JURIES & THEIR UNDERSTANDING OF EXPERT EVIDENCE

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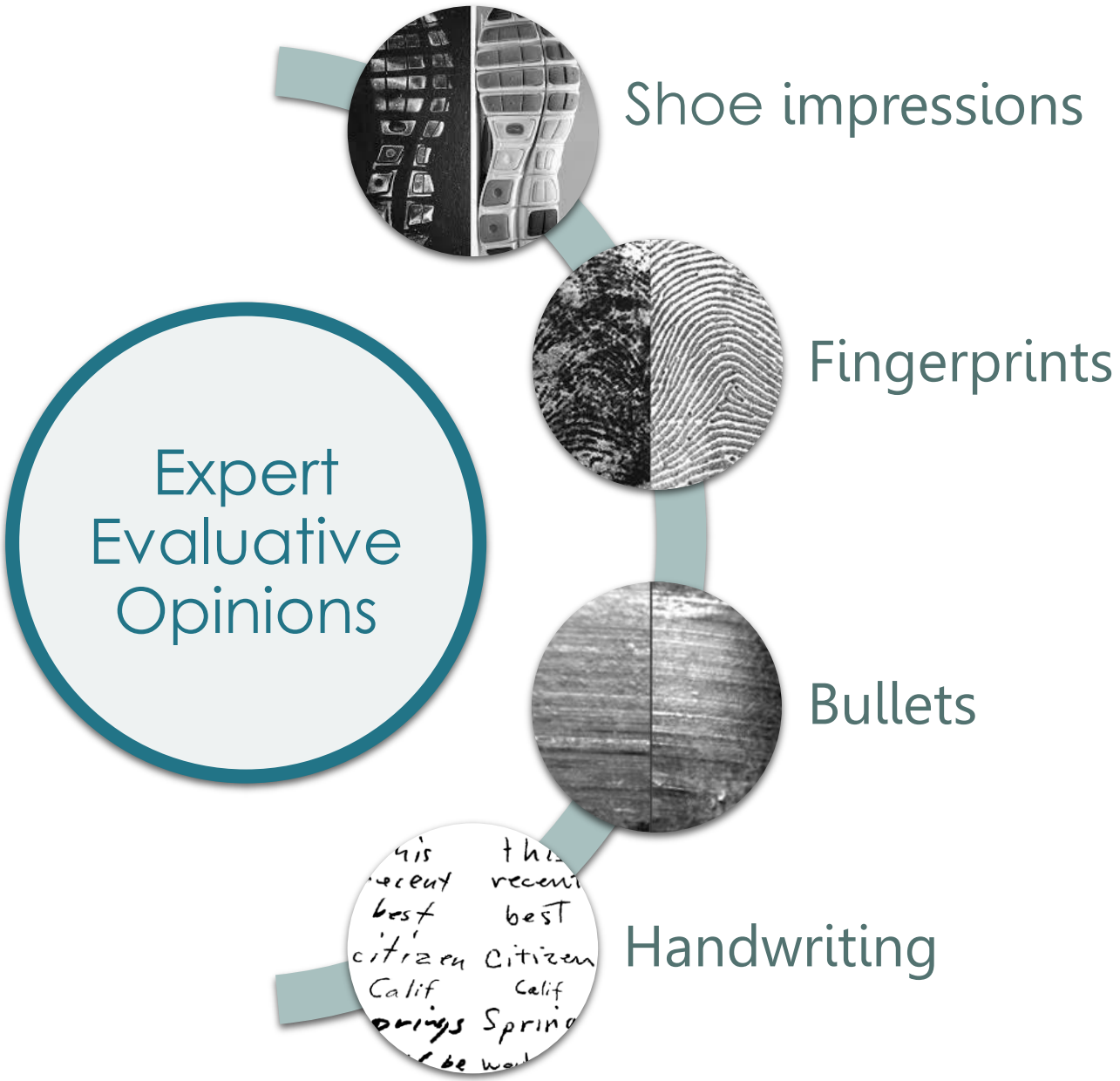
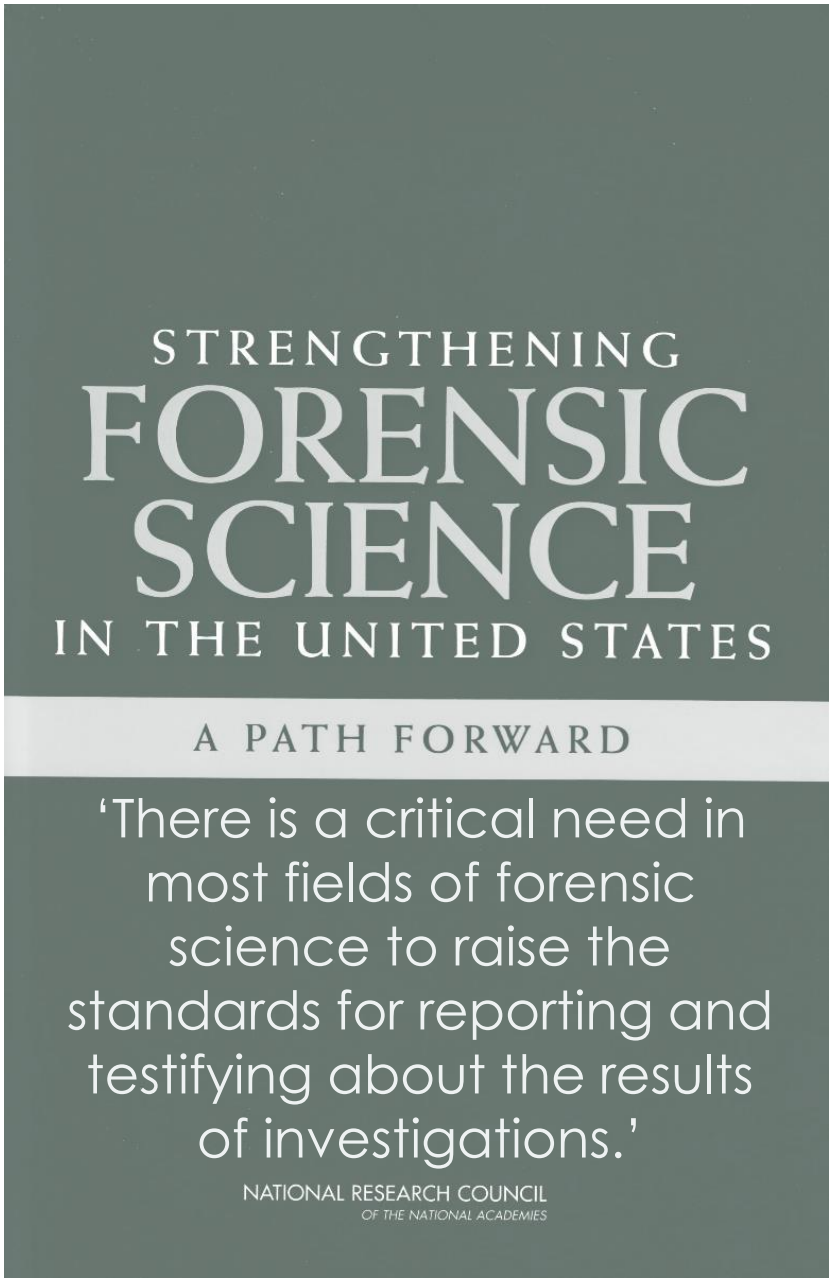
FORENSIC SCIENCE EXPERTS



