Economic analysis of COVID-19 (calculations)

A. In the UK, reported new cases have been growing by about 2500 for the last several days, but modeling suggests that that undercounts the true number of infections by a factor of twenty, leading to an estimate of 50,000 new cases per day. Roughly half of cases will become symptomatic (using data from China, Iceland, Italy, and the Diamond Princess cruise ship), and they are infectious for between 1 and 2.5 days before displaying symptoms. So this implies that there are about 25,000 new cases in each of the last two days who are currently asymptomatic but already infectious. Meanwhile the asymptomatic cases are less infectious but for a longer period (about 7 days), throughout which they are unaware of their status. Given that new cases were lower a week ago, we estimate an average of 20,000 new such cases per day for a total of 140,000 in this category. The overall total is therefore approximately 190,000 people who are currently infectious but not symptomatic. This is roughly 0.3% of the population.

B. Most estimates of the basic reproduction number R_0 for the SARS-COV2 virus fall between 2 and 3; the most complete analysis to date that I have found yields a value of 2.3. Given an infectious period a week, under no social distancing at all there will be approximately 0.3 transmissions per person per day. From the literature cited previously, we know that MSD will already decrease this number substantially and that a lockdown is likely to have a small but positive further effect. Consider going from having nontrivial interactions with 30 distinct people per week under normal conditions (corresponding to the definition of R_0), to 8 under MSD, to 2 under lockdown. The gap of 6 between MSD and lockdown is one fifth of the original total, so the number of additional infections under MSD is 0.3/5 = 0.06 on average. Hence B is 6%.

   One can also think of it as follows. Epidemiologists point out that we need to at least temporarily reduce the effective reproduction number from R_0 to well below 1, a decline of say 80%. If currently four-fifths of the population has 30 nontrivial contacts per week, while the remaining one-fifth has 80 per week (for an average of 40), then we need to get everyone down to about 8 per week, as suggested in the MSD approach. Pushing even further down to 2 or 3 per week (as in lockdown) is not necessary to stop the disease and will incur a large majority of the costs.

C. Current best estimates of the infection fatality rate are 0.1-0.26%, but some of those individuals will become infected anyway and part of the idea of MSD is to protect the high-risk group as much as possible to begin with, so the marginal person getting infected should have a lower risk of death. On the other hand the fatality rate may go up if standard hospital capacity is temporarily surpassed; this study estimates an overall rate of 0.66% in China, albeit only 0.15% for the low-risk (under 60) population that is most relevant here. It is difficult to know how best to balance these various considerations, but a value of 0.2% appears reasonable.