



DECADAL RANK SIZE DISTRIBUTION OF URBAN POPULATION OF NAGPUR DISTRICT

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Abstract:

The Rank-Size Rule is one of the method of analyzing total settlement networks in a region. Hence it is a tool for analyzing the national settlement system and helps in the description and interpretation of the relationship between rank and population size of urban places. When one looks into the various sizes of urban places in an area, it is commonly observed that there are a few large cities, many medium sized and host of small centre's. This trend is universal and can be observed at national and regional levels. In other words, the distribution of urban centres of varying sizes at different distances in a region is said to have certain relationship between the population size and rank on one hand and between the spacing and the hierarchical orders on the other under ideal theoretical conditions.

The importance of this study is to find out if there is uniform development in the study area in terms of trade, transportation lines, industries, administration centres, educational and medical facilities and availability of other services and opportunities for the people of the all tahsils of Nagpur district.

Introduction:

The concept of 'Rank-Size-Rule' was first propounded during the first quarter of the present century. Though the geographical interest in the size distribution of rank-size regularity owes much to Zipf's National Unity and Disunity, yet as Rosing (1966) has remarked, Zipf was by no means the first person to point towards the regularity of city sizes. This empirical existence of a regular relationship between the size of urban centres and their ranks was first presented by Auerback (1913) in a study of German cities. He was of the opinion that the population of the n^{th} city was $1/n^{\text{th}}$

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the size of the largest city. Later on Lotka (1924) observed that the urban concentration indicated by the cities of United States fell in the same pattern.

In the present study, an attempt is been made to examine the validity of such theorization in respect of urban population of the tahsils of the Nagpur district.

Study area:

Urban population of all the tahsils of Nagpur district is chosen as the area of study for Rank Size Rule. Nagpur is the second capital the third largest city of the Indian state of Maharashtra after Mumbai and Pune. Its latitude is 20° 35' North to 21° 44' North and longitude is 78° 15' East to 79° 40' East. Nagpur district is bounded by Bhandara district on the east, Chandrapur district on the south-east, Wardha district on the south- west, Amravati district on the north- west and Chhindwara district of Madhya Pradesh state on the north. Nagpur district consist of 14 tahsils namely , Bhivapur, Hingana, Kalmeshwar, Kamptee, Katol, Kuhl, Mauda, Nagpur Rural, Nagpur Urban, Narkhed, Parshioni, Ramtek, Saoner and Umred.

Objectives of the study:

1. To study the size distribution of the urban population of the tahsils of Nagpur district, whether follows the rank size rule.
2. To study if the size of urban population of the tahsils of Nagpur district deviate from the theoretical norms.
3. To study the position of each urban population of the tahsils of Nagpur district.
4. To study the changes in rank and the nature of changes.

Database and Methodology:

For the purpose of this study secondary data was obtained form the census of India Hand Book, Government of India. To calculate the expected population, the following formula is used -

$$Pr = Pi / r$$

Where,

Pr = population of rth rank city.

Pi = population of the largest city.

r = rank of the city.

The Rank Size distribution among the urban population of the tahsils of Nagpur district is investigated for different selected census year, i.e. 1911, 2001 and 2011. For each census year, the rank and the respective urban population size of each of the tahsils of Nagpur district, which are arranged in the decreasing order of their population size.

Decadal rank size distribution of urban population of Nagpur district

POPULATION DISTRIBUTION OF NAGPUR DISTRICT - 1991

S.N	TAHSIL	URBAN POPULATION (U)	RURAL POPULATION (R)	TOTAL POPULATION (U+R)	U/R%
1	NAGPUR URBAN	1624752	0	1624752	100/0
2	SAONER	72226	115112	187338	38.55/61.45
3	PARSEONI	36305	90185	126490	28.70/71.30
4	RAMTEK	30493	97289	127782	23.86/76.14
5	MAUDA	0	107709	107709	0/100
6	KAMPTEE	110453	72424	182877	60.40/39.60
7	KUHI	0	107984	107984	0/100
8	BHIVAPUR	0	75454	75454	0/100
9	UMRED	43578	87316	130894	33.29/66.71
10	NAGPUR RURAL	21878	112484	134362	16.28/83.72
11	HINGNA	17376	97088	114464	15.18/84.82
12	KATOL	27332	112266	139598	19.58/80.42
13	NARKHED	27277	102246	129523	21.06/78.94
14	KALMESHWAR	19244	78668	97912	19.65/80.35

