

# AADHAAR SERVICE DELIVERY ANALYTICS REPORT

## **Problem Statement: Unlocking Societal Trends in Aadhaar Enrolment & Updates**

Aadhaar is India's foundational digital identity system, enabling access to welfare schemes, public services, and financial inclusion at a national scale. Given its extensive reach, systematic analysis of Aadhaar enrolment and update data is essential to understand population coverage, regional participation, and evolving demographic and biometric patterns over time.

This project leverages large-scale administrative data to analyse Aadhaar enrolment and update activities with the objective of uncovering meaningful societal and operational insights. Using three UIDAI datasets—New Aadhaar Enrolment , Demographic Enrolment (Name, Date of Birth, Gender, Address), and Biometric Enrolment and Authentication (Fingerprint, Iris, and Facial Capture)—the analysis examines regional, demographic, and temporal variations across states, districts, and pin codes.

The study focuses on identifying disparities in age-group coverage, trends in New Aadhaar Enrolments, patterns in biometric enrolment indicators (fingerprint, iris, and facial capture), and the frequency and distribution of demographic updates such as address changes. By detecting spatial anomalies, coverage imbalances, and under-served populations, the project aims to highlight service delivery gaps and operational inefficiencies.

The overarching objective is to transform complex Aadhaar datasets into actionable, evidence-based insights that can support informed policy formulation, targeted governance interventions, and system optimisation, thereby contributing to a more inclusive, efficient, and responsive digital identity ecosystem in India.

## **Dataset Details**

Source of data: event.data.gov.in

Raw Dataset Size: overall 4.84 Million records

1. New Adhar Enrolment Dataset (1006029 rows \* 7 columns)
2. Demographic Update Dataset (2071700 rows \* 6 columns)
3. Biometric Enrolment Dataset (1766212 rows \* 6 columns)

Cleaned Dataset Size: Overall 4.34 Million records

1. New Adhar Enrolment Dataset (983072 rows \* 14 columns)
2. Demographic Update Dataset (1598097 rows \* 13 columns)
3. Biometric Enrolment Dataset (1861108 rows \* 13 columns)

Key fields/variables: date, state, district, pincode, month\_name, Children(0-17) Age, Adult(18+) Age

## **Tools & Technologies:**

Python  (Pandas, NumPy, Seaborn, Matplotlib) – used for Exploratory Data Analysis, Correlation Analysis and Statistical Analysis.

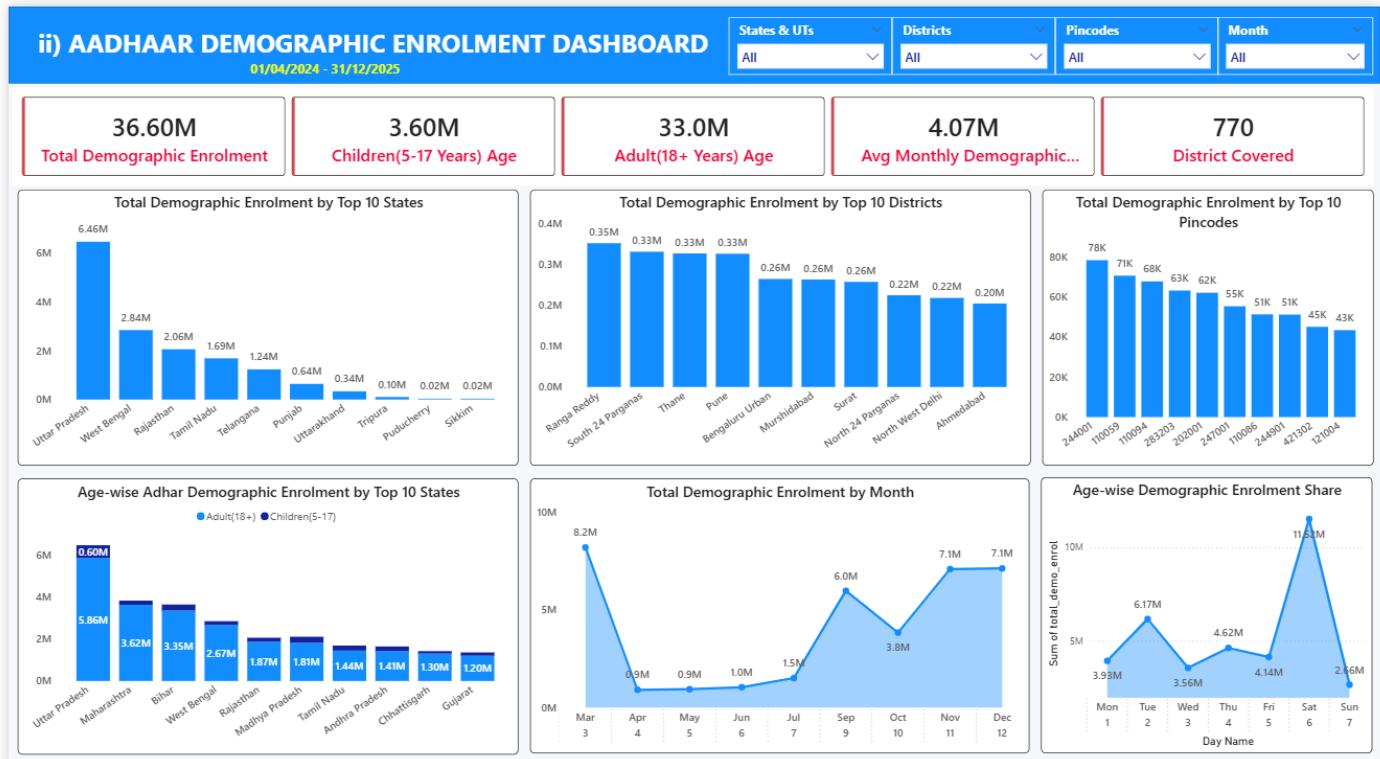
Power BI  – used for KPI cards, Charts, Slicers, Dashboard interactive Creation.

## Methodology:

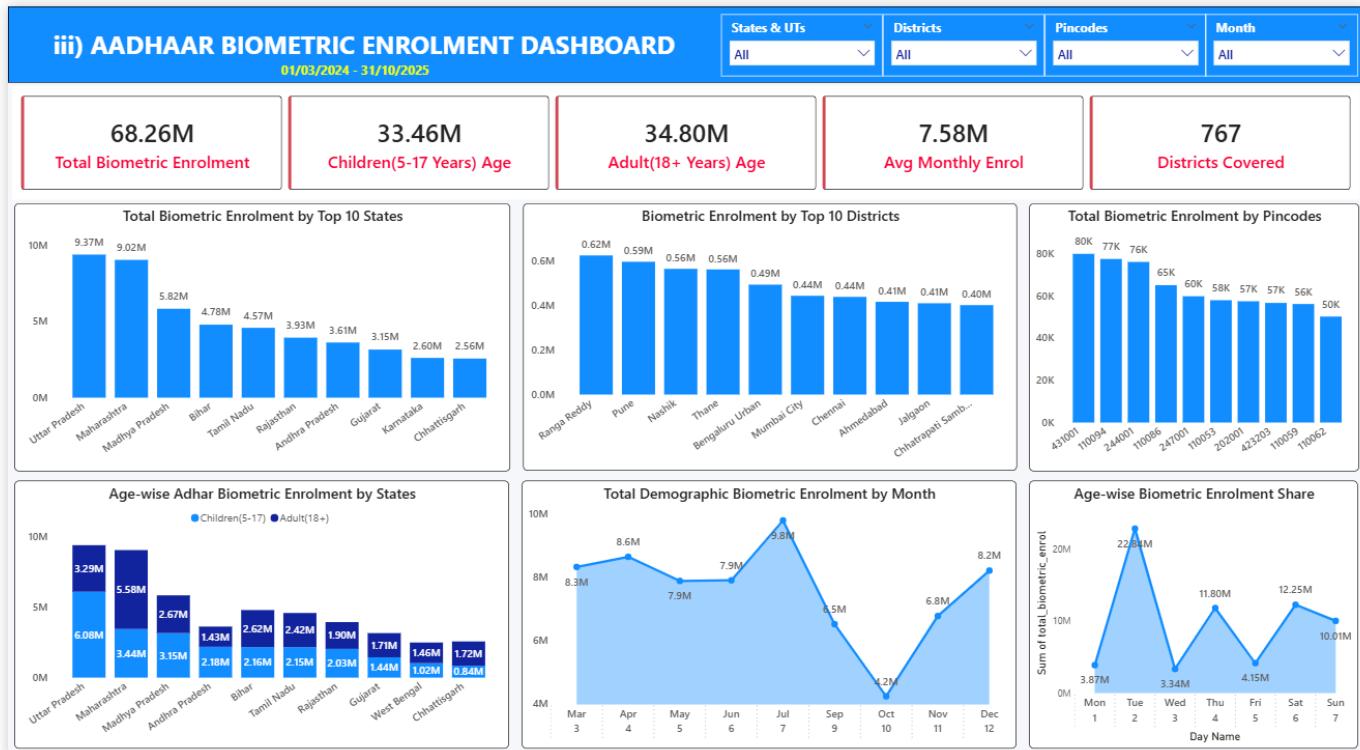
1. Data Ingestion and Understanding: Imported and consolidated multiple Aadhaar CSV files using Pandas to create unified enrolment, demographic, and biometric datasets for analysis.
2. Data Cleaning and Preprocessing: Standardized State, District, and Pincode fields, handled missing and invalid values, derived temporal attributes (Month), and created analytical features using Pandas and NumPy to support structured analysis.
3. Data Exploration: This stage focuses on understanding the dataset's structure, scope, and quality by examining variables, data types, record volumes, missing values, and overall data distribution using Python (Pandas, NumPy).
4. Exploratory Data Analysis (EDA): This phase involves statistical analysis and correlation analysis, along with univariate, bivariate, and trivariate visualizations, to identify patterns, trends, relationships, and anomalies across enrolment, demographic, biometric, and geographic dimensions using Python (Matplotlib, Seaborn).
5. Data Visualization: Interactive dashboards were designed and developed using Power BI to present key insights through KPI cards, trend analyses, geographic breakdowns, enabling clear interpretation and decision-support for governance and service delivery optimization.



