Explaining COVID-19 Statistics to Children

Celia Brown, Associate Professor of Quantitative Research

This blog is a mixture of information for parents, and information and activities for children (aged 8-13). Some activities have different versions for older (10-13) and younger (8-10) children, so please read it through and see which parts may work for your family. The idea is for you to go through this together, with parents explaining what I have written where needed, then children doing the activities. I have purposefully not considered the risk of death related to COVID-19. Please consider the well-being of your family before talking to them about COVID-19 – this blog may not be suitable for all at this time. The answers can be found at the end of this PDF.

Introduction

Another day, another COVID-19 statistic in the news. This pandemic is affecting us all in many, many ways. Fortunately I do not have any serious problems, but as someone used to getting out-and-about every day, I am struggling with "lock-down" and I am sure I am not alone in having my mental health stretched to the limit. But as I tried to explain the risk of catching COVID-19 to my six-year old son (okay that's not on the national curriculum but we must be allowed a little flexibility when home-schooling, surely?) and a prompt from our PPIE Lead Magdalena Skrybant, I thought finding a way of representing this risk to children would make a good blog.

How Many People in the UK have COVID-19?

As of April 16th 2020, there were a total of **103,093** confirmed cases of COVID-19 in the UK (Public Health England statistics). A "confirmed case" is where someone has had a positive test for COVID-19.

1. *For older children: why might this number of cases be an underestimate of the true number, and how could we find out the true number of cases in the UK?*

What Fraction of the UK Population Have COVID-19?

To work out what fraction of the UK population had COVID-19 on April 16th (or had had it by then) we also need to know how not only the number of confirmed cases, but also how many people there are in the UK. We can use the 2018 estimate of the **UK population of 67,780,000** from the virus-tracking website: virusncov.com.

To make the maths a little easier, let's simplify things a bit by rounding down the number of **confirmed cases to 100,000**. This number of people would fill both Wembley stadium AND Colchester Community Football Stadium.

Image: Paul Hudson, 2007 (CC-BY 2.0)

Image: Louis, 2006 (CC-BY 2.0)

To work out the fraction of the UK population who have had a positive test (confirmed cases), we need to divide the number of confirmed cases by the UK population:

$$\frac{100{,}000}{67{,}780{,}000}$$

2a ***For older children**: Can you simplify this fraction?*

2b ***For younger children**: Can you cross off as many 0s from this fraction as possible – but the number of 0s you cross off from the top MUST be the same as the number of 0s you cross off from the bottom.*

Image: Jeremy Weate, 2011 (CC-BY 2.0)

What does this result mean? Out of every 6,778 people, 10 would be infected with COVID-19. This is equivalent to 10 people being infected from a full capacity crowd on Centre Court at Queen's Tennis Club in London.

We can also show this statistic as a proportion by **dividing 10 by 6,778.**

3. *Can you do this on a calculator?*

We can show this as a percentage by multiplying this result by 100.

4a ***For older children**: Can you do this without a calculator? Hint: move the decimal point to the right, the same number of places as there are 0s in 100.*

4b ***For younger children**: Can you do this using a calculator?*

As a comparator, Cancer Research UK suggest that around 0.5% of the population will be diagnosed with cancer this year, just over 3 times the number of confirmed cases of COVID-19 by 16th April.

The problems are:

A. The number of people each person will go onto infect. The World Health Organization say this could be as many as 3 people.

B. The speed at which these new people get infected. This is around 5 days.

C. The (unknown) number of people who have (or have had) COVID-19 but who haven't had a positive test, probably because they only had mild symptoms. These people can still pass it on to others.

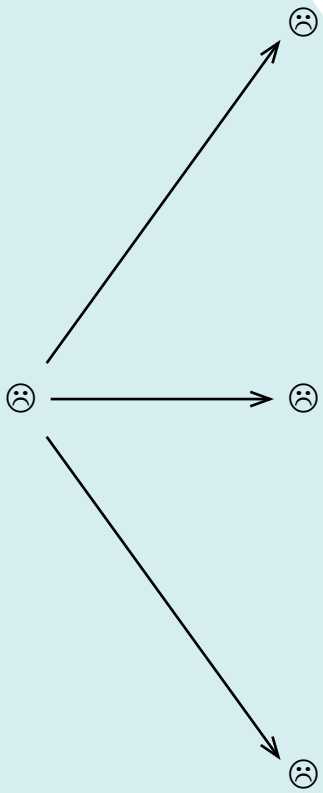
D. The severity of the disease (how poorly it can make you).

