New evidence released on the trends of non-communicable diseases and suicide over a quarter century for every state of India to inform policy and action

- Detailed estimates of the trends of cardiovascular diseases, diabetes, chronic respiratory diseases, cancer, and suicide in every state of India from 1990 to 2016 published in *The Lancet* family of journals.
- Prevalence of ischemic heart disease and stroke has increased by over 50% from 1990 to 2016 in India, with an increase observed in every state.
- The number of persons with diabetes in India has increased from 26 million in 1990 to 65 million in 2016.
- The rate of increase in the burden of ischemic heart disease and diabetes has been the highest in the less developed states of India, where the burden of chronic obstructive lung disease and infectious conditions is already high.
- The number of chronic obstructive lung disease cases in India has increased from 28 million to 55 million from 1990 to 2016, and death rate among these cases is twice as high in the less developed states than in the more developed states.
- The proportional contribution of cancers to the total health loss in India has doubled from 1990 to 2016, but the incidence of different types of cancers varies widely between the states.
- Suicide is presently the leading cause of death in the 15-39 year age group in India, 37% of the total global suicide deaths among women occur in India, and suicide death rate among the elderly has increased over the past quarter century.

New Delhi, 12 September 2018 – The India State-level Disease Burden Initiative, a joint initiative of the Indian Council of Medical Research (ICMR), Public Health Foundation of India (PHFI), and Institute for Health Metrics and Evaluation (IHME) in collaboration with the Ministry of Health and Family Welfare, Government of India, along with experts and stakeholders associated with over 100 Indian institutions, has released today comprehensive analysis of several major non-communicable diseases (NCDs) and suicide for every state in India, based on analysis of all identifiable epidemiological data from India since 1990 as part of the Global Burden of Disease study. These findings are reported in a series of five research papers published in *The Lancet Global Health, The Lancet Public Health,* and *The Lancet Oncology*, along with a commentary in *The Lancet*.

Highlighting some crucial policy-relevant points in these papers, **Professor Balram Bhargava, Secretary to the Government of India, Department of Health Research, Ministry of Health & Family Welfare, and Director General, ICMR,** said, "These papers through detailed analysis have elucidated disease and risk factor trends of major NCDs and suicide in every state over 26 years. While it is known that NCDs have been increasing in India, a major finding of concern is that the highest rate of increase in ischemic heart disease and diabetes is in the less developed states of India. These states already have a high burden from chronic obstructive lung disease and from a range of infectious and childhood diseases, so the control of NCDs in these states has to be boosted without delay. The proportional contribution of cancers to disease burden in India has doubled since 1990, but the incidence of individual cancers varies widely between the states, the reasons for which need to be understood better to guide prevention and control of cancer. Another important finding is the very high

contribution of India to the total suicide deaths in the world, especially among women. The ten-fold variation between the states in the suicide death rate for women emphasises the need to better understand the reasons behind these suicides and make concerted efforts to reduce this avoidable loss of predominantly young lives."

On the release of these new estimates, **Professor Vinod Paul, Member, NITI Aayog,** said, "The insights provided by these findings are very timely for the planning of Ayushman Bharat, the National Health Protection Mission announced recently by the Prime Minister. The findings in these papers demonstrate that major NCDs or suicide do not necessarily follow the same trend in the less developed states, or in the more developed states, indicating the importance of planning health improvements based on specific evidence for each state. The detailed analysis of the changes in the major NCDs and their risk factors reported in these papers are therefore quite useful for titrating the Ayushman Bharat effort according to the need of each state. We plan to utilize these findings in collaboration with the state decision makers to determine the appropriate balance of activities under the Health and Wellness Centres to strengthen comprehensive primary healthcare in each state."