3. **A very small set of pin codes dominates demographic update activity** – The top 10 pin codes (out of 196,522) function as high-capacity service hubs, driven by dense urban populations, higher mobility, and better availability of Aadhaar update infrastructure.
4. **Adult (18+ years) updates dominate demographic activity** – The majority of demographic transactions originate from adults, driven by address changes, marital status updates, and document
5. **Demographic updates peak on weekdays, with the highest activity in sept.** This is driven by welfare verifications, education admissions, employment documentation, and pre-monsoon administrative update drives.

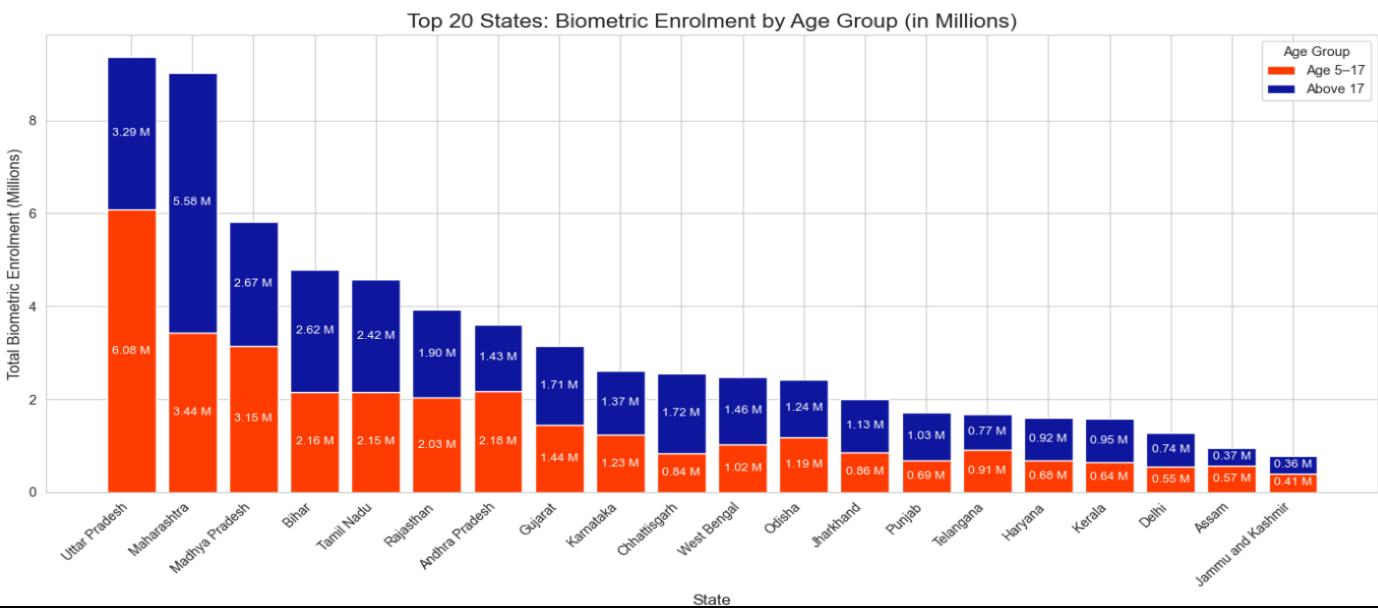
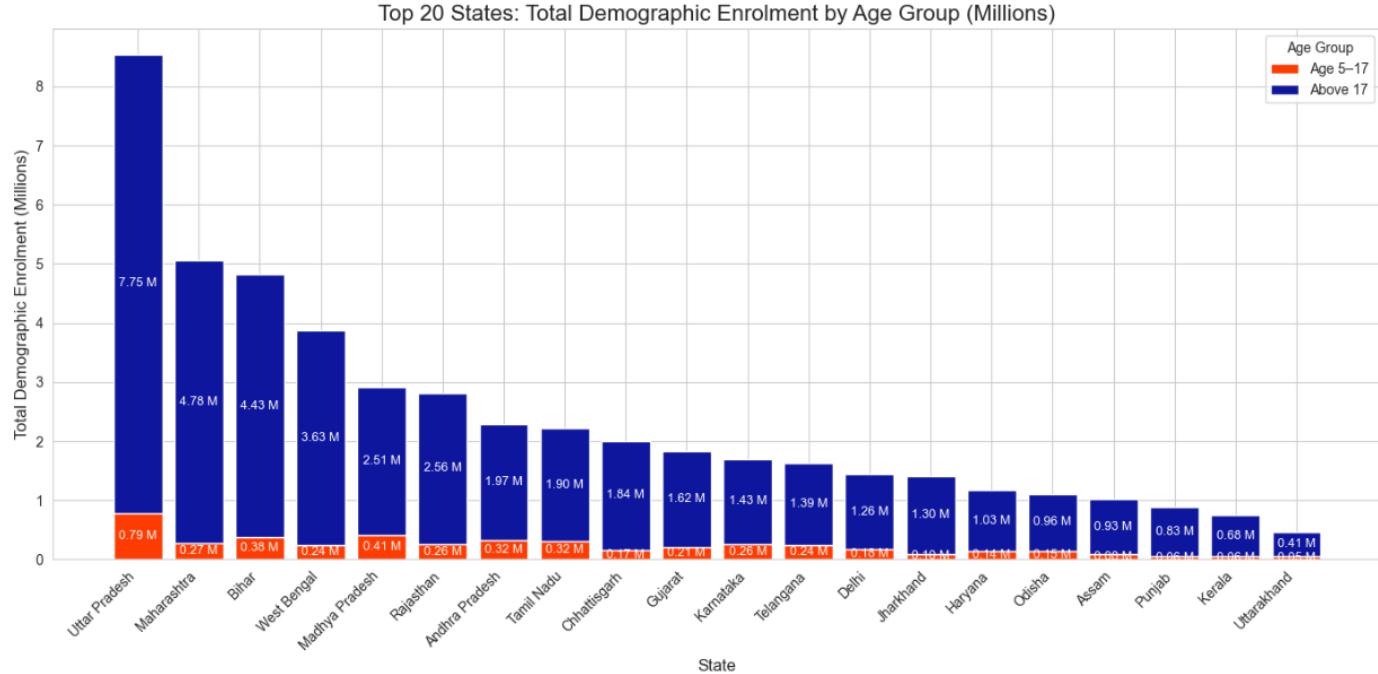
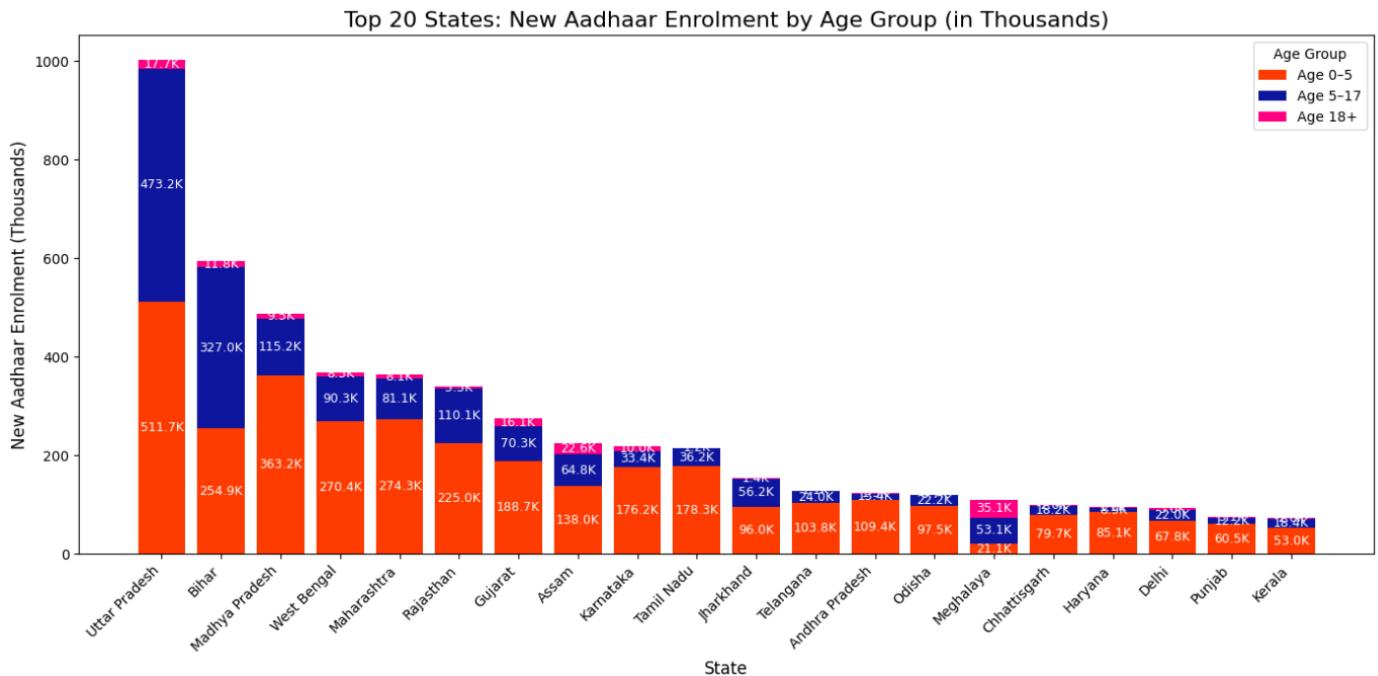


