

**STRICTLY EMBARGOED FOR RELEASE UNTIL 1030 HRS ON 12 MAY 2020 INDIA TIME**

**First comprehensive estimates of district-level trends of  
child mortality and child growth failure in India from 2000 to 2017**

- The under-5 mortality rate (U5MR) and neonatal mortality rate in the first month of life (NMR) have dropped substantially in India since 2000, but there is a 5-6 fold variation in the rates between the states and 8-11 fold variation between the districts of India.
- While U5MR and NMR have been decreasing in almost all districts of India, the progress in this decline has been highly variable because of which the inequality in these rates has increased between districts within many states.
- 68% of the under-5 deaths in India can be attributed to child and maternal malnutrition, 83% of the neonatal deaths to low birth weight and short gestation.
- Child growth failure, measured as stunting, wasting and underweight has improved in India since 2000, but their rates vary 4-5 fold between the districts of India and the inequality between districts within many states has increased.
- If the trends observed up to 2017 were to continue, India would meet the SDG 2030 U5MR target but not the SDG 2030 NMR target; 34% of the districts in India would need higher U5MR reduction and 60% districts would need higher NMR reduction to individually meet the SDG targets.
- The district-level child mortality and child growth failure trends in this report arrived at by using all accessible data sources from India provide the most comprehensive reference so far for further planning to improve child survival across India.

**New Delhi, 12 May 2020** – At this time when India is focussed heavily on how to deal with COVID-19, two important scientific papers on child survival are published today by the **India State-Level Disease Burden Initiative**. These publications remind us that while we must do all that we can to control COVID-19, other crucial health issues in India should also continue to receive attention commensurate with their contribution to health loss in India.

The paper in *The Lancet* reports the first comprehensive estimates of district-level trends of child mortality in India from 2000, and the paper in *EClinicalMedicine* reports detailed district-level trends of child growth failure. The findings show that although the child mortality and child growth failure indicators have improved substantially across India from 2000 to 2017, the inequality between districts has increased within many states, and that there are wide variations between the districts of India. The child mortality and child growth failure trends reported in these papers utilized all accessible georeferenced survey data from a variety of sources in India, which enabled more robust estimates than the estimates based on single sources that may have more biases. The district-specific findings described in these scientific papers highlight the extent of the effort needed in each district to achieve the national and global targets for the child mortality and child growth failure indicators.

**Prof Vinod Paul, Hon'ble Member NITI Aayog** on the release of the findings said, "These research findings have shown that India has made positive strides in protecting the lives of new-borns over the last two decades. Introduction of contextually relevant multi-sectorial actions by the Government of

India and the State Governments like maternal nutrition programmes during pregnancy, access to skilled health providers during childbirth, and family/community-based care through postnatal home visits have shown to have made a difference. The district level data from this study will help in the planning and implementation of local action plans and set the course for further improvements in child mortality and child growth failure in India.”

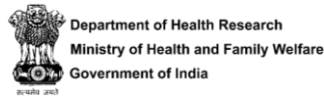
**Prof Balram Bhargava**, Secretary to the Government of India, Department of Health Research, Ministry of Health & Family Welfare, and Director General, ICMR said, “This is India’s first comprehensive consolidated and detailed analysis of sub-national trends of child mortality and growth failure for all the districts and states in India. It is reassuring news for India that with the various governmental and other efforts under-five mortality rate has halved from 2000 to 2017. The district-level trends reported in these papers provide useful guidance for identifying priority districts in each state that need the highest attention. This approach can facilitate further reduction in child mortality in India.”

**Prof Rakhi Dandona**, Professor at the Public Health Foundation of India and the lead author of the child mortality paper said, “Comparison of child mortality trends in each of the 723 districts of India with the National Health Policy and SDG targets has identified the districts with high gap where more targeted attention is needed. Bringing down death numbers among newborn babies in the first month of life by addressing specific causes of death is crucial. Malnutrition continues to be the leading risk factor for child death across India. Low birth weight is the biggest component in this risk factor. Focus on maternal nutrition during pregnancy needs to be a priority to improve birthweight of babies. The health system needs to track every pregnant women and every new born effectively to substantially reduce child deaths in India.”

**Dr R Hemalatha**, Director, National Institute of Nutrition, ICMR and the lead author of the child growth failure paper said, “India has had significant improvements in stunting, wasting and underweight among children since 2000. However, there continues to be a 5-fold variation in the prevalence of these indicators between the districts of India. The relative inequality of this prevalence between districts has increased within several states, indicating that efforts targeting poorly performing districts as identified by our analysis can potentially help hasten overall improvements in child growth failure in India.”

The Director of the India State-Level Disease Burden Initiative, **Prof Lalit Dandona**, who is National Chair of Population Health at ICMR, Professor at PHFI, and senior author of these two papers said, “Over the past couple of years, the India State-Level Disease Burden Initiative has been reporting scientifically strong analyses of key diseases and risk factors for every state to inform health policy formulation. The district-level analyses of child mortality and child growth failure reported today are next in this series, providing robust evidence for policy to further improve child survival in India. Continuing this work, this year we are undertaking a comprehensive analysis of the disease burden caused by COVID-19 across India as well as district-level analyses of other indicators that are important for decentralized health planning to which India aspires.”

**Dr Hendrik J Bekedam**, WHO Representative to India said, “The complementary programmes – National Health Mission, National Nutrition Mission and Swachh Bharat Abhiyaan – have helped in addressing the immediate and underlying causes of child mortality and child growth failure. Importantly, improving health indicators together with other socio development indicators through the Aspirational District Programme will result in greater reduction of child growth failure and resulting mortality in underperforming districts.”



**Prof K Srinath Reddy**, President, Public Health Foundation of India said, “Reductions in under-5 child mortality and neonatal mortality are promising as we move towards the SDG targets. Even neonatal mortality which was previously slow to change is now showing improvement. This decline needs to be further accelerated. Child malnutrition is a major determinant along with maternal malnutrition for these deaths and should be accorded highest priority for corrective action. While stark inter-state and inter-district differences in health and nutrition continue to be challenges, these gaps must be quickly bridged through effective and equitable social development, nutrition and environmental health programmes. Our pre-occupation with Covid19 should not let these development imperatives slip in to the shadows.”

“These studies clearly indicate that, nationally, India has made impressive and substantial progress in reducing the rates of under-5 mortality, however there remain discrepancies in those rates among and within district-level geographies,” said **Prof Christopher J L Murray**, Director of the Institute for Health Metrics and Evaluation at the University of Washington’s School of Medicine. “Health policy makers throughout India will gain critical insights from these studies to help address those discrepancies as the nation seeks to meet the United Nations’ Sustainable Development Goals.”

The findings reported in the papers published today are part of the Global Burden of Disease Study 2017. The analytical methods of this study have been refined over two decades of scientific work, which has been reported in over 16,000 peer-reviewed publications, making it the most widely used approach globally for disease burden estimation. These methods enable standardized comparisons of health loss caused by different diseases and risk factors, between different geographies, sexes, and age groups, and over time in a unified framework.

### **Key findings from the child mortality paper published in *The Lancet*:**

India State-Level Disease Burden Initiative Child Mortality Collaborators. Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000–2017. *Lancet*. 12 May 2020.

[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

#### ***State-level child mortality variations***

- U5MR in India reduced by 49% from 83 in 2000 to 42 per 1000 livebirths in 2017, and NMR reduced by 38% from 38 to 23 per 1000 livebirths during this period.
- There were 1.04 million under-5 deaths in India in 2017, of which 0.57 million were neonatal deaths, down from 2.24 million under-5 deaths including 1.02 million neonatal deaths in 2000.
- The highest number of under-5 deaths in 2017 were in the state of Uttar Pradesh (312,800 which included 165,800 neonatal deaths) and Bihar (141,500 which included 75,300 neonatal deaths).
- U5MR and NMR was lower with the increasing level of development of the states. In 2017, there was 5.7 fold variation in U5MR ranging from 10 per 1000 live births in the more developed (high SDI) state of Kerala to 60 in the less developed (low SDI) state of Uttar Pradesh, and 4.5 fold variation for NMR ranging from 7 per 1000 live births in Kerala to 32 in Uttar Pradesh.
- The annual rate of reduction from 2010 to 2017 for U5MR ranged among the states from 2.7% in a small north-eastern state of Nagaland to 6.5% in the middle SDI state of Telangana, and for NMR from 1.8% in Nagaland to 5.5% in the high SDI state of Tamil Nadu.
- The annual rate of reduction of NMR was lower than that of U5MR in all states during 2010-2017, but this varied considerably between the states.

#### ***District-level child mortality variations***

- U5MR varied 10.5 times between the 723 districts of India in 2017, ranging from 8 to 88 per 1000 livebirths, and NMR varied 8.0 times, ranging from 6 to 46 per 1000 livebirths. The highest district-level U5MR and NMR in 2017 were comparable to the highest rates globally among some Sub-Saharan Africa countries.
- U5MR was 40 or more per 1000 livebirths in 88% of the districts in the less developed (low SDI) states, but only in 2% of the districts in the more developed (high SDI) states.
- Similarly, NMR was 20 or more per 1000 livebirths in 93% of the districts in the low SDI states, but only in 13% of the districts in the high SDI states.
- The annual rate of change 2010-2017 varied widely among the districts from 9.0% reduction to no significant change for U5MR, and from 8.0% reduction to no significant change for NMR.
- Inequality between the districts within the states, measured as coefficient of variation, varied extensively in 2017, ranging 11-fold for U5MR and 13-fold for NMR among the states.
- Despite the decrease in U5MR and NMR in most of the districts from 2000 to 2017, the inequality in these rates increased in 74% of the states for U5MR and in 77% states for NMR.
- The highest increases in inequality between districts within states were in Assam and Odisha among the low SDI states, in the small north-eastern states of Meghalaya and Arunachal Pradesh, and in Haryana among the middle SDI states.

#### ***Identification of priority districts***

- Priority districts for child mortality reduction were identified within states as those that fell in the category of high U5MR and NMR in 2017 and low annual rate of reduction from 2010 to 2017 for

the distribution of rates within the states. Using this approach, priority districts for the nationwide distribution of U5MR and NMR and the rate of reduction were also identified to enable a complimentary understanding of the standing of each district with respect to all districts in India.

- In Uttar Pradesh, which had the highest child mortality rate in 2017 among the states, the districts in the highest priority category of high NMR and U5MR and low annual rate of reduction included a cluster of eight districts in the north-central part (Bahraich, Balrampur, Barabanki, Gonda, Hardoi, Kheri, Shravasti, and Sitapur), three districts in the south (Allahabad, Banda and Chitrakoot), and Lalitpur district in the south-west corner of the state.
- In Assam, which had the second highest child mortality rate in 2017, the highest priority category of high U5MR and NMR and low annual rate of reduction was concentrated in the southern handle of the state (Cachar, Dima Hasao, Hallakandi, Karbi Anglong, Karimganj, and West Karbi Anglong)
- In Bihar, the highest priority was scattered in the north-east (Kishanganj and Purnia) and the south-west of the state (Aurangabad and Kaimur).
- Based on the nationwide district-level distribution of child mortality rate, two-thirds of the districts in the less developed low SDI states fell in the high category of U5MR and NMR.
- In Uttar Pradesh, 48% of the districts fell in the highest priority category of high NMR and low rate of reduction for the nationwide distribution of the district-level rates.

#### ***Comparison of child mortality trends with targets***

- If the trends up to 2017 were to continue, India would not achieve the National Health Policy (NHP) 2025 U5MR target of 23 per 1000 live births or the NHP 2025 NMR target of 16 per 1000 live births. With these trends, India would achieve the SDG 2030 U5MR target of 25 per 1000 live births but not the SDG 2030 NMR target of 12 per 1000 live births.
- In order to achieve these NHP 2025 and SDG 2030 targets individually, most of the less developed low SDI states would need a higher rate of improvement in U5MR and NMR than they had up to 2017.
- Of the 723 districts in India, 34% would need a rate of improvement higher than they had up to 2017 to individually meet the SDG 2030 target for U5MR.
- 59% districts would need a rate of improvement higher than these had up to 2017 to individually meet the SDG 2030 target for NMR; this proportion was 91% in the less developed low SDI states and 21% in the more developed high SDI states.

