Low Probability, Low Credibility

M. Leonor Neto
New York University

Joshua Lewis
New York University

Lucius Caviola
Harvard University

SDJM 2023
November 18, San Francisco

Motivation

Suppose a patient was just diagnosed with cancer.
When discussing the prognosis, the doctor communicates that, based on available data…

… the patient has an **8%** chance of surviving the next 5 years.

… the patient has a **9%** chance of dying within 5 years.

credible?

... the patient has a **91%** chance of surviving the next 5 years.

... the patient has a **92%** chance of dying within 5 years.

$t(601) = 8.05, p < .0001$

Motivation

Suppose a patient was just diagnosed with cancer.
When discussing the prognosis, the doctor communicates that, based on available data…

… the patient has an **8%** chance of surviving the next 5 years.

… the patient has a **9%** chance of dying within 5 years.

credible?

... the patient has a **91%** chance of surviving the next 5 years.

... the patient has a **92%** chance of dying within 5 years.

- How do people evaluate the **credibility** of risk estimates?
- How do people evaluate the **credibility of low probability** estimates?

Baghi & Ince 2016; Johnson & Slovic 1995; Kahneman & Tversky 1979; Keren & Teigen 2001; Slovic et al., 1977; Sunstein 2002

Study 1

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are reading the United Nation’s latest report on climate change as you think about preparing your community for the future. It details the probability of different global temperature increases over the next 75 years based on the latest generation of climate models.

N = 389 policymakers (CivicPulse)

Study 1

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are reading the United Nation's latest report on climate change as you think about preparing your community for the future. It details the probability of different global temperature increases over the next 75 years based on the latest generation of climate models.

Please rate the **credibility** of two statements you might read below:

- There is a **5**% chance that global temperature increases **6.3ºF or more.**
- There is a **95**% chance that global temperature increases **3.8ºF or more.**

1 – Not at all credible; 5 – Extremely credible

N = 389 policymakers (CivicPulse)

Study 1

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are reading the United Nation's latest report on climate change as you think about preparing your community for the future. It details the probability of different global temperature increases over the next 75 years based on the latest generation of climate models.

Please rate the **credibility** of two statements you might read below:

- There is a **5**% chance that global temperature increases **6.3ºF or more / 3.8ºF or less*.**
- There is a **95**% chance that global temperature increases **3.8ºF or more / 6.3ºF or less*.**

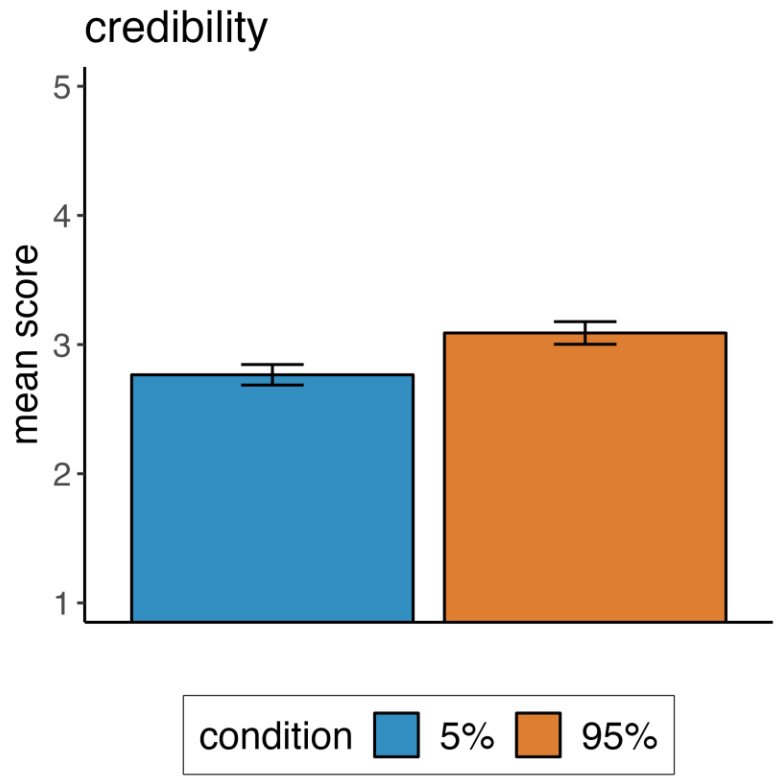
1 – Not at all credible; 5 – Extremely credible

