How to Write a Research Paper

BASE TERMINOLOGY

Methodology - the study of the methods involved in some field, endeavor, or in problem solving
Method - a (systematic ?) codified series of steps taken to complete a certain task or to reach a certain objective
Methodology is defined as:
In recent years methodology has been increasingly used as a pretentious substitute for method in scientific and technical contexts
Methodology is defined as: "the analysis of the principles of methods, rules, and postulates employed by a discipline"; "the systematic study of methods that are, can be, or have been applied within a discipline"; or "a particular procedure or set of procedures."
• a collection of theories, concepts or ideas • comparative study of different approaches
• critique of the individual methods
Methodology refers to more than a simple set of methods; it refers to the rationale and the philosophical assumptions that underlie a particular study.

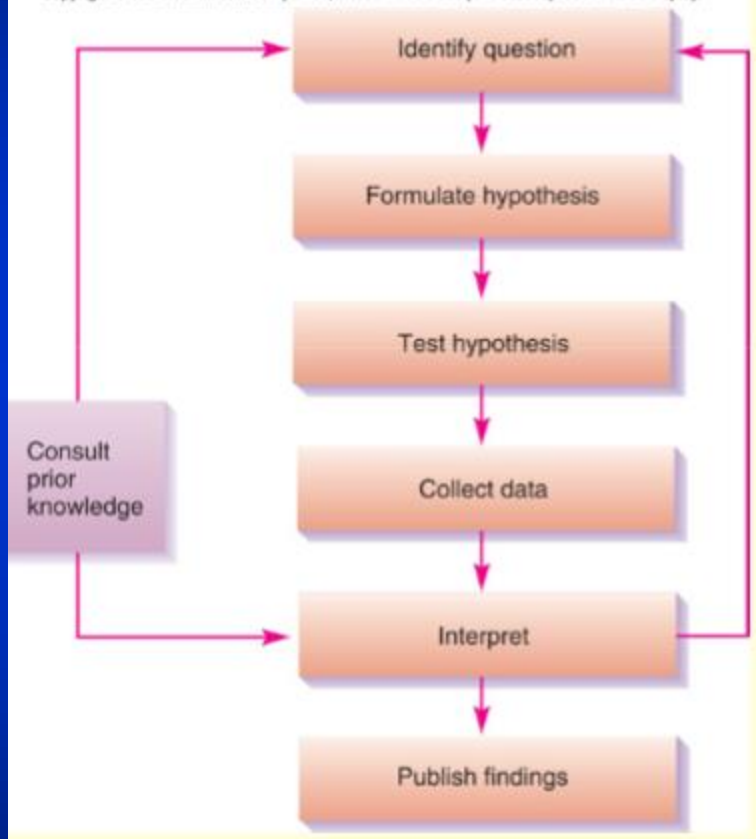
Classical phases

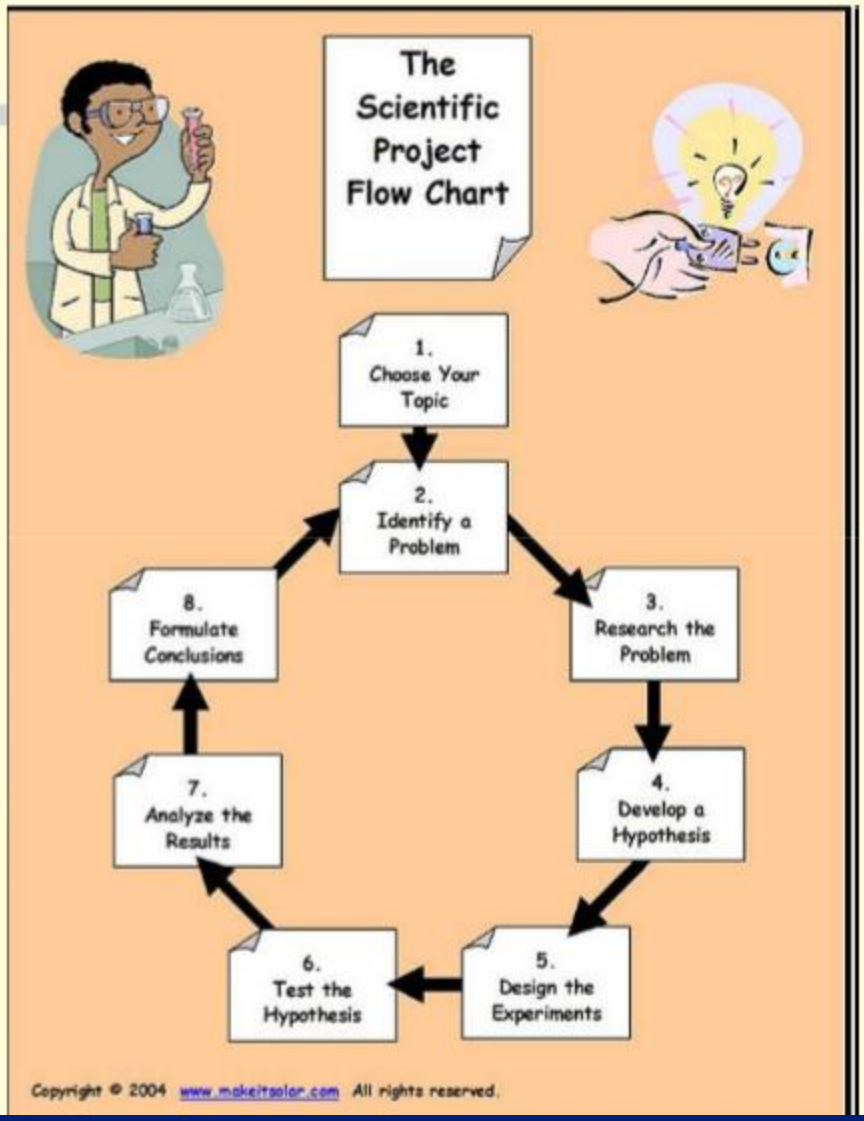
Other variants

1. Define the question
2. Gather information and resources (observe)
3. Form hypothesis
4. Perform experiment and collect data
5. Analyze data
6. Interpret data and draw conclusions that serve as a starting point for new hypothesis
