■ MILESTONE 19

Public trust in vaccines



Satirical artwork from 1802 by James Gillray, showing the supposed effects of using cowpox as a vaccine against smallpox. Credit: GL Archive / Alamy Stock Photo

In early February 2010, The Lancet medical journal retracted a case study it had published 12 years earlier. The retracted study was led by the English physician Andrew Wakefield and claimed to have identified a new 'autistic enterocolitis' syndrome in 12 children. Without providing any supporting data, in the discussion section of the article, the authors proposed a causal link between immunization of these children with the measles, mumps and rubella (MMR) vaccine and the development of this syndrome. Numerous studies have since discredited the idea that the MMR vaccine causes autism, with no evidence of this found in multiple large-scale studies, including one in Denmark that involved more than half a million children. Moreover, subsequent investigations identified major faults in the conduct of the original Wakefield study, and he was later struck off the UK medical register.

Still, by this point the damage had been done. Widespread media coverage of the Wakefield study drove fear and anxiety in parents, causing vaccination rates to plummet. This has contributed to measles outbreaks throughout the world in countries that had previously achieved herd immunity to this dangerous virus. Scepticism of the MMR vaccine persists to this day — in 2019, the UK lost its 'measles-free' status with the WHO.

Unsubstantiated health scares have affected other vaccines too. In England and Wales, rates of childhood immunization with the diphtheria–tetanus–whole-cell-pertussis (DTwP)

the refusal of perfectly safe and effective vaccines is a worrying trend

vaccine fell from 78.5% to 37% in the mid-1970s after the whole-cell-pertussis component was suggested to cause brain damage. In fact, although the cellular pertussis component was shown to cause minor adverse reactions in some children, it was never proved to cause serious neurological damage. However, the loss of public confidence led to a major whooping cough epidemic in the late 1970s and the eventual replacement of DTwP with newer vaccines containing an acellular pertussis component.

An effective vaccine against Lyme disease was licensed by the FDA in 1998 but withdrawn from the market in 2002 after it was wrongly claimed to cause autoimmune side-effects. Anti-vaccine propaganda has affected uptake of the human papillomavirus (HPV) vaccine, which protects against cervical cancer. HPV vaccination rates in Japan plummeted from more than 70% in 2010 to less than 1% in 2013 after the government suspended their proactive recommendation of the vaccine owing to public safety concerns. Although the reported adverse reactions were later investigated and found not to be caused by the vaccine, the government suspension has not been repealed and around 25,000 cases of cervical cancer and more than 5,000 deaths

have been attributed to the drop in vaccination. Geopolitical tensions can also contribute to vaccine hesitancy. The false belief that polio vaccines were contaminated with oestradiol as part of a US-led plot to cause infertility in Muslims prompted the Kano state government in Nigeria to suspend polio vaccination between 2003 and 2004. This caused a resurgence of polio in Nigeria and neighbouring regions, even as far as Indonesia.

Negative public perception of vaccination is not a modern-day phenomenon. In 1802. the English satirist James Gillray depicted the unfortunate recipients of Edward Jenner's cowpox vaccine with bovine projections emitting from their skin and various orifices. Jenner and other early advocates of inoculation also faced theological opposition. A sermon by the Rev. Edmund Massey in 1772 (some 24 years before Jenner's vaccination of James Phipps) denounced the 'dangerous and sinful practice of inoculation'. Massey preached that 'diseases are sent... for the punishment of our sins'. Even today, parents can refuse otherwise mandatory vaccines on the grounds of religious beliefs.

In the midst of a global pandemic, the issue of public confidence in vaccination is more urgent than ever. The WHO has described vaccine hesitancy as one of the top ten threats to global health. Assuming that scientists develop an effective vaccine against COVID-19, can we be sure the public will want to use it? A recent study in Nature that analysed Facebook interactions found that anti-vaccine clusters are more effective than pro-vaccine clusters in engaging with undecided groups. Rather ominously, the study predicted that anti-vaccination views could dominate within a decade. It seems that despite hundreds of properly designed studies supporting the safety and efficacy of vaccines, unfounded opinions on social media can have more traction.

It is important to acknowledge the valid safety concerns that surround some vaccines. However, the refusal of perfectly safe and effective vaccines is a worrying trend. It calls for scientists, politicians and educators to work together to build and maintain public trust.

Yvonne Bordon, Nature Reviews Immunology

ORIGINAL ARTICLE Retraction: Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *Lancet* **375**, 445 (2010)

FURTHER READING Madsen, K. M. et al. A population-based study of measles, mumps, and rubella vaccination and autism. N. Engl. J. Med. 347, 1477–1482 (2002) | Larson, H. J. et al. Addressing the vaccine confidence gap. Lancet 378, 526–535 (2011) | Johnson, N. F. et al. The online competition between pro- and anti-vaccination views. Nature 582, 230–233 (2020) | Simms, K. T. et al. Impact of HPV vaccine hesitancy on cervical cancer in Japan: a modelling study. Lancet Public Health 5, e223–e234 (2020)