



POPULATION FORECASTING OF KURNOOL DISTRICT, ANDHRA PRADESH

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ABSTRACT Population forecasting is a method to predict the future population of an area. These are calculations of population size for a future point of time. Information on past and present population sizes are used to predict the future population size. Population projections and forecasting are considered as simple as an extrapolation of current population trends into the future. In the present study the population forecastings of Kurnool district have been measured using different methods such as Arithmetical mean method, Geometrical increase method, Decreasing rate of growth method and Incremental increase method.

KEYWORDS : Population, Forecasting, Past population, current population, Kurnool District.

INTRODUCTION:

The contents of Population Geography is very extensive that a population geographer needs a large variety of data selected to all the aspects of population at a given point of time. Census data which is considered as a primary data source, geographers and other scholars complacent and making use of this data for a wide range of studies. The other primary sources of the demographic data are surveys, Registrations, Migration reports, estimates, Forecastings and projections. Some statistics may be selectively rearranged or reproduced in secondary sources as compendia, statistical abstracts, year books etc. United Nations is the chief producer of secondary demographic data and that helps the scholars in their comparative studies at international scales. Some additional data is often sought through such secondary sources as journals, text books, research project reports, etc. (Chandna, 2001).

Population geographers do make use of a variety of demographic data for different types of studies. Based on the past and present population data, future size of population can be made. For the prediction of future demographic changes, population forecasting is considered as one of the systematic procedures. These predictions help in sironing the warnings of population changes at global, national and regional levels. Population forecasting is a statistical method to predict the future population of an area. These are calculations of population size for a future point of time, which ultimately helps planners, policy makers, investors, bussiness people etc in order to formulate plans, policies, proposals for the developmental, welfare and other activities.

Study Area:

Kurnool District lies between 14° 54' to 16° 18' N latitudes and 76° 58' to 79° 34' E longitudes. The altitude of the district varies from 100 ft and above from mean sea level. The district is bounded by Tungabhadra and Krishna rivers as well as Mahaboobnagar district of Telangana state in the North, Anantapur district on the south, Bellary district of Karnataka state on the west and Nandyal district on south east and east. Administratively, the district is having 25 mandals (including Kurnool urban + rural). The major soils are red and black cotton soils. The normal annual rainfall is 614.7 mm. The principal rivers flowing in the district are Krishna, Tungabhadra, Handri and kunderu. The total geographical area of the district possess enormous deposits of limestone, suitable for cement manufacturing. According to 2011 census, the total population of the district accounts to 22,71,686 among which 50.23 percent are males and the remaining 49.74 percent are females.

Objectives:

The main objective of the study is to forecast the mandal wise population of Kurnool district for the year 2021, the year of regular census which was not taken up due to COVID-19.

Data Used:

To achieve the set of objective, secondary data related to population census for the years 1971, 1981, 1991, 2001 and 2011 has been collected for Kurnool district taking mandal as unit.

Methodology:

To forecast the population of 2021, four methods namely Arithmetical

mean method, Geometrical increase method, Decreasing rate of growth method and Incremental Increase method were applied to predict the population and discuseed further. Statistical techniques have been used to work out the above said methods and tables were prepared for the analysed data.

RESULTS & DISCUSSIONS:

For population forecasting of Kurnool district, four methods namely Arithmetical mean method, Geometrical increase method, Decreasing rate of growth method and Incremental Increase method were applied using different formulas and analysed the results.

Arithmetical Mean Method:

This method is mainly adopted to predict the future population of old and developed towns, where the rate of population growth is nearly constant. The formula of this method is as follows.

$$P_n = P_o + nx \quad , \text{ where}$$

P_n = predicted population after 'n' number of decades,
 P_o = last known population
 n = number of decades between P_o & P_n , and
 x = the rate of population growth

The results revealed that, the forecasted population for the year 2021 in the study area is accounted as 25,79,310. There was an increase of 3,05,735 persons compared to 2011 census in Kurnool district as per Arithmetical mean method. During the other five inter census periods the increase of population is as follows. From 1971 to 1981, there was an increase of 2,23,681 persons, between 1981 to 1991, it was 3,42,722 persons, between 1991 & 2001, it was reported as 3,32,197 persons, during 2001 & 2011, it was accounted as 3,31,897. More or less the increase of population between intercensus period is around 3 lakhs and so as in 2021 also. But between 1971 & 1981 the increase is only 2,23,681 persons. The population predictions for 2021 at mandal level are described in Table-1.

