

# Aadhaar Insight Atlas

## Unlocking Societal Trends in Aadhaar Enrolment and Updates

Team ID: UIDAI\_14057 Live Project Link: <https://uidai-14057.vercel.app/>

### Problem Statement & Approach

**Challenge:** Identify meaningful patterns, trends, and anomalies from Aadhaar enrollment/update datasets to support informed decision-making.

**Solution:** Aadhaar Insight Atlas – an interactive geospatial analytics platform featuring:

- **Multi-level Drill-Down:** National → State → District → Pincode
- **32+ Analytics Metrics** across 7 categories
- **Two Novel Composite Indices:**
  - **Health Index** = Enrollment (40%) + Freshness (30%) + Updates (30%)
  - **Exclusion Risk** = Deficit (40%) + Staleness (35%) + Update Deserts (25%)
- **ML-powered Clustering:** DBSCAN (cold zones) + KMeans (hot zones)

### Datasets Used

Dataset	Key Columns
<b>Enrollment</b>	pincode, district, state, age_0_5, age_5_17, age_18_greater, date
<b>Biometric Updates</b>	pincode, district, state, date, update_type
<b>Demographic Updates</b>	pincode, district, state, date, field_updated

### Methodology

1. **Data Loading:** DuckDB for high-performance analytics
2. **Preprocessing:** Null handling, date normalization, geographic hierarchy validation
3. **Feature Engineering:** Composite indices, clustering features, anomaly scores
4. **ML Models:** DBSCAN for cold clusters, KMeans for hot clusters, Z-score for outliers

### Key Findings

Analysis	Finding
<b>Enrollment Distribution</b>	Top 10% districts account for majority of enrollments
<b>Health vs Risk Correlation</b>	Strong negative correlation validates complementary indices
<b>Geospatial Clustering</b>	Cold clusters reveal infrastructure gaps in specific regions
<b>Anomaly Detection</b>	Identified phantom children, ghost towns, enrollment mirages

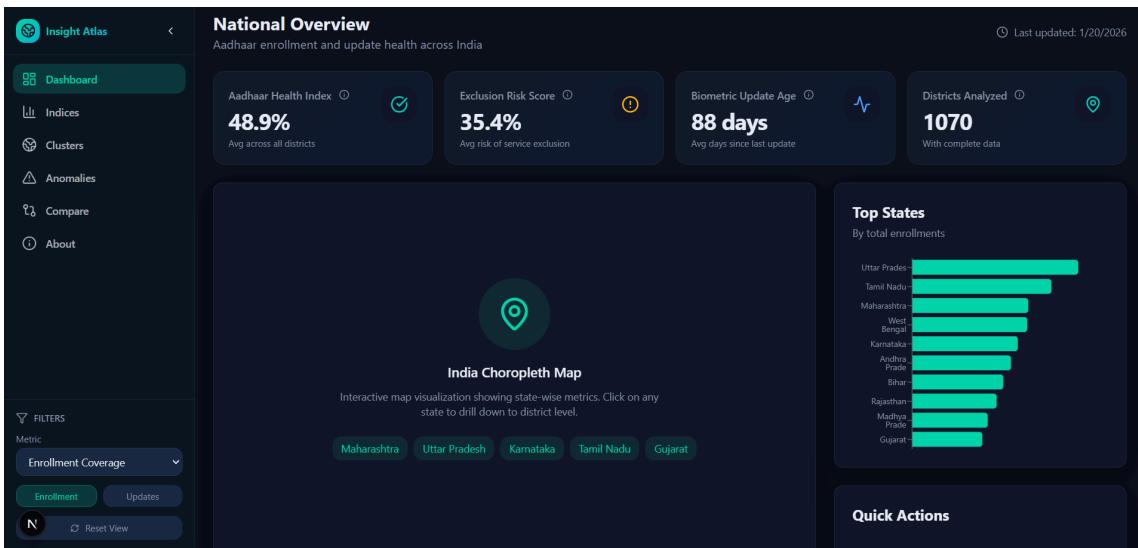
## Impact & Applicability

Insight	Policy Application
<b>Exclusion Risk Index</b>	Prioritize enrollment camps in high-risk districts
<b>Phantom Children</b>	Mandate biometric update compliance for child Aadhaar
<b>Ghost Towns</b>	Infrastructure review for inactive pincodes
<b>Cold Clusters</b>	Regional equity programs for underserved areas

