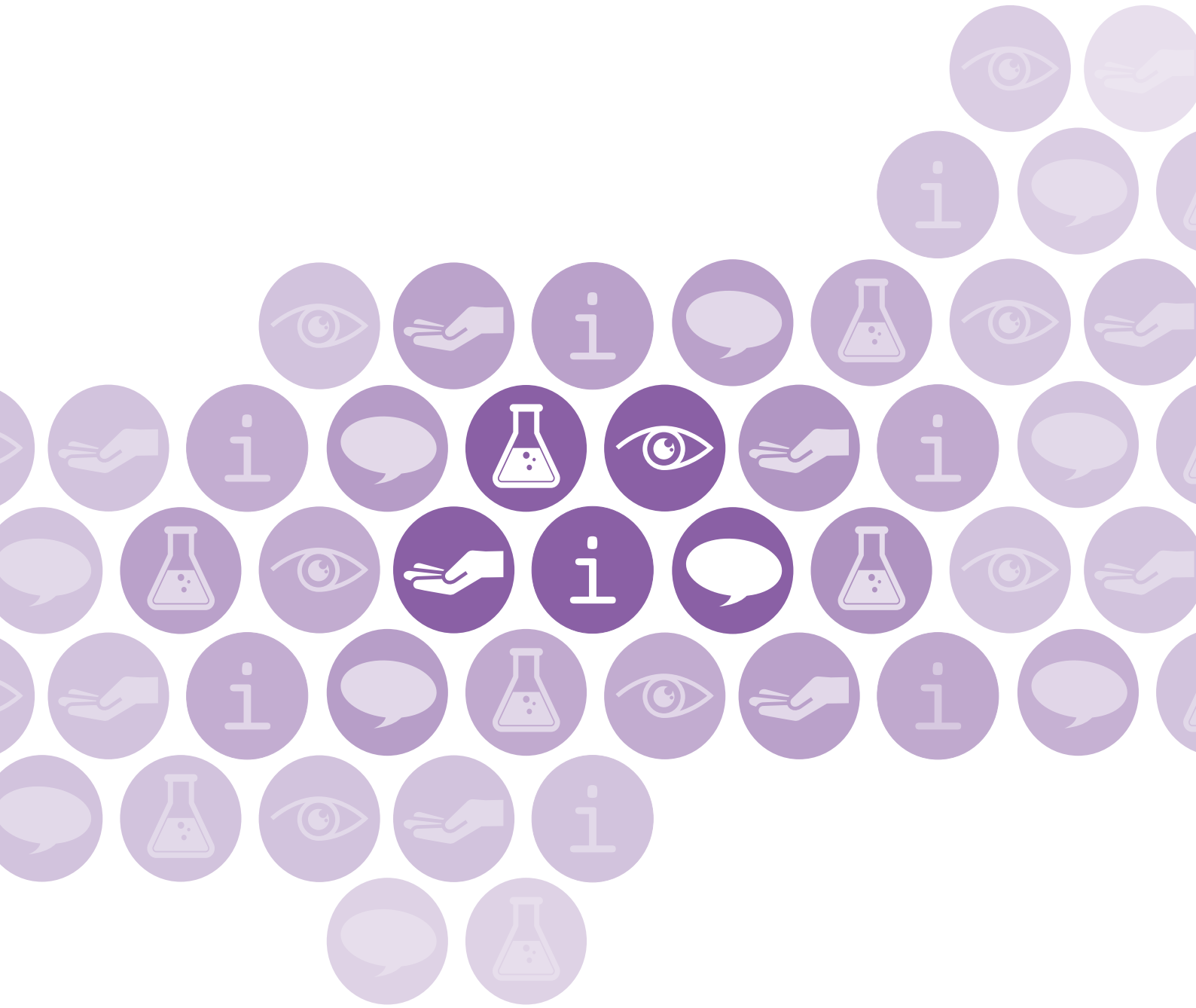




The Royal College of Pathologists
Pathology: the science behind the cure



GIVE IT A SHOT! RESOURCE PACK

Introduction

We can catch infectious diseases quite easily: some through the air and some by touch. Due to misleading and false information in the media, more and more people are uncertain about whether to vaccinate their children against infectious diseases like measles.