Geometrical Increase Method:

Geometrical increase method is normally applied for forecasting the population of young and developing towns, where the rate of growth of population is proportional to the present population. The formula adopted in this method is

$$P_n = P_o [1 + (r/100)]^n, \text{ where}$$

P_n = Predicted population after 'n' number of decades,
 P_o = last known population,
 n = number of decades between P_o & P_n ,
 r = growth rate

Table- 2 depicted that, the predicted population according to Geometrical increase method Kurnool district for the year 2021 was measured as 27,48,740 with an increase of 4,89,208 persons compared to the previous census period i.e., 2011. In the other original census periods, the increase is estimated as described here. About 2,23,681 persons during 1971 & 1981, 3,42,722 persons during 1981 & 1991,

3,32,197 persons during 1991 & 2001, and in the last intercensus period i.e., 2001 and 2011, the increase was estimated as 3,31,897 persons. Mandal level forecasting of population for the year 2021 have been furnished in Table- 2.

Decreasing Rate Of Growth Method:

Generally, this method applied for a town which is reaching a state of saturation point, where the rate of population growth is decreasing and here, the average decrease in growth rate (s) is considered. The following formula is used for this method.

$$P_n = P(n-1) + (r(n-1) - s) / 100 * P(n-1), \text{ where,}$$

P_n = population at required decade,
 P(n-1) = population at previous decade (either predicted or available),
 r(n-1) = growth rate of previous decade and
 s = average decrease in growth rate

The analysis revealed that, the population forecasting of Kurnool district for the year 2021 according to “Decreasing rate of growth method” is 26,94,219 with an increase of 4,32,350 persons compared to previous census period i.e., 2011. Mandal level predictions are also given in Table- 3. The increase of population between 1971 & 1981, 1981 & 1991, 1991 & 2001 and 2001 & 2011 is measured as 2,23,681 persons, 3,42,722 persons, 3,32,197 persons and 3,31,897 persons respectively.

Incremental Increase Method:

In the process of population forecasting, Incremental increase method is generally used for average sized towns under normal conditions, where the rate of population growth is not constant i.e., either increasing or decreasing. It is said that this method is a combination of the arithmetic increase method and geometrical increase method. The predicted values of population are also normally lies between the values of above two methods. The formula used in Incremental increase method is as follows.

$$P_n = (P_0 + n) + (n(n+1)) / 2 * \bar{y}, \text{ where}$$

Table-1: Population Forecasting in Kurnool District (Arithmetical Mean Method)