POPULATION DISTRIBUTION OF NAGPUR DISTRICT – 2001

S.N.	TAHSIL	URBAN POPULATION (U)	RURAL POPULATION (R)	TOTAL POPULATION (U+R)	U/R%
1	NAGPUR URBAN	2052066	0	2052066	100/0
2	SAONER	79381	142537	221918	35.77/64.23
3	PARSEONI	47146	94585	141731	33.26/66.74
4	RAMTEK	36606	115020	151626	24.14/75.86
5	MAUDA	0	135627	135627	0/100
6	KAMPTEE	126097	82906	209003	60.33/39.67
7	KUHI	0	126316	126316	0/100
8	BHIVAPUR	0	83164	83164	0/100
9	UMRED	49577	97266	146843	33.76/66.24
10	NAGPUR	61192	138209	199401	30.69/69.31

Decadal rank size distribution of urban population of Nagpur district

	RURAL				
11	HINGNA	69578	115537	185115	37.59/62.41
12	KATOL	37435	118233	155668	24.05/75.95
13	NARKHED	30274	114485	144759	20.91/79.09
14	KALMESHWAR	24399	90001	114400	21.33/78.67

POPULATION DISTRIBUTION OF NAGPUR DISTRICT – 2011

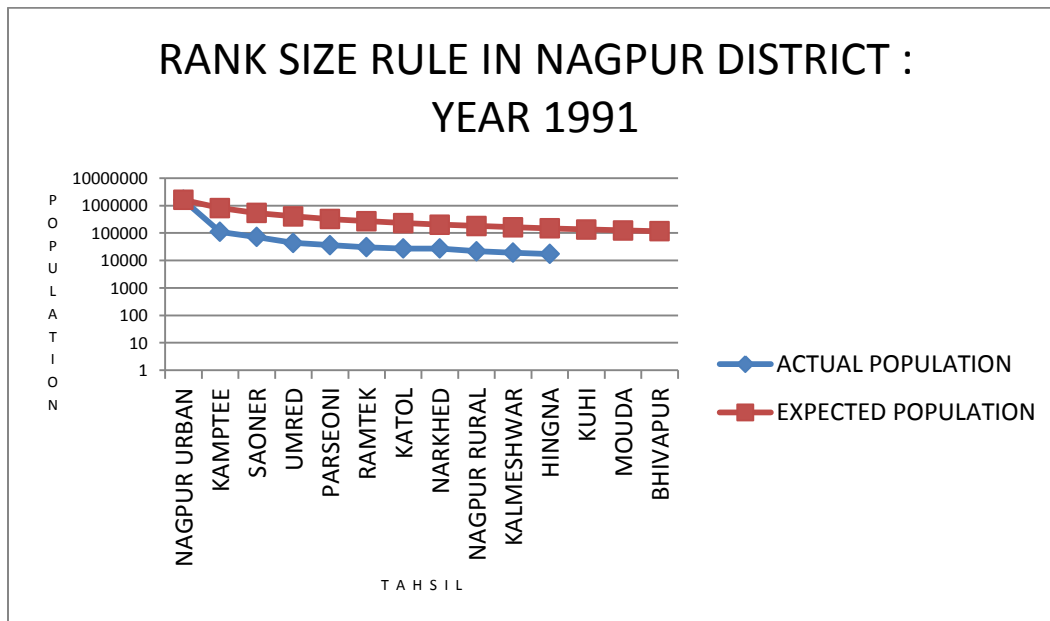
S.N.	TAHSIL	URBAN POPULATION (U)	RURAL POPULATION (R)	TOTAL POPULATION (U+R)	U/R%
1	NAGPUR URBAN	2405665	0	2405665	100/0
2	SAONER	102014	127436	229450	44.46/55.54
3	PARSEONI	47310	95709	143019	33.08/66.92
4	RAMTEK	27409	131234	158643	17.28/82.72
5	MAUDA	14606	125170	139776	10.45/89.55
6	KAMPTEE	142779	96091	238870	59.77/40.23
7	KUHI	0	123977	123977	0/100
8	BHIVAPUR	0	81519	81519	0/100
9	UMRED	53971	100209	154180	35.01/64.99
10	NAGPUR RURAL	153777	148418	302195	50.89/49.11
11	HINGNA	121151	121047	242198	50.02/49.98
12	KATOL	43267	120541	163808	26.41/73.59
13	NARKHED	29904	118003	147907	20.22/79.78
14	KALMESHWAR	36906	85457	122363	30.16/69.84

