MOVING BEYOND THE SEARCH ENGINE FOR RESEARCH

Studies, Statistics and Other Scary Stuff Simplified

Let's start with understanding why we do research studies. The answer can depend on who you ask, but it could include contributing knowledge to the field of interest, a rewarding experience, curiosity, making improvements in health, funding, or recognition - it can add credibility to one's education or career to be published in a journal.

Who does the research? This is historically where an epidemiologist would come into play, but you don't need to be one to understand and care about data. However, it does help to understand what epidemiologists do and when it can be helpful to work with one. So what does the word 'epidemiology' really mean? It comes from Greek words where: Epi (upon) demo (people) ology (study of).

The definition reads: the branch of medicine that deals with the incidence, distribution, and possible control of diseases and other factors relating to health at the population level.
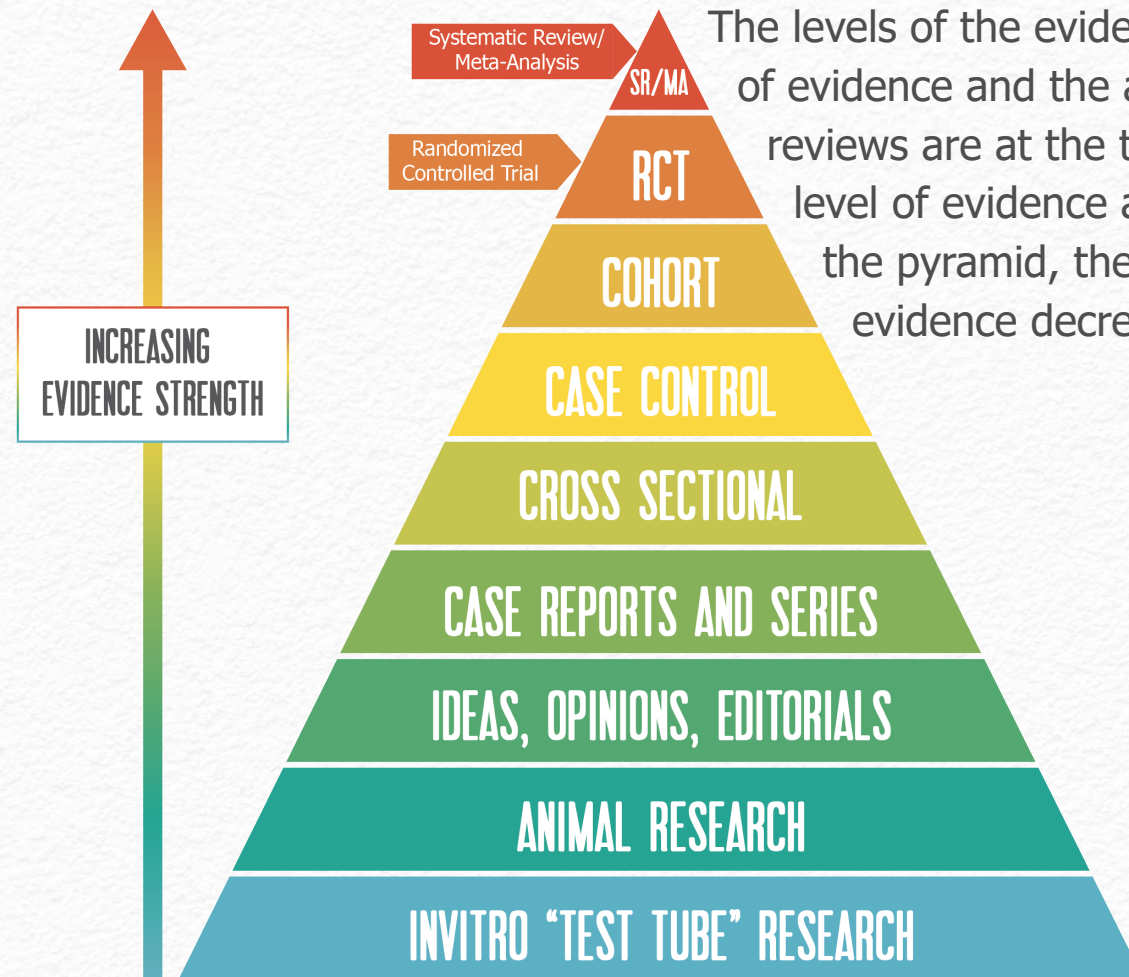
Also, a common misconception is that all epidemiologists work with infectious diseases, but that's only one area of focus. Other areas where epidemiologists work include injury, bioterrorism, emergency response, chronic disease, environmental, substance abuse, or oral health. Epidemiologists can plan and direct research, collect and analyze data, communicate findings through papers or presentations, and also manage healthcare programs. The foundation starts with data, which is necessary to tell the story of what is happening in your community.