"The ability of a health system to respond to immediate and anticipated future challenges depends on estimates of major disease burdens and their evolving trends. The response also has to be appropriate to the context of each state. This study not only profiles how NCDs and suicide are posing menacing public health challenges across the country, but also enables a contextually configured health system response suitable for each state. Much of this burden is preventable and every attempt must be made to avert these diseases and suicides. At the same time, health services must be ready to provide appropriate and timely care to effectively treat diseases that have already manifested. By shining the torchlight on the specific disease burdens that each state must prioritise, this study will help direct health system resources to maximise impact through early prevention and effective treatment." **said Professor K Srinath Reddy, President, Public Health Foundation of India.**

Professor Lalit Dandona, Director of the India State-Level Disease Burden Initiative, said on this occasion, "It is important to note that the detailed analyses reported in these papers have been possible because of the valuable contributions of many hundreds of highly qualified collaborators from India over the past three years. Their engagement and insights have enabled utilization of relevant data from across India over three decades, methodological improvements in the analysis, balanced interpretation of the findings in the context of India's diversity, and identification of data gaps that need to be addressed. Encouraged by this momentum, we anticipate that this collaborative work would result in even more refined insights to inform policy decisions at the centre and in the states to improve the health of people in all parts of India."

"After the successful launch of the initial findings of the India State-Level Disease Burden Initiative last year by the Vice-President and Health Minister of India, I am delighted to see the continuing contributions being made by this Initiative in the form of deeper policy-relevant insights to inform health planning in each state", said **Dr Soumya Swaminathan, Deputy Director General, World Health Organization,** under whose guidance this Initiative was started in 2015 when she was the Director General of ICMR. "The use of the standardized methodology of the Global Burden of Diseases study by this Initiative to understand health loss due to all diseases and risk factors in a single framework,

and the use of disability-adjusted life years that is a composite metric of health loss due to premature mortality and morbidity, has enabled a balanced understanding of the contribution of the various diseases and risk factors in every state of India over a quarter century", she added.

Professor Christopher Murray, Director, Institute for Health Metrics and Evaluation, said "These studies are both invaluable and timely, as they reveal divergent non-communicable disease and suicide trends are emerging across India. The findings will help policymakers tailor health roadmaps specific to each state as they seek to address a growing 'double' burden of disease from communicable and non-communicable disorders alike."

Dr Richard Horton, Editor-in-Chief of *The Lancet*, said: "The papers in the *Lancet* journals reveal a rapid epidemiological transition in India. While the country is engulfed in an emerging epidemic of non-communicable disease, it is also facing the challenge of a significant burden of suicide. The introduction of the Ayushman Bharat has prioritised universal health coverage as a key political issue. As voters go to the polls in India's general election in April 2019, health will rightly become a decisive issue for the world's largest democracy."

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:

https://icmr.nic.in/reports?title=&page=1

https://phfi.org/the-work/research/the-india-state-level-disease-burden-initiative/

http://www.healthdata.org/disease-burden-India

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32804-0/fulltext

Commentary and scientific papers published on 12 Sept 2018:

Bhargava B, Paul VK. 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

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

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

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

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

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

For discussion on the commentary published in *The Lancet* discussing the policy implications of the findings, please contact the authors:

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Key findings from the cardiovascular diseases paper, published in *The Lancet Global Health*:

- CVDs were responsible for 28% of the total deaths in India in 2016 as compared with 15% in 1990.
- Among all causes of health loss in India in 2016, ischemic heart disease was the leading individual cause and stroke was the fifth leading cause.
- Prevalence of ischemic heart disease and stroke has increased by over 50% from 1990 to 2016, with an increase observed in every state of India. The number of ischemic heart disease cases increased from 10 million in 1990 to 24 million in 2016, and of stroke from 3 million to 7 million.
- Though the prevalence of and health loss due to ischemic heart disease is highest in the more advanced states, the age-standardised increase over time is the highest in the less advanced states.
- The DALY rate of ischemic heart disease varied by 9-fold, and stroke by 6-fold across the states of India in 2016.
- Among the total CVD deaths in India in 2016, more than half were in persons aged less than 70 years; this proportion was highest in the less advanced states.
- With 18% of the global population in 2016, India has 23% of the global disease burden for ischemic heart disease.
- While the DALY rate of rheumatic heart disease has decreased considerably over time, India still has 38% of the global disease burden for rheumatic heart disease.
- The prevalence of CVD risk factors such as high blood pressure, high total cholesterol, high fasting plasma glucose, and overweight increased across all states since 1990.
- Urgent policy action is needed to control the increasing prevalence of ischemic heart disease, stroke and their risk factors in all states of India, with particular attention to the less advanced states where the rate of increase in the highest.

