Azim Premji University

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Cross State Comparison of Excess Deaths During the Covid Pandemic in India: Some Measurement and Methodological Considerations

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Centre for the study of the Indian Economy (CSIE)
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Introduction

The first Covid positive case was detected in the state of Kerala, India in January 2020. Between mid-2020 and mid-2022, there were three 'waves' of infection with the second wave during April-June 2021 being the most devastating in terms of number of affected people and lives lost (see Figure 1). While the first was mainly in urban areas, the second wave spread to rural areas as well and affected all parts of the country. The third wave in early 2022 lasted for a shorter duration and like in other parts of the world was less severe with lower mortality.

Estimating the number of deaths due to the pandemic is an important exercise to get a true picture of its gravity. While there have been different estimates, largely due to data gaps it has been difficult to make a true assessment of the number of deaths. Death registration is not complete in India and fewer deaths are medically certified. Further the cause of death is not recorded accurately for a large proportion of even the certified deaths. While the data from the death registrations give some idea, the Census would probably have been the best source of data to assess Covid-induced mortality and its impact on life expectancy. Census was supposed to be conducted in 2021, but got delayed due to the pandemic and is now expected to be conducted in 2026. Data from the sample registration system (SRS) are used to estimate death rates and life expectancy, for the intervening years between two Census.

The Ministry of Health had attributed around 330 thousand deaths in 2021 to covid using data from multiple sources. Reports suggested large-scale under-reporting of Covid-19 deaths (Leffer et.al. 2022, Deshmukh et.al. 2021). A study published in the Lancet estimated that about 4 million excess deaths occurred in India during the period 2020-21 (Wang et.al. 2022). Guilmoto (2022) estimated that the number of excess deaths during the period April 2020 to November 2021 to be in the range of 3.2 – 3.7 million using different sources of data. Gupta et.al (2024) extrapolate from the data from NFHS-5 for the states that conducted the survey in 2021 (14 states) and estimate that there were 1.19 million excess deaths in India in 2020 compared to 2019. While these different estimates are not comparable due to different data sources as well as time periods considered, there has been a wide gap between official reports and each of these different estimates.

The recent release of data from the CRS and SRS gives us an opportunity to give better estimates. Since they are official data that are routinely collected they also enjoy greater credibility. The SRS data for 2021 was released with a significant delay in May 2025. The CRS data for 2021 was also released in May 2025 and for 2022 in June 2025. With the availability of these new datasets, in this note we estimate the number of excess deaths during the pandemic in India. Since most deaths occurred in 2021, we focus on this year for all estimations.

I. Number of Excess Deaths in India

Following the method used in previous studies on this issue both in India as well as globally, we use 'Excess deaths' as a proxy measure to understand Covid-19 deaths in India, particularly in the year 2021 when the number of deaths caused by the pandemic rose sharply. "Excess deaths" is simply the difference between the number of deaths in an unusual period (such as 2021) and the number of deaths in a 'normal' year. While not all of these can automatically be attributed to Covid, a sharp deviation from the usual trend does give a sense of the direct and indirect impact of the pandemic on death rates.

$$Absolute\ Excess\ Deaths\ =\ Deaths\ in\ Year\ A\ -\ Deaths\ in\ Year\ B$$

[where A is the succeeding year to B]

In this note, we have compared the deaths in 2021 to the previous years, 2020 and 2019. Where possible, we have also provided comparisons with the previous five years (2016-20). The two main sources of data on mortality we use are The Report on Vital Statistics of India Based on the Civil Registration System[1] (henceforth called the CRS Report) and the Sample Registration System Statistical Report[2] (henceforth called the SRS Report) particularly relating to the year of 2021 have shed fresh light on the deaths during the pandemic years.

The CRS and SRS Reports do not give us the causes of death, instead, they provide two crucial measurements. First, the CRS report details the number of registered deaths each year nationally, by state, gender and age-group. This gives us a more detailed picture of registered deaths across the country allowing for us to account for regional, gender and age disparities while understanding mortality rates. Second, the SRS is the largest demographic survey in the country providing annual estimates of fertility and mortality across state, gender and broad age-groups. The SRS does not provide an aggregate figure of births and deaths as is in the case with CRS, however, it provides us with birth 'rate' and death 'rate' from the survey sample which is supposed to be representative at the State and National level, and by gender and age-groups.

Table 1 and Figure 1 show the trend for registered deaths over the last five years as per CRS reports. We see a clear and abnormal spike in 2021, deviating from the expected increase in year-on-year mortality and a return to what appears to be the usual rate in 2022. As reported by multiple news reports, the number 21 lakh (2.1 million) excess deaths in 2021 compared to

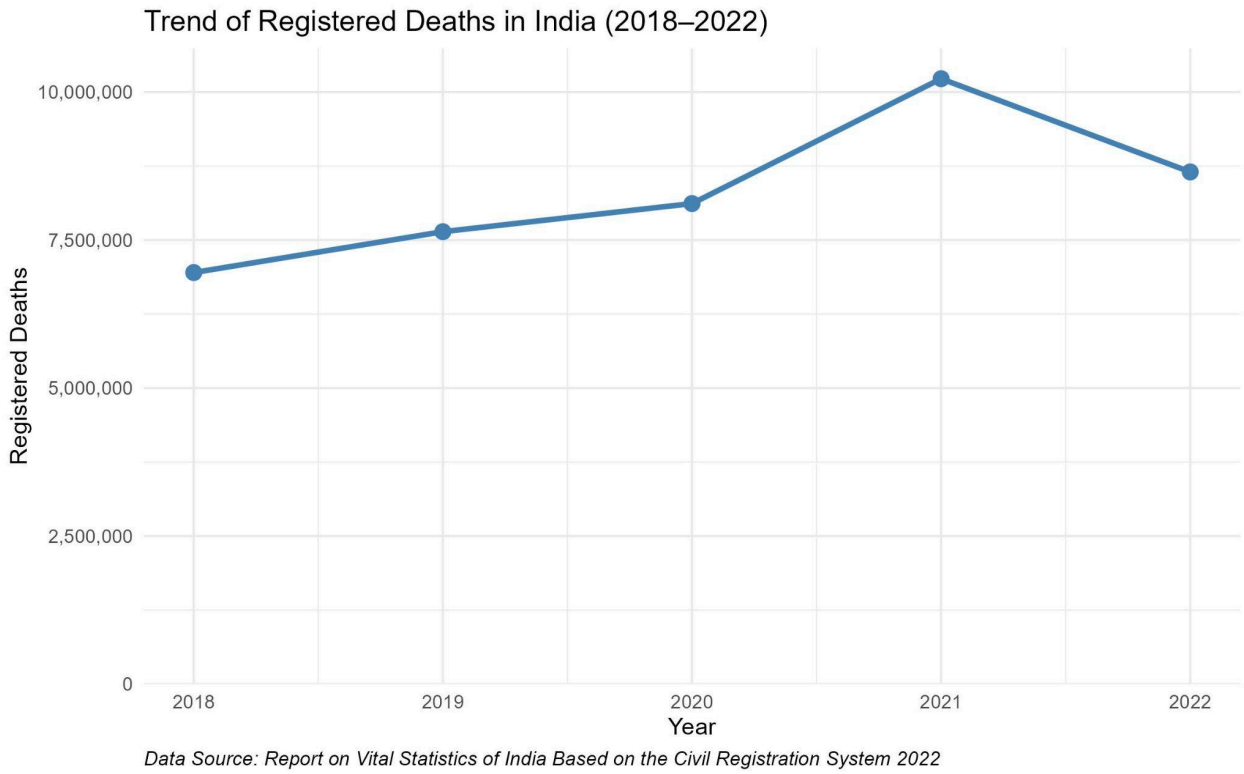
[1] "Vital Statistics - Reports | Government of India." Accessed June 17, 2025. https://censusindia.gov.in/census.website/data/VSREPORT.

[2] "Sample Registration System Statistical Report 2021." Demographic Report. New Delhi: Office of Registrar General and Census Commissioner of India, May 2025. https://censusindia.gov.in/nada/index.php/catalog/45556/download/49753/SRS_STAT_2021.pdf.

2020 is six times more than 3.3 (330,000) lakh Covid-19 deaths officially reported in 2021 by the Government of India[3].

Table 1: Civil Registration System Data on Deaths in India: Last 5 Available Years	
Year	Registered Deaths
2018	6950607
2019	7641076
2020	8115882
2021	10224506
2022	8649930

Figure 1



Data Source: Report on Vital Statistics of India Based on the Civil Registration System 2022

[3] Bureau, The Hindu. "India Reported 21 Lakh Additional Deaths in 2021 Compared with 2020." *The Hindu*, May 8, 2025, sec. India. https://www.thehindu.com/news/national/india-reported-21-lakh-additional-deaths-in-2021-compared-with-2020/article69554285.ece.

We further compare the excess deaths estimates with data from SRS reports over the years (Table 2 and Figure 2). Based on the crude death rates given in the SRS reports we calculate the estimated number of deaths by using the mid-year projected population[4] (1st July) for each year. SRS data as well shows a clear spike in 2021 deaths compared to the preceding years and the excess deaths number totaling to 21 lakhs, similar to the CRS reports. SRS report pertaining to the year of 2022 is yet to be released at the time of writing this article. This matches with the estimates in newspaper 'Mint, where based on the SRS data it was reported that there were nearly 2.1 million excess deaths in India in the year 2021. The death rate in India according to the SRS report was 7.5 per 1000 persons, which is a significant increase from 6-6.2 during the period 2018-20.

Table 2: Sample Registration System Data on Deaths in India: Last 5 Available Years

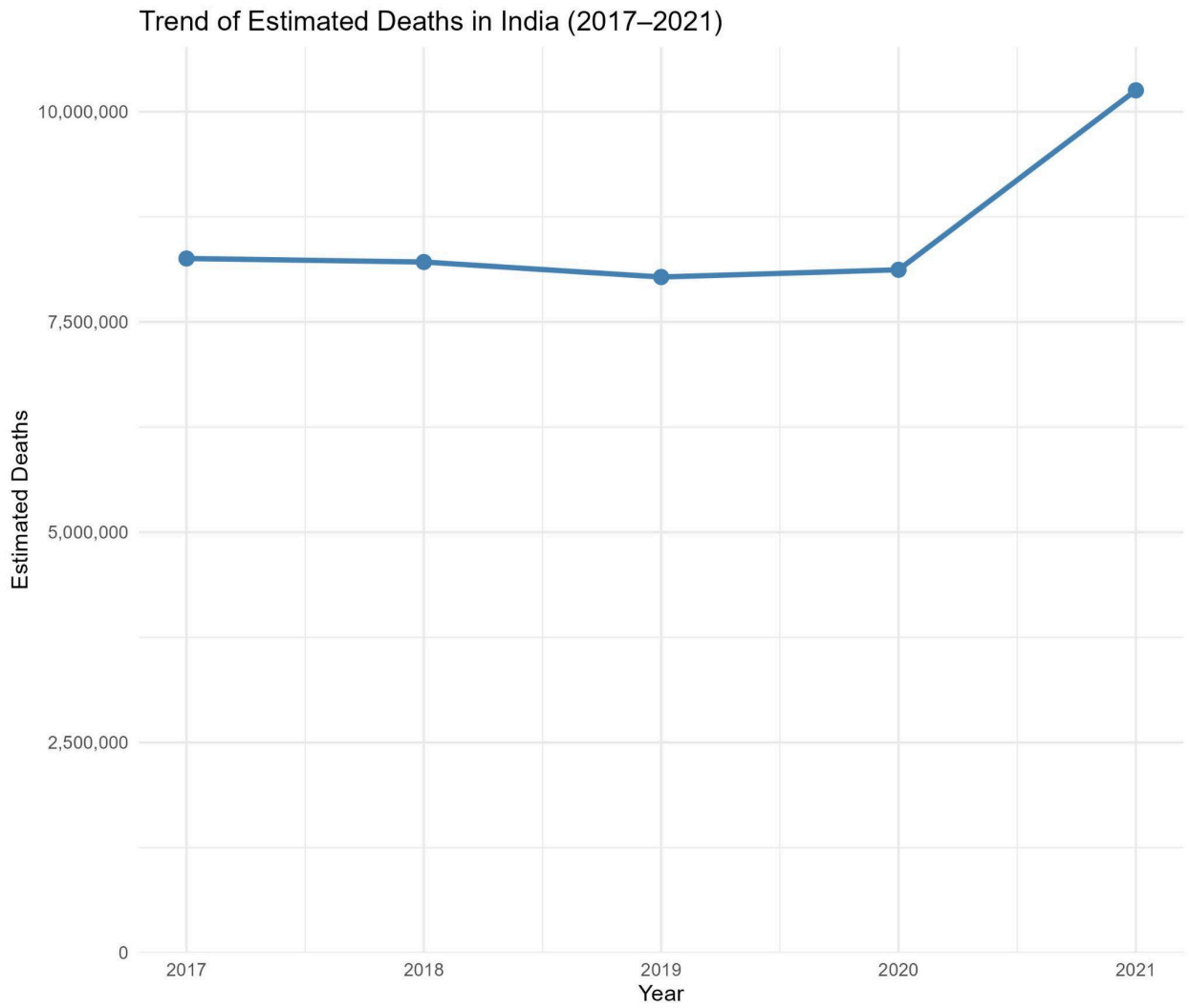
Year	Death Rate	Mid-year Population[5]	Estimated Deaths[6]
2017	6.3	1310222000	8254399
2018	6.2	1324609000	8212576
2019	6	1338995000	8033970
2020	6	1353378000	8120268
2021	7.5	1367173000	10253798

