

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
Enrollment	pincode, district, state, age_0_5, age_5_17, age_18_greater, date
Biometric Updates	pincode, district, state, date, update_type
Demographic Updates	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
Enrollment Distribution	Top 10% districts account for majority of enrollments
Health vs Risk Correlation	Strong negative correlation validates complementary indices
Geospatial Clustering	Cold clusters reveal infrastructure gaps in specific regions
Anomaly Detection	Identified phantom children, ghost towns, enrollment mirages

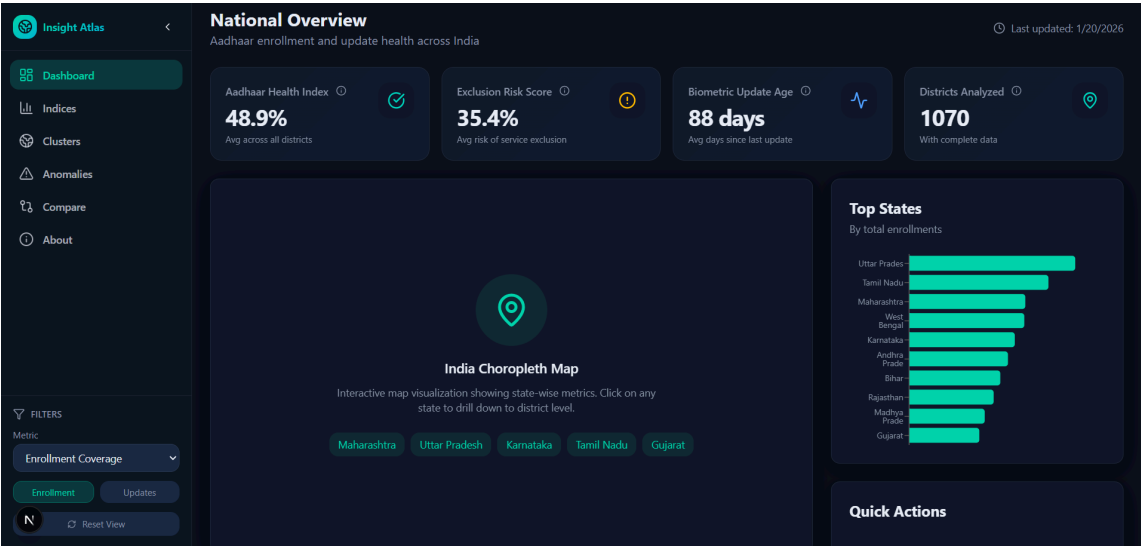
Impact & Applicability

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

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

