Strategies for controlling the medical and socio-economic costs of the Corona pandemic

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Based on (https://clausen.berkeley.edu/wp-content/uploads/2020/04/Corona.pdf)
Introduction: Public health versus the economy?

- Purpose of paper:
  1. Provide a simple estimate of costs of epidemic which is applicable across countries.
  2. Provide model of epidemic when population and government react to spread of disease (key assumption: social distancing becomes acceptable when actual cases rise, providing evidence of its seriousness).
  3. Put the first two elements together to check which approach leads to lowest social costs.
Avant-propos: Two technical points on
i) herd immunity, and i) control
Part I: Simple estimate of (economic) costs of epidemic

• Most models concentrate on value of lives lost.
• We argue: medical (hospitalization, etc.) costs are important in themselves.
• Here: provide simple estimate of order of magnitude of both medical costs and value of lives lost – in a way that can be related to model and directly to overall evaluations of different strategies.
• Two simplifying elements:
  1. No discounting (COVID-19 epidemic takes months, not years)
  2. All figures as % of GDP per capita, facilitates cross country comparisons
Estimating ‘non life’ costs: bottom up versus top down

- Top down: take known costs so far, multiply by (inverse of) population still ‘susceptible’.
- Bottom down: look at key costs caused by infections (and multiply by percentage of population ‘at risk’): Key elements here: Working time lost, Hospital stay, Intensive care
Estimating ‘non life’ costs: top down

- Germany, the Ministry of Health has so far foreseen an increase in expenditure of about €10 billion, which amounts to about €50,000 per case, or 100% of German GDP per capita per case.

- Spain: similar, budget of the central government foresees for 2020 additional health expenditures of around €4.4 billion, or about €20,000 per case, about 2/3rd of Spanish GDP per capita per case (Hernández, 2020).

- Key question: proportion of population that might still be infected?

- For unchecked pandemic medical costs might be very large since potentially up to 90% of population might be infected.

- All this without ‘bottleneck costs’ (ICUs, etc.).
Estimating ‘non life’ costs: bottom up

Key cost elements caused by infections (all in GDP per capita, unit of time 2 weeks (average for symptomatic cases):

First assumption: one half asymptomatic.

• Working time lost, two weeks symptoms plus isolation = one month lost = 5 % GDP p.c. .

• Hospital stay, two weeks for 20 % of cases with cost = 30 % of GDP.

• Intensive care, two weeks for 5 % of all cases with cost = 60 %

• Total hospital: 9 % (of GDP per capita, per case).

• Hospital + working time = 14% = 9 + 5 % (of GDP per capita, per case)
Estimating (economic) cost of lives lost

• Usual approach: take VSL (value of statistical life) and multiply by projected fatalities.

• Number of VSL usually taken from environmental or food safety studies, often in millions of euro/dollar (up to 100 times GDP).

• Immediate result: fatalities of only 0.1% of population (like normal influenza!) still => cost of lives lost = 10% of GDP

• A 1% CFR => 100% of GDP!

• => Models using VSL justify very high containment costs.
Estimating (economic) cost of lives lost, conservative approach

- VSL approach useful for rare events (especially those concerning the young), not for high frequency pandemic;
- we propose approach used in medical practice to value cost of life saving procedures, i.e. Years of life lost (YLL in reality similar to VSLY):
  - Key value of year of life lost: +/- 1-3 times GDP per capita.
  - Age specific fatality rates then become decisive.
<table>
<thead>
<tr>
<th>Age group</th>
<th>(1)=(2)*(3) Years of life lost per infection</th>
<th>(2) Remaining years of life expectancy</th>
<th>(3)=(4)*(5) Contribution to deaths (%)</th>
<th>(4) Share in population (%)</th>
<th>(5) Case fatality rate (%)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-59</td>
<td>0.03</td>
<td>29</td>
<td>0.1</td>
<td>16</td>
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<td>60-69</td>
<td>0.07</td>
<td>20</td>
<td>0.3</td>
<td>12</td>
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<td>70-79</td>
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<td>12</td>
<td>0.7</td>
<td>9</td>
<td>8</td>
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<td>Above 80</td>
<td>0.08</td>
<td>8</td>
<td>1.0</td>
<td>6.40</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
Estimating (economic) cost of lives lost, final

• Age specific CFRs suggest total of years of lives lost = 0.27 per case, based on standard mortality tables.

• COVID-19 fatalities typically show one or several co-morbidity factors, suggesting lower life expectancy. But Hanlon et al. 2020 show that difference is rather limited (1-2 years lower).

• => lower bound for value of lives lost = 0.25 GDP per capita per case.
Summary of cost estimates

• Two key results:
  • Top down and bottom up approaches concur that medical costs can be important in themselves, with +/- 10% of GDP possible for an unchecked epidemic.
  • This is equal to loss of GDP expected by IMF/Commission of 7-9% of GDP for many countries.
  • Value of loss of lives lost would more than double these costs, even on very conservative assumptions
  • => ‘Great Lockdown’ justified?