

# Medical Knowledge and its Limits

Spring 2024

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**Professor:** Ted Poston  
**Email:** ted.poston@ua.edu

**Time:** TR 2:00-3:15pm  
**Place:** Lloyd 307

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## Student Hours

After class, or by appointment.

## Description

Medical knowledge has made great strides over the last 150 years. The 19<sup>th</sup> century development of the germ theory of disease produced the first effective antibiotics and led to significant improvements to sanitation in medical settings. Through the progress of new imaging technology, better tools, and aseptic surgical techniques, surgery became much safer and more effective. Indeed, people began to have great confidence in medical interventions. Yet many claims about the *effectiveness* of medical interventions are not supported by the *evidence*. This course examines the rise of evidence-based medicine and its controversies, including debates about evidential hierarchies, the reliance on less-than-straightforward concepts such as *placebo* and *masking*, and the dismissal of mechanistic reasoning and medical expertise. The course also explores recent arguments from the ubiquity of small effect sizes in medicine, the extent of misleading evidence in medical research, the thin theoretical basis of many interventions, and the malleability of empirical methods to show that medical interventions are generally less effective than we are led to believe. The class will work through Howick's (2011) *The Philosophy of Evidence Based Medicine*, Jacob Stegenga's (2018) *Medical Nihilism*, and Judea Pearl's (2018) *The Book of Why*.

## Required Texts

1. Jeremy Howick, *The Philosophy of Evidence-Based Medicine*.
2. Jacob Stegenga, *Medical Nihilism*.
3. Judea Pearl & Dana Mackenzie, *The Book of Why*
  - this introductory chapter: <https://causalai.net/r60.pdf>
  - there are videos on our youtube channel: <https://www.youtube.com/causalai>

## Assignments

1. Attendance (15%)
  - a. Each day you earn a point for attending. You have two allowed absences for the semester. These are best saved in case of sickness. The attendance calculation will drop the lowest two scores.
2. Reading quizzes (30%)
3. 6 short papers (30%)
  - a. 750 to 1000 words
4. Final paper (25%)
  - a. 2000 to 2500 words

## Grading Standard

The final grades for the class will be calculated with the following ranges: A+=97-100 A=93-96 A-=90-92 B+=87-89 B=83-86 B-=80-82 (and so on...)

**Statement on Academic Misconduct**

Students are expected to be familiar with and adhere to the official Code of Academic Conduct provided in the Online Catalog.

**Statement on Disability Accommodations**

Contact the Office of Disability Services (ODS) as detailed in the Online Catalog.

**Severe Weather Protocol**

Please see the latest Severe Weather Guidelines in the Online Catalog.

**Pregnant Student Accommodations**

Title IX protects against discrimination related to pregnancy or parental status. If you are pregnant and will need accommodations for this class, please review the University's FAQs on the UAct website.

**Religious Observances**

Under the Guidelines for Religious Holiday Observances, students should notify the instructor in writing or via email during the first two weeks of the semester of their intention to be absent from class for religious observance. The instructor will work to provide reasonable opportunity to complete academic responsibilities as long as that does not interfere with the academic integrity of the course. See full guidelines at Religious Holiday Observances Guidelines.

**UAct Statement**

The UAct website provides an overview of The University's expectations regarding respect and civility

## How to write a philosophy paper

Start your paper by stating your goal. Say what you are going to accomplish. Then do it! Here are my grading criteria and some helpful tips.

1. Intelligibility. Can I understand what you're trying to say?
2. Clarity. Is your paper clear? Do you express your points with precision?
3. Understanding. Do you understand the writers and the issues well?
4. Support. Do you support what you say with reasons and arguments?
5. Depth. Do you get at the heart of the issues? Or does your paper show only a superficial understanding?

### *Strunk and White's Rules*

- Use the active voice.
- Put statements in positive form.
- Use definite, specific, concrete language.
- Omit needless words.
- Avoid a succession of loose sentences.
- Keep related words together.
- Write in a way that comes naturally.
- Write with nouns and verbs.
- Revise and rewrite.
- Do not overwrite.
- Do not overstate.
- Avoid fancy words.
- Be clear.
- Do not take shortcuts at the cost of clarity.

### *Pryor's Rules*

- Use simple prose.
- If you wouldn't say it, don't write it.
- Make the structure of your paper obvious.
- Be concise but explain yourself fully.
- Say exactly what you mean.
- Pretend that your reader is lazy, stupid, and mean.
- Use examples and definitions.
- Present and assess the views of others critically, but with understanding.
- Anticipate objections.
- If something in a view you're examining is unclear to you, don't gloss it over. Call attention to the unclarity. Suggest several different ways of understanding the view.