S. No	Mandal	Population in different census years					Average rate of increase of population between 1971 & 2011 (x)	Forecasted population for the year 2021
		1971	1981	1991	2001	2011		
1	C.Belgal	25,657	32,898	40,317	48,139	57,167	7878	65,045
2	Gudur	24,049	27,647	35,273	41,228	46,266	5554	51,820
3	Kallur	37,176	51,608	84,460	1,27,801	1,96,268	39773	2,36,041
4	Kurnool (Rural & urban	1,76,064	2,57,222	2,99,230	3,52,832	4,06,797	57683	4,64,480
5	Orvakal	33,995	38,329	44,411	50,199	58,437	6111	64,548
6	Kodumur	37,592	45,752	56,088	68,395	74,594	9251	83,845
7	Veldurthi	37,666	41,935	49,823	55,649	63,120	4683	67,803
8	Mantralayam	24,075	30,413	40,772	51,620	61,294	9305	70,599
9	Kosigi	30,597	36,705	46,945	58,316	69,275	9670	78,945
10	Kowthalam	38,169	46,392	56,400	67,808	78,149	9995	88,144
11	Pedda Kadubur	22,482	27,908	37,131	47,984	56,966	8621	65,587
12	Yemmiganur	62,933	91,383	1,16,963	1,42,119	1,69,344	26603	1,95,947
13	Nandavaram	27,962	33,519	42,436	51,767	61,215	8313	69,528
14	Gonegandla	32,698	40,368	51,866	63,584	73,873	10294	84,167
15	Adoni	1,30,842	1,59,906	2,05,208	2,43,247	2,69,286	34611	3,03,897
16	Holagunda	26,651	28,953	36,685	46,359	50,592	5985	56,577
17	Halaharvi	24,874	25,708	32,780	37,024	41,123	4062	45,185
18	Alur	35,335	32,497	44,806	49,066	55,834	5125	60,959
19	Aspari	36,432	35,407	47,232	55,115	65,088	7164	72,252
20	Devanakonda	34,081	36,202	48,897	61,923	71,237	9289	80,526
21	Krishnagiri	22,996	25,704	33,321	41,666	47,103	6027	53,130
22	Pattikonda	35,297	35,593	49,405	60,951	68,962	8416	77,378
23	Chippagiri	25,640	26,453	29,234	31,465	33,400	1790	35,190
24	Maddikera	25,161	24,102	32,078	33,601	36,834	2918	39,752
25	Tuggali	32,765	32,266	45,831	51,931	59,462	6674	66,136
	Total District	10,41,189	12,64,870	16,07,592	19,39,789	22,71,686	3,07,624	25,79,310

Table- 2: Population Forecasting in Kurnool District (Geometric Increase Method)

S. No	Mandal	Population in different census years					Growth rate = r	Forecasted population for the year 2021
		1971	1981	1991	2001	2011		
1	C.Belgal	25,657	32,898	40,317	48,139	57,167	22%	69,744
2	Gudur	24,049	27,647	35,273	41,228	46,266	17.1%	54,131
3	Kallur	37,176	51,608	84,460	1,27,801	1,96,268	51.05%	2,96,365

P_n = population predicted after 'n' number of decades,

P₀ = last known population,

n = number of decades between P₀ & P_n,

x = mean or average of increase in population and

\bar{y} = algebraic mean of incremental increase (an increase of increase) of population.

The analysis of Table- 4 reveals that, the forecasted population values in this method are lying between the values obtained in Arithmetical increase method and Geometrical increase method. It is measured that about 26,15,382 persons were forecasted during the year 2021 in Kurnool district. Where as in Arithmetical increase method it is 25,79,310 (Table- 1) and in Geometrical increase method the predicted value was 27,48,740 (Table- 2). Compared to previous census i.e., 2011, there was an increase of 3,38,078 persons in the predicted decade i.e., 2021. During the inter decadal or intercensus periods, the increase of population was 2,23,681 persons (1971&81), 3,42,722 persons (1981&91), 3,32,197 persons (1991 & 2001) and 3,31,897 persons in the last intercensus period (2001 & 2011). The forecasted population for all the mandals of Kurnool district according to Incremental increase method have been furnished in Table- 4.

CONCLUSIONS:

Apart from the variations at mandal level as described in Table- 1 to Table- 4, the obtained population forecastings for the entire Kurnool district according to all the said methods are concluded as follows. The calculated population forecastings for the district as per Arithmetic mean method is 25,79,310, in Incremental method, it is 26,15,382 and in Decreasing rate of growth method it is measured as 26,94,219. Maximum value of population forecastings for the year 2021 was noticed in Geometric increase method followed by Decreasing rate of growth method, Incremental increase method and the least in Arithmetic mean method. It is found that, all the four methods end up with different values. One can say that, it is not possible to get accurate values through any of these methods. But to an extent, certainly they provide information to the planners, administrators policy makers, academicians and bussiness professionals to formulate plans for effective developmental, Welfare, investments and other activities.