1. **Overall Demographic KPI Summary:** During Apr 2024–Dec 2025, Aadhaar services recorded 36.6M demographic updates across 770 districts, with a clear dominance of adult (18+) enrolments and an average monthly throughput of over 4M updates, indicating sustained and widespread nationwide demand for demographic Aadhaar services.
2. **State-wise Concentration:** **A small set of high-population states—Uttar Pradesh, West Bengal, Rajasthan**—account for the majority of both new and demographic enrolments due to population scale, migration, and welfare-scheme linkage requirements.
3. **District & Pincode Skew:** Enrolment activity is **heavily concentrated in urban and peri-urban districts** (Rangareddy, Thane, Bengaluru Urban) and select pincodes, reflecting migration inflows, address corrections, and better service access.
4. **Age-wise Pattern:** **Adult enrolment (18+)** far exceeds children enrolment, highlighting Aadhaar's primary use as an identity and service-delivery instrument rather than only a birth-linked document.
5. **Temporal Trends (Monthly & Weekly):** Enrolments peak during financial year transitions and scheme cycles (Mar, Sep, Nov–Dec) and are consistently higher on weekends—especially Saturdays, indicating citizen preference for non-working days



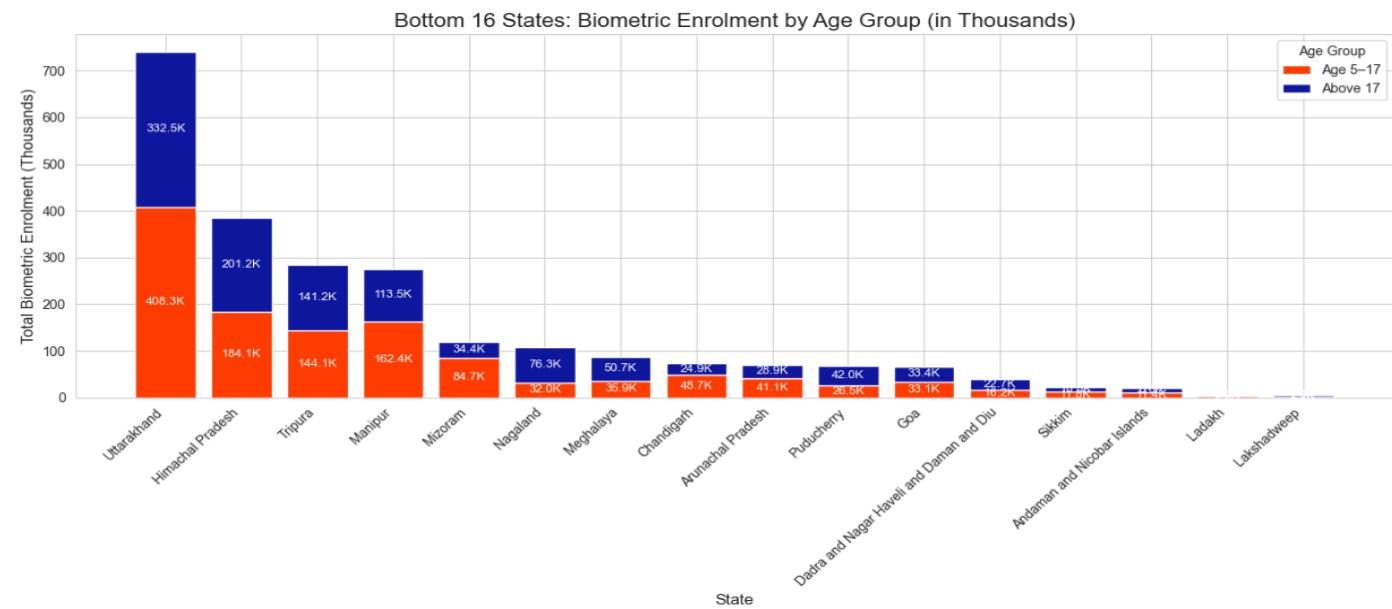
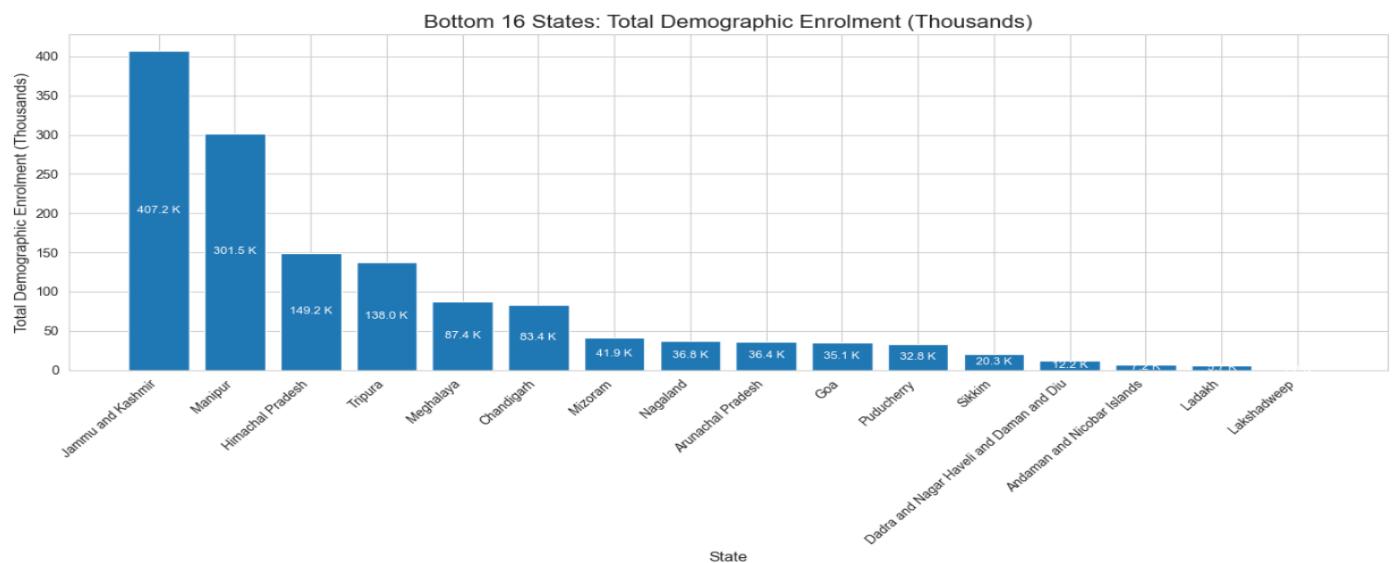
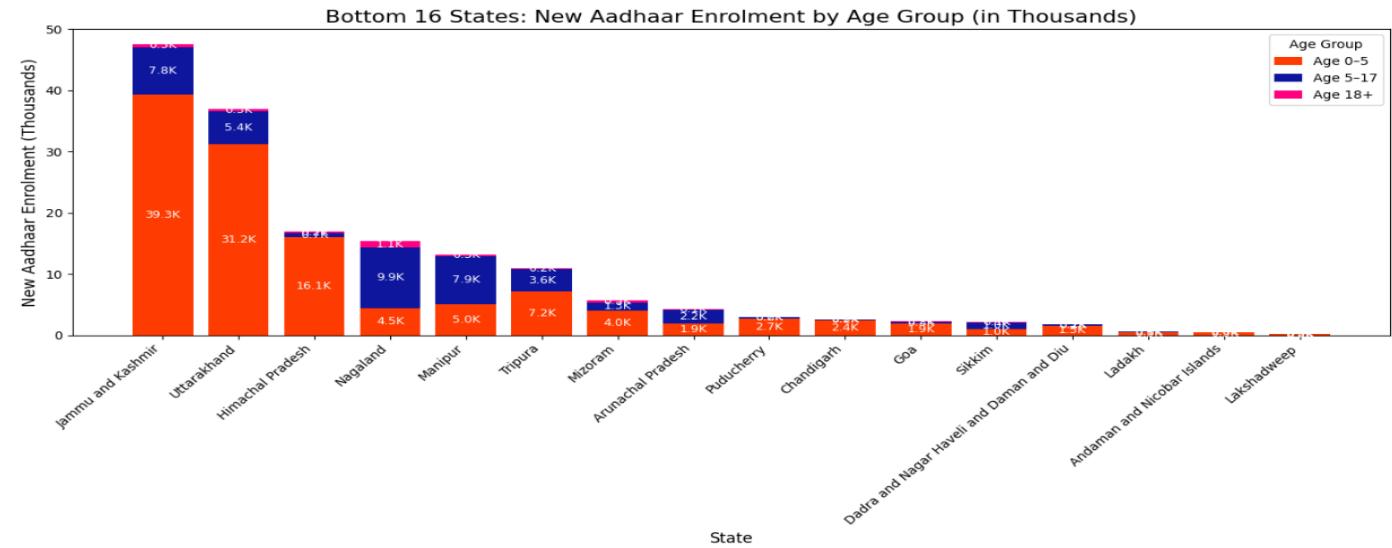
- Overall Biometric KPI Summary:** Between Mar 2024 and Oct 2025, Aadhaar biometric enrolments crossed 68 million across 767 districts, with adults forming a marginally larger share than children and an average of over 7.5 million updates per month, reflecting steady, system-wide biometric service utilization across the country.
- Total Biometric enrolment Coverage is skewed toward high-population states** – Uttar Pradesh, Maharashtra, and Bihar lead in overall demographic representation, reflecting larger population bases, urban-rural distribution, and higher administrative outreach.
- Biometric enrolments are concentrated in urban and semi-urban districts** – Districts like Bengaluru Urban, Pune, and Hyderabad see higher new enrolments due to urban migration, workforce mobility, and easier access to enrolment centers.
- Adults (18+) form the majority of Biometric enrolments** – This is driven by mandatory Aadhaar linkage for banking, government benefits, mobile SIMs, and other financial and social services, whereas enrolments for children (0–17) remain smaller in comparison.
- Biometric enrolments peak during government outreach** and welfare drive periods – Months like March and July witness higher enrolments, aligning with school admissions, employment-linked documentation, and mass enrollment campaigns in high-demand areas.

