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Covid-19 in Kerala and Sri Lanka

Gangan Prathap

Two regions which are remarkably like each other are Sri Lanka and Kerala. A few searches on Google or Bing will produce remarks such as these:

- “In each, you’ll find remarkably lush, green scenery that feels tropical and vibrant – especially in their respective tea countries.”
- “Sri Lanka also has a similar weather throughout. This can be attributed to the similarities in landscape, with close proximity to the ocean and latitudinal closeness. While I was touring in SL, it rained intermittently and I felt right at home. The landscape is very much identical to Kerala.”
- “The cuisine of the Sri Lankans and Malayalis are very similar. [Many] dishes are eaten in both Sri Lanka and Kerala, which are unique, almost only eaten by Sri Lankans and Malayalis.” (<https://www.quora.com/Is-Sri-Lanka-similar-to-Kerala-What-are-the-similarities>)

To this I can add some of my own experiences. Often when I travel abroad, I’m mistaken for a Sri Lankan. When I made a short official visit to Colombo and ventured out to the countryside to see some Buddhist temples and Hindu kovils, I found the native Sri Lankans to be uncannily like my own family members and distant cousins. Indeed, there is an apocryphal legend that the predominant Ezhava community of Kerala may have come from Eezham, the ancient Tamil name for Sri Lanka, and brought the coconut tree and Buddhism with them. So, there might be some genetic affinities as well.

In socio-economic terms, especially as far as they can be described by human development indicators, Kerala is more like Sri Lanka than any other region in India. This is not surprising as they have nearly identical per capita GDPs. The populations are similar (Kerala 35 million,

Sri Lanka 21 million) and so are the GDPs (140 billion US \$ to 84 billion US \$) – all figures from Google and Bing searches.

Yet, their response to the Covid-19 crisis has separated them by an order of magnitude in both number of fatalities per million and the rate at which this number is multiplying. Kerala received a lot of premature accolades in the early days but as it progressed, Kerala has been following the Indian trajectory rather than the Sri Lankan trajectory.

Pandemics and epidemics are characterized by cumulative incidences that grow rapidly, initially in an exponential form and then level off, finally showing an S-shaped or sigmoidal form. Doubling times, i.e. the time intervals in which these incidences double initially, are often used as a measure of the growth. Here, instead, we use a more general form of a multiplying rate over a fixed interval to characterise the initial growth. In earlier studies, we saw that metrics related to Covid-19 from a large cohort of countries globally, or for the cohort of states and union territories with India, with varying population sizes, population age structures, quality of health care facilities, per capita income, reproduction numbers, etc. are dispersed within upper and lower bounds (Funnel plots of multiplying rates of exponential progress of Covid-19, August 2020, DOI: 10.13140/RG.2.2.14343.83361). Funnel plots have become a standard graphical methodology to identify outliers when plotting summary statistics along with upper and lower bounds. It is seen that the scatter plot of multiplying rates with deaths per capita yields an inverted funnel plot from which outliers can be easily identified.

The daily COVID-19 data for India and Sri Lanka is collected from:

<https://github.com/owid/covid-19-data/tree/master/public/data>

and that for Kerala from:

<https://www.mygov.in/corona-data/covid19-statewise-status>

We are interested in tracking the death rates per million of population on from 23/08/2020 to 29/09/2020. The mathematical model looks at how these rates progressed through a fixed

window, from a starting date (t_1) to an ending date (t_2). We decided, after some experimenting that a 4-day interval suffices to compute a reasonable multiplying rate for each state. Shorter or long periods can also be used. For each entity, we compute the multiplying rate mT and note along with it the corresponding value of the death rate per million N_I on the starting date (t_1). High mT s indicate rapid growth and zero values indicate that levelling off is complete.

