UIDAI Data Hackathon 2026

Government of India – Data Innovation Challenge

District-wise Analysis of Aadhaar Biometric Updates in Telangana

A Data-Driven Decision Support Framework for UIDAI

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State Analyzed:

Telangana

Tools Used:

Microsoft Excel, Power BI

Submission For:

UIDAI Hackathon 2026

Objective:

To analyze Aadhaar biometric update data across districts in Telangana in order to identify patterns, trends, anomalies, and predictive indicators, and translate them into actionable recommendations that support UIDAI's service planning and system improvement.

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1. Introduction

Aadhaar has become a core part of India's digital identity system. It enables citizens to access government services, financial systems, and welfare schemes through secure biometric authentication. For Aadhaar to function effectively, biometric information such as fingerprints and iris scans must remain accurate over time.

In practice, biometric data does not remain constant. Factors such as aging, physical labour, environmental exposure, and changes in physical characteristics often affect the quality of biometric records. As a result, many citizens are required to update their biometric information at Aadhaar enrolment and update centres.

However, the demand for biometric updates is not uniform across regions. Some districts experience consistently high volumes of update requests, while others show comparatively low activity. If these regional differences are not properly studied, they can create operational challenges such as long waiting times, overcrowding in certain centres, underutilization of infrastructure in other areas, and inefficient allocation of manpower and resources.

This project focuses on analysing Aadhaar biometric update data at the district level in Telangana. The objective is not only to visualize the data, but to understand how biometric update activity is distributed, how it changes over time, and which districts require greater administrative attention.

By identifying meaningful patterns, trends, anomalies, and predictive indicators, this study aims to translate data into actionable insights that can support UIDAI in improving service planning, optimizing resource deployment, and ...strengthening overall system efficiency.

2. Dataset Description

The dataset used in this study was obtained from the official Open Government Data (OGD) Platform of India (data.gov.in) and is published by the Unique Identification Authority of India (UIDAI). This dataset provides district-level information on Aadhaar biometric update activity and is intended to support transparency, research, and data-driven governance.

For this project, data related to the state of Telangana was extracted and analyzed. The dataset records biometric updates carried out across districts and pin codes over different time periods. Each record reflects the number of biometric updates performed for specific age groups at a given location and date.

The purpose of using this dataset is to understand how biometric update demand varies across districts, how it changes over time, and which regions may require greater administrative attention for improved service delivery.

2.1 Data Source

- **Platform:** Open Government Data Portal (data.gov.in)
- **Published By:** Unique Identification Authority of India (UIDAI)
- **Dataset Title:** Aadhaar Biometric Update Statistics
- **Geographical Scope:** Telangana (District-wise)

2.2 Dataset Structure

The dataset contains the following key fields:

Date: Represents the day on which biometric update transactions were recorded.

State: Indicates the state to which the data belongs. In this study, only Telangana has been considered.

District: Specifies the district where biometric update activity occurred. This field is central to district-wise comparison.

Pincode: Identifies the specific location within each district, enabling finer geographical analysis if required.

bio_age_5_17: Number of biometric updates recorded for individuals in the 5–17 years age group. This category mainly reflects updates required due to physical growth among children and adolescents.

bio_age_17+: Number of biometric updates recorded for individuals aged 17 years and above, representing adult biometric updates.

Month / Year (Derived Fields): Extracted from the date field to enable time-based analysis, allowing month-wise and year-wise comparisons.

Total_Bio (Calculated Field): A derived measure created by summing biometric updates across age groups. This field is used to evaluate the total biometric update workload at the district level.

2.3 Data Preparation

Before performing analysis, the dataset was cleaned and structured using Microsoft Excel and Power BI. The following steps were carried out:

- Removal of blank and incomplete records.
- Standardization of district names to avoid duplication or grouping errors.
- Creation of calculated fields such as Total_Bio for combined biometric counts.
- Extraction of month and year from the date field for trend analysis.

