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| **MEASLES ALERT!** Teacher Guidance | C:\Users\Felix\AppData\Local\Temp\Temp1_smallpox-logo(2).zip\smallpox-logo.jpg |

# NATIONAL CURRICULUM LINKS (ENGLAND)

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| **Upper KS2 (ages 9-11)** |
| **Working scientifically**  Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations  Recording data and results of increasing complexity using tables, bar and line graphs  **English**  Retrieving, recording and presenting information from non-fiction |

# KEY LEARNING OUTCOMES

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| **By the end of these activities children should be able to:** |
| * use tables, bar charts and pie charts to present and interpret data * identify the vital role that vaccination plays today in protecting individuals and populations from disease * explain the reason for the measles outbreak in the simulation * use their knowledge of vaccination to explain similar real-life outbreaks and predict how vaccination might prevent future outbreaks * show some understanding of the concept of herd immunity |

# Lesson Activities

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| **Key questions** | **How do you stop a measles outbreak? What is herd immunity?** | | | |
| **Overview** | **A science, maths and English roleplay resource where children try to fight a measles epidemic**  In this exciting multimedia simulation activity, children work to bring a local measles epidemic under control. Children take on roles in an Outbreak Control Team as Science Advisors, Data Analysts, and Healthcare Workers and use their maths, science and research skills to analyse and fight the outbreak, and their English skills to communicate with the media and persuade the public to vaccinate their children. The simulation is based on real data from the 2013 Swansea measles epidemic. Children will practice using a range of upper KS2 (ages 9-11) maths skills in a real-life context, including: line, bar and pie charts; percentages; calculating the mean; rounding answers; multi-step word problems. | | | |
| **Teaching time** | 6 hrs approx. total | | | |
| **Key vocabulary** | immunity | vaccination | herd immunity | evidence |

**INTRODUCTION**

The resource is split into four “episodes”. Each episode is designed to be completed in one lesson. Some teachers run the whole resource over two mornings. Maths and English are an essential part of this activity, so teachers might consider allocating maths and English time to it.

Each episode is led by a multimedia PowerPoint presentation (split into two files because they are large) that will be controlled by the teacher (the “Teacher Presentations”). This provides the narrative of the outbreak, and the **weekly number of new cases** over the 36 weeks of the simulated outbreak. The files are large, so low resolution versions are included in case the bigger files don’t play on your school system.

The class is split up into **Outbreak Control Teams**, made of up children acting in one of three roles: **data analysts**, **science advisors** and **healthcare workers**. Each role will be given their own task sheets for each episode, contained in a separate PowerPoint (the “Pupil Sheets”). These have been designed so you can print them out in **black and white**, and also as **two slides per A4** page if you wish. You can also edit the PowerPoints to further differentiate for different abilities.

Children use their understanding of vaccination and pattern-finding in data from their work in **The Speckled Monster** resource, along with their general KS2 science, maths, research and English skills, to bring the outbreak under control. It’s a race against time: the outbreak soon turns into an epidemic, and some people even start dying!

Children will monitor the number of new cases each week, determine where the outbreak started and which age groups are being affected, and decide what measures to take to stop it. Sometimes groups will need to work together and share information, or come together as a whole class for discussion. The activity brings the data to life and shows that **every graph tells a story**. Children will have to **work and think scientifically** by finding scientific explanations and solutions to the outbreak – but they will also need to communicate clearly and persuasively with the general public through press conferences, leaflets and report writing. Through their data analysis and research they discover that the local epidemic has resulted from a low uptake of the MMR vaccine and that the best way to stop it is to persuade parents to vaccinate their children.

**This activity is based upon real data and government responses during a measles outbreak in Wales in 2012-2013.** However, the area in the simulation is not named so that you can pretend the outbreak is happening in your local area.

**Episode One**

In this episode, four local (fictional) children in your local area contract measles and the measles outbreak begins.

The class acts as an Outbreak Control Team (OCT). Split the class into mini OCTs, bringing together people with different roles:   
**data analysts   
health care workers   
science advisors.**

**[Create mini OCTs consisting of two children of each role so that each child works with a partner in the same role, totalling six children per mini OCT (some teams may be larger depending on class size)]**

Members of the OCT undergo a training activity. **[Independent learning using Pupil Sheets provided]**

At the end of the episode, the class comes together for their first Outbreak Control Team meeting. The class pools together their learning to answer a series of questions, including where the outbreak started, who is at risk of catching measles from the children, and whose health is at greatest risk if they did catch measles.

**[Teacher leads whole-class discussion following group talk]**

**Episode Two**

In this episode, the outbreak continues and the OCTs must try and predict whether this will become a major outbreak. They also take their first action to combat the outbreak.

The data analysts and science advisors use data on vaccination uptake in the area and an understanding of ‘herd immunity’ to assess whether a major outbreak is likely.

