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Explanation of Risk and Uncertainty in News Coverage of an Anthrax Attack

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Abstract

A content analysis of U.S. news coverage of the 2001 anthrax attacks examined explanations of risk and uncertainty. The sample consisted of 833 stories drawn from 272 newspapers, Associated Press, National Public Radio, and four television networks (CBS, NBC, CNN, ABC). Dominant uncertainty factors included outrage rhetoric, speculation, attribution of unnamed sources, and coverage of confusing incidents. Overall coverage also promoted comparability, through definitions and explanations about risks and transmission vectors. Risk comparisons, specific advice, and process explanations were sparse.

Keywords: news media, framing, bioterrorism, risk communication, uncertainty, journalism

1. Introduction

In October 2001, the U.S. news media faced an unprecedented crisis when letters contaminated with deadly anthrax spores began to surface across the nation. Spores were spread through the postal system, alarming a public already anxious shortly after the 9/11 attacks in New York City. The first anthrax victim, an employee of a Florida supermarket tabloid publisher, died of an illness that doctors could not at first identify. Tommy Thompson, the secretary of Health and Human Services, suggested the victim might have contracted anthrax by drinking water from a stream, but after several postal workers and journalists tested positive for anthrax exposure, he eventually declared that someone was intentionally trying to kill people.

Initially, the official response was confused and spread across many different agencies. Only four letters containing anthrax, postmarked in Trenton, NJ, had entered the postal system. These letters resulted in 22 confirmed cases of anthrax infection, including five deaths.[1] This small-scale dispersion, which constituted a negligible threat to citizens as compared with other prevalent public health risks, generated confusion and panic and illustrated the challenges of communicating information about risk to an alarmed public.

The anthrax outbreaks generated immense media attention[2] and dominated the nightly news for two weeks in October. During this period, anthrax knocked the 9/11 attacks and Afghanistan bombings out of the top news slot.[3] Most reporters learned as they went and found themselves in the midst of a story where journalists were both messengers and potential victims.[4] Maxine Isaacs, former press secretary to Walter Mondale, characterized the anthrax coverage as a "hyperhysterical, meaningless, endless recycling of the same facts over and over again."[5] CBS News anchor Dan Rather said, "I worry about [excessive media coverage] creating exactly what the people who spread this terrible stuff want, which is spreading fear that they hope will result in panic."[6]

The news media serve as the primary source of public information for disaster warnings and predictions[7] because of their broad reach and potential to influence knowledge, attitudes, and behaviors.[8] However, inaccurate, incomplete, and sensational coverage can contribute to public misunderstanding about the risks involved.[9] Officials withheld information from journalists because they feared widespread panic, but the lack of information itself alarmed the public[10] because the resulting coverage often was conflicting, shallow, and lacked validation by health authorities.[11] Experts later concluded that a greater public understanding of the anthrax threat would have helped

reduce fear and panic.[12] Shortly after the attacks, most Americans believed that government officials were not telling Americans everything they needed to know.[13]

The present study explores news coverage promoting uncertainty in coverage of the anthrax attacks, as well as the use of explanatory coverage to help audiences understand risks and put them in context. Uncertainty coverage included outrage rhetoric, speculation, vague advice, conflicting reports, hoaxes, false alarms, and use of off-record interview sources. Explanatory content included risk comparisons, relative risk explanations, process explanations, and definitions.

The ISO 31000 (2010), developed by an international committee of risk experts from more than 30 nations, defines risk as the probability that an activity or inaction will lead to an undesirable outcome. Ultimately, risk is the positive or negative impact of uncertainty on objectives. Uncertainties include events that may or not happen, as well as events caused by ambiguity. Uncertainty involves a lack of information that leads to inadequate understanding of an event, outcome, or likelihood. Uncertainty describes a situation where an outcome is unknown, while risk describes the chance of a hazardous incident occurring.[14] A threat is a possible danger that could exploit vulnerability, and vulnerability is a weakness that exposes a system to harm.[15]

