Silence before the storm?

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The more contagious mutant coronavirus B.1.1.7 was first detected in Kent in South East England in September. Studies suggest an increase of the number of infections between 30% and 70%. The mutant has now become the most common form of the virus in England and Northern Ireland and has been observed also in more than 50 other countries.

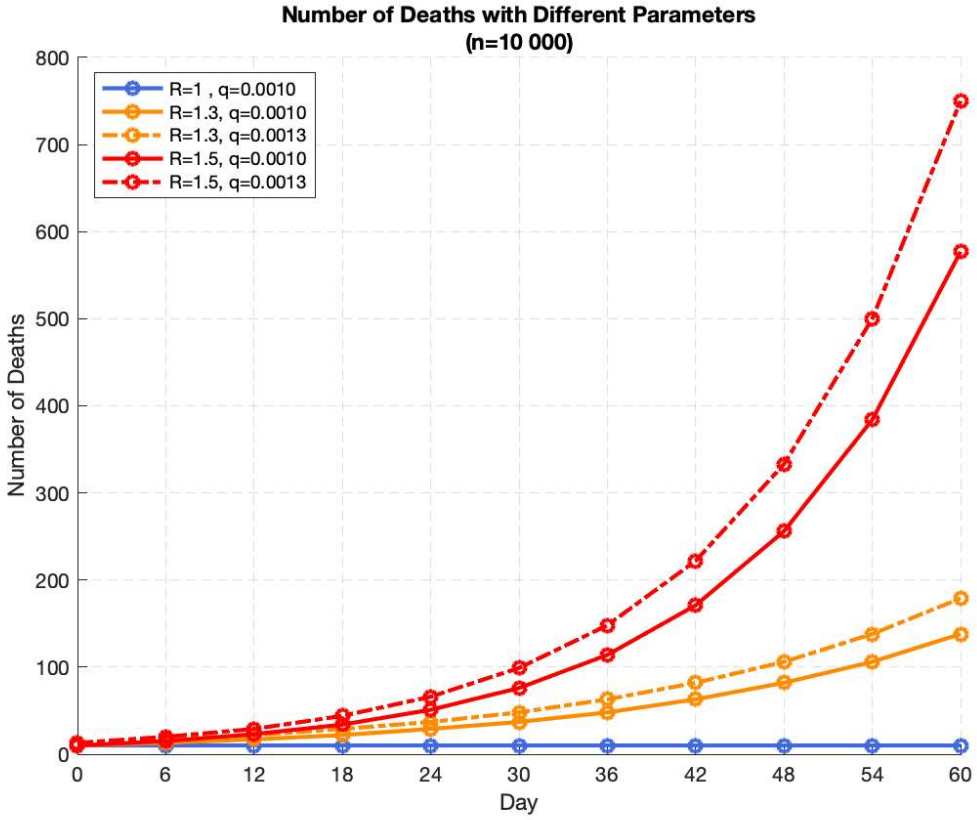
In several countries the current reproduction number R, which is the value that tells us the average number of people an infected person passes the virus to, is close to 1, implying that the the virus is neither spreading nor disappearing. In this article we will assume that the current R is equal to 1. For the infection rate of the mutant virus, we will consider two scenarios: the 'optimistic' 30% scenario and the 'average' 50% scenario. This means that we assume that without any further restrictions, the British variant will lead to a reproduction number equal to 1,3 or 1,5, depending on the scenario that we are considering. For both scenarios, it is only a matter of time before B.1.1.7 will become the dominant variant. It is expected that in many countries this situation will be reached in in 1 to 2 months.

Obviously, the appearance of the B.1.17 variant is a serious threat. Scientific studies investigating the effects of lockdown restrictions on the spreading of the original virus have become worthless in the light of the appearance of the new mutant virus. It is very unlikely that the current restrictions will be sufficient to avoid a new wave, it is rather very likely they will not. 'We are in a rickety truck that is driving down a steep mountain, and we don't know what curves are coming up and whether the road is suddenly about to get steeper', according to virologist Christian Drosten.