LIKELIHOOD RATIOS

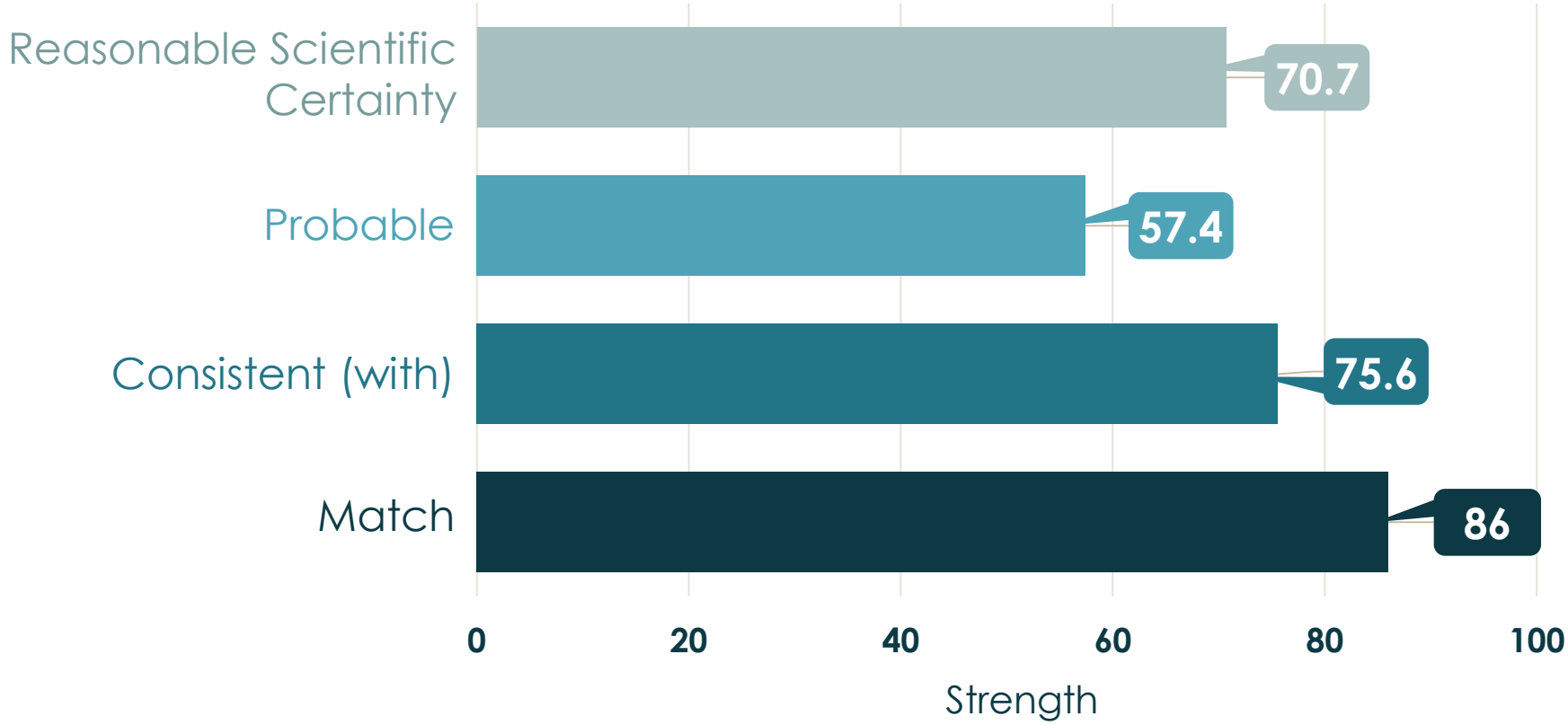


LIKELIHOOD RATIOS

Use of likelihood ratios (and verbal equivalents) as the most scientifically and logically acceptable means of communication.
European Network of Forensic Science Institutes

"…In my opinion, the correspondence between the footwear mark at the crime scene and the shoe of the accused is 4.5 times more likely to occur when the prosecutions version of the crime is correct than when the defense's version of the crime is correct."

VERBAL EXPRESSIONS OF UNCERTAINTY



MATCH : Some concordance, some similarity, but no expression of specificity intended; generally similar but true for a large percentage of the population

McQuiston-Surrett & Saks, 2008

ASSOCIATION OF FORENSIC SCIENCE PROVIDERS

Likelihood Ratio	Verbal Translation (support)
>1-10	Weak or limited
10-100	Moderate
100-1,000	Moderately strong
1,000-10,000	Strong
10,000-1,000,000	Very strong
>1,000,000	Extremely strong

NUMERICAL EXPRESSIONS OF UNCERTAINTY

The Sydney Morning Herald

Tuesday, 29 November, 2011

Written by: Bob Liddelow

A Forecast For Confusion

"I'm confused about the meaning of the weather bureau's language when they deal with the chance of rain", writes a baffled Bob Liddelow, of Avalon. "On Friday they predicted the 'chance of any rain' was '95 per cent'. Does that mean that all of us have a 95 per cent probability that will will get rained on at some time during the day, but for an unspecified length of time? That at all places it will rain for 95 per cent of the day? That at any time of the day there is a 95 per cent probability that it will be raining, so that at any one time 95 per cent of us will be getting wet?".

UNDERSTANDING PROBABILITIES

What does
"There is a 30% chance of rain tomorrow"
convey?

