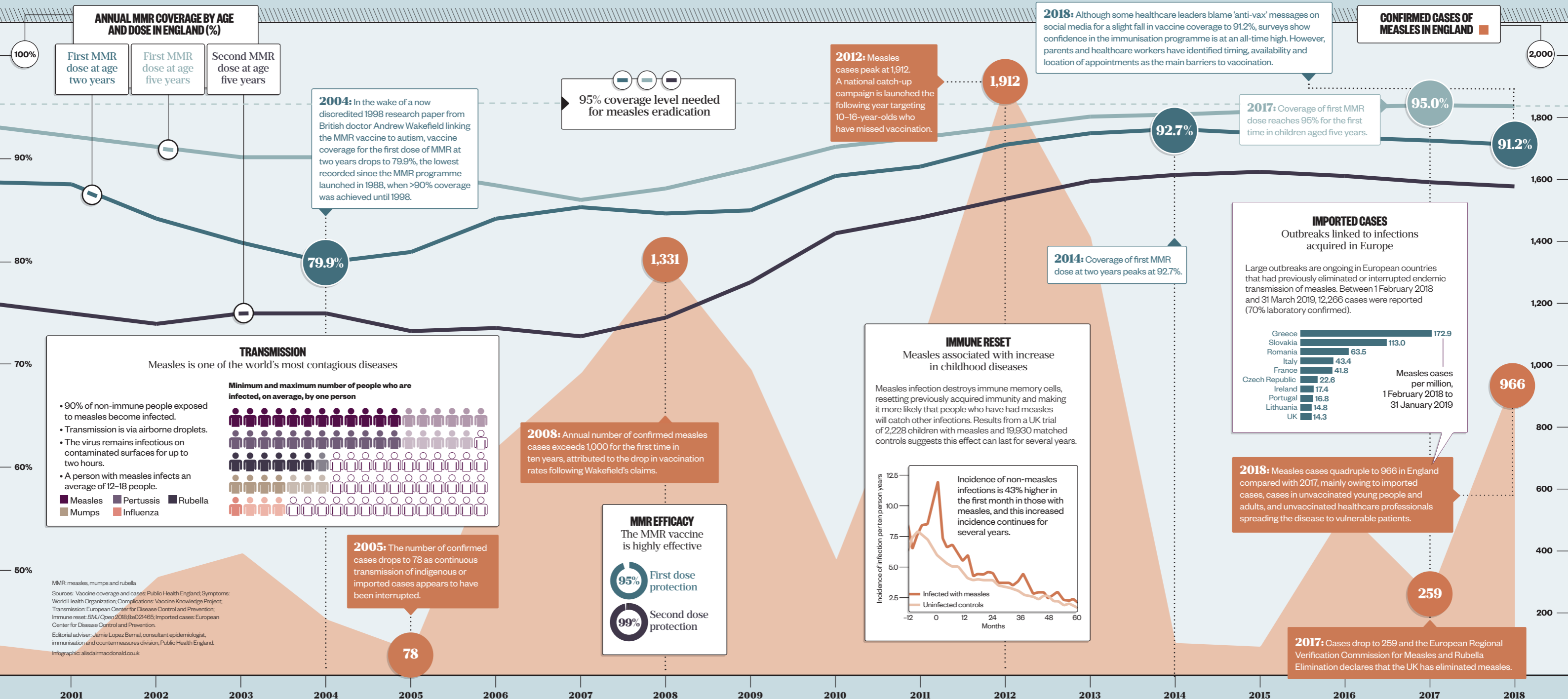


MMR: THE STRUGGLE FOR NATIONAL COVERAGE

Introduction of a measles vaccine in 1968 has reduced annual cases in England from around 460,000 to less than 1,000. However, the levels of vaccine coverage needed to eradicate measles remain elusive.

DAWN CONNELLY



ANNUAL MMR COVERAGE BY AGE AND DOSE IN ENGLAND (%)

- First MMR dose at age two years
- First MMR dose at age five years
- Second MMR dose at age five years

2004: In the wake of a now discredited 1998 research paper from British doctor Andrew Wakefield linking the MMR vaccine to autism, vaccine coverage for the first dose of MMR at two years drops to 79.9%, the lowest recorded since the MMR programme launched in 1988, when >90% coverage was achieved until 1998.

95% coverage level needed for measles eradication

2012: Measles cases peak at 1,912. A national catch-up campaign is launched the following year targeting 10–16-year-olds who have missed vaccination.

2018: Although some healthcare leaders blame 'anti-vax' messages on social media for a slight fall in vaccine coverage to 91.2%, surveys show confidence in the immunisation programme is at an all-time high. However, parents and healthcare workers have identified timing, availability and location of appointments as the main barriers to vaccination.

