Presenting Forensic Data

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BACKGROUND

- Misconception: Jurors greatly value scientific evidence

- Different ways of presenting data affect the outcome of trials

- Assessing undervalue or overvalue

- Bayesian Standard (Explanation on the next slide)

- If jurors undervalue evidence, one can investigate the various ways scientific evidence is presented

Bayes' Rule

PRIOR ODDS × LIKELIHOOD RATIO = POSTERIOR ODDS
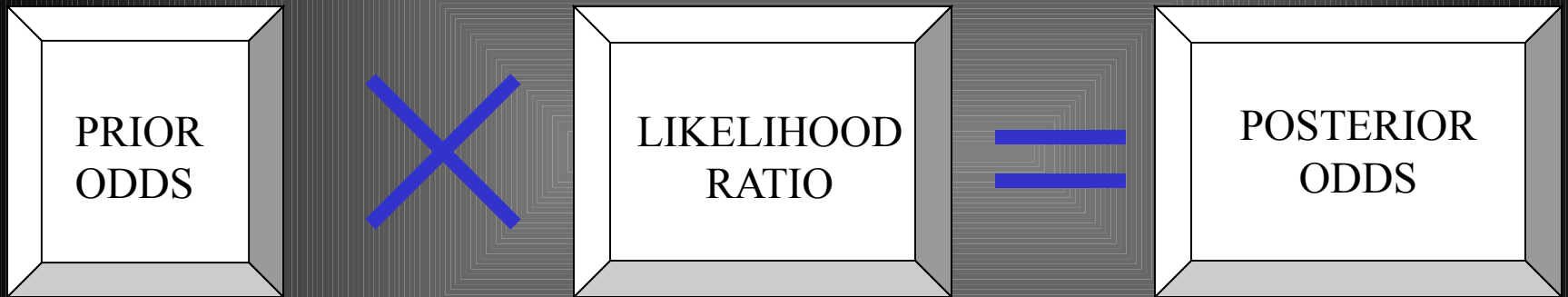
Likelihood Ratio

LIKELIHOOD RATIO

$=$

Probability of getting evidence assuming guilt

Probability of getting evidence assuming innocence

What's the point?

1. Jurors decide what the posterior odds are based on the evidence presented

2. Bayes' Rule determines what the posterior odds are based on the prior odds and the Likelihood ratio of evidence presented

3. This investigation analyzes the difference between the empirically measured posterior odds and the Bayesian normative posterior odds

Experimental Design

- A set of conditions that enable us to test the Bayesian Norm using real-life juror-responses

- Subjects: potential jurors not needed at the Kane County criminal courts

- 7 different carefully designed survey instruments describing the same hypothetical rape scenario

Instrumentation

7 different conditions tested

Surveys asked subjects to determine probability of guilt and whether or not to convict

Prosecution: defendant identification by victim (before and at trial)

Defense: alibi witness (defendant's mother)

Condition 1: No Forensics

No DNA evidence

Accidental loss of semen sample

Condition 2: Mere Match

Expert testifies a match of 2 semen specimen,

No statistical reference to lab error or coincidental match was made

Condition 3: Frequencies

Random match chances is 1 in 25 assuming innocence

Match due to lab error is 1 in 1000 assuming innocence

Condition 4: Likelihood Ratio

All info in Condition 3

Likelihood ratio presented for random match (25x more likely that match occurs if defendant were guilty than if innocent)

Condition 5: Likelihood Ratio + Chart

All info in Condition 4

A conversion chart (based on Bayes' Rule) from Prior Odds and Likelihood Ratios

Prior Prob.	Likelihood Ratio	Posterior Prob.
0.5	25	0.96
0.75	25	0.986
0.95	25	0.998

