



Science Communication in the Digital Era

Scientific disinformation and information disorder

- Alessandro Tavecchio
- Laura Busato

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 “Education and Research” - Component 2: “From research to business” - Investment
3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”



Disinformation and Fake News

Fake News is a very vague, very politicized expression.

Which is why everyone loves it and uses it a lot since 2016.

There are several attempts to break the concept up and approach the issue better, some of which are more helpful than others, but none really applicable in all cases.

Scientific disinformation is usually much easier to identify than most disinfo, but there are still many edge cases.



Microtargeting



Caveat Venditor

- 🌐 The entire business model of ad-tech is based on convincing advertisers that with enough surveillance, machine learning, cookies, tracking, you can find someone who will buy your product no matter what it is.
- 🌐 It's plausible (and in many cases true) that behavioral targeting can do a better job than traditional advertising, but the dominance of Google and Meta comes from their enormous flexibility at extremely low costs, not necessarily from greater efficiency.



Political Microtargeting

STOP **Stop A.I.**

Who is behind this mask? A man? A woman? A terrorist? Burqa is a security risk and it should be banned on U.S soil!



**LIKE AND SHARE
IF YOU WANT BURQA BANNED
IN AMERICA**

STOP ALL INVADERS

11K 1.1K Comments 55K Shares



Army of Jesus

Sponsored · 🌐

👍 Like Page

Today Americans are able to elect a president with godly moral principles. Hillary is a Satan, and her crimes and lies had proved just how evil she is. And even though Donald Trump isn't a saint by any means, he's at least an honest man and he cares deeply for this country. My vote goes for him!

**SATAN: IF I WIN CLINTON WINS!
JESUS: NOT IF I CAN HELP IT!**



PRESS 'LIKE' TO HELP JESUS WIN!

