

Research Article

As Evidence Evolves: Epistemic Recalibration in Sequential WHO Risk Assessments of Filovirus Outbreaks, 2022–2024

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Abstract: Outbreak communication occurs when institutional authorities must convey information before all evidence is available and then update the assessment as knowledge evolves. This study examines how epistemic status and evidential grounding are maintained or recalibrated in sequential World Health Organization (WHO) Risk Assessments regarding three completed filovirus outbreaks: Sudan ebolavirus in Uganda (2022–2023), Marburg virus disease in Equatorial Guinea, and Marburg virus disease in Rwanda. The study used comparative longitudinal corpus-assisted discourse analysis of 17 WHO Risk Assessment sections from 17 DONs, totaling 4,247 cleaned tokens. Corpus-assisted identification of epistemic and evidential resources was combined with manual claim-level longitudinal tracking. The analysis yielded 85 event-specific claim units, including 53 inter-report relationships that could be traced longitudinally. The results show that epistemic positioning is realized through a combination of modal possibility, knowledge-status expressions, inferential predicates, evidential framing, institutional assessment expressions, classification, and temporal updating markers. Seventy-three percent of linked relations are carry-forward, indicating that epistemic persistence is more common than substantive change. When recalibration occurs, it is selective and claim-specific: Uganda primarily exhibits institutional risk reclassification, Equatorial Guinea maintains provisional inferences regarding undetected transmission and incomplete epidemiological knowledge, while Rwanda exhibits evidential strengthening in zoonotic source attribution. The three outbreaks also demonstrate that formal outbreak closure does not produce uniform epistemic closure; current outbreak status can be declared resolved while uncertainty persists regarding source, transmission history, or future re-emergence. The study uses epistemic recalibration as a study-specific analytical construct to capture longitudinal adjustment in epistemic status, evidential grounding, or institutional commitment. The findings demonstrate the analytical value of shifting attention from the distribution of isolated uncertainty markers to the longitudinal organization of event-specific institutional knowledge.

Keywords: epistemic recalibration; evidentiality; uncertainty communication; WHO Risk Assessment; filovirus outbreaks; longitudinal discourse analysis

Received: 19th February 2026

Revised: 23th March 2026

Accepted: 25th April 2026

Published: 30th June 2026

Curr. Ver.: 30th June 2026



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1. Introduction

Communication about disease outbreaks occurs under conditions where the need for rapid information confronts evolving knowledge. In the early stages of a public health event, the source of infection may be unknown, transmission chains incompletely identified, geographical extents are still changing, and risk levels may require reassessment as additional evidence becomes available. In such circumstances, health institutions not only convey known facts but also mark the boundaries between established knowledge, provisional inference, unresolved information, and possibility. The issue, therefore, is not simply whether institutional texts contain uncertainty, but rather how the state of knowledge is maintained or adjusted as evidence evolves from one assessment to the next.

The World Health Organization (WHO) provides a relevant context for observing this process through Disease Outbreak News (DON). WHO describes DON as a public mechanism for disseminating authoritative and independent information on selected confirmed or potential acute public-health events. DON is not intended to be an exhaustive record of all outbreaks handled by WHO, but rather is published when an event meets certain criteria for public dissemination. Studies of the DON development and publication process also indicate that the format is evolving toward structured reports that include a WHO Risk Assessment section (Lata et al., 2024; World Health Organization, n.d.).

The value of the DON as a research resource is increasingly recognized. (Carlson et al., 2023) built a retrospective DON database and demonstrated that it captures not only outbreak events but also high-level institutional decisions about information sharing. (Weets et al., 2025) updated the database for the COVID-19 pandemic period and emphasized that the DON should not be treated as an exhaustive global outbreak record, but rather as a valuable record of how WHO assessed and communicated outbreak risk. A recent analysis by (Quah et al., 2026) reinforces this caveat by demonstrating reporting trends, seasonality, and selectivity in the DON. Event-based surveillance research also positions the DON as a public source that can support a more granular understanding of public-health emergencies (McKnight et al., 2024).

The selectivity of DON also has methodological consequences for the study design. Because the goal of this study is not to exhaustively reconstruct epidemiological history, this selectivity is not treated as a defect to be addressed by incorporating external outbreak databases. Instead, the object of the study is the published institutional assessments themselves. By maintaining source, genre, and event identity, the comparison is directed at changes in the representation of knowledge actually published by WHO. This position distinguishes discourse-analytic questions from epidemiological surveillance questions: the study does not assess whether WHO possessed all relevant evidence at a given date, but rather how available institutional knowledge is made visible in the public risk assessment.

The sequential nature of DONs is crucial for linguistic research. For a given outbreak, the WHO publishes multiple updates on the same event. Because these documents address a developing event with a relatively consistent institutional source and broad reporting purpose, the DON sequence allows analysis not only of uncertainty markers at a single point in time, but also of continuity and change within the same claim. A proposition can be defended, gain new evidential support, be reclassified, or declared resolved. This perspective shifts the focus from isolated linguistic markers to the longitudinal organization of institutional knowledge.

Linguistic studies have long demonstrated that knowledge status is realized through a variety of resources. Stance encompasses lexical and grammatical expressions that signal attitude, judgment, or commitment to propositional content (Biber & Finegan, 1989). More specifically, epistemicity encompasses degree of certainty and information-source meanings (Boye, 2012). Evidentiality focuses on the source or basis of information supporting a proposition (Aikhenvald, 2004), while (Marín Arrese, 2015) shows that epistemic stance in discourse can be realized through modal and evidential expressions, cognitive-attitude predicates, and factive expressions. (Nuyts, 2001) and (Cornillie, 2009) also point to the importance of distinguishing evaluations of likelihood from reliability or source of information. Thus, epistemic positioning cannot be reduced solely to modal auxiliaries such as *may* or *might*.

