Wave50 · Methodology

How the Wave50 score works, why deaths alone mislead, and how the scale behaved on past outbreaks

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Wave50 — Facts, not fear. Know early. Stay calm. Follow official advice.

1. The idea in one paragraph

Wave50 is a free public monitor of epidemic news. Every 4 hours it reads open sources (WHO, CDC, ECDC, Africa CDC, UKHSA, ministries of health, world media), finds outbreaks and gives each of them a score from 1 to 50 — for the world and for each affected country. The score is a simple traffic light for the public. It is not an official assessment and not medical advice.

Not just a formula: an automatic early-warning system

The methodology is only half of Wave50. The other half is the machine that feeds it. Every 4 hours, with no human in the loop, Wave50:

- reads about 900 fresh headlines per run — over 5,000 a day — from Google News in six languages (EN, RU, FR, ES, PT, ZH), WHO Disease Outbreak News and national surveillance feeds (WHO FluNet, ECDC ERVISS, CDC wastewater, UKHSA);
- recognises the disease and the countries in each headline, checks the article date and throws out old or repeated stories;
- merges reports of the same event — whether it is 3, 58 or 168 articles — into one story with all its sources, keeping the most complete figures;
- compares this week with the previous one for every disease and country and recalculates the Wave50 score for the world and for each territory.

Why this matters: with social media and online news, the “temperature” of a story rises much faster than official reports appear. Wave50 is a barometer of where it is heating up fastest — both the real epidemiological signal (new territories, deaths, hospital clusters) and the news wave itself (hype, rumours, sudden attention). Seeing both side by side shows when attention runs ahead of the facts, and when the facts are ahead of attention. The barometer reads news media and official feeds; social networks themselves are not yet connected.

2. The formula

L = T + S + G + H + V, each term 0–10, total 1–50. Each term is a dimension that official methods for assessing epidemic threats already use as a separate criterion:

Term	What we measure	Where the criterion comes from
T — transmission	Growth of reports week to week, person-to-person spread	WHO PISA (2024); CDC PSAF, axis “transmissibility”
S — severity	Case fatality, hospitalisation	WHO PISA “seriousness”; CDC PSAF “clinical severity”
G — geography	How many countries and regions are affected	IHR (2005) Annex 2: risk of international spread
H — consequences	Cases, deaths, burden on hospitals	PISA “impact”; IHR Annex 2; ECDC rapid risk assessment
V — vulnerability	Weak health care and response capacity	WHO rapid risk assessment “context”; INFORM Epidemic Risk Index

Anchors to WHO statuses. Pandemic emergency (IHR, from 19.09.2025) → world ≥ 46 · PHEIC → world ≥ 31 · WHO “very high risk” → territory ≥ 36 · “low risk” → no higher than 15 without new data. “No data” is never zero.

World level and country level are two different numbers. The **world** level answers “how

serious is this for the planet”; the current world formula alone peaks at about 25, so a PHEIC lifts it to the floor of 31. A **country** (territory) level is the plain sum of all five components, each 0–10, for that country. Example, Ebola in the Democratic Republic of the Congo, November 2026: T 9 + S 9 + G 8 + H 9 + V 7 = **42** — calculated, not anchored. So 31 for the world and 42 for the most affected country are both correct at the same time.

