Evidential Pluralism as a methodology for Evidence-Based Law

I am currently working on a Leverhulme funded project with Professor Jon Williamson. The aim of our project is to develop a new approach to evidence-based law using the principles of Evidential Pluralism, called EBL+. Evidence-based law (EBL) is an emerging approach to law that seeks to make use of the best available evidence to ensure that legislations and regulations effectively achieve their aims (EU Commission, 2023; UK Government, 2023; Westminster Foundation for Democracy). This raises the question, 'what evidence should be considered?'

On orthodox evidence-based approaches, randomised controlled trials (RCTs) are the gold standard of evidence. Appreciation of the limitations of orthodox evidence-based approaches have led to calls for a more inclusive approach to evidence in other domains, including medicine and policy.

When we turn to law, the limitations of RCTs are even greater. Firstly, there might be ethical challenges to insisting that individuals in an intervention group must abide by a law that other individuals in the same jurisdiction do not have to abide by. Secondly, it is not possible to properly blind and randomise a law to individuals. This is because participants need to know that they are subject to a law in order to comply with it and enforcers need to know who is subject to a law in order to enforce compliance. Thirdly, there might be spillover effects, such that those in the control group abide by the law because those in the intervention group are abiding by it.

Given the limitations of orthodox evidence-based approaches, it is necessary to adopt a more inclusive approach to evidence when evaluating laws. Evidential Pluralism offers such an approach.

Evidential Pluralism is a philosophical account of causal enquiry. According to Evidential Pluralism, to establish that A is a cause of B requires establishing:

> (i) That A and B are appropriately correlated, and
>
> (ii) That there is some mechanism connecting A and B and which can account for the extent of the identified association.

Evidential Pluralism has previously been applied to develop a more inclusive evidence-based approach in medicine, called EBM+, and policy, called EBP+. A similar application to evidence-based law provides a needed methodology for systematically integrating different kinds of evidence to evaluate the effects of laws, called EBL+.

Covid-19 face mask mandates provide a good proof of concept case study to illustrate the need for and benefits of an EBL+ evaluation. During the Covid-19 pandemic, uncertainty and controversy concerning the effectiveness of public health interventions, including public face mask mandates, resulted from a narrow focus on experimental studies. This prompted calls for a more inclusive approach to evidence in responding to the novel, complex and rapidly changing problem of Covid-19 (Aronson et al. 2020; Greenhalgh et al., 2022).

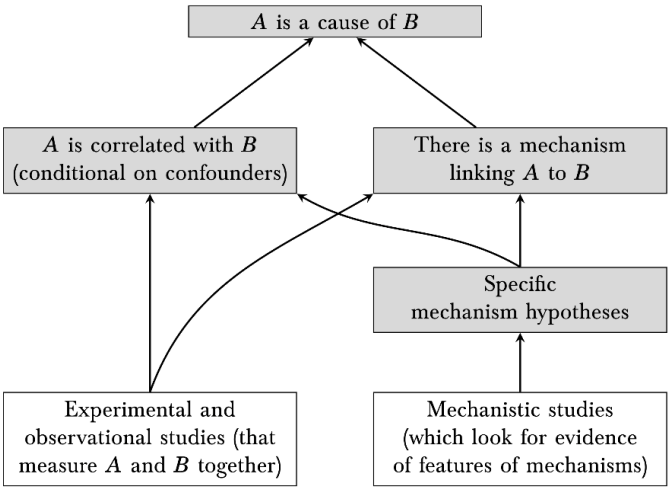


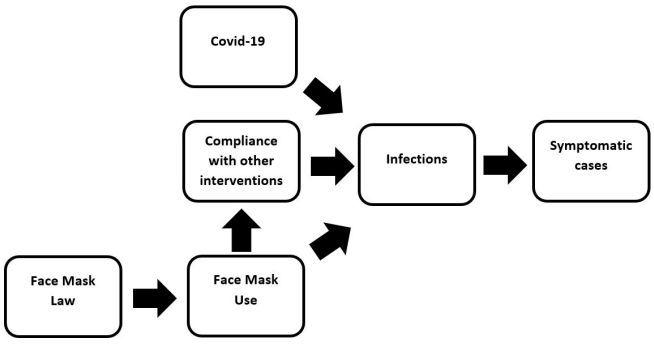
Figure 1: Evidential Pluralism

An EBL+ evaluation begins by specifying the claims of interest. In this case, the causal claim of interest is that a legal requirement to wear a face mask in public reduces the prevalence of symptomatic Covid-19 infections and thereby reduces the number of hospitalisations and deaths.

The correlation claim is that a legal requirement to wear a face mask in public is negatively correlated with symptomatic infections, conditional on potential confounders.

A plausible mechanism hypothesis is that a legal requirement to wear a face mask in public increases the use of face masks which in turn reduces the prevalence of covid-19 which reduces the prevalence of symptomatic infections and thereby the number of hospitalisations and deaths.

A plausible hypothesised counteracting mechanism is that a legal requirement to wear a face mask in public will decrease compliance with other public health interventions, such as social distancing. This, in turn, would result in an increase in the number of symptomatic infections compared to the number that would have occurred if the legal requirement to wear a face mask had not been introduced.



