Urban–Rural Educational Disparity in the Union Territory of Puducherry: A Theoretical and Empirical Context

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ABSTRACT

Education plays a pivotal role in promoting socio-economic development by enhancing human capital, improving productivity, and expanding opportunities for social mobility. Despite sustained policy efforts and overall improvements in literacy, educational benefits remain unevenly distributed across spatial and social groups in India. One of the most persistent dimensions of inequality is the disparity between urban and rural areas, where differences in infrastructure, institutional access, socio-economic conditions, and educational quality continue to shape unequal outcomes. This study examines urban–rural educational disparity in the Union Territory of Puducherry over the period 1971–2021. Using literacy rates as a key indicator, the research analyses long-term trends, measures the extent of educational inequality through appropriate disparity indices, and evaluates inter-regional variations across Puducherry, Karaikal, Mahe, and Yanam. Grounded in theoretical frameworks such as human capital theory, spatial inequality theory, and the capability approach, the study explores the structural and institutional factors underlying persistent educational gaps. The findings are expected to reveal significant progress in overall literacy alongside continued urban–rural and inter-regional disparities, indicating partial convergence rather than complete equity. By providing empirical evidence on the nature and magnitude of educational inequality, the study aims to contribute to academic discourse and support evidence-based policy formulation. The policy implications focus on strengthening rural educational infrastructure, improving teacher deployment, enhancing retention, and promoting inclusive and balanced educational development within the Union Territory of Puducherry.

Key words: Union Territory of Puducherry, educational inequality, disparity, urban, rural.

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Introduction

Education occupies a central position in socio-economic development by enhancing human capabilities, improving productivity, and expanding opportunities for upward social mobility. It is widely recognized as a critical investment in human capital rather than merely a social welfare provision. Through the accumulation of knowledge, skills, and competencies, education contributes not only to individual advancement but also to regional competitiveness and national economic growth. However, educational benefits are not distributed evenly across populations, and disparities in access, quality, and outcomes remain persistent across spatial, social, and economic divisions.

One of the most pronounced manifestations of educational inequality is the disparity between urban and rural areas. Rapid population growth, urbanization, and uneven spatial development have concentrated educational infrastructure, skilled teachers, and institutional resources in urban centers. Urban areas typically offer superior access to schools, higher education institutions, technological resources, and academic support systems. In contrast, rural regions frequently encounter infrastructural deficiencies, limited institutional density, economic constraints, and higher opportunity costs of schooling, which collectively hinder sustained educational participation and achievement. These inequalities contribute to long-term imbalances in human capital formation, labor mobility, and income distribution.

Theoretical Perspectives on Educational Disparity

Several theoretical frameworks provide insight into the persistence of educational disparities. **Human Capital Theory** (Becker, 1964; Schultz, 1961) conceptualizes education as an investment that enhances productivity and lifetime earnings, implying that unequal educational access perpetuates regional and income inequality. Regions that underinvest in education often experience slower economic development and weaker labor-market outcomes.

Spatial Inequality Theory explains how development tends to cluster geographically due to economies of scale, institutional concentration, and infrastructure advantages, leading to cumulative advantages in already-developed regions and persistent deprivation in peripheral areas (Myrdal, 1957). This cumulative causation framework helps explain why urban regions continue to outperform rural areas in educational access and outcomes.

Capability Approach Theory (Sen, 1999) emphasizes that education expands individuals' freedoms and life opportunities. From this perspective, educational disparity reflects a deprivation of capabilities, limiting individuals' ability to participate fully in economic, social, and political life.

Additionally, **Cultural Capital Theory** (Bourdieu, 1986) suggests that educational success is shaped by social and cultural resources embedded within households and communities. Urban families often possess greater cultural and institutional capital, further reinforcing educational advantages over rural households. Together, these theories underscore that educational disparities arise from interlinked economic, spatial, institutional, and socio-cultural factors rather than isolated infrastructural gaps.

