Biological Warfare: Warnings, Clusters, Targeting and Defense

Recognition Lag in U.S. Biodefense: Why the United States Finds Out Late, and What Congress Can Do About It

How long it takes the United States to recognize that a new disease is spreading, why that interval matters for defense against biological weapons, and the three changes in law that would be tested against it

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ABSTRACT

The United States does not learn that a new disease is spreading until weeks or months after the first infection. This paper measures that delay, explains why it matters for defense against biological weapons, and proposes what Congress can do. In seven outbreaks of new or newly arrived pathogens since 2002, the time from the start of spread, as estimated or first observed, to recognition ran from about seven weeks to two years, with a median of about thirteen weeks. Establishing who or what caused an outbreak takes longer: three documented deliberate or concealed biological events took from just over one year to thirteen years to resolve. The 2026 Annual Threat Assessment reports that states with weapons programs are developing capabilities designed to defeat detection and attribution. In 2025 and 2026 the federal offices charged with integration and attribution were dismantled, emptied or left unsettled. The paper sets out three changes in law and the measure that would test each: one accountable official who publishes three response intervals every year; permanent authority and funding for wastewater surveillance and pathogen-agnostic sequencing; and a standing attribution protocol with legal limits on the use of health data. No published evidence shows how many days these changes would save. The reporting requirement is how Congress would find out.

KEYWORDS

biodefense; biosurveillance; attribution; Biological Weapons Convention; pathogen-agnostic sequencing; wastewater surveillance; pandemic preparedness; national security

JEL CLASSIFICATION

H56 National Security and War; I18 Government Policy, Regulation, Public Health; K32 Energy, Environmental, Health, and Safety Law; H11 Structure, Scope, and Performance of Government

SCOPE

Scope. This paper uses only unclassified, public sources. It discusses disease at the level of populations, clinics and laboratories. It contains nothing on how an agent is made, altered or released. COVID-19 appears only as a measure of scale and delay. AI assistance was used for source retrieval, citation checking and language editing; the author is responsible for the content and conclusions. License: CC BY-NC-ND 4.0.

IF YOU READ NOTHING ELSE

The interval	In seven outbreaks of new or newly arrived pathogens since 2002, the time from the start of spread to recognition ran from about seven weeks to two years, with a median of about thirteen weeks. Establishing who or what caused an outbreak takes longer: three documented deliberate or concealed events took from just over a year to thirteen years to resolve.
Why it matters now	The 2026 Annual Threat Assessment reports that states with weapons programs are developing capabilities designed to defeat detection and attribution. In 2025 and 2026 the federal offices charged with integration and attribution were dismantled, emptied or left unsettled.
What Congress could do	Three changes, each with a measure attached: one accountable official who publishes three response intervals every year; permanent authority and funding for wastewater surveillance and pathogen-agnostic sequencing; and a standing attribution protocol with legal limits on the use of health data. No published evidence shows how many days these would save — the reporting requirement is how Congress would find out.

Governing judgment

The United States would probably not recognize a deliberate release of a pathogen that spreads between people materially faster than it recognized the seven natural or zoonotic events of the past twenty-two years, and it would probably not be able to attribute such an event to a state within the first months after recognition. The measures this paper describes act on those two intervals. Their effect is untested, and judgment 4 below rates it at roughly even with low confidence.

Key judgments

Each judgment carries a probability and an analytic confidence, stated separately. The confidence rating reflects the depth and quality of the evidence, not the strength of the conclusion. A rating of roughly even expresses uncertainty between two outcomes. It is not a measured fifty percent.

1. **Recognition would again take weeks to months.** A new pathogen that spreads between people, whether it emerges naturally, escapes from laboratory work or is released deliberately, would probably not be recognized in under six weeks. *Probability: likely. Analytic confidence: moderate.* The seven cases in section 4.1 ran from about seven weeks to two years, with a median near thirteen weeks, and nothing in them suggests the interval shortened across the period, although seven cases cannot establish a trend. In all seven, recognition began with clinicians, veterinarians or laboratories. None began with an environmental sensor. The judgment extends to a deliberate release because the causes of delay in section 3 are properties of infectious disease and do not depend on how an outbreak began. It does not extend to an agent that does not pass between

people, where the method of delivery may itself be evidence that the event was deliberate (section 7.3). Confidence is held at moderate because seven cases are few, their start dates are measured in two ways, their recognition points are of three kinds, and no agency publishes a national series.

2. **Attribution to a state would not be timely.** If a state used a biological weapon, the United States probably could not attribute it to that state within the first months after recognition. *Probability: likely. Analytic confidence: moderate.* The window of months is a stipulation and not a measured threshold. No published source fixes the point at which a proportionate response ceases to be available, and the paper states months because that is the order of magnitude on which the lawful responses in section 7.3 would be decided. The standing international mechanism establishes facts and does not name a responsible state. Attribution in law requires instruction or control over the specific conduct, or later adoption by the state. No statute or published directive names the official who produces a joint epidemiological and intelligence assessment, sets a trigger for it, or sets a deadline. The three documented cases took from one to thirteen years to resolve (sections 2.4 and 7.3). Confidence is moderate because the historical set is small, those three cases measure different endpoints, and classified capability is not visible in these sources.
3. **No official answers for the combined result.** Three statutes assign overlapping biosurveillance duties, and none makes one official answerable for performance across departments. *Probability: almost certain. Analytic confidence: high.* This rests on the statutory text, GAO's findings and the fiscal 2026 appropriations act (section 5.2).
4. **The proposed measures would shorten the intervals.** *Probability: roughly even. Analytic confidence: low.* No published study measures the days that governance and data-sharing failures added to any outbreak, and none estimates what these changes would recover. The low rating is deliberate. The paper proposes annual reporting as the test rather than asserting the result.