7. Publish results
8. Retest (frequently done by other scientists)

[Wikipedia]

Other variants





Why do you need to learn how to write a research paper?

- Because in high school and college you will be asked to write ***many*** research papers, and you need to learn what goes into writing a successful paper.
- This PowerPoint presentation will give you step-by-step directions on how most high school and college teachers/professors expect you to write a basic research paper.

Learning Targets:

- ✓You will learn how to **choose a topic.**
  - ✓ **Depends on the length of your paper, choose a narrower topic for a short paper, and a broader topic for a longer paper.**
- ✓You will learn how to write a **thesis statement.**
  - ✓ **One sentence that summarizes what your paper is about, or what you are trying to prove. (Last sentence of your introduction)**
- ✓You will learn how to explain the differences between a primary and secondary source.
- ✓You will be able to understand the difference between plagiarism and acceptable paraphrasing.
- ✓You will be able to learn how to edit your paper, and make necessary changes.
- ✓You will learn how to use "parenthetical notations."

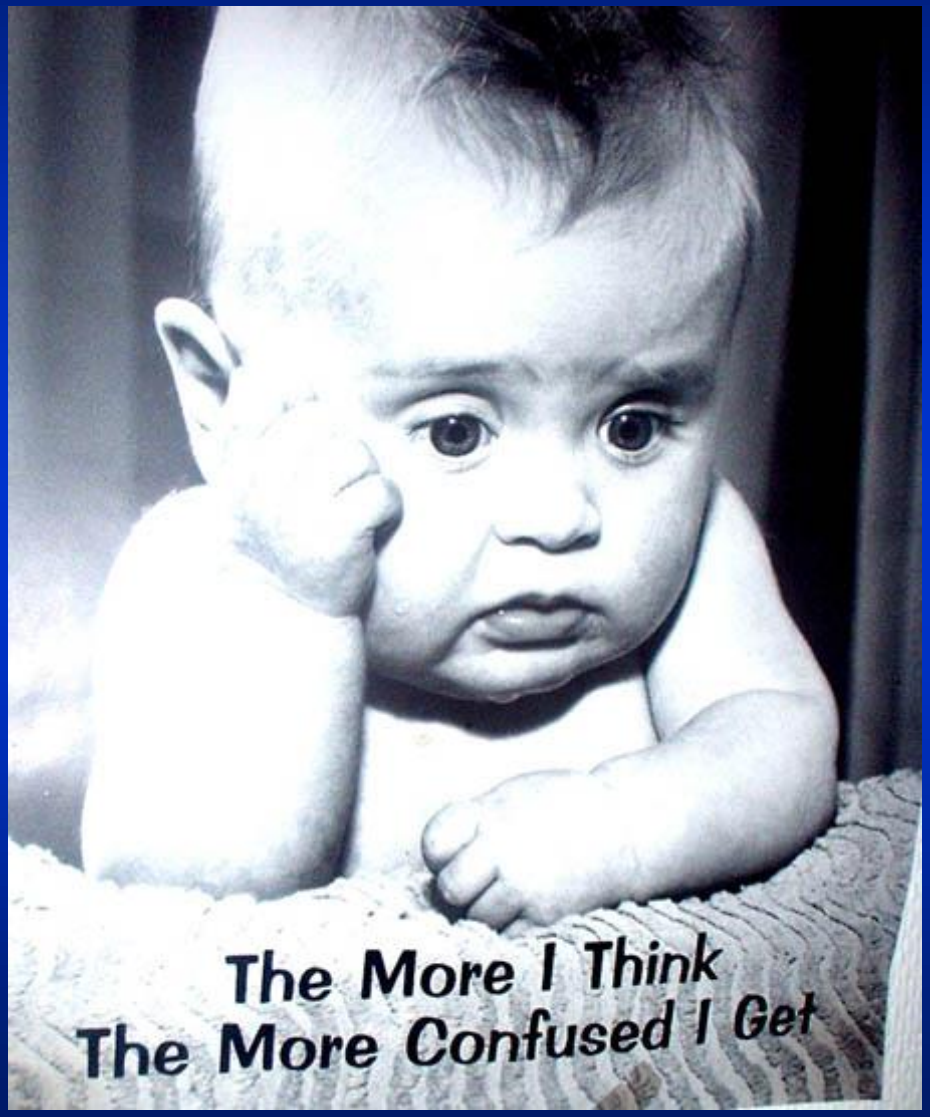
☞*Step-by-step instructions on how to write a research paper*

