

VitaAlert Health Grid

Platform Explainer

AI-Powered Operational Intelligence Infrastructure for Epidemic Response

Executive Summary

What is VitaAlert? VitaAlert is an AI-assisted operational intelligence platform for epidemic response, designed for Africa and other emerging markets. It enables community health workers, NGOs, Ministries of Health, and WHO-aligned teams to predict where an outbreak is moving, identify likely next hotspots, coordinate field operations, and deploy scarce resources against outbreaks including Ebola, Marburg, Cholera, Mpox, and Lassa Fever — even in areas with no internet connectivity.

Sub-Saharan Africa accounts for over 70% of global infectious disease outbreaks, yet lacks the real-time operational intelligence infrastructure available to high-income countries. The 2014–2016 West Africa Ebola outbreak cost an estimated \$6.7 billion and claimed over 11,000 lives — in large part because, once the outbreak was spreading, responders could not predict where it was moving, coordinate quickly enough, or direct scarce resources to the right places in time.

A note on what's built today: this document describes VitaAlert's designed capabilities. The current build is a working prototype (TRL 3–4) demonstrated on a simulated 14-day outbreak scenario. The AI risk-scoring, forecasting, cross-border/IHR-notification, and database-analytics functions described below are not yet computing on live data or field-validated. Specific figures for response timings, confidence levels, and dataset-scale projections are design targets or illustrative demo outputs, not measured or validated results. See “Deployment Phases” at the end of this document for current status.

VitaAlert addresses this gap with seven integrated modules that work together as a continuous intelligence loop: from a field worker submitting a report on a basic Android phone with no signal, through AI risk scoring and predictive outbreak forecasting, to an operational command dashboard that shows national health authorities and responders where the outbreak is heading next — and where to move teams and supplies before cases arrive.

How VitaAlert Works

VitaAlert operates as a closed-loop intelligence system. Data enters at the field level, flows through an AI analysis layer, and is surfaced in real time to coordinators and decision-makers. The system is designed around three principles:

- Offline-first — all critical functions work without internet connectivity
- AI-augmented — machine intelligence assists human operators; it never replaces them
- Interoperable — designed to connect with existing WHO, Africa CDC, and MOH systems

The seven core modules are described in detail in the following sections.

Module 1 — Field Intelligence & Reporting

What It Does

The Field Intelligence module is a structured reporting system built for community health workers (CHWs), rural clinic staff, and NGO field operators — positioning them not only as case reporters but as trusted field intelligence nodes. It runs on Android-first mobile devices and captures a complete suspected case record, along with the wider signals that matter to a response (unexplained deaths, rumours, funeral activity, animal contact, and access constraints), in under five minutes.

Information Captured Per Case

- Patient demographics: age, gender, village/region
- GPS location (auto-captured or manually entered)
- Symptoms checklist: fever, vomiting, bleeding, weakness, diarrhoea, headache, rash, respiratory symptoms
- Exposure history: funeral attendance, household exposure, animal contact, travel history
- Photo upload (optional)
- Voice note upload (optional — supports future speech-to-text pipeline)
- User role and reporting organisation

Offline-First Architecture

This is VitaAlert's most critical differentiator. Cases submitted in zero-connectivity areas are stored locally with a clear visual indicator. When connectivity is restored — even briefly — the device automatically synchronises all pending records to the central system.

Offline Status Indicators: Stored Offline | Awaiting Sync | Synced Successfully

Module 2 — AI Risk Scoring

What It Does

Every submitted case is designed to be analysed by VitaAlert's AI Risk Engine, which will assign a risk classification and generate a plain-language explanation that field supervisors and coordinators can act on immediately — no epidemiology training required. In the current prototype this scoring runs on a simulated demo scenario; the live engine is in development (TRL 3–4) and has not yet been validated against real case data.

Risk Classifications

- CRITICAL RISK — Immediate escalation required
- HIGH RISK — Same-day response triggered
- MEDIUM RISK — Active monitoring, cluster watch
- LOW RISK — Standard recording and follow-up

Factors Analysed

- Symptom combination severity (e.g., haemorrhagic symptoms + fever = elevated Ebola risk)
- Proximity to known or suspected outbreak zones
- Exposure history (funeral attendance is a high-weight factor for Ebola/Marburg)
- Cross-border travel in the 21 days prior to symptom onset
- Cluster density — number of cases from the same household, village, or event
- Mortality indicators in the patient's reported contacts

Explainability

VitaAlert AI provides a human-readable explanation with every risk score, for example:

"HIGH RISK — Haemorrhagic symptoms + funeral attendance in Kasese district within 14 days + 3 related cases from same household. Recommend immediate isolation and PCR confirmation."

Module 3 — Predictive Outbreak Forecasting

What It Does

The Forecasting module is designed to generate predictive intelligence about how an outbreak is likely to evolve over the next 7 to 14 days, based on current case data, movement patterns, population density, and historical outbreak models. This module is not yet computing live forecasts — the prototype demonstrates the intended output on an authored, simulated scenario, and no forecasting accuracy has been measured or validated.

