DOH Covid modelling symposium

Barry Childs, healthcare committee chair
2020 05 21

16 March

19 March

26 March

28 April

Called for volunteers from the healthcare committee and formed a working group and a modelling subgroup.

Divvied up tasks to data gathering, research and literature review and model building.

Wrote code, agonised over assumptions

Published first set of results

Received wide ranging feedback (some saying too high, some too low) and critique for model refinement.

Calibrate to emerging data (base scenario is below current deaths)

Approach is to produce a model for use by broader profession that is sound in its basis and provides guidance in its application. To contribute to national debate. To provide a flexible framework to allow for the application of actuarial judgement. To model the impact of Covid-19 on mortality as well as healthcare resource utilisation

Special thanks to:

Percept	NMG
Clinix	3One
Alexander Forbes	Discovery
Medscheme	Insight

Model structure

Base parameters

- $R0 = 3$
- *Proportion of asymptomatic cases = 75%*
- *Relative Infectiousness of asymptomatic cases (to symptomatic cases) – 50%*
- *30% of mild cases detected, all severe and critical cases detected**
- *Lockdown effect = 60% x R0*
- *NPIs after lockdown = 75% x R0*
- *Infectiousness pre isolation: Asymptomatic 10 days, Mild 7 days, Severe 2.3 days,*
- *Severe isolated in hospital for 3.7 days*
- *Hospital stay: 10 days if not critical, 6 critical days if critical plus 10 days in ICU if recover or 6 if die*
- *Proportion of admissions ending in ICU =21.3%.*

Scenario 2 (else equal to base)
- *R0 = 2.6*
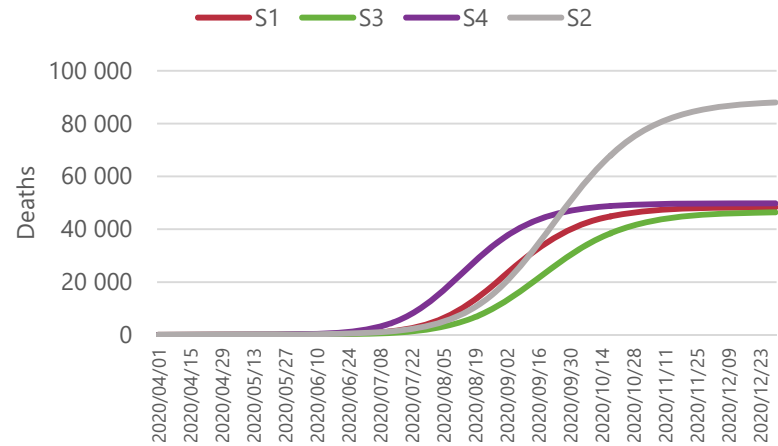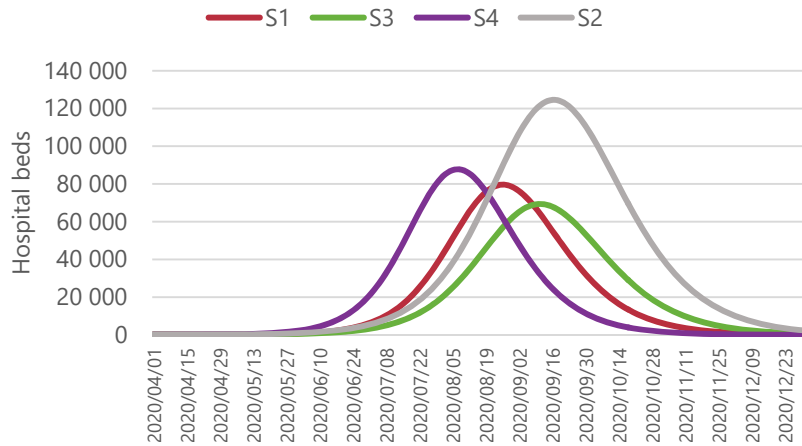- *Asymptomatic proportion = 50%*

Scenario 3 (else equal to base)
- *Lockdown effect = 50% x R0*
- *NPIs after lockdown effect = 70% x R0*

Scenario 4 (else equal to base)
- *Lockdown effect = 70% x R0*
- *NPIs after lockdown effect = 80% x R0*