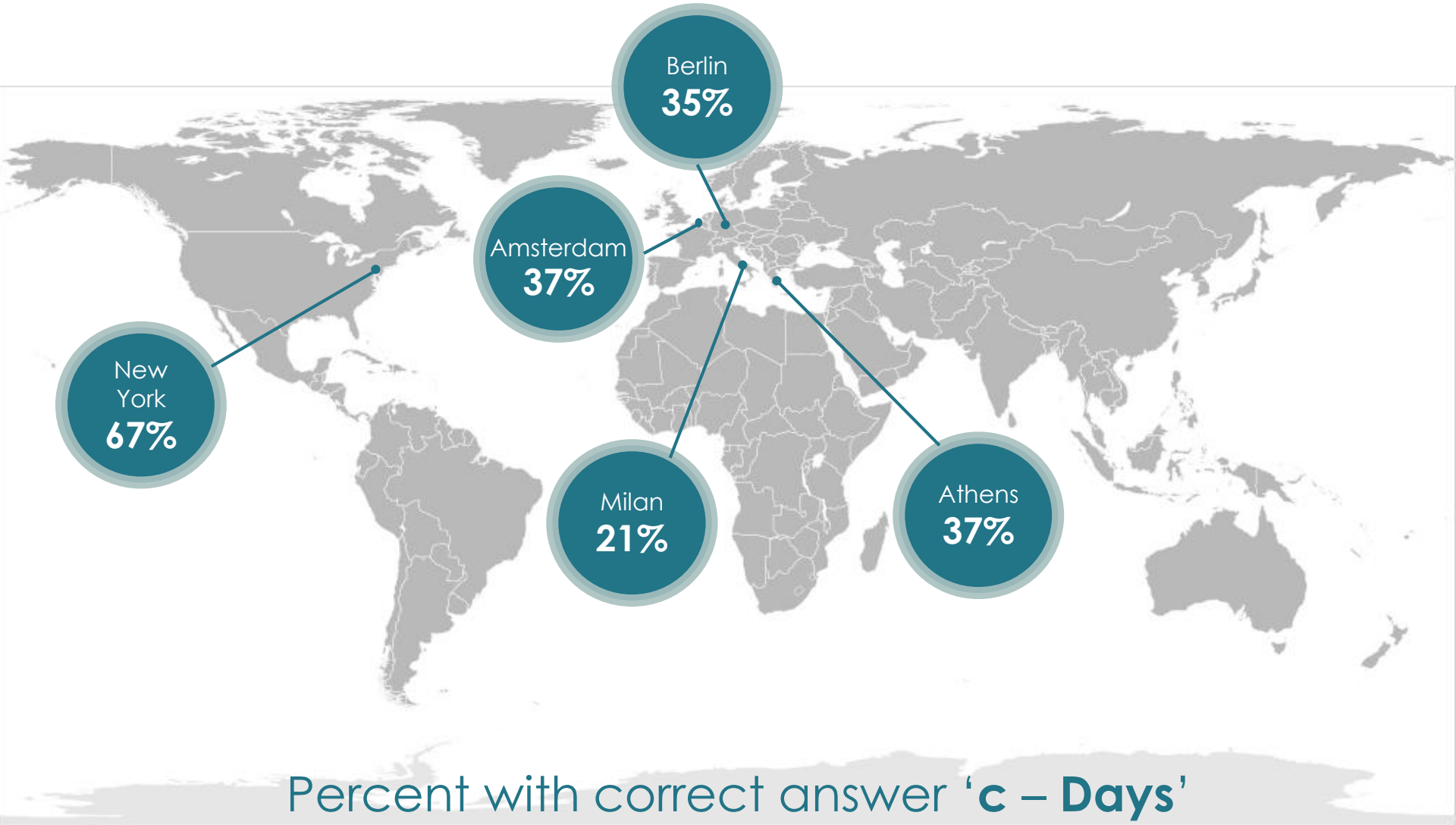
a. It will rain tomorrow for 30% of the **time**

b. It will rain tomorrow in 30% of the **region**

c. It will rain on 30% of the **days** like tomorrow

Gigerenzer, Hertwig, Van Den Brock, Fasolo, & Katsikopoulous, 2005

UNDERSTANDING PROBABILITIES



Percent with correct answer '**c – Days**'

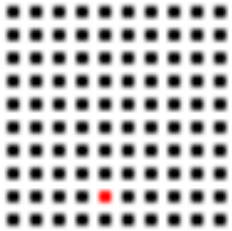
Gigerenzer, Hertwig, Van Den Brock, Fasolo, & Katsikopoulous, 2005

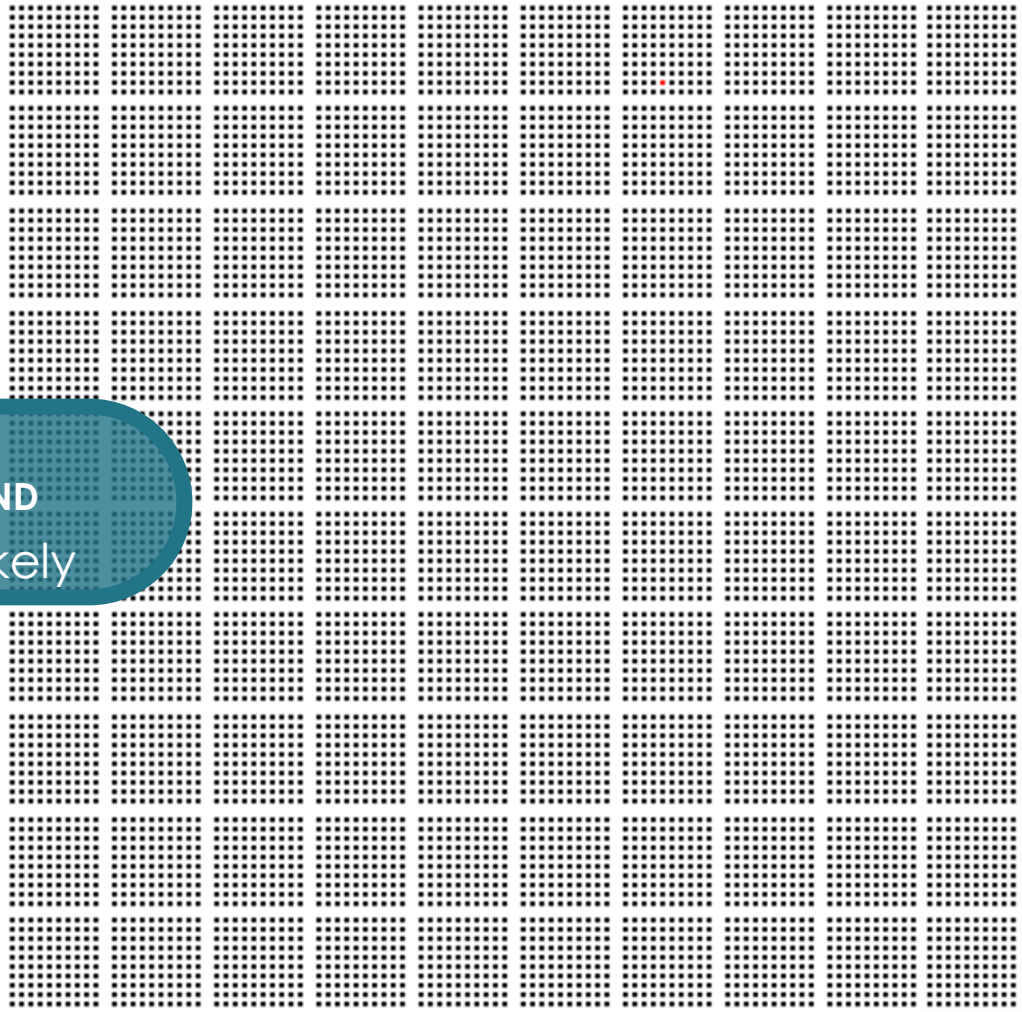
World Map By Frank Bennett [Public domain], via Wikimedia Commons