The healthcare workers research into the very small chances of death from measles and read a piece written by Roald Dahl, whose daughter sadly died of the disease. They look at the safety of the MMR vaccine.

**[Independent learning using Pupil Sheets provided and internet links]**

The Outbreak Control team gets together to discuss how poor vaccine coverage in the area means this could lead to a major outbreak.  
**[Teacher led whole-class discussion]**

The team must then make decisions on which emergency measures to enforce to try to slow the spread of the disease. Tough decisions must be made.

**[Teacher led whole-class discussion]**

The sad death of a man with measles leads to intense interest from the media.

The team must prepare to hold a press conference and answer the tough questions from the press …

**[paired talk]**

…before responding at the press conference.

**[Teacher led whole class activity]Episode Three**

In this episode, numbers of measles cases continue to rise further and the team must use persuasive writing to convince parents to get their children vaccinated. The data analysts must use a formal written letter to persuade the government to send large supplies of the vaccine to the vaccination clinics.

**[Independent learning]**

Cases rise steeply and the data analysts issue a red alert. The team must decide which age children to vaccinate first and where to set up the vaccination clinics.

**[Teacher led class discussion]**

But at the same time as the vaccination programme starts, the numbers start to spiral up.

The episode ends on a cliffhanger… will next week’s figures go down or up?

**Episode Four**

The final episode begins with the number of cases rising to its highest ever level.

The OCT has to convince the Minister of Health to stick with the vaccination programme.

**[Teacher led class discussion]**

The data analysts continue to check the number of measles cases and look for patterns in the data and the shape of their graphs.

They start to observe numbers decreasing rapidly indicating that the vaccination programme is working.

The OCT team start to prepare their ‘Outbreak Report’ which summarises their response to the outbreak, their reasons (based on the data) and how effective this was.

**[Independent Learning]**

Eventually the outbreak is declared over, a brief analysis is received and the outbreak reports are shared.

**[Teacher led]**

Finally the teacher leads a plenary showing how the activity was based upon a real outbreak in Swansea in 2013.

**Episode One – running guide**

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| --- | --- | --- | --- | --- | --- | --- |
| Simulation Week | Science questions | Story/Measles Cases | Activities | | | Classroom logistics |
| Healthcare workers | Data analysts | Science advisors |
| 1-2 | Where will the next cases occur? | Doctors report 4 cases of measles |  |  |  | Before beginning, assign pupils roles as data analysts, healthcare workers, or science advisors |
| 3-5 |  | New cases reported at two local schools.  Outbreak Control Team set up | **Independent learning**  Interview families of measles patients. Answer questions. | **Independent learning**  Start their measles line graph.  Analyse a graph to find out the effect of the introduction of measles vaccine in 1968.  Answer questions. | **Independent learning**  Research background information on measles, how it is spread and the type of vaccine used.  Answer questions. | **Give out Pupil Sheets**  Graph paper for data analysts  (with axes for those needing support) |
| 6 | Where did the outbreak start?  Who is at risk of catching measles?  Whose health is most at risk?  How can they be protected?  Are there any patterns in the number of measles cases?  Where are the new measles cases being found and why? | Measles cases slowly rise at the two infected schools | **Teacher Led**  Outbreak Control Team Meeting  Children share their information to answer the science questions | | | Allow each group to feedback to the class. |

General information about measles <http://www.nhs.uk/Conditions/Measles/Pages/Introduction.aspx>

**Episode Two – running guide**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Week | Science questions | Story | Activities | | | | Classroom logistics | |
| Healthcare workers | Data analysts | | Science advisors |  |
| 7-10 | Could this turn into a major outbreak? | Cases rising | **Independent learning**  Research and analyse pieces written by Roald Dahl, whose daughter died of measles.  Calculate numbers of deaths from measles. | **Independent learning**  Analyse the percentage of children of different ages in the area who are not vaccinated.  Work out the average percentage. | | **Independent learning**  Find out about the history of the MMR vaccine and what is meant by ‘herd’ immunity. | Give out PS1-3.  The healthcare workers and science advisors need access to a tablet or computer with internet access. | |
| 10 | A major outbreak is predicted. What extra actions should be taken to stop measles spreading? | Cases are not dropping significantly | **Teacher led**  Ask data analysts and science advisors for their conclusion on whether a major outbreak is likely, and ask the healthcare workers about how ill people might get.  Discuss which extra emergency measures should be taken. This discussion should use ideas from the science advisors’ training and The Speckled Monster activity. | | | |  | |
| 10-16 | What is the current situation with the measles outbreak?  Plus justifications of response so far | Cases go up and down but no significant overall trend either way. Sadly a death is announced. | **Paired talk**  Prepare answer to the press question “What can parents do to protect their children?” They should ask for advice from science advisors. | | **Paired talk**  Is the outbreak spiralling out of control? | **Paired talk**  Why did you introduce the emergency measures? They should discuss with data monitors. | Option to arrange classroom for a press conference and for some children to roleplay journalists. | |
| 16 |  |  | **Teacher led**  The press conference | | | |  |

