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An optimized approach for community detection of Uttar Pradesh state, India (Census 1991, 2001 & 2011)

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Abstract
The study on the gender ratio of overall population and of children in 0-6 age group for different districts of Uttar Pradesh state concentrates on the following:
The data collected is evaluated for any pattern of sex ratio's in terms of urban, rural segregation and to find whether the indices are different from district to district of Uttar Pradesh state so that precautionary measures can be taken care of to tackle this alarming situation in the state. For comparing sex ratios between pair of districts, it is tempting to arrange these (districts) in an increasing or decreasing order of sex ratio. But the reported sex ratios are not directly comparable since their "reliability" depends on the size of the population of the districts. Hence, a more reasonable index of dissimilarity between districts is the Chi-square measure computed under the hypothesis that the districts have the same sex ratio. The sex ratios/Chi-square values cannot be arranged on a linear interval scale and hence one has to think of an alternative more complex partial ordering among the districts to reflect a more meaningful structure that may be present in the data. Any ordering based on the results to be meaningful should be such that in the sequence, the difference between neighboring districts possible and the "effective difference" may be defined as the largest of these differences between successive pairs along the ordered set. Hence, ordering between every pair of districts must be such that this largest "gap" between consecutive pairs along the ordering should be as small as possible, that is among all possible sequences one can introduce between any specified district pairs. Hence, Minmaxion, an operation which enables one to find such "optimal approach distance" between every district pair, based on the Chi-square as an index or dissimilarity with respect to the sex ratios.

Keywords: 0-6 gender ratio, rural and urban groups, districts, Uttar Pradesh Census 1991, 2001 & 2011, the lexisearch method

Introduction
As per the Census 2011, the overall sex ratio at the national level has increased by 7 points since the 2001 census to reach 940 females per 1000 males¸ this is lower than 1961 when the figure stood at 941 females per 1000 males.
Despite introducing several laws on female foeticide and schemes to encourage the families to have a girl child, the sex ratio in India has gone down. The child sex ratio has gone to 914 females per 1000 males which is the lowest record since independence. These numbers clearly state that the Indian society still prefer boys over girls such that they could have a security for their future. The child sex ratio has gone down to 914 from 927 when the last census was taken. The monotonic decline in the sex ratio over the last decade, despite the improving socio economic characteristics reinforces the existence of gender discriminatory practices which starts even before birth; which requires the urgent attention of public policy, as improving literacy and economic value of women is necessary but not sufficient for enhancing the relative life chances of girl child (Srinivasan, 1994).
However, this figure conceals the wide variation across the states in India and a distinct geographical pattern. The state of Mizoram has the highest child sex ratio with 971 females per 1000 males, while Meghalaya has 970 per 1000 males.
Normally, the states like Punjab and Haryana have lower sex ratio, but in the recent years, an increasing trend has been seen in these states as compared with 2001 census. Haryana has 830 females while Punjab has 846 females per 1000 males.

The 2001 & 2011 census highlighted this issue by devoting a full section on child sex ratio. This distressing state of affairs raised voice of grave concern across all sections of society. It set into motion serious debates and resulted in a series of action on several fronts to curb the menace of female foeticide in certain parts of the country. In this direction, (Haragopal and Pandit, 2006) (Haragopal and Lakshman Rao, 2014) analyzed the data for Andhra Pradesh, Delhi, Punjab and Haryana states and found that there is a substantial drop of 0-6 female sex ratio. This was noticed by analyzing the data on village wise/district wise. With this experience we have analyzed the data on Uttar Pradesh state for the 1991, 2001 and 2011 censuses and present the results in the next sections.

The analysis of results in Uttar Pradesh district wise data revealed a significant insight into the problem at levels below the state at the national level particularly in certain parts of the country. The rural-urban differentials in the sex ratio in the age group 0-6 further sheds light on the spatial analysis of possible adverse impact on the female child due to the spread of the modernization and technological advancement in the villages and urban centers. The Uttar Pradesh state has 71 districts (Census 2011) and as per the data provided by the census.