Urban–Rural Educational Disparity in India

In India, urban–rural educational disparity remains a persistent policy concern despite decades of reform aimed at universalizing elementary education and improving literacy. National initiatives such as the Sarva Shiksha Abhiyan (SSA), Rashtriya Madhyamik Shiksha Abhiyan (RMSA), and the National Education Policy (NEP) have expanded enrolment and improved literacy rates. However, gaps persist in school retention, learning outcomes, and access to higher education.Empirical studies highlight that rural students face compounded disadvantages due to poverty, child labor, gender norms, limited institutional access, and weaker educational quality (Kingdon, 2007; Tilak, 2002). Coleman et al. (1966) demonstrated that family background and community context exert a strong influence on educational achievement, reinforcing spatial inequality. These findings suggest that reducing educational disparity requires structural interventions beyond school expansion, including economic support, teacher deployment reforms, and community-based educational development. Based on the above theory the following objectives are framed.

The specific objectives of the study are:

1. To examine trends in urban and rural literacy rates in the Union Territory of Puducherry.
2. To measure the extent of urban–rural educational disparity using appropriate statistical indices.
3. To analyze inter-regional variations in educational development across Puducherry, Karaikal, Mahe, and Yanam.
4. To propose policy measures aimed at reducing educational inequality and promoting inclusive educational development.

Context of the Study and methodology

Methodology

The analysis is based exclusively on secondary data obtained from officially published Census reports and Statistical Handbooks of Puducherry issued by the Directorate of Economics and Statistics. These sources provide consistent and reliable information on literacy levels across urban and rural areas for selected census years.The study adopts a descriptive and analytical research design to examine patterns of literacy development and urban–rural disparity in the Union Territory of Puducherry. The unit of analysis comprises the four administrative regions of the Union Territory—Puducherry, Karaikal, Mahe, and Yanam. Literacy rates are analysed separately for urban and rural populations to capture spatial differences in educational attainment. Since Mahe and Yanam do not have rural populations, rural literacy analysis is confined to Puducherry and Karaikal. The study period extends from 1971 to 2021, with the 2021 figures based on estimates derived from officially available data. To examine the changes and regional variation, literacy data are systematically tabulated and compared across census years. Descriptive statistical techniques such as percentages and ratios are used to trace trends in literacy growth, while ranking analysis is employed to assess the relative performance of regions over time. These techniques enable a clear comparison of educational outcomes across space and time.

To quantify the extent of inequality between urban and rural literacy levels, the Urban–Rural Disparity Index is computed for each region using the following formula:

Urban–Rural Disparity Index (D) = (Urban Literacy Rate – Rural Literacy Rate) / Total Literacy Rate

The index provides a standardised measure of disparity that facilitates inter-temporal comparison irrespective of changes in overall literacy levels. Higher index values indicate greater urban–rural inequality, while lower values reflect convergence. Inferential statistical tools are used to assess the significance of observed differences. One-way Analysis of Variance (ANOVA) is applied to test whether urban literacy rates differ significantly across regions, while an independent sample t-test is used to examine differences in rural literacy between Puducherry and Karaikal (since only two samples, Mahe and Yanam does not have Rural region). The results are interpreted at the 5 per cent level of significance. By integrating descriptive measures, index-based analysis, and inferential statistics, the methodology ensures a systematic and robust assessment of long-term trends in urban–rural educational disparity in the Union Territory of Puducherry.

Hence the paper has the following sections: Introduction and the theories related to Educational Disparity along with objective and methodology is

discussed in section 1. Section 2 deals with literature review, data analysis and interpretation is discussed in section 3. Finally, conclusion and policy suggestions are presented in section 4.

Section 2: Review of Literature

Urban–rural disparity in education has been a central theme in development economics and social science research. Scholars have consistently emphasized that spatial inequalities in educational access and outcomes reflect broader socio-economic and infrastructural imbalances.

