

Preparing for Vaccine Hesitancy in Future Pandemics

Joseph T Wu

Sir Robert Kotewall Professor in Public Health





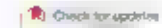
HUMAN VACCINES & IMMUNOTHERAPEUTICS
2019, VOL. 15, NO. 12, 2786-2789
<https://doi.org/10.1080/21645515.2019.1682360>



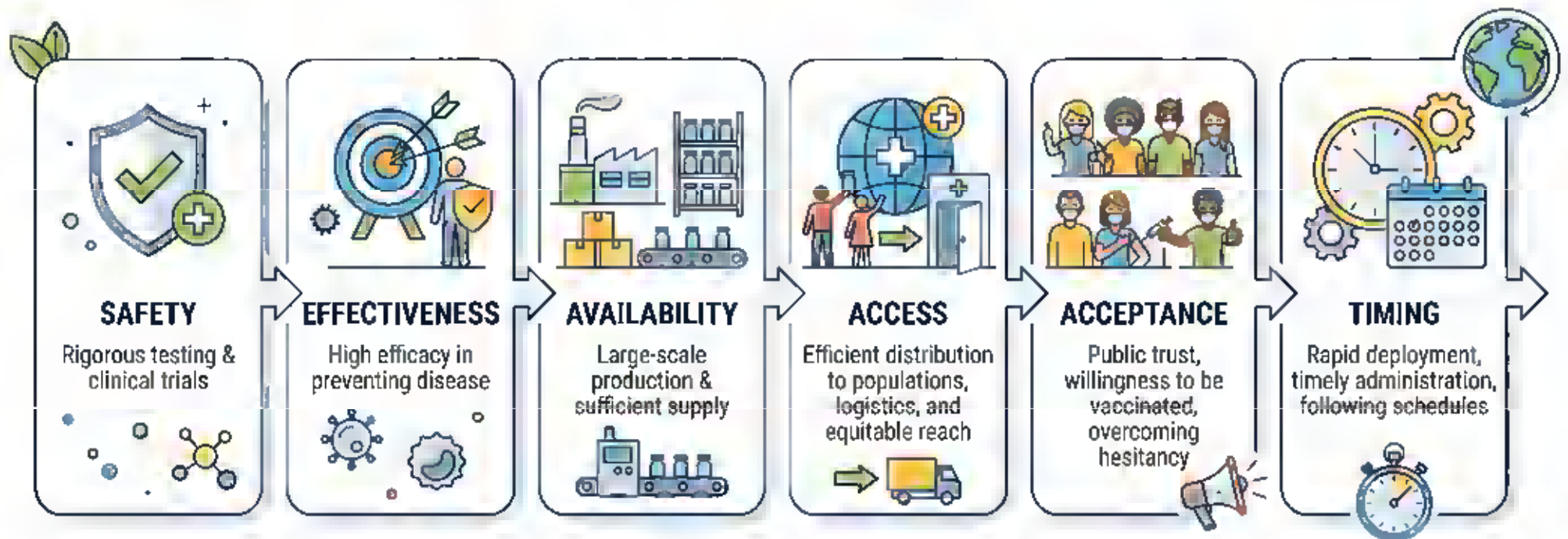
PORTRAIT

Vaccines don't save lives. Vaccinations save lives

Walter Orenstein

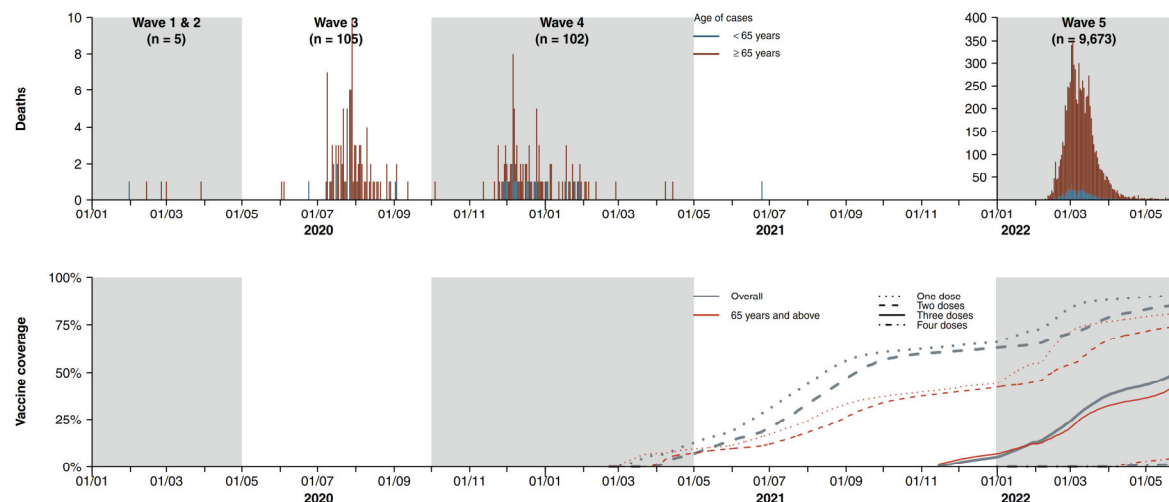
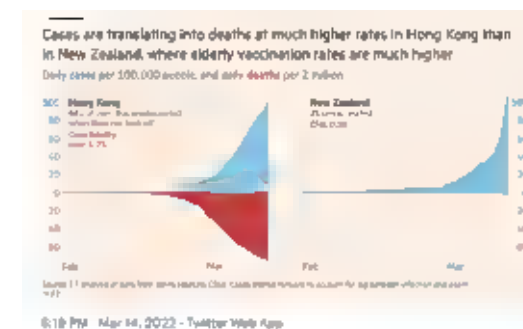
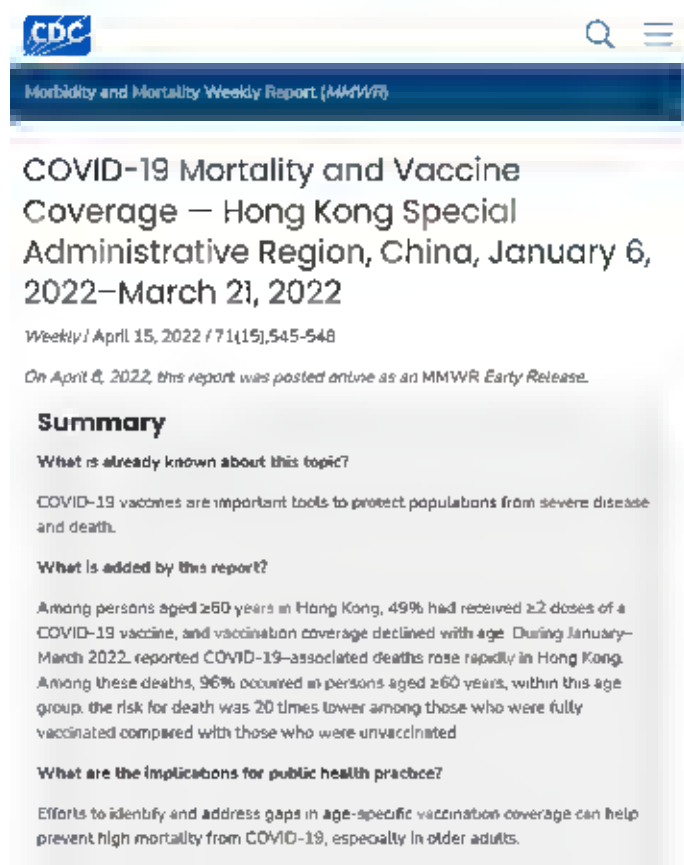


