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POPULATION PROJECTIONS

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8

Population projections

It is of interest to examine the variation of the Provisional Population Totals of Census 2011 with the figures projected by the Expert Committee/Technical Group on Population Projections set up by Government of India. This would give data users the confidence level with which the figures can be used.

Projection is an attempt to scientifically predict the future using the data available at present. The projections depend on the accuracy of input data and on the assumptions made in respect of the future trends of various components.

A Technical Group under the Chairmanship of Registrar General, India was constituted by the National Commission on Population (NCP) to work out population projections for India, States and Union Territories up to the year 2026. For projecting the population, the Expert Committee has used two types of methodologies. These are the Component Method and the Mathematical Method.

The Component method was applied for States having population of 1 crore or more during 2001 Census. The exceptions to this were Himachal Pradesh and Uttarakhand. Thus, in the case of 21 States, the component method was used. In 7 States/UTs, the Mathematical Model was used. For the remaining States which comprises the 7 North Eastern States (excluding Assam), a hybrid method was used wherein the projection was made for the 7 States in a combined manner using the component method and then the projected values were assigned to individual States using the Mathematical model. The two methodologies of projection are briefly discussed in the following paragraphs.

Component Method: The size of the population can change as a result of the combined effects of the population process-fertility, mortality and migration. These are the basic factors or components of population change in any given area. Procedures which take the components of population change into account individually are known as component method for projecting the population. In such procedures, three inputs are required. These are (i) a base population, (ii) separate assumptions of birth, death and migration during the period covered by the projection and (iii) a tool by which the assumptions are applied to the base population to get the projected population.

Mathematical Method: Unlike the component method, mathematical method simply base the projections of population size on past growth performance. Such methods are usually less reliable than component method. It is generally used in situations when only limited data on population size is available for the past periods.

The assumptions made by the Technical Group to project the population of India, States and Union Territories up to 2026 by component method are briefly indicated here after.

(i) **Fertility:** Total Fertility Rate (TFR) was considered as the overall indicator of fertility. The Sample Registration System (SRS) data, being available as a time series, was used as base level estimates for India and all the major States. The Technical Group has used the Gompertz model for projecting the future levels of TFR in the major States as well as for the country as a whole. For fitting Gompertz model, three types of upper asymptotes were taken for the States depending upon whether the particular State is a high, medium or low TFR State. The upper asymptote was taken as 6 for Southern States and 7 for the Northern States. For Western and Eastern States, upper asymptote was taken as 6.5. The lowest threshold of TFR was assumed to be 1.8. The TFR obtained through the Gompertz model specifies that the replacement level of fertility, that is, TFR of 2.1 for the country is likely to be achieved by 2021 taking into consideration the weighted TFRs of States. The projected levels of TFRs assumed for India for the initial period 2001-2005 and the terminal period 2021-2025 were 2.9 and 2.0 respectively.

(ii) **Sex Ratio at Birth:** The Sex Ratios at Birth (SRB) for the years 1998-2000 published in the Report of the Sample Registration System (SRS) 2000 for the country and major States were considered for the present projection exercise. These SRBs were assumed to remain constant during future years.

(iii) **Mortality:** Starting with the average SRS based Age Specific Death Rates (ASDR) for 1999-2001, which was taken as the base year, separate life tables for males and females for each major State have been constructed. The expectation of life at birth for males and females at the base year has been estimated to be 61.8 years and 64.1 years respectively. It has been assumed that increase in the life expectancy becomes relatively slower as it reaches higher levels. With the help of base years expectation of life at birth for males and females, the expectation of life at birth for each of the five year groups from 2001-2005 to 2021-2025 by sex were projected by interpolation. To decide whether high, medium or low improvement should be assumed for each State, the expectation of life at birth for the periods 1990-94 and 1995-99 obtained from SRS life table were examined for India and States and patterns obtained through these values were assumed to continue in future for India and the States.

(iv) **Migration:** Based on the migration data of 2001 Census, inter-State net migrants during decade 1991-2001 was assumed to remain constant throughout the projection periods for all major States including Himachal Pradesh. The component of international migration was assumed to be negligible, so it was not considered for projection exercise.

(v) **Impact of HIV/AIDS on the projected population:** The likely impact of AIDS on death rate was also considered by the Group. It was opined that in the absence of any reliable data on AIDS, making projections for the future was difficult taking into consideration its impact. In the absence of any dependable information pertaining to the effect of AIDS on life expectancy, the Group felt that only at the All-India level, the estimated number of persons affected due to AIDS might be worked out and State level figures need not be presented.