These steps ensured that the dataset was consistent, accurate, and suitable for identifying patterns, trends, anomalies, and predictive indicators related to biometric update activity.

It is acknowledged that the dataset represents aggregated administrative records and does not capture individual-level behavior. Therefore, interpretations are made at a regional and operational level rather than at a personal level.

3. Methodology

This study follows a structured, data-driven approach to analyse Aadhaar biometric update activity across districts in Telangana. The objective of the methodology is to transform raw administrative data into meaningful insights that can support informed decision-making and system improvements for UIDAI.

The analysis was carried out using Microsoft Excel for data preparation and Power BI for visualization and interpretation. The overall workflow involved data cleaning, feature creation, aggregation, visualization, and insight generation.

3.1 Data Cleaning and Validation

The raw dataset obtained from the Open Government Data Portal was first reviewed for completeness and consistency. The following actions were performed:

- Removal of blank and incomplete records.
- Correction and standardization of district names to prevent duplication during grouping.
- Verification of numerical fields to ensure biometric counts were correctly recognized as numbers.
- Conversion of date fields into a proper date format.

These steps ensured that the dataset was accurate and suitable for further analysis.

3.2 Feature Engineering

To enhance analytical depth, additional fields were created from the original data:

- **Total_Bio:**

  A calculated field obtained by summing biometric updates across age categories (5–17 and 17+). This represents the total biometric update workload at each location.

- **Month and Year:**

  Extracted from the date field to enable time-based analysis, allowing month-wise and year-wise comparisons.

These derived fields made it possible to study trends, compare districts, and identify workload distribution patterns.

3.3 Aggregation and Comparative Analysis

The prepared dataset was aggregated at multiple levels:

- **District-wise aggregation** to compare overall biometric update volumes across Telangana.
- **Monthly aggregation** to examine how update activity varies over time.
- **Top-N analysis** to identify districts with the highest biometric workloads.

This enabled identification of high-demand regions, under-utilized areas, and regional imbalance in service usage.

3.4 Visualization Using Power BI

Power BI was used to convert numerical data into interactive and interpretable visual dashboards:

- **Bar charts** for district-wise biometric load comparison.
- **Line charts** for time-series analysis of monthly trends.
- **Conditional formatting tables** to highlight high-load and low-load districts.
- **Top-5 district trend charts** to indicate future service pressure and growth patterns.

These visualizations allowed quick identification of patterns, trends, and anomalies within the dataset.

3.5 Insight Generation

Based on visual and statistical analysis, key insights were derived regarding:

- Uneven distribution of biometric update demand across districts.
- Growth or decline of update activity over time.
- Districts that consistently exhibit high workload and may require additional administrative resources.

This structured methodology ensures that conclusions are transparent, data-driven, and suitable for policy-oriented planning and system improvement by UIDAI.

This approach emphasizes interpretability and practical relevance over complex modeling, ensuring that findings can be directly used for administrative decision-making.

4. Pattern Analysis: District-wise Biometric Load

This section analyses the distribution of Aadhaar biometric update activity across districts in Telangana to identify regional patterns in service demand. Using aggregated district-level data, the total number of biometric updates was compared to understand which districts experience higher workload and which show lower levels of activity.

The district-wise comparison reveals that biometric update demand is not uniformly distributed across the state. Certain districts consistently report significantly higher volumes, while others show comparatively low activity.

High-load districts such as **Hyderabad, Medchal–Malkajgiri, Ranga Reddy, and Karimnagar** consistently contribute a major share of total biometric updates... These districts are characterized by higher population density, urban concentration, and increased citizen interaction with government services. As a result, Aadhaar update requests related to demographic changes, address updates, and biometric re-enrolment are more frequent.

In contrast, districts such as **Mulugu, Jogulamba Gadwal, Komaram Bheem, and Narayanpet** show lower biometric update volumes. This pattern may be influenced by factors such as lower population density, limited access to enrolment centres, or reduced awareness of update requirements among residents.

