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# **Week 2. Information Proliferation and Misinformation**

**Jessie Chin**

Assistant Prof., School of Information Sciences

University of Illinois at Urbana-Champaign

# Example of Misinformation

## A message from social media:

Quaker oatmeal causes cancer.

Oatmeal contains carcinogen.

# Oatmeal, breakfast foods contain unsafe amounts of cancer-linked weed killer, report says

The New York Times

These breakfast foods contain wee

Author: Marc Daalder (Detroit Free Press)  
Published: 11:24 AM MDT August 15, 2018  
Updated: 9:01 AM MDT August 17, 2018

## *Report Finds Traces of a Controversial Herbicide in Cheerios and Quaker Oats*



# What we know or don't know

- [Fact] Previously, jury orders Monsanto to pay nearly \$300 million to cancer patients in Roundup lawsuit
- [Fact] Some Quaker oat products contain glyphosate. (common weedkillers for crops)
- [Emerging Evidence] Mixed findings about links between glyphosate and cancer

# What we know or don't know

- [Fact] Previously, jury orders Monsanto to pay nearly \$300 million to cancer patients in Roundup lawsuit
  - It is not the evidence that glyphosate caused cancer
  - It was based on the lack of enough warning about the “potential carcinogen” in their products
- [Fact] Some Quaker oat products contain glyphosate. (common weedkillers for crops)
  - From a 2018 private sector report, Environmental Working Group (EWG), claiming 31 out of 45 products contain excessive glyphosate, using different criteria
  - From FDA 2016 report, the amount of glyphosate in Quaker products did not exceed the criteria
- [Emerging Evidence] Mixed findings about links between glyphosate and cancer
  - 2015, WHO, glyphosate is probable carcinogen
  - 2017, NIH stated NO evidence showed the link between glyphosate and cancer
  - 2017, EPA (Environmental Protection Agency), “glyphosate is not likely to be carcinogenic to humans”
- [Fact] Nature paper showed link between glyphosate and fatty liver

# Think...

- **False simplification**
- Oatmeal causes cancer
- Oatmeal contains carcinogens
- **False causal inference**
- A company being sued due to that its products cause cancer
- A company being sued due to that it did not label its product contains probable carcinogens
- The mixed findings/emerging evidence about whether something is carcinogen
  - Court order as scientific evidence?
  - What is evidence in science?

When do you find you need to validate the information you find?

What do you usually do if you find some information that you are not sure?

# Why people (don't) investigate

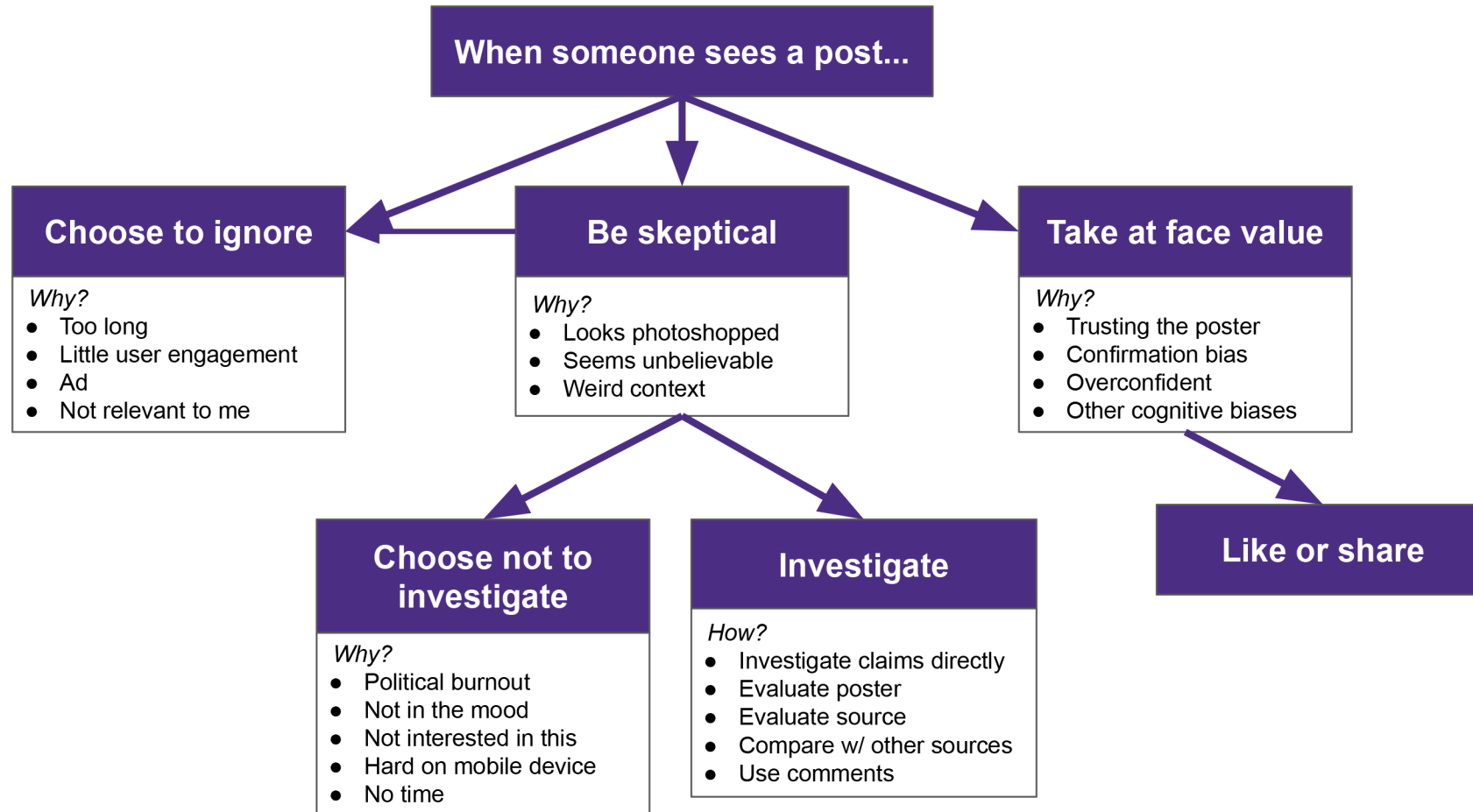


Figure from Franziska Roesner, University of Washington  
Geeng, Yee & Roesner, 2020 (CHI'20)