McCollum (2006) defines a hazard as a situation or theoretical risk of harm that poses a threat to life, health, property, or the environment. Once a hazard becomes active, it can create a crisis incident. Determining the likelihood of a hazard occurring, potential seriousness or severity of the incident to various populations if it did occur, and the community's capacity to mitigate the incident, helps risk managers determine whether and how a hazard should be addressed.[16]

News audiences may misinterpret risk messages when they have difficulty understanding a lack of scientific certainty.[17] Media coverage may promote uncertainty when it fails to present scientific knowledge about how a hazard causes adverse health effects, fails to provide precise risk assessment,[18] constructs a disagreement among experts or data sources, or uses imprecise language.[19] Uncertainty also may increase when audiences expect one outcome but something different occurs.[20] Discussing uncertainties in news coverage of an incident may reinforce anxiety while reducing public confidence.[21]

The amount of news coverage about a particular hazard can increase risk perception because audiences believe a hazard occurs more frequently when they can easily recall or imagine such instances. When news coverage of a risk increases, this increases the perceived likelihood that it will occur.[22] In turn, officials can manipulate news coverage more easily when an event involves greater uncertainty.[23] In a crisis, official estimates of risk often are value laden, politically and economically influenced, or based on invalid assumptions.[24]

1.1. *Outrage*

The present study will identify outrage rhetoric in news coverage of the 2001 anthrax attacks. In a threatening situation, uncertainty triggers outrage, the principal determinant of perceived hazard. Outrage occurs when individuals are upset about a threat, believe they are in danger,[25] and perceive greater risk than actually exists.[26] The magnitude of outrage may depend on audience members' personal knowledge, training, and previous experience with the situation. People tend to focus more on feelings of outrage than the hazard itself[27] and may be more outraged by trivial risks that are imposed.[28] In anthrax attacks, public outrage is expressed as fear, panic, or anxiety and is provoked by the perception that a hazard is involuntary, unfamiliar, artificial, controlled by others, has no visible benefits, or has delayed effects.[29]

Indeterminate risks breed greater fear,[30] and news coverage of a threat can amplify the perception of indeterminate risk. The newer a risk, the more unfamiliar and dreaded it is.[31] A risk is dreaded if consequences are potentially catastrophic, uncontrollable, potentially fatal, not equitable in their distribution, pose a high risk to future generations, are not easily reduced, or are involuntarily imposed. A risk is unknown if it is not observable, not evident to those exposed, or if its effects are delayed and not definitively known to science. Risks that are both dreaded and unknown are more likely to produce broad social, political, and policy consequences and provoke higher-order concerns such as moral trepidation or perceived threats to future generations.[32]

News coverage can promote outrage if it fails to connect specific events to larger issues,[33] amplifies or ignores risks, or emphasizes drama over scientific facts.[34] Media emphasis on a hazard can shape perceived danger, exaggerate social and economic responses, and lead to consequences far more serious than the initial threat.[35] Misrepresenting the prevalence or causes of death and their risk factors can contribute to distorted perceptions of a health hazard.[36] While stating that a risk is insignificant can create public suspicion that officials are suppressing important information that could put citizens at risk,[37] exaggerated stories spread quickly when officials overestimate death rates for infected patients.[38]

When news coverage prompts audiences to worry about getting sick, the more they will consider a hazard to be important.[39] During the anthrax attacks, news coverage asserted that Cipro was the antidote to anthrax infection, but most Americans lacked access to these high-level antibiotics. Many who did manage to obtain Cipro experienced side effects from misusing it. Hospitals became inundated with "worried well," frightened citizens, and these hysterical public reactions hindered the health system's ability to treat those in need of medical care.[40]

To reduce outrage, risk messages must reassure, be clear, increase individual knowledge and compliance, provide adequate information, neither under- nor over-emphasize risk, increase trust,[41] and simplify complex information.[42] News coverage must thoroughly and precisely present this content from trusted sources, in order to reduce outrage. Audiences also must understand the seriousness of a risk and how their practical responses could mitigate possible consequences.[43] When individuals perceive a risk as high, they may reject advice presented through public channels, unless the message bolsters enough self-efficacy to adopt the recommended protective behavior.[44]