Overall, the observed pattern highlights a clear regional imbalance in biometric update workload across Telangana. Urban and semi-urban districts experience sustained pressure on Aadhaar services, whereas several rural districts remain underutilized. This uneven distribution suggests the need for region-specific operational planning rather than uniform allocation of resources across the state.

Key Observations

- Biometric update demand is concentrated in a few high-population districts.
- Urban districts consistently record higher update volumes than rural districts.

- Several districts show persistently low activity, indicating possible access or awareness gaps.

Implications for UIDAI

The district-wise pattern indicates that a one-size-fits-all approach to resource deployment may not be effective. Districts with consistently high workload may require:

- Additional enrolment centres.
- Increased staffing during peak periods.
- Improved appointment and queue management systems.

Meanwhile, low-activity districts may benefit from:

- Awareness campaigns regarding biometric update requirements.
- Mobile enrolment units to improve reach in remote areas.
- Integration with local administrative offices to improve accessibility.

This pattern analysis provides a data-backed foundation for targeted service planning and more efficient utilization of infrastructure across Telangana.

5. Trend Analysis: Monthly Biometric Updates

This section examines how Aadhaar biometric update activity changes over time across districts in Telangana. Using month-wise aggregation of biometric update data, temporal trends were analysed to understand whether demand is increasing, decreasing, or fluctuating during different periods.

A time-series analysis was conducted using monthly totals derived from the dataset. The resulting visualization highlights variations in biometric update activity across months and reveals important patterns related to seasonality, administrative cycles, and citizen behaviour.

The analysis shows that biometric update activity does not remain constant throughout the year. Certain months record significantly higher volumes, while others experience noticeable declines. These fluctuations may be influenced by factors such as academic admission periods, government scheme enrolments, population mobility, and awareness drives related to Aadhaar updates.

Several districts demonstrate a gradual rise in biometric update activity during specific periods, indicating increasing demand for Aadhaar-related services. Conversely, some months show a consistent dip in activity, which could be associated with reduced footfall at enrolment centres or limited administrative operations during holiday or off-peak periods.

Overall, the monthly trend analysis reveals that biometric update demand follows a **cyclical pattern rather than a linear one**, with identifiable peaks and troughs across the year.

Key Observations

- Biometric update volumes vary significantly from month to month.
- Certain periods consistently show higher demand across multiple districts.
- Declines in activity during specific months suggest seasonal or operational influences.

High-demand districts tend to maintain relatively higher activity even during low-demand months

Implications for UIDAI

Understanding monthly trends is essential for efficient service planning. Based on the observed patterns:

- High-demand months can be supported with **temporary staffing increases and extended service hours.**
- Resource deployment can be optimized by **aligning workforce availability with peak periods.**
- Predictable low-demand periods provide opportunities for **system maintenance, training, and process improvements** without disrupting citizen services.

By aligning operational capacity with observed trends, UIDAI can improve service responsiveness while minimizing congestion and waiting times at enrolment centres.

6. Anomaly Detection: High vs Low Districts

This section focuses on identifying anomalies in Aadhaar biometric update activity across districts in Telangana. Anomalies refer to districts whose biometric update volumes deviate significantly from the general pattern observed across the state. These deviations may indicate operational pressure, access limitations, or underlying demographic and administrative factors.

Using district-wise aggregated totals and comparative visualizations, districts with unusually high and unusually low biometric update activity were examined.

The analysis shows that a small number of districts consistently record disproportionately high volumes of biometric updates. Districts such as **Hyderabad, Ranga Reddy, Medchal–Malkajgiri, and Karimnagar** stand out as high-activity outliers. Their update volumes are significantly higher than the state average, suggesting sustained pressure on Aadhaar enrolment and update infrastructure in these regions. This pattern may be attributed to high population density, urban migration, greater awareness, and increased service usage.

In contrast, several districts exhibit exceptionally low biometric update activity. Districts such as **Mulugu, Narayanpet, Komaram Bheem, and Jogulamba Gadwal** fall well below the average. These low-activity outliers may reflect limited access to enrolment centres, lower awareness of update requirements, logistical challenges, or demographic characteristics that reduce demand.