Section 6 sets out three measures that act on those intervals, ordered by sequence and feasibility:

1. One official answerable for how fast the government detects, identifies and responds, required to publish three intervals every year: time to detection, time to identification, and time to countermeasure readiness, with the integration center's home and membership fixed in statute.
2. Standing authority and dedicated funding for wastewater surveillance and pathogen-agnostic sequencing, with a time standard for identifying an agent that is on no test panel.
3. An attribution protocol in statute: named leads, a trigger, a deadline for a first joint assessment, and legal limits on the use of public health data.

What this paper does not assess

No unclassified source reports a biological campaign against the United States or its allies, and this paper assesses none. The 2026 Annual Threat Assessment says states with chemical and biological warfare programs are developing capabilities "designed to challenge the ability to detect, treat, or attribute attacks" (ATA 2026, p. 18), and also that most such programs were built for tactical use. The COVID-19 figures in this paper measure a pandemic whose origin is unresolved. They are not evidence of a deliberate release and do not forecast the scale of an attack.

Evidence base

Sources are classified by reliability tier, with the judgments that rest on each. A source is placed by the role it plays in the claim it supports: an agency or treaty body cited for its own act, notification, laboratory result or legal text sits in tier 1, and the same institution cited for an analytic conclusion sits in tier 2. The reliability of a source and the confidence in a judgment are separate measures. A tier 1 statute can settle conclusively what a duty is without bearing on whether a proposed change would shorten any interval.

Tier	Sources used	Judgments resting on them
1. Primary official or legal text	U.S. Code, titles 6, 18, 42 and 50; Public Law 119-60 section 6404; Executive Order 14292 at 90 FR 19611; H.R. 8800 as engrossed in the House, with House roll call 278 and Senate vote 195; GAO reports and recommendation statuses; the 2025 and 2026 Annual Threat Assessments; the State Department compliance report; the Biological Weapons Convention; the International Law Commission's articles; the 1986 Nicaragua judgment; the consolidated International Health Regulations; UNODA; NIH notice NOT-OD-25-112; CDC MMWR, CDC program pages, and WHO Disease Outbreak News and chronologies, where cited for their own notifications, laboratory results or program facts	2 and 3, and with tier 2, judgment 1
2. Peer-reviewed or authoritative secondary	Pekar, Nguyen, Fraser, Faria, Msemburi, Ebrahimoghli, Cutler and Summers, Meselson, Török, Jernigan, Downie and Hijawi; the Radiation Effects Research Foundation; the 2011 National Research Council review; the Bipartisan Commission on Biodefense; Congressional Research Service products	4, and with tier 1, judgments 1 and 2
3. Reputable reporting and professional statements	Bloomberg Law; Associated Press; Lawfare; Think Global Health; The Sick Times; Arms Control Association; and statements by ASM, NACCHO, NEHA, SecureBio and the Institute for Progress	No key judgment rests on tier 3. These sources support the coverage and funding figures in section 5.1, the confirmed chemical use in section 2.3, the sequencing cost range in sections 5.3 and 6.2, and the origin discussion in the Annex.
4. Unverified or single-source	No source outside tiers 1 to 3 is relied on. One provenance limitation is recorded rather than concealed: the published H5N1 estimates in section 4.1 rest on two independent assisted reads of the publisher's page, not on the author's own reading of the typeset text (section 10).	None

One figure sits between tiers and is marked where it appears. The published H5N1 dates in section 4.1 come from the article of record, but the publisher's site returns a human-verification page to automated access, so the author has not read the typeset text (section 10).

1 The problem: late warning, uncertain cause, no intercept

In late January 2024, veterinarians saw dairy cows eating less and giving less milk. On 25 March the government confirmed the cause in Texas cattle: H5N1 avian influenza. By the scientists' published estimate, the virus had been spreading among cattle since about November 2023. It took more than four months to find out. A disease that spreads between people gives no warning before people fall ill, its cause may never be proven, and once it is spreading no defense can intercept it. Those three facts, more than the number of deaths a weapon could cause, define the problem this paper addresses. A nuclear missile is seen before it lands, and its launch point is known. A disease is seen only after people are sick, and its source may never be known. The table compares the two on warning and attribution only. It does not rank them by destructive power. Section 4.4 gives the recorded death tolls on both sides and explains why ranking them is not useful.

Question	Ballistic nuclear attack	Disease that spreads between people
When is it known?	Minutes before impact. Sensors detect the launch.	After people are sick. The first sign is a cluster of patients, weeks or months after the first infection (section 4).
Who did it?	The launch point is observed.	Sequencing identifies the agent, not the actor. A natural outbreak, an accident and an attack can look alike for months, or permanently.
Can it be contained?	Effects are bounded by yield and fallout. They do not pass from person to person.	The agent goes where people go. No one, including whoever released it, can set a boundary.
What is the defense?	Deterrence, and interceptors sized for a limited attack.	Detection, identification and treatment, all after exposure.

Deterrence works by threatening to punish an attacker. To punish, a government must first know that it was attacked and by whom. With a biological event it may know neither.

2 The threat

Three kinds of evidence support the threat picture: intelligence assessments, formal treaty findings, and confirmed events. They do not carry equal weight.

2.1 What the Intelligence Community says

The 2026 Annual Threat Assessment (information as of 14 March 2026) makes five statements that bear on this paper.

- Adversary states probably maintain offensive chemical and biological warfare (CBW) programs (p. 17).