*counterbalanced frame

N = 389 policymakers (CivicPulse)

Study 1

Results



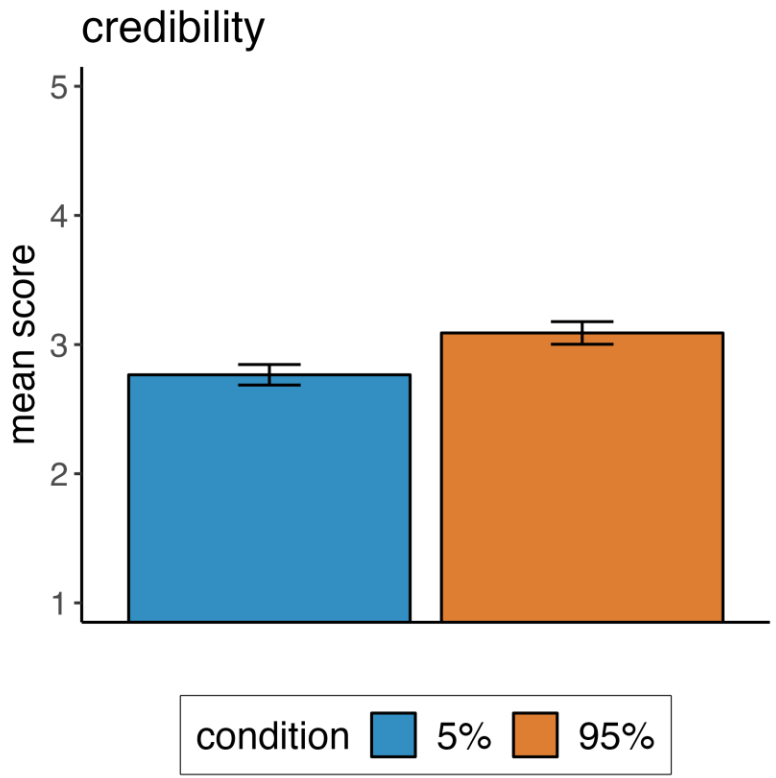
t(388) = 5.331, p < .0001, d = .28

CI in error bars

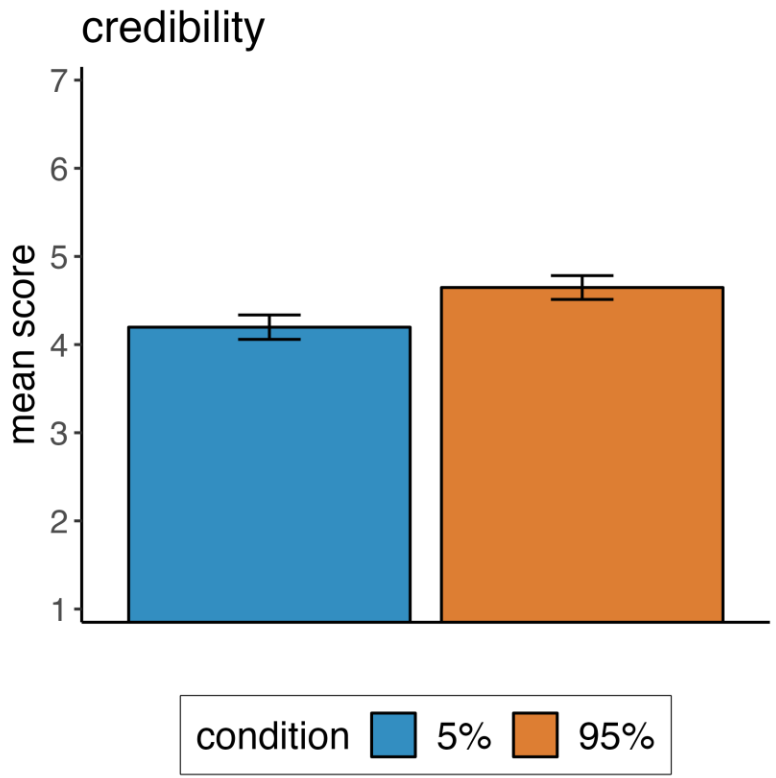
N = 389 policymakers (CivicPulse)

