

## **Excess mortality in Madhya Pradesh during the COVID-19 pandemic: A factsheet<sup>1</sup>**

### *What death registration data is available?*

Monthly registered deaths from Madhya Pradesh's online civil registration system from January 2018 to May 2021 are [available on github](#). District-wise data for April and May of 2018, 2019, 2020 and 2021 is also available at the same location. The data was reported in [Scroll](#). The data is recorded according to date of registration.

### *What do we know about delays in registration?*

According to the [2019 CRS report](#), 82% of registrations occurred within 21 days, and 85% within 30 days. There were thus moderate delays in registration in the pre-pandemic period.

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

According to the 2019 CRS report, an estimated 78% of deaths were registered in 2018, rising to 89% in 2019. The available data comes from the online portion of the Civil Registration System in the state; in 2018 and 2019 respectively this system captured 96% and 91% of the registrations given in the 2019 CRS report.

Registered deaths in the online system saw a 10% increase between 2018 and 2019. While the online system was capturing an increasing fraction of total deaths, it captured a declining fraction of registered deaths. During 2019, there was a slight increasing trend in registrations against a background of significant underlying fluctuations.

### *Are there risks of bias in using this data?*

There are risks arising from the fact that death registration was incomplete in the state prior to the pandemic, and that the online system captured a changing fraction of registered deaths in the state. Ignoring the trends in registration, or the fluctuations in registration in early 2020, risks affecting the results.

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

There were significant fluctuations in registered deaths during the early part of 2020. Jan-April 2020 saw 5% fewer registrations than the same period in 2019; Feb-April 2020 saw 9% fewer registrations than the same period in 2019; while even the six month period March-August 2020 saw 3% fewer registrations than the same period in 2019.

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

2019 values or the 2018-19 average, possibly adjusted to account for a registration drops during 2020, can give baseline expectations for registered deaths during the pandemic. We can also choose to adjust the registration baseline for 2020, without altering the registration baseline for 2021.

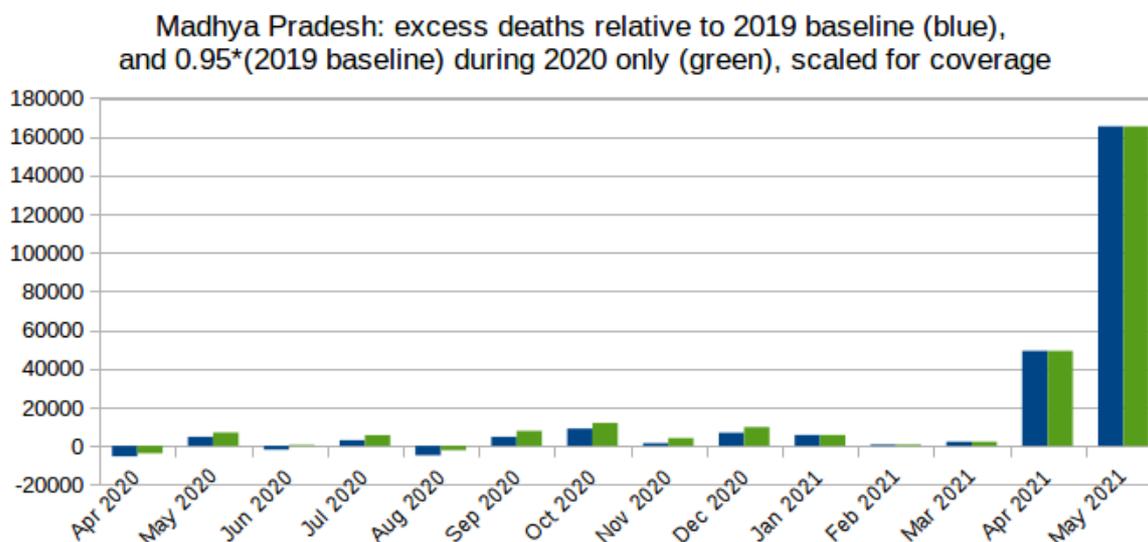
Here we make two choices for baseline deaths: 2019 values; and 2019 values reduced by 5% during 2020 only (equivalent to assuming a 5% drop in registration coverage during 2020, followed by recovery in 2021. We refer to the latter baseline as an adjusted 2019 baseline. The adjustment increases total excess deaths only by around 10%, but significantly improves the alignment between excess deaths and COVID-19 deaths (see later).

Excess registered deaths calculated against such a baseline can then be rescaled again to account for registration coverage.

<sup>1</sup> Prepared on 22<sup>nd</sup> August 2021, by Murad Banaji and Aashish Gupta.

