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Abstract

The article is concerned with the analysis of the human development achievement and improvement indices of Indian states for the time period of 1981, 1991, 2001 and 2011. The analysis points out how Indian states have, over time, extensively changed their position in terms of various achievements and improvement index values. There is wide difference in the ranking of the states in terms of achievement and improvement indices. There is non-linearity in the improvement of various dimensions as well as the overall human development. The most striking result is the low improvement of the low-achieving states. This is a cause of serious concern and must be addressed through increasing input allocation and efficient utilization of such inputs. The public sector could also be more strengthened in such states.

JEL: O15, H70, I00, C00

Keywords

Human development, indexing, Indian states

Introduction

India has experienced, more or less, a high average growth in per capita income in the past two decades that is in contrast to its slow progress in human development. The basic purpose of development is to enlarge people's choices. Human development is a process of enlarging people's choices by enhancing their functioning and capabilities (United Nation Development Programme [UNDP], 1992). At all the levels of development, the three essential requirements for people are to lead a long and healthy life; to acquire knowledge; and to have access to resources needed for decent standard of living. The discussion on human

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development signifies a shift away from the growth oriented notions of development to a more development centric approach towards social development. The per capita income is no longer an appropriate measure of standard of living of a particular country or society as a whole, but rather summarizes the current state of economic activities (agriculture, manufacturing, banking, transport, etc.) within a society. One of the limitations of the per capita ranking measure is that it is a one-dimensional measure and does not capture the basic human needs, inequality, environmental degradation and illiteracy. Development research has come up with new differentiating rules to measure the level of human development. In fact, UNDP's human development index (HDI) has been rather successful in serving as an alternative measure of development that supplements GDP (Sen, 1999).

The HDI is currently used for many different purposes, from a comparative index to a decision-making instrument for public policy. The essence of the UNDP's perspective in Human Development Reports (HDRs) is that while income is an important dimension, development must encompass improvements in other non-income indicators as well, because human well-being cannot be equated with income. It is therefore important to evaluate a country's performance in achieving human development. The objectives of this study are as follows: to find out the states which are performing best for achieving human development for the four different time periods, 1981, 1991, 2001 and 2011; and to find out pattern of improvement of states in achieving the same.

The article is organized as follows. The next section gives brief review on various issues related to HDI. In the third section, the article discusses the data sources; and the fourth section describes the methodology. The main empirical results are presented in the penultimate section and the last section concludes.

Literature on Human Development: Brief Review

The HDI was first introduced to the public in UNDP's HDR in the year 1990. Much of the literature on human development has focused on what are the appropriate measures of human development and whether economic growth or per capita income levels are sufficient as measures of the well-being of the population. There are various studies which have been directed towards the comparison of various indices from various policy points of view (Anand & Sen, 1994). Their basic objective was to review the HDR of 1990, 1991 and 1992 and formulate HDI in terms of country's deprivation or shortfall in each of the three separate dimensions, that is, life expectancy, education and adjusted income. This perspective has some merit in drawing attention to the distance a country still has to travel in order to achieve what is regarded as a desirable target or goal. To modify it, they measured HDI in terms of attainment rather than shortfall of country (Anand & Sen, 1994). This is more useful if one wishes to assess changes

in HDI over time. There is another set of study which tries to bridge the gaps between the 1990 and 1994 methods of computing the goal posts (Majumdar, 2003). There are also a few empirical studies that deal with inter-regional disparity in human development (see, for example, Dholakia, 2003; Kurian, 2000; and Singh, Bhandari, Chen & Khare, 2003). While Singh et al. (2003) find no evidence of absolute or conditional divergence in human development across 14 major states in India, Dholakia (2003) observes that while per capita income does not show any significant trend in regional disparity, the overall indices of human development show a clear and highly significant declining trend during 1981–2001. It has been observed that India displays a two-way causality between economic growth and human development, indicating possibilities of vicious cycles (Ghosh, 2006).

It is seen that earlier studies did not emphasize the measurement of improvement in human development. The present study will bridge this gap. The value addition of this article is that, unlike most of the earlier papers that consider income as a proxy for GDP indicator,¹ this article includes various household amenities as a proxy for standard of living, which is a broad indicator compared to GDP. In terms of health indicators also, the article carries some of our modifications. Instead of considering only life expectancy (proxy for longevity), the article considers some more indicators such as total fertility rate and infant mortality rate to capture the stabilization in the population.

Indicators and Data Sources

The health-related variables for which data are available are infant mortality rate, total fertility rate, stillbirth rate and life expectancy at birth. Data are reported by the Sample Registration System (SRS), which is supervised by the Office of the Registrar General only. As far education indicators are concerned, literacy rate and school enrolment data published by the Ministry of Human Resource Development, Government of India, in *Education in India*, are considered. For standard of living, the study considers all types of household amenities like percentage of households having toilet facility, drinking water facility, electricity consumption, *pucca* house, semi-*pucca* house and *kutcha* house based on census data. All the data are collected for four time periods, that is, 1981, 1991, 2001 and 2011. On the basis of all the given variables, the study has constructed health achievement index, education achievement index and standard of living achievement index, and taking the average of all these three indices, the study has calculated overall human development achievement index. The study has also calculated improvement index in 1991 over 1981, in 2001 over 1991, in 2011 over 2001 and finally, 2011 over 1981. The difference between the achievement indices for each decade yields the improvement index between the two decades.

Construction of Index

Health Achievement Indicators

1. **Life Expectancy at Birth:** Life expectancy at birth of an individual (at any age) is the number of years the newborn is expected to live given the prevailing age-specific mortality rates of the population to which he or she belongs. It is an indicator of the longevity that a person is likely to enjoy in any society. It has an intrinsic value for people and its value also lies in its instrumental attributes of enabling the pursuit of other valued personal and social goals. It also indicates some other aspects of health attainments, namely, nutrition adequacy and a relative lack of morbidity.
2. **Total Fertility Rate:** Total fertility rate is defined as number of children born to a woman if she were to live through her reproductive years (age 15–49 years) and to bear children at each age in accordance with the prevailing age-specific fertility rates. This indicator pertains to the number of live births and not pregnancies. This is an indicator which is useful for analyzing the prospects of population stabilization.
3. **Infant Mortality Rate:** Infant mortality rate is defined as number of deaths per 1,000 live births in the first year of a child's life. It reflects the probability of a child dying before attaining the age of one year. Unlike the indicators on life expectancy that are relatively stable and slow moving, the infant mortality indicator is likely to be more sensitive to changes that have a bearing on the quality of life, particularly to the health and longevity of people. These could be sudden adversities or non-availability of critical public health and life support services. They are, thus, more useful from the point of policy targeting and tracking changes in health attainments of a population at more frequent intervals, when population is yet to complete its demographic transition.
4. **Stillbirth Rate:** Stillbirth occurs when a foetus which has died in the uterus during labour or delivery exits a woman's body. It occurs in full-term pregnancies. This is also one of the mortality indicators. The chances of dying increase if complication arises in deliveries that do not take place in health institutions or if they cannot be quickly transported to a referral unit in case the need arises.

