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Population: It's Spatial Dimensions and Attributes in Ranchi District

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Abstract
Population geography is an important branch of Human Geography that focuses on the study of Human population, its density, growth, composition and distribution. The study of population distribution refers to the statistical characteristics of a population including age, gender, race ethnicity, income, education and geographic location. Analyzing demographic distribution is crucial for understanding the social dynamics, economic trends and public policy implications. This policy can inform businesses, governments and organizations about the need and preferences of different population segments.
The spatial distribution of population across geographic areas exhibits certain patterns which are of primary interest to both the demographers and geographers. This paper attempts to analyze the regional disparity of population at block-level in the most populous district of Jharkhand. Ranchi district is contributed by combination of various factors that has developed it into the most populous district of Jharkhand using the concentration index component. Apart from the trends in population growth, various methods have been adopted to gain a better understanding of the spatial dimension of the population.

Keywords: Spatial distribution, Regional disparity, Concentration Index.

Introduction

Population studies are a vital aspect of understanding the socio-economic development and regional planning of any area. The spatial distribution and demographic attributes of a population provide insights into resource utilization, settlement patterns, infrastructure development, and future growth potential. Ranchi district, located in the eastern Indian state of Jharkhand, presents a unique case for population analysis due to its diverse landscape, rapid urbanization, and historical socio-cultural significance.
With a geographical area encompassing urban centres, rural villages, and tribal regions, Ranchi has witnessed significant demographic changes over the years. The population growth, density, and composition in this district are influenced by various natural and human factors such as topography, availability of resources, industrial development, and migration. The analysis of spatial dimensions—how population varies across different regions—and attributes such as age, gender, literacy, and occupation, is crucial for policymakers to address issues like regional disparity, unemployment, and access to public services.
This study aims to explore the spatial distribution of population across Ranchi district, identifying key demographic trends and correlating them with geographical features and socio-economic variables. By

understanding these factors, it becomes possible to assess challenges related to population pressure, urban sprawl, and resource management.

Objectives

The main objectives of the present study are as follows:

a) To identify the characteristics of population growth between the different blocks in Ranchi district.
b) To identify the block with maximum concentration of population.

Study Area

Ranchi district, located in the southern part of Jharkhand state, India, is one of the most prominent districts in the region due to its historical, economic, and administrative significance. Spanning a total area of approximately 5,097 square kilometres, Ranchi is characterized by a diverse topography, with plateaus, hills, rivers, and forests forming its natural landscape. The district lies at an average elevation of 651 meters above sea level. It is situated between **23°13′ N to 23°40′ N latitude** and **85°18′ E to 85°34′ E longitude**, bordered by Gumla, Lohardaga, Khunti, and Ramgarh districts. Its central location within the state makes it a critical point for regional connectivity and development.

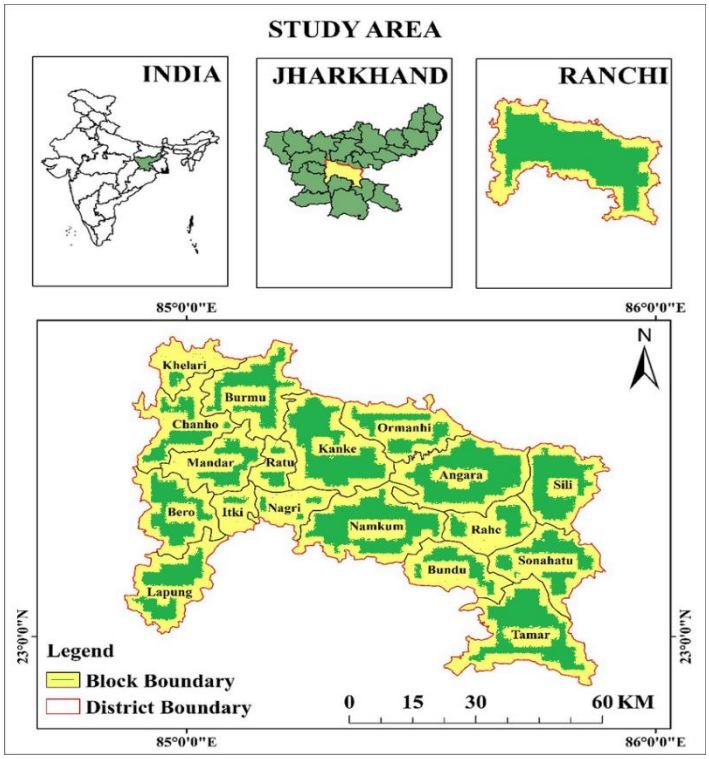

Fig. 1.1: Map showing the study area (Ranchi district).

According to the 2011 Census, Ranchi district had a population of **2.91 million**, with a literacy rate of **76.06%** and a population density of **576 persons per square kilometer**. Ranchi's population shows a stark contrast between urban and rural areas, with rapid urbanization occurring in and around Ranchi city. Moreover, the district's demographic diversity, varying population densities, and uneven distribution of resources across its blocks make it a suitable case for comparative analysis of urban and rural development trends.