Human capital theorists emphasize education's role in enhancing productivity and economic returns **(Becker, 1964; Schultz, 1961). Sen (1999)** frames education as a core component of human development, linking inequality in educational access to broader social exclusion.**Tilak (2002)** argues that public expenditure patterns significantly shape educational access and equity, with underinvestment exacerbating regional inequality. **Kingdon (2007)** documents persistent educational gaps across Indian states, attributing them to institutional quality, income disparities, and opportunity costs. **Asadullah and Yalonetzky (2012)** highlight that regional educational gaps reflect both household-level constraints and institutional capacity, suggesting that targeted regional interventions are essential. **Tilak (2015)** highlighted that rural areas in India continue to lag behind urban centers in terms of educational infrastructure, teacher availability, and access to higher education. According to the study, although literacy levels have improved nationally, disparities persist due to income inequality, occupational structure, and uneven public investment. **Desai and Kulkarni (2016)** examined regional inequalities in education and found that urban populations benefit disproportionately from institutional expansion and private sector participation. Their findings suggest that rural households face higher opportunity costs of schooling, leading to lower retention and transition rates at secondary and higher levels. **Kingdon (2017)**analyzed gender and spatial dimensions of educational inequality in India and observed that rural girls face compounded disadvantages due to poverty, social norms, and limited institutional access. The study emphasized that reducing urban–rural gaps requires targeted interventions beyond universal enrolment policies. **Basu and Das (2018)** studied literacy trends across Indian states and reported a gradual convergence between urban and rural literacy rates in socially progressive regions. However, they noted that convergence is uneven and slower in regions with limited economic diversification. **Rao and Sharma (2019)** focused on Union Territories and found that smaller administrative regions often exhibit internal disparities despite high average literacy levels. Their study pointed out that regional heterogeneity within Union Territories is frequently overlooked in policy formulation. **Kumar and Rani (2020)** examined enrolment patterns in technical education and found that rural students and socially disadvantaged groups remain underrepresented despite expansion in skill-based education. The study stressed the need for inclusive policies targeting rural youth. Recent work by **UNESCO (2021)** emphasized that equitable educational development requires reducing spatial inequalities, improving rural infrastructure, and ensuring inclusive access to technical and higher education. The report highlighted that sustained reduction in urban–rural disparity is essential for achieving inclusive and sustainable development. **UNESCO (2022)** emphasized that the COVID-19 pandemic widened pre-existing urban–rural educational gaps, particularly due to unequal access to digital infrastructure in rural areas. The report highlighted that rural students experienced greater learning loss and recommended blended learning models and community-based digital centres to bridge the divide. **The World Bank (2022)** examined learning poverty in developing countries and observed that rural regions continue to lag behind urban areas in foundational literacy and numeracy. The study stressed that improving rural school quality, teacher training, and early childhood education is essential for long-term convergence. **ASER (Annual Status of Education Report) 2023** revealed that although enrolment levels in rural India have recovered to pre-pandemic levels, learning outcomes remain uneven when compared with urban counterparts. The report pointed out that rural students show lower proficiency in reading and arithmetic, indicating quality-related disparities rather than access-related issues. **Kumar and Singh (2023)** analysed the impact of digital education initiatives under the National Education Policy (NEP) 2020 and found that urban students benefit more from online and hybrid learning due to better connectivity and device availability. The study argued that rural digital infrastructure development is crucial for ensuring equitable educational outcomes. **Rani and Mohanty (2024)** studied regional educational inequality in Indian Union Territories and concluded that internal disparities persist despite high average literacy rates. Their findings align with earlier studies, emphasizing that rural pockets within small administrative regions require targeted policy interventions. A recent **UNESCO–UNICEF joint report (2025)** highlighted that inclusive and resilient education systems must focus on rural innovation, community participation, and localized solutions. The report stressed that reducing spatial educational inequality is central to achieving Sustainable Development Goal 4 (Quality Education).

Section 3: Data Analysis and Interpretation

3.1. Urban Literacy Rate in Puducherry

Table1 provides the quantitative foundation for understanding regional variations in educational attainment within urban areas of the Union Territory. While the absolute literacy levels indicate steady improvement across all regions, a deeper understanding of relative performance and convergence requires supplementary analytical tools. Accordingly, ranking analysis and statistical testing are employed to assess whether observed differences are persistent and statistically meaningful.

