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

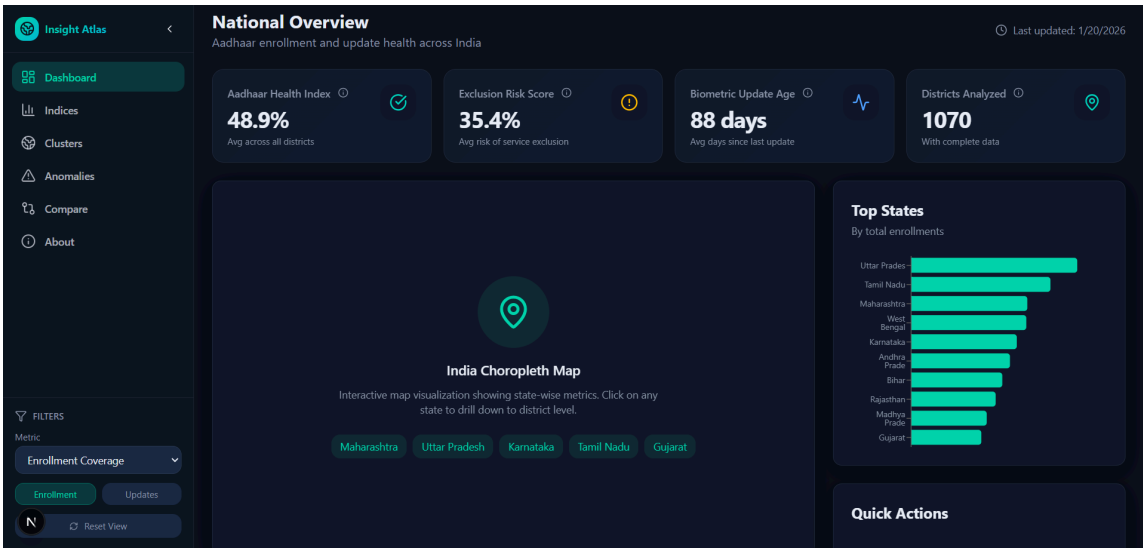
Insight	Policy Application
Exclusion Risk Index	Prioritize enrollment camps in high-risk districts
Phantom Children	Mandate biometric update compliance for child Aadhaar
Ghost Towns	Infrastructure review for inactive pincodes
Cold Clusters	Regional equity programs for underserved areas