Top-down, one-way communication, as presented by official sources speaking through daily news coverage, tries to bring public belief in line with expert views.[45] When officials speak about a hazard, the main goal is to convey "Have faith; we are in charge."[46] Official statements, meant to assure the public that the mail, airlines, or water supply is safe, may have the opposite effect. Instead of alleviating concern, such statements can increase anxiety and avoidance of an activity previously assumed to be safe. The fact that an investigation is underway can provoke fear and suspicion. Warning systems often produce false alarms, leading to confusion, rumors, mistrust in the warning systems, and desensitization to future warnings.[47]

1.2. *Other uncertainty factors*

News coverage of the anthrax attacks promoted uncertainty through the use of speculation, conflicting reports, off-record sourcing, vague advice, and coverage of confusing incidents. Speculation can fuel uncertainty and dread. Experts often predict future events rather than provide statistical data.[48] Media speculation occurs in the absence of centralized expertise. During the anthrax attacks, journalists needed instant access to information that was unavailable, experts that were inaccessible, and statements about issues that interview sources felt unprepared to address.[49] When the Pentagon restricted the information flow, this led to increased speculation in news coverage.[50] Stories sparked outrage by predicting adverse, uncontrollable outcomes and continually warning of possible dangers.[51] Journalists frequently asked experts to speculate about possible outcomes. Even authoritative sources provided rumors, sweeping claims, and conspiracy theories. Repetitive network television news coverage often highlighted speculation about future attacks.[52]

Conflicting statements in news coverage can trigger outrage. In a crisis, communication channels often break down. Journalists must filter and interpret multiple, competing sources of information. Specialization of expertise and fragmentation of knowledge create the appearance of public disputes among experts. Media-constructed conflict often portrays a responsible government doing its best to deal with a hazardous situation, pitted against non-experts expressing fear of the unknown. When journalists are unable to sort out whether there is any real threat of harm to citizens, they typically inform the public that a controversy is occurring and identify the players on each side.[53] This strategy empowers interview sources to suppress facts, manipulate information, or announce unfounded conclusions. Then the public cannot decide which sources to trust and what advice to follow.[54]

When authoritative sources disagreed during the anthrax attacks, this led to confusing, mixed messages.[55] Disagreements among experts may emerge when limited authority, data, and resources are available to assess risks, when coverage fails to disclose the uncertainties and limitations of risk assessments, and when news coverage does not examine stakeholder interests and concerns.[56] The perceived or actual disagreements erode public trust, leading to the belief that risks are continually underestimated, ignored, or covered up. [57]

When journalists cannot access authoritative sources, they turn to off-record or otherwise unnamed sources. In an Oct. 25, 2001 NPR interview, bioweapons policy consultant Matthew Meselson remarked, "A political person, or even an outside expert who isn't authorized and fully knowledgeable and fully in contact, may not know exactly what's right. A lot of things have been attributed to unnamed sources, which is certainly the worst thing of all, 'unnamed government sources.'"

When official advice is too vague, it can increase outrage, even if it is intended to reassure anxious individuals. Although many officials tried to balance uncertainty and reassurance during the anthrax attacks, these messages ultimately sowed chaos and confusion.[58] Journalists sometimes interpreted experts' hedging language as evidence of stonewalling or incompetence, rather than a portrayal of the uncertain nature of the situation, and then looked for sources who would speak with less caution.[59] When stories advise the public to ignore scare-mongering statements, they may imply that those in charge are spreading hysterical lies and deliberate distortions, which can lead to polarization, confusion, and the perception that the hazard is unpredictable and uncontrollable.[60]

Confusing incidents, such as hoaxes and false alarms, may trigger outrage responses to a threat. During the anthrax attacks, the unfamiliar crisis raised daily questions that health experts could not answer quickly or that they did not know how to address. While some interview sources were unwilling to say "I don't know" when facts were unavailable, others released information before key facts were known. Conflicting information heightened journalists' concern that there was more to the story that the public needed to know.[61]

Within the first month of the attacks, media coverage depicted top officials as bumblers who failed to move aggressively against anthrax-tainted mail while offering shifting explanations of the danger.[62] When the FBI and CIA were stumped, they second-guessed earlier statements. For example, federal officials initially declared that the anthrax incidents were not acts of terrorism, then linked them to 9/11, and finally concluded that they were probably domestic terrorism unrelated to 9/11.[63]