[4] "Population Projection Report 2011-2036: Report of the Technical Group on Population Projections." Population Projection. New Delhi: National Commission on Popultion, Ministry of Health and Family Welfare, July 2020. https://mohfw.gov.in/sites/default/files/Population%20Projection%20Report%202011-2036%20-%20upload_compressed_0.pdf.

[5] Ibid.

[6] Crude Death Rate = (Number of deaths during the year/Mid-year population) × 1000
Estimated number of deaths during the year = (Crude Death Rate * Mid-year population)/1000

Figure 2



Data source: Sample Registration System reports, Office of the Registrar General & Census Commissioner, India

While the estimated number of deaths in 2021 compared to 2020 is similar based on CRS as well as SRS data, there is a significant divergence in number of deaths between the two sources in the years prior to 2020. Based on the data, almost 99% of the deaths are registered in 2020 and 2021 seem to be registered. We need more data to be able to confirm whether this is indeed the case. On the other hand, given the disruption in the health system as well as all other institutions during the pandemic, there could have actually been a negative impact on death registration. It is not clear why there could have been such a drastic improvement in death registration in 2020. Further, NFHS-5 data do not reflect a similar trend with death registration at the national level being only around 70% of all deaths. Therefore, according to reporting by households in the NFHS-5 which was conducted during 2019-21, about 29.2% of the deaths go

unregistered (state-wise table and figure in Annexure 1). The Census would be one way to verify this, whenever the Census data becomes available. Given this issue, the following analysis on excess deaths needs to be read with caution as they might be underestimated.

Figure 3 shows the absolute number of excess deaths in 2021 based on CRS data. The excess deaths are estimated in comparison to deaths in 2020 as it is immediately preceding 2021 and with 2019 since that could be considered the last 'normal' year before Covid-19. The other comparisons are with the average of 2019 and 2020, the two immediately preceding years which would have the most relevance and match the upward trend of death rates and hence would not bring the averages down by a huge margin. We also compare the excess deaths in 2021 to the average deaths of 2016-19 and 2016-20.

Figure 4 presents corresponding figures using SRS data. While the number of excess deaths increases the further back we compare with, there is no such trend in the case of SRS. The excess deaths estimation based on SRS data remains quite stable between ~2000 thousand and ~2100 thousand excess deaths through all the comparisons (Figure 4), whereas they range between ~2100 thousand and ~3300 thousand deaths over the different comparisons using CRS data (Figure 3). That is because as we saw earlier as well, SRS death estimates are quite stable until 2020, whereas CRS also reflects the trend of improving death registration and not just actual deaths.

Figure 3: CRS-Based Absolute Excess Deaths

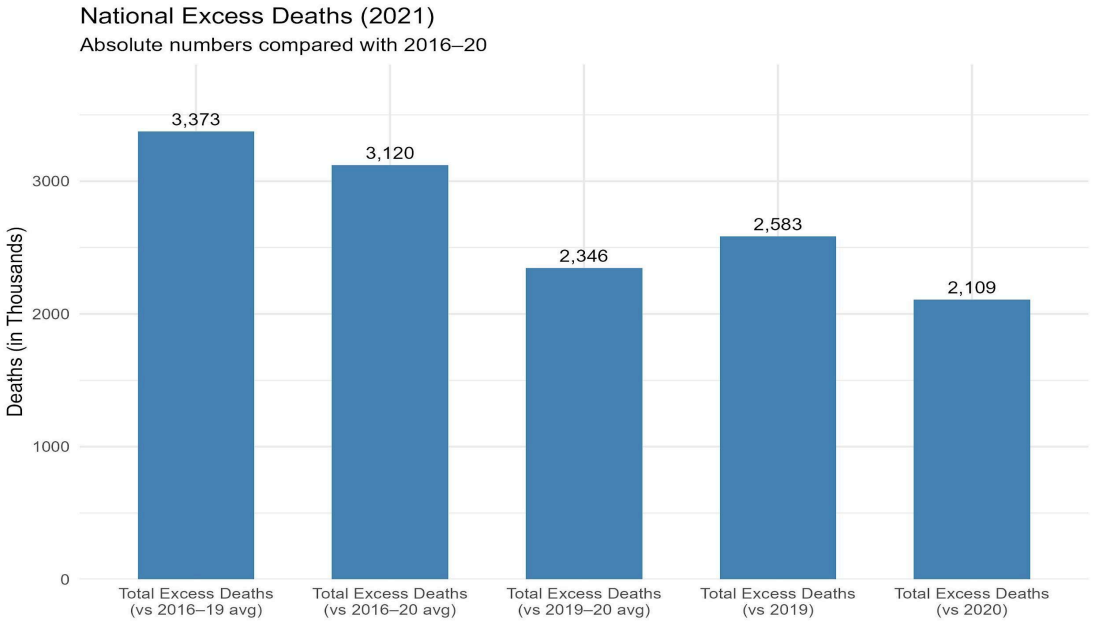
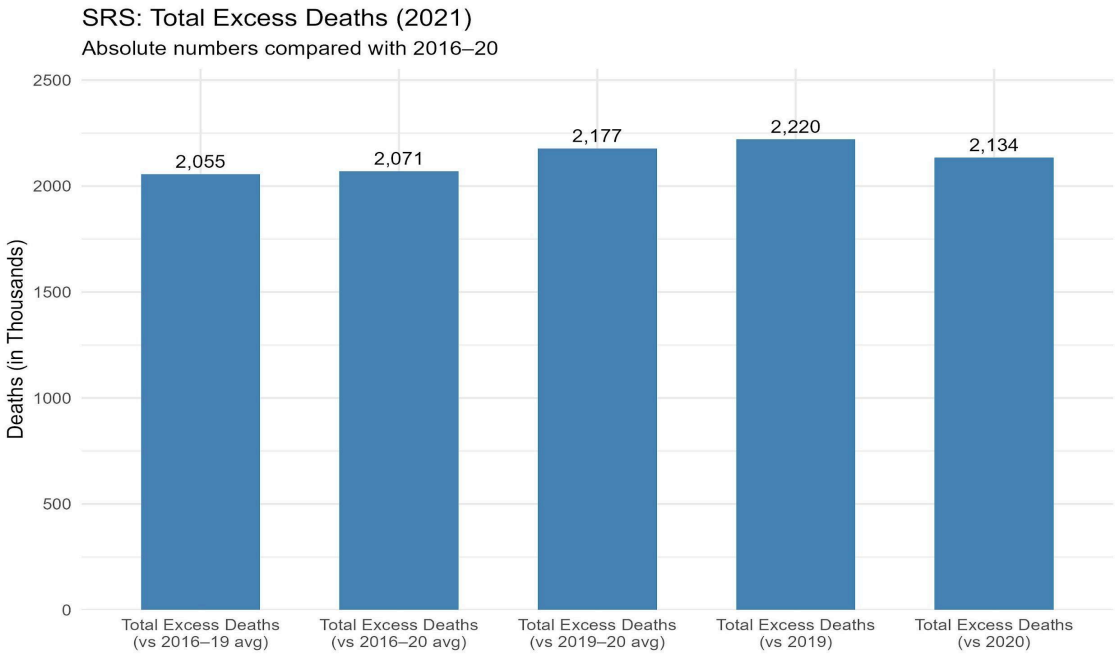


Figure 4: SRS-Based Absolute Excess Deaths



Figures 5 and 6 present the number of excess deaths in 2021 compared to 2019 and average of 2019-20 respectively, based on CRS data at the state/UT level. Only CRS data has been used for all state-level analysis, as they give the exact number of deaths and not death rates estimated from a sample. All the caveats related to completeness of death registration discussed above, remain relevant.

Uttar Pradesh, Maharashtra and Gujarat have the highest absolute excess deaths across the three plots. Uttar Pradesh (231,704,000[7]) and Maharashtra (124,762,000[8]) are expected to have the highest deaths considering their populations are the two highest according to 2021 projections.

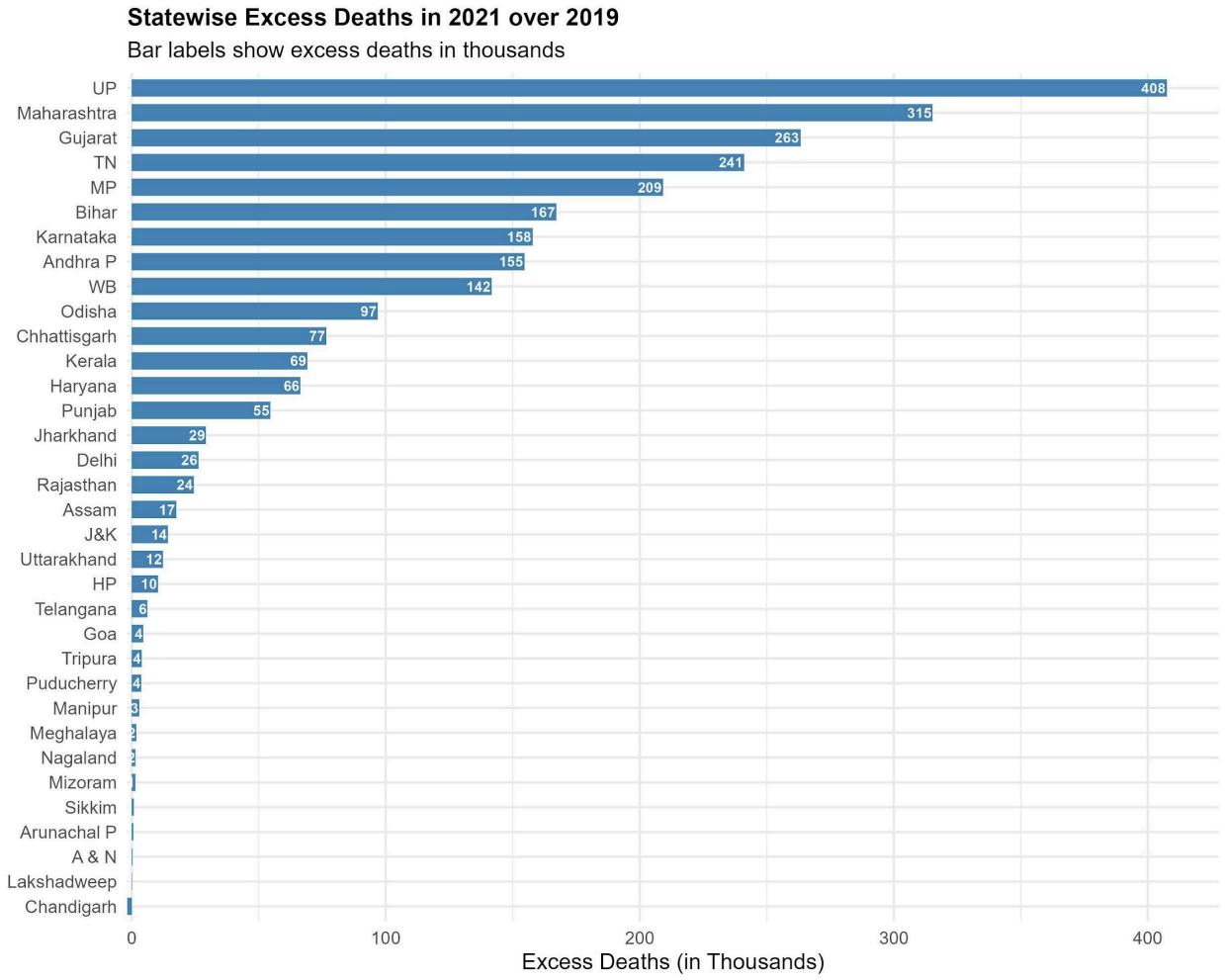
Whereas Bihar is the third highest populated state (123,695,000[9]) only marginally behind Maharashtra and yet at 6th or 7th position in terms of absolute excess deaths. This could be a reflection of the poor death registration in the state especially considering the NFHS-5 data estimates only 36.4% death registration for Bihar, placing it last among all the States in India.