Uncertainty in public health communication has also been studied from the perspective of risk and science communication. (Reynolds & Seeger, 2005) positioned crisis and emergency risk communication as a model that combines risk and crisis communication in rapidly changing situations. A systematic review by (Sopory et al., 2019) showed that uncertainty in public health emergencies is multidimensional, while (Kalke et al., 2021) highlighted probability, ambiguity, complexity, and scientific uncertainty, as well as the heterogeneity of terminology used in the literature. A review by (Gustafson & Rice, 2020) and an experiment by (van der Bles et al., 2020) showed that the impact of communicated uncertainty on trust is not simple and depends on form and context. Experimental studies by (Han et al., 2021) and (Dries et al., 2024), along with the systematic review by (Schuster & Scheu, 2026), further confirm that explicit uncertainty does not automatically undermine trust and can be relevant when evidence changes. (Jensen, 2008) and (van der Bles et al., 2019) also showed that hedging and forms of epistemic uncertainty have consequences that depend on framing and communicative settings.

However, the presence of uncertainty in WHO outbreak communication is not an unexplored area. (Ayine, 2025), for example, analyzed 111 DON 2023–2024 and showed how plausibility shields and attribution shields were used to manage uncertainty while providing evidential and institutional grounding. Temporal variation in epistemicity has also been examined. (Poole et al., 2019) demonstrated changes in the distribution of epistemic stances in diachronic science writing, while (Carretero, 2023) compared epistemicity across two stages of pandemic newspaper discourse. Therefore, this research gap is not an absence gap, but rather a configuration gap: it is unclear how event-specific institutional claims themselves develop within a linked reporting sequence of the same event.

This research uses the term epistemic recalibration as a study-specific analytical label, not a new theory of epistemicity. The term calibration/recalibration has precedent in linguistic research, for example, in the modulation of epistemic stance in conversation (Chor, 2018) and the fine-tuning of access claims according to relative epistemic status (Koskinen & Stevanovic, 2022). In this research, epistemic recalibration refers to the longitudinal adjustment of the epistemic status, evidential grounding, or institutional commitment attached to an event-specific claim when the evidential basis changes across successive reports. When the corresponding claim is carried over to the next report without substantive change in that dimension, this research calls it epistemic persistence.

To ensure comparability, the study focused on sequential WHO Risk Assessments from three completed filovirus outbreaks: Sudan ebolavirus in Uganda (2022–2023), Marburg virus disease in Equatorial Guinea (2023), and Marburg virus disease in Rwanda (2024). Related outbreak families provide a broadly comparable high-consequence infectious-disease context, while focusing solely on the WHO Risk Assessment section limits the institutional units being compared. Based on this design, the study addresses three research questions:

RQ1. What linguistic resources are used to construct epistemic status and evidential grounding in sequential WHO risk assessments of filovirus outbreaks?

RQ2. How do event-specific knowledge claims persist or change in epistemic status and evidential grounding across successive risk assessments of the same outbreak?

RQ3. How does the distribution of uncertainty across claim domains change over the reporting trajectory from initial assessment to formal outbreak closure?

The scope of three outbreaks also allows for contrastive logic without turning the research into a broad disease comparison. The goal of cross-case comparison is not to test whether one country or outbreak is more definitive than another, but rather to assess whether mechanisms of persistence and recalibration emerge in different trajectories. Therefore, each outbreak is first reconstructed internally before patterns are compared across cases.

This research contributes on three levels. Empirically, it shifts attention from collection-level description to matched sequences from the same outbreak. Methodologically, corpus-assisted identification of linguistic resources is combined with claim-level longitudinal tracking to distinguish repeated wording from substantive change. Analytically, epistemic recalibration links changes in linguistic realization with evidential grounding and institutional commitment without assuming that evolving outbreak knowledge moves linearly from uncertainty to certainty.

2. Literature Review and Theoretical Framework

2.1 Epistemicity, Epistemic Stance, and Evidentiality

The analysis of how a text signals knowledge status has interrelated but not identical traditions. One broad umbrella concept is stance. (Biber & Finegan, 1989) describe stance as the lexical and grammatical expression of attitudes, feelings, judgments, or commitments to propositional content. (Hyland, 2005) later demonstrated the importance of writer positioning in written discourse, although his model was primarily developed for academic discourse and writer-reader interaction. This study uses these insights as background, not as the primary coding framework.

For the purposes of this research, epistemicity becomes a more precise umbrella. (Boye, 2012) connects degree-of-certainty meaning with information-source meaning as two subdomains of epistemic meaning. (Nuyts, 2001) emphasizes the importance of epistemic modality as an evaluation of the likelihood of a state of affairs, while (Cornillie, 2009) cautions that the reliability of an information source should not automatically translate into a degree

of epistemic commitment. This distinction is important because the WHO can specify the evidence base without having to convert a proposition into a categorical assertion.

The information source dimension is related to evidentiality. (Aikhenvald, 2004) developed evidentiality as a category related to information sources and showed that in some languages, these distinctions can be grammatically obligatory. English does not have such a compulsory evidential system; therefore, research on WHO English prose requires attention to discourse-level evidential resources. Expressions such as "based on epidemiological investigation," "references to laboratory confirmation," "sequencing," "surveillance," or "environmental testing" can function as explicit evidential grounding without being treated as grammatical evidentials in a narrow typological sense.

(Marín Arrese, 2015) provides a bridge between epistemicity and discourse analysis by showing that modal and evidential expressions, cognitive-attitude verbs, and expressions of factivity can function as epistemic stance resources. This perspective supports the decision not to reduce coding to conventional hedges. Expressions such as unknown, under investigation, may indicate, confirmed, based on available information, or WHO assesses perform distinct epistemic work. Therefore, this study separates epistemic status from evidential grounding and examines how both develop across successive institutional assessments.