1.3. *Comparability factors*

As an antidote for outrage, news coverage can help audiences compare or weigh risks.[64] To understand a risk message, audiences must consider tradeoffs among different risks or weigh costs and benefits.[65] To promote comparability, media accounts must promote rational understanding of an unfamiliar hazard. Journalists are faced with the challenge of alarming the public when appropriate, without causing audiences to ignore alarms when danger is still present.[66]

News coverage that promotes comparability provides understanding of risk comparisons, gradients of risk, or how much it costs to reduce a risk. Risk comparisons include estimated deaths or injuries/illnesses across time, time between exposure to a hazard and its effects, links between exposure to a hazard and various health impacts, and ways that citizens can control exposure to a hazard.[67] Elucidating explanations promote comparability by defining or clarifying a confusing risk concept or listing its essential features.[68] Risk-reducing statements also can reduce uncertainty by explaining why health effects are unlikely, how contamination is prevented, how anthrax infections can be treated, or how risks are reduced through preventive measures.[69]

Most anthrax coverage failed to report on antidotes, vaccines, as well as the fact that anthrax is not contagious and that the spores are inactivated by ultraviolet light or direct moisture. Even when they did report on antidotes, journalists on deadline sometimes had no opportunity to question possible special interest involvement. The media indirectly promoted the widespread use of Cipro-brand antibiotic for treating anthrax infection, even though less-expensive generic versions of the same antibiotic were just as effective.[70] For example, early in the crisis Tom Brokaw closed the

NBC Nightly News with the remark, "In Cipro we trust." [71]

The present study is based on the supposition that news coverage of anthrax provoked outrage and uncertainty but also provided explanations to help citizens frame the risks rationally and put them into context. Three research questions were used to guide an examination of the uncertainty and comparability factors used in this coverage, as well as the interrelationships among them:

1） Which uncertainty and comparability factors characterized the anthrax coverage?
2） Which media channels promoted comparability and uncertainty factors to a greater extent?
3） How did the relationships among these factors highlight strengths and weaknesses of the coverage?

2. Method

This content analysis examined 833 stories from major U.S. newspapers, as well as the Associated Press newswire and transcripts from National Public Radio and four U.S. television news networks (ABC, CBS, CNN, NBC). Within the sample, 457 (55%) of the stories came from 272 newspapers, 93 (11%) from AP, 168 (20%) from NPR, and 114 (14%) from TV networks.

The time frame was Oct. 1-Dec. 31, 2001. The first anthrax report appeared on Oct. 4, when a Boca Raton photo editor lapsed into unconsciousness from exposure to anthrax spores. By mid-October, anthrax-laced letters had been sent to members of the national media and Congress, and by Nov. 1, five people had died of anthrax infection and 12 others had been infected. The anthrax crisis began to slowly wind down by December. Mebane and colleagues identified the anthrax crisis period as Oct. 4-Dec. 3, 2001.[72] The analysis extended through the end of December, so that the overall pattern and eventual decline in coverage could be evaluated.

The unit of analysis was an individual story, defined as a news story or opinion article in the Lexis-Nexis Academic Universe database mentioning "anthrax" in the headline or lead. Lexis-Nexis searches rendered 5,389 news stories that fit these inclusion criteria. The final sample represented one in every 7th article in the universe. Story corrections, abstracts, letters to the editor, non-U.S. publications, obituaries, reprints, sports stories, and digests/round-up summaries were excluded, as well as stories less than 150 words and material originating from another publication. In order to evaluate search terms and categorization schemes, 20 stories were randomly downloaded and analyzed by three coders. The results of this pilot test were used to further refine the original coding instrument. After categories were tested and coders were trained to reduce intercoder bias, five coders then independently coded the final sample of 833 stories. Using Cohen's kappa, intercoder reliability was 0.88.