This 'vaccine hesitancy' is being made worse by misinformation shared on social media. As a result, some infections such as measles are increasing in countries that were previously close to eliminating them. This includes the UK.

Vaccines are given to protect against diseases that can be serious. Vaccines are not just for our own protection.

The more individuals in a community who are vaccinated, the less likely it is that a disease like measles will spread. This is known as herd immunity. According to the World Health Organisation, we need to vaccinate 19 out of every 20 people to prevent illnesses like measles taking hold again.

And remember - antibiotics don't work for illnesses caused by viruses, so preventing them by vaccination is the best protection possible.

Audience

Parents, secondary school students, undergraduates, families

Age-range

Ages 5 and up

Equipment

- A 'dartboard-style' mat for floor/desktop counter game. You can download and print an A3 cut-out version from the same webpage as this resource. A 1m x 1m version of the mat can be borrowed from the College on request.
- 'Injection counters' for dartboard game – these can be downloaded, printed and cut out from the same page as this pack. The College have some that can be borrowed upon request as well.
- MMR visualisation 'board'/set of posters. You can download, print and staple A4 versions from the same webpage as this resource. A larger version of this MMR visualisation board can be borrowed from the College on request.
- Reusable shot glasses – at least 11 of these:
 - Six shot glasses for the 'vaccinate' set-up (four with blue liquid representing healthy individuals, one with pink liquid representing one ill individual, one with water representing vaccine)
 - Five shot glasses for the 'no vaccination' set-up (four blue/healthy, one pink/ill) – see diagram of set-up below.
- 3ml pipettes (three or four per set-up)
- Butterfly pea flower tea extract, diluted with water (see below for recipe)
- Pink food colouring, diluted with water (see below for recipe)
- Vinegar (colourless)
- Water
- Doll or image of baby (the image can be downloaded from the same webpage as this pack)
- **OPTIONAL:** School paint palettes with six wells
- **OPTIONAL:** Introductory PowerPoint slides for introducing this activity. You can download this from the same webpage as this pack. There are notes within the PowerPoint which give ideas on what you might say as you show each slide. To view these notes click into the 'Outline' view when you open the presentation.
- **OPTIONAL:** Three images of people suffering with measles, mumps and rubella. You can download these images (purchased by the RCPATH from Shutterstock) from the same webpage as this pack and print them or show them on a tablet or screen.

Recipes for solutions:

- Make up the 'healthy individual' shot glasses (blue) by adding five drops (using a pipette) of butterfly pea flower tea extract to 25ml water in each shot glass. Since you will have to make up quite a few of these shot glasses, it may be best to use a 500ml jug filled with water, and mix in 5ml (or a teaspoon) of the extract.
- Make up the 'ill individual' shot glasses (pink) for the first set-up by adding three drops of pink food colouring to 25ml of **vinegar** in a shot glass.
- Make up the 'ill individual' shot glasses (pink) for the second set-up by adding three drops of pink food colouring to 25ml of **water** in a shot glass.

Note: If you cannot find Butterfly pea flower tea extract, an alternative could be to make some red cabbage indicator by soaking and squeezing pieces of red cabbage in water, until you get a purple-blue solution. Red food colouring can be used too, but may need further diluting with water.

As food colouring may vary depending on the manufacturer, do test out the colour changes prior to running the activity, to ensure you are satisfied with the effect. (In the first scenario, you will need the colour of the blue shot glasses to turn into a similar pink shade as the pink-coloured vinegar).

