台北大學 統計系 學士班 生物統計方法 (Biostatistical Methods)

林建甫

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1. 為何要學生物統計學?

- 生物統計諮詢碩士 US\$ 75.00 dollars per hour, 博士 US\$ 150.00 dollars per hour
- 在美國, 生物統計碩士起薪與 EECS 碩士相同, 在生物科技公司工作, 同樣有高額分紅.
- 對生物醫學研究資料有興趣.

2. What is Biostatistics?

Statistics is the collection, processing, interpretation and presentation of numerical information. The application of statistics allows statisticians to:

- Formulate questions to be answered by collecting data
- Specify by what design the data are to be collected
- Summarize the information in the data as statistics
- Analyze statistics to draw and present conclusions

Biostatistics is a branch of statistics that applies its methods for research in biology, medicine, and public health. The intent of biostatistics is to better understand the factors that affect human health through the judicious use of statistical methods. Biostatistics is the application of statistics to questions about human health. Because the factors that affect human health are various, biostatistics is an umbrella term that encompasses statistical research in several subject matter areas. These fields include: pharmacology, biology, biotechnology, genetics, medicine (including biometry, dentistry, psychiatry, physiology, radiology / medical imaging, cancer, AIDS), public health (including epidemiology. health status of populations assessment. environmental health. medical decision making. nutrition. health policy assessment. health services research. health behavior intervention assessment). Fields that either encompass or share concepts with biostatistics are statistics, medical informatics, epidemiology, operations research, and medicine.

- 3. 生物統計方法:上課方式
 - Time: Wednesday, 9:10am-12:00am
 - Classroom: 商學大樓 1F16
 - 助教:
 - Textbook/Note: 林建甫, 醫學統計.
 - Textbook: Rosner (2006), Fundamentals of Biostatistics (with CD-ROM), Sixth Edition, Duxbury, Thomson Learning (台灣歐亞書局).
 - 不准翻印教科書
 - Office Hours: Wednesday, 8:00am–9:00am, 12:00noon-12:30noon (make appointment by e-mail)
 - 統計系課業輔導時間
 - 統計軟體: R, SAS
 - 統計主要是分析研究資料,先有研究資料才有統計學,統計學應用許多數學理論,但統計學並不是數學的分支學科
 - 生物統計方法課程強調生物醫學實例應用,分析與結果解釋
 - 生物統計方法課程包含 50% 60% 一般生物醫學統計法
 - 流行病學統計學(下學期)課程包含 30% -40% 一般生物醫學統計法(進階課程)
 - (另外 10% 一般生物醫學統計法為迴歸分析與變異數分析)
 - Evaluation
 - Quiz and/or Homework or Small Group-Project 50%
 - One or Two Mid-term Exam(s) 20%
 - Final Exam or Final Group-Project 30% (cumulative)
 - 上課缺席1小時,每次扣學期成績結算後總分5分,上課缺席6小時,學期成績結算總分0分;上 課遲到(上課鐘響後,比教師晚到10分),算上課缺席2小時
 - 作業遲交,該次作業0分,未交作業,每次再扣學期成績結算後總分5分
 - 不定時上課小考 (Quiz), 期中考, 期末考, 作弊, 學期成績 0 分
- 4. 學生責任
 - 課前預習,每週 2-4 小時
 - 上課準時出席,專心聽講與發問
 - 課後複習與作業練習,每週6小時
 - 參加上課小考
 - 交作業當日在上課前交作業,上課不准寫作業,作業可討論,但須獨立完成,不可互相抄襲
 - 有興趣同學,上課分組 (每週一組),共同講義與筆記
 - 沒有興趣同學,請勿選修

5. Course Objectives

This course is intended to provide students and researchers in public health with a broadbased introduction to the principles underlying modern biostatis. tical methods and their application in scientific research. Rather than viewing biostatistics as a compendium of 'recipies' or 'procedures,' methodologies and strategies for analysis are viewed in the larger context of biostatistical inference as a science in its own right. Applications to real data from a variety of studies in public health and clinical research are used throughout the course to illustrate the material. Students also work with statistical software on a weekly basis

- (a) Understand specific biostatistical methodologies in the context of broader frame-works for inference.
- (b) Recognize and choose appropriate basic approaches to drawing inference from study designs commonly encountered in public health and clinical research, and contrast the relative benefits of competing choices.
- (c) Critique assumptions underlying basic statistical analyses in the context of their application.
- (d) Implement standard methodologies such as contingency table analysis and linear regression analysis using a commercially-available statistical software package.
- (e) Interpret results of analyses in the context of the research to which they are being applied, and describe findings in an expository fashion.

6. Biostatistical Methods Outlines

- (a) Data, Variable, Sample, Population (1 week)
- (b) Study Design (1 week)
- (c) Epidemiologicl Measures (1 weeks)
- (d) Summary Statistics (1 week)
- (e) Probability, Distributions (2 week)
- (f) Sampling and sampling Distributions (1 week)
- (g) Point Estimation and Parametric Interval Estimation (1 week)
- (h) Hypothesis Testing and One Sample Inference (1 week)
- (i) Two Sample Testing: Two-Sample Student t Test and Paired t Test (1 week)
- (j) Categorical Data Analysis: Analysis of Proportion (3 weeks)
 Cross-sectional study, retrospective study, case-control study, prospective study, matched-pair study
 Two Sample Testing (2 × 2 Tables): Chi-Square Test, Fishes's Exact Test *R* × *C* Contingency Tables,
 Confounding, Effect Modification and Interaction
 Stratified Categorical Data: Mantel-Haenzsel Test
- (k) Nonparametric Methods: (2-3 weeks)
 Sign Test, Wilcoxon's Signed-Rank Test, Wilcoxon Rank-Sum Test, Kruskal-Wallis Test,
 Friedman Test
- (l) Sample Size and Power Calculation (1 week)
- (m) Analysis of Rate (1 week)

Feel free to ask questions during class; your questions are an important part of this course. Few students are able to master the material without keeping up on a regular basis. I welcome you to the class and hope that you have an enjoyable and successful semester!

References

- [1] Marcello Pagno and Kimberlee Gauvareau (2000), *Principles of Biostatistics*, 2nd, Duxbury, California.
- [2] B. Dawson and R. G. Trapp (2004), Basic and Clinical Biostatistics, 4th ed., McGraw-Hill, New York.
- [3] P. Armitage and G. Berry (2002), *Statistical Methods in Medical Research*, 4th ed., Blackwell, London.
- [4] Douglas G. Altman (1991), Practical Statistics for Medical Research, Chapman and Hall, London.
- [5] Steve Selvin (1995), *Biostatistical Methods*, Oxford.
- [6] Steve Selvin (1995), Practical Biostatistical Methods, Duxbury, California.
- [7] Steve Selvin (2004), *Biostatistics*, Prentice Hall.
- [8] J. A. Ingelfinger, F. Mosteller, L. A. Thibodeau and J. H. Ware (2004), *Biostatistics in Clinical Medicine*, 3rd ed., McGraw-Hill, New York.
- [9] Stanton A. Glantz (1995), Primer of Biostatistics, 5th ed., McGraw-Hill, New-York.
- [10] R. H. Riffenburgh (1999), Statistics in Medicine, Academic Press, New York.
- [11] D. E. Matthews and V. T. Farewell (1996), Using and Understanding Medical Statistics, 2nd ed., Karger, Basel, Switzerland.
- [12] Motulsky, Intuitive Biostatistics.
- [13] Fisher and Van Belle, Biostatistics, John, Wiley and Son.