Let's dive into the nuts and bolts of research before taking a look at when you might want to work with an epidemiologist.

TYPES OF STUDY DESIGNS

INCREASING
EVIDENCE STRENGTH

Systematic Review/
Meta-Analysis

SR/MA

Randomized
Controlled Trial

RCT

COHORT

CASE CONTROL

CROSS SECTIONAL

CASE REPORTS AND SERIES

IDEAS, OPINIONS, EDITORIALS

ANIMAL RESEARCH

INVITRO "TEST TUBE" RESEARCH

Adaption of the Evidence Pyramid Diagram developed by the Medical Research Library of Brooklyn, SUNY Downstate Medical Center.

Credit: Univ of New Hampshire/SUNY Downstate

The levels of the evidence pyramid provides a way to visualize both the quality of evidence and the amount of evidence available. For example, systematic reviews are at the top of the pyramid, meaning they are both the highest level of evidence and the least common. As you move towards the base of the pyramid, the amount of evidence will increase as the quality of the evidence decreases.

Let's take a look at the levels:
- Test-Tube Research
- Animal Research
- Ideas, Editorials, Opinions
- Case Reports and Series
- Cross-Sectional: looks at data from a population in a specific point in time
- Case-Control: compares people with a disease
- Cohort: also called epidemiological studies, they follow large groups of people over a period of time to see how exposure affects outcomes
- Randomized Controlled Trial: usually two groups, one receives the intervention or medication and the other does not or receives a placebo
- Systematic Review/Meta-Analysis

GOOD VS. BAD RESEARCH

How do we know what is considered good research or bad research? Think about a time when you read a news story or article about "study finds coffee slows aging" or "an apple a day keeps the doctor away." So the second example may just be an old adage, but think about the background of the study that's not shared in the news story – where is the reference? What is the study? Who performed the study? These are critical aspects to knowing if a study is worth your time to dig deeper into it.

Look for peer-reviewed studies. This means that the study and results are reviewed or evaluated by others within the same field. Typically, a researcher submits their manuscript to a journal, who then sends the manuscript, usually anonymously without the authors name on it, to several other individuals to review. The individual reviewers either accept or reject it, or suggest revisions or edits. The reviewed manuscript is then sent back to the journal to be shared with the author. However, be aware of online journals that charge a fee – there is a strong likelihood that they are simply trying to make money and don't care if the research is truly credible.

HOW TO SPOT FAKE NEWS

CONSIDER THE SOURCE
Click away from the story to investigate the site, its mission and its contact info.

READ BEYOND
Headlines can be outrageous in an effort to get clicks. What's the whole story?

CHECK THE AUTHOR
Do a quick search on the author. Are they credible? Are they real?

SUPPORTING SOURCES?
Click on those links. Determine if the info given actually supports the story.

CHECK THE DATE
Reposting old news stories doesn't mean they're relevant to current events.

IS IT A JOKE?
If it is too outlandish, it might be satire. Research the site and author to be sure.

CHECK YOUR BIASES
Consider if your own beliefs could affect your judgement.

ASK THE EXPERTS
Ask a librarian, or consult a fact-checking site.

STATISTICS

Statistics can be an intimidating topic for most, but it doesn't have to be. Even the simplest of statistical analyses can provide insights and spark actionable change in the world of health.

TERMINOLOGY 101

Variables: Refers to a factor or condition. There are independent, dependent, and controlled variables. Example of an independent variable is injury or no injury, and the dependent variables are things like age, gender, fitness level, or other health factors.

Rates: When an event occurs within a defined population in a defined time, such as death rate.

Incidence: The number of new cases or events out of the total number of people at risk. For example, this might be reported incidents for flu.

Prevalence: The number of people with the disease at a given time out of the total number of people at risk; this looks at the burden of a disease.