4	Kurnool (Rural & urban)	1,76,064	2,57,222	2,99,230	3,52,832	4,06,797	21.3%	4,92,224
5	Orvakal	33,995	38,329	44,411	50,199	58,437	14.41%	66,618
6	Kodumur	37,592	45,752	56,088	68,395	74,594	17.7%	87,275
7	Veldurthi	37,666	41,935	49,823	55,649	63,120	13.52%	71,957
8	Mantralayam	24,075	30,413	40,772	51,620	61,294	25.9%	77,230
9	Kosigi	30,597	36,705	46,945	58,316	69,275	22.44%	84,516
10	Kowthalam	38,169	46,392	56,400	67,808	78,149	19.5%	92,997
11	Pedda Kadubur	22,482	27,908	37,131	47,984	56,966	25.7%	71,777
12	Yemmiganur	62,933	91,383	1,16,963	1,42,119	1,69,344	26.9%	2,15,067
13	Nandavaram	27,962	33,519	42,436	51,767	61,215	21.5%	74,070
14	Gonegandla	32,698	40,368	51,866	63,584	73,873	22.23%	90,125
15	Adoni	1,30,842	1,59,906	2,05,208	2,43,247	2,69,286	18.8%	3,20,450
16	Holagunda	26,651	28,953	36,685	46,359	50,592	15.34%	58,181
17	Halaharvi	24,874	25,708	32,780	37,024	41,123	10.72%	45,647
18	Alur	35,335	32,497	44,806	49,066	55,834	14.13%	63,651
19	Aspari	36,432	35,407	47,232	55,115	65,088	13%	73,549
20	Devanakonda	34,081	36,202	48,897	61,923	71,237	17.2%	83,347
21	Krishnagiri	22,996	25,704	33,321	41,666	47,103	18.4%	55,582
22	Pattikonda	35,297	35,593	49,405	60,951	68,962	10%	75,169
23	Chippagiri	25,640	26,453	29,234	31,465	33,400	4.5%	35,070
24	Maddikera	25,161	24,102	32,078	33,601	36,834	8.93%	40,149
25	Tuggali	32,765	32,266	45,831	51,931	59,462	10.54%	66,003
	Total District	10,41,189	12,64,870	16,07,592	19,39,789	22,71,686	21.3%	27,48,740

Table- 3: Population Forecasting in Kurnool District (Decreasing Rate of Growth Method)

S. No	Mandal	Population in different census years					Growth rate at Previous decade (r)	Average decrease in growth rate (s)	Forecasted population for the year 2021
		1971	1981	1991	2001	2011			
1	C.Belgal	25,657	32,898	40,317	48,139	57,167	18.8	-3.14	69,709
2	Gudur	24,049	27,647	35,273	41,228	46,266	12.21	-0.93	52,345
3	Kallur	37,176	51,608	84,460	1,27,801	1,96,268	53.57	4.92	2,91,752
4	Kurnool (Rural & urban)	1,76,064	2,57,222	2,99,230	3,52,832	4,06,797	15.3	-10.24	5,10,693
5	Orvakal	33,995	38,329	44,411	50,199	58,437	16.41	1.22	67,314
6	Kodumur	37,592	45,752	56,088	68,395	74,594	9.1	-4.2	84,515
7	Veldurthi	37,666	41,935	49,823	55,649	63,120	13.42	0.7	71,149
8	Mantralayam	24,075	30,413	40,772	51,620	61,294	18.74	-2.53	74,331
9	Kosigi	30,597	36,705	46,945	58,316	69,275	18.8	-0.39	82,569
10	Kowthalam	38,169	46,392	56,400	67,808	78,149	15.3	-2.08	91,731
11	Pedda Kadubur	22,482	27,908	37,131	47,984	56,966	18.71	-1.94	68,729
12	Yemmiganur	62,933	91,383	1,16,963	1,42,119	1,69,344	19.16	-8.68	2,16,489
13	Nandavaram	27,962	33,519	42,436	51,767	61,215	18.25	-0.54	72,717
14	Gonegandla	32,698	40,368	51,866	63,584	73,873	16.18	-2.43	87,621
15	Adoni	1,30,842	1,59,906	2,05,208	2,43,247	2,69,286	10.70	-3.84	3,08,440
16	Holagunda	26,651	28,953	36,685	46,359	50,592	9.13	0.17	55,125
17	Halaharvi	24,874	25,708	32,780	37,024	41,123	11.07	2.57	44,619
18	Alur	35,335	32,497	44,806	49,066	55,834	13.79	1.9	62,462
19	Aspari	36,432	35,407	47,232	55,115	65,088	18.09	5.1	73,543
20	Devanakonda	34,081	36,202	48,897	61,923	71,237	15.04	2.94	79,857
21	Krishnagiri	22,996	25,704	33,321	41,666	47,103	13.05	0.43	53,047
22	Pattikonda	35,297	35,593	49,405	60,951	68,962	13.14	4.1	75,196
23	Chippagiri	25,640	26,453	29,234	31,465	33,400	6.15	1.77	34,863
24	Maddikera	25,161	24,102	32,078	33,601	36,834	9.62	1.81	39,711
25	Tuggali	32,765	32,266	45,831	51,931	59,462	14.5	4.33	65,509
	Total District	10,41,189	12,64,870	16,07,592	19,39,789	22,71,686	17.1	-1.5	26,94,219