Operationally, the separation of status and evidence also helps handle cases that appear superficially contradictory. A proposition may use a strong institutional classification but have an evidential basis that is still open to updating; conversely, evidence may accrue without generating a categorical claim. Therefore, analytical status is not determined by a single lexical cue. Coding considers the proposition, scope of negation, source attribution, surrounding explanation, and relationship to prior published formulations. This approach ensures that evidentially supported is not automatically equated with confirmed, and that lexical possibility is not always read as low institutional commitment if the modified proposition differs from the core risk judgment.

This distinction also prevents overly coarse whole-document categorization. A risk assessment can have a strong commitment to one proposition while maintaining uncertainty about another. Thus, a text is not globally labeled as certain or uncertain. Epistemicity is treated at the claim level, so source, transmission, spatial spread, risk classification, outbreak status, and future re-emergence can have different trajectories.

2.2 Uncertainty Communication in Public-Health Emergencies

Uncertainty is an inherent feature of many public health emergencies because epidemiological evidence, diagnostic information, source attribution, transmission patterns, and response conditions can change rapidly. In their model of crisis and emergency risk communication, (Reynolds & Seeger, 2005) emphasize the need for communication that adapts to the changing threat environment. The WHO also places transparency regarding what is known, what is not known, and what is being done to learn more as a crucial part of emergency risk communication (WHO, 2018). More recent guidance from the World Health Organization Regional Office for Europe specifically addresses uncertainty communication in health emergencies. Guidance 2025 is used here as the contemporary context, not as evidence of the intention behind the wording of the 2022–2024 corpus.

(Sopory et al., 2019) demonstrated through a systematic review that uncertainty in public health emergencies is a multidimensional phenomenon. (Kalke et al., 2021) demonstrated that health uncertainty research encompasses probability, ambiguity, complexity, and scientific uncertainty, but the terminology remains heterogeneous. These findings support analytical distinctions between claim domains and reject the treatment of all limited-knowledge expressions as a single undifferentiated category.

The literature on audience response also cautions against simple assumptions. (Jensen, 2008) found that hedged cancer-news coverage can influence perceptions of credibility; (van der Bles et al., 2019) reviewed multiple forms of epistemic uncertainty and showed that effects differed by the object and form of uncertainty; (Gustafson & Rice, 2020) concluded that experimental evidence on uncertainty communication is mixed. In a large experimental program, (van der Bles et al., 2020) found only small trust effects for communicated uncertainty about facts and numbers. (Han et al., 2021) showed that uncertainty-normalizing language can reduce ambiguity-averse reactions in the context of COVID-19, while (Dries et al., 2024) found that communicating uncertainty can protect against loss of trust when

evidence changes. (Schuster & Scheu, 2026) also demonstrated through a systematic review that the relationship between communicated scientific uncertainty and trust depends on forms, contexts, and audiences.

This research corpus does not measure trust, comprehension, or behavioral responses. Therefore, this literature is used to demonstrate the relevance of the problem of uncertainty communication, not to use linguistic forms as a proxy for credibility. The research question remains limited to how institutional texts construct, maintain, and change knowledge status.

The DON is an appropriate locus for this issue. (Carlson et al., 2023), (Lata et al., 2024), (Weets et al., 2025), and (Quah et al., 2026) show that the DON is a structured but selective institutional record. (Ayine, 2025) is the closest linguistic study: it demonstrates the systematic use of plausibility and attribution shields in 111 DONs. However, such distributional analysis does not specifically link the same proposition from the first report to the next. Claim tracking therefore provides an additional analytical layer.

2.3 From Epistemic Markers to Sequential Epistemic Recalibration

Changes in epistemic discourse over time are not entirely unexplored. (Poole et al., 2019) analyzed a diachronic corpus of science writing and demonstrated systematic temporal shifts in epistemic stance. (Carretero, 2023) compared 400 newspaper articles across two phases of the COVID-19 pandemic and showed that changing knowledge environments are reflected in the distribution of epistemic expressions. Both studies demonstrate the value of temporal comparison, but the primary analytical unit remains corpus periods or groups of texts, rather than matched propositions within the same reporting sequence of events.

Sequential outbreak reports offer a different possibility. When multiple documents discuss the same event, analysts can inquire whether a particular proposition was newly introduced, carried over to the next report with the same status, gained additional evidential support, was reclassified, or was declared resolved. This approach requires epistemic persistence to be coded alongside change. Without baseline persistence, repeated claims and updated claims are easily treated as equivalent occurrences.

The term epistemic recalibration is used to describe this substantive longitudinal adjustment. (Chor, 2018) demonstrates the use of recalibration for epistemic stance changes in conversational development, while (Koskinen & Stevanovic, 2022) use epistemic calibration to fine-tune access claims and generalizations based on the relative epistemic status of interlocutors. This study does not directly transfer the interactional model. The sequence unit here is institutional reports, and recalibration is defined as the adjustment of an already trackable institutional claim relative to its earlier published formulation.

Operationally, recalibration can involve changes in epistemic status, evidential grounding, or institutional commitment. Conversely, persistence occurs when the core claim and relevant epistemic configuration remain substantively stable, even if the wording or supporting details undergo minor modifications. The analysis also uses uncertainty reconfiguration as a derived concept to describe changes in the distribution of unresolved, possible, provisional, or evidentially supported claims across domains. This concept is not a pre-assigned code and is only derived after individual claim trajectories are compared.

With this architecture, the research connects corpus-assisted discourse analysis with longitudinal claim tracking. Briefly, the research's position can be understood through three shifts: from marker to claim, from collection to matched sequence, and from general temporal difference to within-event updating. This configuration does not replace prior research on hedging, evidentiality, uncertainty, or diachronic epistemicity, but connects this literature at the level of longitudinal institutional knowledge.