[7] 2021 mid-year project population as per "Population Projection Report 2011-2036: Report of the Technical Group on Population Projections."
[8] Ibid.
[9] Ibid.

On the other hand, Gujarat is at 2nd or 3rd in terms of absolute excess deaths despite having the 8th highest mid-year 2021 projected population (70,075,000[10]). Gujarat's number of deaths (725,537[11]) in 2021 is unusually high relative to its size in the country.

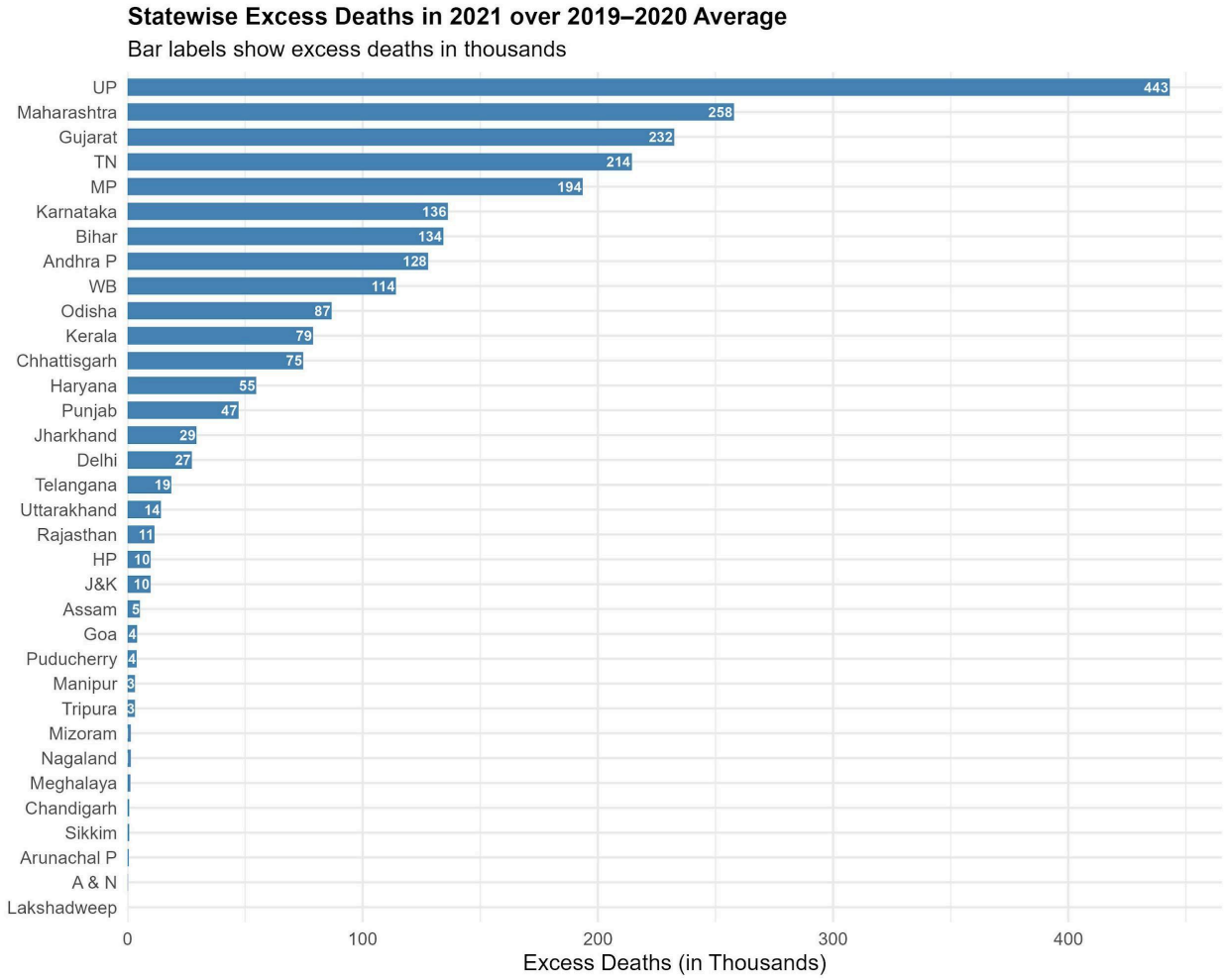
Southern States like Kerala, Karnataka and Tamil Nadu (TN) may have higher absolute excess deaths due to higher completeness in death registration (see Mishra 2021; Basu and Adair 2021). Specifically, Kerala is considered the standard when it comes to births and deaths registration, as also seen in the NFHS-5 data (in Annexure 1), achieving 97.8% death registration.

Figure 5



[10] Ibid.
[11] "Vital Statistics - Reports | Government of India," accessed June 17, 2025, https://censusindia.gov.in/census.website/data/VSREPORT.

Figure 6



II. Excess Death Rates in India and States

To account for the population variance among states and to make better comparisons, we estimate the excess death rates (i.e. excess deaths per 1000 population).

$$Excess\ Deaths\ per\ 1000\ Population\ = \frac{Deaths\ in\ Year\ A - Deaths\ in\ Year\ B}{Population\ in\ Year\ A} \times 1000$$

Based on CRS data (Figure 7), there is a steady increase in the deaths rate from 1.54 all the way up to 2.47 excess deaths per 1000 population as we go further back from 2021 to the preceding 4-5 year averages. There is not as much variation based on SRS data (Figure 8), the plausible reasons for which have been explained above. It is also clear that the year 2020 is included in the comparisons, the rates come down slightly compared to when it is left out, indicating that there might have been a reasonable increase in deaths in 2020 as well during the first wave of the pandemic, albeit being milder in terms of excess deaths. Excess death rate in 2021 when compared with 2020 is quite similar on the basis of both the datasets – CRS and SRS.