Director of the US National Immunization Program (1993-2004)



The Lesson of Timely Acceptance

When Omicron started to spread in Jan 2022, more than 50% of those aged 60+ were unvaccinated. 96% of COVID-19 deaths occurred in this age group.



Yang et al. The Lancet Regional Health – Western Pacific 2024

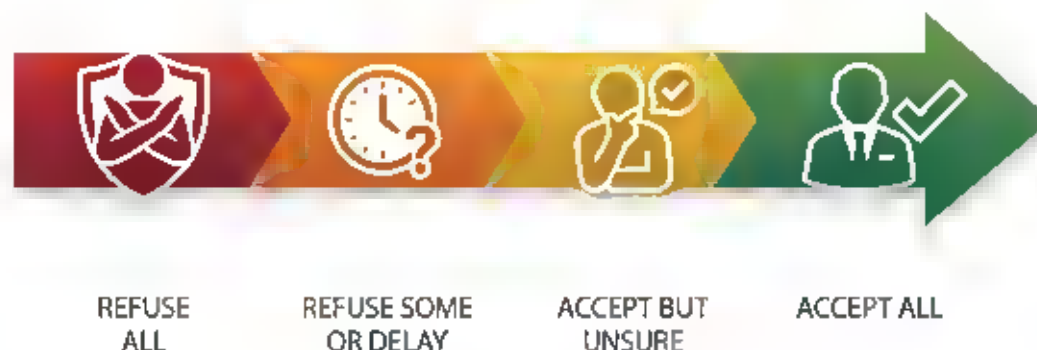


1. Global influenza pandemic
2. Ebola and other high-threat pathogens
3. Non-communicable diseases
4. **Vaccine hesitancy**
5. Antimicrobial resistance
6. Air pollution and climate change
7. Fragile and vulnerable settings
8. Weak primary health care
9. Dengue
10. HIV

“Vaccine hesitancy – the reluctance or refusal to vaccinate despite the availability of vaccines – threatens to reverse progress made in tackling vaccine-preventable diseases.”

Vaccine Hesitancy

- Definition: A motivational state of being conflicted about, or opposed to, getting vaccinated; this includes intentions and willingness.
- A complex, dynamic continuum instead of a binary divide between pro-vaccine and anti-vaccine stances



- Highly context-specific psychological phenomenon:
 - Varies across time, place and vaccines
 - Heavily influenced by systemic, structural, and deeply entrenched psychological enablers and barriers