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

---

Platform Screenshots

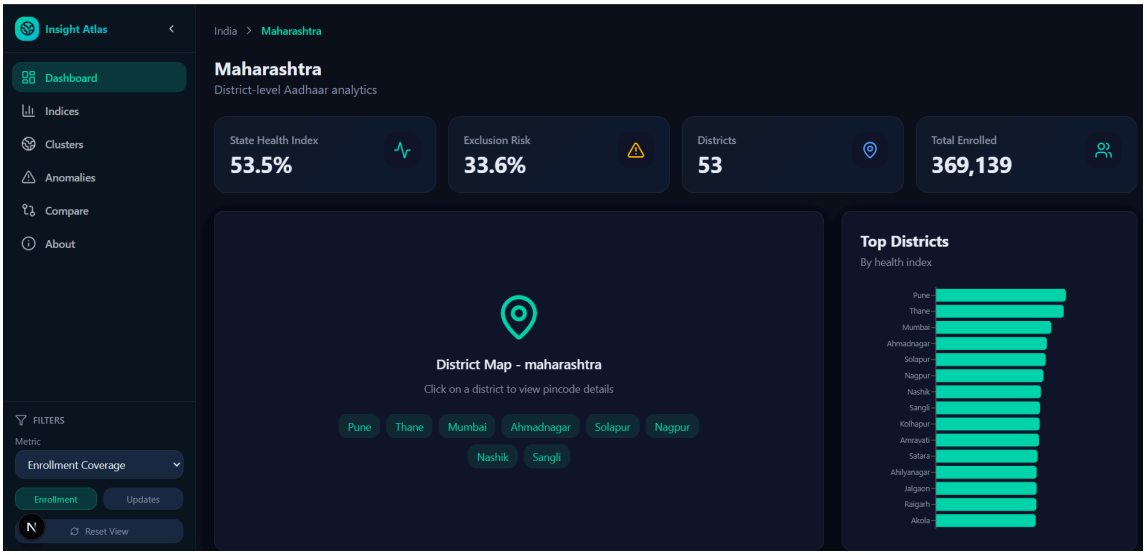
1. National Dashboard



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

---

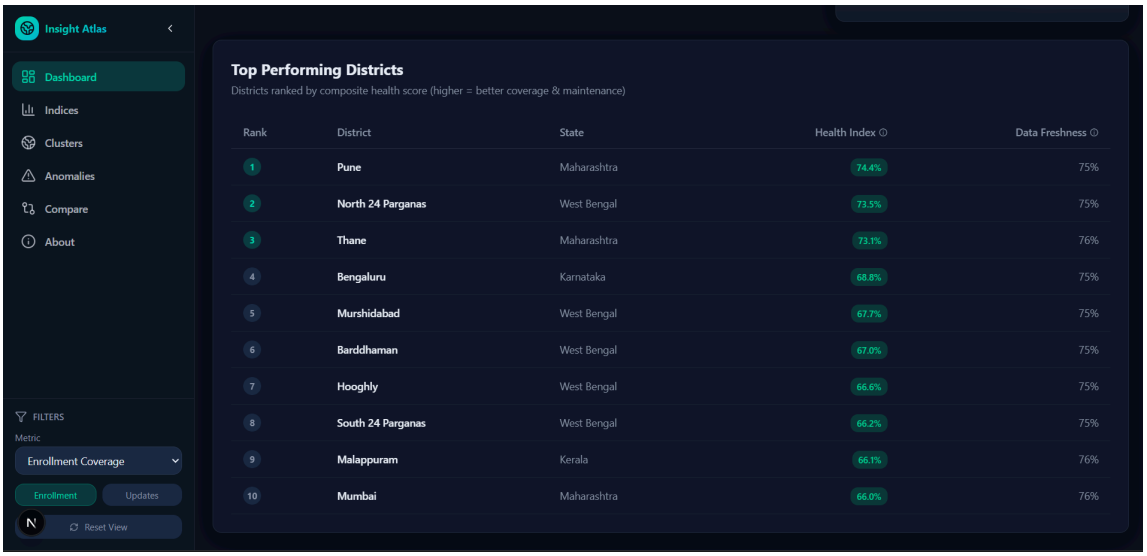
2. State Dashboard



