Closing and reopening borders in response to COVID-19

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Singapore’s idiosyncratic pandemic

Arrivals from most countries to do on arrival PCR, 14d quarantine in hotel or other facility, and exit PCR before release

All cases are isolated in a healthcare facility (hospital or temporary facility)

Aug to Dec:
130 local cases
1110 importations

Early closure of border to travel from Hubei, then PRC

Travellers allowed to quarantine at home

Almost zero cross-border travel

Default policy: 14d strict quarantine with PCR tests

Local cases
Imported cases

Infections among foreign workers not shown: the numbers are just too large
Impact of border control

Model overview

Hypothetical population of travellers

- Hard to detect
- Can be detected
- High chance of detection

Testing strategies simulated

- Secondary infections $R_0 = 2$
- Spillover to community

Key parameter: sensitivity

PCR

Antigen

Turning Discovery into Healthier Communities
## Impact of border control

<table>
<thead>
<tr>
<th>On arrival</th>
<th>Quarantine exit</th>
<th>Prevalence</th>
<th>Infected travellers (/ 10 000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR</td>
<td></td>
<td>2%</td>
<td>200</td>
</tr>
<tr>
<td>Quarantine</td>
<td></td>
<td>1%</td>
<td>100</td>
</tr>
<tr>
<td>PCR</td>
<td></td>
<td>0.5%</td>
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</tr>
<tr>
<td>PCR</td>
<td></td>
<td>0.15%</td>
<td>15</td>
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### On arrival PCR

<table>
<thead>
<tr>
<th>Quarantine</th>
<th>% missed</th>
<th>N missed</th>
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<tbody>
<tr>
<td>3d</td>
<td>17%</td>
<td>33</td>
</tr>
<tr>
<td>7d</td>
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<td>15</td>
</tr>
<tr>
<td>10d</td>
<td>4%</td>
<td>7</td>
</tr>
<tr>
<td>14d</td>
<td>2%</td>
<td>3</td>
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3 Prevalence of infection within the last 14d
## Impact of border control

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<tr>
<th>Prevalence</th>
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<td>4%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14d</td>
<td>2%</td>
<td>5</td>
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Prevalence is of infection within the last 14d.
Cases and deaths per million, 2020

ASEAN

Cases: 6
Deaths: 0
MYANMAR

Cases: 2,300
Deaths: 50
LAOS

Cases: 15
Deaths: 0
VIETNAM

Cases: 23
Deaths: 0
CAMBODIA

Cases: 370
Deaths: 7
BRUNEI

Cases: 3,600
Deaths: 15
MALAYSIA

Cases: 4,400
Deaths: 87
PHILIPPINES

Cases: 2,800
Deaths: 83
INDONESIA

Cases: 10,000
Deaths: 5
SINGAPORE

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For comparison:

USA
Cases: 61,000
Deaths: 1,100

UK
Cases: 37,000
Deaths: 1,100

France
Cases: 39,000
Deaths: 960

Turning Discovery into Healthier Communities
image derived from original by freepik www.freepik.com/vectors/travel