## Top 20 States: New Aadhaar, Demographic Update & Biometric Enrolment by Age Group:



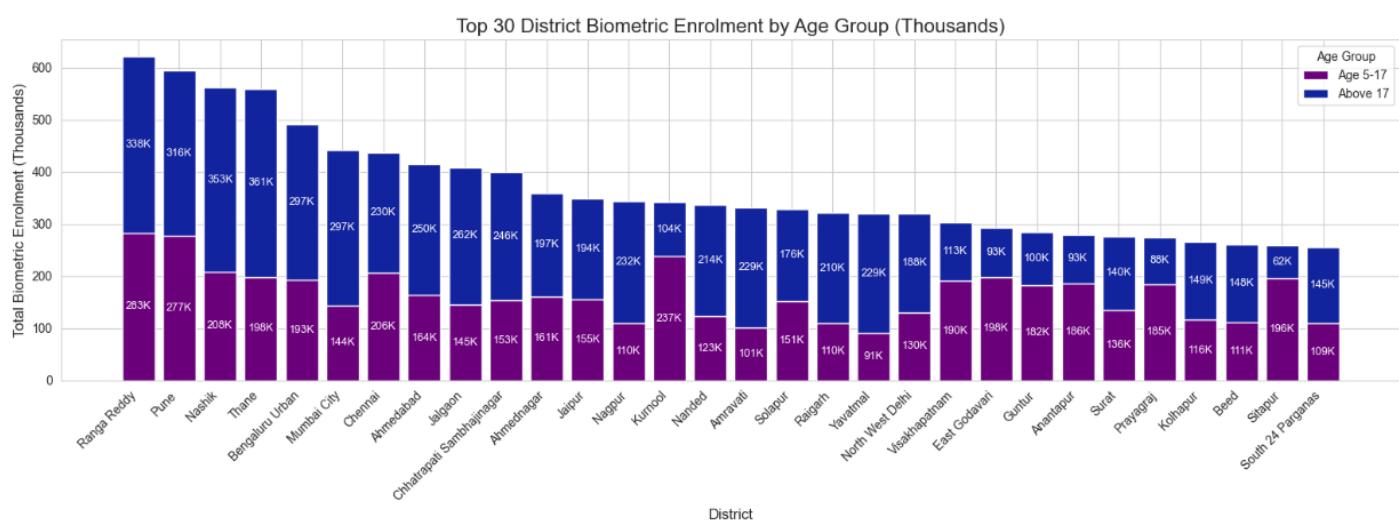
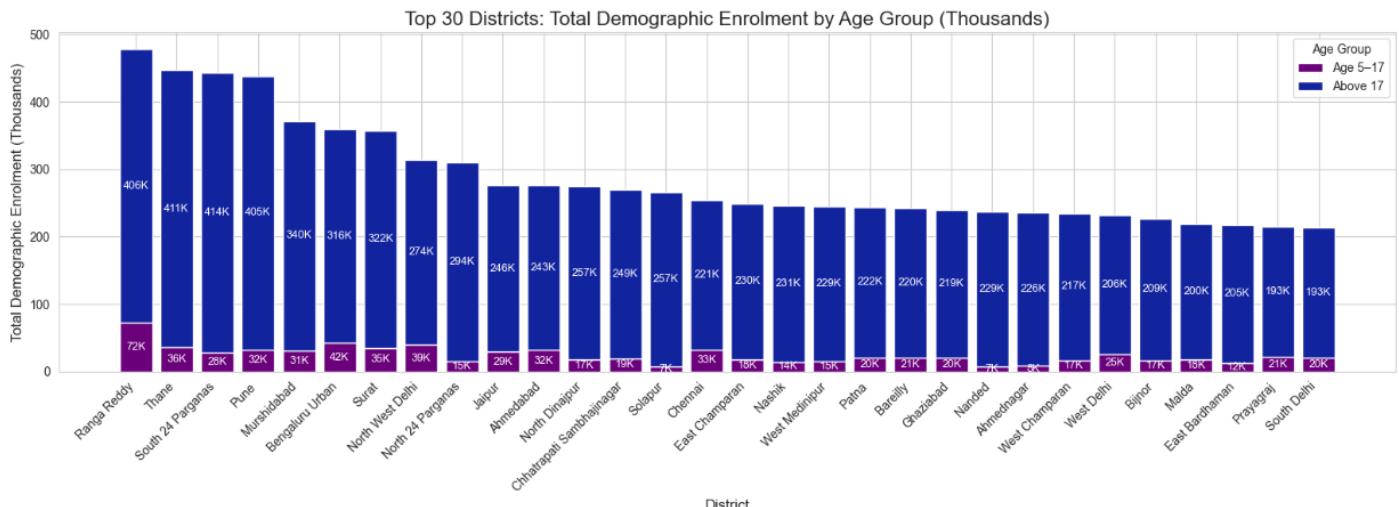
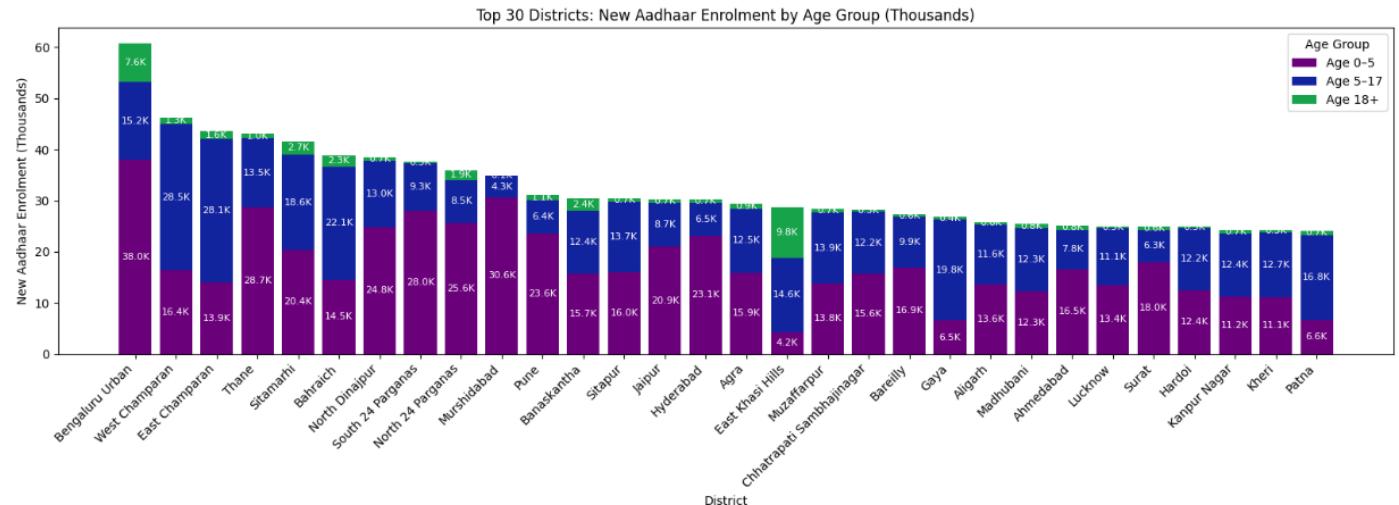
- High-population states like Uttar Pradesh, Maharashtra, and Bihar lead in total coverage due to extensive administrative infrastructure managing large-scale demographic and biometric updates.
- Across all states and union territories, the highest participation in New Aadhaar and Biometric enrolments is observed among children aged 0–17 years, whereas in Demographic Updates, the majority of participants are adults aged 18 years and above.

### **Bottom 16 States & UTs: New Aadhaar, Demographic Update & Biometric Enrolment by Age Group:**



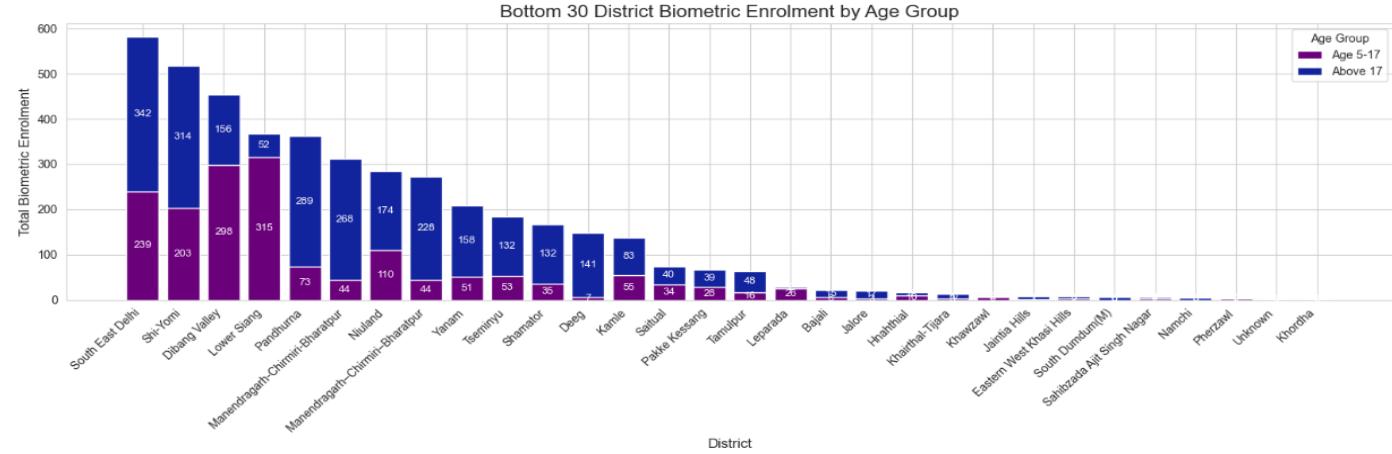
