

Message

From: Ferguson, Neil M [neil.ferguson@i&s]
Sent: 26/01/2020 10:28:30
To: WOOLHOUSE Mark [mark.woolhouse@i&s]
Subject: Re: current situation CONFIDENTIAL

So there are a few issues we are looking at:

- detection window - we assumed this before, while we may be able to estimate it now
- Epidemic growth - this also has an impact on the “effective” mean incubation period we should use in the calculation. Our current calculation is only strictly accurate for constant infection hazard
- Censoring - 10 cases with air travel history have now been detected overseas with onset up to 18/01.

The second 2 of these will increase our estimate above 4000. Not sure about the first yet.

Best,

Neil

From: WOOLHOUSE Mark <Mark.Woolhouse@i&s>
Sent: Sunday, January 26, 2020 08:39
To: Ferguson, Neil M
Subject: Re: current situation CONFIDENTIAL

Neil,
Another technical question.
Your case underestimation report is absolutely critical at the moment.
I certainly hope that it's right given the implications it has for the case fatality rate.
As I read the report you have made conservative assumptions and tested them with sensitivity analysis.
My question though is, despite all this, could you be wrong? (I don't want you to be and I doubt very much you are, but it's a worst case question).
The only think I could think of is that in some way the exported cases are linked. For example, they all passed through Wuhan airport on the same day and got infected from the same source [wild speculation, but perhaps a security guard or a waiter]. I doubt we can know this, but the result is so important it should be tested to destruction.
Or are there other ways the data could be misleading?
mw

From: Ferguson, Neil M <neil.ferguson@i&s>
Sent: 25 January 2020 16:58
To: WOOLHOUSE Mark <Mark.Woolhouse@i&s>
Subject: Re: current situation CONFIDENTIAL

Interesting question. Depends on if there is differential detection of severe vs milder cases. If it's the same, you could be right. In which case the delay from confirmation to death is critical (we don't know that, of course!)

Best,

Neil

From: WOOLHOUSE Mark <Mark.Woolhouse@I&S>
Sent: Saturday, January 25, 2020 4:41:04 PM
To: Ferguson, Neil M <neil.ferguson@I&S>
Subject: Re: current situation CONFIDENTIAL

Neil,
Quick technical question.
Is the likely underestimation of CF a function of the "true" doubling time or the observed one (agreeing with the caveats about that you list)? I have a nasty feeling it's the latter.
mw

From: Ferguson, Neil M <neil.ferguson@I&S>
Sent: 25 January 2020 16:21
To: WOOLHOUSE Mark <Mark.Woolhouse@I&S>; Jeremy Farrar <J.Farrar@I&S>
Subject: Re: current situation CONFIDENTIAL

All good points. We think the doubling time is between 6 and 8 days. Could be shorter if the Wuhan epidemic was even larger than 10000 onsets by 18 Jan.

But the real problem right now is that it is impossible to interpret recent rises in cases in China. Much of it is likely scaling of testing, with some backlog of testing. So we have no real incidence measure right now. We also don't know the mean time from onset to death. And people discharged from hospital are apparently not being reliably reported.

We are currently trying to put rough bounds on CFR though.

Report is at:

<https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/news--wuhan-coronavirus/>

See also

https://twitter.com/mrc_outbreak/status/1221032729971773440?s=21

And

https://twitter.com/neil_ferguson/status/1221048222820524032?s=21

Best,

Neil

Best,

Neil

From: WOOLHOUSE Mark <Mark.Woolhouse [I&S]>
Sent: Saturday, January 25, 2020 16:12
To: Ferguson, Neil M; Jeremy Farrar
Subject: RE: current situation CONFIDENTIAL

Neil,
One last update on the case-fatality rate estimates.
As I understand it the WHO are using the crudest possible measure of known death over known cases. No censoring. With confirmed cases doubling every 2 days this could be a big underestimate. As far as we can make out the published patient data reports admission dates and death dates but not coronavirus confirmation date, so it's impossible to correct the estimate. I can easily see it being double the 4% figure though.
Presumably someone, somewhere is doing this properly, but the lack of information is a real concern.
I came into the office this morning thinking we had a $R_0=2$, $CF=0.04$ event. I leave it now concerned that we have a $R_0=3$, $CF=0.08$ event, i.e. SARS all over again.
Yes, that correction for under-reporting could (hopefully will) make a massive difference to the scenario. But, as a Chinese colleague pointed out to me today, the Chinese government are behaving as if they are working with the SARS scenario. Do we know if they are?
Kind regards,
Mark
PS Didn't see your report on-line yet.

From: WOOLHOUSE Mark
Sent: 25 January 2020 11:54
To: Ferguson, Neil M <neil.ferguson [I&S]>; Jeremy Farrar <J.Farrar [I&S]>
Subject: RE: current situation CONFIDENTIAL

Neil,
This is really good, many thanks. But it reinforces the high R_0 (as accurately as can be done at the moment I'm quite sure) but does not address the case-fatality rate. Once we're reconciled to the former the latter becomes critical. Do you have a revised estimate of that based on your estimate of hidden cases? And will the WHO incorporate it into their briefings? Until we do have a lower CF estimate we are led infer an imminent crisis.
I also agree that the estimates do depend on I_0 (number of seed cases). The Edinburgh phylogeneticists have been onto this. With the (still ridiculously limited) sequence data that's been made available (are people sitting on that?) we do think it's a point source, but it could be a point source super-spreader event (e.g. not one animal but a cage full of them [pure speculation]). We don't think there's been sustained zoonotic transmission (which you and I discussed before).
Kind regards,
Mark

From: Ferguson, Neil M <neil.ferguson [I&S]>
Sent: 25 January 2020 10:38
To: WOOLHOUSE Mark <Mark.Woolhouse [I&S]>; Jeremy Farrar <J.Farrar [I&S]>
Subject: RE: current situation CONFIDENTIAL

Resending to J's correct wellcome address. Sorry for multiple repeats

From: Ferguson, Neil M <neil.ferguson [I&S]>
Sent: 25 January 2020 10:23
To: WOOLHOUSE Mark <Mark.Woolhouse [I&S]>; j.farrar [I&S]
Subject: Re: current situation CONFIDENTIAL

Fully agree. Jeremy and I were saying the same to Patrick Vallance and Chris Whitty last night. I hope (and think likely) that COBRA will meet early next week.

We will be releasing the attached in the next hour or two. It is a longer version of a report circulated to WHO, UK & US govt earlier this week. Our estimates are likely conservative. A lot of the recently reported international cases had onset and travelled before 18th Jan, the cut-off of our analysis estimating 4000 cases in Wuhan. We will update when we can, but my feeling is that $R_0 \sim 3$ is not unreasonable.

Best,

Neil

From: WOOLHOUSE Mark <Mark.Woolhouse@I&S>

Sent: Saturday, January 25, 2020 9:50:54 AM

To: j.farrar@I&S <j.farrar@I&S>; Ferguson, Neil M <neil.ferguson@I&S>

Subject: 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

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