- ☞The topic
- ☞The thesis or introductory statement
- ☞The outline
- ☞Selecting and analyzing sources & selecting websites
- ☞Compiling information on index cards or in Microsoft Word
- ☞Plagiarizing, paraphrasing, and direct quoting
- ☞Bibliography & the proper format
- ☞Proofreading & the cover page
- ☞Rubric

You should also have:

1. A note-taking handout. As we go through the assignment, take notes, or write down any questions you have
2. A sample outline
3. Examples of plagiarizing v. paraphrasing

Where Do We Begin?



Overview:

Requirements *(What you need for your paper)* √

Topic Questions *(What you need to put into your paper)* √

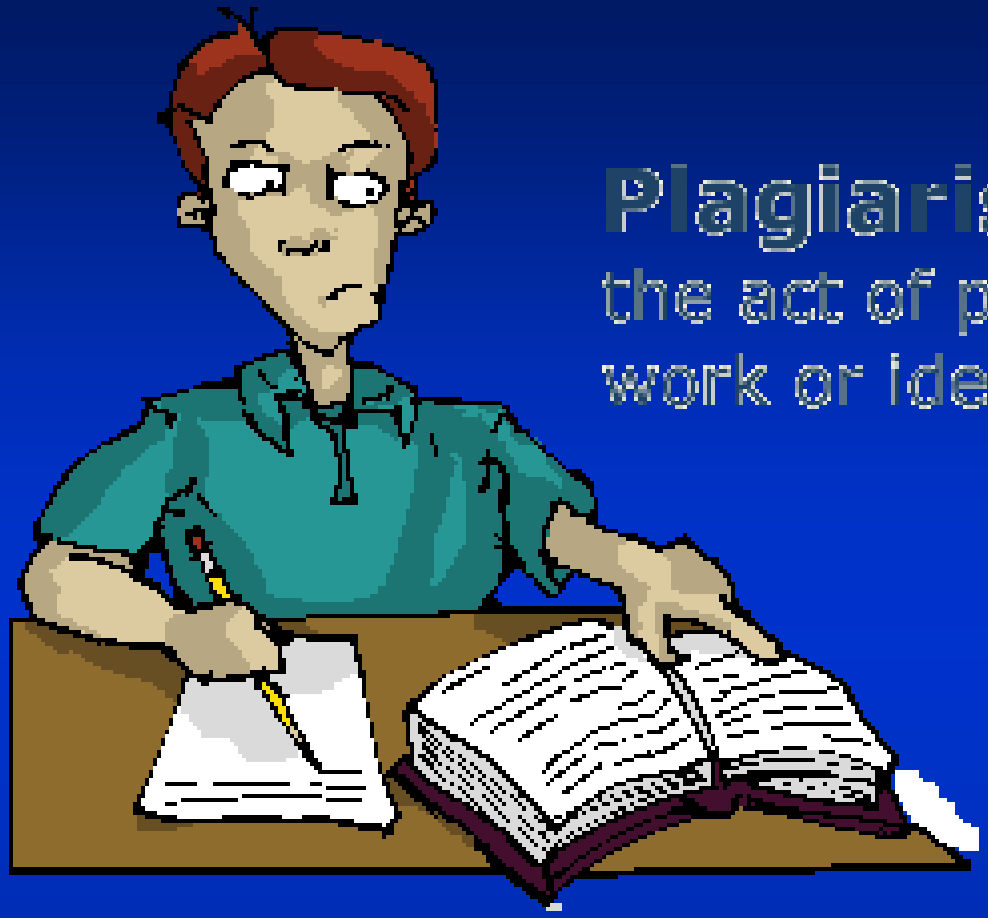
Choices *(The disasters you will research)* √

How to write your research paper: Follow these instructions step-by-step!

1. **Your outline should be written before you start your paper. It organizes your thoughts and creates a plan so you know how your paper will look.**
2. **Your introduction or thesis statement tells the audience what you will explain in your paper. It will let the audience know what to expect from reading your paper.**
3. **You are required to use a *minimum* of three sources. You must have *at least* one book , one website, and one encyclopedia *(online or book format)* *No wikipedia.org; mtv.com; or youtube.com unless by permission of Mrs. Nuzzo**

As you research the answers to the topic questions you can use the information two ways:

1. If it is from a non-computer source, you can use index cards to copy the information needed, or can type the information on a documents in Microsoft Word.
2. Make sure you have a heading on the index card or word document so you know the topic or question you are answering with this information
3. Always **SAVE** any information you type into Microsoft Word! Make sure you save it to your number…NOT to the computer you are working on. **SAVE** information frequently!!!



