

Sentinel India

From Crisis to Control: A New Era for Public Health

Disease Outbreak Early Warning (Epidemiology AI) – Predicting & Preventing Epidemics

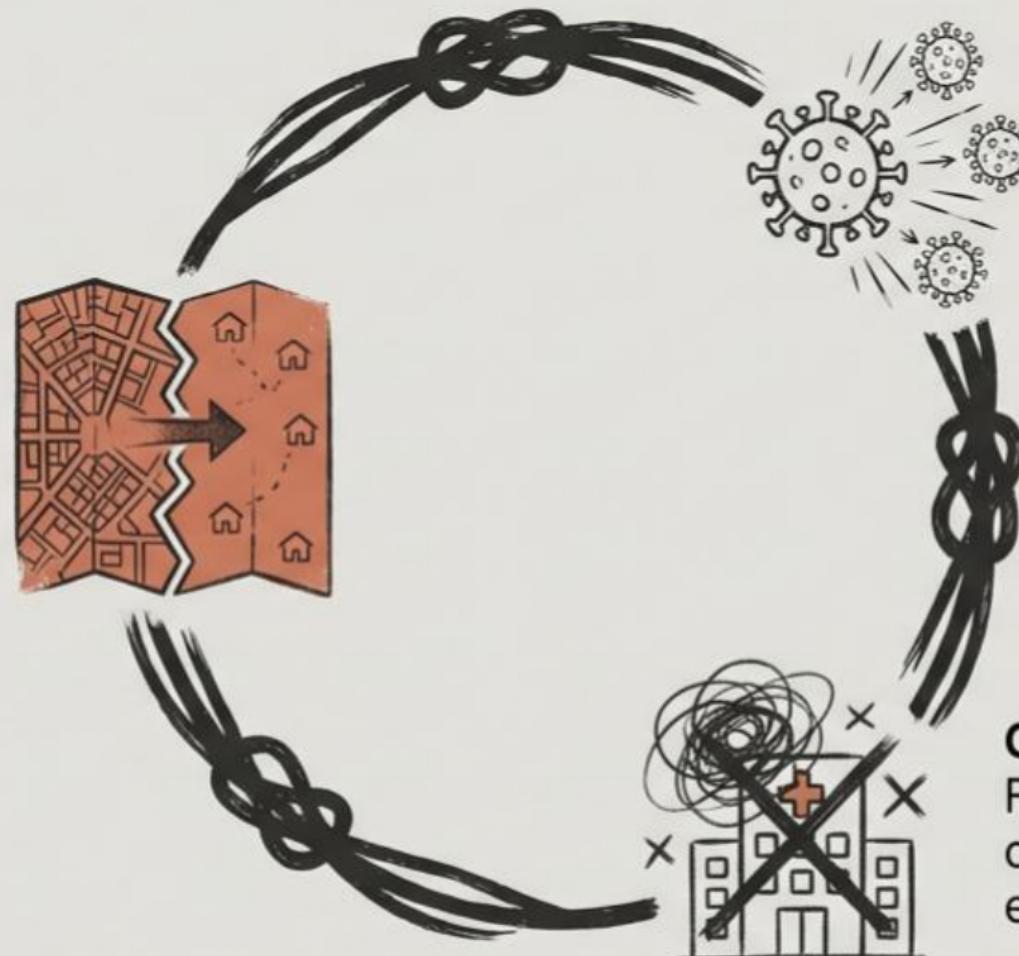


Problem

India's Vicious Cycle of Outbreak Response

Current systems act only after the crisis begins.

Unequal Impact: The burden falls heaviest on rural and vulnerable communities, amplifying healthcare inequality.



Delayed Detection: Outbreaks of dengue, malaria, and COVID-19 are identified only after widespread community transmission.

Overwhelmed Systems: Fragmented data leads to overloaded hospitals and stressed emergency services.

India has the data, but lacks the predictive tools.



