

Fake News and Infection Prevention

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January 24, 2023

Outline of the presentation

- Background and definitions
- Misinformation by type of actor
- Case study: vaccines
- Covid as a catalyst for misinformation
- The scientific literature on misinformation
- Misinformation based on scientific studies
- Case studies in hand hygiene
- Approaches to addressing misinformation



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Useful terms:

Misinformation: possibly accidental

Disinformation: aims to deceive

Fake News: misinformation / disinformation about something that is then advertised or spread



What defines misinformation and fake news?

Authenticity & Intent

They often exploit individual vulnerabilities:

Naïve Realism: my perceptions of reality are the only accurate views

Confirmation Bias: I prefer to receive information that confirms my existing views



*Shuet al. "Fake News Detection on Social Media: A Data Mining Perspective". <https://dl.acm.org/doi/pdf/10.1145/3137597.3137600>

How fake news affects infection prevention and control (IPC)

- Within the field of IPC we often work with low category of evidence (case reports and expert opinion)
- Some misinformation about products and practices originate from the public sphere, some from academia
- The nexus of sharing of information between IPC and the public is vulnerable
- Misinformation can affect human behavior, risk taking, etc.



Goal: to find out why is fake news so ubiquitous and effective, and how to prevent it from negatively impacting public health



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Misinformation by actor:

- Individuals
- Private entities/non- governmental organizations
- Social media
- Academia and scientific community
- Governments (acting domestically)
- Governments (acting internationally)
- Supranational actors



Sept. 28, 2021, 5:00 a.m. ET
By Davey Alba

Facebook groups promoting ivermectin treatment continue to flourish.



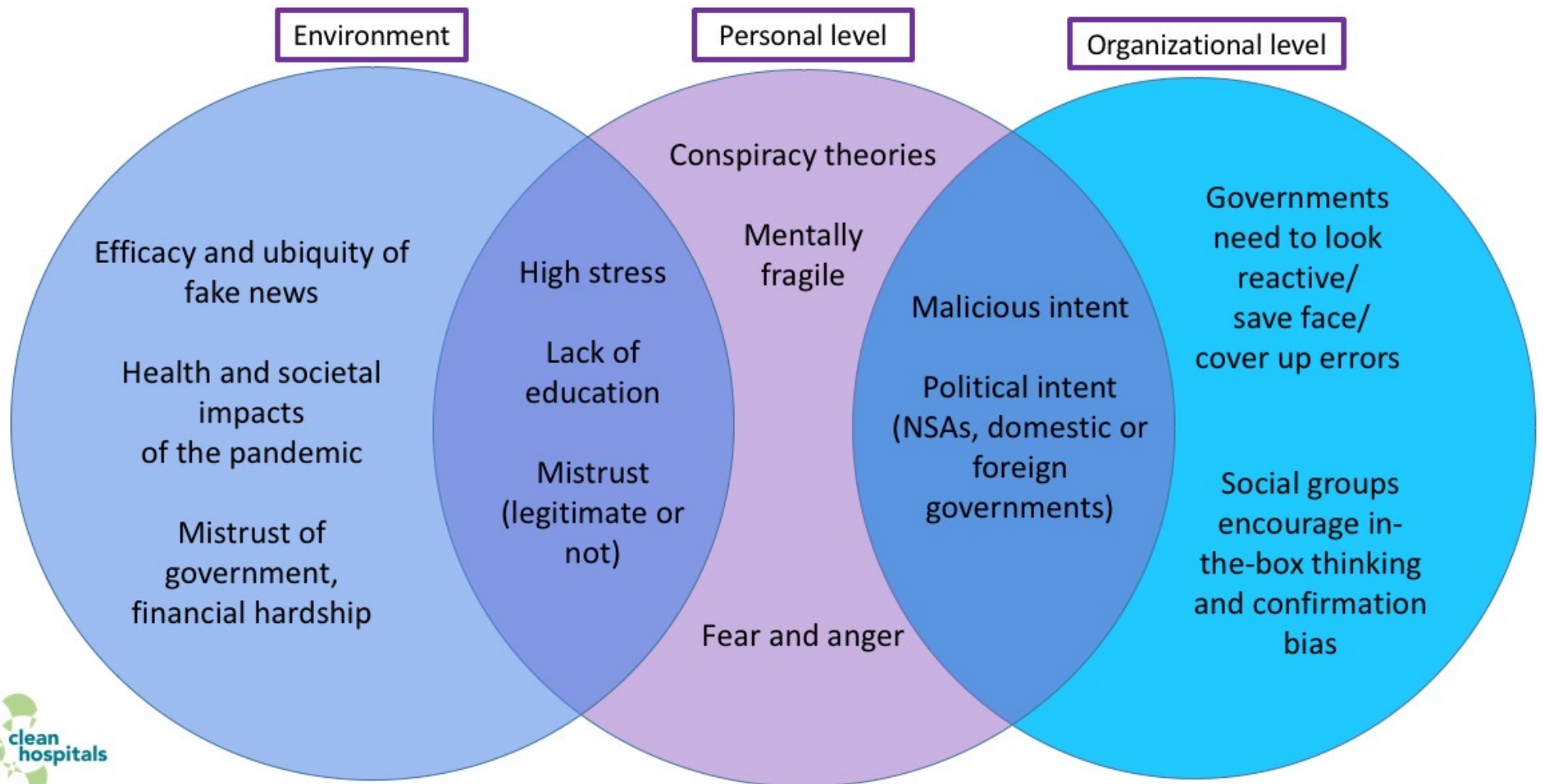
Houston Cofield for The New York Times



Individuals: do we live in a post-factual world?

- Conspiracy theories
- Lack of social cohesion
- Deep distrust in science and medicine
- “My ignorance is as valid as your knowledge”

What makes individuals susceptible to misinformation?



The role of social media



Youtube

- Strong bias toward keeping up content¹
- Has no clear definition of misinformation²
- Videos that disinform or misinform users in harmful ways, are not actively recommended and may lose monetized advertising^{1,2}
- Ex. anti vaxx video channels not receiving monetized advertising (2019)³

YouTube vows to recommend fewer conspiracy theory videos

Site's move comes amid continuing pressure over its role as a platform for misinformation and extremism

The image shows the YouTube logo, which consists of the word "YouTube" in a white, sans-serif font, centered within a white play button icon. The play button is set against a dark red background.

¹<https://www.euractiv.com/section/digital/news/in-the-fight-against-fake-news-youtube-has-a-bias-toward-keeping-content-up/>

²<https://www.theguardian.com/technology/2019/jan/25/youtube-conspiracy-theory-videos-recommendations>

³<https://www.bbc.com/news/technology-47357252>

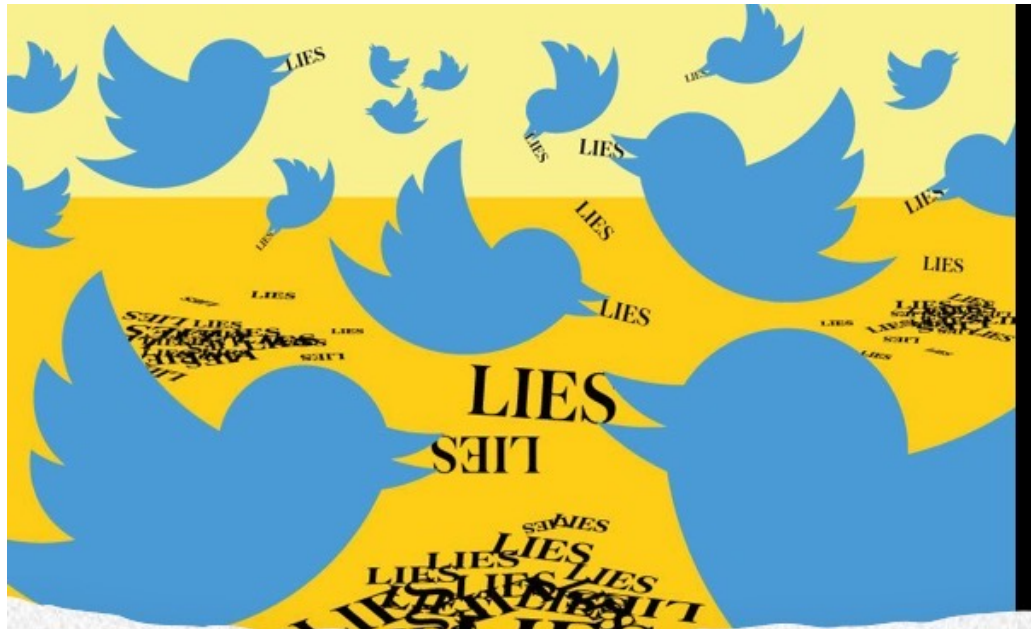
Facebook

- Groups also allowed insulated communities to spread fake news and hate speech to millions of users¹
- Uses «proactive detection technology» and reporting from group members to identify inappropriate content²
- Does it work?



¹<https://www.theguardian.com/world/2019/may/22/far-right-facebook-groups-spreading-hate-to-millions-in-europe>

²<https://www.theguardian.com/technology/2019/aug/14/facebook-private-groups-rules-extremist-fake-news>



REPORT

The spread of true and false news online

SOROUSH VOSOUGHI DEB ROY AND SINAN ABAL [Authors Info & Affiliations](#)

SCIENCE • 9 Mar 2018 • Vol 359, Issue 6380 • pp. 1146-1151 • DOI:10.1126/science.1252229

29 1,346

GET ACCESS

Lies spread faster than the truth

There is worldwide concern over false news and the possibility that it can influence political, economic, and social well-being. To understand how false news spreads, Vosoughi *et al.* used a data set of rumor cascades on Twitter from 2006 to 2017. About 126,000 rumors were spread by ~3 million people. False news reached more people than the truth; the top 1% of false news cascades diffused to between 1000 and 100,000 people, whereas the truth rarely diffused to more than 1000 people. Lies spread 6x faster than the truth. The degree of novelty and the



Lies spread 6x faster on Twitter than the truth

Twitter

- Tweets containing falsehoods were 70% more likely to be retweeted*
- Major issues with bots and political agendas



[Am J Public Health](#). 2018 October; 108(10): 1378–1384.

PMCID: PMC6137759

Published online 2018 October. doi: [10.2105/AJPH.2018.304567](https://doi.org/10.2105/AJPH.2018.304567)

PMID: [30138075](https://pubmed.ncbi.nlm.nih.gov/30138075/)

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

Am J



*<https://www.science.org/doi/abs/10.1126/science.aap9559> ²<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6137759/>

Why is social media such a breeding ground for fake news?

- Subjects elicit emotional reactions
- Format and topics encourage engagement
- People then tend to communicate in boxes and be subject to confirmation biases
- “Polarization is a great business model”*



... football Tech Business
... es, 5G, Bill Gates: why are
... stralians gathering to spread
... coronavirus conspiracy theories?

Weekend anti-lockdown protests drew people with a range of grievances but are unlikely to grow as they have in the US



▲ Any group with pre-existing conspiracy theories has projected their conspiracy theories onto the corona crisis.

<https://www.nytimes.com/2018/03/08/technology/twitter-fake-news-research.html>



Self- policing vs. legislation

- 2018 voluntary code of practice against disinformation¹ signatories incl. Facebook, Twitter & Google (not Youtube)
- EU asked for more efforts to be effective²
- 2022 Strengthened Code of Practice on Disinformation- Facebook no longer a signatory
- 2023 Twitter since Elon Musk...

¹<https://wayback.archive-it.org/12090/20210728072832/https://digital-strategy.ec.europa.eu/en/policies/code-practice-disinformation>

²https://ec.europa.eu/commission/presscorner/detail/en/IP_19_2914

FACEBOOK

COVID-19 Information Center

Get reliable, up-to-date information about COVID-19.