97 Reactions 15 Comments 29 Shares

👍 Like 💬 Comment ➦ Share

NERIS

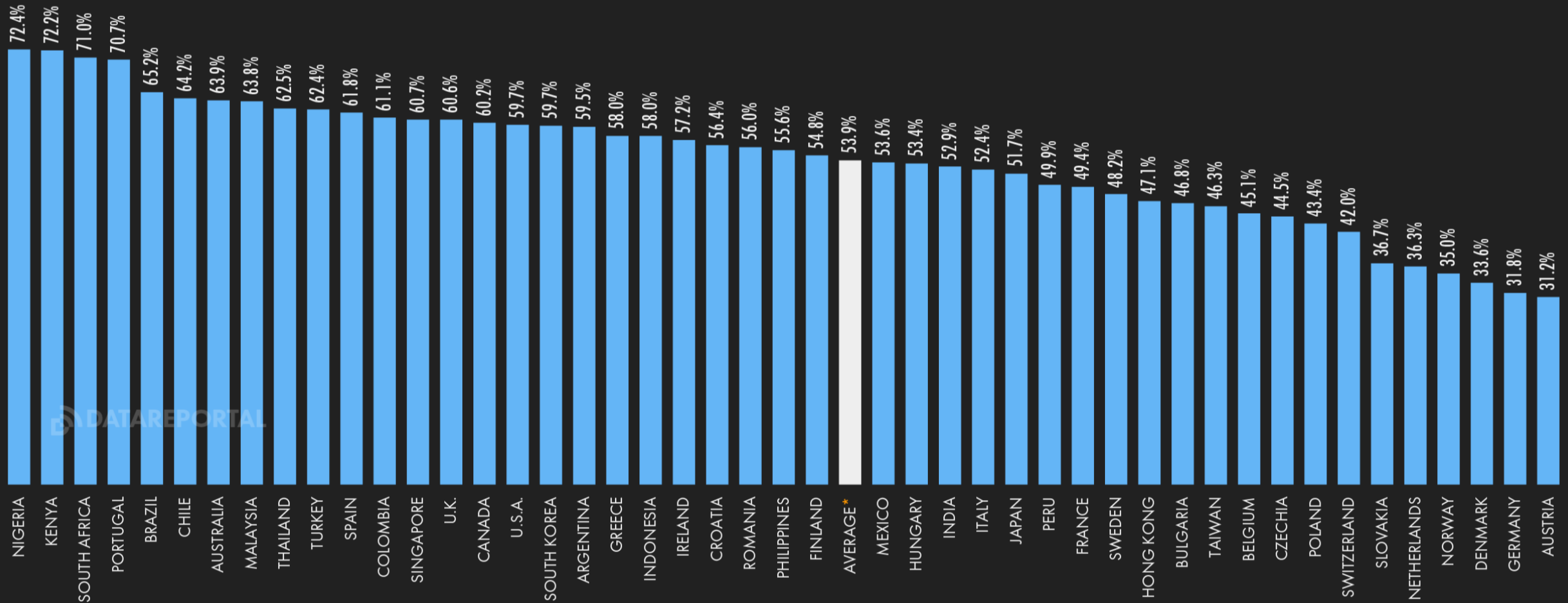
JAN
2023

CONCERNS ABOUT ONLINE MISINFORMATION

PERCENTAGE OF ADULTS AGED 18+ WHO ARE CONCERNED ABOUT WHAT IS REAL OR FAKE ON THE INTERNET



GLOBAL OVERVIEW

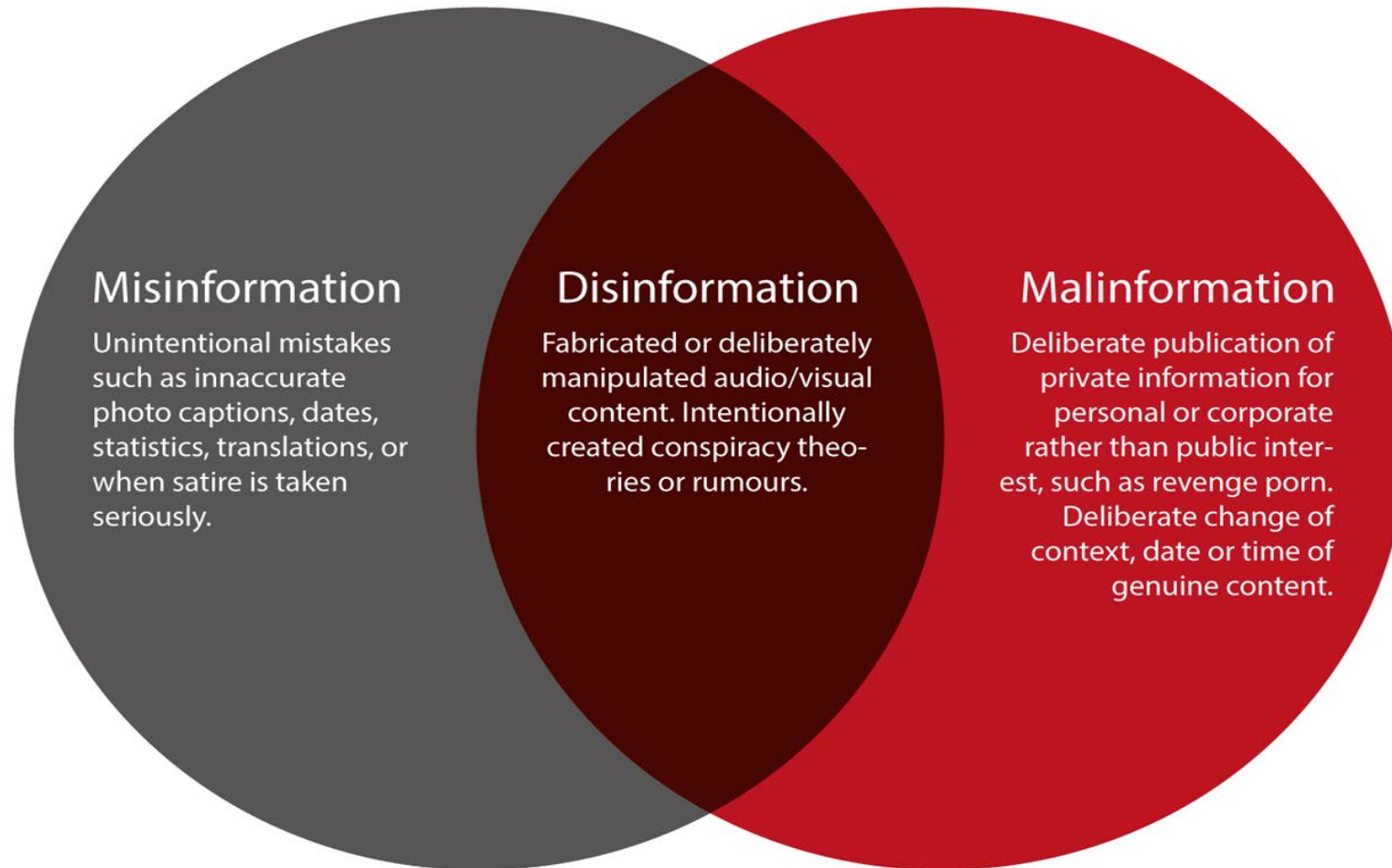


DATA REPORTAL

TYPES OF INFORMATION DISORDER

FALSENESS

INTENT TO HARM



Vino e tè: berli potrebbe rallentare il declino cognitivo, lo dice uno studio

Un nuovo studio sostiene che bere vino o tè aiuta a rallentare il declino cognitivo e la perdita della memoria. Tutto merito dei flavonoli.

Dissapore > Notizie





@b

**l'Italia altro che esempio
è solo vergogna** 😡



**Mei cortei in Francia
i manifestanti
espongono striscioni
con scritto:**

**"NOI NON FAREMO
LA FINE DELL'ITALIA"**

Vespa killer arrivata anche in Italia: il pericoloso insetto di grosse dimensioni avvistato in diverse regioni. Ha ucciso una cinquantina di persone in Cina e Giappone



Propaganda: an operative definition

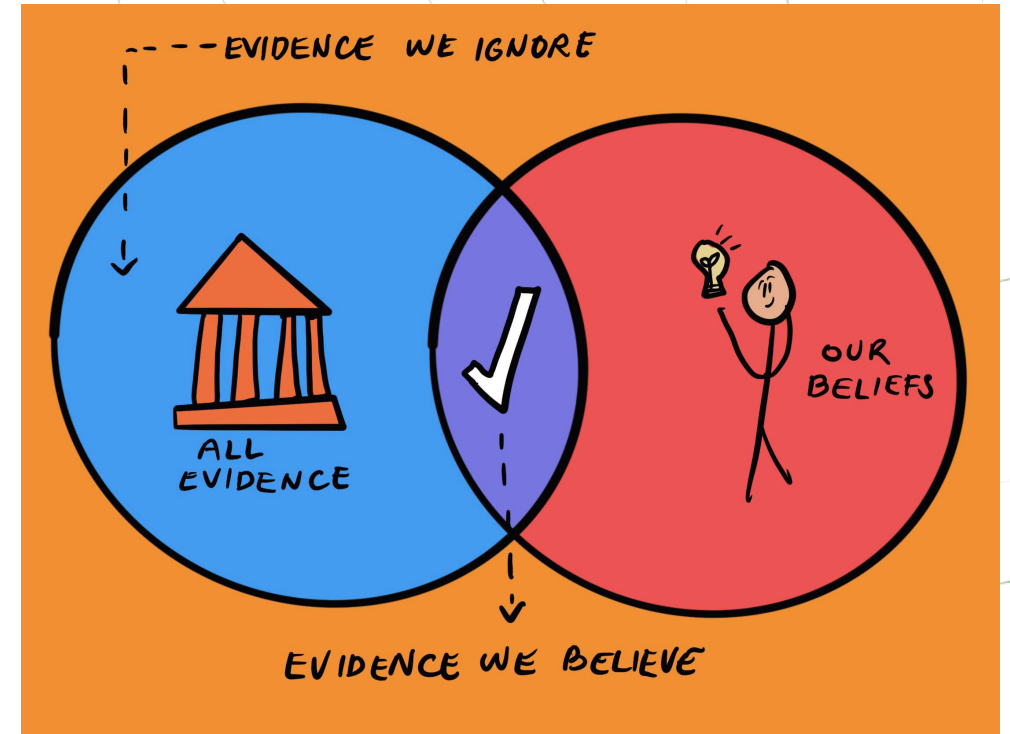
Disseminating information which is designed to mislead a population, interfere with the public's right to know and the right of individuals to seek and receive, as well as to impart, information and ideas of all kinds; and undermine the public's trust in information, the media, or public institutions.

Table I. A matrix of four typologies of propagations.