# How to validate/verify information

- Simplification
- Causal claims
- Provoking language (emotional expressions)
- Common conspiracies
  - Third-party fact-check websites
- Source of information
- Basis of evidence – quality of evidence (case study, peer review)

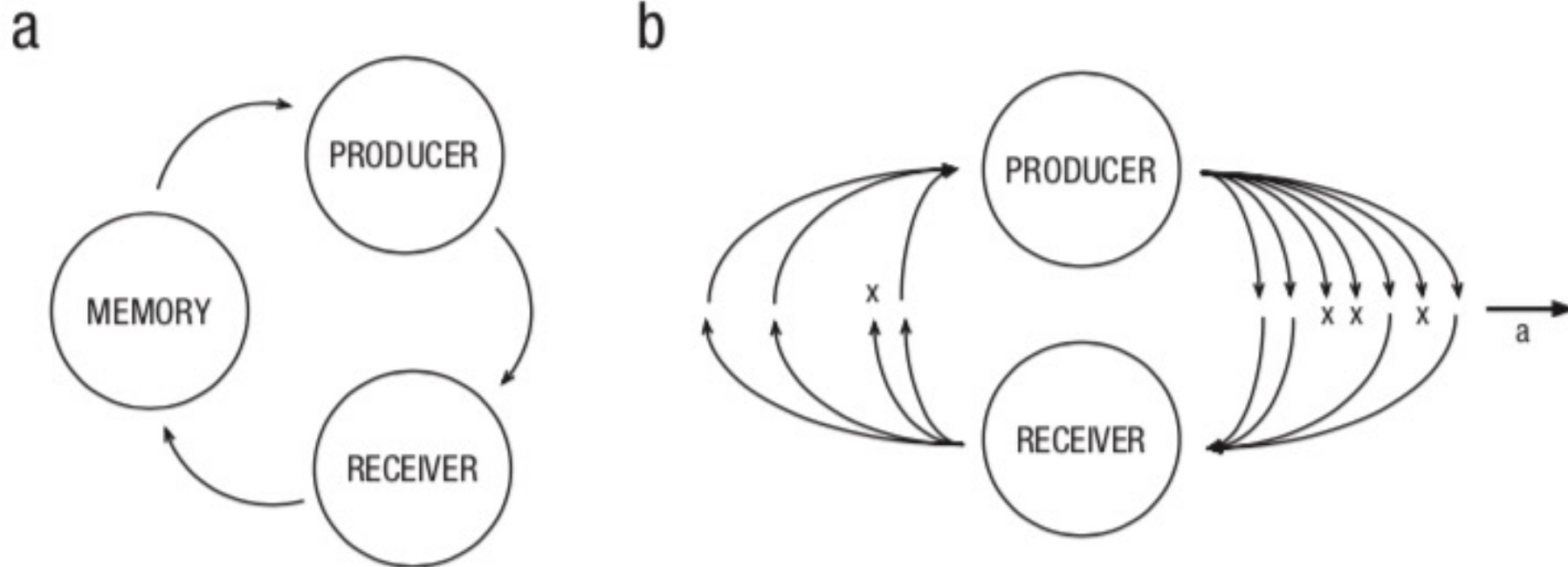
# Lack of Training in Evidence Searching

- How to evaluate a scientific argument?
- What will be considered as evidence?
  - How to evaluate the strength/robustness of evidence (of health information)?
- Recent findings in COVID-19 vaccine (Loomba et al., 2021)
  - RCT in US/UK: misinformation -> decline in COVID-19 vaccination intention
  - Scientific sounding misinfo

Are all information equal?

# The Evolution of Info Ecosystems

- The cognitive lifecycle of information is accelerated: Produce-> Receive-> Memory



# The Evolution of Info Ecosystems

- More competition during “information receiving” (search, uptake, encoding)
- Reduce info generation time
- Faster generation times accelerate **adaptation** → The more rapidly we can access, select and reproduce **preferred info**, the more readily the info reflect the **cognitive bias** of users

# The Evolution of Info Ecosystems

- **Cognitive Selection** comes in -- info proliferation vs. limited attentional resource
- Hence, some information become more competitive/appealing:
  - Belief-consistent
  - Negative info
  - Social Info

# Are all information equal?

- Misinformation vs Disinformation
  - Belief-Consistent: confirmation bias
  - Negative
  - Social
- In terms of its evolutionary advantages (Hills et al., 2018)

# Belief-Consistent

- Confirmation Bias (e.g., Lord, Ross & Lepper, 1979)
- Echo-Chamber Effect/Filter Bubbles (Nikolov, et al., 2015; Barbera et al., 2015)
- Algorithms/Recommender System