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

---

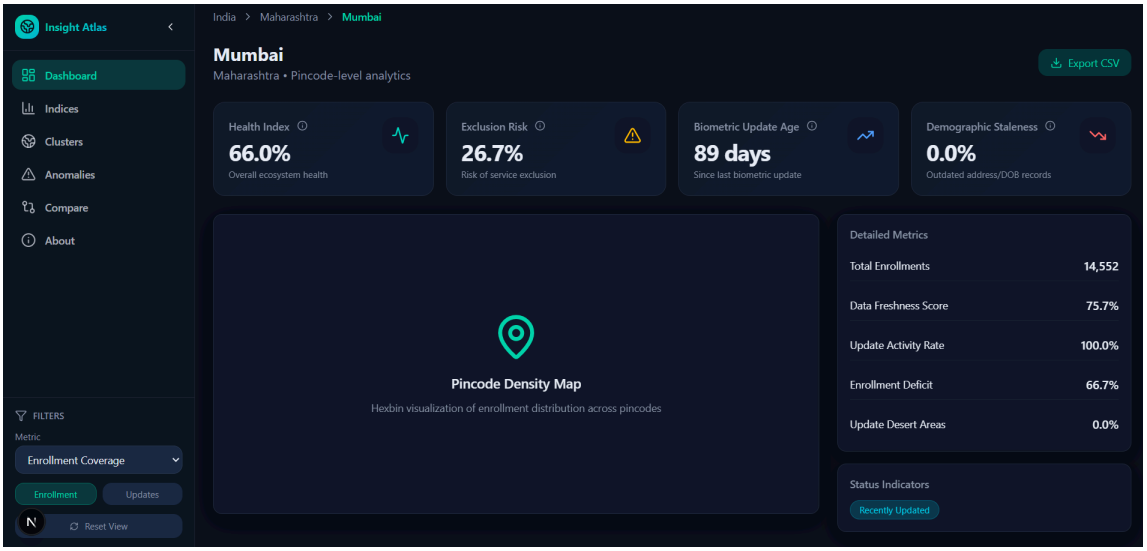
3. Districts Table



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

---

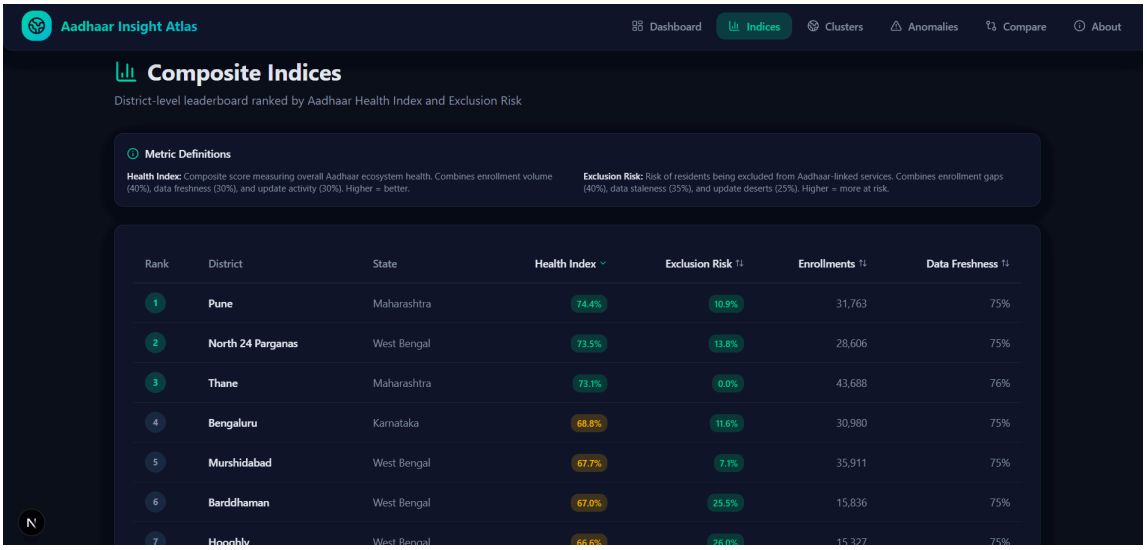
4. District Dashboard



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