Figure 7: CRS-Based Crude Excess Death Rates

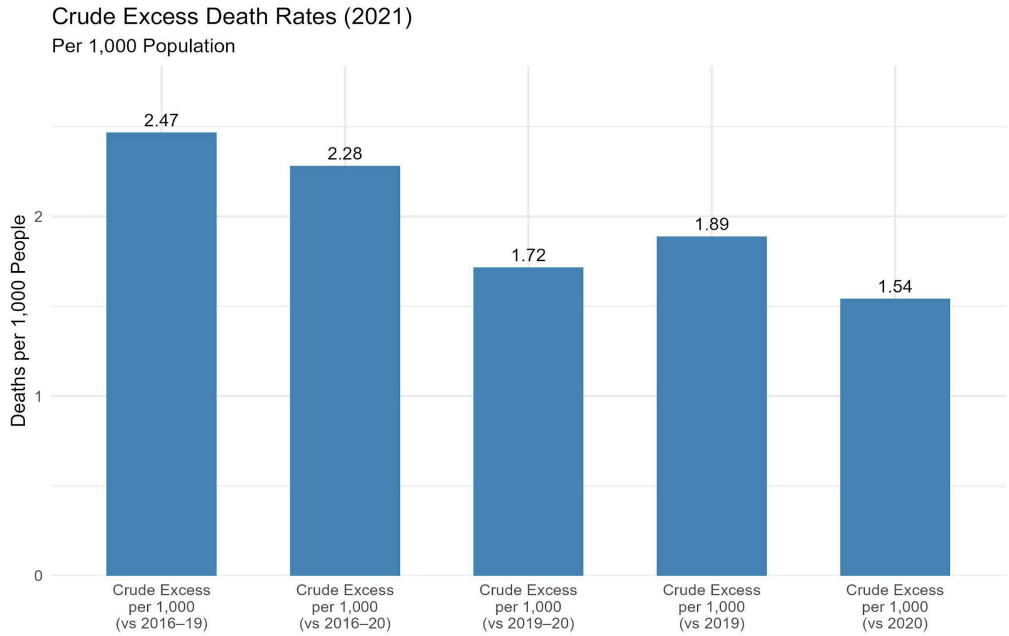


Figure 8: SRS-Based Crude Excess Death Rates

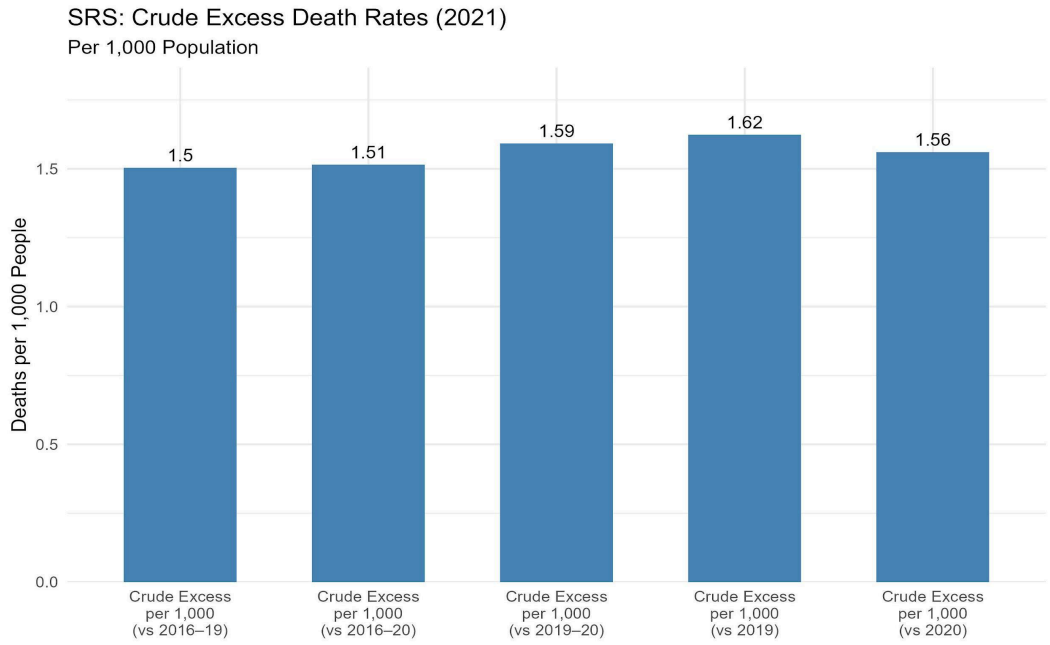
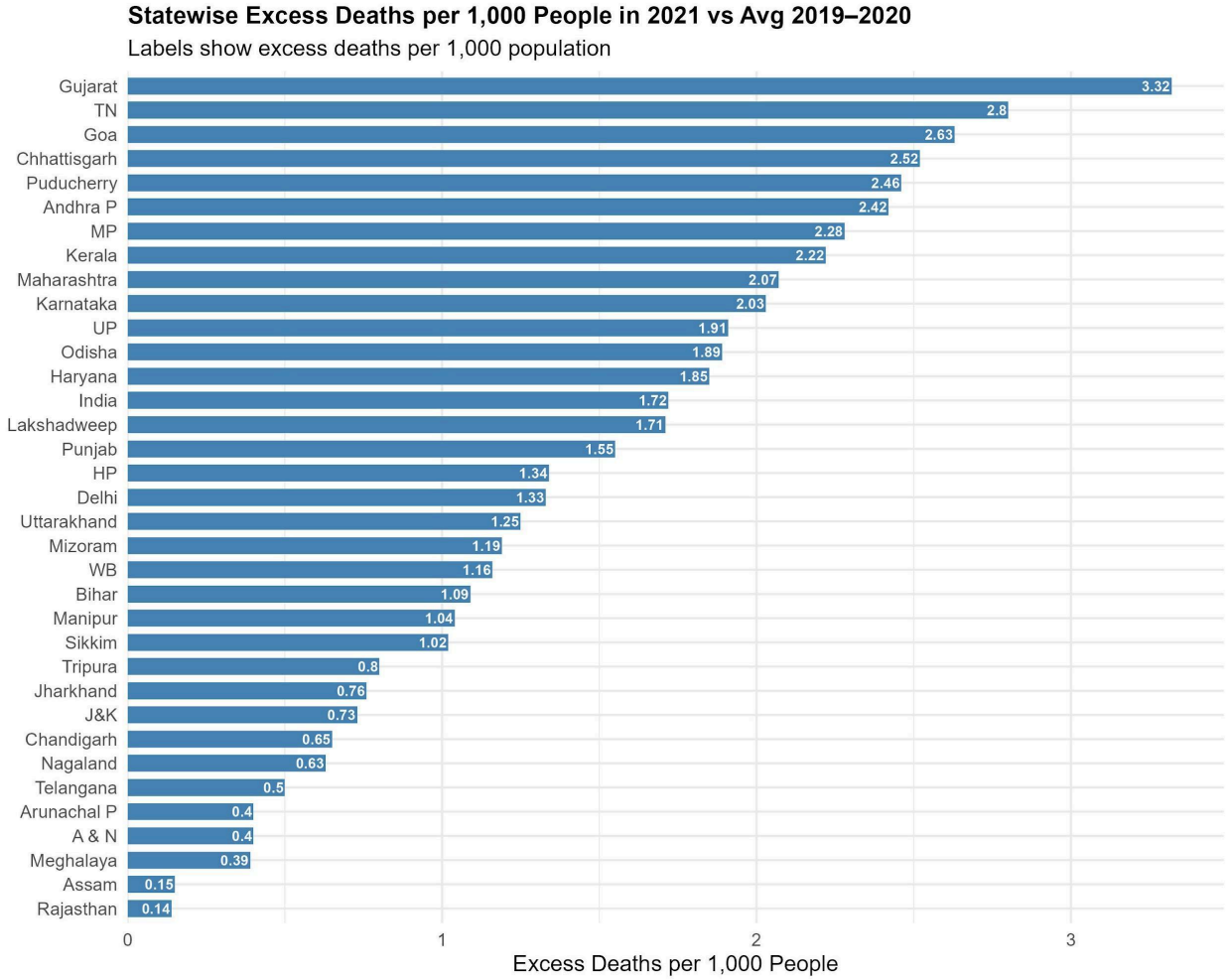


Figure 9 presents the state-wise excess death rate in 2021 compared to the average deaths for 2019 and 2020.

Figure 9



Gujarat has the highest excess deaths per 1000 population. Tamil Nadu as well had a relatively high number of deaths compared to the rest of the country (accounting for major States excluding Union Territories). The Union Territories of Puducherry and Lakshadweep have relatively higher numbers of excess deaths per 1000 population. Andaman and Nicobar Islands, Ladakh, Daman and Diu and Dadra and Nagar Haveli, Telangana, Rajasthan and some of the North-Eastern States such as Assam, Arunachal Pradesh, Meghalaya and Nagaland have relatively low excess deaths per 1000 population.

III. Alternative Projections: Estimated Excess Deaths and Excess Deaths per 1000

Projected Estimated Excess Deaths - All India

We carry out an illustrative exercise to estimate an alternative projection of deaths in India and the states using NFHS-5 death registration percentages and CRS registered deaths. We do this for the years of 2019 to 2021 since the Demographic and Health Survey NFHS-5 was carried out during those years and the data could be considered to be indicative of this period.

$$Projected\ Deaths\ = \frac{(Registered\ Deaths \times 100)}{Death\ Registration\ Percentage}$$

We use the projected deaths formula to estimate deaths in Table 2 and Figure 10.

Table 2: Alternative Projection: Estimated Deaths in India Using NFHS-5 Death Registration Percentages and CRS Death Registration Data (2019-21)[12]

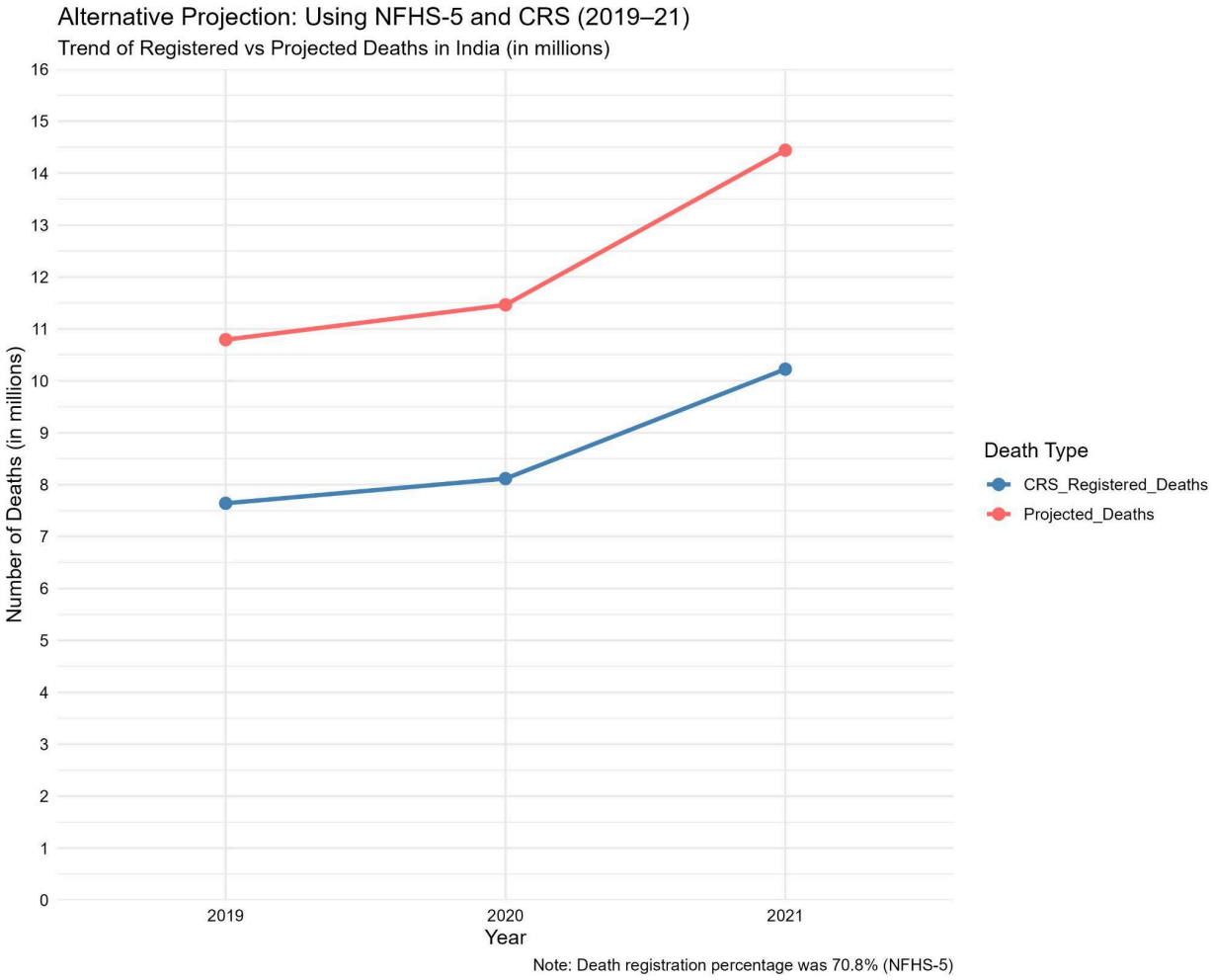
Year	CRS Registered Deaths	Projected Deaths
2019	7641076	10792480
2020	8115882	11463110
2021	10224506	14441393

As is evident, as opposed to the CRS estimated excess deaths of 21 lakh (or 2.1 million) in 2021 over 2020, the projected estimates show excess deaths to be 29.8 lakh (or 2.98 million). Which is a difference of 8.8 lakhs or 880,000 between the two. If we were to consider the projected estimates, the excess deaths in 2021 over 2020 would be 9 times more than the official Covid-19 death toll reported by the Government of India. While these projected estimates are alarming, they rely on NFHS-5 survey's death registration percentages. The NFHS-5 survey was conducted over two years in phases which were affected by the pandemic. The difference between a survey and a comprehensive registry have already been noted. We also reiterate that while the NFHS-5 survey was interrupted by the pandemic, so were the death registrations across the country. In a vast and idiosyncratic country such as India, these complexities in data have become par for the course. These projected estimates should be cautiously taken to be indicative as they could potentially add another dimension to the SRS death rates and the CRS registered deaths data.

[12] Projected Deaths = (Registered Deaths * 100) / Death Registration Percentage

The **projected excess deaths per 1000 population for All India** and the states are illustrated in Figures 12 and 13. We can see that India's projected excess deaths per 1000 for 2021 vs 2019 is 2.67, which is an increase of 0.78 from the CRS estimates of 1.89 (Figure 7). For the 2021 vs 2019-20 average comparison it is 2.42, which is an increase of 0.7 from the CRS estimates of 1.72 (Figure 7).

Figure 10



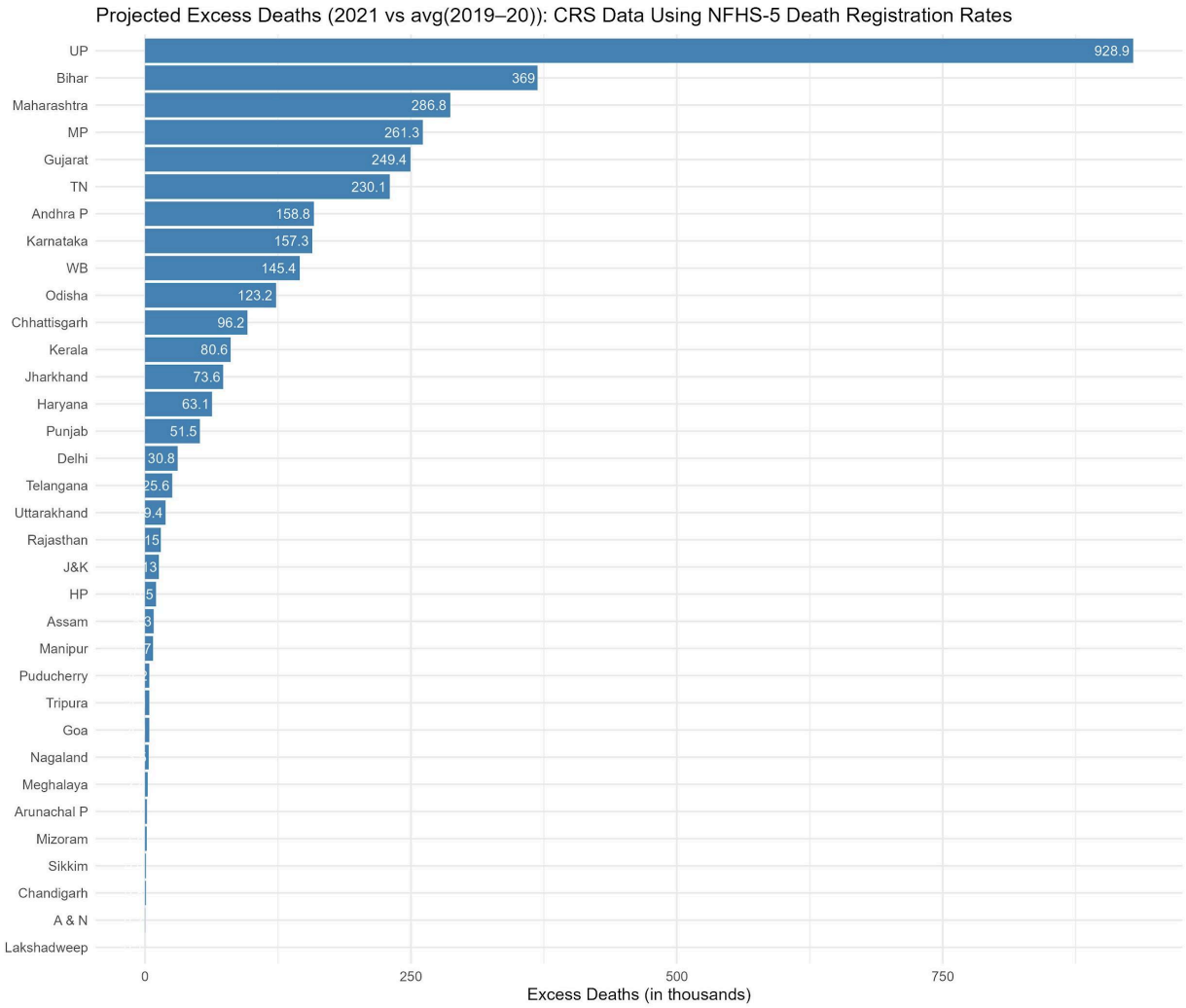
Projected Estimated Excess Deaths - States

