



## Can the dual hurdle model of advice taking be utilized to understand and improve medical decision-making processes: a Bayesian Computational approach.

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### Introduction

Judgements and decision making are an integral part to lots of clinical practises and health environments. When making these decisions as humans, we're never going to be able to ignore the issues of human error and emotion affecting the outcome of such decisions. In recent years, the involvement of AI algorithms has become increasingly popular, and current research suggests that large-scale judgements may benefit from the integration of algorithmic advice.

This research project will apply such concepts to the field of medicine, specifically to calculating risk scores for colorectal cancer. Using a modified version of an algorithm published by Himmelstein (2022) we will perform a secondary data analysis on a dataset to investigate if there's a significant shift in judgement, comparing our results to the primary research findings.

The application of findings from this kind of research has the potential to be immensely beneficial to the medical world, such as:

- detection of high-risk cancer patients
- more accurate diagnoses which in turn would
- reduce unnecessary costs such as time and equipment.

From previous findings by Himmelstein (2022) we can hypothesise that healthcare professionals are more likely to adopt algorithmic advice when there is improved transparency about the algorithms working

As an exploratory hypothesis, this research will also look at the role of experience as a GP to see whether this significantly impacts their decision to adopt the advice

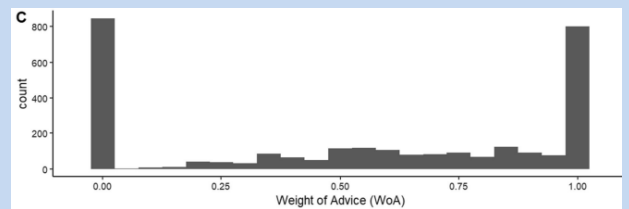
### Methods

- Demographics of GPs are collected, incl. age, gender, level of qualification, and year of qualification
- GPs are presented with hypothetical patient profiles (vignettes) and make a judgement as to the likelihood of the patient having colorectal cancer (as well as a lower an upper limit)
- Same hypothetical profile is entered into a cancer risk score calculator and this risk score is given to the GPs (algorithmic advice)
- GPs are then given the opportunity to re-evaluate their initial judgement and give a new likelihood score.
- This is how the study was conducted in the primary research paper, we will be conducting a secondary data analysis
- In this research, an algorithm that has been adapted to this dataset will be applied to the previous findings to investigate whether similar significant results can be found

### Analysis

- As this is a secondary research analysis, we will be using data from previous research by Palfi et al (2022) and running this through a different algorithm to the one used in their paper
- This algorithm comes from Himmelstein (2022) and the priority of our research will be to adapt and modify this algorithm to create an algorithm that uses the same framework however fits our data's set of variables
- Bayes theorem is integrated within the algorithm to investigate significance of judgement shift (updating of judgement)
- Purpose of this is to investigate whether we can find similar significant results to those published by Palfi et al (2022), as well as investigating any differences

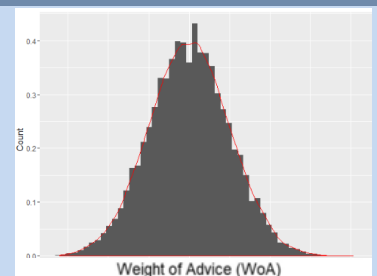
### Primary research results



From these primary results published by Palfi et al (2022), we can draw the conclusions that there is either a strong shift in judgement (GPs adopt the advice and change their decision to be closer to the algorithm score) or they strongly reject the advice and stick to their initial judgement creating a bimodal shape in the data

### Potential secondary analysis results

If the data from our analysis differs from the primary analysis, it might look more like a bell curve, suggesting that GPs generally compromise on their judgement instead of strongly adopting/rejecting the advice.



### Discussion

If the outcome of our analysis suggests that GPs tend to either stick to their initial judgment without influence of the algorithmic advice, then we'd expect a graph that is close to the primary results. If the outcome suggests that there is not a significant shift in judgement, then we may expect to see something that more closely resembles the second graph