	PROPAGATOR	
INJECTOR/PROPAGATOR	judges as 'false'	judges as 'true'
judges as 'false'	Pure disinformation (1)	Disinformation propagated through misinformation (3)
judges as 'true'	Misinformation propagated through disinformation (2)	Pure misinformation (4)

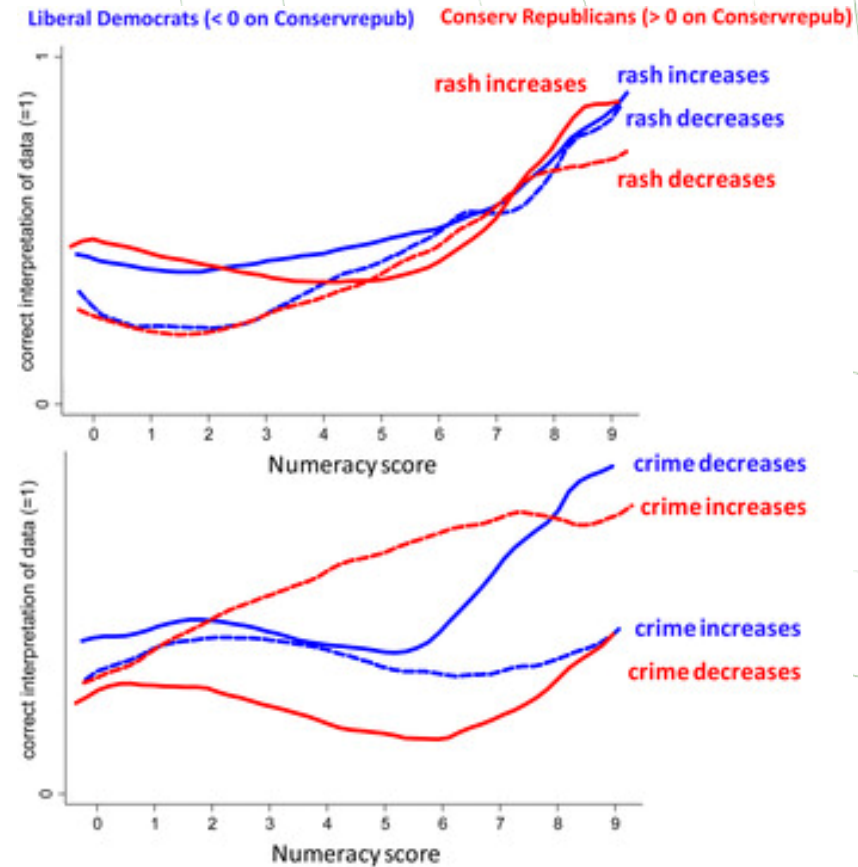
Value Conflict in Science Controversies

- Most scientific controversies debates (e.g., vaccine denial, GMOs, climate change denial, creationism) are rooted in value conflicts, not knowledge gaps
- Most scientific controversies are about disagreement on values driving the incentive for actors to push for disagreement on facts. The values come first
- The same “controversial” topic can actually have more than one core value conflict at his root, e.g. vaccines:
 - individual liberty vs. communal health
 - purity/naturalness vs “chemicals”
 - religious beliefs vs secular norms

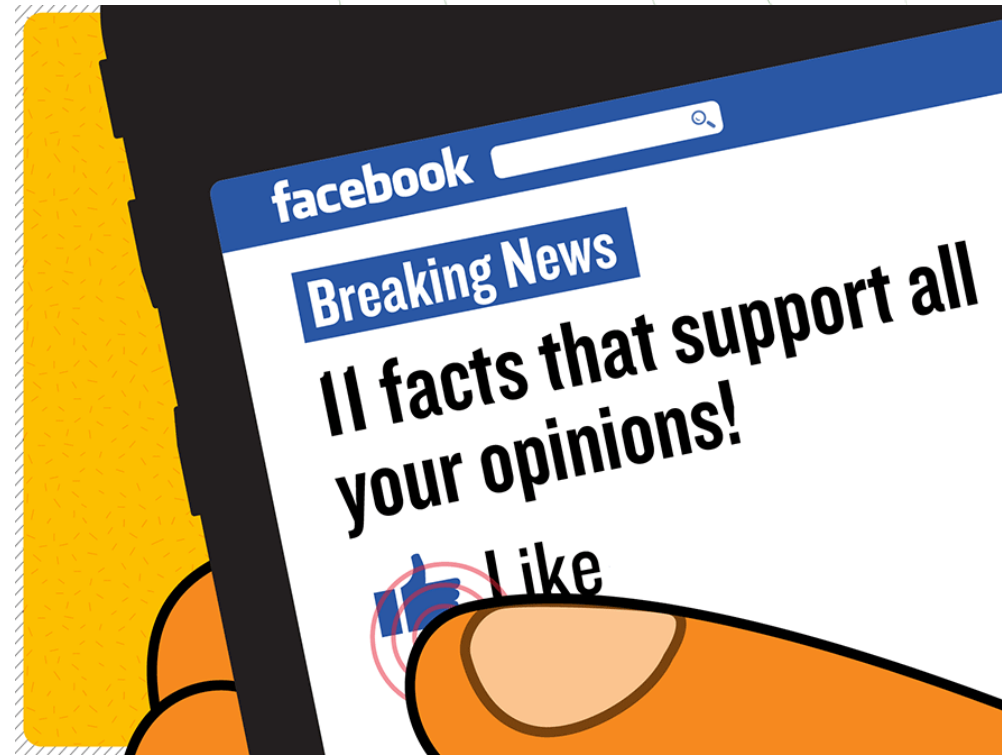
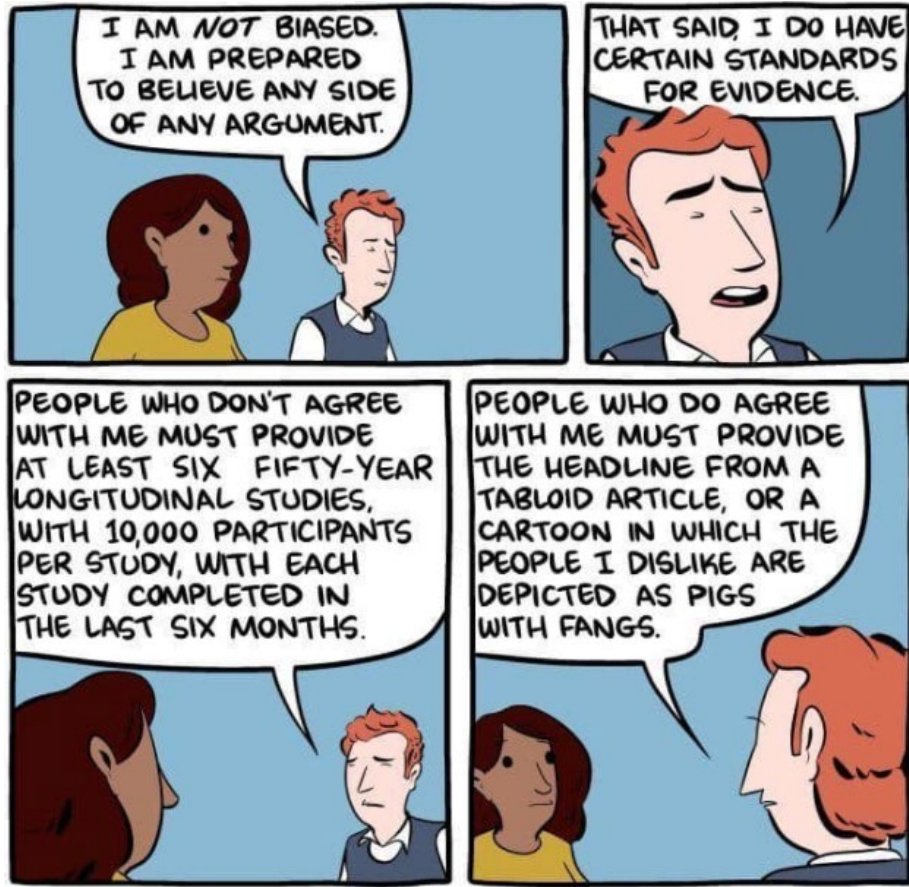