3. Methods

3.1 Research Design and Corpus Selection

The study employed comparative longitudinal corpus-assisted discourse analysis, combining corpus-based identification of linguistic resources with qualitative claim-level longitudinal tracking. Corpus-assisted discourse studies allow recurring patterns to be systematically identified and examined through contextual close reading (Ancarno, 2020; Baker et al., 2008; Partington et al., 2013; Taylor & Marchi, 2018). Because the primary goal of the study was not to estimate aggregate lexical distributions but to trace changes in

institutional knowledge, corpus procedures were supplemented by manual alignment to corresponding event-specific claims.

The data comes from publicly accessible WHO DONs. The corpus was purposively selected based on four criteria: the event was a filovirus outbreak; WHO published more than one DON regarding the same outbreak; the outbreak had reached formal closure; and the official English-language DON was publicly available. These criteria yielded three trajectories: Sudan ebolavirus in Uganda (2022–2023), Marburg virus disease in Equatorial Guinea (2023), and Marburg virus disease in Rwanda (2024). The primary corpus includes 17 WHO Risk Assessment sections derived from 17 DONs, totaling 4,247 cleaned tokens.

DON467, dated 8 May 2023, was excluded from the Equatorial Guinea series because WHO combined Equatorial Guinea and Tanzania into a single document. Including only one subsection of the combined report would have introduced manual segmentation not applied to the other documents. The webpage version analyzed was the version available on the retrieval date of 28 August 2026. Publication date and amendment information are retained in the metadata; specifically for DON459, the WHO page records an amendment of 17 April 2023, following the publication date of 15 April 2023 (World Health Organization, 2023b).

Table 1. Corpus and Analytical Dataset

Outbreak	Period	DONs analyzed	Documents	Cleaned tokens
Sudan ebolavirus – Uganda	Sep 2022–Jan 2023	DON410, DON421, DON423, DON425, DON428, DON433	6	1,200
Marburg – Equatorial Guinea	Feb–Jun 2023	DON444, DON449, DON459, DON472	4	884
Marburg – Rwanda	Sep–Dec 2024	DON537, DON539, DON540, DON541, DON543, DON544, DON548	7	2,163
Total	2022–2024		17	4,247

Source: World Health Organization (2022a–e, 2023a–e, 2024a–g).

3.2 Corpus Preparation and Analytical Boundaries

The primary analytical text was strictly limited to the WHO Risk Assessment section. Description of the Situation was used only as a contextual verification layer when necessary to understand background evidence and was not included in the token count, claim count, or transition counts. Situation at a Glance, Epidemiology, Public Health Response, WHO Advice, Further Information, tables, captions, navigation elements, and reference material were excluded from the primary corpus. This boundary is consistent with the standardized functional separation in contemporary DON structures (Lata et al., 2024).

Cleaning was done conservatively: navigation artifacts, headings, hyperlink artifacts, figure/table captions, and duplicated webpage formatting were removed, while punctuation, negation, modal forms, numerals, acronyms, and original wording were retained. Repeated text between reports was not removed because repetition can represent institutional persistence. Two analytical layers were retained: the Full Published Risk-Assessment Corpus for linguistic-resource discovery and descriptive inspection, and the Longitudinal Claim-Transition Dataset for tracing corresponding event-specific propositions.

3.3 Claim Segmentation, Coding, and Longitudinal Matching

The primary unit of longitudinal analysis is an event-specific claim, a proposition about a developing outbreak that can receive relatively independent epistemic status. A compound sentence can be split into more than one claim if the propositions fall within domains that can develop differently. Evidential phrases that only support the main proposition are not

coded as standalone claims. Generic disease knowledge is labeled GEN and excluded from longitudinal transition analysis.

The claim domains used are STA (case/outbreak status), SRC (source/origin), TRN (transmission/linkage), SPR (spatial extent/spread), RSK (institutional risk assessment), DIA (diagnostic/clinical knowledge), CAP (response/detection capacity when relevant as a basis for assessment), and REM (re-emergence/persistence). National, regional/subregional, and global risks can be treated as separate propositions if their trajectories differ.

The epistemic-status codebook distinguishes UNKNOWN/UNRESOLVED, POSSIBLE/CONTINGENT, PROVISIONAL INFERENCE, EVIDENTIALLY SUPPORTED, ESTABLISHED/CONFIRMED, and META-EPISTEMIC. Categories are used contextually, not mapped automatically from individual lexical forms. Evidential grounding is coded multi-labelly: LAB (laboratory/diagnostic), EPI (epidemiological investigation/data), LNK (contact or epidemiological linkage), SUR (surveillance/case-finding), GENO (genomic/phylogenetic), ENV (environmental/animal), TEMP (temporal epidemiological criterion), HIST (historical/scientific knowledge), MOB (mobility/geographical), INST (institutional/currently available information), and NONE when the base is not called explicit.

Linguistic realization is recorded through modal possibilities, non-exclusion constructions, knowledge-deficit expressions, inferential predicates, evidential framing, institutional assessment predicates, confirmation/classification, temporal updating, and meta-epistemic resources. Corresponding propositions are then linked across successive reports using the update relationships NEW, CF-E (carry-forward essentially unchanged), CF-M (carry-forward with modification), STR (strengthened), QUAL (qualified), REV (revised/reclassified), RES (resolved), and REO (reopened). If the prior claim no longer appears without explicit evidence of resolution, the case is given the NI (Not Reiterated) tracking flag, not treated as resolution.

Longitudinal matching is not based solely on lexical identity. Two formulations can be paired when the referential object and propositional content remain comparable despite wording changes; conversely, lexical repetition does not automatically result in a match if the subsequent sentence shifts scope or temporal reference. The distinction between CF-M and STR is primarily determined by whether additional wording merely clarifies the rationale without changing the claim's status, or actually increases evidential/epistemic support. REV is used when institutional classification changes, while RES requires explicit textual closure. This rule is deliberately conservative so that the disappearance or simplification of wording is not read as a substantive epistemic event without evidence.