RANK SIZE RULE IN NAGPUR DISTRICT - 1991

S.N.	TAHSIL	ACTUAL POPULATION	EXPECTED POPULATION	DIFFERENCE	DIFFERENCE AS OF %
1	NAGPUR URBAN	1624752	1624752	0	0
2	KAMPTEE	110453	812376	-701923	-86.40
3	SAONER	72226	541584	-469358	-86.66
4	UMRED	43578	406188	-362610	-89.27
5	PARSEONI	36305	324950	-288645	-88.83
6	RAMTEK	30493	270792	-240299	-88.74
7	KATOL	27332	232107	-204775	-88.22

Decadal rank size distribution of urban population of Nagpur district

8	NARKHED	27277	203094	-175817	-86.57
9	NAGPUR RURAL	21878	180528	-158650	-87.88
10	KALMESHWAR	19244	162475	-143231	-88.15
11	HINGNA	17376	147704	-130328	-88.24
12	KUHI	0	135396	-135396	-100
13	MAUDA	0	124981	-124981	-100
14	BHIVAPUR	0	116054	-116054	-100

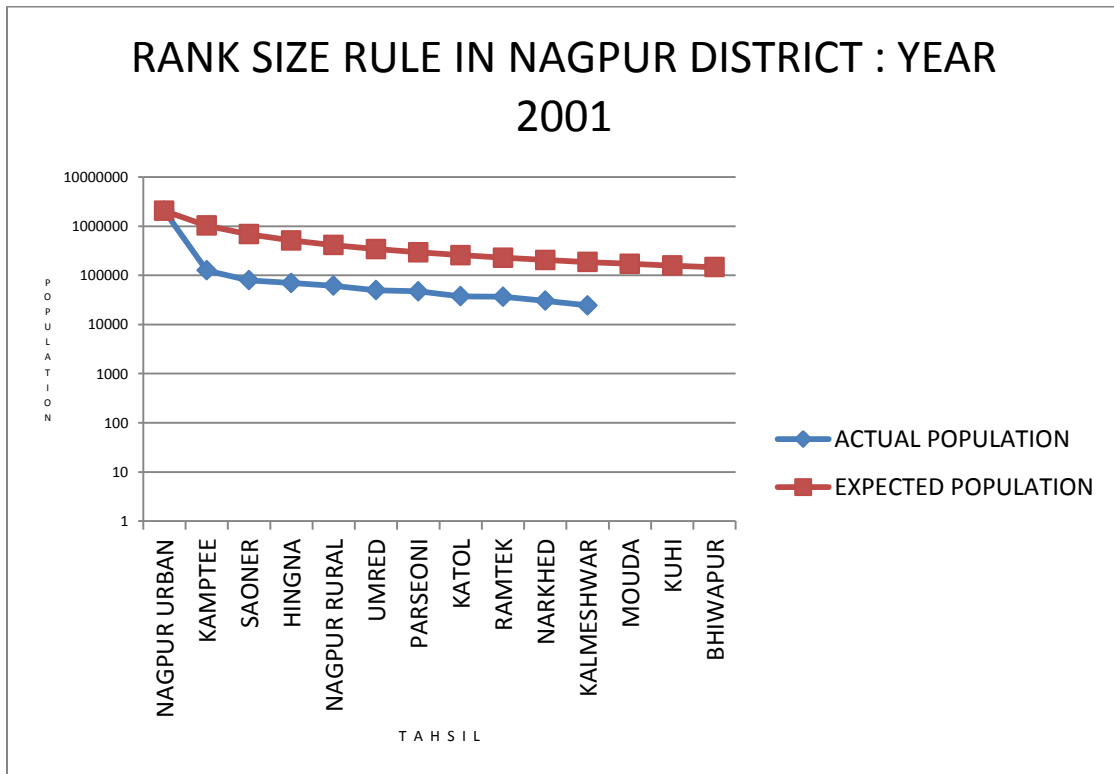


**RANK SIZE RULE IN NAGPUR
DISTRICT – 2001**

S.N.	TAHSIL	ACTUAL POPULATION	EXPECTED POPULATION	DIFFERENCE	DIFFERENCE AS OF %
1	NAGPUR URBAN	2052066	2052066	0	0