Motivated Reasoning: knowing more can make it worse

- Cultural Cognition Thesis (Kahan et al., 2011): individuals conform factual beliefs to align with group identities and cultural values
- Explains polarization on science issues where information threatens core identities (e.g., climate, vaccines)
- Studies show higher science literacy can increase polarization when identity is activated (Kahan et al., 2012)



Confirmation Bias



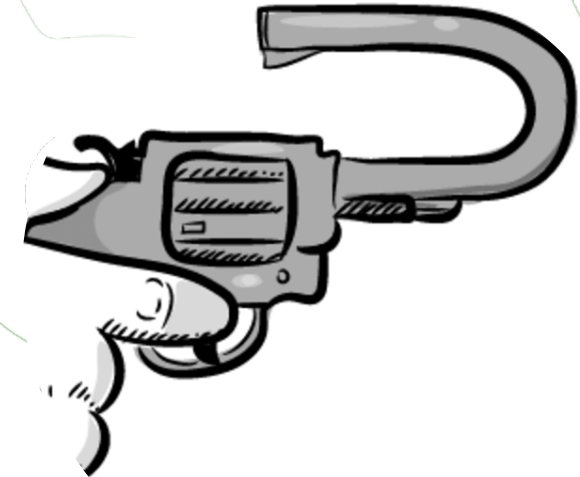
Backfire effects: when corrections make it worse

An imperfect taxonomy of backfires:

Backfire from psychological reactance, when messages are perceived as threats to freedom/autonomy

Familiarity Backfire (Illusion of Truth)

- Repeating a myth, even to debunk it, can increase familiarity → makes it feel **truer** over time
- Based on fluency heuristics: repeated statements are processed more easily, boosting perceived credibility
- Strategy: Focus on repeating correct information, avoid reiterating myths unnecessarily (Lewandowsky et al., 2012)



Backfire effects: when corrections make it worse (?)

- **Boomerang Effect (Backfire effect)**

Information intended to correct misconceptions reinforces false beliefs, leading audiences to double down. Early studies (Nyhan & Reifler, 2010) showed political corrections sometimes strengthened original misperceptions. Later research (Wood & Porter, 2019) suggests boomerang effects are very rare, but possible in highly polarized contexts