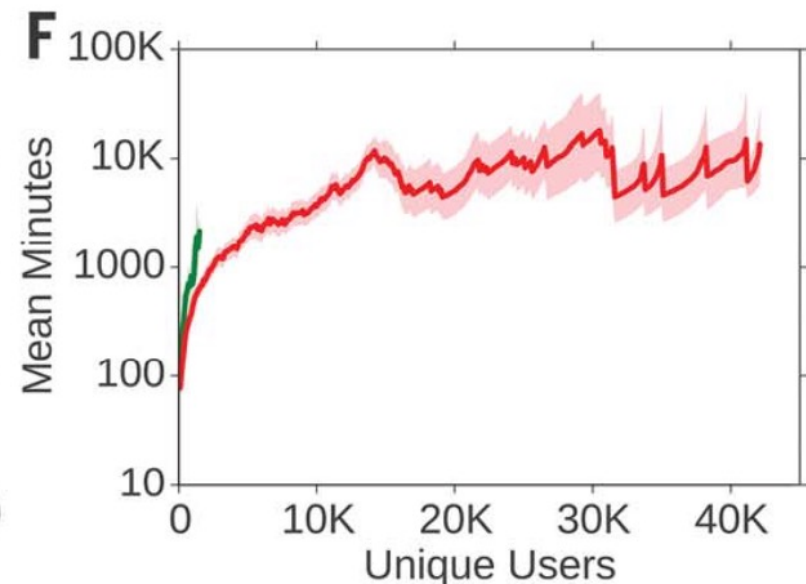
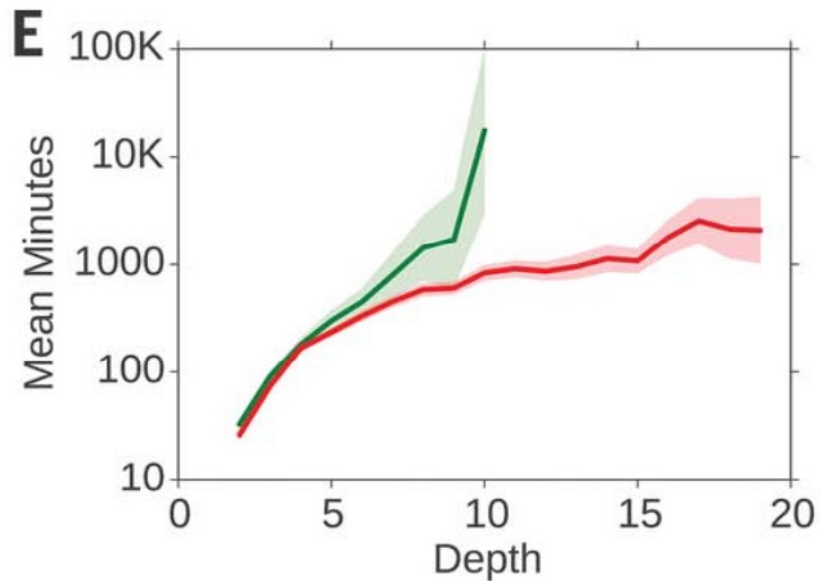
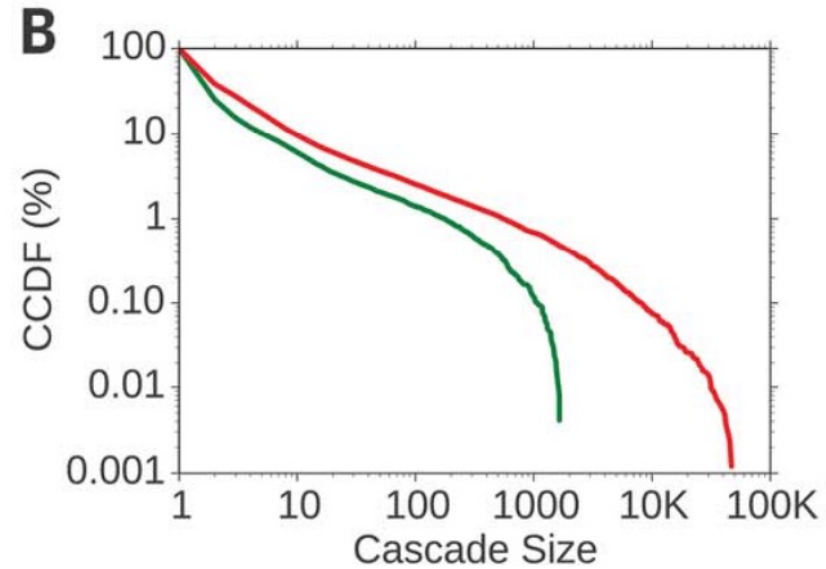
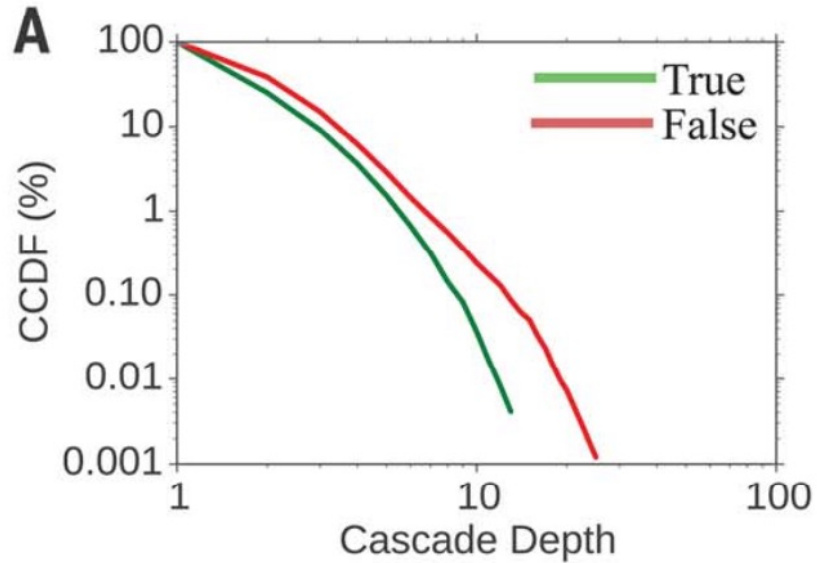
# Negative Info

- Social Risk Amplification (Kasperson et al., 1988)
  - "Telephone" game (Moussaid, Brighton & Gaissmaier, 2015): Chain of individuals pass info starting from balanced articles about antibacterial agents