#### ***Causes of child mortality***

- Lower respiratory infections (17.9%), preterm birth (15.6%), diarrhoeal diseases (9.9%), and birth asphyxia and trauma (8.1%) were the leading causes of under-5 death in India in 2017.
- Preterm birth (27.7%), birth asphyxia and trauma (14.5%), lower respiratory infections (11.0%), and congenital birth defects (8.6%) were the leading causes of neonatal deaths in India in 2017. 80% of the neonatal deaths were in the early neonatal period of 0–6 days.
- There were wide variations in the percentage of under-5 deaths due to various causes across the states even within the same SDI group. For example, within the low SDI states, the percentage for lower respiratory infections ranged from 15% in Odisha to 27% in Rajasthan, for diarrheal diseases from 6% in Chhattisgarh to 16% in Bihar, and for preterm birth from 11% in Bihar to 19% in Chhattisgarh.
- The rates for most causes of under-5 death in India were lower in the more developed states than in the less developed states.

- The death rate for all major causes of under-5 death reduced in India from 2000 to 2017, with the highest decline in measles (82%), followed by diarrhoeal diseases (69%), and lower respiratory infections (57%) and least for congenital birth defects (15%). There were wide variations in the magnitude of decline between the states, even within the same SDI group.

### ***Risk factors for child deaths***

- The dominant risk factor for under-5 death in India in 2017 was child and maternal malnutrition, to which 68% of the deaths could be attributed. The largest contributors to this were low birth weight and short gestation (46%) followed by child growth failure (21%).
- 11% of the under-5 deaths in India in 2017 could be attributed to unsafe water and sanitation and 9% to air pollution.
- For neonatal death, child and maternal malnutrition was the predominant risk factor to which 83% of deaths could be attributed, almost all of which was due to low birth weight and short gestation.
- The proportion of under-5 deaths attributable to child and maternal malnutrition varied between the states from 51% to 73%, unsafe water and sanitation from 1% to 14%, and air pollution from 2% to 14%.
- The proportion of neonatal deaths attributable to child and maternal malnutrition varied between the states from 63% to 87%, unsafe water and sanitation from 1% to 6%, and air pollution from 2% to 9%.
- The contribution of these risk factors to under-5 and neonatal deaths was relatively higher in the less developed low SDI states.

### ***Implications of these findings***

- This study provides the most comprehensive understanding of child mortality trends across the states and districts of India over the past two decades, highlighting the enduring disparities in child survival between the states and districts.
- The comparison of child mortality trends with the India and the SDG targets in this study identifies the states and districts that have gaps where more attention is needed.
- An approach combining the different levels of mortality rates and the rate of decline to identify priority districts in each state as used in this study could be used by policy makers to target districts that have persistently high child mortality rates and low rates of mortality reduction.
- The trends of the causes of under-5 and neonatal deaths reported in this study are a useful guide for the relative effort needed to deal with particular causes of child mortality in each state.
- The risk factor analysis reported in this study for each state highlights that child mortality can be reduced substantially with more effective improvements in the leading risk factors.
- The estimation of granular child mortality trends across all districts of the country combined with estimation of causes of death and risk factors at the state level, using all accessible data sources from India in a single framework as reported in this study provides crucial inputs for further planning of child mortality reduction in India.

### **Targets set by the National Health Policy 2025 and the SDG 2030**

| <b>National Health Policy 2025 targets</b> | <b>SDG 2030 targets</b>              |
|--|--------------------------------------|
| U5MR: 23 per 1000 live births by 2025      | U5MR: 25 per 1000 live birth by 2030 |
| NMR: 16 per 1000 live births by 2025       | NMR: 12 per 1000 live births by 2030 |



## **Key findings from the child growth failure paper published in *EClinicalMedicine*:**

India State-Level Disease Burden Initiative CGF Collaborators. Mapping of variations in child stunting, wasting and underweight within the states of India: the Global Burden of Disease Study 2000-2017.

*EClinicalMedicine*. 12 May 2020.

<https://www.thelancet.com/pb-assets/Lancet/pdfs/ECM-GBD-India.pdf>

### ***District-level variations***

- The prevalence of stunting among children under five years of age in India in 2017 was 39%, which varied 3.8 times between the 723 districts, ranging from 16% to 63%. Stunting prevalence was 40% or more in the 67% districts in the less developed (low SDI) states, but only in 1% of the districts in the more developed (high SDI) states.
- The prevalence of wasting among children under five years of age in India in 2017 was 16%, which varied 5.4 times between the districts ranging from 6% to 30%.
- The prevalence of underweight among children under five years of age in India in 2017 was 33%, varying 4.6 times between the districts from 11% to 51%.
- The annual rate of change from 2010 to 2017 varied widely among the districts. Stunting prevalence declined in 99% of the districts with a maximum decline of 41% and underweight in 95% of the districts with a maximum decline of 54%, but wasting declined only in 61% of the districts with a maximum decline of 44%.
- A higher proportion of the districts in the low SDI states had less than 20% reduction in stunting prevalence compared with the high SDI states (67% versus 46%), while for wasting a relatively higher proportion of districts in the high SDI states had less than 20% reduction compared with the low SDI states (44% versus 35%).

### ***Inequality within states***

- Inequality between the districts within the states, measured as coefficient of variation (CV), varied extensively in 2017, ranging 7-fold for stunting, 12-fold for wasting, and 9-fold for underweight among the states.
- The magnitude of inequality in stunting, wasting and underweight varied widely even between states at similar levels of socio-demographic development. For example, the CV for stunting in 2017 varied from 4% in Bihar to 21% in Odisha among the less developed (low SDI) states, and from 3% in Delhi to 19% in Kerala among the more developed (high SDI) states.
- Despite the decrease in stunting, wasting and underweight in most of the districts from 2000 to 2017, the inequality in these indicators increased in 90% of the states for stunting, in 52% states for wasting, and in 65% states for underweight.
- For stunting, the highest increase in inequality between districts within states was in Odisha among the low SDI states, in Telangana and Haryana in the middle SDI states, and in Nagaland and Delhi in the high SDI states.
- For underweight and wasting, the inequality between the districts within the states increased from 2000 to 2017 in some of the states, while it decreased for the others, spread across the low, middle and high SDI states.

### ***Identification of priority districts in states***

- Priority districts for child growth failure reduction were identified within states as those that fell in the category of high prevalence of stunting, wasting or underweight in 2017 and low annual rate of reduction from 2010 to 2017 for their distribution within the states. Using this approach, priority districts for the nationwide distribution of the prevalence of stunting, wasting and underweight and the rate of reduction were also identified to enable a complimentary understanding of the standing of each district with respect to all districts in the country.
- In Odisha, which had the highest inequality between districts for all the three CGF indicators in 2017, the districts in the highest priority category of high prevalence and low annual rate of reduction for stunting, wasting and underweight included a cluster of three districts in the south-west handle of the state (Kalahandi, Koraput, and Rayagada), and additionally for underweight and wasting in the neighbouring three districts (Nuapada, Nabarangapur and Malkangiri), and for stunting and underweight in Balangir district.
- In Uttar Pradesh, which had the highest stunting prevalence and medium level of inequality in 2017, the districts in the highest priority category of high prevalence and low rate of reduction for stunting included a cluster of 13 districts in the northern part (Pilibhit, Shahjapur, Lakhimpur Kheri, Sitapur, Bahraich, Sharavasti, Balrampur, Siddharth Nagar, Gonda, Barabanki, Faizabad, Basti, and Maharajganj).
- Based on the nationwide district-level distribution of the prevalence of CGF indicators, all 38 districts in Bihar were in the high tertile of stunting and none were in the high tertile for their rate of reduction, while in Uttar Pradesh, 97% of the districts fell in the high tertile for stunting and only 12% were in their high tertile for the rate of reduction.
- Interestingly, for wasting, 60% of the districts in the Odisha were in the high nation-wide tertile in 2017, while 67% in Uttar Pradesh were in the low tertile, indicating the contrast even within the less developed (low SDI) states.

#### ***Comparison of CGF indicators trends with targets***

- Of the 723 districts in India, 83% of the districts would need a rate of improvement higher than they had up to 2017 to individually meet the NNM stunting target of 25% prevalence in 2022; this proportion was 98% in the less developed (low SDI) states and 56% in the more developed (high SDI) states.
- In order to achieve the WHO/UNICEF 2030 target of 50% reduction in stunting prevalence from 2012 to 2030, 80% of the districts would individually need a rate of improvement higher than they had up to 2017; this proportion was 89% in the low SDI states and 63% in the high SDI states.
- 99% of the districts would need a rate of improvement higher than they had up to 2017 to individually reach the NNM 2022 underweight target of 2 percentage point reduction annually, and all the districts to reach the WHO/UNICEF wasting target of less than 3% prevalence in 2030.

#### ***Correlation between major national surveys***

- This report assessed the correlation for the district-level estimates of CGF indicators between the National Family Health Survey- 4 (NFHS-4, 2015–2016) and the two complementary household surveys (District-Level Household Survey [DLHS-4, 2012–2014] and Annual Health Survey [AHS, 2014]) for the 27 states covered by these surveys.
- The correlation between the NFHS-4 and AHS, which covered the same nine states, for district-level estimates of the CGF indicators was significant only in three states for stunting, three states



for wasting, and two states for underweight, with Pearson correlation coefficient of more than 0.7 only in Odisha for stunting and underweight.

- In Bihar and Uttar Pradesh, that had the highest prevalence of stunting in 2017, there was no correlation between NFHS-4 and AHS, and no or very poor correlation for wasting and underweight.
- The correlation between NFHS-4 and DLHS-4, which covered the same 18 states, for district-level estimates of the CGF indicators was significant only in four states for stunting, in three states for wasting, and in two states for underweight, but with Pearson correlation coefficient of more than 0.7 only in four small north-eastern states and in none of the other larger state.

### ***Implications of these findings***

- This study provides a comprehensive understanding of the trends of CGF indicators for every district of India since 2000, highlighting the persistently high inequality in child nutrition between the districts.
- The comparison of the trends of CGF indicators with the India and the global targets in this study identifies the district that have gaps and need more attention.
- An approach combining the different levels of CGF indicators and their rate of decline to identify priority districts in each state used in this study can help policy makers in better targeting of the districts that have persistently high prevalence and low rates of reduction.
- The poor correlation between the national surveys for the district-level estimates of CGF indicators highlights the need to standardize the survey design and collection of anthropometric data in India.
- This find-grid geospatial mapping, using all accessible data sources from India in a single framework as reported in this study can facilitate better strategic targeting of resources at sub-state levels to improve child nutrition as suggested under NNM.

### **Targets set by the National Nutrition Mission 2022 and the WHO/UNICEF 2030**

| <b>National Nutrition Mission 2022 targets</b>                                  | <b>WHO/UNICEF 2030 targets</b>  |
|---|---|
| Child stunting: prevalence of 25% in 2022                                       | Child stunting*: 50% reduction in number of children under-five who are stunted from 2012 to 2030 |
| Child underweight: 2% points reduction in prevalence annually from 2017 to 2022 | Child wasting: prevalence of less than 3% by 2030   |

\*A relative reduction in the prevalence of stunting was estimated instead of the absolute numbers for consistency with other indicators, as all other targets are based on prevalence.