Simple summary: We think that anyone who gets COVID-19 will pass it on to 3 other people in 5 days.

So if we start with 1 person infected with COVID-19 on day 0, by day 5, 4 will be infected (the original person, plus the 3 people that person infected).

5. *Can you complete the diagram below to find how many people will be infected by the end of 15 days (just over two weeks)?*

	Day 0	Day 5	Day 10	Day 15
Total people infected	1	(3+1) = 4		



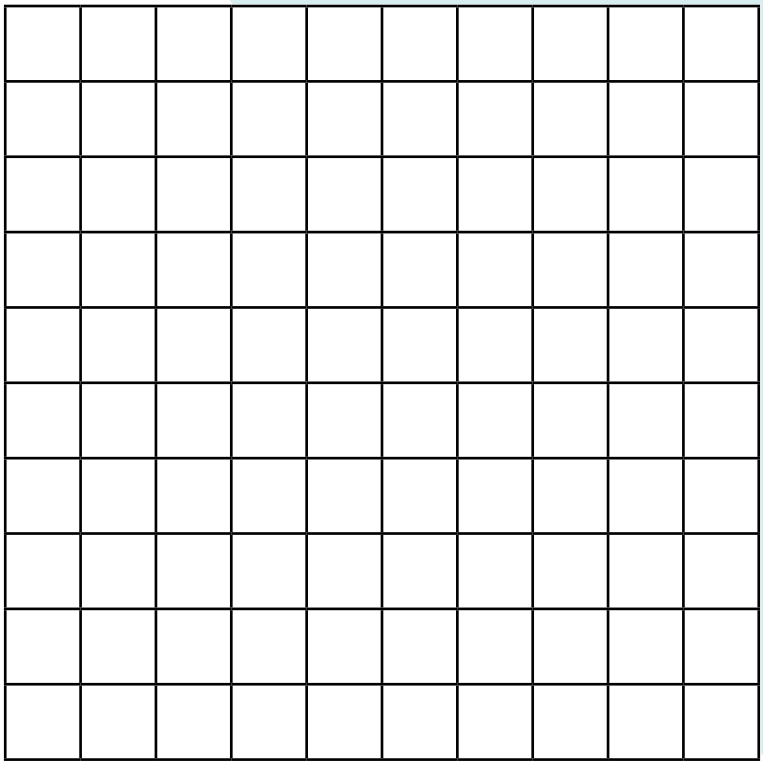
There's quite a complicated formula to work this out for any given number of 5 day periods. The diagram hopefully gave you an indication of the speed at which the number of people infected would increase if no measures to stop COVID-19 spreading were put in place.

In fact, without any action, almost the entire nation of 67 million people would be infected by day 80 (which is why we are all at home and going out – where we can be in contact with others – as little as possible).

Now we need to think about how poorly COVID-19 can make you. Of **100 people infected**, around **80** would have mild symptoms, **15** would have severe symptoms and **5** would be in a "critical" condition, needing ventilation. Most people who get COVID-19 will recover fairly quickly without any lasting impact on their health – and this applies to almost all children who are infected. The elderly, smokers and those with other health problems are more likely to be very poorly if they get COVID-19, which is why you may not be able to see your grandparents at the moment.

