Infodemic Intelligence for 2025 Infections

AIV, FMD, MPox, and HMPV

CSoNet 2025

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December 2025

Motivation

- Disease outbreaks now unfold in online media spaces
- Public perception affects compliance, panic, and policy
- Classical surveillance misses these information dynamics

Recent cases illustrate this clearly:

- H5N1 (Avian Influenza): public attention collapsed after U.S. agencies stopped issuing regular alerts, despite ongoing infections [5, 3].
- HMPV: (Human Metapneumovirus) a January 2025 surge in China triggered global social-media panic, although epidemiology remained seasonal [1].
- FMD (Foot-and-Mouth Disease): economic news dominated traditional media, yet conspiracy narratives emerged across countries and languages [4].
- MPox (Monkey Pox): continued outbreaks in Africa received limited coverage after the disease disappeared from the "Global North" [2].

What Is an Infodemic?

- Overabundance of true and false information
- Rapid spread through social and digital media
- Amplifies fear, confusion, and mistrust

An infodemic is not just misinformation: even accurate information, when excessive or poorly framed, can overwhelm decision making and public understanding during health crises.

For example, in January 2025, reports of Human Metapneumovirus cases in China, within normal seasonal ranges, were rapidly amplified on social media, triggering global panic and high negative sentiment, despite no corresponding escalation in epidemiological risk.

Infoveillance and Infodemiology

- Infoveillance: monitoring online signals
- Infodemiology: studying dynamics, sentiment, framing
- Complements case-based surveillance

These concepts allow us to quantify attention, emotional reactions, and narratives, providing insight into how societies react to emerging health threats.

Why Existing Systems Are Not Enough

- Existing public-health infoveillance systems do exist
- Coverage is limited by platform, language, or scope
- Many systems focus on traditional media only

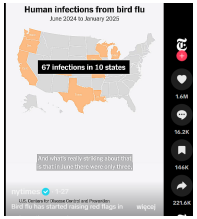
In practice, most operational systems are run at the EU or international level (e.g., ECDC epitweetr, EC MEDISYS, WHO EIOS), but their coverage remains uneven, particularly for Eastern European languages, social media platforms, and animal-host (non-human) or or zoonotic infections.

Research Questions

- How does attention evolve across diseases?
- How do policies affect public discourse?
- Where do misinformation and panic emerge?

We focus on temporal dynamics, sentiment, and platform composition rather than clinical outcomes.

Studied Infections



- Avian Influenza (AIV, H5N1): zoonotic virus affecting birds and mammals, with occasional human spillover
- Foot-and-Mouth Disease (FMD): highly contagious livestock disease with major economic impact
- MPox: zoonotic infection endemic in parts of Africa, with periodic global spread
- Human Metapneumovirus (HMPV): seasonal respiratory virus primarily affecting children and the elderly

Together, these infections span animal-host, zoonotic, endemic, and human-only respiratory threats

Data Sources and Period

- Twitter/X, Telegram, Facebook, Instagram, TikTok
- Forums and traditional news media
- Dec 25, 2024 – Jul 15, 2025

We track multilingual keywords across platforms to capture both professional reporting and grassroots reactions.

AI and NLP Pipeline

- Keyword-based collection (Brand24)
- Sentiment analysis
- Topic discovery using LLMs