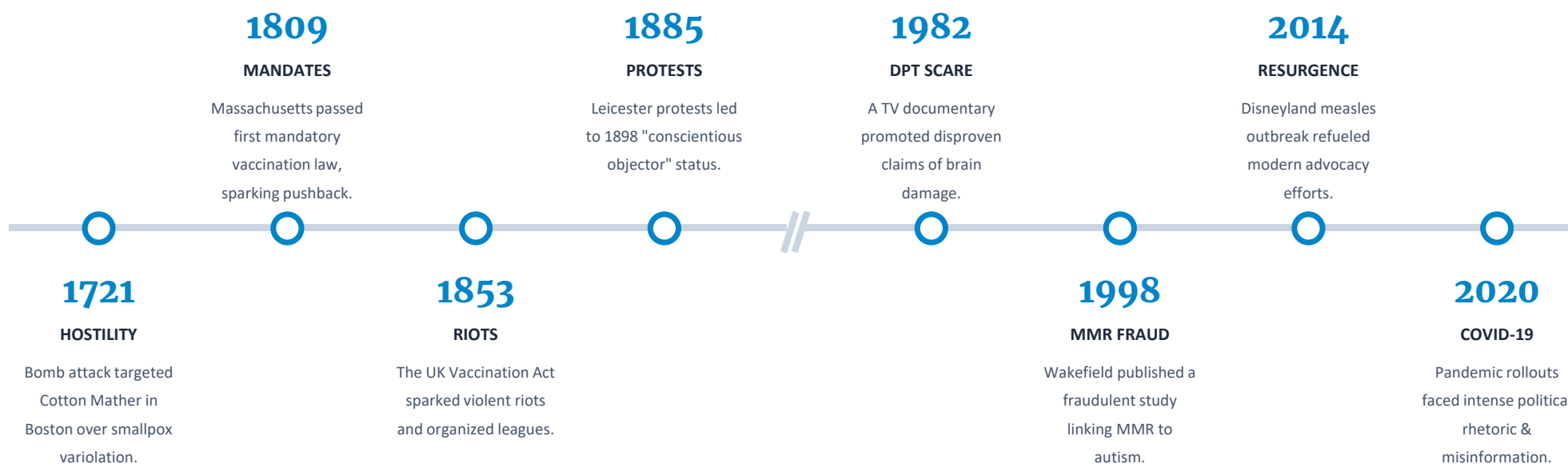
Vaccine hesitancy is not a new challenge, but its scope and scale has escalated.



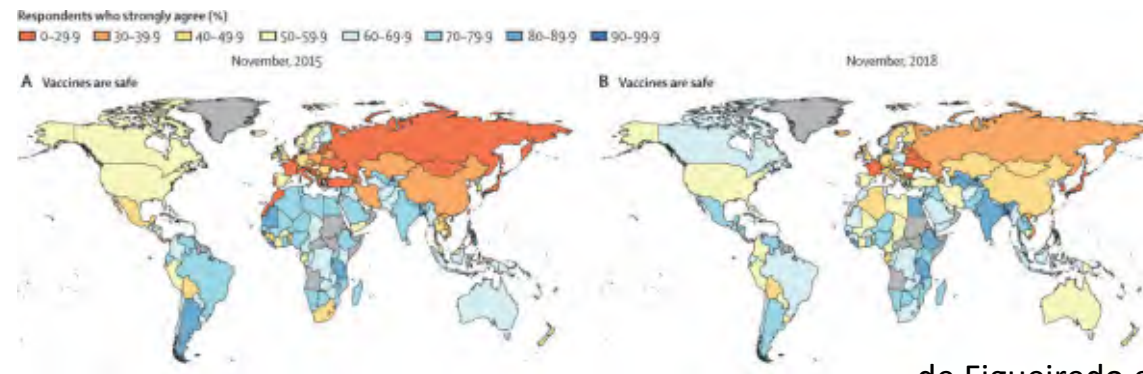
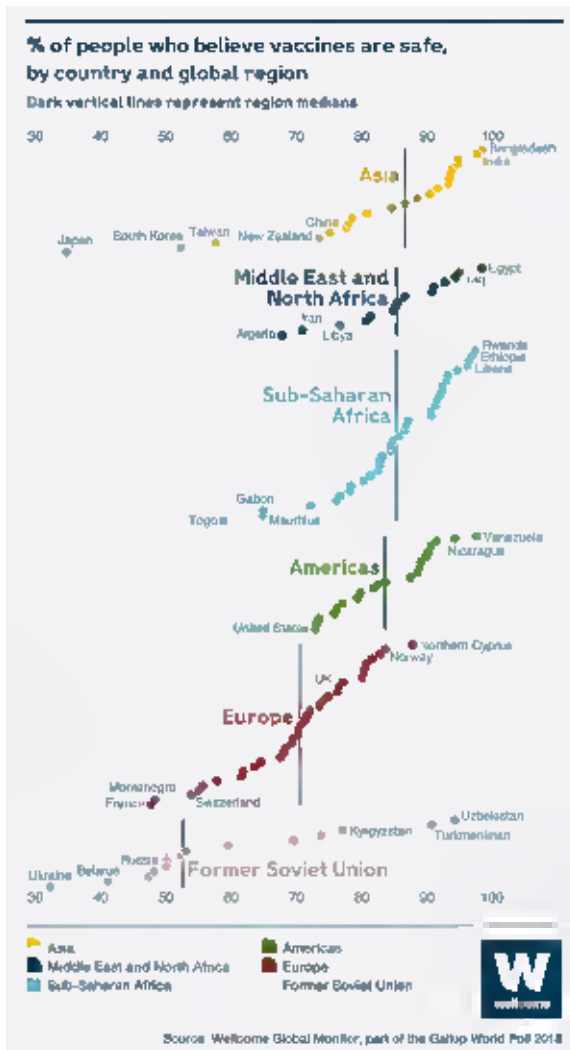
City of Toronto Archives, Fonds 1244, Item 25