Links: Roald Dahl account <http://www.ovg.ox.ac.uk/blogs/ojohn/how-dangerous-measles>

Video clip explaining herd immunity <https://www.youtube.com/watch?v=CPcC4oGB_o8>

**Episode 3 – running guide**

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| --- | --- | --- | --- | --- | --- | --- |
| Week | Science questions | Story/Measles Cases | Activities | | | Classroom logistics |
| Health care workers | Data analysts | Science advisors |
| 17 | Find a new strategy to defeat the outbreak. |  | **Teacher led**  Whole-class discussion. Conclusion: start a vaccination campaign. If needed teachers should steer the discussions to this conclusion. | | |  |
| 18-21 | How can you persuade parents that it is vital to get their children vaccinated? | Cases have risen slightly | **Independent learning**  Create a leaflet to persuade parents to get children vaccinated. (Children could refer to their reading of Roald Dahl’s account) | **Independent learning**  Write a letter to the government persuading them to send large quantities of vaccine and to give money to pay for more health workers. | **Independent learning**  Write a letter to parents persuading them to get their children vaccinated | Give out PS 1a,b |
| 21-22 | Which age groups should be vaccinated first? | Cases rise sharply.  Data analysts issue a red alert.  The government agrees to send more vaccine. | **Independent learning**  Interpret a bar graph to find out which age groups had the most and least cases of measles during a similar outbreak. The children could also draw their own bar graph. | **Independent learning**  Use an understanding of percentages to work out whether measles is more likely to spread quickly amongst 3 year olds or 11 year olds. | **Independent learning**  Complete tables using an understanding of percentages and draw pie charts to show how the supplies of vaccine will be distributed to different age groups. | Give out PS 2-3 |
| **Teacher led**  Whole-class discussion to decide which age groups should be vaccinated first. | | |  |
| 23 | Where should the new vaccination clinics be held? | The vaccine arrives. | **Teacher led**  A quick discussion should decide how the agreed age group could be best targeted in terms of choice of location of clinics. | | |  |
| 24 | How long do we have to wait to see if your vaccination programme is having an effect? | Cases rise again and reach the highest so far (158) | **Teacher led**  Whole-class discusses the data and questions as the data comes in.  Children interview for ‘national news’ if there is time. | | |  |
| 25-26 | Is the vaccination programme working?  Do you predict the figures will go up, down or stay the same? | Cliffhanger for next episode |  |
| 25 | Is the vaccination programme working? | Data monitors must decide the trend in measles cases (generally going down now) |  |

**Episode 4 – running guide**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Week | Science questions | Story/Measles Cases | Activities | | | | Classroom logistics |
| Health care workers | Data analysts | | Science advisors |
| 26 | Why should we not abandon the vaccine campaign? | The biggest number of cases yet (163) | **Teacher led**  Quick whole-class discussions | | | |  |
| 27-28 | Is the vaccination programme working? | Number of cases drops dramatically |
| 29 | Optional percentages problem |  | Group or individual problem-solving. | | | |
| 30 | Does this mean the outbreak is going to get worse again? | A slight rise in cases |  | | | |
| 31-32 |  | Cases continue to fall. |
| 33 | Optional percentages problem |  | Group or individual problem-solving | | | |
| 34-36 |  | Cases fall to zero. |  | | | |  |
| 36 | How did you use science to bring the outbreak under control? | Cases drop further so it is time to start reviewing the control of the outbreak.  Data monitors must check that cases don’t rise again and announce if and when the outbreak is over.  In the Outbreak Report the data monitors must present their measles cases graph and answer some questions on the data. | **Independent learning**  Write an explanation of who was vaccinated, when and why. | **Independent learning**  Complete labels to add to the measles cases graph. Show what actions were taken when, and how these were prompted by the data. | **Independent learning**  Write an explanation of why the area was at risk of an outbreak and why it is now unlikely to experience a future outbreak. | | Hand out all Pupil Sheets.  This graph is editable so you may wish to adjust this for your class.  The data analysts need scissors and glue. |
|  |  |  | **Teacher led**  Allow each team time to put their Outbreak Reports together (e.g. on sugar paper) and then ask each team to share their report with the whole class | | | | Sugar paper, glue, scissors needed or access to computers if electronic reports or presentations being produced. |
| Plenary |  | The last two slides explain the real life outbreak upon which this simulation was based, and highlight how serious a problem measles still is in developing countries. | **Teacher led plenary** | | | | Option to show a real BBC news clip about the Swansea outbreak. |

The real outbreak in Swansea in 2013: <http://www.bbc.co.uk/news/uk-wales-22350001>

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