These sharp contrasts between high and low districts represent **structural anomalies** rather than random variation, highlighting systemic imbalances in service utilization across the state.

Key Anomalies Identified

- A few districts contribute a disproportionately large share of total biometric updates.
- Multiple districts remain consistently underrepresented in biometric activity.
- The gap between the highest and lowest districts is significant, indicating unequal service reach.

Operational Interpretation

These anomalies indicate structural service inequalities rather than random fluctuations.

High-volume districts may face:

- Overcrowded enrolment centres.
- Longer waiting times and service delays.
- Increased pressure on staff and infrastructure.

Low-volume districts may indicate:

- Insufficient physical access to update facilities.
- Lower awareness of mandatory biometric updates.
- Possible administrative or connectivity limitations.

Implications for UIDAI

Anomaly detection enables targeted interventions rather than uniform policy implementation. Based on these findings:

- High-load districts may require **additional enrolment units, mobile counters, or extended working hours.**
- Low-load districts may benefit from **outreach programs, mobile enrolment camps, and integration with local governance bodies.**
- Continuous monitoring of these anomalies can help UIDAI proactively address service imbalances and ensure equitable access across regions.

This anomaly-based approach supports more responsive planning and promotes balanced delivery of Aadhaar services across Telangana.

7. Predictive Indicators: Future Service Pressure

While patterns and anomalies explain what has already occurred, predictive indicators help anticipate future operational challenges. This section uses time-based trends of high-activity districts to identify areas that are likely to experience continued or increasing demand for Aadhaar biometric updates.

To develop predictive indicators, the monthly biometric update trends of the **top-performing districts** were analysed using time-series visualizations. Districts with consistently high volumes and upward or sustained trends were treated as early signals of future service pressure.

The analysis reveals that districts such as **Hyderabad, Ranga Reddy, Medchal–Malkajgiri, and Karimnagar** not only register high biometric update volumes, but also maintain strong activity across multiple months. In several cases, these districts exhibit steady or rising trends, indicating that demand is not temporary but structurally embedded in these regions.

They provide a practical basis for forecasting operational load without requiring complex statistical modeling. If current trends continue, these districts are likely to face:

- Increased footfall at enrolment and update centres.
- Higher operational load on biometric equipment and staff.
- Greater risk of service delays and congestion.

Conversely, districts with consistently low or declining trends may continue to experience underutilization unless targeted interventions are introduced.

Key Predictive Signals

- Districts with **persistently high monthly volumes** indicate long-term service pressure.
- Districts showing **upward trends over consecutive months** suggest growing future demand.

- Minimal seasonal variation in top districts indicates structurally high dependence on Aadhaar services.

Decision-Support Interpretation

These predictive indicators allow UIDAI to move from reactive management to proactive planning. Rather than responding only after congestion occurs, future demand can be anticipated and addressed in advance.

Based on observed trends:

- Districts with rising demand should be prioritised for **capacity expansion.**
- Early identification of pressure points enables **advance deployment of staff, mobile units, and biometric devices.**
- Trend-based monitoring can be used to establish **thresholds** (for example, sustained growth over multiple months) that trigger operational action.

Implications for System Planning

The predictive view supports strategic improvements in Aadhaar service delivery:

- **Preventive Resource Allocation:** Resources can be redistributed before service bottlenecks arise.
- **Data-Driven Scheduling:** Staffing and operational hours can be aligned with expected workload.
- **Scalable Infrastructure:** High-growth districts can be prepared for future population and service expansion.

By using trend-based predictive indicators, UIDAI can strengthen planning, reduce service disruptions, and enhance citizen experience through anticipatory governance.

8. Solution Framework for UIDAI

This section translates the analytical findings of this study into practical recommendations that can support informed decision-making and system improvement for UIDAI. Based on the identified patterns, anomalies, and predictive indicators, the following framework proposes targeted, data-driven interventions rather than uniform policy measures.

