



Netherlands Forensic Institute  
*Ministry of Justice*

## Intervals for LR's panel: answer to the three questions

Prof. dr. Marjan Sjerps

- Netherlands Forensic Institute
- University of Amsterdam

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## 3 questions

1. What is the parameter we are constructing an interval for when we present an interval for the value of evidence? What additional information does an interval capture about the value of the evidence?
2. How does a decision maker use an interval to make a decision (in a logical and coherent manner)?
3. Does presenting the interval as a surrogate for the value of evidence cause any harm?



What is the parameter we are constructing an interval for when we present an interval for the value of evidence? What additional information does an interval capture about the value of the evidence?

- We construct an interval for the parametric expression we derived for the value of the LR, e.g.  $1/p$
- This expression has a 'true value' that we can estimate
- Interval shows our uncertainty of this estimate:
  - Confidence interval (e.g. 95%): We are pretty confident that this interval contains the true value (the method we used produces intervals containing the true value 95% of the time)
  - Credible interval (e.g. 95%): We have strong belief that this interval contains the true value (95% probability)



## How does a decision maker use an interval to make a decision (in a logical and coherent manner)?

- He may decide additional research is required
- He may decide that the number produced is sufficiently reliable to use
- (He may decide not to be logical and coherent but give the benefit of the doubt to the suspect)



## Does presenting and interval cause any harm?

- It may confuse decision makers if meaning is not clearly presented



## Does NOT presenting and interval cause any harm?

- It may confuse decision makers if we state that we have calculated a LR value from a dataset but there is no uncertainty whatsoever



What is the evidence?

**Switcheroo!!!!**

Full Bayesians: Evidence = observations in case + database

Some others: Evidence = observations in case



## Does NOT presenting and interval cause any harm?

- In a full Bayesian approach, the Bayes Factor represents the **value of the evidence and datasets combined**
  - If this is presented as the value of the evidence, it is unclear why different experts get different numbers for the same evidence
  - If the Bayes Factor is near to one, it is unclear whether the evidence is weak or the dataset is small
  - In the numerator and denominator of the Bayes Factor, the probabilities are expected values of some distribution. The variance of these distributions represents our uncertainty but is ignored.





## Best way to report?

- Frequentist LR and full Bayesian Bayes Factor are both mathematically valid
- But...they are both difficult to interpret as value of the evidence
- Frequentist: what is the meaning of the LR if  $P[H_p]$  and  $P[H_d]$  are undefined?
- Full Bayesian: Quality of data is mixed with value of evidence, and all uncertainty is integrated out
- Best of both worlds is required for forensic reports