Uncertainty factors included outrage rhetoric, speculation, conflicting reports, off-record attribution, vague advice, and confusing incidents. Outrage rhetoric included mentions of terrorism/bioterrorism, contagion, fear, scares, panic, or anxiety. Types of speculation included food or water contamination, anthrax spraying by crop dusters or aerosol containers, economic consequences, a 9-11 link, or possible perpetrators; coders could select any number of these categories. An article contained conflicting reports if it specifically mentioned conflicting reports; coders did not evaluate whether statements within a story were conflicting. Off-record attribution was coded for sources that were not identified by name. Vague advice merely recommended that audience members not panic. Confusing incidents included suspected but unconfirmed anthrax incidents, deliberate hoaxes, false alarms, scares or negative test results, mysterious pathways of exposure, and media organizations receiving suspicious letters.

Comparability factors, which may have assisted citizens in assessing their risk of anthrax exposure, included risk explanations, specific advice, antidotes, process explanations, definitions of key terms, and descriptions of transmission vectors. Risk explanations included estimates of citizens' general risk of anthrax exposure, estimates of citizens' risk of exposure from handling personal mail, and risk comparisons. Risk comparison was selected if a story defined or explained how one risk compared with another or if it discussed tradeoffs. A story contained specific advice if it mentioned a particular tip for avoiding anthrax exposure. Stories were coded according to whether they mentioned vaccines as preventives or antibiotics as antidotes to

anthrax infection. Process explanations included dormancy of spores, anthrax testing methods, strategies for identifying a perpetrator strain of anthrax, latency/incubation of spores, and preparedness. Definitions of key terms included basic explanations of anthrax, weaponization, and basic infection types (inhalation and cutaneous). Transmission vectors were natural sources (streams, dirt, etc.), postal mail, equipment or other items with residue, and air currents.

Several limitations should be considered when interpreting the findings. The results reflect the subjective views of five raters. Stories were drawn from an online database, rather than from a random sample of all coverage of the attacks, which reduces generalizability of the results. It was assumed that stories in the database would not be qualitatively different from stories not in the database.

3. Results

Coverage peaked during the second week of the crisis, but the amount of coverage remained intense for nearly a month after the initial story (Figure 1). Although a third of newspaper stories appeared on the front page, most page-one stories did not appear until a month after the initial anthrax infection was reported. Overall coverage peaked dramatically Oct. 15-22, when Dan Rather's assistant became infected, various media outlets began receiving powdery letters, Sen. Tom Daschle's staff member opened a tainted envelope, and spores were discovered in the building where mail is processed for legislators (Figure 1).

Stories containing uncertainty factors, which accounted for 98% of the coverage, included material that could promote irrational risk decisions among audiences through outrage, confusion, panic, or lack of media credibility through sensationalism or off-record attribution. Stories containing outrage rhetoric accounted for 77% of the coverage. Among all stories, 64% mentioned terrorism or bioterrorism, 42% mentioned fear/panic and 17% mentioned contagion. Stories containing outrage rhetoric frequently offered both vague advice and specific advice, and these stories were more likely to speculate about economic impact and mention anthrax definitions and media organizations receiving suspicious letters. NPR was more likely than other media to include outrage rhetoric in its coverage, and broadcast outlets were more likely than print media to mention contagion (Table 1). Stories mentioning terrorism also frequently mentioned contagion, fear, and speculation, including conjecture

