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Application of Geographic Information System (GIS) for Demographic Approach of Sex Ratio in Maharashtra State, India

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Abstract: Sex ratio is the most vital and basic demographic characteristics of a population which influences the marriage pattern, growth rate of population and occupation structure. A huge masculine sex ratio is one of the crucial demographic characteristics of the Indian subcontinent. Being industrially developed and economically progressive state Maharashtra depicts the masculine sex ratio. During the last century Maharashtra state has experienced dramatically decrease in sex ratio which is alarming for the overall socio-economic health of society. This paper tries to explain the trend of sex ratio during the last century from 1901 to 2011 in the state of Maharashtra. In the first half-century (1901 to 1951 census years) 16 districts show negative sex variation less than 20 on the other hand only 3 districts have positive sex variation more than 20. This picture of the sex ratio becomes grimmer in the second half of the century. In the second half (1961 to 2011 census years) 23 districts show negative sex variation less than 20 on the other hand only 2 districts have positive sex variation more than 20. There is also district wise variation in the sex ratio of Maharashtra State. With the help of the GIS approach district wise decadal model of intercourse ratio in Maharashtra states all through 1901 to 2011 census years. It's been placed that a decline in sex ratio in Maharashtra states is strongly indicated numerous reasons like forget of female youngsters, a variant in food plan, intercourse-selective abortions, male favored migrations and traditional mind-set of son preference society. The existing information for sex ratio is crucial for a spread of sorts of schemes, planning, and improvement for the research of some other demographic function including nasality, mortality, migration, marital popularity, economic relationship within a network.

Keywords: Sex Ratio, Graphical Representation, GIS, Maharashtra State.

I. INTRODUCTION

Sex ratio is an important indicator of social health, the economic situation as well as demographic characteristics of any society. Even though female gender is biologically stronger than males and females generally have lower death rates than that of men at most ages in most countries (Scarpa 2016; Zhou et al. 2012; Székely and Székely 2012; Snipp 1997; Wissler 1996; Xu and Qiang 2019; Grover and Vijayvergiya 2006; Mary 2013). Sex ratio means simply the ratio between males to females in a population. It is expressed per thousand males in India. The sex ratio of the country directly influences not only the number of married persons in a population and birth rate, death rate and migration but also indirectly influences the supply of labor forces in the total workforce of the nation (Jeet et al. 2019; Fan 2013). It is assumed that the proportion of males in the total population is large than that of females, the supply of labor force is more. The separate data for males and female are important for a variety of types of schemes, planning and development for the investigation of another demographic characteristic such as nasality, mortality, migration, marital status, economic relationship within a community (Okwechime and Roberson 2015; Murphy 2014; Alagarajan 2003; Balk and Grace 2020; Chaudhry 1992; Chaurasia 2020). If the quantity of males in a population is huge it resulted in to decline in age at marriage for girls and social customs like polygamy. If proportion female to total population is less than required level then instability, found in society the sex ratio influence with fertility, mortality, and migration (Banister, 2004; Pande and Astone, 2007; Bang, 2008; Chu, 2001; Coale 1991; Basu 1992; Torkel 2013; Hilary 2019; Choudhury 2000; Griffiths 2000; Egon 1965; Bisen and Kudnar 2019; Kudnar 2016). Sex ratio is also a significant and demographic characteristic of a population study. The highest masculine sex ratio is observed in many African and Asian Countries and India is no exception to this. Over the last century proportion of women in the total population is persistently and gradually decreasing in India.

The sex ratio of the country was 972 in 1901 it declines sharply and reaches 940 in 2011 though the 2011 census shows a marginal increase in sex ratio still it is approximately the same as sex ratio in the 1961 census. The most astonishing fact is that this decline in sex ratio is due to the contribution from the prosperous states like Punjab, Haryana, Gujarat, and Maharashtra. It is again surprising in the sex ratio distribution of our country; the Northwestern region is always showing a masculine sex ratio on the other hand Northeastern region is feminine sex ratio. Similarly, the southern region shows the feminine sex ratio compare to the northern part of the country. The most threatening fact is that the sex ratio at birth is also declining from 976 in 1961 to 914 in the 2011 census year. It is very clear that after the 1991 census year overall sex ratio is consistently rising but simultaneously falls in child sex ratio is more and in 2011 child sex ratio reach its all-time low with 914. Several scholars (Sucharita 2013; Arokiasamy 2002; Christophe 2018; Anantharam and Premi 1989; Barakade 2012; Sutapa 2012; Mayer 1999; Kudnar 2018; Kudnar, 2019; Bisen and Kudnar 2013) he studied a micro-level study of sex ratio in the in India. His study 1991 to 2011 census years concludes that the sex ratio is always maximum in tribal peoples. Other scholars (Chandna 1986; Sulagna 2019; Rubiana and Martin 2010; Salunke V. S 2015, 2016) studied the Disparities of Sex Ratio in the Maharashtra State of India. Sex ratio is one of the significant indexes of social but also an economic condition of an area and important device for regional analysis, of all the demographic attributes of the population the sex structure is a most essential aspect of humankind (Shejul et al, 2020, 2020; Pawar 2013; Marie-Claire 2013; Gadekar Deepak 2019, 2016; Kudnar 2015, Kudnar, 2017, Gadekar D.J, 2018, 2019, 2017, Salunke V. S 2018, 2018) Women are considered as the most important factors in education. The sex ratio represents the radial recognizable component of the population. Sex ratio considered in same types, Primary Sex ratio is the sex ratio at the time of conception, secondary sex ratio is the ratio at the time of birth and tertiary sex ratio is the ratio found at the time of enumeration (Ismail 2019; Itismita 2014; Jeffrey 2011; Gadekar D.J, 2016). Department of Family Welfare, Ministry of Health, (1990), Planning Commission, Government of India. (1979), Population Reference Bureau, (April 1991), Registrar General and Census Commissioner, India, Demography Division, (1979) and Registrar General and Census Commissioner, India, (March 1991) all government department recently expresses meaningful observation that prevalent use of sex determination technology and sex-selective abortion makes the rural community of Maharashtra gender unequal. The study also states that with public sector services there are a number of small private hospital offerings for such facilities in this state. Their study also shows that 18 percent of all identified aborted women have reported that the primary reason for the abortion was to avert the birth of a girl child. Another important finding of their study is that sex-selective abortion seekers were significantly more likely to come from joint families and were economically sound but they have less freedom and mobility.

A. Study Area

Maharashtra State was formed on 1st May 1960. It extends from 15° 45' to 20° 6' north range and 70° 36' to 80° 54' east longitude (Figure 1). The entire geographical place is 3, 07,713 sq. Km. Maharashtra ranks third with recognize to region. There are three bodily areas of Maharashtra which can be Konkan (shoreline), ghat (hilltop) and pathar (plateau). The western ghat is the bodily backbone of the Maharashtra kingdom. Deccan Plateau is geographical identity of state. Maharashtra occupies the western and central part of the country and has a long shoreline stretching nearly 720 Km along the Arabian Sea. Maharashtra state has tropical climate in three distinct seasons Hot season -march to may, Rainy season June to September Mild winter- October to February. Godavari, Krushna, Bhima, Tapi and Wainganga are the main rivers of State (Kudnar and Rajasekhar 2020; Kudnar 2020). The relative location of Maharashtra state is Chhattisgarh in the East, Andhra Pradesh in the Southwest, Karnataka in the South and Goa in the Southwest, Madhya Pradesh in the North. Maharashtra state has 36 districts and 355 Taluka and 63663 villages under 6 subdivisions. According to 2011 census state has 35 districts and newly adds Palghar (total Districts are 36). According to 2011 census the sex ratio is 925 and population density is 365 per sq.km. Human Development Index (HDI) of Maharashtra state is 0.695 which ranks 15th rank in country according to 2017, current population 124,862,220 in 2020.

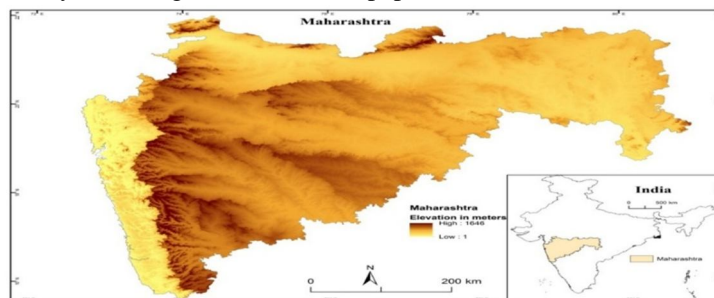


Figure 1: Location Map Maharashtra State

B. Amis and Objective

The main objective of this present research work is to assess graphical representation and Demographic approach of sex ratio in Maharashtra state during 1901 to 2011 census periods. The study of sex ratio has been in the district wise of Maharashtra state. This study has been done for a sapto-temporal analysis.