The following Statement provides the fertility and mortality assumptions used for projections and the projected population of India for the period 2001-2025.

Statement 36

Projected values of expectation of life at birth, Total Fertility Rate and corresponding population projections for different periods

Sl. No	Indices	Period				
		2001-05	2006-10	2011-15	2016-20	2021-25
1	2	3	4	5	6	7
1	Projected values of Expectation of life at birth					
	Males	63.8	65.8	67.3	68.8	69.8
	Females	66.1	68.1	69.6	71.1	72.3
2	TFR	2.9	2.6	2.3	2.2	2.0
3	Projected Population	1112.2	1192.5	1269.0	1339.7	1399.8
		(2006)	(2011)	(2016)	(2021)	(2026)

Notes

- Population Projected for particular year is shown in millions
- Figures in the parentheses indicate the end year for which the corresponding projections have been made.
- Source: Population Projections for India and States : 2001-2026. National Commission on Population, May 2006

To examine the accuracy of Population Projections made by the Expert Committee/Technical Group during last five decades, the absolute and percentage variations of these projected figures from the respective final/provisional totals at the National level have been presented in Statement 37. This gives an opportunity to the users like city planners, economists, public agencies, environmentalists, and social scientists to know the confidence with which the projected figures can be used for various purposes.

Statement 37

Projected and Actual/Provisional Population of India, 1971 - 2011 (in '000)

Year	Projected Population	Actual/Provisional Population	Difference ⁽¹⁾	Percent difference ⁽²⁾
1	2	3	4	5
1971	559,622 ⁽³⁾	5,48,160	-11,462	-2.05
1981	672,014 ⁽⁴⁾	683,329 ⁽⁹⁾	11,315	1.68
1991	837,249 ⁽⁵⁾	846,421 ⁽¹⁰⁾	9,172	1.09
1991	843,596 ⁽⁶⁾	846,421 ⁽¹⁰⁾	2,825	0.33
2001	1,012,386 ⁽⁷⁾	1,028,737 ⁽¹¹⁾	16,351	1.62
2011	1,192,507 ⁽⁸⁾	1,210,193 (P) ⁽¹²⁾	17,686	1.48

Notes

P: Provisional

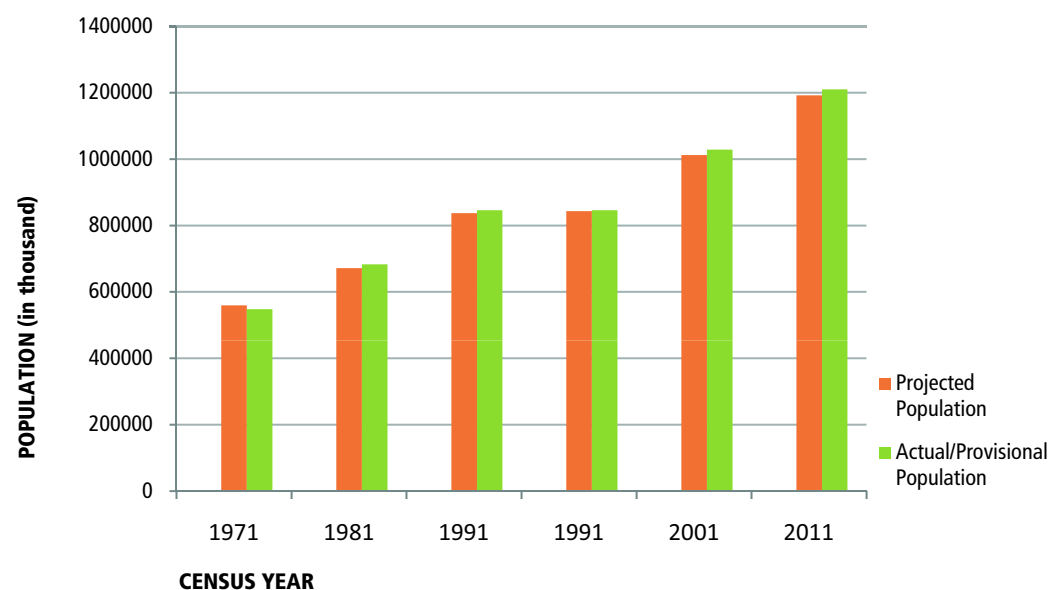
- [Column(3) - Column(2)]
- [Column(3) - Column(2)] * 100 / Column(2)
- See note, at the end of the Chapter
- Please see notes behind figures at a glance

Except in 1971, the projected populations have been lower than the respective actual populations in all the Census years with variations being less than 2 percent. For the 2011 Census, it is 1.5 percent.