8.1 Addressing Regional Workload Imbalance

Observed Issue

District-wise analysis shows that a limited number of districts account for a disproportionately high share of biometric updates, while several others remain underutilized. This imbalance leads to service congestion in high-demand districts and inefficient infrastructure usage in low-demand areas.

Proposed Action

UIDAI should adopt a district-based operational planning model in which resources are allocated according to actual biometric update demand rather than uniform distribution.

- High-load districts: Increase number of enrolment counters, biometric devices, and operators.
- Low-load districts: Maintain essential infrastructure while redirecting surplus capacity where needed.

Expected Outcome

- Reduced waiting times in high-demand areas.
- Balanced utilization of manpower and infrastructure.
- Improved overall service efficiency.

8.2 Predictive Resource Planning

Observed Issue

Trend analysis indicates that certain districts show sustained or increasing biometric update volumes, acting as early indicators of future service pressure.

Proposed Action

Implement a **trend-based early warning system** using monthly biometric update data.

- Monitor districts with continuous growth across multiple months.
- Define operational thresholds (for example, consistent month-on-month increase).
- Trigger proactive actions such as temporary staffing, mobile enrolment units, or extended working hours before congestion occurs.

Expected Outcome

- Prevention of service overload.
- Transition from reactive management to proactive planning.
- Higher service reliability during peak demand periods.

8.3 Improving Service Accessibility in Low-Activity Districts

Observed Issue

Anomaly detection highlights districts with unusually low biometric update activity, potentially reflecting limited access, lower awareness, or logistical constraints.

Proposed Action

Introduce targeted outreach and accessibility programs, such as:

- Mobile enrolment camps in remote or under-served areas.
- Collaboration with local administrative offices and panchayats.
- Public awareness drives regarding the importance of timely biometric updates.

Expected Outcome

- Improved coverage and inclusion.
- Greater equity in Aadhaar service access.
- Reduced regional disparities in update activity.

8.4 Enhancing Biometric Quality and Reducing Repeat Updates

Observed Issue

Persistently high update volumes in certain districts may indicate frequent biometric mismatches or quality issues, especially in labour-intensive regions where fingerprint wear is common.

Proposed Action

- Conduct periodic biometric quality audits in high-load districts.
- Upgrade capture devices and strengthen operator training.
- Introduce citizen guidance on correct biometric capture practices.

Expected Outcome

- Lower frequency of repeat updates.
- Improved authentication accuracy.
- Reduced long-term operational costs.

8.5 Data-Driven Governance Model

Strategic Recommendation

Institutionalize a **data-driven planning framework** where monthly biometric update metrics inform decisions related to:

- Infrastructure investment

- Staffing and training
- Technology upgrades
- Policy adjustments

Dashboards and regular analytical reviews can enable continuous performance monitoring and adaptive governance.

Expected Outcome

- Evidence-based policy formulation.
- Scalable and responsive Aadhaar service delivery.
- Strong alignment between operational planning and actual citizen demand.

9. Conclusion

This project set out to analyse Aadhaar biometric update data for the state of Telangana with the aim of identifying meaningful patterns, trends, anomalies, and predictive indicators that could support informed decision-making and system improvement for UIDAI.

Through district-wise analysis, the study revealed a clear imbalance in biometric update activity across the state. A small number of districts consistently handle a large share of update requests, while several others remain underutilized. Monthly trend analysis further showed that biometric update demand varies over time, following identifiable cycles rather than remaining constant. Anomaly detection highlighted districts with unusually high and low activity, pointing to differences in access, awareness, population density, and administrative demand.

Most importantly, the identification of predictive indicators demonstrated how time-based trends can be used to anticipate future service pressure. Districts with sustained or rising update volumes were recognized as early warning signals of potential congestion and operational stress. By linking these insights with practical recommendations, this study moved beyond descriptive analysis and focused on actionable, data-driven decision support.