**Tech Stack:** Next.js 16, TailwindCSS, Recharts, FastAPI, DuckDB, scikit-learn

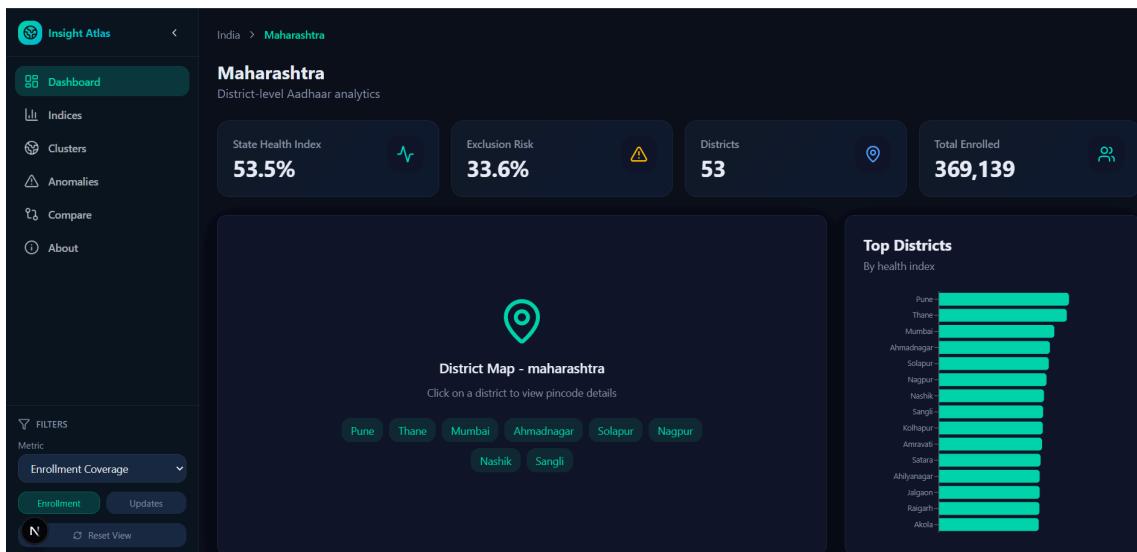
## Platform Screenshots

### 1. National Dashboard



**Route:** /dashboard | Shows national-level Health Index, Exclusion Risk, Biometric Update Age, Districts Analyzed, top states chart, and top-performing districts leaderboard.

### 2. State Dashboard



**Route:** /dashboard/state/[state] | State-level drill-down with district-wise health scores, exclusion risk averages, and clickable district navigation.