Epistemic recalibration It is defined as a substantive longitudinal adjustment in epistemic status, evidential grounding, or institutional commitment attached to an event-specific claim. Epistemic persistence is carry-forward without substantive change in that dimension. Uncertainty reconfiguration is not a coding category, but a derived cross-domain pattern determined after comparing trajectories.

3.4 Analytical Procedures and Quality Control

The analysis was conducted in four stages. First, the full Risk Assessment corpus was examined to identify recurring epistemic and evidential resources through lexical search, concordance-style inspection, and contextual close reading. Second, event-specific propositions were segmented and coded according to claim domain, epistemic status, evidential grounding, and linguistic realization. Before full coding, the codebook was tested on 25 purposively selected claims covering all three outbreaks and the opening, intermediate, and closure phases. The pilot did not yield the need for a new epistemic category, and the codebook was then locked.

Third, corresponding claims were linked sequentially within each outbreak. The primary comparison was conducted within the event; cross-outbreak comparisons were conducted only after each trajectory was reconstructed. Fourth, all coding and evidence boundaries were re-audited after full analysis. The final dataset consisted of 85 event-specific claim units; 32 were NEW claims and 53 generated linked inter-report relationships. Categories that did not generate robust cases, QUAL and REO, were still reported as zero counts rather than being removed post hoc.

Coding was performed by a single analyst. Therefore, the study does not report intercoder reliability coefficients. Consistency was supported by a locked codebook, explicit

decision rules, a formal pilot, distinction between primary and contextual evidence, and a full-dataset consistency audit. Quantitative analysis was descriptive; inferential statistics were not used due to the small corpus and the non-independence of observations due to textual carry-forward. All data are publicly accessible institutional documents and do not involve human participants, personal data, interviews, or interventions.

4. Results

4.1 Epistemic and Evidential Resources in WHO Risk Assessments

RQ1 shows that epistemic status in WHO Risk Assessments is not constructed by a single grammatical category. Knowledge status is realized through a combination of modal expressions, knowledge-status expressions, inferential predicates, institutional assessment expressions, evidential framing, and temporal markers. These resources allow WHO to distinguish between propositions that are unresolved, possible, provisionally inferred, evidentially supported, or established.

Knowledge deficits primarily emerge through expressions such as unknown, pending, not identified, and formulations that the investigation is still ongoing. Possibility is realized through may, might, possible, and negative-exclusion constructs. In Uganda DON410, for example, the risk was assessed as high at the national level when the scope of the outbreak was still developing and international spread could not be ruled out (World Health Organization, 2022). Thus, uncertainty in one claim domain can coexist with categorical institutional judgment in another domain.

Provisional inference occurs when available evidence allows interpretation but does not yet support a categorical assertion. Equatorial Guinea DON459, for example, links geographically dispersed or epidemiologically unlinked cases with the possibility of undetected transmission through inferential wording such as "may indicate," while "missing transmission chains" maintains the possibility of unidentified contacts (World Health Organization, 2023b). This resource differs from a simple knowledge deficit because the proposition is generated as an inference from available evidence.

Explicit evidential grounding is most evident in Rwanda. In DON541, zoonotic source attribution was linked to an outbreak investigation that included a health-facility record review, epidemiological data, serology, genomic sequencing, and environmental and animal testing. However, the dates of symptom onset remained unresolved. Evidential strengthening of the source claim, therefore, does not eliminate uncertainty in the temporal information (World Health Organization, 2024).

The corpus also shows resources that organize the temporal status of assessments, including remains unchanged, references to newly available information, and statements that assessments can be revised. Overall, RQ1 suggests that epistemicity is constructed through the relationship between degree of institutional commitment and evidential basis; modal possibility is just one resource in a broader repertoire.

4.2 Epistemic Persistence and Selective Recalibration across Successive Assessments

Of the 85 event-specific claim units, 32 are NEW claims, and 53 can be linked to corresponding claims in successive assessments. The distribution of update relations indicates that carry-forward is the dominant longitudinal relationship.

Table 2. Distribution of Inter-report Update Relations

Update relationship	n	%
CF-E – Carry-forward essentially unchanged	24	45.3
CF-M – Carry-forward with modification	15	28.3
STR – Strengthened	7	13.2

Update relationship	n	%
REV – Revised/reclassified	4	7.5
RES – Explicitly resolved	3	5.7
QUAL – Qualified	0	0.0
REO – Reopened	0	0.0
Total	53	100.0

The combination of CF-E and CF-M covered 39 of the 53 linked relations, or 73.6%. Thus, epistemic persistence was more common than substantive recalibration. Some claims were maintained almost unchanged, while others retained their basic epistemic status but underwent modifications in wording, supporting details, or evidential elaboration.

Substantive change emerged selectively. STR covered 13.2% of linked relationships and primarily emerged when propositions gained stronger evidential support; REV covered 7.5% and was primarily seen in institutional risk classification; RES occurred in only three cases (5.7%), all of which were related to formal declarations that the outbreak had ended. No robust transitions were found that met QUAL or REO. These results indicate persistence punctuated by selective recalibration, not a continuous movement from uncertainty to certainty.

Zero counts of QUAL and REO do not mean that cautious language or residual uncertainty are absent from the corpus. They simply mean that there is no robust longitudinal transition that meets the definition of change. Many claims were initially qualified or possible but retained that status in subsequent updates. Similarly, future re-emergence after a declaration of closure is not coded as REO because the proposition about future possibility differs from the proposition that the current outbreak has ended. This distinction maintains claim identity as the basis for longitudinal analysis.

