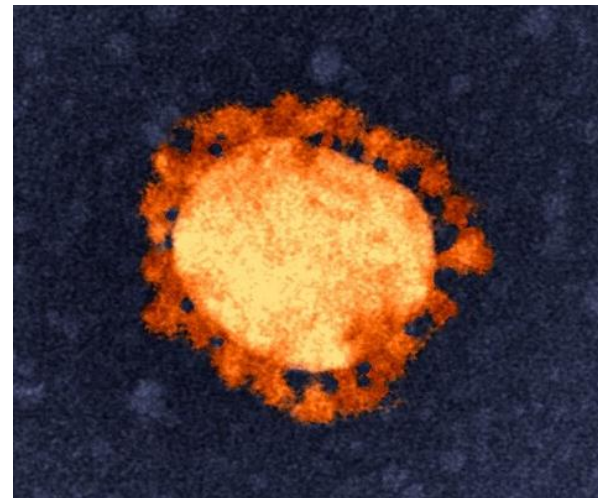




COVID-19 TASK FORCE

Informing the Caribbean's Response



<https://www.theasm.org.au/covid19>

COVID-19 Vaccine: Safety, Efficacy and Acceptability

Professor Clive Landis

Pro Vice Chancellor, Board for Undergraduate Studies
The University of the West Indies;

Chair, UWI COVID-19 Task Force

Disclosure

I have NO financial disclosure or conflicts of interest with the presented material in this presentation.

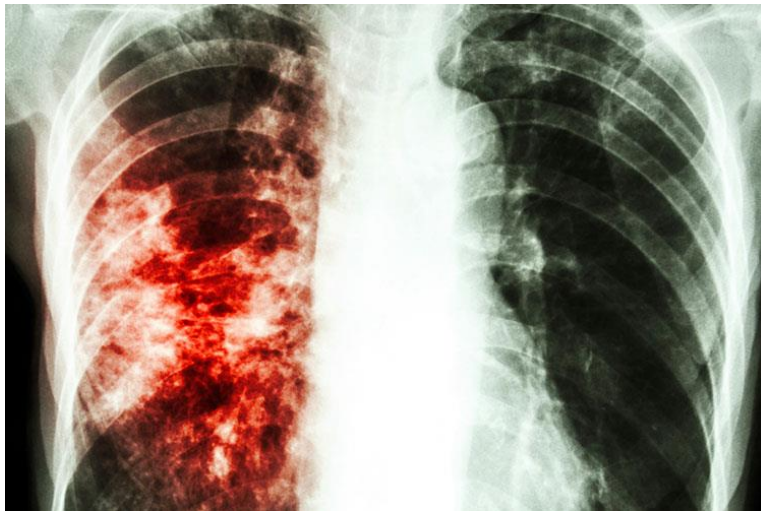
Smallpox: Estimated 300M deaths in 20th C.
Globally eradicated by vaccination in 1980 ¹



Measles: eliminated in USA in 2000. ²
Resurgence in USA and Europe since 2010.



Tuberculosis: 1.5M deaths in 2018.
58M lives saved with vaccination in 21st C. ³



Polio: 350,000 paralysis cases in 1988.
Vaccination reduced cases to 38 in 2018. ^{4,5}



1 <https://globalbiodefense.com/2019/09/30/why-do-we-need-a-new-smallpox-vaccine/>

2 <https://patch.com/georgia/atlanta/measles-georgia-add-highest-rate-disease-eradication>

3 <https://www.who.int/teams/global-tuberculosis-programme/global-report-2019>

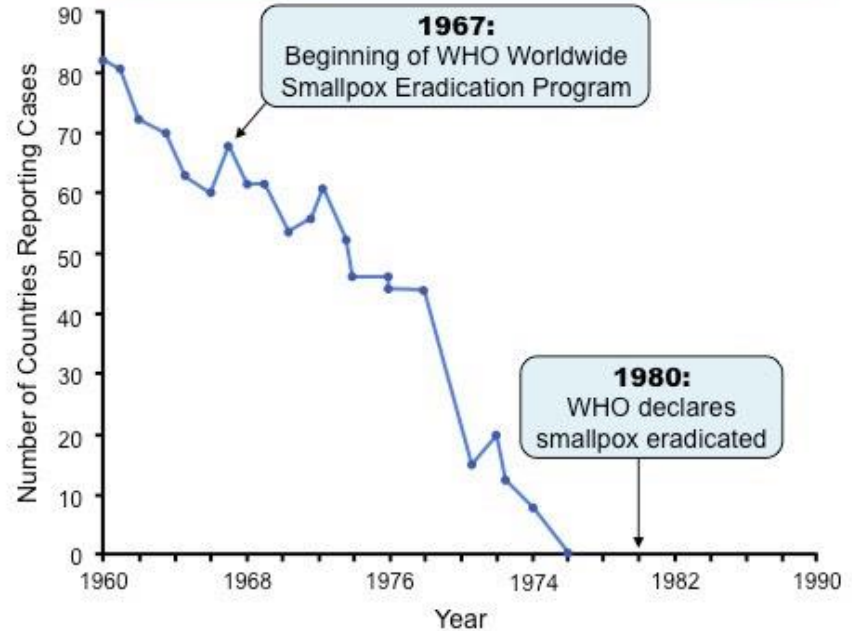
4 <https://blog.forumias.com/polio-in-india/>

5 <https://ourworldindata.org/polio>

Symptoms of Smallpox



Timeline of the Eradication of Smallpox



<https://ib.bioninja.com.au/higher-level/topic-11-animal-physiology/111-antibody-production-and/vaccination.html>



<https://ed.ted.com/lessons/how-we-conquered-the-deadly-smallpox-virus-simona-zompi>



Vaccine History



1000

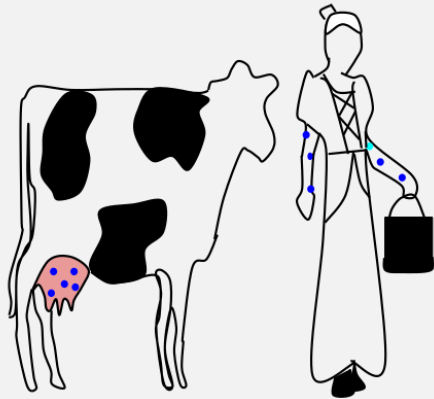
1796

1884

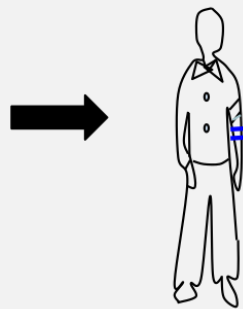
Chinese inoculate

Jenner

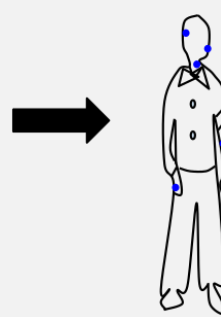
Pasteur creates



Sarah Nelmes, a milkmaid infected with cowpox.



James Phipps is inoculated with cowpox pus from Nelmes.



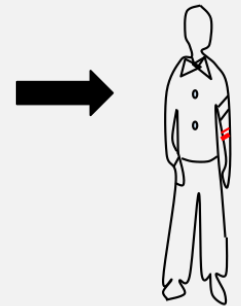
Phipps falls ill with a mild case of cowpox.



Scabs are collected from a smallpox patient.



Phipps is inoculated with the scabs of smallpox.



Phipps is unaffected. Protection is complete.

https://en.wikipedia.org/wiki/Edward_Jenner#/media/File:Edward_Jenner-_Smallpox.svg

Vaccine Safety

Benefit vs. Risk

Variolation – 1% mortality (cf. 30% for wild type smallpox)
Modern vaccines – 0.00001% mortality (typically 1 per Million)

(Elaine R. Miller, Pedro L. Moro, Maria Cano, and Tom Shimabukuroa. Deaths following vaccination: What does the evidence show? *Vaccine*. 2015 Jun 26; 33(29): 3288–3292)

When things go wrong - polio vaccine

The Cutter Incident (1953)

- 40,000 polio infections
- 200 paralytic cases
- 10 deaths



When things go wrong - unethical human experimentation on black and Caribbean study populations

Tuskegee, AL Syphilis Study (U.S. Public Health Service 1932 - 1972)

- 600 persons enrolled without informed consent
- diagnosis of syphilis withheld
- medication for syphilis withheld



Presidential Apology:
<https://www.cdc.gov/tuskegee/clintonp.htm>

Guatemala STD Study (U.S. Public Health Service, NIH 1946 - 1948)