Education Achievement Indicators

1. **Youth Literacy Rates:** The census of India currently defines the youth literacy rate as proportion of literates to total population in the age group of 7–14 years. It is one of the important indicators to enhance human capital and productivity, and enables the process of acquisition, assimilation and communication of information and knowledge, all of which augments a person's quality of life.
2. **Adult Literacy Rates:** Adult literacy rate, in India, is defined as the proportion of literate population in age group 15 years and above. Like literacy

rate, adult literacy rate gives an indication of enhancing choices and functioning of the people which leads to higher human development. More particularly, it is a prevalence measure of education that reflects average social effort, in a society, over many years. Such a measure is relatively intensive to current spread of education among children and underplays the importance of social investment in educating the youth in a society.

3. **School Enrolment:** Enrolment is calculated as the ratio of the total number of students enrolled in the relevant stage by the estimated population in a specified age group. Thus, the enrolment in primary section is defined as Classes 1–5, with the corresponding age group of 6–10 years. Classes 6–8 constitute the secondary school enrolment, with associated age group being 11–14 years, while higher secondary school enrolment is Classes 9–12, with associated age group being 15–18 years. It is the indication of the current flow of or spread of education.

Standard of Living Achievement Indicators

In UNDP HDR, per capita GDP is considered as a measure of standard of living but is not appropriate because increase in GDP need not necessarily reflect a higher standard of living. Per capita income is only a crude proxy. Therefore, the study is based on some other indicators like household amenities as a proxy for standard of living. These indicators are briefly explained next.

1. **Quality of House:** The census presents data on quality of houses based on the material used for construction of walls and roof separately. If both the walls and roofs are made of *pucca* material, a house is classified as *pucca*. If wall and roof are made of *kutchra* material, the house is classified as *kutchra*. In all other cases, the house is classified as semi-*pucca*. A wall is considered *kutchra* if the material used includes grass, leaves, bamboo, mud, un-burnt brick or wood. It is the *pucca* when the material used in its construction is burnt brick, metal sheets, stone and cement/concrete. Similarly, a roof is considered *kutchra* if the material used is grass, mud, un-burnt brick or wood. It is *pucca* when the material used includes tiles, slate, corrugated iron, zinc or other metal sheets, asbestos, cement sheets, bricks, lime, stone and concrete.
2. **Electricity Consumption:** Access to electricity is a basic amenity in today's context. It is measured by the percentage of households using electricity as a source of lighting. This is a proxy for standard of living.
3. **Safe Drinking Water:** As per census of India, if a household has access to drinking water supplied from a tap, or a hand pump or tube well situated within premises, it is considered as having access to safe drinking water. It is also measured by percentage of households having tap or tube well for their purpose of drinking water.
4. **Toilet Facility:** Toilet facility is one of the most important indicators of having good health and is also a proxy of standard of living. It is also

measured by percentage of households having toilet facility for the disposal of waste water.

On the basis of all the given variables, non-linear achievement indices for health, education and standard of living have been constructed, and averaging these three indices, the human development achievement index has been arrived at.

Methodology

Human development is defined to be a process of enlarging people's opportunities and expanding capabilities that enhance individual well-being. So, there is a need to select the most important capabilities affecting well-being; the HDR selects longevity, knowledge and income.

In constructing the country-level HDI, it is necessary to calculate a country's extent of deprivation for each of the three indicators, life expectancy, literacy and income. In the HDR, this deprivation is absolute in nature. So, a particular country feels deprived because its achievements are below that attained by the top performer in particular indicator. The HDR assumes that the extent of deprivation is linear in the difference between a country's attainment and the global maximum for any particular indicator. Let I_{ij} denotes country j 's index of deprivation for the i th social indicator. Therefore,

$$I_{ij} = \frac{Max_i - X_{ij}}{Max_i - Min_i}, \quad (1)$$

where Max_i and Min_i are the global maximum and minimum values for the indicator respectively and X_{ij} is the own values for the respective indicator. The overall index of deprivation for country j is the simple average of the deprivation indices for the three indicators is given by

$$\frac{1}{3} \sum I_{ij} \quad (2)$$

Human development is defined as the absence of deprivation. Hence,

$$(HDI)_j = 1 - \frac{1}{3} \sum I_{ij} \quad (3)$$

But there is a problem in the basic index if comparisons are made across time period. The basic HDI cannot be used to measure a country's performance across time because the global maximum and minimum values will naturally change. In order to correct this problem, the HDR suggests that the global maximum and

minimum values should be defined over a period of time and not for each point of time. Let Max_{it} and Min_{it} denote the global maximum and minimum values of indicator i . Then, the deprivation index for country j with respect to indicator i for the time period t_1 and t_2 is given by the following:

$$\bar{I}_{ij} = \frac{Max_{it} - X_{ijt}}{Max_{it} - Min_{it}} \quad (4)$$

So, the index of human development is as follows:

$$(HDI)_j = 1 - \frac{1}{3} \sum \bar{I}_{ij} \quad (5)$$

A major problem with this basic deprivation index is that deprivation is defined to be linear in the difference between the maximum and actual value. Kakwani (1993) points out that as far as the non-income indicators are concerned, there are biological and physical limits to the maximum achievements possible. This is because the values of several indicators have to satisfy some natural constraints. Consider two states, A and B, with, say, infant mortality rates of 50 and 40 respectively. Then, State A will find it easier to reduce the mortality rate to 45 than B to reduce the mortality rate to 35. A linear measure of deprivation does not address this problem. Kakwani (1993) suggests an axiomatic procedure for deriving indices of achievement for indicators which have asymptotic limits. He points out that it is essential to use non-linear transformations of the actual variables in measuring achievements in the social sector. A linear measure of achievement does not take this phenomenon into account. For indicators where lower values are more desirable, this effect is captured by taking strictly concave transformations. On the other hand, for measures such as the percentage completing a given level of education, higher values are more desirable, and then strictly convex transformations are appropriate. Let x denote some non-linear indicator such that higher levels are desirable.² Let the asymptotic upper bound for this indicator be M in the sense that x never reaches this value but it may come arbitrarily close to M . Let m be the lower bound of x . Now suppose the value of indicator x moves from x_1 to x_2 . Therefore, Kakwani's improvement index is given by $Q(x_1, x_2, M, m)$. Kakwani's improvement index is defined as follows:

$$Q(x_1, x_2, M, m) = f(x_2, M, m) - f(x_1, M, m), \quad (6)$$

where $f(x_2, M, m)$ and $f(x_1, M, m)$ are the values of an achievement index.