II. DATA BASE AND METHODOLOGY

For present study data regarding sex, the ratio has been collected at a district-wise level for the year 1901 to 2011. This present study depends on secondary data sources using various research papers, reference books. The data for the study has been collected from the Indian census from 1901 to 2011 (District Census Handbook). Covering sex ratio of Maharashtra state, census handbook 1901 to 2011 in district wise. The data collected is numerically and qualitatively processed using different graphs. The GIS software is used to create various maps between the 1901 to 2011 census periods. The statistical data is compressed to the core of the study. With the main difference being six census years. Shown figure 2 methodologies have been used, the growth rate of the sex ratio population, as well as the district-level exponential ratio, is calculate with the help of the following formula:

$$\text{Sex Ratio} = \text{Number of Male} / \text{Number of Females} \times 1000.$$

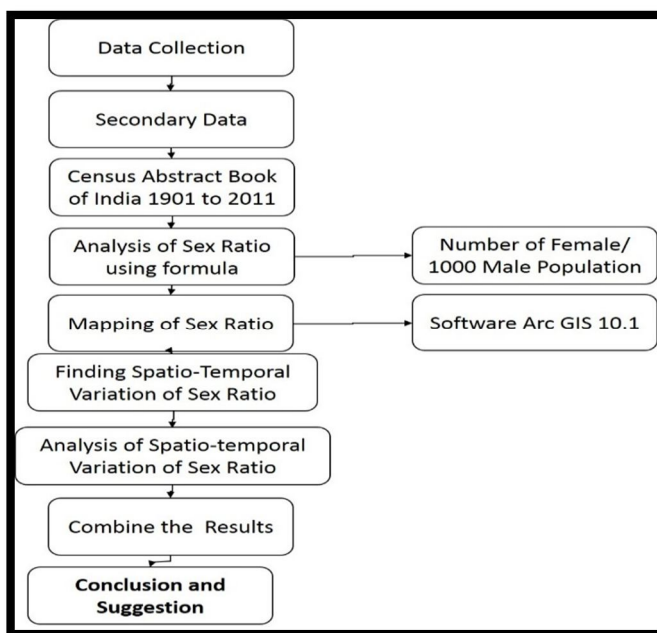


Figure 2: Methodology

III. RESULTS AND DISCUSSION

The sex ratio of the country was 972 in 1901 it declines sharply and reaches 940 in 2011 though the 2011 census shows a marginal increase in sex ratio still it is approximately the same as sex ratio in the 1961 census. Similarly, the southern region shows the feminine sex ratio compare to the northern part of the country. The most threatening fact is that the sex ratio at birth is also declining from 976 in 1961 to 914 in the 2011 census year. It is very clear that after the 1991 census year overall sex ratio is consistently rising but simultaneously falls in child sex ratio and in 2011 child sex ratio reaches its all-time low with 914.

A. Temporal Analysis of Sex Ratio in Maharashtra State and India

Table 1, I have shown the data of sex ratio and decadal variation in sex ratio at State and national levels. Sex ratio is the sensitive indicator of socio-economic development, it gives an account on the social status of women and consequently entire social set up of society. Sex ratio is always linked with Status of female literacy, age of marriage, incidences of female foeticide and female work participation rate. In the case of Maharashtra state, it is an Alarming signal that the sex ratio of the state is continuously decreasing comparing to national average of sex ratio. Since 1901 in the demographic history of Maharashtra sex ratio is constantly decreases except 1981 where it rose by 7females only. It is again shameful that in the last century sex ratio is fallen from 978 females to 925 females per thousand males.

Missing Females or an absolute decrease of 53 females per thousand has been recorded in this entire century. In the same time span sex ratio of the country has fallen from 972 females to 940 females per thousand males. Missing females figure for the whole country was 32 females per thousand males for the same period. Even though Maharashtra is a much progressive, socially and economically developed state compare to other states of the country it has a legacy of great social reformers and social activist but the sex ratio of Maharashtra state is much below than national average.

B. High Decrease in Sex Ratio (1901 to 1931)

In this period Sex ratio of Maharashtra State was sharply dropped from 978 to 947 females per thousand males. In case of India sex ratio decreased from 972 to 950 females per thousand. Sharp decrease in sex ratio was noticed in four decades. This period is noticed as high decrease in sex ratio as this is pre transitional society where patriarchal social set up is observed. Son preference family set up is observed. Female literacy rate and work participation rate is very low therefore Female foeticide and infanticide are in mass practice, High Maternal mortality is experienced in society. Many female deaths are result of social crimes like dowry deaths, rape, Sati etc., and social customs, therefore males are outnumbered than females. In the decade of 1911 to 1921 sex ratio of Maharashtra state was sharply decline from 966 to 950 females per thousand male where decadal variation is 16 females which is recorded as highest fall in sex ratio in state as well as nation over the century.

C. Moderate Decrease in Sex Ratio (1941 to 1971)

In this period the Sex ratio of Maharashtra State was sharply dropped from 978 to 947 females per thousand males. In the case of India sex ratio decreased from 972 to 950 females per thousand. A sharp decrease in sex ratio was noticed in four decades. This period is noticed as a high decrease in sex ratio as this is a pre-transitional society where patriarchal social set up is observed. Son preference family set up is observed. Female literacy rate and the work participation rate are very low therefore Female foeticide and infanticide are in mass practice, High Maternal mortality is experienced in society. Many female deaths are the result of social crimes like dowry deaths, rape, Sati, etc., and social customs, therefore males are outnumbered than females. In the decade of 1911 to 1921 sex ratio of Maharashtra state sharply declined from 966 to 950 females per thousand male where decadal variation is 16 females which are recorded as highest fall in sex ratio in the state as well as a nation over the century.

D. Mild Increase in Sex Ratio (1981 to 2011)

It has been observed from the census year 1981 sex ratio in state and country was increasing slowly. Therefore this period is characterized by slow but sure up-downs in the Sex ratio of Maharashtra State. It was dropped from 937 to 925 females per thousand males. At the beginning of the century, the 2011 census shows a small rise in sex ratio from 922 to 925 females per thousand males. For the same period of time the country has recorded a gradual rise in sex ratio from 934 to 940 females per thousand males. After the new millennium steady growth in sex ratio was observed. Education enrollment ratio in school, Colleges and others were continuously raising, free and compulsory Education, Educate Girl child and Save Girl child Movement, Several health schemes all lead to Women empowerment. Advance medical facilities strictly ban on PCPNDT (Pre -Conception, Pre-Natal Diagnostic Technique) strictly ban on Sex-selective abortions made this grim picture quite favorable. In the decade of 1981 to 2011 sex ratio of Maharashtra state was declined from 937 to 922 females per thousand male in 2001. The situation in the state slightly recovered up to 925 females per thousand males in the 2011 census. A threatening boom of missing girls was observed in 2001 where decadal variation was 12 females which are recorded as the highest fall in sex ratio in the last 80 years. From 1981 country shows promising pictures regarding sex ratio, it rises from 934 to 940 females per thousand males in the 2011 census (Figure 3).

Census data shows there are many undulations in sex ratio at the National and State levels. Since the 1901 sex ratio of Maharashtra and India is continuously decreasing. It has been observed sex ratio decreasing rate of State is greater than the country. According to the 1901 census sex ratio in India was 972 females per 1000 males at the same time of Maharashtra Sex ratio was 978 which is quite higher than that of India. But eventually sex ratio of Maharashtra state decline shapely to 925 females per thousand males in the 2011 census. As per the 2001 census, the sex ratio was increased to 933 females per thousand males. According to the 2011 census, the sex ratio of India has 940 females. As per the 1991-2011 census years, the period was positive improvement in sex ratio in India. In 1991 Census national sex ratio was 927 females which rose up to 940 females per thousand males in 2011Census. It means there is remarkable progress that is 13 sex ratio. Whereas Maharashtra shows a declining trend in the sex ratio for the same period with the minute exception in 2011Census. Table 2 shows a line graph of sex ratio, from the sex ratio it is observed that from 1901 to 2001 census sex ratio is decreasing but slight growth has been observed in the last decade of 2011. It can see that the sex ratio of the country is higher than that of Maharashtra in the 2011 census year.

E. Temporal Analysis of Sex Ratio in Maharashtra State (District Wise)

As per 1901 (Figure 4 and 5) census 10 district shows the highest sex ratio of more than 1000 females per thousand males. Those districts are Bhandara (1071), Gondiya (1071), Gadchiroli (1023), Chandrapur (1023), Nanded(1004), Raigarh (1000), Ahmednagar (1005), Satara (1031), Ratnagiri (1119), Sindhudurg (1111). These Districts from Konkan and Vidharbha are prominently tribal habitat districts and due to the matriarchal family system, these districts show the highest sex ratio. Simultaneously because of out-migration of male sex ratio was increased. As per 2011 (Figure 6) census same districts shows a sharp decline in sex ratio. Viz. Bhandara (984), Gondia (996), Gadchiroli (975), Chandrapur (959), Nanded (935), Raigarh (955), Ahmednagar (934), Satara (986), Ratnagiri (1123), Sindhudurg (1033) Palghar (900). The declining sex ratio in these districts is because of multiple factors conducive to the trend of declining sex ratio. Sex selection and medical technology are misused in India for detecting the sex of the unborn child and ultimately for the sex selection, Female fetuses, thus identified and aborted. The Socio-Economic Status of Women depends on or parameters are sex ratio, literacy rate, female employment etc. As per the 2011 census only two districts have sex ratio more than 1000 Ratnagiri (1123) Sindhudurg (1037) because of the out-migration of males in search of employment towards the Mumbai Metropolitan Region which is the textile and industrial hub of Maharashtra. Change in social structure in terms of literacy, better treatments of female, etc. regional pattern of the study area is closely related with the economy of region (Chandana, 1986) High sex ratio can be attributed to, (i) the region have male-selective migration to urban areas of the state. Such male selective migration into the urban areas. (a) preconception against female employment and mobility (b) scarcity of jobs suitable for females and (c) problems of housing and high cost of living in urban centers, which dispirited many male migrants not take their families with them, (ii) due to the improvement in medical facilities, female infant mortality rate decreased as well as female permanency has also increased, (iii) females according to traditional views are supported to be concierges of households and also as a good agricultural labor force. District wise sex ratio of Maharashtra state has shown in table No II and (Figure V to XVI) Out of total 36 districts in Maharashtra 24 districts have a low sex ratio of below 950 females per thousand males. The lowest sex ratio was recorded 777 females per thousand males in the 2001 census and 838 females per thousand males in the 2011 census in Mumbai urban area. Ratnagiri (1123) and Sindhudurg (1037) districts recorded the highest sex ratio with above 1000 mark even with the fact that both have shown a decline in the sex ratio of the population during 2001-11 by (-13) and (-42) respectively. The decline of sex ratio were seen in some districts such as Ahmednagar (-6), Ratnagiri (-13), Satara (-9), Sindhudurg (-42), Solapur (-3), Jalgaon (-11), Jalna (-22), Latur (-11), Aurangabad (-8), Beed (-24), Buldhana (-18), Dhule (-3), Gadchiroli (-1), Gondiya (-9), Hingoli (-18), Nanded and Nadurbar (-5), Osmanabad (-12), Parbhani (-18), Pune (-9) Raigarh (-21), Washim (-13) during 2011. This is too far from the range of State level average is 925 and national average about 940 females per thousand males. There are 13 districts within states where the sex ratio is quite stable and mild increases were observed viz. Akola (4), Amravati (9), Bhandara (3), Chandrapur (11), Kolhapur (4), Mumbai City (61), Mumbai suburban (35), Nagpur (16), Nashik (4), Sangali (7), Thane (22), Wardha (11) and Yavatmal (2) during 2011 census year.