- 1308 persons deliberately infected with STDs
- 83 deaths

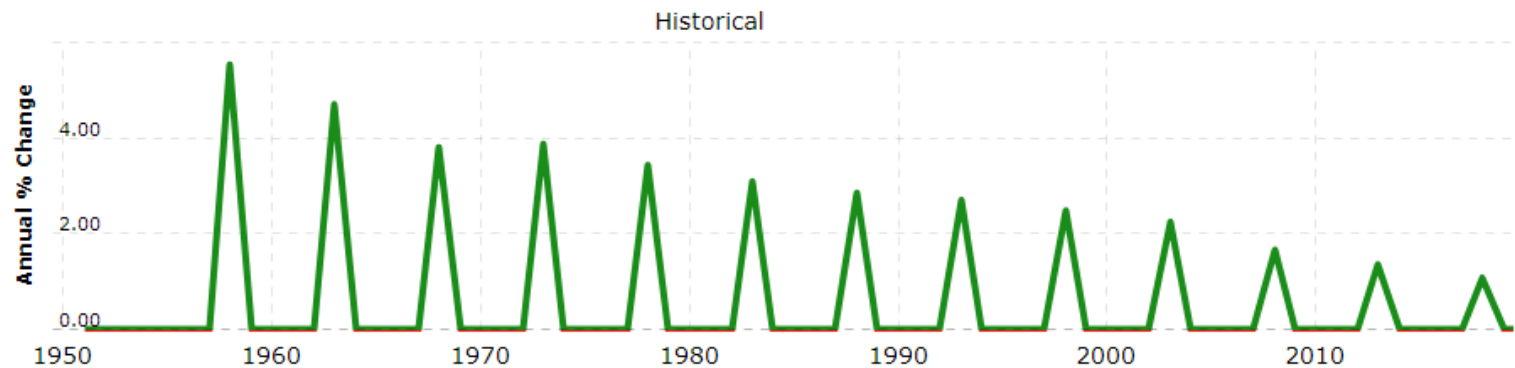
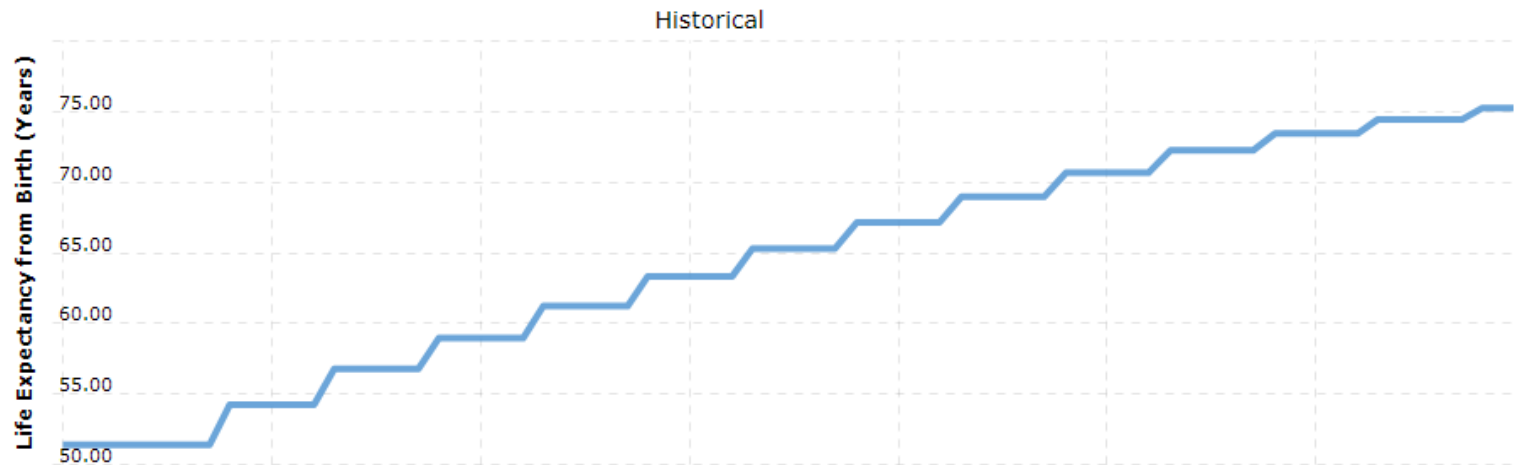


Presidential Apology:
<https://www.bloomberg.com/news/articles/2010-10-01/obama-apologizes-to-guatemala-for-infecting-prisoners-with-stds-in-1940s>

Life expectancy in the age of vaccination: Latin America and Caribbean

From: 1950 To: 2019

Zoom: 10Y 20Y 30Y 40Y 50Y All



<https://www.macrotrends.net/countries/LCR/latin-america-and-the-caribbean/life-expectancy#:~:text=The%20life%20expectancy%20for%20Latin,a%2000%25%20increase%20from%202016.>

Impact of Vaccines in the Americas

Disease

Before
Vaccines

After
Vaccines

Achievements



A lot of humanity knows
nothing about polio,

The Last Few Polio Survivors – Last of the Iron Lungs | Gizmodo

<https://www.youtube.com/watch?v=gplA6pq9cOs>

#GetVax

www.paho.org/vwa



PAHO

HOW A NEW VACCINE IS DEVELOPED, APPROVED AND MANUFACTURED

Food and Drug Administration (FDA) sets rules for the three phases of clinical trials to ensure the safety of the volunteers. Researchers test vaccines with adults first.

PHASE 1



20-100 healthy volunteers



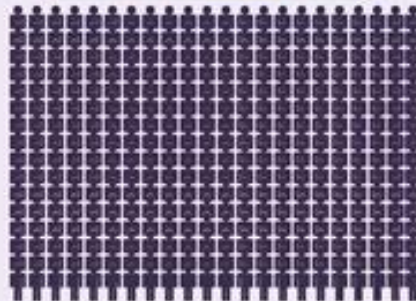
Is this vaccine safe?

Does this vaccine seem to work?

Are there any serious side effects?

How is the size of the dose related to side effects?

PHASE 2

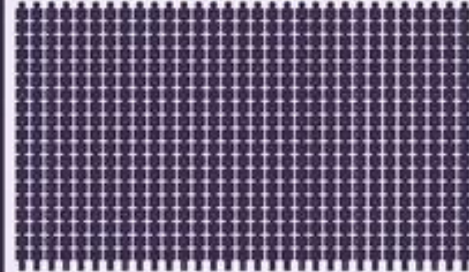


several hundred VOLUNTEERS

What are the most common short-term side effects?

How are the volunteers' immune systems responding to the vaccine?

PHASE 3



HUNDREDS or THOUSANDS of VOLUNTEERS

How do people who get the vaccine and people who do not get the vaccine compare?

Is the vaccine safe?

Is the vaccine effective?

What are the most common side effects?

FDA licenses the vaccine only if:

- It's safe and effective
- Benefits outweigh risks



Vaccines are made in batches called lots.

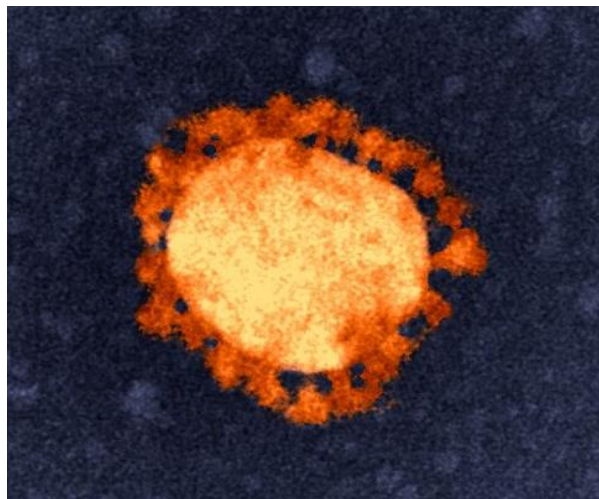


Manufacturers must test all lots to make sure they are safe, pure and potent. The lots can only be released once FDA reviews their safety and quality.

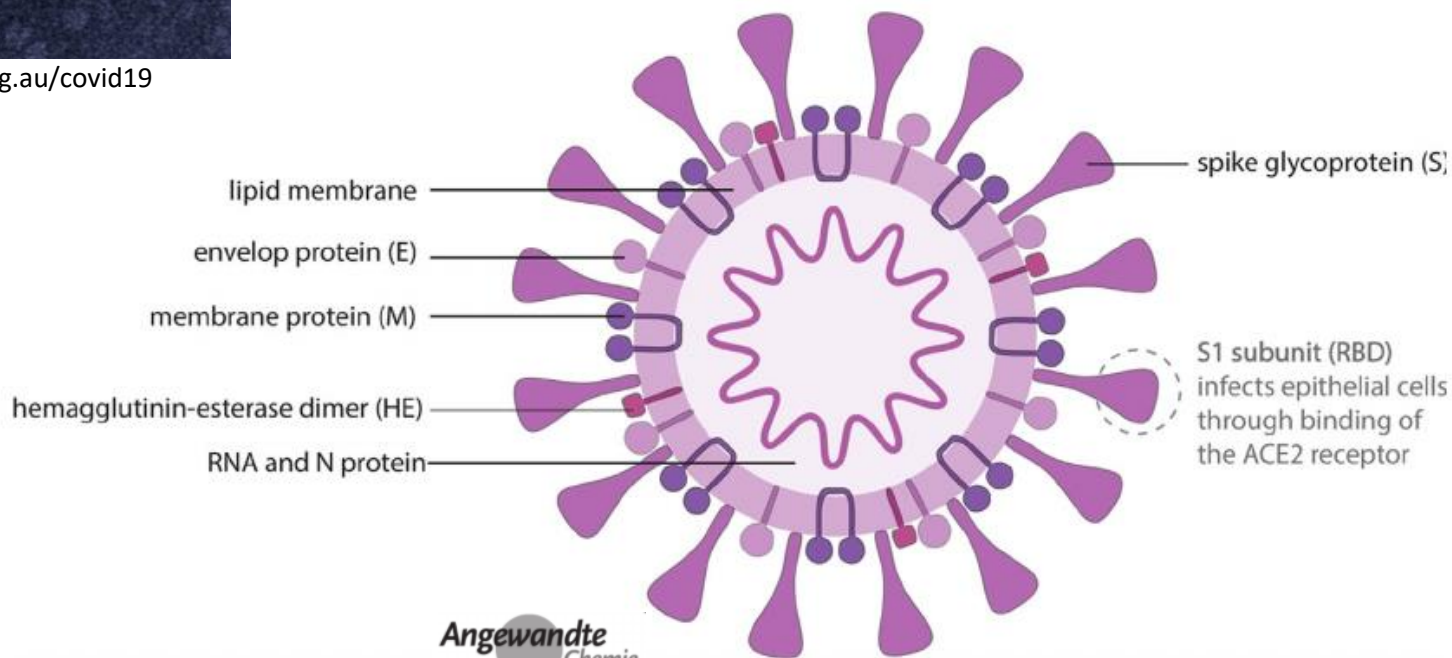


The FDA inspects manufacturing facilities regularly to ensure quality and safety.