### 3. Districts Table

**Insight Atlas**

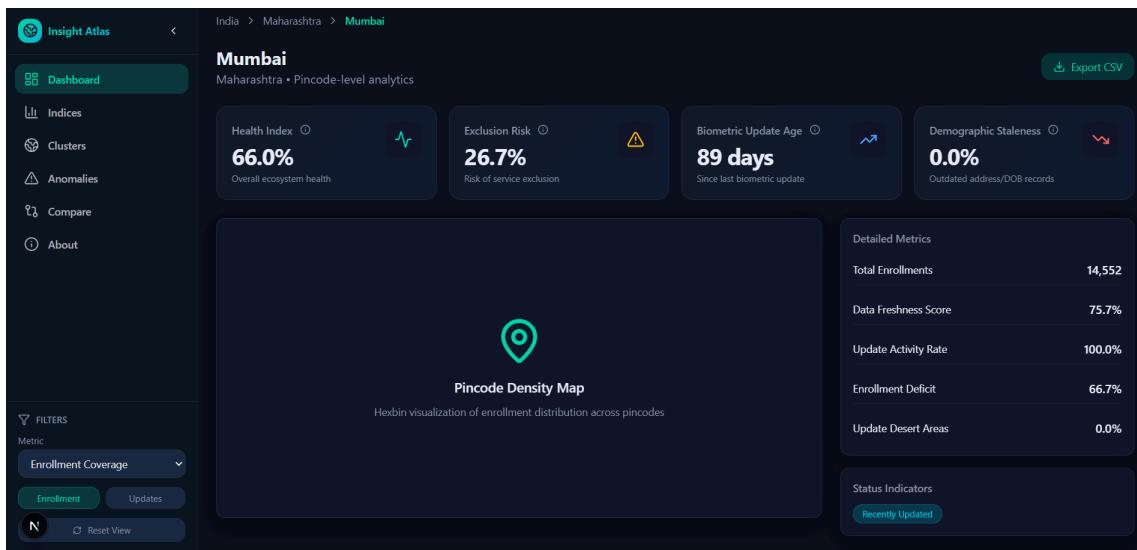
### Top Performing Districts

Districts ranked by composite health score (higher = better coverage & maintenance)

Rank	District	State	Health Index	Data Freshness
1	Pune	Maharashtra	74.4%	75%
2	North 24 Parganas	West Bengal	73.5%	75%
3	Thane	Maharashtra	73.1%	76%
4	Bengaluru	Karnataka	68.8%	75%
5	Murshidabad	West Bengal	67.7%	75%
6	Bardhaman	West Bengal	67.0%	75%
7	Hooghly	West Bengal	66.6%	75%
8	South 24 Parganas	West Bengal	66.2%	75%
9	Malappuram	Kerala	66.1%	76%
10	Mumbai	Maharashtra	66.0%	76%

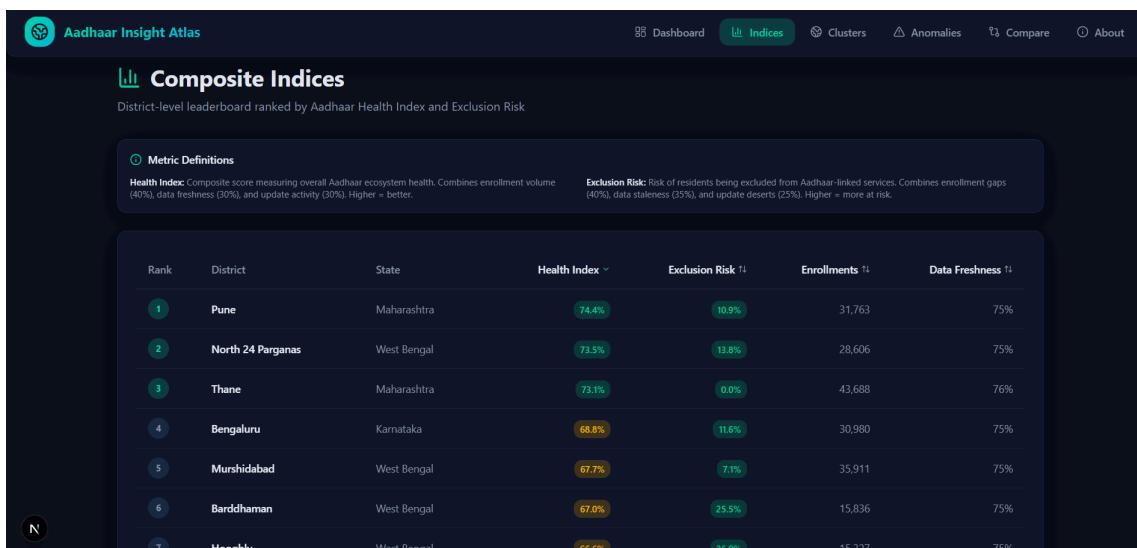
**Route:** /dashboard/state/[state] | Comprehensive district metrics table with color-coded indicators for quick comparison.