The table 3 and figure above shows that sex ratio 1901 to 2011 appears to be declining (Figure 7). The sex ratio is a group into five-level, first less than 850, second 850 to 900, third 900 to 950, fourth 950 to 1000 and fifth more than 1000 sex ratio(Figure 8). According to the 1901 census there were two districts in the severe sex ratio group (less than 850) as well as the in satisfactory sex ratio group (950 to 1000) there are 23 districts and in the Good sex ratio group (more than 1000) were 9 those districts.viz. Bhandara, Gondiya, Gadchiroli, Chandrapur, Raigarh, etc. (Figure 9). The Alarming fact is that numbers of districts in this group are sharply declined up to 2 districts only in the entire Maharashtra state. According to the 2011 census, those districts are Ratnagiri, Sindhudurg. This is really threatening for societal health. (Figure 10, 11, 12, 13, 14, 15, 16).

F. Variation of Sex Ratio in Maharashtra State

In terms of population Maharashtra state is the second largest state in Country. As per sex ratio the state ranks 22nd with 925 females per thousand males against 940 at the national level. In the case of the Child sex ratio it is 883 girls per 1000 boys against 914 at the national level.

There is 35 district in the state of Maharashtra, which their sex ratio variation in given below. At both level general sex ratio and child sex ratio Maharashtra state is lagged behind the national average constantly. The total century is divided into two major phases first half (1901to 1951 census years) and the Second half (1961to 2011 census years).

In the first half-century (1901to 1951 census years) 16 districts show negative sex variation less than 20 on the other hand only 3 districts have positive sex variation more than 20. These few districts were Mumbai suburban (60), Raigarh (40), Yavatmal (01), Satara (20), Ratnagiri (120) and Washim (03).

The highest sex ratio maximum with positive growth has been in Ratnagiri district because of maximum male migration in the Mumbai metropolitan region and cotton textile hub in search of employment. Figure 17 Show Akola (16), Amravati (14), Nagpur (19), Mumbai Suburban (113), Mumbai (212) and Sangli (07) these all-district expresses positive change sex ratio variation. The maximum positive variation in sex ratio is seen in Mumbai and Mumbai Suburban because of its economic importance. Several textile, chemical, heavy machinery, and vehicle industries work like a magnet and attract laborers and skilled human resources from the country. Thus the number of job gravitation in this place and the number of males and females migrated in this place. Table 3 and Figure 18 & 19 show sex ratio variation in the second half of the century (1901 to 2011 census year).

In the second half (1901 to 2011 census years) 23 districts show negative sex variation less than 20 on the other hand only 2 districts have positive sex variation more than 20. These two districts are namely Mumbai (Suburban) (205) Mumbai (186) Ratnagiri (04). It is really surprising that urban areas always show low sex ratio but in the case of Mumbai and Mumbai suburban region it shows positive growth in sex ratio because in recent decades progress in transport and communication had change migration patterns of male-only. Small families are migrating from a rural area and the major cause is the work participation rate of females are drastically increase particularly in IT industries, Offices, firms and teaching fields like school and college teacher. The increase in female enrollment in school, colleges and university levels is recognizable. But critical case about sex ratio in the rest of the district appears to be greatly reduced because of sex-selective abortion techniques and prenatal Ultrasound Sonography testing in the upper-middle-class led to falling in sex ratio. Society is not aware of illness, negligence to fertile diet, and inaccessibility to a medical facility, maternal mortality, etc. are major causes of declining sex ratio. The sharp decline in sex ratio was seen in the Bhandara district with 87 and Aurangabad District ranks second about 81 as well as other districts like as Gondiya (75), Sindhudurg (74), Bid (73), Ahmadnagar (71) (Table 4).

IV. CONCLUSION

The above analysis of regional pattern in Maharashtra in district wise the fast changes in sex ratio. It is observed that the sex ratio has constantly decreased. There is a wide variation in the sex ratio period of 1901 to the 2011 census. As per 2011 census, only two districts have sex ratio more than 1000 Ratnagiri (1123) Sindhudurg (1037) because of indicates out-migration of a male in search of jobs outside on one hand and change the social structure in terms of literacy, better treatments of female, etc. regional pattern of the study area is closely related with the economy of the region. The study region recording high sex ratio suffers from poor agricultural and show emigration, while the region of low sex ratio has undergone industrial development attracting in migration. The sex ratio is observed that from 1901 to 2001 census sex ratio is decreasing but can see that the sex ratio of the country is higher than that of Maharashtra in the 2011 census year.

Table 1. Temporal analysis of sex ratio in Maharashtra State and India

| Census Years | Maharashtra State Sex ratio | Decadal Variation | India Sex ratio | Decadal Variation |
|--------------|-----------------------------|-------------------|-----------------|-------------------|
| 1901 | 978 | | 972 | |
| 1911 | 966 | -12 | 964 | -8 |
| 1921 | 950 | -16 | 955 | -9 |
| 1931 | 947 | -3 | 950 | -5 |
| 1941 | 949 | 2 | 945 | -5 |
| 1951 | 941 | -8 | 946 | 1 |
| 1961 | 936 | -5 | 941 | -5 |
| 1971 | 930 | -6 | 930 | -11 |
| 1981 | 937 | 7 | 934 | 4 |
| 1991 | 934 | -3 | 927 | -7 |
| 2001 | 922 | -12 | 933 | 6 |
| 2011 | 925 | 3 | 940 | 7 |

Table 2. Temporal analysis of sex ratio in Maharashtra State 1901 to 2011 census

| Sr.No. | State/District Name | Sex-ratio since (Number of females per 1000 males) | | | | | | | | | | | |
|--------|---------------------|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
| | MAHARASHTRA | 978 | 966 | 950 | 947 | 949 | 941 | 936 | 930 | 937 | 934 | 922 | 925 |
| 1 | Nandurbar | 980 | 978 | 976 | 969 | 969 | 973 | 975 | 968 | 982 | 975 | 977 | 972 |
| 2 | Dhule | 980 | 978 | 976 | 969 | 969 | 968 | 961 | 948 | 954 | 945 | 944 | 941 |
| 3 | Jalgaon | 975 | 983 | 971 | 968 | 970 | 971 | 957 | 948 | 950 | 940 | 933 | 922 |
| 4 | Buldana | 992 | 985 | 979 | 971 | 972 | 981 | 959 | 954 | 957 | 953 | 946 | 928 |
| 5 | Akola | 968 | 968 | 958 | 952 | 957 | 953 | 926 | 931 | 939 | 934 | 938 | 942 |
| 6 | Washim | 968 | 968 | 958 | 952 | 957 | 971 | 956 | 957 | 963 | 946 | 939 | 926 |
| 7 | Amravati | 960 | 959 | 953 | 939 | 946 | 958 | 933 | 931 | 936 | 936 | 938 | 947 |
| 8 | Wardha | 987 | 983 | 973 | 975 | 978 | 983 | 964 | 949 | 948 | 939 | 935 | 946 |
| 9 | Nagpur | 991 | 981 | 967 | 953 | 955 | 956 | 929 | 922 | 924 | 922 | 932 | 948 |
| 10 | Bhandara | 1071 | 1038 | 1024 | 1017 | 1010 | 1005 | 993 | 984 | 989 | 980 | 981 | 984 |
| 11 | Gondiya | 1071 | 1038 | 1024 | 1017 | 1010 | 1004 | 1000 | 989 | 1004 | 995 | 1005 | 996 |
| 12 | Gadchiroli | 1023 | 1005 | 1004 | 990 | 989 | 1000 | 998 | 986 | 981 | 976 | 976 | 975 |
| 13 | Chandrapur | 1023 | 1005 | 1004 | 990 | 989 | 994 | 979 | 963 | 959 | 948 | 948 | 959 |
| 14 | Yavatmal | 988 | 980 | 968 | 966 | 978 | 989 | 972 | 961 | 958 | 951 | 942 | 947 |
| 15 | Nanded | 1004 | 995 | 981 | 966 | 965 | 983 | 970 | 955 | 960 | 945 | 942 | 937 |
| 16 | Hingoli | 996 | 992 | 978 | 963 | 960 | 989 | 975 | 968 | 966 | 952 | 953 | 935 |
| 17 | Parbhani | 996 | 993 | 978 | 963 | 960 | 974 | 969 | 954 | 968 | 954 | 958 | 940 |
| 18 | Jalna | 998 | 989 | 988 | 966 | 957 | 976 | 970 | 959 | 970 | 958 | 951 | 929 |
| 19 | Aurangabad | 998 | 988 | 991 | 967 | 957 | 974 | 955 | 935 | 936 | 922 | 925 | 917 |
| 20 | Nashik | 974 | 984 | 960 | 963 | 953 | 956 | 946 | 940 | 937 | 940 | 927 | 931 |
| 21 | Thane | 939 | 947 | 937 | 935 | 940 | 920 | 919 | 894 | 883 | 879 | 858 | 880 |
| 22 | Mumbai (Subur | 652 | 570 | 561 | 592 | 616 | 712 | 744 | 769 | 801 | 831 | 822 | 857 |
| 23 | Mumbai | 652 | 570 | 561 | 592 | 616 | 574 | 626 | 670 | 729 | 791 | 777 | 838 |
| 24 | Raigarh | 1000 | 1023 | 1028 | 1009 | 1036 | 1040 | 1058 | 1056 | 1046 | 1010 | 976 | 955 |
| 25 | Pune | 979 | 977 | 957 | 952 | 948 | 939 | 944 | 933 | 937 | 933 | 919 | 910 |
| 26 | Ahmadnagar | 1005 | 983 | 978 | 971 | 969 | 971 | 962 | 956 | 959 | 949 | 940 | 934 |
| 27 | Bid | 985 | 980 | 963 | 949 | 941 | 957 | 969 | 954 | 965 | 944 | 936 | 912 |
| 28 | Latur | 980 | 965 | 940 | 943 | 941 | 947 | 950 | 942 | 959 | 942 | 935 | 924 |
| 29 | Osmanabad | 980 | 964 | 939 | 942 | 942 | 948 | 948 | 947 | 958 | 937 | 932 | 920 |
| 30 | Solapur | 985 | 967 | 943 | 934 | 942 | 945 | 936 | 933 | 942 | 934 | 935 | 932 |
| 31 | Satara | 1031 | 1025 | 1030 | 1006 | 1035 | 1051 | 1047 | 1037 | 1061 | 1029 | 995 | 986 |
| 32 | Ratnagiri | 1119 | 1164 | 1187 | 1129 | 1158 | 1239 | 1264 | 1263 | 1258 | 1205 | 1136 | 1123 |
| 33 | Sindhudurg | 1111 | 1154 | 1174 | 1119 | 1148 | 1200 | 1194 | 1213 | 1205 | 1137 | 1079 | 1037 |
| 34 | Kolhapur | 975 | 967 | 946 | 952 | 968 | 964 | 961 | 953 | 962 | 961 | 949 | 953 |
| 35 | Sangli | 984 | 952 | 942 | 950 | 954 | 968 | 957 | 949 | 967 | 958 | 957 | 964 |