4.3 Outbreak-Specific Trajectories of Epistemic Change

4.3.1 Uganda: Risk Reclassification and Subsequent Persistence

Uganda exhibits the clearest trajectory in risk classification. In DON410, WHO assessed the overall risk as high nationally and low regionally and globally, while the scope of the outbreak was still evolving (World Health Organization, 2022). In DON421, the assessment changed to very high nationally and high regionally, while the global risk remained low (World Health Organization, 2022). DON423 maintained the revised configuration but added evidential rationales such as multi-district spread, mobility, possible missed contacts, IPC problems, and cross-border surveillance limitations (World Health Organization, 2022). DON425 retained the same configuration (World Health Organization, 2022), and DON428 explicitly stated that the assessment remains unchanged (World Health Organization, 2022).

Final DON433 categorically changed the outbreak-status domain, declaring that the outbreak had ended after 42 days without new cases. However, the final assessment maintained the possibility of re-emergence through an animal reservoir or persistent virus (World Health Organization, 2023a). Uganda thus followed the pattern of major risk reclassification, subsequent stabilization, formal closure, and residual re-emergence uncertainty.

4.3.2 Equatorial Guinea: Provisional Transmission Inference and Persistent Incompleteness

Equatorial Guinea exhibits incomplete epidemiological knowledge that persists for a longer period. DON444 stated that available information does not yet confirm the identification of all cases; untracked transmission chains and unidentified contacts remain possible. Risk was assessed as high nationally, moderate regionally, and low globally (World Health Organization, 2023b). In DON449, additional cases, wider geographical spread, and uncertain epidemiological links triggered escalation to very high nationally, high subregionally, moderate regionally, and low globally (World Health Organization, 2023b).

DON459 did not shift concerns about transmission to categorical confirmation. Cases or clusters without clear epidemiological links were treated as provisional indications of

undetected transmission, while investigations into transmission chains were ongoing (World Health Organization, 2023b). Final DON472 declared the outbreak formally over after the closure criteria were met, but the initial source remained unidentified, not all transmission chains were definitively linked, and future emergence remained possible (World Health Organization, 2023b). Equatorial Guinea therefore achieved epidemiological closure without complete resolution of the source and historical transmission knowledge.

4.3.3 Rwanda: Evidential Strengthening of Source Attribution

Rwanda provides the clearest trajectory for evidential strengthening. In the Primary Risk Assessment corpus, the source trajectory can be traced starting from DON539, when the source, likely first-case onset, and additional epidemiological information were still pending investigation (World Health Organization, 2024). DON540 carried over this unresolved configuration into the next update while maintaining the risk classification and stating that the assessment could be revised as the outbreak develops (World Health Organization, 2024).

Substantive changes occurred in DON541. Based on record review, epidemiological data, serology, genomic sequencing, and environmental and animal testing, the source was reported to have zoonotic origin and was associated with cave exposure. At the same time, symptom-onset dates remained unknown (World Health Organization, 2024). The source attribution was then maintained in DON543 and DON544, while onset uncertainty remained (World Health Organization, 2024). The final DON548 declared the outbreak over and reduced the risk to low at the national, regional, and global levels, but the risk of re-emergence remained through potential future spillover or viral persistence (World Health Organization, 2024). Rwanda thus demonstrated unresolved source knowledge, evidential strengthening, stabilization of supported attribution, and closure with residual future-oriented uncertainty.

Table 3. Cross-Outbreak Longitudinal Trajectories

Outbreak	Dominant recalibration	Dominant persistence	Status at closure	Residual uncertainty
Uganda	Major national/regional risk reclassification	Revised risk configuration afterward maintained	Outbreak formally over	Re-emergence through reservoir or persistent virus
Equatorial Guinea	Risk escalation and provisional inference concerning undetected transmission	Incomplete transmission knowledge persists	Outbreak formally over	Source, parts of transmission history, and future emergence
Rwanda	Evidential strengthening of zoonotic source attribution	Strengthened source attribution afterward maintained	Outbreak formally over	Future re-emergence despite supported source attribution

4.4 Uncertainty Reconfiguration at Formal Outbreak Closure

RQ3 compares the distribution of uncertainty when the three outbreaks reached formal closure. All three final assessments categorically resolved the current outbreak status but did not achieve uniform resolution in other domains. Uganda did not return to the foreground source or historical transmission in the final Risk Assessment, but maintained the possibility of re-emergence (World Health Organization, 2023a). Equatorial Guinea achieved closure when the source remained unresolved and the transmission history had not been fully reconstructed (World Health Organization, 2023b). Rwanda had evidenced-supported zoonotic source attribution, but future re-emergence remained an explicit risk (World Health Organization, 2024).

Table 4. Knowledge-Domain Status at Formal Outbreak Closure

Knowledge domain	Uganda	Equatorial Guinea	Rwanda
Current outbreak status (STA)	Resolved: outbreak over	Resolved: outbreak over	Resolved: outbreak over
Source/origin (SRC)	Not reiterated	Unresolved	Evidentially supported zoonotic attribution
Historical transmission/linkage (TRN)	Not foregrounded	Partly unresolved	Not foregrounded
Re-emergence/persistence (REM)	Possible / cannot be excluded	Possible	Risk remains

The closure comparison also shows that resolved statuses need to be read semantically. The RES label in the dataset is not a generalized resolution of uncertainty, but rather an explicit closure of a specific proposition. This is important because institutional reports can simultaneously close the current-event status, maintain uncertainty about the historical source, and open the prospective possibility of re-emergence. By limiting resolution to claims that are truly closed, the analysis avoids the inference that increased operational control is always synonymous with complete epistemic knowledge.