The proposed solution framework emphasizes targeted resource allocation, proactive capacity planning, improved service accessibility in under-served regions, and continuous quality enhancement. Together, these measures illustrate how administrative data can be transformed into a strategic asset for improving governance and citizen service delivery.

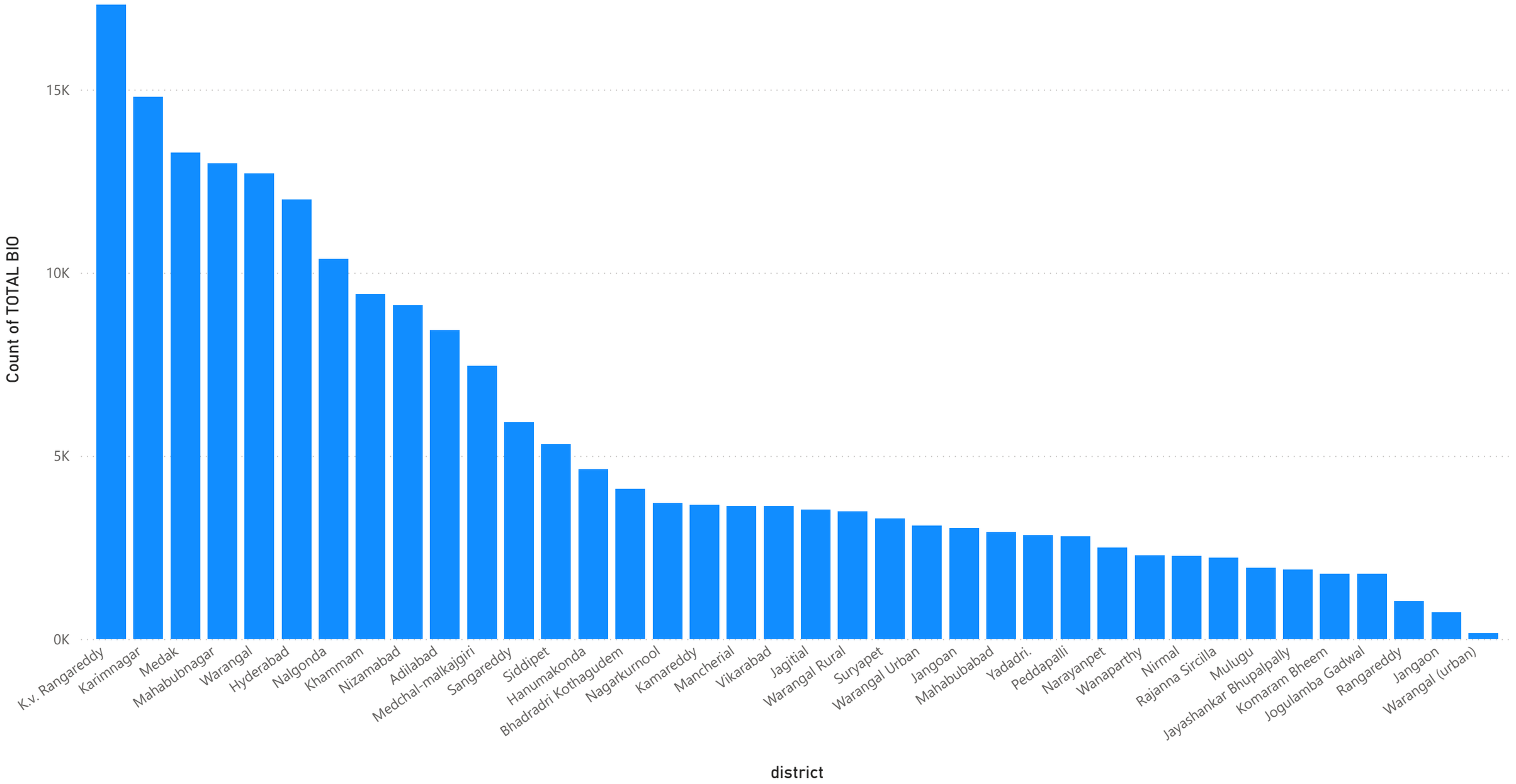
In conclusion, this project demonstrates that systematic analysis of Aadhaar biometric update data can enable UIDAI to plan more effectively, respond proactively to emerging demand, and ensure equitable access to services across regions. The approach presented in this report highlights the value of evidence-based decision-making in strengthening large-scale digital identity systems and enhancing public trust through efficient, responsive service delivery.