Child sex ratio district level analysis

Table 1: Distribution of districts by range of 0-6 child sex ratio of Uttar Pradesh state: 1991, 2001 & 2011

Child sex ratio (0-6)	Number of Districts		
	1991	2001	2011
880 & below	--	10	14
881-915	17	22	30
916-950	33	31	27
951-985	11	7	--
986 & above	1	--	--

* Data source: Data C. D's from Census India- 1991, 2001 and 2011

From Table 1, it is observed that very few of the districts in the state have the 0-6 child sex ratio above 916. The number of districts seems to be dropping down and the state should recover comprehensively in the improvement of the Indices. The district level data on child sex ratio provides further insight into the pattern that exists at this level within a state. Keeping this point in view we have analyzed the district level data with urban and rural segregation and found that an alarming situation exists in the districts of Uttar Pradesh where a highest fall in the sex ratio is observed.

On the whole the sex ratio at the district level is below the ideal of 1000. However, as will be seen later in many districts the variations in sex ratio is considerably being quite low in some districts and relatively very high in some other districts.

Analysis for the present situation is as follows: In this section we present the data into a structured form as per the six characteristics in tables in each district for each of the sub-districts the sex ratio of all children, rural children and urban children as well as entire population including the children and rural and urban separately evaluated for the data.

Table 2, mentioning here the structure form of data in terms of Census 2011 considering for analysis, like wise we did for Census 1991 & 2001. it is clear that Uttar Pradesh was 63 districts in 1991 & 70 in 2001 & 71 districts in 2011 census as per this segregation the analysis is done.

Analysis of Uttar Pradesh districts

Table 2: Totals of 71 districts for each of six groups data

	Population	Male	Female	Pop 0-6	Male 0-6	Female 0-6
Total	155317278	80992995	74324283	25040583	13135595	11904988
Rural	44495063	23487515	21007548	5750748	3049986	2700762
Urban	199812341	104480510	95331831	30791331	16185581	14605750

* Data source: Data C. D's from Census India-2011

As a first step we have listed out the 6 characteristics in the table 2, which gives totals of 71 districts of Uttar Pradesh in Census 2011. Similarly we have listed out for 1991 & 2011 censuses.

The associations of these characteristics are analyzed by Chi-square statistic for overall population for the data and the statistic values for 1991, 2001 and 2011 census data are 1881.9, 6458.9 and 5678.3. From these values it can be concluded that there is a difference between overall male population and overall female population with respect to rural and urban areas for three census data respectively.

Similarly, overall male 0-6 population and overall female 0-6 population with respect to rural and urban areas for 1991, 2001 and 2011 census data respectively. Chi-square values for overall 0-6 population for 1991, 2001 and 2011 census data are 16.9, 1277.1 and 629.0 respectively. From these values it can be concluded that there is a difference between overall male 0-6 population and overall female 0-6 population with respect to rural and urban areas for 1991, 2001 and 2011 census data respectively.

Table 3: Proportion of female, female 0-6 of 71 districts for 2011 data

	Male	Female	Male 0-6	Female 0-6
Total	0.5215	0.4785	0.5304	0.4696
Rural	0.5246	0.4754	0.5229	0.4771
Urban	0.5279	0.4721	0.5257	0.4743

Also, we have calculated the proportion of female and female 0-6 population for all the 71 districts and are given in Table 3, same calculations did for 1991 & 2001 also. From this we observed that there is no improvement in terms of female 0-6 population for the data and found that the difference between rural and urban areas and are misleading.

With the above observations in sight we want to see that whether there is any difference within the 71 districts of the

state and found that there is a difference within the districts for the six characteristics considered and these results are given in table 4 and found that most of the districts are different.