Plagiarism:
the act of presenting another's work or ideas as your own.

Paraphrase!!!

Plagiarism v. Paraphrasing Samples

Direct quote from research:

"Japan's beautiful Mount Fuji last erupted in 1707 and is now classified as dormant. Dormant volcanoes show no signs of activity, but they may erupt in the future."

Non-plagiarized paraphrase:

Mount Fuji, the highest mountain in Japan, is actually a dormant volcano. Dormant means that it is not active. The last time Mount Fuji erupted was in 1707, and there is always the possibility of a future eruption.

Direct quote from research:

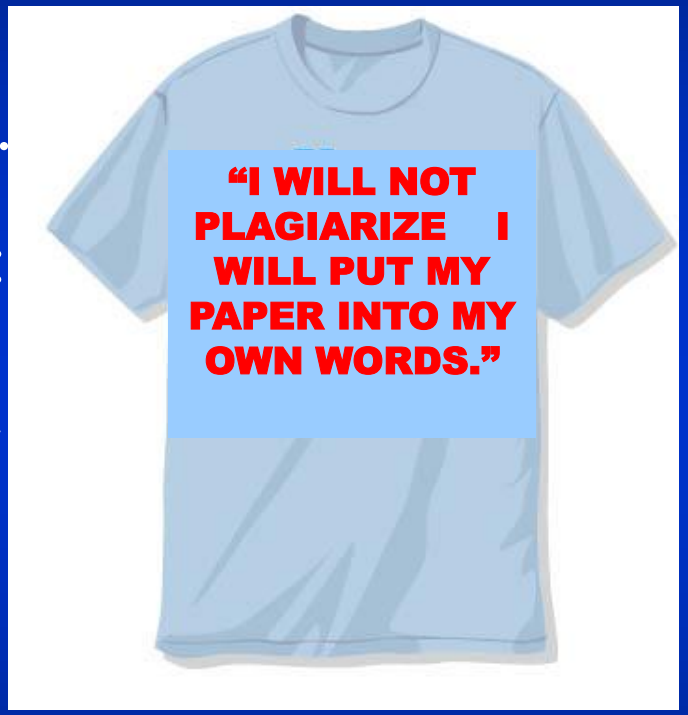
"Three weeks after Katrina, warnings of the arrival of Hurricane Rita sent residents of cities such as Houston, Texas, rushing to evacuate, fearing for their lives. Fortunately, Hurricane Rita turned out to be much less severe than Katrina. However, mass evacuations like this bring hazards of their own, as panicking drivers may cause accidents on the jammed roads."

Non-plagiarized paraphrase:

Shortly after Hurricane Katrina devastated the city of Houston, Texas, a warning for a new hurricane named Rita was broadcast, which caused many people to panic and flee the city. However, the mass departure of people leaving Houston at the same time could have caused many car accidents, even though the hurricane turned out to be not as dangerous as Katrina.

"How do I *QUOTE* an author?"

- If you quote an author, insert "quotation marks" around the text you are using.
- At the end of the quotation, ***parenthetical notations*** are needed.
- Simply write the quote and then put the author's name and page number:
- **(Williamson, 148)**
- You will cite the entire source when you get to the bibliography page of your paper.



Bibliography or Works Cited Page

1. At the end of your paper you will include a bibliography or works cited page.
2. This gives the authors of your sources credit for their work.
3. In your packet you will find sample bibliography entries for various sources.
4. If you have any questions you can refer to: **http://www.aresearchguide.com/12biblio.html** or the information in the packet.
5. Sources should be in alphabetical order and double spaced.
6. You can also use the following website to input your source information for your bibliography or works cited page: **www.noodletools.com/quickcite/**

Works Cited

"Battery." *Encyclopedia Britannica*. 1990.

"Best Batteries." *Consumer Reports Magazine* 32 Dec. 1994: 71-72.

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Brain, Marshall. "How Batteries Work." *howstuffworks*. 1 Aug. 2006 <http://home.howstuffworks.com/battery.htm>.

"Cells and Batteries." *The DK Science Encyclopedia*. 1993.

Dell, R. M., and D. A. J. Rand. *Understanding Batteries*. Cambridge, UK: The Royal Society of Chemistry, 2001.

"Learning Center." *Energizer*. Eveready Battery Company, Inc. 1 Aug. 2006 <http://www.energizer.com/learning/default.asp>.

"Learning Centre." *Duracell*. The Gillette Company. 31 July 2006 <http://www.duracell.com/au/main/pages/learning-centre-what-is-a-battery.asp>.

Proofread, Proofread, & Proofread!!!

1. Are all words spelled correctly? (Use a paper or online dictionary is unsure!)
2. Did I capitalize the beginning of each sentence and all proper nouns?
3. Did I punctuate correctly?
4. Do I use grammar correctly?
5. Did I answer all of the topic questions, and fulfill all of the requirements on my rubric.
6. Did I include an introduction and conclusion?
7. Did I type the paper using the correct font type, size, line spacing and margin requirements?
8. Did I paraphrase all content?
9. Did I use parenthetical notations for quotes?
10. Do my sentences make sense when read aloud?
11. Have I had my paper peer edited?
12. Does my paper flow well?
13. Did I include a bibliography page?