APPENDIX

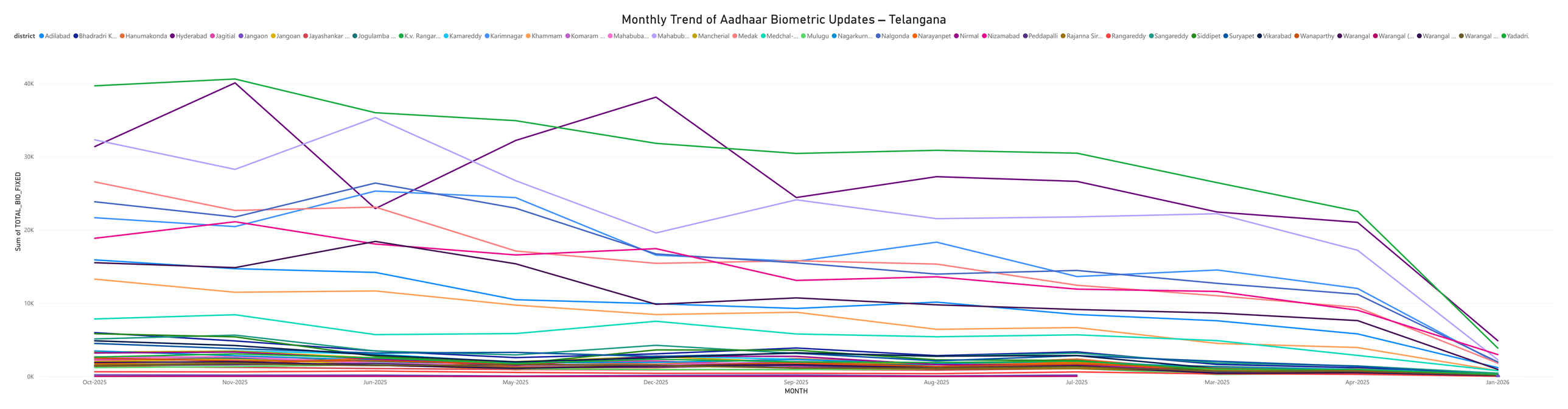
Power BI Dashboards

The following dashboards were developed using Power BI to support the analysis and findings discussed in the report.

District-wise Biometric Update Load — Telangana (UIDAI 2026)