COVID-19 Vaccine Development



<https://www.theasm.org.au/covid19>



Angewandte
International Edition
Chemie

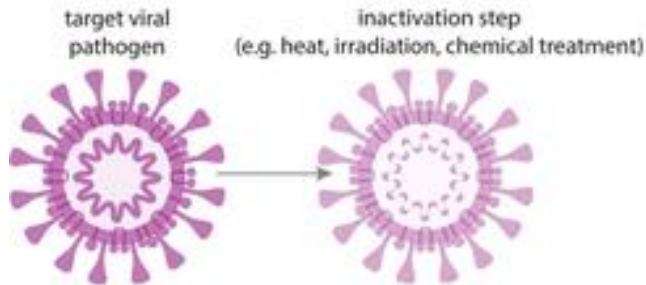
2 Wiley Online Library

© 2020 Wiley-VCH GmbH

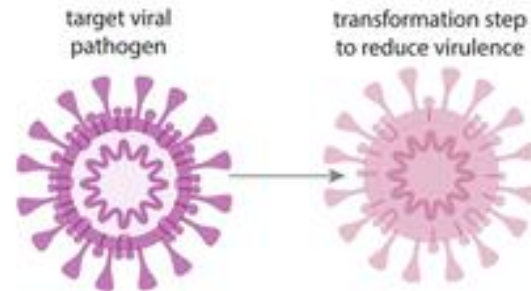
Angew. Chem. Int. Ed. 2020, 59, 2–15

Tingting Ye Dr. Zifu Zhong Prof. Dr. Adolfo García-Sastre Prof. Dr. Michael Schotsaert
Prof. Bruno G. De Geest. Current Status of COVID-19 (Pre)Clinical Vaccine Development.
Angew. Chem. Int. Ed. 2020, 59, 2 – 15 .

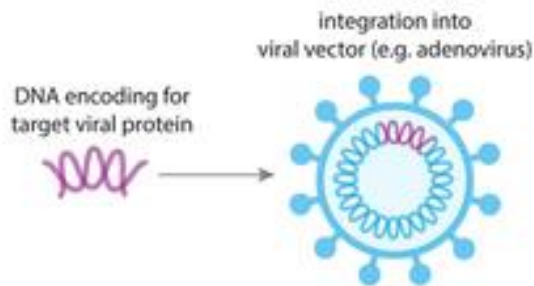
inactivated virus vaccine



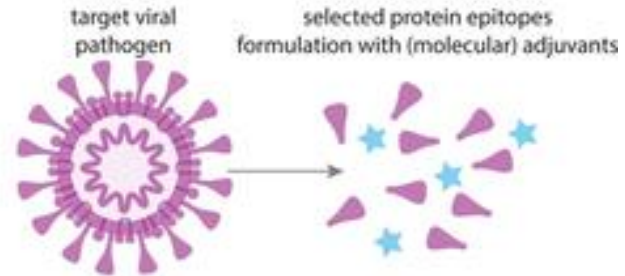
live attenuated virus vaccine



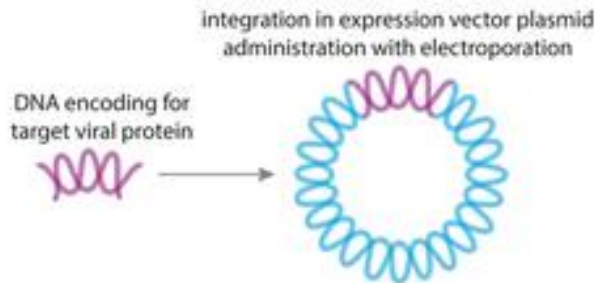
viral vector vaccine



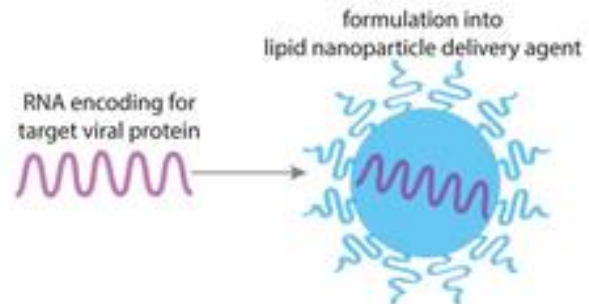
protein subunit vaccine



DNA vaccine



RNA vaccine



Keeping track of the SARS-CoV-2 vaccine pipeline

Parker EPK, Shrotri M, Kampmann B. Nat Rev Immunol. 2020 Sep 28:1.

The screenshot shows a web browser window with the URL `vac-lshtm.shinyapps.io/ncov_vaccine_landscape/`. The page has a dark blue navigation bar with the title "COVID-19 vaccine tracker" and menu items: "Home", "Landscape", "Clinical trials", "Trial mapper", "Living review", and "More". Below the navigation bar, there is an introductory paragraph: "The COVID-19 pandemic has prompted numerous research institutes and companies to develop vaccine candidates targeting this novel disease. This tracker was developed by the Vaccine Centre at the London School of Hygiene & Tropical Medicine to follow candidates as they progress through the development pipeline. Read our Commentary in Nature Reviews Immunology for further details." A "Share" button is located below the text. The main content area is divided into four sections, each with a title, an icon, a brief description, and a "View" button: 1. "Vaccine landscape" with a syringe icon, description "Summary of vaccine candidates and trial timelines", and "View landscape" button. 2. "Clinical trials database" with a clipboard icon, description "Key attributes of registered COVID-19 vaccine trials", and "View trials" button. 3. "Efficacy trial mapper" with a globe icon, description "Map of planned and ongoing efficacy trials", and "View map" button. 4. "Living review" with a line graph icon, description "Published data on safety and immunogenicity", and "View data" button.

COVID-19 vaccine tracker - Google Chrome

vac-lshtm.shinyapps.io/ncov_vaccine_landscape/


COVID-19 vaccine tracker Home Landscape Clinical trials Trial mapper Living review More ▾

The COVID-19 pandemic has prompted numerous research institutes and companies to develop vaccine candidates targeting this novel disease.

This tracker was developed by the [Vaccine Centre](#) at the [London School of Hygiene & Tropical Medicine](#) to follow candidates as they progress through the development pipeline. Read our [Commentary](#) in *Nature Reviews Immunology* for further details.

Share


Vaccine landscape



Summary of vaccine candidates and trial timelines

[View landscape](#)


Clinical trials database



Key attributes of registered COVID-19 vaccine trials

[View trials](#)


Efficacy trial mapper



Map of planned and ongoing efficacy trials

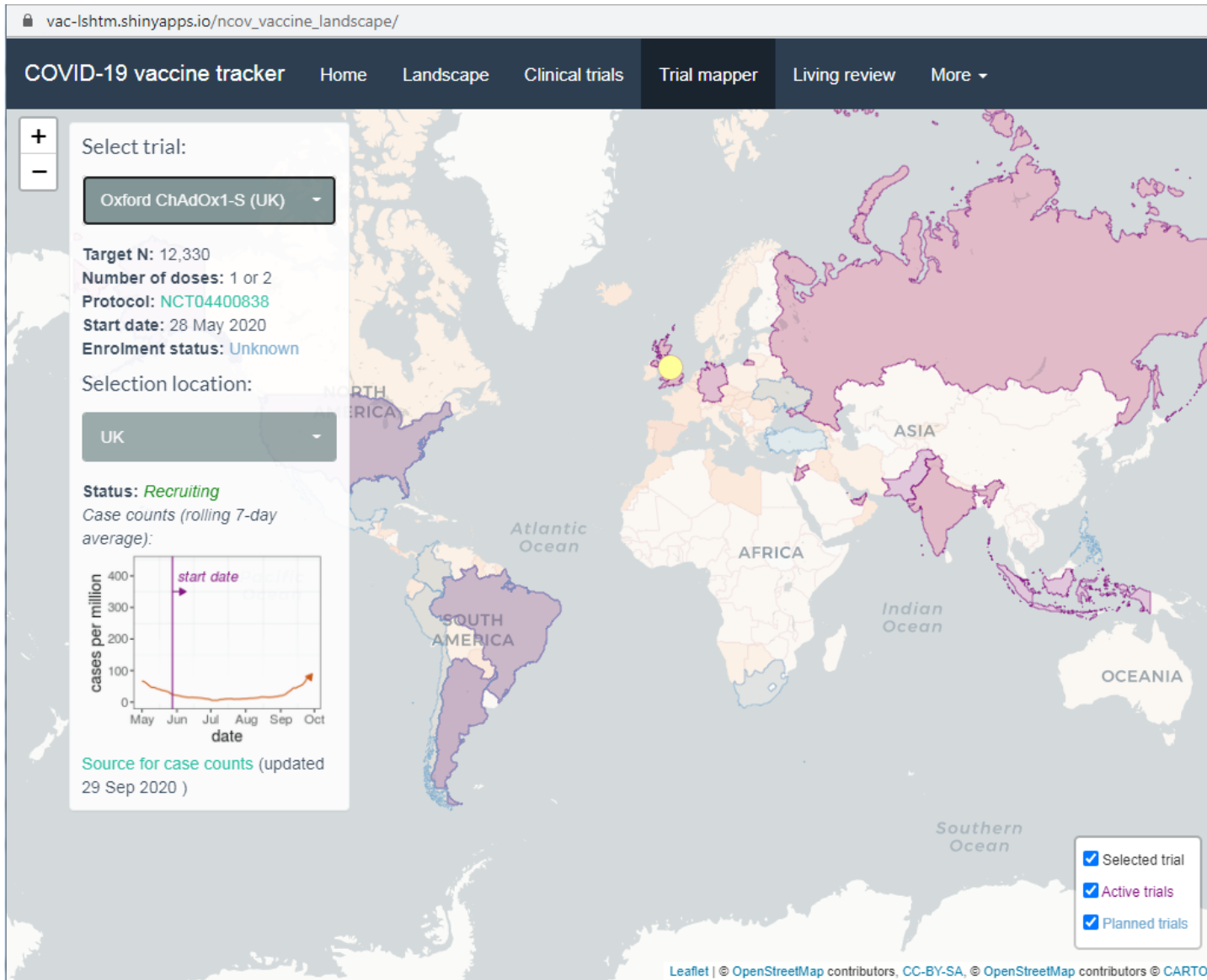
[View map](#)