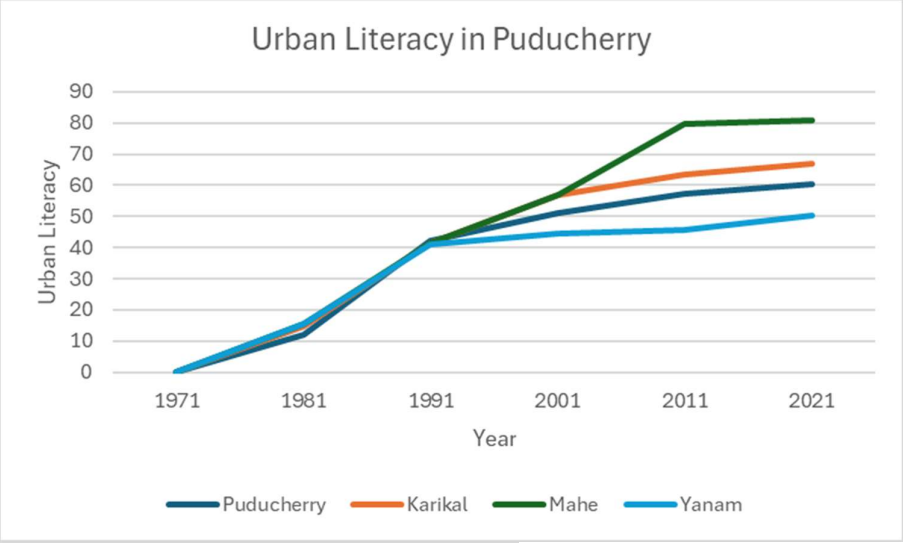
Table 1:Urban Literacy Rate

Year	Puducherry	Karikal	Mahe	Yanam
1971	56.23	54.50	54.50	54.50
1981	63.03	62.50	63.00	63.00
1991	79.88	77.00	77.00	76.90
2001	85.05	85.50	85.50	78.80
2011	88.49	89.08	97.87	79.47
2021*	90.20	91.00	98.50	82.00

Source: Various sources of Statistical Handbook, Puducherry (DES)

3.1.1. Trend Analysis

Chart. 1: Trend Analysis of Urban Literacy Rate



The trend analysis (chart 1) of urban literacy in Puducherry shows a steady improvement across all regions from 1971 to 2021. The zero values in 1971 represent the base year for comparison. From 1981 onwards, urban literacy increased consistently in every region.Puducherry and Karaikal recorded gradual and continuous growth over the decades. Mahe showed a faster rise,especiallyafter2001, and emerged as the best-performing region in urban literacy. Yanam also experienced improvement, though at a comparatively slower pace. By 2011and 2021,the gap between regions became more visible, particularly with Mahe leading. Karaikal maintained a better position than Puducherry in most years. Despite differences in growth rates, all regions achieved notable progress in urban literacy. Overall, the trend reflects sustained improvement along with regional variation in the pace of urban literacy development.

3.1.2. Ranking Analysis

Table 2: Ranking Urban Literacy

Year	Puducherry	Karikal	Mahe	Yanam
1971	1	2	2	2
1981	1	4	2	2
1991	1	2	2	4
2001	3	1	1	4
2011	3	2	1	4
2021	3	2	1	4

The ranking analysis of urban literacy rates from the above table 2, shows noticeable changes in the relative position of regions over time. In 1971, Puducherry secured the first rank, while Karaikal, Mahe, and Yanam shared the second position, indicating similar levels of urban literacy at the initial stage. By 1981, Puducherry continued to hold the first rank, whereas Karaikal slipped to

the fourth rank, and Mahe and Yanam occupied the second position. In 1991, Puducherry again ranked first, followed by Karaikal and Mahe in second position, while Yanam moved to fourth rank. A significant shift occurred in 2001, when Karaikal and Mahe attained the first rank, while Puducherry moved to the third position and Yanam remained at the lowest rank. This pattern continued in 2011 and 2021, with Mahe consistently securing the first rank, Karaikal occupying the second position, Puducherry remaining in the third rank, and Yanam continuing in the fourth rank. The ranking pattern clearly indicates that Mahe emerged as the strongest performer in urban literacy in the later years, while Yanam lagged despite improvement in absolute terms.