- Most states with such programs developed them for tactical use, such as targeted killings and special military operations. Some have recently pursued or expanded large-scale capabilities for battlefield use (p. 18).
- These states are developing capabilities "designed to challenge the ability to detect, treat, or attribute attacks" (p. 18).
- China, North Korea and Russia probably keep the knowledge and capability to produce and use traditional pathogens and toxins, and North Korea still pursues pathogens that cause highly contagious disease (p. 18).
- Russia probably will keep to the norm against large-scale chemical, biological and nuclear use unless its war with Ukraine shifts significantly (p. 19).

The second statement sets a limit on this paper's argument. The Intelligence Community's public description centers on tactical use. A pandemic-scale event is the worst case for a transmissible agent. It is not the use the Intelligence Community assesses as most likely.

Two statements changed between the 2025 and 2026 editions. On China, the 2025 report said "most likely possesses capabilities relevant to chemical and biological warfare" (ATA 2025, p. 14). The 2026 report says China "probably possesses CBW capabilities" (pp. 18–19). Neither report publishes a scale for these terms, and "most likely" appears once in the 2025 text against twenty-nine uses of "probably." The change reads as a move to the report's standard term, not as a reassessment. The second change is substantive. The 2025 report said North Korea "maintains its CBW capabilities" and may use such weapons (p. 28). The 2026 report says North Korea "maintains its CW capabilities" (p. 19): chemical only. The assessment that North Korea continues to pursue pathogens causing highly contagious disease remains (p. 18).

2.2 What the State Department has found

The State Department's April 2025 compliance report makes the formal findings under the Biological Weapons Convention (BWC). Two are findings of violation. Two are compliance concerns.

State	Finding	Pages
Russia	Maintains an offensive biological warfare program and is in violation of Articles I and II. The report assesses that the Soviet program was "absorbed, not dismantled."	37–38
North Korea	Has an offensive program, described as dedicated and national-level, and is in violation of Articles I and II.	34–35
China	Past activities, and toxin and biotechnology research at military medical institutions in 2024, raise Article I concerns. The United States cannot determine whether China eliminated its historical program as Article II requires.	32–33

State	Finding	Pages
Iran	Activities raise Article I concerns. Iran has not abandoned its intention to conduct research and development of biological agents and toxins for offensive purposes.	35–36

2.3 Confirmed use has been chemical

The recent state use of prohibited weapons that has been confirmed is chemical, not biological. On 1 May 2024 the State Department determined that Russia used chloropicrin against Ukrainian forces (Arms Control Association; 89 FR 87279). Three OPCW technical assistance reports confirmed the riot control agent CS in samples from the front line (November 2024, February 2025, June 2025). None of the three says who used it. With samples in hand, the international body confirmed the agent and did not name the user.

2.4 Three cases from history

Three documented biological events show how long it took to establish the cause and the source.

Event	What happened	Time to establish cause	What established it
Sverdlovsk, USSR, 1979	Anthrax outbreak. Soviet authorities blamed contaminated meat. Meselson et al. identified 77 patients, 66 of whom died, and traced them to an airborne release from a military facility on 2 April 1979.	13 years to official acknowledgment (1992)	Epidemiology and pathology on site, after a change of government
The Dalles, Oregon, 1984	751 cases of salmonellosis from deliberately contaminated restaurant salad bars (Török et al.).	More than one year	A separate criminal investigation; an indistinguishable strain was found in a laboratory at the commune
U.S. anthrax letters, 2001	22 cases and 5 deaths (Jernigan et al.).	Investigation closed 19 February 2010, over eight years later	FBI investigation. The 2011 National Research Council review found that science alone could not establish the source.

2.5 What this paper does not claim

No unclassified assessment reports an ongoing deliberate biological campaign against the United States or its allies. This paper claims none. Most recorded outbreaks of new pathogens are natural. The BWC has no verification regime, and its Working Group on strengthening the Convention had adopted no compliance mechanism through August 2026 (BWPP report).

3 Why recognition comes late

Late recognition is a property of infectious disease. It does not depend on how the outbreak began.

- **Infection comes before illness.** People are infected days before they feel sick. Where a disease spreads before symptoms appear, it moves before anyone is visibly ill.
- **Early illness looks ordinary.** The first patients resemble patients with common illnesses. The signal is a departure from the usual pattern in severity, age, place, season or genome, and early departures are small.
- **Confirmation takes steps.** A clinician must notice. A laboratory must identify. A new agent must be sequenced.

Two things follow for any claim that a disease was aimed at a population. No one controls where a transmissible agent goes after the first cases. And whoever released it puts their own people at risk, unless those people were protected in advance on a scale others would be likely to see. A claim of targeting is therefore a hypothesis that needs epidemiological and intelligence support. The absence of early attribution is the expected condition in a natural, accidental or deliberate event.

4 How long it takes

No U.S. agency publishes how long the country takes to detect or identify a new disease. This section assembles the record from published cases.

4.1 From first infection to recognition

Event	Start of spread	Recognized	Interval
SARS, 2002–2003	First known case, 16 November 2002 (WHO chronology)	China reports the outbreak to WHO, 11 February 2003	12 weeks
H1N1 influenza, 2009	12 January 2009, model estimate; range 3 November 2008 to 2 March 2009 (Fraser et al.)	CDC identifies the virus, 14 April 2009 (MMWR)	13 weeks
MERS, 2012	Hospital outbreak in Zarqa, Jordan, April 2012; cause unknown at the time (Hijawi et al.)	United Kingdom reports a new coronavirus case to WHO, 22 September 2012 (WHO)	About 5 months
Ebola, West Africa, 2013–2014	First case falls ill, 26 December 2013 (WHO)	Laboratory confirms a filovirus, 21 March 2014	12 weeks
Zika in the Americas	Arrival between May and December 2013, model estimate (Faria et al.)	Brazil confirms local transmission, May 2015 (WHO)	17 to 24 months

Event	Start of spread	Recognized	Interval
SARS-CoV-2	Mid-October to mid-November 2019, model estimate (Pekar et al.)	Wuhan Municipal Health Commission statement, 31 December 2019 (WHO timeline)	About 7 to 11 weeks
H5N1 in U.S. dairy cattle	10 November 2023, model estimate; range 4 October 2023 to 22 January 2024 (Nguyen et al., Science 388, eadq0900)	USDA confirmation, 25 March 2024	19 weeks

The seven events were chosen by one rule: a new pathogen, or a known one newly arrived in a host or region, since 2002, with a published start date and a dated point of recognition. The shortest interval is about seven weeks. The longest is two years. The median is about thirteen weeks. In no case did recognition come within six weeks.