Sources: Census Reports of Government of India (1901 to 2011)

Table 3. Index of Sex ratio in M.H States 1901 to 2011 census years

| Index value/sex ratio | Remarks | Census Years | | | | | | | | | | | |
|-----------------------|--------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
| | | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
| <850 | Severe | 02 | 02 | 02 | 02 | 02 | 02 | 02 | 02 | 02 | 02 | 02 | 01 |
| 850.1-900 | Poor | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 01 | 01 | 01 | 01 | 02 |
| 900.1-950 | Moderate | 01 | 01 | 06 | 07 | 08 | 06 | 10 | 13 | 10 | 18 | 21 | 22 |
| 950.1-1000 | Satisfactory | 23 | 24 | 19 | 22 | 19 | 21 | 19 | 15 | 17 | 10 | 08 | 08 |
| >1000.1 | Good | 09 | 08 | 08 | 06 | 06 | 06 | 04 | 04 | 05 | 04 | 03 | 02 |

Table 4. Census variation in Maharashtra State

| Sl. No. | District | 1901-1951 | 1961-2011 | 1901-2011 | Sl. No. | District | 1901-1951 | 1961-2011 | 1901-2011 |
|---------|------------|-----------|-----------|-----------|---------|--------------------|------------|------------|------------|
| 1 | Nandurbar | -7 | -3 | -8 | 19 | Aurangabad | -24 | -38 | -81 |
| 2 | Dhule | -12 | -20 | -39 | 20 | Nashik | -18 | -15 | -43 |
| 3 | Jalgaon | -4 | -35 | -53 | 21 | Thane | -19 | -39 | -59 |
| 4 | Buldana | -11 | -31 | -64 | 22 | Mumbai(Suburban) | 60 | 113 | 205 |
| 5 | Akola | -15 | 16 | -26 | 23 | Mumbai | -78 | 212 | 186 |
| 6 | Washim | 3 | -30 | -42 | 24 | Raigarh | 40 | -103 | -45 |
| 7 | Amravati | -2 | 14 | -13 | 25 | Pune | -40 | -34 | -69 |
| 8 | Wardha | -4 | -18 | -41 | 26 | Ahmadnagar | -34 | -28 | -71 |
| 9 | Nagpur | -35 | 19 | -43 | 27 | Bid | -28 | -57 | -73 |
| 10 | Bhandara | -66 | -9 | -87 | 28 | Latur | -33 | -26 | -56 |
| 11 | Gondiya | -67 | -4 | -75 | 29 | Osmanabad | -32 | -28 | -60 |
| 12 | Gadchiroli | -23 | -23 | -48 | 30 | Solapur | -40 | -4 | -53 |
| 13 | Chandrapur | -29 | -20 | -64 | 31 | Satara | 20 | -61 | -45 |
| 14 | Yavatmal | 1 | -25 | -41 | 32 | Ratnagiri | 120 | -141 | 4 |
| 15 | Nanded | -21 | -33 | -67 | 33 | Sindhudurg | 89 | -157 | -74 |
| 16 | Hingoli | -7 | -40 | -61 | 34 | Kolhapur | -11 | -8 | -22 |
| 17 | Parbhani | -22 | -29 | -56 | 35 | Sangli | -16 | 7 | -20 |
| 18 | Jalna | -22 | -41 | -69 | | Maharashtra | -37 | -11 | -53 |

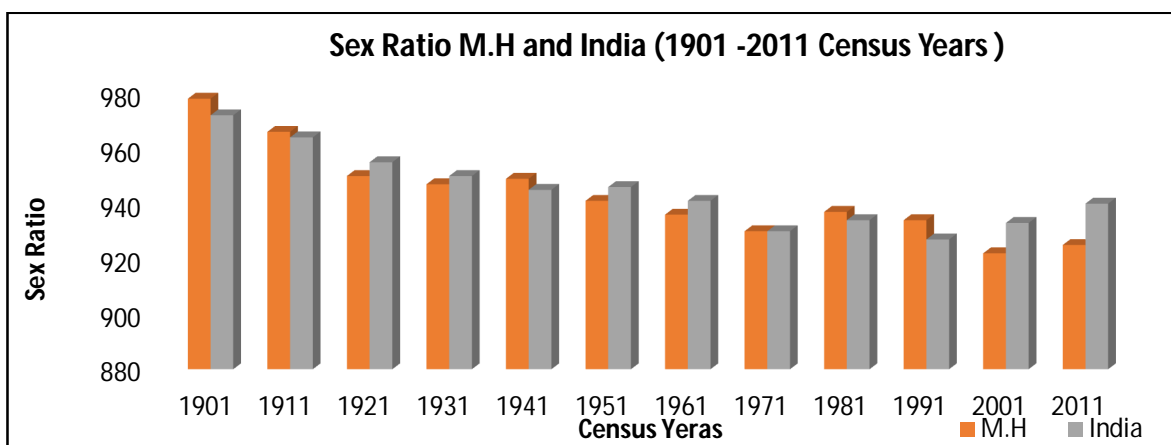


Figure 3: Temporal analysis of sex ratio in Maharashtra State and India

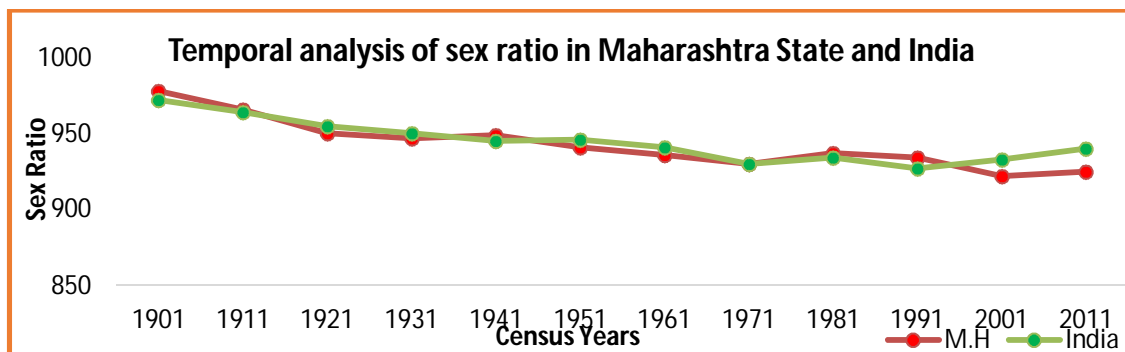


Figure 4: Temporal analysis of sex ratio in Maharashtra State and India (1901 to2011 census years)