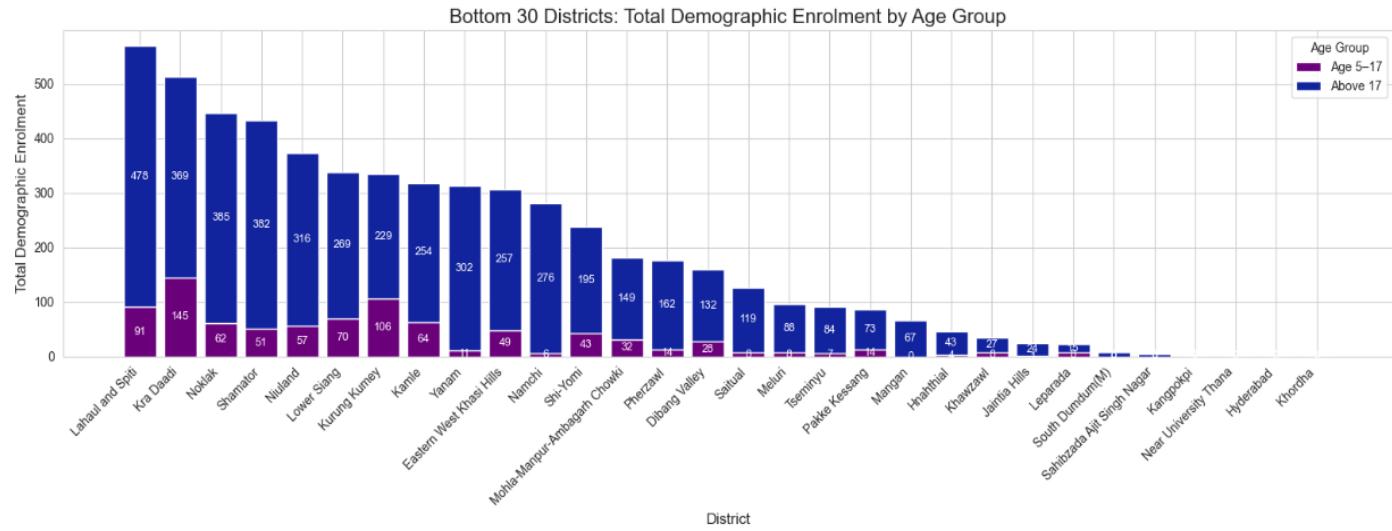
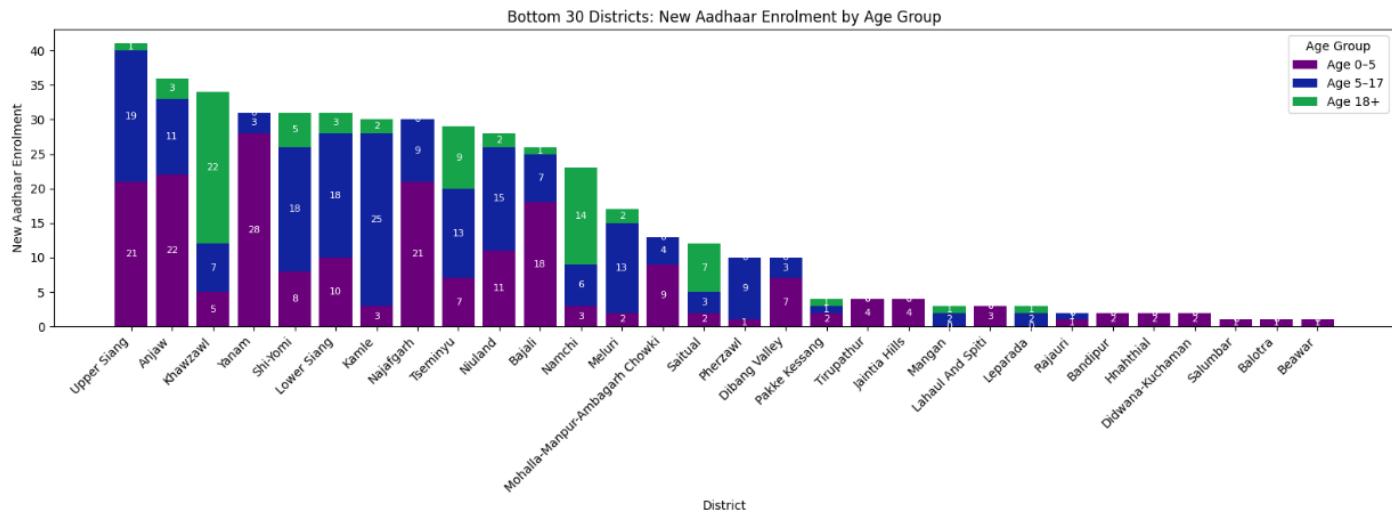
- Total demographic enrolment is low mainly because their overall population base is very small (unlike giants like UP)
- Coverage Relative to Population Size: Smaller states such as Jammu & Kashmir and Uttarakhand show the lowest demographic enrollment rates, indicating infrastructure and outreach challenges disproportionate to their scale.
- Children(0-17) Surge in New Enrollments:** Children aged 0–17 exhibit higher-than-proportional new Aadhaar enrollment rates relative to their demographic share in low-performing states, reflecting the nationwide Bal Aadhaar prioritization.
- Adult Dominance in Updates: Adults aged 18 years and above consistently lead in biometric enrollments and demographic updates across low-performing states.