Study 1 & Study 2

Results



t(388) = 5.331, p < .0001, d = .28



t(307) = 4.460, p < .0001, d = .26

CI in error bars

N = 389 policymakers (CivicPulse)
N = 37 judges, 271 lawyers

Study 3

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are a doctor (…)
Imagine the medical consultant said, “The best estimate for early mobility exercises is that they reduce the length of hospital stays by 1.8 days on average,

N = 201 doctors (YouGov)

Study 3

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are a doctor (…)
Imagine the medical consultant said, “The best estimate for early mobility exercises is that they reduce the length of hospital stays by 1.8 days on average, but there is a **2.5%** chance that the true effect is a reduction of **at least* 2.6 days** on average.”

…there is a **97.5%** chance that the true effect is a reduction of **at least* 1.1 days** on average.

*counterbalanced frame

N = 201 doctors (YouGov)

Study 3

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are a doctor (…)
Imagine the medical consultant said, “The best estimate for early mobility exercises is that they reduce the length of hospital stays by 1.8 days on average, but there is a **2.5%** chance that the true effect is a reduction of **less than* 1.1 days** on average.”

…there is a **97.5%** chance that the true effect is a reduction of **less than* 2.6 days** on average.

*counterbalanced frame

N = 201 doctors (YouGov)

Study 3

Design & Procedure

2 (Probability: high vs. low) within-subjects

Imagine you are a doctor (…)
Imagine the medical consultant said, “The best estimate for early mobility exercises is that they reduce the length of hospital stays by 1.8 days on average, but there is a **2.5%** chance that the true effect is a reduction of **at least 2.6 days** on average.”

How **credible** would you find the **2.5%** probability estimate?

1 – Extremely uncredible; 7 – Extremely credible

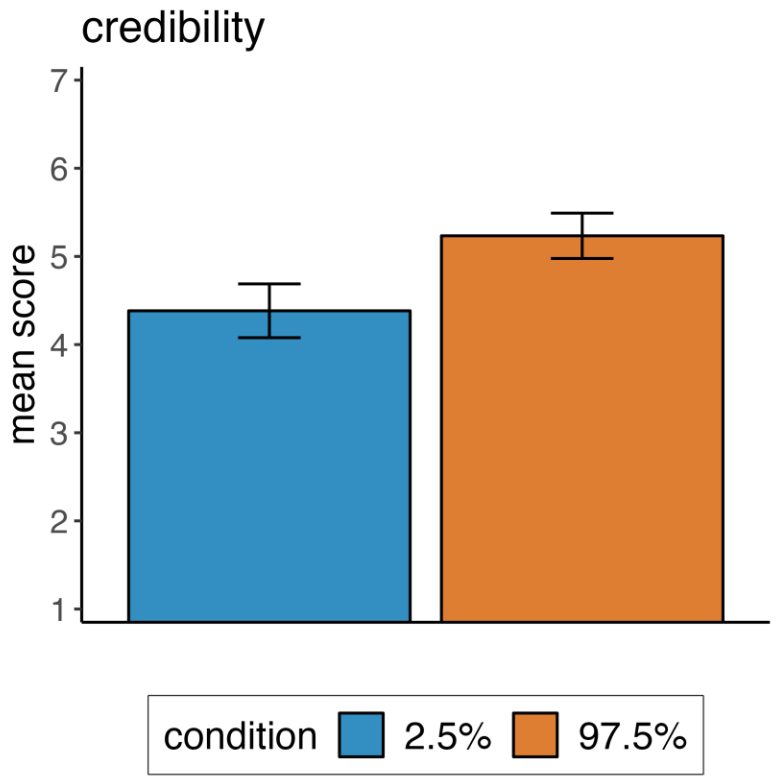
Would the medical consultant have made you more or less likely to **recommend** early mobility exercises to patients?

