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**From:** WOOLHOUSE Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=9C4153BCEE124D7181397F6F48883523-MEJW]  
**Sent:** 25/01/2020 10:10:44  
**To:** Ferguson, Neil M [neil.ferguson@i&s.com]; j.farrar@i&s.com  
**Subject:** Re: current situation CONFIDENTIAL

Dear Jeremy and Neil,

Having spent the past few days trying to answer the question 'how bad is it going to get' in a measured but accurate way I think we need an evidence-based answer to that question as soon as we possibly can.

The 2 key numbers reported in the WHO statement on Thursday are  $R_0=2$  and case-fatality rate = 4%. Plus we can estimate or make a reasonable guess at the generation time.

If we take those numbers at face value we quickly get a ballpark estimate of almost half the people in the UK (and many other countries) getting this infection over a year or so, at least a doubling of the gross mortality rate (much more during epidemic peak), and a completely overwhelmed health system.

I know that, you both know that, anyone in the infectious disease modelling community knows that, PHE must surely know that, and my undergraduate class could work it out with a pocket calculator if they thought about it for a few minutes. So someone, somewhere will be publishing it soon (if they haven't already) and the press will pick it up.

What's the right response? That's not a worst case; that's based on the central estimates published by WHO. What we hope and believe is that the numbers are wrong, especially that the case-fatality rate is massively overestimated (by an order of magnitude or so, ideally). It would be very, very helpful to have a revised estimate made and accepted by WHO extremely speedily. I'm not at the coalface in terms of epidemic data so I don't know whether it can be done with the information available.

Turning to government, my hope is that COBRA meetings are being informed by Neil and colleagues so that they understand both what the WHO figures imply and what the actual reality is likely to be. One signal is the PHE risk level. I get the logic of designating it low, but I sincerely hope that government machinery is not assuming it will stay there for long. In Scotland I do not see any signs that they are anticipating a  $R_0=2$   $CF=0.04$  event, and they hopefully they are right not to be, but what are they anticipating and on the basis of what evidence?

Sorry for the long e-mail.

Kind regards,  
Mark