To illustrate the consequences of this new threat, we start from an initial group of 10000 infected people. We assume that an infection round takes 6 days. A person who is infected today will then infect a number of others in 6 days from here. As mentioned above, we suppose that the current reproduction number R equals 1. In this case, the number of infections is stable over time. Indeed, the initial group of 10000 infectious people will infect 10000 others. These 10000 newly infected persons will then again infect 10000 others in the next infection round. Further, let us suppose that the fatality rate q is equal to 0,1%, meaning that the probability that an infected person will die from the virus is 0,1%.

In the following graph, the numbers of fatalities (deaths) caused by consecutive infection rounds for the case R = 1 and q = 0,1% are displayed in blue. The horizontal axis of the graph indicates time, expressed in days. The blue curve on the graph shows the number of fatalities among the 10000 infected people observed at times 0, 6, 12 and so on. Notice that the 10 000 infections observed at each infection round will in the end lead to 10 deaths (on average). The numbers of deaths corresponding to different times shown in the graph are not the deaths observed at the

respective times, but the number of deaths caused eventually the group of infected people at that time.



Suppose now that the B.1.1.7 mutant of the virus has entered a particular country where the actual reproduction number for the original virus is equal to 1. Suppose that the variant has infected already 10000 persons. Let us first assume that the mutated variant is 30% more transmissible, leading to a B.1.1.7 reproduction number equal to 1,3. Starting from a group of 10000 people infected with the new variant, the number of B.1.1.7 infections is now growing exponentially. After 6 days (that is 1 round of infections), the number of B.1.1.7 - infected people rises to 10000 x 1,3 = 13000. One infection round later, the new number of B.1.1.7 - infected people is equal to 13000 x 1,3 = 16900. After 30 days (that is 5 infection rounds), the number of infected people has increased to 37130. This means that due to the appearance of the B.1.1.7 variant, the number of B.1.1.7 - infected people has become 3,7 times higher after only one month.

The number of fatalities from period to period follow from multiplying the number of infections by the fatality rate of 0,1%. In the graph, the number of B-1.1.7 related fatalities is depicted by the orange curve. After one month, the number of fatalities has also become 3,7 times higher than one month ago. Notice that the factor 3,7 is independent of the number of infected people at time 0 an also independent of the level of the fatality rate.

In a similar way, we can make the calculations for the second month. After two months, at the end of the tenth infection round, has grown to 137850, while the number of fatalities caused by the tenth infection round equals 138. In 2 months, both the number of infections and the number of fatalities has become 13,78 times higher!

So far, we considered the 'optimistic scenario' of a 30% increase of the reproduction number. Let us now have a look at the likely more realistic scenario of an increase of the reproduction number

R. by 50%. The red curve in the graph shows the number of fatalities after each infection round in case the B.1.1.7 variant increase the infection rate by 50%. In this scenario, the number of infections and fatalities has become 7,59 times higher after only one month, and even 57,67 times higher after 2 months!

Recently, some researchers believe that B.1.1.7 might not only be more infectious, but also more deadly. According to some early studies, the new strain is suspected to be 30% more deadly, meaning that the fatality rate grows from 0,1% to equal 0,13% for the new variant. In the graph, the numbers of fatalities in this case are shown by the dotted orange curve (for R = 1,3) and the dotted red curve (for R = 1.5). Comparing the full and dotted orange curves, we see that the 30% increase of the reproduction number causes a much more dramatic increase of fatalities than the additional 30% increase of the fatality rate. A 30% more deadly variant will lead to 30% more deaths, whereas a 30% more infectious variant will lead to a number of extra fatalities that is increasing exponentially over time. In this sense, there should be much more concern about the increase of the number of infections by 30% than about the additional increase of the fatality rate by 30%.

The more infectious B.1.1.7 variant will soon become the dominant one, leading to an exponentially increasing number of infections, hospitalizations and finally, also deaths. The situation might become unmanageable, except if additional restrictions which lead to a reproduction number R smaller than 1 are imposed. With extra restrictions reducing R to level 0,9, it will take about 36 days to reduce the number of infections and fatalities by 50%. Restrictions leading to an R equal to 0,7 will enable to let the numbers drop by 50% in only 12 days. Policy makers who are currently hesitating to impose extra restrictions because the explosive growth is yet not very visible in the figures, are showing irresponsible behavior. Instead of continuing with reactive decision making, they should now focus on proactive strategies to avoid a potential disaster.