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The South Asia Food and Nutrition Security Initiative

PUBLIC HEALTH IN INDIA AND FOUR STATES IN TRANSITION

An epidemiological transition is well underway in India, in common with countries throughout much of the developing world. The transition refers to a change in the prevailing causes of illness (morbidity) and death (mortality) that is often observed by demographers as economic development and technology enables improvements in public health and sanitation. It sees a substantial decline in the communicable or infectious diseases that disproportionately afflict mothers and prenatal and young children, including diarrheal and respiratory infections and nutrition deficiencies. Life expectancy increases, and the non-communicable, chronic diseases associated with older age—such as diabetes, heart disease, and stroke—become the leading risk factors for disability and death. This epidemiological shift necessitates a greater focus on the prevention and management of chronic conditions, such as cardiovascular diseases, diabetes, chronic respiratory diseases, mental health disorders, and cancers.

Between 1990 and 2016, India experienced much of this process. In 1990, four of the five most prominent causes of illness and death were the results of communicable diseases, poor nutrition, and unsafe sources of drinking water. By 2016, these had given way to non-communicable illnesses relating to indoor and outdoor air pollution, high blood pressure, heart disease, and high blood sugar. While these now account for four of the five leading risk factors for health loss—measured in terms of disability-adjusted life years—in India, the scale of magnitude of the country obscures the wide diversity of conditions within its respective states. The north Indian states of Uttar Pradesh and Uttarakhand and the states of Meghalaya and Nagaland in India's far northeast are important cases in point. The difference in the rates of the epidemiological transition between these states, and between them and India as a whole, reveals patterns that can usefully inform local public health policy and priority setting within them. Addressing the non-communicable diseases that today represent the leading risks to public health will entail determining how financial and other resources are most appropriately disbursed to local governments and their partners in the health industry. And yet, even with their relative decline as causes of health loss, the communicable diseases that were once the leading risk factors warrant continued policy focus because they remain among the top 10 causes of health loss and death in India and within the four states examined here. Because there are substantial differences in the burden of specific diseases even between neighboring states, it is essential that the control of communicable and non-communicable diseases be tailored to the epidemiological status of each state.

Portrait smiling indian children on Varkala during puja ceremony on holy place - on the Papanasam beach - Alexandra Lande / Shutterstock.com

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South Asia Region

Life expectancy at birth, nationally, by state, and by sex

	India		Meghalaya		Nagaland		Uttar Pradesh		Uttarakhand	
	1990	2016	1990	2016	1990	2016	1990	2016	1990	2016
Both sexes	59.0	68.6	61.3	69.4	63.9	71.4	54.2	65.6	59.1	68.0
Males	58.3	66.9	59.8	66.8	63.1	69.1	54.9	64.6	57.8	65.3
Females	59.7	70.3	63.2	72.4	64.9	74.5	53.5	66.8	60.5	71.1

Contrasts between female and male health indicators, and between indicators in the four states and national-level, all-India averages are instructive, and many of the results of the burden of disease study are reported in these terms. The longer life expectancy typical of women over men and the rate at which this changes for the two sexes is clearly evidenced in the four states as it is elsewhere in India. Across India, life expectancy rose by 8.6 years among males and by 10.6 years among females between 1990 and 2016 – a two-year gap in the increase. The period saw a dramatic, 13.3-year increase in female life expectancy in Uttar Pradesh, which in 1990 had been the only Indian state in which male life expectancy exceeded female life expectancy. Male life expectancy in the state rose by 9.7 years during the 26-year period. The smallest increase in life expectancy took place among males in Nagaland, where it rose by 6 years. The differential in the change in female and male life expectancy was the widest in Uttarakhand, where it increased from 2.7 years in 1990 to 5.8 years in 2016. It is evident that the epidemiological transition has different effects on males and females, which suggests the need for careful attention to gender, even as overall health outcomes in India continue to improve.

Expressed in crude birth rates and age-standardized death rates, the demographic transition India is currently undergoing quickly becomes apparent. Between 1990 and 2015 the crude birth rate decreased from 32 to 19 births per 1,000 people in India, while the age-standardized death rate per 1,000 people declined from 16.5 to 11.6. In Uttarakhand, this mortality rate fell from 18.5 to 11.5 deaths per 1,000 people between 1990 and 2016. Mortality rates in Nagaland exhibited the lowest decline of the four states, from 13.6 to 9.7 deaths per 1,000 people during the same period. Overall, lower birth and death rates will result in a relatively older population, which require careful planning appropriate for the healthcare needs of the aging population.

The 84 risk factors tracked by the global burden of disease study are broadly classified into three types: metabolic, environmental, and behavioral. Metabolic risks include high blood pressure, high blood sugar, and obesity – measured by body mass index. Environmental risks include poor sanitation, unsafe water, air pollution, and occupational risks associated with workplace activities. Behavioral risks include malnutrition, especially among mothers and small children, poor diets, and consumption of alcohol, tobacco, and drugs. Those risks which account for a high proportion of premature death and disability adjusted life years are natural targets for public health policy and addressing them effectively can substantially reduce India's overall disease burden. As each state progresses through the epidemiological transition, targeting the most significant risk factors is critical to improving health outcomes.