# Social Info

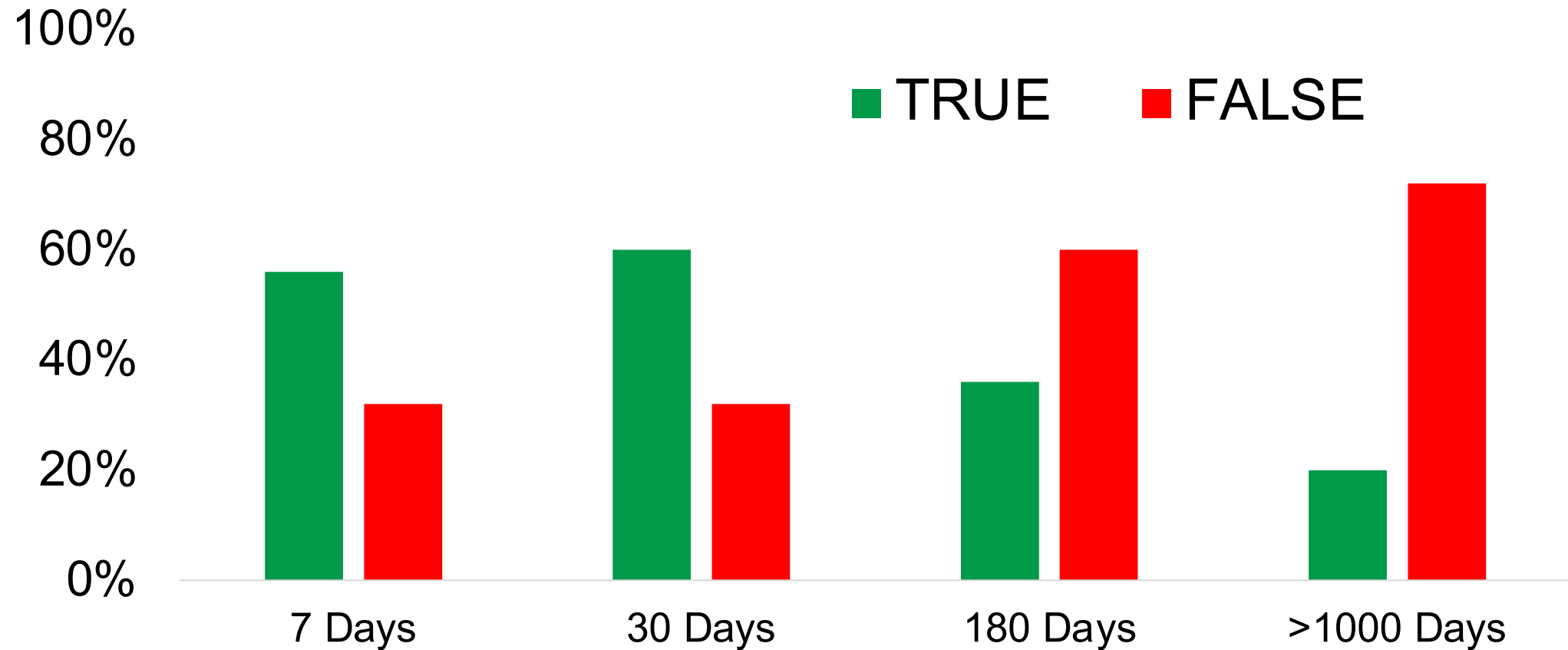
- Social connectivity: avoid exploration – suboptimal decisions (Mason, Jones & Goldstone, 2008)
- Long-tailed distribution of citations counts of scientific papers, web search, products, etc. (Clauset, Larrenmore & Sinatra, 2017)

# Fake news goes viral the the true ones



(Vosoughi, Roy & Aral, 2018)