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

Below is a plot of excess deaths relative to a 2019 baseline and an adjusted 2019 baseline, scaled for coverage in the online system.



*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](https://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 2019 baseline	2019 baseline	adjusted 2019 baseline	2019 baseline	adjusted 2019 baseline	2019 baseline	adjusted 2019 baseline
<b>Apr 2020-Feb 2021</b>	24	47	0.3	0.6	5%	9%	6.1	12.1
<b>March-May 2021</b>	217	217	2.6	2.6	191%	191%	51.6	51.6
<b>Apr 2020-May 2021</b>	240	263	2.9	3.1	38%	43%	29.8	32.6

With these baselines the second wave saw much higher excess mortality than the first, with 80-90% of the total excess mortality seen during April 2020-May 2021 occurring in the three months of March-May 2021. Moreover, reporting of COVID-19 deaths worsened very significantly during the second wave.

These asymmetries remain, but are reduced somewhat, if we assume that registration coverage dropped by more than 5% in 2020 relative to 2019.

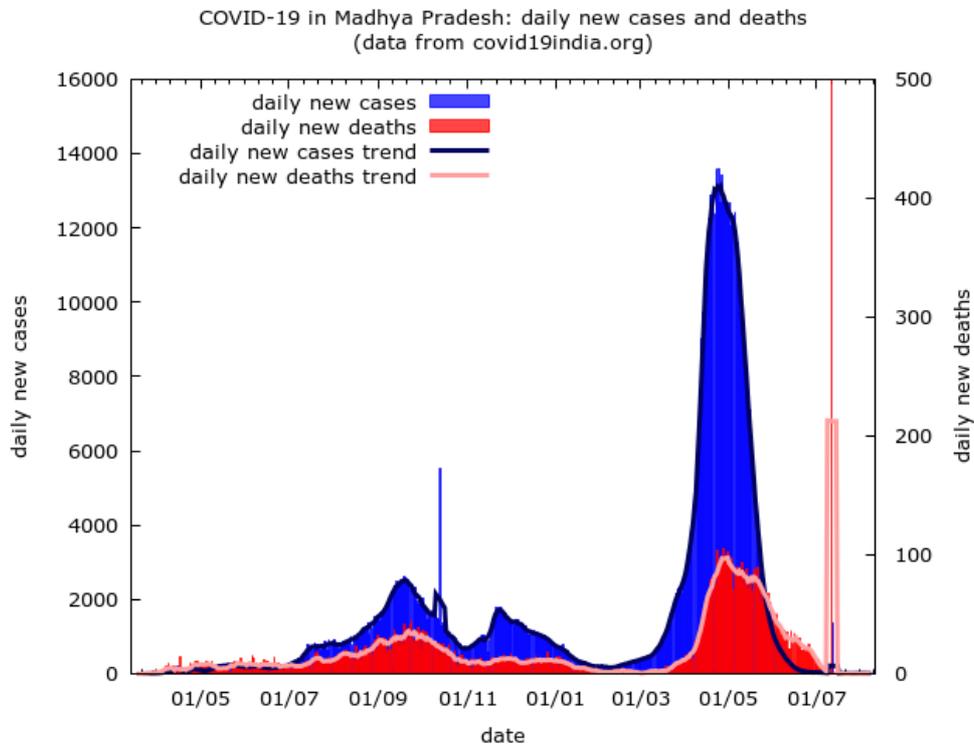
*Are there other notable features in the death registration data?*

There were significant excesses over 2019 values during December 2020 and Jan 2021, when recorded COVID-19 mortality was limited. But (see below), there is a good chance that this is a real COVID-linked resurgence in mortality.

The fact that mortality returns close to baseline levels during February-March, 2021, provides some confidence in the choice of baseline.

*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](https://covid19india.org), is shown below.