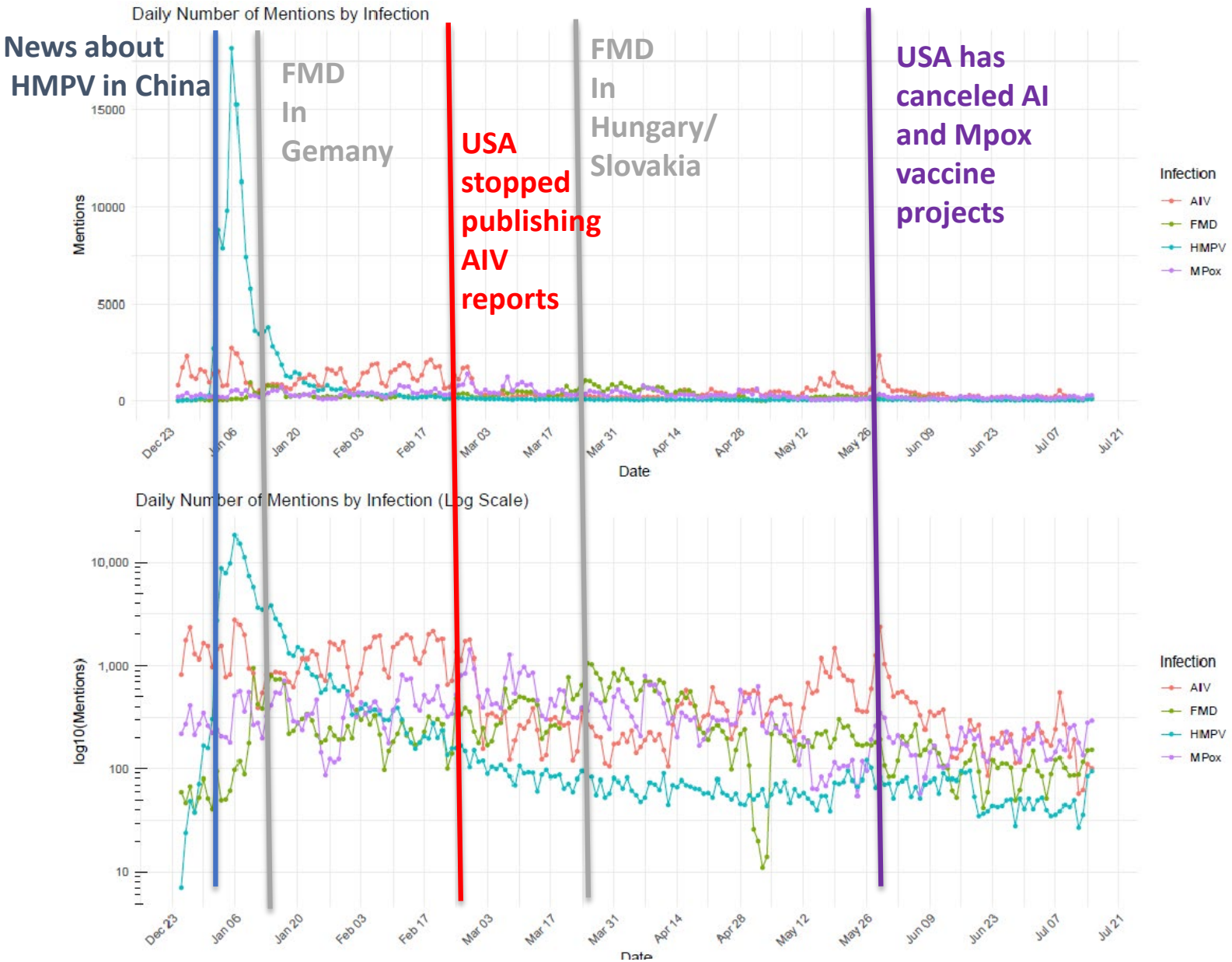
Large language model (ChatGPT) help interpret narratives and conspiracy frames beyond simple keyword counts.