Research Methodology

The present study is based on the secondary data collected from the District Statistical Handbooks, Published research articles and government publications. It implies certain methods to identify the blocks with higher population density and concentration. This study adopts a mixed-method approach, combining both qualitative and quantitative methods. The quantitative component involves statistical analysis of demographic data, while the qualitative component focuses on understanding the socio-economic attributes and spatial distribution patterns.

Result & Discussion

Uneven Population Distribution in Ranchi District:

The uneven population distribution across different blocks in Ranchi district can be attributed to several socio-economic factors, including urbanization, economic opportunities, infrastructure development, and access to education and healthcare. Below is a detailed analysis of these key factors:

a) Urbanization and Economic Opportunities

Urban-Centered Growth: Ranchi, the district headquarters and the capital of Jharkhand, serves as a major economic and administrative hub. Blocks closer to Ranchi city, such as **Kanke**, **Namkum**, and **Ratu**, have higher population densities due to the availability of employment opportunities in industries, services, and government institutions. The presence of educational institutions, hospitals, and markets in urbanized blocks attracts migration from rural areas, contributing to higher population density in these blocks.

Industrialization: Blocks like **Kanke** and **Namkum** have witnessed significant industrial growth, including small and medium-scale industries. This has led to increased employment opportunities, drawing more people to settle in these areas. In contrast, blocks such as **Lapung** and **Burmu**, which lack industrial development, have lower population density as people migrate to more economically vibrant areas.

b) Agricultural Productivity

Blocks with fertile land and better irrigation facilities, such as **Bero** and **Silli**, have a relatively higher population density, as agriculture remains the primary livelihood for a large section of the population. **Lapung** and **Burmu** blocks, which have hilly terrain and less fertile soil, support fewer people due to limited agricultural productivity, leading to lower population density.

c) Infrastructure Development

Transportation and Connectivity: Blocks that are well-connected by roads and public transportation, such as **Ratu**, **Mandar**, and **Kanke**, tend to have higher population densities. Good connectivity enhances access to markets, education, and healthcare, making these areas more attractive for settlement. Remote blocks like **Lapung** and **Burmu** have poor transportation infrastructure, limiting economic activities and access to services, resulting in sparse population distribution.

Access to Public Services: Blocks with better access to schools, healthcare centers, and public utilities have higher population densities. **Namkum** and **Silli** blocks, for example, have relatively better access to these services, encouraging people to settle there. In contrast, blocks with inadequate public services, such as **Itki** and **Lapung**, have lower population densities, as people move to better-served areas.

d) Migration Patterns

In-Migration: Blocks like **Kanke**, **Namkum**, and **Ratu** experience significant in-migration due to job opportunities, better living conditions, and proximity to Ranchi city.

Out-Migration: Blocks such as **Lapung**, **Mandar**, and **Burmu** experience out-migration, as people move to urban centers in search of better livelihoods and services. Seasonal migration is also common in these rural areas, where people temporarily migrate to cities for work during lean agricultural periods.

CONCENTRATION INDEX

The **Concentration Index (CI)** is a statistical measure used to quantify the degree of inequality in the spatial distribution of a population or any other socio-economic attribute across different regions. It provides a single value that reflects how concentrated or unevenly distributed the population is in a given area.

The Concentration Index (CI) is given by:

$$CI = \frac{\sum \left(\frac{P_i}{P_t} \cdot \frac{A_t}{A_i} \right)}{n}$$

Where:

- *Pi* : Population of block *i*
- *Pt*: Total population of Ranchi district
- *Ai*: Area of block *i*
- *At*: Total area of Ranchi district
- *n*: Total number of blocks

Interpretation of CI Values

- **CI ≈ 1**: Indicates a balanced population distribution. Population density is proportional to land area across blocks.
- **CI > 1**: Population is concentrated in certain areas relative to their size (higher density in smaller areas).
- **CI < 1**: Population is more dispersed, with larger areas having relatively lower populations.

Table 1.1: The concentration index of different blocks of Ranchi district.