Figure 5: Sex Ratio of Maharashtra State in 1901

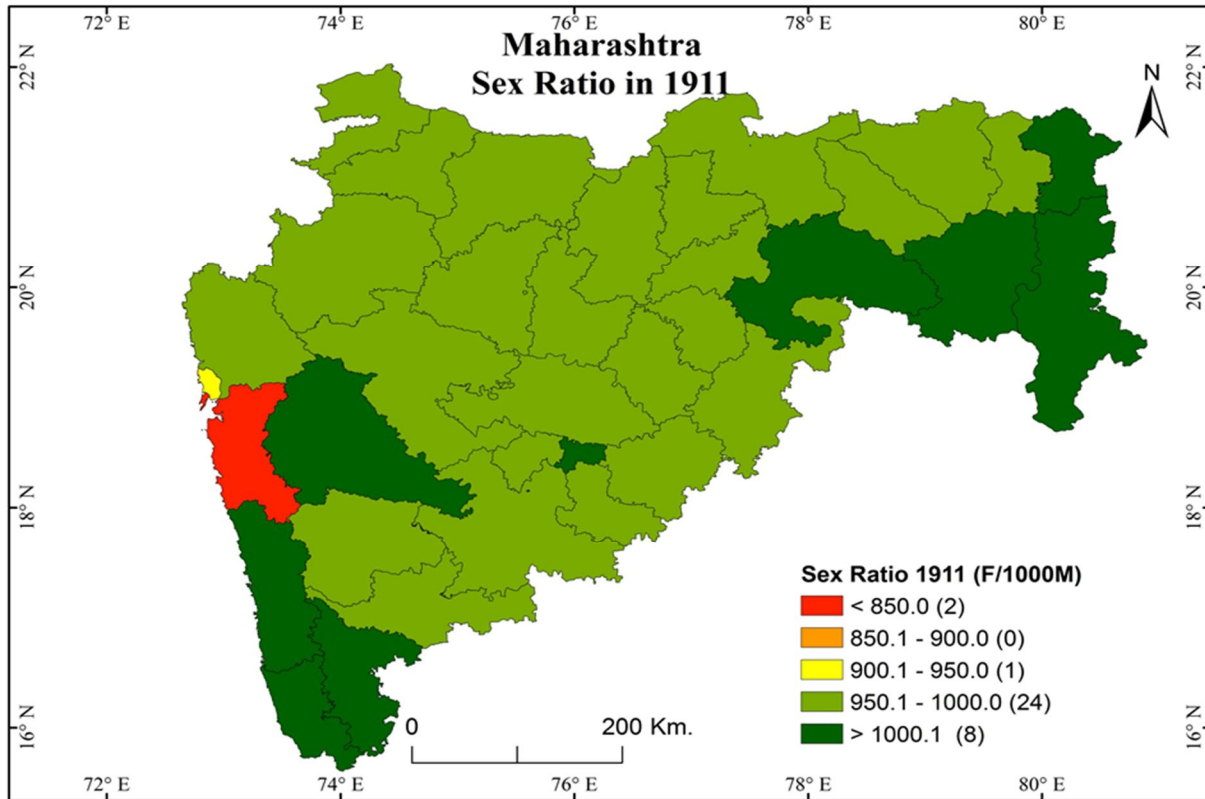


Figure 6: Sex Ratio of Maharashtra State in 1911

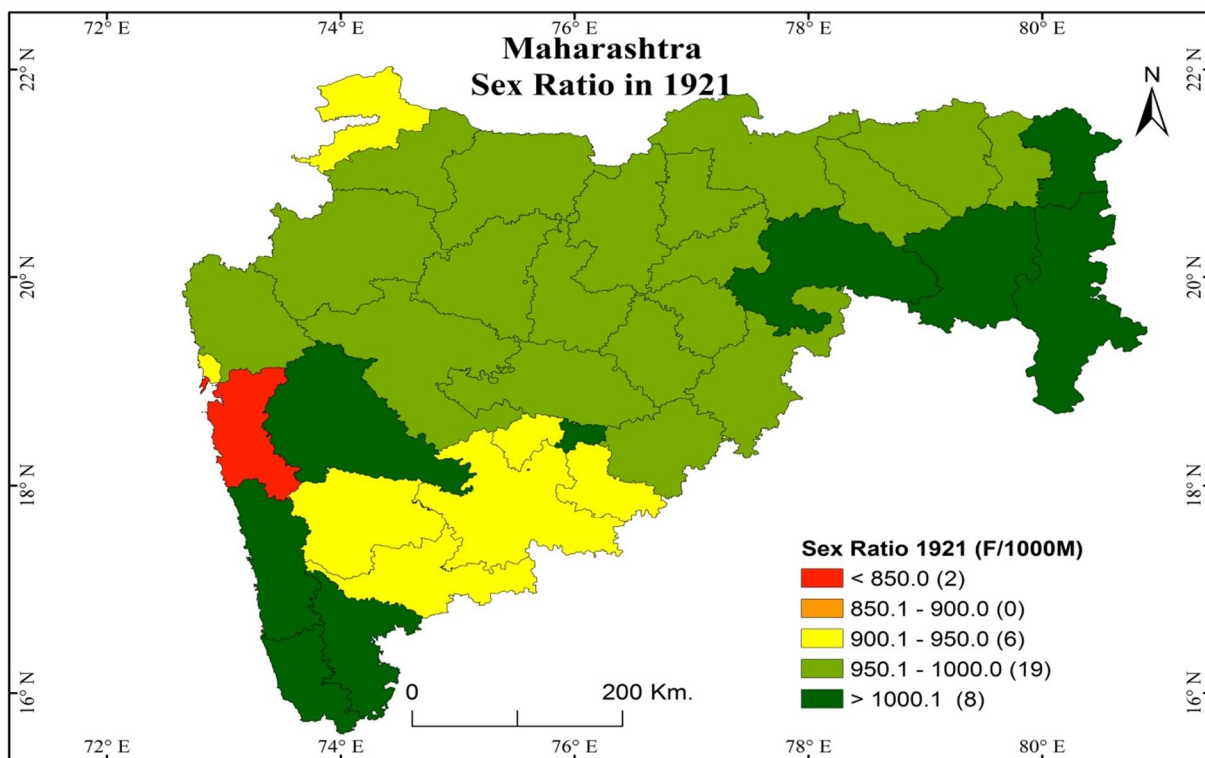


Figure 7: Sex Ratio of Maharashtra State in 1921

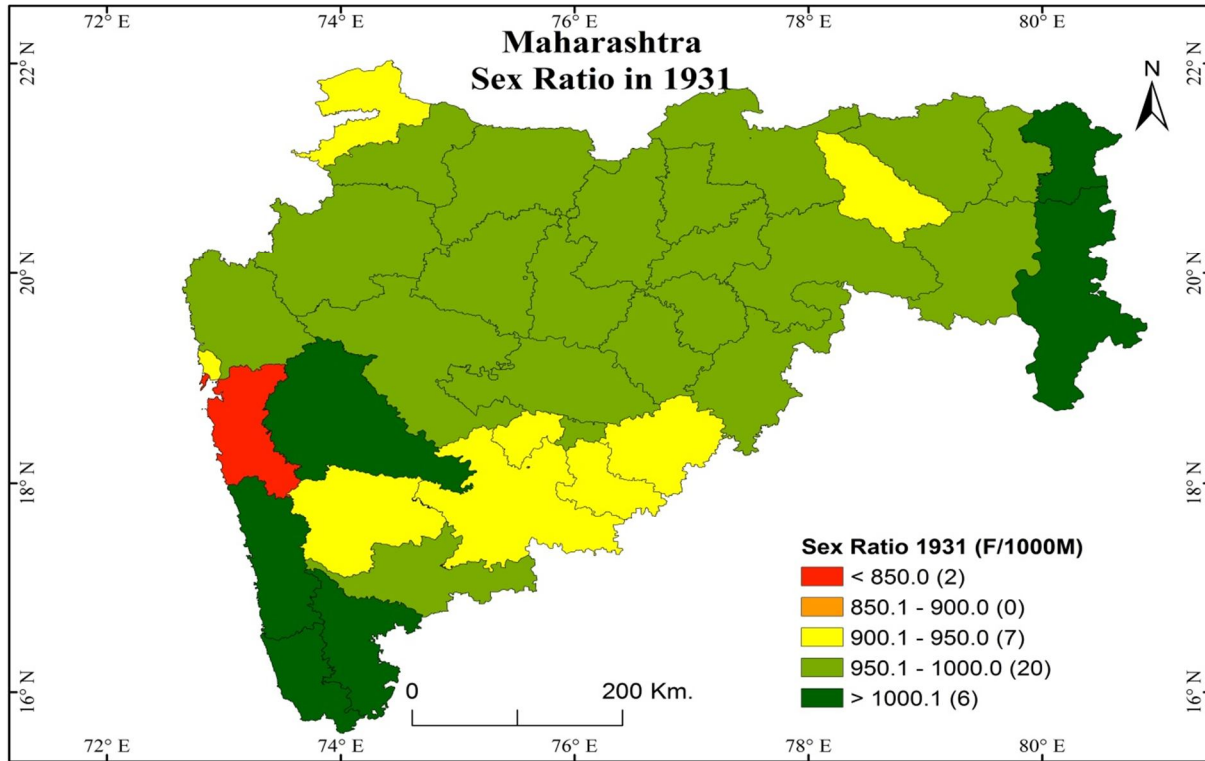


Figure 8: Sex Ratio of Maharashtra State in 1931

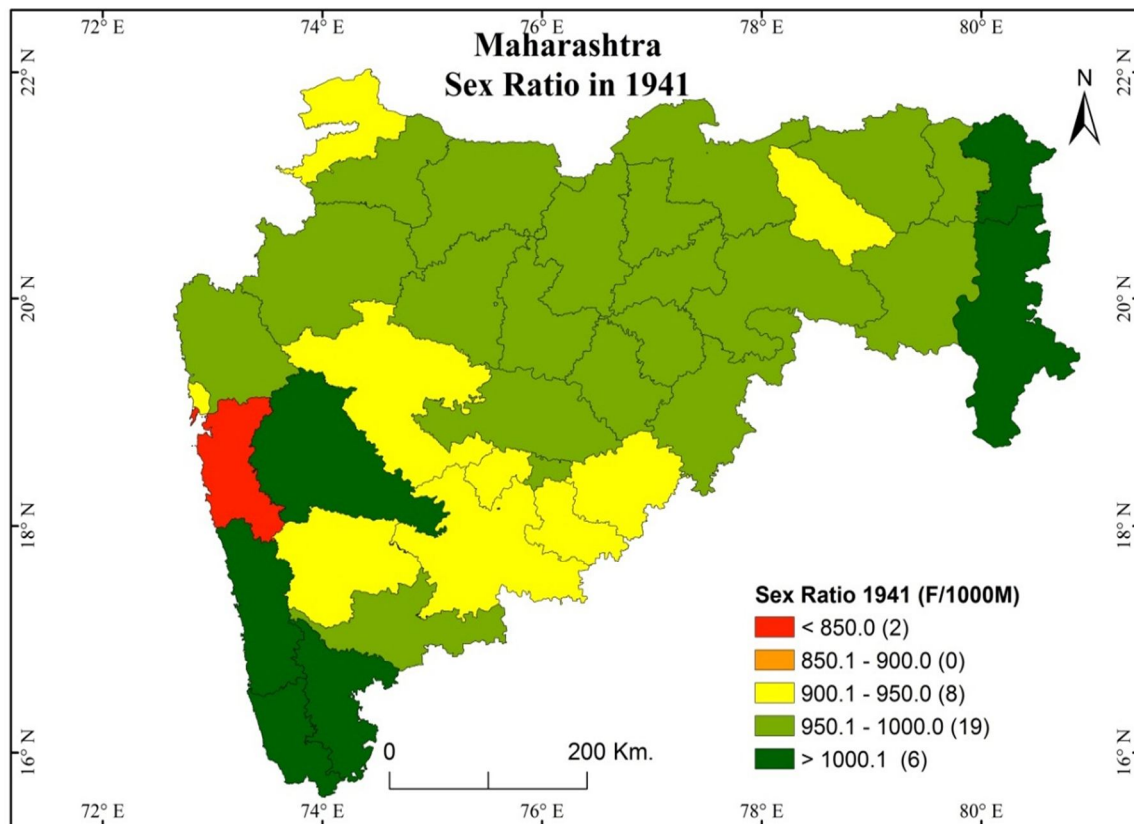