6a ***For older children***: *Can you draw a pie chart to show these data (by hand or using Excel)? Given 103,093 cases, how many would be mild, how many severe and how many critical?*

6b ***For younger children***: *Can you colour in the correct number of squares of the diagram below to show each of these numbers? Use green for mild, orange for severe and red for critical.*

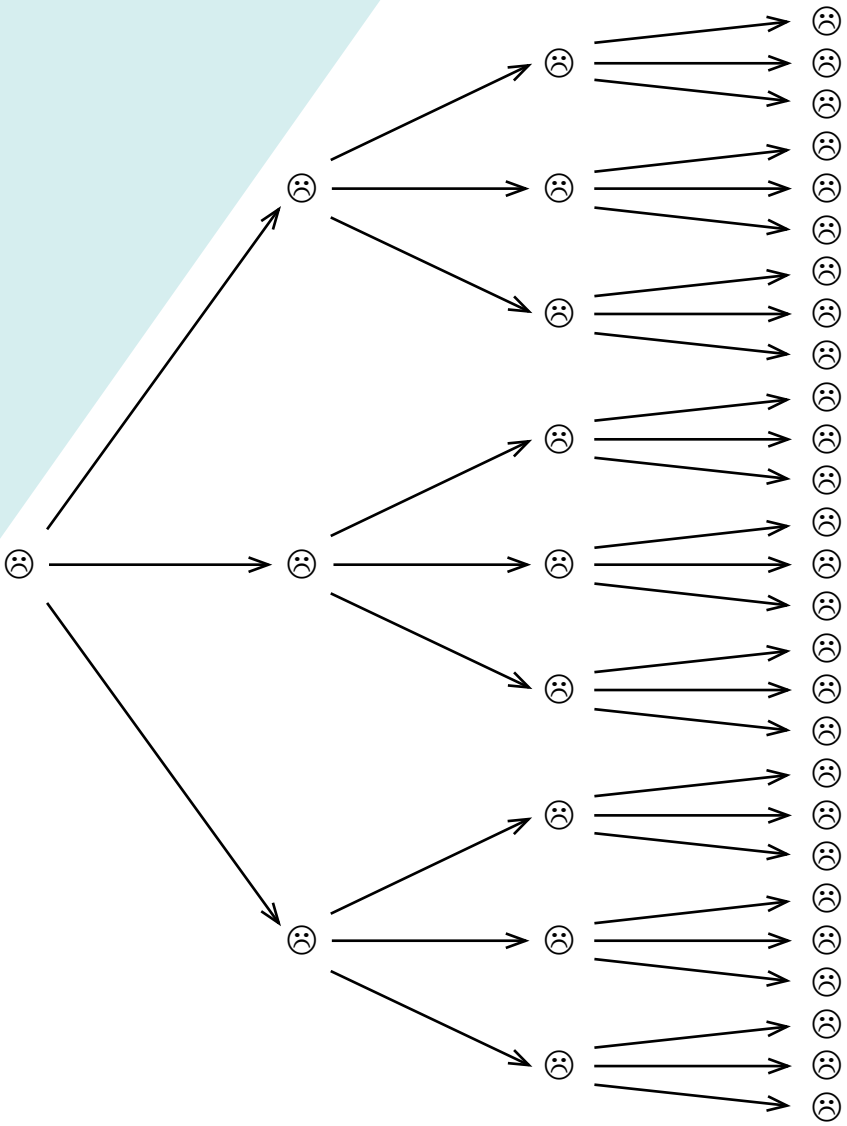


The speed of spread of COVID-19, together with its severity, makes it easy to see how the NHS would quickly be unable to cope if nothing was being done. So I'm off to wash my hands, and perhaps you should too!

Statistics Answers

1. The number of cases is likely to be an underestimate because the number of confirmed cases depends on the number of tests done and not everyone has been tested. We would only know the true number of cases if everyone in the country was tested in a single day: this would give us the point prevalence.
2. 10/6,778 (or 5/3,389) – there are four 0s top and bottom which can be "cancelled".
3. 0.00148
4. 0.148%. This means that around 0.15% of the population had a confirmed case of COVID-19 by 16th April.
5. 40 people (for adults, you can also calculate this using the formula: $\sum_{i=1}^{n} 3^{i-1}$ where i is period number and n is total number of periods).

	Day 0	Day 5	Day 10	Day 15
Total people infected	1	(3+1) = 4	(9+4) = 13	(13 + 27) = 40



6. 82,474 mild cases, 15,464 severe cases and 5,145 critical cases, all to the nearest whole number (103,093 x 0.8, 0.15 and 0.05, respectively).

Pie chart to show severity of COVID-19 cases