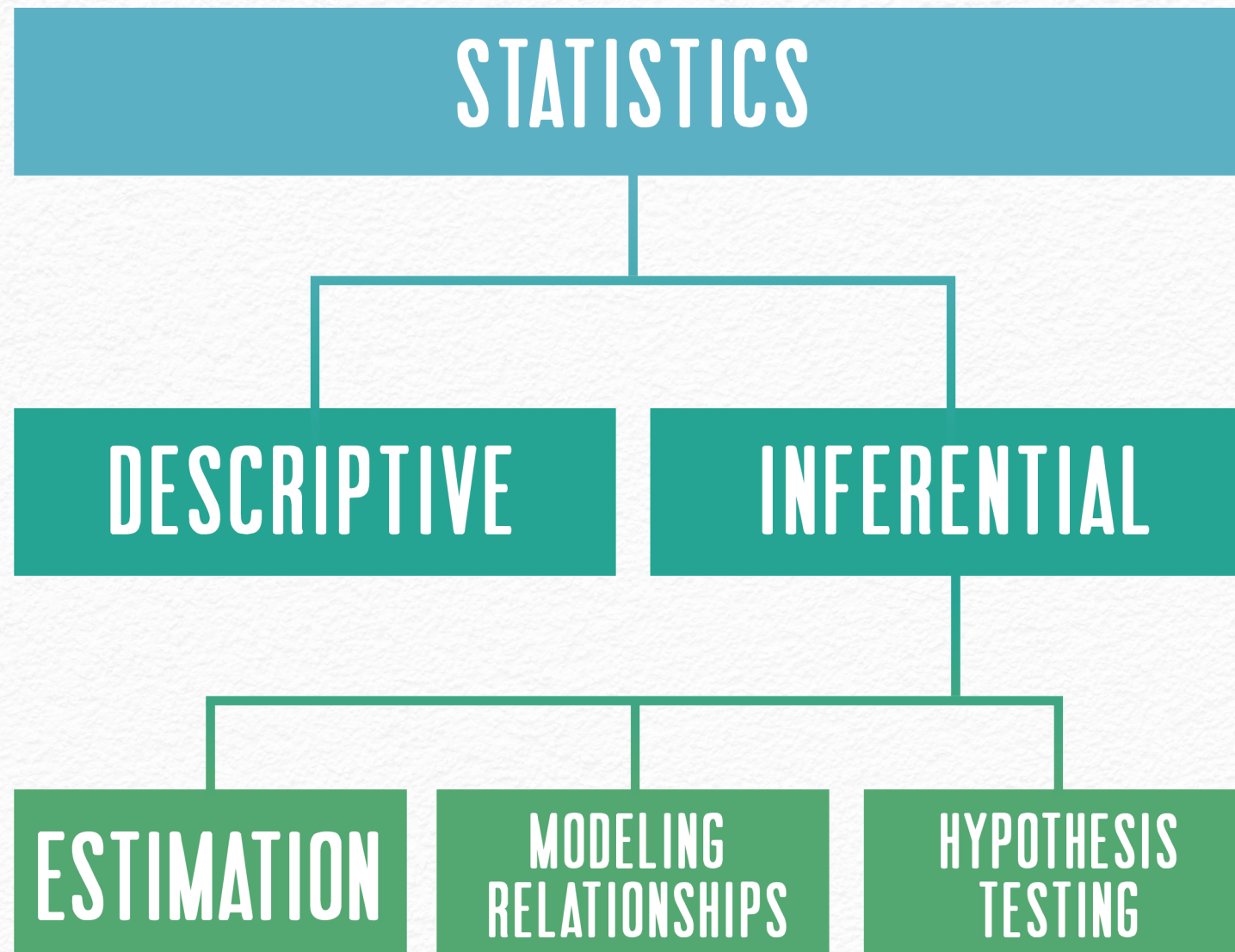*Qualitative data:* Names or labels, such as dog, cat or bird.

Quantitative data: Numeric variables.

WHAT IS STATISTICS?

STATISTICS

DESCRIPTIVE

INFERENTIAL

ESTIMATION

MODELING RELATIONSHIPS

HYPOTHESIS TESTING

Statistics is defined as a branch of mathematics dealing with the collection, analysis, interpretation, presentation and organization of data. To maintain brevity, there are two primary types of statistics, descriptive and inferential. Descriptive statistics is a simple summary of the data, while inferential statistics is the relationship among variables. If you are interested in diving deeper into statistics, there are several websites that provide courses in several concepts of statistics.

Free Learning Resources
Khan Academy | CDC.gov | Coursera

SEARCHING FOR STUDIES

This step might be the most challenging – finding a study worth your time. There are paid and free articles; it's important to keep in mind that paid doesn't necessarily equate to better. Some online search tools to start with include PubMed, Medline, Google Scholar and Research Gate. Sometimes, if you are doing background research, simply reviewing abstracts is enough knowledge to get you started and pointed in the right direction with what you are trying to accomplish. Abstracts provide a preview of the article and are always free.