It is observed from the Statement that except in 1971, the projected populations have been lower than the respective actual populations in all the Census years with variations being less than 2 percent. For the 2011 Census, it is 1.5 percent. Figure 31 shows the projected and corresponding actual/provisional population totals at the country level during last five decades.

Figure 31

Projected and actual/provisional population totals: 1971-2011



For 10 major States, provisional population total is within 2 percent of projected population

An analysis of the Provisional Population Totals of Census 2011 at the State level, as compared to the projections made by the Expert Committee as shown in Statement 38 reveals that in 10 States the figures are within 2 percent of projected population. These States are as follows:

Statement 38

Projected and Provisional Population of States as on 1st March, 2011 with percent difference within (+/-) 2 percent (in'000)

Year	State	Projected population ¹	Provisional population	Difference ²	Percent difference ³
1	2	3	4	5	6
1	Uttar Pradesh	2,00,764	1,99,581	-1183	-0.59
2	Haryana	25,439	25,353	-86	-0.34
3	Maharashtra	1,12,660	1,12,373	-287	-0.25
4	Andhra Pradesh	84,735	84,666	-69	-0.08
5	Punjab	27,678	27,704	26	0.09
6	Madhya Pradesh	72,200	72,598	398	0.55
7	Himachal Pradesh	6,793	6,857	64	0.94
8	Rajasthan	67,830	68,621	791	1.17
9	Uttarakhand	9,943	10,117	174	1.75
10	Assam	30,568	31,169	601	1.97

Notes

- See note 8 at the end of the Chapter
- Provisional population - Projected population
- (Provisional population - Projected population) X 100/ Projected population

For the following 11 States and Union Territories (Statement 39), the variations are outside the range of (+/-) 2 percent:

Statement 39

Projected and Provisional Population of States and Union Territories as on 1st March, 2011 with percent difference outside (+/-) 2 percent (in '000)

Sl. No.	State/ Union Territory [#]	Projected population ¹	Provisional population	Difference ²	Percent difference ³
1	2	3	4	5	6
1	NCT of Delhi [#]	18,451	16,753	-1,698	-9.20
2	Kerala	34,563	33,388	-1,175	-3.40
3	West Bengal	89,499	91,348	1,849	2.07
4	Gujarat	59,020	60,384	1,364	2.31
5	Karnataka	59,419	61,131	1,712	2.88
6	Orissa	40,750	41,947	1,197	2.94
7	Jharkhand	31,472	32,966	1,494	4.75
8	Chhattisgarh	24,258	25,540	1,282	5.28
9	Bihar	97,720	1,03,805	6,085	6.23
10	Tamil Nadu	67,444	72,139	4,695	6.96
11	Jammu & Kashmir	11,718	12,549	831	7.09

Notes

1. See note 8 at the end of the chapter
2. Provisional population - Projected population
3. (Provisional population - Projected population) X 100/ Projected population

The variation ranges from -9.20 percent in the NCT of Delhi to 7.09 percent in the case of Jammu & Kashmir. Reasons for the variation will be revealed only when further details on migration and fertility are available.

PROJECTIONS FOR 7 COMBINED NORTH-EASTERN STATES (EXCLUDING ASSAM)

For the first time, an attempt was made by the Technical Group for working out the population projections of the combined north-eastern states excluding Assam by component method for different quinquennial periods upto 2026 and then distributing the projected populations among the respective states by ratio method, the ratio being the population of individual 7 States to the total of these States as per 2001 Census. Based on this methodology the following Statement 40 shows the variation of the provisional population with the respective projected population of the 7 North-Eastern States.



Statement 40

Projected and Provisional Population of North-Eastern States (excluding Assam) as on March 1, 2011 (in '000)

Sl. No.	State	Projected population ¹	Provisional population	Difference ²	Percent difference ³
1	2	3	4	5	6
1	Nagaland	2,249	1,981	-268	-11.92
2	Sikkim	612	608	-4	-0.65
3	Tripura	3,616	3,671	55	1.52
4	Mizoram	1,004	1,091	87	8.67
5	Manipur ⁴	2,449	2,722	273	11.15
6	Arunachal Pradesh	1,241	1,383	142	11.44
7	Meghalaya	2,621	2,964	343	13.09

Notes

- See note 8 at the end of the chapter
- Provisional population - Projected population
- $(\text{Provisional population} - \text{Projected population}) \times 100 / \text{Projected population}$
- Please see notes behind figures at a glance

It is observed that except for Sikkim and Nagaland, in the remaining 5 States, the provisional population exceeds the respective projected population in the range of 55 thousand to 343 thousand.