Volume and Reach Overview

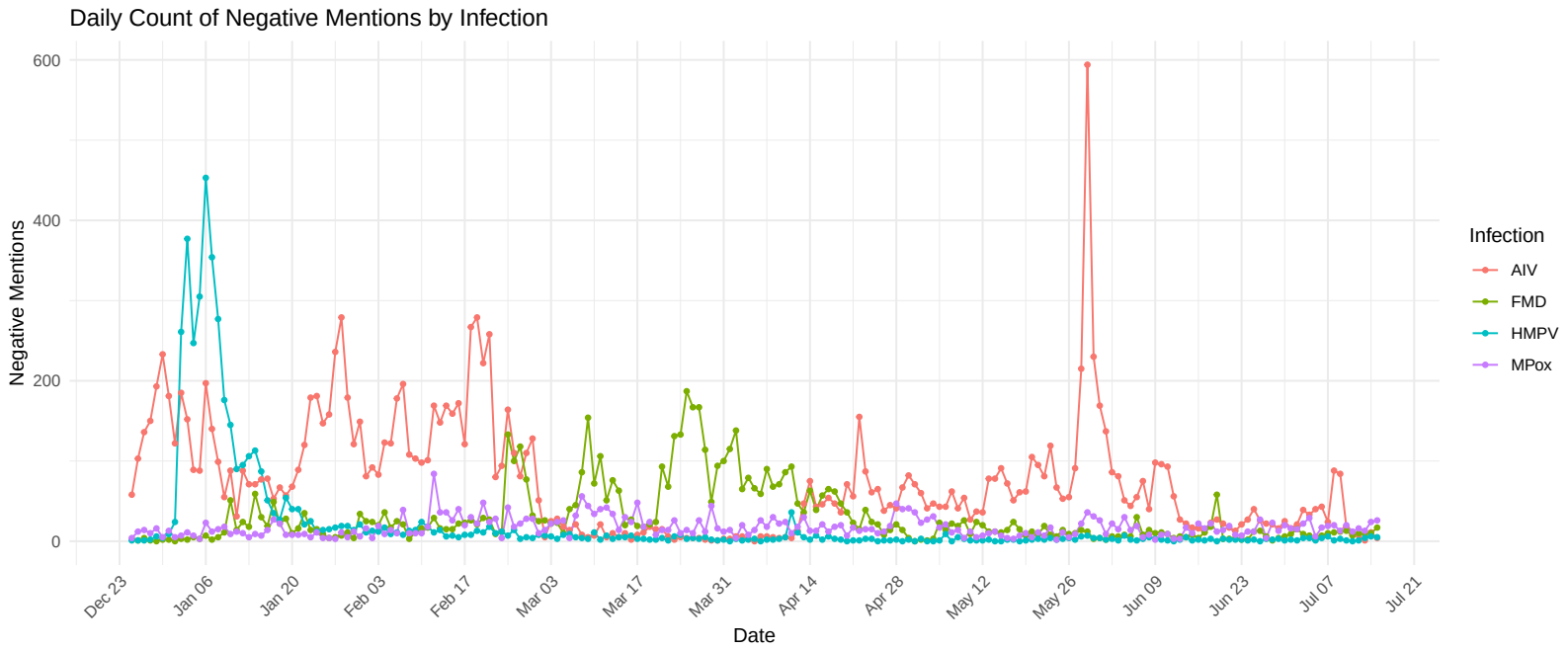
Infection	MPox	AIV	FMD	HMPV
Total mentions	50 773	134 220	55 682	137 810
Social media mentions	19 392	42 168	20 091	98 107
Non-social media mentions	31 381	92 052	35 591	39 703
Positive mentions	2 147	2 453	3 409	5 743
Negative mentions	2 712	14 959	6 093	4 292
Social media reach	211 M	586 M	145 M	1 954 M
Non-social media reach	173 M	759 M	241 M	326 M