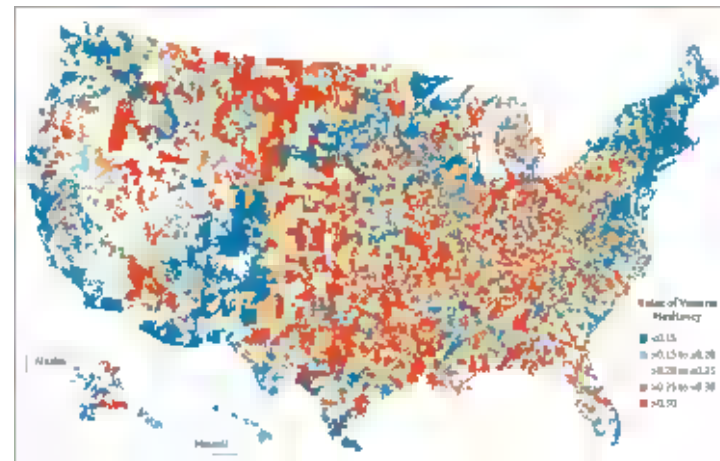
<https://www.washingtonpost.com>



Disparities and Volatility of Vaccine Hesitancy



de Figueiredo et al *Lancet* 2020



Larson et al *NEJM* 2022

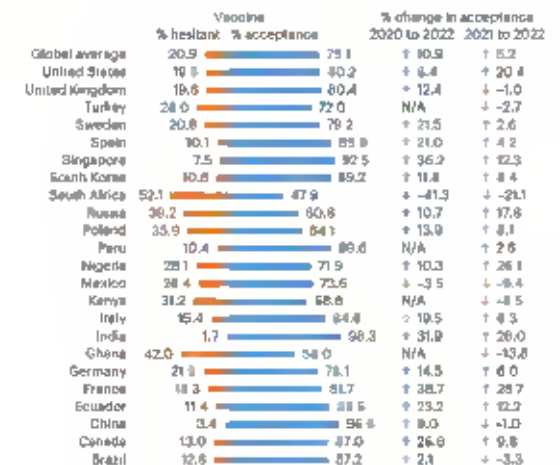
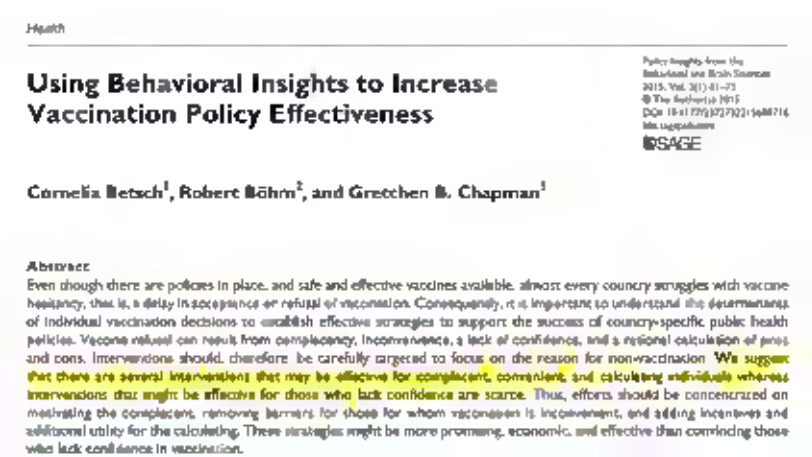


Fig. 1 | COVID-19 vaccine acceptance and hesitancy in June 2022, percent change from 2020 and 2021. COVID-19 vaccine acceptance in June 2021

Lazarus et al *Nat Med* 2023

Peacetime Pillar: Building Trust Before the Emergency

Trust cannot be surged on demand.



Most trusted sources for vaccine confidence:

- Doctors and primary care providers
- Nurses, pharmacists, and other healthcare professionals
- Family and close friends
- Community and faith leaders
- Public health agencies and scientists

Freed et al Pediatrics 2011; Paterson et al Vaccine 2016



For many communities, the messenger is the intervention. The same message can have very different effects depending on whether it comes from a distrusted or trusted entity.

nature medicine

Explore content v About the journal v Publish with us v

nature > nature medicine > brief communications > article

Brief Communication Published: 29 April 2024

Influence of COVID-19 on trust in routine immunization, health information sources and pandemic preparedness in 23 countries in 2023

Jeffrey V. Lazarus , Jennifer M. White, Katsiyona Wyke, Scott C. Reiter, Kenneth Baker, Heidi J. Larson, Federico Marten Terna, Erwan Kucher, Salim S. Ahmed, Kaum Tamara Gales Jureck, Selma Muller, Carolina Barrios, Nellie Wylabough, Reine Kamukama & Ayman El Mohandes

Nature Medicine 30 | 1559–1563 (2024) | [Go to the article](#)

246 Accesses | 104 Citations | 219 Altmetric | Metrics

Abstract

It is unclear how great a challenge pandemic and vaccine fatigue present to public health. We assessed perspectives on coronavirus disease 2019 (COVID-19) and routine immunization as well as trust in pandemic information sources and future pandemic preparedness in a survey of 23,000 adults in 23 countries in October 2023. The participants reported a lower intent to get a COVID-19 booster vaccine in 2023 (71.6%), compared with 2022 (87.9%). A total of 60.3% expressed being more willing to get vaccinated for diseases other than COVID-19 as a result of their experience during the pandemic, while 33.3% reported being less willing. In 1

sources of vaccine information each averaged less than 2 on a 10-point scale with one's own doctor or nurse and the World Health Organization, averaging a 4.9 and 6.5, respectively. Our findings confirm that vaccine hesitancy and trust challenges remain for public health, underscoring the need for targeted, culturally sensitive

[View publication stats](#)

nature medicine

Explore content v About the journal v Publish with us v

nature > nature medicine > brief communications > article

Brief Communication Published: 20 October 2020

A global survey of potential acceptance of a COVID-19 vaccine

Jeffrey V. Lazarus , Scott C. Reiter, Adam Palapies, Wemricka O. Gordon, Heidi J. Larson, Kenneth Baker, Spencer Kimbel & Ayman El Mohandes

Nature Medicine 27 | 225–229 (2021) | [Go to the article](#)