Parts of a Manuscript

- Introduction
  - Identifies the problem
- Background/Literature Review
  - Identifies what's known and what's not known
- Methods
  - Identifies the who, when, how
- Results
  - Identifies the what (found)
- Discussion
- Conclusion

Functions of Discussion Section

- Gives meaning to the results, the “why”
- Places results in context of theory or conceptual framework
- Places results in context of previous research
- Assesses importance of findings
- Acknowledges limitations of methods
- Identifies new areas for exploration and/or ‘next steps’

Discussion vs Results

- Results are the facts of the findings, unedited and unqualified
- Results are the presentation of the hard data (statistics, tables, figures)
- Discussion is about what the results mean
- Discussion is about the implications of the findings

Discussion vs Background

- Discussion is not the place to bury other important and relevant literature
- Doing so may lead to over-inflating importance of current findings
- Sometimes it's simply a matter of time sequence
- Discussion is about how the findings fit into the body of literature appropriately introduced in the Background

Something Old vs Something New

BUT, there is a subtle distinction between new literature on theoretical context and new literature with similar objective findings

Rigid Formula vs Positing New Ideas

"The 'discussion' should always refer back to the original conceptual framework and not introduce new ones (e.g., Zajonc's mere exposure hypothesis and Sutherland's theory of differential association). This diverts attention from the original purpose of the study and the actual answers to study questions..."

--Anonymous Reviewer

Principal Findings

- Emphasis on “discussion”
- Summarize major findings
- Do not simply reiterate results
- Shift from numeric data to descriptive words
- Do not introduce additional or new results

Structure of Discussion

- Principal findings
- Interpretation of findings
- Interpretation in context of literature
- Implications
- Limitations
- Summary

Interpretation

- What do the findings/results mean?
- Are the findings consistent with previous research or do they counter previous findings?
- Posit why this might be, particularly if your findings differ from others
- Do not restate content from Background
- Focus on points of comparison that bear on findings

Implications

- How the results might be generalized
- Often implications mean clinical implications
- May have other implications (e.g., methodological)
- New things to consider as result of findings

Some view the Discussion as the most important section because it is where we **explain** the results and their **meaning**, particularly for clinical practice

Limitations

- Be thoughtful and reasonable
- Don’t beat yourself up
- Acknowledge issues of scientific concern
- Don’t trash the validity of your study

Goal is to preempt the reviewer’s criticism and to demonstrate your knowledge of the limitations and understanding of practical limits and judgment calls in research.

Summary

The Summary of the Discussion section may be the Conclusion

Summary: summarizes the findings/conclusion

Conclusion: ultimate take-away message

Conclusion

- Succinctly summarize implications of findings as previously discussed
- Don’t make sweeping statements or conclusions that reach beyond your data
- Present the bottom line message, point, value of the described study
- Tell the reader what they should take away

How Many Points to One Paper?

"Your manuscript is not only too long for the 'Methodology Corner,' it is too long for a regular article. At the same time, you now have 'neither fish nor fowl.' The merits of the combined methodologies are lost in prolonged discussion of the strengths and weaknesses of each method and in the long account of the study. On the other hand, the study is devoid of a context of its own." --Journal Editor

Surprise Ending

"I am still interested in the article, but my sense is that you should report your study in full, separately, and not muddy the waters." --Journal Editor

Journal Guidelines re: Discussion

- "Findings interpreted in the context of other research, conceptual frameworks, or design." *Nursing Research*
- "Base the discussion only on the reported results. Describe any further study needed." *Western Journal of Nursing Research*
- "Report the results of the study. Discuss the significance of the findings, interpret the results and conclusions." *The Journal of Nutrition*
- "The Discussion should explain the significance of the results and place them into a broader context. It should not be redundant with the Results section. This section may contain subheadings and can in some cases be combined with the Results section." *Cell*

Journal Guidelines re: Discussion

- "The discussion section (not to exceed 1,500 words including citations) should be as concise as possible and should include a brief statement of the principal findings, a discussion of the validity of the observations, a discussion of the findings in light of other published work dealing with the same or closely related subjects, and a statement of the possible significance of the work. Extensive discussion of the literature is discouraged." *The Journal of Neuroscience*

Journal Guidelines re: Discussion

- “This section should not contain paragraphs dealing with topics that are beyond the scope of the study. Four manuscript pages should in general be enough to compare and interpret the data with regard to previous work by yourself and others.” *Cardiovascular Research*

- “The discussion should set the results in context and set forth the major conclusions of the authors. Information from the Introduction or Results section should not be repeated unless necessary for clarity. The authors' speculations concerning the possible implications of the findings may be presented in this section but should be clearly separated from the direct inferences.” *Translational Research, The Journal of Laboratory and Clinical Medicine*

The STROBE Statement

(Strengthening the Reporting of Observational Studies in Epidemiology)

- Scope intended to cover 3 main study designs: cohort, case-control and cross-sectional

- 22 item checklist (18 common across designs, 4 with specifics to each design)

--Elm, E., et al. for the STROBE Initiative (2007) *Preventive Medicine, 45*, 247-251

STROBE Items for Discussion Section

- #18: Summarise key results with reference to study objectives.
- #19: Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.
- #20: Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.
- #21: Discuss the generalisability (external validity) of the study results.