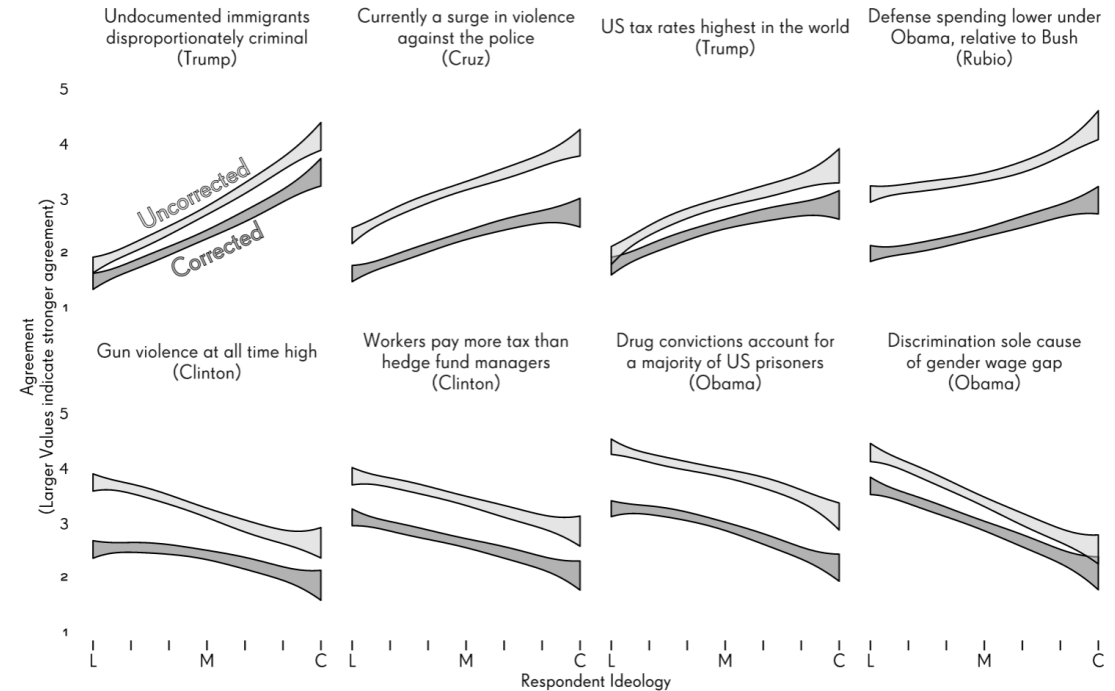
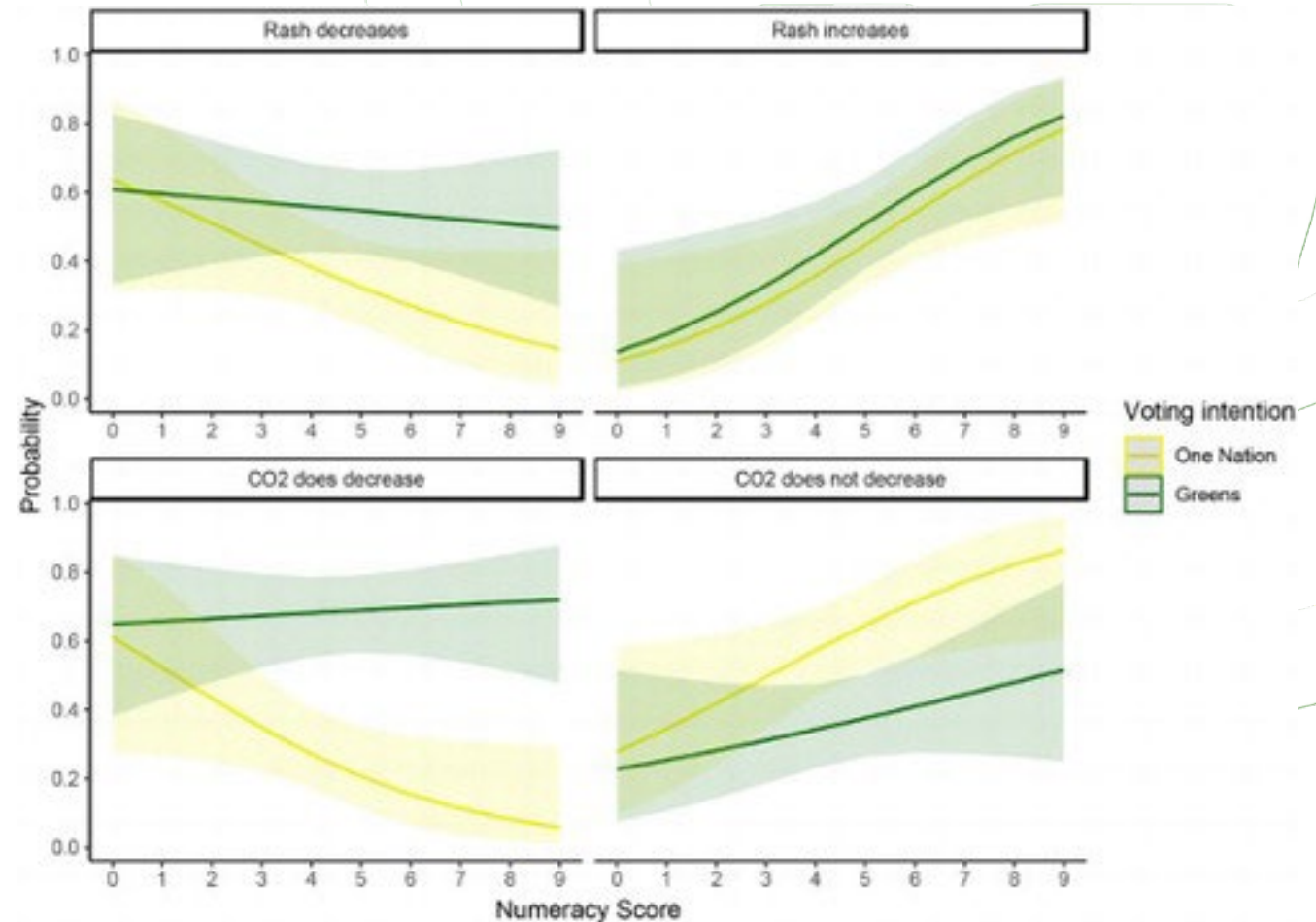


Figure 1: Study 1 correction effects. Curves are the conditional predictions and their 95% confidence intervals drawn from the regression models described in table 4, on page iv. Issues are sorted by the overall relationship between ideology and agreement.

Identity Protective Cognition

- People process information to protect their group identity — a phenomenon called identity-protective cognition
- When scientific messages conflict with group values (political, cultural, religious), individuals are motivated to dismiss or counter-argue the information
- This selective processing helps maintain social belonging and self-consistency with one's group.
- The best way to avoid triggering defensive reactions is to be perceived as a member of the ingroup, which is why plurality and diversity is extremely important

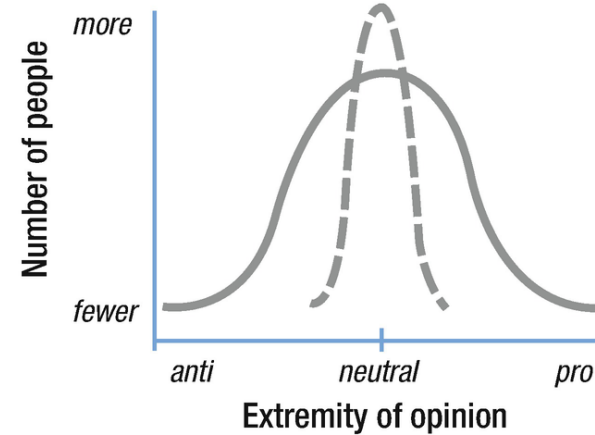


Polarization: an important yet overused concept

In the social sciences, the term ‘polarization’ is typically understood as some form of distance measure on a (typically one-dimensional) distribution of opinions. Under this general framework, polarization may be quantified in numerous ways, including but not limited to spread, dispersion, regionalization, community fracturing, distinctness and group size. [...] the most common measure of polarization in the political literature is probably bimodality, which is the idea that the population can be usefully broken down into two subpopulations.

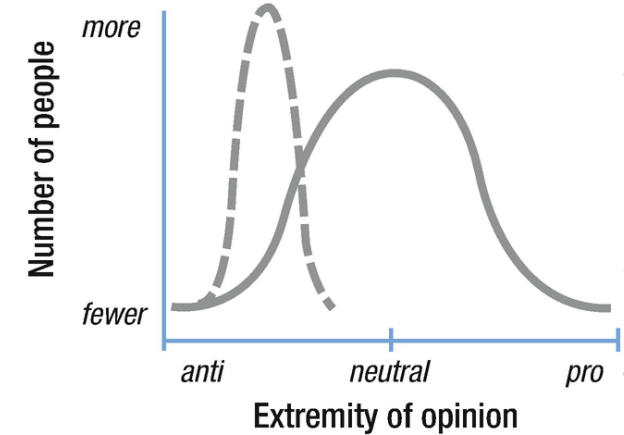
(a) Conformity

A reduction in the variability of private opinions after group discussion (Asch, 1956)



(b) Group Polarization

A shift in the extremity of private opinions toward the local norm after group discussion (Moscovici & Zavalloni, 1969)



Online closed spaces and disinformation

- 🌐 Private, closed or semi-closed networks, such as messaging app groups or Discord, are one of the main channels for the spread of disinformation and are opaque and difficult to study.
- 🌐 Some scholars (and many marketers) observe that a transition towards one-way social platforms has been underway for years, along with a shift of public conversation into private spaces.