To ensure that the achievement index lies between 0 and 1, Kakwani specifies,

$$F(x, M, m) = 1 - \frac{g(M-x)}{g(M-m)}, \quad (7)$$

where $g(\cdot)$ is a positive, increasing function with $\lim_{x \rightarrow 0} g(x) = 0$ as x approaches 0. The higher the value of x , the more difficult it is to record a further increase. In order to incorporate this into achievement index, it is sufficient to make g a concave function. Kakwani uses the class of constant elasticity (Atkinson) functions defined in equation 1.

$$g(x) = \frac{1}{(1-e)} x^{(1-e)}, \quad 0 \leq e \leq 1 \quad (8)$$

This improvement index has the property that an equal increase is translated into a bigger improvement if it is achieved at a higher level.³ The advantage of using achievement and improvement indices of the class given by equations (6)–(8) is that even the higher performing country in any given indicator has an incentive to improve its performance, because any increase will show up as an increase in achievement in that indicator.⁴ In order to present the achievements of states in comprehensible form, four time periods, namely, 1981, 1991, 2001 and 2011, have been considered. We have used the Kakwani index for calculating health achievement index, education achievement index and standard of living achievement index. Finally, the average of these three indices will give us the human development achievement index. The difference between the achievement indices for each time period yields the improvement index between two periods. The improvement index between two time periods should help in understanding the dynamics of the states in achieving overall HDI. Appendix 1 captures a detailed note on methodology.⁵

Results

Achievement Index

Health Achievement Index

We start with a discussion of the results in health achievement index. Table 1 presents the achievement index in health for the time periods, 1981, 1991, 2001 and 2011, at all-India as well as state level. It is seen that the health achievement index has gradually increased over time. Moreover, there was a gradual converging trend from 1981 to 2001 across states in terms of health achievement index as shown by the falling coefficient of variation (CV). However, there is a slight increase in the coefficient of variation in 2011 which indicates divergence in the health achievement index. It is seen that some of the states like Andhra Pradesh, Jammu & Kashmir, Himachal Pradesh, Karnataka and Bihar has done better job in terms of health achievement index in 2011 compared to previous years. On the contrary, Maharashtra, Manipur, Nagaland, Mizoram, Meghalaya and Tamil Nadu deteriorate their ranking in 2011 compared to 2001. There are some states like

Table I. Health Achievement Index

States	Levels				Rankings			
	1981	1991	2001	2011	1981	1991	2001	2011
Andhra Pradesh	0.412	0.468	0.49	0.69	11	12	14	4
Arunachal Pradesh	0.402	0.456	0.49	0.52	14	14	14	15
Assam	0.398	0.413	0.46	0.56	16	19	19	13
Bihar	0.298	0.312	0.39	0.49	26	26	26	19
Delhi	0.559	0.612	0.654	0.76	2	2	2	2
Goa	0.4	0.492	0.501	0.601	15	9	11	8
Gujarat	0.431	0.551	0.518	0.63	9	4	7	6
Haryana	0.319	0.411	0.484	0.489	23	20	17	20
Himachal Pradesh	0.437	0.506	0.517	0.717	7	7	8	3
Jammu & Kashmir	0.403	0.398	0.42	0.62	13	22	23	7
Karnataka	0.491	0.495	0.5	0.67	4	8	12	5
Kerala	0.596	0.67	0.695	0.795	1	1	1	1
Madhya Pradesh	0.336	0.397	0.438	0.478	22	23	21	23
Maharashtra	0.476	0.514	0.526	0.576	5	6	5	10
Manipur	0.534	0.526	0.556	0.576	3	5	4	11
Meghalaya	0.457	0.461	0.525	0.575	6	13	6	12
Mizoram	0.426	0.474	0.506	0.516	10	11	10	17
Nagaland	0.397	0.436	0.515	0.525	17	15	9	14
Orissa	0.305	0.341	0.399	0.459	24	25	25	26

(Table I Continued)

(Table 1 Continued)

States	Levels					Rankings				
	1981	1991	2001	2011		1981	1991	2001	2011	
Punjab	0.396	0.49	0.495	0.517		18	10	13	16	
Rajasthan	0.359	0.428	0.443	0.487		20	17	20	22	
Sikkim	0.407	0.425	0.482	0.492		12	18	18	18	
Tamil Nadu	0.434	0.559	0.569	0.589		8	3	3	9	
Tripura	0.394	0.433	0.485	0.489		19	16	16	21	
Uttar Pradesh	0.302	0.41	0.418	0.468		25	21	24	25	
West Bengal	0.358	0.389	0.427	0.477		21	24	22	24	
All India	0.412	0.464	0.496	0.59						
CV (%)	0.18	0.17	0.14	0.16						

Source: Author's calculations.

Kerala, followed by Delhi, that occupied the top position throughout this period. The notable feature of the table is that the ranks of the states in general reveal not much large variations over four time periods, though there are some exceptions. In terms of health achievement, states like Andhra Pradesh, Delhi, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka and Kerala were above the national average in 2011. It is also noticed that though Maharashtra and north Indian states have above-average health achievement index for the period 1981 to 2001, in 2011, those states' health achievement index is below the national average. It is seen that Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal were in the bottom-most position in terms of health achievement for all the periods.

Education Achievement Index

Table 2 illustrates the education achievement index of Indian states for the four time periods, 1981, 1991, 2001 and 2011. Though the variation among the states in education achievement slightly increased in 1991 as compared with 1981, there was a drastic fall in 2001 and 2011, indicating some convergence. It is seen that in 2001, Assam, Delhi, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Nagaland, Tamil Nadu and West Bengal have above national average achievement value. However, Manipur, Nagaland, Meghalaya, among others, have below national average education achievement index in 2011.

For most of the states, the education achievement index increases in every period over the previous one. The table highlights that Delhi has maintained the same position (rank 4th) in 1991 and 2001, but it ranked 3rd in 1981 and 2nd in 2011 in education achievement index. Though Kerala got 1st rank in 1981, it slipped to 2nd in 1991 and 2001. However, in 2011, Kerala again manage to reach 1st rank in terms of the said index. The most important observation from the table is that most of the states did better in 2011 compared to previous periods. States like Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Punjab and Maharashtra have better position in 2011 over 2001. West Bengal maintains the same 5th position in 1981 and 1991 but in 2001, it lost its position and slipped to 7th and 10th in 2011.