Table 4: Chi-square values for the proportion of overall female population, female 0-6 population of 71 districts with respect to rural, urban areas data

Districts	Proportion of females pop. in the pop.	Proportion of female 0-6 in the pop.	proportion of females in the rural region	proportion of female 0-6 in the rural region	proportion of females in the urban region	proportion of female 0-6 in the urban region
Saharanpur	562.6*	54.8*	6.5*	2.3	537.4*	39.1*
Muzaffar nagar	884.5*	297.7*	0.6	21.7*	695.8*	321.8*
Bijnor	0.4	110.4*	137.9*	8.7*	21.6*	67.0*
Rampur	76.7*	16.6*	94.2*	64.1*	10.8*	50.8*
Meerut	647.9*	223.5*	11.1*	111.9*	731.1*	418.7*
Ghaziabad	680.5*	215.9*	159.3*	200.1*	1427.6*	597.0*
Aligarh	1263.7*	126.9*	1.0	0.2	1044.8*	113.2*
Agra	2226.6*	252.3*	251.4*	66.3*	2683.9*	377.7*
Firozabad	1344.4*	58.8*	0.7	0.1	1066.2*	55.1*
Mathura	1751.4*	106.6*	193.2*	20.4*	1952.0*	136.9*
Mainpuri	859.5*	34.9*	22.0*	0.9	572.5*	30.6*
Buduan	2855.4*	16.1*	51.6*	23.5*	1968.3*	2.2
Etah	1072.9*	58.0*	0.6	0.8	856.8*	50.2*
Bareilly	1134.5*	2.6	0.9	24.0*	902.6*	0.1
Shahjahan pur	2117.2*	0.0	5.6*	0.0	1569.0*	0.1
Kheri	656.2*	45.6*	6.4*	8.2*	419.2*	67.2*
Sitapur	1361.7*	116.6*	70.0*	28.5*	837.9*	164.6*
Hardoi	3338.9*	12.1*	3.7	9.2*	2579.5*	2.4
Unnao	105.1*	31.8*	45.3*	6.1*	29.0*	41.6*
Lucknow	65.6*	32.0*	726.9*	38.4*	26.6*	24.3*
Rae Bareli	674.4*	60.0*	80.6*	5.9*	936.1*	81.7*
Farrukha bad	1011.3*	12.2*	15.0*	6.8*	891.8*	17.9*
Philibhit	285.3*	5.4*	0.9	1.0	197.5*	7.9*
Kanpur Dehat	1579.4*	3.5	0.9	1.4	1290.0*	2.5
Kanpur Nagar	1111.4*	31.9*	1252.7*	41.9*	3616.6*	140.4*
Jalaun	1368.1*	33.4*	16.5*	1.1	1191.8*	33.5*
Jhansi	223.3*	81.8*	16.3*	14.3*	307.4*	111.7*
Lalitpur	58.6*	5.3*	24.9*	7.4*	16.6*	12.1*
Hamirpur	1001.7*	9.2*	37.0*	4.5*	942.5*	12.6*
Banda	1605.3*	1.2	16.7*	2.0	1389.7*	0.0
Fatehpur	199.0*	0.9	11.0*	0.0	99.5*	2.5
Pratapgarh	5840.9*	15.2*	91.8*	6.0*	6466.7*	29.5*
Allhabad	14.2*	21.8*	486.7*	2.8	225.4*	24.0*
Bahraich	750.9*	156.5*	19.5*	16.1*	467.7*	204.3*
Gonda	22.8*	68.0*	8.7*	6.0*	82.9*	95.9*
Barabanki	43.0*	100.2*	12.2*	17.1*	5.3*	135.2*
Faizabad	1908.8*	75.2*	6.9*	4.9*	1707.0*	89.7*
Sultanpur	4754.6*	46.8*	41.6*	2.3	5306.6*	68.2*
Siddharth nagar	2496.4*	120.1*	87.3*	9.4*	2915.3*	155.1*
Mahraj ganj	487.0*	74.6*	66.3*	6.7*	726.5*	101.7*
Gorakhpur	1872.8*	4.5*	25.7*	1.2	1774.3*	7.6*
Deoria	8921.9*	48.8*	106.9*	8.0*	9126.8*	68.7*
Mau	2282.3*	11.8*	470.4*	107.2*	2732.2*	58.9*
Ballia	387.0*	3.6	35.7*	0.7	553.6*	0.6
Jaunpur	14295.1*	28.3*	158.5*	9.0*	14962.9*	49.7*
Ghazipur	1314.8*	0.8	28.7*	2.0	1593.6*	5.0*
Basti	1579.4*	62.6*	6.4*	1.8	1812.2*	82.2*
Azamgarh	13255.6*	32.6*	293.8*	20.4*	14140.5*	60.8*
Varanasi	123.9*	33.4*	13.3*	1.5	0.6	47.7*
Mirzapur	73.8*	0.6	33.1*	0.4	71.1*	0.0
Sonbhadra	41.4*	57.8*	54.6*	3.8	14.3*	47.9*
Kannauj	824.3*	2.9	7.3*	0.2	584.5*	1.5
Etawah	1176.4*	53.7*	0.6	2.0	889.8*	52.4*
Auraiya	1295.8*	5.2*	0.1	1.1	1014.5*	2.3
Mahoba	361.7*	6.6*	5.2*	0.4	317.2*	4.3*
Chitrakoot	436.2*	0.7	0.2	0.8	338.6*	1.3
Kaushambi	45.6*	23.4*	9.6*	5.0*	10.7*	35.7*
Ambedkar nagar	2489.8*	55.6*	179.1*	34.7*	2869.2*	90.4*
Shrawati	463.3*	26.8*	3.6	6.7*	333.1*	40.7*
Balrampur	66.8*	213.8*	26.8*	17.2*	144.5*	259.8*
Sant Kabir nagar	1550.8*	101.1*	20.0*	15.5*	1729.2*	131.5*