1 – Much less likely; 7 – Much more likely

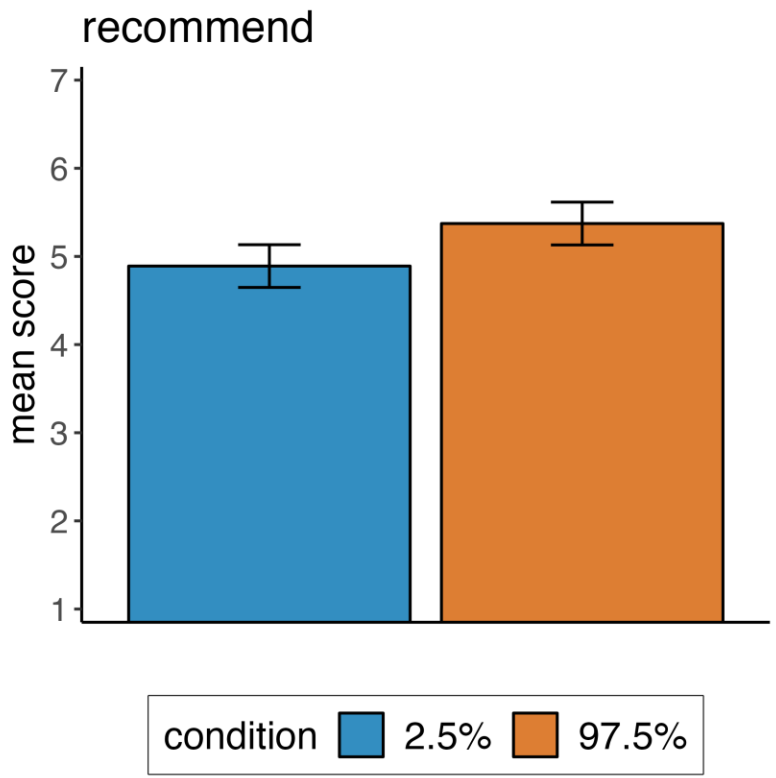
N = 201 doctors (YouGov)

Study 3

Results



t(200) = 6.662, p < .0001, d = .59



t(200) = 5.056, p < .0001, d = .39

CI in error bars

N = 201 doctors (YouGov)

Interim Summary

- S1 & S2: Lower probabilities → lower credibility

- **Why?** Credibility judgements are *difficult*
- Probability in the statement casts doubt on the statement

Study 4

Design & Procedure

2 (Probability: high vs. low) x 2 (Number of Probabilities: 1 vs. 2) mixed design

NP = 1	There is a **5%** chance that global temperature increases **6.3ºF or more*.**	There is a **95%** chance that global temperature increases **3.78ºF or more*.**
NP = 2	There is a **5% chance** that global temperature increases **6.3ºF or more***, and a **1% chance** that global temperature increases **10.26ºF or more***.	There is a **95% chance** that global temperature increases **3.78ºF or more***, and a **99% chance** that global temperature increases **1.8ºF or more***.

