

Extracting information from obstetricians' judgments using order-constrained models

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Background

- Obstetricians measure fetal heart rate during labor to evaluate the health of babies
- Using FIGO standards, babies can be classified as “normal”, “suspicious”, or “pathological”
- Reliability of classifications is low
- In previous research:
 - Simple hypotheses of agreement on nominal classifications reliability of classifications have been tested
 - Classifications have been treated as nominal
- By treating classifications as ordinal we can test more elaborate hypotheses

Current Project

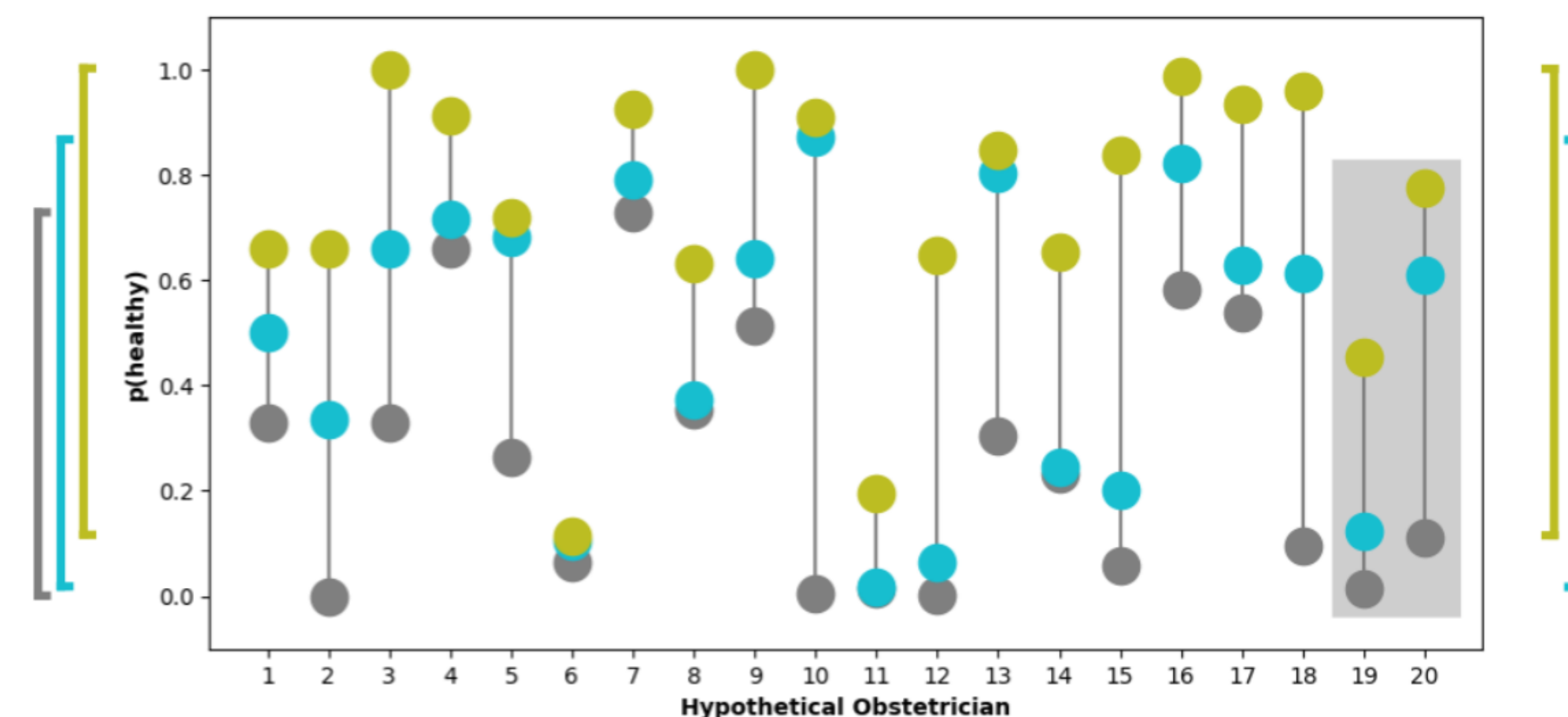
- We propose the probability that a baby is healthy is expected to increase as the classification improves:

$$p(\text{healthy}|\text{normal}) > p(\text{healthy}|\text{suspicious}) > p(\text{healthy}|\text{pathological})$$