Key Outputs

- Predicted spread zones — geographic areas at elevated risk of new cases
- Transmission growth index — rate at which the outbreak is expanding
- District-level risk escalation probability — likelihood each nearby district will see its first case
- Timeline replay — animated day-by-day progression of the outbreak from Day 1 to Day 14
- 7-day escalation forecast with confidence bands

Super-Spreader Detection

VitaAlert's contact network intelligence identifies individuals linked to an unusually high number of downstream exposures. Example alert:

"Case #284 is linked to 17 downstream exposures across 3 villages. Immediate contact investigation and movement tracing recommended."

Module 4 — Contact Tracing

What It Does

The Contact Tracing module builds a visual network graph of exposure relationships, allowing coordinators to map the chain of transmission and identify nodes requiring priority intervention.

Network Graph

Each case is represented as a node. Exposure links (household, funeral, market, clinic) are drawn as edges. The graph is interactive and filterable by:

- Exposure type (direct contact, funeral, healthcare setting, community event)
- Date of exposure
- Geographic cluster
- Case status (suspected, confirmed, cleared, deceased)

Example Transmission Chain

Index case → 4 household contacts → funeral attendance (12 contacts) → market (3 contacts) → rural clinic (2 healthcare workers)

Module 5 — Geospatial Intelligence

What It Does

VitaAlert's map layer provides a real-time geospatial view of outbreak activity, risk levels, and response resources — updated continuously as field reports are synchronised.

Map Layers

- Confirmed cases — geolocated case pins with status and risk level
- Suspected cases — open-status reports awaiting confirmation
- Predicted spread zones — shaded probability overlay from the forecasting engine
- Heat maps — density visualisation of case clusters
- Cross-border corridors — high-movement routes between affected regions and neighbouring countries
- Clinic and ETU locations — treatment facilities and their current capacity status
- Response centres — WHO, NGO, and government coordination points

Cross-Border Alerts

VitaAlert is designed to flag outbreak clusters within 50 km of an international border and draft a notification for designated border health authority contacts to review and send. This is a critical feature given that many African outbreak events, including the 2018–2020 DRC Ebola outbreak, involved significant cross-border movement. As with the rest of the platform, this workflow is demonstrated today on simulated data — it is not yet a live integration with any government or WHO notification system, and no IHR (2005) notification is sent automatically without human review.

Module 6 — Operations Dashboard

What It Does

The Operations Dashboard is a Palantir-style command interface designed for outbreak coordinators, MOH supervisors, WHO rapid response leads, and NGO programme directors. It provides a unified real-time view of all active and suspected cases, AI alerts, and resource status.

Dashboard Components

- Live outbreak map with animated case progression
- Active case queue with risk-level colour coding
- AI alert panel with actionable recommendations
- Transmission velocity indicator — real-time R-value proxy
- Resource stress indicators — PPE shortages, bed capacity, clinic overload warnings
- Timeline replay control — step through the outbreak day by day
- Contact tracing network graph
- Cross-border alert feed

AI Alert Examples

"Potential outbreak cluster detected in Bundibugyo district. 5 cases within 72 hours, 3 linked by funeral attendance."

"High transmission probability corridor identified: Goma → Rutshuru border crossing. Cross-border notification sent."

"Resource shortage risk: Kasese ETU projected to exceed 80% capacity within 72 hours at current admission rate."

"Predicted outbreak expansion within 7 days: Masisi and Walikale districts flagged for pre-emptive response positioning."

Module 7 — Case Management

What It Does

Case Management allows field workers, clinic staff, and supervisors to track every reported case through its full lifecycle — from initial submission to final outcome.

Case Lifecycle

- Pending — submitted, awaiting triage
- Under Review — being assessed by a supervisor or clinician
- Escalated — referred for confirmatory testing or response

- Confirmed — laboratory-confirmed positive
- Cleared — negative or alternative diagnosis confirmed

User Roles

VitaAlert supports role-based access with five user types:

- Community Health Worker — field case submission only
- Clinic Operator — case review and local management
- Supervisor — district-level oversight and escalation authority
- NGO Coordinator — multi-district view and resource allocation
- Ministry Admin — national dashboard and full system access

VitaAlert as a Database and Contact Network

Beyond its operational capabilities, VitaAlert is designed to become a structured, real-time epidemiological database for emerging markets — and a living contact and coordination network for the global humanitarian health community.

The Database Layer

Every case submitted to VitaAlert is permanently stored with full geospatial, temporal, demographic, and clinical metadata. This creates a dataset that grows more powerful with every deployment:

- Historical outbreak records — searchable by disease, region, date range, and outcome
- Exposure network records — who contacted whom, where, and when
- Symptom-outcome correlations — linking presenting symptoms to confirmed diagnoses over time
- Resource utilisation records — clinic capacity, PPE consumption, and staffing data from real outbreaks
- Cross-border movement logs — documented transmission events across administrative boundaries

This database is intended to be the long-term strategic asset of the platform. After five years of continental deployment, VitaAlert could become one of the most complete structured datasets of African infectious disease outbreak events — invaluable for research, preparedness planning, and grant-funded epidemiological studies.