571k Accesses | 3466 Citations | 3618 Altmetric | Metrics

1 An [Author Correction](#) to this article was published on 11 January 2021

2 This article has been [undated](#)

Abstract

Several coronavirus disease 2019 (COVID-19) vaccines are currently in human trials. In June 2020, we surveyed 13,426 people in 19 countries to determine potential acceptance rates and factors influencing acceptance of a COVID-19 vaccine. Of these, 71.3% of participants reported that they would be very or somewhat likely to take a COVID-19 vaccine, and 48.1% reported that they would accept their employer's recommendation to do so. Differences in acceptance rates ranged from almost 90% (in China) to less than 50% (in Russia), reporting higher levels of trust in information from government sources were more likely to accept a vaccine, and those employed and less likely to do so.

nature medicine

Explore content v About the journal v Publish with us v

nature > nature medicine > perspectives > article

Perspective Published: 10 March 2022

An epidemic of uncertainty: rumors, conspiracy theories and vaccine hesitancy

Ed Parwez , Clarissa James & Heidi J. Larson

Nature Medicine 28 | 456–458 (2022) | [Go to the article](#)

121k Accesses | 343 Citations | 778 Altmetric | Metrics

Abstract

The COVID-19 ‘infodemic’ continues to undermine trust in vaccination efforts aiming to bring an end to the pandemic. However, the challenge of hesitancy is not only a problem of the information age, but a human one. Rumors and conspiracy theories with their associated disinformation. In this Perspective, we argue that the epidemiological and social crises brought about by COVID-19 have magnified widely held social anxieties and mistrusts that, in the unique circumstances of this global pandemic, have exacerbated skepticism toward vaccines. We argue that trust is key to overcoming vaccine hesitancy, especially in a context of widespread social uncertainty brought about by the pandemic, where public sentiment can be volatile. Finally, we draw out some implications of our argument for strategies to build vaccine confidence.

nature human behaviour

Search Log in

Explore content v About the journal v Publish with us v

nature > nature human behaviour > articles > article

Article Published: 17 May 2021

Trust in science, social consensus and vaccine confidence

Patrick Sturm , Ian Brunton-Smith & Jonathan Jackson

Nature Human Behaviour 1 | 1528–1534 (2021) | [Go to the article](#)

47k Accesses | 277 Citations | 498 Altmetric | Metrics

Abstract

While scholarly attention to date has focused almost entirely on individual level drivers of vaccine confidence, we show that macro-level factors play an important role in understanding individual propensity to be confident about vaccination. We analyse data from the 2018 Wellcome Global Monitor survey covering over 120,000 respondents in 126 countries to assess how societal level trust in science is related to vaccine confidence. In countries with a high aggregate level of trust in science, respondents are more likely to be confident about vaccination and to have their individual-level scientific trust. Additionally, we show that societal consensus around trust in science moderates these individual-level and country-level relationships. In countries with a high level of consensus regarding the trustworthiness of science and scientists, the positive correlation between trust in science and vaccine confidence is stronger than it is in comparable countries where the level of social consensus is weaker.

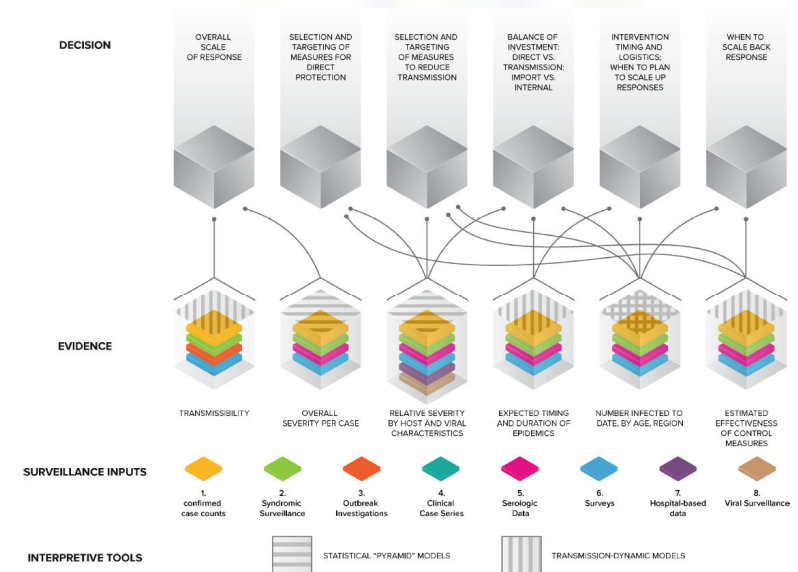
Epidemic nowcasting is the assessment of the current state of an ongoing outbreak using the latest available data on key pathogen, epidemiological, clinical, and socio-behavioral characteristics.

Objectives: To provide situational awareness, inform decisions about control measures, and assess uncertainty—an essential component of building trust.