-  Vast volumes of health-related data are generated daily across the nation.
-  However, this data remains **under-utilized**, non-predictive, and locked in silos.
-  Factors like high population density, climate variability, and urbanization accelerate disease **spread**, making the need for a data-driven system urgent.

The Solution: An AI-Powered Early Warning Platform

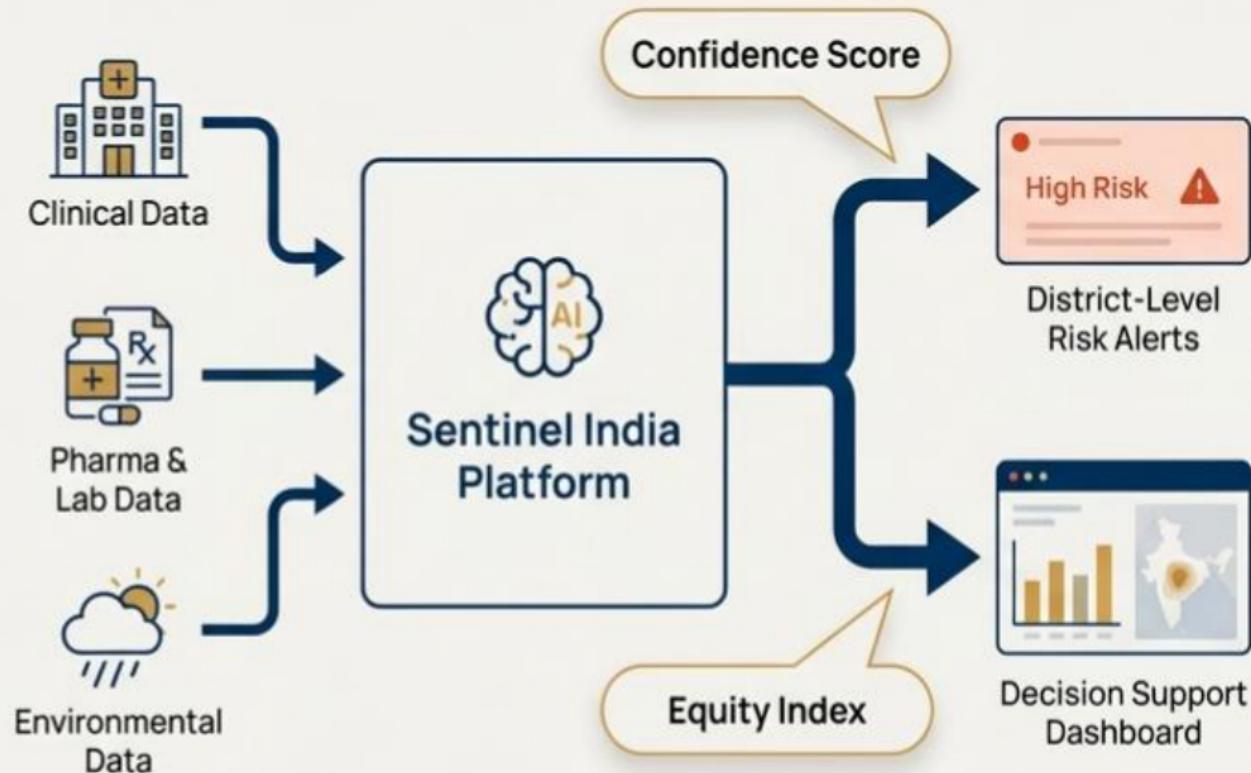
A continuous epidemiological surveillance platform that integrates and analyzes multi-source data in real time.

Generates district-level outbreak risk predictions to guide resource allocation and intervention.

Uniquely enriches alerts with two critical dimensions:

Confidence Scores: To quantify the reliability of each AI prediction.

Healthcare Vulnerability Indicators: To ensure an equitable response.



Core Function: To provide authorities with alerts that are early, accurate, and equitable.