Standard of Living Achievement Index

Table 3 highlights the standard of living achievement index for the time periods 1981, 1991, 2001 and 2011 of Indian states. The result indicates that over the decade, value of achievement index is increasing for the states and the country as a whole. It is evident that though there was convergent across states in terms of standard of living achievement index from 1981 to 2001, but in 2011, there seems to be divergence in terms of the said index which is shown by the increase in CV. It is seen that relative rankings of the states do not change much in terms of the standard of living achievement index. It is seen that Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Punjab, Tripura and West Bengal were above national average in 2011. Although Tamil Nadu, Madhya Pradesh and Uttar Pradesh had above nation average index value

Table 2. Education Achievement Index

States	Levels				Rankings			
	1981	1991	2001	2011	1981	1991	2001	2011
Andhra Pradesh	0.101	0.12	0.181	0.381	22	20	15	9
Arunachal Pradesh	0.116	0.126	0.171	0.271	16	19	18	19
Assam	0.12	0.157	0.228	0.340	13	12	9	12
Bihar	0.084	0.09	0.109	0.339	24	25	26	13
Delhi	0.237	0.247	0.271	0.471	3	4	4	2
Goa	0.193	0.207	0.27	0.470	6	7	5	3
Gujarat	0.129	0.14	0.168	0.302	12	14	22	15
Haryana	0.102	0.115	0.176	0.342	21	21	16	11
Himachal Pradesh	0.113	0.133	0.183	0.383	18	16	14	8
Jammu & Kashmir	0.071	0.098	0.14	0.268	26	24	24	21
Karnataka	0.115	0.145	0.214	0.314	17	13	11	14
Kerala	0.299	0.317	0.342	0.576	1	2	2	1
Madhya Pradesh	0.104	0.099	0.171	0.271	20	23	18	20
Maharashtra	0.168	0.181	0.215	0.415	7	8	10	5
Manipur	0.146	0.158	0.188	0.288	10	11	12	18
Meghalaya	0.12	0.163	0.23	0.260	13	9	8	22
Mizoram	0.23	0.261	0.292	0.408	4	3	3	6
Nagaland	0.158	0.22	0.251	0.291	8	6	6	16
Orissa	0.101	0.11	0.15	0.180	22	22	23	25
Punjab	0.113	0.128	0.176	0.396	18	18	16	7
Rajasthan	0.079	0.088	0.169	0.289	25	26	21	17
Sikkim	0.12	0.13	0.185	0.190	13	17	13	23
Tamil Nadu	0.249	0.358	0.375	0.468	2	1	1	4
Tripura	0.144	0.163	0.17	0.190	11	9	20	24
Uttar Pradesh	0.152	0.134	0.125	0.167	9	15	25	26
West Bengal	0.22	0.23	0.245	0.376	5	5	7	10
All India	0.146	0.167	0.208	0.333				
CV (%)	0.4	0.42	0.30	0.30				

Source: Author's calculations.

in 2001, in 2011, index values of these states are below national average. The most notable point is that Delhi maintains the top most position in all the four time periods in terms of the said index value. Kerala is not a stable in terms of position. It ranked 5th, 6th, 2nd and 4th in 1981, 1991, 2001 and 2011, respectively.

Table 3. Standard of Living Achievement Index

States	Levels				Rankings			
	1981	1991	2001	2011	1981	1991	2001	2011
Andhra Pradesh	0.178	0.272	0.370	0.390	23	20	17	16
Arunachal Pradesh	0.156	0.247	0.270	0.290	25	24	24	23
Assam	0.189	0.251	0.290	0.330	21	22	22	22
Bihar	0.22	0.242	0.252	0.270	17	25	25	26
Delhi	0.519	0.532	0.546	0.646	1	1	1	1
Goa	0.328	0.421	0.496	0.596	6	5	3	2
Gujarat	0.36	0.443	0.465	0.576	3	2	7	3
Haryana	0.319	0.411	0.490	0.510	7	7	5	6
Himachal Pradesh	0.349	0.432	0.491	0.530	4	4	4	5
Jammu & Kashmir	0.299	0.395	0.410	0.440	9	8	12	12
Karnataka	0.232	0.389	0.450	0.490	14	9	8	7
Kerala	0.345	0.42	0.516	0.540	5	6	2	4
Madhya Pradesh	0.295	0.373	0.404	0.420	10	10	13	14
Maharashtra	0.307	0.36	0.412	0.450	8	12	11	11
Manipur	0.239	0.276	0.323	0.350	13	18	20	20
Meghalaya	0.182	0.268	0.271	0.280	22	21	23	24
Mizoram	0.201	0.296	0.323	0.350	18	16	20	21
Nagaland	0.193	0.282	0.331	0.370	20	17	19	19
Orissa	0.124	0.18	0.200	0.280	26	26	26	25
Punjab	0.386	0.437	0.442	0.480	2	3	9	8
Rajasthan	0.251	0.323	0.357	0.390	12	14	18	17
Sikkim	0.17	0.361	0.378	0.380	24	11	16	18
Tamil Nadu	0.23	0.31	0.391	0.410	16	15	15	15
Tripura	0.199	0.25	0.467	0.480	19	23	6	9
Uttar Pradesh	0.232	0.274	0.404	0.430	14	19	13	13
West Bengal	0.255	0.34	0.431	0.473	11	13	10	10
All India	0.26	0.338	0.390	0.432				
CV (%)	0.33	0.25	0.230	0.240				

Source: Author's calculations.

Human Development Achievement Index

After getting the vivid picture of the position of the Indian states in achieving the three dimensions of health, education and standard of living index, Table 4 demonstrates their position in overall human development achievement over time.

Table 4. Human Development Achievement Index

States	Levels				Rankings			
	1981	1991	2001	2011	1981	1991	2001	2011
Andhra Pradesh	0.230	0.287	0.347	0.487	21	19	17	7
Arunachal Pradesh	0.225	0.276	0.310	0.360	24	22	24	23
Assam	0.236	0.274	0.326	0.386	19	23	20	20
Bihar	0.201	0.215	0.250	0.366	25	25	25	22
Delhi	0.438	0.464	0.490	0.626	1	2	2	2
Goa	0.307	0.373	0.422	0.556	4	5	4	4
Gujarat	0.307	0.378	0.384	0.558	4	4	7	3
Haryana	0.247	0.312	0.383	0.445	16	14	9	12
Himachal Pradesh	0.300	0.357	0.397	0.543	8	6	5	5
Jammu & Kashmir	0.258	0.297	0.323	0.467	13	16	21	10
Karnataka	0.279	0.343	0.388	0.491	11	10	6	6
Kerala	0.413	0.469	0.518	0.637	2	1	1	1
Madhya Pradesh	0.245	0.290	0.338	0.390	18	18	19	16
Maharashtra	0.317	0.352	0.384	0.480	3	7	7	8
Manipur	0.306	0.320	0.356	0.405	6	11	15	14
Meghalaya	0.253	0.297	0.342	0.372	14	16	18	21
Mizoram	0.286	0.344	0.374	0.389	10	9	10	17
Nagaland	0.249	0.313	0.366	0.395	15	13	14	15
Orissa	0.177	0.210	0.250	0.306	26	26	25	26
Punjab	0.298	0.352	0.371	0.464	9	7	12	11
Rajasthan	0.23	0.280	0.323	0.389	21	21	21	18
Sikkim	0.232	0.305	0.348	0.354	20	15	16	25
Tamil Nadu	0.304	0.409	0.445	0.469	7	3	3	9
Tripura	0.246	0.282	0.374	0.386	17	20	10	19
Uttar Pradesh	0.229	0.273	0.316	0.355	23	24	23	24
West Bengal	0.278	0.320	0.368	0.442	12	11	13	13
All India	0.273	0.323	0.365	0.444				
CV (%)	0.21	0.19	0.16	0.19				