CLEAR COMMUNICATION

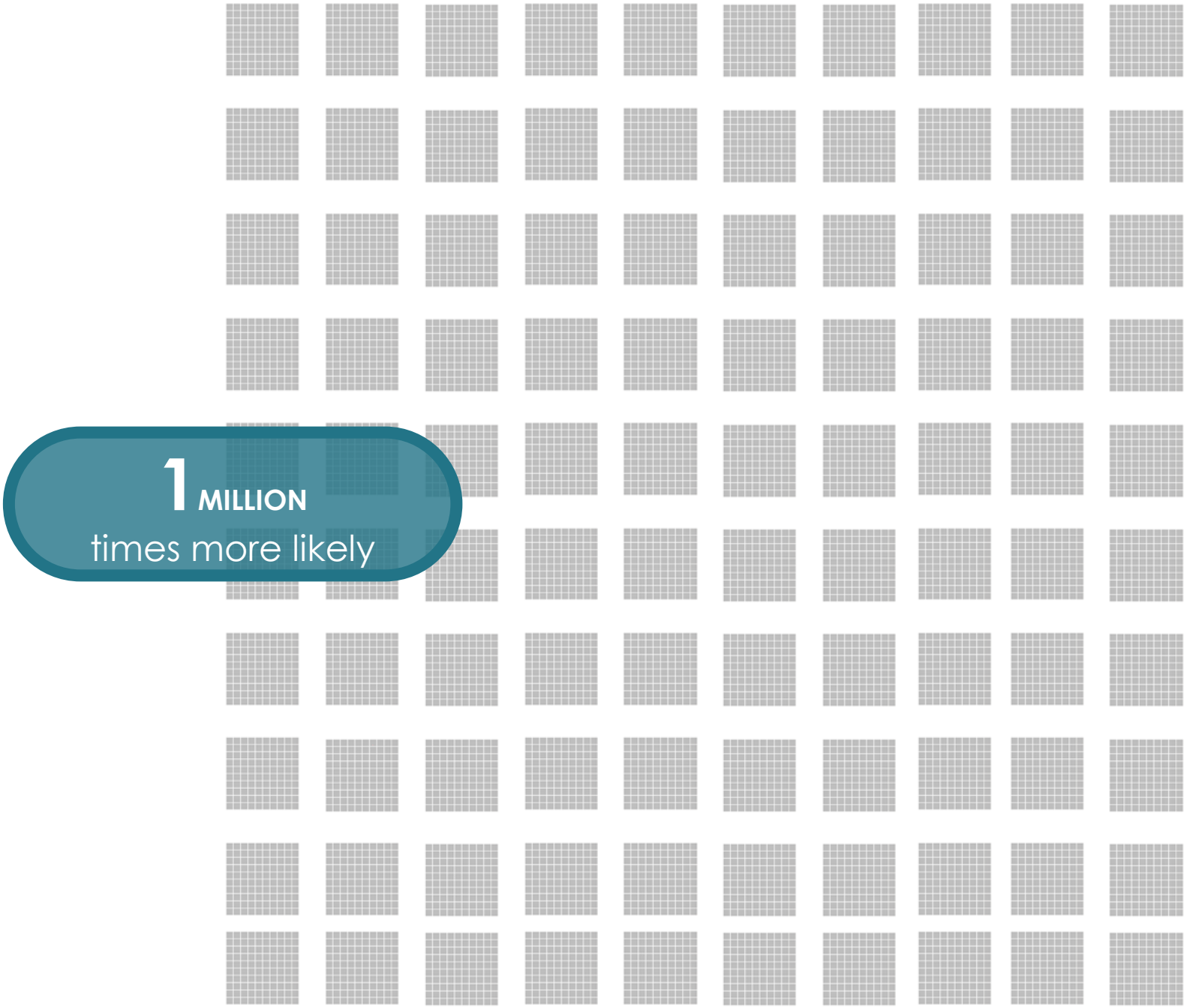
Opinions should be expressed in simple, precise and unambiguous terms