Common Prevention Tips

See All

- When you can't keep a safe distance from others, cover...
- Keep a safe distance from others
- Clean hands often and disinfect frequently...
- Don't touch your eyes, nose or mouth

Facts About COVID-19

Leading Health Organizations

Get COVID-19 Info

Articles

- Vermont state troopers resign amid probe into fake COVID-19 vaccine cards
thehill.com
Sep 8 · 568 shares
- Fact Check-NHS-headed document warning of significant COVID-19 vaccine fatalities is fake
reuters.com
Aug 25 · 6 shares
- Six held in Gujarat over 250 fake Covid vaccine certificates
indianexpress.com
Aug 16 · 15 shares

Search "COVID is fake" on facebook

Since Musk bought Twitter:

- Twitter stopped taking action against tweets breaching its Covid rules in November*
- Twitter previously had a 5- strike system concerning Covid misinformation



*<https://www.bbc.com/news/technology-63796832>

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The origins of the Anti-vaxx movement

1796 - Edward Jenner successfully tests the idea that cowpox protects against smallpox

1805 - First attempt at compulsory vaccination, in Italy, fails

1820 - Smallpox deaths in London fall significantly

1840 - Vaccination Act makes vaccinations free

1853 - New Vaccination Act makes vaccination compulsory in the first three months of a child's life

1867 - Vaccinations compulsory for all children below 14

1869 - Leicester Anti-Vaccination League founded

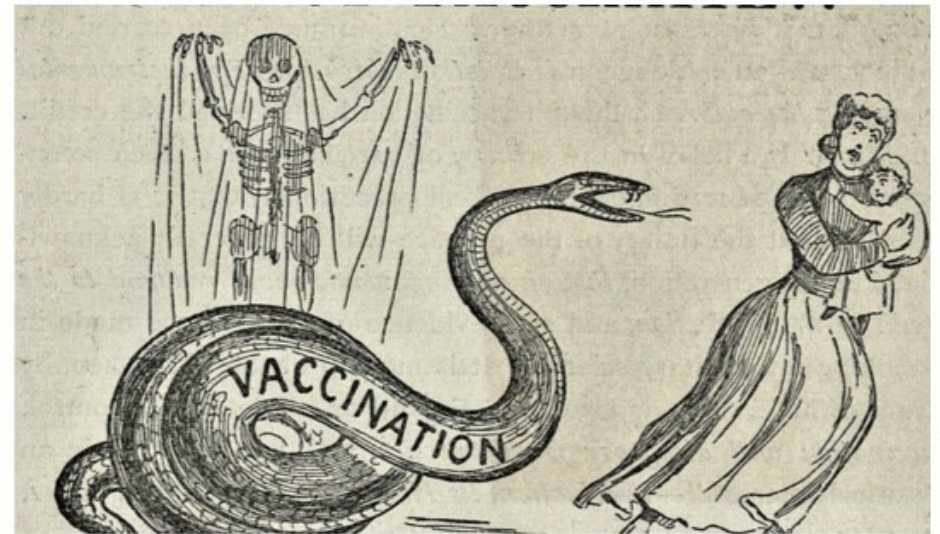
1885 - Mass protest held in Leicester

1898 - Vaccination Act introduces "conscientious objection" clause

<https://www.bbc.com/news/uk-england-leicestershire-50713991>



Antique anti-vaxx



A cartoon from a December 1894 anti-vaccination publication (Courtesy of The Historical Medical Library of The College of Physicians of Philadelphia)

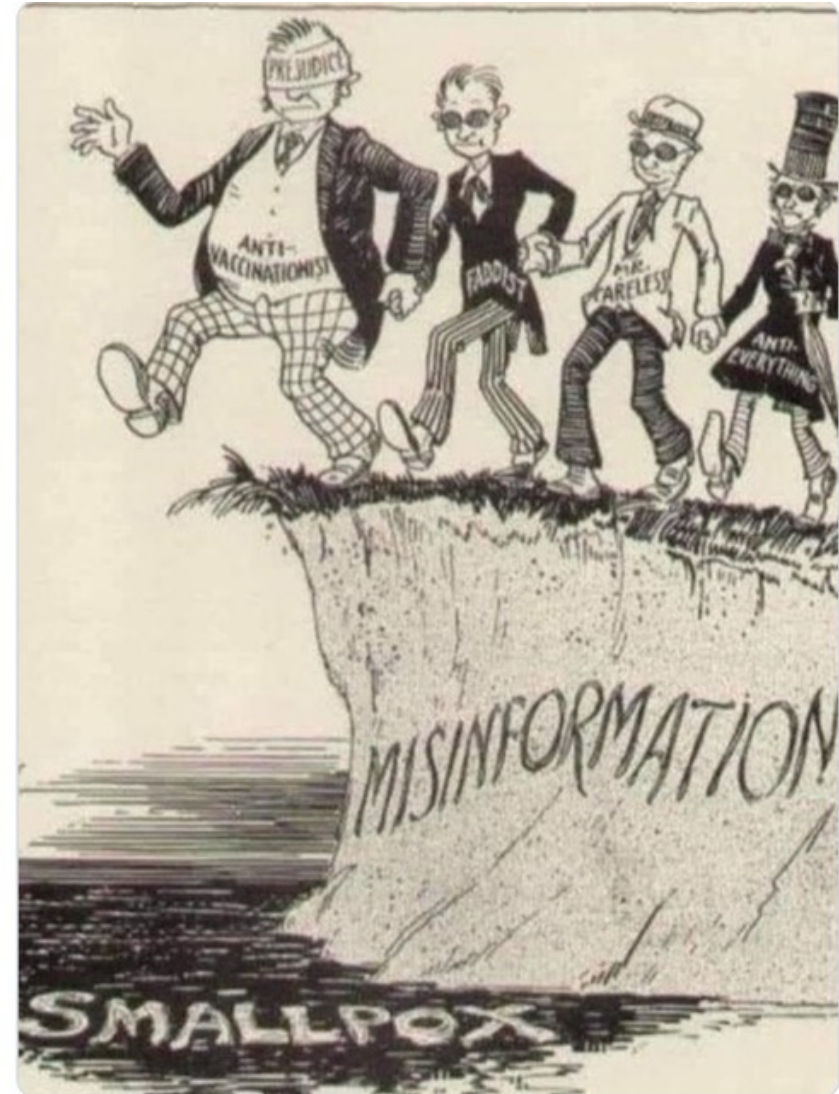


The Cow-Pock — or — the Wonderful Effects of the New Inoculation! — Vide. the Publications of J. A. ...

Pub. June 11, 1801 by
GETTY IMAGES

“Those who fail to learn from history are doomed to repeat it”

George Santayana & Sir Winston Churchill



Source: “Health in Pictures”, 1930. Courtesy of the American Public Health Association

The modern birth of anti vaxx: Measles

1998- Wakefield et al. publish in *The Lancet* about a possible link between measles, mumps, and rubella (MMR) vaccine and autism

- Retracted in 2010

Reasons for the retraction:

- Uncontrolled study design
- Small sample size
- Speculation in the conclusions
- Blatant conflicts of interest
- Allegations of misconduct & ethical violations



Ethical violations by Andrew Wakefield:

- Child abuse- unnecessary and invasive procedures of autistic children incl. lumbar punctures, endoscopies etc.¹
- UK gov. Investigation found deliberate falsification of research and he was struck off the UK medical register²
- Today Wakefield continues to be a vocal supporter and speaker of anti-vaxx groups³
- “The rate of Texan children exempted from at least one vaccine had surged by a staggering 1,900 per cent since Wakefield's arrival”⁴



¹<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC381348/> ²https://web.archive.org/web/20110809092833/http://www.gmc-uk.org/Wakefield_SPM_and_SANCTION.pdf_32595267.pdf ³<https://www.acsh.org/news/2019/02/21/andrew-wakefield-helps-elect-anti-vaccine-politicians-texas-13830> ⁴<https://www.news.com.au/lifestyle/health/health-problems/exiled-british-doctors-antivax-cult-alive-and-well-in-america/news-story/4738454aad62bf0aae93acfdb2923c8c>

The long-term effect of Wakefield's study

The article was published and circulated in the media; people around the developed world began to increasingly fear vaccines



Effect on vaccination rates

- Extremely low vaccination rates in certain areas, 2016-2019 there was a major increase in measles cases globally.*
- A. Wakefield is a vocal supporter of the anti-vaxx movement



In the literature:

In 2018- cited over 2800 times including 1360 times since 2012*

In 2022- cited over 4500 times including 2180 times since 2012!!!*



*<https://scholar.google.com/>

News

Unvaccinated “Wakefield cohorts” blamed for 5000 cases of mumps in England last year

BMJ 2020 ; 368 doi: <https://doi.org/10.1136/bmj.m619> (Published 14 February 2020)

Cite this as: *BMJ* 2020;368:m619

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Zosia Kmietowicz

[Author affiliations ▾](#)

Students and young people who may have missed out on their measles, mumps, and rubella (MMR) vaccinations are being encouraged to get immunised as figures show there were 5042 laboratory confirmed cases of mumps in England in 2019, the highest number of cases since 2009. This compared with 1066 cases in 2018, according to provisional figures from Public Health England (PHE).

The number of cases has been highest in the north west (996 cases in 2019) and lowest in the east of England (301).

The rise in cases looks set to continue in 2020, said the agency, with 546 confirmed cases in January 2020 compared with 191 during the same period in 2019.

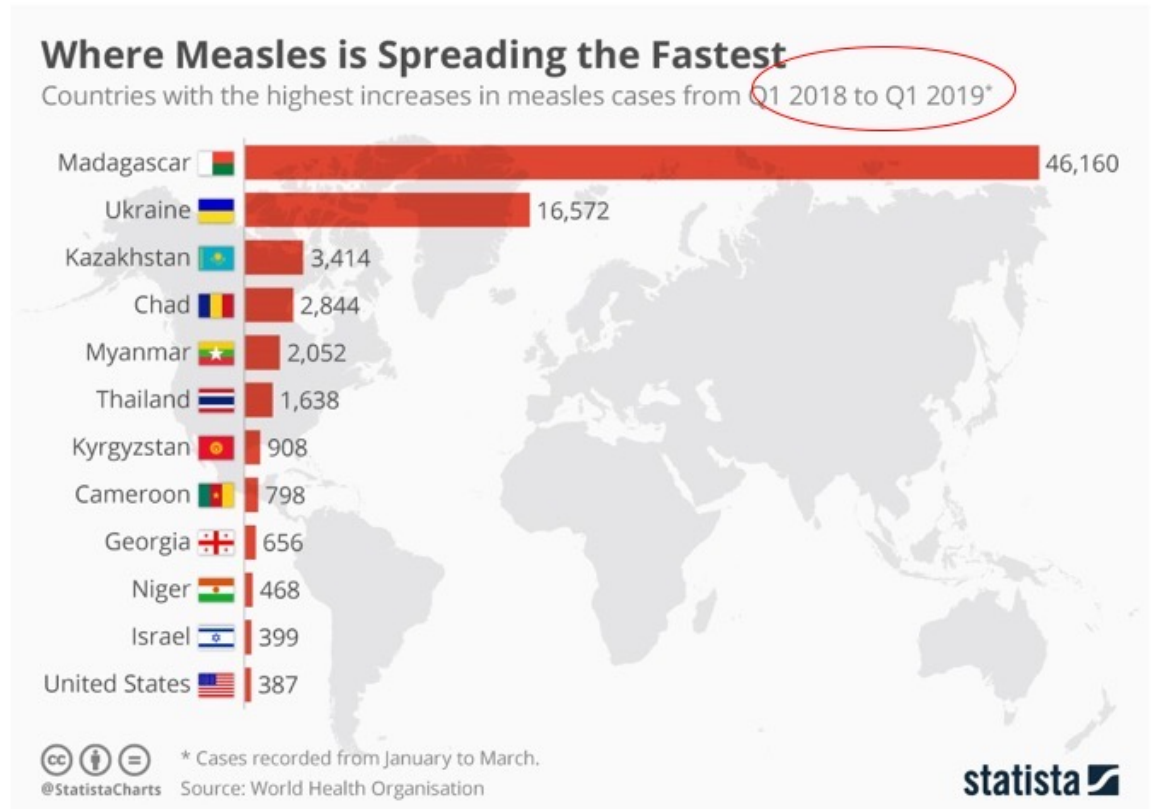
https://www.bmj.com/content/368/bmj.m619?utm_source=etoc&utm_medium=email&utm_campaign=tbmj&utm_content=weekly&utm_term=20200221

The
problem
continues...