**These persons can be contacted for discussion on the child mortality findings and their implications:**

Prof Balram Bhargava, Indian Council of Medical Research, New Delhi  
secy-dg@icmr.gov.in, +91-11-26588204

Prof Rakhi Dandona, Public Health Foundation of India, Gurugram  
rakhi.dandona@phfi.org, +91-9971155650

Prof Siddarth Ramji, Maulana Azad Medical College, New Delhi  
siddarthramji@gmail.com, +91-9968604304

Prof Subodh S Gupta, Mahatma Gandhi Institute of Medical Sciences, Wardha  
subodhsgupta@gmail.com, +91-9822926934

Prof Rashmi Kumar, King George's Medical University, Lucknow, India  
rashmik2005@gmail.com, +91-9415408777

Prof Rakesh Lodha, All India Institute of Medical Sciences, New Delhi  
rlodha1661@gmail.com, 91-9873019470

Prof Anita Kar, School of Health Sciences, Savitribai Phule Pune University, Pune  
dranitakar@gmail.com, +91-9823548828

Prof Anura V Kurpad, St John's Medical College, Bengaluru  
a.kurpad@sjri.res.in, +91-9686512233

Dr Hendrik J Bekedam, World Health Organisation, New Delhi  
BekedamH@who.int, 91-11-66564800

Dr R S Sharma, Indian Council of Medical Research, New Delhi  
radheyss@gmail.com, +91-9891052057

Prof Lalit Dandona, Indian Council of Medical Research, New Delhi; Public Health Foundation of India, Gurugram  
lalit.dandona@icmr.gov.in, lalit.dandona@phfi.org, +91-9971188236

**These persons can be contacted for discussion on the child growth failure findings and their implications:**

Prof Balram Bhargava, Indian Council of Medical Research, New Delhi  
secy-dg@icmr.gov.in, +91-11-26588204

Dr R Hemalatha, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad  
rhemalathanin@gmail.com, +91-9246283362

Prof Siddarth Ramji, Maulana Azad Medical College, New Delhi  
siddarthramji@gmail.com, +91-9968604304

Prof Rakesh Lodha, All India Institute of Medical Sciences, New Delhi  
rlodha1661@gmail.com, +91-9873019470

Prof Subodh S Gupta, Mahatma Gandhi Institute of Medical Sciences, Wardha  
subodhsgupta@gmail.com, +91-9822926934

Prof Anita Kar, School of Health Sciences, Savitribai Phule Pune University, Pune  
dranitakar@gmail.com, +91-9823548828

Prof Anura V Kurpad, St John's Medical College, Bengaluru  
a.kurpad@sjri.res.in, +91-9686512233

Dr Hendrik J Bekedam, World Health Organisation, New Delhi  
BekedamH@who.int, +91-11-66564800

Prof Rakhi Dandona, Public Health Foundation of India, Gurugram  
rakhi.dandona@phfi.org, +91-9971155650

Prof G S Toteja, Indian Council of Medical Research, New Delhi  
gstoteja@gmail.com, +91-9868368075

Prof Lalit Dandona, Indian Council of Medical Research, New Delhi; Public Health Foundation of India,  
Gurugram  
lalit.dandona@icmr.gov.in, lalit.dandona@phfi.org, +91-9971188236

## About the India State-Level Disease Burden Initiative

The India State-Level Disease Burden Initiative was launched in 2015 as a collaborative effort between the Indian Council of Medical Research, Public Health Foundation of India, Institute for Health Metrics and Evaluation, and a number of other key stakeholders in India, including academic experts and institutions, government agencies and other organizations, under the aegis of the Ministry of Health & Family Welfare. Over 300 leading scientists and experts representing about 100 institutions across India are engaged with this collaborative work.

The first set of findings by the India State-Level Disease Burden Initiative on the variations in epidemiological transition across the states of India were presented in a *Report* released by the Vice-President and Health Minister of India and in a scientific paper published in *The Lancet* in November 2017:

- Indian Council of Medical Research, Public Health Foundation of India, and Institute for Health Metrics and Evaluation. India: Health of the Nation's States — The India State-Level Disease Burden Initiative. New Delhi: ICMR, PHFI, and IHME, 2017.  
<https://www.icmr.nic.in/sites/default/files/reports/2017%20India%20State-Level%20Disease%20Burden%20Initiative%20-%20Full%20Report.pdf>  
<https://phfi.org/the-work/research/the-india-state-level-disease-burden-initiative/>  
<http://www.healthdata.org/disease-burden-india>
- India State-Level Disease Burden Initiative Collaborators. Nations within a nation: variations in epidemiological transition across the states of India, 1990-2016 in the Global Burden of Disease Study. *The Lancet* 2017.  
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(17\)32804-0/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32804-0/fulltext)

These findings have received high-level policy attention, including reference to these state-level findings in the Economic Survey of India released in early 2018, which is considered one of the most important policy planning instruments in India. The Initiative has subsequently published nine detailed topic-specific papers in the *Lancet* journals in 2018 and 2019 on the state-level trends of major diseases and risk factors. In 2019, the findings from this Initiative have been utilised in a major government policy report for the Economic Advisory Council to Prime Minister.

- India State-Level Disease Burden Initiative CVD Collaborators. The changing patterns of cardiovascular diseases and their risk factors in the states of India: the Global Burden of Disease Study 1990-2016. *The Lancet Global Health* 2018.  
[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30407-8/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30407-8/fulltext)
- India State-Level Disease Burden Initiative Diabetes Collaborators. The increasing trend of diabetes and variations among the states of India: the Global Burden of Disease Study 1990–2016. *The Lancet Global Health* 2018.  
[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30387-5/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30387-5/fulltext)
- India State-Level Disease Burden Initiative CRD Collaborators. The burden of chronic respiratory diseases and their heterogeneity across the states of India: the Global Burden of Disease Study 1990-2016. *The Lancet Global Health* 2018  
[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30409-1/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30409-1/fulltext)
- India State-Level Disease Burden Initiative Cancer Collaborators. The burden of cancers and their variations across the states of India: the Global Burden of Disease Study 1990–2016. *The Lancet Oncology* 2018  
[https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045\(18\)30447-9/fulltext](https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(18)30447-9/fulltext)

- India State-Level Disease Burden Initiative Suicide Collaborators. Gender differentials and state variations in suicide deaths in India: the Global Burden of Disease Study 1990–2016. *The Lancet Public Health* 2018.  
[https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667\(18\)30138-5/fulltext](https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(18)30138-5/fulltext)
- Informing NCD control efforts in India on the eve of Ayushman Bharat. *The Lancet* 2018.  
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)32172-X/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)32172-X/fulltext)
- India State-Level Disease Burden Initiative Air Pollution Collaborators. The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: the Global Burden of Disease Study 2017. *The Lancet Planetary Health* 2018.  
[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(18\)30261-4/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30261-4/fulltext)
- The burden of child and maternal malnutrition and the trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. *The Lancet Child & Adolescent Health* 2019.  
[http://www.thelancet.com/journals/lanchi/article/PIIS2352-4642\(19\)30273-1/fulltext](http://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(19)30273-1/fulltext)
- The burden of mental disorders across the states of India: the Global Burden of Disease Study 1990–2017. *The Lancet Psychiatry* 2019.  
[http://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366\(19\)30475-4/fulltext](http://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366(19)30475-4/fulltext)
- Mortality due to road injuries in the states of India: the Global Burden of Disease Study 1990–2017. *The Lancet Public Health* 2019.  
[https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667\(19\)30246-4/fulltext](https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(19)30246-4/fulltext)

The India State-Level Disease Burden Initiative plans to expand the scope of analysis to provide more disaggregated findings and forecasting to better inform health policy formulation and health systems development across India.

**The Indian Council of Medical Research (ICMR)**, is the apex government body in India for the formulation, coordination and promotion of biomedical and health research. It is one of the oldest medical research bodies in the world. Besides the headquarters in New Delhi, ICMR has 26 research institutes, centres and units across India. ICMR funds both intramural and extramural research in India. The priorities of ICMR coincide with the national health priorities and have the goal of reducing the total burden of disease and to promote health and well-being of India's population. As part of this agenda, ICMR is interested in improving the estimates of disease burden and risk factors in India, especially at the sub-national levels, for better health planning, policy framing and fund allocation. For more information please visit <http://www.icmr.nic.in>

**The Public Health Foundation of India (PHFI)** is a premier public health institution in India with presence across the country. It collaborates with multiple constituencies including Indian and international academia, state and central governments, multi- and bi-lateral agencies, and civil society groups. The vision of PHFI is to strengthen India's public health institutional and systems capability and provide knowledge to achieve better health outcomes for all through strengthening training, research and policy development in public health. As part of this vision, PHFI has major interest in improving the robustness of sub-national disease burden estimates to inform health action and in evaluating the impact of large-scale population health interventions. For more information please visit [www.phfi.org](http://www.phfi.org)

**The Institute for Health Metrics and Evaluation (IHME)** is a global research institute at the University of Washington in Seattle that provides independent, rigorous, and comparable measurement of the world's most important health problems and evaluates the strategies used to address them. IHME aims to identify the best strategies to build a healthier world by measuring health, tracking program performance, finding ways to maximize health system impact and developing innovative measurement systems to provide a foundation for informed decision-making that will ultimately allocate resources to best improve population health. For more information please visit [www.healthdata.org](http://www.healthdata.org)

For more information, please contact:

**Indian Council of Medical Research**

Dr Rajni Kant

[kantr.hq@icmr.gov.in](mailto:kantr.hq@icmr.gov.in)

Mobile: +91-9891274684

**Public Health Foundation of India**

Ms Gina Sharma

[gina.sharma@phfi.org](mailto:gina.sharma@phfi.org)

Mobile: +91-9811887088



## Description of Key Terms

The child mortality indicators in SDG are:

- **Under-five mortality rate:** Probability of dying between birth and exactly five years of age expressed per 1,000 live births.
- **Neonatal mortality rate:** Probability of dying between birth and first 28 days of life expressed per 1,000 live births.

Child growth failure term includes:

- **Child stunting:** A child is considered stunted if her/his height-for-age is more than two standard deviations below the WHO Child Growth Standards median.
- **Child wasting:** A child is considered wasted if her/his weight-for-height is more than two standard deviations below the WHO Child Growth Standards median.
- **Child underweight:** A child is considered underweight if her/his weight-for-age is more than two standard deviations below the WHO Child Growth Standards median.

**Socio-demographic Index (SDI):** A summary measure that identifies where states, countries or other geographic areas fall on the spectrum of socio-demographic development. SDI is a composite measure based on per capita income, educational attainment and fertility rate, with the index value ranging from 0 to 1.

**Coefficient of variation:** A simple metric of the relative spread of a distribution, defined as the ratio of standard deviation to the mean, expressed as a percentage.

**Tertiles:** Three parts of a distribution based on division after placing all values in the distribution in an ascending order such that each part contains a third of the distribution.

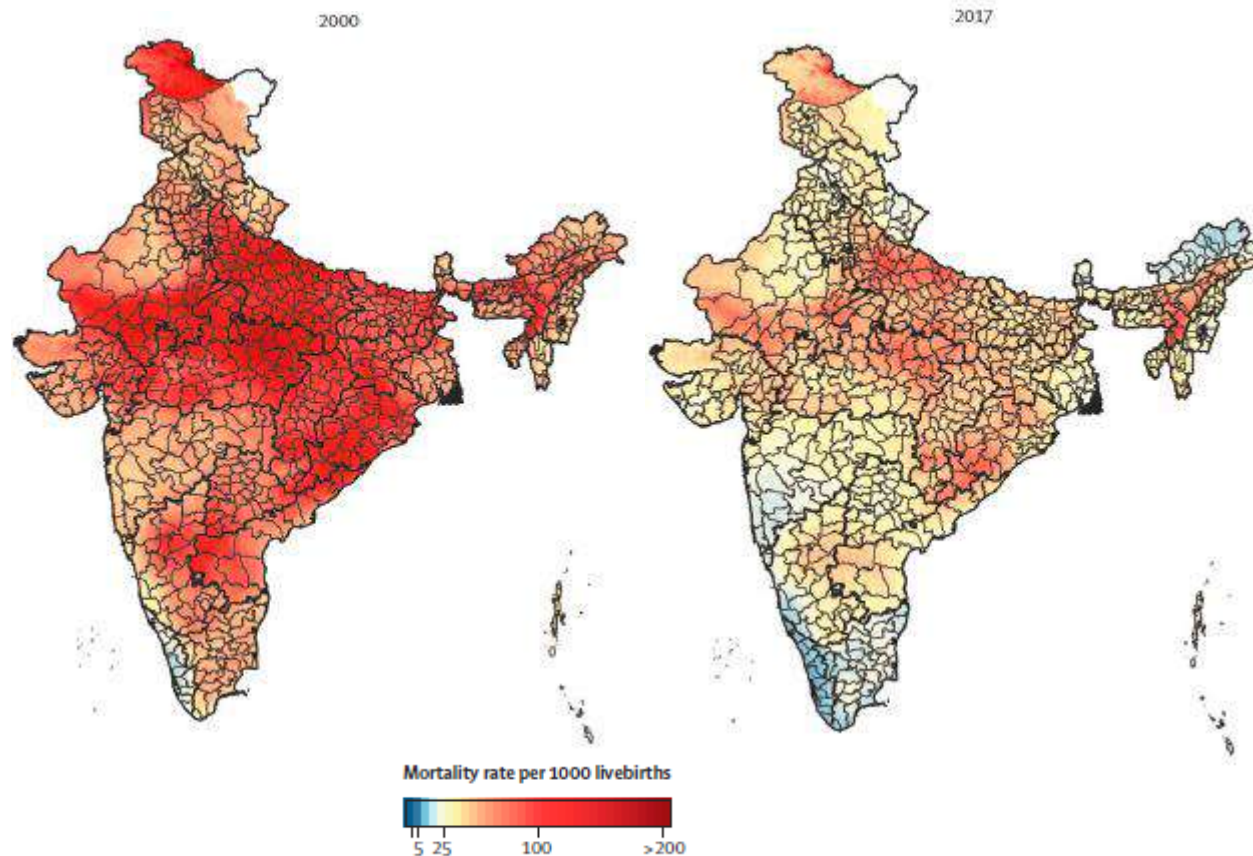
**Uncertainty interval (UI):** A range of values that is likely to include the correct estimate of risk exposure or health loss from a particular risk or cause. Narrow uncertainty intervals indicate that evidence is strong, while wide uncertainty intervals show that evidence is not so strong.