Table 1 shows the multiplying rates over the latest 4-day window (25/09/2020 to 29/09/2020) for the 4-day period for the three entities we are tracking. The tracking had been done for every day from 23/08/2020 to 29/09/2020. We see that in the latest window, there has been no change for Sri Lanka. Kerala has a multiplying rate that is nearly three times that of India. It has therefore an exceedingly long way to go to reach herd immunity, i.e. when m becomes asymptotically zero. Sri Lankan fatality rates are one-thirtieth that of Kerala and one-hundredth that of India and yet it was Kerala that hogged the limelight until very recently, when reality finally sank in.

Figure 1 shows this condition graphically. It is the so-called inverted funnel plot showing the dispersion of the multiplying factor m based on the latest 4-day window (25/09/2020 to 29/09/2020) vs the death rates per million of population on 25/09/2020 for Sri Lanka, Kerala and India. One can interpret the lower right-hand corner of the triangle as the condition of herd immunity, i.e. a safe corner. India has some time to get there. Kerala is straggling somewhere at the peak and has an even longer and difficult days ahead before it nears the safe corner. This is the levelling off phase of the logistic curve. For some yet to be determined reason, Sri Lanka has defied the herd immunity condition! It is also not clear why when it is so like Kerala, it is so different in the way Covid-19 has affected it. Kerala is two and a half times more densely populated than Sri Lanka (860 per sq. km. to 345.6) but this is unlikely to lead to a 30-fold factor in fatality rate.

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Table 1. The multiplying rates over the latest 4-day window (25/09/2020 to 29/09/2020) for India, Kerala and Sri Lanka.

code	location	Deaths per million	
		25/09/2020	25/09/2020
IND	India	66.88	0.011
KER	Kerala	18.35	0.032
LKA	SriLanka	0.61	0.000

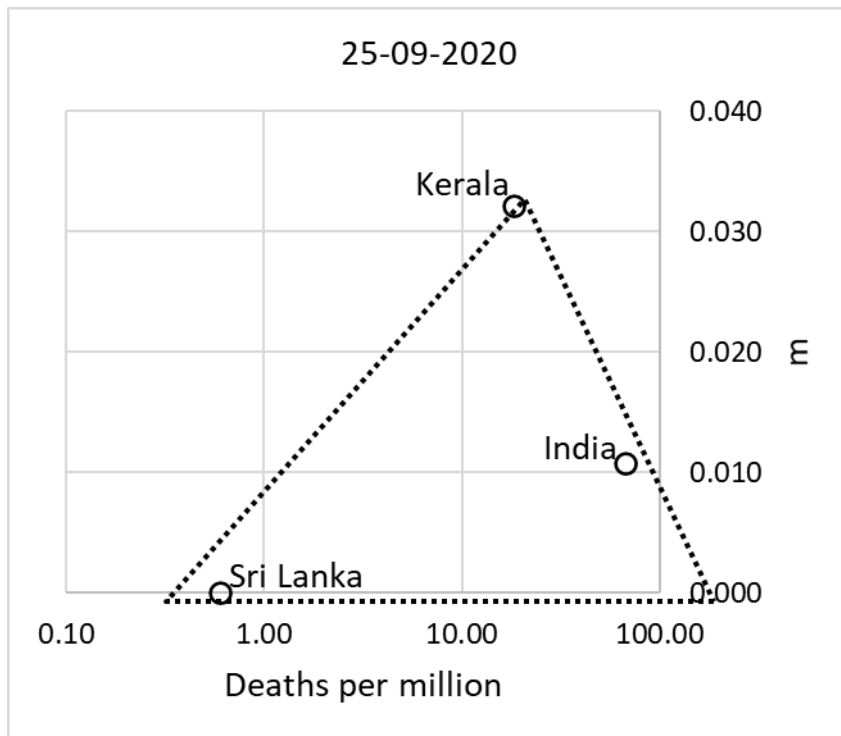


Figure 1. The funnel plot showing the dispersion of the multiplying factor m based on the latest 4-day window (25/09/2020 to 29/09/2020) vs the death rates per million of population on 25/09/2020 for Sri Lanka, Kerala, and India.