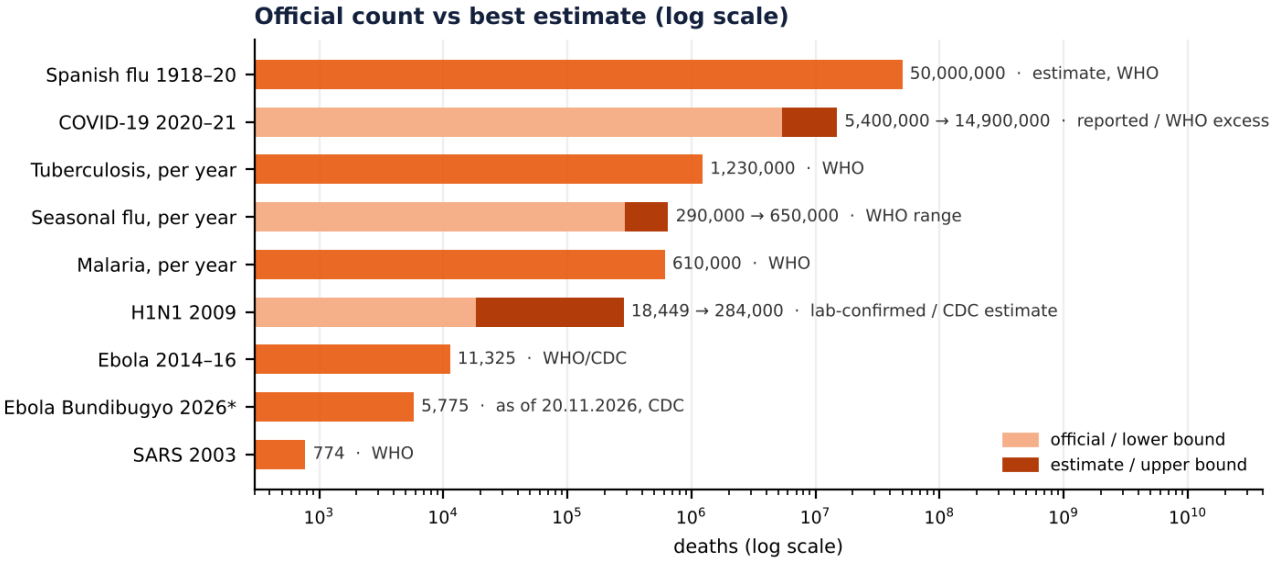
3. Ten traffic-light bands

Levels	What it means	What to do
1–5	Unusual signal, not confirmed	Source check, primary card
6–10	Confirmed single event	Follow contacts and new information
11–15	Local outbreak	Regular update, transmission check
16–20	Multiple hotspots or increasing uncertainty	Expert analysis of the context
21–25	Sustained transmission or severe outcomes	Update more often, evaluate the load
26–30	Regional distribution	Assess neighbours’ readiness
31–35	Interregional / cross-border risk	Interdepartmental assessment
36–40	Very high local load	Urgent inspection by specialists
41–45	Widespread crisis, multiple overloads	Coordination between countries
46–50	Exceptional overshoot of response capacity	Constant expert monitoring

4. Why the number of deaths alone is not a fair comparison

“19,000 deaths from one disease and millions from another” sounds like a clear comparison. It is not, for four reasons:

- **Counting.** Official counts include only confirmed deaths. For H1N1 2009, WHO counted about 18,449 laboratory-confirmed deaths; a CDC-led study later estimated 151,700–575,400 deaths in the first year — roughly 15 times more. For COVID-19, 5.4 million deaths were reported in 2020–2021, while WHO estimated 14.9 million excess deaths for the same period.
- **Time window.** Seasonal flu kills 290,000–650,000 people every year; malaria about 610,000 a year. A pandemic total and a yearly total are different units.
- **Lag.** Deaths are the last thing to appear. On 19 January 2020 the world had 6 recorded COVID-19 deaths. A decision that waits for the death toll comes too late.
- **Different risk per person.** Ebola 2014–16 killed 11,325 people, but about 40% of known patients died. Seasonal flu kills far more people in total, at a very low fatality rate and with vaccines in place. These are different kinds of danger.



* ongoing outbreak. Light bar — official or lower figure; dark bar — best estimate or upper figure.

That is why WHO (PISA) and CDC (PSAF) already measure several axes instead of one number. Wave50 takes the same axes and folds them into one public traffic light that is updated every 4 hours. The death count stays important — it is one of five inputs, not the whole picture.

