

Excess mortality in Kerala during the COVID-19 pandemic: A factsheet¹

What death registration data is available?

Monthly registered deaths in the civil registration system from Jan 2015 to May 2021, broken down by gender, are [available on github](#). The data was reported in [The Hindu](#) on June 26 2021. The data is recorded according to date of death (rather than date of registration), and totals for April and May 2021 are likely to be increase as a consequence of delayed registrations.

What do we know about delays in registration?

According to [2019 CRS report](#), 65% of registrations occurred within 21 days, and 81% within 30 days. There were thus, even in pre-pandemic times, relatively large delays in registration.

What do we know about registration coverage and trends in the state/within this system?

According to the 2019 CRS report, Kerala saw complete death registration during 2011 to 2019, apart from 2016 when death registration was reported to be 97.3%. [According to NFHS-5](#), however, registration levels were 97.4% during the three years prior to the NFHS (which was conducted between July and December 2019 in the state). We do not correct for the possibly lower coverage reported by NFHS-5; but note that doing so would marginally increase estimates of excess mortality.

Although there is only a slightly increasing trend in CRS totals during 2015 to 2018, 2019 saw a 5% increase in registrations over 2018.

Total registrations in the reported data during 2015 to 2019 account, respectively, for 94%, 96%, 96%, 99% and 98% of the registrations during these years as reported in the 2019 CRS report.

Are there risks of bias in using this data?

To make use of the data we need to factor in a possible drop in registration coverage during the pandemic period (see below). Simply using 2019 as a baseline results in negative excess deaths during the pandemic period so far.

Were there unusual fluctuations in registration during the early part of 2020?

In this data, overall, 2020 saw 5.4% fewer registrations than 2019. The drop was most marked during the middle of the year, with an 11% drop during the six month period April-September, 2020 relative to the same period in 2019.

According to data from the [Sevana civil registration portal](#) (accessed on August 8, 2021), in 2020, Kerala saw a 7% drop in birth registrations relative to 2019. As births during 2020 should not be significantly affected by the pandemic, this provides some evidence that the drop in registered deaths is a consequence of disrupted registration rather than a drop in mortality.

What are possible choices for baseline deaths and hence excess deaths?

Using 2019 as a baseline gives negative excess mortality over the pandemic period. Using an average over 2015-19 gives very low excess mortality during the first wave - less than recorded COVID-19 mortality.

January to July 2020 saw 5.5% fewer death registrations in this system than the average registrations during this period during 2015-2019. On the other hand, Kerala saw a very limited COVID epidemic until August 2020 (see below). One possibility is to use 94.5% of average registrations during 2015-2019 as a choice of baseline mortality. (This is equivalent to assuming that expected mortality was at 2015-2019 average levels, but there was a 5.5% drop in registration

¹ Prepared on 22nd August 2021, by Murad Banaji and Aashish Gupta.

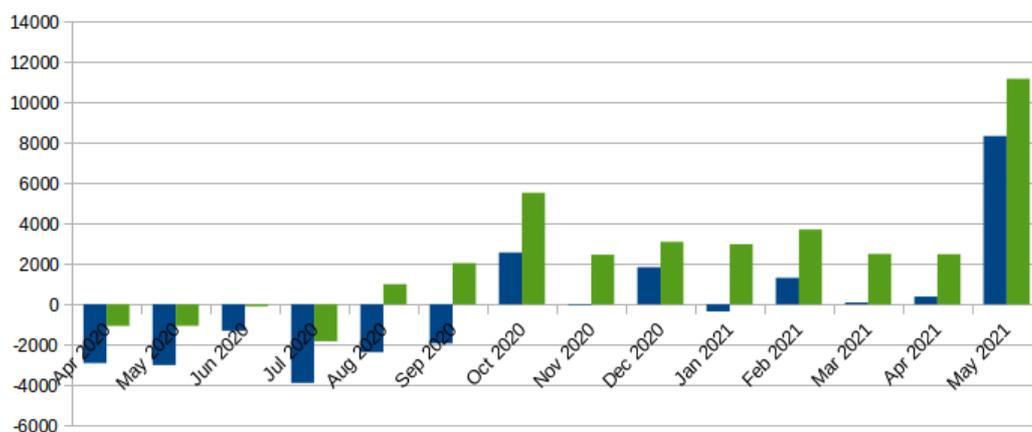
coverage.) Even with this baseline April-July, 2020 saw about 5% fewer deaths than expected. The way that excess mortality data under this assumption on baseline mortality aligns with Kerala's epidemic is discussed in this piece for [The Wire](#).