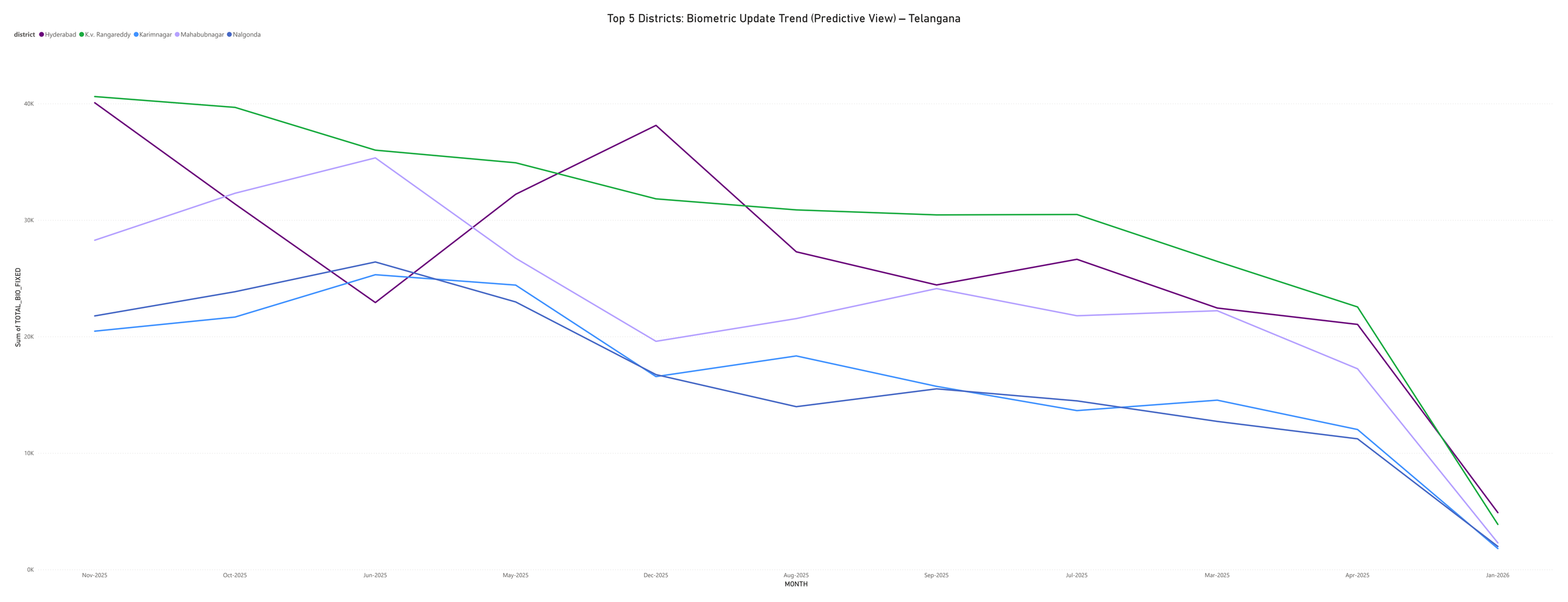


Monthly Trend of Aadhaar Biometric Updates – Telangana



Anomaly Detection: High vs Low Biometric Activity Districts

district	Sum of TOTAL_BIO_FIXED
K.v. Rangareddy	3,27,678.00
Hyderabad	2,91,419.00
Mahabubnagar	2,51,404.00
Karimnagar	1,84,486.00
Nalgonda	1,81,610.00
Medak	1,70,808.00
Nizamabad	1,54,414.00
Warangal	1,20,989.00
Adilabad	1,07,807.00
Khammam	85,827.00
Medchal-malkajgiri	60,910.00
Sangareddy	34,294.00
Bhadradri Kothagudem	33,223.00
Suryapet	29,428.00
Siddipet	29,296.00
Vikarabad	27,753.00
Kamareddy	22,987.00
Mancherial	21,663.00
Nirmal	20,819.00
Nagarkurnool	20,818.00
Yadadri.	20,705.00
Hanumakonda	19,200.00
Jogulamba Gadwal	18,186.00
Komaram Bheem	17,283.00
Wanaparthy	17,006.00
Jagitial	16,784.00
Mahabubabad	16,702.00
Narayanpet	14,609.00
Jangoan	13,834.00
Warangal Rural	13,396.00
Warangal Urban	13,134.00
Rajanna Sircilla	12,350.00
Peddapalli	12,109.00
Mulugu	10,088.00
Jayashankar Bhupalpally	9,212.00
Rangareddy	5,224.00
Jangaon	1,317.00
Warangal (urban)	191.00
Total	**24,08,963.00**


Top 5 Districts: Biometric Update Trend (Predictive View) – Telangana
district
Hyderabad
K.v. Rangareddy
Karimnagar
Mahabubnagar
Nalgonda
Sum of TOTAL_BIO_FIXED
40K
30K
20K
10K
0K
Nov-2025
Oct-2025
Jun-2025
May-2025
Dec-2025
Aug-2025
Sep-2025
Jul-2025
Mar-2025
Apr-2025
Jan-2026
MONTH