site. Gave myself temporary access to an archived site.

VETS7021 - Data Analysis for Epidemiology Research

This Unit of Study, delivered by distance education using an online classroom, will using four case studies introduce students to the application of three statistical procedures (linear regression, logistic regression, survival analysis) in epidemiological research for animal health and public health. Approaches to account for the impact of confounding, effect modification and clustering suitable for these statistical procedures will be discussed.

Unit coordinator: Dr Navneet Dhand

Some elearning tools used but still one big PDF.

PUBH5018 - Introductory Biostatistics

This unit aims to provide students with an introduction to statistical concepts, their use and relevance in public health. This unit covers descriptive analyses to summarise and display data; concepts underlying statistical inference; basic statistical methods for the analysis of continuous and binary data; and statistical aspects of study design. Specific topics include: sampling; probability distributions; sampling distribution of the mean; confidence interval and significance tests for one-sample, two paired samples and two independent samples for continuous data and also binary data; correlation and simple linear regression; distribution-free methods for two paired samples, two independent samples and correlation; power and sample size estimation for simple studies; statistical aspects of study design and analysis. Students will be required to perform analyses using a calculator and will also be required to conduct analyses using statistical software (SPSS). It is expected that students spend an additional 2 hours per week preparing for their tutorials. This unit may be undertaken in face to face or online/distance mode. Computing tasks are self-directed.

Unit coordinator: Associate Professor Petra Macaskill, Dr Timothy Dobbins

PUBH5212 - Categorical Data Analysis

In this unit the biostatistical concepts covered in earlier units are extended to cover analysis of epidemiological studies where the outcome variable is categorical. Topics of study include: testing for trend in a 2 x r contingency table; the Mantel-Haenszel test for the combination of several 2 x 2 tables, with estimation of the combined odds ratio and confidence limits; multiple

logistic regression; Poisson regression; modelling strategy. The assignments will involve practical analysis and interpretation of categorical data. Data analyses will be conducted using statistical software (SAS).

Unit coordinator: Associate Professor Petra Macaskill

Pre-requisites: PUBH5018

This course includes some audio slide lectures, groups

BACH5068 - Statistics for Clinical Research

This unit aims to introduce students to basic statistical principles relevant to the manipulation and analysis of clinical data. Students will be exposed to concepts of sampling, distributions of scores, summaries of data, and treatment of categorical and quantitative data. This last topic will include chi square analysis, calculation of confidence intervals, tests for differences in the locations of samples (including t-tests and tests for non-normally distributed data), correlation and regression, sample size estimation and an introduction to survival analysis. It is expected that at the conclusion of the unit students will be able to: appraise published statistical analyses; perform simple statistical tests by hand and with the assistance of a computer package SAS or SPSS; and present statistical data.

Unit coordinator: Dr Rob Heard, Dr Zakia Hossain

Benchmarking Biometry / Biostatistics Courses Online

Best Practices

- Quiz to self-test assumed knowledge
- Modularisation of course content: breaking the course into bite size topics (see demonstration site for an example of this)
- Providing a variety of learning objects within each module:
 - Extensive use of existing web resources i.e. statistics sites, or how to use software packages
 - Audio-visual lectures - refer to the demonstration site for an example of this
 - Audio-visual demonstrations of how to use software packages – these can be recorded by using Camtasia software that is available through the university licence.
 - Online Assignment delivery and submission through Assignment tool
 - Case study assignments for authentic learning material
 - Discussions on case studies or other learning material

Pitfalls

- Delivery of all course material in one long text file
- Non interactive site i.e. solely delivery of material

Suggestions on how to overcome these pitfalls

The Long Text File

Break it down into:

- UOS Outline including:
 - Introduction
 - Learning outcomes
 - Overview
 - Assumed knowledge and skills
 - Overview of Assessment
- Key dates
- Contacts / Authors
- Self assessment quiz on assumed knowledge
- Modules/topics including:
 - Audio visual presentations on:
 - Key concepts
 - Software Demonstrations
 - Case Studies
 - Pdf versions for printing
 - Readings - essential and optional
 - Exercises for practice and self assessment
 - Discussion on each topic for students to ask questions to each other or to the teacher.

- Learning Resources
 - Text book
 - Recommended resources
 - Online resources
 - Software information
 - Software Demonstration – made with screen capture and voice over software.
 - Assessment
 - Assignments distributed with assessment criteria
 - Drop box for assessment submission
 - Help
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Overcoming Staffing Limitations

The problem

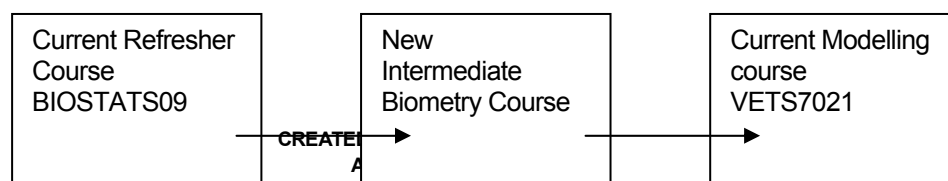
The design and development of an online course is generally done with the view to having a lecturer available to maintain the site and to provide student feedback. i.e. to update learning materials, read discussions, answer questions, mark assignments and exams. However the two Biometry Staff in the faculty of Veterinary science are presently working to full capacity so it would be very difficult to assign a lecturer to the site.

The solution

A Biometry course site can be designed as a Stand Alone Module. This means that the course would be carefully targeted at the postgraduate students in Veterinary Science. It would have a clear focus on the skills they will need in the area Intermediate Biometry including:

- ANOVA
- Regression
- Experimental Design

This intermediate course would assume the knowledge contained in the Refresher Course and it would prepare students for the more advanced modelling course presently run.



A Stand Alone course would require minimum maintenance. It would not require any input from a lecturer. Formative assessment with feedback will be an essential aspect of the course. Marking if required, would be done automatically by the LMS.

Conclusions

After reasonably thorough research on the Biometry/Biostatistics courses available at the University of Sydney and ongoing discussions with the project staff from the faculty of Veterinary Science, there is consensus that none of the available courses cover the content that is needed. Even if they did, certainly none of them use examples or case studies that are relevant to veterinary students.

This report and the Biometry Demonstration Site created as an example of these recommendations outline and demonstrate the best practices that are used when teaching the Biometry/Biostatistics given the current Technology available within the University of Sydney.

Through discussions that have occurred during this project phase, the gap in teaching material has been identified. The exact content that is needed is identified above on page. Further discussions need to be carried out within the faculty to ensure that the three courses – refresher, intermediate, advanced – compliment each other and do not over lap.

A Stand Alone Course for at least Intermediate course could be designed and developed to minimise workload for staff. This type of Stand Alone Course could also be created for the Refresher course.

The recommendations made for best practice pedagogy and delivery of online courses proposed for this Intermediate course are also recommended for the existing online Refresher course BIOSTATS09 and AdvancedStand Alone course VETS7021. This would mean recreating the current Refresher course the Advanced-modelling course to bring them in line with best practices while minimising workload for staff.

Implementation

The faculty of Veterinary Science can submit an Expression of Interest to:

- Redesign the two existing courses
- Create the new Intermediate course

in such a way as to meet best practices described and demonstrated in this report.

This would need to be in to Sally Pope and Meg Vost by July.