Living review

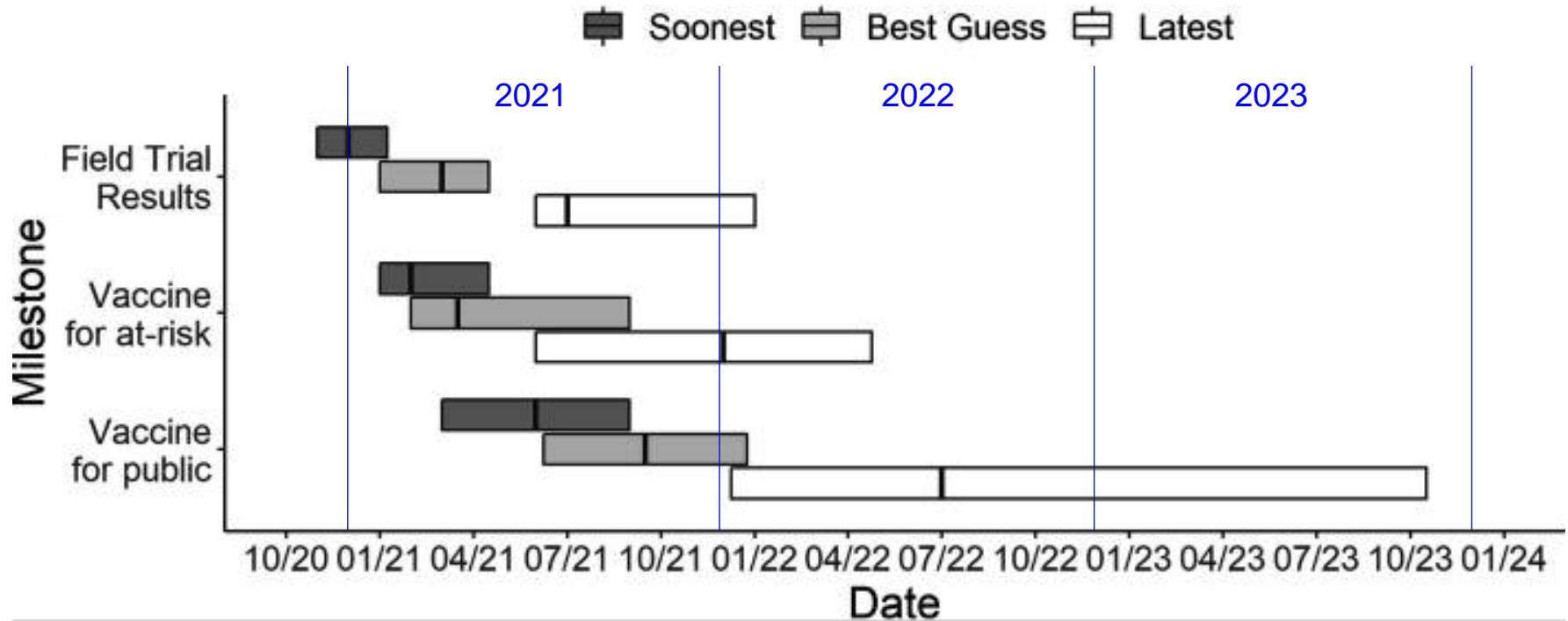


Published data on safety and immunogenicity

[View data](#)



Soonest, Best Guess and Latest Forecasts of COVID-19 Vaccine Milestones



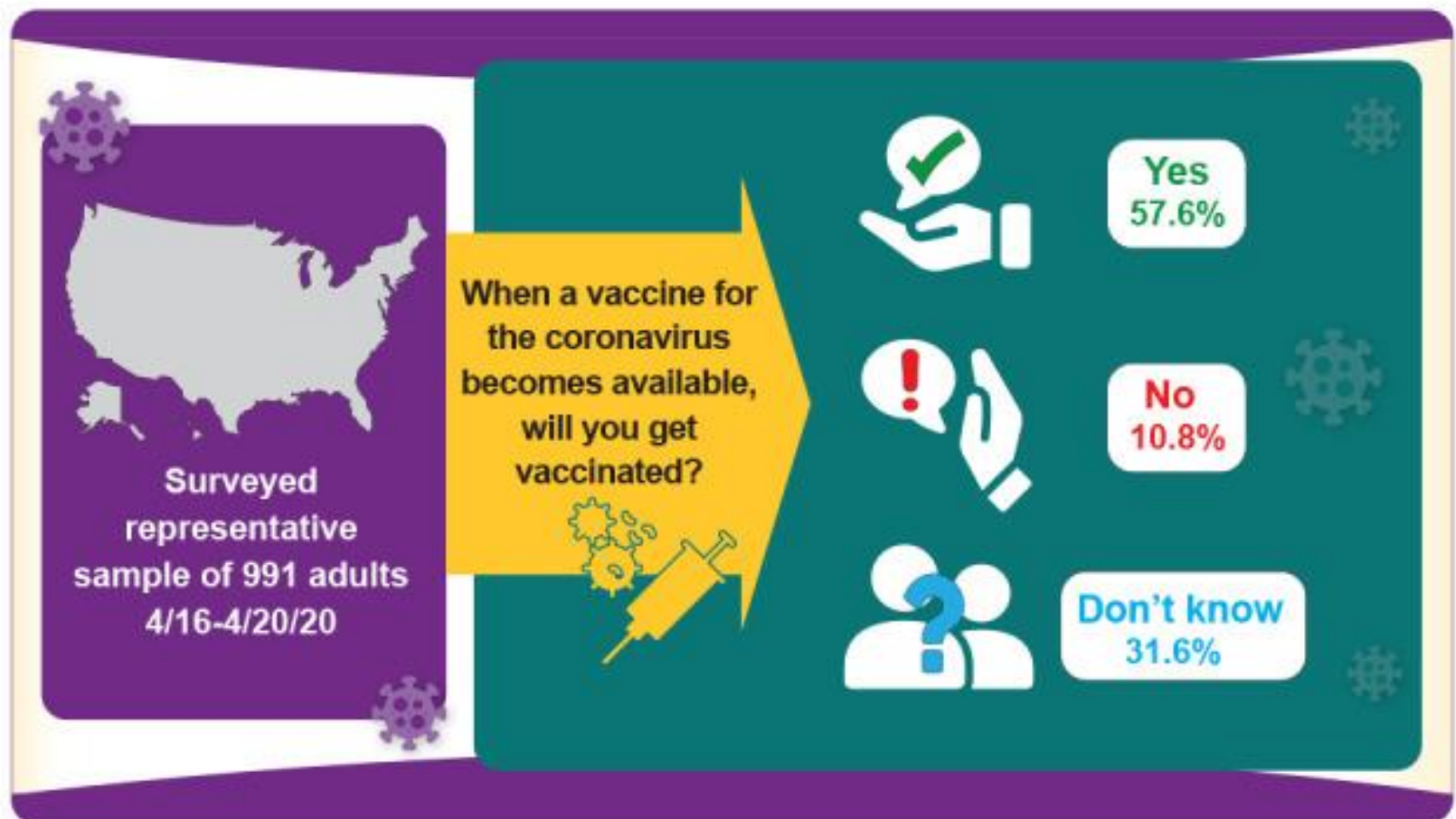
Kane PB, Moyer H, MacPherson A, Papenburg J, Ward BJ, Broomell SB, Kimmelman J. Expert Forecasts of COVID-19 Vaccine Development Timelines. *J Gen Intern Med.* 2020 Sep 28;1-3. *Chem. Int. Ed.* 2020, 59, 2 – 15 .