Read the table with three cautions. Four start dates are model estimates and three are the first known case found in hindsight, so they are not measured the same way. The recognition points differ too: a report to WHO, a laboratory result, a public statement. And seven events are a small sample. The table shows the order of magnitude. It is not a statistic. Within those limits, the series shows no improvement. The earliest case, SARS in 2002, was recognized in twelve weeks. The most recent, H5N1 in 2024, took nineteen. Seven cases cannot establish a trend, but nothing in them suggests the interval has shortened across twenty-two years.

The H5N1 case deserves weight. It happened inside the United States, in 2024, in livestock, outside every human surveillance system in section 5.1. Its start date is the common ancestor of the sampled cattle viruses. The published estimate replaced the authors' preprint, which gave 9 December 2023 (range 12 October 2023 to 26 January 2024) and approximately four months. Veterinarians saw the first signs in late January 2024, two months before confirmation.

Finding the cause of an outbreak is a separate question and takes longer (section 2.4).

4.2 From recognition to a genome and a vaccine

Step	Observed interval	Case
Recognition to public genome	11 to 12 days (31 December 2019 to 11–12 January 2020)	SARS-CoV-2
First laboratory confirmation in the outbreak to first public genome, measured across two countries	13 days (United Kingdom, 6 May, to Portugal, 19 May 2022)	Mpox, multi-country outbreak (WHO; INSA)
Capture of an agent by an air collector to laboratory result	12 to 36 hours	BioWatch (GAO-21-292, p. 10)

Step	Observed interval	Case
Public genome to first U.S. vaccine authorization	335 days (11 January to 11 December 2020)	SARS-CoV-2

Once an event is recognized, the science moves fast: about two weeks to a public genome. The medicine does not. The first COVID-19 vaccine authorized in the United States came about eleven months after the genome.

4.3 What a pandemic costs

COVID-19 is the one modern measure of what an uncontained respiratory pathogen does. WHO estimates 14.83 million excess deaths in 2020 and 2021 (95% interval 13.23 to 16.58 million). Governments reported 5.42 million (Msemburi et al.). Official counts miss much of the toll. Iran reported 136,166 deaths through February 2022; the estimate of excess deaths was 240,390 (Ebrahimoghli et al.). Cutler and Summers put the cost to the United States at about $16 trillion (JAMA, 2020). The origin of SARS-CoV-2 is unresolved (Annex). These figures describe a pandemic. They do not forecast an attack.

4.4 How this compares with nuclear use

Section 1 compares the two threats on warning and attribution and does not rank them by destructive power. The reason is that the ranking depends on which case is chosen, and the recorded cases are far apart.

The two nuclear weapons used in war killed between 150,000 and 246,000 people within two to four months. The estimates run from 90,000 to 166,000 at Hiroshima, against a city population of 340,000 to 350,000, and from 60,000 to 80,000 at Nagasaki, against 250,000 to 270,000 (Radiation Effects Research Foundation). The recorded pandemics are larger by about two orders of magnitude. The 1918 influenza pandemic infected roughly 500 million people, a third of the world, and killed at least 50 million, about 675,000 of them in the United States (CDC). COVID-19 killed an estimated 14.83 million in two years (4.3). Against the midpoint of the 1945 range, the COVID-19 estimate is about seventy-five times larger and the 1918 estimate about 250 times larger.

The kind of harm also differs. The effects of a nuclear detonation are set by yield and geography and decline with distance and time. The effects of a transmissible agent are set by contact patterns and immunity, and they can grow for months in places far from the first cases.

Three limits apply to all of this, and the paper observes them.

- **1945 is not a measure of modern arsenals.** A large exchange today would not resemble 1945. This paper takes no position on what it would cost, and nothing here should be read as a claim that a biological event would be worse than nuclear war.

- **The pandemic figures are natural events, not attacks.** No case in the record shows what a deliberate release would do. Section 2.1 reports that the Intelligence Community describes most state programs as built for tactical use, such as targeted killings and special military operations, rather than for mass casualties.
- **Scale is not this paper's argument.** The argument is that a nuclear attack is seen, attributed and deterred, and that a biological event may be none of the three. That holds whichever consequence figures a reader prefers, and it is why the three measures in section 6 act on time rather than on yield.

5 Where the United States stands

The shortfalls are of two kinds. The technology meant to replace BioWatch air sampling has not matured. And the systems that do work, in clinics, wastewater plants and sequencing laboratories, lack settled authority, accountability and funding.