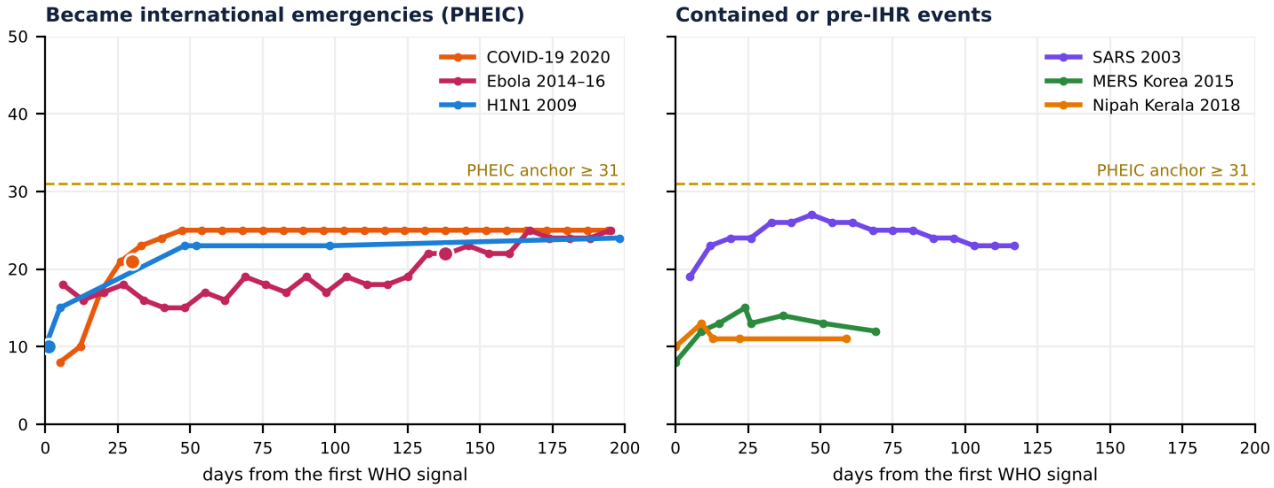
5. Same scale, different shape of danger

	Ebola 2014–16	Seasonal flu (one year)	COVID-19 (2020)
Deaths	11,325 (whole outbreak)	290–650 thousand	1.9 million reported by end-2020
Fatality per patient	≈ 40% of known cases	well below 1%	about 1–2% of confirmed cases
Spread	Mostly 3 countries, 10 with cases	Every country, every year	Almost every country within 3 months
WHO status	PHEIC 2014–2016	No emergency (expected)	PHEIC, then pandemic
What Wave50 shows	High S and V, lower G	Constant risk, not an outbreak	High T and G, rising H

Seasonal flu is shown in the separate “constant risks” folder on the site, so it never hides a new outbreak — and a new outbreak is never hidden by it.

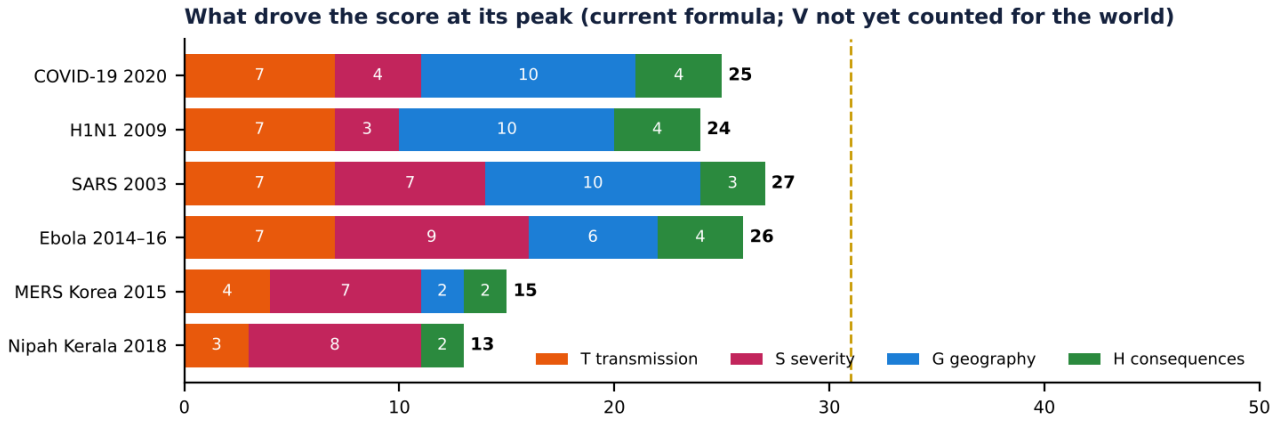
6. Calibration on past outbreaks

We recalculated the current Wave50 world formula week by week for six outbreaks: three that WHO declared international emergencies (COVID-19, Ebola 2014–16, H1N1 2009) and three that stayed regional or local (SARS 2003 — before today's IHR rules, MERS in Korea 2015, Nipah in Kerala 2018). Data: Our World in Data, WHO situation reports, WHO cumulative SARS reports, WHO Disease Outbreak News.



