A simple numerical example that illustrates the Coronavarus epidemic

Sometimes, it is easier to understand abstract problems through a numerical example.

Assume one person gets infected with Coronavirus; that this person, in turn, infects two other persons; that the initially infected one is then identified as sick, and is immediately quarantined. The following day, the next two infected persons, in turn, infect two others, are then identified, and are also immediately quarantined. Repeat this process, with the mentioned infected persons, for fourteen consecutive days (two weeks).

The total number of infected Coronavirus cases, on the fourteenth day (the ones infected before are assumed already identified and quarantined) will be 2^K (two daily infected persons, to the power of K=14, where K is the number of days) = 16384, all of which now need to be identified, and quarantined for two weeks. Consider also, that identifying and finding who and where these 16384 newly infected persons are is, by no means, an easy or rapid task.

Of these 16384 infected persons, 80% will get well on their own (which means that 20% will need some medical attention). Thence, 3276 persons will need to go to the hospital to receive some treatment (requiring medical staff, respirators etc.). If the mortality rate is only 2% (currently this rate is being updated to 3.5%), there will be 16384*0.02 = 328 deaths.

I have not discussed, for ease of understanding, the ENTIRE number of Coronavirus infected cases, which can be obtained by adding the 16384 cases of the fourteenth day, with the 2^13=8192 cases of the thirteenth day, with all the other previous days, downward, until reaching the first, original infection case. Then we can recalculate the ENTIRE number of cases requiring medical attention, the total number of deaths, etc.

This is the size of the problem we are currently facing.

One KEY element to help decrease an epidemic outbreak is to keep low the Ro (R naught) number: (https://www.healthline.com/health/r-nought-reproduction-number)

What Is R0? Gauging Contagious Infections

Three possibilities exist for the potential spread or decline of a disease, depending on its R 0 value:. If R 0 is less than 1, each existing infection causes less than one new infection. In this …

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The importance of slowing the spread of an epidemic (infections) is that it buys us time to better research its viral characteristics (currently poorly known, for Coronavirus), to come up with a vaccine, and to build up an outbreak infrastructure (enough hospital isolation units, respirators, train the medical staff, make protective equipment for the medics, etc.).

Additional info canbe found in:
https://www.ncbi.nlm.nih.gov/pubmed/8261248

The estimation of the basic reproduction number for infectious diseases.

1. Stat Methods Med Res. 1993;2(1):23-41. The estimation of the basic reproduction number for infectious diseases. Dietz K(1). Author information: (1)Department of Medical Biometry, University of Tübingen, Germany. The basic reproduction number R_0 is the number of secondary cases which one case would produce in a completely susceptible population.

www.ncbi.nlm.nih.gov

An actual example of this situation can be found in the recent article:

https://www.cnn.com/2020/03/04/health/new-york-coronavirus-cases/index.html

New York: 1,000 people have been asked to self-quarantine after officials report a new cluster of coronavirus - CNN

The biggest city in the US is now a search zone for anyone who had close contact with five people recently diagnosed with novel coronavirus.

www.cnn.com

Statisticians study these problems using the well-known "Birth and Death" stochastic models.

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