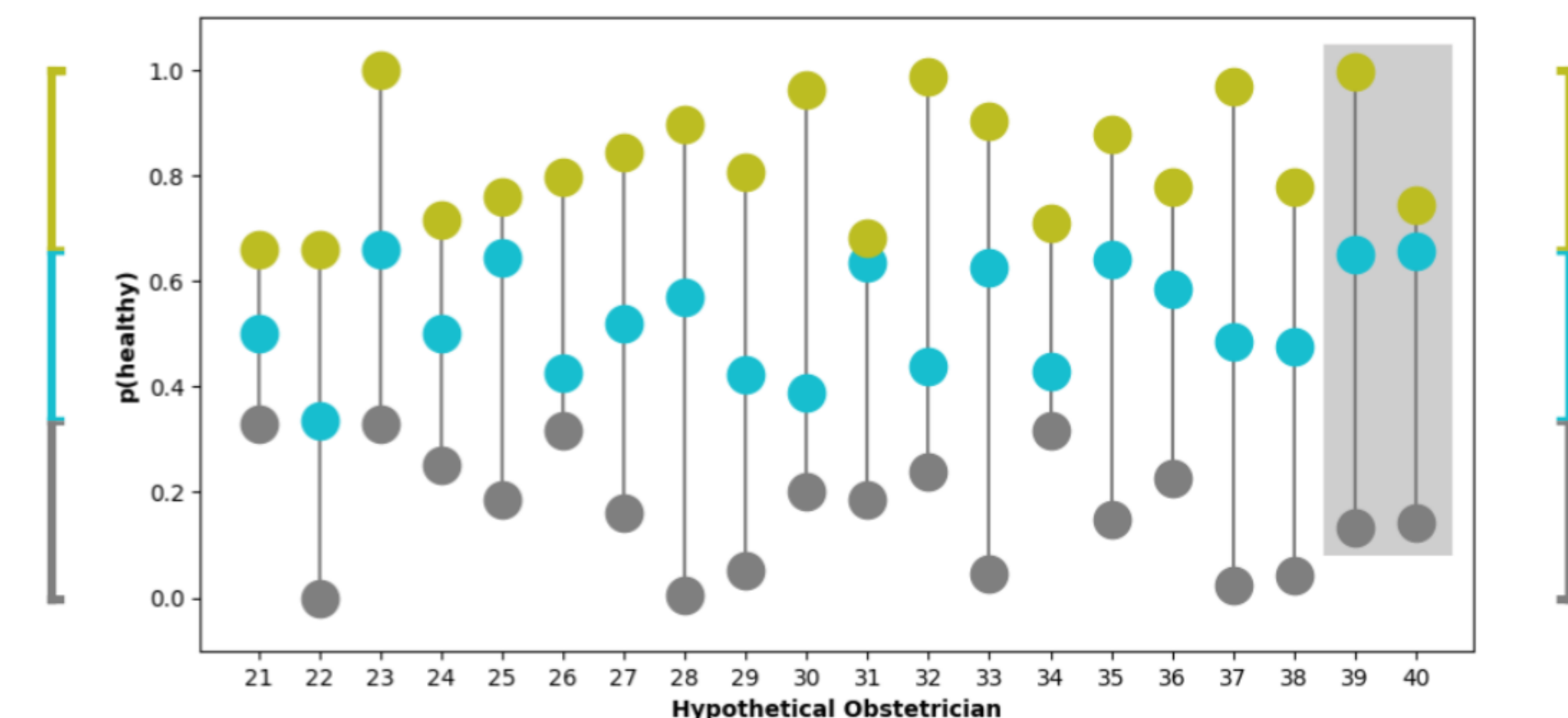
- We test different hypotheses about the ordinal patterns obstetricians' evaluations
- We use the CTU-CHB Intrapartum Cardiotocography Database, which contains baby health data, including CTG recording and evaluations by obstetricians