Khushinagar	1959.9*	83.8*	26.8*	6.2*	2361.0*	115.6*
Chandauli	3.3	4.3*	9.6*	0.2	20.7*	6.7*
Sant Ravidas nagar Bhadohi	841.0*	3.6	4.9*	11.6*	835.6*	0.0
Jyotiba phule nagar	49.4*	5.5*	91.3*	29.9*	3.2	0.1
Moradabad	185.5*	14.4*	143.5*	66.6*	52.9*	43.1*
Baghpat	1224.8*	244.8*	17.2*	11.3*	1077.4*	242.4*
Gautam Budha nagar	403.5*	232.7*	1094.5*	39.5*	1965.2*	288.2*
Bhulanda shahar	500.0*	428.7*	45.0*	15.1*	277.6*	416.4*
Kanshiram Nagar	649.5*	5.4*	3.9*	1.5	465.3*	6.5*

* indicates difference in the characteristics considered.

Similarly we did for 1991 & 2001 hence, the interpretation for three censuses 1991, 2001 and 2011 we found that in case of proportion of female 0-6 population in the overall population for 1991 census data that there are 50 districts which are different. And for 2001 census data it was found that there are 60 districts which are different. While for 2011 census data it was found that there are 60 districts which are different. Over three decade 1991 to 2011, districts are increasing seem to have no improvement with respect to the proportion of female 0-6 in the overall population.

Also, with respect to proportion of female 0-6 in the rural region for 1991 census data that there are 38 districts which differ. And for 2001 census data it was found that there are 47 districts which are different. While for 2011 census data it was found that there are 44 districts which are different. Over three decade from 1991 to 2011, districts are increasing seem to have no improvement with respect to the proportion of female 0-6 in the rural region.

Also, with respect to proportion of female 0-6 in the urban region for 1991 census data that there are 57 districts which differ. And for 2001 census data it was found that there are 61 districts which are different. While for 2011 census data it was found that there are 57 districts which are different. Over three decade from 1991 to 2011, districts are increasing seem to have no improvement with respect to the proportion of female 0-6 in the urban region.