COVID-19 Vaccine Acceptability



<https://hub.jhu.edu/magazine/2018/winter/vaccines-mistrust-and-misinformation/>

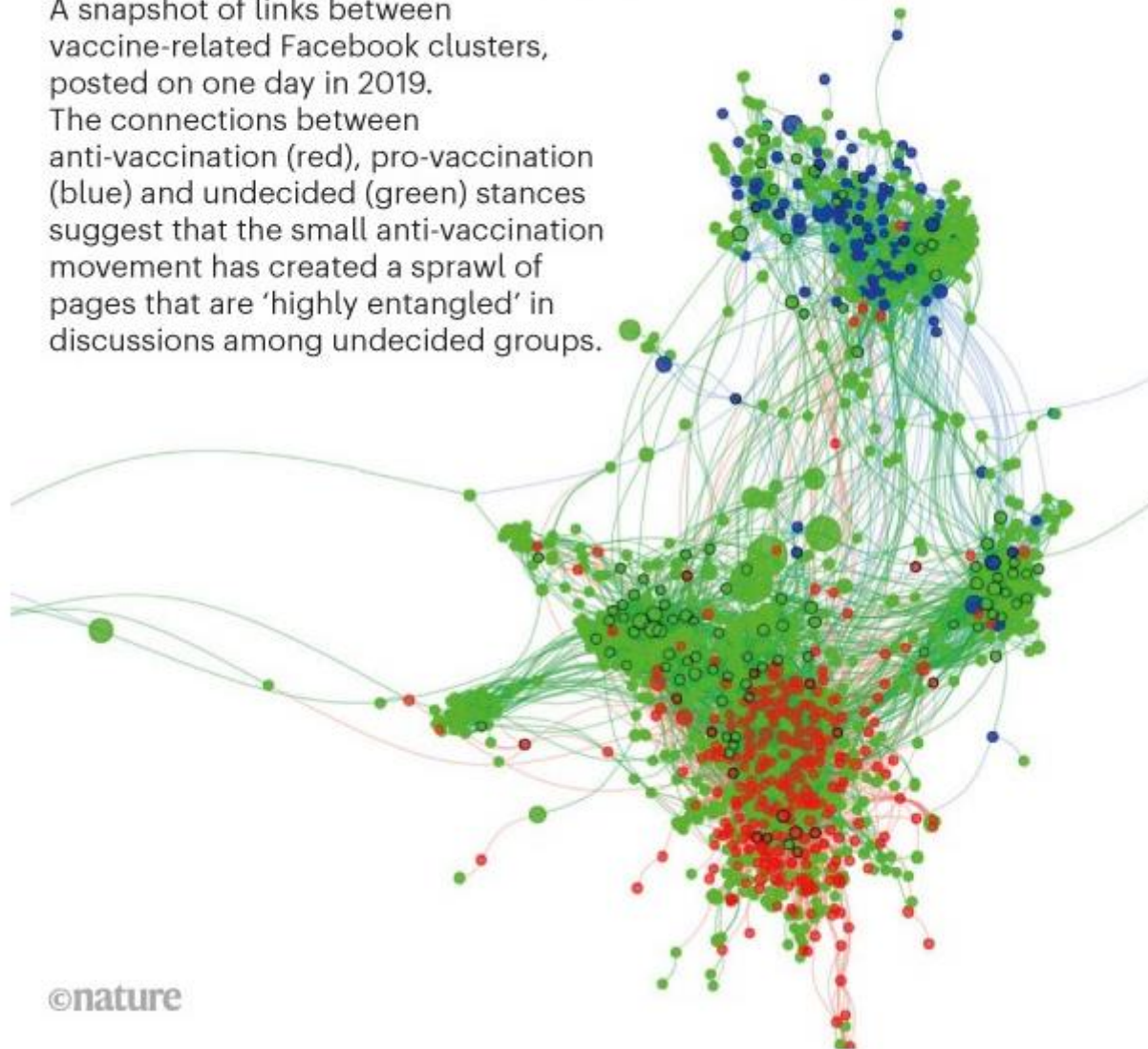
Do adults residing in the US intend to receive COVID-19 vaccination when it becomes available?



ONLINE COMPETITION BETWEEN VACCINE VIEWS

A snapshot of links between vaccine-related Facebook clusters, posted on one day in 2019.

The connections between anti-vaccination (red), pro-vaccination (blue) and undecided (green) stances suggest that the small anti-vaccination movement has created a sprawl of pages that are 'highly entangled' in discussions among undecided groups.



©nature



⚠ Retracted article
See the [retraction notice](#)

> [Lancet](#). 1998 Feb 28;351(9103):637-41. doi: 10.1016/s0140-6736(97)11096-0.

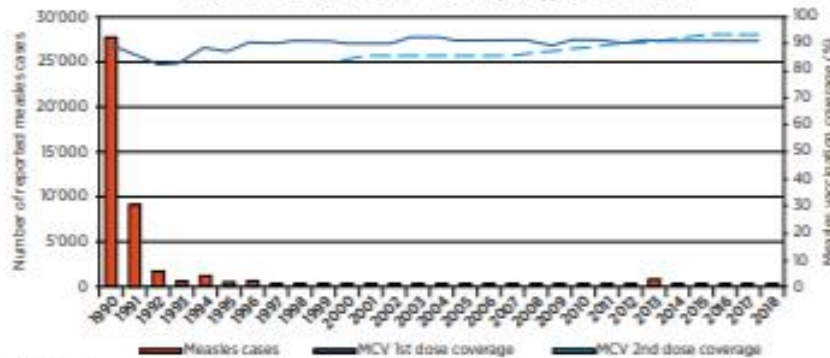
Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

A J Wakefield ¹, S H Murch, A Anthony, J Linnell, D M Casson, M Malik, M Berelowitz, A P Dhillon, M A Thomson, P Harvey, A Valentine, S E Davies, J A Walker-Smith

“The UK lost its measles-free status and the US is soon to follow”

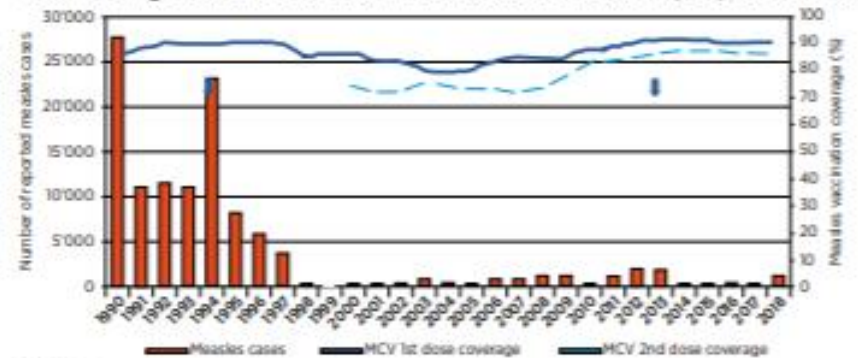
”

Reported measles cases and MCV vaccination coverage, United States of America (the), 1990-2018



Data source: Measles cases - Reported by National Authorities to WHO annually; Measles Containing Vaccines (MCV) vaccination coverage (Data as of 1 July 2019); WHO (UNICEF immunization coverage estimates 1990-2018 (Data as of 1 July 2019)) (Activities (SIA): WHO/EPI database (Data as of 1 July 2019)). Supplementary Immunization Activities (SIA): WHO/EPI database (Data as of 1 July 2019). https://www.who.int/entity/immunization/monitoring_surveillance/data/Summary_Measles_SIAs.xls

Reported measles cases and MCV vaccination coverage, United Kingdom of Great Britain and Northern Ireland (the), 1990-2018



Data source: Measles cases - Reported by National Authorities to WHO annually; Measles Containing vaccines (MCV) vaccination coverage (Data as of 1 July 2019); WHO (UNICEF immunization coverage estimates 1990-2018 (Data as of 1 July 2019)) (Activities (SIA): WHO/EPI database (Data as of 1 July 2019)). Supplementary Immunization Activities (SIA): WHO/EPI database (Data as of 1 July 2019). https://www.who.int/entity/immunization/monitoring_surveillance/data/Summary_Measles_SIAs.xls

Source: www.who.int (29 Aug 2019)

Wakefield tells GMC he was motivated by concern for autistic children. Dyer O. *BMJ*. 2008 Apr 5; 336(7647):738

Wakefield admits fabricating events when he took children's blood samples. Dyer O. *BMJ*. 2008 Apr 5; 336(7649):850

Wakefield was struck off for MMR research. Dyer O. *BMJ*. 2010 Mar 29;340:c593

Lancet retracts Wakefield's MMR research. Dyer C. *BMJ*. 2010 Mar 29;340:c593

Wakefield is struck off for fabricating findings. *BMJ*. 2010 Mar 29;340:c593

Wakefield's article was fraudulent. *BMJ*. 2011 Jan 29;342:c593

Assuring research. Opel DJ, Dieker. *BMJ*. 2011 Jan 29;342:c593

Wakefield sues Dyer C. *BMJ*. 2011 Jan 29;342:c593

Texas court disallows Wakefield's lawsuit. Andrew Wakefield. 2014 Oct 6;349

Unvaccinated "Wakefield cohorts" blamed for 5000 cases of mumps in England last year. Kmietowicz Z. *BMJ*. 2020 Feb 14;368:m619.

The MMR Vaccine and Autism. Frank DeStefano, Tom T. Shimabukuro. *Annu Rev Virol*. 2019 Sep 29; 6(1): 585–600.

Wakefield is struck off for the “serious and wide-ranging findings against him” *BMJ* 2010;340:c2803

Andrew Wakefield, the British gastroenterologist who sparked a worldwide scare over the measles, mumps, and rubella (MMR) vaccine, has been found guilty of serious professional misconduct and struck off the medical register by the General Medical Council.

In January Dr Wakefield was found guilty of dishonesty and irresponsibility by the GMC, the UK's regulatory body. The fitness to practise panel held that Dr Wakefield abused his position, subjected children to intrusive procedures such as lumbar puncture and colonoscopy that were not clinically indicated, carried out research that flouted the conditions of ethics committee approval, and brought the medical profession into disrepute (*BMJ* 29 January 2010, ;340:c593)

During the two and half year case, the longest in GMC history, Dr Wakefield was found to have failed to show that he had received funding from the legal aid board through a solicitor who hoped to mount a legal action against the vaccine manufacturer and that he had filed a patent for a new vaccine when he submitted the paper to the *Lancet*.