Source: Author's calculations.

It is not surprising that overall human development achievement value has increased from 1981 to 2011 for all states as well as for the country. It is also seen that there was a converging trend in terms of human development achievement

across states up to 2001. However, there is an increase in CV in 2011 which indicates some divergence in human development achievement index in recent period. It is revealed that Arunachal Pradesh, Assam, Bihar, Orissa, Rajasthan and Uttar Pradesh are in the bottom position in terms of human development achievement. The major improvement is achieved in Andhra Pradesh and Gujarat in recent period. For example, Andhra Pradesh shifted from 17th (in 2001) to 7th in 2011 and Gujarat shifted from 7th (in 2001) to 3rd in 2011. More interestingly, Tamil Nadu did better in 1991 and 2001 compared to 1981. In 1981, Tamil Nadu ranked only 7th but reached 3rd position in 1991 and 2001. However, it shifted from 3rd to 9th position in the recent period. It is seen that Kerala, Delhi, Gujarat and Goa are the top four states in 2011 in terms of human development achievement index.

Analysis of Improvement Index

It is interesting to look into the improvement over time in the three dimensions and overall HDI of Indian states and country as a whole. The pattern of improvement in health sector index and the ranking of the states according to this index are presented in Table 5. It reveals that there was a wide variation in state ranking over the four time periods. One of the important findings is that Himachal Pradesh, Andhra Pradesh, Jammu & Kashmir, Delhi and Goa were the top five states where overall improvement (2011 over 1981) in health sector was high. In period II (2001 over 1991), Nagaland, Bihar, Haryana, Meghalaya, Orissa, Sikkim, Tripura, Assam and West Bengal were the states where better improvement had taken place in terms of health improvement index. It is evident that in period III (2011 over 2001), Jammu & Kashmir, Karnataka, Andhra Pradesh, Himachal Pradesh and Gujarat experienced a better improvement in the health sector.

Table 6 highlights the value and ranking of the states in terms of education improvement index pertaining to the four time periods. An important finding from the table is that Tamil Nadu was in the top position in education improvement index in period I (1991 over 1981). Most notable thing is that the improvement index value of Uttar Pradesh was continuously negative, which indicates that education achievement index has continuously fallen from 1981 to 2001 in Uttar Pradesh. However, there was a positive improvement in terms of the said index in 2011. Another case was Madhya Pradesh where improvement index was negative in period I (1991 over 1981), which indicates that education achievement index in 1991 was less than 1981; nevertheless, it improved in period II (2001 over 1991) and it ranked 2nd, but again shifted to rank 16th in period III (2011 over 2001). On the other hand, interestingly, Assam was in the almost top position in terms of this improvement index for period I and period II (4th in period I and 3rd in period II) but shifted to rank 19th in period III (2011 over 2001). In recent period, Punjab,

Table 5. Health Improvement Index

States	Improvement in Index				Rankings			
	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981
	I	II	III	IV	I	II	III	IV
Andhra Pradesh	0.056	0.022	0.2	0.28	11	16	2	2
Arunachal Pradesh	0.054	0.034	0.03	0.12	12	12	18	20
Assam	0.015	0.047	0.1	0.16	21	8	8	12
Bihar	0.014	0.078	0.1	0.19	22	2	9	8
Delhi	0.053	0.042	0.106	0.2	13	9	6	4
Goa	0.092	0.009	0.1	0.2	5	22	10	5
Gujarat	0.12	-0.033	0.112	0.2	2	26	5	7
Haryana	0.092	0.073	0.0	0.17	6	3	25	10
Himachal Pradesh	0.069	0.011	0.2	0.28	8	20	3	1
Jammu & Kashmir	-0.005	0.022	0.2	0.22	25	17	1	3
Karnataka	0.004	0.005	0.17	0.18	23	24	4	9
Kerala	0.074	0.025	0.1	0.2	7	15	7	6
Madhya Pradesh	0.061	0.041	0.04	0.14	10	10	17	15
Maharashtra	0.038	0.012	0.05	0.1	17	19	14	22
Manipur	-0.008	0.03	0.02	0.04	26	14	21	26
Meghalaya	0.004	0.064	0.05	0.12	24	4	15	21
Mizoram	0.048	0.032	0.01	0.09	14	13	22	24
Nagaland	0.039	0.079	0.01	0.13	15	1	23	16
Orissa	0.036	0.058	0.06	0.15	18	5	11	14
Punjab	0.094	0.005	0.022	0.12	4	25	19	18
Rajasthan	0.069	0.015	0.044	0.13	9	18	16	17
Sikkim	0.018	0.057	0.01	0.09	20	6	24	25
Tamil Nadu	0.125	0.01	0.02	0.16	1	21	20	13
Tripura	0.039	0.052	0.004	0.1	16	7	26	23
Uttar Pradesh	0.108	0.008	0.05	0.17	3	23	12	11
West Bengal	0.031	0.038	0.05	0.12	19	11	13	19
All India	0.052	0.032	0.074	0.16				

Source: Author's calculations.

Gujarat and Andhra Pradesh are the topmost states in terms of education improvement index.