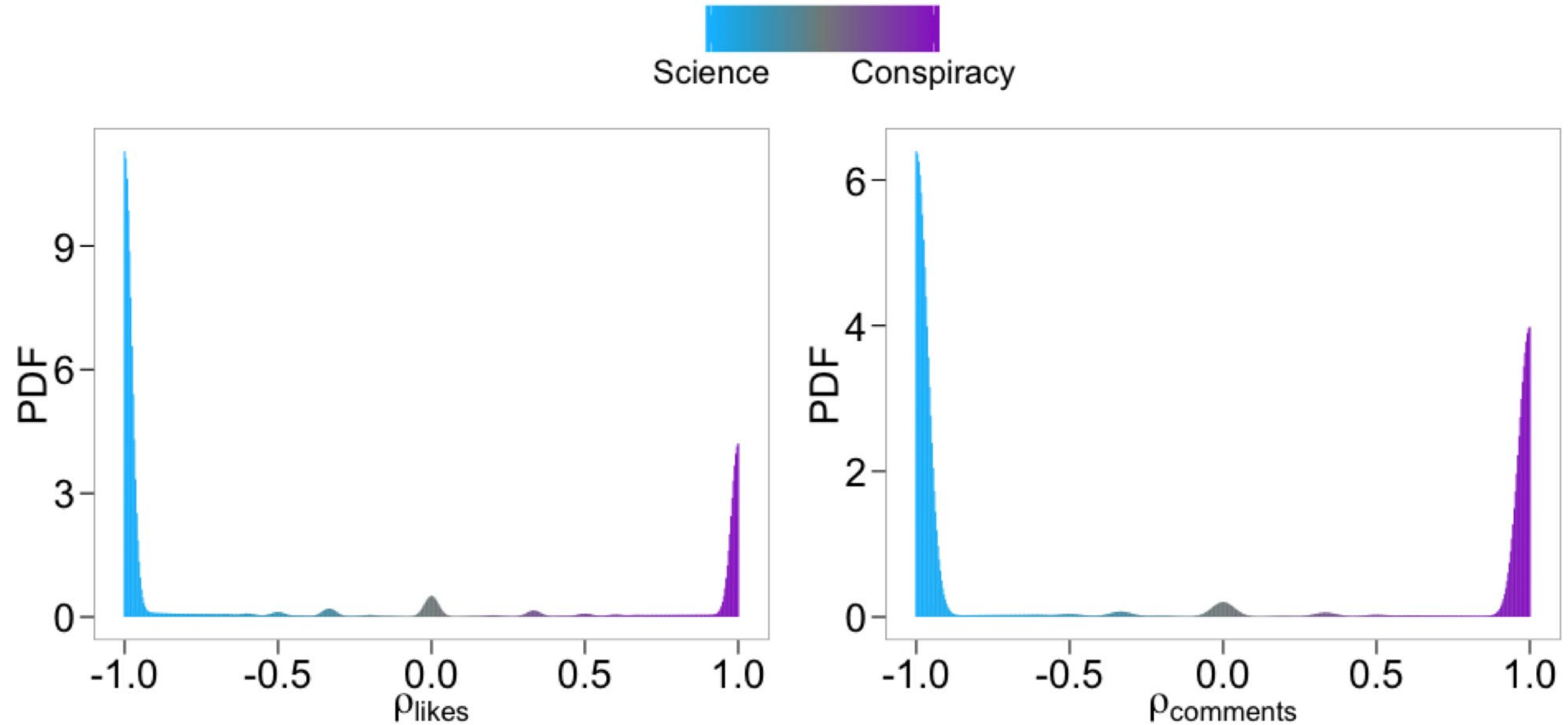
Echo Chambers & Filter Bubbles

- 🌐 Echo chambers are environments—often in closed or semi-closed networks—where dissenting views are actively excluded or discredited, reinforcing group identity and making users more resistant to outside perspectives.
- 🌐 Filter bubbles are the result of algorithmic personalization, where users are unknowingly isolated from diverse viewpoints as platforms curate content based on past behavior

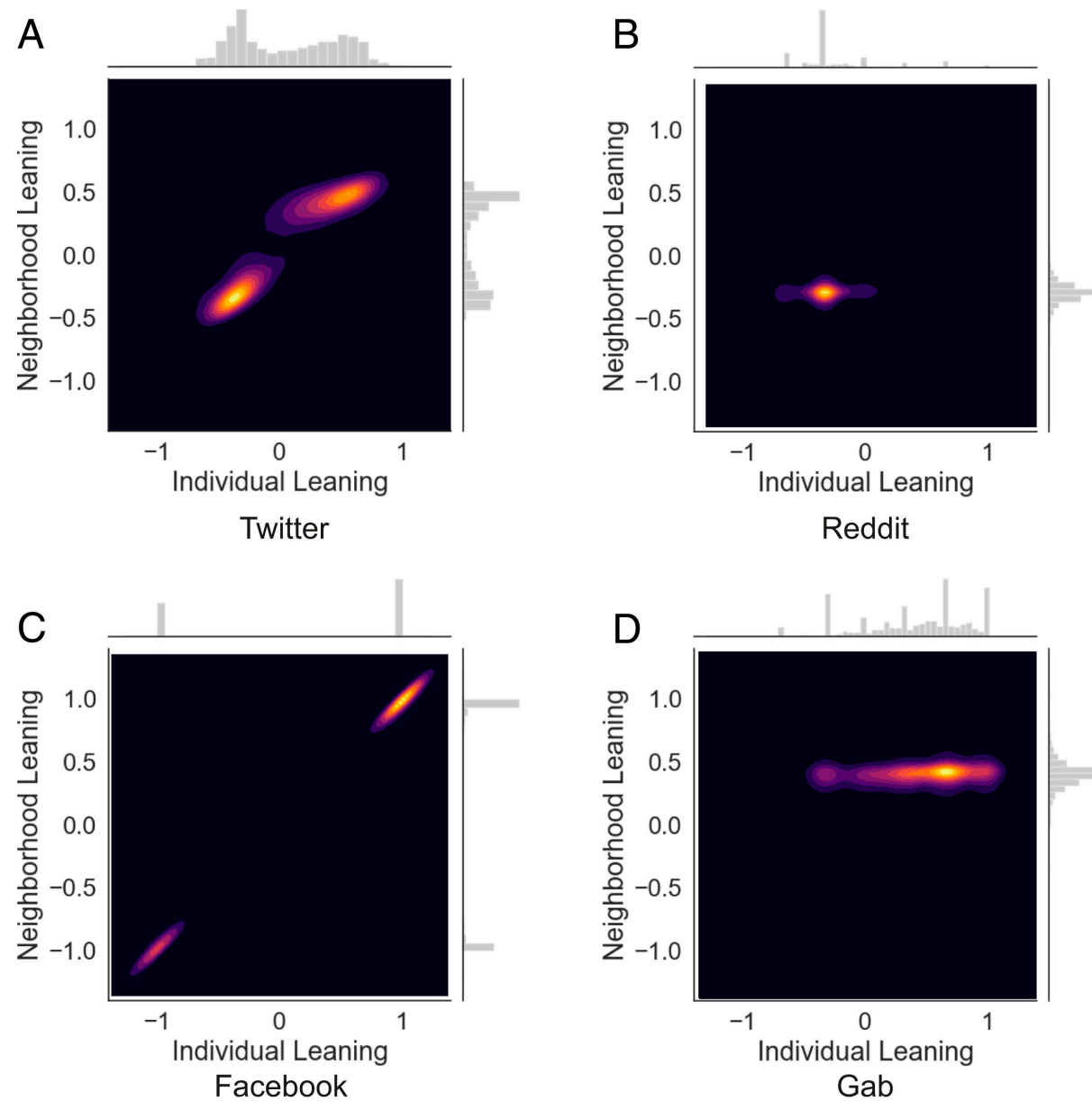
Both lead to distorted perceptions, but echo chambers are more resilient to correction and, can, ultimately, generate polarization.