---

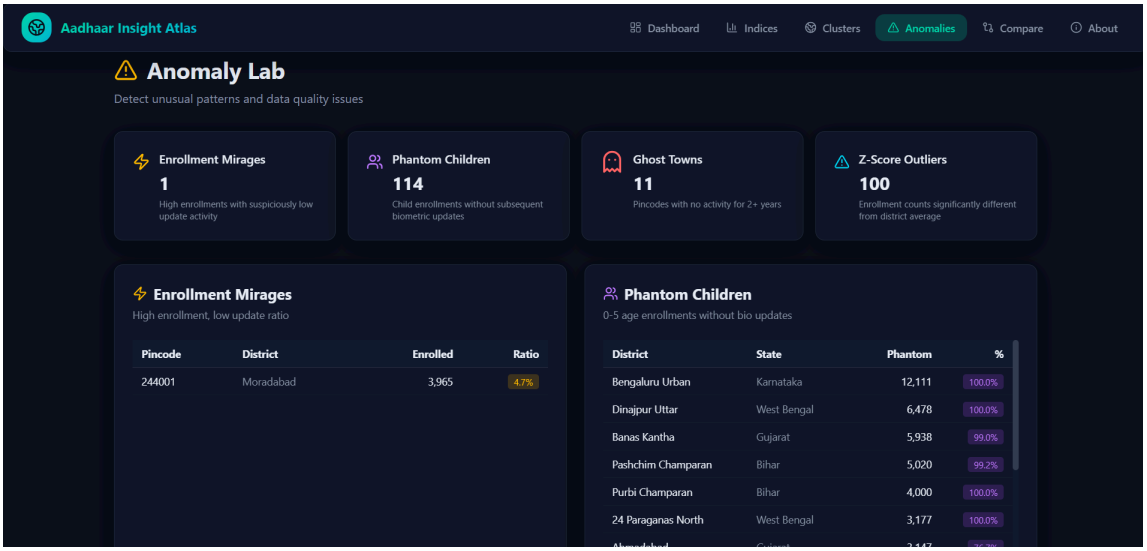
5. Composite Indices



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

---

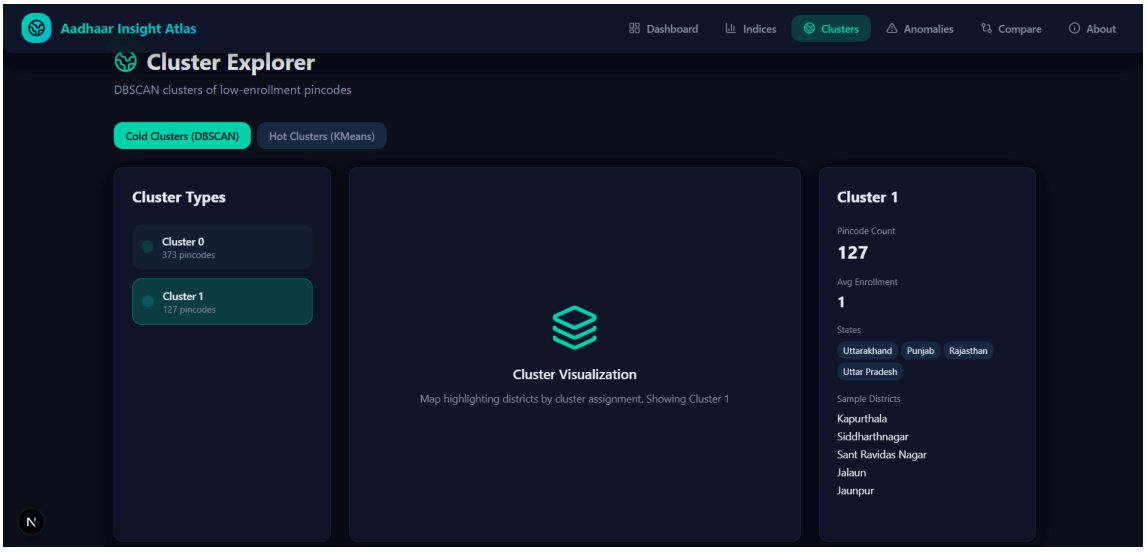
6. Anomaly Lab



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

---

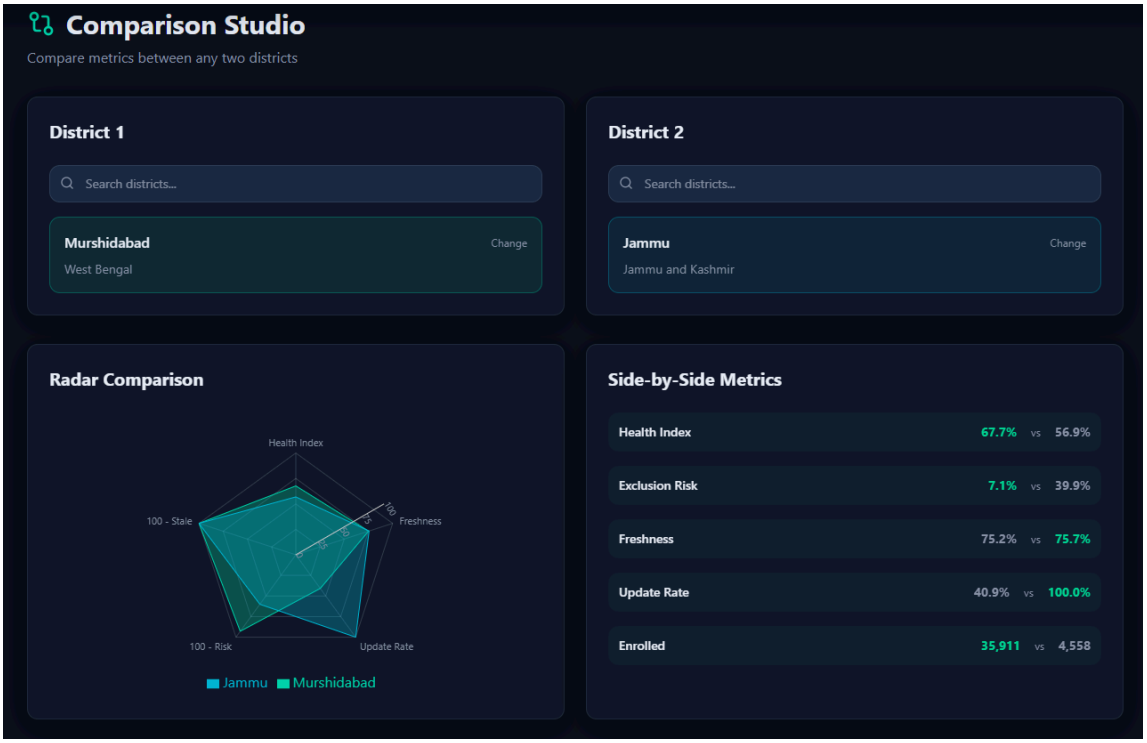