You can see how this works in some short videos on our YouTube channel:

Video of what happens when you add the pink-coloured vinegar ('infected person') to the blue butterfly pea flower tea extract (representing unvaccinated person/people in the community)

<https://www.youtube.com/watch?v=FojS60vIcZ0&feature=youtu.be>

Video of what happens when you add the pink-coloured water ('infected person') to the blue butterfly pea flower tea extract (representing vaccinated person/people in the community)

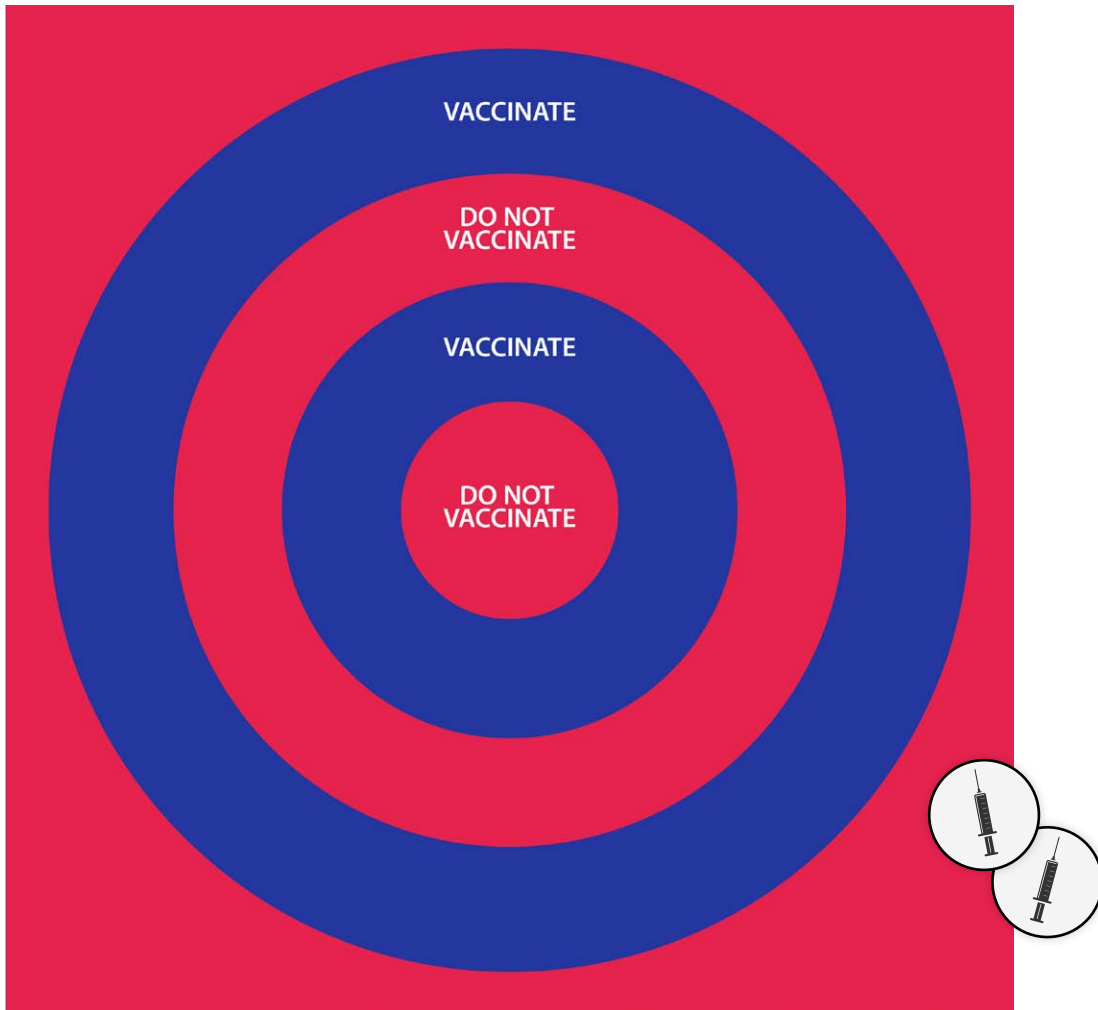
<https://www.youtube.com/watch?v=cYVzRY7Vc1M&feature=youtu.be>

Vaccinate or not? - Give it your best shot!

