

## Outline

## Professional Ethics for Statisticians:

### *Issues and Advice*

ST 810A, Spring 2005



- General comments on the role of statisticians
- Responsibilities and advice for graduate students
- Responsibilities and advice for teaching
- Responsibilities and advice for methodological research
- Responsibilities and advice for working with collaborators/clients
- Issues: authorship, objectivity, etc.

## General Comments

### The discipline of Statistics:

- Statistics is concerned with **collection** and **interpretation** of information (data)
- In some sense, Statistics is **unique**, as we would not exist but for the need to do this in other disciplines
- For knowledge in all disciplines to advance uncompromised, collection and interpretation must be done in an **honest** and **principled** fashion

## General Comments

**Restated:** Statistics is concerned with **honest** and **principled** collection and interpretation of information (data)

- The contribution of statistics is to make sure that evidence on which public and private decisions are based and on which the next steps in advance of science are formulated is **credible**

## General comments

### Collection and interpretation of data:

- In general, investigators are focused on pursuit of **the truth**
- Excited investigators have hypotheses to verify, ideas to defend, and hope that data may be collected that have an interpretation that supports their objectives
- However, hypotheses and ideas can be **incorrect**, or may be correct but evidence in their favor can be **weak** or **inappropriate**...

## General comments

### The role of statisticians:

- Ensure that data are collected in a **fair** and **unbiased** way so as not to favor certain viewpoints
- Ensure that questions to be addressed can **in fact** be addressed with available information
- Ensure that interpretations are made **independently** of desired results or predispositions
- To some extent, statisticians are the “**morality police**” for science!

## General Comments

### In particular:

- The FDA bases regulation and approval of drugs, biologics, and devices on formal statistical evidence
- Many substantive journals require that claims be supported by formal statistical evidence
- Environmental regulations are based on formal statistical approaches and evidence
- Teams conducting clinical trials are almost always required to include at least one statistician

## General Comments

### At the same time:

- Statistics has a “**PR**” **problem**
- *How to Lie With Statistics* (Huff, 1954)
- “There are three kinds of lies: lies, damned lies, and **statistics**” (Benjamin Disraeli)
- Despite our role, the public is **suspicious** of statistics

## General Comments

**Result:** Statisticians have a **special obligation** to practice our profession **independently** and with **principle, honesty, integrity, and fairness**

- **More generally**, we have a responsibility to act this way in **everything** we do, statistical or otherwise

## Advice for Graduate Students

**Get in the habit early in your career!**

- Play by the rules in your coursework, **always** – if the instructor directs you not to collaborate, consult certain materials, etc., **DON'T DO IT!!!**
- Not adhering to the rules now will make it more difficult for you to do so later, when it matters **even more** . . .
- . . . and you will have not developed the skill of **learning independently** that is critical to being a good statistician (in research or applications)



## Advice for Graduate Students

**Coursework:** Don't cheat yourself

- Treat your coursework as an opportunity to learn and hone **technical/applied skills**, demonstrate your **ability to learn and master** your discipline, cultivate an ability to **work independently** as preparation for your later **work habits, NOT** as a just a prerequisite for an "A"
- Accept the idea that graduate school is **NOT** about grades!

## Advice for Graduate Students

**Coursework:** Don't cheat yourself

- Graduate school is one time in your professional life where you have the **luxury** to learn
- Take demanding (not "easy A") courses that will **expand** your knowledge of Statistics and **challenge** your abilities
- Take courses **beyond** the minimum requirement for your degree



## Advice for Graduate Students

**Dissertation research:** Don't cheat yourself

- A dissertation is an exercise in learning to work and think **independently**, critical to your ability to contribute and carry out your responsibilities later
- This is **NOT homework!** Do not expect your advisor to “assign” the next task

## Advice for Graduate Students

**Dissertation research:** Don't cheat yourself

- Don't just get results, **interpret them!** Do the results make sense? Could there be a mistake in your program?
- Identify the **next step yourself:** investigate new approaches on your own, try new simulation scenarios, etc.



## Advice for Teaching

**Not just academia:** Industry, government short courses, presentations

- Teaching Statistics or communicating statistical ideas carries a responsibility for **completeness**; **honesty** about what can and cannot be done, assumptions, etc.; staying **up-to-date**

## Advice for Teaching

**Responsibility:** To students and the profession

- Developing and maintaining a **good** course is **hard work** and time-consuming, but cutting corners will only shortchange the profession by telling an incomplete or outdated story to students
- Promoting Statistics to non-majors (and majors!) through clear, thoughtful teaching benefits the **entire discipline**



## Advice for Teaching

**Responsibility:** To students and the profession

- Teaching is **not** a popularity contest! An **easy**, **entertaining** course and **light workload** may please students in the short term, but fails them in the longer term