Andrew Wakefield calls Trump "on our side" over vaccines after meeting. Dyer O. *BMJ*. 2016 Dec 5;355:i6545

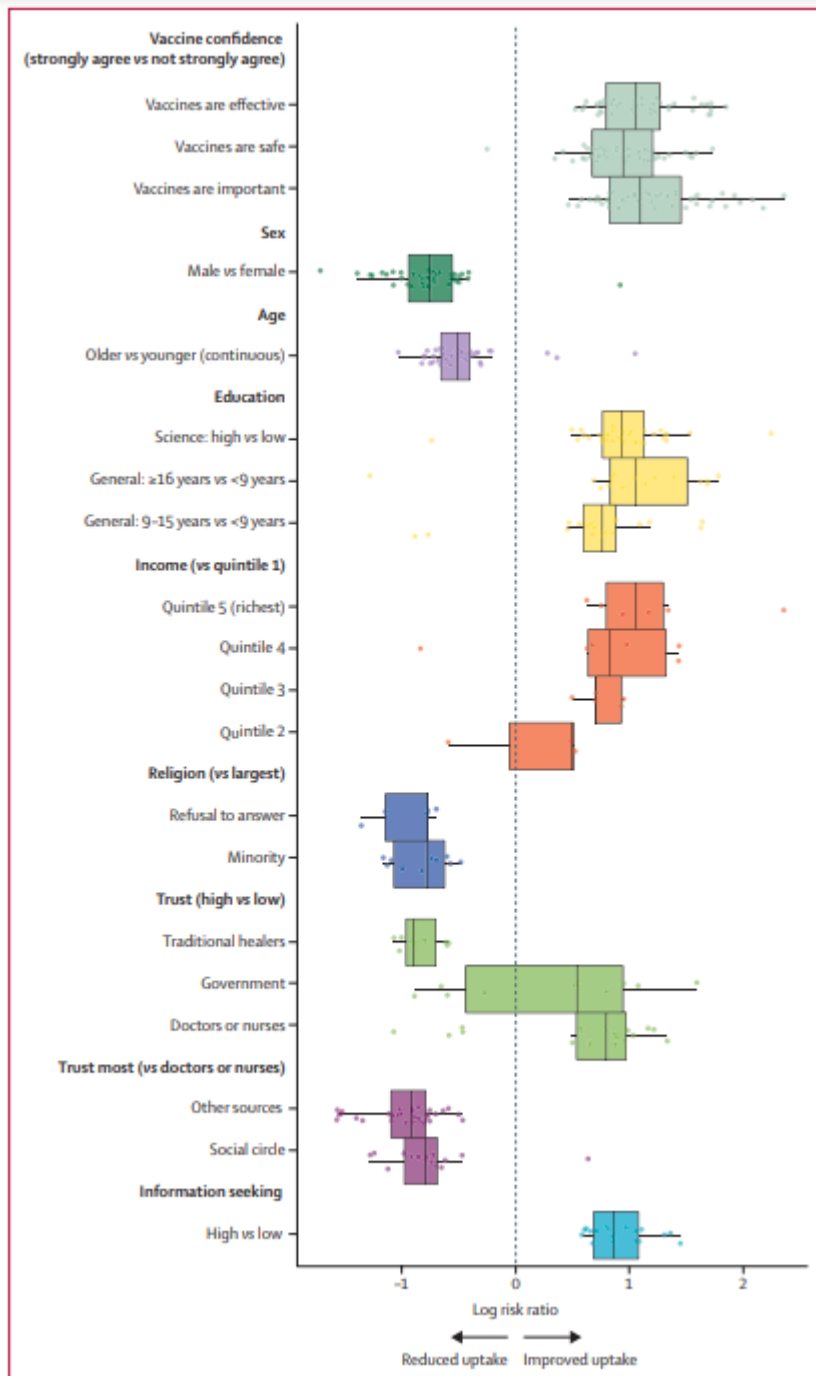
- Donald J. Trump** @realDonaldTrump · 4 Sep 2014
I'm not against **vaccinations** for your children, I'm against them in 1 massive dose. Spread them out over a period of time & autism will drop!
- 546 657 856
- Donald J. Trump** @realDonaldTrump · 3 Sep 2014
I am being proven right about massive **vaccinations**—the doctors lied. Save our children & their future.
- 637 1.5K 1.5K
- Donald J. Trump** @realDonaldTrump · 30 Mar 2014
"@Kramersfarm: You are spot on with your opinion on **vaccinations**. Big pharma and big Ag control a lot of misinformation. Great job."
- 22 49 89
- Donald J. Trump** @realDonaldTrump · 27 Mar 2014
"@CheryllMossTyler: @realDonaldTrump thank you for stand on child **vaccinations**. 35yr ago 1 child in 3 counties. Now 3 classes in some schools
- 10 11 30
- Donald J. Trump** @realDonaldTrump · 27 Mar 2014
If I were President I would push for proper **vaccinations** but would not allow one time massive shots that a small child cannot take - AUTISM.
- 663 1.7K 1.8K
- Donald J. Trump** @realDonaldTrump · 27 Mar 2014
Autism WAY UP - I believe in **vaccinations** but not massive, all at once, shots. Too much for small child to handle. Govt. should stop NOW!
- 340 480 532

- Donald J. Trump** @realDonaldTrump
Great News on Vaccines!
ÖS 3:13 · 15 Tem 2020
- 210,2 B 56,9 B kişi bu konu hakkında Tweetliyor
- Donald J. Trump** @realDonaldTrump
Vaccines are coming along really well. Likewise therapeutics. Moving faster than anticipated. Good news ahead (in many ways)!
5:32 PM · Jun 2, 2020 · Twitter for iPhone
- 30.7K Retweets 168.4K Likes
- Donald J. Trump** @realDonaldTrump
The deep state, or whoever, over at the FDA is making it very difficult for drug companies to get people in order to test the vaccines and therapeutics. Obviously, they are hoping to delay the answer until after November 3rd. Must focus on speed, and saving lives! @SteveFDA
7:49 AM · Aug 22, 2020 · Twitter for iPhone
- 13.4K Retweets and comments 37.5K Likes
- Donald J. Trump** @realDonaldTrump
New FDA Rules make it more difficult for them to speed up vaccines for approval before Election Day. Just another political hit job! @SteveFDA
9:09 PM · Oct 6, 2020 · Twitter for iPhone

Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study.

de Figueiredo A, Simas C, Karafillakis E, Paterson P, Larson HJ

Lancet. 2020 Sep 26;396(10255):898-908



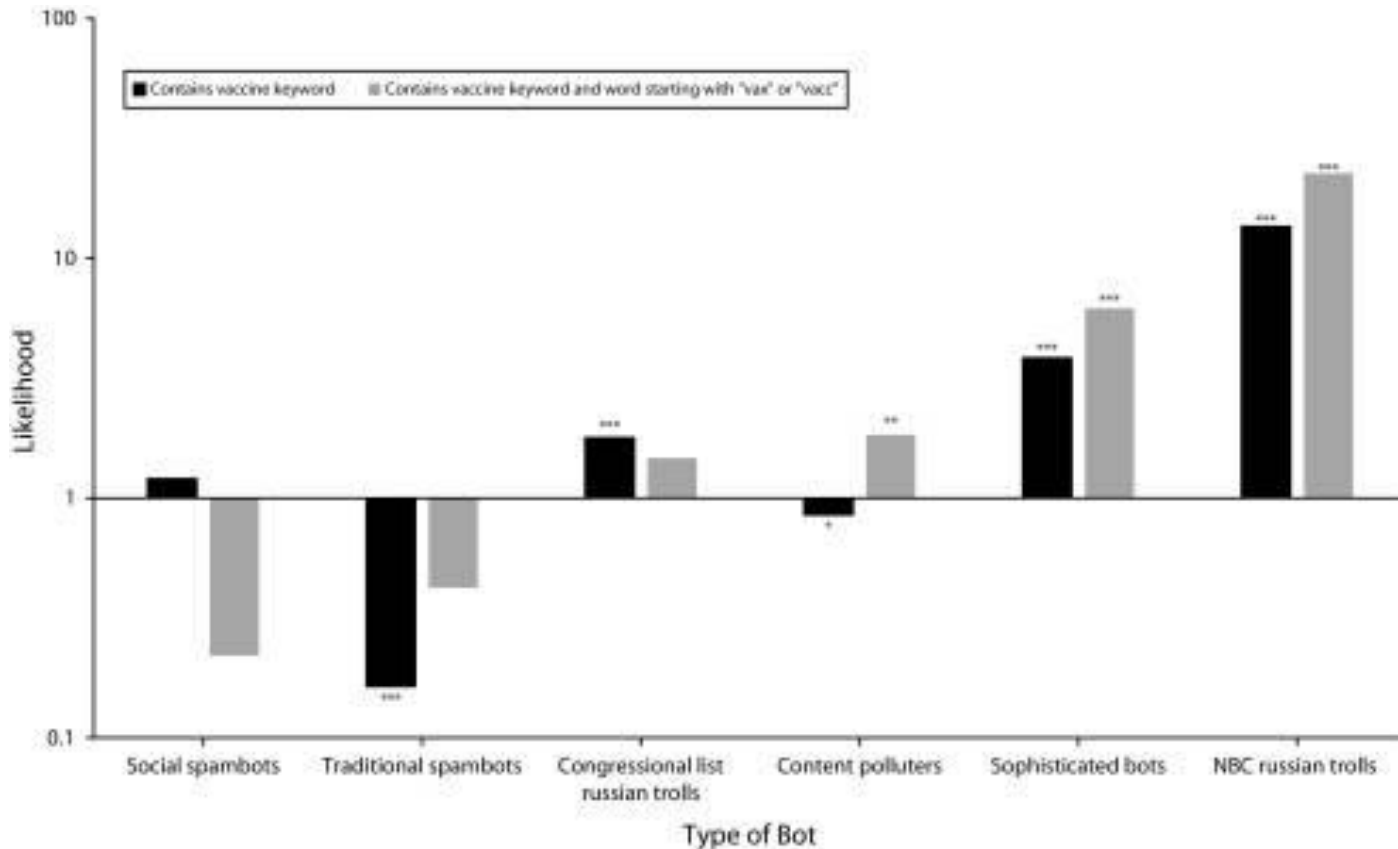
Grassroots or Astro-Turf ?