Outbreak	Cases	Deaths	Fatality	Countries	WHO status	Wave50 peak	First ≥ 20
COVID-19 (2020)	80 million*	1.9 million*	≈2%	219	PHEIC 30.01.2020, pandemic 11.03	25	26.01.2020 (4 days before PHEIC)
H1N1 (2009–10)	not counted	18,449 lab-conf.	<0.1%	214	PHEIC 25.04.2009, pandemic 11.06	24	11.06.2009
SARS (2003)	8,096	774	9.6%	29	Global alert 12.03.2003 (no PHEIC — pre-IHR 2005)	27	24.03.2003 (12 days after alert)
Ebola W. Africa (2014–16)	28,600+	11,325	≈40%	10	PHEIC 08.08.2014	26	02.08.2014 (6 days before PHEIC)
MERS Korea (2015)	186	38	20%	2	Not a PHEIC	15	never
Nipah Kerala (2018)	19	17	89%	1	Local, contained	13	never

* COVID-19 figures for 2020 only. Wave50 peak — maximum of the current world formula before anchors; "first ≥ 20" — the first week the score reached the "multiple hotspots / sustained transmission" zone. For SARS the WHO weekly data show up to 37 countries/areas incl. later-discarded probable cases; final WHO count 29.



- **It separates big from small.** The three emergencies and SARS reached 24–27; the contained MERS and Nipah outbreaks stayed at 13–15 (“local outbreak”), even though Nipah killed 89% of patients. Severity alone does not lift the score — spread does.
- **It warns early.** COVID-19 reached 20 four days before PHEIC, Ebola six days before; SARS twelve days after WHO’s global alert.
- **It saturates — the main limitation.** In the current formula T and H are halved and V is not counted for the world, so the maximum is about 27. SARS (8,096 cases) and COVID-19 (80 million) look almost the same. That is why official WHO anchors set the high levels today.
- **Fix under test.** With full T and H, extended tiers for H (100 thousand, 1 million deaths) and G (number of continents), and V counted, the peaks become COVID-19 ≈ 37, Ebola ≈ 41, SARS ≈ 36, H1N1 ≈ 36, MERS ≈ 22, Nipah ≈ 22. It goes live only after review by an epidemiologist.

7. Wave50 next to official scales

Scale	Who	Output	Wave50 difference
PHEIC / pandemic emergency	WHO, under IHR	Yes / no decision	Used as anchors
Emergency grading	WHO	Grade 1–3 (WHO workload)	Wave50 measures risk, not WHO’s workload
PISA	WHO	Qualitative levels per axis	Same axes, one number
PSAF	CDC	Two axes: spread × severity	Adds geography and vulnerability
Rapid risk assessment	ECDC / WHO	Very low → very high	Automatic, every 4 hours
INFORM Epidemic Risk	WHO + European Commission	Country risk 0–10	Event-based, not only country baseline

8. Honest limits

- The criteria come from official documents; turning each into 0–10 and adding five numbers is our simplification. None of the official methods add scores exactly this way.
- News volume is not the same as cases. Media signals are a reason to check, not a confirmed fact (confidence grades A — official, B — WHO report, C — media only).
- The score is a benchmark for comparison, not an official assessment and not medical advice. Decisions — only on official recommendations.
- Next step: review of the six-outbreak retrospective and of the full formula by an independent epidemiologist.

Sources

— WHO — 14.9 million excess deaths associated with COVID-19 in 2020 and 2021 (05.05.2022)
— CDC — 2009 H1N1 pandemic: 151,700–575,400 deaths worldwide in the first year
— WHO — seasonal influenza: 290,000–650,000 respiratory deaths per year; 1918 pandemic ~50 million
— WHO / CDC — Ebola 2014–2016: 28,600+ cases, 11,325 deaths; PHEIC from 08.08.2014
— WHO PISA, 2nd ed. 2024 · CDC PSAF (Reed et al., Emerg Infect Dis 2013) · IHR (2005) Annex 2 · ECDC Rapid Risk Assessment Methodology 2019 · INFORM Epidemic Risk Index 2018 · WHO QIRA and MS-RRA (2026)
— Data: Our World in Data (COVID-19), WHO situation reports (Ebola 2014–16), WHO updates (H1N1 2009); malaria and tuberculosis — WHO fact sheets
— SARS: WHO cumulative number of reported probable cases, 2003 (dataset compiled from WHO reports); MERS Korea: WHO DON and WPRO 2015; Nipah Kerala: WHO DON 31.05 and 07.08.2018