THE SEPIR-MODEL: A SHORT DESCRIPTION

Together with Erhard Scholz we propose a new model for epidemics which we call SEPIR-model [KS]. The five letters stand for 5 compartments people pass through in this order: The **Susceptibles**, who are candidates to receive the virus, the **Exposed**, these are people who are infected but not yet infectious, the Propagators, who infect other people, the **Isolated**, either in quarantine or hospital, and the **Removed**, who have overcome the disease. The most important compartment is I, this occurs in the data sets under the name "Active cases", the people which are reported to be infected and are either sent to quarantine or hospital, so we call them isolated. So, the "I" also stands for those counted as infected (but, since in quarantine or hospital, not infecting others).

The model is recursive and just describes what happens: People who are infectious but not yet in quarantine or hospital infect daily a certain percentage of susceptibles. This percentage which we call infection rate is dependent on medical facts like the strength of the virus on the one hand and on the social behavior on the other hand. So it is a number $a(k)$ which changes from day to day. This process is the "engine" of the epidemic. Those who are infected move from the compartment S to compartment E, they are exposed. After a certain number of days they become themselves infectious although they don't show any symptoms yet. So they are in compartment P, they are going around and ready to infect others. After a few days they show symptoms (if not they are called asymptomatic and we discuss their role carefully). They will consult a doctor and will be sent to quarantine or hospital. Only at this moment they occur in the statistics of the health system, they are active cases. Since they are separated we call them isolated. After some time they are released from the quarantine or hospital and counted as removed.

This process is recursive and leads to a set of formulas which constitute the SEPIR model. It is easy to program and we found a systematic way to read of the central datum, the infection rate from the data. This allows to compute model curves and to compare them with the data. In the countries we have checked we found a good approximation of the data by model curves with a small number of constancy intervals for the infection rate. The result looks rather convincing. Harald Grohganz has written a program which allows everybody to see, what the SEPIR is good for https://sc.blsq.org/sepir/sim. One can give a date and the program will show you the model curve until that date and a forecast into the next 4 weeks. If you write a date from the past you can see how close the model curve is to the data. This gives some confidence that the model is rather realistic. If you give the actual date you see what the model predicts for the next 4 weeks. Since the infection rate is naturally fluctuating the forecast will change from day to day, sometimes dramatically. So it is recommended to look at the forecast for a few consecutive days.

Reference: Kreck, M., Scholz, E: Proposal of a compartment model of epidemics and applications to the Covid-19 pandemic https://arxiv.org/pdf/2009.00308.pdf