ICMJE Guidelines for Discussion

"Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or the Results section. For experimental studies it is useful to begin the discussion by summarizing briefly the main findings, then explore possible mechanisms or explanations for these findings, compare and contrast the results with other relevant studies, state the limitations of the study, and explore the implications of the findings for future research and for clinical practice." -- Uniform Requirements for Manuscripts Submitted to Biomedical Journals

ICMJE Guidelines for Discussion (cont.)

"Link the conclusions with the goals of the study but avoid unqualified statements and conclusions not adequately supported by the data. In particular, authors should avoid making statements on economic benefits and costs unless their manuscript includes the appropriate economic data and analyses. Avoid claiming priority and alluding to work that has not been completed. State new hypotheses when warranted, but clearly label them as such." -- Uniform Requirements for Manuscripts Submitted to Biomedical Journals

Bottom Line

The Discussion should answer the two deadly questions facing all research:

So What?

Who Cares?

Key Lecture Concepts

- Understanding the process described as “the scientific method”
- The role of a hypothesis in a research study
- Strategies underlying hypothesis formulation
- The manner to frame your statement of a hypothesis

Research is …….

- Knowledge acquisition gained
  - through reasoning
  - through intuition
  - but most importantly through the use of appropriate methods

The Scientific Method

Basic Elements of the Scientific Method

- Empiricism: the notion that enquiry is conducted through observation and knowledge verified through evidence
- Determinism: the notion that events occur according to regular laws and causes. The goal of research is to discover these
- Scepticism: the notion that any proposition is open to analysis and critique

Scientific Method

1. Choose a question to investigate
2. Identify a hypothesis related to the question
3. Make testable predictions in the hypothesis
4. Design an experiment to answer hypothesis question
5. Collect data in experiment
6. Determine results and assess their validity
7. Determine if results support or refute your hypothesis

The Scientific Method

1. Suspicion that a factor (exposure) may influence occurrence of disease or a noted health outcome

   - Observations in clinical practice
   - Examination of disease/outcome patterns
     - Do subpopulations have higher or lower rates?
     - Are disease rates increased in the presence of certain factors?
   - Observations in laboratory research
   - Theoretical speculation

The Scientific Method

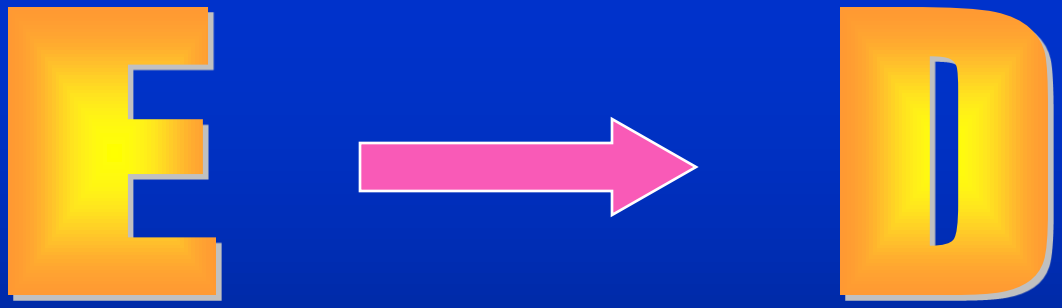
2. Identify variables you are interested in:
   - Exposure - (risk factor, protective factor, predictor variable, treatment)
   - Outcome - (disease, event)

3. Formulate a specific hypothesis
   - Frame a hypothesis which seeks to answer a specific question about the relationship between an exposure and an outcome

Basic Question in Research

Are exposure and disease/outcome linked?

Is there an association between them?



Exposure

Disease / Health Outcome

Next Step: Design Study

- Study Designs …(not exhaustive)
  - Case series
  - Cross-sectional
  - Case-control
  - Cohort
  - Randomized controlled clinical trial

Association

- From the results of your study, does a statistical relationship exist between two or more events, characteristics, or other variables

- Is there a statistical relationship, or association, between exposure and disease/outcome?

Statistical Association

The degree to which the rate of disease or outcome in persons with a specific exposure is either higher or lower than the rate of disease or outcome among those without that exposure.