Cross-case comparisons show that formal epidemiological closure is not identical to uniform epistemic closure. What changes is the configuration of uncertainty across domains. The current outbreak status can be resolved categorically, while the source, historical transmission, or future re-emergence are in a different epistemic status. This pattern is called uncertainty reconfiguration. Overall, the results yield four findings: persistence is the dominant inter-report relation; recalibration is selective and domain-specific; the form of epistemic change follows different evidential configurations; and formal closure does not produce uniform resolution across knowledge domains.

5. Discussion

5.1 Epistemic Persistence as the Baseline of Sequential Risk Assessment

The first finding is the dominance of epistemic persistence: 39 of 53 linked relationships, or 73.6%, are carry-forward. Sequential Risk Assessments thus more often maintain prior claims than replace them. Change is indeed more salient when risk increases, new evidence emerges, or an outbreak is declared over, but repetition itself is an essential part of the longitudinal organization of institutional knowledge.

These findings are consistent with the conception of stance as positioning of propositional content (Biber & Finegan, 1989; Marín Arrese, 2015). In sequential institutional text, maintaining the same claim means the current document retains its prior epistemic configuration. However, this corpus does not prove that persistence is a deliberate rhetorical strategy or that persistence increases trust. Public-health communication literature demonstrates the relevance of consistency and transparency for communication outcomes, but reception effects require audience data, which is not available here (Gustafson & Rice, 2020; Sopory et al., 2019).

The dominance of persistence also demonstrates why raw lexical frequency can be misleading in sequential DONs. If wording assessments are subject to multiple updates, the repeated occurrence of a modal or risk phrase may reflect textual inheritance, not independent epistemic decisions. Claim-level tracking distinguishes between new assessments, persistence, and substantive recalibration. In this context, (Ayine, 2025) research on the distribution of plausibility and attribution shields can be supplemented with a temporal question: whether a tentative formulation remains tentative, is strengthened by evidence, is revised, or is simply no longer reiterated.

5.2 Selective Recalibration and the Claim-Specific Nature of Epistemicity

The second finding is that recalibration is selective and claim-domain specific. Uganda primarily shows revisions to risk classification; Equatorial Guinea maintains its provisional inference about undetected transmission; and Rwanda shows source attribution that gains

stronger evidential grounding. These changes do not occur simultaneously across all epistemic content within a single report.

This pattern supports the separation of degree of commitment from information-source meanings in epistemicity (Boye, 2012) and aligns with the distinction between epistemic modality and evidentiality (Aikhenvald, 2004; Cornillie, 2009; Nuyts, 2001). Rwanda is the clearest illustration: epistemic strengthening in sources does not arise simply because modality becomes stronger, but because the evidential architecture changes through epidemiological, serological, genomic, environmental, and animal evidence. At the same time, the onset information remains unresolved. Whole-document labels such as "more certain" would obscure these claim-specific dynamics.

These results also provide nuance to temporal epistemicity research. (Poole et al., 2019) and (Carretero, 2023) demonstrate aggregate temporal changes in epistemic resources. This research moves at a different level by following corresponding claims within the same event. The term epistemic recalibration is therefore used as an operational bridge between claim identity, evidence, and sequential change, not as a general new theory. (Chor, 2018) and (Koskinen & Stevanovic, 2022) provide terminological precedents for calibration/recalibration, but the institutional-document context here differs from conversational epistemic rights.

5.3 Evidential Strengthening, Risk Reclassification, and Different Routes of Epistemic Change

Cross-outbreak comparisons show that substantive changes follow different routes. Risk reclassification is closely related to epidemiological spread, mobility, transmission conditions, and response capacity; source strengthening can rely on investigation, serology, sequencing, and environmental evidence. Risk judgment and etiological knowledge are therefore analytically related but non-isomorphic. In Rwanda, source attribution strengthened while risk configuration persisted for several updates; in the final report, the risk decreased after the closure criterion was met, although future re-emergence remains possible.

This distinction is important because the WHO DON is an institutional reporting genre, not a simple repository of facts. Research on the DON demonstrates standardized publication practices, as well as selection effects and reporting biases (Carlson et al., 2023; Lata et al., 2024; Quah et al., 2026; Weets et al., 2025). Thus, the Risk Assessment represents published institutional judgment built on multiple types of evidence. Authority in this corpus does not always take the form of categorical language; strong risk judgment can coexist with explicit acknowledgment of unresolved knowledge.

WHO emergency communication guidance emphasizes the importance of conveying knowns, unknowns, and ongoing efforts to learn more (WHO, 2018). Contemporary guidance also treats uncertainty as an explicit communication issue (World Health Organization Regional Office for Europe, 2025). Empirical studies show that the effects of uncertainty communication on trust depend on context, form, and timing (Dries et al., 2024; Han et al., 2021; Schuster & Scheu, 2026; van der Bles et al., 2020). The findings of this study do not test causal audience effects, but they do demonstrate textual configurations relevant to the literature: categorical judgment, explicit evidential grounding, and unresolved knowledge can coexist in a single institutional assessment.

5.4 Formal Outbreak Closure and the Reconfiguration of Uncertainty

The fourth and most consistent finding across cases is that formal outbreak closure does not produce uniform epistemic closure. All three outbreaks met the closure criterion, but the final risk assessments-maintained uncertainty in different configurations. Uganda maintained the possibility of re-emergence; Equatorial Guinea still had an unresolved source and incomplete transmission history; and Rwanda maintained supported source attribution but also had a risk of future re-emergence.

This pattern indicates uncertainty as a domain-specific configuration, not a global property of a document. (Kalke et al., 2021) and (Sopory et al., 2019) both demonstrate the multidimensionality of uncertainty in health contexts. The current data provides a linguistic illustration that an event can be closed in the current outbreak status domain but remain unresolved or possible in the source, transmission history, or future emergence. Therefore, the term uncertainty reconfiguration is more appropriate than relocation: uncertainty can

resolve in one domain, persist in another, and emerge in a future-oriented form simultaneously.