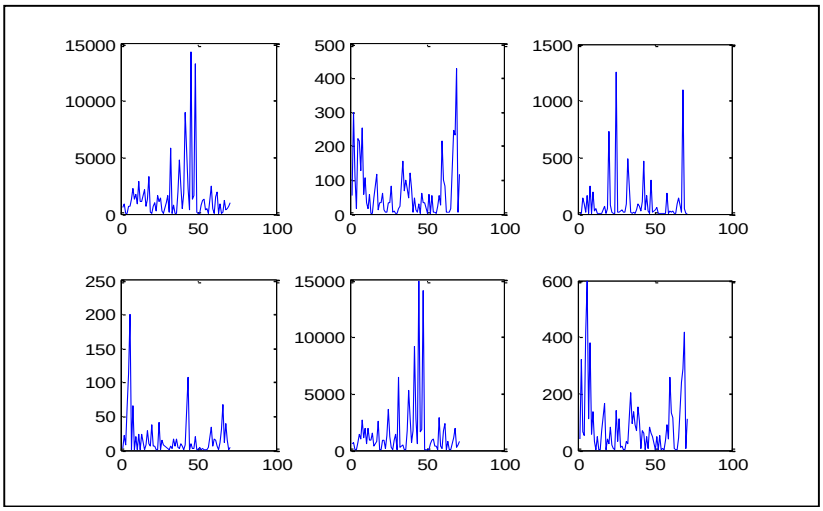
Whereas, from three censuses 1991, 2001 and 2011 we found that in case of proportion of female population in the overall population for 1991 census data that 60 districts which are different. And for 2001 census data it was found that 70 districts which are different. While for 2011 census data it was found that there are 69 districts which are different. Over three decade 1991 to 2011, districts are increasing seem to have no improvement with respect to the proportion of female in the overall population.

And three censuses 1991, 2001 and 2011 we found that in case of proportion of female population in the rural region for 1991 census data that there are all 53 districts which are different. And for 2001 census data it was found that there are 58 districts which are different. While for 2011 census data it was found that there are 58 districts which are different. Over three decade 1991 to 2011, districts are increasing seem to have no improvement with respect to the proportion of female in the rural region.

And for three censuses 1991, 2001 and 2011 we found that in case of proportion of female population in the urban region for 1991 census data that there are 62 districts which are different. And for 2001 census data it was found that there are 56 districts which are different. While for 2011 census data it was found that there are 69 districts which are different. Over three decade 1991 to 2011, districts are increasing seem to have no improvement with respect to the proportion of female in the urban region.

The major characteristic of female 0-6 population with respect to all regions of rural, urban and overall areas of these districts shows a major decline. From this observation we understand that the 0-6 child sex ratio is quite different in almost all the districts of Uttar Pradesh.

This justification can be observed in the Figures 1 for 2001, likewise 1991 & 2001 represent how the chi-square values are changing is displayed for 1991, 2001 and 2011 census data, clearly showing that there is no comparison or improvement in a decade with respective to the chi-square values.



X – Axis: Districts
Y – Axis: Chi – square values

Fig 1: (for 2011)

From this analysis we find that there is a change in the overall female and female 0-6 population in rural and urban areas for three Censuses (1991, 2001 and 2011). This inadequacy made us to study further the data for these three censuses, and in the next section we have studied how each district performs with each other districts is analyzed.

Further, to know which district differs with respect to all the other districts is analyzed by considering the district data of 1991, 2001 and 2011 censuses. The Chi – square values have been calculated for the six characteristics of the population for 1991, 2001 and 2011 censuses separately and results are reported.

From the total adult male and total adult female population for the 1991 census difference is observed in majority of the districts. Whereas, for some of the districts do not differ with another districts when compared with all the districts.

Similarly the other five characteristics also calculated differ leaving very few districts not differing. The same procedure of chi-square is computed for the data on 2001 census for six characteristics, found that all the districts are different keeping some districts left with no difference.

Similarly for the data on 2011 census for six characteristics, found that all the districts are different keeping some districts left with no difference. That is, this analysis shows that there is no improvement over these six characteristics from 1991 to 2011 census.

In particular, we can understand that the 0-6 child sex ratio is quite different in almost all the districts of Uttar Pradesh. With this status of difference in all the districts of Uttar Pradesh for the six characteristics considered seem to have a mixed reaction. To see how the districts perform, entirely different or having some sort of similarities among these districts is studied by considering the clustering technique.