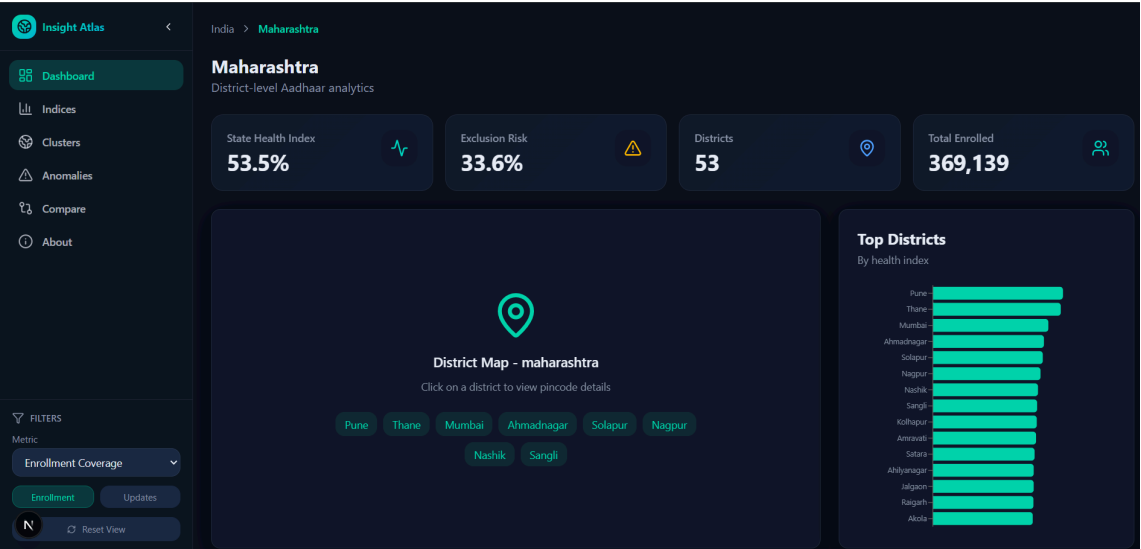
Platform Screenshots

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



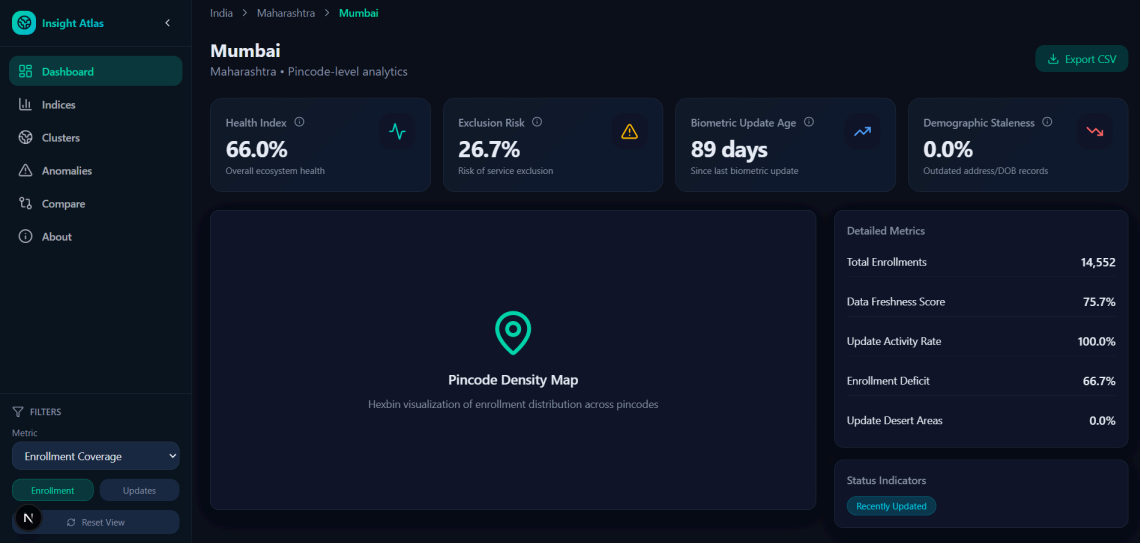
Route: `/dashboard/state/[state]` | State-level drill-down with district-wise health scores, exclusion risk averages, and clickable district navigation.

3. Districts Table

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	68.0%	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

Composite Indices
District-level leaderboard ranked by Aadhaar Health Index and Exclusion Risk

Metric Definitions

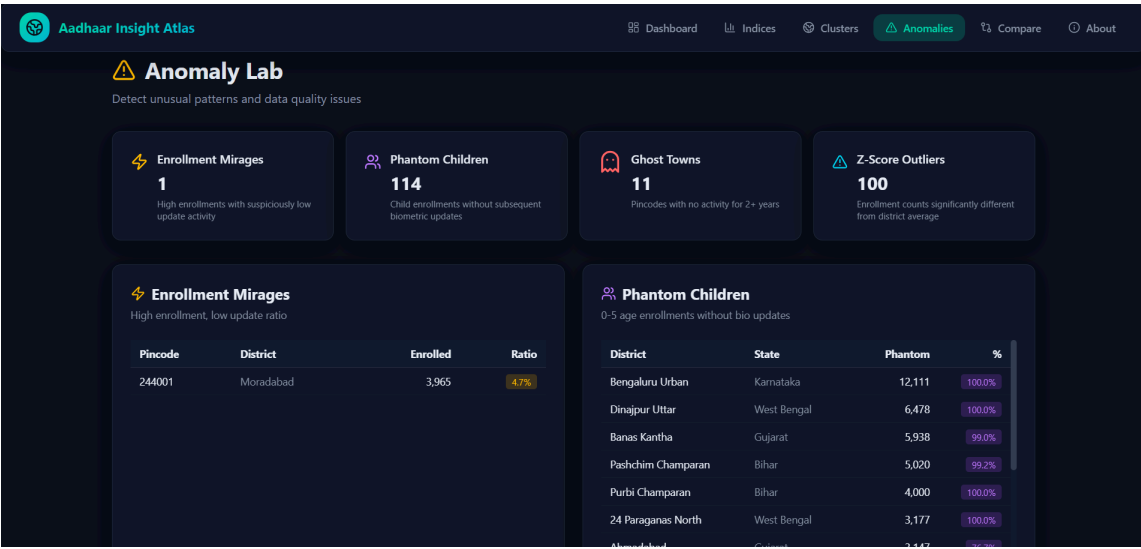
Health Index: Composite score measuring overall Aadhaar ecosystem health. Combines enrollment volume (40%), data freshness (30%), and update activity (30%). Higher = better.

