Probability reasoning in judicial fact-finding

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Abstract

We argue that the laws of probability promote coherent fact-finding and avoid potentially unjust logical contradictions. But we do not argue that a probabilistic Bayesian approach is sufficient or even necessary for good fact-finding. First, we explain the use of probability reasoning in *Re D (a Child)* [2014] EWHC 121 (Fam) and *Re L (A Child)* [2017] EWHC 3707 (Fam). Then we criticise the attack on this probabilistic reasoning found in *Re A (Children)* [2018] EWCACiv 171, which is the appeal decision on *Re L*. We conclude that the attack is unjustified and that the probability statements in the two cases were both valid and useful. We also use probabilistic reasoning to enlighten legal principles related to inherent probability, the Binary Method and the blue bus paradox.

Keywords: Fact-finding; Bayes' formula; Laws of Probability; Inference to the Best Explanation; Relative Plausibility; Inherent Probability; Blue Bus Paradox; The Binary Method

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In this article, we argue that the laws of probability can promote coherent fact-finding and avoid logical contradictions. We assume that the laws of probability hold, that Bayes' formula is valid and that probability is interpreted as subjective degrees of belief. Our argument is essentially that probability reasoning is therapeutic: an "elementary probabilistic model of degrees of belief often contains just the right balance of accuracy and simplicity to enable us to command a clear view of the issues and see where we [are or could be] going wrong" (Horwich, 1993, page 62).

An example of therapeutic probabilistic reasoning in fact-finding is as follows. Assume that there are three mutually exclusive and exhaustive explanations for something that happened and that the judge reckons that the probability of each explanation being true is less than 0.5. Also assume that on pain of incoherence the judge ensures that the sum of her subjective probabilities is one. In this case, no legal facts can be found "on the balance of probabilities"; to find otherwise would imply a contradiction in terms of the laws of probability (in particular that the three probabilities must sum to one) or require a post-hoc fix to the originally reckoned probabilities. Worse than a mere contradiction or a fix-up of the odds, a finding of fact for an event with probability less than 0.5 risks serious injustice.

We analyse two real cases in which judges apply similar reasoning. These cases are *Re D (a Child)* [2014] EWHC 121 (Fam) and *Re L (A Child)* [2017] EWHC 3707 (Fam). We also analyse *Re A (Children)* [2018] EWCACiv 1718, which is the appeal decision on *Re L*. The ruling in *Re A* admonishes judges to avoid using the laws of probability in findings of fact, going as far to suggest that referring to the probability of a past event is pseudo-mathematics. In this article we respectfully respond to the criticisms launched by *Re A*. We conclude that the probability references in *Re D* and *Re L* were careful, justified and useful. We acknowledge that there is an element of vindicatorship in these conclusions. But we carefully quote from the cases concerned, so a reader can make her own mind up about the bones of contention; and we have made an honest effort to provide reasons for our conclusions.

The rest of this paper is structured as follows. First, we explain the reasoning behind the fact-finding decisions in *Re D* and *Re L*. Secondly, we give a generous interpretation to the objections to this reasoning that were raised in *Re A*. Thirdly, we criticise the best objections and set out our case for using subjective probability arguments in judicial fact-

finding. Fourthly, we argue that probabilistic reasoning enlightens, in a therapeutic sense, legal principles related to inherent probability, the Binary Method and the blue bus paradox.

The first three sections are written in the style of an opinionated "case comment". Our responses to the judgments are coloured by our respective experiences as an implicated judge and an independent statistician. The last section is in the context of particular principles related to fact-finding.[1] Here we take the opportunity to further explicate our theoretical position, which is essentially that Bayesian reasoning has an important therapeutic, but not defining, role to play in judicial fact-finding. Implicitly, we also argue that subjective probabilistic reasoning can be well constrained by legal principles; hence, we conclude that there is little risk in allowing judges to use the laws of probability, especially when it helps *explain* their ultimate fact-finding decisions, as it did in *Re D* and *Re L*. Our theoretical position borrows much from the pragmatic philosophical stance of Horwich (1993) and concurs with Friedman (1997), who concludes on page 291 that "[i]t is necessary to keep Bayesian methods in their proper place with respect to juridical proof. For the most part, they are of analytical assistance only, to those who think about and craft evidentiary law — but for that purpose they are of very great assistance indeed."

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This article supersedes a shorter one that was written in 2014 by Ian Hunt. As at August 30, 2019, this article is currently "in-press" and will soon appear in the International Journal of Evidence and Proof (https://journals.sagepub.com/home/epj). In the meantime, please contact the corresponding author (ihunt@bunhill.co.uk) for a preprint version of the latest manuscript (or the original version which was authored solely by Ian Hunt).

[1] We limit our analysis to fact-finding by judges and do not discuss civil jury instructions.