Figure 4: Univariate determinants of vaccine uptake within the Wellcome Global Monitor dataset
Global trends in univariate associations between vaccine uptake and confidence in vaccines, demographics and socioeconomic status, sources of trust, and information-seeking behaviours. Each point represents a significant association (95% HPD interval excludes zero) between a variable and uptake in a given country. Boxplots show the median log risk ratio and IQR. All variables (except age, which is continuous) are categorical and baseline groups are specified by each category (eg, high vs low denotes low as the baseline group; see the table for definitions). HPD=highest posterior density.

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

David A. Broniatowski, Amelia M. Jamison, SiHua Qi, Lulwah AlKulaib, Tao Chen, Adrian Benton, Sandra C. Quinn, Mark Dredze

Am J Public Health. 2018 Oct; 108(10): 1378–1384.

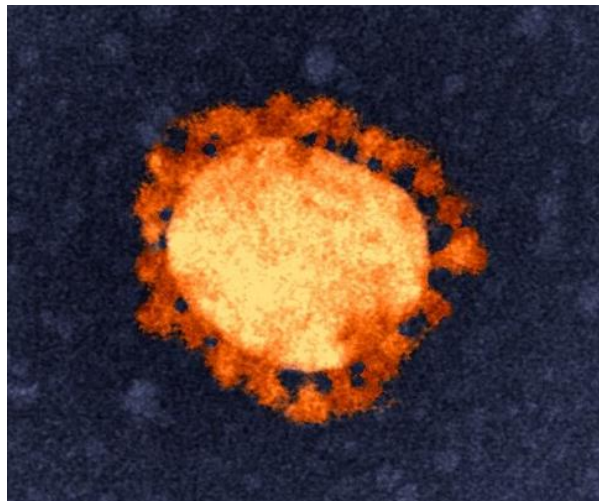


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Am J Public Health. 2018 Oct; 108(10): 1378–1384.

Antivaccine theme	Example tweet	Provaccine theme	Example tweet
Freedom of choice/antimandatory vaccines	VaccinateUS mandatory #vaccines infringe on constitutionally protected religious freedoms	Vaccines work	#VaccinateUS #vaccines save 2.5 million children from preventable diseases every year
Can't trust government on vaccines	Did you know there was a secret government database of #vaccine-damaged children? #VaccinateUS	Vaccines should be mandatory	Your kids are not your property! You have to #vaccinate them to protect them and all the others! #VaccinateUS
Pharmaceutical companies want vaccine profits	Pharmacy companies want to develop #vaccines to cash, not to prevent deaths #VaccinateUS	People who don't vaccinate are stupid	#VaccinateUS You can't fix stupidity. Let them die from measles, and I'm for #vaccination!
Vaccines cause bad side effects	#VaccinateUS #vaccines can cause serious and sometimes fatal side effects	Vaccination protects herd immunity	#VaccinateUS #vaccines protect community immunity
Natural immunity is better	#VaccinateUS natural infection almost always causes better immunity than #vaccines	People who don't vaccinate put me/my kids at risk	#VaccinateUS My freedom ends where another person's begins. Then children should be #vaccinated if disease is dangerous for OTHER children
General vaccine conspiracy theories	Dont get #vaccines. Illuminati are behind it. #VaccinateUS	Vaccines don't cause autism	#vaccines cause autism—Bye, you are not my friend anymore. And try to think with your brain next #VaccinateUS
Vaccines cause autism	Did you know #vaccines caused autism? #VaccinateUS	You deserve bad things if you don't vaccinate	#vaccines are a parent's choice. Choice of a color of a little coffin #VaccinateUS
Vaccine ingredients are dangerous	#VaccinateUS #vaccines contain mercury! Deadly poison!	Alternative medicine doesn't work	Do you still treat your kids with leaves? No? And why don't you #vaccinate them? Its medicine! #VaccinateUS
Diseases aren't so dangerous	#VaccinateUS most diseases that #vaccines target are relatively harmless in many cases, thus making #vaccines unnecessary	People died without vaccines	Most parents in Victorian times lost children regularly to preventable illnesses. #vaccines can solve this problem #VaccinateUS



<https://www.theasm.org.au/covid19>

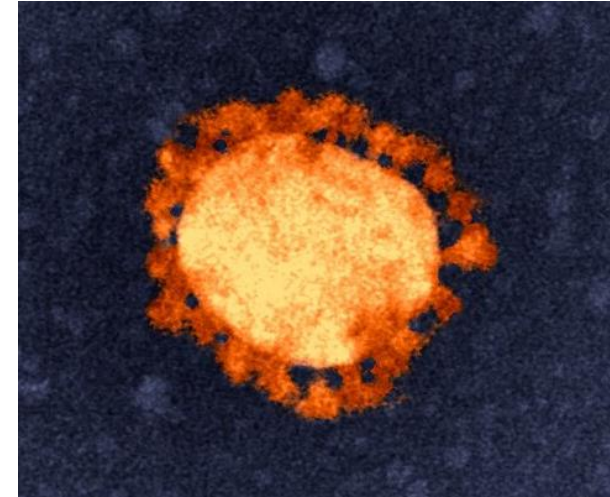
COVID-19 Vaccine: Conclusions

- 1. The scale of vaccine development against COVID-19 is unprecedented**
- 2. There is broad consensus that an effective vaccine will be discovered**
- 3. Vaccine safety is paramount: regulatory agencies must not yield to political pressures in the approval and licensing process**
- 4. Licensing of a safe and effective COVID-19 vaccine is likely in 2021**
- 5. The scientific community must engage more actively in communicating the public-health benefits of vaccination**
- 6. Grassroots anti-vaccine communities should be acknowledged and engaged respectfully; knowledge-seeking should be encouraged**
- 7. Synthetic anti-vaccine social media content must be exposed**