Exclusion Risk: Risk of residents being excluded from Aadhaar-linked services. Combines enrollment gaps (40%), data staleness (35%), and update deserts (25%). Higher = more at risk.

Rank	District	State	Health Index ¹	Exclusion Risk ¹	Enrollments ¹	Data Freshness ¹
1	Pune	Maharashtra	74.4%	10.9%	31,763	75%
2	North 24 Parganas	West Bengal	73.5%	13.8%	28,606	75%
3	Thane	Maharashtra	73.1%	0.0%	43,688	76%
4	Bengaluru	Karnataka	68.8%	11.6%	30,980	75%
5	Murshidabad	West Bengal	67.7%	7.7%	35,911	75%
6	Bardhaman	West Bengal	67.0%	25.5%	15,836	75%
7	Hoochly	West Bengal	66.6%	28.0%	15,327	76%

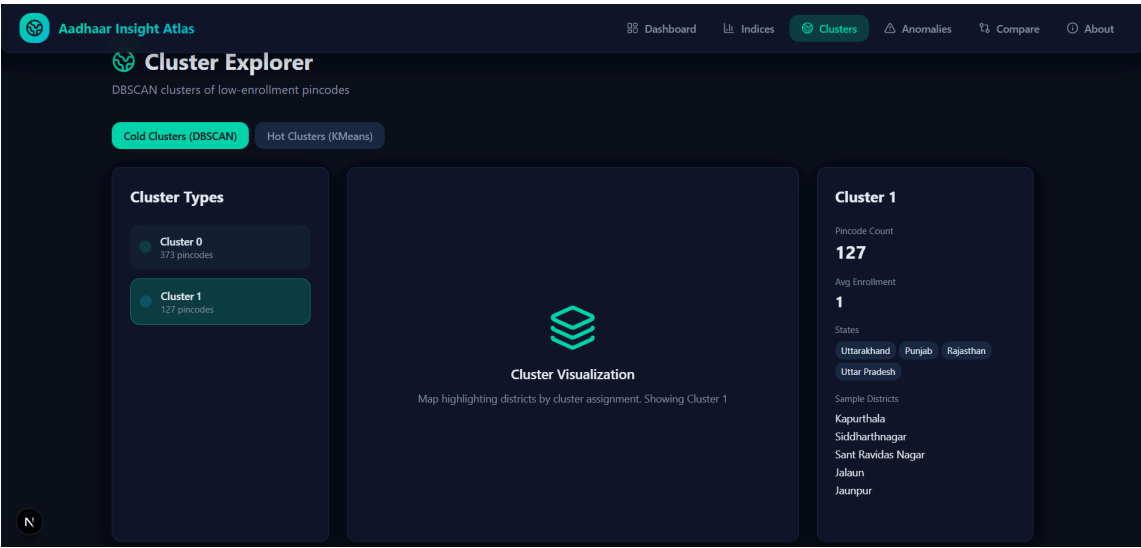
Route: `/indices` | District ranking by Health Index and Exclusion Risk with metric definitions and drill-down links.