5.1 Detection systems

System	Latest public coverage	Status
National Syndromic Surveillance Program	85% of U.S. emergency departments, more than 7,500 facilities (CDC, August 2026)	Operating
National Wastewater Surveillance System	About 1,300 sites covering about 144 million people (press report, June 2026)	No dedicated budget line; supplemental funds since 2020 (coalition letter)
Traveler-based Genomic Surveillance	Voluntary sampling of arriving international travelers since 2021; more than 1 million participants (CDC)	Operating
Advanced Molecular Detection	$40 million in fiscal 2025, $43 million in fiscal 2026 (NACCHO)	Fiscal 2027: a coalition of professional societies requests $175 million, the level CDC estimates is needed; supplemental funds projected to run out in fiscal 2027 (ASM)
BioWatch air sampling	More than 30 metropolitan areas (DHS); 12 to 36 hours from capture to a result	Funded through FEMA in fiscal 2026

Three attempts to upgrade BioWatch failed. DHS cancelled the first in April 2014, having given a risk-adjusted life-cycle estimate of $5.8 billion at the 80 percent confidence level in June 2011 (GAO-12-810; GAO testimony). It cancelled the second in September 2018 (GAO-21-292, pp. 12–13). It discontinued the third in March 2024, after testing found the critical technologies not mature enough, and issued its final report on 30 September 2024 (GAO-16-99 status; GAO-21-292 status). In all seven cases in section

4.1, recognition began with clinicians, veterinarians or laboratories. None began with an environmental sensor.

5.2 Three statutes, and no one answerable for the combined result

Three statutes bear on integration. None makes one official answerable for the combined result.

- **DHS, 2007: integration across domains.** The National Biosurveillance Integration Center combines human, animal, plant, food and environmental surveillance data (6 U.S.C. § 195b). Taking part is voluntary. A member agency is one whose head has signed a memorandum of understanding (§ 195b(j)(4)), and members owe "best efforts" (§ 195b(e)). GAO found in 2015 that the center struggled to obtain data and that 3 of 19 partners supplied liaisons (GAO-15-793). A 2023 review found improvement, with 11 of 12 agencies using its products (GAO-24-106142).
- **HHS, 2006: the public health network.** The Secretary must establish a near real-time nationwide biosurveillance capability (42 U.S.C. § 247d-4(c)). The deadline in § 247d-4(f) was 30 September 2023. GAO reported in 2022 that HHS had not built the network, and all 12 of its recommendations are listed as open (GAO-22-104600).
- **White House, 2022: policy coordination.** The Director of the Office of Pandemic Preparedness and Response Policy coordinates federal preparedness and sets goals and metrics. The Director has no authority to direct departments (42 U.S.C. § 300hh-3). The office had no staff from the end of June 2025 (Think Global Health). A director was appointed in July 2026, and press reports describe one official in an office authorized for up to 25 (Bloomberg Law).

The DHS center has no settled home. The fiscal 2026 DHS appropriations act dismantled the office that housed it, and the fiscal 2027 request would move it again (CRS R48979). Its statute still names an Assistant Secretary whose office no longer exists.

5.3 Finding an agent no test was built for

A targeted test finds the agent it was built to find. Pathogen-agnostic (metagenomic) sequencing reads whatever genetic material is in a sample, so it is the tool that applies to a new agent. A CDC-authored survey found 84 of 146 federally supported entities performing it, more than half of states with no federally funded capability, and no national coordination (Downie et al., 2024). The fiscal 2026 budget request proposed $52 million for a national program (SecureBio). Whether it was enacted is not confirmed.

Congress is considering a military version. Section 2842 of H.R. 8800, the fiscal 2027 National Defense Authorization Act, would require the Secretary of Defense to begin a wastewater monitoring pilot at no fewer than four military installations and a separate pathogen-agnostic monitoring pilot. Each would start within 180 days of enactment and run two years, with a report to the defense committees 90 days after it ends and a strategic plan to Congress within one year (text as passed by the House). The section authorizes no money. The House passed the bill on 22 July 2026 by 216 to 212 (roll call 278). Cloture on

the motion to proceed to the Senate companion, S. 4784, failed on 14 July 2026 by 50 to 46 (vote 195), and no fiscal 2027 act had been enacted as of this writing.

5.4 Attribution

The forensic and medical-intelligence pieces exist: the National Bioforensic Analysis Center, the FBI and the National Center for Medical Intelligence. The center that coordinated them does not. ODNI's August 2025 reorganization judged the National Counterproliferation and Biosecurity Center redundant (ODNI fact sheet). Section 6404 of the fiscal 2026 intelligence authorization, in Public Law 119-60, required its termination within 180 days of 18 December 2025. The duties stay with the Director of National Intelligence, who names an official to oversee them, and a status report was due to Congress on 18 March 2026 (section text). The same act requires six intelligence elements each to name a senior official for biotechnology (50 U.S.C. § 3063).

The sources reviewed identify no statute or published directive that says who produces a joint epidemiological and intelligence assessment of a suspicious outbreak, on what trigger, or how fast.

6 Three measures, and what each would require

Three measures act on the interval from first infection to attribution. Each rests on a statute that already exists, and each is useful whether an outbreak is natural, accidental or deliberate. They are ordered by sequence and feasibility, not by lives saved. Once an event is recognized, the speed of vaccines and treatments probably decides more of the death toll (6.4). Key judgment 4 rates the effect of all three at roughly even, with low confidence.

Order	Measure	Accountable lead	Change in law	Metric and provisional target
1	One official answerable for performance across departments, with a yearly public report	Director, Office of Pandemic Preparedness and Response Policy, for reporting; HHS and DHS keep operations	Amend 42 U.S.C. § 300hh-3, 6 U.S.C. § 195b and 42 U.S.C. § 247d-4(f)	Three intervals published each year as median and 90th percentile; year one sets the baseline
2	Standing authority for wastewater surveillance and pathogen-agnostic sequencing, with a time standard	Director, CDC, with state public health laboratories	Authorization in the Public Health Service Act; dedicated appropriations lines	Days from specimen receipt to confirmed identification of an unlisted agent in blinded exercises; 7 days at the median
3	A standing attribution protocol	ODNI official named under 50 U.S.C. § 3057, with the FBI and CDC	Fiscal 2027 intelligence authorization	Hours from trigger to first joint assessment; 72 hours

The targets are provisional. No measured national baseline exists for any of them.