Figure 9: Sex Ratio of Maharashtra State in 1941

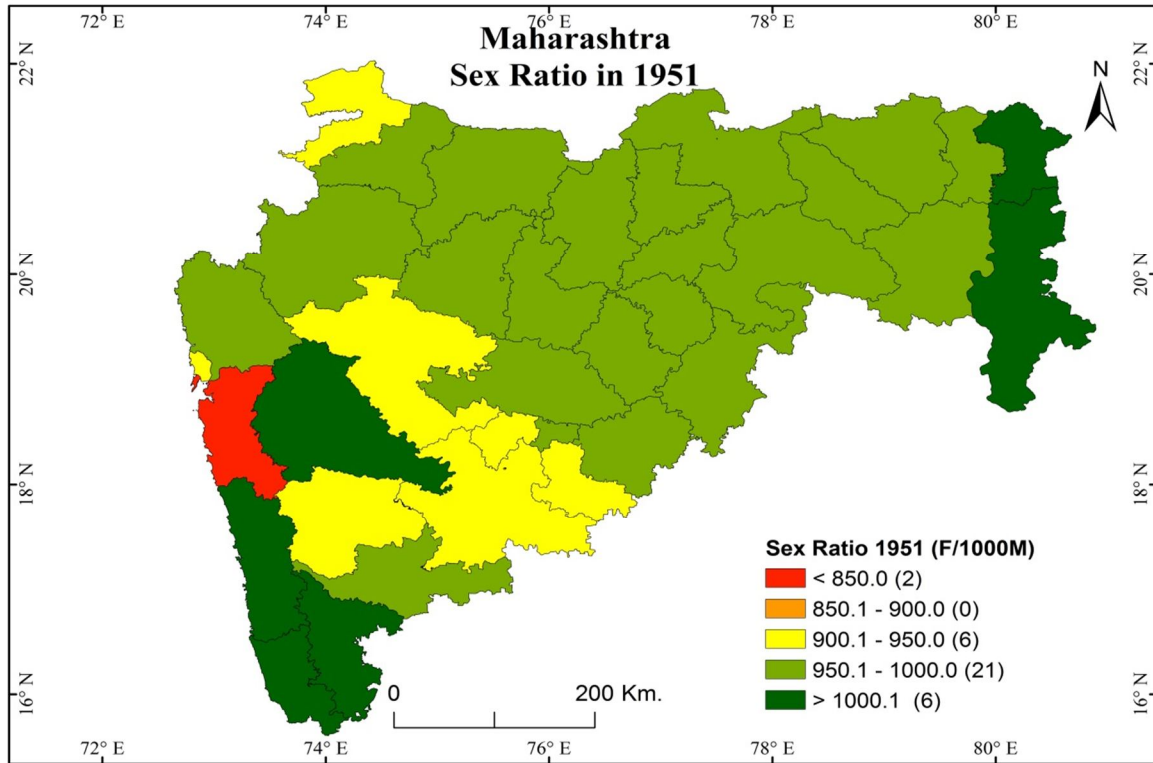


Figure 10: Sex Ratio of Maharashtra State in 1951

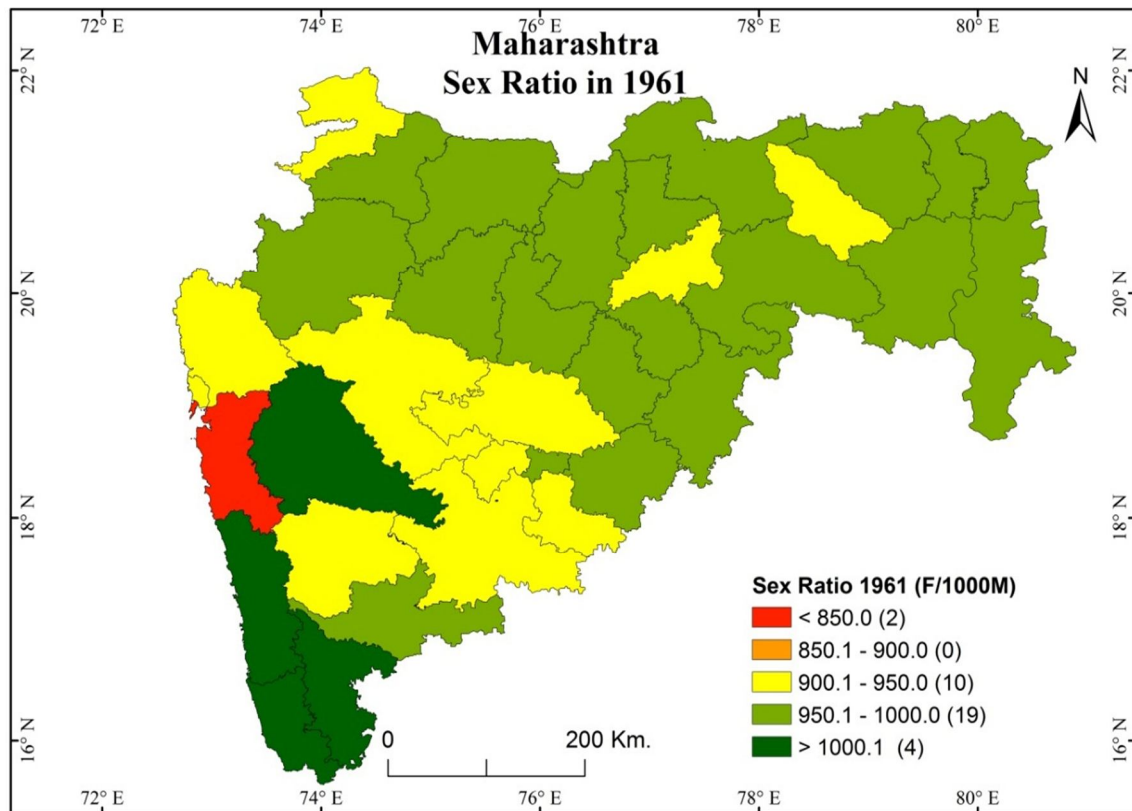


Figure 11: Sex Ratio of Maharashtra State in 1961

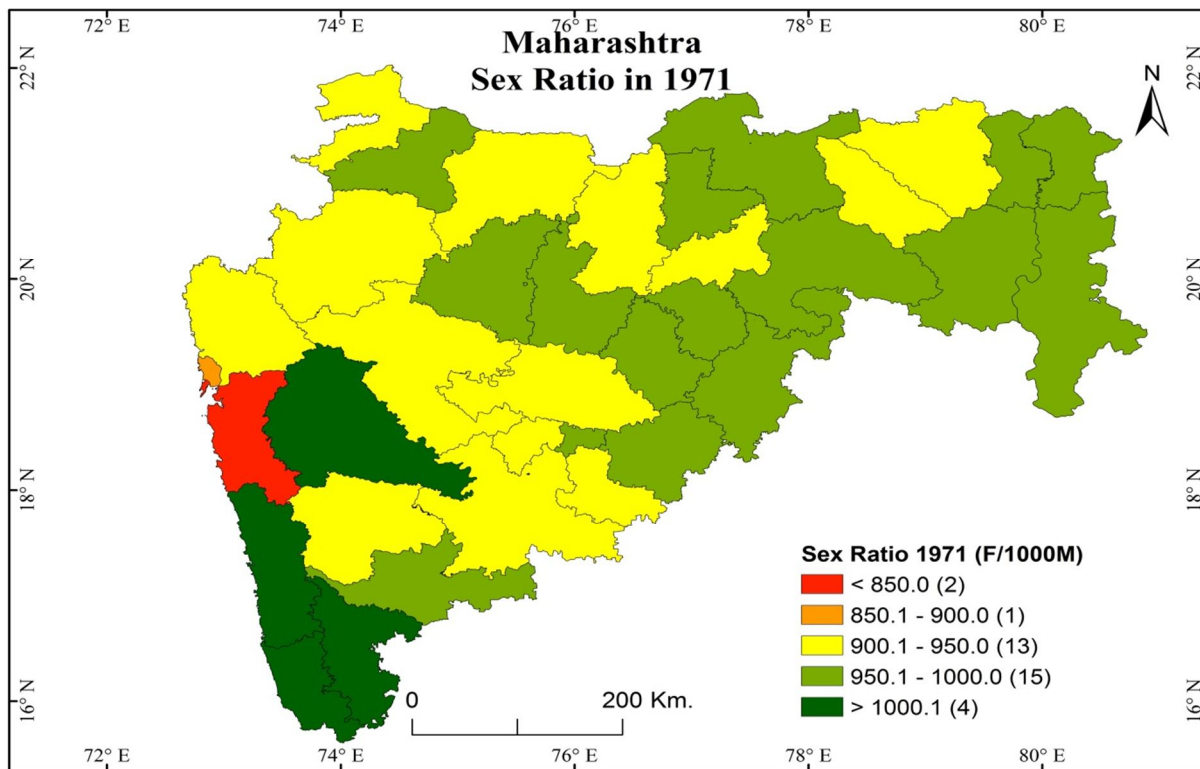


Figure 12: Sex Ratio of Maharashtra State in 1971

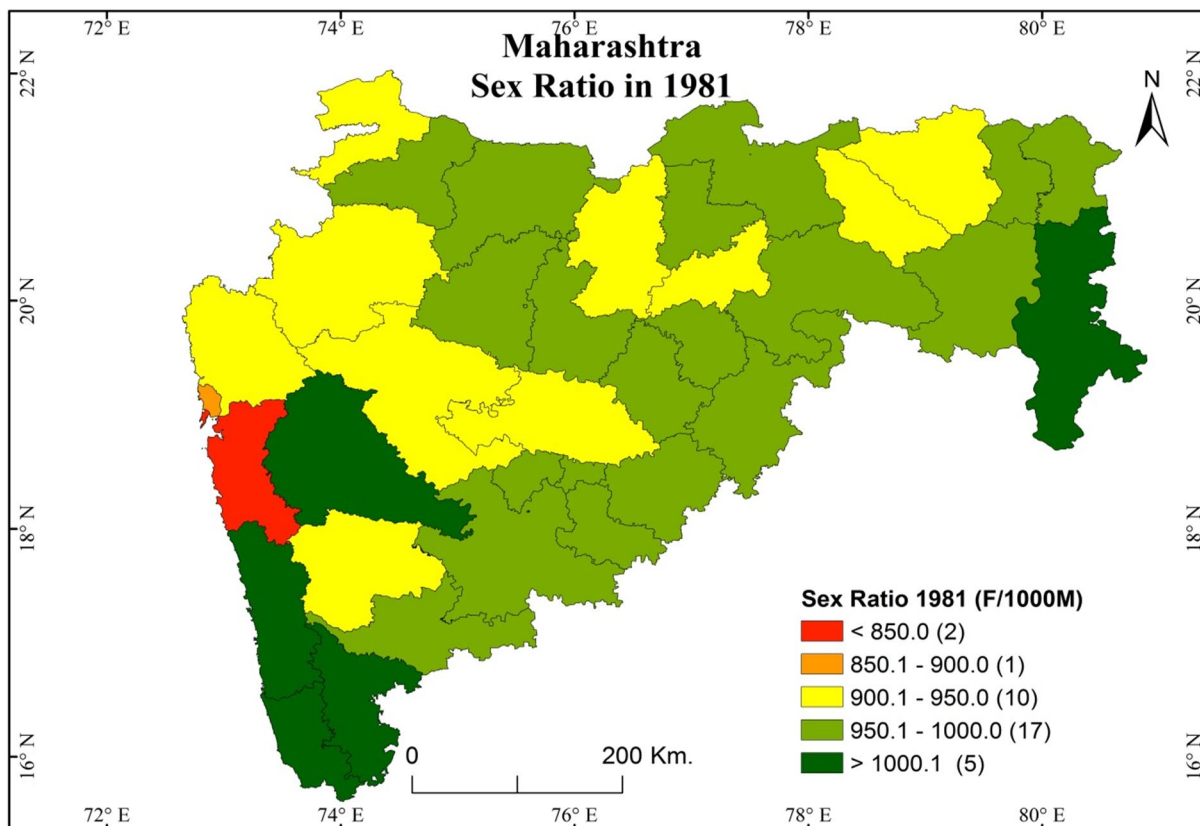