Debunking in a world of tribes, Zollo et al, (2017)



The echo chamber effect on social media, Cinelli et al, 2021



Recurring emotional patterns

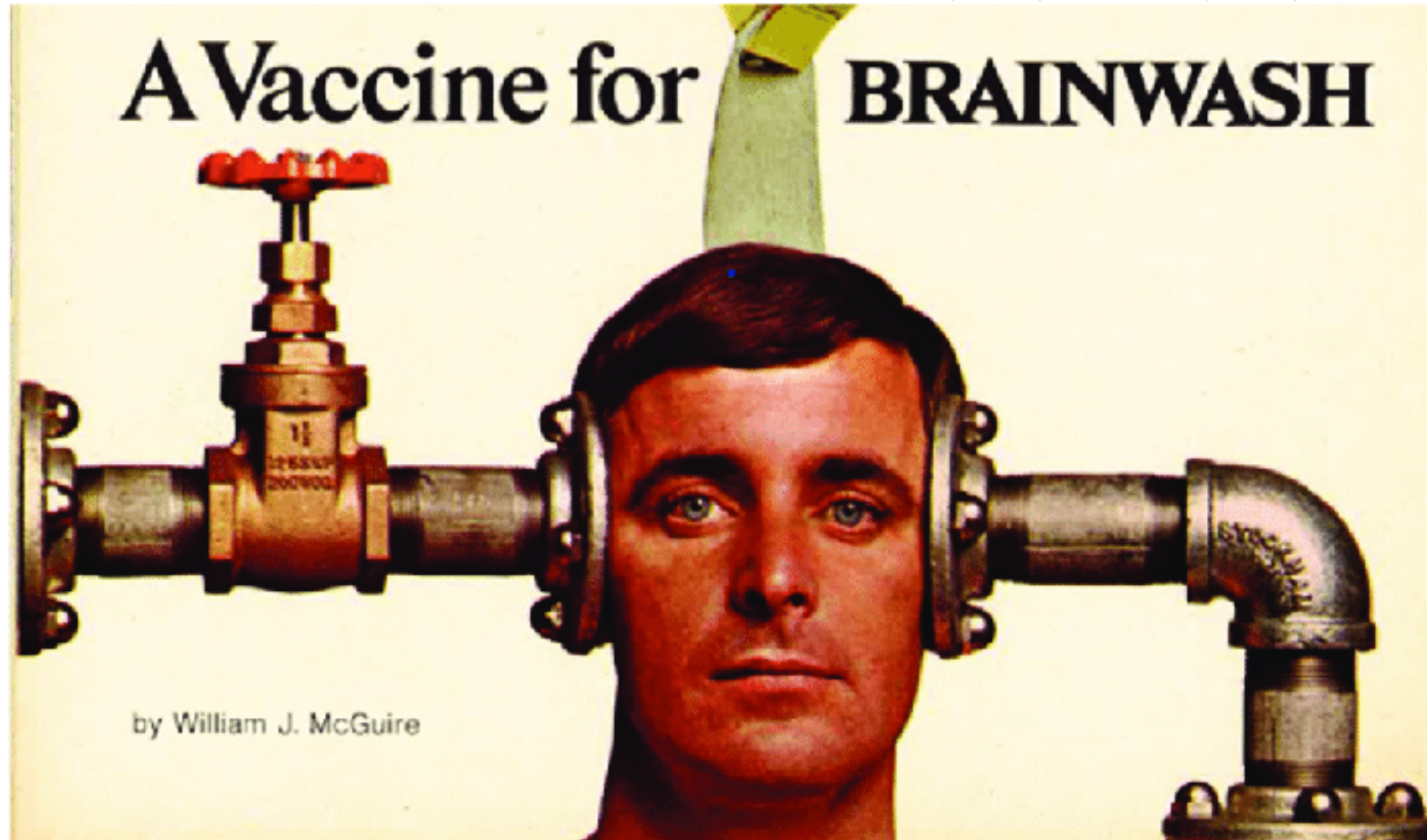


What can be done, then?

- Know your audience and avoid universal messaging — one size does not fit all.
- No, really, know your audience: not in the usual demographics/marketing sense, but try to understand the cultural, social and political context. Be a good listener
- Emphasize values and concerns you share with your audience. People often use statement of facts but they are more than anything expressing an emotion
- Try to be original when appropriate: pattern matching can be used to dismiss your arguments without even listening to them.