A more complex alternative would be to use expected registrations based on the linear trend in registrations during 2015-19, adjusted for the drop in registered deaths observed during Jan-July 2020. The results (not presented) are similar to the case of adjusting the 2015-19 average.

What do monthly excess deaths look like relative to various baselines?

Below is a plot of excess deaths during March 2020 to May 2021, relative to 2019, and relative to the adjusted 2015-19 baseline discussed above (94.5% of average registrations during 2015-2019).

Kerala: excess deaths relative to 2019 (blue) and adjusted 2015-19 (green) baselines, scaled for coverage



What is the scale of first and second wave excess deaths relative to various baselines?

We have the following estimates (official COVID-19 deaths are from covid19india.org):

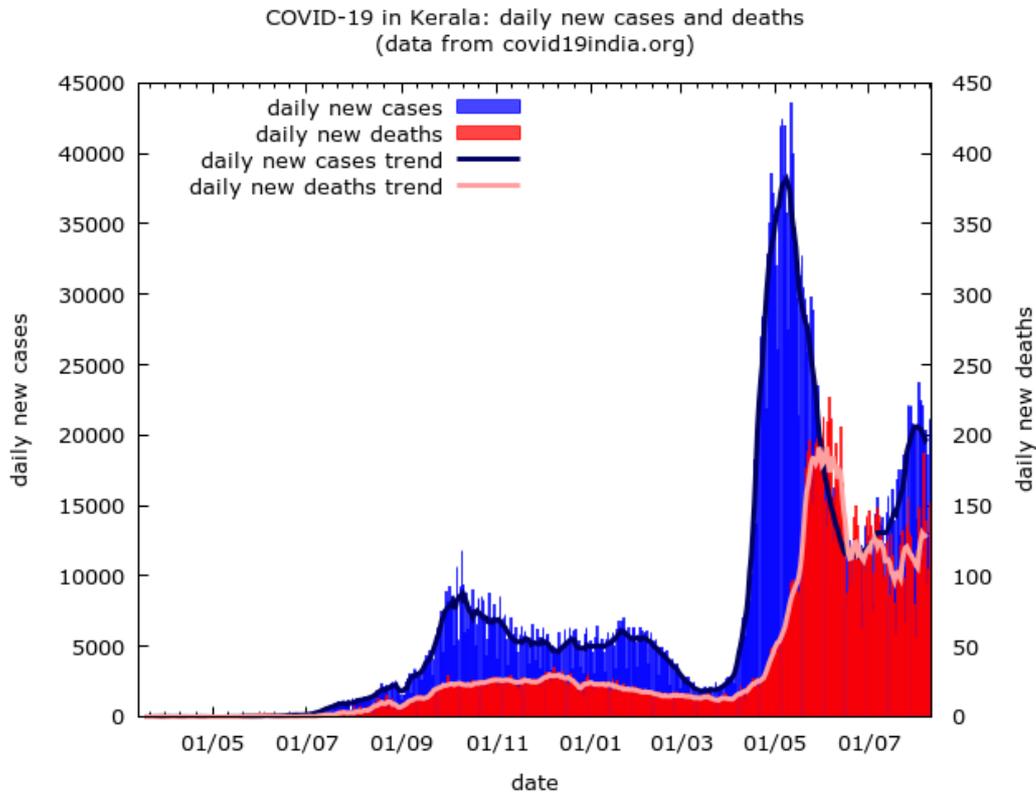
	excess deaths (to nearest 1000)		excess deaths per 1000 population		surge relative to baseline		ratio of excess deaths to official COVID-19 deaths	
	2019 baseline	adjusted 2015-19 baseline	2019 baseline	adjusted 2015-19 baseline	2019 baseline	adjusted 2015-19 baseline	2019 baseline	adjusted 2015-19 baseline
Apr 2020-Feb 2021	-10	17	-0.3	0.5	-4%	7%	-	4.0
March-May 2021	9	16	0.2	0.5	14%	27%	1.9	3.5
Apr 2020-May 2021	-1	33	0.0	0.9	0%	11%	-	3.7

Are there other notable features in the death registration data?