### 4. District Dashboard



**Route:** /dashboard/district/[district] | Deep-dive metrics: Freshness Score, Update Rate, Enrollment Deficit, Update Desert Areas, and status badges.

## 5. Composite Indices



**Route:** /indices | District ranking by Health Index and Exclusion Risk with metric definitions and drill-down links.

## 6. Anomaly Lab

**Aadhaar Insight Atlas**

**Anomaly Lab**

Detect unusual patterns and data quality issues

**⚡ Enrollment Mirages**  
**1**  
High enrollments with suspiciously low update activity

**∅ Phantom Children**  
**114**  
Child enrollments without subsequent biometric updates

**👻 Ghost Towns**  
**11**  
Pincode with no activity for 2+ years

**▲ Z-Score Outliers**  
**100**  
Enrollment counts significantly different from district average

**⚡ Enrollment Mirages**  
High enrollment, low update ratio

Pincode	District	Enrolled	Ratio
244001	Moradabad	3,965	4.7%

**∅ Phantom Children**  
0-5 age enrollments without bio updates

District	State	Phantom	%
Bengaluru Urban	Karnataka	12,111	100.0%
Dinajpur Uttar	West Bengal	6,478	100.0%
Banas Kantha	Gujarat	5,938	99.0%
Pashchim Champaran	Bihar	5,020	99.2%
Purbi Champaran	Bihar	4,000	100.0%
24 Paraganas North	West Bengal	3,177	100.0%

**Route:** /anomalies | Detects enrollment mirages, phantom children (0-5 age without updates), ghost towns (2+ years inactive), and bulk enrollment days ( $3\sigma+$  outliers).

## 7. Cluster Explorer

**Aadhaar Insight Atlas**

**Cluster Explorer**

DBSCAN clusters of low-enrollment pincodes

Cold Clusters (DBSCAN)
Hot Clusters (KMeans)