6.1 One accountable official and three reported intervals

This measure separates two things that statute now mixes: who operates the systems, and who answers for the result. It has five parts, and each carries a consequence.

- **Accountability.** The Director of the pandemic preparedness office becomes answerable for a performance report covering every department, while HHS keeps the network and DHS keeps the center. The Director cannot direct departments, so the measure works only if the amendment also obliges them to supply the data, and only if the office is staffed. It had no staff from the end of June 2025 until July 2026.
- **The DHS center.** An amendment to 6 U.S.C. § 195b would fix the center's placement and make participation mandatory for named departments, including USDA for animal-health data. Transferring the center to HHS is the alternative, and its consequence is unmeasured: GAO found the center improved in 2023, and no study compares the two models. A GAO comparison within twelve months would supply that measure before any transfer.
- **The HHS network.** Resetting the lapsed deadline in 42 U.S.C. § 247d-4(f), tied to GAO's 12 open recommendations, restores a date against which the department can be held.
- **Reporting.** A yearly unclassified report of three intervals, each with a defined start and end: earliest signal to recognition; specimen receipt to identification of an agent on no test panel; and identification to countermeasure readiness in a validated exercise. Reported as median, 90th percentile and share within target.
- **Review.** A review after three reporting years. The comparison would show whether the intervals moved. It would not establish that the measures caused the movement, because coverage, reporting practice and the events themselves vary as well. Attributing a change to the measures would require a design that holds those factors constant, and no reporting requirement provides one.

The Bipartisan Commission on Biodefense would place accountability with the National Security Advisor (Blueprint, recommendation 1, p. 35). Recommendation 1 asks Congress to codify the National Security Advisor as leader of the national biodefense enterprise, and lists the pandemic preparedness office among those that advise and assist under that leadership. Placing the reporting duty on the Director of that office is therefore a different design, not an implementation of the Commission's recommendation. The two offices differ in statutory authority, in access to the President and in committee jurisdiction, and the pandemic preparedness office had no staff from the end of June 2025 until July 2026. Which of those differences should decide the question is for Congress.

Jurisdiction lies with the Senate HELP and Homeland Security and Governmental Affairs committees and the House Energy and Commerce and Homeland Security committees. A reauthorization of the Pandemic and All-Hazards Preparedness Act, most of which lapsed in September 2023 (CRS IF12683), is the vehicle for the HHS and White House changes. None was confirmed as introduced in this Congress as of this writing.

6.2 Standing programs that can find an unlisted agent

Wastewater surveillance and pathogen-agnostic sequencing can detect an agent no test was built for. Neither is authorized as a program in its own right, and neither has a dedicated appropriations line.

- **Wastewater.** Authorization of the national system with its own budget line. A coalition of public health organizations has asked for $120 million for fiscal 2027.
- **Sequencing.** Authorization of a pathogen-agnostic program within CDC's Advanced Molecular Detection activity. Public estimates run from about $50 million to $100 million a year (SecureBio; Institute for Progress).
- **Standard.** Blinded exercises at least once a year, measuring time to a preliminary result, to confirmed identification, and to receipt by the responsible public health authority, reported as median and 90th percentile.

Section 2842 of H.R. 8800 would create the nearest version of this standard if enacted. It is limited to military installations and authorizes no money. A civilian program measured the same way would require separate authorization and an appropriation of its own. Jurisdiction lies with the Senate HELP and House Energy and Commerce committees and the Labor-HHS appropriations subcommittees.

6.3 A standing attribution protocol

Congress ended the coordinating center in December 2025. This measure does not rebuild it. It attaches a protocol to officials Congress has already required. The Bipartisan Commission on Biodefense recommended a national attribution decision-making apparatus in 2024 (Blueprint, recommendation 6, action item a); this is narrower and creates no new organization.

- **Leads.** The ODNI official who oversees the former center's duties leads for intelligence, the FBI for forensic and criminal work, and CDC for epidemiology.
- **Trigger.** CDC and the ODNI official define in advance which features of an outbreak start the protocol.
- **Deadline.** A first joint assessment within a fixed period, stating the evidence, the alternative explanations, the confidence level and what remains unknown. It may conclude that attribution is not yet possible.
- **Data limits.** Statute sets the permitted purpose, minimization, retention, access, audit, onward disclosure and oversight for public health data shared under the protocol.
- **Exercise and report.** One exercise a year and a yearly report to the intelligence and health committees.

Jurisdiction lies with the intelligence committees, and with the health committees for the data provisions.

6.4 Measures for the legislative companion

- **Countermeasure speed.** A genome-to-first-dose time, measured in exercises, applied to the vaccine and antiviral platforms the government keeps. For COVID-19, public genome to first U.S. authorization

took 335 days. HHS ended 22 BARDA mRNA investments in August 2025 (HHS). The same measured time applies to whatever platform replaces them.

- **Supply resilience.** Standards for the most concentrated medical supplies, such as two qualified suppliers in different countries.
- **International data.** Arrangements for early genomic and epidemiological data that do not depend on WHO membership, which ended on 22 January 2026 (HHS). Section 7.1 notes that the United States remains listed as a State Party to the International Health Regulations.

7 Three ways an outbreak can begin, and what each would prove

An outbreak can begin in three ways: natural emergence, a release tied to laboratory work, or deliberate use. The measures in section 6 are the same for all three, because the origin is not known when the response begins. The three differ in what evidence exists, how long a finding takes, and which authorities apply.