The data does not divide very clearly into "waves". This is consistent with the trajectory of official COVID-19 cases and deaths in the state (see below). The excess deaths during December 2020-March 2021 are consistent with continuing cases and official COVID-19 deaths during this period (see below).

What are the broad features of the state's COVID-19 epidemic so far?

The trajectory of recorded COVID-19 cases and deaths, using data from covid19india.org, is shown below.



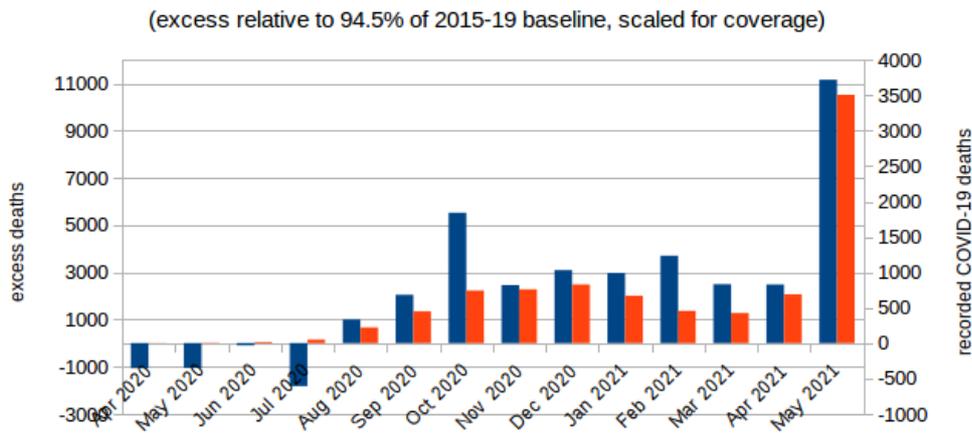
The state saw a first wave peak in daily cases at around 8.7K daily cases around October 10, 2020, followed by a high plateau. There was only a brief lull in February and March before a resurgence, with a second peak at around 38K daily cases around May 9, 2021. However, by early August, 2021, cases were seeing a resurgence.

It is notable that June, 2021 saw over 4400 official COVID-19 deaths, higher even than May. This suggests that we should expect continuing excess deaths during June 2021.

How does the mortality data align with official COVID-19 data?

Excess deaths relative to the adjusted 2015-19 baseline discussed previously, alongside recorded COVID-19 deaths from covid19india.org, are plotted below.

Kerala: excess deaths (blue) and recorded COVID-19 deaths (red)



Relative to a 2019 baseline, there is a reasonable correlation (correlation coefficient: 0.83) during April 2020 to Feb 2021 between monthly recorded COVID-19 deaths and monthly excess mortality. This rises to 0.91 during April 2020 to May 2021.

Relative to an adjusted 2015-19 baseline, there is a stronger correlation (correlation coefficient: 0.88) during April 2020 to Feb 2021 between monthly recorded COVID-19 deaths and monthly excess mortality. This rises to 0.92 during April 2020 to May 2021.

Other notes

Because of the relatively low excess mortality implied by Kerala's data upto May, 2021, the estimates are quite sensitive to factors such as the choice of baseline, and assumptions about changes in registration. This means that excess mortality estimates and estimates of the ratio of official deaths to COVID-19 deaths come with a significant degree of uncertainty.

For example, if the drop in registration during the pandemic period relative to the previous five year average was 2.5% (rather than 5.5%), would imply around 23K excess deaths upto the end of May (as against 33K), giving a ratio of excess deaths to COVID-19 deaths of 2.6. On the other hand, if the drop was 8.5%, this would imply around 44K excess deaths, giving a ratio of excess deaths to COVID-19 deaths of 5.0.