**Cluster Types**

- Cluster 0  
573 pincodes
- Cluster 1  
127 pincodes



**Cluster Visualization**  
Map highlighting districts by cluster assignment. Showing Cluster 1

**Cluster 1**

Pincode Count  
**127**

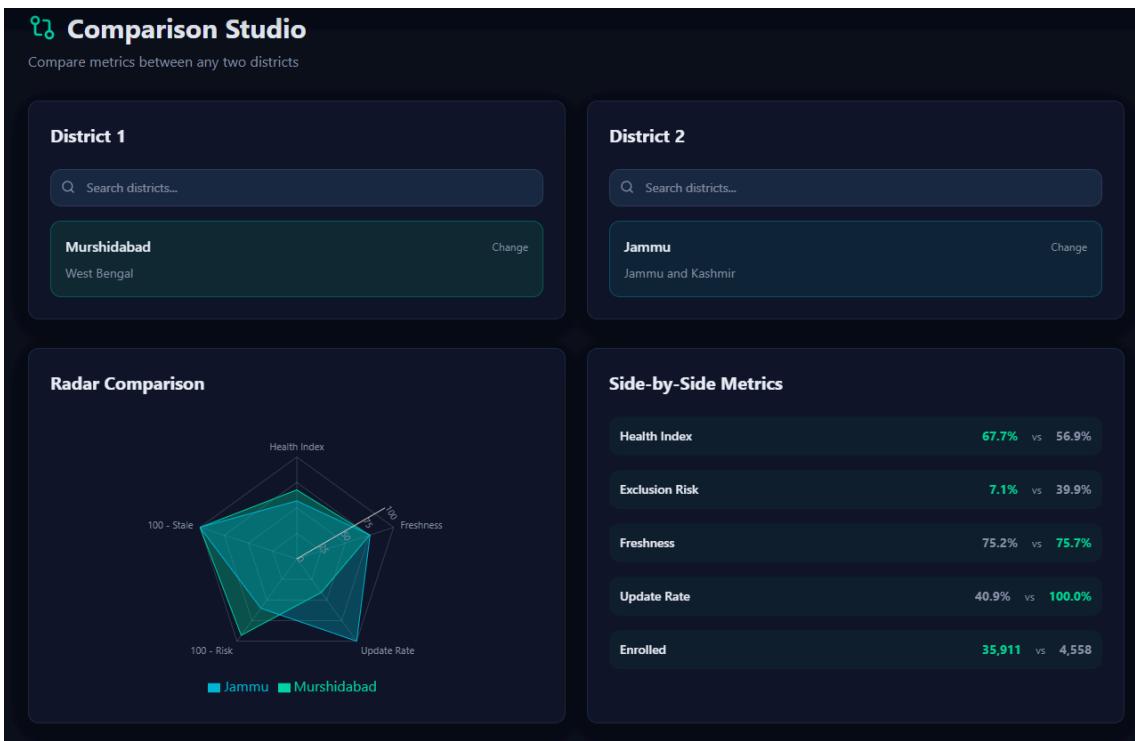
Avg Enrollment  
**1**

States  
Uttarakhand Punjab Rajasthan  
Uttar Pradesh

Sample Districts  
**Kapurthala**  
**Siddharthnagar**  
**Sant Ravidas Nagar**  
**Jalau**  
**Jaunpur**

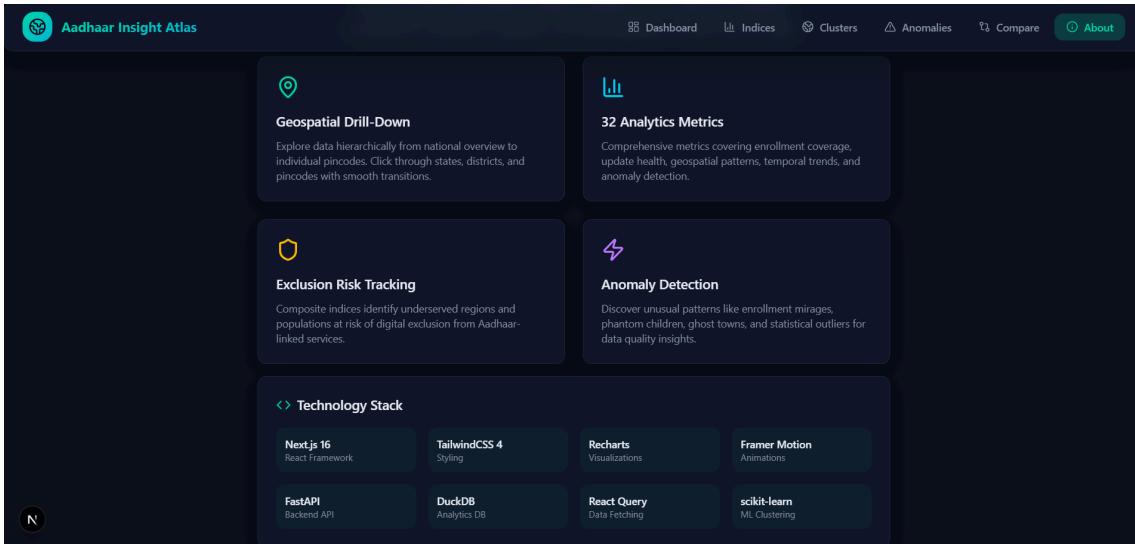
**Route:** /clusters | ML-powered clustering identifying underserved regions (cold) and successful enrollment hubs (hot).

## 8. Comparison Studio



**Route:** /compare | Side-by-side district comparison with radar visualization across Health Index, Freshness, Update Rate, and Risk metrics.

## 9. About Page



**Route:** /about | Platform introduction, 4 key features, technology stack, and breakdown of 32+ metrics across 7 categories.