Measles before & during Covid

- Covid-19 created the perfect storm
- Issues with access
- Issues with antivaxx
- In 2020, 23 million children missed out on all basic childhood vaccines. That's the highest number seen since 2009 and 3.7 million more than in 2019*



*<https://www.unicef.org/stories/measles-cases-spiking-globally>

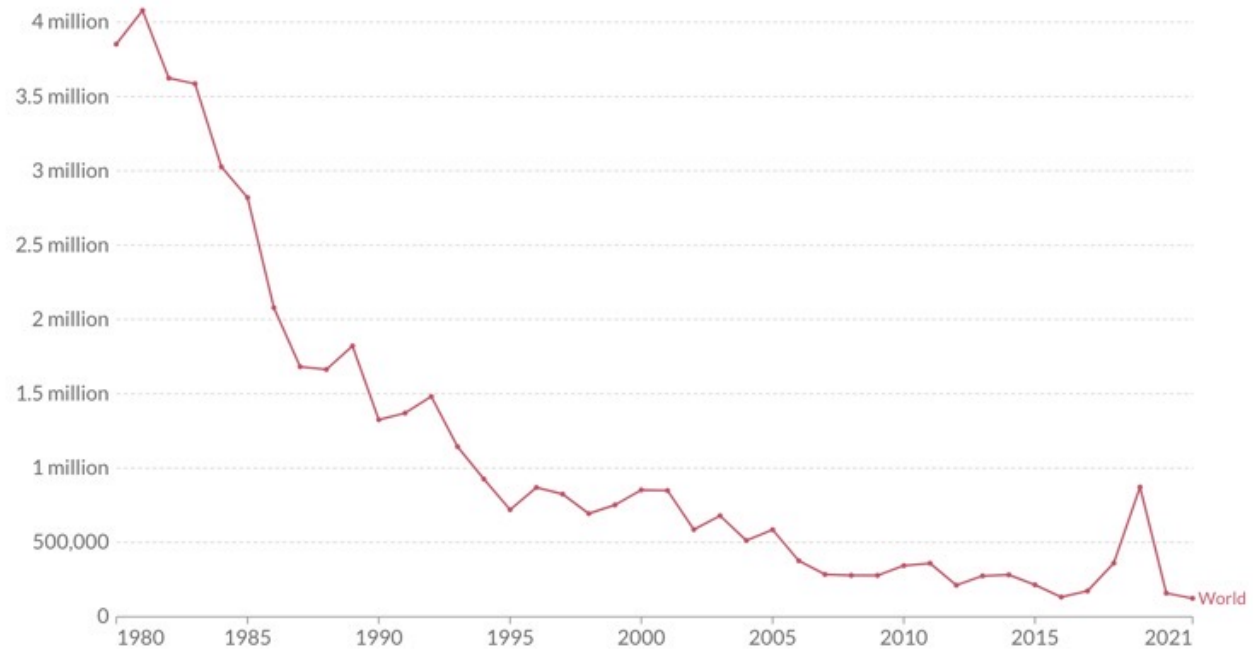
Measles today

Overall, the global situation looks to be improving again

Reported cases of measles, 1980 to 2021

Our World in Data

+ Add country



Source: WHO, Global Health Observatory

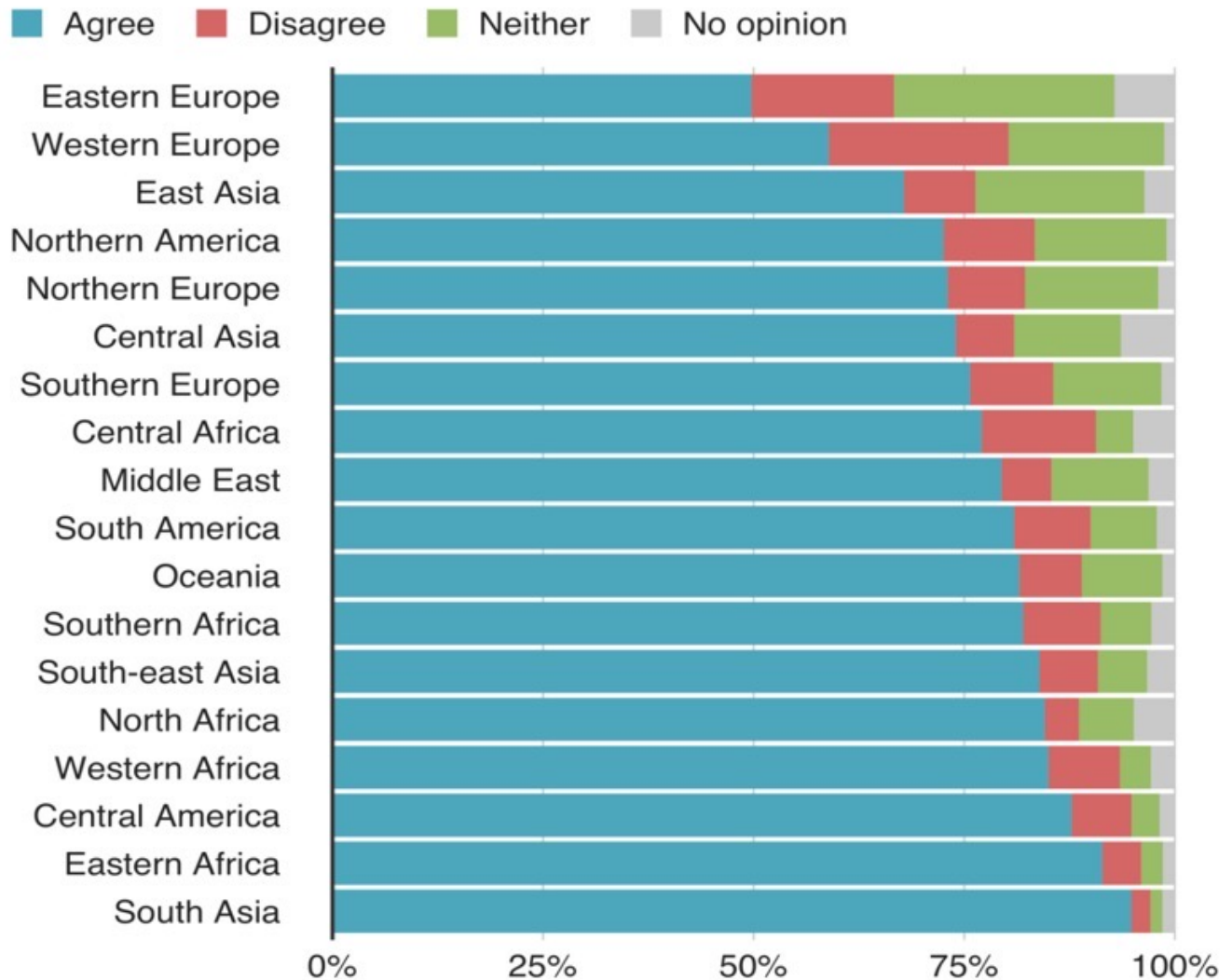
OurWorldInData.org/vaccination/ • CC BY



<https://ourworldindata.org/grapher/reported-cases-of-measles>



Percentage of people around the world that agree that vaccines are safe (pre-Covid)



Source: Wellcome Global Monitor, Gallup World Poll 2018



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Before Covid-19 one could say that...

In high-income settings, individuals lack personal experience with communicable disease

Polio



Tetanus



Mumps



But... during Covid-19...

- It was STILL difficult to get people vaccinated!
- Why??



"We're not just fighting an epidemic; we're fighting an infodemic."



- Tedros Adhanom Ghebreyesus, WHO Director-General



<https://www.who.int/director-general/speeches/detail/munich-security-conference>

A simulation of human behavior in emergencies

- 2005 virtual pandemic in World of Warcraft video game- affected 4 million live players and was studied to predict behavior (including in the Lancet)¹



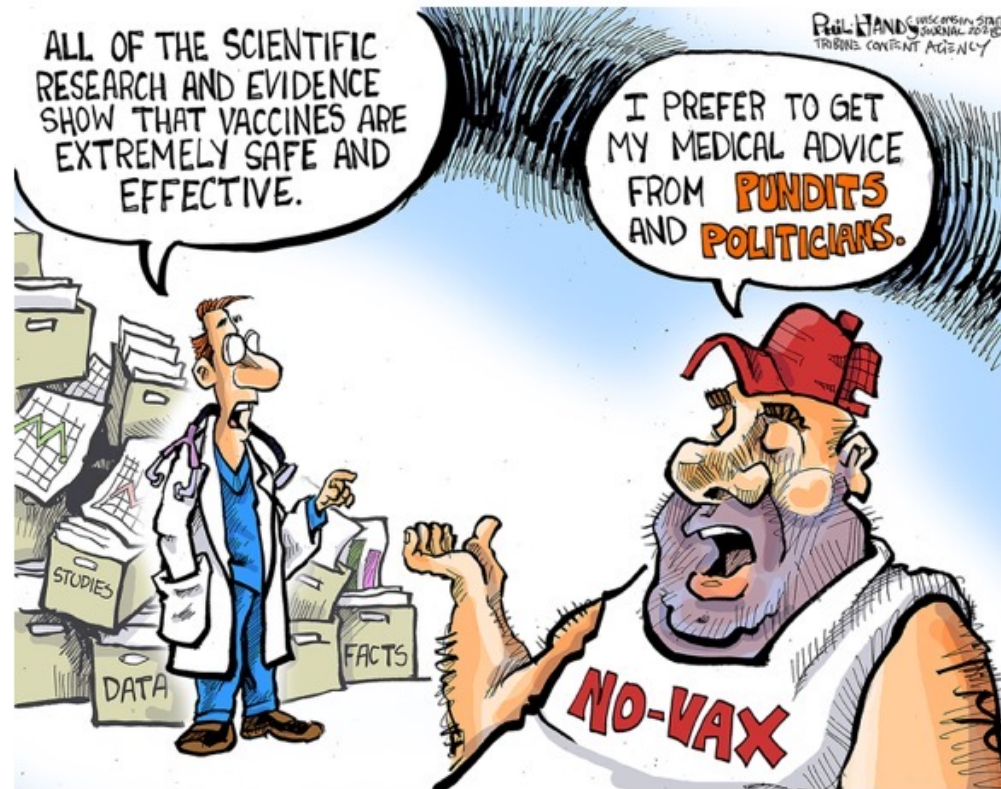
- Saw a large range of behavior, game developers couldn't control it, and fake news was rampant²
- Thought people would choose collective good if it were real³

¹[https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(07\)70212-8/references](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(07)70212-8/references)

²<https://www.reuters.com/article/us-flu-virtual/online-blood-plague-offers-lessons-for-pandemics-idUKTRE53Q4HI20090427>

³<https://nautil.us/issue/17/big-bangs/how-world-of-warcraft-might-help-head-off-the-next-pandemic>

We unfortunately can't expect most people to behave rationally



From a UK Parliament committee

Supplementary Written Evidence Submitted by Gillian Jamieson
(CLL0114)

Covid vaccines, treatments, mental health and the future

This shows level of
anxiety in the
population

I am extremely concerned about the fact that the novel gene-based Covid vaccines are resulting in deaths, sometimes of quite young people, or causing miscarriages, blindness, neurological symptoms and so on, but that few mention this and Government adverts tell us that vaccines are safe even for pregnant women. It seems that the risk/benefit equation does not add up, especially then the average age of death from Covid is 82.5 years. These are vaccines still in clinical trials and authorised for emergency use only. There should be enough important data on excess deaths to show that there is and has been no emergency.

A distressing example of harm is the death of a healthy young baby at 5 months after being breast fed by a mother vaccinated against Covid. This appears in a US Vaers report.

In fact there is no *informed consent*. My experience is that the NHS sends out a leaflet saying vaccines are safe and you are invited to a vaccine centre without prior notification of the vaccine to be used, and without your doctor present helping you to decide. In Scotland the patient information leaflet was given to my neighbour, but only when the needle was poised to enter the arm. Few people seem to realise that the vaccine is still in clinical trials.

I have many other concerns about harms caused by Government actions. I will list them under various headings. I see that the Hart Group (Health Advisory and Recovery Team) has addressed some of the issues I mention in the bulletin <https://www.hartgroup.org.uk/may-2021/> and I will refer to this.

Vaccine deaths and adverse effects

The daily rate of vaccine deaths is now higher than Covid deaths. Death figures in the UK for the 2 main vaccines at the links below are 1227 plus 149 miscarriages, the latter figure showing a steep rise.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/983472/COVID-19_mRNA_Pfizer-BioNTech_vaccine_analysis_print.pdf
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/983475/COVID-19_vaccine_AstraZeneca_analysis_print.pdf

It is estimated that a maximum of 10% of adverse events are reported via the Yellow Card, which means actual deaths will be about 12,270 and miscarriages about 1490, at a minimum. On the other hand very few of the Covid deaths are likely to have been caused by Covid. They are only designated as "with Covid" based on a highly inaccurate and inappropriate test. Thus vaccine deaths are likely to be vastly higher than actual Covid deaths at present. We are told that vaccines are preventing deaths. We do not know this. The decline in "Covid deaths" could be attributed to changing the Ct value of the PCR test or just because the virus is disappearing or because of pre-acquired natural immunity via T-cells etc.

The facts are that these vaccines were approved for emergency use only. There is now no emergency and they should be withdrawn, especially as clinical trials do not finish until 2023 and as we now have a safe and effective treatment in ivermectin (Hart bulletin) and other drugs and supplements.

A review of ivermectin studies is here: https://journals.lww.com/americantherapeutics/fulltext/2021/06000/review_of_the_emerging_evidence_demonstrating_the_4.aspx

Other treatment includes the use of corticosteroids and antihistamines if symptoms are still present on the 8th day of illness as suggested by Dr. Shakara Chetty here: <https://covexit.com/the-8th-day-therapy-for-covid-19/>. In the UK this is being followed up by Dr. Chris Newton here: <https://www.linkedin.com/in/chris-newton-813ab229/detail/recent-activity/shares/>

Animal trials for these vaccines are not even complete. It is misleading to say that they do not affect fertility. There is no data for this yet. (Hart) Neither is there any long-term safety data. Neurological effects, for example, may take years to develop. The AstraZeneca blood-clotting issues are now well-known and many younger people have died because of this. There are however other concerns e.g. the spike proteins which the vaccine causes the body to

<https://committees.parliament.uk/writtenevidence/36788/html/>

Context: Paracetamol

- It is estimated that between **82 000** and **90 000** patients present in the UK each year with paracetamol overdose*
- Between 150 and 250 deaths occur annually in the UK alone*



Context: Covid-19

- As of Oct. 13th, 172,874 people in the UK died with COVID-19 on the death certificate¹
- A 2022 Lancet study showed that people were not more likely to die if they were vaccinated (it looked at data from more than 298 million doses of mRNA vaccine)²
- It's difficult to convince people to take ANY risk if they are not experiencing symptoms...but as soon as they have a headache...