The Scientific Method

Assess validity of association

- Does the observed association really exist?
  - Is the association valid?
  - Are there alternative explanations for the association?
    - Chance
    - Bias
    - Confounding

Hypotheses

Shape and guide a research study in terms of:

- identification of study sample size
- what issues should be involved in data collection
- the proper analysis of the data
- data interpretation

Hypothesis Formulation

--- **Formulate a hypothesis**

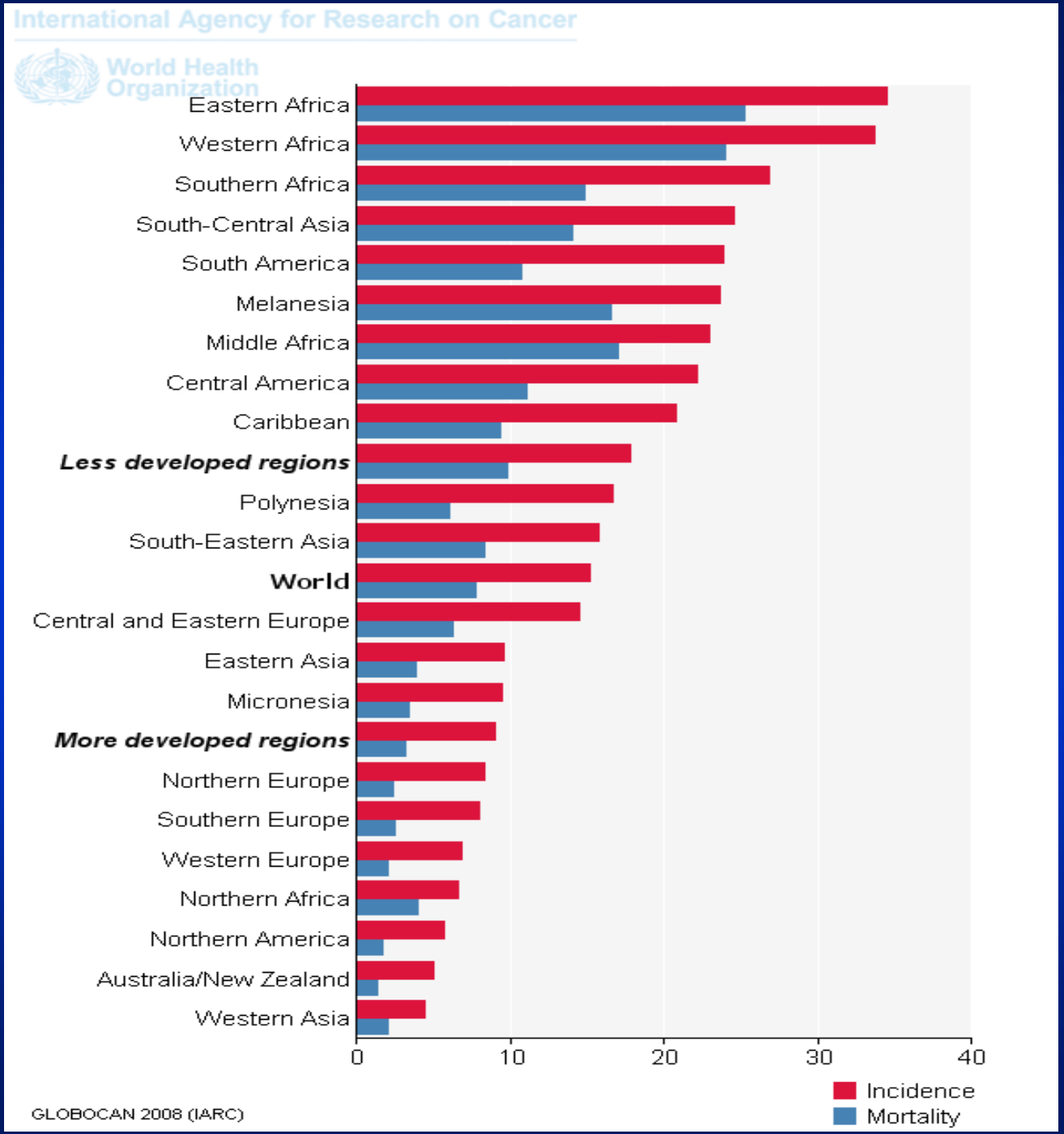
--- **Frame the hypothesis in a format that is testable**

--- **Test the hypothesis**

Hypothesis Formulation

- Observations from:
  - Literature (review PubMed on topic area)
  - Natural experiments (e.g. migrant studies)
  - Multi-national comparisons
  - Descriptive studies (assessment of person, place, and time characteristics)
  - Creativity

Cervical Cancer



- Infectious and chronic diseases show great variation from one country to another.

- Some differences may be attributed to:

  --- Climate
  --- Cultural factors
  --- Diet
  --- Genetics

Descriptive Study Designs

Used to help formulate hypotheses

Case Series Approach

- Identify the experience of a group of patients with a similar diagnosis, or
- Identify the experience of a group of individuals with an exposure in common

  – Patients or individuals may be identified from a single or multiple sources

Population Survey Approach

- Describe issues related to disease or exposure in populations
- Usually rely upon routinely collected data from established surveillance or notifiable disease systems

Unique Component: usually identify the characteristics of an issue from a representative sample of the population

Three essential characteristics that we look to measure in descriptive studies are...

- Person
- Place
- Time

Person

Since disease not does occur at random:

What kinds of people tend to develop a particular disease, and who tends to be spared? What's unusual about those people?