Figure 11 shows us the **projected absolute excess deaths across states** during the pandemic. We see an order that is close to the population order of the states. UP, Bihar, Maharashtra—the top 3 states by population are reflected accordingly in the projected absolute excess deaths. MP which is the 5th highest populated state (84,860,000[13]) is also among the

[13] 2021 mid-year project population as per "Population Projection Report 2011-2036: Report of the Technical Group on Population Projections."

top 5 states for projected absolute excess deaths. Gujarat continues to feature towards the top of the graph due to its unusually high number of deaths in 2021.

Figure 11



As for the **state-wise projected excess deaths per 1000** we see that Gujarat, UP, TN, MP and Andhra Pradesh are consistently at the top across both Figures 12 and 13. Whereas Bihar is 2nd in Figure 12 and 7th in Figure 13, perhaps indicating that the number of deaths in 2020 relative to its population were lower compared to the rest of the states. A good majority of the North-Eastern states (Mizoram, Tripura, Meghalaya, Arunachal Pradesh and Assam) and Telangana and Rajasthan are consistently at the base of the graph, perhaps indicating a better performance than the rest of the country in terms of death rates during the Covid years. We ask if these estimates would be a fairer reflection of the reality of the pandemic years and open up questions for future research.

Figure 12

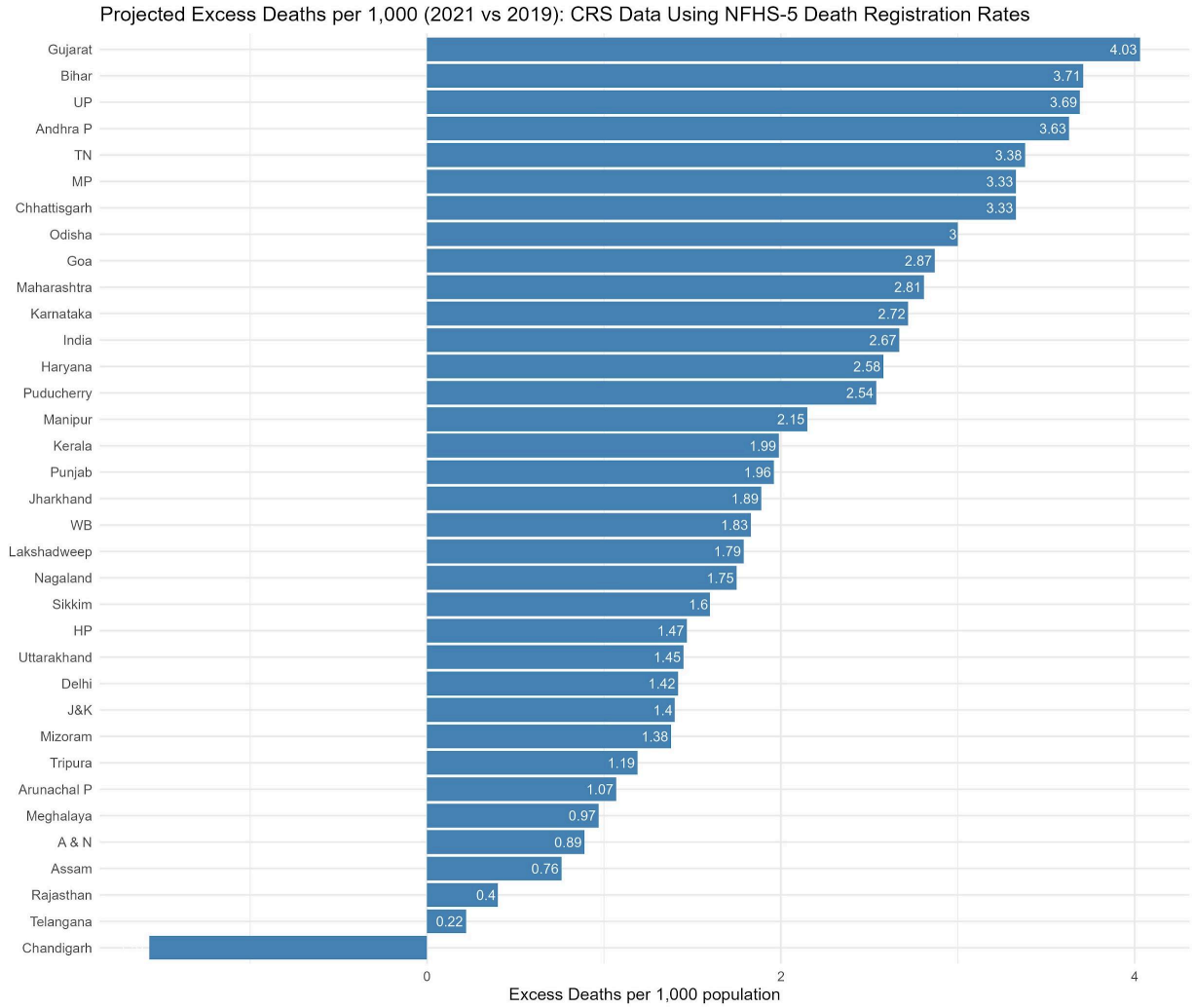
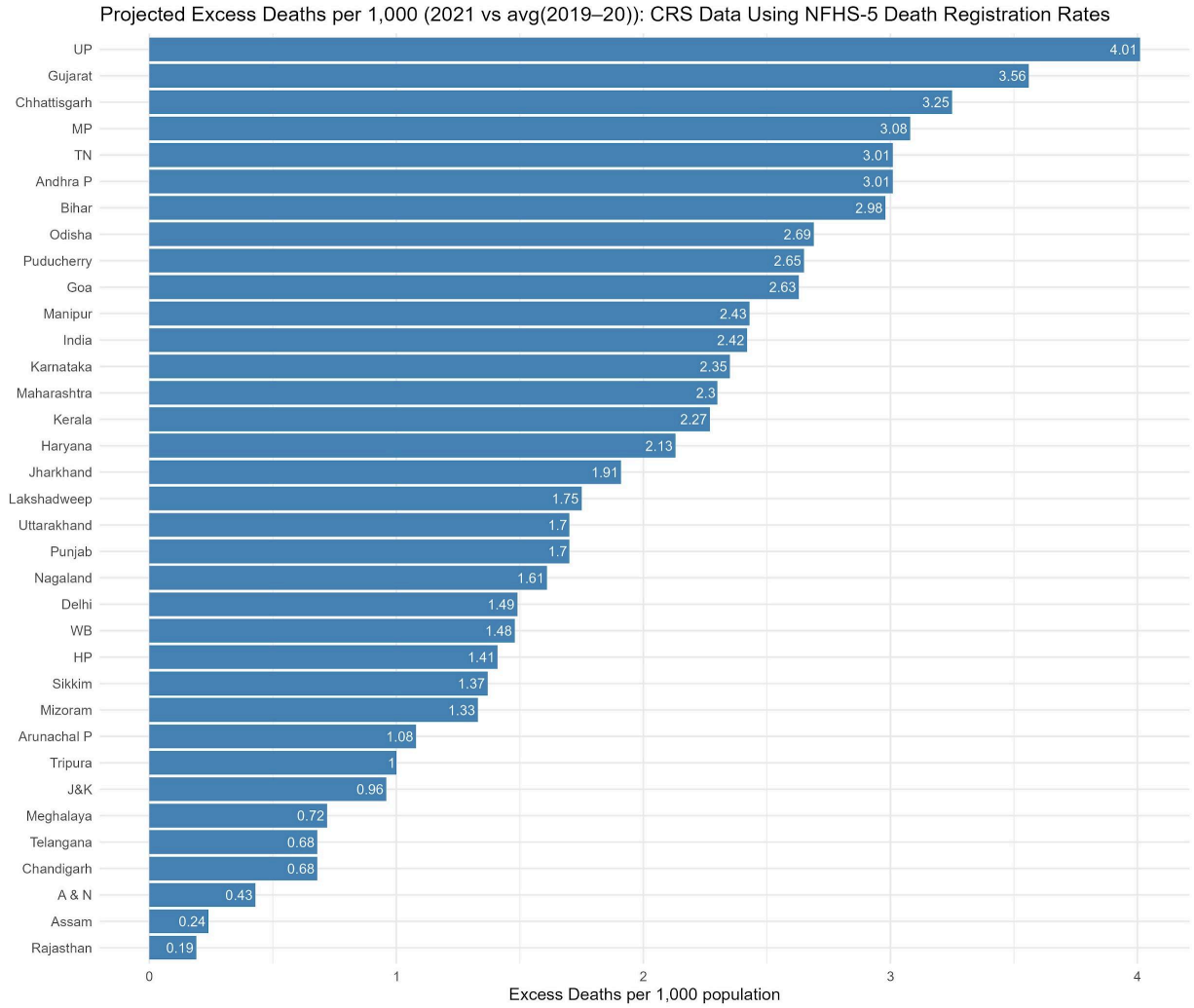

Projected Excess Deaths per 1,000 (2021 vs 2019): CRS Data Using NFHS-5 Death Registration Rates
Gujarat 4.03
Bihar 3.71
UP 3.69
Andhra P 3.63
TN 3.38
MP 3.33
Chhattisgarh 3.33
Odisha 3
Goa 2.87
Maharashtra 2.81
Karnataka 2.72
India 2.67
Haryana 2.58
Puducherry 2.54
Manipur 2.15
Kerala 1.99
Punjab 1.96
Jharkhand 1.89
WB 1.83
Lakshadweep 1.79
Nagaland 1.75
Sikkim 1.6
HP 1.47
Uttarakhand 1.45
Delhi 1.42
J&K 1.4
Mizoram 1.38
Tripura 1.19
Arunachal P 1.07
Meghalaya 0.97
A & N 0.89
Assam 0.76
Rajasthan 0.4
Telangana 0.22
Chandigarh
0
2
4
Excess Deaths per 1,000 population

Figure 13



IV. Age-Standarised Death Rates

While excess deaths per 1000 population nationally and state-wise account for the population variance, they do not account for the demographic age variance across states. Age-standardised excess death rate for India is useful for making any global comparisons. Age-standardisation normalises the age variance across the different populations against a chosen standard population as older populations expectedly would have higher deaths than younger populations.

