DOH Covid modelling symposium
Barry Childs, healthcare committee chair
2020 05 21
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.

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

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)

Special thanks to:
Percept
Clinix
Alexander Forbes
Medscheme

NMG
3One
Discovery
Insight

Quantifying Risk, Enabling Opportunity.
Model structure

Base parameters

- $R_0 = 3$
- 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 = $60\% \times R_0$
- NPIs after lockdown = $75\% \times R_0$
- 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)
- $R_0 = 2.6$
- Asymptomatic proportion = 50%

Scenario 3 (else equal to base)
- Lockdown effect = $50\% \times R_0$
- NPIs after lockdown effect = $70\% \times R_0$

Scenario 4 (else equal to base)
- Lockdown effect = $70\% \times R_0$
- NPIs after lockdown effect = $80\% \times R_0
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 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.

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.
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

2017 Cause of death estimates

Global health data exchange

~ 1,300 deaths a day
### Contributors to disease progression and effect

<table>
<thead>
<tr>
<th>Latent factors</th>
<th>Policy factors</th>
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<tbody>
<tr>
<td>Age profile</td>
<td>Early lockdown bought time for scaling up testing, planning,</td>
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<tr>
<td>Comorbidities</td>
<td>training, facility preparedness</td>
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<tr>
<td>HIV and TB</td>
<td>High levels of testing by international standards, positive</td>
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<td>Obesity</td>
<td>rate of +/- 1/30 tests but delays are a problem</td>
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<tr>
<td>Density</td>
<td>Overall hospitals bed capacity looks manageable</td>
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<td></td>
<td>ICU capacity may still be breached if the surge comes</td>
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<td>Young age profile by international standards</td>
<td>High general awareness and education of hand washing, social</td>
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<td>should keep mortality rates low</td>
<td>distancing, mask wearing. Difficulties persist in compliance</td>
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<tr>
<td>Moderate relative burdens of NCDs</td>
<td>– some related to queuing for food, grants, etc</td>
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<tr>
<td>High burden but not yet indicated as significant</td>
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<td>risk factors. HIV not on treatment remain a concern</td>
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<td>Moderate to high levels of obesity</td>
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<td>High proportion of population in urban areas</td>
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