First set of scenarios

Model outputs illustrate sensitivity to some key parameter values. Lowering the Reproduction rate pushes curves back but overall figures remain similar unless R0 can be maintained below 1. Altering asymptomatic assumption has a significant effect. Based on feedback and critique from the broader profession models and parameters are being refined.
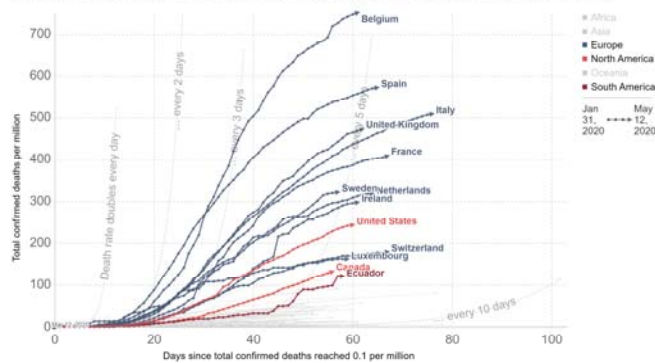
Models
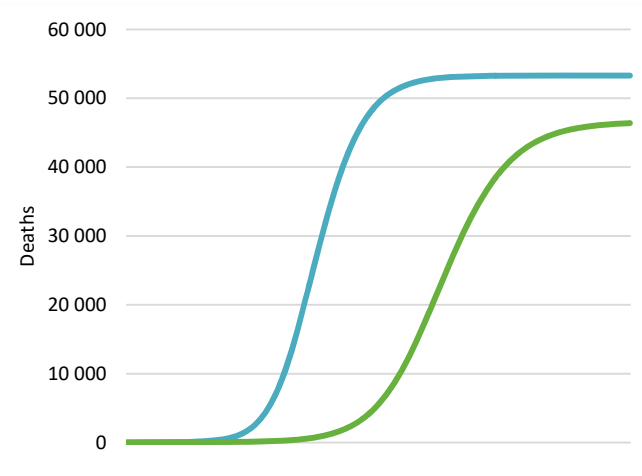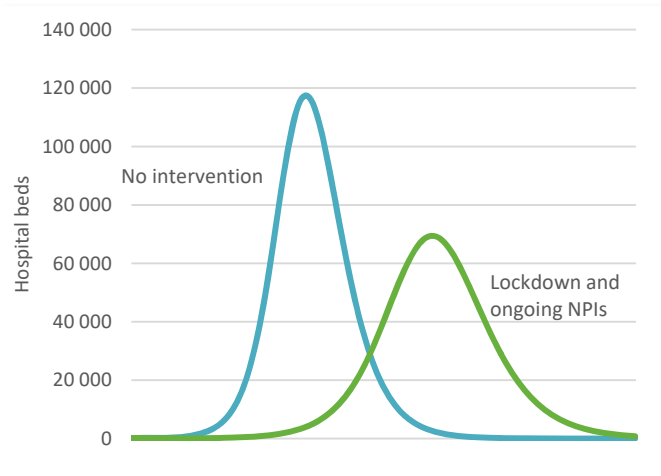
Models driven by parameters, informed by research and literature. Useful for predictions and policy testing. Sensitive to model structure and parameter choices. Much remains unknown. Model shortcomings such as spatial dynamics, population heterogeneity, variations in infectivity, etc still need to be allowed for.
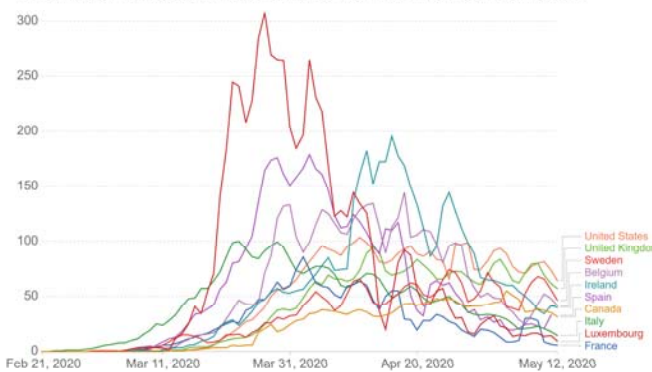
International data

