Review of: "Notes on the Implications of Ignoring Bayes' Rule in Search and Rescue Practice in the UK"

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Potential competing interests: No potential competing interests to declare.

NB. I see that the MS has been accepted since I accepted the review assignment. My comments below apply to the original version. They may or may not be relevant any more.

This is an interesting, concise manuscript on an important problem. It is well written, and most of my comments are simply requests to unpack the exposition to make it clearer to the reader (who will lack the background knowledge of the author).

Major comments

1. I confirmed equation A myself, but I strongly recommend the two-line "derivation" from Bayes' rule be provided to the readers explicitly. I also strongly suggest this be done in a mathematically unambiguous manner. I realize the author is not using LaTeX, but the equations should be formatted in LaTeX style.

2. The table needs a header. Also, this information might be described by means of figures as well, which allows entire curves to be inspected.

3. "With the overall original POA of 50% and POD of 70%, gives us a new POA figure of 15% using the traditional multiplication approach, and 23% using Bayes' rule."

This is a key fragment, and it needs to be unpacked for the benefit of the reader. I assume the "new POA" is based on the search party coming back without reporting the misper – for all five areas searched, presumably? It needs to be more clear what exactly the data are that are being analyzed, and how the result is being obtained – I recommend that the relevant data are plugged into the equation explicitly, so the reader knows exactly what is being done.

4. The difference between the Bayesian estimate and the traditional one can be quantified analytically. The expression for the difference could be provided (maybe something simplifies, for instance when it is done on the log odds scale).

5. It would help to provide the reader with an intuition for what the common multiplicative approach is missing compared to an application of Bayes' rule.

Minor comments

a. "Thomas Bayes (1702-1761) has had a big influence on the science of inference since he discovered the

mathematically correct way of adjusting probabilities to account for new evidence."

Pierre-Simon Laplace independently discovered "inverse probabilities," and it is Laplace who developed and popularized them. It may be claimed that if Bayes' manuscript had not been published, the practice and theory of Bayesian inference would not have been affected in the least.

b. "With three marbles in a bag; red, blue, and yellow, for example, we know that the likelihood of our picking the yellow one having previously picked the red one is 16.5%"

The way this is phrased suggests that we condition on the outcome of the first draw ("having previously picked"), which yields a result of 50%. It should also be made clear that the draws are without replacement.

I always sign my reviews,

E.J. Wagenmakers