3.1.2. One way ANOVA

Table 3: ANOVA Table

Source of Variation	SS	df	MS	F	P-value	F critical
Between Groups	151.24901	3	50.416	0.230	0.874	3.098
Within Groups	4385.4855	20	219.274			
Total	4536.7345	23				

To examine whether urban literacy levels differ significantly across the regions of Puducherry Union Territory, a one-way ANOVA test was applied and its results are presented in table 3. The calculated F-statistic is 0.230, with a corresponding p-value of 0.8744. Since the p-value is much higher than the 5% level of significance, the null hypothesis is not rejected, which indicates that there is no statistically significant difference in urban literacy rates among Puducherry, Karaikal, Mahe, and Yanam. Although numerical and ranking differences are observed across regions, these variations are not strong enough to establish statistical disparity. Hence, urban literacy levels across the regions have largely converged over time.

3.2. Rural Literacy Rate in Puducherry

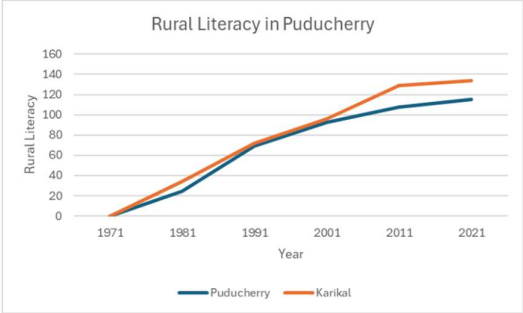
Table 4:Rural Literacy Rate

Year	Puducherry	Karikal	Mahe	Yanam
1971	38.60	37.20	0.00	0.00
1981	47.98	49.80	0.00	0.00
1991	65.36	64.00	0.00	0.00
2001	74.28	73.00	0.00	0.00
2011	80.10	85.09	0.00	0.00
2021	83.00	87.00	0.00	0.00

Source: various issues of Statistical Handbook, Puducherry (DES)

3.2.1.Trend Analysis

Chart 2 Trend Analysis of Rural Literacy Rate



The trend analysis of rural literacy in Puducherry shows a clear and continuous improvement over the study period from 1971 to 2021. The zero value in 1971 represents the base year for comparison. From 1981 onwards, both Puducherry and Karaikal recorded a sharp increase in rural literacy levels. Karaikal consistently performed better than Puducherry, showing faster growth in rural literacy across all decades. By 2011 and 2021, the improvement became more pronounced, indicating strong progress in rural educational development. Mahe and Yanam region do not have rural areas, and hence rural literacy is not applicable to them. Therefore, rural literacy trend analysis is confined only to Puducherry and Karaikal. Overall, the trend reflects significant improvement in rural literacy, with Karaikal maintaining a lead over Puducherry throughout the period.

3.2.2. Ranking Analysis

The ranking analysis of rural literacy in Puducherry shows variations only between Puducherry and Karaikal over the study period. In 1971, Puducherry secured the first rank, while Karaikal stood second. In 1981, Karaikal moved to the first position, indicating better rural literacy performance during that decade. Puducherry regained first rank in 1991 and continued to hold it in 2001. However, in 2011 and 2021, Karaikal again occupied the first rank, showing stronger improvement in recent years. Mahe and Yanam

were consistently placed in the third rank because rural population does not exist in these regions, making rural literacy not applicable.

Table 5: Ranking Rural Literacy

Year	Puducherry	Karikal	Mahe	Yanam
1971	1	2	3	3
1981	2	1	3	3
1991	1	2	3	3
2001	1	2	3	3
2011	2	1	3	3
2021	2	1	3	3

Therefore, the ranking analysis mainly reflects comparative rural literacy performance between Puducherry and Karaikal. Overall, the results show that rural literacy leadership shifted between these two regions over time, with Karaikal performing better in the later years.

3.2.3. One sample t-test

The statistical analysis of rural literacy is restricted to Puducherry and Karaikal, as Mahe and Yanam do not have rural areas, and therefore rural literacy data is not applicable to these regions. An independent t-test was conducted to examine whether rural literacy levels differ significantly between Puducherry and Karaikal. The calculated t-statistic is –0.103, with a p-value of 0.92. Since the p-value exceeds the 5% level of significance, the null hypothesis is not rejected. This result suggests that there is no statistically significant difference in rural literacy rates between Puducherry and Karaikal. The finding indicates that both regions have experienced similar progress in rural education over time.