As of 2016, 31 percent of India's disease burden was attributable to behavioral risk factors, whereas metabolic risks accounted for 16 percent and environmental risks for 17 percent. For policy makers this suggests that communicable and nutritional diseases warrant continued attention, while the increasing incidence of non-communicable diseases places them as priorities which have emerged more recently. High systolic blood pressure in particular has become the leading risk factor for disease in India given its

direct role in contributing to related disorders such as ischemic and hypertensive heart disease and stroke, as well as its less direct but still substantial role in increasing diabetes and kidney disease. Low birth rate and babies born after abbreviated gestation periods are the second leading risk factor, and account for a large proportion of neonatal disorders relative to lower respiratory and diarrheal infections which were more prominent in 1990. India is presently facing a "double burden." Risk factors for non-communicable diseases are on the rise, but communicable and childhood diseases are still a major health concern.

The variation of age structures between Meghalaya, Nagaland, Uttar Pradesh, and Uttarakhand makes it necessary to standardize population age structures across the states to reveal how differently the epidemiological transition is progressing in each. In Uttarakhand, metabolic risks, particularly high body mass index and total cholesterol were proportionately much greater drivers of health loss than in the other three states, while smoking was revealed as the major behavioral driver. In Uttar Pradesh, the environmental risks of poor sanitation, unsafe water for drinking and washing, and lack of access to handwashing facilities were the most important drivers. Uttar Pradesh was also the only one of the four states in which particulate matter and household air pollution—again environmental factors—ranked among the top ten drivers of disability adjusted life years. Each state thus has a unique set of challenges to health, which requires specific interventions targeting these problems at the population level.

Nutrition and dietary remain salient issues in all four states, as they do throughout India. Maternal and childhood (including prenatal) are foremost among these, and their longer-term developmental repercussions for children remain unclear. Throughout India, these persist as leading causes of health loss in India, attributable for an estimated 68 million disability adjusted life years

Leading dietary risk factors for DALYs in India and the four states, both sexes, age-standardized, 2016

	India	Meghalaya	Nagaland	Uttar Pradesh	Uttarakhand
Low fruit	1	1	1	2	2
Low nuts and seeds	2	2	2	1	1
Low omega-3	3	4	4	3	3
Low vegetables	4	3	3	4	4
High sodium	5	5	5	6	5
Low fiber	6	7	7	5	7
Low whole grains	7	6	6	12	6
Low legumes	8	9	9	8	9
High trans fat	9	8	8	7	8
Low polyunsaturated fatty acids	10	11	11	10	10
Low calcium	11	10	10	9	11
Low milk	12	12	12	11	12
High processed meat	13	13	13	13	13
Highly sweetend beverages	14	14	14	14	14

in 2016. In Uttarakhand, the proportion of years lost to premature death and disability attributable to low birth rate and short pregnancies increased from 6.1 to 7.6 percent between 1990 and 2016. Nutrition-related risks at all ages also contributed to the number of disability adjusted life years that were attributable to cardiovascular diseases in 2016. Standardizing for age, 11 specific dietary risks accounted for leading factors in the four states – and in all four, diets low in fruits, vegetables, nuts, seeds, and omega-3 fatty acids were among the leading risks among these. While each state has a specific combination of risk factors and health challenges, dietary and nutritional risk factors are common to all the states; national attention to these issues may therefore lead to significant health gains across all age-groups.

Opportunities for further work

The subnational-level disease burden estimates in India lay the groundwork for future study. The GBD comparative risk assessment framework may be used to provide an expansive quantitative view of the relationship between nutrition and cognition, as well as the impacts of broader determinants of health and nutrition in India. Persistent deficits in cognitive development and skills can be caused by poor health and inadequate nutrition early in life, leading to lifelong challenges for reasoning, employment, and overall well-being. In India, where the burden of malnutrition, diarrhea, and other infectious diseases is high in children under 5, these missed opportunities for full cognitive development are likely to be significant. To generate a cohesive set of estimates of the level and trends in cognitive development, and to quantify the impact of nutrition and other key drivers in cognitive outcomes, the following work is anticipated: a comprehensive systematic review; development of a standardized approach to measuring trends and levels in cognition; and estimate the impact of nutrition and other risks on cognitive function. Another opportunity for further work is to provide rural-urban burden of disease and risk factors estimates for all states of India and the union territories. This is planned as part of Global Burden of Disease 2017 study, and would include estimates of diarrheal diseases, nutritional diseases, and dietary and malnutrition-related risk factors in the burden of disease framework.

Finally, the India State-Level Disease Burden Initiative is expanding the network of experts involved in the Initiative to identify further relevant data, benefit from the expert knowledge in India in the analysis and interpretation of findings and increasing dissemination efforts in India to inform policy. Continued work on analyzing rural versus urban trends and quantifying the losses attributable to different risk factors can potentially establish the benchmarks for important health policies. Fostering scientific and governmental collaboration can galvanize the utilization of these results in health policy, informing state and national priorities, and ultimately improving health of India's population through targeted, local, evidence-based decision-making.

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