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Key findings from the diabetes paper, published in *The Lancet Global Health*:

- Among the major non-communicable diseases, diabetes has had the highest increase in disease burden measured in term of DALYs since 1990.
- The number of persons with diabetes increased from 26 million in 1990 to 65 million in 2016.
- The prevalence of and DALY rate from diabetes has substantially increased in every state from 1990 to 2016 with 4-fold variation of DALY rate between the states of India in 2016.
- The age-standardised increase in diabetes prevalence and DALY rate has been the highest in the relatively less developed states.
- Overweight, the major risk factor of diabetes, has almost doubled in every state of India since 1990.
- For every 100 overweight persons in 2016, there are twice as many persons with diabetes in India compared to the global average, indicating the higher risk of diabetes in India.
- These findings could serve as a guide for policy planning to address this public health challenge across the states of India.

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Key findings from the chronic respiratory diseases paper, published in *The Lancet Global Health*:

- India has a disproportionate burden of chronic respiratory diseases, with 32% of the global DALYs or health loss from these diseases.
- The number of chronic obstructive lung disease cases in India increased from 28 million to 55 million over a 26-year period.
- The prevalence and age-standardised DALY rate of chronic obstructive lung disease were highest in the relatively less developed north Indian states in 2016, with a 4-fold variation in DALY rate across the states of India.
- Most states had higher chronic obstructive lung disease DALY rates than what would be expected for their sociodemographic level, with the rates generally highest in several north Indian states.
- In 2016, the case-fatality rate of chronic obstructive lung disease was two times higher in the less developed Indian states.
- Air pollution was the leading risk factor for chronic obstructive lung disease in India in 2016, followed by smoking.
- The time trends in chronic respiratory disease burden in the states of India emphasise the urgency for strategies to prevent and control these diseases, including multi-sectoral efforts to reduce risk factors such as exposure to ambient air pollution.

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Key findings from the cancer paper, published in *The Lancet Oncology*:

- The proportional contribution of cancers to the total health loss in India has doubled from 1990 to 2016.
- The crude incidence rate of all cancers in India increased by 28% from 1990 to 2016, with the number of new cancer cases increasing from 548,000 in 1990 to 1.1 million in 2016.
- The cancers causing the highest health loss in India in 2016 in terms of DALYs were stomach (9%), breast (8%), lung (7%), lip and oral cavity (7%), pharynx other than nasopharynx (7%), colon and rectum (6%), leukaemia (5%), cervical (5%), oesophageal (4%), and brain and nervous system (3%) cancers.
- Over the past quarter century in India, there have been increases in age-standardised incidence rates of some cancers such as breast (41%), prostate (30%), and liver (32%) cancer, and decreases in others such as stomach (40%), lip and oral cavity (6%), cervical (40%), oesophageal cancer (31%), and leukaemia (16%).
- There are wide variations in the incidence rates of different types of cancers across the states of India in 2016, ranging 3-fold to 12-fold for common cancers such as lip and oral cavity, breast, lung, and stomach.
- Among females, breast cancer was the first or second leading cause of cancer deaths in most Indian states, while lung cancer was the first or second leading cause of cancer deaths in more than half of the Indian states among males.
- The age-standardised death rates from all cancers together in 2016 were highest in the north-eastern states of Mizoram, Meghalaya, Arunachal Pradesh, and Assam.
- Tobacco use was the leading risk factor for cancer health loss in India in 2016.
- Additional collaborative research efforts are needed to understand the varying drivers of cancer burden in different parts of India.
- Besides attempts at earlier detection of breast, cervical and oral cancers that is being attempted in India, detection and management of other leading types of cancer should also be enhanced.