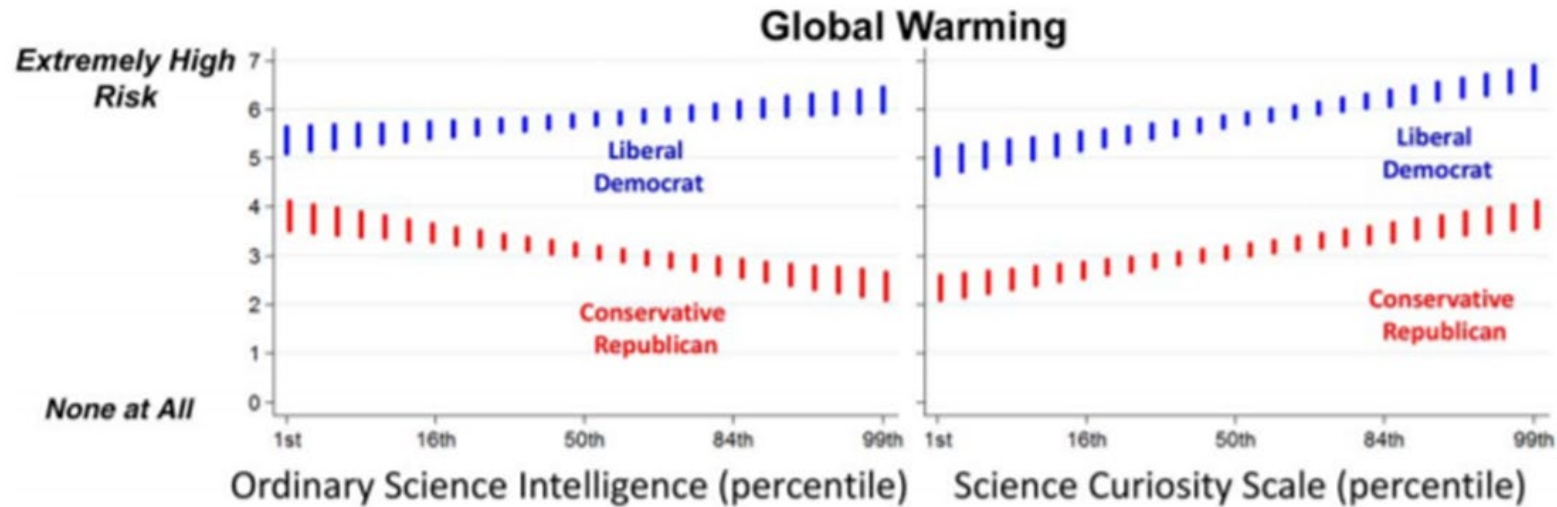


Pre-Bunking?



Why community and science communication still matters

*“How much risk do you believe **XXX** poses to human health, safety, or prosperity?”*



Mercury, Media & Misinformation

A Roleplaying Simulation on Crisis Communication
in the Age of Social Media

A new scientific assessment from UNEP reveals that mercury levels in fish are still rising, especially in low-income coastal regions. Despite years of global negotiation (like the Minamata Convention), emissions from artisanal mining, coal combustion, and consumer products persist.

<https://tinyurl.com/MercuryCrisis>



Phase 1 - The Leak

- 🌐 A draft UNEP report is leaked online. It shows mercury levels in certain fish species are 40% higher than 2010 projections.
- 🌐 Within hours social media posts on the top are already all over the place:
- 🌐 A viral X (Twitter) thread claims: "UNEP has been hiding this data for years. Fish is now toxic. They lied to protect corporate interests."
- 🌐 A popular nutrition influencer reposts: "No fish is safe to eat anymore. Protect your kids. Don't trust institutions."

Phase 1 - The Leak

As members of the UNEP communication office, you need to quickly make your move:

- 🌐 Draft an initial unified message to put out on social media as an official statement, trying to anticipate the political fallout.
- 🌐 Use the information from the assessment as a guide on the state of the art of the science
- 🌐 Write 300-500 characters, deciding the immediate communication tone (reassuring, factual, transparent?) and how much uncertainty you want to explain.

Phase 2 – It's getting worse

A media storm erupts after several social posts go viral:

🌐 "UN admits fish is toxic. WHO silent. What are they hiding?"

🌐 "Mercury in baby food? This explains the unprecedented rise in autism diagnosis"

🌐 "UN hid this for years, they knew fish was slowly poisoning you"

🌐 "Avoid all seafood. UNEP and WHO in cover-up."

🌐 "UN study shows fish = poison. Yet they kept funding Chinese mercury factories."

🌐 "Mercury, vaccines, infertility... It's all connected. Who funds UNEP anyway?"

Phase 2 – Social Response Package

Part of the team should pivot and prepare refutation of what they consider the most dangerous false claims, clarifying actual data, and redirecting attention to solution.

Pick two of the viral social posts and prepare two quote for media outlets that could appear in an article: “A UNEP spokesperson said: ...”

Use the information from the mercury assessment to inform your statements, keeping in mind that different stakeholders are going to have different priorities and reactions. Especially different political entities.

Phase 3 – It hits the fan

US Health Secretary Robert Kennedy Jr. has put out a statement:

“For years, international elites denied the dangers of mercury. Now the truth leaks out. Mercury in fish, mercury in vaccines—same playbook. No one is held accountable.

As Secretary of Health, I recommend:

- ◆ Avoid all freshwater and coastal fish until mercury levels are independently verified
- ◆ Pregnant women and children should abstain completely
- ◆ Demand transparency from UN and WHO”

The fishing industry is feeling scapegoated and is preparing a counter-report.

Phase 3 – It hits the fan

Global Federation of Fisheries & Aquaculture (GFFA) has put out a statement:

“We urge the public and media to remain calm and resist fear-based narratives.

The seafood sector operates under the highest international safety standards.

The data in this leaked report is incomplete, non-peer-reviewed, and lacks context. Mercury levels in commercial fish stocks remain within safe limits — a fact confirmed by decades of food safety monitoring.”

“Statements from political figures suggesting consumers ‘avoid all seafood’ are reckless and ignore the vital role fish plays in global nutrition and livelihoods, especially in coastal and indigenous communities. We call on UNEP to clarify its position and on the WHO to reaffirm existing food safety guidelines.”

Phase 4 – Live Interview:

Choose a UNEP spokesperson.

They will be interviewed by a prime time news program. The whole interview segment will be 3 minutes.

It's your last best chance to put your message out, but you'll have to be prepared to roll with whatever comes up.

The internal UN administration has made clear that you should address RFK Jr. and GFFA without escalating. Depending on how the interview evolves, you might have the chance to do it directly or indirectly.



THANKS!

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 “Education and Research” - Component 2: “From research to business” - Investment
3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”