¹<https://coronavirus.data.gov.uk/details/deaths?areaType=nation&areaName=England>

²Rosenblum HG, et al.. Safety of mRNA vaccines administered during the initial 6 months of the US COVID-19 vaccination programme: an observational study of reports to the Vaccine Adverse Event Reporting System and v-safe. *Lancet Infect Dis.* 2022 Jun;22(6):802-812. doi: 10.1016/S1473-3099(22)00054-8. Epub 2022 Mar 7. PMID: 35271805; PMCID: PMC8901181.

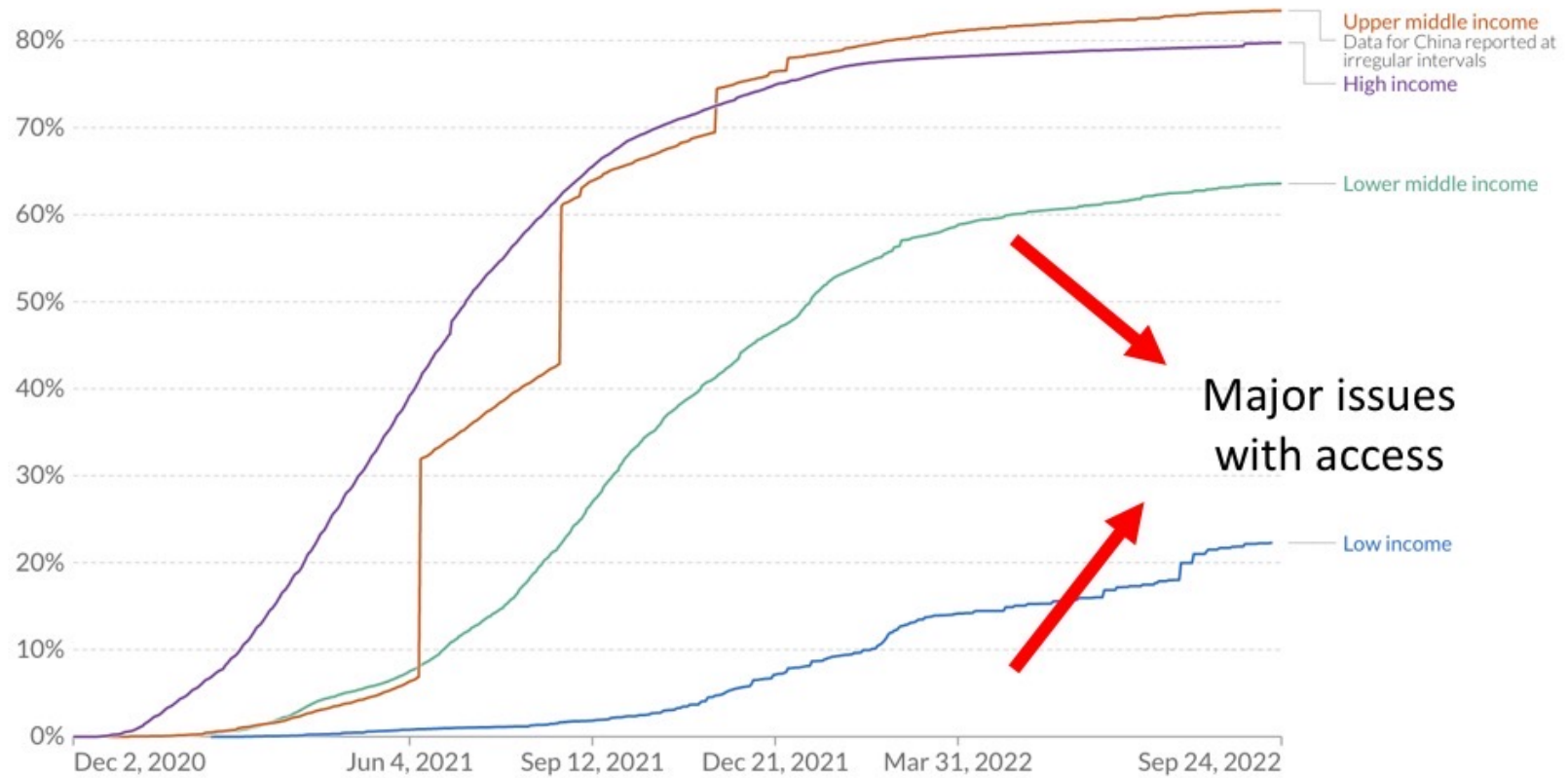


Share of people who received at least one dose of COVID-19 vaccine

Total number of people who received at least one vaccine dose, divided by the total population of the country.



+ Add country



Source: Official data collated by Our World in Data - Last updated 25 September 2022

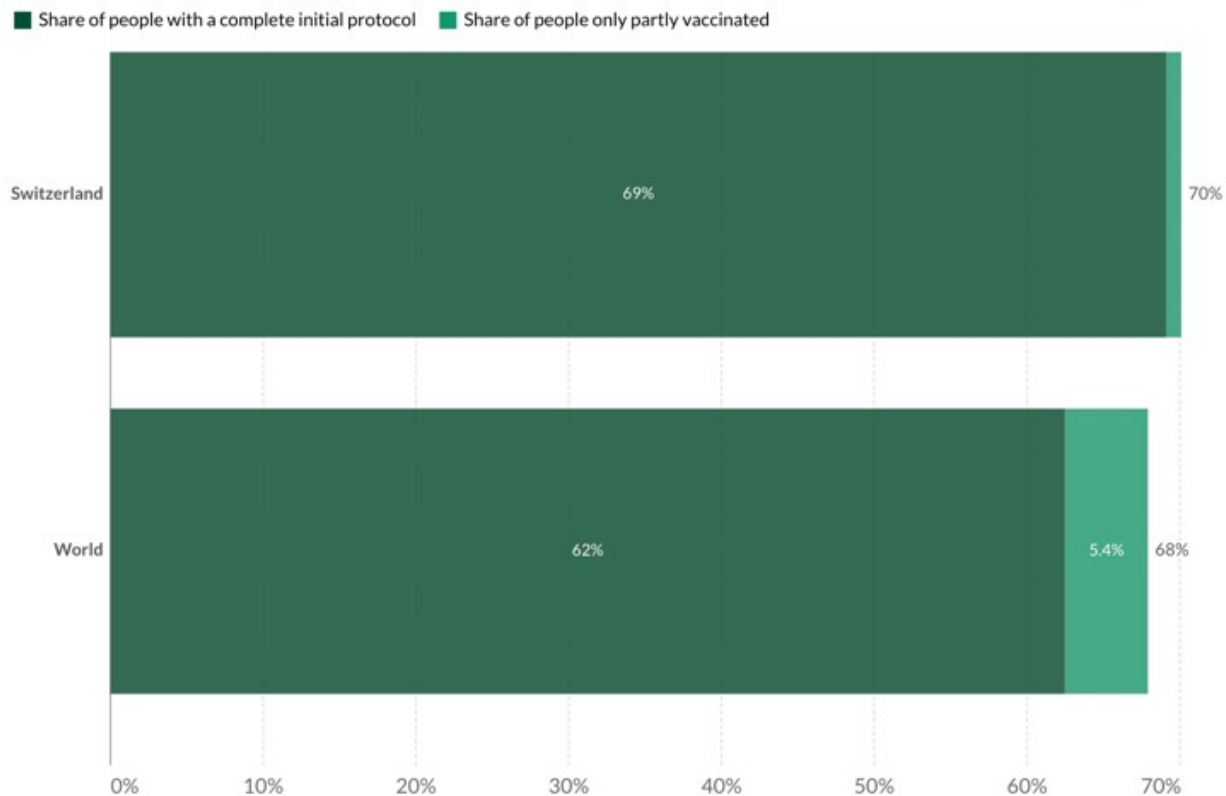
OurWorldInData.org/coronavirus • CC BY



Covid Vaccination rates in Switzerland

Share of people vaccinated against COVID-19, Sep 24, 2022

Our World
in Data



...definitely
no issues
concerning
access...



Source: Official data collated by Our World in Data
Note: Alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries.

CC BY

Sometimes the
effect of Covid
seems to be
positive and
paradoxical



Anti vaxx effects on public health pre-covid

- In the UK, MMR vaccine coverage dropped from 91% in 1998 to 80% in 2003¹ and measles cases increased from 56 cases per population of 58.5 million in 1998 to 1370 in a population of 61 million in 2008²
- Affluent California schools up to 70% of students exempt from vaccination for non-medical reasons
 - Lower vaccination rate than South Sudan

¹Flaherty, D. K. The Vaccine-Autism Connection: A Public Health Crisis Caused by Unethical Medical Practices and Fraudulent Science

²<http://data.oecd.org/pop/population.htm>.

³ <https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics/2021-22#top>



Anti vaxx effects on public health post-covid

- In the UK, MMR vaccine coverage dropped from 91% in 1998 to 80% in 2003¹ and measles cases increased from 56 cases per population of 58.5 million in 1998 to 1370 in a population of 61 million in 2008²
- The MMR vaccination rates in the UK have since recovered, but remain below 95%³
- Affluent California schools up to 70% of students exempt from vaccination for non-medical reasons
- California becomes the first US state to mandate COVID-19 vaccine requirements for school

¹Flaherty, D. K. The Vaccine-Autism Connection: A Public Health Crisis Caused by Unethical Medical Practices and Fraudulent Science

²<http://data.oecd.org/pop/population.htm>.

³ <https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics/2021-22#top>

⁴ <https://www.gov.ca.gov/2021/10/01/california-becomes-first-state-in-nation-to-announce-covid-19-vaccine-requirements-for-schools/>



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A body of literature about fake news??!!





ISSN: 0002-9637
E-ISSN: 1476-1645

OA COVID-19–Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis

Download

Md Saiful Islam^{1,2}, Tonmoy Sarkar¹, Sazzad Hossain Khan¹, Abu-Hena Mostofa Kamal³, S. M. Murshid Hasan⁴, Alamgir Kabir^{2,5}, Dalia Yeasmin¹, Mohammad Ariful Islam¹, Kamal Ibne Amin Chowdhury¹, Kazi Selim Anwar⁶, Abrar Ahmad Chughtai², Holly Seale²

View Affiliations

Publisher: The American Society of Tropical Medicine and Hygiene^{EQ}

Source: The American Journal of Tropical Medicine and Hygiene, Volume 103, Issue 4, 7 Oct 2020, p. 1621 - 1629

DOI: <https://doi.org/10.4269/ajtmh.20-0812>

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Abstract



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INTRODUCTION

GO TO SECTION...