# Using Twitter HPV vaccine misinformation as an example



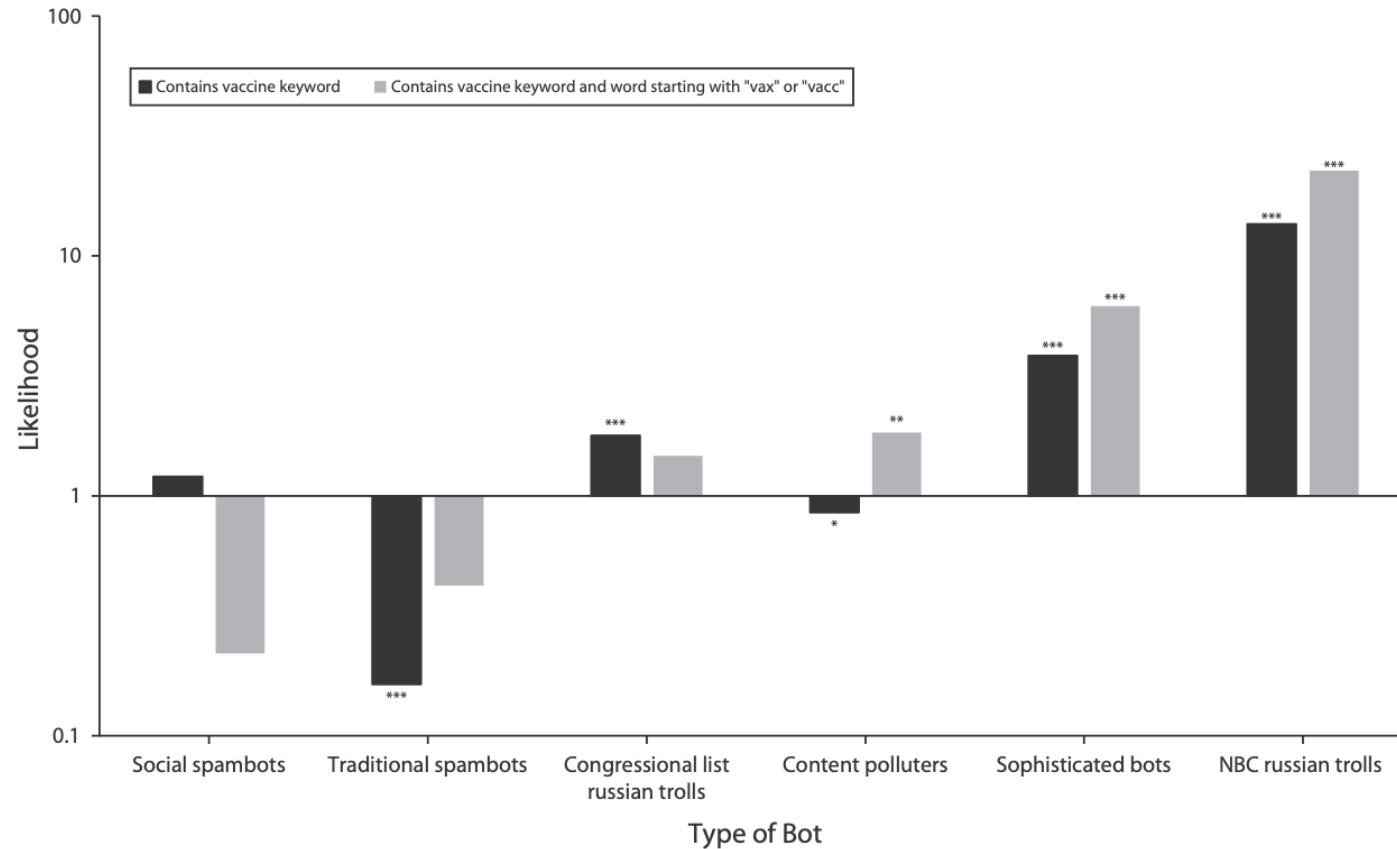
# Bots vs Trolls

# About Misuse of Accounts

Twitter Review on Jan 31, 2018

- Identify 3841 Internet Research Agency-linked accounts (IRA; Russian government-linked organization)
- Estimated unique users who receive influences during 2016 US election: 677,775
- 50258 Bots (Russian-linked, election-related)
- [https://blog.twitter.com/en\\_us/topics/company/2018/2016-election-update.html](https://blog.twitter.com/en_us/topics/company/2018/2016-election-update.html)
- During May and June 2018, Twitter suspended more than 70 million fake accounts

# Russian Trolls and Vaccines



*Note.* NBC= National Broadcasting Network. All results remained significant after controlling for multiple comparisons using the Holm–Bonferroni procedure. Raw counts are given in Table B (available as a supplement to the online version of this article at <http://www.ajph.org>).

\* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$ .

AJPH OPEN-THEMED RESEARCH

Am J Public Health. 2018;108:1378–1384.  
doi:10.2105/AJPH.2018.304567

**Weaponized Health Communication: Twitter Bots and Russian Trolls Amplify the Vaccine Debate**

David A. Broniatowski, PhD, Amelia M. Jamison, MAA, MPH, SiHua Qi, SM, Luhwah AlKulaib, SM, Tao Chen, PhD, Adrian Benton, MS, Sandra C. Quinn, PhD, and Mark Dredze, PhD

# Psychological Effects of Misinformation on Our Cognition



# Effects of repeated exposure

## Fake News



**Election Night: Hillary Was Drunk, Got Physical With Mook and Podesta**

According to Todd Kincannon of the Kincannon Show, he spoke to a CNN reporter about...

DAILYHEADLINES.NET



**Obama Was Going To Castro's Funeral—Until Trump Told Him This...**

Obama just had the rug pulled out from under him.

THELASTLINEOFDEFENSE.ORG



**Donald Trump Sent His Own Plane To Transport 200 Stranded Marines**

After hearing about 200 Marines left stranded after returning home from Operation Desert Storm back in 1991, Donald J. Trump came to the aid of those Marines by sending one...

UCONSERVATIVE.COM



**Mike Pence: Gay Conversion Therapy Saved My Marriage**

Vice President-elect Mike Pence claims that a 1983 conversion therapy saved him.

NCSOOPER.COM | BY RANDALL FINKELSTEIN



**Pennsylvania Federal Court Grants Legal Authority To REMOVE TRUMP After Russian Meddling**

The Russian government's interference in the Presidential election could provide legal...

BIPARTISANREPORT.COM | BY GEORGIA BRISTOW



**Trump on Revamping the Military: We're Bringing Back the Draft**

Trump unveiled his plan to 'make the military great again,' saying he intends to reinstate...