**India State-Level Disease Burden Initiative Child Mortality Collaborators.  
Subnational mapping of under-5 and neonatal mortality trends in India: the Global  
Burden of Disease Study 2000–2017. *Lancet*. 12 May 2020.**

[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

**RESEARCH: India State-Level Disease Burden Initiative reports the first comprehensive estimates of district-level trends of child mortality in India from 2000 to 2017 published in @TheLancet**

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

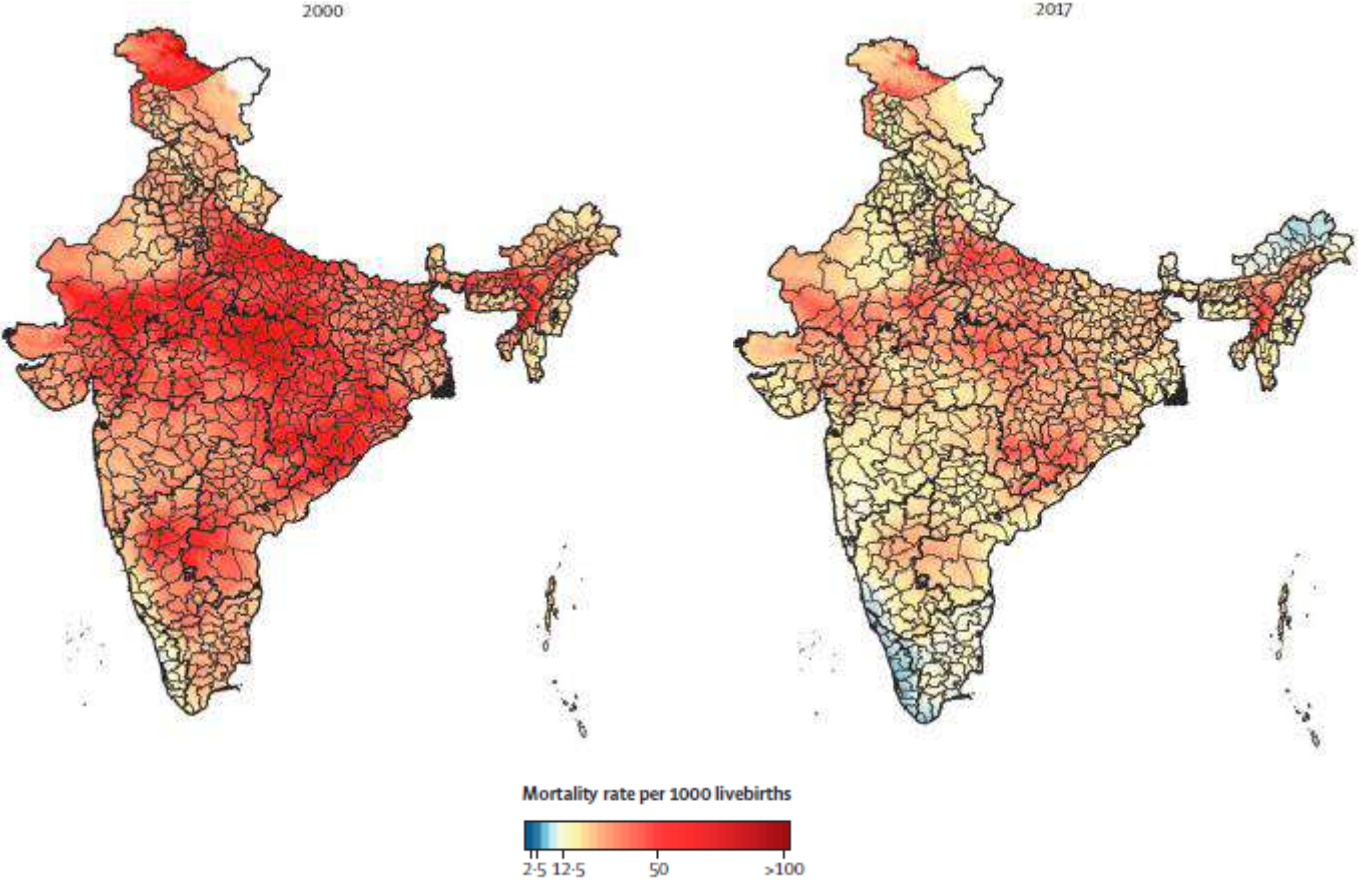


**U5MR mapping in India**

- Under-5 Mortality Rate (U5MR) has dropped in India since 2000 by 49%, but there is a 6 fold variation in the rate between the states and 11 fold variation between the districts of India
- India had 1.04 million under-5 deaths in 2017, down from 2.24 million deaths in 2000

Neonatal deaths in India have reduced from 1.02 million deaths in 2000 to 0.57 million deaths in 2017

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

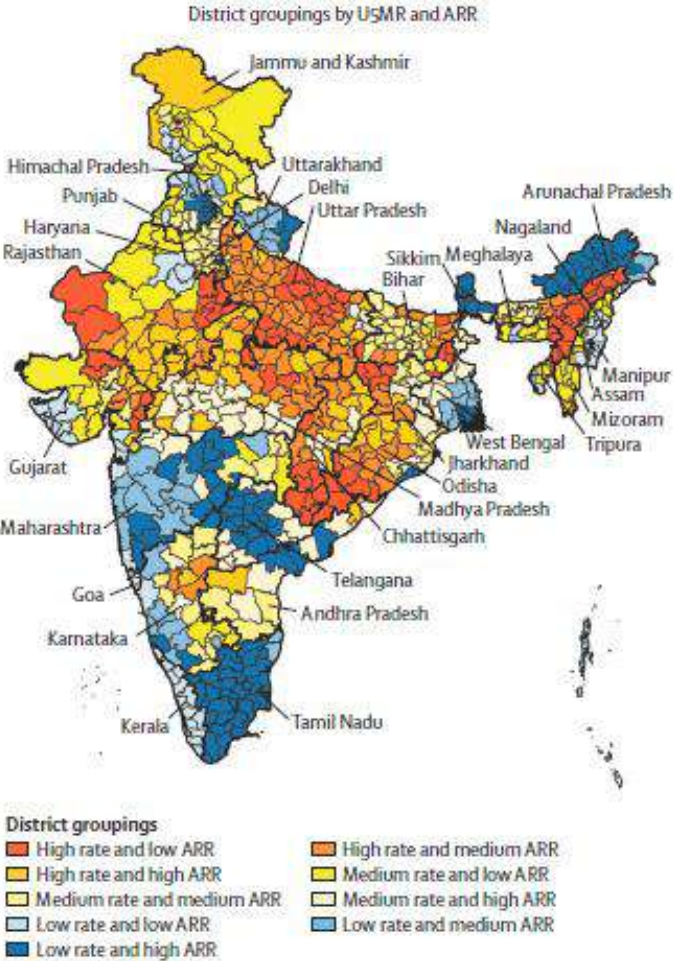


NMR mapping in India

- Neonatal Mortality Rate (NMR) has dropped in India since 2000 by 38%, but there is a 5 fold variation in the rate between the states and 8 fold variation between the districts of India
- The reduction in NMR has been less than for U5MR, and this reduction has been quite variable across the states and districts

# Identification of priority districts for U5MR in India based on current rate and the rate of reduction

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)



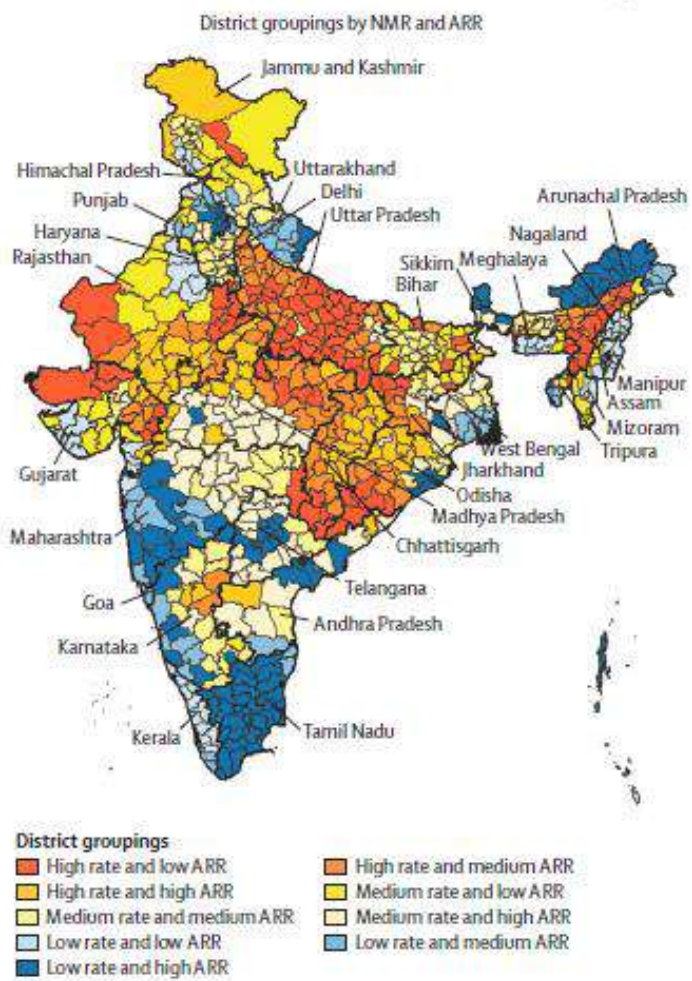
U5MR was 40 or more per 1000 livebirths in 88% of the districts in the less developed states in 2017, but only in 2% of the districts in the more developed states

District groupings of U5MR based on tertiles of district-level rates in 2017 and the annual rate of reduction from 2010 to 2017