Integrating Diverse Datasets to Uncover Hidden Patterns



Clinical Data

Hospital & clinic visit records
(e.g., symptom frequencies,
admission rates).



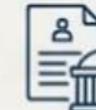
Environmental Data

Climate and weather data
streams (temperature, rainfall,
humidity) from APIs.



Pharmaceutical Data

Pharmacy medicine sales and
demand trends for relevant
medications.



Public Health Data

Existing government health
datasets and historical
outbreak records.

Data mining across these siloed sources enables the discovery of non-obvious correlations and hidden patterns that precede an outbreak.

Innovation 1: Prediction with Confidence

Moving beyond simple risk labels to build trust and enable decisive action.



Traditional systems provide a single,
uncertain risk label.

High Risk – 87% Confidence



Medium Risk – 62% Confidence



Our ensemble models (Regression + Random Forest) generate a confidence score, allowing leaders to prioritize high-certainty alerts.

Innovation 2: The Equity-Aware Index to Protect the Most Vulnerable

What It Is

A composite health risk index that understands outbreak severity is a function of both disease spread *and* a community's capacity to respond.

How It Works

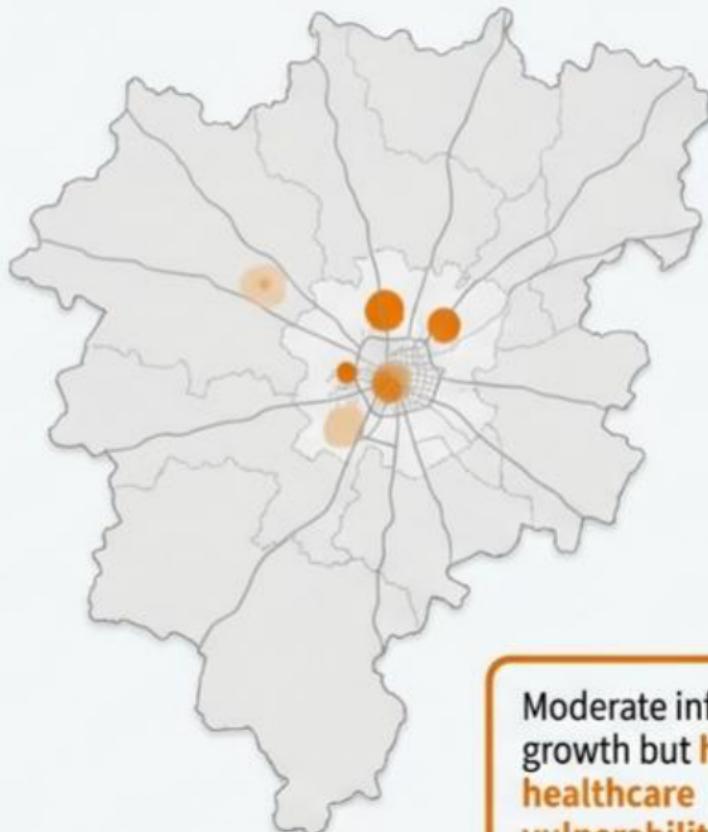
The index combines the AI-driven disease spread risk with key healthcare vulnerability indicators:

-  Hospital & clinic density
-  Rural vs. urban healthcare access
-  Historical response capability
-  Infrastructure proxies