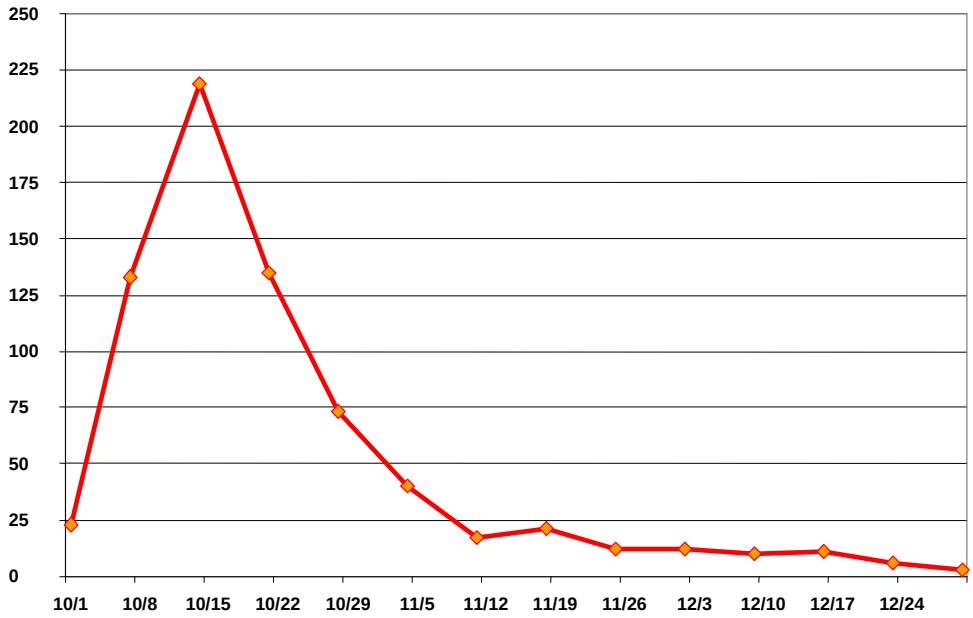

Figure 1: Anthrax news coverage, Oct. 1-Dec. 4, 2001.

about crop dusters, suspects, or a 9-11 link. These stories also frequently mentioned explanations about weaponization, exposure risk, and anthrax testing (Table 2).

These stories were more likely to include vague advice than specific advice, and they were more likely to address inhalation than cutaneous infection.

Table 1: Significant differences in coverage, by media type

	Relative amount of media coverage	**Significance** ***(X^2, df)***
UNCERTAINTY		
Outrage	NPR > Papers > TV > AP	28.26 (6)**
Fear/panic/scares	NPR > TV > Papers > AP	28.10 (3)**
Contagion	NPR > TV > Papers > AP	49.62 (3)**
Speculation		
9-11 link	Papers > TV > AP > NPR	42.70 (3)**
Crop dusters	Papers > TV > AP > NPR	13.25 (3)**
Suspects	NPR > TV > Papers > AP	13.47 (3)**
Conflicting reports	NPR > TV > Papers > AP	21.89 (3)**
Confusing incidents		
Hoaxes, false alarms	Papers > TV > AP > NPR	14.81 (6)*
Media receiving letters	NPR > TV > AP > Papers	13.90 (3)**
COMPARABILITY		
Risk explanations	NPR > TV > AP > Papers	53.17 (12)**
General risk	NPR > TV > AP > Papers	14.38 (3)**
Mail-handling risk	AP > TV > NPR > Papers	18.57 (3)**
Risk comparisons	Papers > TV > NPR > AP	17.58 (3)**
Antidotes/preventives		
Vaccine	NPR > AP > Papers > TV	18.05 (6)**
Definitions	AP > TV > NPR > Papers	49.84 (21)**
Anthrax	AP > NPR > TV > Papers	23.80 (12)*
Weaponization	TV > NPR > Papers > AP	18.55 (3)**
Cutaneous infection	TV > Papers > NPR > AP	8.17 (3)*
Transmission vectors	TV > AP > Papers > NPR	34.56 (15)**
Postal mail	TV > AP > Papers > NPR	7.84 (3)*
Equipment residue	AP > TV > Papers > NPR	46.06 (3)**

** = p<.01; * = p<.05; n = 833

Broadcast media were more likely to mention fear than print media. Stories that mentioned fear also frequently included mentions of contagion, methods for identifying perpetrator strains, media organizations receiving suspicious letters, and transmission vectors including mail and equipment residue. These stories often included both vague advice and specific advice. Coverage of contagion often appeared in concert with speculation about crop dusters and aerosol dispersion, explanations about incubation and anthrax dissemination via natural sources, air currents, and mail, as well as definitions of anthrax and weaponization.

Speculation, mentioned in half the coverage, discussed various "what ifs": suspects (26% of all stories), economic consequences (5%), crop dusters (4%), food/water contamination (3%), and aerosol dispersion of anthrax (2%). Speculation frequently accompanied coverage of risk comparisons, as well as explanations about dormancy and incubation of spores, bioterrorism preparedness, vaccines, and equipment residue. However, these speculation stories also were more likely to offer vague advice than specific advice and often speculated about more than one issue. Stories that speculated about a 9-11 link were more likely to

mention crop dusters, food/water contamination, and suspects, while stories mentioning food or water contamination were more likely to mention crop dusters and aerosol dispersion. Newspapers were the most likely to speculate about a possible 9-11 link or crop dusters, while broadcast media speculated about suspects more often than print media.