Closure statements and future possibilities are not contradictory because they operate on different temporal and epistemic objects. Formal closure uses epidemiological criteria for the current outbreak status, while source reconstruction is historical and re-emergence assessment is prospective. This distinction explains why the absence of prior uncertainty in a later report cannot automatically be coded as resolution. The NI tracking flag is maintained to prevent arguments from silence.

5.5 From Marker Distribution to the Longitudinal Organization of Institutional Knowledge

Methodologically, the results demonstrate the benefits of shifting attention from isolated markers to linked claims. Corpus counts help identify recurrent resources, but they do not differentiate between new knowledge, repeated formulation, stronger evidence, institutional revision, and explicit resolution. CADS traditions emphasize the value of integrating computational/quantitative patterning with contextual interpretation (Ancarno, 2020; Baker et al., 2008; Partington et al., 2013; Taylor & Marchi, 2018); longitudinal claim alignment adds temporal relations as an analytical dimension.

This approach also has implications for corpus design in genres that use rolling updates. In such corpora, document count and token count do not always represent the number of independent communicative decisions because portions of the text can be inherited. Automatic deduplication would eliminate evidence of persistence, but treating every repeated occurrence as independent would inflate apparent salience. The dual-layer design used here offers a middle ground: the full published text remains available for lexical discovery, while the claim-transition dataset stores the relationships between versions. The same principle could potentially be applied to institutional situation reports, regulatory updates, technical advisories, or other serial documents that update common event states.

The contribution of this research, therefore, is not to claim that epistemicity, uncertainty, evidentiality, or WHO DON have never been studied. The more defensible contribution lies in the analytical configuration: matched within-event sequence, event-specific claim tracking, separation of epistemic status and evidential grounding, and explicit coding of persistence and change. This configuration results in three shifts: marker to claim, collection to sequence, and aggregate temporal comparison to within-event updating.

At a broader level, institutional knowledge in sequential risk discourse appears layered and updateable. Certain claims can stabilize, others gain new evidence, risk assessments can be revised, and one domain can be closed without resolving questions in another. Because change is only visible relative to prior stability, persistence is not a residual category but an analytical baseline for recalibration.

5.6 Limitations and Directions for Further Research

Several limitations limit generalization. First, the corpus consists of 17 WHO Risk Assessment sections from three filovirus outbreaks and does not represent the entire WHO DON. Disease-family control improves comparability but limits transferability to pathogens with different transmission dynamics or reporting architectures. Second, the DON is a selective publication; (Carlson et al., 2023), (Weets et al., 2025), and (Quah et al., 2026) show that reporting patterns cannot be treated as a complete global outbreak record. The findings therefore apply to published WHO risk-assessment discourse, not all internal knowledge available to WHO.

Third, the analysis used retrievable webpage versions dated August 28, 2026. DONs, such as DON459, can undergo post-publication amendments, so the corpus is not an immutable archive of the exact text readers saw on publication day. Future work could use web archives or versioned institutional datasets to examine within-document revisions. Fourth, claim segmentation and longitudinal matching involve single-analyst qualitative judgment. Formal pilots, locked codebooks, explicit decision rules, and full-dataset audits enhance transparency but do not eliminate interpretive judgment.

Fifth, this study analyzed institutional text, not reception. Literature shows that uncertainty communication can influence credibility, trust, ambiguity aversion, and interpretation under certain conditions (Dries et al., 2024; Han et al., 2021; Jensen, 2008; van

der Bles et al., 2019), but these outcomes cannot be inferred from this corpus. Future research could test the framework on larger pathogen sets, compare DON sections, track corresponding claims across national and international institutional sources, or combine longitudinal discourse analysis with audience studies.

6. Conclusion

This study examines how institutional knowledge was constructed and updated in sequential WHO Risk Assessments regarding three filovirus outbreaks in 2022–2024. Combining corpus-assisted discourse analysis and claim-level longitudinal tracking, the study explores whether event-specific claims were maintained, evidentially strengthened, revised, or declared resolved. Analysis of 17 WHO Risk Assessment sections yielded 85 event-specific claim units and 53 linked inter-report relationships.

RQ1 shows that epistemic positioning is realized through a broader repertoire than conventional hedging: modal possibility and non-exclusion constructs, knowledge-deficit expressions, provisional inferential predicates, explicit evidential framing, institutional assessment predicates, confirmation/classification, and temporal updating markers. RQ2 shows that 39 of 53 linked relations, or 73.6%, are carry-forward, so epistemic persistence is a longitudinal baseline. Recalibration occurs selectively: Uganda primarily shows risk reclassification, Equatorial Guinea sustained provisional transmission inference, and Rwanda evidential strengthening in source attribution. RQ3 shows that formal epidemiological closure is not identical to uniform epistemic closure. Current outbreak status can be resolved when the source, transmission history, or future re-emergence still have different epistemic states.

Overall, the sequential WHO Risk Assessments do not demonstrate a simple progression from uncertainty to certainty. Institutional knowledge develops through a combination of epistemic persistence, selective recalibration, evidential differentiation, and uncertainty reconfiguration. Research contributions are primarily analytical and methodological: linking matched within-event comparison, event-specific claim tracking, epistemic status, evidential grounding, and inter-report update relations. The term epistemic recalibration is used limitedly as a study-specific analytical construct, not as a new theory of epistemicity.

Interpretation remains limited by corpus size, DON selectivity, retrievable webpage versions, and single-analyst coding. Future research could expand sequential analysis to other pathogen families, compare multiple sections or institutional sources, use archived versions for within-document revision, and examine reception consequences through experimental or audience designs. Nevertheless, claim-level longitudinal analysis demonstrates how evolving evidence becomes visible not only through markers of certainty or uncertainty, but also through changing relationships between propositions, evidence, and institutional commitment from one assessment to the next.

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