Hypotheses and Results

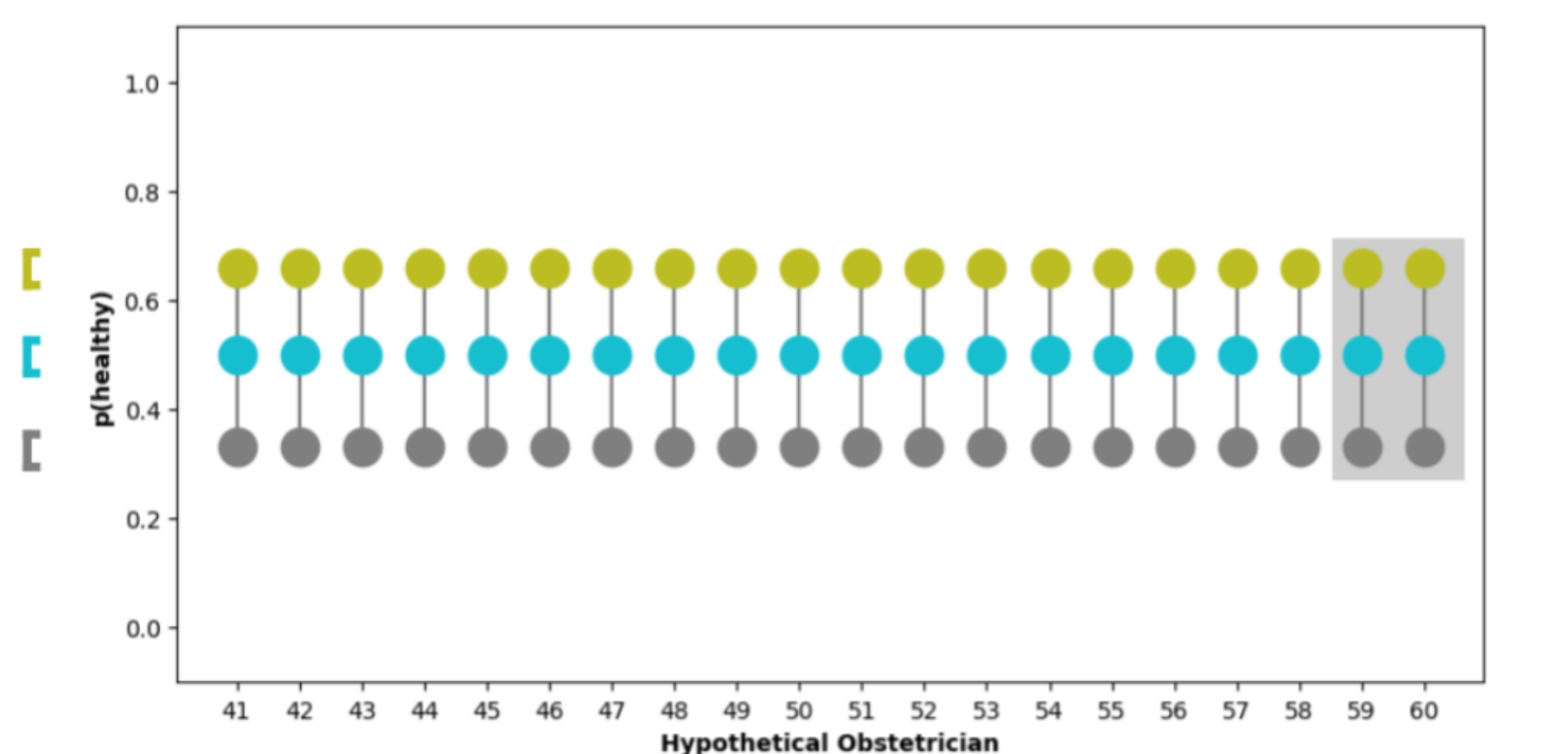
Hypothesis 1



Hypothesis 2



Hypothesis 3



	evaluates	as	Hypothesis 1	Hypothesis 2	Hypothesis 3
Obstetrician 1	Baby A	Pathological	...is less likely healthy than...	yes	yes
	Baby B	Normal	...is more likely healthy than...	no	yes
Obstetrician 2	Baby C	Suspicious	...is equally likely healthy as...	no	yes
Obstetrician 3	Baby D	Suspicious		✓	✗

yes Hypothesis does require constraint
 no Hypothesis does not require constraint
 ✓ Hypothesis confirmed
 ✗ Hypothesis rejected

Discussion

- The probability that a baby is healthy or unhealthy given an obstetrician's evaluation is comparable across obstetricians.
- Based on our findings, the probability of finding a healthy baby increases when obstetricians give a better evaluation.
- The obstetricians are not all equal but there seems to be consistency amongst clinicians' evaluations.
- Overall, the current study:
 - Suggests that the FIGO guidelines can be helpful and obstetrician's evaluations contain some information.
 - Highlights the need for action in order to achieve more comparable outcomes across obstetricians.

References

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