### Top 30 Districts: New Aadhaar, Demographic Update & Biometric Enrolment by Age Group



- Urban and semi-urban districts, as well as densely populated areas such as Bengaluru Urban, Ranga Reddy, Pune, and West Champaran, record the highest levels of new Aadhaar enrolment, biometric enrolment, and demographic updates.
- Biometric and demographic updates are highest among adults aged 18 years and above, whereas new Aadhaar enrolments are highest among children aged 0–17 years.

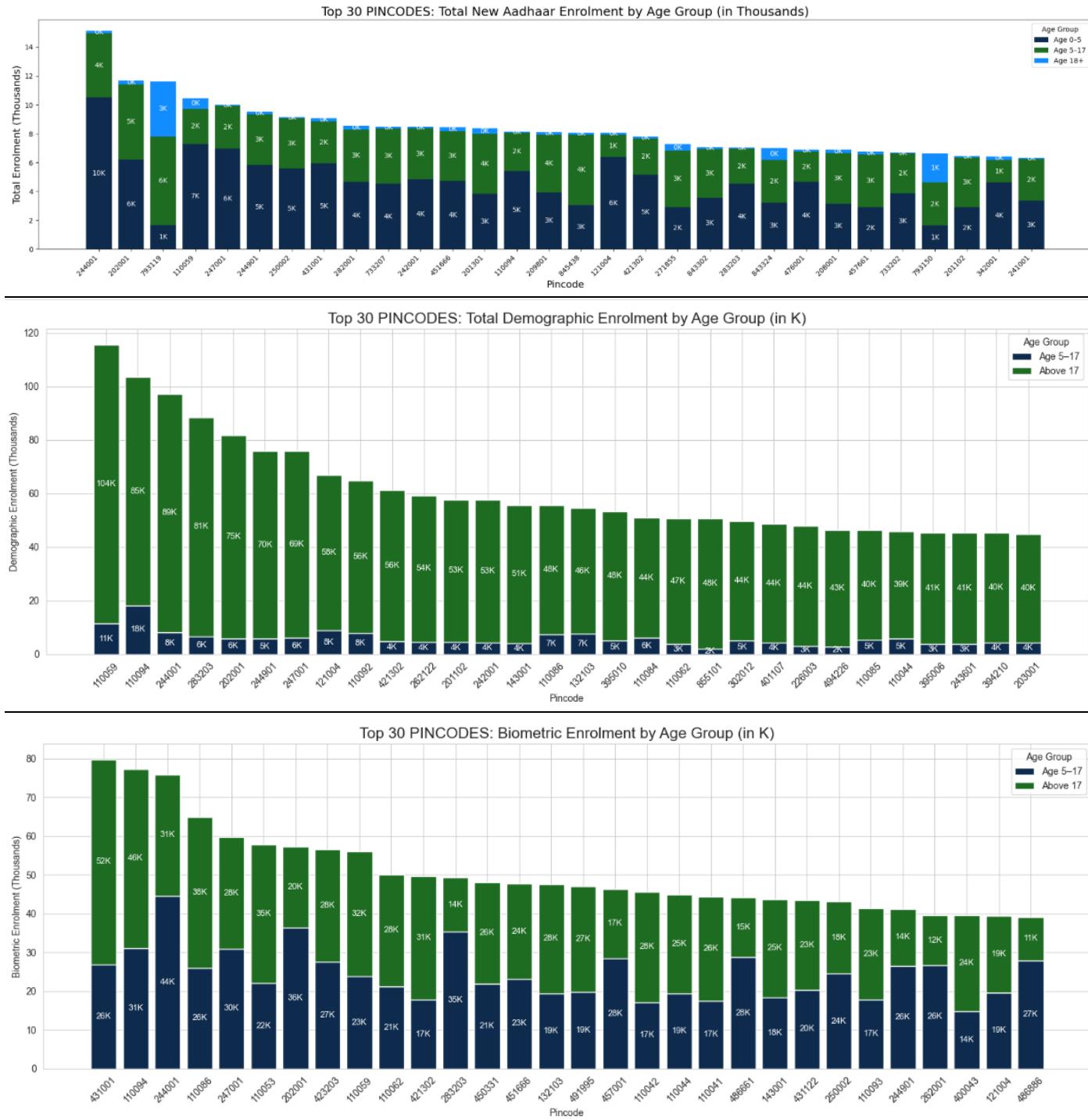
### **Bottom 30 Districts: New Aadhaar, Demographic Update & Biometric Enrolment by Age Group**



- Across almost all bottom-performing districts, new Aadhaar enrolment is dominated by children aged 0–17 years, while biometric enrolment and demographic updates are predominantly driven by adults aged 18 years and above.