# Identification of priority districts based on current NMR and the rate of reduction

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

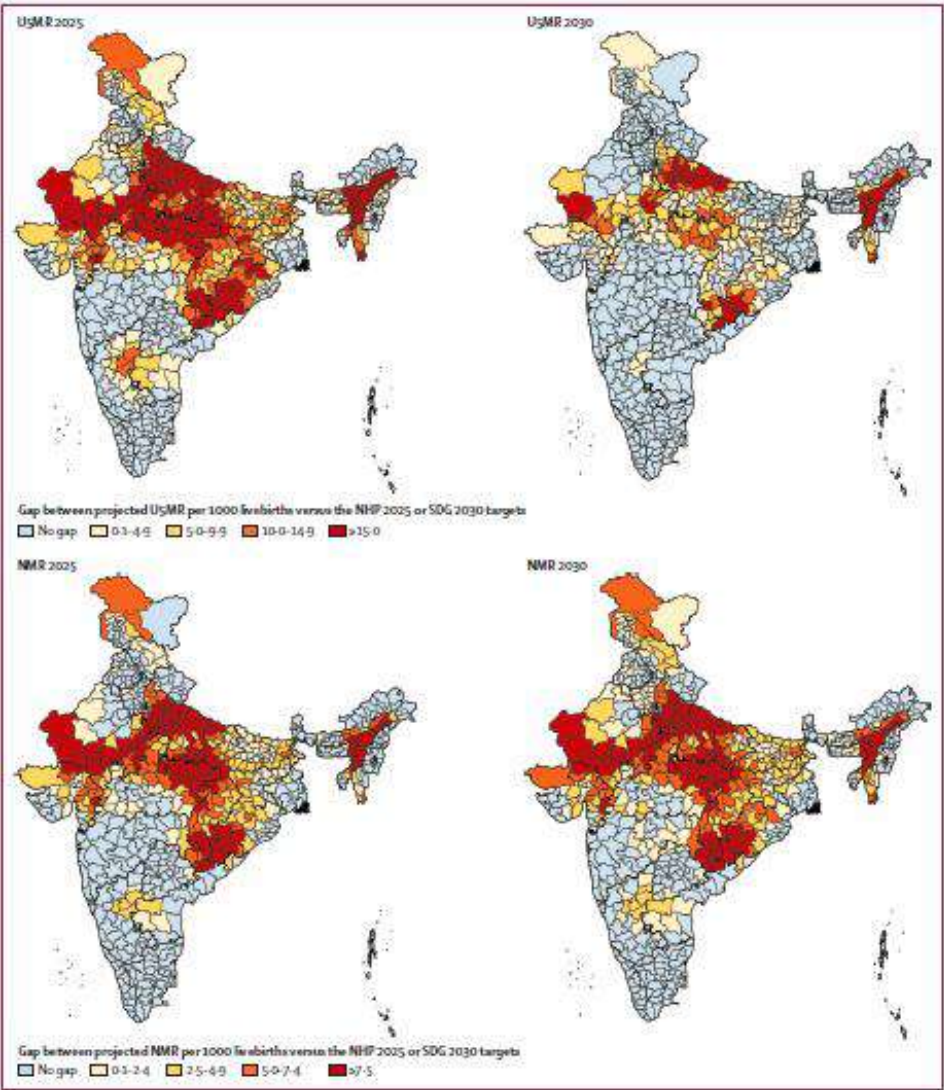


NMR was 20 or more per 1000 livebirths in 93% of the districts in the less developed states in 2017, but only in 13% of the districts in the more developed states

District groupings of NMR based on tertiles of district-level rates in 2017 and the annual rate of reduction from 2010 to 2017



If the trends up to 2017 were to continue, India would meet the SDG 2030 U5MR target but not the SDG 2030 NMR target  
Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

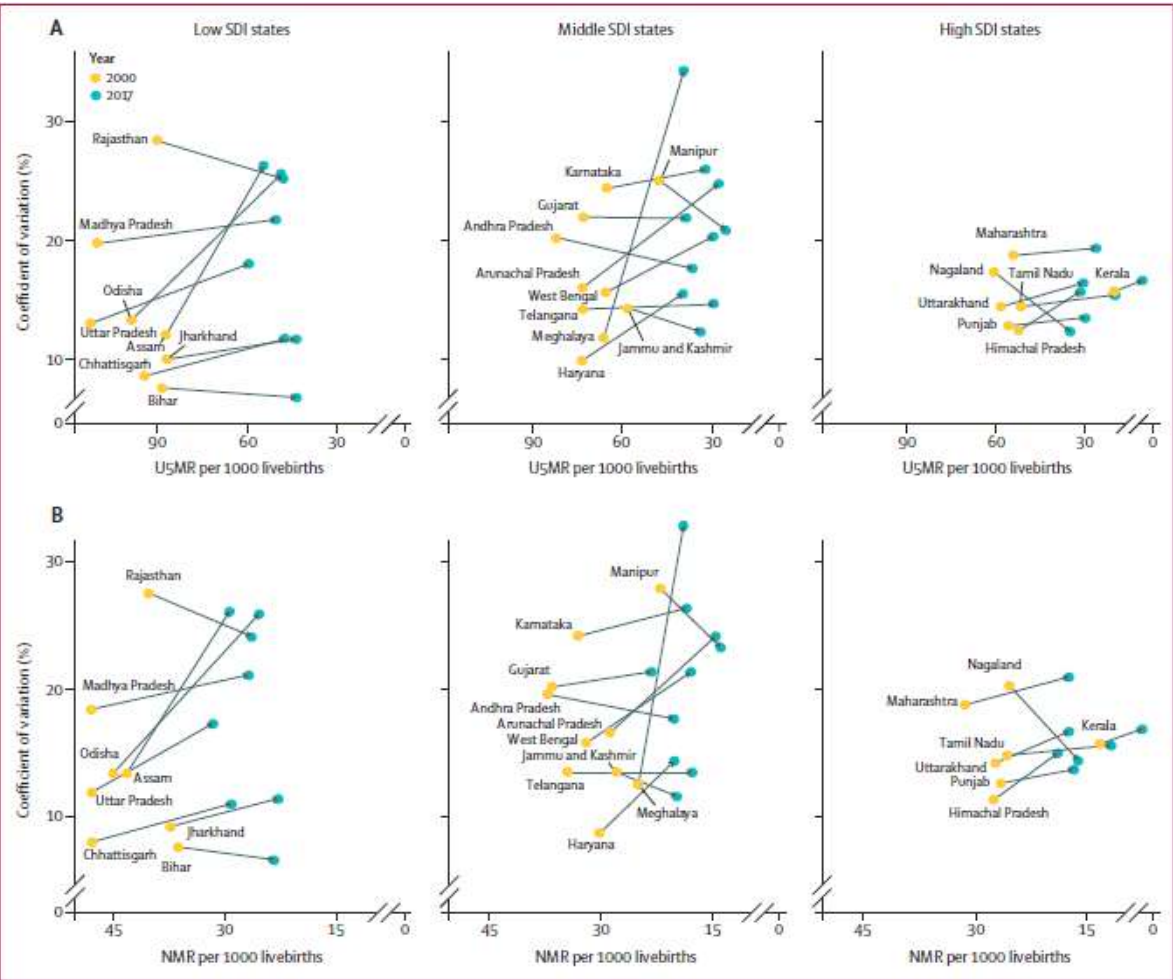


- 34% of the districts in India would need higher U5MR reduction and 60% districts would need higher NMR reduction to individually meet the SDG targets
- 91% of the districts in the less developed states have this gap as compared with 21% districts in the more developed states
- NHP 2025 target for U5MR is 23 per 1000 livebirths and for NMR is 16 per 1000 livebirths
- SDG 2030 target for U5MR is 25 per 1000 livebirths and for NMR is 12 per 1000 livebirths

District-level gaps for NHP 2025 and SDG 2030 targets if the trends up to 2017 were to continue

# Inequality in U5MR and NMR between the districts within states of India varied widely

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)



- Inequality within states, measured as coefficient of variation, ranged 11-fold for U5MR and 13-fold for NMR among the states in 2017
- Despite decrease in U5MR and NMR in most districts, inequality in these rates increased in 74% states for U5MR and in 77% states for NMR
- This indicates that districts with less improvements in each state have to be identified for focused attention

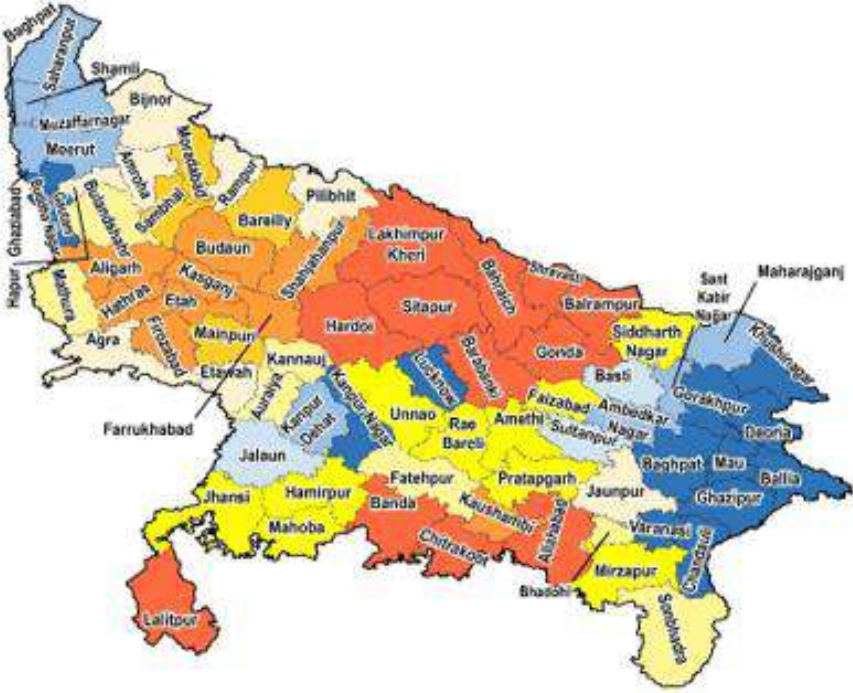
Coefficient of variation for U5MR and NMR between districts within the states of India, 2000 and 2017  
Higher coefficient of variation indicates higher inequality between the districts within a state

# Priority districts in Uttar Pradesh identified for under-5 mortality reduction

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

High, medium, and low groups based on tertiles of rate in 2017 and the annual rate of reduction (ARoR) from 2010 to 2017 among the districts within the state

- High rate and low ARoR
- High rate and medium ARoR
- High rate and high ARoR
- Medium rate and low ARoR
- Medium rate and medium ARoR
- Medium rate and high ARoR
- Low rate and low ARoR
- Low rate and medium ARoR
- Low rate and high ARoR



The highest priority districts with high U5MR and low rate of reduction are a cluster of eight districts in the north-central part, three districts in the south and one district in the south-west corner of the state

Priority districts in Uttar Pradesh, U5MR

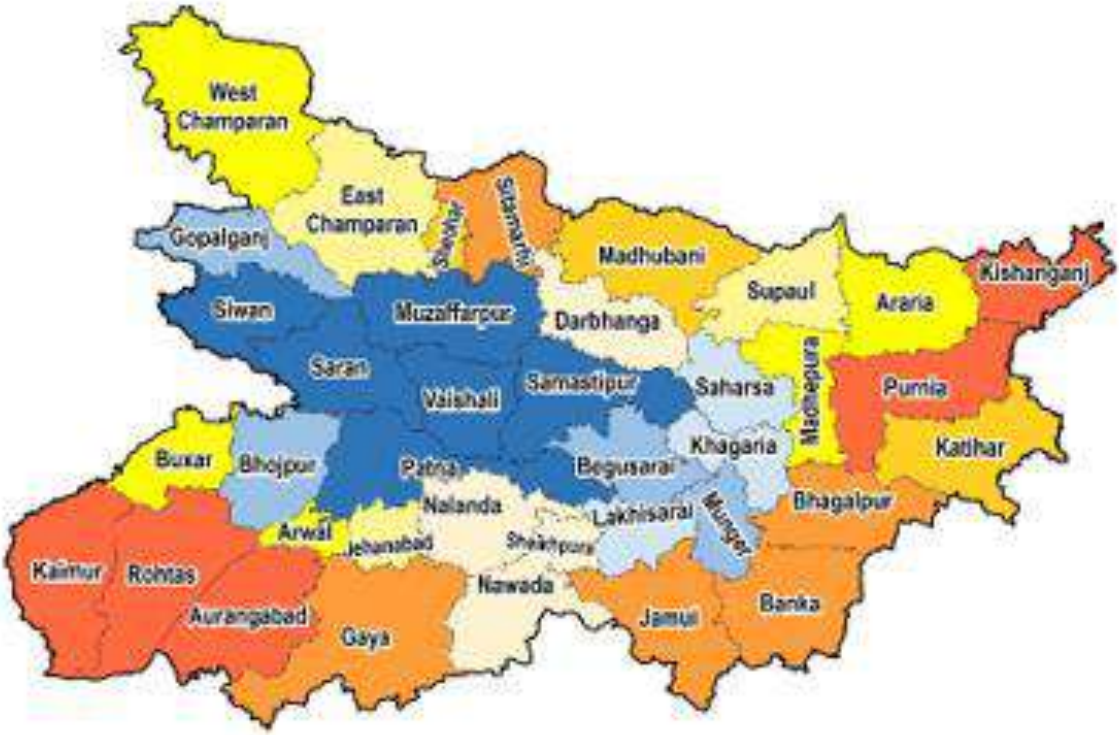


# Priority districts in Bihar identified for neonatal mortality reduction

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

High, medium, and low groups based on tertiles of rate in 2017 and the annual rate of reduction (ARoR) from 2010 to 2017 among the districts within the state