Figure 13: Sex Ratio of Maharashtra State in 1981

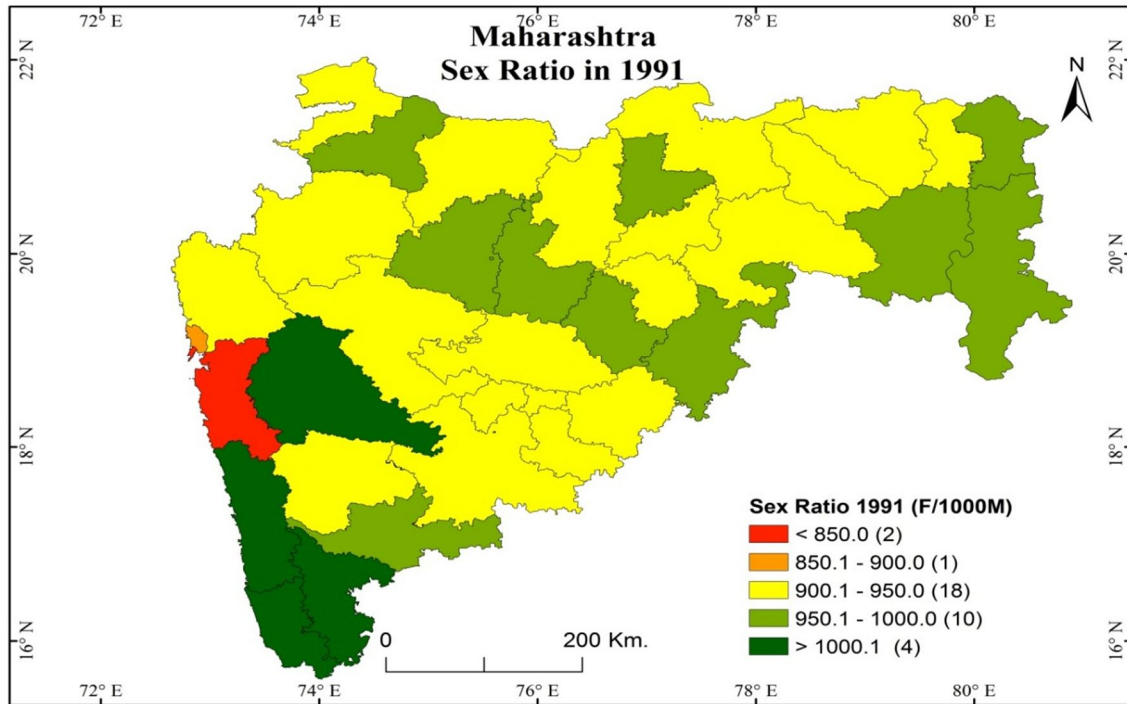


Figure 14: Sex Ratio of Maharashtra State in 1991

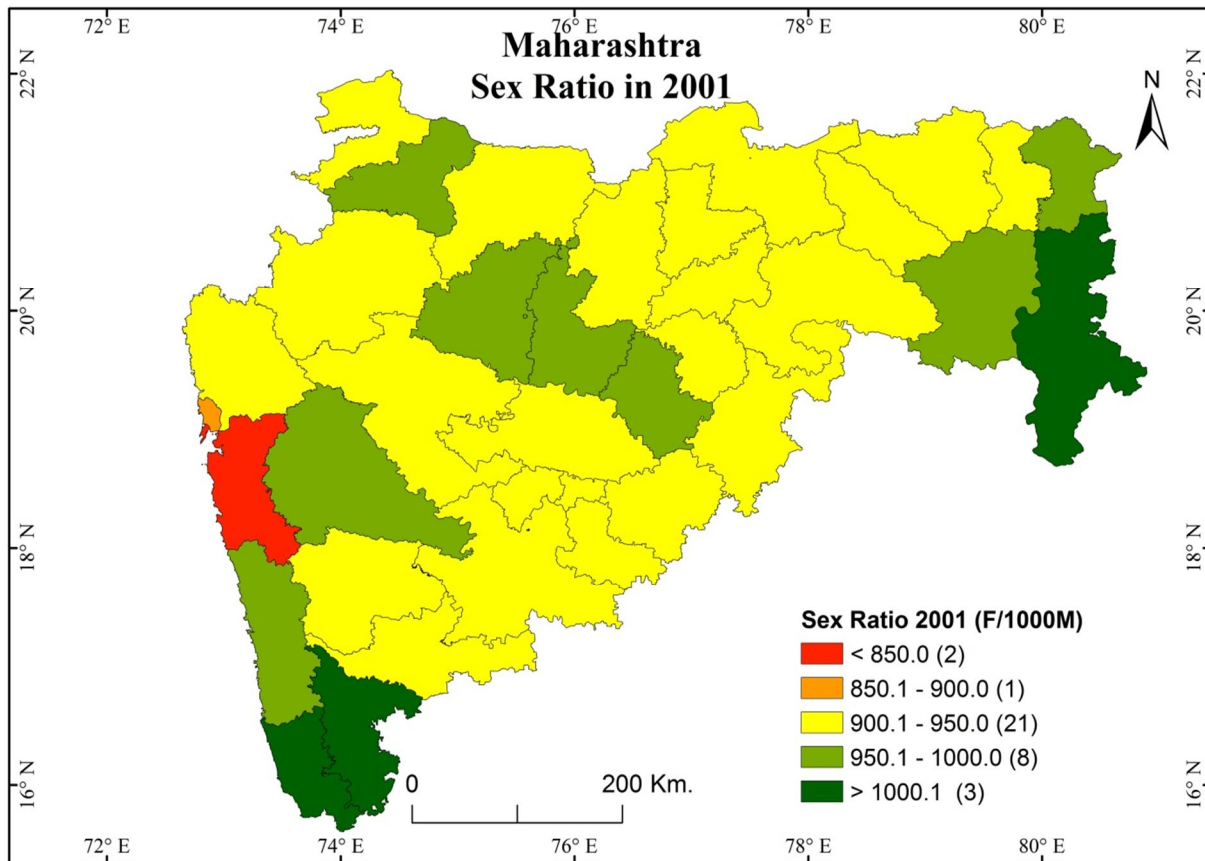


Figure 15: Sex Ratio of Maharashtra State in 2001

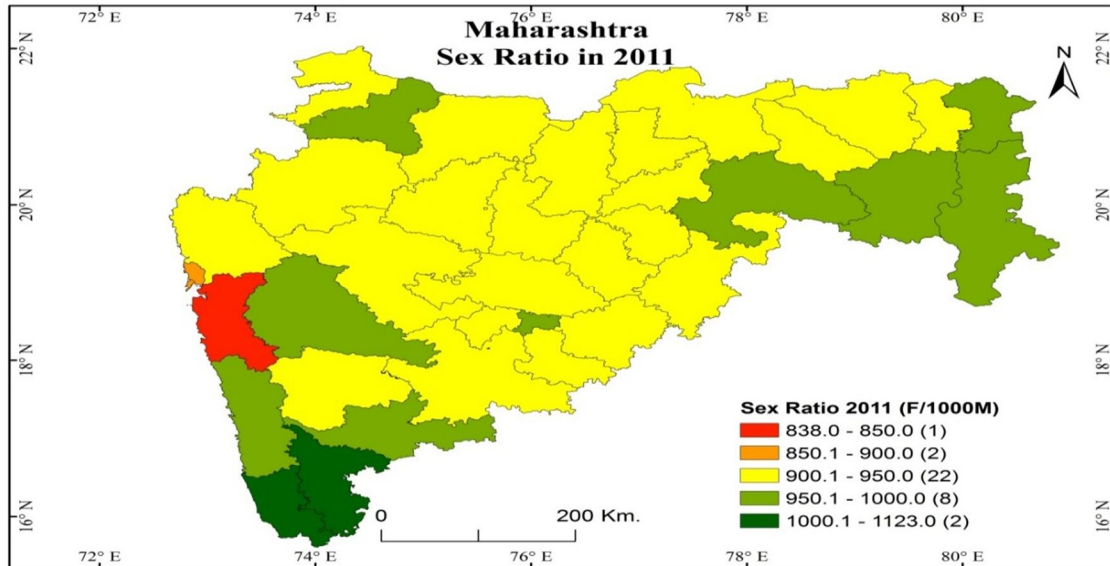


Figure 16: Sex Ratio of Maharashtra State in 2011

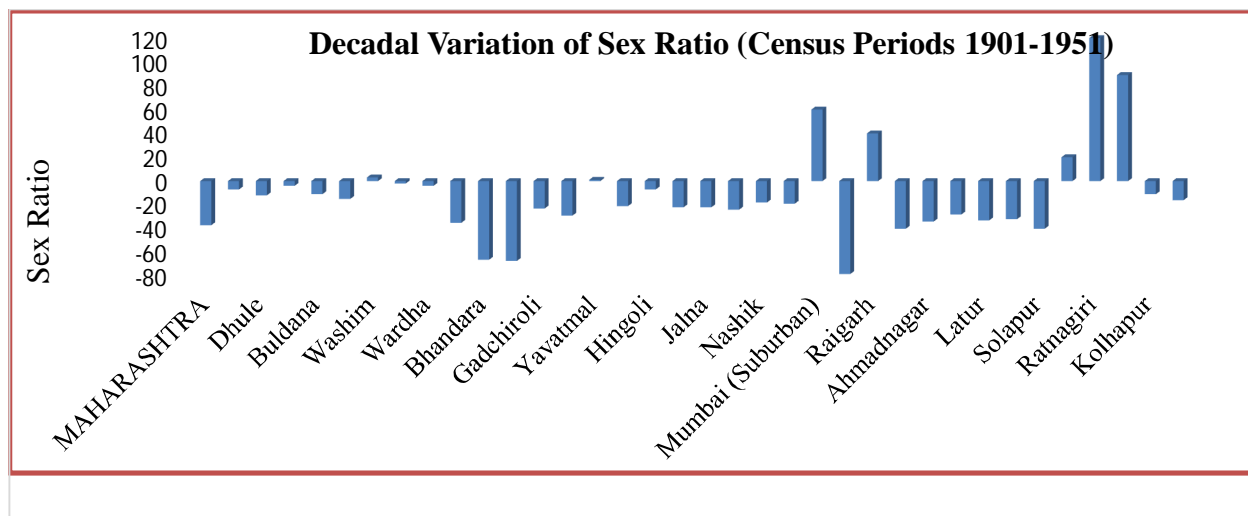