**Your goal:** Communicate statistical thinking and principles in the best way you know how

## Advice for Research

**“Publish or perish”** In academia, pressure to publish is **considerable** in any discipline

- The eternal struggle: **Quantity** vs. **quality**
- The **“minimum publishable unit”**
- Temptation to send out work that is **incomplete** or promote methods that are **not well-studied**



## Advice for Research

**Responsibility:** The objective of research is to **advance knowledge**. Ask yourself

- Does this work represent a **“ $> \epsilon$ ”** advance?
- Have I portrayed the advantages **and disadvantages** fairly and accurately?
- Have I done my best to communicate my work **clearly** and **effectively**, rather than expecting editors/referees to do it for me?

## Advice for Collaboration

**The practice of statistics:** As a statistician, you will work with investigators/clients on **“real problems”**

- As a **consultant** to a client who has already collected data and wants help with an analysis
- As a **collaborator** who participates in conception, design, analysis, and reporting of results (publication)

**The most challenging aspect of being a statistician!**



## Advice for Collaboration

**First principle:** Be principled!

- Statistics is about **impartial**, **fair**, **unbiased** interpretation
- Statistics recognizes and is **up-front** about the **limitations** of methods and assumptions
- A statistician should always strive to present **only** what is reasonable to infer, to make limitations **transparent**, and not be pressured by “**special interests**”

## Advice for Collaboration

**Example 1:** The mission – **Statistical Significance!**

- Investigators obviously hope to show their hypotheses, theories, conjectures are **true** and would like statistical analyses that support this!
- It's all about the **p-value!**
- Some client/collaborators view statistical methods a “bag of tricks”
- “What if we analyzed this as a two-way analysis of variance instead?”

## Advice for Collaboration

**Statistician's obligation:**

- Use the most relevant model and method with reasonable assumptions, regardless of outcome
- **Stand your ground**

## Advice for Collaboration

**Example 2:** The sample size conundrum

- A collaborator wants to conduct a study to test a hypothesis but has **limited resources**
- You: “What's an **important (subject-matter) difference?**”
- Them: “Whatever I can detect with at most 50 patients/rats/plots”

## Advice for Collaboration

### Statistician's obligation:

- It may be a waste, or downright **unethical**, to conduct a study that is **too small** (underpowered) or **poorly designed**
- Help the client to understand what s/he can reasonably hope to achieve within his/her constraints and to focus on the **scientific relevance** given the limitations

## Advice for Collaboration

### Example 3: The color of money

- If the FDA approves this drug, we'll all be rich!
- The word from upper management: Statisticians, your **job** is to deliver  $p < 0.05$



## Advice for Collaboration

### Statistician's obligation:

- This can be **tough!**
- Strength of character, integrity, **self-confidence** (comes from knowing your discipline very well)
- Strive within your organization to **educate**

## Advice for Collaboration

### Example 4: The VIC (Very Important Client)

- Unfortunately, some clients/collaborators do not think highly of Statistics or statisticians (and view them as “**staff**” who run software packages. . . )
- Unfortunately, some clients/collaborators think they know **as much or more** than you do
- “Run this analysis and bring me the results”

**Statistician's obligation:** See previous slide!



## Advice for Collaboration

**Example 5:** The obsessive-compulsive (you!)

- Sloppiness or haphazard work is **unacceptable**
- “The mystery of the treatment codes”

**Statistician’s obligation:** Be precise and careful with every design, analysis, report, **no matter** how small

## Issues

**Authorship:** For collaborative work

- If you have made a **contribution** to a paper, you should be listed as an **author**
- In some substantive disciplines, there is a **protocol** for authorship
- In others, you may have to **fight** for recognition



## Issues

**Reporting results:** For collaborative work

- Collaborators (and their journals) often insist on **minimal** statistical content/description
- **Insist** at the minimum that the paper state clearly: statistical model (reference), assumptions, limitations, extent of generalizability

## Issues

**Know what you don’t know:**

- You can’t be a statistician in a vacuum; when working with subject-matter investigators, make an effort to learn the basics of the area. . .
- . . . while recognizing you are not an **expert**
- Listen to your collaborators, **ask questions**
- Don’t be afraid to be “**dumb!**”



## Issues

### Peer review:

- When acting as a referee, resist the temptation to be **competitive**
- Your goal should be to evaluate whether the contribution is **substantial enough** to be communicated
  - be honest, fair

## Some References

Vardeman, S.B. and Morris, M.D. (2003) Statistics and ethics: Some advice for young statisticians. *The American Statistician* 57, 21–26.

American Statistical Association (1999) Ethical guidelines for statistical practice (at the ASA web site; see the class web page)

Additional links are the class web page.