The Contact Network

VitaAlert is also a coordination network. Every clinic, ETU, NGO field team, MOH district office, and WHO emergency unit registered on the platform becomes a node in a verified, maintained contact directory — with operational status, capacity data, and direct communication links.

Network includes: Field hospitals and ETUs · MSF, WHO, Red Cross field teams · Africa CDC regional offices · Ministries of Health · Border health authorities · Community health worker networks

This contact network enables VitaAlert to serve as the connective tissue of the African public health response ecosystem — not just a tool used by individual organisations, but the platform that enables those organisations to coordinate with each other.

Outreach and Onboarding

VitaAlert includes a built-in Outreach Center module that allows coordinators to introduce the platform to new clinics, NGO branches, and health workers. The module supports direct email outreach with professional RFI (Request for Information) templates, contact management, and onboarding tracking — enabling systematic expansion of the VitaAlert network region by region.

Supported Disease Modes

VitaAlert ships with five pre-configured disease modes, each tuned with disease-specific symptom weights, incubation periods, transmission parameters, and case definitions:

Ebola Virus Disease (EVD) — High-fatality haemorrhagic fever; funeral transmission is a critical factor; WHO case definition applied

Marburg Virus Disease — Closely related to Ebola; distinct fruit bat reservoir; high cross-border spread risk

Cholera — Waterborne; cluster detection focused on water source proximity and sanitation infrastructure

Mpox (Monkeypox) — Zoonotic; skin lesion symptom set; enhanced contact network density weighting

Lassa Fever — Endemic to West Africa; rodent reservoir; healthcare worker risk flagging enabled

The platform's modular architecture allows additional disease modes to be added through configuration rather than code changes, supporting rapid deployment for emerging threats.

Technical Overview

Platform Architecture

- Android-first mobile app (Flutter/FlutterFlow), iOS compatible in Phase 2
- Offline-first local storage with automatic background synchronisation
- Firebase or Supabase cloud backend with real-time data streams
- OpenAI / Claude API for risk scoring and natural language alert generation
- Mapbox or Google Maps for geospatial visualisation
- React-based web operations dashboard for coordinators and supervisors

Multilingual Support

VitaAlert launches with English, French, and Swahili interfaces. The architecture supports the addition of further languages without structural changes, supporting rollout across Francophone West Africa, East Africa, and Southern Africa.

Security and Privacy

- Role-based access control: each user type sees only the data relevant to their role
- Patient data anonymised at the case level; identifiable records restricted to clinical supervisors

- Authentication and access gating enforced before production deployment
- Data residency options for national MOH deployments requiring in-country hosting

Who Uses VitaAlert and How

Community Health Workers

CHWs use the mobile app to submit suspected case reports from remote villages. The app guides them through a structured symptom checklist, automatically captures GPS location, and stores the report locally if there is no network. When they reach a town or health centre with connectivity, reports synchronise automatically.

Clinic and ETU Staff

Clinical staff use the case management module to review incoming reports, update case status, and track escalation outcomes. They receive automatic alerts when a case in their facility is linked to a confirmed outbreak cluster.

NGO Field Coordinators

NGO coordinators use the operations dashboard to monitor case counts across their operational area, identify resource gaps, and coordinate with other organisations. The Field Network Directory provides verified contact details for all active ETUs, MSF teams, and Red Cross branches in the region.

Ministries of Health

National health authorities use VitaAlert as their operational intelligence and coordination layer for outbreak response. The database layer provides historical records for annual reporting to WHO and Africa CDC. Once fully built and validated, the AI system is designed to give ministry decision-makers a forecast of where the outbreak is moving and actionable recommendations in near real time, rather than 48–72 hours after an event — a capability demonstrated today only on simulated data, not yet field-validated.

WHO and Africa CDC

WHO-aligned teams and Africa CDC analysts use VitaAlert's dashboard and data exports for regional operational intelligence, cross-border coordination, and preparedness planning. The platform's database layer supports research and epidemiological analysis.

Deployment Phases

Phase 1 — Prototype & Demo (Now)

Fully functional demo environment with simulated outbreak data. Suitable for grant presentations, NGO demonstrations, and ministry briefings.

Phase 2 — NGO Pilot (Q4 2026)

Pilot deployment with a partner NGO in a target country. Real field data, supervised deployment, outcome measurement.

Phase 3 — District Deployment (H1 2027)

First district-level deployment with a Ministry of Health partner. Community health worker onboarding, clinic integration.

Phase 4 — Regional Scale (H2 2027)

Multi-district rollout. Cross-border coordination activated. Africa CDC integration.

Phase 5 — Continental (2028+)

Continental outbreak intelligence platform. VitaAlert as shared infrastructure for African public health.

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