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SPEAKERS

Sumon Majumdar

Okay, now we're doing the model of infections, and looking at the impact of different values of the parameters N and P on how infection spread. And the reason why we do that, is that in social sciences, very often we're talking about policies which have an impact on this, or we try and anticipate what's going to be the impact of a particular policy on various things, including the spread of infections. So unlike sciences, right, you cannot just run an experiment, a little experiment in a lab, and see what's the impact. So oftentimes, you really have to do that policy on a, on a large scale, and try and therefore you need to anticipate what might be the impact of a policy like that. So what we're going to do in the context of our simple example, with the spread of infections, is going to see what's going to be the impact of different policies, which impact N and P on the spread of infections.

So in the last video clip, we looked at the basic model, right, and the idea of the basic model is that if there were no restrictions, nothing was done. This is how, what the model predicted how the number of new infection would spread, right? So this really balloons up very quickly. Now suppose you think that suppose a lockdown is imposed. So what's the impact of a lockdown? so it reduces the number of interactions that people can have. So lockdown can come in different flavors, it can be a strict lockdown, super strict or moderate lockdown. Like you know, we have seen various types of policies implemented in different provinces and different countries across the world during this pandemic. So let's, let's look at what's going to be the impact. So here in the basic models, the number of interactions that people have per day is given by N equal to 20. What happens that suppose you have a lockdown, where the number of interactions as a result fall from 20 to 5. So let's see what's the impact? Again, like if we start with one infection, how do the infection spread when the number of interactions between people is now limited? So again, we're going to use the same formula that we had before and to do equal to N times 5, sorry, N is 5 times P, N times P to the power of T minus one, right? And what's sorry, what's T, it's this here is my day. Alright, so that's E6, minus one. And I hit Enter, that computes for me the number of new infections. In this new scenario, right, where due to lockdown, the number of number of interactions per person has fallen from N equal to 20 to N equal to 5. And now suppose we want to know check what happens to the spread of infections. Again, we're going to copy the cell that we've already computed now, and we're going to paste it using the formula in the other sets. And now you can if you compare this situation here, right, with the situation of the basic model with lockdowns, you can immediately see what's happening. In this scenario, we started with one infection like in the basic model, but now in day two, it's gone up to 1.5. Day three, it's 2.25, day four 3.375. And by day 10, it's gone up to about 38. And you see immediately the impact of a lockdown. Without the lockdown the number of new infections on day 10 in the basic model was 10 million. Now that has come down to 38. Right? So you can immediately see what's the impact of changing the N from N equal to 20 to N equal to 5. And you can try out for yourself various values of N in between, that suppose you don't have that strict a lockdown right, which is reducing your interaction to only 5 people. What happens, suppose N is equal to, is equal to 10. You can try this out because this particular Excel file is there on the module and you can change the parameters as you wish.

What happens suppose we move, so this was a lockdown where the number of interactions comes down and equal becomes 5, right? What if it's a really strict lockdown, right, things like we had seen in Italy, or Australia, okay. And let's say now as a result of the strict lockdown, the end comes down from 5 to even 2. That means every day each person can at most interact with 2 people. Right, so that's a really, really strict lockdown. So what's going to be the impact of that on the number of new infections. So let's again use the formula, it's equal to N is now 2, times P 0.3 to the power of that's T I6 minus one.

Okay, and now I copy that and I paste it in all the other cells. And now you see how the, how the number of new infections evolve under the super strict lockdown. It started with one, now it has come down to 0.6, day three it's 0.36. And by day 10 it's become really, really tiny, 0.0100 something something, right. So what this shows is that strict lockdowns, right, really have an impact on the spread of infections. Here without lockdown, the infection was just spreading wildly, crazily, right. Here, it has come down and become much less.

So this is the type of models that that epidemiologists use in order to try and predict what's going to be the impact of different policies like lockdowns. And in this particular model what lockdown impacts is the N. It was initially N equal to 20, then it's N equal to 5, now it's N equal to 2. Now the other type of policy that we talk about a lot, and the ones that are really having an effect, I'm recording this in the summer of 2021, are vaccinations. So what vaccinations do is that they reduce the probability of the infection spreading, right, so what it impacts is the P. So so let's say naturally, the level of contagion due to this virus is point three, so 30%. But let's say due to vaccinations, that probability of infection falls to 0.04, which is just 4%. Now, suppose we let life just be as normal, so we have no restrictions on interaction. So N goes back to N equal to 20. Now let's see if these in fact if this vaccinations are going to have an impact on the spread of the virus, again, we're starting with one we're going to do now, on day two, it's going to be N which is 20, times P, which is 0.04 to the power of, again, this is my day, M6 minus one, hit that. And if I copy this, and again, paste it in the other cells, that becomes, that gives you the spread of infections. So some of you may be wondering why this looks like this as compared to this column here. It's basically the alignment. So if I hit the Align Left, then it becomes like this. But, but the main thing is coming back to the impact of vaccinations here, you see that even if you start with one new infection due to vaccinations on day two it's 0.8, day three 0.64, then 0.51, and so on. And by day 10, it has fallen 0.13. So that means even if you go back to your normal routine, you have 20 interactions a day, but with vaccinations reducing the likelihood of the infection spreading from one infected person to another, the number of new infections doesn't go crazy. In fact, it starts falling.

[illegible]

And in fact, you know, you can change lots of things. Suppose you instead of one, you start with the number of new infections as 10, like you did in the clicker question, and the only thing that you would have to change is let's go back to the formula. Remember, in the formula, then the number of new infections will be 10 times N P to the power T minus one, that's that was the answer to your clicker question. So then this becomes this. And then if I copy this and paste here I get this. Now you see that even if there were a cluster of 10 new infections under vaccinations, the number of new infections start falling, right, it goes to 8, 6.4, and by day 10, it almost comes down to one. So this is what epidemiologists mean by vaccinations having an impact. They really reduce the number of, number of infections that, the number of new infections that come up.