### *Paul's Principles*

- If you are going to evaluate an argument, be sure to formulate the argument as clearly as you can. Don't ever say that an argument is good or bad, valid or invalid, convincing or not, unless you lay it out explicitly.
- Always say precisely what you mean. Reread to make sure that your wording isn't unclear.
- Don't use rhetorical questions.
- Argue for your claims.

- If you don't need to make a contentious claim to make your point, don't make the claim.
- If something you say isn't necessary for proving your point, or helpful in elucidating what you mean, drop it.
- Don't bite off more than you can chew. Given the choices of being broad and shallow or narrow and deep, go for narrow and deep.
- Never say an unkind word about any thinker or that thinker's intentions.
- Be careful of amphiboly: it will invite your critics to poke fun at your expense.
- Do all of the thinking for your reader. Never leave any inference, no matter how obvious, to the (in)capable hands of your reader. The same goes for explaining quotations. Always tell the reader what she should take from the quotation, even if it is obvious to you.
- Use signposts. First tell me what you are going to do. Then tell me that you are doing it. Finally, tell me what you have done.
- Never employ a technical term before defining it unless you are confident that your reader knows exactly what it means from you.
- Proof-read!

## Course Outline

### PART I: THE PHILOSOPHY OF EVIDENCE-BASED MEDICINE

#### A. WHAT IS EVIDENCE-BASED MEDICINE

##### [Lecture 1: The controversy over evidence-based medicine](#)

Thursday, January 11

Reading

1. Howick Ch 1 pp. 3–9; Stegenga Ch 1 pp. 1–19

##### [Lecture 2: EBM & good evidence for clinical decisions](#)

Thursday, January 18

Reading

1. Howick Ch 2 & 3 pp. 10–30

Background reading:

1. “[Evidence-based Medicine: A new approach to the practice of medicine](#)”

Assessment

- Quiz 1

#### B. THE METHODOLOGY OF RANDOMIZED CONTROL TRIALS

##### [Lecture 3: Rival hypotheses & the paradox of effectiveness](#)

Tuesday, January 23

Reading

1. Howick Ch 4 & 5 pp. 33–62

Background reading:

1. Smith & Pell “[Parachute use to prevent death and major trauma](#)”

Assessment

- Short paper 1, due Monday by midnight

##### [Lecture 4: Fisher significance tests & randomization](#)

Thursday, January 25

Reading

1. Worrall “[Evidence in Medicine and Evidence-Based Medicine](#)”

Background reading

1. Fisher “The Design of Experiments” Chapters 1 & 2
2. Fisher, “[Cigarettes, Cancer, and Statistics](#)”

Assessment

##### [Lecture 5: Ideal RCTs & probabilistic causality](#)

Tuesday, January 30

Reading

1. Cartwright “[Are RCTs the Gold Standard?](#)”

Background reading:

1. Cartwright “[What Are Randomized Controlled Trials Good For?](#)”
2. Deaton & Cartwright “[Understanding and Misunderstanding Randomized Controlled Trials.](#)”

Assessment

- Short paper 2

### Lecture 6: The Science of causal inference

Thursday, February 1

Reading

1. Pearl *The Book of Why* Introduction & Chapter 1

Assessment

- Quiz 2

### Lecture 7: A history of causal inference, the rise of statistics, and Bayesian inference

Thursday, February 8

Reading

1. Pearl *The Book of Why* Chapters 2 & 3

Assessment

### Lecture 8: Confounding and Deconfounding

Tuesday, February 13

Reading

1. Pearl *The Book of Why* Chapter 4

Assessment

### Lecture 9: Smoking & Simpson's Paradox

Thursday, February 15

Reading

1. Pearl *The Book of Why* Chapters 5 & 6

Background reading

1. Cartwright "[Causal Laws and Effective Strategies](#)"

Assessment

- Short paper 3 (Application of Causal Diagrams)

### Lecture 10: Pearl's Big Idea

Tuesday, February 20

Reading

1. Pearl *The Book of Why* Chapters 7 & 8

Assessment

- Quiz 3

### Lecture 11: Counterfactuals & Data [No class, paper 4 due]

Thursday, February 22

Reading

1. Pearl *The Book of Why* Chapters 9 & 10

Assessment

- Short paper 4 (summary on chapters 9 & 10)

### Lecture 12: Statistical Prediction Rules

Tuesday, February 27

Reading

1. Bishop & Trout "The Amazing Success of Statistical Prediction Rules"

Assessment

## PLACEBOS

### Lecture 13: Double masking & Placebo Controls

Thursday, February 29

Reading

1. Howick Ch 6 & 7 pp. 63–95
2. Holman “[Why Most Sugar Pills Are Not Placebos](#)”

Background

1. Howick “[Sticks and Stones...and Words can hurt you: the Nocebo Effect](#)” (YouTube)

Assessment

### Lecture 14: More on Placebos

Tuesday, March 5

Reading

1. Howick Ch 8 pp. 96–116
2. Due “[What are Side Effects?](#)”

Background

1. Miller and Brody [Understanding and Harnessing the Placebo Effect: Clearing away the Underbrush](#).

Assessment

Short paper 4 due on Sunday Oct 16<sup>th</sup>.