From this big data analytics of Uttar Pradesh state we found that over 3 decades the indices seem to be in a very bad state and has to be improved immediately. After realizing the drastic changes in the data we want to study that whether these districts are similar or not with respect to 0-6 sex ratio etc is explored by the technique of clustering.

Cluster analysis is computed for finding the district similarities for data with respect to six characteristics of the population separately and found that there is a difference within the districts and among the districts with respect to the six characteristics.

Min Maxion Approach

In this section we have explored another technique to evaluate the data for the possible path with respect to the six characteristics for the all districts for the computed Chi-square values as distance matrix, which is non-metric matrix, for finding the possible meaningful district paths.

The Chi-square values for rural 0-6 child male population and rural 0-6 child female population tabulated 2001& 2011 census data is taken as the distance matrix D, as an illustration to explain the Min Maxion technique.

Then the Minmax Satiated Matrix S= D* of the distance matrix is computed.

Next the Direct Link Matrix P is obtained from S.

Lastly the Step Length Matrix L from the Direct Link Matrix P is computed.

With the help of the 3 matrices the Minmaxion paths are listed below for all the Census data.

Now, from these observations we formulate the paths for the state for the three decades for the characteristics as follows: The path obtained is the optimal one in arranging them as changes of sex ratio. This path can help in trying to link the possible causes of difference in sex ratio with those factors which change in similar way among the districts. For example Education, Transportation facilities, Industrialization etc., thus, it is an exploratory tool which arranges districts according to gradual changes in sexratios and suggesting to explore whether any other characteristics (like Education, Welfare groups etc.,) about the districts show a similar ordering. Also, by comparing all these paths for all the characteristics it is observed that all the paths differ drastically with each other. Thus, the causes operating on the sex ratios may not be the same but differ from path to path for the data. For instance the overall male, female population path indicates that the indices for the district Auraiya to Banda is not much different while, when we compare district Auraiya to Jaunpur the indices is very different and the distance between these districts is large. Similar path evaluations by this method are explored and are tabulated below for the other characteristics. Which indicate that the distances between the districts are clearly observed. If we observe these paths in some characteristics some districts does not seen, indicates that they have the same distance are dropped from the list.

Path for overall male population and overall female population

Auraiya	→	Banda	→	Hamirpur	→	Jalaun	→	Kanpur Dehat	→	Baghpat	→	Agra
Firoza bad	→	Farrukha bad	→	Kanpur Nagar	→	Mahamaya Nagar	→	Etah	→	Kannauj	→	Shrawasti
Kanshiram Nagar	→	Chitrakoot	→	Mahoba	→	Aligarh	→	Bareilly	→	Bahraich	→	Gautam Buddha Nagar
Ghazia bad	→	Meerut	→	Pilibhit	→	Saharan pur	→	Muzaffar nagar	→	Jhansi	→	Fateh pur
Lalitpur	→	Lucknow	→	Rampur	→	Unnao	→	Kaushambi	→	Bara Banki	→	Mirza pur
Jyotiba Phule Nagar	→	Allahabad	→	Chandauli	→	Balram pur	→	Bijnor	→	Sonbha dra	→	Varanasi
Mahraj ganj	→	Rae Bareli	→	Ghazipur	→	Gorakhpur	→	Kushi nagar	→	Basti	→	Sant Ravidas Nagar (Bhadohi)
Faiza bad	→	Sant Kabir Nagar	→	Siddharth nagar	→	Ambedkar Nagar	→	Sultan pur	→	Mau	→	Pratap garh
Deoria	→	Jaunpur										