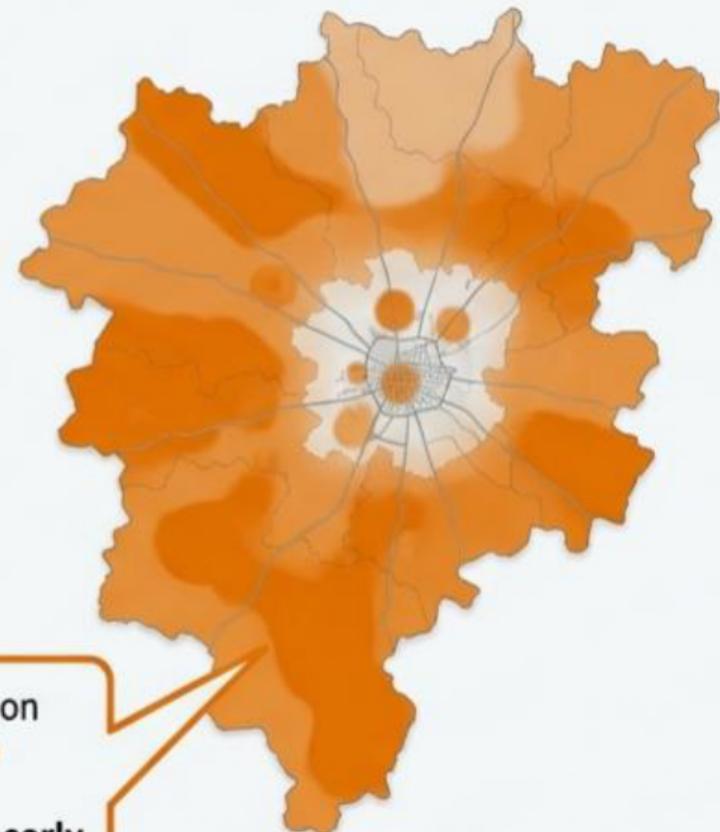
Why It Matters

This ensures underserved and rural regions are not ignored. A district with moderate case growth but high vulnerability can be flagged for early intervention, ensuring an equitable response.