Table 7 presents the standard of living improvement index of Indian states for the periods I, II, III and IV. Tripura and Uttar Pradesh were in the topmost position

Table 6. Education Improvement Index

States	Improvement in Index				Rankings			
	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981
	I	II	III	IV	I	II	III	IV
Andhra Pradesh	0.019	0.061	0.2	0.28	9	7	5	3
Arunachal Pradesh	0.01	0.045	0.1	0.16	18	12	14	17
Assam	0.037	0.071	0.04	0.15	4	3	19	18
Bihar	0.006	0.019	0.23	0.26	24	22	3	8
Delhi	0.01	0.024	0.2	0.23	18	21	9	11
Goa	0.014	0.063	0.2	0.28	13	6	10	4
Gujarat	0.011	0.028	0.3	0.34	17	19	1	1
Haryana	0.013	0.061	0.166	0.24	14	7	11	10
Himachal Pradesh	0.02	0.05	0.2	0.27	8	10	6	6
Jammu & Kashmir	0.027	0.042	0.2	0.27	7	13	7	7
Karnataka	0.03	0.069	0.1	0.2	6	4	15	13
Kerala	0.018	0.025	0.234	0.28	11	20	2	5
Madhya Pradesh	-0.005	0.072	0.1	0.17	25	2	16	14
Maharashtra	0.013	0.034	0.2	0.25	14	15	8	9
Manipur	0.012	0.03	0.1	0.14	16	18	17	19
Meghalaya	0.043	0.067	0.03	0.14	3	5	22	20
Mizoram	0.031	0.031	0.01	0.07	5	16	25	23
Nagaland	0.062	0.031	0.04	0.13	2	16	20	21
Orissa	0.009	0.04	0.03	0.08	22	14	23	22
Punjab	0.015	0.048	0.22	0.28	12	11	4	2
Rajasthan	0.009	0.081	0.12	0.21	22	1	13	12
Sikkim	0.01	0.055	0.005	0.07	18	9	26	24
Tamil Nadu	0.109	0.017	0.033	0.16	1	23	21	15
Tripura	0.019	0.007	0.02	0.05	9	25	24	25
Uttar Pradesh	-0.018	-0.009	0.042	0.02	26	26	18	26
West Bengal	0.01	0.015	0.131	0.16	18	24	12	16
All India	0.021	0.041	0.122	0.19				

Source: Author's calculations.

in period II (2001 over 1991); however, improvement was very less in the recent period. From the table, it can be said that improvement in standard of living has taken place in Gujarat, Delhi, Goa, Orissa and West Bengal more in period III (2011 over 2001) compared to other periods.

Table 7. Standard of Living Improvement Index

States	Improvement in Index				Rankings			
	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981
	I	II	III	IV	I	II	III	IV
Andhra Pradesh	0.094	0.098	0.02	0.212	5	3	18	6
Arunachal Pradesh	0.091	0.023	0.02	0.134	8	18	20	20
Assam	0.062	0.039	0.04	0.141	18	14	6	17
Bihar	0.022	0.01	0.018	0.05	25	24	22	26
Delhi	0.013	0.014	0.1	0.127	26	23	2	21
Goa	0.093	0.075	0.1	0.268	6	8	3	2
Gujarat	0.083	0.022	0.111	0.216	12	19	1	5
Haryana	0.092	0.079	0.02	0.191	7	7	19	10
Himachal Pradesh	0.083	0.059	0.039	0.181	12	10	8	11
Jammu & Kashmir	0.096	0.015	0.03	0.141	3	22	13	18
Karnataka	0.157	0.061	0.04	0.258	2	9	7	3
Kerala	0.075	0.096	0.024	0.195	16	4	17	9
Madhya Pradesh	0.078	0.031	0.016	0.125	15	16	23	22
Maharashtra	0.053	0.052	0.038	0.143	20	11	10	16
Manipur	0.037	0.047	0.027	0.111	24	13	14	23
Meghalaya	0.086	0.003	0.009	0.098	10	26	25	24
Mizoram	0.095	0.027	0.027	0.149	4	17	15	15
Nagaland	0.089	0.049	0.039	0.177	9	12	9	13
Orissa	0.056	0.02	0.08	0.156	19	20	4	14
Punjab	0.051	0.005	0.038	0.094	21	25	11	25
Rajasthan	0.072	0.034	0.033	0.139	17	15	12	19
Sikkim	0.191	0.017	0.002	0.21	1	21	26	7
Tamil Nadu	0.08	0.081	0.019	0.18	14	6	21	12
Tripura	0.051	0.217	0.013	0.281	21	1	24	1
Uttar Pradesh	0.042	0.13	0.026	0.198	23	2	16	8
West Bengal	0.085	0.091	0.042	0.218	11	5	5	4
All India	0.078	0.052	0.04	0.17				

Source: Author's calculations.

Table 8 shows the human development improvement index, along with ranking of the states. The important conclusion from the table is that among the four states, namely Kerala, Delhi, Goa and Gujarat, which were the topmost states in terms of human development achievement index in 2011, only Goa and Gujarat were in the

Table 8. Human Development Improvement Index

States	Improvement in Index				Rankings			
	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981	1991/ 1981	2001/ 1991	2011/ 2001	2011/ 1981
	I	II	III	IV	I	II	III	IV
Andhra Pradesh	0.057	0.06	0.140	0.257	9	3	4	1
Arunachal Pradesh	0.051	0.034	0.050	0.135	13	20	18	20
Assam	0.038	0.052	0.060	0.150	20	5	15	16
Bihar	0.014	0.035	0.116	0.165	25	19	8	11
Delhi	0.026	0.026	0.136	0.188	24	23	5	9
Goa	0.066	0.049	0.134	0.249	4	6	6	3
Gujarat	0.071	0.006	0.174	0.251	3	26	1	2
Haryana	0.065	0.071	0.062	0.198	5	2	14	8
Himachal Pradesh	0.057	0.04	0.146	0.243	9	15	2	4
Jammu & Kashmir	0.039	0.026	0.144	0.209	19	23	3	7
Karnataka	0.064	0.045	0.103	0.212	6	10	9	6
Kerala	0.056	0.049	0.119	0.224	11	6	7	5
Madhya Pradesh	0.045	0.048	0.052	0.145	15	8	17	18
Maharashtra	0.035	0.032	0.096	0.163	22	21	10	14
Manipur	0.014	0.036	0.049	0.099	25	17	19	26
Meghalaya	0.044	0.045	0.030	0.119	16	10	21	24
Mizoram	0.058	0.030	0.015	0.103	8	22	24	25
Nagaland	0.064	0.053	0.029	0.146	6	4	22	17
Orissa	0.033	0.040	0.056	0.129	23	15	16	21
Punjab	0.054	0.019	0.093	0.166	12	25	11	10
Rajasthan	0.05	0.043	0.066	0.159	14	12	13	15
Sikkim	0.073	0.043	0.006	0.122	2	12	26	23
Tamil Nadu	0.105	0.036	0.024	0.165	1	17	23	12
Tripura	0.036	0.092	0.012	0.140	21	1	25	19
Uttar Pradesh	0.044	0.043	0.039	0.126	16	12	20	22
West Bengal	0.042	0.048	0.074	0.164	18	8	12	13
All India	0.05	0.042	0.079	0.171				

Source: Author's calculations.

topmost position when the improvement index is considered (2011 over 1981). More surprising fact is that over time, improvement in Delhi was negligible and it was almost in the bottom position in terms of the human development improvement index in period II. However, in period III, Delhi experienced increase in

improvement in terms of human development improvement index and achieved rank 5th. It is evident that Jammu & Kashmir, Gujarat, Himachal Pradesh and Andhra Pradesh were the states where, over time (2011 over 2001), improvement in HDI has taken place. This will be helpful for the states to reach a high level of development in the near future.