COVID-19 TASK FORCE

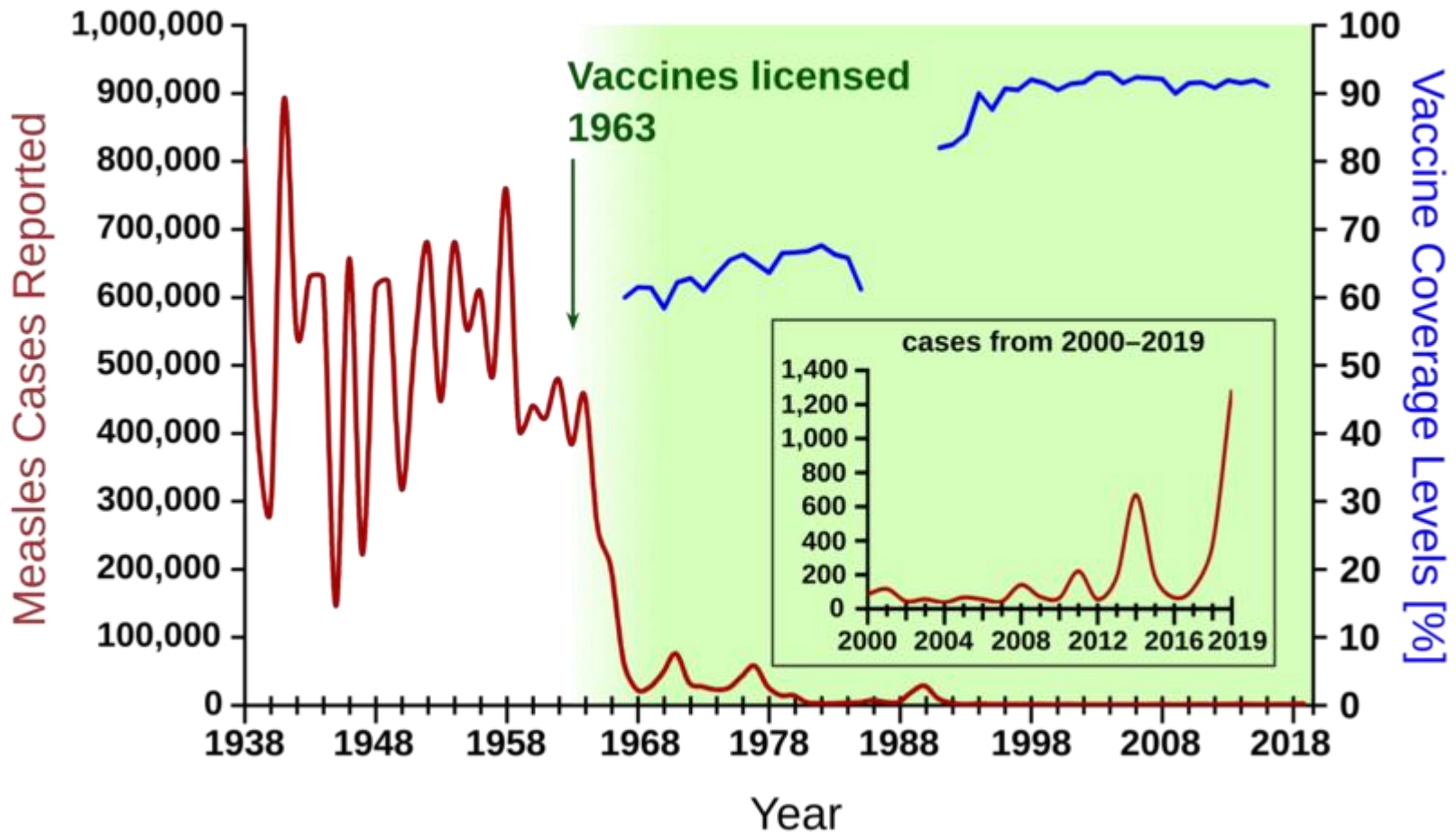
Informing the Caribbean's Response



<https://www.theasm.org.au/covid19>

Thank You

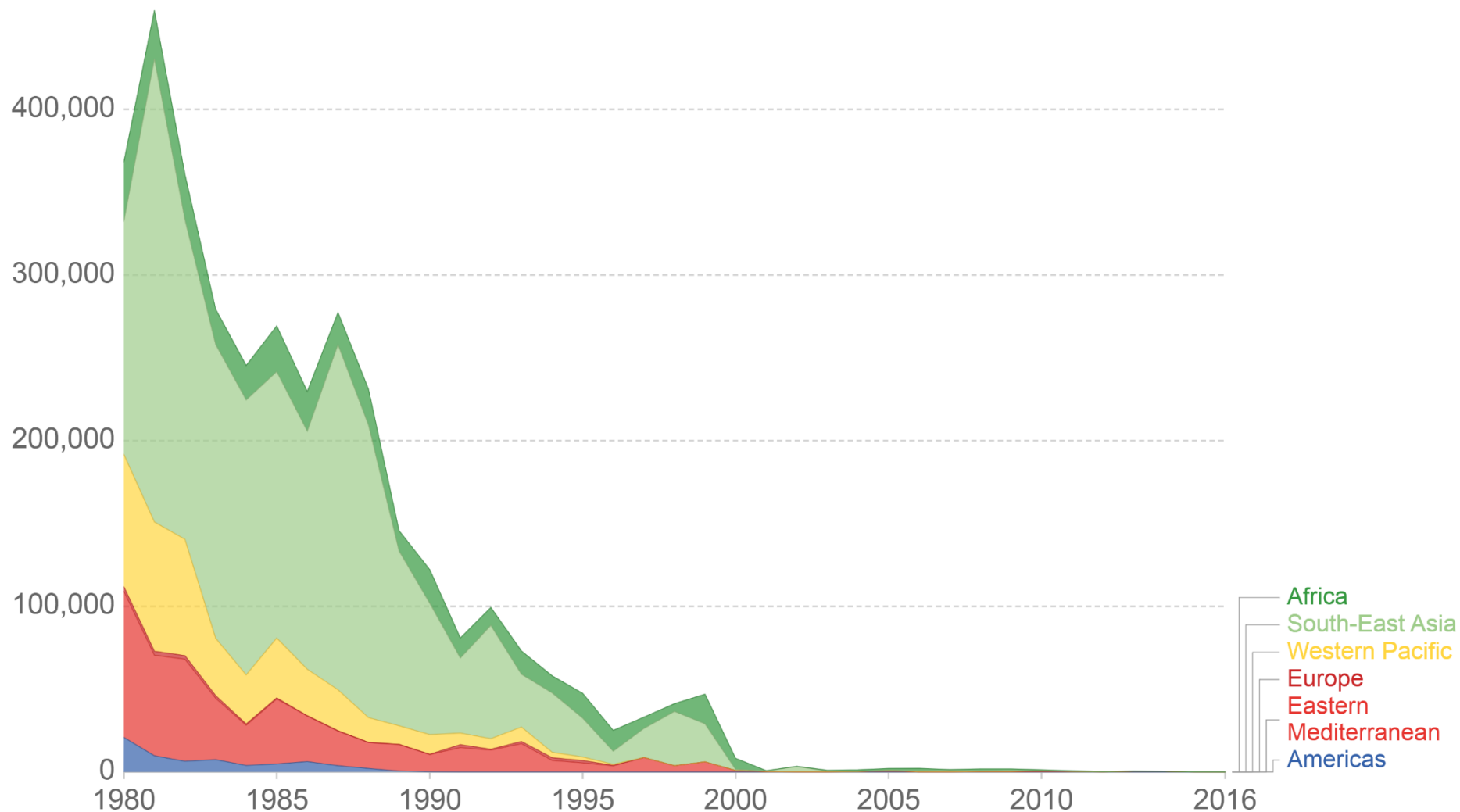
Measles cases in the United States, 1938–2019



https://commons.wikimedia.org/wiki/File:Measles_US_1938-2019.png

Polio cases by world region, 1980 to 2016

Shown is the estimate of the total number of paralytic polio cases.



Source: WHO (2018) and Tebbens et al. (2011)

Note: These estimates are based on a model by Tebbens et al. (2011) that multiplies the reported number of cases with a correction factor based on the quality of each country's surveillance system. After a country is certified polio-free, however, the reported polio cases are used.

Maximum and current reported cases of vaccine-preventable diseases and adverse events, USA

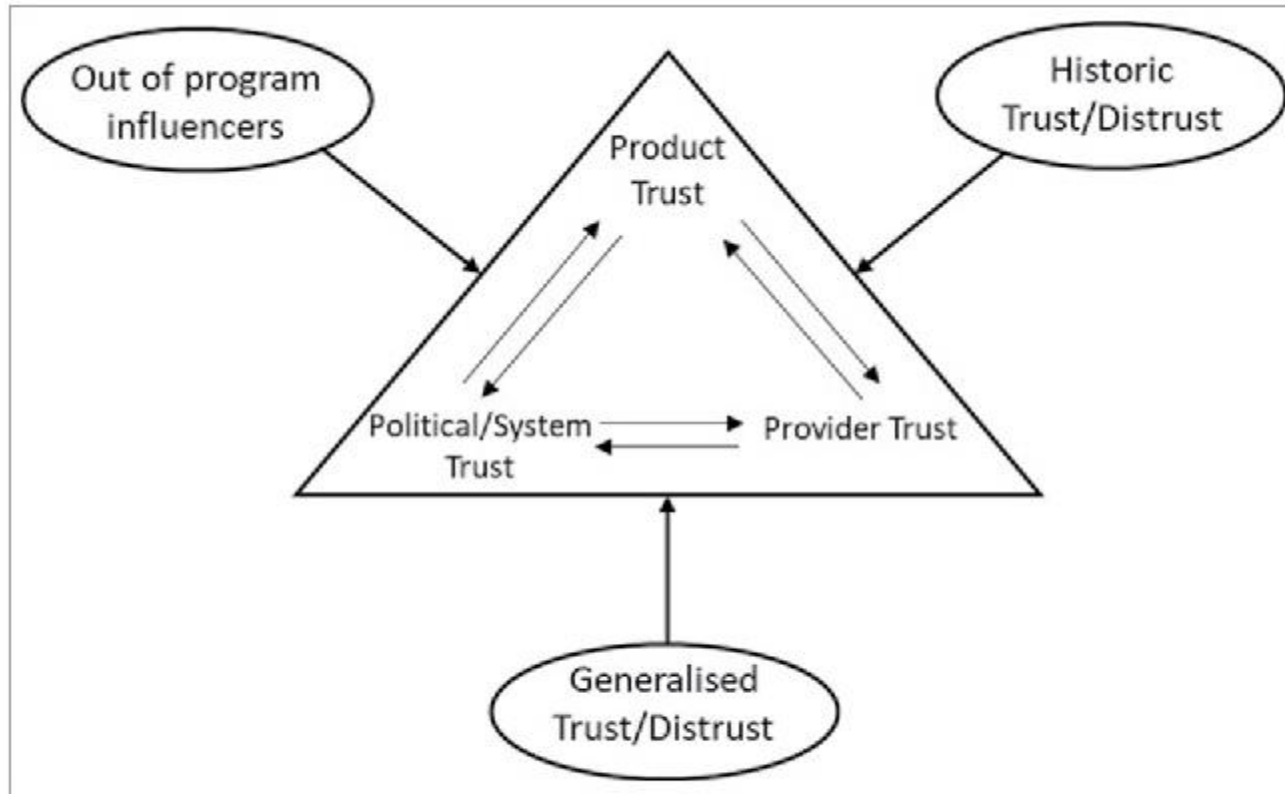
Disease	Prevaccine era* (year)	1997†	% change
Diphtheria	206 939 (1921)	5	-99-99
Measles	894 134 (1941)	135	-99-98
Mumps	152 209 (1968)	612	-99-60
Pertussis	265 269 (1934)	5519	-97-92
Polio (wild)	21 269 (1952)	0	-100-00
Rubella	57 686 (1969)	161	-99-72
Congenital rubella syndrome	20 000 (1964-5)†	4	-99-98
Tetanus	1560 (1948)†	43	-97-24
Invasive Hib disease	20 000 (1984)†	165	-99-18
Total	1639 066†	6644	-99-59
Vaccine adverse events	0	11 365	+++

*Maximum cases reported in prevaccine era and year.
 †Provisional. ‡Estimated because no national reporting existed in the prevaccine era.
 Hib = *Haemophilus influenzae* b

Vaccine adverse events: causal or coincidental?

Robert T. Chen, Frank DeStefano

Lancet 351(103): 611-612. (1998)



A visualisation of the trust relationship related to vaccination.

Measuring trust in vaccination: A systematic review.

Larson HJ, Clarke RM, Jarrett C, Eckersberger E, Levine Z, Schulz WS, Paterson P.

Hum Vaccin Immunother. 2018 Jul 3;14(7):1599-1609.