6. Anomaly Lab



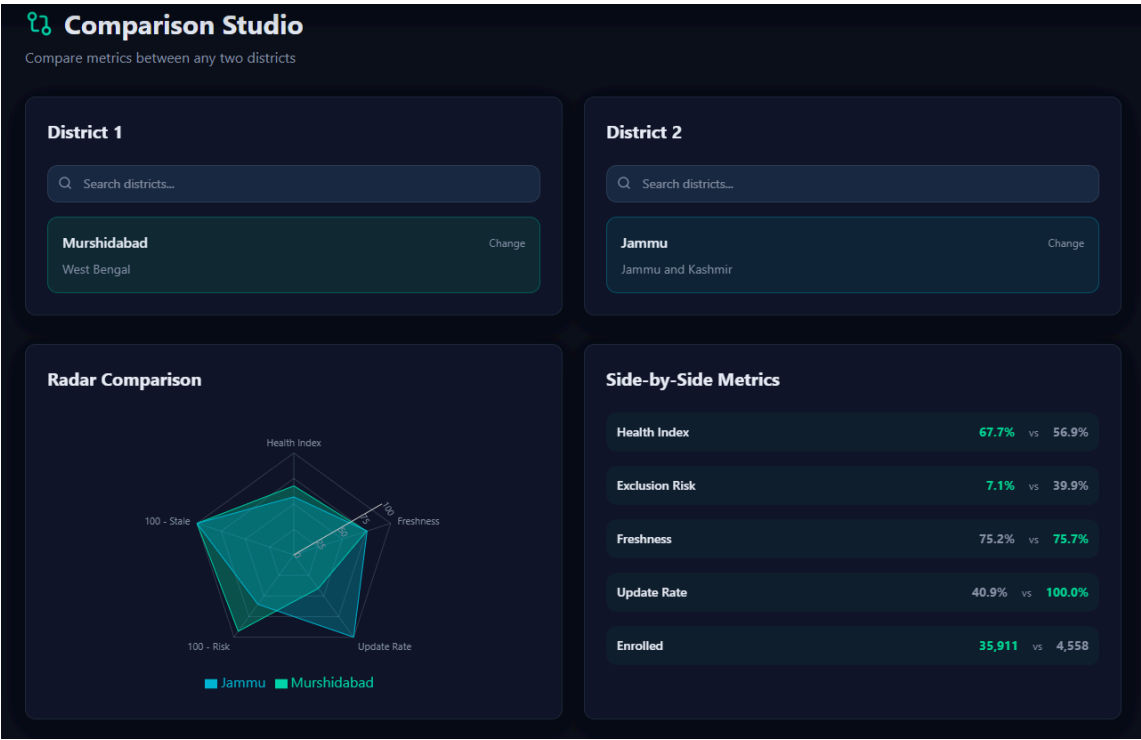
Route: `/anomalies` | Detects enrollment mirages, phantom children (0-5 age without updates), ghost towns (2+ years inactive), and bulk enrollment days (3 σ + outliers).

7. Cluster Explorer



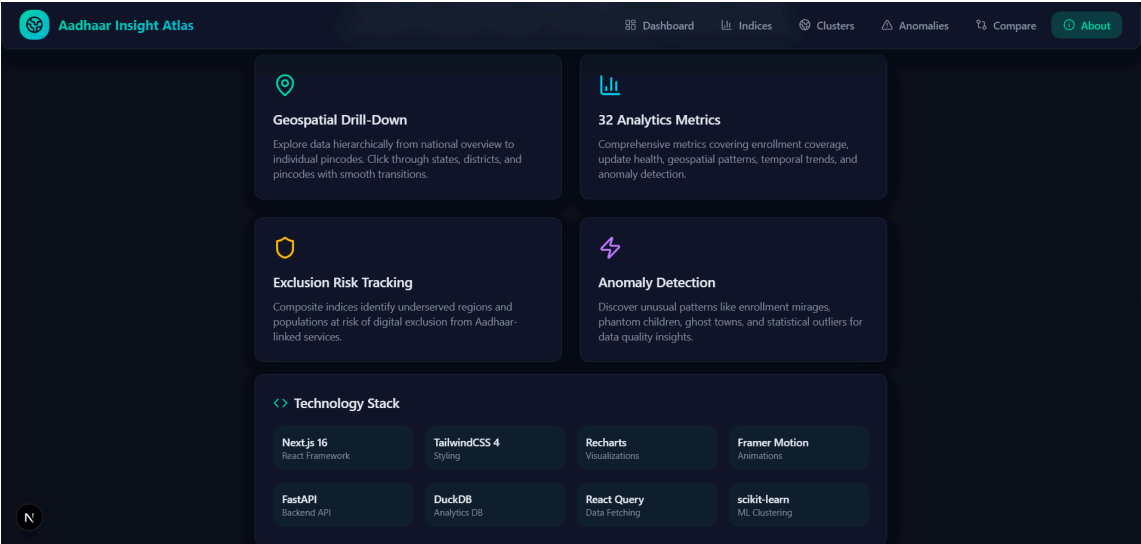
Route: `/clusters` | ML-powered clustering identifying underserved regions (cold) and successful enrollment hubs (hot).

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.