For a comprehensible depiction of the Indian states' position, the states are classified according to the improvement index in periods I, II and III for each and every dimension and for overall HDI. The states are classified on the basis of all-India improvement value: if the improvement index value is below the all-India average, then the states have low improvement; and if the improvement index value is above all-India average, then the states have high improvement in that particular index. These classifications are presented in Tables 9–16. It is quite remarkable that in periods I and II, though low improvements have taken place in Gujarat and Maharashtra in health and education, high improvement has taken place for standard of living. However, in period III, Gujarat experienced a high

Table 9. Classification of States in Terms of Health Improvement Index in Period I (1991/1981) and Period II (2001/1991)

	Low Improvement in Period II (2001/1991)	High Improvement in Period II (2001/1991)
Low Improvement in Period I (1991/1981)	Gujarat, Jammu & Kashmir, Karnataka, Maharashtra, Manipur	Assam, Bihar, Meghalya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, West Bengal
High Improvement in Period I (1991/1981)	Andhra Pradesh, Himachal Pradesh, Kerala, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh	Arunachal Pradesh, Delhi, Goa, Haryana

Source: Author's calculations.

Table 10. Classification of States in Terms of Education Improvement Index in Period I (1991/1981) and Period II (2001/1991)

	Low Improvement in Period II (2001/1991)	High Improvement in Period II (2001/1991)
Low Improvement in Period I (1991/1981)	Bihar, Delhi, Gujarat, Kerala, Maharashtra, Manipur, Orissa, Tripura, Uttar Pradesh, West Bengal	Andhra Pradesh, Arunachal Pradesh, Goa, Haryana, Himachal Pradesh, Madhya Pradesh, Punjab, Rajasthan, Sikkim
High Improvement in Period I (1991/1981)	Mizoram, Nagaland, Tamil Nadu	Assam, Jammu & Kashmir, Karnataka, Meghalaya

Source: Author's calculations.

Table 11. Classification of States in Terms of Standard of Living Improvement Index in Period I (1991/1981) and Period II (2001/1991)

	Low Improvement in Period II (2001/1991)	High Improvement in Period II (2001/1991)
Low Improvement in Period I (1991/1981)	Assam, Bihar, Delhi, Manipur, Orissa, Punjab, Rajasthan	Kerala, Tripura, Uttar Pradesh, West Bengal
High Improvement in Period I (1991/1981)	Andhra Pradesh, Arunachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Meghalaya, Mizoram, Nagaland, Sikkim	Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Tamil Nadu

Source: Author's calculations.

Table 12. Classification of States in Terms of Human Development Improvement Index in Period I (1991/1981) and Period II (2001/1991)

	Low Improvement in Period II (2001/1991)	High Improvement in Period II (2001/1991)
Low Improvement in Period I (1991/1981)	Bihar, Delhi, Jammu & Kashmir, Maharashtra, Manipur, Orissa	Assam, Madhya Pradesh, Meghalaya, Uttar Pradesh, West Bengal
High Improvement in Period I (1991/1981)	Arunachal Pradesh, Gujarat, Himachal Pradesh, Mizoram, Punjab, Tamil Nadu	Andhra Pradesh, Goa, Haryana, Karnataka, Kerala, Nagaland, Rajasthan, Sikkim

Source: Author's calculations.

Table 13. Classification of States in Terms of Health Improvement Index in Period II (2001/1991) and Period III (2011/2001)

	Low Improvement in Period III (2011/2001)	High Improvement in Period III (2011/2001)
Low Improvement in Period II (2001/1991)	Maharashtra, Manipur, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Mizoram	Andhra Pradesh, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala
High Improvement in Period II (2001/1991)	Arunachal Pradesh, Madhya Pradesh, Meghalaya, Haryana, Nagaland, Orissa, Sikkim, Tripura, West Bengal	Assam, Bihar, Delhi

Source: Author's calculations.

improvement in all the three dimensions and Maharashtra experienced a high improvement in education sector only.

However, in Delhi, improvement in health sector is high in all the time periods, but in case of education and standard of living, low improvement is observed in

Table 14. Classification of States in Terms of Education Improvement Index in Period II (2001/1991) and Period III (2011/2001)

	Low Improvement in Period III (2011/2001)	High Improvement in Period III (2011/2001)
Low Improvement in Period II (2001/1991)	Manipur, Mizoram, Nagaland, Orissa, Tripura, Uttar Pradesh, Tamil Nadu	Bihar, Delhi, Gujarat, Kerala, West Bengal, Maharashtra
High Improvement in Period II (2001/1991)	Arunachal Pradesh, Karnataka, Madhya Pradesh, Assam, Meghalaya, Rajasthan, Sikkim	Andhra Pradesh, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Goa

Source: Author's calculations.

Table 15. Classification of States in Terms of Standard of Living Improvement Index in Period II (2001/1991) and Period III (2011/2001)

	Low Improvement in Period III (2011/2001)	High Improvement in Period III (2011/2001)
Low Improvement in Period II (2001/1991)	Arunachal Pradesh, Assam, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Rajasthan, Sikkim	Delhi, Gujarat, Orissa
High Improvement in Period II (2001/1991)	Andhra Pradesh, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Tamil Nadu, Tripura, Uttar Pradesh	Goa, Karnataka, West Bengal

Source: Author's calculations.

Table 16. Classification of States in Terms of Human Development Improvement Index in Period II (2001/1991) and Period III (2011/2001)

	Low Improvement in Period III (2011/2001)	High Improvement in Period III (2011/2001)
Low Improvement in Period II (2001/1991)	Arunachal Pradesh, Manipur, Mizoram, Tamil Nadu, Orissa	Bihar, Delhi, Gujarat, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Punjab
High Improvement in Period II (2001/1991)	Assam, Haryana, Madhya Pradesh, Meghalaya, Nagaland, Rajasthan, Sikkim, Tripura, Uttar Pradesh, West Bengal	Andhra Pradesh, Goa, Karnataka, Kerala

Source: Author's calculations.

periods I and II. Kerala is in different position for the said three improvement indices. In Kerala, improvement in period I in health sector is much better than period II; in education sector, improvement is low in both periods I and period II; and in standard of living, improvement in period II is better than period I and period III. However, in period III, health and education sector improvement is high in Kerala compared to period II.