We have followed the WHO Age Standardisation Methodology as laid out by Ahmad et al. (2001)[14]. The data required for age standardisation are age-group wise deaths and the age

[14] Omar B Ahmad et al., "Age Standardization of Rates: A New WHO Standard," *World Health Organisation*, no. GPE Discussion Paper Series: No.31 (2001).

distribution of the population (i.e. number of people in each of those age groups) for the regions being studied.

$$ASED\ per\ 1000\ = \left[\sum\left(\frac{d_{ij}}{p_{ij}} \times w_{ij}\right)\right] \times 1000$$

where:

i is the lower end of an age-group and j is the upper end of an age-group

d is the age-group specific excess deaths

p is the age-group specific population as per 2021 projections

w is the age-standard weights; taken from a standard population (WHO Age Standards or All India Average Age-Group Distribution)

DATA SOURCES:

1. d

The number of deaths in each age group is taken from the Report on Vital Statistics of India Based on the Civil Registration System 2021, 2020, 2019. Age wise number of deaths for each of these states of India are taken from the CRS reports. Since the CRS reports collect details of death registration from the state governments, there are some missing data for some states. The total number of deaths for these states are available, and have been used for the estimates presented above – however, the age group-wise disaggregation has not been provided. The details of the missing data are as follows:

(a) The 2019 CRS Report does not have age-group specific deaths for Bihar, Haryana, Jharkhand, Ladakh, Manipur and Uttarakhand.
(b) The 2020 CRS Report does not have age-group specific deaths for Jharkhand.
(c) All the 3 years used for age-standardisation calculations: 2019, 2020 and 2021 CRS Reports do not have age-group specific deaths for Maharashtra and Sikkim.
(d) All-India or national age-group specific deaths are not readily available as aggregate figures in the CRS reports, they had to be summed up from the State-wise age-group specific deaths. Hence, the national age-standardisation estimates based on CRS do not account for the missing states – the data is exclusive of missing states in terms of both the numerator (age-group specific deaths) and denominator (age-group specific population).

Since there are some states missing in the All India estimates based on CRS, All India estimates have also been made using death data from the SRS - Sample Registration System Statistical Reports 2021, 2020, 2019, 2018, 2017, 2016

2. p

Population by age group for Indian states is taken from Report of the Technical Group on Population Projections, 2020, Ministry of Health and Family Welfare, Government of India. The population data we have used above is mid-year 2021 population projection data from the Report of the Technical Group on Population Projections, 2020 Ministry of Health and Family Welfare, Government of India for both national and state-wise crude excess mortality calculations. For age-group calculations, there is only one population projection available for

2021, no mid-year population is available. While the state level age standardisation has been carried out using the All-India population distribution as the standard, for national age-standardisation calculations, WHO World Averages are also used.

3. *w*

The weights used are derived from the age distribution as given by WHO Age Standards and the Indian population projection data. For the Indian population projection, there is only one population projection available for 2021, no mid-year population is available. [Age Standard Weights (w) = (WHO Age Standard or India Age-Group Percentage) / 100]

Table 4: Age-Group Intervals Used for Age-Standardisation

WHO Age Standards (2000-2005)[15]		**India Population Projection 2021[16]**	
Age Group (Based on CRS State-wise Age Group Intervals)	World Average 2000-2025	Age Group Intervals (Based on CRS State-wise Age Group Intervals)	Indian Population Proportion
0_4	8.86	0_4	8.3
5_14	17.29	5_14	17.2
15_24	16.69	15_24	18.5
25_34	15.54	25_34	16.9
35_44	13.74	35_44	13.8
45_54	11.41	45_54	11
55_64	8.27	55_64	7.5
65_69	2.96	65_69	2.5
greater_than_70	5.275	greater_than_70	4.3

WHO recommends age-group intervals to be every 5 years for age-standardisation. However, the age-group specific deaths in the CRS reports the age-groups used are decadal, with a five year interval being used for the youngest age group, and all those above 70 years being clubbed together. We have therefore classified WHO Age Standards within the same intervals, which meant aggregating the proportions of certain age groups (Annexure 3).

The data for age standardisation was organised in the above mentioned age intervals (Table 4). The excess death rates by age group were then standardised against WHO Age Standards for

[15] Age Standardisation of Rates: A New WHO Standard

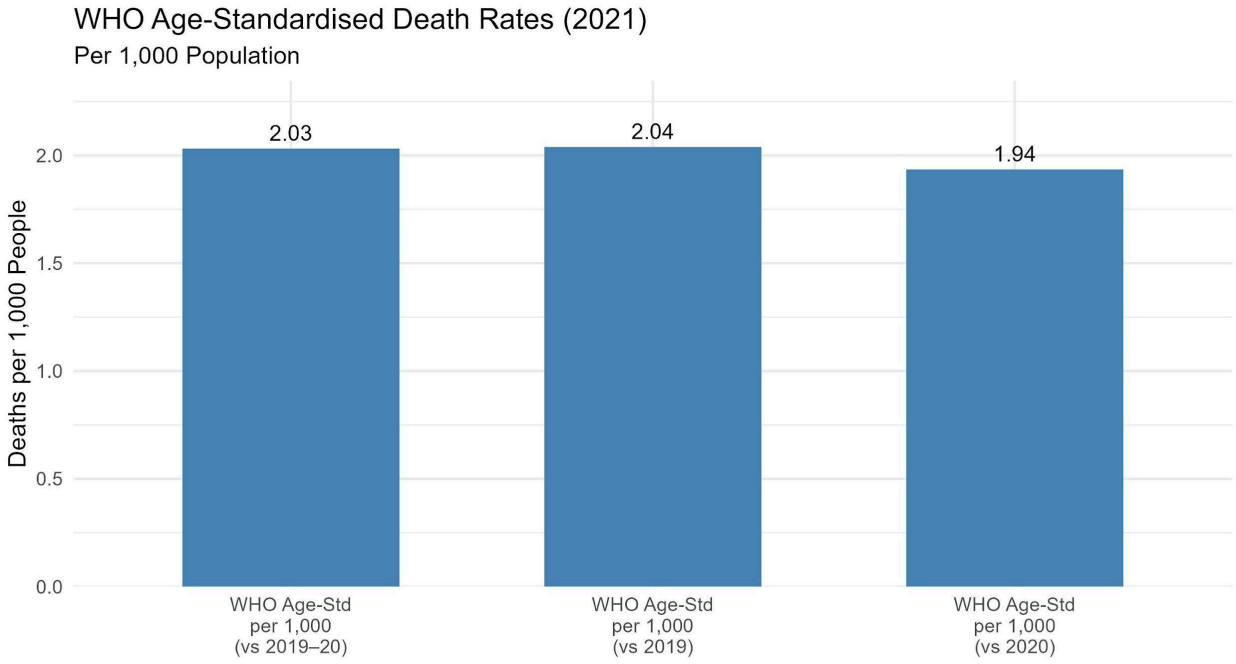
[16] Report of the Technical Group on Population Projections, 2020, Ministry of Health and Family Welfare, Government of India

national estimates. For state estimates the excess death rates by age group were standardised against National Age Standards.

Age Standardised Excess Death Rates – All India

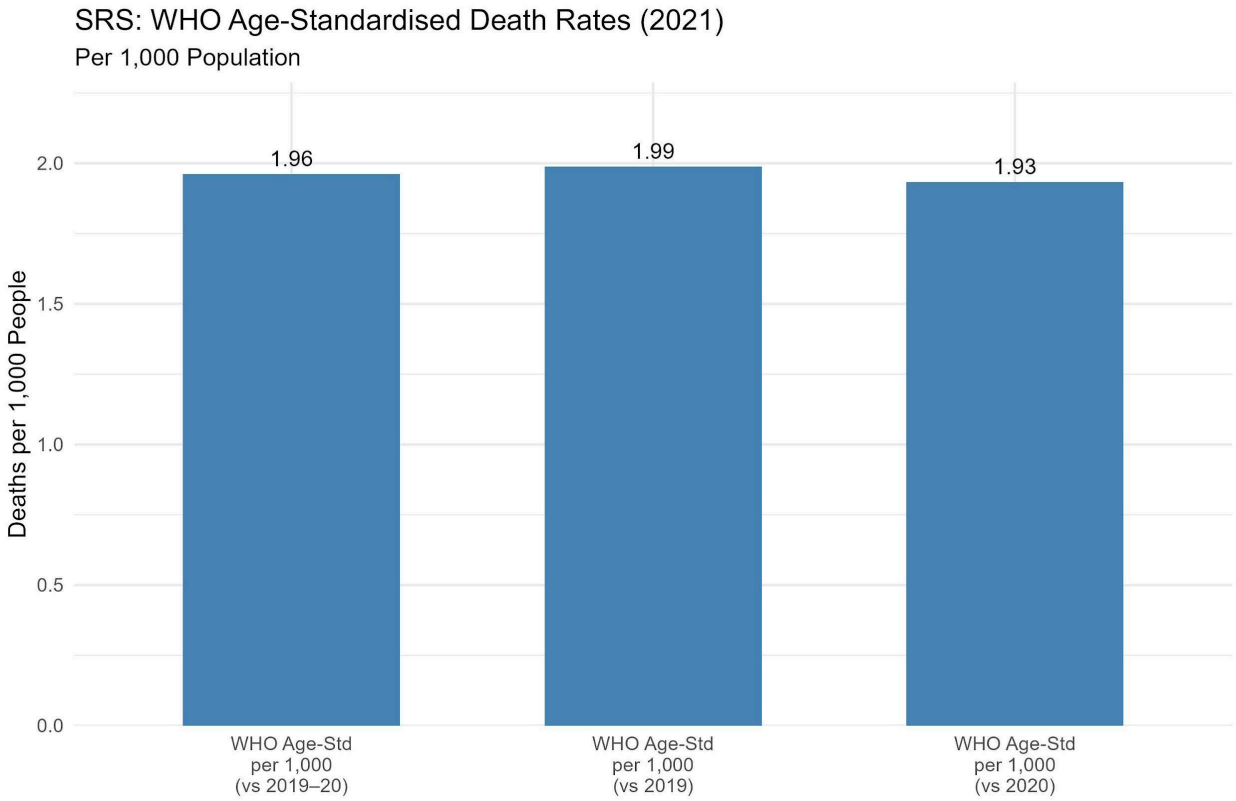
The age-standardised excess deaths per 1000 for All India on the basis of CRS registered age-group specific excess deaths (Figure 14) and on the basis of SRS estimated age-group specific excess deaths (Figure 15) are presented below. The SRS estimations were calculated using age-specific death rates and the age-group specific population for the years 2019-21. We see that there is a slightly higher variance between the bars in Figure 14 (0.1) compared to the bars in Figure 15 (0.06), which again comes from the variation in the number of deaths between the two sources, CRS and SRS for the earlier years, as discussed in the above sections.

Figure 14: CRS based Age Standardised Death Rates – All India



Note:
- *2019 data is unavailable for Bihar, Uttarakhand, Jharkhand, Haryana, Ladakh, and Manipur.*
- *2020 data is unavailable for Jharkhand.*
- *2021, 2020, and 2019 data are all unavailable for Maharashtra and Sikkim.*
- *Age-standardised rates use WHO 2000–2025 population weights.*
- *Crude death rates use a total mid-year population of 1,367,173,000 (India, 2021).*

Figure 15: SRS based Age Standardised Death Rates – All India



Going by our primary data source of CRS, there were 1.94 excess deaths in 2021 compared to 2020, 2.04 compared to 2019 and 2.03 compared to the average of 2019-20. As mentioned above, the missing data in these CRS estimates need to be noted. Since the CRS report does not give age-wise death rates for All India, these have been summed from the data for the states. Therefore, in Figure 14 any data that includes the year of 2019, i.e., the first two bars (vs 2019-20 and vs 2019) does not include the states of Bihar, Haryana, Jharkhand, Ladakh, Maharashtra, Manipur, Sikkim and Uttarakhand. These eight states are not accounted for in calculating age-group specific excess deaths or while considering the denominator of age-group specific population. Since d is not available for the eight states above we have subtracted their numbers from p as well to have more accurate age-standardisation. Similarly, for any plots using the year 2020, i.e., the third bar (vs 2020), there are three states missing. Jharkhand, Maharashtra and Sikkim. The three states excluded from both numerator d denominator p.