Pain points

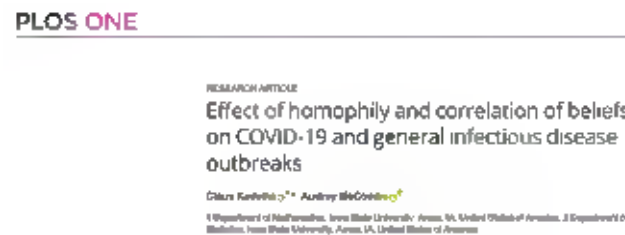
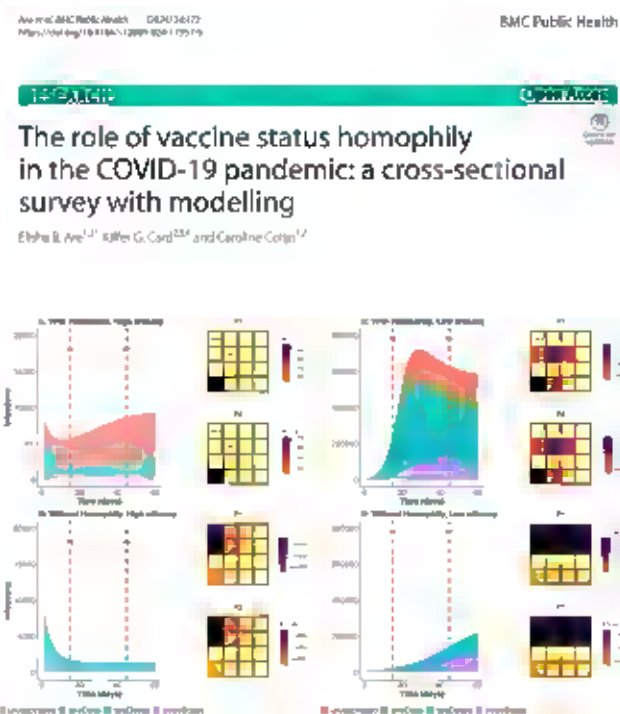
1. Clinical and genomic surveillance have become part of nowcasting, but behavioural and confidence surveillance remains fragmented, episodic, and underfunded.
2. Vaccine uptake data are useful but lag behind the underlying drivers and barriers.
3. Compared to the disease itself, vaccine hesitancy is arguably associated with greater disparities and volatility because vaccine sentiments are highly reactive to adverse-events after immunization and misinformation.

The Blind Men and the Elephant

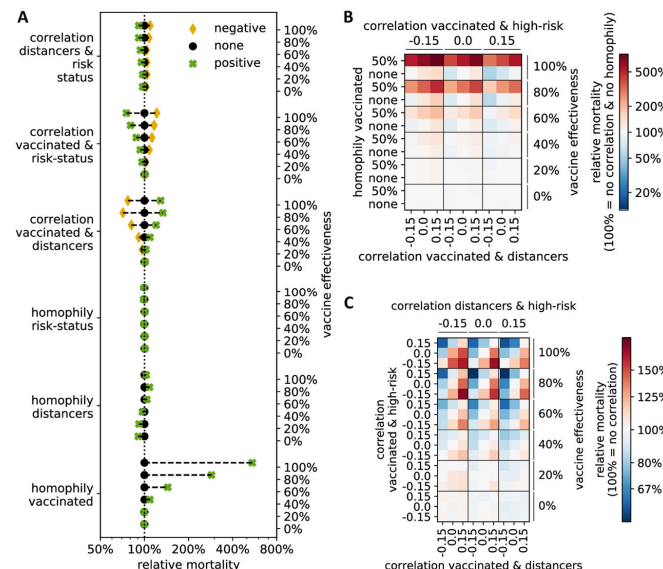


Vaccine Impact is Strongly Affected by the Distribution of Vaccine Hesitancy

Example: Homophily / Assortative mixing: Tendency of similar individuals to interact



The *passat sanitaire* increased levels of vaccination, but to a lower extent among the most vulnerable, and did not reduce vaccine hesitancy itself, showing the importance of outreach to underserved communities and the potential limits of mandatory vaccination policies.



Digital Advances is a Double-edged Sword

Communication today is far more horizontal and less hierarchical.

Previously trusted “authorities” are challenged by freely available online arsenals of information.

Drastic changes in the modes and speed of information exchange

New on-line mechanisms for virtual “communities” of like-minded people to self-organize around shared beliefs, ideologies and concerns well beyond their local geographies.

Once spread, misinformation is very difficult to eradicate.
Once lost, trust is very difficult to regain.



WORLD VIEW • 16 OCTOBER 2018

The biggest pandemic risk? Viral misinformation



A century after the world's worst flu epidemic, rapid spread of misinformation is undermining trust in vaccines crucial to public health, warns Heidi Larson.



Dec. 17, 2020, 1:35 p.m. ET
By Katherine J. Wu

No, there are no microchips in coronavirus vaccines.



SCIENTIFIC AMERICAN

Subscribe

PUBLIC HEALTH

Nine COVID-19 Myths That Just Won't Go Away

From a human-made virus to vaccine conspiracy theories, we rounded up the most persistent false claims about the pandemic

By Tanya Lewis on August 18, 2020

The Impact of Digital Spread of Vaccine Information

RESEARCH

SOCIAL SCIENCE

The spread of true and false news online

Socnoob Vannith, Tech Bay, Susan Aral

We investigated the differential diffusion of all of the verified true and false news stories distributed on Twitter from 2006 to 2017. The data comprise ~125,000 stories tweeted by ~3 million people more than 4.5 million times. We classified news as true or false using information from six independent fact-checking organizations that evaluated 95 to 98% agreement on this classification. Falsehoods diffused significantly further, faster, deeper, and more broadly than the truth in all categories of information, and the effects were more pronounced for false political news than for false news about terrorism, natural disasters, science, urban legends, or financial information. We found that false news was more novel than true news, which suggests that people were more likely to share novel information. Moreover, false stories evoked fear, disgust, and surprise in replies, true stories evoked acceptance, sadness, joy, and trust. Contrary to conventional wisdom, robots accelerated the spread of true and false news at the same rate, implying that false news spreads more than the truth because humans, not robots, are more likely to spread it.

nature human behaviour

Article

Understanding and combatting misinformation across 16 countries on six continents