Except Assam, in all other north-eastern states, health improvement is low in period III. Assam, Bihar and Delhi have high improvement in health index in both period II and period III. Andhra Pradesh, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka and Kerala have high improvement in health index in period III but low improvement in period II.

Both Orissa and West Bengal have improved much better in period II compared to period I and period III in health sector, albeit less in both periods I and II in terms of education improvement index. However, West Bengal has improvement in education index in period III. In terms of standard of living improvement index, Orissa is still in low improvement group in periods I and II but is in high improvement group in period III. West Bengal improved much better in period II and period III as compared to period I. An important finding is that Assam, Madhya Pradesh, Meghalaya, Uttar Pradesh and West Bengal are the states where more improvement in overall HDI has taken place in period II as compared to period I. On the other hand, Andhra Pradesh, Goa, Karnataka, Kerala, Nagaland, Rajasthan and Sikkim are the states where improvement in overall HDI has taken place in period I and period II. Among these states, Andhra Pradesh, Goa, Karnataka and Kerala continued to have high human development improvement index in period III too.

For example, relatively high income, literacy and good health care infrastructure has helped Goa to achieve high improvement value in both the periods. In case of Kerala, better education facility has enhanced the job opportunity of the labour force, thereby reducing poverty. The increase in job opportunity has not only created increased demand for goods but also enhanced the human development by increasing demand for education, health, housing and other related goods and services.

In Bihar, Delhi, Jammu & Kashmir, Manipur, Maharashtra and Orissa, improvement in overall HDI is lower in period I and period II. However, among these states, Bihar, Delhi, Jammu & Kashmir and Maharashtra increase the improvement in HDI in period III.

It must be kept in mind that there is non-linearity in the improvement of various dimensions as well as the overall human development. As a corollary, Delhi and Kerala seems to have shown lower improvement values, whereas states like Andhra Pradesh, Bihar, Assam, Haryana, Madhya Pradesh, Tripura, etc., have shown higher improvement values because the latter states were low achievers previously. For example, in Haryana, Madhya Pradesh and Bihar, state government policies help to develop the social infrastructure to support overall human development. State governments proposed to provide modern

facilities to educational and research institutes to come up in the state. Modern health care institutes were also set up in Haryana which enhanced the human development in recent years. The recent initiatives to empower women and girl child in Madhya Pradesh have been appreciated across the country. The state has done very well in terms of infrastructural development and other social sector development. Haryana, Madhya Pradesh and Bihar have a potential for high human development in the future. However, there is a need for proper utilization of the scarce resources in the right places at the right time. Conversely, the most sticking result is the low improvement of the low-achieving states (Arunachal Pradesh, Orissa, Uttar Pradesh, etc.). These states are in a most critical situation and the government should take proper initiatives to improve the level of human development and poverty reduction in these states.

Conclusion

The study has calculated health, education and standard of living achievement indices and then, by taking average, constructed the human development achievement index for the period 1981, 1991, 2001 and 2011. To see how achievement level progressed or deteriorated over time, the study also utilized the improvement index of health, education, standard of living and human development indices for different time points. As expected, the achievement index value is low where the initial rates are low. The analysis points out how Indian states have extensively changed, over time, their position in terms of various achievements and improvement index values. There is wide difference in the ranking of the states in terms of achievement and improvement indices. It is clear that states with lower ranking in terms of achievement index have achieved the topmost position with respect to improvement index and vice versa indicating some convergence. There is non-linearity in the improvement of various dimensions as well as the overall human development. The impressive levels of achievements of Delhi and Kerala in health, education and standard of living will not come as a surprise to anyone. However, in both the states, improvement over time is low. This supports the fact that these states have already reached higher level of achievement. On the other hand, states like Andhra Pradesh, Assam, Haryana, Madhya Pradesh, Tripura, etc., have shown higher improvement values because these states were low achievers previously. The most striking result is the low improvement of certain low-achieving states (Arunachal Pradesh, Orissa, Uttar Pradesh, etc.). This means that these states are not making the effort to improve human development, even though they have lower achievement level. This is a cause of serious concern and it must be addressed through increasing input allocation and efficient utilization of such inputs. The public sector could also be more strengthened in such states.

Appendix I

Note on Methodology

IMRAI (Infant mortality rate achievement index) = $1 - ((X - 10)/(230 - 10)^{0.5})$

LERAI (Life expectancy rate achievement index) = $1 - ((85 - X)/(85 - 25)^{0.5})$

SBRAI (Stillbirth rate achievement index) = $1 - ((X - 3)/(53.1 - 3)^{0.5})$

TFRAI (Total fertility rate achievement index) = $1 - ((X - 1.3)/(10 - 1.3)^{0.5})$

YLIRAI (Youth literacy rate achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

ALIRAI (Adult literacy rate achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

SERPAI (School enrolment in primary achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

SERSAI (School enrolment in secondary achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

SERHAI (School enrolment in higher secondary achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

TAI (Toilet facility achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

DWAI (Drinking water facility achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

ECAI (Electricity consumption achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

PHAI (*Pucca* house achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

SPHAI (Semi-*pucca* house achievement index) = $1 - ((100 - X)/(100 - 0)^{0.5})$

KHAI (*Kutcha* house achievement index) = $1 - ((X - 0)/(100 - 0)^{0.5})$

State Code	State	State Code	State
AP	Andhra Pradesh	MN	Manipur
AR	Arunachal Pradesh	ME	Meghalaya
AS	Assam	MI	Mizoram
BI	Bihar	NA	Nagaland
DE	Delhi	OR	Orissa
GO	Goa	PU	Punjab
GU	Gujarat	RA	Rajasthan
HA	Haryana	SK	Sikkim
HP	Himachal Pradesh	TN	Tamil Nadu
JK	Jammu & Kashmir	TR	Tripura
KA	Karnataka	UP	Uttar Pradesh
KE	Kerala	WB	West Bengal
MP	Madhya Pradesh	AI	All-India
MA	Maharashtra		

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Notes

1. One of the limitations of the GDP per capita ranking measure is that it is a one-dimensional measure and does not capture the basic human needs.
2. If x represents an indicator where lower value is expected for the society, then it is socially optimal to reduce the level of x . In that case, the role of M and m need to be interchanged.
3. Kakwani chooses the form of $g(x) = \text{Ln}(x)$, and claims that the corresponding improvement index lies between 0 and 1. This claim is based on the intriguing assertion that 'it is customary to define $\text{Ln}(x)$ approaching zero as x approaches zero'.
4. This is not the case with the HDR procedure, where the top performer has zero deprivation.
5. Due to space constraints, we had to ignore placing the components scores for each index. Interested readers may contact author directly.

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