Xi'an Jiaotong-Liverpool University
西交利物浦大學

*Wisdom Lake Academy of Pharmacy*

# MODULE HANDBOOK

# *APH101*
# *Biostatistics and R Programming*

*Jieyun Yin, Xiaoqin Yang & Daiyun Huang*

**Semester *2***

**2022-2023**

## SECTION A: Basic Information

- **Brief Introduction to the Module**

*Biostatistics (also known as biometry) are the development and application of statistical methods to a wide range of topics in biology. It encompasses the design of biological experiments, the collection and analysis of data from those experiments and the interpretation of the results. This introductory module is designed to prepare students with basic introduction to the principles of biostatistics, study design and skills in basic statistical methods using R programming language.*

- **Key Module Information**

Module name: *Biostatistics and R Programming*

Module code: *APH101*

Credit value: *5.0*

Semester in which the module is taught: *2*

Pre-requisites needed for the module: *N/A*

Programmes on which the module is shared: *BCs Biomedical Statistics*

- **Delivery Schedule**

Lecture room:
*SA164 (weeks 2-13)*

Lecture time:
*Friday 13:00pm-15:00pm (weeks 2-13)*

Lab room:
*CBG15E (weeks 2-13)*

Lab times:
*Monday 10:00am-12:00am (weeks 2-13)*

- **Module Leader and Contact Details**

Name: *Daiyun Huang*

Brief Biography: *Dr. Daiyun Huang obtained his Bachelor's degree in Mathematics from the University of Liverpool in 2017. He went on to complete his Master's degree in Statistical Science from the University of Oxford in 2018, and subsequently earned his PhD in Computer Science from the University of Liverpool in 2022. His research interests mainly focus on biological data analysis using statistical and machine learning methods and model development for artificial intelligence-aided drug discovery. He is now a postdoctoral fellow co-cultured by Fudan University and Wisdom Lake Academy of Pharmacy, Xi'an Jiaotong-Liverpool University.*

Email address: *Daiyun.Huang@xjtlu.edu.cn*

Office telephone number: (*0512) 8188 3213*

Room number and office hours: *Science Building, Block D, 334A, by appointment only*

Preferred means of contact: *Daiyun.Huang@xjtlu.edu.cn*

- **Additional Teaching Staff and Contact Details**

Name: *Jieyun Yin*

Brief Biography: *Dr. Jieyun Yin, Associate Professor at Soochow University, received her PhD degree from Huazhong University of Science and Technology and Duke University. Her research focuses mainly on medical statistics and the epidemiology of cardiovascular diseases in women and children.*

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## SECTION B: What you can expect from the module

- **Educational Aims of the Module**

*The aim of this module is to provide students with a basic introduction to the principles of biostatistics, study design and analysis in pharmacy. Students will learn basic statistical methods using R programming language, and the application of*

*statistics to pharmacy-based research. Students will gain fundamental statistical skills that are used in investigations of a range of issues in clinical practice and pharmaceutical care. The module will cover methods of summarizing data, the process of statistical inference and the use of estimation techniques.*

## ❑ Learning Outcomes

*A. Discuss the importance of data in pharmacy, including the importance of proper data collection, analysis and interpretation.*
*B. Identify the nature of statistical inference as applied to clinical practice and pharmaceutical care.*
*C. Outline estimation and testing methods in the analysis of univariate and bivariate relationships.*
*D. Interpret the results of data analysis correctly and effectively with minimal reliance on statistical jargon.*
*E. Describe how to use statistical software/programming skills to summarize data numerically and visually to perform data analysis.*

## ❑ Assessment Details

### *Initial assessment*

| Sequence | Method | Assessment Type (EXAM or CW) | Learning outcomes assessed (Use codes under learning outcomes.) | Duration | Week | % of final mark | Resit (Y/N/S) |
|---|---|---|---|---|---|---|---|
| *#001* | *Assignments* | *CW* | *A, B, C, D* | | | *15* | *N* |
| *#002* | *Quizzes* | *CW* | *A, B* | | | *15* | *N* |
| *#003* | *Final Exam* | *EXAM* | *B, C, D, E* | *3 hours* | *15* | *70* | *Y* |