Give a short introduction on the importance of vaccines (see above), and tell participants that with the MMR vaccine, many of us as parents are gambling with not only our children's lives, but we're putting others' lives at risk too.

Start by handing attendees the doll/picture of a baby and saying, 'Here, you have have a baby and you need to choose whether to vaccinate it or not!'

Ask attendees to pick up an 'injection counter' and 'give it their best shot' by throwing it onto the large dartboard-style mat on the table or floor, which will tell us whether they wish to vaccinate their child or not.



Depending on what they land on, move onto one of the activities below, and then swap round. Make sure participants have a chance to do both activities.

Vaccinate: 'Herd immunity' activity

Have two set-ups ready, one without vaccination, one with.

Set up five shot glasses in a group on a table (in a paint palette if available) and another six on the same table but separate to the other five (in a separate paint palette if using). The diagram below shows how to set this up:

SET-UP 1

Five shot glasses.



SET-UP 2

Six shot glasses.



Show the PowerPoint and/or the **herd immunity animation** as an introduction to the situation here, as a non-vaccinated/non-immune community, where one person has become ill. The animation is included in the PowerPoint presentation, which also includes ideas on what you might say as you show each slide. To view these notes click into the 'Outline' view when you open the presentation.

Explain that if there was to be an outbreak of a disease e.g. measles, and the few unvaccinated people caught it, it would be difficult for measles to spread as everyone else has been vaccinated. This is known as 'herd immunity' (i.e. protection by the wider community). If more people are unvaccinated than vaccinated, then the disease can spread more easily.

Start off with the first set-up. Tell participants that this is a community (or a 'herd') and the 'pink person' (shot glass with pink-coloured vinegar) is the ill person who will now infect everyone (the blue healthy, but unvaccinated, people) in their community.

Ask participants to use a pipette to take some liquid from the pink 'ill' person and add this, i.e. 'infect' all of the blue people in the community.

Participants will notice that all of the blue individuals have turned pink. So, one person being ill from measles can infect everyone else, if no one is vaccinated.

What about if members of the community are vaccinated?

This time, using the second set-up of shot glasses, ask participants to first vaccinate the healthy individuals (i.e. the blue shot glasses), by adding a couple of drops of the vaccine (the shot glass containing plain water) using a pipette. This represents the MMR vaccine. The blue people will remain blue after adding the vaccine, i.e. they are still healthy and look the same!

Now introduce the pink 'ill' person, and repeat as before, 'infecting' the blue people using a pipette. (Note: in this set-up the pink solution is made of pink food colouring and water, so there will be no colour change).

Participants should notice that the blue shot glasses remain blue. And only the infected individual remains infected.

By vaccinating the community, we have prevented the disease from spreading.

If running this in a classroom you can divide the class into groups of five or six, and have two set-ups for each group, or (with limited timing) have half the class do the first set-up while the other half watch, and then swap round.

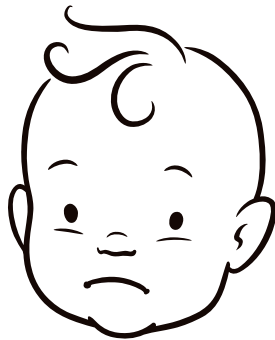
Provide more pipettes so that pupils can all have a go at 'infecting'.

If you are running this as an activity on a drop-in stand, have spare set ups ready to go in case of a crowd/quick succession of participants, so that they do not have to wait for you to reset the activity.

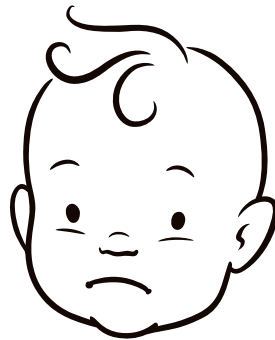
Do not vaccinate: 'What does M, M and R actually look like?' activity

Explain to those who choose not to vaccinate their child that the increase in social media and celebrity influencers and endorsers, has meant that there is a lot of misinformation out there on health issues. (It is one of the reasons we promote science education for all, as we need more scientifically-literate citizens understanding the research and evidence).