The term infodemic, defined as “an overabundance of information—some accurate and some not—that makes it hard for people to find trustworthy sources and reliable guidance when they need it,” was coined to categorize some of the common features of rumors, stigma, and conspiracy theories during public health emergencies.¹ During the Ebola outbreak in the Democratic Republic of Congo in 2019, misinformation was linked to violence, mistrust, social disturbances, and targeted attacks on healthcare providers.² During the SARS outbreak in China in 2002–2003, fear and anxiety about contracting the disease caused social stigma against Asian people.³ Stigmatized persons may delay seeking medical care, potentially remaining undetected, but contributing to the expansion of the epidemic via community transmission.^{4,5} The UN secretary-general identified COVID-19–related rumors as a global enemy.⁶ Globally, there have been reports of rumors, stigma, and

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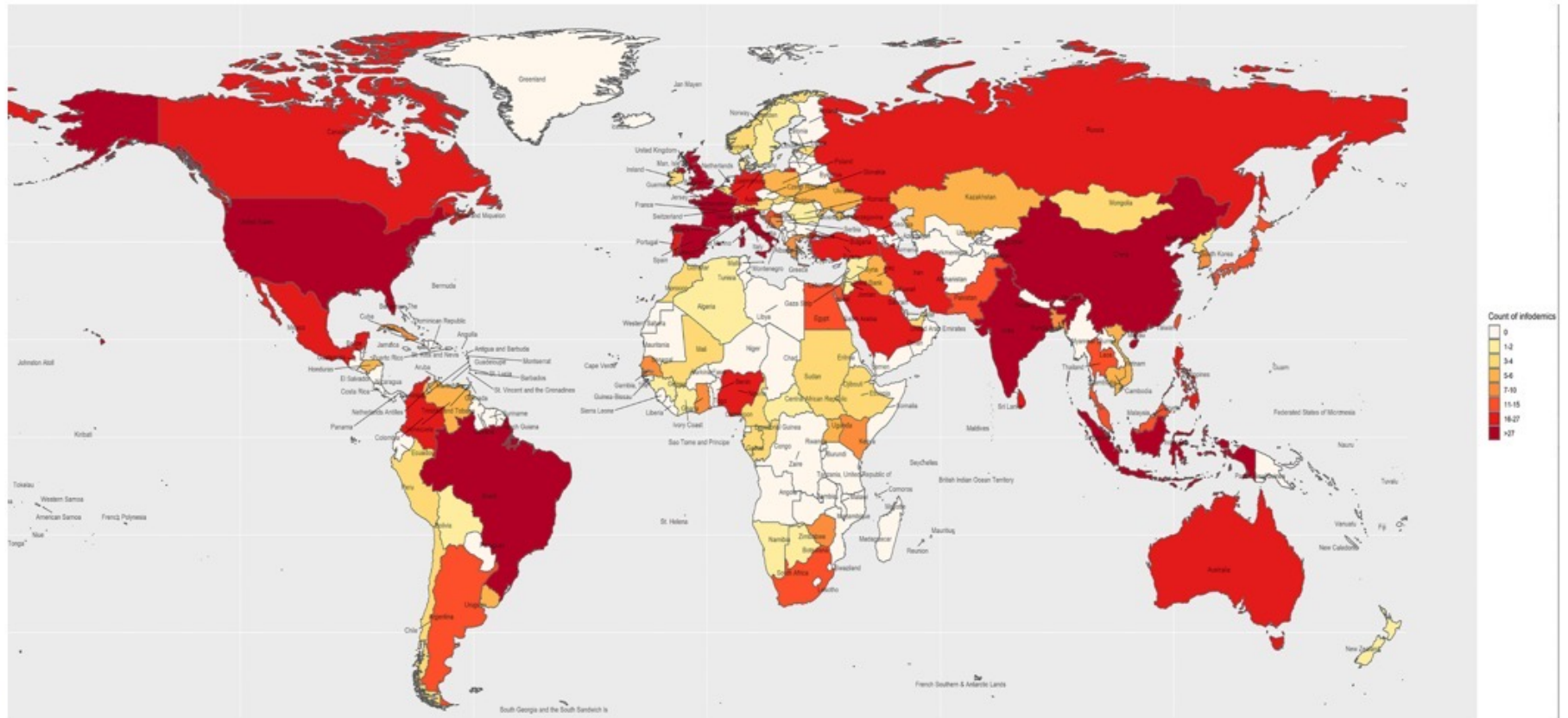
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- 📄 Export citation ▾
- 👍 Recommend to library
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Access Key



Infodemic map (2021):



<http://www.ajtmh.org/content/journals/10.4269/ajtmh.20-0812;jsessionid=-ETrfB53Hw7IIHnlp2BbSu4i.ip-10-241-1-122>

- Found a directional negative relationship between online misinformation and vaccination uptake rates
- Associations between vaccine outcomes and misinformation remain significant when accounting for political as well as demographic and socioeconomic factors

scientific reports

www.nature.com/scientificreports

Check for updates

OPEN

Online misinformation is linked to early COVID-19 vaccination hesitancy and refusal

Francesco Pierri^{1,3,✉}, Brea L. Perry², Matthew R. DeVerna³, Kai-Cheng Yang³, Alessandro Flammini³, Filippo Menczer³ & John Bryden³

Widespread uptake of vaccines is necessary to achieve herd immunity. However, uptake rates have varied across U.S. states during the first six months of the COVID-19 vaccination program. Misbeliefs may play an important role in vaccine hesitancy, and there is a need to understand relationships between misinformation, beliefs, behaviors, and health outcomes. Here we investigate the extent to which COVID-19 vaccination rates and vaccine hesitancy are associated with levels of online misinformation about vaccines. We also look for evidence of directionality from online misinformation to vaccine hesitancy. We find a negative relationship between misinformation and vaccination uptake rates. Online misinformation is also correlated with vaccine hesitancy rates taken from survey data. Associations between vaccine outcomes and misinformation remain significant when accounting for political as well as demographic and socioeconomic factors. While vaccine hesitancy is strongly associated with Republican vote share, we observe that the effect of online misinformation on hesitancy is strongest across Democratic rather than Republican counties. Granger causality analysis shows evidence for a directional relationship from online misinformation to vaccine hesitancy. Our results support a need for interventions that address misbeliefs, allowing individuals to make better-informed health decisions.

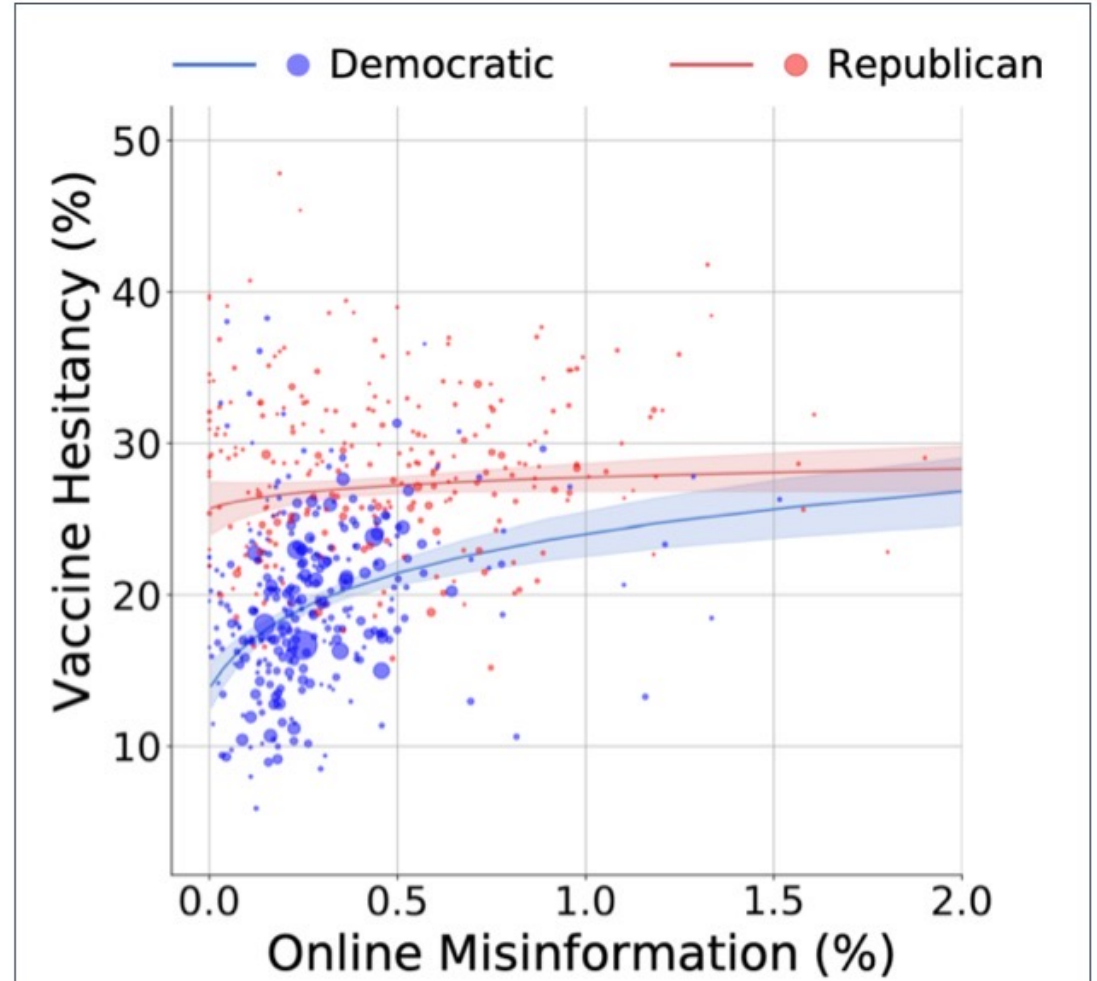
Pierri, F., Perry, B.L., DeVerna, M.R. et al. Online misinformation is linked to early COVID-19 vaccination hesitancy and refusal. *Sci Rep* 12, 5966 (2022). <https://doi.org/10.1038/s41598-022-10070-w>



Association of online misinformation and political partisanship

Each dot represents a U.S. county, with size and color indicating population size and political majority

Pierrri, F., Perry, B.L., DeVerna, M.R. et al. Online misinformation is linked to early COVID-19 vaccination hesitancy and refusal. *Sci Rep* 12, 5966 (2022). <https://doi.org/10.1038/s41598-022-10070-w>



- Information spreading can strongly influence people's behavior and alter the effectiveness of government countermeasures
- Models to forecast virus spreading are starting to account for the behavioral response of the population with respect to public health interventions



Cinelli, M., Quattrociochi, W., Galeazzi, A. *et al.* The COVID-19 social media infodemic. *Sci Rep* 10, 16598 (2020).

www.nature.com/scientificreports

**SCIENTIFIC
REPORTS**

nature research

Check for updates

OPEN **The COVID-19 social media infodemic**

Matteo Cinelli^{1,2}, Walter Quattrociochi^{1,2,3✉}, Alessandro Galeazzi⁴, Carlo Michele Valensise⁵, Emanuele Brugnoli¹, Ana Lucia Schmidt², Paola Zola⁶, Fabiana Zollo^{1,2,7} & Antonio Scala^{1,3}

We address the diffusion of information about the COVID-19 with a massive data analysis on Twitter, Instagram, YouTube, Reddit and Gab. We analyze engagement and interest in the COVID-19 topic and provide a differential assessment on the evolution of the discourse on a global scale for each platform and their users. We fit information spreading with epidemic models characterizing the basic reproduction number R_0 for each social media platform. Moreover, we identify information spreading from questionable sources, finding different volumes of misinformation in each platform. However, information from both reliable and questionable sources do not present different spreading patterns. Finally, we provide platform-dependent numerical estimates of rumors' amplification.

The World Health Organization (WHO) defined the SARS-CoV-2 virus outbreak as a severe global threat¹. As foreseen in 2017 by the global risk report of the World Economic forum, global risks are interconnected. In particular, the case of the COVID-19 epidemic (the infectious disease caused by the most recently discovered

- It was found that altruism, instant news sharing, self-promotion, and socialization are predictors of fake news sharing
- The human mind plays a significant role in spreading misinformation
- The role of critical thinking of individuals is very much important in controlling the flow of misinformation



Review Article

Tahir Mumtaz Awan*, Mahroz Aziz, Aruba Sharif, Tehreem Raza Ch, Taha Jasam, Yusra Alvi

Fake news during the pandemic times: A Systematic Literature Review using PRISMA

<https://doi.org/10.1515/opis-2022-0131>
received February 26, 2021; accepted March 29, 2022.

Abstract: The purpose of this systematic literature review is to review the major studies about misinformation and fake news during COVID-19 on social media. A total of 144 articles studies were retrieved from ScienceDirect, Scopus, and Web of Science databases and 20 relevant articles were selected using the PRISMA technique. It was found that altruism, instant news sharing, self-promotion, and socialization are predictors of fake news sharing. Furthermore, the human mind plays a significant role in spreading misinformation while the role of critical thinking of individuals is very much important in controlling the flow of misinformation.

Keywords: COVID-19; fake news; misinformation; social media; rumors.



Awan, Tahir Mumtaz, Aziz, Mahroz, Sharif, Aruba, Ch, Tehreem Raza, Jasam, Taha and Alvi, Yusra. "Fake news during the pandemic times: A Systematic Literature Review using PRISMA" Open Information Science, vol. 6, no. 1, 2022, pp. 49-60.

Published on 17.11.2021 in Vol 7 , No 11 (2021) :November

📄 Preprints (earlier versions) of this paper are available at <https://preprints.jmir.org/preprint/30642>, first published May 23, 2021.