7.1 Natural emergence

Most recorded outbreaks of new pathogens are natural. This is the baseline against which the other two are judged. The duty to report does not wait for a finding about origin. Under the International Health Regulations (2005), as amended, a State Party notifies WHO within 24 hours of assessing a qualifying event (Article 6). The duty covers unexpected or unusual events “irrespective of origin or source” (Article 7). WHO may take into account reports from sources other than notifications (Article 9). When the United States accepted the Regulations, it put its own reading on record: States must notify potential emergencies “whether they involve the natural, accidental or deliberate release” of biological, chemical or radionuclear materials (p. 70). The 2024 amendments, adopted as resolution WHA77.17 on 1 June 2024, added a pandemic emergency category and entered into force on 19 September 2025 for States Parties that did not reject them. The United States rejected them. U.S. membership of WHO ended on 22 January 2026, but WHO’s list of States Parties, updated on 19 June 2026, still includes the United States, under the Regulations as amended in 2014 and 2022 (Appendix 1, p. 68).

7.2 A release tied to laboratory work

This origin is hard to prove and hard to rule out. The agent may look the same as one that emerged naturally. The decisive records sit with the institution and the state where the work was done. The question often turns on documents and access as much as on sequence data. COVID-19 is the available measure. Nearly seven years after the first cluster was reported, its origin is unresolved, with a low-confidence U.S. judgment on one side and a WHO advisory group finding that a laboratory accident can be neither ruled out nor proven (Annex).

The U.S. oversight rules for this kind of research are themselves unsettled. That weakens the position from which the United States asks another state to account for its laboratories. The 2024 federal policy on dual use research of concern and pathogens with enhanced pandemic potential was to take effect on 6

May 2025. Executive Order 14292, signed 5 May 2025 and published at 90 FR 19611, directed the suspension of federally funded dangerous gain-of-function research until a replacement policy issued, due within 120 days. NIH rescinded its implementation notice on 7 May 2025 (NOT-OD-25-112; CRS IN12554). Whether the replacement policy has issued was not confirmed for this paper.

7.3 Deliberate use by a state, directly or through a proxy

Two findings are needed, and they are not the same. The first is that a release happened and was deliberate. The second is that a particular state is responsible.

For the first, the standing international route is the United Nations Secretary-General's Mechanism. The General Assembly established it by resolution A/42/37 C (1987) and the Security Council reaffirmed it by resolution 620 (1988). Any Member State may report an alleged use. The Secretary-General decides whether to investigate. An investigation ascertains "in an objective and scientific manner the facts of the matter" and reports to all Member States. It is not a standing body. It draws on rosters of experts and laboratories that States nominate, current as of November 2025. Because the Biological Weapons Convention has no implementing organization, UNODA describes the Mechanism as the only international mechanism to investigate alleged use of biological weapons (UNODA). It ascertains facts and reports them. It does not name a responsible state. Section 2.3 shows the limit in practice: with samples in hand, the OPCW confirmed the agent and named no user.

For the second, international law applies a test to conduct. What a state organ does is the state's own act. What a person or group does is attributable to a state when they act "on the instructions of, or under the direction or control of" that state, or when the state "acknowledges and adopts the conduct in question as its own" (ILC Articles on State Responsibility, Articles 4, 8 and 11, annexed to A/RES/56/83 of 12 December 2001). The International Court of Justice has required proof of "effective control of the military or paramilitary operations in the course of which the alleged violations were committed" (Nicaragua, judgment of 27 June 1986, paragraph 115). Use through a proxy therefore defeats attribution in law unless instruction or control over the specific conduct can be shown, or the state later adopts the conduct as its own. Showing instruction or control is an intelligence problem more than a laboratory one.

The responses divide the same way. Under the Convention, a State Party that finds another in breach may lodge a complaint with the Security Council, and Parties undertake to cooperate with any investigation the Council initiates. Article VII provides for assistance if the Council decides that a Party has been exposed to danger as a result of a violation (BWC, Articles VI and VII). Both routes run through a body in which the states most likely to be accused hold a veto. Domestic law reaches individuals, not states. Sections 175 and 2332a of title 18 create offenses, with extraterritorial jurisdiction over an offense "committed by or against a national of the United States" (18 U.S.C. § 175), and section 2332a takes its definitions from section 178. A conviction proves that a person is guilty. It does not prove that a state is responsible.

On how targeted such an event could be, section 3 governs. A transmissible agent cannot be confined to one population once the first cases exist. A claim that one was aimed at a population is a hypothesis that needs epidemiological and intelligence support. It cannot be inferred from the pattern of cases. An event

involving an agent that does not pass between people would look like the cases in section 2.4: a defined set of exposed people, and attribution still slow. Whether such an event is recognized as deliberate at all depends on the method of delivery. Powder arriving in envelopes was evident as deliberate at once in 2001. Soviet authorities attributed Sverdlovsk to contaminated meat for thirteen years, and The Dalles required a separate criminal investigation and more than a year. Attribution took longer still in each case: the 2001 letters were investigated for over eight years, and the 2011 review found that science alone could not establish the source.

The conclusion is the one in section 6.3. Attribution of a deliberate biological event to a state would rest mainly on intelligence. Forensics can narrow the list of sources, and an international investigation can establish the facts. Neither names a responsible state. No statute or published directive says who produces that assessment, on what trigger, or how fast.

8 Limits and objections

These measures are meant to shorten the delay. They cannot end it. Every system in section 5 detects an infection after it exists, and an agent that looks like ordinary illness can still go unrecognized for weeks. Forensics narrows the list of possible sources and seldom proves one, as the 2011 review of the anthrax investigation found.