2	KAMPTEE	126097	1026033	-899936	-87
3	SAONER	79381	684022	-604641	-88.39
4	HINGNA	69578	513017	-443439	-86.44
5	NAGPUR RURAL	61192	410413	-349221	-85.09

Decadal rank size distribution of urban population of Nagpur district

6	UMRED	49577	342011	-292434	-85.50
7	PARSEONI	47146	293152	-246006	-83.92
8	KATOL	37435	256508	-219073	-85.41
9	RAMTEK	36606	228007	-191401	-83.95
10	NARKHED	30274	205207	-174933	-85.25
11	KALMESHWAR	24399	186551	-162152	-86.92
12	MAUDA	0	171006	-171006	-100
13	KUHI	0	157851	-157851	-100
14	BHIVAPUR	0	146576	-146576	-100

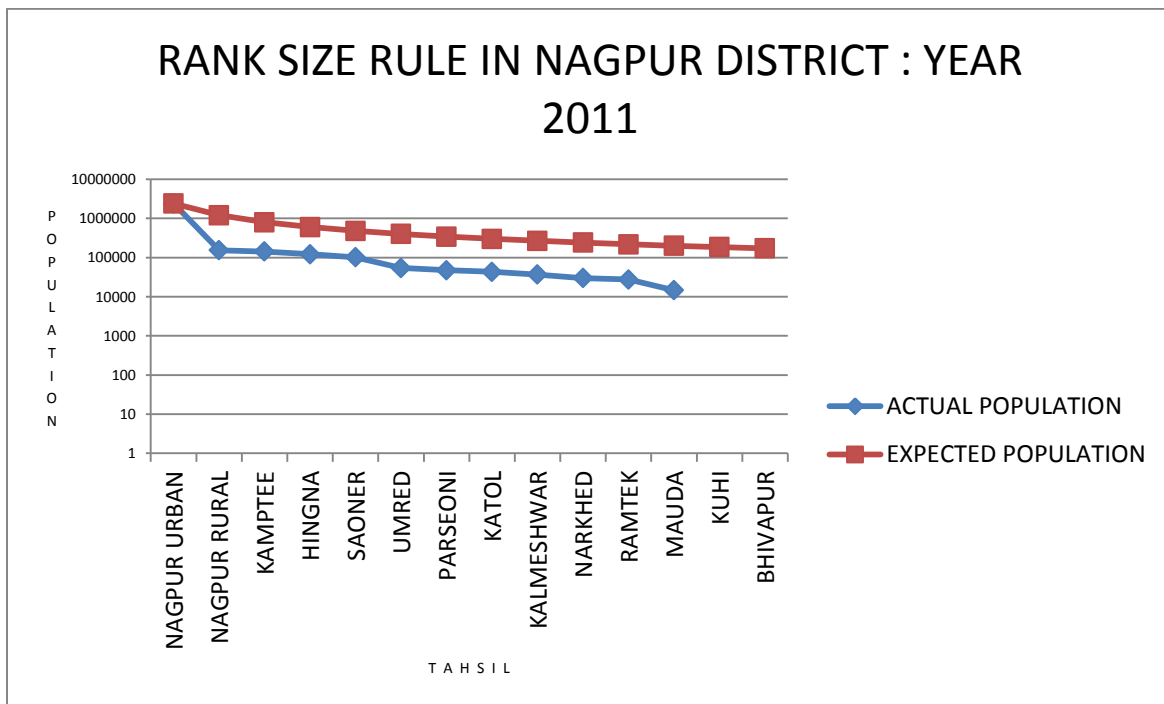


RANK SIZE RULE IN NAGPUR DISTRICT - 2011

S.N.	TAHSIL	ACTUAL POPULATION	EXPECTED POPULATION	DIFFERENCE	DIFFERENCE AS OF %
1	NAGPUR (U)	2405665	2405665	0	0
2	NAGPUR (R)	153777	1202833	-1049056	-87.22
3	KAMPTEE	142779	801888	-659109	-82.19
4	HINGNA	121151	601416	-480265	-79.86
5	SAONER	102014	481133	-379119	-78.80