- High rate and low ARoR
- High rate and medium ARoR
- High rate and high ARoR
- Medium rate and low ARoR
- Medium rate and medium ARoR
- Medium rate and high ARoR
- Low rate and low ARoR
- Low rate and medium ARoR
- Low rate and high ARoR

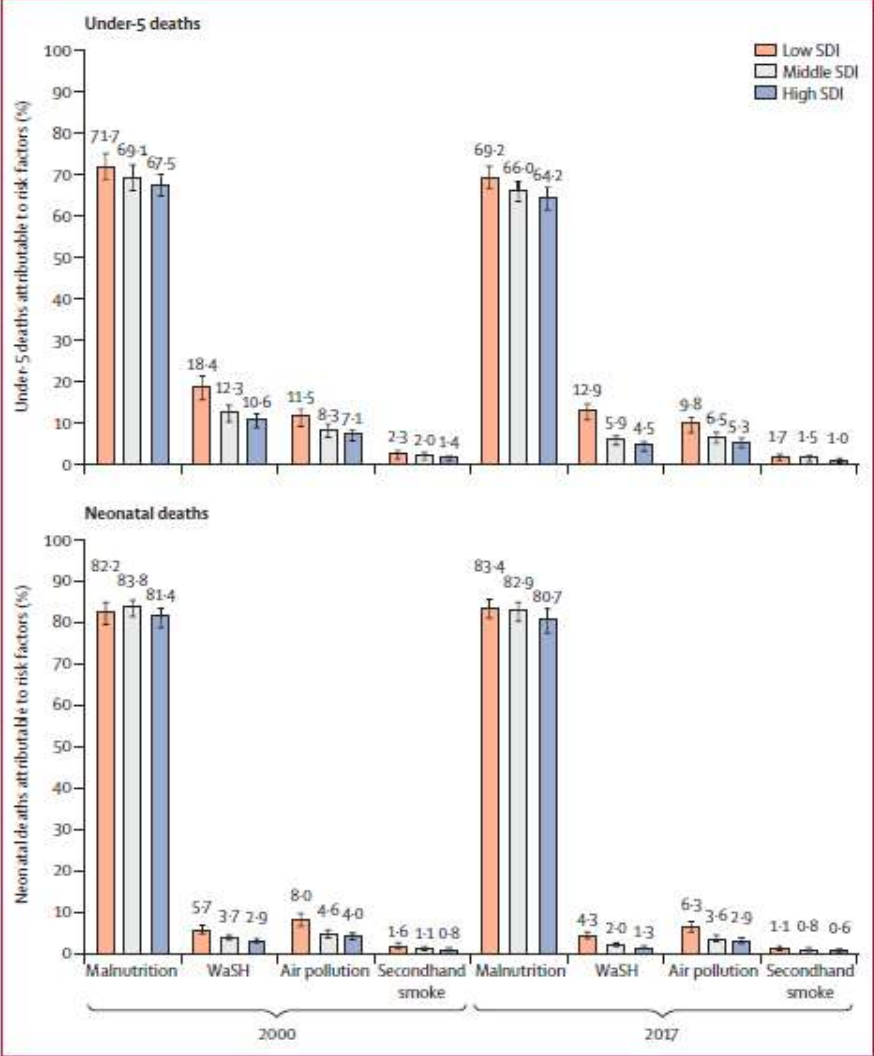


The highest priority districts with high NMR and low rate of reduction are in the north-east and south-west corners of the state, whereas the districts with relatively low NMR and high rate of reduction are in the west-central part of the state

Priority districts in Bihar, NMR

**Key risk factors for child mortality in India are malnutrition, water and sanitation, and air pollution**

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)

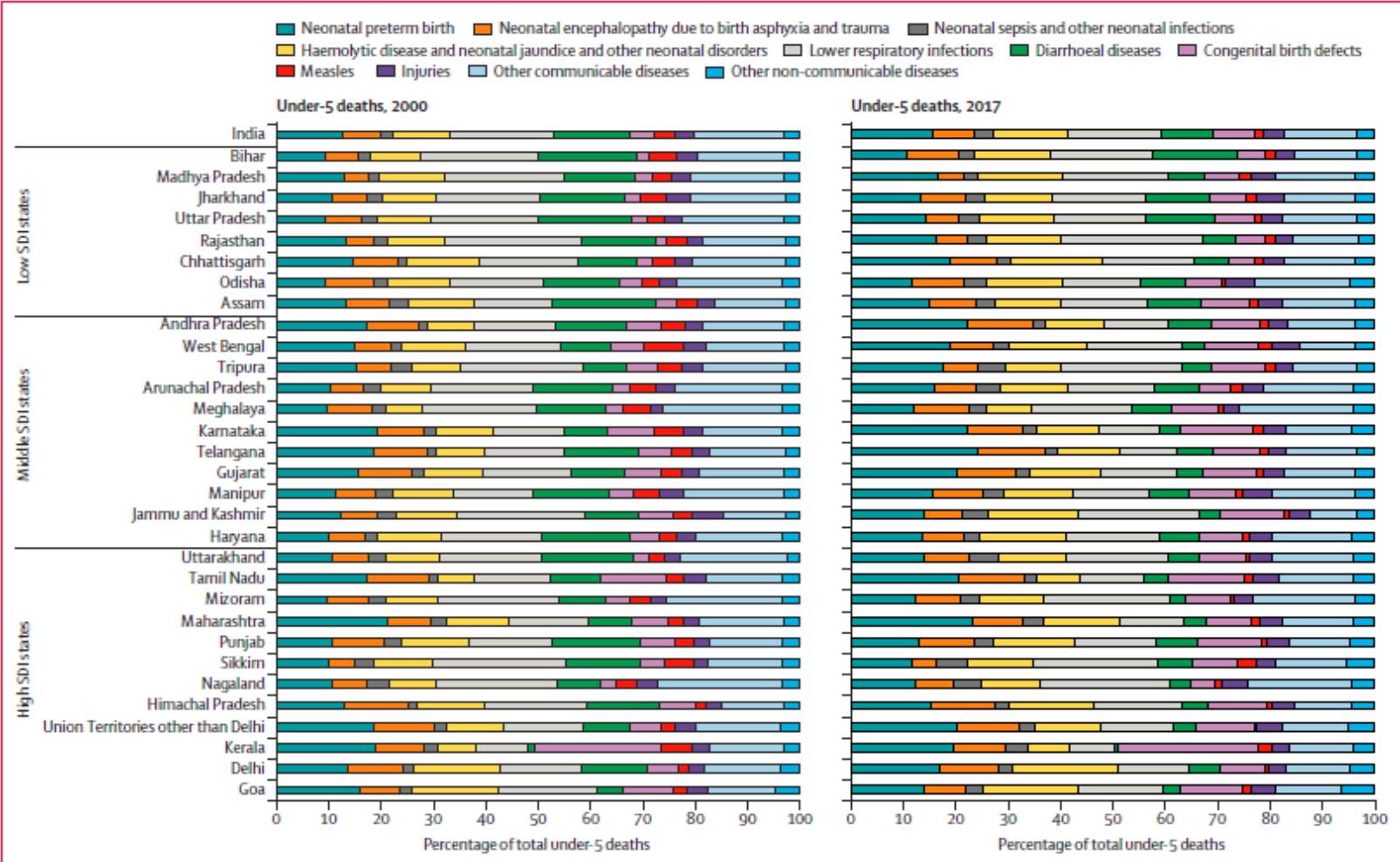


Risk factors for under-5 and neonatal death by SDI state groups in India, 2000 and 2017

- 68% of under-5 deaths in India are attributable to child and maternal malnutrition; the largest contributors within this risk factor are low birth weight and short gestation (46%) and child growth failure (21%)
- 83% of the neonatal deaths are attributable to low birth weight and short gestation
- 11% of the under-5 deaths in India are attributable to unsafe water and sanitation and 9% to air pollution
- The contribution of these risk factors is relatively higher in the less developed states

# Variations in the causes of child mortality among the states of India

Read more in @theLancet [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30471-2/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30471-2/fulltext)



Major causes of under-5 death in the states of India for 2000 and 2017

- The leading causes of under-5 death in India are lower respiratory infections (17.9%), preterm birth (15.6%), diarrhoeal diseases (9.9%), and birth asphyxia and trauma (8.1%)
- The death rate for all major causes decreased between 2000 and 2017, with the highest decline for infectious diseases, intermediate decline for neonatal disorders, and the smallest decline for congenital birth defects
- The current rates of the causes and the magnitude of their decline vary widely between the states

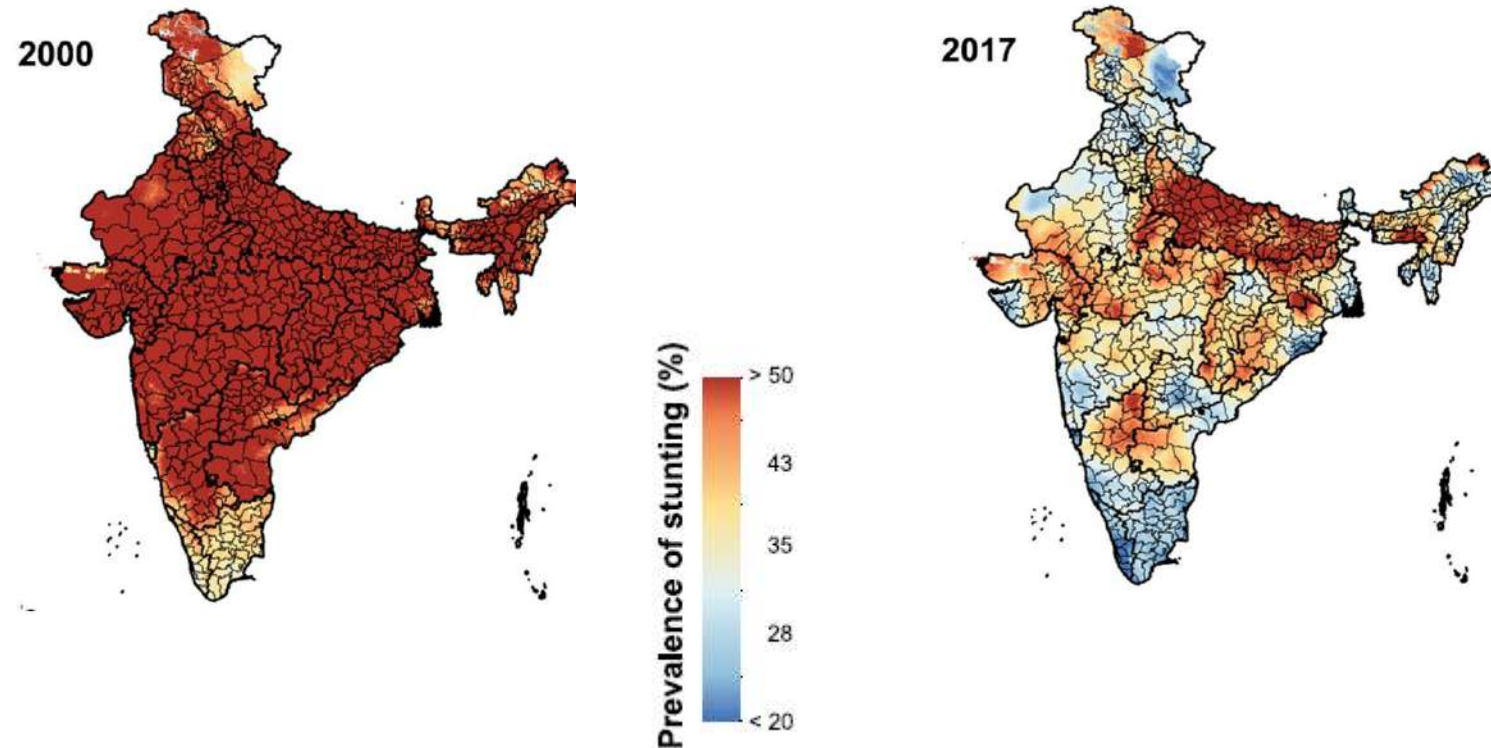


**India State-Level Disease Burden Initiative CGF Collaborators. Mapping of variations in child stunting, wasting and underweight within the states of India: the Global Burden of Disease Study 2000-2017. *EClinicalMedicine*. 12 May 2020.**

