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Sent:	12/05/2020 12:20:19
To:	Christopher Williams (Public Health Wales - No. 2 Capital Quarter, Health Protection) [Christopher.Williams25@wales.nhs.uk]
CC:	Goulding, David (HSS - DHP Public Health) [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=09352f82b48c4a25a6b6cf936fa8673f-Goulding, D]; Atherton, Frank (HSS - Chief Medical Officer) [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=7f89dd16eea4492188440f6fb67d90a2-Atherton, F]; Quentin.Sandifer@wales.nhs.uk
Subject:	RE: Science into Policy for COVID-19

Hi Chris

Please could we discuss? Perhaps John isn't sighted on circuit breaker work or surveillance strategy.

Rob

From: John Watkins <WatkinsJ8@[I&S]
Sent: 12 May 2020 12:17
To: Quentin.Sandifer@wales.nhs.uk; Orford, Rob (HSS - Primary Care & Health Science) <Rob.Orford@gov.wales>
Cc: Goulding, David (HSS - DHP Public Health) <David.Goulding@gov.wales>; Atherton, Frank (HSS - Chief Medical Officer) <Frank.Atherton@gov.wales>
Subject: Science into Policy for COVID-19

Hi Both

I am writing to you both to express my concern as an Epidemiologist on two issues, the first being the differential approach adopted in Wales compared to England on the relaxing of Lockdown and the second around the almost evangelistic belief that the way to monitor control of the COVID-19 pandemic in the UK is via the value of R0.

On the first point, I find it quite alarming that the four home nations are not marching in step in addressing the challenge of exiting 'lockdown'.

From a scientific point of view, the epidemiology of this disease does not warrant this differential approach and therefore I am a concerned that opinion is diverging. Wales, with its extended land border with England, crossed daily by citizens for work, with differing rules backed by law, puts people in a particularly difficult position . If all policy in this matter is based on Science and I am not aware of any difference in the scientific advice given to Welsh Government compared to England, then why have ministers chosen a different course?

On the second and more worrying point R0 seems to have taken on a meaning and an unwarranted prominence, in the national strategy to control this pandemic.

Just for clarity the following should be made clear to politicians and decision makers about R0;

- R0 is difficult to calculate at the best of times but virtually impossible, with any degree of certainty, in the middle of an epidemic with incomplete data
- The value of R0 is very dependent on the method by which it is calculated, with little agreement between methods

- Each method to calculate R0 gives rise to a different distribution function hence divergence will occur in R0 at various value points
- R0 is not a biological constant of the virus
- R0 is a spatially dependent variable which also varies with the transmissibility of the pathogen concerned
- R0 depends on social structure, population density, mobility and duration of infectivity
- Calculation of R0 is a product of past history and has an inherent error that arises from this
- The stochastic nature of the disease leads to errors in R0 no matter how it is calculated
- Heterogeneity exists in population network structure, this structure is a non-linear, power law distribution, this leads to greater dispersion in the value of R0 across a society
- This variation means there is no average value for a population.
- Preferential attachment theory leads, in the early stages of disease, to highly connected individuals, such as the PM, getting infected.

When the network structure of society is taken into account a number of factors flow from this. High dispersion values in R0 (due to varied population dynamics) leads to much lower epidemic peaks than SIR models would predict (cf. the Imperial and LSHTM models which predicted very high mortality rates). In power law distributed network structures diseases with an R0 > 1 do not necessarily cause epidemics cf. Ebola and SARS, by the same token an R0<1 does not lead to extinction of the disease and can lead to an endemic course in a population. These high dispersion values of R0 also mitigate against the unfounded belief, propagated by governmental briefings and the media, that there will be a more lethal second and subsequent waves, there is very little historical evidence, or precedent, for this.

Given how difficult it is to calculate a value for R0 and how dependent this value is on the method used, it is quite surprising the level of faith and precision being placed on it as a tool to modulate suppression strategies. As the number of cases fall (cases themselves have huge uncertainties surrounding them as they are highly dependent on testing rates. Death counts as a metric, on the other, while being a more robust, hard outcome, has its own problems in terms of; time delay from infection to death, incomplete reporting, reporting bias not including all community deaths, deaths with but not caused by, COVID-19 etc.) then the computed value of R0 becomes more uncertain. This latter point is quite important, in that, Boris Johnson, suggested in his speech on Sunday that suppression and lockdown measures would be modulated, area by area, via the local value of R0 and technology enabled smartphone apps.

In this country we have been really good at convincing the public to go along with government policy and that this policy can be trusted because it is led by science, we therefore do people a disservice in attaching such precision to an imprecise metric such as R0, so much so, David Shukman, a well-respected journalist, even produces it with a graphic of a volume control as if it could be modulated like the sound of music.

I would be grateful for your views on my observations.

Best wishes

John

Professor John Watkins