### *Resit assessment*

| Sequence | Assessment Type (EXAM or CW) | Learning outcomes assessed (Use codes under learning outcomes.) | Duration | Week | % of final mark |
|---|---|---|---|---|---|
| *R001* | *EXAM* | *B, C, D, E* | | | *70* |

*Marks for components where no resit opportunities are offered will be carried forward, whether or not they are passed or failed, and will be calculated, with the same weighting, in the final module mark.*

## ❑ Methods of Learning and Teaching

1. *Didactic component - the core of the teaching is lecture-based with Q/A and feedback.*
2. *Self-learning component - students are encouraged to read around the subject materials.*
3. *Comprehension/review exercise - two continuous assessments, following supervised discussion and Q/A sessions in the seminars.*
4. *Case studies will be supplied to help students place the course material in context.*
5. *Working in computer lab with R environment to solve practical problems.*

- **Syllabus & Teaching Plan**

1. Introduction to R environment, R functions, R data types; workspace and files, R scripts and packages, R graphics
2. Parametric test 1: t-tests
3. Parametric test 2: one-way analysis of variance
4. Parametric test 3: two-way analysis of variance
5. Non-parametric test 1: rank sum test for <=2 samples
6. Non-parametric test 2: Kruskal-Wallis test, Friedman test
7. Non-parametric test 3: inter-rater reliability for categorical variables, Fisher's exact test, chi-square test for RxC tables
8. Multiple linear regression
9. Logistic regression
10. Survival analysis 1: survival data and Kaplan Meier test
11. Survival analysis 2: Cox proportional hazards regression models
12. Meta-analysis 1: basic introduction and test for heterogeneity
13. Meta-analysis 2: fixed and random effect models

- **Tutorial Schedule**

- **Reading Materials**

**Mandatory Textbook:** N/A

**Optional textbook:**

| Title | Author | ISBN/Publisher |
|---|---|---|
| Biostatistics for the Biological and Health Sciences. | Tiola MM, Triola MF, Roy J | Pearson |

**Reference textbook:** N/A

| Title | Author | ISBN/Publisher |
|---|---|---|

| | | |
|---|---|---|
| Discovering Statistics Using IBM SPSS Statistics | Andy Field | Sage Publisher |

## SECTION C: Additional Information

- **Student Feedback**

  The University is keen to elicit student feedback to make improvements for each module in every session. It is the University policy that the preferred way of achieving this is by means of an Online Module Evaluation Questionnaire Survey. Students will be invited to complete the questionnaire survey for this module at the end of the semester.

  **You are strongly advised to read the policies mentioned below very carefully, which will help you better perform in your academic studies. All the policies and regulations related to your academic study can be found in 'Student Academic Services' section under the heading "Policies and Regulations" on E-bridge.**

- **Plagiarism, Cheating, and Fabrication of Data.**

  Offences of this type can result in attendance at a University-level committee and penalties being imposed. You need to be familiar with the rules. Please see the "Academic Integrity Policy" available on e-Bridge in the 'Student Academic Services' section under the heading 'Policies and Regulations'.

- **Rules of submission for assessed coursework**

  The University has detailed rules and procedures governing the submission of assessed coursework. You need to be familiar with them. Details can be found in the "Code of Practice for Assessment" available on e-Bridge in the 'Student Academic Services' section under the heading 'Policies and Regulations'.

- **Late Submission of Assessed Coursework**

  The University attaches penalties to the late submission of assessed coursework. You need to be familiar with the University's rules. Details can be found in the "Code of Practice for Assessment" available on e-Bridge in the 'Student Academic Services' section under the heading 'Policies and Regulations'.

- **Mitigating Circumstances**

  The University is able to take into account mitigating circumstances, such as illness or personal circumstances which may have adversely affected student performance on a module. It is the student's responsibility to keep their Academic Advisor, Programme Director, or Head of Department informed of illness and other factors affecting their progress during the year and especially during the

examination period. Students who believe that their performance on an examination or assessed coursework may have been impaired by illness, or other exceptional circumstances should follow the procedures set out in the “Mitigating Circumstances Policy”, which can be found on e-Bridge in the ‘Student Academic Services’ section under the heading ‘Policies and Regulations’.

- **Learning Mall**
  Copies of lecture notes and other materials are available electronically through LMO, the University’s virtual learning environment at: https://core.xjtlu.edu.cn/.