<https://doi.org/10.1016/j.eclinm.2020.100317>

# RESEARCH: India State-Level Disease Burden Initiative reports comprehensive estimates of district-level trends of child growth failure in India from 2000 to 2017

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>

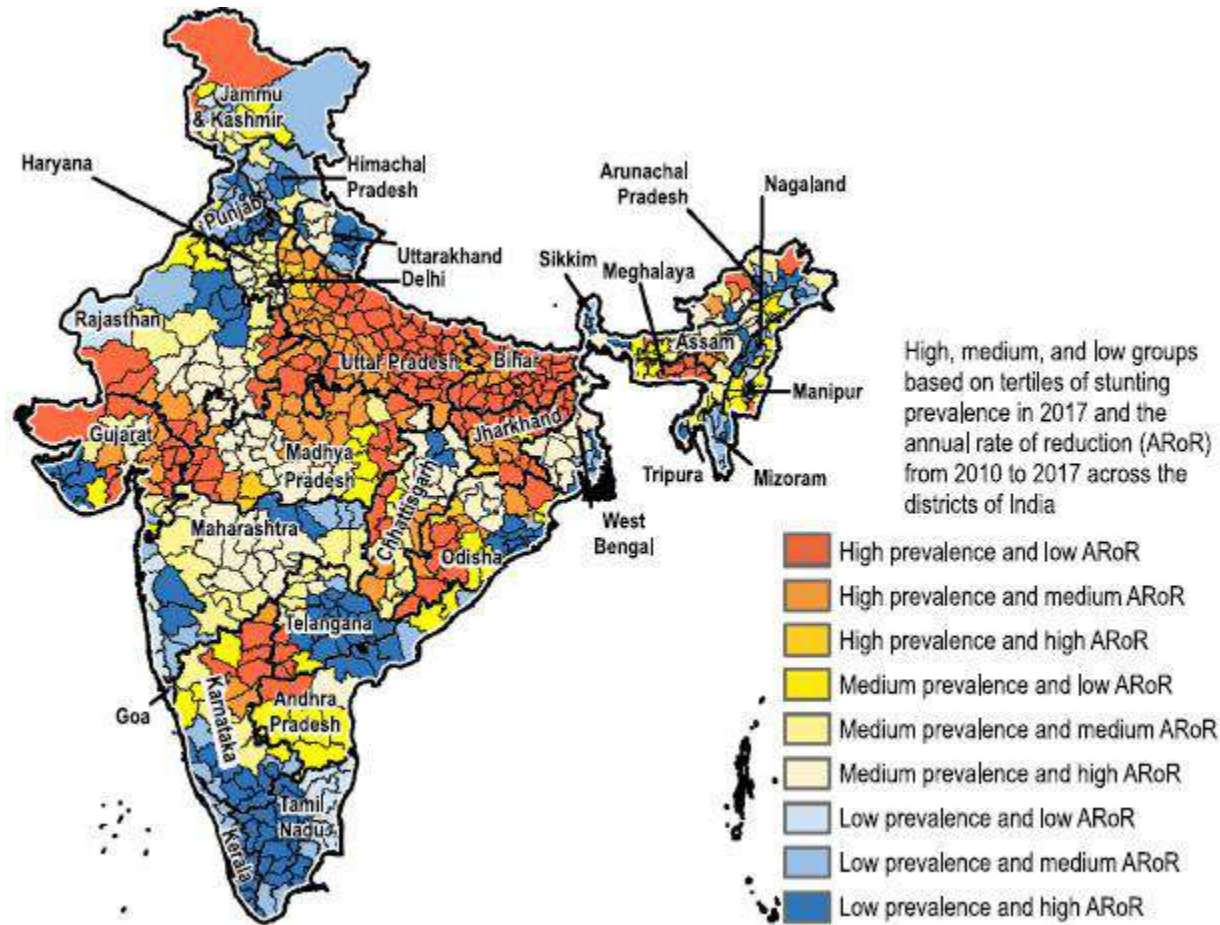


Stunting mapping in India

- Prevalence of stunting among under-5 children in India in 2017 was 39%, which varied 4-fold between the districts from 16% to 63%
- Stunting prevalence declined in 99% districts, but this decline was very variable ranging from 41% to no decline since 2000

# Identification of priority districts for stunting in India based on current prevalence and the rate of reduction

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>

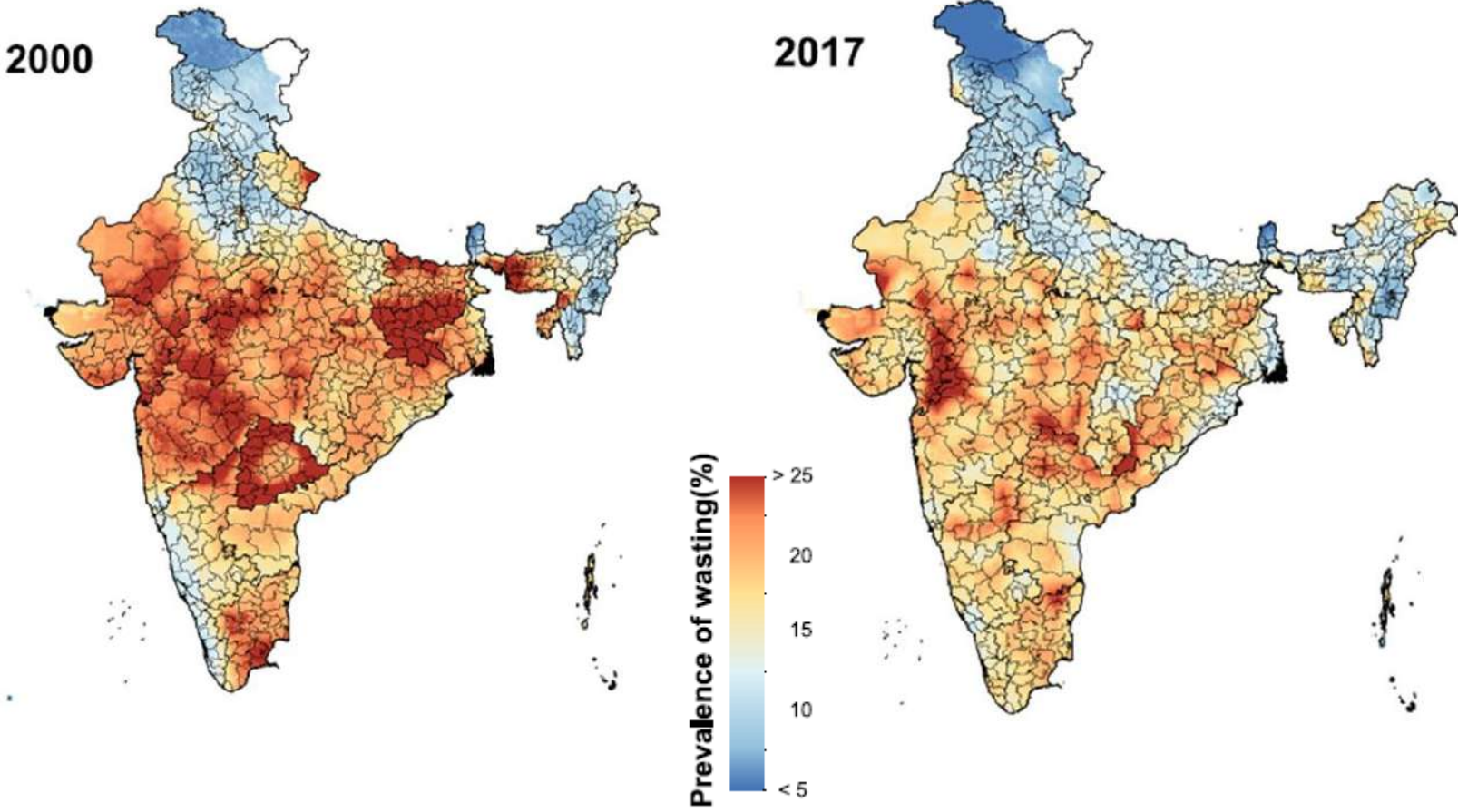


Stunting prevalence was 40% or more in the 67% districts in the less developed states, but only in 1% of the districts in the more developed states

District groupings of stunting based on tertiles of district-level prevalence in 2017 and the annual rate of reduction from 2010 to 2017

# District-level variations of wasting prevalence among under-5 children in India

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>

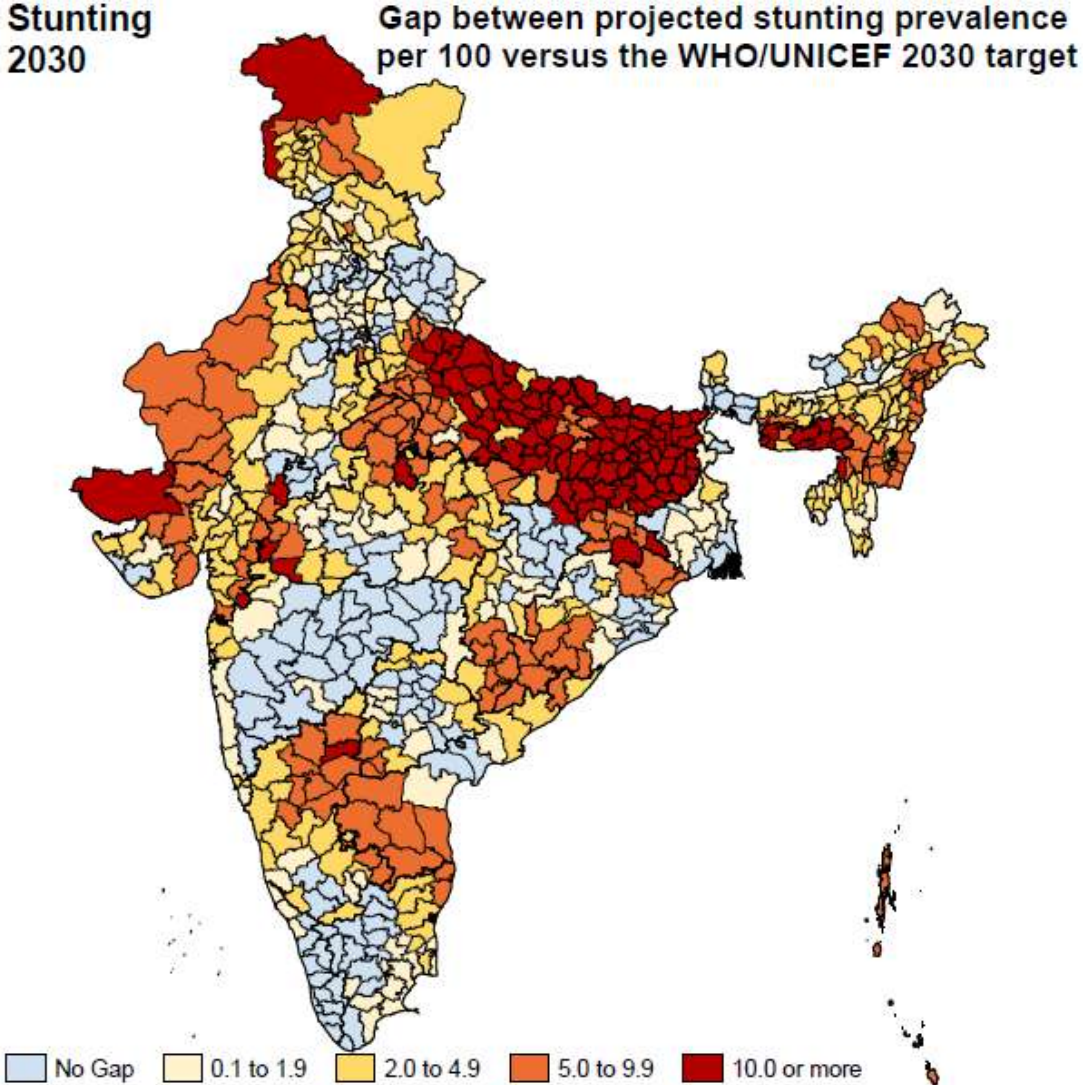


- Prevalence of wasting in India was 16% in 2017, which varied 5-fold between the districts from 6% to 30%
- Wasting declined in 61% of the districts, but this decline was very variable ranging from 44% to no decline since 2000