REALNEWSRIGHTNOW.COM | BY R. HOBBUS, JD

Familiarity  
Stage: 6T, 6F



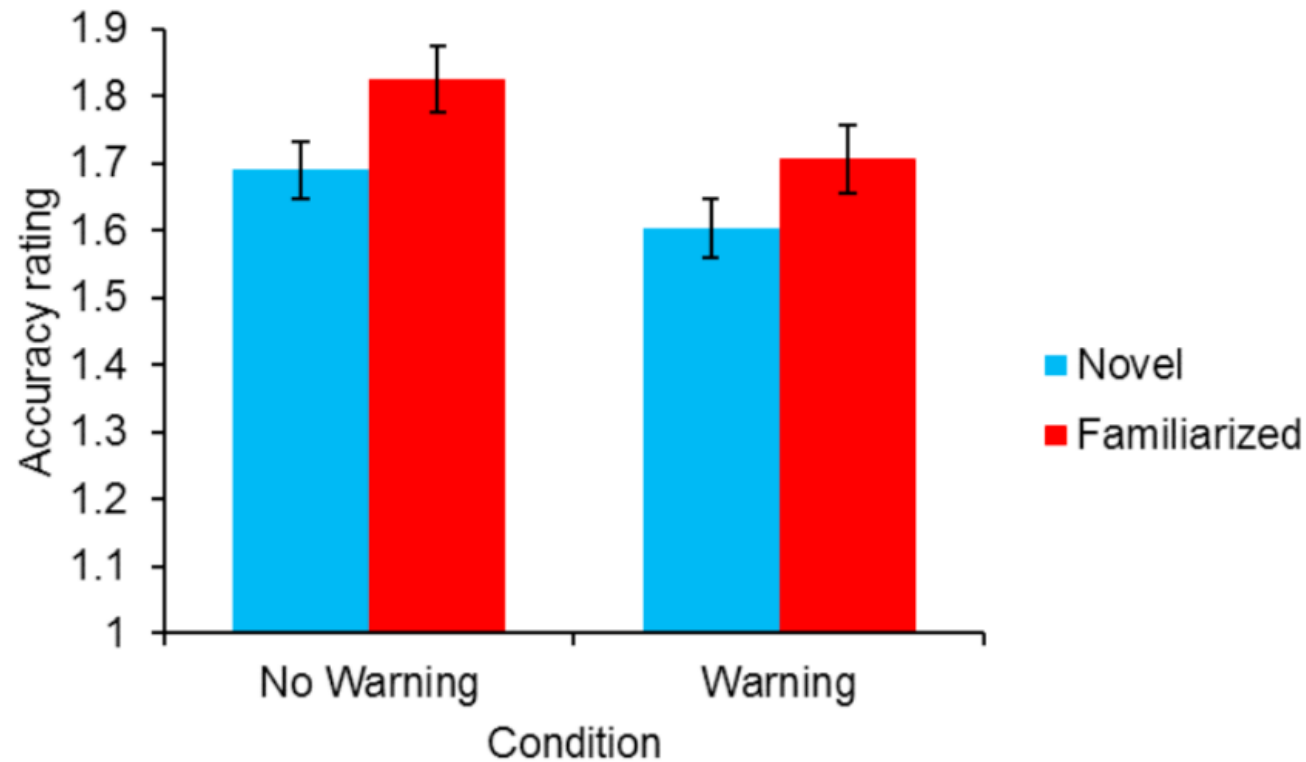
Distractor  
Stage (Survey)



Assessment  
Stage: Rate 24  
(12new, 12 old)

500 people. Half of them received warning.