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Key findings from the suicide paper, published in *The Lancet Public Health*:

- Suicide death rate was 2.1 times higher among women and 1.4 times higher among men in India than the global average in 2016.
- India had 18% of the global population in 2016, but accounted for 37% of the global suicide deaths among women and 24% among men.
- Suicide was the leading cause of death in India among 15-39 year-olds in 2016; with 71·2% of the suicide deaths among women and 57·7% among men in this age group.
- Most states had suicide death rate much higher than would be expected for their sociodemographic level among both women and men.
- The national level estimates mask the large variations seen in suicide deaths at the state level in India; there was a 10-fold variation between the states in the suicide death rate for women and 6-fold variation for men in 2016.
- Increasing suicide death rate among the elderly has also been observed over the past quarter century.
- If the trends observed so far continue, the majority of states in India that have 80% of the country's population are unlikely to achieve the SDG suicide death rate target of one-third reduction from 2015 to 2030.
- These time trend data provide guidance for suicide prevention in each state of India, which can be utilised to develop approaches suitable for each state within a national suicide prevention strategy in order to reduce suicide deaths across India.

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About the India State-Level Disease Burden Initiative:

The India State-Level Disease Burden Initiative is a collaborative effort between the Indian Council of Medical Research (ICMR), Public Health Foundation of India (PHFI), Institute for Health Metrics and Evaluation (IHME), and experts and stakeholders from about 100 institutions across India. The work of this Initiative is overseen by an Advisory Board consisting of eminent policymakers and involves extensive engagement of 14 domain expert groups with the estimation process. The Health Ministry Screening Committee at the Indian Council of Medical Research and the ethics committee of the Public Health Foundation of India approved the work of the India State-Level Disease Burden initiative.

The findings reported in the technical papers published today are a part of the Global Burden of Disease Study 2016. The analytical methods of this study have been standardised 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 standardised comparisons of the health loss burden caused by different diseases and risk factors, between different geographies, sexes, and age groups, and over time in a unified framework. The key metric used for this comparison is disability-adjusted life years (DALYs), which are a sum of the number of years of life lost due to premature death and a weighted measure of the years lived with disability due to a disease or injury.

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

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

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Annexures:
Commentary and five research papers

Glossary of key terms

Age-standardisation: A statistical technique used to compare populations with different age structures, in which the characteristics of the populations are statistically transformed to match those of a reference population. Useful because relative over- or underrepresentation of different age groups can obscure comparisons of age-dependent diseases (e.g., ischaemic heart disease or neonatal disorders) across populations.

Disability-adjusted life-years (DALYs): Years of healthy life lost to premature death and suffering. DALYs are the sum of years of life lost and years lived with disability.

Epidemiological transition level (ETL): Based on the ratio of the number of DALYs in a population due to communicable, maternal, neonatal, and nutritional diseases to the number of DALYs due to non-communicable diseases and injuries together. A decreasing ratio indicates advancing epidemiological transition with an increasing relative burden from non-communicable diseases as compared with communicable, maternal, neonatal, and nutritional diseases.

Socio-demographic Index (SDI): A summary measure that identifies where countries or other geographic areas fall on the spectrum of development. Expressed on a scale of 0 to 1, SDI is a composite average of the rankings of the per capita income, average educational attainment, and fertility rates of all areas in the GBD study.

Uncertainty interval (UI): A range of values that is likely to include the correct estimate of health loss for a given cause. Narrow uncertainty intervals indicate that evidence is strong, while wide uncertainty intervals show that evidence is weaker.

Years of life lost (YLLs): Years of life lost due to premature mortality.

Years lived with disability (YLDs): Measure of years lived with disability due to a disease or injury, weighted for the severity of the disability.