Here are a few tips to find a study that will match what you're looking for

- Use specific search terms

- Limit to the last 10 years and then expand if needed

- Always start with the abstract

- Remember to check the credibility of the author and journal or source

Components of a Research Paper

- *Abstract:* Quick summary (Usually 250 words)
- *Background/Introduction:* Statement of the problem or issue, and why topic is being written about or researched
- *Methods:* How was the data collected, analyzed, etc. - thorough enough to be reproducible
- *Results:* Just the data, don't discuss or interpret
- *Discussion:* Compare the results to what others have found
- *Limitations:* Identify issues impact study
- *Conclusion:* Wrap it up
- Affiliations, conflicts of interest
- References
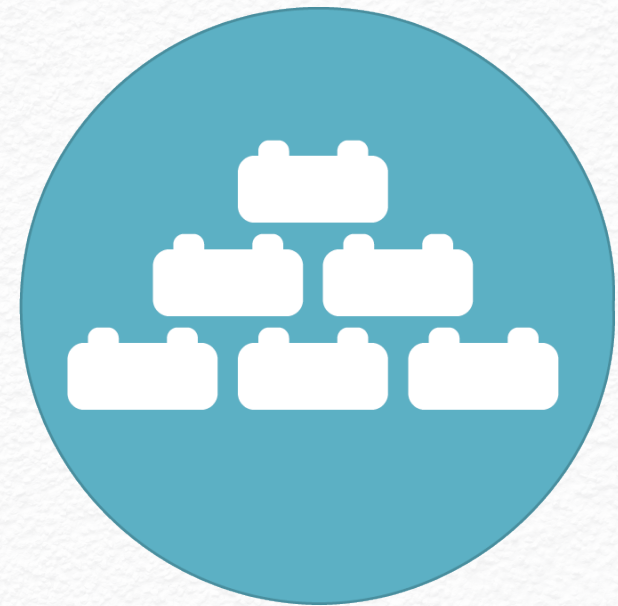
READING & WRITING THE RESEARCH

DID YOU KNOW?

There are very specific rules in the scientific community to who is included in the author list of a paper. Most prominently being that any author listed has to have contributed substantially to the paper, such as data collection, data analysis, and writing or reviewing the paper. Order of the authors matters too - the first author is the main writer of the paper. The order usually follows with who contributed the most to the least, and sometimes the last author listed can be an "honorary" spot for someone like the head of a department.

Steps to Writing a Research Paper

STEP 1: Collect and analyze data, identify co-authors

STEP 2: Develop an outline

STEP 3: Identify a journal to submit to

STEP 4: Write and gather resources

STEP 5: Send to co-authors for review

STEP 6: Submit to journal

STEP 7: Wait for the journal to respond...wait some more. This step can take a while.

STEP 8: Review the journal's reasoning for rejection. Use advice to improve and resubmit

After reading this eBook, you may have a better understanding of the components of research studies, and how to begin searching for and writing a research paper, but you may still be looking for the critical piece of looking at and analyzing the actual data. This is where an epidemiologist plays a key role. By working with an epidemiologist, you can have a better understanding of the data you're collecting and gain insight into the areas you want to make improvements. The groundwork for an epidemiologist is data and research, but there are several phases of work required to produce effective research. There's planning, data collection, analysis and communicating the findings to your audience. Without going through these phases, it's like a paramedic showing up to a scene without an ambulance or equipment—patient care would be severely limited.

> "Things get done *only* if the data we gather can *inform & inspire* those in a position to make a *difference*."
>
> — Michael Schmoker

MORGAN K. ANDERSON, MPH

Morgan Anderson, MPH, joined the ImageTrend team in January 2017. She graduated from the Medical College of Wisconsin in 2011 with a Master's degree in Public Health with an emphasis in epidemiology. Prior to coming to ImageTrend, Morgan spent 5 years with the Army Public Health Center as an Injury Prevention Epidemiologist. In addition to working with clients, she plays a key role in refining ImageTrend's Active Data Monitoring, further expanding the monitors and topical content available for Continuum, and publishing findings for scientific advancement. Her most recent work includes developing the content and managing the data collected for CrewCare, a mental health awareness app for first responders. Morgan has research published in American Journal of Preventative Medicine, The American Journal of Sports Medicine, Public Health, Military Medicine, and others.

IMAGETREND

ImageTrend, Inc. is dedicated to connecting life's most important data in the healthcare and emergency response community. ImageTrend delivers software solutions, data analytics and services for EMS, Fire, hospitals, community paramedicine (CP), critical care, and preparedness to enable fully integrated patient-centric healthcare and public safety. ImageTrend's commitment to innovation, its clients, and providing world-class implementation and support is unsurpassed. Based in Lakeville, Minnesota, ImageTrend combines business analysis, creative design and data driven architecture to offer scalable solutions and strategies for today and the future.

ABOUT COLLABORATE®

Collaborate is a research and analysis program dedicated in providing vital insights into clinical, operational, licensing/credentialing, systems of care registries and public health data for the enhancement of EMS and the healthcare industry.

WORKING WITH IMAGETREND ON RESEARCH

Are there topics you want to see covered or interested in working with the ImageTrend team on future research? Send us an email to get in touch!

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www.ImageTrend.com/**ClinicalResearchServices**

clinicalresearch@imagetrend.com | (888) 469-7789