COVID-19 Vaccine Hesitancy on Social Media: Building a Public Twitter Data Set of Antivaccine Content, Vaccine Misinformation, and Conspiracies

Goran Muric ¹ ; Yusong Wu ¹ ; Emilio Ferrara ^{1, 2, 3} 

Article

Authors

Cited by

Tweetations (22)

Metrics

- [Abstract](#)
- Introduction
- Methods
- Results
- Discussion
- References
- Abbreviations

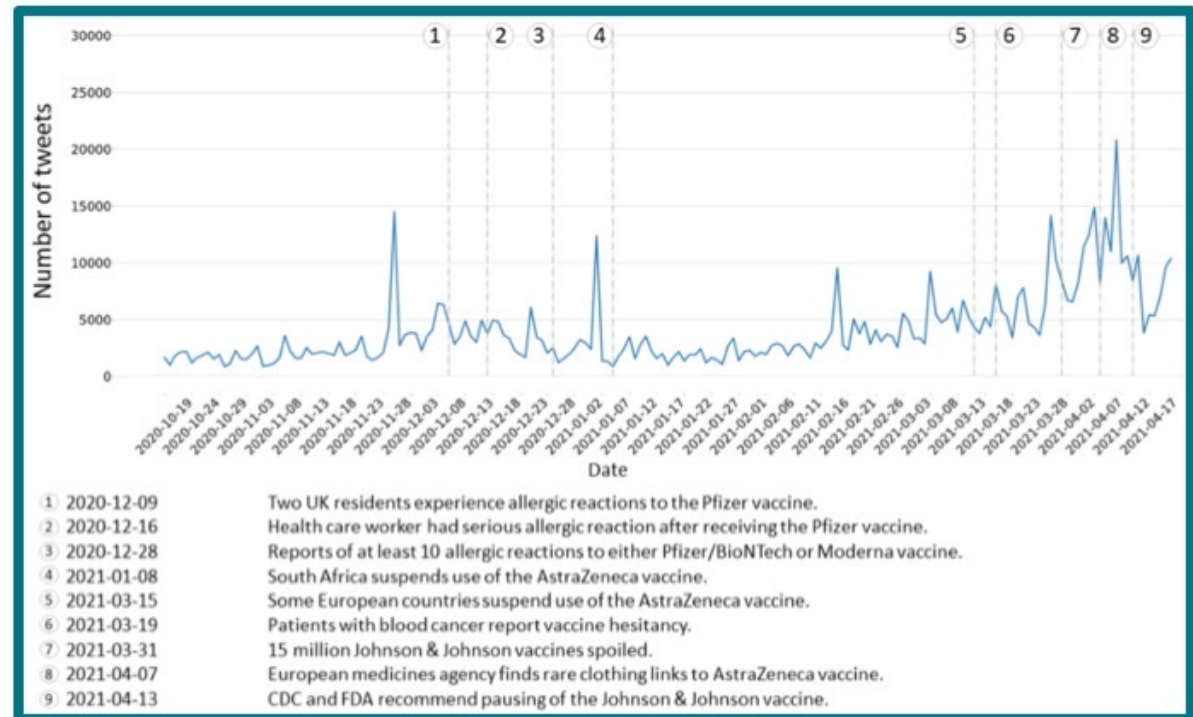
Abstract

Background:

False claims about COVID-19 vaccines can undermine public trust in ongoing vaccination campaigns, posing a threat to global public health. Misinformation originating from various sources has been spreading on the web since the beginning of the COVID-19 pandemic. Antivaccine activists have also begun to use platforms such as Twitter to promote their views. To properly understand the phenomenon of vaccine hesitancy through the lens of social media, it is of great importance to gather the relevant data.

Tweets using anti-vaccine keywords

- 1.8 million tweets
- 719,000 unique accounts
- October 2020- April 2021
- Spikes that do not often correspond to major announcements regarding vaccine research /authorization
- Surprising as news usually drives the discussion on Twitter



Muric G, Wu Y, Ferrara E. COVID-19 Vaccine Hesitancy on Social Media: Building a Public Twitter Data Set of Antivaccine Content, Vaccine Misinformation, and Conspiracies. *JMIR Public Health Surveill* 2021;7(11).

Outline of the presentation

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- Misinformation based on scientific studies
- Case studies in hand hygiene
- Approaches to addressing misinformation

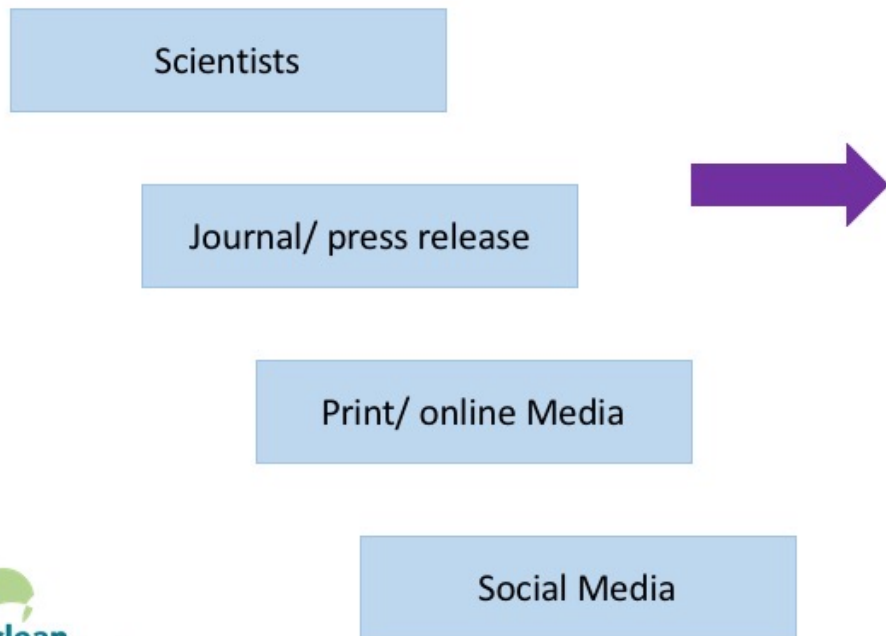


Misinformation based on scientific studies

- The more alarmist an article is, the more attention and traction it is likely to get
- Paywalls limit access to published peer-reviewed work for the majority of the audience that reads scientific articles
- General public reads scientific information almost exclusively through open access sources
- the average individual does not know how to critically read a scientific study



Scientific publishing: misinformation can take place at various levels:



Results:

- Misleading statements
- Ecological fallacy
- Inferences without sufficient evidence
- Abstract misleading compared to paper
- Sensationalist / alarmist titles
- Echo chambers



COVID-19 Panic Publishing

- Explosion of COVID literature
- Surge in online research¹
- Questionable quality
- Ethics issues
- Questionable motivation- money, power, prestige, etc.
- In the first 5 months of 2020, the number of publications related to COVID-19 is already more than triple that of the number of publications on HIV in the last 20 years.²
- Over 286 papers on COVID have been retracted to date



¹Parmar A. Panic publishing: An unwarranted consequence of the COVID-19 pandemic. *Psychiatry Res.* 2020;294:113525. doi:10.1016/j.psychres.2020.113525

²Safieddine M., Kassir R. COVID 19 and the race to publish: an ethical issue. *British Journal of Surgery.* 2020;107(11):e504. doi: 10.1002/bjs.11966. John Wiley and Sons Ltd.

³<https://retractionwatch.com/retracted-coronavirus-covid-19-papers/>

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Fake news and hand hygiene:

What rumors have you heard?



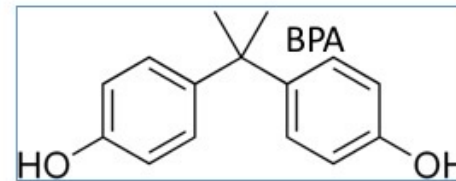
A brief overview of misinformation in hand hygiene

- Bisphenol A
- Triclosan/triclocarban
- E. faecium tolerance to alcohol
- Handrubs create “superbugs”
- Influenza and handrub
- Handrubs lower the immune system
- All handrubs are toxic (methanol scare)
- Gloves as a substitute for hand hygiene



ABHR and Bisphenol A

- Healthcare worker (HCW) applies a large amount of ABHR containing skin penetration enhancers (such as propylene glycol)
- HCW touches paper containing BPA for an artificially prolonged time (4 min)
- HCW eats ten French fries after holding each fry for 10 seconds
Absorption of BPA in blood is measured



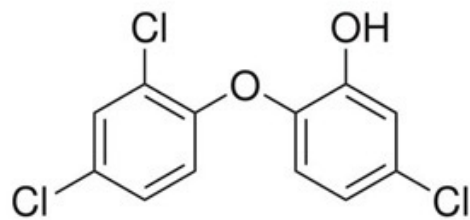
Effect of the study

- Likely reduction in ABHR use by HCW in France
- Luckily did not spread internationally
- Possible impact on transmission of HAI

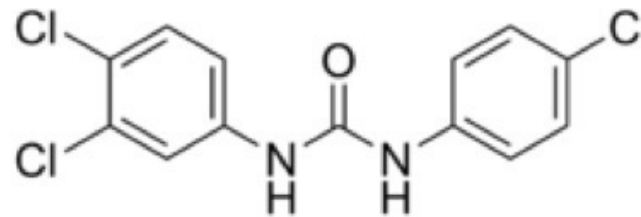


Triclosan & Triclocarban

- Media falsely linking triclosan and triclocarban to all ABHRs
 - Some recommending to stop using ABHR
- ABHRs generally never contained these chemicals
- *The Florence Statement on Triclosan and Triclocarban* might have raised awareness and concern



Triclosan



Triclocarban

Bacterial tolerance to ABHR?

- 2018 Australian study from Pidot et al. in Science and Translational Medicine
- Authors looked at tolerance to a 23% alcohol solution
- When using a 70% solution, no difference between resistant and sensitive isolates
- Efficacy test was in environment not in hands

A screenshot of a web page from Science Translational Medicine. The header includes the journal title 'Science Translational Medicine' and navigation links for 'Home', 'News', 'Journals', 'Topics', and 'Careers'. Below the header is a banner image with the text 'We can. We will. We must.' and a 'Find out more' button. The main content area features a 'SHARE' section with social media icons for Facebook, Twitter, and Google+. The article title is 'Increasing tolerance of hospital *Enterococcus faecium* to handwash alcohols'. Below the title are the authors' names: 'Sacha J. Pidot^{1*}, Wei Gao^{1*}, Andrew K. Buitjens^{1*}, Ian R. Monk², Román Guellot³, Glen P. Carter⁴, Jean Y. H. Lee⁵, Marg...'. There is a link to 'See all authors and affiliations'. The article is dated '01 Aug 2018' and includes volume and issue information. A navigation bar below the article title has options for 'Article', 'Figures & Data', 'Info & Metrics', 'eLetters', and 'PDF'. A summary box titled 'Alcohol loses its luster' contains a short abstract. At the bottom, there is a copyright notice: 'Copyright © 2018 The Authors, some rights reserved, exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.'

- Research was important and well-conducted
- Title of paper referring to “handwash alcohols”
- Press release “alcohol loses its luster”
- Conflating of hypotheses concerning the environment vs. handrubbing

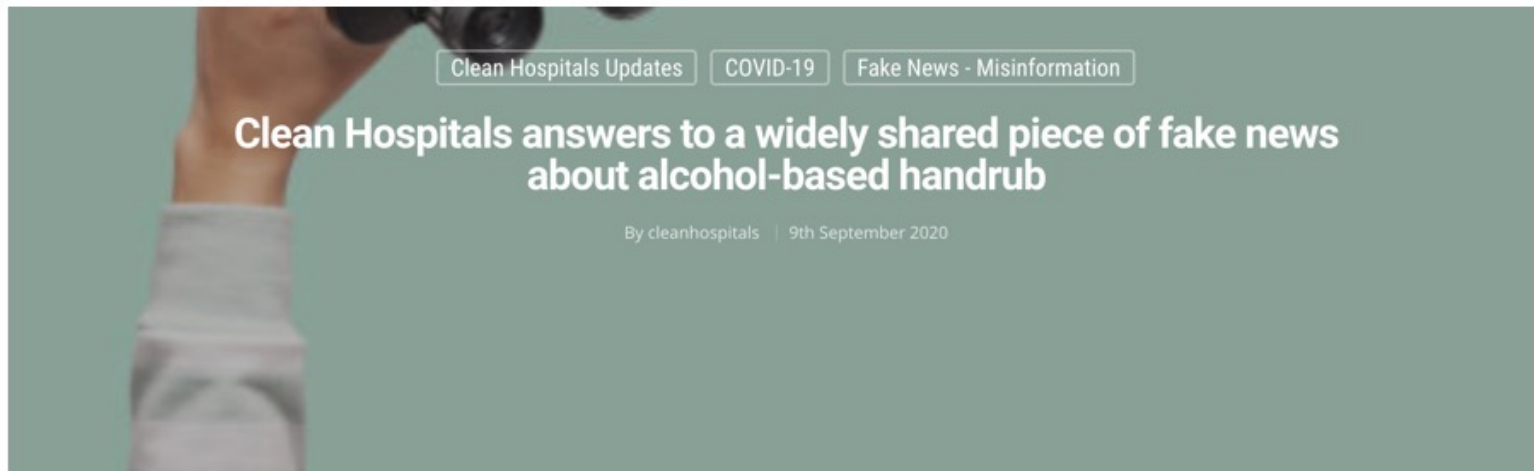
This rumor worsened during COVID

The screenshot shows the Express website interface. At the top, the Express logo is on the left, and navigation links for LOGIN, REGISTER, and social media icons are on the right. Below the logo, there's a sub-header: "Home of the Daily and Sunday Express". A secondary navigation bar includes links for Apps, Puzzles, Horoscopes, In Your Area, Shop, and Paper. The main navigation bar lists categories: HOME, NEWS, SHOWBIZ & TV, SPORT, COMMENT, FINANCE, TRAVEL, ENTERTAINMENT, LIFE & STYLE. Below this, a sub-navigation bar lists: UK, WORLD, POLITICS, WEATHER, SCIENCE, ROYAL, NATURE, WEIRD, SUNDAY, SCOTLAND. The breadcrumb trail shows: Home > News > UK. The main article headline is "Coronavirus warning: Mass use of hand gels could CREATE unstoppable superbugs - expert". The sub-headline reads: "THE mass use of hand gels to fight coronavirus could create unstoppable superbugs, researchers warn." The byline is "By LUCY JOHNSTON, EXCLUSIVE" and the publication date is "PUBLISHED: 11:36, Sun, Aug 30, 2020 | UPDATED: 11:47, Sun, Aug 30, 2020". Below the article text are social sharing buttons for SHARE, Facebook, TWEET, Twitter, LinkedIn, Pinterest, and Email. To the right of the article is a "Most read in UK" section with two items: 1. "UK lockdown update: What are the new lockdown rules in England?" with a photo of Boris Johnson and a sign that says "TEMPORARILY CLOSED DUE TO COVID19". 2. "Lockdown RETURNS: Boris Johnson shuts down England with major new" with a photo of Boris Johnson.