Age Standardised Excess Death Rates – States

The State-wise age-standardised excess deaths per 1000 are illustrated in Figures 16 and 17. However, Gujarat, Chhattisgarh and Madhya Pradesh are among the states with the highest age standardised death rates in both comparisons (vs 2019 and vs 2019-2020). Gujarat was also amongst the top States for absolute excess deaths and excess deaths per 1000 population

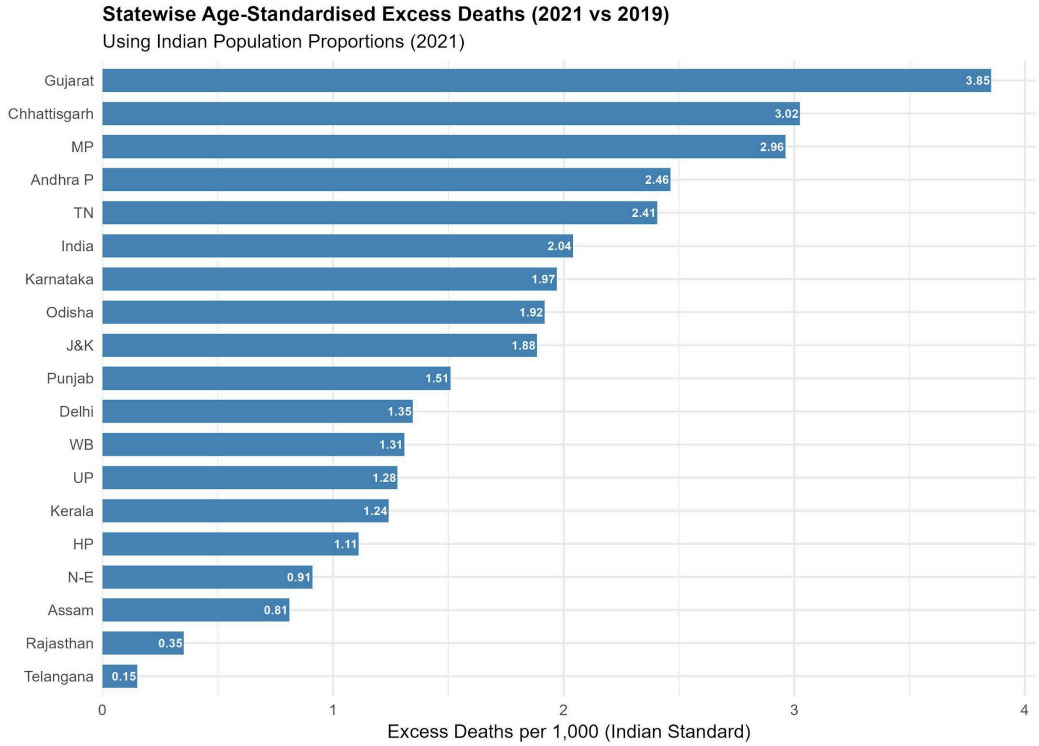
probably indicated a spike in deaths in Gujarat in 2021. One may be inclined to think this could also be due to prompt death registration (93.2%), however, Gujarat reported only ~5,800[17] Covid-19 deaths, that is an underreporting of 35x the excess deaths in 2021 compared to 2020 (202,000).

Karnataka and Kerala are also on the top when compared with the average of 2019-20, and Andhra Pradesh and Tamil Nadu in the comparisons with 2019. This could also be due to prompt and complete death registration across age-groups as discussed earlier within the Southern States. This needs to be examined further.

On the other hand, as observed in the previous section as well, Rajasthan, Telangana, Assam and the North-Eastern States have the lowest age-standardised excess deaths per 1000 across. While, according to NFHS-5, Rajasthan and Telangana have a reasonable death registration rate of 76.7% and 73.2% respectively and they are above the Indian average, the North-Eastern States of Assam (65%), Meghalaya (54.1%), Manipur (42.7%), Nagaland (39.4%) and Arunachal Pradesh (36.6%) have relatively lower death registration rates, which could partly explain why they are low in the mortality rate charts. On the other hand, post the consideration of the projected estimates from the previous section where the above states continue to be at the base of the graph, it could indicate that these states may have well and truly performed better than the rest of the country in mortality rates during the pandemic.

[17] "India Logged 19.7L Excess Deaths in 2021, 6x Official Covid Toll: Government Data," *The Times of India*, May 9, 2025, https://timesofindia.indiatimes.com/india/india-logged-19-7l-excess-deaths-in-2021-6x-official-covid-toll-government-data/articleshow/121013243.cms.

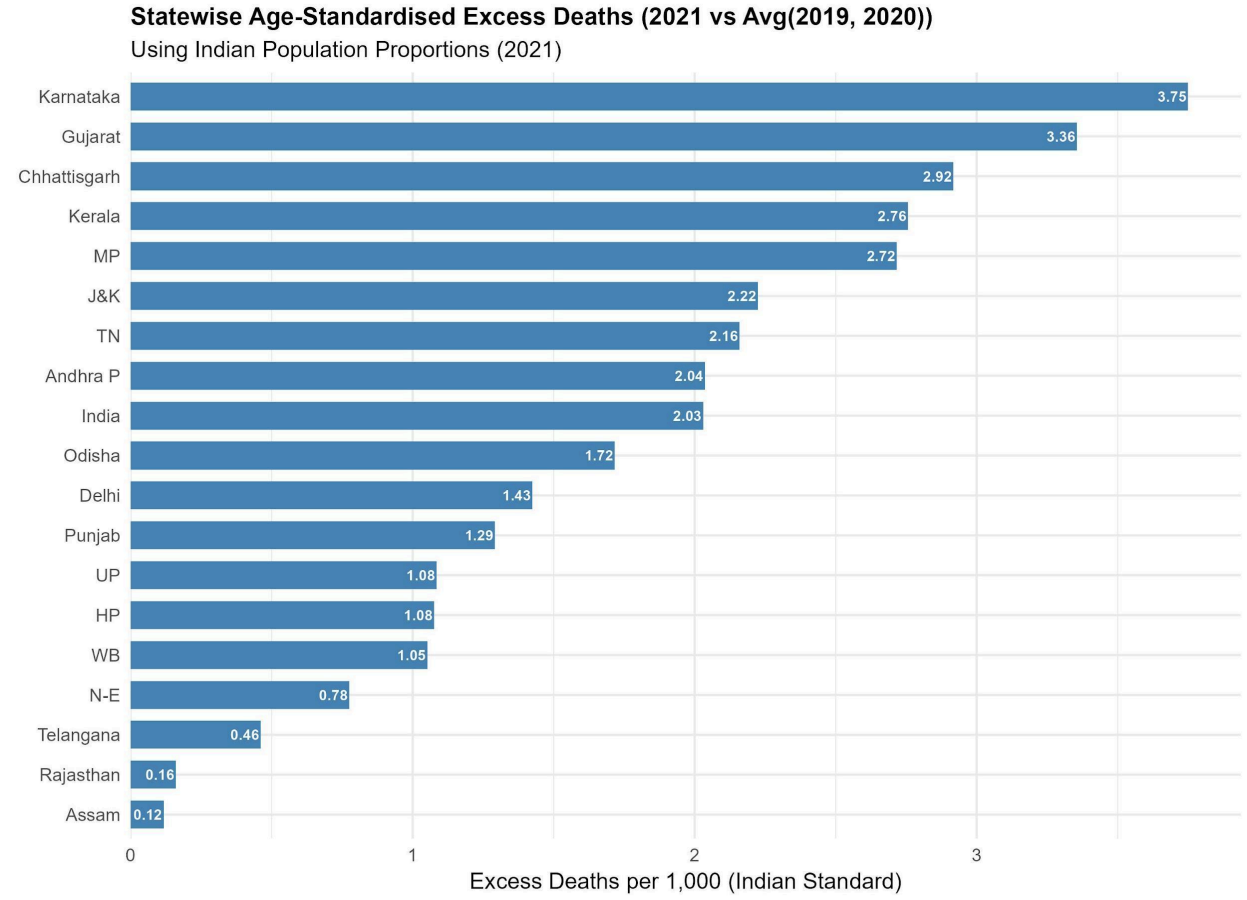
Figure 16



Note:

- *2019 data is unavailable for Bihar, Uttarakhand, Jharkhand, Haryana, Ladakh, and Manipur.*
- *2020 data is unavailable for Jharkhand.*
- *2021, 2020, and 2019 data are all unavailable for Maharashtra and Sikkim.*

Figure 17



Note:
- *2019 data is unavailable for Bihar, Uttarakhand, Jharkhand, Haryana, Ladakh, and Manipur.*
- *2020 data is unavailable for Jharkhand.*
- *2021, 2020, and 2019 data are all unavailable for Maharashtra and Sikkim.*

A note on North-East being one single entity N-E: The Report of the Technical Group on Population Projections, 2020, Ministry of Health and Family Welfare, Government of India does not provide age-group specific population projections for each North-Eastern state separately. The States of Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are given as a unified entity of North-East. To exclude relevant states (Manipur and Sikkim from 2019 comparisons) and (Sikkim from 2020 comparison), we subtracted the age-group specific projected 2021 population from the denominator p, to maintain good grounds for comparison

Discussion

In this paper, we estimate the number of excess deaths, excess deaths per 1000 population and age-standardised excess death rates for India and states, in the year 2021 in comparison with previous years. This has been done using two official sources of data – death registration data from CRS and estimates of death rates from the SRS which is a sample survey with a large sample size. While there have been earlier estimates of excess deaths during the Covid pandemic in India, official data are only now available. All excess deaths cannot be attributed to

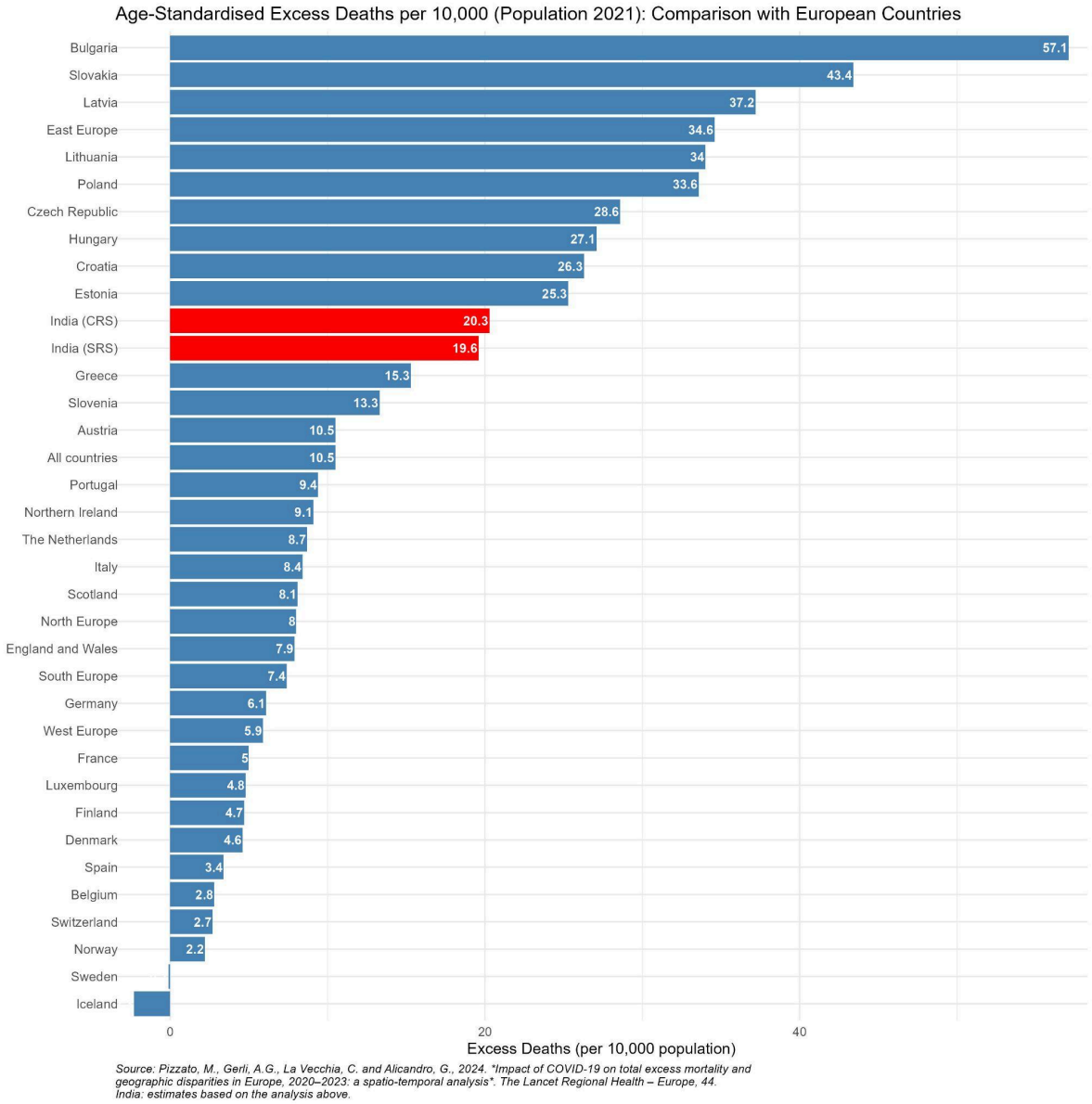
Covid, but a sharp divergence in the trend in the number of deaths would very strongly indicate the direct and indirect consequences of the pandemic. Cause of death data is inadequate for further analyses.