Path for rural male population and rural female population

Mau	→	Azamgarh	→	Siddharth nagar	→	Pratapgarh	→	Mahrajganj	→	Deoria	→	Rae Bareli
Lucknow	→	Sultanpur	→	Jyotiba Phule Nagar	→	Kushinagar	→	Ballia	→	Lalitpur	→	Mainpuri
Ghazipur	→	Balrampur	→	Rampur	→	Sitapur	→	Sant Kabir Nagar	→	Unnao	→	Morada bad
Kaushambi	→	Chandauli	→	Fatehpur	→	Bahraich	→	Basti	→	Shrawasti	→	Bara Banki
Shahjahan pur	→	Muzaffar nagar	→	Kheri	→	Sant Ravidas Nagar (Bhadohi)	→	Hardoi	→	Pilibhit	→	Meerut
Auraiya	→	Chitrakoot	→	Bareilly	→	Firoza bad	→	Aligarh	→	Etah	→	Kanpur Dehat
Mahamaya Nagar	→	Ghaziabad	→	Farrukha bad	→	Baghpat	→	Jalaun	→	Faizabad	→	Mahoba
Banda	→	Mirzapur	→	Hamirpur	→	Mathura	→	Allaha bad	→	Kanpur Nagar		

Path for urban male population and urban female population

Gautam Buddha Nagar	→	Banda	→	Hamirpur	→	Auraiya	→	Kanpur Dehat	→	Kanpur Nagar	→	Mathura
Jalaun	→	Baghpat	→	Etawah	→	Agra	→	Farrukha bad	→	Shrawasti	→	Etah
Mahamaya Nagar	→	Chitrakoot	→	Firozabad	→	Kannauj	→	Mahoba	→	Kanshiram Nagar	→	Sitapur
Mainpuri	→	Bahraich	→	Aligarh	→	Bareilly	→	Ghazia bad	→	Kheri	→	Saharan pur
Pilibhit	→	Meerut	→	Jhansi	→	Fatehpur	→	Mirzapur	→	Lalitpur	→	Buland shahr
Morada bad	→	Kaushambi	→	Rampur	→	Bara Banki	→	Jyotiba Phule Nagar	→	Sonbha dra	→	Lucknow
Varanasi	→	Chandauli	→	Gonda	→	Balram pur	→	Ballia	→	Mahraj ganj	→	Gorakh pur
Ghazipur	→	Sant Ravidas Nagar (Bhadohi)	→	Kushinagar	→	Faizabad	→	Basti	→	Sant Kabir Nagar	→	Ambedkar Nagar
Siddharth nagar	→	Mau	→	Sultan pur	→	Pratap garh	→	Deoria	→	Azamgarh	→	Jaunpur

Path for overall 0-6 child male population and overall 0-6 child female population

Gautam Buddha Nagar	→	Baghpat	→	Buland shahr	→	Ghaziabad	→	Meerut	→	Muzaffar nagar	→	Agra
Mahamaya Nagar	→	Jhansi	→	Mathura	→	Aligarh	→	Etawah	→	Bijnor	→	Etah
Firozabad	→	Jalaun	→	Kanpur Nagar	→	Saharanpur	→	Mainpuri	→	Varanasi	→	Hamir pur
Mahoba	→	Farrukha bad	→	Auraiya	→	Budaun	→	Kanshiram Nagar	→	Jyotiba Phule Nagar	→	Hardoi
Sant Ravidas Nagar (Bhadohi)	→	Kanpur Dehat	→	Kannauj	→	Ballia	→	Bareilly	→	Banda	→	Mirza pur
Shahjahanpur	→	Ghazipur	→	Fatehpur	→	Chitrakoot	→	Gorakhpur	→	Chandauli	→	Pilibhit
Moradabad	→	Lalitpur	→	Pratapgarh	→	Mau	→	Azamgarh	→	Rampur	→	Kheri
Unnao	→	Sultanpur	→	Kaushambi	→	Deoria	→	Gonda	→	Shrawasti	→	Rae Bareli
Lucknow	→	Kushinagar	→	Basti	→	Sitapur	→	Ambedkar Nagar	→	Sonbhadra	→	Bara Banki
Faizabad	→	Bahraich	→	Siddharth nagar	→	Sant Kabir Nagar	→	Balram pur				