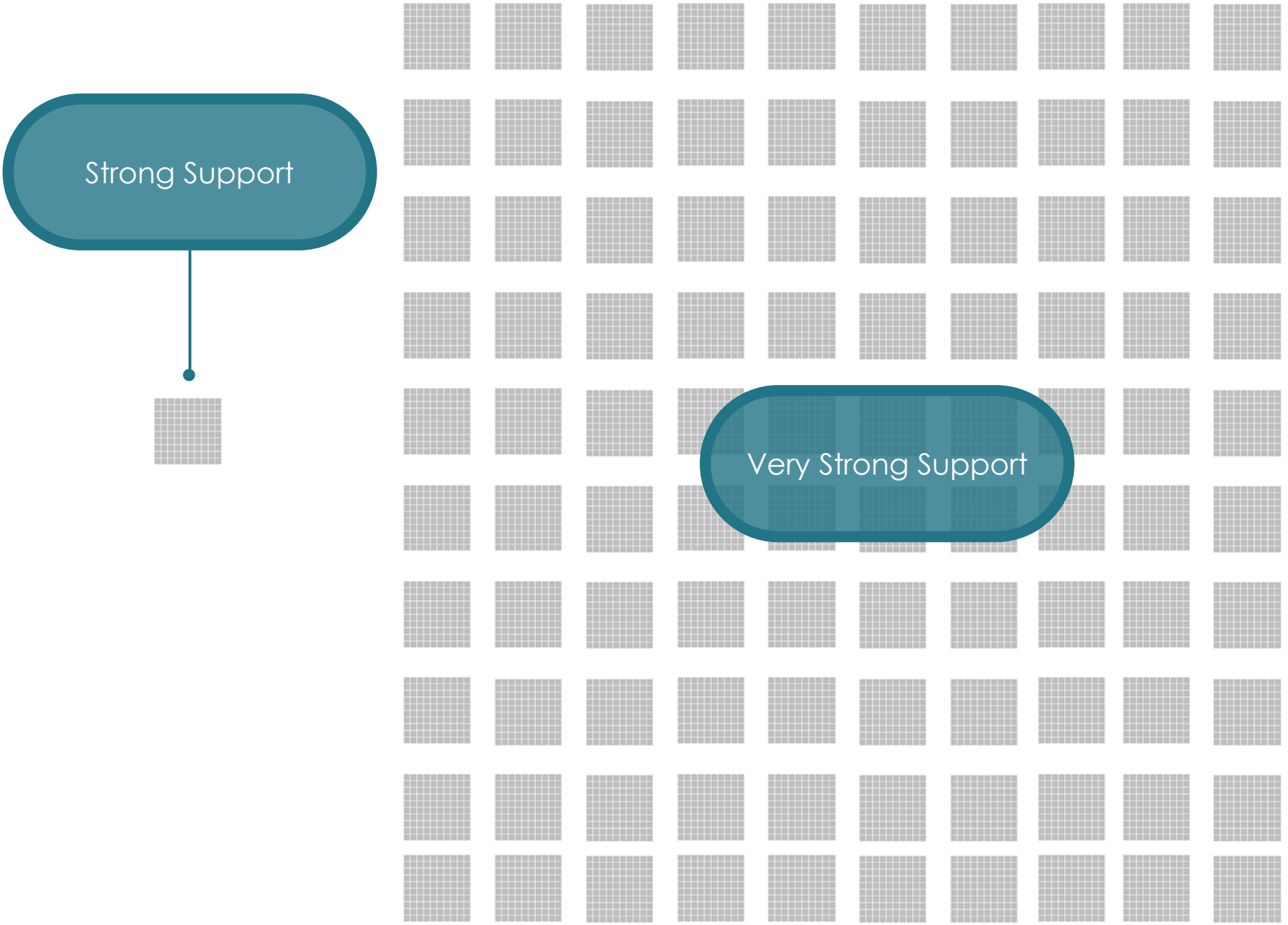
1 HUNDRED
times more likely



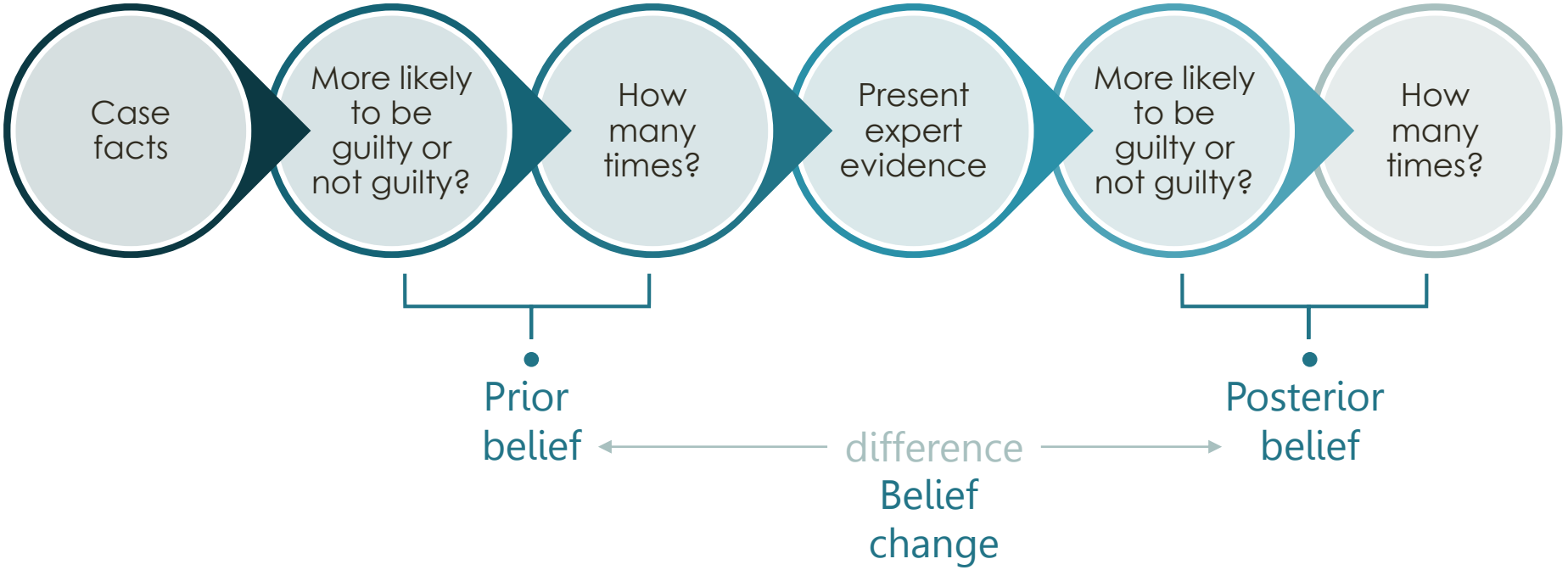


10 THOUSAND
times more likely


1 MILLION
times more likely


Strong Support
Very Strong Support

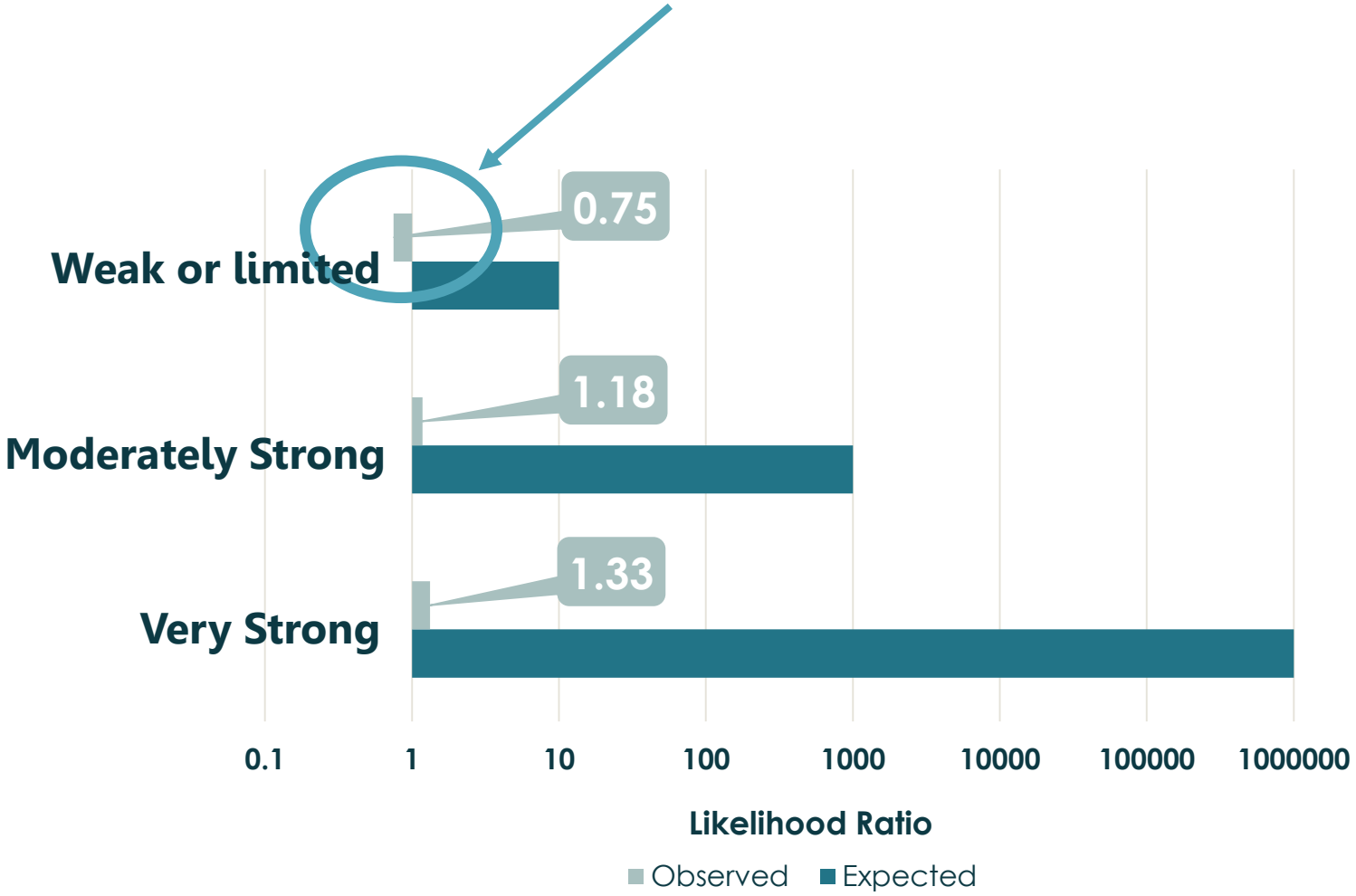
RESEARCH APPROACH



EXPERIMENT 1.