- Low enrolment in bottom-performing districts is driven by small and dispersed populations, remote, hilly, and tribal geography, and seasonal accessibility constraints. In addition, limited Aadhaar infrastructure, a shortage of trained operators, administrative capacity constraints, and lower levels of digital awareness further suppress demographic and biometric update volumes, while volume-based performance metrics inherently disadvantage low-population districts.

### **Top 30 PIN Code Areas: New Aadhaar, Demographic, and Biometric Enrolments by Age Group**



- Urban Concentration and Infrastructure:** Top-performing PIN code areas are largely urban and semi-urban areas with high population density, better Aadhaar infrastructure, and higher digital awareness, enabling easier access to enrolment and update services.
- Age-wise Enrolment Pattern:** Across almost all bottom-performing PIN code areas, new Aadhaar enrolment is dominated by children aged 0–17 years, while biometric enrolment and demographic updates are predominantly driven by adults aged 18 years and above.

## Bottom 30 PIN Code Areas: New Aadhaar, Demographic, and Biometric Enrolments by Age Group

Bottom 30 Pincodes Total New Aadhaar Enrolment

pincode	age_0_5	age_5_17	age_18_greater	total_enrol
19218	847202	0	0	1
5873	403724	1	0	1
8420	500110	1	0	1
12691	627765	1	0	1
12017	611117	1	0	1
12656	627420	1	0	1
8408	500093	1	0	1
9527	522510	0	0	1
12876	629902	1	0	1
4924	380057	1	0	1
4932	382010	1	0	1
1221	176062	1	0	1
7483	461222	1	0	1
18378	804435	1	0	1
3216	271805	0	1	1
18407	805135	1	0	1
10095	534435	1	0	1
5636	400035	1	0	1
1177	175137	1	0	1
18220	800028	0	1	1
1416	182104	1	0	1
14901	695038	1	0	1
12946	631006	1	0	1
7602	465695	0	1	1
9244	517646	0	0	1
916	160017	1	0	1
16371	744304	1	0	1
16379	751008	1	0	1
16345	743700	1	0	1
1986	212212	1	0	1

Bottom 30 Pincodes Demographic Enrolment

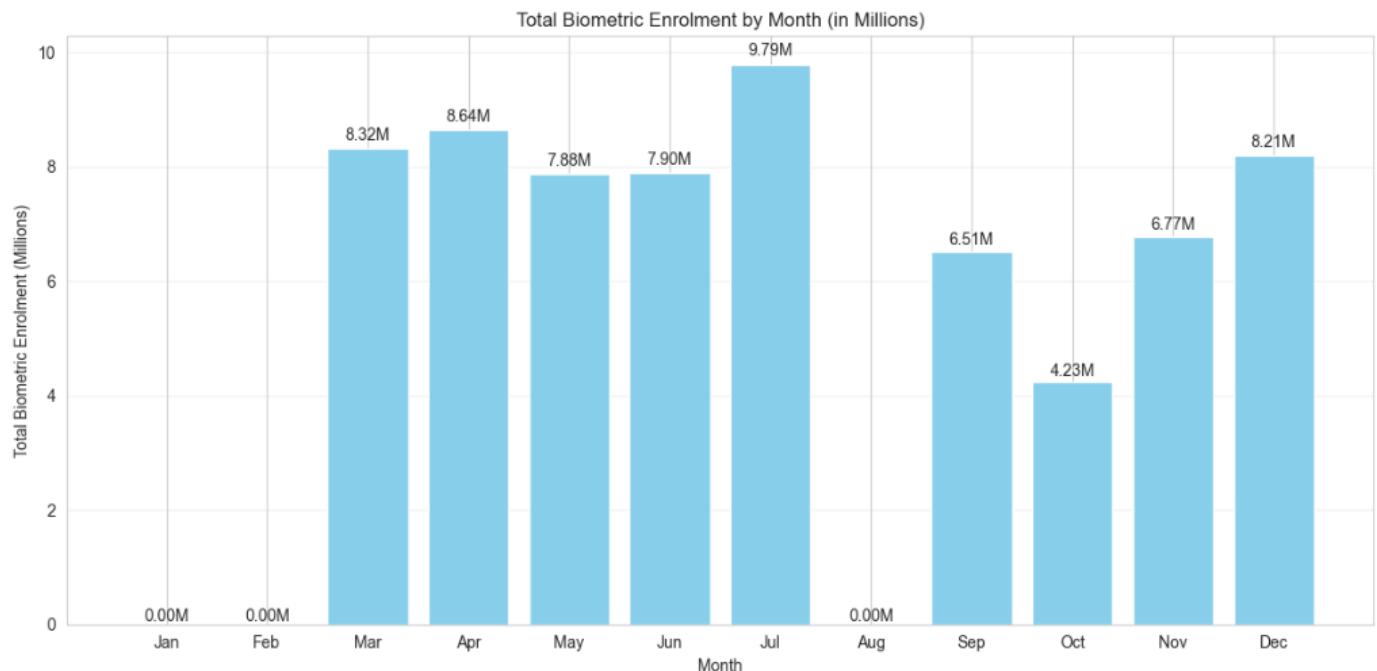
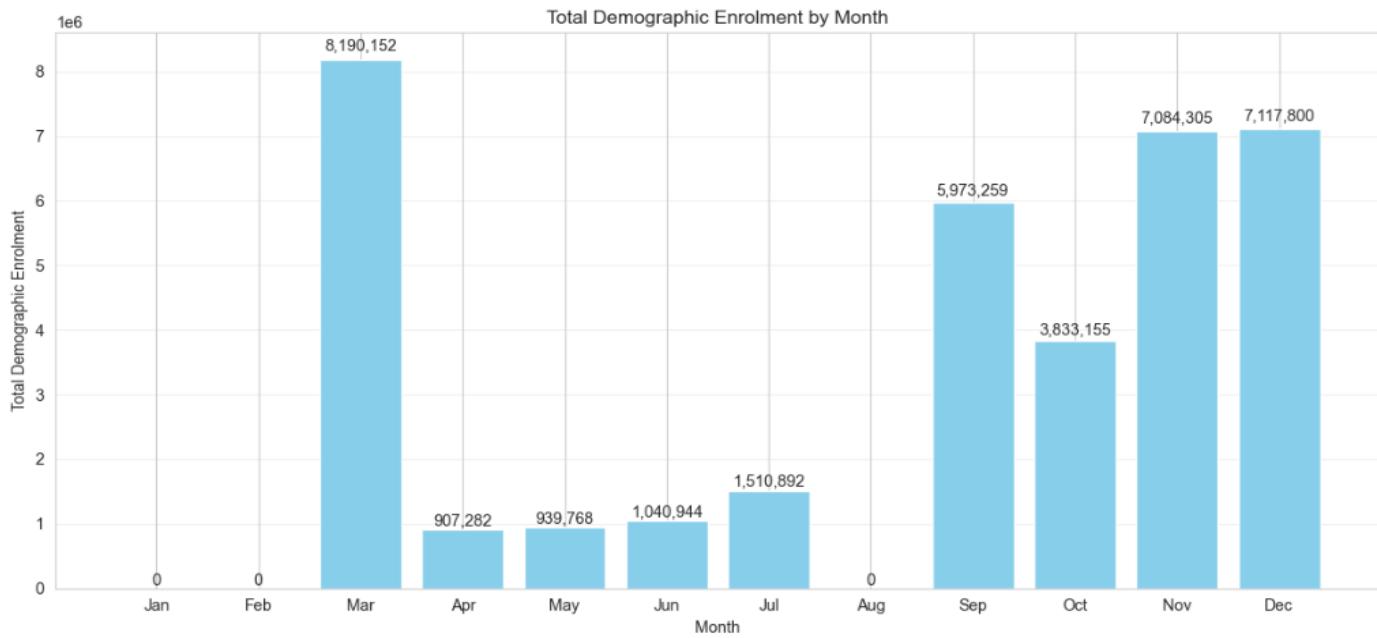
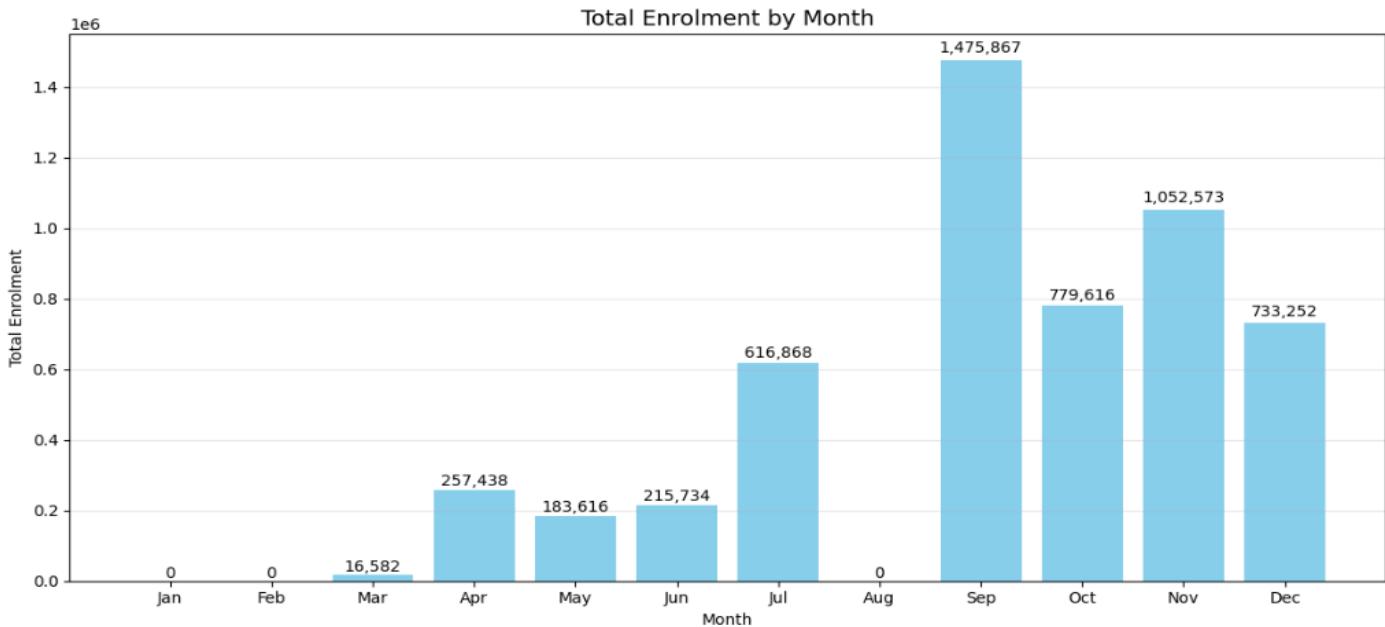
pincode	age 5-17	above 17	total_enrol
19480	846008	0	1
12628	625015	0	1
16421	742286	0	1
19194	835238	0	1
13049	629855	0	1
1592	194204	0	1
18917	824213	0	1
18982	827002	0	1
8538	500113	0	1
8497	500066	0	1
11306	583152	0	1
7655	464334	0	1
4548	342021	1	0
2003	212110	0	1
16478	743274	0	1
16534	743413	0	1
5709	400041	0	1
18767	814115	1	0
7786	471516	0	1
4401	333037	0	1
16193	735232	0	1
8693	503322	0	1
5777	400613	0	1
12833	627436	1	0
3721	302035	0	1
17850	785002	0	1
2548	232114	0	1
15389	711321	0	1
14669	686560	1	0
3297	272141	0	1