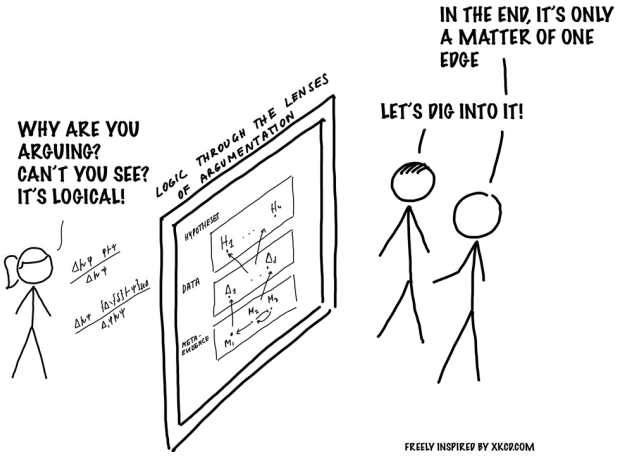
Taking account of available evidence, we found that experimental and observational studies detect a robust correlation across contexts. We also found that each stage of the mechanism hypothesis is supported by a range of studies and that there is evidence against the hypothesised counteracting mechanism. Overall, we conclude that the combination of evidence of correlation and evidence of mechanisms establishes the effectiveness of face mask mandates (Trofimov and Williamson, forthcoming).

As illustrated through the proof of concept case study of Covid-19 face mask mandates, Evidential Pluralism provides a much-needed methodology for systematically incorporating a range of evidence to evaluate laws.

Alexandra Trofimov
Philosophy, University of Kent

How Argumentation Theory and Antisequents Can Shed Light on the Scientific Debate

The objective of logic is to formalize correct reasoning. However, the valid rules of inference are contingent upon the circumstances. In the context of scientific reasoning, the scientific community has repeatedly engaged in significant debates (the Ptolemaic vs. Copernican system, the expansion of the universe or, more recently, the efficacy of certain vaccines). Such debates are not just about the collection and interpretation of data but also about the logical framework through which scientists understand and communicate their findings. Keeping implicit the methodological aspect of the scientific research can lead into several problems in terms of transparency and evaluation of results. Introducing new logical systems that formalize scientific methodologies appears to be a reasonable approach to tackle these issues. However, it's important to note that the scientific community may not be accustomed to the specific language and formalisms of logic, and an intermediate level of abstraction could bridge this gap. One potential solution is to adopt Dung's style argumentation theory. As Dung (1995: On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games, Artificial Intelligence, 77(2):321-357) proposed in his seminal paper, argumentation frameworks can be visualized as a directed graph where the nodes represent the arguments and the edges a relation between the arguments, intuitively understood as 'attack'. These frameworks can be enriched in several ways: adding weights to the attack relations, introducing a support relation, instantiating the arguments, etc. Furthermore, with different definitions of semantics, different sets of arguments can be justified in various ways. In essence, argumentation frameworks have a significant expressive power and their structure is easy to understand. Consequently, by instantiating arguments using logical formulas (and this can be done in several ways) and possibly also the relations among the arguments, we can make explicit the actual practice scientists use and the implicit logic they use. It is important to note that the formalization of the scientific methodology in terms of logical terms will not prescribe scientists' actions; rather, it will enhance the comprehension of where and why scientists agree or disagree. If the motivation for building this bridge is clear, many are the ways to do it. We could work on a fully abstract level by simply distinguishing three types of arguments: hypotheses, data, and meta-evidence. However, if we want to see which logic is at work we should instantiate the arguments and the relations among them using logical formulas. In the literature of logical argumentation theory, it has been explored how to use sequents to instantiate arguments, see e.g. Arieli and Straßer (2019: Logical argumentation by dynamic proof systems. Theoretical Computer Science, 781:63-91). In a recent paper by Piazza, Pulcini and Sabatini (2023: Abduction as Deductive Saturation: a Proof-Theoretic Inquiry, Journal of Philosophical Logic, 52(6):1575-1602) it is explored the concept of abduction and its relationship with deductive saturation from a proof-theoretic perspective. Abduction, as a form of reasoning, involves generating hypotheses that are able to explain empirical evidence or phenomena, it is often described as "inference to the best explanation" and, as the authors say in Piazza et al. (2023, 1576): "the ultimate goal of a rational agent in abductive reasoning can be described as the search for the missing premise of an "unsaturated" deductive inference". Furthermore, they introduce a hybrid system where the rules are defined in terms of both sequents and antisequents that, in the context of refutation calculi, are introduced to denote sequents that assert their own invalidity. Given the central role of the attack relation in argumentation theory and the rejection of hypotheses in the scientific practice, the use of a system defined in terms of antisequents seems a new and potentially fruitful connection. Following the approach of Arieli and Straßer, a new dynamic proof system could be defined and possibly simplify the process of arguments evaluation. Then, starting from a real case – perhaps from the field of life sciences – we could investigate which abductive algorithm is justified by the actual scientific practice. In addition, always having the real scientific practice as justification method, we could investigate if it is possible to identify some patterns, that in the literature are referred to as attack principles, among the arguments instantiates either with sequents or antisequents once they share in their supports (the antecedent) or in their claims (the consequent) some propositional formula.



By employing this comprehensive approach we should be able to let the lab scientists and the logicians talk. Providing a framework to make the logical structure of scientific reasoning explicit, scientists can then better communicate their methodologies and findings both to the broader scientific community and society

Esther Anna Corsi
LUCI Lab, University of Milan