Likelihood Ratio	Verbal Translation (support)
>1-10 [4.5]	**Weak or limited**
10-100	Moderate
100-1,000 [450]	**Moderately strong**
1,000-10,000	Strong
10,000-1,000,000 [405,000]	**Very strong**
>1,000,000	Extremely strong

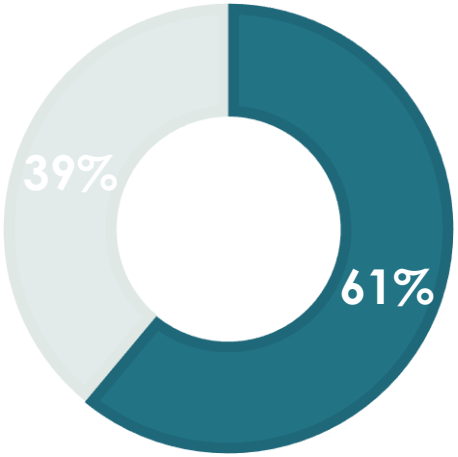
EXPERIMENT 1 – VERBAL EXPRESSIONS.



Martire, Kemp, Watkins, Sayle & Newell, 2013

EXPERIMENT 1.

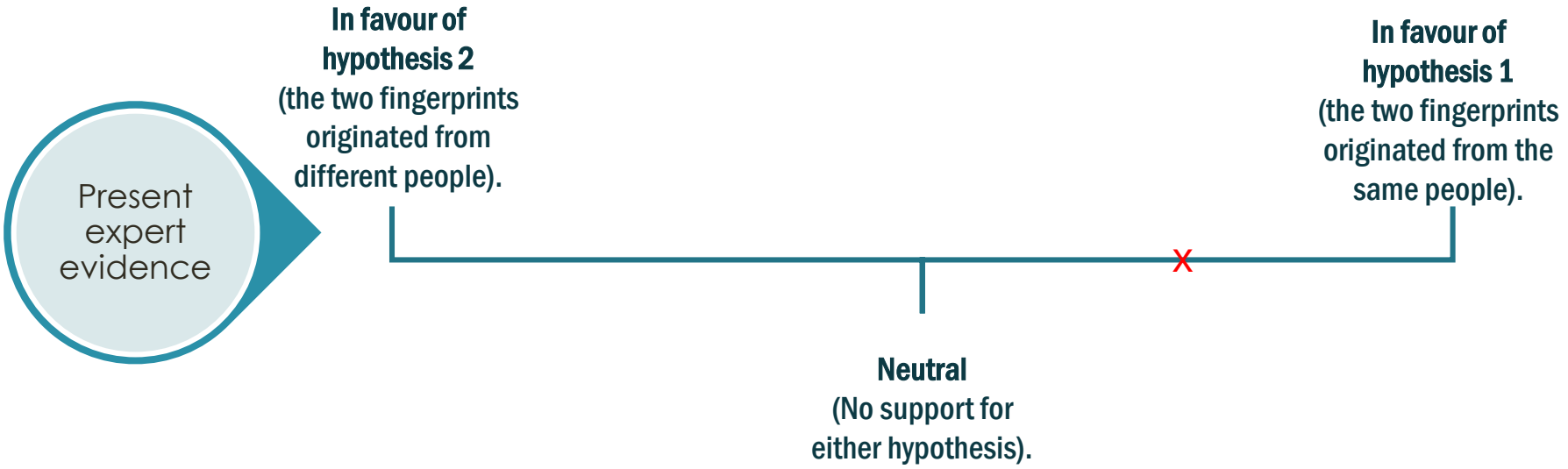
DAMNED
by feint PRAISE



is that the BEST you can do?

Weak or limited support

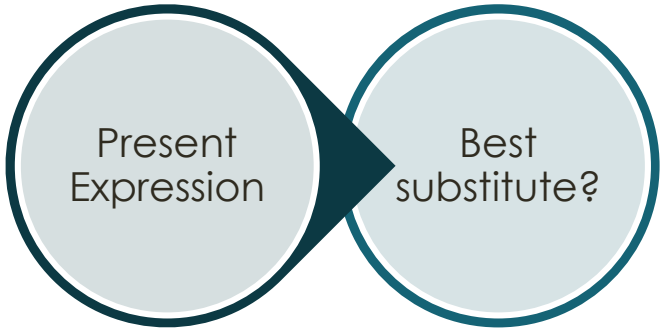
EXPERIMENT 3.