“Nothing shows these reforms would shorten recognition.” This is the strongest objection, and the paper cannot fully answer it. GAO documents failures of governance and data sharing. It does not measure how many days those failures added to any outbreak, and no published study does. One available response is procedural: report the intervals, review after three years, and treat the organizational changes as a hypothesis under test. Reporting would not establish that a change caused an effect. It would establish whether the intervals moved, which is not currently known.

“Deterrence should come first.” The violators are Russia and North Korea, and no surveillance program changes their calculation. But deterrence by punishment depends on recognition and attribution, and the Intelligence Community says state programs are built to defeat both.

“Joining public health and intelligence data endangers privacy and trust.” It does, and the risk bears on security as well as liberty. Clinicians and laboratories that distrust how their data will be used report less. State reporting laws and clinical confidentiality rules also limit what can be shared. That is why the protocol in section 6.3 puts its data limits in statute.

“The 2025–2026 changes cut waste, not readiness.” Some address real problems, and BioWatch’s record supports ending weak programs. This paper applies one test to each change: after it, which official holds the function, and what interval does it achieve?

9 Decisions for Congress

One of the five decisions below attaches to a bill now before Congress: section 2842 of the fiscal 2027 defense authorization has passed the House and is waiting on the Senate. Two others fall within the subject matter of authorizations expected in this Congress rather than of any provision confirmed as introduced. The attribution protocol in section 6.3 falls within the fiscal 2027 intelligence authorization. The HHS and White House changes fall within a reauthorization of the Pandemic and All-Hazards Preparedness Act, most of which lapsed in September 2023. A further consideration is that the baseline does not exist. The first year of reporting creates it, and until it exists no later decision on organization or funding can be judged against anything.

1. Which official answers for biosurveillance performance across departments, and whether that official must publish the three intervals each year.
2. Whether to fix the integration center's home in statute, make agency participation mandatory, and commission a comparison before any transfer.
3. Whether to reset the lapsed deadline for the HHS network.
4. Whether wastewater surveillance and pathogen-agnostic sequencing become authorized programs with their own budget lines.
5. Whether the fiscal 2027 intelligence authorization sets an attribution protocol and its data limits.

Three oversight questions can be asked now. Did the Director of National Intelligence deliver the section 6404 status report due on 18 March 2026? How many of GAO's 12 recommendations on the HHS network has the department closed? Does the fiscal 2027 defense authorization keep section 2842, and if it does, will its results reach the health committees as well as the defense committees?

If Congress requires the intervals in section 4 to be reported, every later decision on organization and funding can be judged by one question: did the intervals get shorter?

10 Limitations

- **Sources.** The paper uses unclassified sources only. Classified collection may change the threat picture in either direction.
- **A small and mixed sample.** Section 4.1 rests on seven events chosen by a stated rule. Start dates are measured in two ways and recognition points in three. The median describes these seven events and nothing more.
- **Ebola dating.** The index-case date follows WHO's account. The first published investigation placed the first suspected case in early December 2013 (Baize et al., New England Journal of Medicine, 2014), which would lengthen that interval by about three weeks.
- **No baseline and no evidence of effect.** No national series exists for the proposed measures, the targets are provisional, and no study shows that the changes would shorten recognition or attribution.

- **Press and advocacy sources.** Wastewater coverage and funding, staffing of the pandemic preparedness office and the placement of BioWatch rest on press reports or advocacy letters.
- **H5N1 source.** Section 4.1 uses the figures in the published article. The publisher's site returns a human-verification page to automated access, so the author did not open the typeset text. The published figures were confirmed by two independent assisted reads of the publisher's page, which agreed, and the superseded preprint figures are stated beside them. The manuscript deposited in the NSF public access repository is the preprint and records that it was not certified by peer review.
- **Section 7 sources.** The status of the replacement research-oversight policy required by Executive Order 14292 was not established. The International Court of Justice judgment of 26 February 2007 in the Bosnia genocide case could not be opened, so section 7.3 rests on the International Law Commission's articles and the 1986 Nicaragua judgment and makes no claim about the relationship between the effective-control and overall-control tests.
- **Facts in motion.** Budget, legislative and organizational facts are as of 23 October 2026.

What would change these judgments

Each of the four key judgments has an indicator that would move it.

Judgment	What would change it
1. Recognition would again take weeks to months	A published national series showing recognition inside six weeks, or any event first recognized by wastewater surveillance, pathogen-agnostic sequencing or an environmental sensor rather than by a clinician or veterinarian
2. Attribution to a state would not be timely	A statute or published directive naming the official who produces a joint epidemiological and intelligence assessment, with a trigger and a deadline; or a completed attribution of a biological event to a state by any government within months of recognition
3. No official answers for the combined result	A statute making one named official answerable for biosurveillance performance across departments, or a published performance report covering every department for which one official is accountable. An enacted change in the integration center's placement, or in whether agency participation is mandatory, would not by itself change this judgment, because neither creates that accountability
4. The proposed measures would shorten the intervals	Two or more years of reported intervals, which would show whether the intervals moved; and a study that isolates the contribution of the governance and data-sharing changes, which is what would show whether the measures caused the movement. The first reporting year establishes the baseline only and cannot move this judgment in either direction

ANNEX

Annex. The origin of SARS-CoV-2

The origin of SARS-CoV-2 is unresolved, and this paper takes no position on it. The CIA assessed in January 2025, with low confidence, that a research-related origin is more likely than a natural one (AP). WHO's advisory group reported in June 2025 that the weight of available evidence favors zoonotic spillover and that a laboratory accident could be neither ruled out nor proven (SAGO report, pp. 10–12). ODNI released declassified records in June 2026 with a news release asserting a laboratory origin. The release states no new coordinated assessment, and its reading of the records is disputed (release 11-26; Lawfare).

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