Worst affected countries starting to level off, topping out at 600 deaths per million (excl. Belgium*). Many countries, especially developing countries have followed a much lower path. Concerns remain about under reported deaths and excess mortality which will still aggravate figures, and re-emergence of cases

Other, 28 300, 6%

Other infectious diseases, 32 010, 7%

Maternal, neonatal, neurological, mental, & msk disorders, 28 024, 6%

Neoplasms, 48 637, 10%

Self harm, violence, transport, substance abuse, 39 435, 8%

HIV, STDs, Respiratory infctions & TB, 183 300, 39%

NCDs, 115 661, 24%

2017 Cause of death estimates
Global health data exchange

~ 1,300 deaths a day
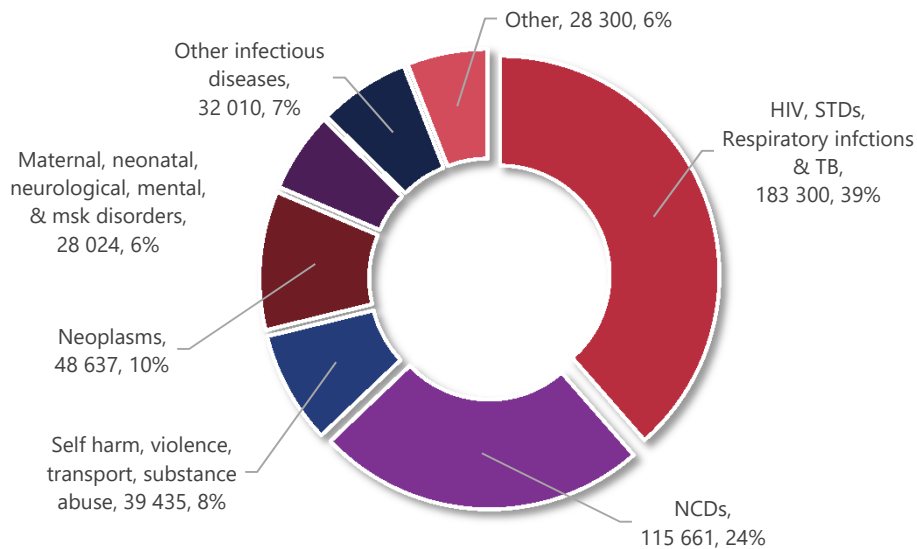
Significant concern that management of other conditions fall by the way side due to focus on Covid-19

"In high burden settings, HIV, TB and malaria related deaths over 5 years may be increased by up to 10%, 20% and 36%, respectively, compared to if there were no COVID-19 epidemic. We estimate the greatest impact on HIV to be from interruption to ART, which may occur during a period of high or extremely high health system demand; for TB, we estimate the greatest impact is from reductions in timely diagnosis and treatment of new cases, which may result from a long period of COVID-19 suppression interventions"

Report 19 - The Potential Impact of the COVID-19 Epidemic on HIV, TB and Malaria in Low- and Middle-Income Countries, Imperial College London

Contributors to disease progression and effect

Latent factors

Age profile	Young age profile by international standards should keep mortality rates low
Comorbidities	Moderate relative burdens of NCDs
HIV and TB	High burden but not yet indicated as significant risk factors. HIV not on treatment remain a concern
Obesity	Moderate to high levels of obesity
Density	High proportion of population in urban areas Large geographies have low density

Policy factors

Early lockdown	Early lockdown bought time for scaling up testing, planning, training, facility preparedness
Testing	High levels of testing by international standards, positive rate of +/- 1/30 tests but delays are a problem
Bed capacity	Overall hospitals bed capacity looks manageable ICU capacity may still be breached if the surge comes
Education Awareness Mobility NPI Compliance	High general awareness and education of hand washing, social distancing, mask wearing. Difficulties persist in compliance – some related to queuing for food, grants, etc

Share of men that are obese, 2016
Obesity is defined as having a body-mass index (BMI) equal to or greater than 30. Body mass index is a person's weight in kilograms divided by his height in metres squared.

Persons per km sq
0   3 009

No data 0%   5%   10%   15%   20%   25%   30%   35%   >40%

Source: WHO, Global Health Observatory   OurWorldInData.org/obesity • CC BY