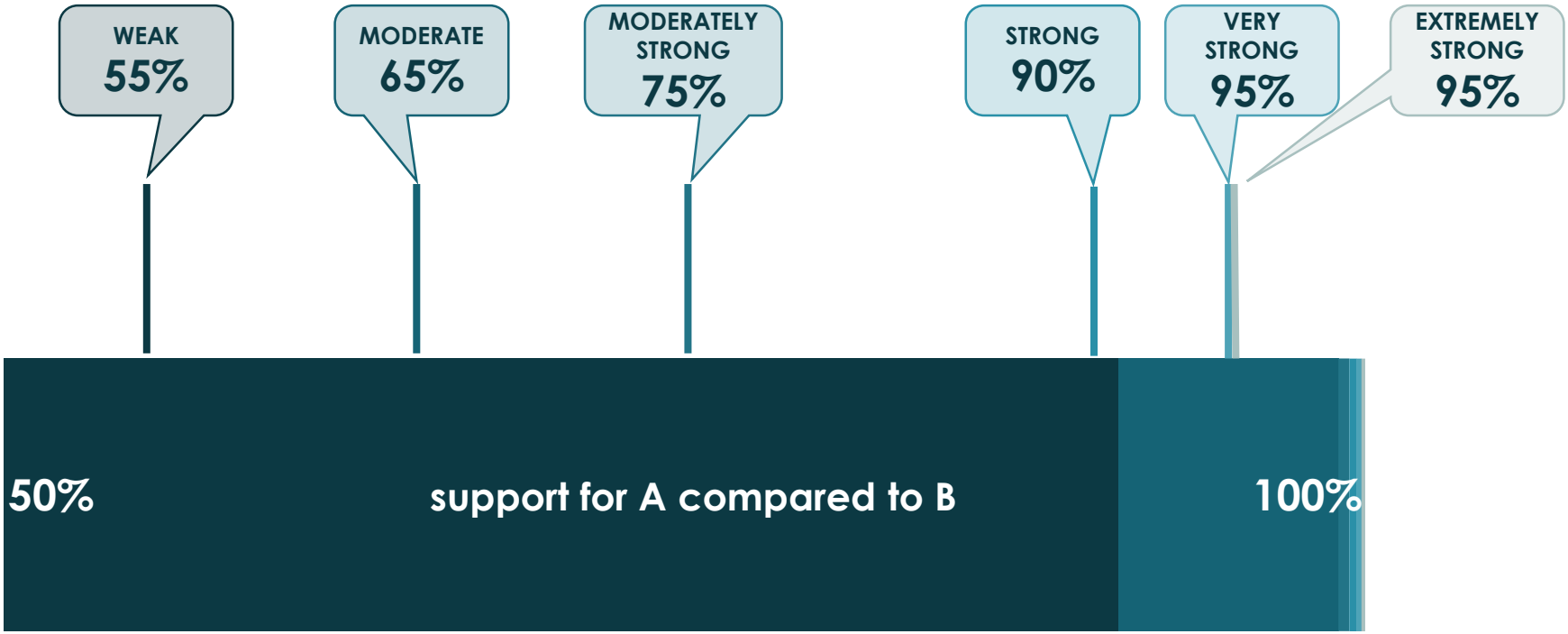
Value of likelihood ratio	1-10 times more likely if the two fingerprints originated from the same person than from different people	10-100 times more likely if the two fingerprints originated from the same person than from different people	100-1,000 times more likely if the two fingerprints originated from the same person than from different people	1,000-10,000 times more likely if the two fingerprints originated from the same person than from different people	10,000-1,000,000 times more likely if the two fingerprints originated from the same person than from different people	> 1,000000 times more likely if the two fingerprints originated from the same person than from different people
Corresponding verbal equivalent	Offers **Weak to limited support** for Hypothesis 1 (two fingerprints originated from the same person)	Offers **Moderate support** for Hypothesis 1 (two fingerprints originated from the same person)	Offers **Moderately strong support** for Hypothesis 1 (two fingerprints originated from the same person)	Offers **Strong support** for Hypothesis 1 (two fingerprints originated from the same person)	Offers **Very strong support** for Hypothesis 1 (two fingerprints originated from the same person)	Offers **Extremely strong support** for Hypothesis 1 (two fingerprints originated from the same person)

Martire, Kemp, Sayle & Newell, 2014

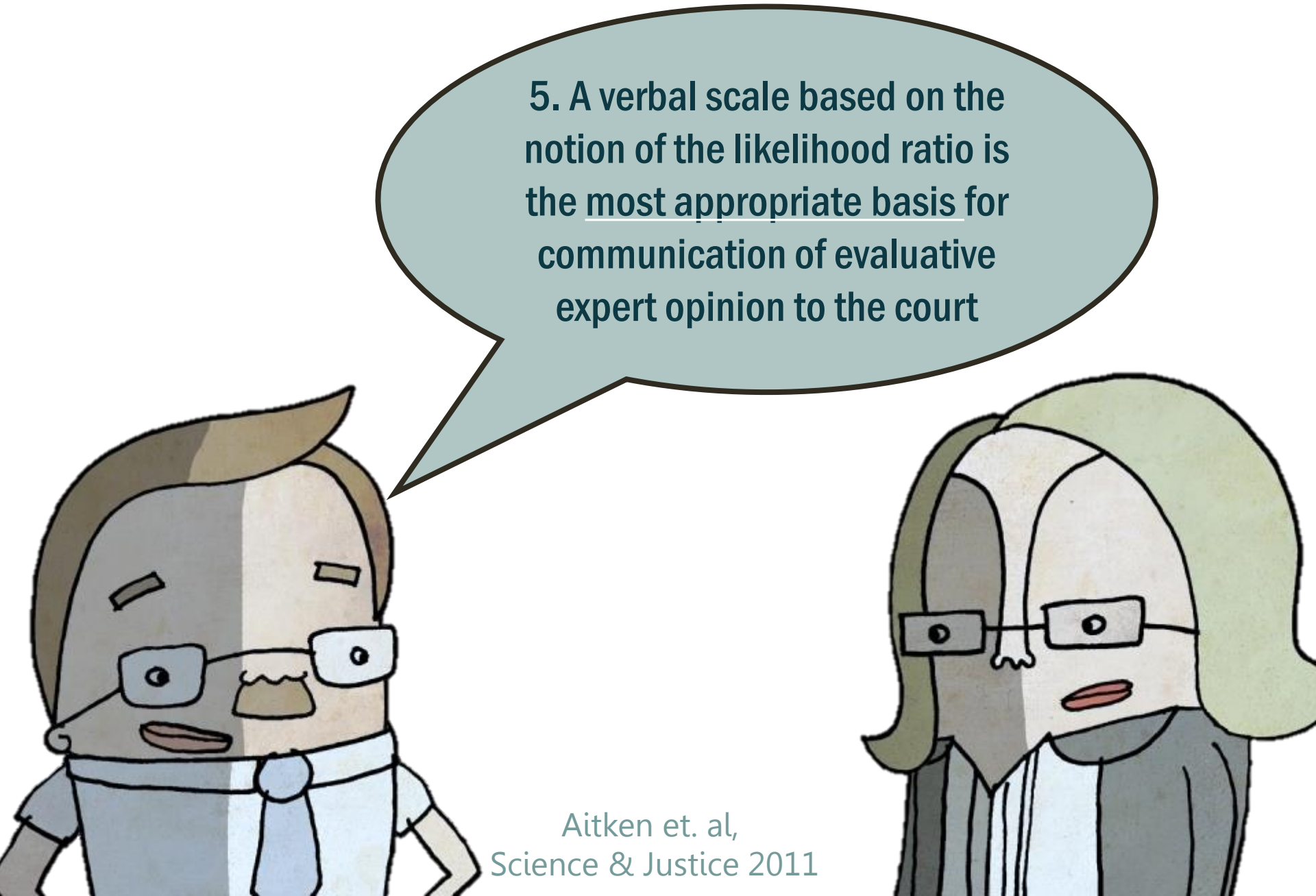
EXPERIMENT 4.