Path for rural 0-6 child male population and 0-6 rural child female population

Mau	→	Shrawasti	→	Ambedkar Nagar	→	Sant Kabir Nagar	→	Balrampur	→	Mahraj ganj	→	Bara Banki
Siddharth nagar	→	Azamgarh	→	Sant Ravidas Nagar (Bhadohi)	→	Lalitpur	→	Moradabad	→	Pratap garh	→	Kushi nagar
Kaushambi	→	Budaun	→	Gonda	→	Deoria	→	Jaunpur	→	Rae Bareli	→	Kheri
Faizabad	→	Lucknow	→	Bareilly	→	Basti	→	Sultanpur	→	Bijnor	→	Banda
Ghazipur	→	Auraiya	→	Pilibhit	→	Ballia	→	Saharanpur	→	Mahoba	→	Gorakh pur
Mirzapur	→	Kannauj	→	Chandauli	→	Fatehpur	→	Shahjahanpur	→	Firoza bad	→	Varanasi
Etah	→	Mainpuri	→	Kanshiram Nagar	→	Etawah	→	Chitrakoot	→	Mahama ya Nagar	→	Sonbha dra
Bulands hahr	→	Farrukha bad	→	Kanpur Nagar	→	Jhansi	→	Hamirpur	→	Agra	→	Baghpat
Ghaziabad	→	Meerut										

Path for urban 0-6 child male population and urban 0-6 child female population

Baghpat	→	Gautam Buddha Nagar	→	Ghaziabad	→	Meerut	→	Buland shahr	→	Agra	→	Muzaffar nagar
Mahama ya Nagar	→	Jhansi	→	Mathura	→	Kanpur Nagar	→	Etawah	→	Aligarh	→	Etah
Jalaun	→	Bijnor	→	Mainpuri	→	Varanasi	→	Hamirpur	→	Farrukha bad	→	Mahoba
Allaha bad	→	Kanshiram Nagar	→	Auraiya	→	Kanpur Dehat	→	Kannauj	→	Hardoi	→	Budaun
Ballia	→	Sant Ravidas Nagar (Bhadohi)	→	Banda	→	Mirzapur	→	Bareilly	→	Shahjahan pur	→	Jyotiba Phule Nagar
Chitra koot	→	Ghazipur	→	Gorakhpur	→	Chandauli	→	Pilibhit	→	Lucknow	→	Lalitpur
Pratap garh	→	Jaunpur	→	Azamgarh	→	Unnao	→	Kheri	→	Sultanpur	→	Kaushambi
Rampur	→	Sonbhadra	→	Gonda	→	Rae Bareli	→	Mau	→	Shrawasti	→	Kushinagar
Basti	→	Sitapur	→	Mahrajganj	→	Faizabad	→	Bara Banki	→	Ambedkar Nagar	→	Bahraich
Siddharth nagar	→	Sant Kabir Nagar	→	Balrampur								

Conclusions

From this analysis we could find that there is a difference between the associations of the six characteristics while the cluster analysis we could not find any similarities among the districts with respect to the six characteristics. Thus we have explored for the first time by applying Min-Maxion technique the possible path for the district wise patterns with respect to the characteristics.

From the analysis we could find that drastic changes have taken place in Uttar Pradesh and specifically we found that alarming changes has occurred with respect to the 0-6 child sex ratio during 2011 census. Since, in overall comparisons 0-6 child sex ratio is found to be lower in rural areas than in urban communities, reason for this anomaly needs looking in to. Does it imply that larger female infant mortality in rural areas or is there a selective migration of families from rural to urban setting over a period of time.

An investigation about possible different mortality ratio of girl – infants in the rural and urban areas is perhaps in order. Also, the distribution of 'last child's sex and of the birth sequence, by sex in the families, and socio economic status of families may throw some light on this matter.

Therefore, continued monitoring of Sex Ratio can be of help in formulating and implementing policies to overcome the adverseness in the Sex Ratio. Hence, a five year sample survey for this sort of data should also be undertaken to take the stock of the situation for corrective action.

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