7. Cluster Explorer



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

---

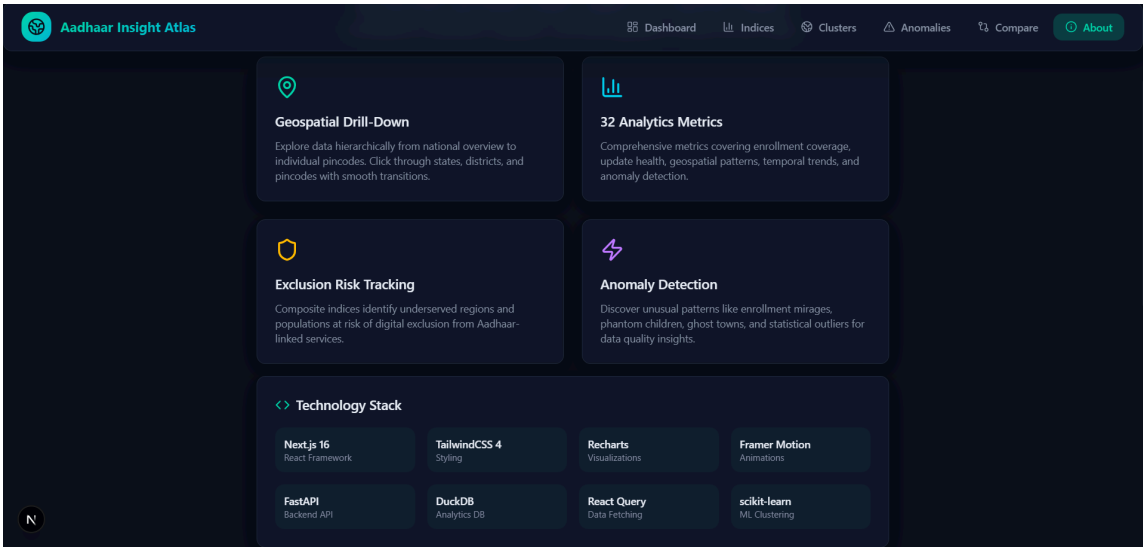
8. Comparison Studio



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.

Document prepared for UIDAI Data Analytics Challenge Submission