Wasting mapping in India



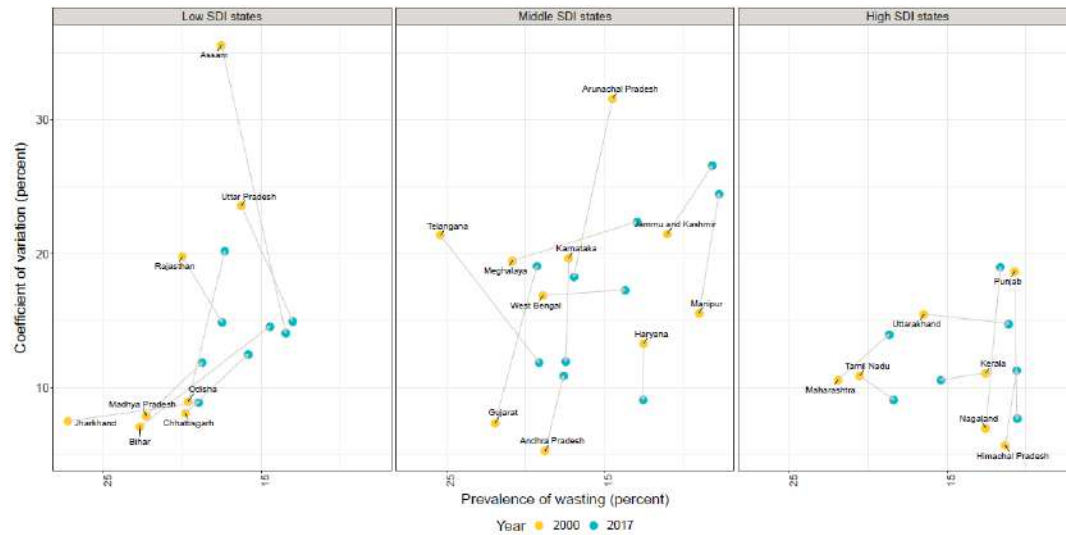
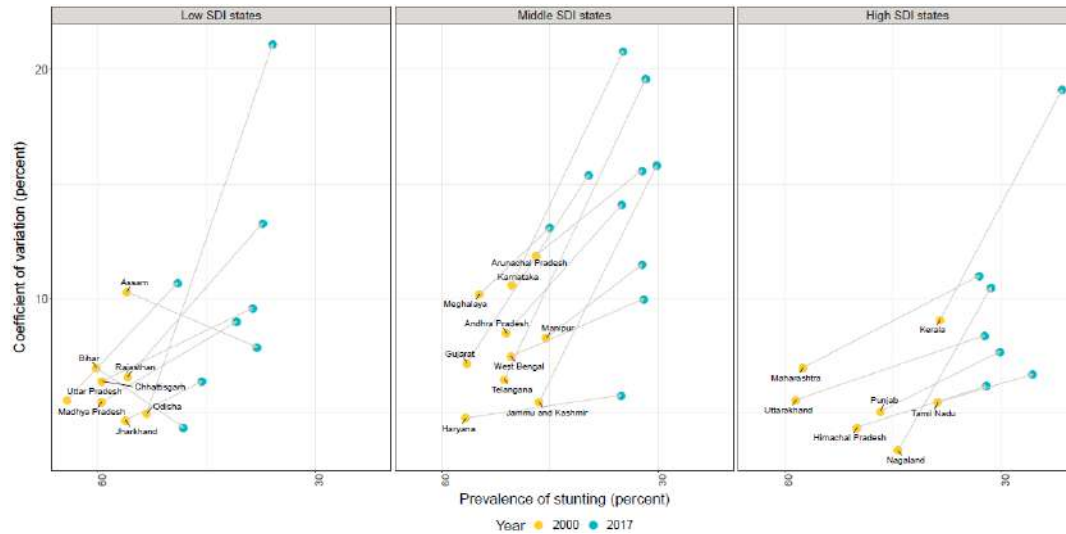
**Comparison of district-level trends of stunting with WHO/UNICEF 2030 target**  
Read more in @EclinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>



- 80% districts would individually need a rate of improvement higher than they had up to 2017 in order to achieve the WHO/UNICEF 2030 target of 50% reduction in stunting prevalence from 2012 to 2030
- 89% of the districts in the less developed states and 63% in the high developed states need a higher rate of improvement to meet this target

# Inequality in stunting and wasting between the districts within states of India varied widely

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>



- Inequality within states, measured as coefficient of variation, ranged 7-fold for stunting and 12-fold for wasting among the states
- Despite a decrease in stunting and wasting in most of the districts from 2000 to 2017, the inequality in these indicators increased in 90% of the states for stunting and in 52% states for wasting
- This indicates that districts with less improvements in each state have to be identified for focused attention

Coefficient of variation for stunting and wasting between the districts within the states of India for 2000 and 2017  
Higher coefficient of variation indicates higher inequality between the districts within a state



# Identification of priority districts in Uttar Pradesh for stunting reduction

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>

High, medium, and low groups based on tertiles of prevalence in 2017 and the annual rate of reduction (ARoR) from 2010 to 2017 among the districts within the state

- High prevalence and low ARoR
- High prevalence and medium ARoR
- High prevalence and high ARoR
- Medium prevalence rate and low ARoR
- Medium prevalence and medium ARoR
- Medium prevalence and high ARoR
- Low prevalence and low ARoR
- Low prevalence and medium ARoR
- Low prevalence and high ARoR



The highest priority districts with high stunting prevalence and low rate of reduction are a cluster of 13 districts in the northern part of Uttar Pradesh

Priority districts in Uttar Pradesh for stunting

# Identification of priority districts in Bihar for stunting reduction

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>

High, medium, and low groups based on tertiles of prevalence in 2017 and the annual rate of reduction (ARoR) from 2010 to 2017 among the districts within the state

- High prevalence and low ARoR
- High prevalence and medium ARoR
- High prevalence and high ARoR
- Medium prevalence rate and low ARoR
- Medium prevalence and medium ARoR
- Medium prevalence and high ARoR
- Low prevalence and low ARoR
- Low prevalence and medium ARoR
- Low prevalence and high ARoR

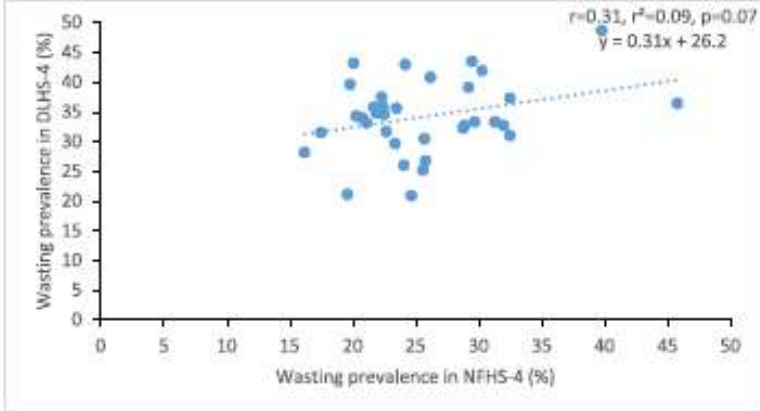
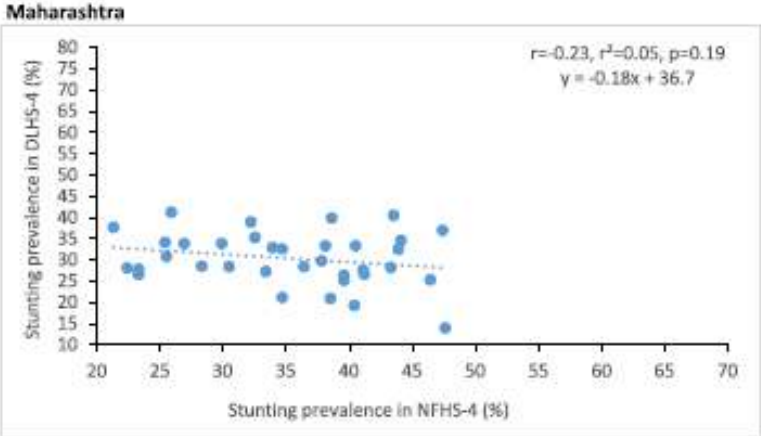
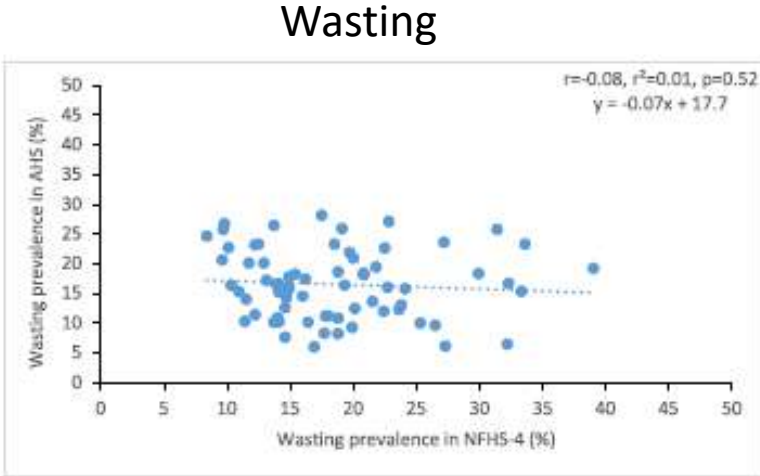
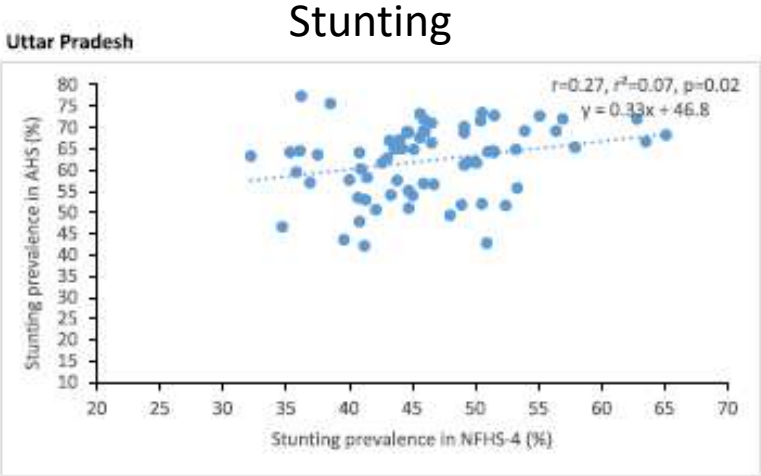


The highest priority districts with high stunting prevalence and low rate of reduction include a cluster of three districts in the south-east corner and one district in the south-west corner of Bihar

Priority districts in Bihar for stunting

# Poor correlation between major national surveys for estimates of district-level child growth failure indicators

Read more in @EClinicalMedicine <https://doi.org/10.1016/j.eclinm.2020.100317>



Each dot in these plots represents a district

## Correlation between national surveys for district-level prevalence in Uttar Pradesh and Maharashtra

- The correlation between NFHS-4 and AHS for district-level estimates was poor for most states, as in this example of Uttar Pradesh
- The correlation between NFHS-4 and DLHS-4 for district-level estimates was poor for most states, as in this example of Maharashtra
- This highlights the need to standardize anthropometric data collection in large surveys in India
- And this highlights the advantage of composite estimates using multiple data sources as done in this study