Decadal rank size distribution of urban population of Nagpur district

6	UMRED	53971	400944	-346973	-86.54
7	PARSEONI	47310	343666	-296356	-86.23
8	KATOL	43267	300708	-257441	-85.61
9	KALMESHWAR	36906	267296	-230390	-86.19
10	NARKHED	29904	240567	-210663	-87.57
11	RAMTEK	27409	218697	-191288	-87.47
12	MAUDA	14606	200472	-185866	-92.71
13	KUHI	0	185051	-185051	-100
14	BHIVAPUR	0	171833	-171833	-100



On arranging the urban population of the tahsils of Nagpur District , in a decreasing order, in the year 1991 according to the Census of India data the urban population of Nagpur Urban is found to be the highest and it is 1624752 and it ranked first amongst all the tahsils of Nagpur District in terms of urban population. In the same year the urban population of Hingna tahsil is found to be the lowest and it is 17376, while Kuhi, Mauda and Bhivapur is found to have no urban population i.e. their urban population was nil.

In the year 2001 according to the Census of India data the urban population of Nagpur Urban is found to be the highest and it rose to 2052066 and again it ranked first amongst all the tahsils of Nagpur District in terms of urban population. The urban population of Kalmeshwar tahsil in 2001 is found to be the lowest and it is 24399, while Mauda, Kuhi and Bhivapur is again found to have no urban population i.e. their urban population was nil.

Decadal rank size distribution of urban population of Nagpur district

In the year 2011 according to the Census of India data the urban population of Nagpur Urban is again found to be the highest and it is 2405665 and again it ranked first amongst all the tahsils of Nagpur District in terms of urban population. The population of Mauda tahsil in 2011 is found to be the lowest and it is 14606 and it is showing an urban population which was nil in earlier two decades of 1991 and 2001. Now in 2011 only two tahsils i.e. Kuhi and Bhivapur is found to have nil urban population.

DECADAL RANK SIZE DISTRIBUTION OF URBAN POPULATION

In order to examine the rank size distribution of urban population of the study area i.e. Nagpur District , three double logarithmic graphs showing population size on the ordinate and rank on the abscissa were drawn for all the urban population at each census from 1991, 2001 and 2011. As is evident from these graphs the size distribution of urban population of the tehsils of Nagpur district does not conform to the rank size rule.

The curves for the census year 1991, 2001 and 2011 do not suggest any conformity with the rank size rule as depicted in the graphs. The urban population of Nagpur Urban , shows a population of 1624752, 2052066 and 2405665 in 1991, 2001 and 2011 respectively. This is taken as the first ranking urban population of the study area.

The second largest urban population of Kamptee tahsil shows a population of 110453, 126097 and 142779 in the year 1991, 2001 and 2011 respectively , while according to rank size rule its population should have been 812376, 1026033 and 801888 respectively. Thus the actual population fell short of 701923, 899936 and 659109 to its expected population; the deficiency is found to be -86.40, -87 and -82.19 percent respectively.

The third largest urban population of Saoner shows a population of 72226, 79381 and 102014 in the year 1991, 2001 and 2011 respectively; while according to the rank size rule its population should have been 541584, 684022 and 481133 respectively. Thus the actual population fell short of 469358, 604641 and 379119 to its expected population; the deficiency is found to be - 86.66, -88.39 and -78.80 percent respectively.

A stochastic model of the actual and expected population of the urban population of the tahsils of Nagpur district and its variation from the expected ones provide interesting results as given in tables. Thus, it is evident from the above discussion that the urban population of the tahsils of Nagpur district do not conform to the rank size rule.