Person Factors

- Age, gender, race, ethnicity
- Genetic predisposition
- Concurrent disease
- Diet, exercise, smoking
- Risk taking behavior
- SES, education, occupation

Place

Since disease not does occur at random:

Where is the disease especially common or rare, and what is different about those places?

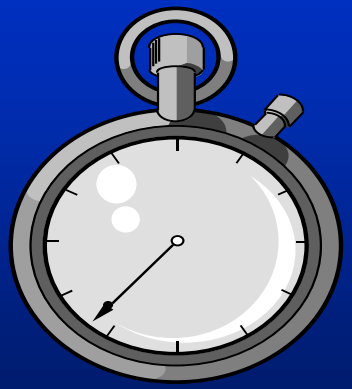
Place Factors

- Geographic place
  - residence
  - occupation
  - climate
  - geology
  - population density
  - economic development
  - nutritional practices
  - medical practices

Time

Since disease not does occur at random:

How does disease frequency change over time, and what other factors are temporally associated with those changes?



Time Factors

- Calendar Time / Time of Day
- Time since an event
- Date of onset
- Age (time since birth in the young)
- Seasonality
- Temporal trends

Remember the Elements of the Scientific Method

Discoveries or hypotheses are sometimes resisted because they seem counter-intuitive

Hypothesis Framing

Traditionally…..

H_0: "Null" hypothesis (assumed)
H_1: "Alternative" hypothesis

Case Series (in practice)

- Description of clinical/epidemiologic characteristics of a number of patients with a given disease
  - usually a consecutive set of clinical cases of disease (or health issue)

- Analyze cases together to learn about the disease (be careful as results do not demonstrate temporal relationships)

Hypothesis Framing

H_0: There is no association between the exposure and disease of interest

H_1: There is an association between the exposure and disease of interest (beyond what might be expected from random error alone)

Hypothesis Framing

Another Type of Framing:

What is the best estimate of the risk of disease in those who are exposed compared to those who are unexposed (i.e. exposed are at XX times higher risk of disease).

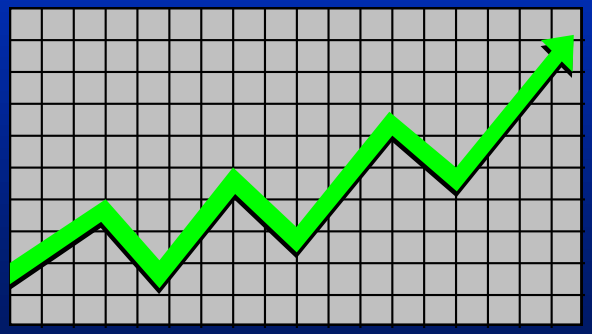
This moves away from the simple dichotomy of yes or no for an exposure/disease association – to the estimated magnitude of effect irrespective of whether it differs from the null hypothesis.

Hypothesis Framing

Ways to Express Hypotheses:

1. Suggest possible events…

The rate of survival will increase after surgery.



Hypothesis Framing

Ways to Express Hypotheses:

2. Suggest relationship between specific exposure and health-related event…

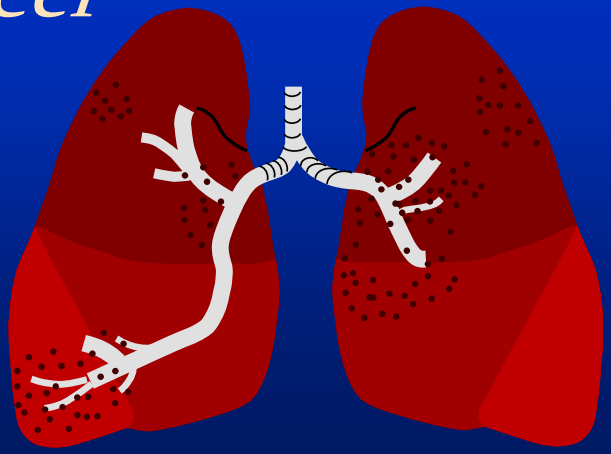
   A high cholesterol intake is associated with the development (risk) of coronary heart disease.

Hypothesis Framing

Ways to Express Hypotheses:

3. Suggest cause-effect relationship….

Cigarette smoking is a cause of lung cancer



Hypothesis Framing

Ways to Express Hypotheses:

4. "One-sided" vs. "Two-sided"

One-sided example:

Helicobacter pylori infection is associated with increased risk of stomach ulcer

Two-sided example:

Weight-lifting is associated with risk of lower back injury

Hypothesis Framing

Guidelines for Framing Hypotheses:

1. State the exposure to be measured as specifically as possible.
2. State the health outcome as specifically as possible.

Strive to explain the smallest amount of ignorance

Hypothesis Framing

Example Hypotheses:

POOR

Eating junk food is associated with the development of cancer.

GOOD

The human papilloma virus (HPV) subtype 16 is associated with the development of cervical cancer.

The Next Step

- Formally test the identified hypotheses in a research study
  - The study should follow a specific plan or protocol (the study design)
  - Study designs direct how the investigation is conducted and allows for the translation of a conceptual hypothesis into an operational one

Finished!!! You did it!!!