Chapter 1 – Introduction to Statistical Consulting

- Discuss syllabus, course and your background: one of our goals is to take our book knowledge and apply it to real problems – communication is therefore essential
- In this course, you’ll work in groups of 3 students with a client(s) (in person, by phone and/or via email)
- As statistical consultants, we serve as problem solvers
- Symbiosis between data and theory (see examples on pp.3-4) – called the scientific method (SM):

![Scientific Method Diagram]
§1.1 History of the Scientific Method

- Our text on p.5 (ignores Eastern philosophy of Confucius etc.) talks about challenges of Galileo, Kepler and Copernicus, and fallacy of the Greek model
- Sir Francis Bacon (1561-1626)

![Image of Sir Francis Bacon]

- Rene Descartes (1596-1650)

  "There is nothing more futile than to busy oneself with bare numbers and imaginary figures." [Data without context have little meaning.]

![Image of Rene Descartes]

- The SM lead to many discoveries in the 18th – 19th – 20th centuries including the calculus in math, and the field of probability and statistics
§1.2 The Development of Statistics

- The roots of statistics lie in probability (Pascal and Fermat). Next came the CLT and LLNs (Quetelet), and then regression and correlation (Galton & Pearson); the controversy between Pearson and Fisher is now legendary (see e.g., Agresti’s CDA books)

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- Empirical evidence was used to confirm Boyle’s law: \( PV = K \) (relating air pressure to volume)
- Gosset’s (1876-1937) work at Guinness Brewery in Dublin and the Student’s t distribution
- Fisher’s work at Rothamsted: ANOVA, bioassay, \( \alpha = 5\% \)
- In industry: QC, Control charts, TQM, QA, Deming
- In health sector: link between smoking and lung cancer was finally admitted by Liggett Group in 1997
- See summary table on p.11
§1.3 An Overview of Statistical Consulting

- “The problem is that most researchers don’t have time to acquire this specialized [statistical] knowledge along with the practical experience to apply it appropriately. There is a need to involve someone who understands the scientific process & has the quantitative skills to fulfill this important role: the statistical consultant.”

- Book outline is at top of p.12
- Consultants can work on teams or as advisors/consult.
- Required skills include:
  - Scientific (learn quickly; comes with practice)
  - Statistical (course work or short courses)
  - Computational (courses, seminars, on your own)
  - Communication (it’s important to practice)
- Need to truly listen; challenging to do always and especially over email!

1.4 Statistical Consulting Environments

- Pharmaceutical (statistician tasks on p.16)
  - Nonclinical discovery → Preclinical → Clinical
    - Phase I (safety, PK, healthy volunteers)
    - Phase II (target patients, MTD: max. tolerated dose)
    - Phase III (large clinical study; safety and efficacy)
    - Phase IV (post-marketing, AEs)
• Telecommunication – as pointed out on p.17, very large databases, different types of jobs in research versus business divisions
• Business
  - Consulting companies (Smith Hanley, PPD, ICF International (Macro), etc.) – stages of work on p.19 for work in market research survey analysis
  - Private consultants – tough to ‘juggle’
  - Expert witness
• Government – Census Bureau, Commerce, World Bank, NCHS, USAID, NIH, CDC, FDA, NIEHS, etc.
  http://www.bls.gov/ooh/math/statisticians.htm
• University
  - Need Consulting Center
  - Consulting course