The 3FactorFormula says balancing meetings makes the virus leave after 100 days

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A country is visited by a virus. Which will disappear again if we follow a simple rule: with normal hygiene, balance meeting time and meeting size to avoid congestion for a prolonged period. So, we need to balance to build up a herd immunity that will make the guest disappear instead of remaining for years.

At least, this is the clear message from the two infection formulas that calculate the basic reproduction number, i.e. how many people an infected person can infect. If the number is less than 1, the virus will gradually disappear.

The first infection formula is a three-factor formula that can easily be found on Google. The formula finds the basic reproduction number by multiplying three factors: impurity, meeting time and meeting size, thus reflecting the danger of meeting the impure in time and in space.

The three-factor formula is a doubling-formula that calculates the doubling of the basic reproduction number coming from doubling one or more of the three factors. Thus, it will increase from its starting level of 2.5 to 20 if all three factors are doubled. And it will fall to 0.3 by halving all three factors.

Doubling-formulas are known from the driving test where doubling the speed will quadruple the braking distance, which, conversely, is reduced to one quarter at half speed. The advice therefore is to adapt the speed to the situation, without, of course, stopping up.

In the case of an infection, the advice is the same, adapt the three factors mutually. If one factor doubles, another must be halved to keep the basic reproduction number unchanged. If the number of participants doubles, the meeting time must be halved, and the opposite. Stay normal, and, in bigger groups, shorten time a little since the time factor is the easier to change individually.

Staying at home is like stopping up, you're not going anywhere. When you leave home, the virus will still be there. And will disappear only when the population has achieved a herd immunity with about 60% infected.

In the three-factor formula, the first factor is hygiene, which may be kept calm with soap and alcohol.

The two other factors relate to our interaction in space and time. They may be kept calm with a limited group size for a limited time to avoid that many people are close together for a long time.

By doubling the three factors multiple times, after-skiing is an effective greenhouse for the cultivation of a virus. Later, if some participants attend an event doubling the number of participants and days, it may be assumed that almost all participants will become infected. As in Herning in Denmark, where a five days horse event in the beginning in March was attended by about 50,000 people, several of whom had previously attended after-skiing in the Alps.

Thus, at the beginning of April there was extra pressure on local hospitals calling for extra respirators, the number of which should be kept below 1,000 according to the Danish authorities. Whether this is possible depends on how quickly the basic reproduction number decreases as population immunity grows.

The second infection formula calculates how the basic reproduction number decreases over time. The formula comes in two versions, one uses periodic growth and a worksheet, the other uses instant growth and a formula book. They are both fictitious formulas based on assumptions, and then according to Occam's Razor, the simplest should be chosen.

Anyone can set up the spreadsheet model in just five and no more than ten minutes. Modeling hospital beds allows using actual data retrieved from the authorities.

The model assumes that the basic reproduction number decreases evenly from its starting value at 2.5 to zero after a number of periods. With 5 days as the period length, there is fine accordance with the Danish authority's numbers from March 16 to March 25 when the March 11 lockdown begins to show effect.

The model shows that herd immunity is reached after 20 periods, i.e. after 100 days. After 12 periods, the bed number has grown from 1 to its maximum of 878, of which approximately one in five or 176 persons need a respirator, thus well below the limit of 1000. Throughout the epidemic period there will be 6290 hospitalizations.

The model also shows that the epidemic began in mid-February. If it had been detected at this time by testing people returning from the virus greenhouses in the Alps, the virus would have left 100 days later, that is, by the end of May.

The model assumes that 1 bed per 550 infected is needed. Figures from Herning suggest that more likely 1 bed per 1650 infected is needed, which would then lead to full immunity in the 5.8M big Danish population.

But the model also shows that it has a great sensitivity to change. If the basic reproduction number changes by 1%, the maximum number of respirators will change by 14%. It is therefore important to avoid excessive changes in the normal state, and simply to ensure that the number of beds is close to what the model predicts. Thus, changing one of the three factors must be balanced with counter-changes in the other two factors so that the overall change is zero.

The authorities use the alternative formula book model, where the basic reproduction number decreases with increasing immunity. In this model, sensitivity is half, but still this recommends balanced interventions.

A third infection calculation is about percentages. It says that of those infected, only a percentage becomes sick, of which only a percentage becomes hospitalized, of which only a percentage will need intensive care, of which only a percentage will require a respirator.

The horse event in Herning offers a unique opportunity to determine these percentages, which will allow calculating the number of infected from the number of people hospitalized. We must therefore hope that the authorities will ensure that all the relevant figures from this horse event are obtained.

Hammering down the infection will not bring herd immunity. Instead, it brings us back to the start to next time use guidance from the three factors: with normal hygiene, balanced size and time when meeting.

So, during the virus visit we must postpone large and lengthy gatherings, and leave every other seat empty in events and during transport. The basic reproduction number then will rise to its initial value from which we just have to wait 100 days for the flock immunity to occur. Then, when the guest no longer feels welcome, it will leave the country.

Both infection formulas therefore warn against interventions that disturb the balance between the three factors. We must not exaggerate purity, we must not exaggerate the distance between us, and we must not drastically shorten the time of interaction. We must show normality and aim at balancing the three factors.

When the infection formulas so clearly recommend balance, why have politicians opted for lockdown?

The ancient Greek sophists warned that to practice democracy, the population must know nature from choice to avoid being patronized by choice masked as nature. So, in the future, maybe political parties should set up their own centers of knowledge.

Then, the next time a virus pays a visit, knowledge of the two infection formulas will immediately warn against unbalanced interventions so that the intruder can leave us again after 100 days.

With knowledge, we can avoid again wasting 100 days or more before getting started. Also, we can avoid the enormous costs of a lockdown when there is only a need to limit activities unable to balance the three factors.

The two infection formulas involve calculation techniques called proportionality and calculus or change-calculation, traditionally postponed to middle school and late high school. However, according to a Tarp 2018 paper in the Journal of Mathematics Education, both may be introduced in grade one if respecting instead of rejecting the double-numbers with units as 2 3s that children create when they adapt to and develop mastery of Many before school.

So, with proportionality and calculus from grade one, and with political knowledge centers, the next virus visit will be short-lived.

The model may be found at http://mathecademy.net/infection-model-time-based/.