Condition 6: Posterior Probability

Presents random match probability into likelihood ratio assuming prior odds of 1:1 (needs to be converted to probability)
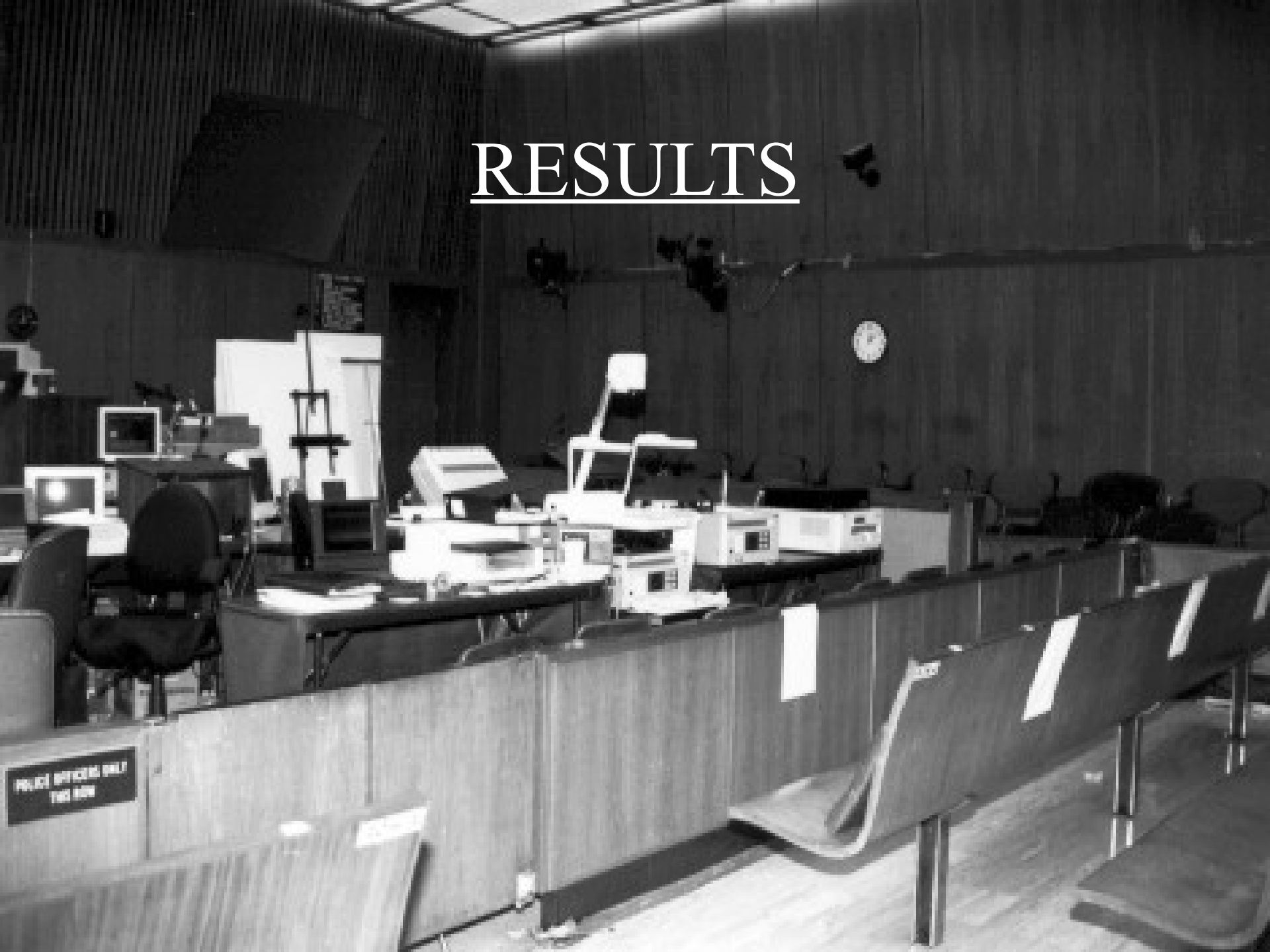
Condition 7: Expectancies