# Danger of social media misinfo: The perceived accuracy increases with each single exposure

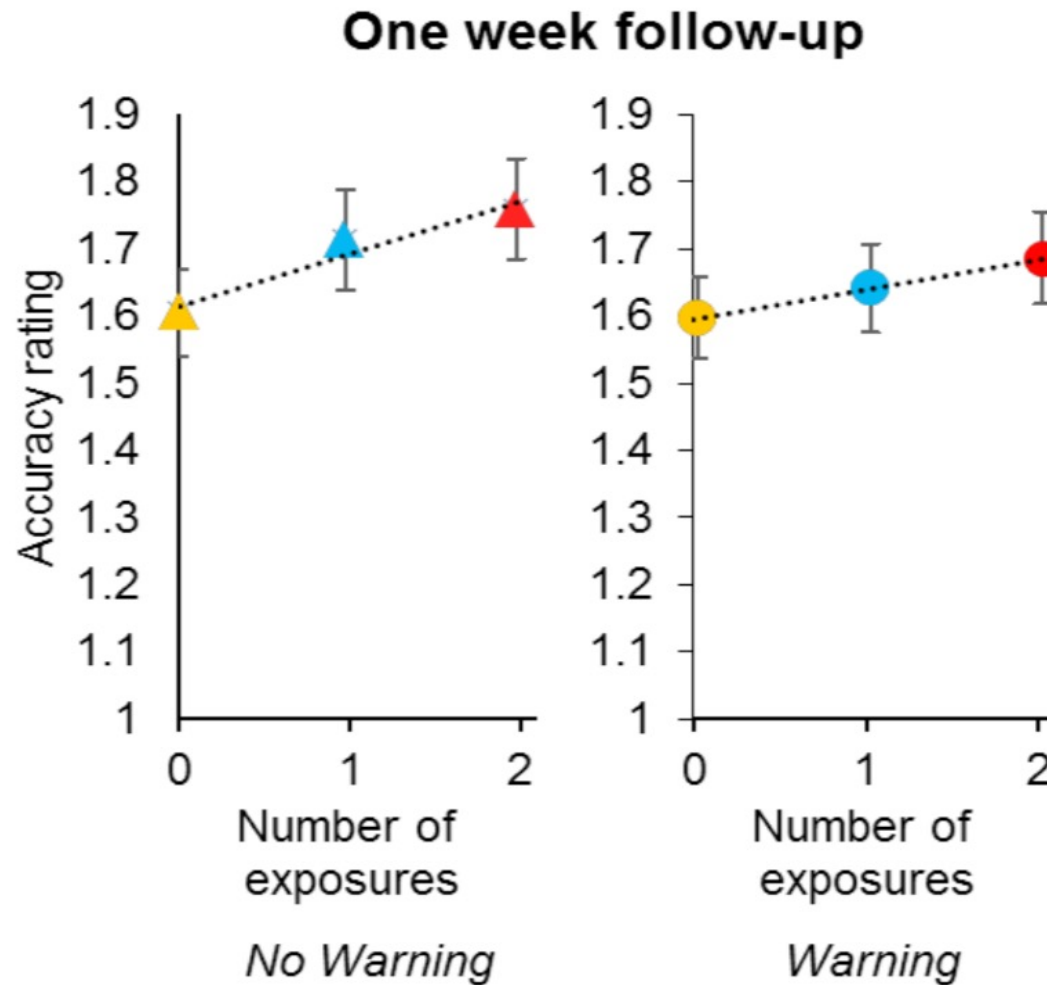


The effect was evident **regardless of their previous beliefs about the news**

**Illusory Truth Effect**

**Echo Chamber**

# After one week, illusory truth effects sustain

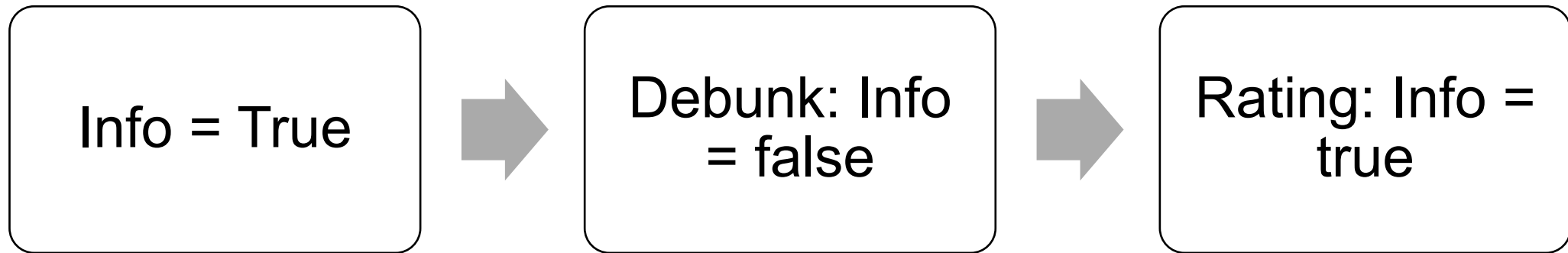


**Illusory Truth**  
**Effect**

# Misinformation during the pandemic or crisis events: Risk Amplification

- Public risk perception (e.g., hazardous events)
- Risk Information diffusion
- 10-subject experimental diffusion chain (Moussaid, Brighton, & Gaissmaier, 2015)
  - Shorter
  - Gradually inaccurate
  - Increasing dissimilar
  - Harms > benefits of antibacterial agent
- Social amplification of risk

# Continued Influence Effect



**Continued**  
**Influence Effect**

# Debunking is extremely complicated and cannot be eliminated completely

Recommendation 1: reduce the generation of arguments in line with the misinfo.

Recommendation 2: create conditions that facilitate **counterarguing** of misinfo.

Recommendation 3: correct misinfo with **new detailed info** but keep expectations low.

*General Article*

## Debunking: A Meta-Analysis of the Psychological Efficacy of Messages Countering Misinformation



Man-pui Sally Chan<sup>1</sup>, Christopher R. Jones<sup>2</sup>,  
Kathleen Hall Jamieson<sup>2</sup>, and Dolores Albarracín<sup>1</sup>

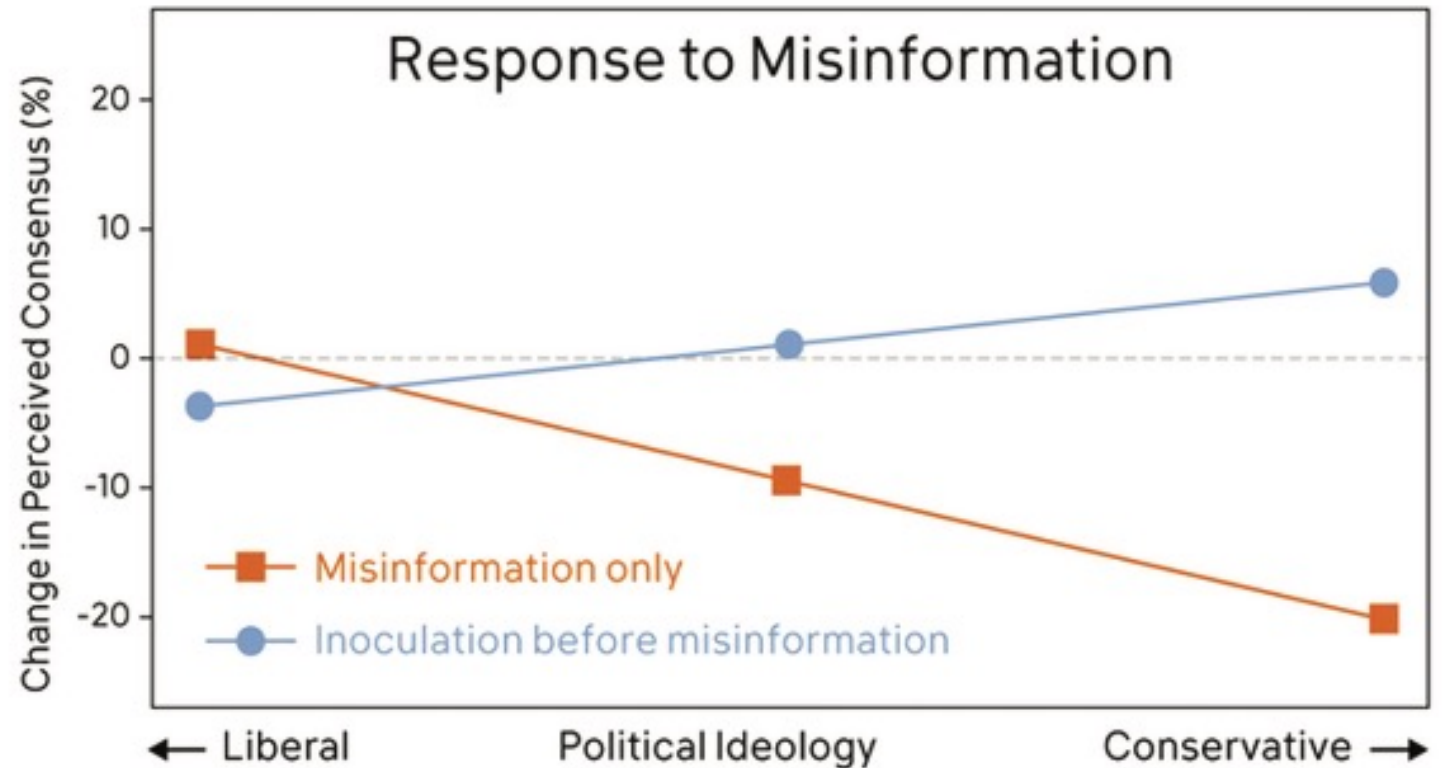
<sup>1</sup>Department of Psychology, University of Illinois at Urbana-Champaign, and <sup>2</sup>The Annenberg Public Policy Center, University of Pennsylvania

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www.psychologicalscience.org/PS  
SAGE

# Inoculation as a new hope

- Proactive measure: Inoculation (Lewandowsky & van Der Liden, 2021)
- Before exposing to misinfo:
  - Informed
  - Weakened example
  - Immune to misinfo afterwards



The effects of ideology on receptivity to misinfo and its elimination by inoculation. Cook et al., (2017)

# Discussion

- Would you agree that we should prioritize the free, open and equal access?
  - Digital colonialism vs. Make information accessible vs. Fragmented society
- Accountability: Who should be governing the information?
  - Engineers, users, service providers?