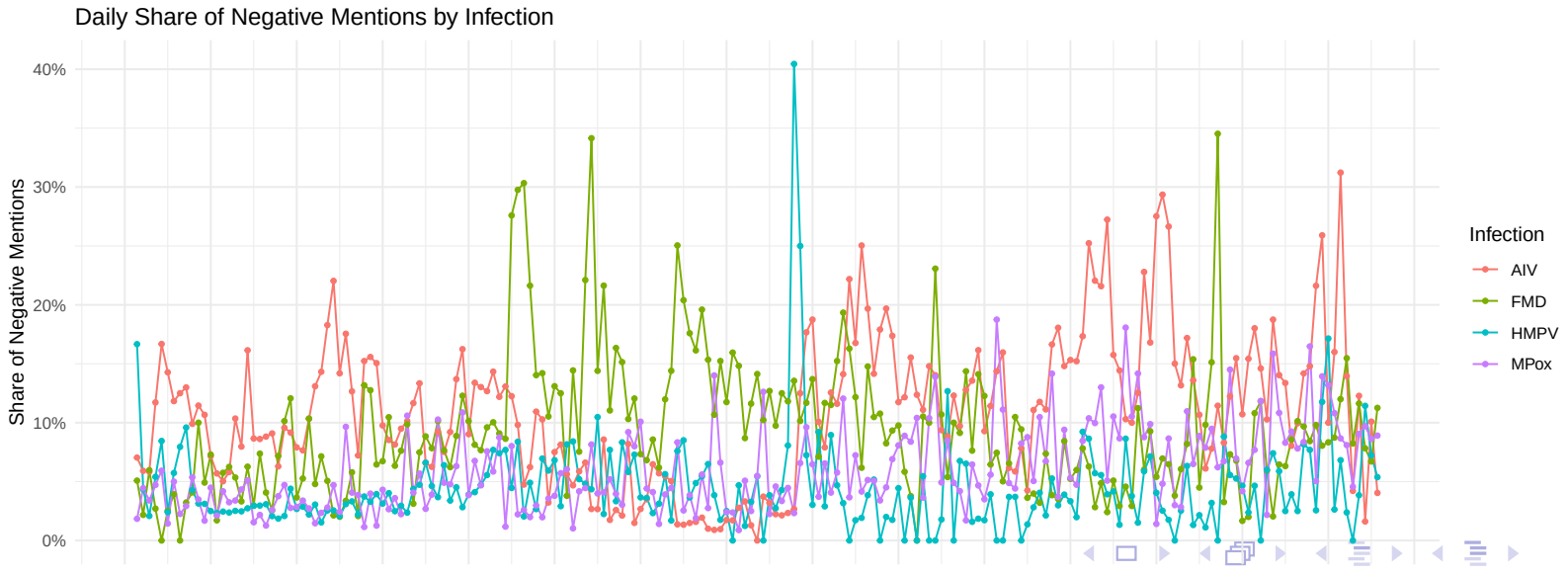
- HMPV and AIV generate very similar volumes of discussion in terms of total mentions, around 135 thousand. However, their reach is fundamentally different.
- HMPV achieves substantially higher reach primarily due to dominant amplification on social media platforms. This indicates viral spread driven by platform algorithms rather than sustained coverage by traditional media.
- In contrast, AIV and FMD rely much more heavily on non-social media sources
- Negative sentiment is particularly pronounced for AIV, which aligns with policy controversies and economic impacts such as egg shortages.

Temporal Dynamics of Attention



Negative Sentiment Dynamics





Case Study: Foot-and-Mouth Disease

- Peaks during outbreaks in Germany and Central Europe
- Dominated by traditional media coverage
- Framed primarily as an economic and trade risk

Using large language models for topic modeling, we detected recurring conspiracy narratives despite limited social media activity.

Language	Conspiracy Rate (%)	Mentions
Slovak	2.37	3 890
Polish	0.94	4 675
German	1.43	5 259
Hungarian	4.21	5 467
English	4.32	8 468

Conspiracy narratives identified via LLM-based topic modeling of traditional media content.

Case Study: Avian Influenza

- Mammalian infections in the US
- Strong negative reactions to policy decisions
- Attention decays after alert cessation

This is a clear agenda-setting effect: reduced official communication leads to rapid decline in public attention.