Table- 4: Population Forecasting in Kurnool District (Incremental Increase Method)

S. No	Mandal	Population in different census years					x	y	Forecasted population for the year 2021
		1971	1981	1991	2001	2011			
1	C.Belgal	25,657	32,898	40,317	48,139	57,167	7878	596	65,641
2	Gudur	24,049	27,647	35,273	41,228	46,266	5554	480	52,300
3	Kallur	37,176	51,608	84,460	1,27,801	1,96,268	39773	18012	2,54,053
4	Kurnool (Rural & urban)	1,76,064	2,57,222	2,99,230	3,52,832	4,06,797	57683	-9064	4,51,698
5	Orvakal	33,995	38,329	44,411	50,199	58,437	6111	1301	65,849
6	Kodumur	37,592	45,752	56,088	68,395	74,594	9251	-654	83,191
7	Veldurthi	37,666	41,935	49,823	55,649	63,120	4683	1067	68,870
8	Mantralayam	24,075	30,413	40,772	51,620	61,294	9305	1112	71,711
9	Kosigi	30,597	36,705	46,945	58,316	69,275	9670	1617	80,562
10	Kowthalam	38,169	46,392	56,400	67,808	78,149	9995	706	88,850
11	Pedda Kadubur	22,482	27,908	37,131	47,984	56,966	8621	1185	66,772
12	Yemmiganur	62,933	91,383	1,16,963	1,42,119	1,69,344	26603	-408	1,95,539
13	Nandavaram	27,962	33,519	42,436	51,767	61,215	8313	1297	70,825
14	Gonegandla	32,698	40,368	51,866	63,584	73,873	10294	873	85,040
15	Adoni	1,30,842	1,59,906	2,05,208	2,43,247	2,69,286	34611	-1008	3,02,889
16	Holagunda	26,651	28,953	36,685	46,359	50,592	5985	577	57,154

17	Halaharvi	24,874	25,708	32,780	37,024	41,123	4062	1088	46,273
18	Alur	35,335	32,497	44,806	49,066	55,834	5125	3202	64,161
19	Aspari	36,432	35,407	47,232	55,115	65,088	7164	3666	75,918
20	Devanakonda	34,081	36,202	48,897	61,923	71,237	9289	2398	82,924
21	Krishnagiri	22,996	25,704	33,321	41,666	47,103	6027	910	54,034
22	Pattikonda	35,297	35,593	49,405	60,951	68,962	8416	2572	79,950
23	Chippagiri	25,640	26,453	29,234	31,465	33,400	1790	374	35,564
24	Maddikera	25,161	24,102	32,078	33,601	36,834	2918	1431	41,183
25	Tuggali	32,765	32,266	45,831	51,931	59,462	6674	2677	68,813
	Total District	10,41,189	12,64,870	16,07,592	19,39,789	22,71,686	3,07,624	36,072	26,15,382

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