

Professional Ethics in Statistical Practice: Responsible Conduct of Research

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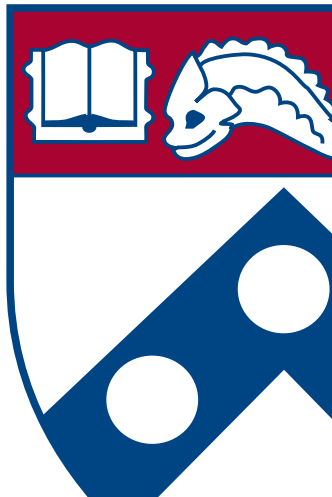
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Career Goals

Job

Contacts

Promotion

Tenure

Respect

Professionalism

Truthfulness

Integrity

ISI code of professional ethics

1. Pursuing objectivity
2. Clarifying obligations and roles
3. Assessing alternatives impartially
4. Conflicting interests
5. Avoiding preempted outcomes
6. Guarding privileged information
7. Exhibiting professional competence
8. Maintaining confidence in statistics
9. Exposing and reviewing methods and findings
10. Communicating ethical principles
11. Bearing responsibility for the integrity of the discipline
12. Protecting the interest of subjects

Protecting the interests of subjects

- We are obligated to protect subjects, individually and collectively, insofar as possible, against potentially harmful effects of participating
- Not absolved by consent or by the legal requirement to participate
- Intrusive potential requires that inquiry be undertaken only with great care, full justification of need, and notification of those involved
- Inquiries should be based, as far as practicable, on the subjects' freely given, **informed consent**
- Identities and records of all subjects should be kept **confidential**
- Measures should be utilized to prevent data from being released in a form that would allow a subject's identity to be disclosed or inferred

- **Planning research**
 - ▶ Protection of human subjects
 - ▶ Informed consent
- **Conducting research**
 - ▶ Data collection and protection
 - ▶ Data monitoring
- **Reporting research**
 - ▶ Best practices
 - ▶ Reproducible research

Common Rule (45 CFR 46, Subparts A–D)

Provides a comprehensive articulation of society's expectations for the responsible use of **human subjects** in **research** (Subpart A)

- **Research:** Investigation, including research development, testing and evaluation, designed to contribute to generalizable knowledge
 - ▶ Uses a commonly accepted scientific (statistical) method
 - ▶ Conducted with the intention of generating inference
- **Human subjects:** Living individuals, about whom an investigator conducting research obtains data through intervention or interaction with the individual or identifiable private information
 - ▶ Institutional approval is required
 - ▶ Institutional Review Board (IRB)
- Additional requirements for sensitive groups
 - ▶ Pregnant women, human fetuses and neonates (Subpart B)
 - ▶ Prisoners (Subpart C)
 - ▶ Children (Subpart D)

- Risks to subjects are minimized
- Risks to subjects are reasonable in relation to anticipated benefits, if any, to subjects, and the importance of the knowledge that may reasonably be expected to result
- Selection of subjects is equitable
- **Informed consent** will be sought from each prospective subject or the subject's legally authorized representative, and documented
- When appropriate, the research plan makes adequate provision for **monitoring** the data collected to ensure safety of subjects
- When appropriate, there are adequate provisions to protect the **privacy** of subjects and to maintain the **confidentiality** of data

- Much more than obtaining a signature on a form
- Requires that investigators educate potential subjects to ensure they can reach a truly informed decision about whether to participate
- Must be given freely, without coercion
- Based on a clear understanding of what participation involves
 - ▶ Purpose of the research, duration of study
 - ▶ Procedures to be followed, identify experimental procedures
 - ▶ Risks and discomforts as well as potential benefits
 - ▶ Alternative procedures or treatments, if any
 - ▶ Statement regarding voluntary participation and right to withdraw

Discussion questions

1. Last week my father had a stent placed in an artery leading to his heart. Immediately before surgery, he was approached by a research coordinator who wanted to enroll him in a study. Do you think his consent was given freely, without coercion?

- **Appropriate methods:** who, what, when, where, why, how
 - ▶ Quantitative versus qualitative
 - ▶ Statistical and experimental design
- **Attention to detail**
 - ▶ Preparation through study design
 - ▶ Avoid errors and missing data
- **Appropriate authorization**
 - ▶ Authorization to conduct study
 - ▶ Authorization to access collected data
- **Archiving**
 - ▶ Hard-copy or electronic data
 - ▶ Document changes for **reproducibility**

- **Data storage:** Prevent accidental damage, loss, theft
 - ▶ Stored in secure location
 - ▶ Backup computer files
- **Confidentiality**
 - ▶ Ensure confidentiality of participants' personal information
 - ▶ Ensure protection of confidential data or results
- **Period of retention**
 - ▶ Determine reasonable time horizon
 - ▶ Ensure **reproducibility** of results

Data and Safety Monitoring Board [Ellenberg, 2012]

- Review and evaluate accumulated study data for participant safety, study conduct and progress, and, when appropriate, efficacy
- Make recommendations concerning the continuation, modification, or termination of the study
- Review cumulative study data to evaluate safety, study conduct, and scientific validity and integrity of the study
 - ▶ Evidence of study-related adverse events
 - ▶ Evidence of efficacy according to pre-established statistical guidelines
 - ▶ Data quality, completeness and timeliness
 - ▶ Performance of individual centers
 - ▶ Adequacy of compliance with goals for recruitment and retention
 - ▶ Adherence to the study protocol
 - ▶ Factors that might affect confidentiality of the study data
 - ▶ External factors that may impact participant safety or study ethics

2. You analyze the data from a laboratory experiment, which has negative (null) results. The researcher informs you that some of the data were incorrect. Upon reanalysis, the results are positive. How do you ascertain which data were correct?

Best practices for reporting

- Determine authorship in advance based on established criteria
 - ▶ Substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data
 - ▶ Drafting the article or revising it for important intellectual content
 - ▶ Final approval of the version to be published
- Avoid honorary authorship
- Avoid trivial or duplicate publications
- Properly cite previous literature and statistical methods, software
- Methods section should be sufficiently detailed
- Provide access to study data and analysis code

- **Goal:** Tie specific instructions to data analysis and experimental data so that scholarship can be recreated, better understood, and verified
- **Tool:** `knitr` extension package to R
 - ▶ General-purpose tool for embedding R code with which to analyze data within the text of an analysis report
 - ▶ Extracts R code in the input document (e.g., `.Rnw`), evaluates it, and writes the results to the output document (e.g., `.tex`)
 - ▶ Data analysis and report generation is integrated and automated
 - ▶ No need to manually copy and paste anything; avoids errors
 - ▶ If the source data are changed, then you simply run the process again, and all results can be updated; saves time
 - ▶ R source code can be displayed in the typeset document, or extracted to an external R file, so that others can verify the analysis you produced
 - ▶ cran.r-project.org/web/packages/knitr/index.html



Ellenberg SS. Protecting clinical trial participants and protecting data integrity: Are we meeting the challenges? PLoS Med 2012; 9(6):e1001234.

Steneck NH. Introduction to the Responsible Conduct of Research.
ori.dhhs.gov/education/products/RCRintro/