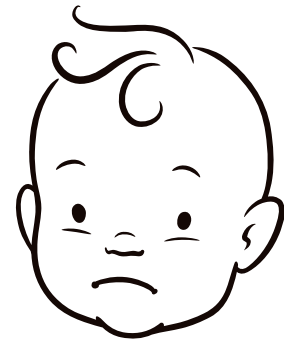
Ask attendees to look at the three illustrations of young children's faces on the flaps of the visualisation board/ stapled sheets.



M _____



M _____



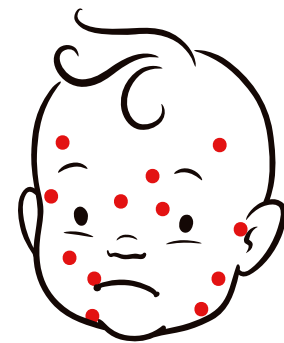
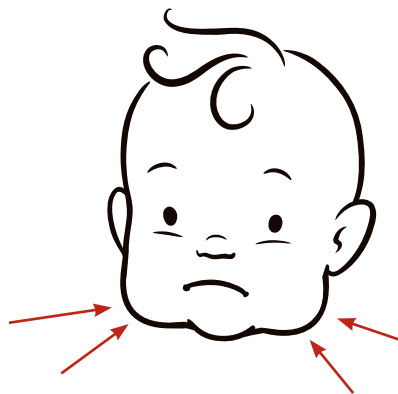
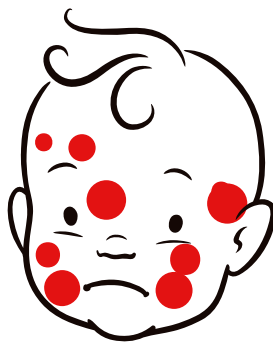
R _____

Most children are given the Measles, Mumps and Rubella (MMR) vaccination, by injection.

What do attendees think will happen if someone contracted each of these diseases?

The MMR vaccine is a vaccine for measles, mumps and Rubella (German measles). We have our 1st vaccination at 9-15 months old, and 2nd at 15 months to 6 years old (with at least 4 weeks between the two doses). By giving a combination vaccine, it leaves less time between vaccinations for the child to contract the other diseases.

Ask participants to lift the flaps to see what happens to the faces of these now infectious individuals:



- Measles virus - Blotchy rash, fever, dry cough, runny nose, sore throat, inflamed eyes (conjunctivitis), tiny white spots with bluish-white centers on a red background found inside the mouth on the inner lining of the cheek — also called Koplik's spots.
- Mumps virus - Swollen parotid glands (in the neck), pain and tenderness of the testicles, fever, headache, muscle aches, tiredness.
- German measles - Rubella virus - spotty rash that spreads from face to rest of body, mild fever, usually under 102°F, swollen and tender lymph nodes, runny or stuffy nose, headache, muscle pain, inflamed or red eyes.

Infected individuals in all these cases have to take plenty of rest, drink lots of fluids, and use painkillers (Ibuprofen and Paracetamol), with the infection passing within a couple of weeks. There's no treatment. Here you can show the images of people suffering with each of the diseases.

This might not sound like much, **BUT** there can be severe complications. Because vaccine-preventable diseases have become so rare in many countries, new generations have no idea how serious these diseases can be.

Now talk through the possible complications of each disease -

- Measles can cause fits, pneumonia, inflammation of the brain...and death. Yes, measles KILLS.
- Complications from mumps could include inflammation of the testicles (males), or ovaries (females), and even inflammation of the pancreas, brain (encephalitis) or the tissue covering the brain and spinal cord (meningitis).
- Pregnant women who are infected with Rubella could have a miscarriage or stillbirth, or their babies could have severe life-long birth defects.