CONFIRMED CASES OF MEASLES IN ENGLAND

2017: Coverage of first MMR dose reaches 95% for the first time in children aged five years.

2014: Coverage of first MMR dose at two years peaks at 92.7%.

IMPORTED CASES

Outbreaks linked to infections acquired in Europe

Large outbreaks are ongoing in European countries that had previously eliminated or interrupted endemic transmission of measles. Between 1 February 2018 and 31 March 2019, 12,266 cases were reported (70% laboratory confirmed).

Country	Measles cases per million, 1 February 2018 to 31 January 2019
Greece	172.9
Slovakia	113.0
Romania	63.5
Italy	43.4
France	41.8
Czech Republic	22.6
Ireland	17.4
Portugal	16.8
Lithuania	14.8
UK	14.3

2018: Measles cases quadruple to 966 in England compared with 2017, mainly owing to imported cases, cases in unvaccinated young people and adults, and unvaccinated healthcare professionals spreading the disease to vulnerable patients.

2017: Cases drop to 259 and the European Regional Verification Commission for Measles and Rubella Elimination declares that the UK has eliminated measles.

2005: The number of confirmed cases drops to 78 as continuous transmission of indigenous or imported cases appears to have been interrupted.

2008: Annual number of confirmed measles cases exceeds 1,000 for the first time in ten years, attributed to the drop in vaccination rates following Wakefield's claims.

MMR EFFICACY

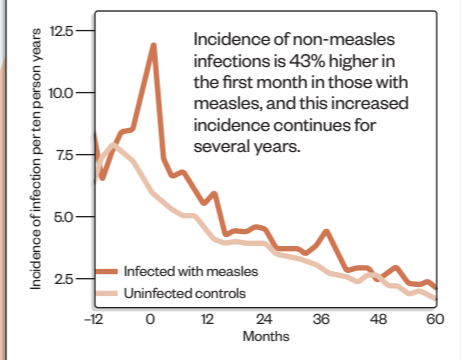
The MMR vaccine is highly effective

- 95% First dose protection
- 99% Second dose protection

IMMUNE RESET

Measles associated with increase in childhood diseases

Measles infection destroys immune memory cells, resetting previously acquired immunity and making it more likely that people who have had measles will catch other infections. Results from a UK trial of 2,228 children with measles and 19,930 matched controls suggests this effect can last for several years.



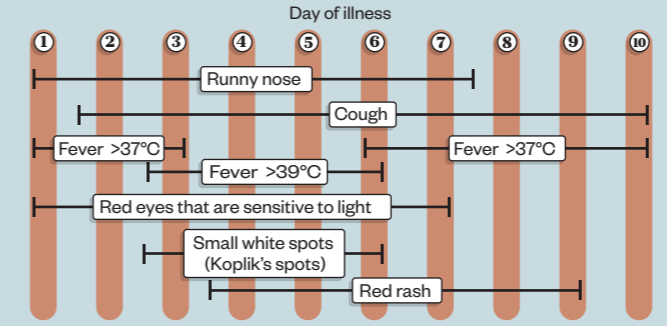
Complications

- Measles causes death in 1 in 5,000 cases in the UK;
- The potential complications of measles are more common than the side effects of the MMR vaccine.

	Measles	MMR vaccine
Diarrhoea:	Affects 1 in 12 people with measles	Affects up to 1 in 100 people who receive MMR
Respiratory infections:	1 in 16 people with measles get pneumonia	Up to 1 in 100 people develop upper respiratory tract infection
Encephalitis:	Affects 1 in 1,000 people with measles	Affects up to 1 in 100,000 people who receive MMR
Otitis media:	Affects 1 in 12 people with measles	Not known
Convulsions:	Affects 1 in 200 people with measles	Affects up to 1 in 1,000 people who receive MMR

Symptoms

- The incubation period for measles is 10–12 days;
- The disease is characterised by cold-like symptoms followed by a red-brown blotchy rash that starts on the head and spreads outwards to the rest of the body.



MMR: measles, mumps and rubella. Sources: Vaccine coverage and cases: Public Health England; Symptoms: World Health Organization; Complications: Vaccine Knowledge Project; Transmission: European Center for Disease Control and Prevention; Immune reset: *BMJ Open* 2018;doi:10.1136/bmjopen-2018-021465; Imported cases: European Center for Disease Control and Prevention. Editorial adviser: Jamie Lopez Bernal, consultant epidemiologist, immunisation and countermeasures division, Public Health England. Infographic: alliedairmacdonald.co.uk