3.3 Urban–Rural Disparity

Table 6 shows a steady decline in the Urban–Rural Disparity Index in Puducherry and Karaikal from 1971 to 2021, indicating a significant reduction in literacy inequality between urban and rural areas. The sharper decline in Karaikal reflects faster rural literacy improvement compared to Puducherry. The constant index value of 1.00 for Mahe and Yanam reflects the absence of rural population in these regions, making urban–rural disparity analysis inapplicable. Overall, the results confirm a clear trend towards convergence in literacy levels between urban and rural areas within the Union Territory.

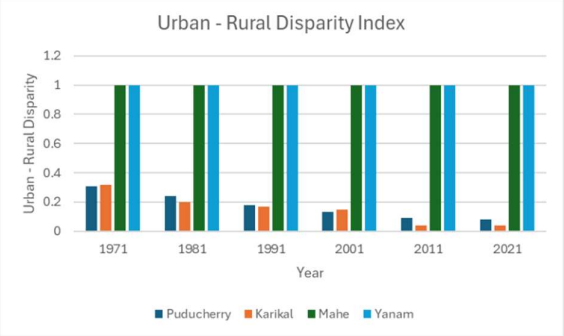
Table 6: Urban - Rural Disparity Index

Year	Puducherry	Karikal	Mahe	Yanam
1971	0.31	0.32	1.00	1.00
1981	0.24	0.20	1.00	1.00
1991	0.18	0.17	1.00	1.00
2001	0.13	0.15	1.00	1.00
2011	0.09	0.04	1.00	1.00
2021	0.08	0.04	1.00	1.00

Source: Author's computation

Chart 3 Urban - Rural Disparity Index

The Urban–Rural Disparity Index which is presented in chart 3, measures the extent of difference between urban and rural literacy levels. In Puducherry, the index values for Puducherry declined from 0.31 in 1971 to 0.08 in 2021, indicating a substantial reduction in urban–rural literacy disparity over time. This shows that rural literacy has improved and gradually moved closer to urban literacy levels. Karaikal also recorded a sharp decline in disparity, from 0.32 to 0.04, reflecting stronger convergence between urban and rural literacy compared to Puducherry. Lower index values in the later years indicate greater equality in literacy attainment between urban and rural areas. In contrast, Mahe and Yanam show a constant index value of 1.00 throughout the period because there is no rural population in these regions, and therefore urban–rural disparity is not applicable. Hence, the disparity analysis is meaningful only for Puducherry and Karaikal. Overall, the declining disparity index values indicate a significant reduction in urban–rural literacy inequality in the regions where rural population exists.



Section 4:

(a) Conclusion

The present study examined the patterns of literacy development and the extent of urban–rural educational disparity in the Union Territory of Puducherry over the period 1971–2021. Using census-based secondary data and a combination of descriptive, ranking, index-based, and inferential statistical techniques, the study analysed trends across the four regions—Puducherry, Karaikal,

Mahe, and Yanam. The findings reveal a sustained and significant improvement in literacy levels across all regions during the study period. Urban literacy consistently remained higher than rural literacy; however, the gap between urban and rural areas has narrowed considerably over time. The declining values of the Urban–Rural Disparity Index in Puducherry and Karaikal clearly indicate convergence in literacy attainment, driven primarily by faster improvement in rural literacy levels. Statistical analysis further confirms that differences in urban literacy across regions and rural literacy between Puducherry and Karaikal are not statistically significant, suggesting a broad equalisation of literacy outcomes over time.

Despite this encouraging progress, the persistence of residual disparities highlights that improvements in literacy alone do not guarantee complete educational equity. Issues related to quality of education, retention, digital access, and progression to higher levels of learning continue to affect rural areas disproportionately. The results therefore suggest that while Puducherry has made commendable strides in reducing basic educational inequality, sustained and targeted interventions are required to ensure inclusive and balanced educational development.

(b) Policy Suggestions

Based on the empirical findings of the study, the following policy suggestions are proposed:

(i)Strengthening Quality of Rural Education, (ii)Promoting Educational Continuity and Retention, (iii) Reducing Digital and Technological Gaps (iv) Region-Specific and Decentralised Planning (v) Continuous Monitoring of Educational Disparities

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