University of Kent

Evaluating evidence in medicine

Evidence-based medicine has transformed the way in which statistical evidence is used in medicine. Hierarchies of evidence are now routinely used by medical researchers and health policy makers to assess evidence for the effectiveness of treatments and health policies: studies that simply observe patients after treatment are ranked lower than studies that randomly decide who to treat, and these in turn rank lower than studies that review the evidence obtained by a series of trials. Evidence hierarchies have become so widely endorsed that they are now being used across the social sciences and in public policy, as well as in medicine.

While there has been some debate about which sorts of trials should be placed at the top of the hierarchy, this project focuses on the bottom level, which is normally occupied by evidence that is not obtained from a statistical trial. In our view, while it is appropriate to relegate anecdotal evidence and hearsay to this lowest level, other, better quality evidence is also being ignored, simply because it is often not obtained from statistical trials.

In particular, evidence of the underlying physiological and biochemical mechanisms is often classified as inferior to statistical evidence. This is because evidence of mechanisms is normally obtained, not simply via statistical trials, but in a complex way, by integrating a mixture of laboratory experiments, basic scientific knowledge and case studies as well as past trials. Recent work suggests that it is wrong to view evidence of mechanisms as inferior. Philosophers of causality and historians of medicine have argued that evidence of mechanisms is required alongside statistical evidence in order to evaluate whether treatments or health policies are effective. This is because such evidence helps to determine whether positive results of a trial are due to genuine effectiveness or are simply a statistical blip; such evidence is also crucial when designing and interpreting a statistical trial, and when determining effectiveness in a new population or a particular patient

But how can one formulate explicit guidelines for considering mechanistic evidence alongside statistical evidence? One reason why non-statistical evidence is relegated to the bottom of the hierarchies is that it is very

hard to weigh against evidence obtained from statistical trials. In this project we seek to understand how to evaluate mechanistic evidence alongside statistical evidence in medical research and health policy.

This AHRC-funded project ran from 1st June 2015 – 31 May 2018.

Doctoral training initiative: evidence and its quality.

Research Questions

- Overarching research question [Q]: **How can evidence of mechanisms be considered alongside evidence of correlation to evaluate causal claims in medical research and health policy?**
  The answer to this overarching question will build on answers to following questions:

  - [EM: Evidence of Mechanisms]: **What is evidence of a mechanism, and how do we get it?**
  - [QE: Quality of Evidence]: **How can quality of evidence be characterised?**
  - [PC: Philosophy of Causality]: **Which accounts of causality best fit the programme for integrating evidence of mechanisms with evidence of correlation?**

People

- The Centre for Reasoning at the University of Kent: Christian Wallmann, Michael Wilde, Jon Williamson
- The department of Science and Technology Studies at University College London (UCL): Brendan Clarke, Athena Drakou, Donald Gillies, Phyllis Illari, Charles Norell
- The department of Philosophy at the University of Amsterdam (UvA): Federica Russo
- The National Institute for Health and Clinical Excellence (NICE): Beth Shaw
- The International Agency for Research on Cancer (IARC): Kurt Straif
- The Institute of Public Health at Cambridge University: Mike Kelly
- The Medical School at Leiden University: Jan Vandenbroucke

Publications

Volumes

Veli-Pekka Parkkinen, Christian Wallmann, Michael Wilde, Brendan Clarke, Phyllis Illari, Michael P. Kelly, Charles Norell, Federica Russo, Beth Shaw and Jon Williamson: *Evaluating evidence of mechanisms in medicine: Principles and procedures*, Springer, 2018.

Activities

20 June 2018: **Book launch: Evaluating evidence of mechanisms in medicine**, at the UK Integrated HPS Workshop, UCL.

2-3 May 2018: **Connecting the medical humanities with healthcare**, UCL.

Donald Gillies: *Causality, probability and medicine*. Routledge, 2018.

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Jon Williamson: **Establishing causal claims in medicine**, *International Studies in the Philosophy of Science* 32(1): 33-61, 2019. doi: 10.1080/02698595.2019.1630927

Mark R. Tonelli & Jon Williamson: **Mechanisms in clinical practice: use and justification**, *Medicine, Health Care and Philosophy*, 2019. doi: 10.1007/s11019-019-09915-5

Veli-Pekka Parkkinen & Jon Williamson: **Extrapolating from model organisms in pharmacology**, in La Caze, A., & Osimani, B., (eds), *Uncertainty in pharmacology: epistemology, methods, and decisions,* Springer, 2020, pp. 59-78. ISBN: 978-3-030-29178-5

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Jeffrey K. Aronson, Adam La Caze, Michael P. Kelly, Veli-Pekka Parkkinen and Jon Williamson: **The use of mechanistic evidence in drug approval**, *Journal of Evaluation in Clinical Practice* 24(5):1166-1176, 2018. doi: 10.1111/jep.12960

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3-5 July 2017: **Mechanisms in Medicine,** University of Kent.

15 May 2017: **Inferring Policy from Experiments**, University of Kent.

3 May 2017: **Your Health, Your evidence**, School volunteering programme conference, UCL.

4 November 2016: **Evidence in action**, symposium at the Philosophy of Science Association conference (PSA 2016).

5-6 September 2016: Workshop. **Buiding EBM**, UCL.

20 June 2016: Workshop. **New frontiers for evaluating evidence in medicine**.UCL.

16 May 2016: Workshop. **Explanation and evidence of mechanisms across the sciences**, University of Kent.

12 May 2016: Workshop. **Processes**, University of Kent.

21 January 2016: **EBM+ workshop**. Amsterdam.

13 July 2015: **Project kick-off workshop**. Canterbury.

8-9 January 2015: **EBM+ Workshop**. Canterbury

More events can be found here.

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