Suggested duration:

15-30 minutes (or longer, depending on if drop-in activity or within an event).

Additional information:

Other vaccinations people commonly receive in the UK include polio and tuberculosis vaccines.

In a disease outbreak, it's important to find the first person to become infected with the pathogen — called 'patient zero' — because knowing that person's history can help researchers determine how and when the outbreak started. This could be a possible extra discussion topic with participants who are particularly interested to find out more.

Maybe also mention how vaccination programmes and attitudes vary between countries. For example in France some vaccines are mandatory. In the USA President Trump was at first a sceptic of vaccines but changed his view and expressed support for vaccination amid a resurgence of measles cases.

Why not try?

Edward Jenner's work on the smallpox vaccine has been covered in our activity, Blossom the Cow, which can be found in the **RCPATH Pathology For Life activity pack**.

Find out more: www.rcpath.org

Useful links:

- MMR vaccine overview: <https://www.nhs.uk/conditions/vaccinations/mmr-vaccine/>
- NHS information on vaccination: <https://www.nhs.uk/conditions/vaccinations/why-vaccination-is-safe-and-important/>
- Number of cases of measles, mumps and rubella in UK since 1996: <https://www.gov.uk/government/publications/measles-confirmed-cases/confirmed-cases-of-measles-mumps-and-rubella-in-england-and-wales-2012-to-2013>
- No link between MMR and autism, major study finds: <https://www.nhs.uk/news/medication/no-link-between-mmr-and-autism-major-study-finds/>
- Immunisation: The Facts: <https://parentinfo.org/article/immunisation-the-facts>
- Why do we need vaccines: <https://wellcome.ac.uk/news/why-do-we-need-vaccines>
- Herd immunity: https://en.m.wikipedia.org/wiki/Herd_immunity
- Podcast with Dr Peter Hotez, vaccine scientist from Baylor College of Medicine in Texas, about his book: 'Vaccines Did Not Cause Rachel's Autism': <http://orinocomms.com/research-comms-blog/2019/8/8/research-comms-podcast-dr-peter-hotez-on-vaccines>
- Low trust in vaccination 'a global crisis': <https://www.bbc.co.uk/news/health-48512923>
- The budding doctor killed by exposure to Europe's worst measles outbreak: <https://www.bbc.co.uk/news/stories-48668841>
- Half of new parents shown anti-vaccine misinformation on social media: <https://www.theguardian.com/society/2019/jan/24/anti-vaxxers-spread-misinformation-on-social-media-report>
- How France is convincing its citizens to get vaccinated: <https://qz.com/1652132/fear-of-vaccines-are-causing-a-rise-in-measles-deaths-in-europe/>
- The anti-vaccination movement is spreading to pets: <https://www.wgbh.org/news/science-and-technology/2019/06/05/the-anti-vaccination-movement-is-spreading-to-pets>
- Medical science can find no cure for the belief in quack remedies: <https://www.thetimes.co.uk/article/medical-science-can-find-no-cure-for-the-belief-in-quack-remedies-5s5hxpflh>
- MMR vaccination rates in slight fall among children in Scotland: <https://www.bbc.co.uk/news/uk-scotland-48757000>
- MMR vaccination rates in Coventry at 10-year low: <https://www.coventrytelegraph.net/news/coventry-news/mmr-vaccination-anti-vaxxer-coventry-16517481>
- Boris Johnson declares war on anti-vaxx movement with campaign to counter vaccine scaremongering: <https://www.independent.co.uk/news/uk/politics/boris-johnson-anti-vaxx-movement-vaccination-parents-children-mmr-measles-a9064496.html>
- Vaccines: Calling The Shots (short film on herd immunity entered in the 2016 SMASH Media Summit): Trailer: <https://vimeo.com/180077842>, Transcript: <https://www.pbs.org/wgbh/nova/video/vaccinescalling-the-shots/>