Similar to mere match: expert testifies to 2 specimen matches
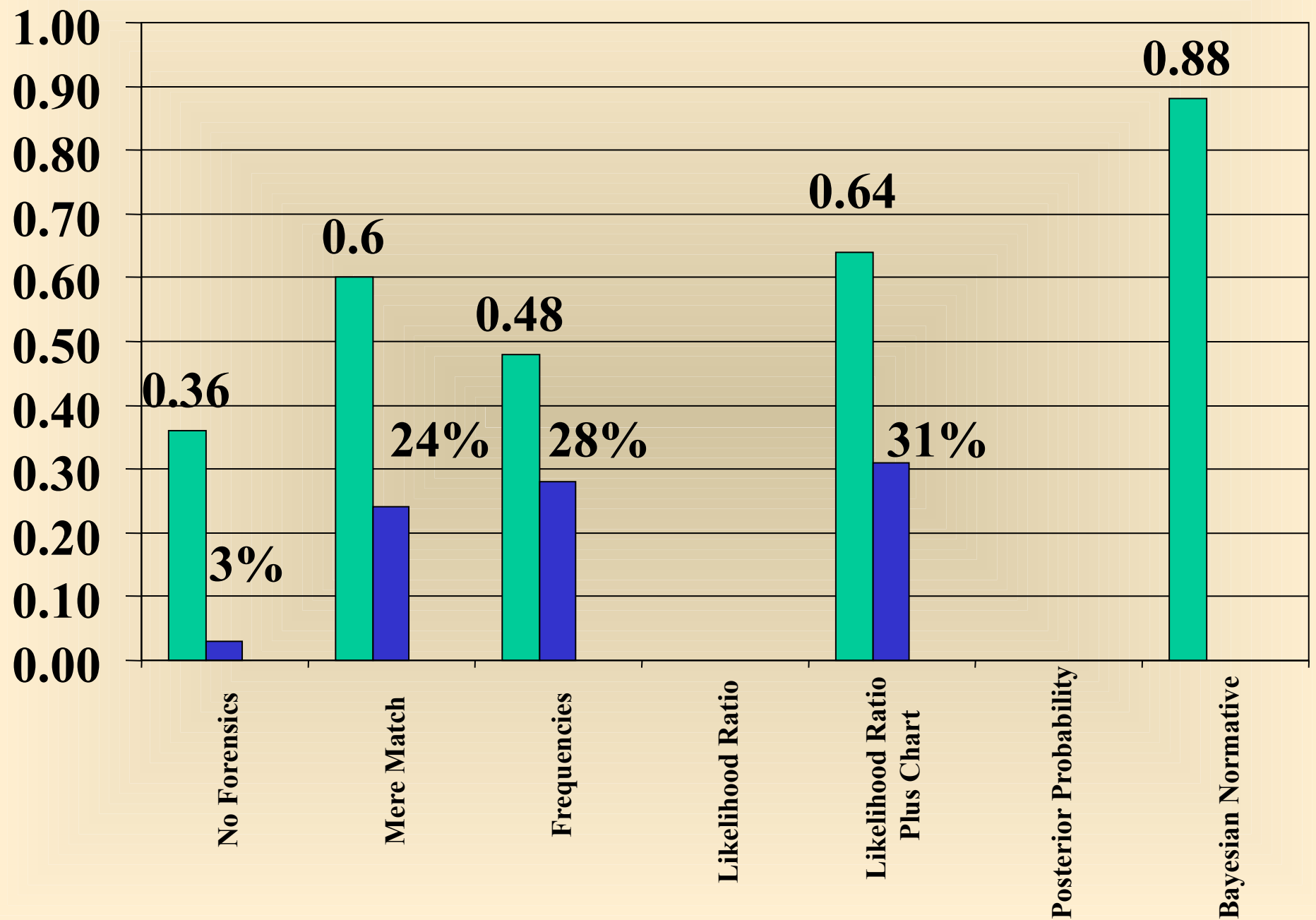
No expert scientific testimony

Subjects estimate the probability of false positive due to lab error, random matches, and other causes

Calculation of Bayesian norm

RESULTS

Calculation of Bayesian Norm

POSTERIOR ODDS = [P(G)/P(#G)] x L(E) = (.36)/(.64) x 17.54

= 9.87

POSTERIOR PROBABILITY = O(G|E)/[O(G|E)+1] = (9.87)/(9.87+1)

= 0.88

Discussion

Mean Probability of Guilt

- Bayesian norm is accepted as legitimate standard of comparison

- Scientific evidence is undervalued

- Mere Match & LR+Chart are closest to Bayesian norm, not significantly different from each other

	No Forensics	Mere Match	Frequencies	Likelihood Ratio + Chart	Bayesian Norm
Mean Probability of Guilt	0.36	0.60	0.48	0.64	0.88
Conviction Rate	3%	24%	28%	31%	

Conviction Rate

- Mere Match and LR+Chart significantly different

- Difference in medians: MM(0.60), LR+C(0.75)

- Loose correlation between Mean Probability of Guilt and Conviction Rate

- "Cloud of doubt" due to absent information in MM

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Final Thoughts

- Beyond a shadow of doubt vs. Convicting at a quantified probability of guilt

- Mere Match vs. Likelihood Ratio+Chart

- Lower Conviction Rate or Higher Conviction Rate

- Different ways of presenting data will influence the way jurors perceive scientific evidence

- Affect probability of guilt, conviction rate & outcome of trial