<https://www.express.co.uk/news/uk/1329220/coronavirus-superbug-warning-hand-gels-health-danger-andrew-kemp-covid-19>

Our reaction



Clean Hospitals Updates COVID-19 Fake News - Misinformation

Clean Hospitals answers to a widely shared piece of fake news about alcohol-based handrub

By cleanhospitals | 9th September 2020

[Share](#) [Tweet](#) [Pin](#) [0 SHARES](#)

Press Release

Geneva, 8 September 2020 - Clean Hospitals would like to bring your attention to a piece of misinformation about hand hygiene written by Lucy Johnston interviewing Dr. Andrew Kemp in the Express.¹

Categories

- Articles
- Clean Hospitals Updates
- COVID-19
- Events



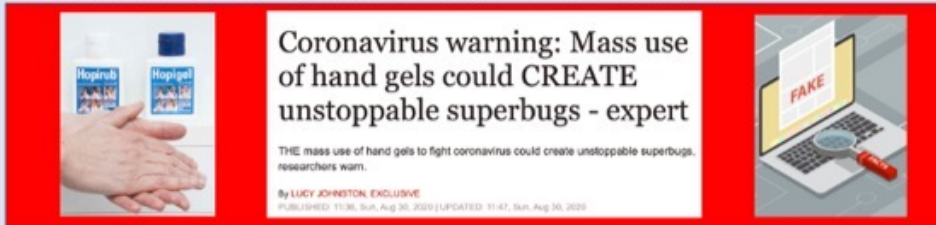
What if we had unlimited time to combat a piece of fake news?



WHAT SHOULD HAVE WORKED BUT DIDN'T REALLY: ADDRESSING HAND HYGIENE MISINFORMATION IN THE PRESS

Alexandra Peters¹, Sotoudeh Ghasemi², Didier Pittet¹

¹ Geneva University Hospitals, Geneva, Switzerland ² University of Geneva, Geneva, Switzerland



Background: The misinformation around COVID-19 has reached unmanageable proportions. A piece in the UK tabloid *The Express* spread fake news about alcohol-based handrub creating antibiotic-resistant “superbugs”.¹ The “expert” interviewed was allegedly “Head of Scientific Advisory Board” at the British Institute of Cleaning Science (BICSc).

Objectives: We wanted to measure the impact of our ability address a potentially dangerous piece of fake news, if time and resources were not an issue.

Methods: We sent a fully documented email detailing the false information to the publisher. We contacted the Independent Press Standards Organisation (IPSO) to file a complaint and provided a detailed analysis of which points of their Editors’ Code of Practice were violated in the concerned article. We contacted BICSc, to see if they supported the opinion of their “expert”. All inaccurate or misleading elements of the article were analyzed, with full documentation of the scientific literature, and published as a press release on the Clean Hospitals® website.²

Results: Though each inaccuracy was addressed specifically with plenty of evidence, *The Express* refused to take any action to correct or remove the article, claiming to be confident about the content. IPSO rejected the claim filed, as they considered that the article contained the point of view of the interviewed person, and thus did not violate any of their standards. BICSc specified that the “expert” was an unpaid consultant and released a statement (also sent to IPSO) that maintained that the views of their consultant did not reflect their own. Clean Hospitals® released a press release that was shared by members and partners.

Conclusion: Even with ample resources, it proved to be very difficult, if not impossible, to have a measurable impact on misinformation about infection prevention in the lay press. More work needs to be done to address this divide between academic and public spheres; reducing it is crucial for infection prevention and public health.

¹ <https://www.express.co.uk/news/uk/1379220/coronavirus-superbug-warning-hand-gels-health-danger-andrew-kemp-covid-19>

On Wikipedia: “antimicrobial resistance”

Pandemics, disinfectants and healthcare systems [edit]

Increased antibiotic use during the COVID-19 pandemic may exacerbate this [global health challenge](#).^{[48][49]} Moreover, pandemic burdens on some healthcare systems may contribute to antibiotic-resistant infections.^[50] On the other hand, a study suggests that "increased hand hygiene, decreased international travel, and decreased elective hospital procedures may reduce AMR pathogen selection and spread in the short term".^[51] **Disinfectants such as in various forms of use of alcohol-based hand sanitizers, and antiseptic hand wash may also have the potential to increase antimicrobial resistance.**^[52] According to a study, "Extensive disinfectant use leads to mutations that induce antimicrobial resistance".^[53]

<https://www.science.org> › doi › scitranslmed.aar6115

Increasing tolerance of hospital *Enterococcus faecium* to ...

by SJ Pidot · 2018 · **Cited by 176** — Pidot et al. now show that the multi drug-resistant bacterium *Enterococcus faecium* has become increasingly tolerant to the alcohols in widely used hospital ...
Missing: et al

<https://www.science.org> › doi › science.abg4380

Disinfection spreads antimicrobial resistance - Science

by J Lu · 2021 · **Cited by 56** — M. Wand et al., *Antimicrob. Agents Chemother.* 61, e01162-16 (2017). Go to reference. Google Scholar. 7. S. J. Pidot et al., *Sci. Transl.*

Not a study, a 339- word letter citing Pidot et al.

https://en.wikipedia.org/wiki/Antimicrobial_resistance



But it's not all bad news: ex. ABHR and Influenza



[mSphere](#). 2019 Sep-Oct; 4(5): e00474-19.

PMCID: PMC6751490

Published online 2019 Sep 18. doi: [10.1128/mSphere.00474-19](https://doi.org/10.1128/mSphere.00474-19)

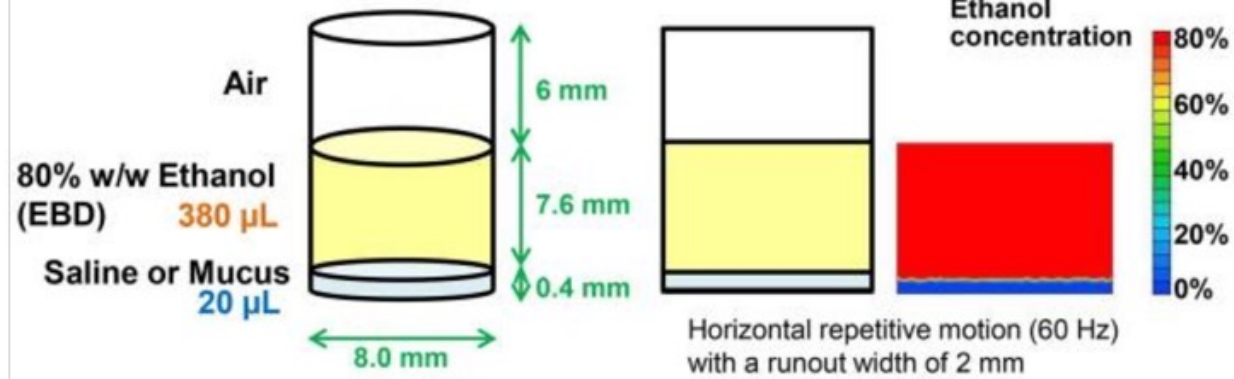
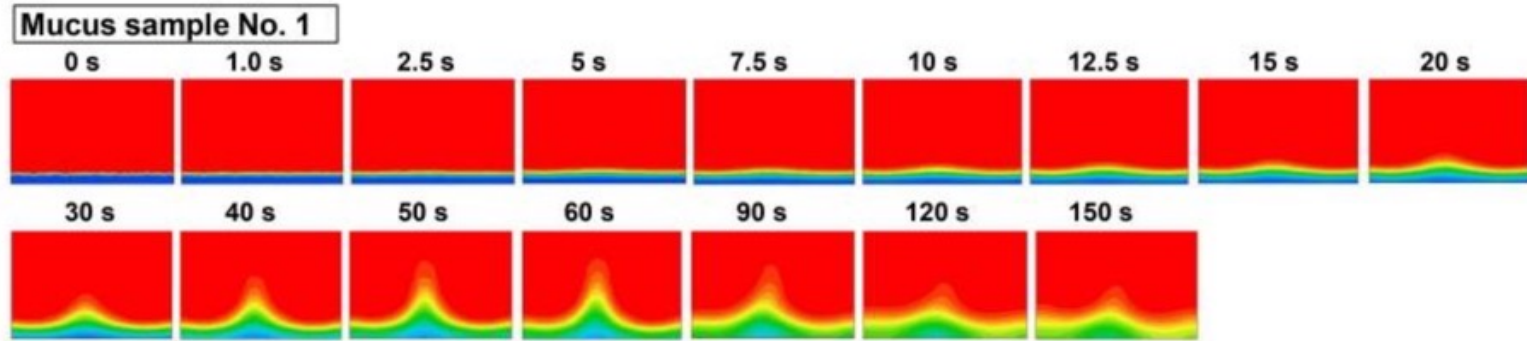
PMID: [31533996](https://pubmed.ncbi.nlm.nih.gov/31533996/)

Situations Leading to Reduced Effectiveness of Current Hand Hygiene against Infectious Mucus from Influenza Virus-Infected Patients

[Ryohei Hirose](#),^{a,b} [Takaaki Nakaya](#),^b [Yuji Naito](#),^a [Tomo Daidoji](#),^b [Risa Bandou](#),^{b,c} [Ken Inoue](#),^a [Osamu Dohi](#),^a [Naohisa Yoshida](#),^a [Hideyuki Konishi](#),^a and [Yoshito Itoh](#)^a

Helene F. Rosenberg, Editor

Helene F. Rosenberg, National Institute of Allergy and Infectious Diseases;

A**D**



AMERICAN
SOCIETY FOR
MICROBIOLOGY



[mSphere](#). 2019 Nov-Dec; 4(6): e00719-19.

Published online 2019 Nov 27. doi: [10.1128/mSphere.00719-19](https://doi.org/10.1128/mSphere.00719-19)

PMCID: PMC6881721

PMID: [31776242](https://pubmed.ncbi.nlm.nih.gov/31776242/)

Influenza and Alcohol-Based Handrub: the Danger of Ignoring Clinical Relevance

[Alexandra Peters](#)^a and [Didier Pittet](#)^{Ma}

Helene F. Rosenberg, Editor

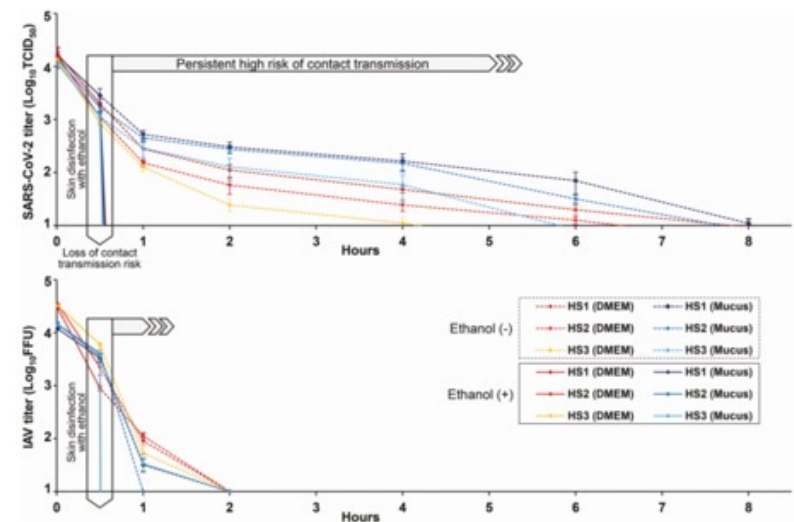
Helene F. Rosenberg, National Institute of Allergy and Infectious Diseases;



Update: Sars-CoV-2 study

- Same authors, testing alcohol on IFV and Sars-CoV-2 one human skin samples
- New conclusion on dead skin with 15s ethanol is that it works on both viruses (even on mucus)
- Still an issue with clinical relevance of 9hr survival time on a skin sample

Figure 3.