In the following States and Union Territories, as figures for TFR and Life expectancy are not available from SRS on account of their small size, Mathematical Method (Urban-Rural Growth Difference method URGD) was used to make projections. Statement 41 is presented below.

It has been observed that in all the States/UTs, provisional population is short

Statement 41

Projected and Provisional Population of Goa and Union Territories (excluding NCT of Delhi) as on March 1, 2011 in which URGD method has been used (in '000)

Sl. No.	State /Union Territory [#]	Projected population ¹	Provisional population	Difference ²	Percent difference ³
1	2	3	4		5
1	Chandigarh [#]	1,438	1,055	-383	-26.63
2	Andaman & Nicobar Islands [#]	494	380	-114	-23.08
3	Goa	1,767	1,458	-309	-17.49
4	Lakshadweep [#]	76	64	-12	-15.79
5	Puducherry [#]	1,391	1,244	-147	-10.57
6	Daman & Diu [#]	270	243	-27	-10.00
7	Dadra & Nagar Haveli [#]	354	343	-11	-3.11

Notes

- See note 8 at the end of the chapter
- Provisional population - Projected population
- $(\text{Provisional population} - \text{Projected population}) \times 100 / \text{Projected population}$

of respective projected population ranging from 27 percent to 3 percent. The technique of using URGD method for making population projection of small States and Union Territories (UTs) has the limitation that it does not take into consideration the different components of population change, namely, fertility, mortality and migration separately. In that way, the method is considered to be robust. Only based on the assumption of constant growth rate of population of earlier decades, the population of the future years is projected for small States and UTs. As mentioned earlier, the main reason for using this method is that the data on TFR and expectation of life at birth is not available in time series from any source.

Preliminary analysis suggests that there is no single reason for this variation. Each State/Union Territory has particular reasons for the variation. Only a detailed analysis would reveal the reasons. This will be taken up at the appropriate time. Comparable figures showing projected population with actual population at the national, State and Union Territory level in earlier censuses from 1971 to 2001 are presented in Tables 5 to 9.

CHILD POPULATION IN AGE GROUP 0 - 6 YEARS : CENSUS VIS-À-VIS PROJECTIONS

1. It would be interesting to study the difference in the child population in the age group 0-6 as obtained from Census 2011 with that estimated by the Population Projections (2006) for major States. Statement 42 is presented below.

Statement 42

Difference in Population and child population in the age group 0-6 years between projected and census in selected major States: 2011 (in '000)

State/ Union Territory [#]	Child Population in the age group 0-6 years		Difference (col. 3-2)	Population		Difference (col. 6-col.5)
	Projected ¹	Census ²		Projected ¹	Census ²	
1	2	3	4	5	6	7
INDIA	1,60,128	1,58,789	-1,339	11,92,506	12,10,193	17,687
Andhra Pradesh	9,554	8,643	-911	84,735	84,666	-69
Assam	4,166	4,511	345	30,568	31,169	601
Bihar	14,775	18,582	3,807	97,720	1,03,805	6,085
Chhattisgarh	3,524	3,584	60	24,258	25,540	1,282
Gujarat	7,307	7,494	187	59,020	60,384	1,364
Haryana	3,330	3,298	-32	25,439	25,353	-86
Himachal Pradesh	761	764	3	6,793	6,857	64
Jammu & Kashmir	1,580	2,009	429	11,718	12,549	831
Jharkhand	4,345	5,238	893	31,472	32,966	1,494
Karnataka	6,836	6,856	20	59,419	61,131	1,712
Kerala	3,602	3,322	-280	34,563	33,388	-1,175
Madhya Pradesh	11,176	10,548	-628	72,200	72,598	398
Maharashtra	13,808	12,848	-960	1,12,660	1,12,373	-287
NCT of Delhi [#]	2,024	1,971	-53	18,451	16,753	-1,698
Orissa	4,837	5,036	199	40,750	41,947	1,197
Punjab	3,209	2,942	-267	27,678	27,704	26
Rajasthan	10,192	10,505	313	67,830	68,621	791
Tamil Nadu	6,997	6,895	-102	67,444	72,139	4,695
Uttar Pradesh	34,215	29,728	-4,487	2,00,764	1,99,581	-1,183
Uttarakhand	1,445	1,329	-116	9,943	10,117	174
West Bengal	9,721	10,113	392	89,499	91,348	1,849

Notes

1. See note 8 at the end of the Chapter
2. Please see notes behind figures at a glance

Statement 42 gives the difference in population in the age group 0-6 from the above two mentioned sources for some more populous States and India.