Block	Area (sq. km)	Population	Pi / Pt	At / Ai	CI Component
Angara	398.56	1,12,759	0.0681	11.98	0.8151
Bero	290.7	1,13,090	0.0683	16.42	1.1208
Bundu	250.85	61,921	0.0374	19.03	0.7112
Burmu	319.67	89,889	0.0543	14.93	0.8101
Chanho	272.8	1,07,503	0.0649	17.5	1.1353
Itki	96.86	50,058	0.0302	49.28	1.4889
Kanke	347.11	2,16,930	0.1309	13.75	1.8005
Khelari	131.38	21,869	0.0132	36.33	0.4796
Lapung	300.88	63,053	0.0381	15.87	0.6038
Mandar	238.24	1,28,585	0.0776	20.04	1.555
Nagri	121.93	65,252	0.0394	39.15	1.5418
Namkum	415.61	1,18,002	0.0712	11.49	0.818
Ormanjhi	227.97	88,927	0.0537	20.94	1.1238

Rahe	180.42	53,916	0.0325	26.46	0.861
Ratu	104.47	54,186	0.0327	45.69	1.4943
Silli	289.54	1,01,054	0.061	16.49	1.0055
Sonahatu	273.12	77,252	0.0466	17.48	0.8149
Tamar I	513.53	1,32,672	0.0801	9.3	0.7443

Analysis of Blocks Based on CI Components

1. Blocks with High CI Values (≥ 1.4)

These blocks have a significantly higher population density compared to their land area:

- **Itki**: 1.4889
- **Ratu**: 1.4943
- **Nagri**: 1.5418
- **Mandar**: 1.5550

These blocks are likely urban or semi-urban centers, contributing to higher population concentrations within smaller areas. Urbanization and infrastructural developments might be prominent here.

2. Blocks with Moderate CI Values (1.0–1.4)

These blocks exhibit a relatively balanced population distribution:

- **Kanke**: 1.8005
- **Chanho**: 1.1353
- **Silli**: 1.0055
- **Bero**: 1.1208
- **Ormanjhi**: 1.1238

These blocks might be transitioning between rural and semi-urban status, indicating a gradual population influx without significant overpopulation issues relative to their areas.

3. Blocks with Low CI Values (< 1.0)

These blocks are sparsely populated relative to their land area:

- **Sonahatu**: 0.8149
- **Angara**: 0.8151
- **Namkum**: 0.8180
- **Burmu**: 0.8101
- **Bundu**: 0.7112
- **Tamar I**: 0.7443
- **Khelari**: 0.4796

These blocks are more rural and may have lower population densities, possibly due to geographical challenges, limited resources, or a predominantly agrarian economy.

Observations

1. **Urban Influence**: Blocks like **Kanke** and **Ratu** exhibit high CI values due to their proximity to Ranchi city, where population density is typically higher.
2. **Rural Areas**: Blocks like **Bundu**, **Tamar I**, and **Khelari** are relatively underpopulated, indicating the presence of large land areas with lower population pressure.
3. **Mixed Dynamics**: Blocks with moderate CI values (e.g., **Chanho**, **Bero**) may be undergoing a transition, potentially impacted by infrastructure development or migration.

Present day scenario: The C.I of the different blocks of Ranchi district has been calculated using the Census data of 2011, but the situation a decade back could also influence the present-day scenario. Therefore, it can be analysed that the blocks like **Kanke**, **Ratu**, **Nagri**, and **Mandar** with high CI values, indicating significant population concentrations will likely experience further urbanization and population growth due to their proximity to Ranchi city, the district's administrative and economic hub. Increased housing demand, traffic congestion, and pressure on urban infrastructure are expected. The trend is also amplified by the developmental projects like the Smart City Mission.

Whereas, the blocks like **Chanho**, **Bero**, **Ormanjhi**, and **Silli** which show moderate CI values, suggesting a transition phase between rural and semi-urban characteristics. These regions may see population growth due to spillover effects from urban centers. Improved connectivity and infrastructure development, such as roads, schools, and hospitals, has played an important role to attract inward migration. The agricultural region has also seen a decline. And the blocks like **Khelari**, **Bundu**, **Tamar I**, and **Sonahatu** showing low CI values might maintain their rural character with slower population growth in the upcoming years. A large number of youths have been migrating from these blocks due in search of better job opportunities and can lead to possible aging population due to out-migration of youth seeking jobs in urban areas.

Conclusion

The study of population distribution in Ranchi district highlights significant spatial disparities, with urban areas experiencing high population concentrations and rural regions showing sparser populations. The Concentration Index (CI) analysis further elucidates this trend, revealing that blocks close to Ranchi city are seeing urbanization and population growth, while more rural areas are facing challenges such as outmigration and aging populations.

As Ranchi continues to urbanize, it is crucial to focus on sustainable urban planning in high-CI areas to manage overcrowding, resource pressure, and infrastructure demands. Simultaneously, rural areas need targeted development initiatives to improve agriculture, livelihoods, and basic services, in order to retain and attract populations, especially the youth. The spatial dimensions of population in Ranchi district are shaped by a combination of economic opportunities, access to services, and geographical factors, which drive migration patterns. A balanced development strategy is necessary to bridge the urban-rural divide, ensuring that both urban and rural areas experience growth and prosperity in tandem.

In conclusion, the population dynamics of Ranchi district underscore the need for strategic interventions to foster equitable growth. By focusing on urban sustainability, rural development, and resource management, Ranchi can successfully navigate its population challenges, leading to a more resilient and prosperous future for all its residents.

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