Hirose R, et al. Survival of SARS-CoV-2 and influenza virus on the human skin: Importance of hand hygiene in COVID-19. Clin Infect Dis. 2020 Oct 3:ciaa1517.

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Tools to fight misinformation

- Traditional and social media
- Schools
- Government policies
- Social pressure
- Targeting academia



Education is KEY, but it's not that simple!

Net difference in belief that vaccines are safe, between those with and without tertiary education (% points)

The Wellcome Trust analysis included responses from more than 140,000 people in over 140 countries

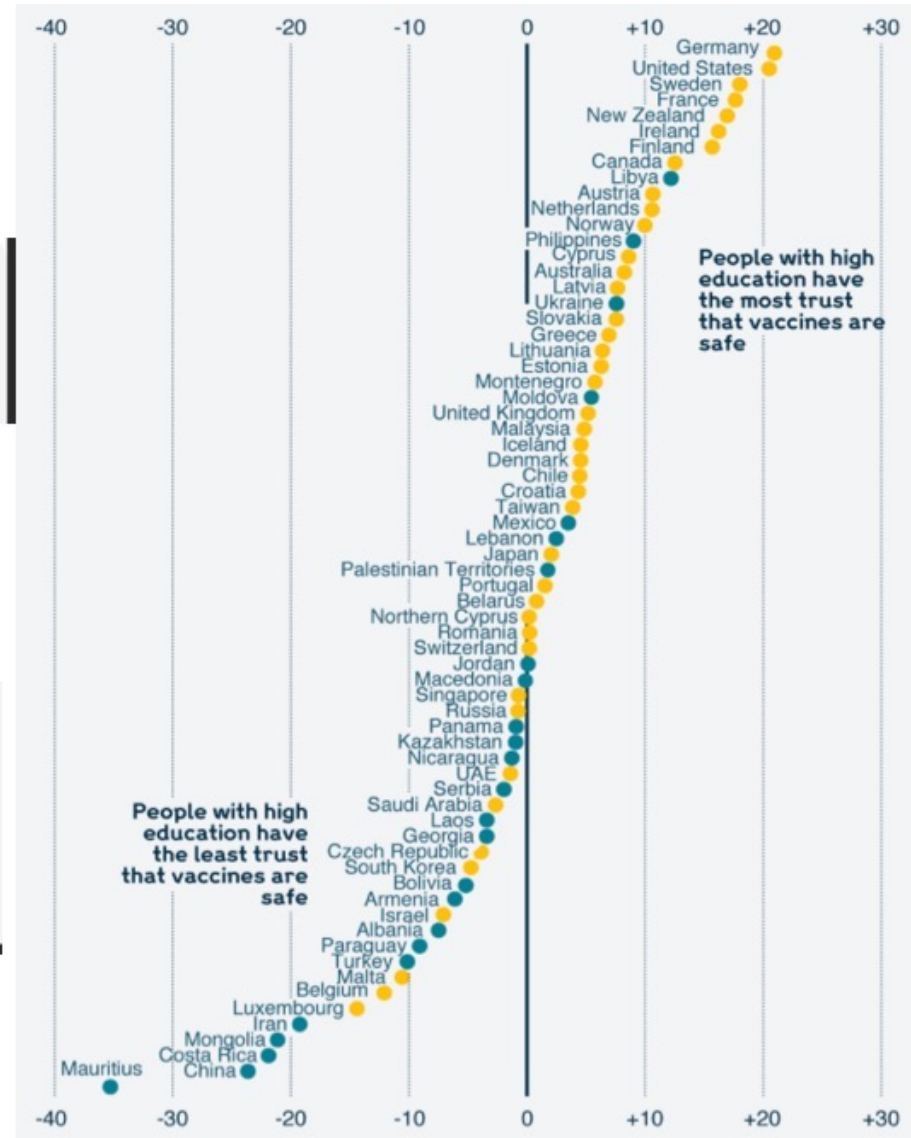
- Highly developed countries: Human Development Index above 0.8
- Developing countries: Human Development Index below 0.8



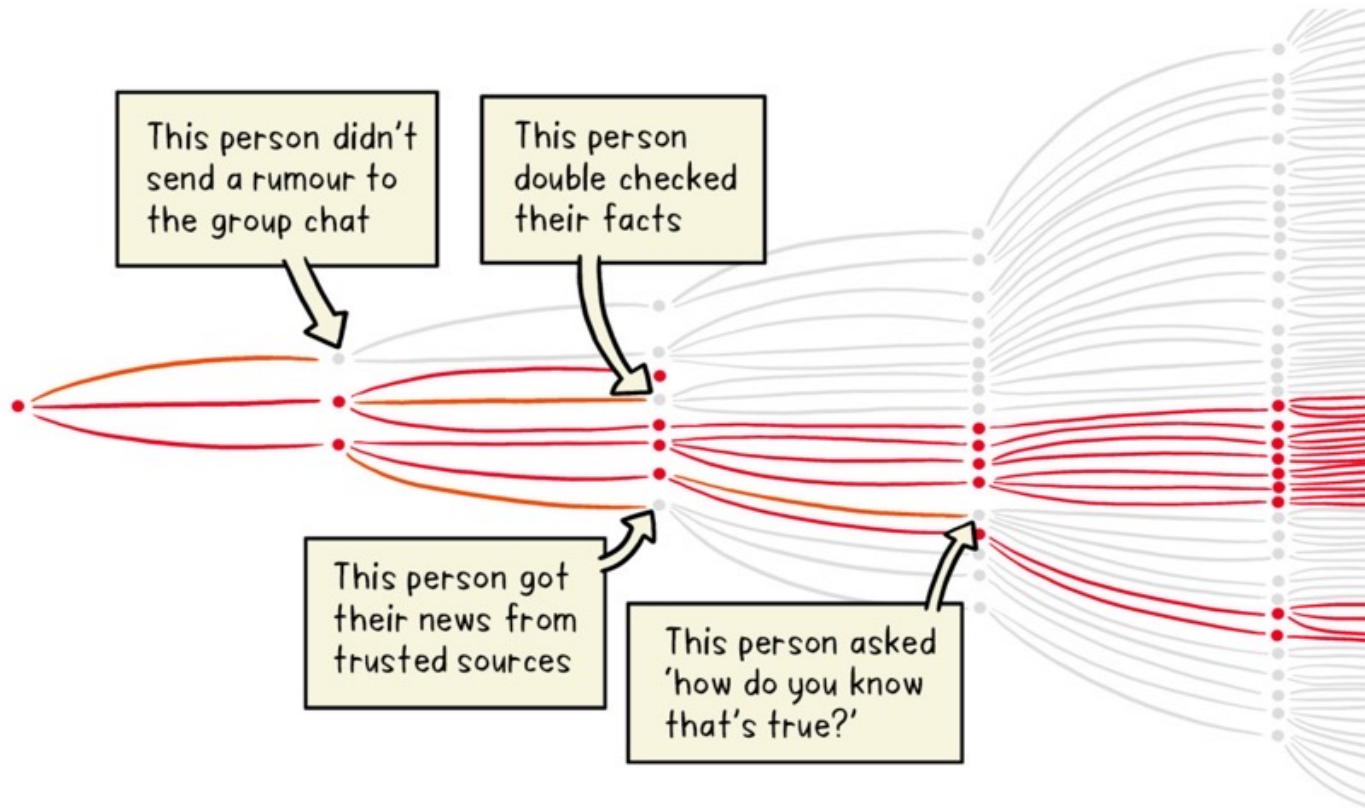
Source: Wellcome Global Monitor, part of the Gallup World Poll 2018



<https://wellcome.org/reports/wellcome-global-monitor/2018#gid=b962&pid=0>



Flattening the infodemic curve:



[who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters)

Pressure on social media companies can work

September 29, 2021

The New York Times

[The Coronavirus Pandemic >](#) | [LIVE Covid-19 Updates](#) | [Coronavirus Map and Cases](#) | [Your Booster Shot Questions, Answered](#) | [Vaccine Mandate](#)

[Tracking Viral Misinformation: Latest Updates >](#)

YouTube bans all anti-vaccine misinformation.



1 hour ago
By Davey Alba



<https://www.nytimes.com/2021/09/29/technology/youtube-anti-vaxx-ban.html?smid=fb-nytimes&smtyp=cur&fbclid=IwAR3fE4gZfoGppenFdDvbMYBb2Gx-qQBpBFofWh0idu7zNmqdPDeoestYrb0>

Building awareness of tactics which spread misinformation

- Cherry picking facts
- Finding a testimonial from someone somewhat-qualified and charismatic (even if a tiny minority)
- Facts out of context
- Dubious sources
- Sea lioning
- Gish gallop
- And more...



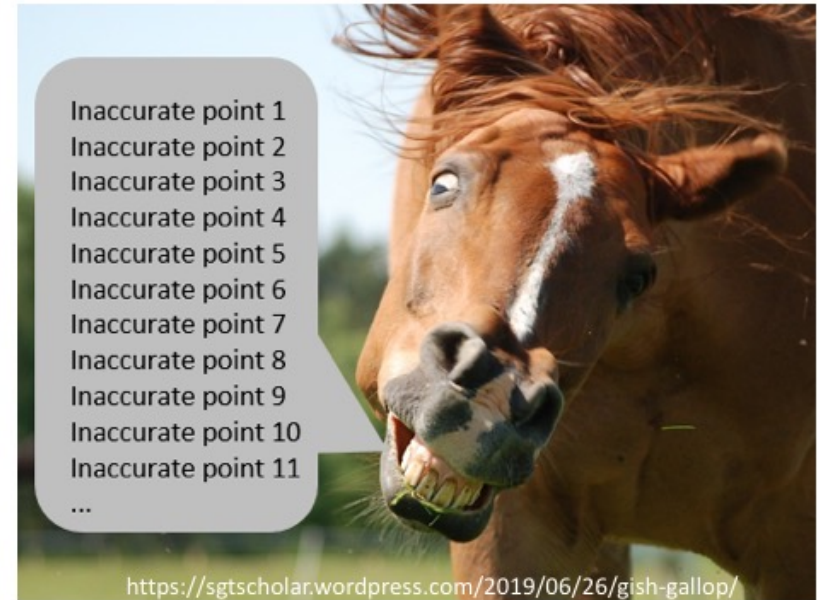
Sea lioning:



“Sealioning refers to the disingenuous action by a commenter of making an ostensible effort to engage in sincere and serious civil debate, usually by asking persistent questions of the other commenter.”

The Gish gallop

Is a rhetorical technique that involves overwhelming your opponent with numerous vague arguments with no regards to accuracy, validity or relevance of those arguments



- It is easier to raise weak arguments than refute them
- People prefer simple arguments not complex refutations. Gish gallop often sounds compelling because of this



<https://deepstash.com/idea/63382/who-uses-gish-gallops-and-why>

New leads



- A report showed that twelve anti-vaxxers are responsible for almost two-thirds of anti-vaccine content circulating on social media platforms
- In the US, physicians who generate and spread COVID-19 vaccine misinformation or disinformation risk disciplinary action by state medical boards¹

¹<https://www.fsmb.org/advocacy/news-releases/fsmb-spreading-covid-19-vaccine-misinformation-may-put-medical-license-at-risk/>

²<https://counterhate.com/research/the-disinformation-dozen/>



It comes
down to
human nature

People are not rational most of the time... (but science is when it's done well)

People often do not act in their own self-interest

Belief is entrenched with personal identity, and changing it is extremely difficult



How to fix this? There are no easy answers

- Promote understanding of science and trust in science
(Mistrust is not always unreasonable)
- Better national and local level-communication in crises
- Promote transparency
- Fight anti-intellectualism
- Put issues into relatable contexts
- Listen to people's concerns and underlying fears
- Encourage accountability



*Thank
You*



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January 26, 2023

[PERSONAL PROTECTIVE EQUIPMENT IMPLEMENTATION IN HEALTHCARE SETTINGS](#)

Speaker: **Prof. Maria Clara Padoveze**, University of São Paulo, Brazil

February 2, 2023

[SURFACES – A FOUNDATIONAL ISSUE IN INFECTION CONTROL](#)

Speaker: **Linda Lybert**, Healthcare Surfaces Institute

February 15, 2023

(FREE South Pacific Teleclass)

[PREVALENCE, COST AND PREVENTION OF HEALTHCARE ASSOCIATED INFECTIONS IN NEW ZEALAND](#)

Speaker: **Dr. Arthur Morris**, Auckland City Hospital, New Zealand

February 23, 2023

(FREE Teleclass ... Denver Russell Memorial Teleclass Lecture)

[USING ELECTRONIC SYSTEMS TO MONITOR HAND HYGIENE: STRATEGIES TO PROMOTE UPTAKE](#)

Speaker: **Prof. Dinah Gould**, City University, London

March 7, 2023

(European Teleclass)

[AUTOMATING THE SURVEILLANCE OF HEALTHCARE-ASSOCIATED INFECTIONS:](#)

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