Figure 17: Decadal Variation of sex ratio (Census Periods 1901-1951)

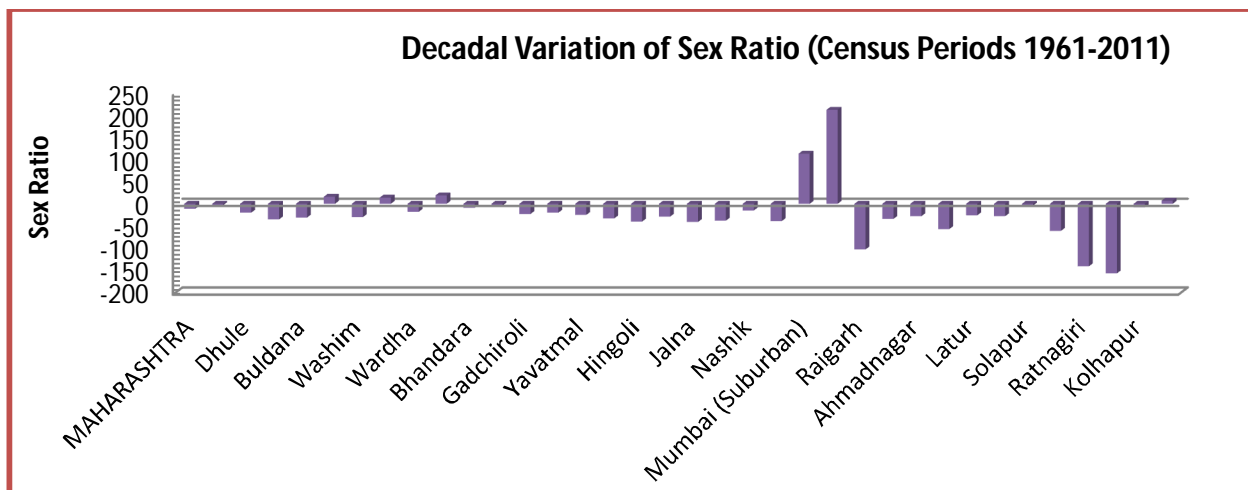


Figure 18: Decadal Variation of sex ratio (Census Periods 1961-2011)

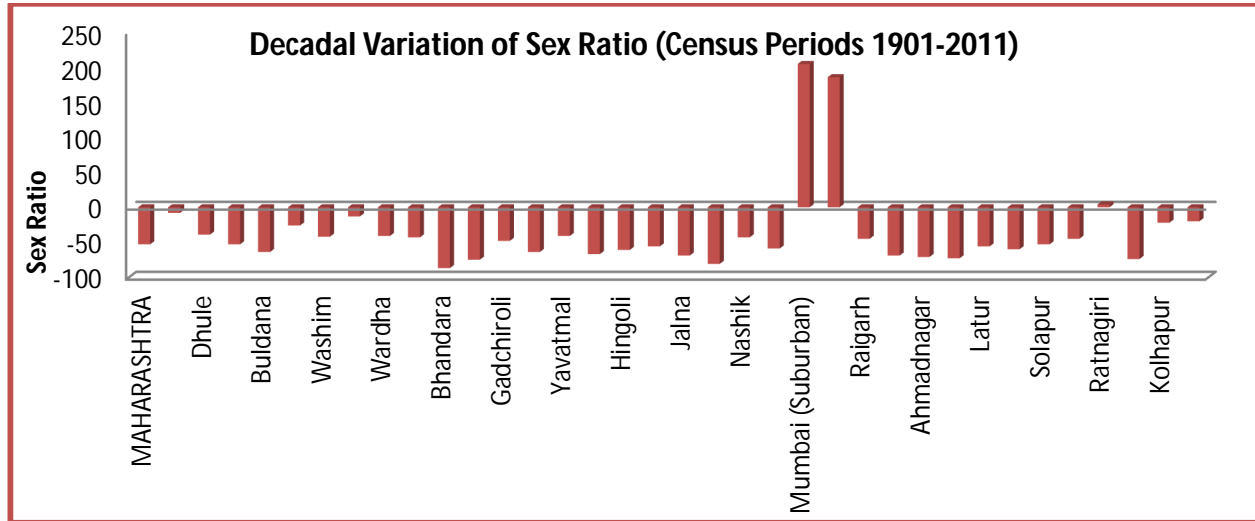


Figure 19: Decadal Variation of sex ratio (Census Periods 1901-2011)

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