Case Study: MPox

- Ongoing outbreaks in Africa
- Stable but low attention
- Gradual increase in negativity

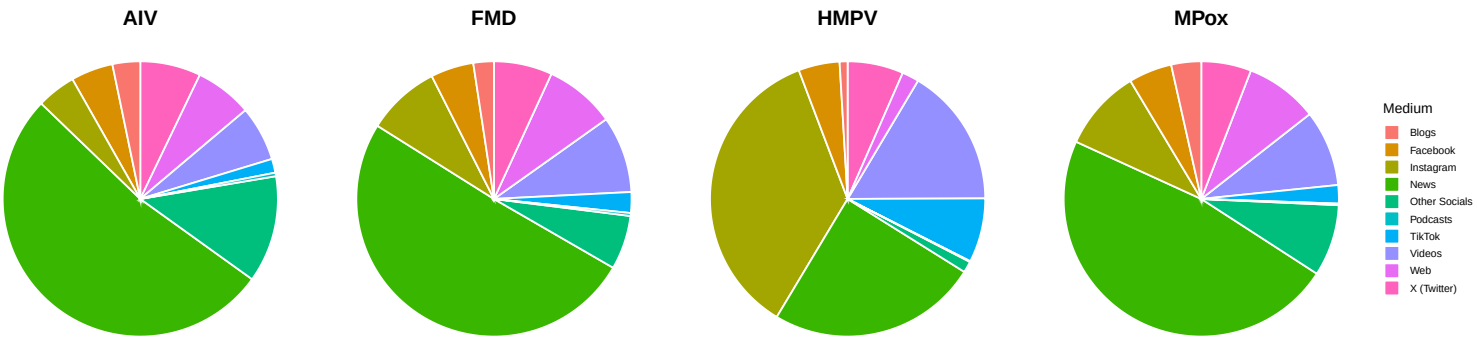
Once MPox left the Global North, media salience dropped sharply despite continued transmission.

Case Study: HMPV

- Sharp spike in January 2025
- Dominated by social media
- Extremely high reach

HMPV illustrates how human respiratory threats can trigger rapid online panic even without unusual epidemiological severity.

Media Composition



Different diseases propagate through distinct media ecosystems, influencing both speed and framing of discourse.

Temporal Dynamics of Media Attention

Infection	SD[1]	Skewness[2]	Peaks[3]	Half-life[4]	Seasonality[5]
AIV	579	1.30	12	3	0.30
FMD	219	1.46	14	4	0.23
MPox	217	1.64	11	2	0.32
HMPV	2237	5.23	8	3	0.07

- HMPV exhibits extreme volatility and skewness, indicating short, shock-like attention bursts typical of social-media-driven infodemics.
- AIV and FMD show stronger weekly seasonality, consistent with institutional and policy-driven reporting cycles.
- MPox displays lower volatility but persistent attention, reflecting endemic discussion rather than acute outbreaks.

[1]SD: standard deviation of daily mentions (volatility of attention).
[2]Skewness: asymmetry of attention distribution (sharp spikes vs sustained interest).
[3]Peaks: number of days exceeding mean + 2×SD (significant attention surges).
[4]Half-life: median days until attention drops below 50% of a peak.
[5]Seasonality: strength of weekly reporting cycle.

Key Findings

- Policy communication shapes attention (Agenda-setting effect)
- Social media amplifies panic
- Diseases affecting humans receive substantially more relative and absolute attention on social media
- Strong Global North–South bias

Infodemics follow systematic patterns that can be measured and anticipated.

Limitations

- Keyword noise and naming ambiguity
- Language-specific biases
- Proprietary data collection

Careful interpretation and triangulation with other data sources remain essential.

Future Research

- Deeper LLM-based narrative extraction
- Causal links between policy and discourse
- Early misinformation detection

We build on our prior work using LLMs for drug discontinuation detection (JMIR 2025) to extend fine-grained event understanding in infodemics.

Conclusions

- Infodemics are measurable and actionable
- AI enables real-time public health intelligence
- Integration into preparedness is critical

Infodemiology should become a standard component of epidemic preparedness and response.

Thank you

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