Uttar Pradesh and Uttarakhand have continued with the trend of adding far less children than projected.

Bihar and Jharkhand together have recorded nearly 4.7 million more children in the age group 0-6 years than projected for this age group.

2. Among the States, both Uttar Pradesh and Uttarakhand have continued with the trend of adding far less children than projected, with the number of children in the age group 0-6 years recorded in the Census lower than the projections by 4.5 million in Uttar Pradesh and 0.1 million for Uttarakhand. Some of other more populous States which have added lesser children compared to the projection are Maharashtra (less by 0.96 million), Andhra Pradesh (less by 0.91 million), Madhya Pradesh (less by 0.63 million), Kerala (less by 0.28 million), Punjab (less by 0.27 million) and Tamil Nadu (less by 0.1 million). However, Bihar and Jharkhand together have recorded nearly 4.7 million more children in the age group 0-6 years than projected for this age group. All the north-eastern States, including Assam, have added about 0.8 million more and Rajasthan, West Bengal, Orissa and Gujarat have each added a few hundred thousands more than the levels projected for these States.

Population Projections for India are made by several institutions, National and International, from time to time. Moreover, individual demographers also make projections for India and States/UTs. The assumptions made in respect of the future trends of various components vary from one another depending upon the different scientific perceptions about the happenings likely to take place in future. Based on different assumptions, the population projections made at the National level for 2011 have been considered from the recent available four sources, namely, National Commission on Population, O/o Registrar General & Census Commissioner, India, Population Division, U.N., US Census Bureau and Book titled 'Twenty First Century India' edited by Tim Dyson et al. It has been observed that these projections vary from 1189.2 million by US Census Bureau to 1230.8 million by the Population Division of U.N. Statement 43 presents the projections made for India by different sources. Table 10 presents the projections for India 2010/2011.



Statement 43

Projected Population of India in 2011 by individuals and organisations

Sl. No.	Year of Publication	Name of the individual/organisation	Population Projection for the year 2011 (in million)	Percentage variation from provisional population of 1210.2 million
1	2	3	4	5
1	2006	National Commission on Population, O/o Registrar General & Census Commissioner, India	1192.5	1.48
2	2004	Twenty First Century India edited by Tim Dyson et al, Oxford University Press	1204.5	0.46
3	2008	Department of Economic and Social Affairs, Population Division, United Nations	1230.8	-1.69
4	2010	US Census Bureau, International Data Base	1189.2	1.75

It is thus concluded that at the national level provisional population of Census of India – 2011 is observed to be close to the projected population made by the National Commission on Population of Government of India as well as other agencies and individual demographers mentioned above. The variations are in the range of (+/-) 2 percent. Since the projections are based on assumptions about the future course of events, birth, death and migration, these vary from author to author.

Notes

- 3 Report of the Expert Committee on Population Projections, General, India, July, 1968.
- 4 Report of the Expert Committee on Population Projections, General, India, October 1978.
- 5 Report of the Expert Committee on Population Projections, Registrar General, India, January 1988.
- 6 Report of the Standing Committee of Experts on Population Projections, Planning Commission, India, New Delhi, 1989
- 7 Report of the Technical Group on Population Projections for India and States, 1996-2016, Registrar General, India, New Delhi, 1996.
- 8 Report of the Technical Group on Population Projections for India and States 2001-2026, National Commission on Population (MHPW), New Delhi, 2006.
- 9 The 1981 Census could not be held owing to disturbed conditions prevailing in Assam. Hence the population figures for 1981 Assam have been worked out by 'interpolation'.
- 10 The 1991 Census could not be held owing to disturbed conditions prevailing in Jammu & Kashmir. Hence the population figures for 1991 of Jammu & Kashmir have been worked out by 'interpolation'.
- 11 Includes estimated population of Paomata, Mao Maram and Purul sub-divisions of Senapati District of Manipur for 2001.