# In the Contemporary Society,...

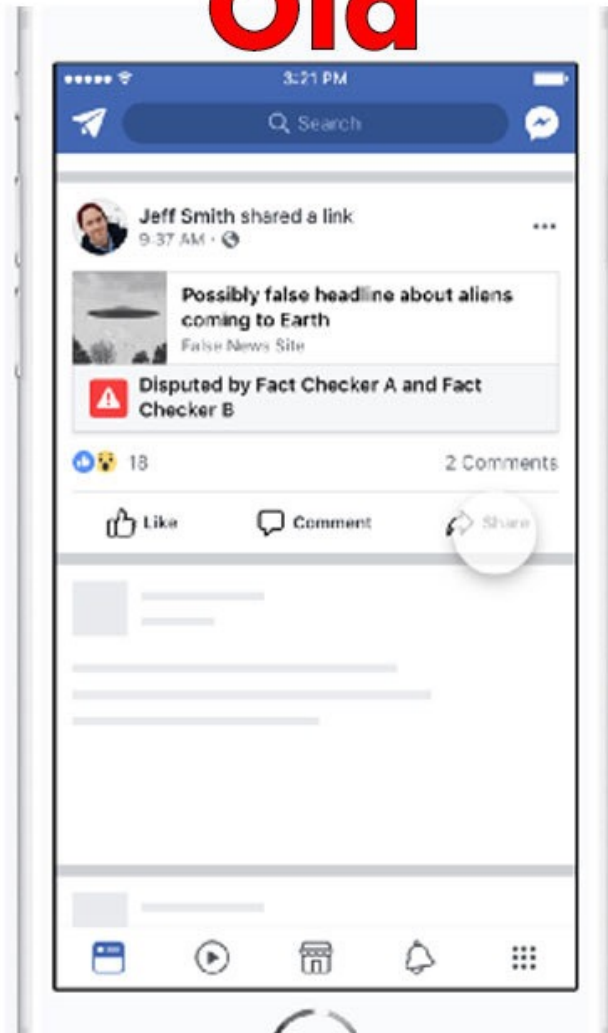
- Service provider holds its own values
  - Algorithms, regulations, terms of service
- Sometimes, values implied their business interests
  - Legal vs. Ethical responsibility
- The fragmentation of information ~ the fragmentation of society
  - Free speech vs censoring
  - Privacy vs sharing
  - Digital colonialism vs information access

# Socio-technical Approach of Fake News Combatting

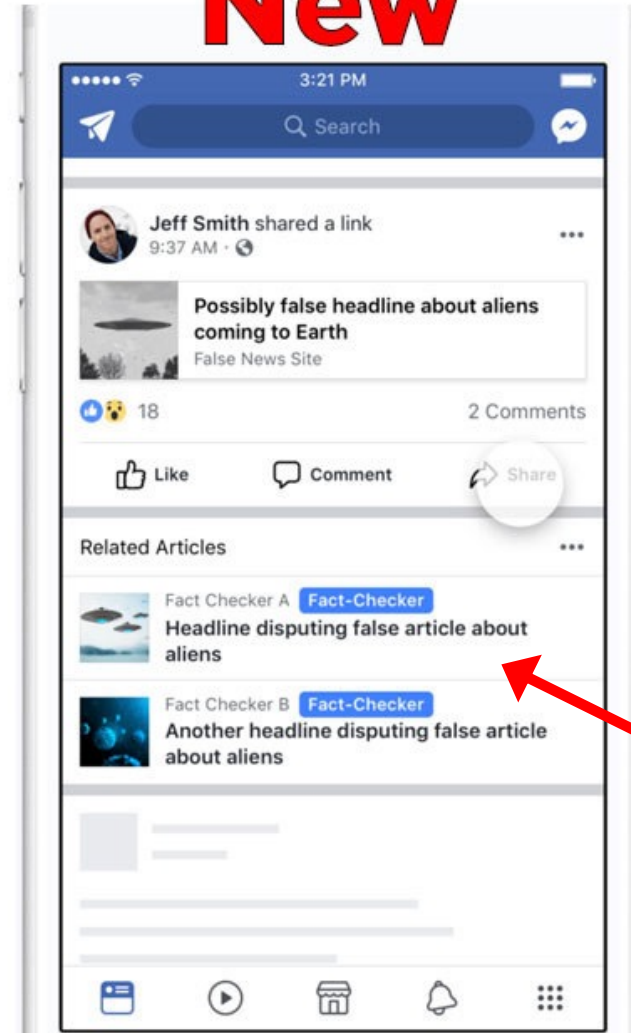
- Third-party fact checking
- Government agencies
- Company (e.g., Facebook, Twitter)

# To Combat Misinformation is So Much Difficult

**Old**



**New**



# Applying AI to Combat Misinformation

## AI-based Solution

- Credible threat of violence, violate the community standards-> Remove it
- Borderline content: 3<sup>rd</sup> party fact checker
- False, Mixed veracity, only false title-> decrease its reach (News Feed)

# New concerns around fake news combatting

- Should we adopt AI-based solution or human intelligence to identify misinformation?
  - Accuracy? (e.g., Deepfakes)
- To what extent do we want to tackle misinformation with the consideration of the freedom of expression?

# Take Home Messages

- Bots vs Trolls
- Illusory Truth Effect
- Echo Chamber Effect/Filtering Bubble
- Continued Influence Effect/ Social Amplification of Risk
- Debunking/Inoculation

**Keep Thinking!!**