Aracelis A. Sanchez III^{1,2,3,4}, Jennifer Allen¹, Adam J. Bernstein⁵, Emily Coker⁶, De Coudane^{1,2}, Kian Garivault¹, Jonathan Gully⁷, Andrew H. Lee⁸, Robert H. Lipp⁹, Michael H. Shugart¹, Yuhang Zhang¹, Gordon Pennycook¹⁰, David G. Rand^{1,11}

Received: 28 May 2022
Published online: 29 June 2022

Check for updates

The spread of misinformation online is a global problem that negatively impacts public health, the environment, and democracy. In a representative sample of 16 countries across 6 continents (N = 34,286; 676,605 observations) to assess predictors of susceptibility to misinformation about COVID-19 and interventions to combat the spread of this information. In every country, participants with a lower analytic cognitive style and lower accuracy-related motivation were better at discerning truth from falsehood. Voluntary democracy was also associated with greater trust in government, whereas endorsement of individual responsibility over government support was negatively associated with truth discernment in most countries. Surveys promoting people to think about accuracy had a generally positive effect on their trust in the government, suggesting that promoting accuracy-related motivation might be a useful strategy. Finally, aggregating large-scale, non-partisan participation to provide a more accurate view of the population with high accuracy in all countries via the wisdom of crowds. The combined patterns we observe suggest that the psychological factors underlying the media for massive challenges are similar across all of these regional settings, and that similar solutions may be broadly effective.

nature human behaviour

Explore content About the journal Publish with us

Article Published: 05 February 2022

Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA

Sehil Loomis, Alexandre de Figueiredo, Simon J. Patek, Kristen de Graaf & Henry J. Jackson

Nature Human Behaviour 5, 337–348 (2021) | Cite this article

2874 Accesses | 1561 Citations | 2334 Downloads | Metrics

An Author Correction to this article was published on 06 July 2021

An Author Correction to this article was published on 08 March 2022

This article has been updated

Abstract

Widespread acceptance of a vaccine for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) will be the next major step in fighting the coronavirus disease 2019 (COVID-19) pandemic, but achieving high uptake will be a challenge and may be impeded by online misinformation. To inform successful vaccination campaigns, we conducted a randomized controlled trial in the UK and the USA to quantify how exposure to online misinformation around COVID-19 vaccines affects intent to vaccinate to protect oneself or others. Here we show that in both countries – as of September 2020 – participants would definitely take a vaccine that is likely required for herd immunity, and that, relative to factual information, vaccine misinformation induced a decline in intent of 6.2 percentage points (95th percentile interval: 3.0 to 9.3) in the UK and 6.4 percentage points (95th percentile interval: 4.0 to 8.8) in the USA among those who stated that they would definitely accept a vaccine. We also find that some socio-demographic groups are differentially impacted by exposure to misinformation. Finally, we show that science-sounding misinformation is more strongly associated with declines in vaccination intent.

Science

Current issue First release papers More

HOME SCIENCE VOL 366 NO 6459

Quantifying the impact of misinformation and vaccine-skeptical content on Facebook

JENNIFER ALLEN, ALEXANDRE DE FIGUEIREDO AND KRISTEN DE GRAAF

RESEARCH ARTICLE MISINFORMATION

Quantifying the impact of misinformation and vaccine-skeptical content on Facebook

31 May 2022 | Vol 366 | Issue 6459 | DOI:10.1126/science.abb2301

19,363 99 101

Editor's summary

The COVID-19 pandemic was exacerbated by poor utilization of vaccines caused by the spread of misinformation. Fortunately, the impact of flagrant vaccine misinformation on Facebook was greatly attenuated once such posts were flagged and debunked as false by third-party fact checkers. However, ambiguous misinformation remained unflagged. Allen *et al.* examined a gray area that eluded fact-checkers: factually accurate but deceptive content (see the Perspective by van der Linden and Kyrchenko). This unflagged content cast doubts on vaccine safety or efficacy and was 46-fold more consequential for driving vaccine hesitancy than flagged misinformation. Tech companies assert that unflagged content must be protected by First Amendment free speech rights. However, this study's causal evidence that unflagged content posed the greatest threat to public health carries policy implications for government regulation needed to save lives. —Ekeoma Uzogara

Takeaways

- Timely vaccine acceptance was a critical weak link in the pathway of vaccine impact in many countries during the COVID-19 pandemic.
- Trust in those delivering vaccination message is essential for building vaccine confidence, and trust cannot be “surged” on demand.
- Trust-building must therefore be a cornerstone of pandemic preparedness.
- Uncertainty undermines trust. Nowcasting is the key for assessing, communicating, and reducing uncertainty during crises.
- Nowcasting vaccine hesitancy remains a major gap compared with clinical and genomic surveillance, and must be strengthened for future pandemics.

Navigating Vaccine Hesitancy: From Foundations to Future Uptake

Vaccine hesitancy is a multi-dimensional challenge shaped by individual beliefs, socio-political environments, and information ecosystems. This summary outlines the core drivers of hesitancy and the evidentiary tools used to build trust and ensure effective vaccine implementation.