Case Data Only



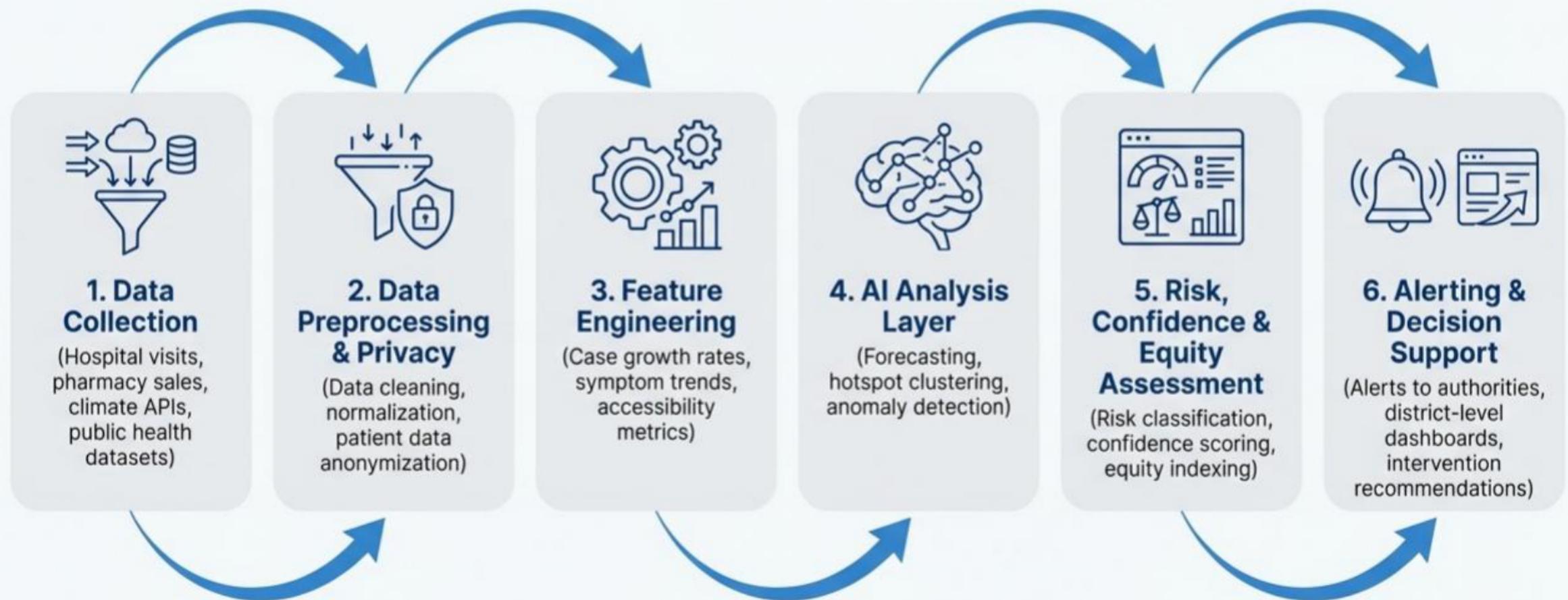
Sentinel India: Equity-Aware Index



Moderate infection growth but **high healthcare vulnerability** – early intervention recommended.

From Fragmented Data to Actionable Alerts in Six Steps

Alerts in Six Steps



The Core AI & Data Analysis Toolkit



Regression Analysis

To identify and quantify relationships between variables like climate factors and case numbers.



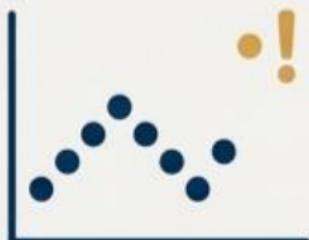
K-Means Clustering

To group districts with similar outbreak patterns, identifying emerging regional hotspots.



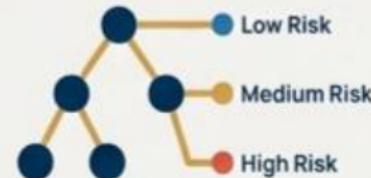
Time-Series Forecasting

Using models like LSTM to predict short-term outbreak trajectories and trends.



Anomaly Detection

To automatically flag sudden, statistically significant spikes in cases or medicine demand.



Random Forest Classification

To categorize districts into Low, Medium, or High-risk zones for prioritized action.

The Unified Intelligence Engine

DATA INTEGRATION



Hospital Visits



Pharmacy Sales



Climate APIs



Public Health Datasets

AI ANALYSIS

Forecasting

Hotspot
Clustering
(K-Means)

Anomaly
Detection

ACTIONABLE ALERTS



District-Level Dashboards
Confidence & Equity Scores
Prioritized Recommendations

Case Study

Averting a Dengue Outbreak in District Y: A Use Case



The Alert

"Sentinel India issues a 'High Risk (92% Confidence)' alert for District Y. Data shows a spike in fever-related medicine sales and ideal climate conditions, despite low official case reports."



The Insight

"The Equity Index reveals two specific rural sub-districts have extremely low clinic density, making them highly vulnerable."



The Proactive Response

"Authorities are dispatched **before** a major outbreak. They deploy mobile clinics, launch awareness campaigns, and initiate vector control measures, successfully containing the spread."

Expected Impact: A More Resilient and Equitable Public Health Future



Early Outbreak Identification

Detecting outbreaks weeks in advance, before large-scale community spread occurs.



Reduced Healthcare Strain

Allowing for proactive preparedness that reduces hospital overload and emergency service burnout.



Improved Rural Preparedness

Ensuring an equitable response that prioritizes and protects vulnerable rural populations.



Transparent & Trustworthy AI

Fostering higher trust in AI systems within the public sector through confidence scoring and interpretability.



Data-Driven Resource Allocation

Enabling precise and efficient deployment of medical resources, personnel, and supplies based on real-time needs.

Ultimate Outcome: A significant reduction in preventable deaths and the associated economic damage from epidemics.

Transforming Public Health from a Reaction into a Promise.



By uniting predictive intelligence with transparency and social equity, Sentinel redefines public health surveillance. It offers the tools to protect every community, especially the most vulnerable, before a crisis begins.

Predictive Intelligence + Transparency + Equity = Lives Saved.