

# Life-saving maths: How does vaccination work?



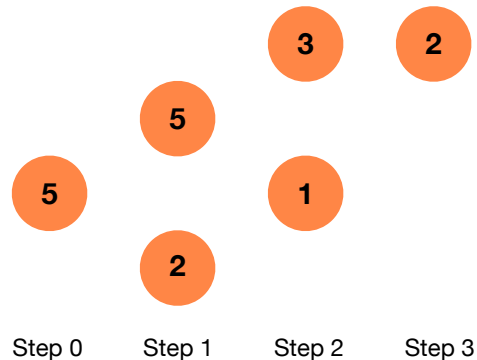
## Counter Plague

You will need (per student, pair or small group):

- 20 - 30 counters, the colour doesn't matter
- a 6-sided die

The activity:

- Step 0: put one counter on the table. This is the first infection.
- Step 1: throw the die. Use one of the tables below to see how many people are infected, and place the appropriate number of counters to the right of the first counter. The example above uses the LH table. A 5 at Step 0 means that two more people are infected, shown by the two counters at Step 1.
- Step 2: repeat for each newly infected person. In the example, a 5 for the top counter means two more infections, while the 2 for the bottom counter means no further infections.
- Step 3: repeat until either the epidemic dies out or you run out of counters (meaning the whole population has been infected). In the example, the epidemic died out after the 2 at Step 3.



Record the progress of the epidemic on a graph.

Number on die	Number of people infected
1	0
2	0
3	1
4	1
5	2
6	3

Number on die	Number of people infected
1	0
2	0
3	1
4	1
5	1
6	2

Counter Plague as a model for an epidemic:

- Run several 'epidemics', using the same table for the outcomes of each throw of the die.
- How do the graphs compare?
- Now run several 'epidemics' using the other table of outcomes.
- How do these compare with each other and with the first set of graphs?

How good is the Counter Plague model?

- What aspects of the model help us to understand how epidemics progress?
- Are there important factors which it does not include?
- Can you think of ways to improve it?

## Vaccination: Counter Plague

<https://motivate.maths.org/content/MathsHealth/Vaccination/>

Produced by Motivate, part of the Millennium Mathematics Project at the University of Cambridge, with grant funding from the Wellcome Trust (c) University of Cambridge 2011.

Permission is granted to reproduce this sheet for non-commercial educational uses only; for any other use please contact us: [mmp@maths.cam.ac.uk](mailto:mmp@maths.cam.ac.uk) [www.mmp.maths.org](http://www.mmp.maths.org)