DRIVERS & FOUNDATIONS

● The Roadmap of Vaccine Impact Presenter: Joseph Wu

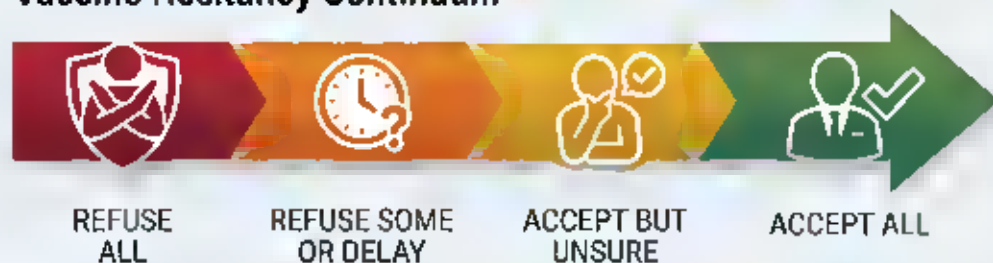


● Determinants of Hesitancy

Presenters: Julie Leask, Pauline Paterson, Thomas Abraham



● Vaccine Hesitancy Continuum



COMMUNICATION & DATA FOR ACTION

● Multi-Channel Communication

Presenters: Julie Leask, Pauline Paterson, Thomas Abraham, Jennifer Allen

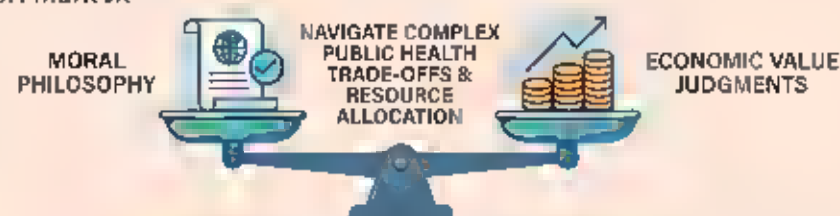


● Data-Driven Decision Making Presenters: Joseph Wu, Edward Parker



● Ethics and Economics in Policy

Presenter: Mark Jit



References

- Allen J, Watts DJ, Rand DG. (2024). Quantifying the impact of misinformation and vaccine-skeptical content on Facebook. *Science*; 384:eadk3451.
- Are EB, Card KG, Colijn C. (2024). The role of vaccine status homophily in the COVID-19 pandemic: a cross-sectional survey with modelling. *BMC Public Health*; 24:472.
- Arechar AA, Allen J, Berinsky AJ. (2023). Understanding and combatting misinformation across 16 countries on six continents. *Nat Hum Behav*; 7(9):1502-13.
- Betsch C, Böhm R, Chapman GB. (2015). Using behavioral insights to increase vaccination policy effectiveness. *Policy Insights Behav Brain Sci*; 2(1):67-73.
- Betsch C, Schmid P, Heinemeier D, et al. (2018). Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. *PLoS One*; 13(12):e0208601.
- de Figueiredo A, Simas C, Karafillakis E, et al. (2022). Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study. *Lancet*; 96(10255):898-908.

References

- Freed GL, Clark SJ, Butchart AT et al. (2011). Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics*; 127(Suppl 1):S107-12.
- Kadelka C, McCombs A. (2021). Effect of homophily and correlation of beliefs on COVID-19 and general infectious disease outbreaks. *PLoS One*; 16(12):e0260973.
- Larson HJ, Gakidou E, Murray CJL. (2022). The Vaccine-Hesitant Moment. *N Engl J Med*; 387:58-65.
- Larson HJ. (2016). Vaccine trust and the limits of information. *Science*; 353(6305):1207-8.
- Larson HJ. (2018). The biggest pandemic risk? Viral misinformation. *Nature*; 562(7727):309.
- Lazarus JV, Ratzan SC, Palayew A, et al. (2021). A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med*; 27:225-8.
- Lazarus JV, White WM, Wyka K, et al. (2024). Influence of COVID-19 on trust in routine immunization, health information sources and pandemic preparedness in 23 countries in 2023. *Nat Med*; 30: 1559-63.

References

- Lazarus JV, Wyka K, Trenton M White TM, et al. (2023). A survey of COVID-19 vaccine acceptance across 23 countries in 2022. *Nat Med*;29(2):366-375.
- Lipsitch M, Santillana M. (2019) Enhancing Situational Awareness to Prevent Infectious Disease Outbreaks from Becoming Catastrophic. In: *Current Topics in Microbiology and Immunology*. https://doi.org/10.1007/82_2019_172
- Loomba S, de Figueiredo A, Piatek SJ. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nat Hum Behav*; 5(3):337-48.
- Orenstein W. (2019). Vaccines don't save lives. Vaccinations save lives. *Hum Vaccin Immunother*;15(12):2786–2789.
- Paterson P, Meurice F, Stanberry LR, et al. (2016) Vaccine hesitancy and healthcare providers. *Vaccine*; 34(52):6700-6.
- Pertwee E, Simas C, Larson HJ. (2022). An epidemic of uncertainty: rumors, conspiracy theories and vaccine hesitancy. *Nat Med*; 28:456-9.

References

- Smith DJ, Hakim AJ, Leung GM, et al. (2022). COVID-19 Mortality and Vaccine Coverage — Hong Kong Special Administrative Region, China, January 6, 2022–March 21, 2022. *MMWR Morb Mortal Wkly Rep*; 71(15):545-548.
- Sturgis P, Brunton-Smith I, Jackson J. (2021). Trust in science, social consensus and vaccine confidence. *Nat Human Behav*; 5:1528-34.
- Vosoughi S, Roy D, Aral S. (2018). The spread of true and false news online. *Science*; 359(6380): 1146-51.
- Ward JK, Gauna F, Gagneux-Brunon A. (2022). The French health pass holds lessons for mandatory COVID-19 vaccination. *Nat Med*; 28(2):232-5.
- WHO. (2017). Vaccination and trust. <https://www.who.int/publications/i/item/vaccination-and-trust>
- Yang B, Lin Y, Xiong W, et al. (2024). Comparison of control and transmission of COVID-19 across epidemic waves in Hong Kong: an observational study. *Lancet Reg Health West Pac*; 43:100969.