What is the best substitute for **"weak support"?**

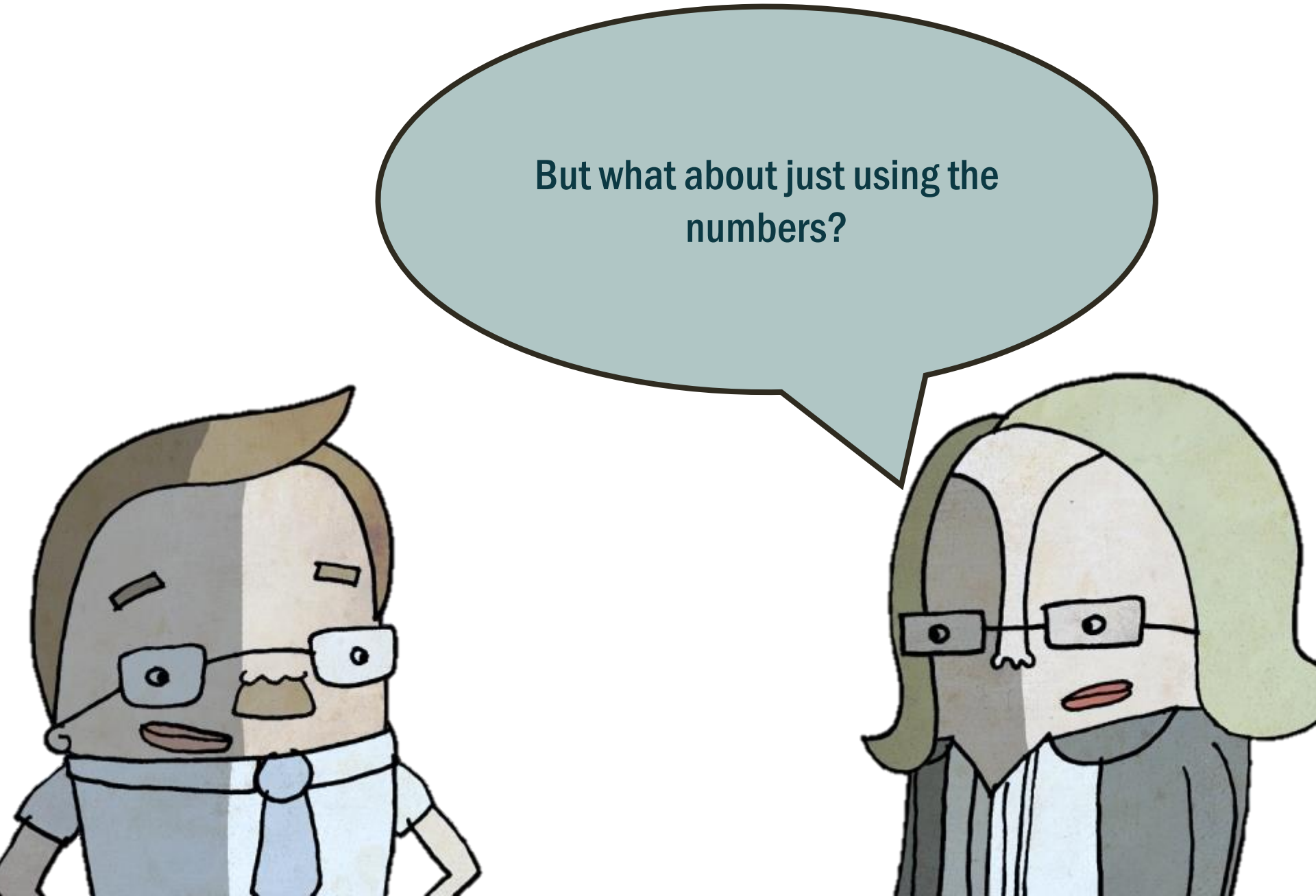


POSITION STATEMENT

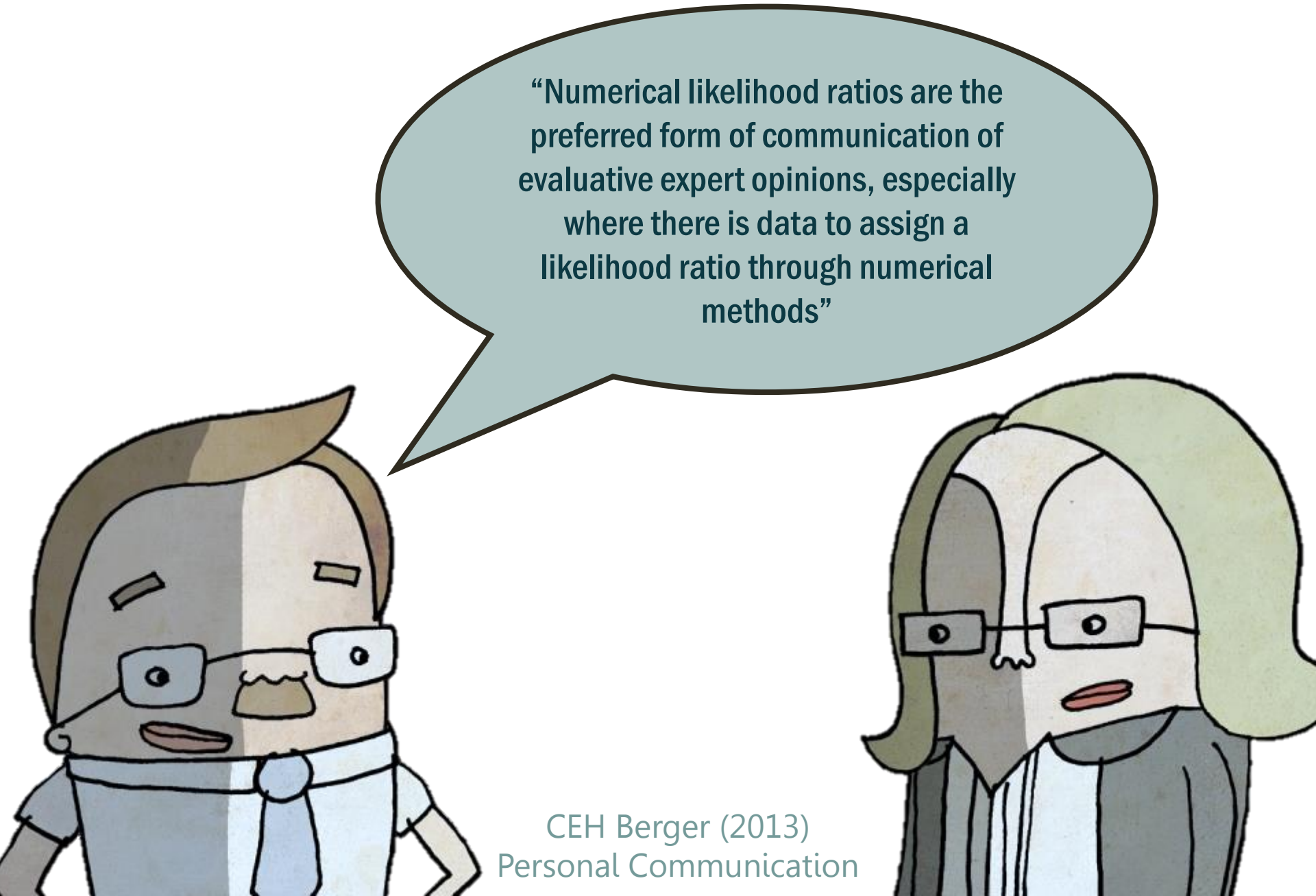


Aitken et. al,
Science & Justice 2011

POSITION STATEMENT



POSITION STATEMENT



CEH Berger (2013)
Personal Communication

EXPERIMENT 5.

Present Expression → Likelihood of source?

What is the likelihood that the defendant **was the source of the DNA** from the crime scene?

Aytugrul v The Queen [2012] HCA 15

TAKE HOME MESSAGE

1. Probabilistic evidence is challenging
2. Presentation format does matter
3. Evidence does not always mean the same thing to everyone
4. Consultation and collaboration is required

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