Bottom 30 Pincodes Biometric Enrolment

pincode	age 5-17	above 17	total_enrol
16848	755062	0	1
16796	754286	1	0
16842	755045	0	1
16749	754155	1	0
3148	263144	1	0
6834	425106	1	0
5764	400613	0	1
8139	488050	0	1
2802	246445	1	0
12733	626144	1	0
16285	741225	0	1
12993	629187	0	1
861	151107	0	1
893	152020	1	0
16060	734002	1	0
16057	733246	1	0
8681	503322	1	0
2689	244245	0	1
4892	365730	0	1
18273	796291	0	1
10725	573132	0	1
14668	686596	0	1
3752	303329	0	1
14646	686560	1	0
1938	210010	1	0
18738	814115	0	1
19318	843152	1	0
10707	573114	0	1
10679	572168	1	0
2512	231224	0	1

- Minimal activity in low-performing PIN code areas** – The bottom 30 PIN code areas in New Aadhaar, Biometric, and Demographic enrolments report extremely low activity, often only a single enrolment per PIN code area. These areas are typically rural, remote, or hilly, with low population density and limited access to enrolment centers.
- Underlying challenges and implications** – Low awareness, socioeconomic constraints, seasonal migration, and administrative rollout issues further contribute to minimal participation. These findings highlight the need for targeted outreach, mobile enrolment units, and improved service accessibility in underrepresented and hard-to-reach regions.

## Monthly Trend Analysis of New Aadhaar Enrolment, Demographic, and Biometric Enrolments



- **Academic-cycle influence on new enrolments** – New Aadhaar enrolments peak in **September (1.47 million)** and **July**, suggesting a strong linkage with school admission cycles and education-related documentation requirements.
- **Deadline-driven demographic update spikes** – Demographic updates register significant surges in **March (8.19 million)**, **November**, and **December**, likely reflecting year-end financial compliance, welfare scheme linkages, and administrative cut-off timelines.
- **Consistently high biometric transaction volumes** – Biometric enrolments remain persistently high, averaging **6–9 million transactions per month**, driven by mandatory lifecycle updates (particularly for children) and the continuous requirement for identity verification across banking, telecom, and social welfare services.

## **Key Insights:**

1. **System-wide scale and maturity:** Aadhaar service delivery has transitioned to an update-led usage model, recording **5.33M new enrolments, 36.6M demographic updates, and over 68M biometric transactions**, reflecting sustained nationwide utilization rather than enrolment expansion.
2. **Clear age-wise functional separation:** New Aadhaar enrolments are predominantly driven by **children (0–17 years)**, while **adults (18+)** account for the majority of **demographic and biometric updates**, underscoring Aadhaar's role in service access, compliance, and identity verification.
3. **State-level concentration in high-population regions:** High volumes of enrolment and update activity are concentrated in **large, high-population states**, where population scale and administrative density naturally generate higher Aadhaar service demand.
4. **District and PIN code-level urban skew:** Urban and semi-urban districts and PIN code areas record disproportionately higher enrolment and update volumes due to **migration inflows, dense settlements, and better-developed Aadhaar infrastructure**.
5. **Persistent underperformance in low-population and remote areas:** Lower enrolment and update volumes are concentrated in **rural, low-population, and geographically challenging regions**, where dispersed settlements, limited infrastructure, and accessibility constraints suppress service throughput.
6. **Predictable temporal demand patterns across services:** New Aadhaar enrolments peak in **July and September** in line with academic cycles, **demographic updates surge in March, November, and December** due to compliance and welfare deadlines, while **biometric enrolments remain consistently high year-round (6–9M per month)**.

## **Suggestions:**

1. **Expand last-mile access in low-coverage areas:** Scale up mobile enrolment units, temporary camps, and decentralized centres in rural, remote, hilly, and tribal districts and low-performing PIN code areas to address physical access and geographic constraints.
2. **Strengthen Aadhaar infrastructure and operator capacity:** Increase the availability of permanent centres, biometric devices, and trained operators, supported by regular training, system uptime monitoring, and adequate staffing to improve service reliability and throughput.
3. **Adopt population-adjusted, demand-based planning metrics:** Move beyond absolute volumes by using per-capita and population-normalized KPIs at state, district, and PIN code levels to enable equitable planning and fair performance evaluation.

4. **Implement age-responsive and institution-linked service models:** Institutionalize school-, Anganwadi-, and hospital-based enrolment for children (0–17), and bank, workplace, and welfare-office-linked update services for adults (18+) to reduce service friction and improve coverage.
5. **Align operational capacity with predictable demand cycles:** Proactively scale staffing, appointment slots, and system capacity during academic admissions, financial year-end compliance periods, and welfare scheme rollouts to manage peak demand efficiently.
6. **Strengthen outreach, decentralization, and monitoring mechanisms:** Enhance local awareness campaigns, expand service delivery through CSCs, post offices, panchayats, and urban local bodies, and use real-time district- and PIN-code-level dashboards to enable timely corrective action.

### **Conclusion:**

Aadhaar service delivery has matured into an update-driven system, with demand concentrated in urban high-population areas and among adults, underscoring the need for targeted, data-driven interventions to ensure equitable nationwide access.

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