## MECHANISTIC REASONING

### Lecture 15: The role of mechanistic reasoning in EBM

Thursday, March 7

Reading

1. Howick Ch 9 & 10 pp. 119–157
2. Illari “[Mechanistic Evidence: Disambiguating the Russo–Williamson Thesis](#)”

Background reading

1. Gillies, D “[Mechanisms in Medicine](#)”

Assessment

- Quiz 9

## EXPERT JUDGMENT

### Lecture 16: Trust & Expertise

Tuesday, March 19

Reading

1. Goldman “[Experts: Which Ones Should You Trust?](#)”
2. Wieten “[Expertise in EBM](#)”

Assessment

- Short paper 5 due Sunday Oct 30

### Lecture 17: Trust & Expertise

Thursday, March 21

Reading

1. Howick Ch 11 & 12

## Assessment

### PART II: MEDICAL NIHILISM

#### *EFFECTIVENESS*

##### Lecture 18: Effectiveness & the nature of disease

Tuesday, March 26

Reading

1. Stegenga Ch 2 “Effectiveness of Medical Interventions”
2. R. Cooper “[Disease](#)”

Background reading

Assessment

##### Lecture 19: What is an effective medical intervention?

Thursday, March 28

Reading

1. Stegenga Ch 3 “Effectiveness & Medicalization”
3. Stegenga Ch 4 “Magic Bullets”

Background reading

Assessment

- Quiz 10

#### *EVIDENCE*

##### Lecture 20: Against evidential hierarchies

Tuesday, April 2

Reading

1. Stegenga Ch 5 “Down with the Hierarchies”
2. Watch this overview on the Cochrane meta-analysis: <https://youtu.be/egJlW4vkb1Y>

Assessment

##### Lecture 21: The perils and promise of meta-analysis

Thursday, April 4

Reading

1. Stegenga Ch 6 “Malleability of Meta-Analysis”
2. Holman “[In Defense of Meta-Analysis](#)”

Assessment

- Short paper 6

##### Lecture 22: Assessing Medical Evidence

Tuesday, April 9

Reading

1. Stegenga Ch 7 “Assessing Medical Evidence”
2. [AMSTAR 2](#)
3. Hill “[The Environment and Disease: Association or Causation?](#)”

Background reading

1. Dammann, Poston, and Thagard “[How do medical researchers make causal inferences?](#)”

Assessment



### Lecture 23: Measuring Effectiveness

Thursday, April 11

Reading

1. Stegenga Ch 8 “Measuring Effectiveness”

Background reading

Assessment

- Quiz 11

### Lecture 24: Evaluating harm profiles

Tuesday, April 16

Reading

1. Stegenga Ch 9 “Hollow Hunt for Harms”
2. Winsberg, et. al. “[How Government Leaders Violated Their Epistemic Duties during the SARS-CoV-2 Crisis](#)”

Assessment

## *EVIDENCE AND VALUES*

### Lecture 25: Bias & Fraud

Thursday, April 18

Reading

1. Stegenga Ch 10 “Bias & Fraud”
2. Fuller “[Meta-Evidence Research for Evaluating Therapies](#)”

Background reading:

1. John Ioannidis (2005) [Why most published research findings are false](#)

### Lecture 26: Extrapolation & Absence of Evidence

Tuesday, April 23

Reading

1. Fuller “[The myth and fallacy of simple extrapolation in medicine](#)”
2. [Elliott Sober](#) “[Absence of Evidence and Evidence of Absence](#)”

### Lecture 27: The Replication Crisis

Thursday, April 25

Reading

1. John Ioannidis (2005) [Why most published research findings are false](#)
2. Alex Bird (2020) [Understanding the Replication Crisis as a Base Rate Fallacy](#)

### Lecture 28: Medical nihilism & gentle medicine

Reading

1. Stegenga Ch 11 “Medical Nihilism”
2. Stegenga Ch 12 “Conclusion”

### Lecture 29: Reflections on *Medical Nihilism*

Reading

1. [Book Forum](#) on *Medical Nihilism*

Final paper: Due Wednesday May 1