



Outbreak Risk Horizon Scan — 2026

A SENTINEL- Φ early-warning assessment of global viral spillover & amplification risk · InfectorNET — an independent open-science project · infectonet.org

Executive summary

InfectorNET's pilot early-warning engine, **SENTINEL- Φ** , fuses three orthogonal signal classes — **ecological forcing** (ENSO/ONI, NDVI, rainfall, soil moisture, Indian Ocean Dipole, deforestation, conflict), **genomic amplification** (recent sequencing/lineage growth), and **event corroboration** (WHO/PAHO/WOAH alerts, recency-gated to 90 days) — into a single 0–100 Spillover/Amplification Index (SAI) with tiered WATCH/ADVISORY/WARNING alerts. After hindcast calibration against the Andes-virus/ENSO record (best ONI threshold +1.5; ~16-month mean lead), the tiering is genomic-led and specificity-favouring.

Key message: five pathogens currently sit at WARNING. Four are driven by a real **genomic surge** — **avian influenza H5, chikungunya, Oropouche, and Crimean-Congo haemorrhagic fever** — and one by an active emergency with recent corroboration — **Ebola** (DRC/Uganda Bundibugyo PHEIC). These warrant priority preparedness now.

Current risk tiers (live, calibrated SENTINEL- Φ sweep)

Pathogen	SAI	Tier	E-G-N	Scenario & region of concern
Avian Influenza A (H5)	84	WARNING	90-100-25	Global/pandemic. H5N1/H5N5 2.3.4.4b spilling to mammals (US cattle, polar bear & walrus Svalbard, Antarctica). Watch mammalian-adaptation mutations.
Crimean-Congo Haemorrhagic Fever	66	WARNING	58-100-0	Turkey/C. Asia → Iberia. Genomic surge; Hyalomma tick moving north with warming; autochthonous cases in Spain.
Oropouche virus	62	WATCH	48-100-0	Amazon → Caribbean. Genomic surge; unprecedented 2024 expansion; Cuba first detection; vertical-transmission concern.
Ebola virus	58	WARNING	96-0-100	DRC / Albertine Rift. Active Bundibugyo PHEIC with recent alerts; amplified by M23 conflict & health-system collapse.
Chikungunya virus	57	WATCH	38-100-0	Asia · Americas · S. Europe. Genomic surge; Aedes albopictus expanding to temperate zones (E1-A226V).
Mpox (monkeypox)	49	WATCH	75-38-0	Central/East Africa. Clade 1b cross-border spread from DRC; ecological pressure high.
Hantavirus	47	ADVISORY	72-0-100	Patagonia. El Niño lag (2023-24) + recent cruise-ship ANDV outbreak; person-to-person transmission.
Nipah virus	41	WATCH	90-0-0	Bangladesh/India. Seasonal date-palm-sap exposure; Pteropus reservoir.
Marburg virus	40	WATCH	88-0-0	East/Central Africa. High ecological pressure (Rousettus bat caves); no current genomic surge.
Rift Valley Fever	30	NONE	38-33-0	East Africa. Watch the Indian Ocean Dipole; flood-linked vector breeding.
Lassa Fever	29	WATCH	65-0-0	Nigeria/West Africa. Dry-season Mastomys rodent contact.
Dengue virus	26	WATCH	58-0-0	Brazil hyperendemic. El Niño + high NDVI + saturated soil drive Aedes.
West Nile Virus	25	NONE	38-20-0	Mediterranean · USA. Summer Culex transmission; monitor NDVI/temperature.
Yellow Fever virus	24	NONE	48-5-0	Brazil · Africa. El Niño + NDVI; sylvatic primate cycle.
Zika virus	22	NONE	48-0-0	Tropical Americas/Asia. Aedes-borne; ecological pressure present.

E = ecological forcing · G = genomic amplification · N = event corroboration (recency-gated, last 90 days), each 0–100. Tiering is genomic-led: WARNING needs a genomic surge corroborated, or a very strong ecological driver with recent alerts; the news channel never alerts alone. Source: [live /api/earlywarning sweep](https://live.api/earlywarning/sweep), InfectoNET, June 2026.

Driving mechanisms (from InfectoNET EcoRisk signals)

- **El Niño 2023–24 (ONI +2.06, 5th strongest since 1950)** → Patagonia hantavirus (12–18-mo lag); Amazon dengue/Oropouche/yellow fever (rainfall + NDVI + saturated soil); Horn of Africa RVF if the Indian Ocean Dipole turns positive.
- **Warming + Aedes/Hyalomma range expansion** → chikungunya & dengue into southern Europe and the temperate USA; CCHF tick into Iberia and central Europe.
- **Migratory bird flyways + H5** → HPAI already at both poles (Arctic Svalbard, Antarctica); next threshold is sustained mammal-to-mammal adaptation.
- **Armed conflict in eastern DRC (M23)** → Ebola, Marburg and mpox amplified as surveillance and contact-tracing collapse.

Recommended risk-reduction actions

1. **Climate-indexed pre-season alerts.** Trigger SENTINEL-Φ WATCH alerts when ONI $\geq +1.5$ (the calibrated threshold): enhanced rodent surveillance in Patagonia and vector control in the Amazon / Horn of Africa **up to 12–18 months ahead.**
2. **One Health animal–human interface.** Sequence H5 in mammals (cattle, seals, bears) to catch adaptation mutations (e.g. PB2 D701N); monitor fruit-bat reservoirs in the Albertine Rift and Congo Basin.
3. **Decentralised genomic capacity.** The genomic channel — the strongest WARNING trigger — only fires where sequencing happens. Close the gaps (Brazil dengue; conflict-affected Central Africa) with pre-positioned portable sequencing.
4. **Conflict-sensitive response.** For Ebola/Marburg/mpox in the DRC, establish humanitarian surveillance corridors; conflict is the dominant structural amplifier.
5. **Temperate vector vigilance.** Entomological surveillance of *Aedes albopictus* and *Hyalomma* ticks at the new climatic frontiers in southern Europe and the USA.

What InfectoNET uniquely enables: a single open, cryptographically-verifiable score that correlates the ecological *driver* + the genomic *response* + recency-gated news *corroboration* — moving surveillance from reactive to anticipatory, with 2-week to 12-month lead depending on the pathogen.

SENTINEL-Φ is a research pilot from an independent open-science project and not a substitute for official public-health alerts from WHO, PAHO or national authorities. Hindcast calibration (ANDV/ENSO): best ONI ≥ 1.5 , sensitivity 0.67, specificity 0.77, ~16-month lead. Data: NCBI, GISAID, Nextstrain, NOAA, Open-Meteo, NASA MODIS, World Bank, ACLED. Contact: infectonet@gmail.com.