Both CRS and SRS, show that there were around 2 million excess deaths in India in 2021, when compared with the number of deaths in 2019 and 2020. This is much higher than the official number of stated Covid-related deaths (about 6 times higher). The increase in death rates in 2021 as estimated by SRS also shows clearly that the number of Covid deaths in India was significant and higher than officially stated.

This note presents age-standardised excess deaths per 1000 population using the CRS data of states and SRS data for all India. Standardising excess deaths by age, allows for better comparisons across states as well as with other countries. Some state-wise comparisons are presented in the sections above.

Although not strictly comparable because of different methodologies and time periods under consideration, for illustration, Figure 18 presents the age-standardised excess mortality rates per 10,000 population from a study published in the Lancet (Pizzato, 2024). This study models excess deaths in each of the Covid years (2020-2023) using weekly mortality data for the period 2010-2023. The study included only European countries. The figure below compares the age-standardised excess deaths rates from this paper for the year 2021, with our estimates for India from CRS and SRS for 2021. More robust global comparisons based on existing estimates can also be taken up in future.

Figure 18



The CRS data, while representing deaths that were registered and therefore most reliable in one sense, also have a lot of gaps. Firstly, from what we know from other sources death registration in India is not complete and varies across sources. Matching the CRS with SRS data, it seems like death registration improved drastically from 2020 onwards. On the other hand, NFHS-5 conducted during the same period (2019-21) shows only around 70.8% death registration in India based on reporting by households of deaths and whether they were registered. This needs further analysis. Further, when it comes to age wise deaths, there is a lot of missing data from CRS, which also affects the all India estimates which are nothing about a cumulation of the state data. As a next step age standardised excess deaths estimation using SRS data can be attempted.

The next Census is due to be conducted in 2026. Although it comes with a lag, data from the Census would also be able to throw further light on the impact of the pandemic on mortality in India.

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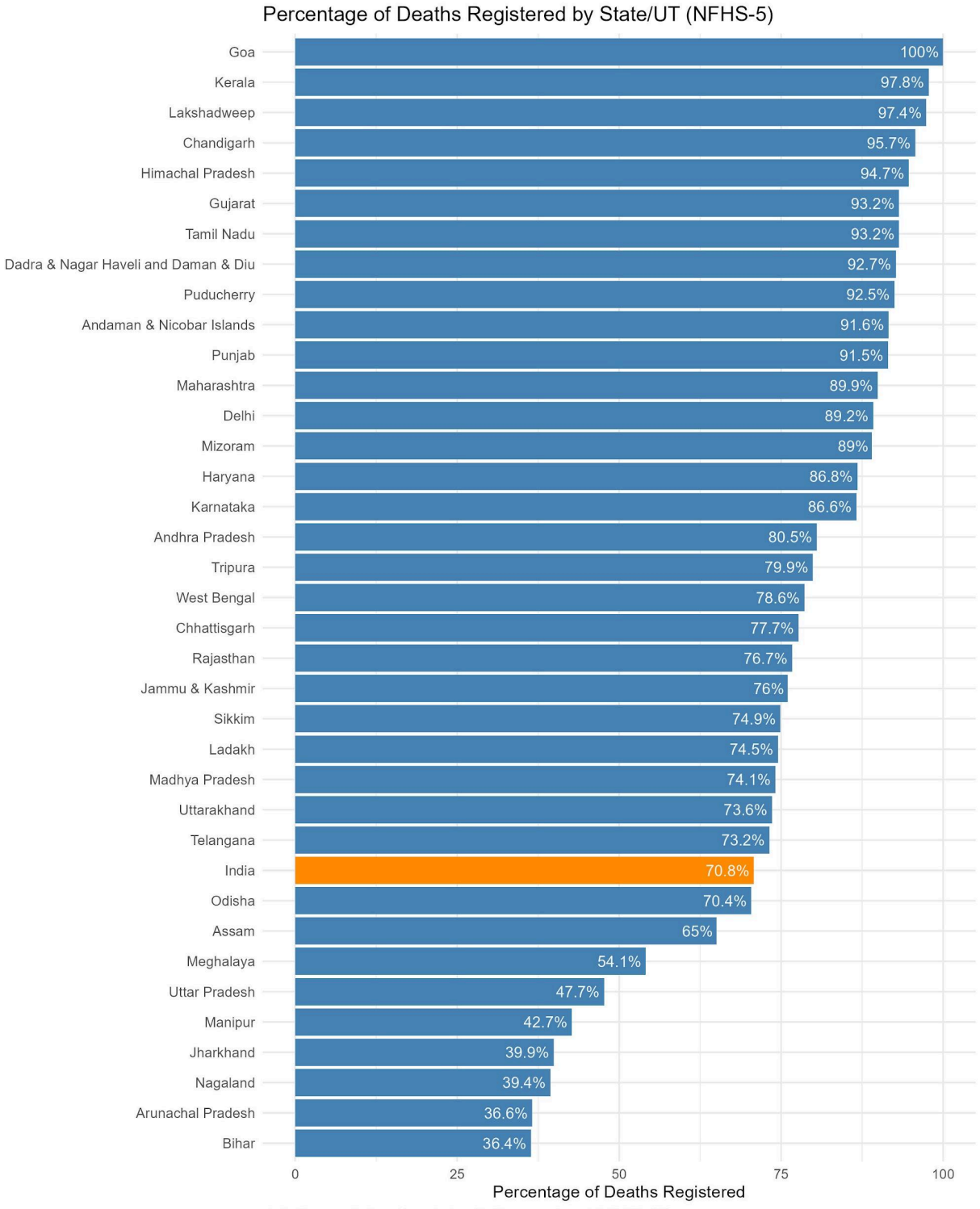
Annexure 1

Death Registration Percentage in India: National and State-wise	
State/UT	Percentage of Deaths Registered
India	**70.8**
Andaman & Nicobar Islands	91.6
Andhra Pradesh	80.5
Arunachal Pradesh	36.6
Assam	65
Bihar	36.4
Chandigarh	95.7
Chhattisgarh	77.7
Dadra & Nagar Haveli and Daman & Diu	92.7
Delhi	89.2
Goa	100
Gujarat	93.2
Haryana	86.8
Himachal Pradesh	94.7
Jammu & Kashmir	76
Jharkhand	39.9
Karnataka	86.6
Kerala	97.8
Ladakh	74.5
Lakshadweep	97.4
Madhya Pradesh	74.1

Maharashtra	89.9
Manipur	42.7
Meghalaya	54.1
Mizoram	89
Nagaland	39.4
Odisha	70.4
Puducherry	92.5
Punjab	91.5
Rajasthan	76.7
Sikkim	74.9
Tamil Nadu	93.2
Telangana	73.2
Tripura	79.9
Uttar Pradesh	47.7
Uttarakhand	73.6
West Bengal	78.6
Data Source: National Family Health Survey - Round 5 (2019-21)	



Data Source: National Family Health Survey - Round 5 (2019–21)

Annexure 2

Alternative Projection: Estimated Deaths Using NFHS-5 Death Registration Percentages and CRS Death Registration Data (2019-21)[18]							
State	Registered Deaths 2019	Registered Deaths 2020	Registered Deaths 2021	Death Registration Percentage	Projected Deaths 2019	Projected Deaths 2020	Projected Deaths 2021
A & N	2616	2951	2943	91.6	2856	3222	3213
Andhra P	401472	455000	556102	80.5	498723	565217	690810
Arunachal P	3490	3475	4093	36.6	9536	9495	11183
Assam	163057	187085	180476	65	250857	287823	277655
Bihar	359349	425047	526520	36.4	987223	1167712	1446484
Chandigarh	23592	18370	21767	95.7	24652	19195	22745
Chhattisgarh	188211	191938	264790	77.7	242228	247024	340785
Daman & Diu	NA	11916	10403	92.7	NA	12854	11222
Delhi	145284	142789	171476	89.2	162874	160077	192238
Goa	13851	14601	18337	100	13851	14601	18337
Gujarat	462284	523892	725537	93.2	496013	562116	778473
Haryana	188910	212238	255325	86.8	217638	244514	294153
HP	43633	44449	53964	94.7	46075	46937	56984
India	7641076	8115882	10224506	70.8	10792480	11463110	14441393
J&K	44227	53070	58502	76	58193	69829	76976
Jharkhand	119374	119037	148587	39.9	299183	298338	372398
Karnataka	508584	551808	666402	86.6	587279	637192	769517
Kerala	270567	250983	339648	97.8	276653	256629	347288
Ladakh	NA	742	684	74.5	NA	996	918
Lakshadweep	336	342	455	97.4	345	351	467
Maharashtra	693800	808783	1009114	89.9	771746	899647	1122485
Manipur	2990	2230	5896	42.7	7002	5222	13808
Meghalaya	18298	19191	20034	54.1	33823	35473	37031
Mizoram	6606	6703	8101	89	7422	7531	9102

[18] Projected Deaths = (Registered Deaths * 100) / Death Registration Percentage

MP	493328	524454	702527	74.1	665760	707765	948080
Nagaland	2266	2509	3780	39.4	5751	6368	9594
Odisha	342947	362982	439726	70.4	487141	515599	624611
Puducherry	13255	12923	16979	92.5	14330	13971	18356
Punjab	215045	229846	269605	91.5	235022	251198	294650
Rajasthan	451315	477151	475730	76.7	588416	622100	620248
Sikkim	3308	3543	4119	74.9	4417	4730	5499
Telangana	228294	203127	234425	73.2	311877	277496	320253
TN	633897	687212	875012	93.2	680147	737352	938854
Tripura	30419	31645	34307	79.9	38071	39606	42937
UP	944596	873419	1352101	47.7	1980285	1831067	2834593
Uttarakhand	66313	62219	78550	73.6	90099	84537	106726
WB	551695	606714	693450	78.6	701902	771901	882252

Annexure 3

Table 5: WHO Age Standards (2000-2005)[19]			
Age Group	World Average 2000-2025	Age Group (As Per CRS Grouping)	World Average 2000-2025
0-4	8.86	0_4	8.86
5-9	8.69	5_14	17.29
10-14	8.6	15_24	16.69
15-19	8.47	25_34	15.54
20-24	8.22	35_44	13.74
25-29	7.93	45_54	11.41
30-34	7.61	55_64	8.27
35-39	7.15	65_69	2.96
40-44	6.59	greater_than_70	5.275
45-49	6.04		
50-54	5.37		
55-59	4.55		
60-64	3.72		
65-69	2.96		
70-74	2.21		
75-79	1.52		
80-84	0.91		
85-89	0.44		
90-94	0.15		
95-99	0.04		
100+	0.005		
Total	100		

[19] Age Standardisation of Rates: A New WHO Standard