RANK FLUCTUATIONS OF TAHSIL WISE URBAN POPULATION

S.N.	NAME OF TAHSIL	1991	2001	2011
1	NAGPUR URBAN	1	1	1
2	KAMPTEE	2	2	3
3	SAONER	3	3	5
4	UMRED	4	6	6
5	PARSEONI	5	7	7

Decadal rank size distribution of urban population of Nagpur district

6	RAMTEK	6	9	11
7	KATOL	7	8	8
8	NARKHED	8	10	10
9	NAGPUR RURAL	9	5	2
10	KALMESHWAR	10	11	9
11	HINGNA	11	4	4
12	KUHI	12	13	13
13	MAUDA	13	12	12
14	BHIVAPUR	14	14	14

Rank fluctuations of urban population:

The table shows the rank of urban population of the 14 tahsils of Nagpur district, and changes in their rank over a period of three decades (1991, 2001 and 2011). Table reveals that Nagpur Urban, the largest urban population maintain its rank through out the whole period. Kamptee maintained its second rank in 1991 and 2001, but fell to third rank in 2011. Saoner maintained its third rank in 1991 and 2001, but fell to fifth rank in 2011. Umred witnessed a fall from fourth rank in 1991 to sixth rank in 2001 and 2011. Parseoni also witnessed a fall from fifth rank in 1991 to seventh rank in 2001 and 2011. Ramtek shows great fluctuations, wherein in 1991 it was on sixth rank, fell to ninth rank in 2001 and again fell to eleventh rank in 2011. Katol ranked seventh in 1991, but fell to eighth rank in 2001 and 2011. Narkhed ranked eighth in 1991 but fell to tenth in 2001 and 2011. Nagpur Rural ranked ninth in 1991 but rises to fifth position in 2001 and again rises to second position in 2011. Kalmeshwar ranked tenth in 1991, fell to eleventh position in 2001 and again rises to ninth position in 2011. Hingna started in the eleventh rank in 1991, had risen to fourth position in 2001 and 2011. Kuhi ranked twelfth in 1991, fell down to thirteenth position in 2001 and 2011. Mauda ranked thirteenth in 1991, rises to twelfth position in 2001 and 2011. Bhivapur ranked fourteenth in all the three decades. The fluctuations in the rank of urban population in the tahsils of Nagpur district may be attributed to several factors responsible for urban growth such as industrialization, developments of transport and accessibility, administration, etc.

Result and Conclusion:

Thus, the study of spatial distribution pattern of urban population in the tehsils of Nagpur District (the study area) reveals the following conclusions :

- 1.The urban population in the tehsils of Nagpur District do not conform to the rank size rule. The actual urban population of all the tehsils of the study region is much less than the expected population.
2. The actual urban population of Nagpur Urban is found to be 1624752, 2052066 and 2405665, in the year 1991, 2001 and 2011, respectively. Nagpur Urban has ranked first position in all the three decades of the study. Its population has been taken as the base population to calculate the expected population of other centres of the study area.

Decadal rank size distribution of urban population of Nagpur district

3. The urban population of Kamptee tehsil maintained second rank in the years 1991 and 2001, but fell down to third rank in the year 2011. The expected population is found to be less by 86.40, 87 and 82.19 percent in the years 1991, 2001 and 2011 respectively.
4. The urban population of Saoner tehsil maintained third rank in the years 1991 and 2001, but fell down to fifth rank in the year 2011. The expected population is found to be less by 86.66, 88.39 and 78.80 percent in the years 1991, 2001 and 2011, respectively.
5. The urban population of Nagpur Rural is found to be on the ninth rank in the year 1991, but it rises to fifth position in the year 2001, and again it rises to second rank in the year 2011, and thus shows a continuous improvement in its ranking position.
6. The urban population of Kuhi and Bhivapur tehsils is found to be nil in all the three decades of the study period.
7. The urban population of Mauda tehsil is found to be nil in 1991 and 2001, but shows urban population of 14606 in the year 2011, and the expected population is less by 92.71 percent in 2011.
8. Only Nagpur Urban has maintained its position i.e. first rank through out the whole period of study (1991 – 2011).
9. The rank of other urban population tehsils show continuous changes in their ranks over a period of three decades (1991 – 2011).
10. The rank of Bhivapur is fourteenth and the last in all the three decades of the study period.

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