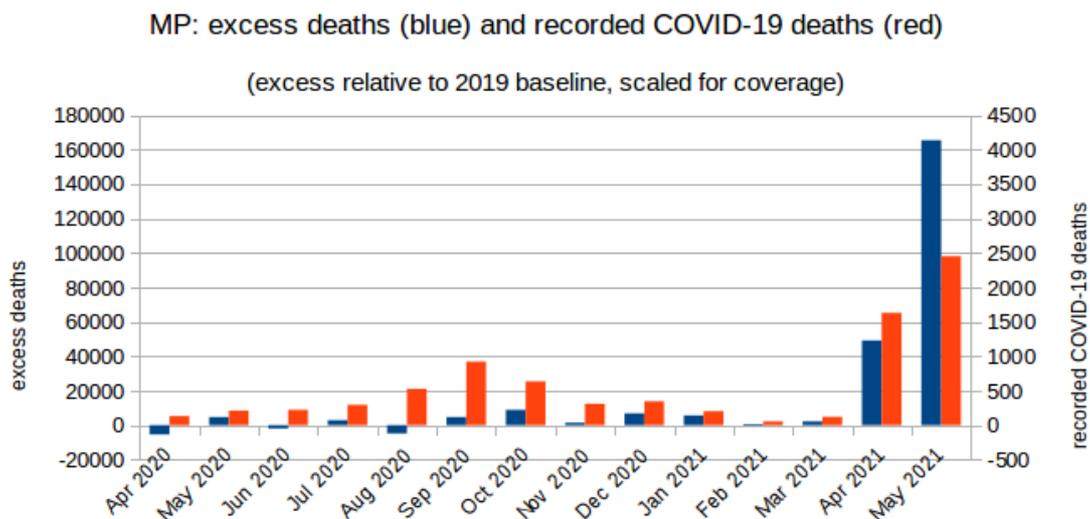
The state saw two first wave peaks in daily cases. The first (at around 2500 daily cases) occurred around Sep 19, 2020. The second, at around 1400 daily cases, occurred around December 4, 2020. The December peak was not associated with a clear peak in recorded COVID-19 deaths. It does however appear consistent with registration data.

The second wave peak in daily cases (at around 13000 daily cases) occurred around Apr 26, 2021.

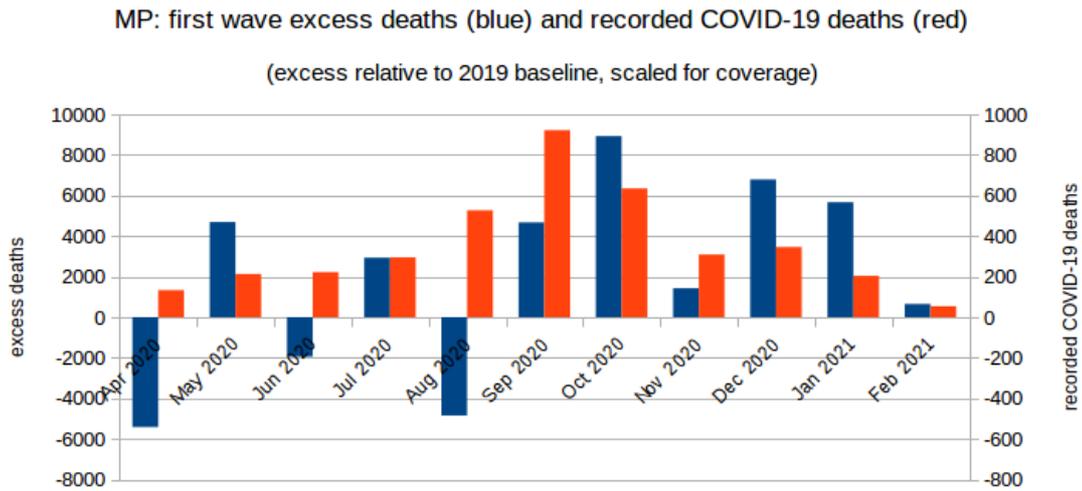
There was an addition of 1481 official COVID-19 deaths on July 12, 2021, [reported in the media](#). This amounted to a 16% increase in MP's official COVID-19 toll.

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

Excess deaths relative to 2019 values, scaled for coverage in the online system, alongside recorded COVID-19 deaths (from [covid19india.org](https://covid19india.org)) are plotted below.



Because the massive surge in deaths during May obscures what is happening during the first wave, we separately plot first wave excess deaths, alongside COVID-19 deaths:



During April 2020 to February 2021, there is a weak correlation between monthly excess deaths and official COVID-19 deaths. Using a 2019 baseline the correlation coefficient is 0.33. The correlation improves if we assumed a drop in registration coverage in the online system during 2020 (an assumed 5% drop in registrations gives a correlation coefficient of 0.45).

It is also noteworthy that what appears as an increase in excess deaths during December 2020 and January 2021 is roughly consistent with the second "first-wave" peak in COVID-19 cases which occurred in early December 2020.

*Other notes*

Madhya Pradesh's data suggests considerable asymmetry between the two waves of the disease. Both mortality and the ratio of excess deaths to recorded COVID-19 deaths appeared to surge during the second wave. These features are damped somewhat, but still remain, if we assume some drop in registration coverage during 2020, followed by a recovery during 2021.