*counterbalanced frame, order, and probability presented in Number of Probabilities = 1

Credibility: credible, believe, accurate, trust, expert

α = 0.97

N = 799 (Prolific)

Study 4

Design & Procedure

2 (Probability: high vs. low) x 2 (Number of Probabilities: 1 vs. 2) mixed design

NP = 1	There is a **5%** chance that global temperature increases **3.78ºF or less*.**	There is a **95%** chance that global temperature increases **6.3ºF or less*.**
NP = 2	There is a **5% chance** that global temperature increases **3.78ºF or less***, and a **1% chance** that global temperature increases **1.8ºF or less***.	There is a **95% chance** that global temperature increases **6.3ºF or less***, and a **99% chance** that global temperature increases **10.26ºF or less***.

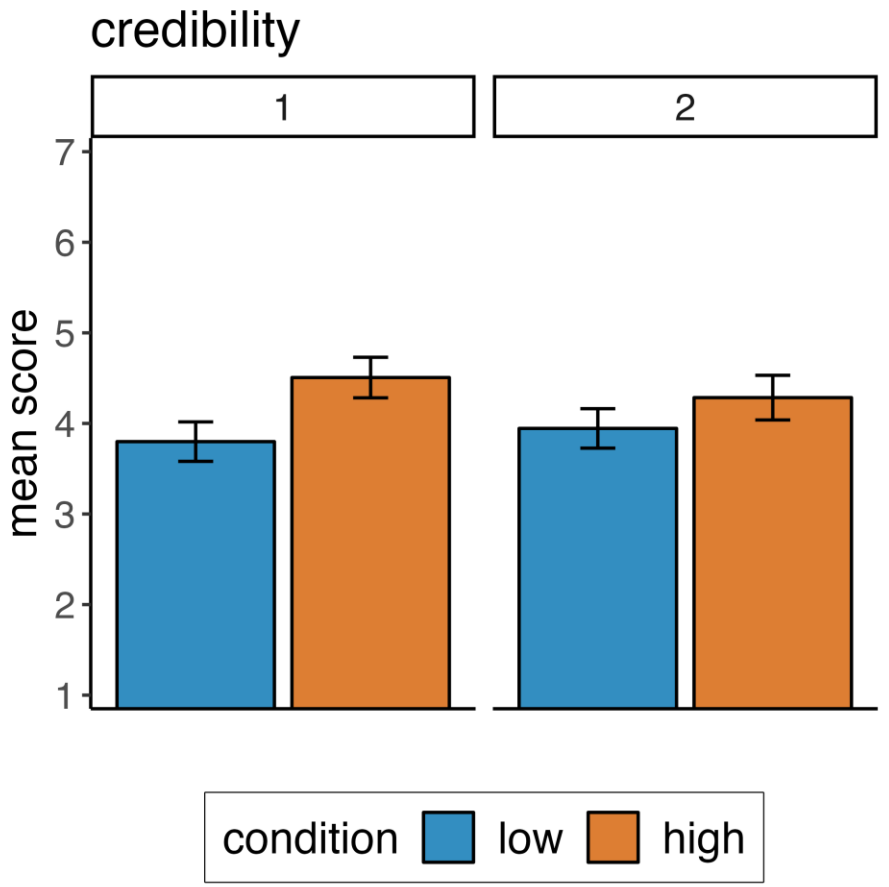
*counterbalanced frame, order, and probability presented in Number of Probabilities = 1

N = 799 (Prolific)

credible, believe, accurate, trust, expert α = 0.97

Study 4

Results



Probability: B = 0.524, t(795) = 7.635, p < .0001
Int: B = -0.368, t(795) = -2.680, p = .0074

CI in error bars

N = 799 (Prolific)

Summary & Contribution

- Lower probability estimates ↓ credibility
- We have replicated this effect:
  - With different samples (e.g., experts, student samples, online samples)
  - In different contexts (e.g., economic recession, sales forecasts)
  - With real and hypothetical risk estimates
  - Controlling for participants' beliefs

- **Why?**
  - Substitution
  - Directionality of probabilities

- Results have direct implications for policy-making and risk communication

Bagchi & Ince 2016; Gal & Rucker 2011; Kahneman & Frederick, 2002; Keren & Teigen 2001

Thank you.

✉ leonor.neto@stern.nyu.edu