Table 2: Uncertainty and comparability factors in anthrax coverage

UNCERTAINTY	820 (98.4 %)	**COMPARABILITY**	833 (100.0 %)
Outrage:	645 (77.4 %)	*Risk explanations:*	427 (51.3 %)
Fear/panic	349 (41.9 %)	General risk	393 (47.2 %)
Contagion	143 (17.2 %)	Mail risk	279 (33.5 %)
Terrorism	530 (63.6 %)	Risk comparisons	63 (7.6 %)
		Specific advice	137 (16.4 %)
Vague advice	46 (5.5 %)	*Antidotes/preventives:*	428 (51.4 %)
		Antibiotics	418 (49.5 %)
Speculation:	425 (51.0 %)	Vaccinations	32 (3.8 %)
9/11 link	265 (31.8 %)	*Process explanations:*	115 (13.8 %)
Food/water contamination	23 (2.8 %)	Dormancy of spores	18 (2.2 %)
Economic consequences	38 (4.6 %)	Anthrax testing	70 (8.4 %)
Crop dusters	31 (3.7 %)	Perpetrator strain ID	23 (2.8 %)
Aerosol dispersion	13 (1.6 %)	Latency / incubation	23 (2.8 %)
Suspects	213 (25.6 %)	Preparedness	18 (2.2 %)
		Definitions:	687 (82.5 %)
Conflicting reports	106 (12.7 %)	Anthrax	677 (81.3 %)
		Weaponization	118 (14.2 %)
Off-record attribution	310 (37.2 %)	Cutaneous infection	238 (28.6 %)
		Inhalation infection	367 (44.1 %)
Confusing incidents:	510 (61.2 %)	*Transmission vectors:*	660 (79.2 %)
Hoaxes, false alarms	391 (46.9 %)	Postal mail	548 (65.8 %)
Media receiving letters	177 (21.2 %)	Natural anthrax sources	91 (10.9 %)
Mysterious infections	122 (14.6 %)	Postal equipment residue	201 (24.1 %)
		Air currents	109 (13.1 %)

** = p<.01; * = p<.05; percentages out of total stories (n = 833)

Vague advice, which merely recommended that people not panic, appeared in nearly 6% of the coverage. Stories containing vague advice also frequently mentioned specific advice, contagion, risk comparisons, and transmission vectors.

Stories that included conflicting reports, 13% of the coverage, often mentioned fear, speculation about a 9-11 link, food/water contamination and aerosol dispersion, mysterious infections, media organizations receiving suspicious letters, risk comparisons, and transmission vectors including air currents. These stories also were likely to include process explanations, including dormancy and incubation of spores, weaponization, techniques for identifying perpetrator strains, bioterrorism preparedness, anthrax vaccines, and analysis procedures. Process explanation stories were more likely to report anthrax infections through inhalation, a more serious infection route than skin contact.

Broadcast media were more likely than print media to present conflicting reports. Stories containing off-record attribution frequently included speculation, conflicting reports, a 9/11 link, risk comparisons, methods for identifying perpetrator strains, and anthrax dissemination via air currents. However, stories that used traditional attribution were more likely to include uncertainty factors, including outrage rhetoric, conflicting reports, and confusing incidents. Stories with conventional attribution were more likely than those citing off-record sources to promote overall

comparability, mention transmission vectors, and offer specific advice (Table 3).

Table 3: Attribution patterns

	On-record attribution	***Significance* (X^2, *df*)**	**Off-record attribution**	***Significance* (X^2, *df*)**
UNCERTAINTY	512 (61.5 %)	20.27 (10)*	308 (37.0 %)	
Outrage	401 (48.1 %)	9.92 (2)**	244 (29.3 %)	
Speculation	257 (30.9 %)		168 (20.2 %)	16.32 (6)**
Conflicting reports	56 (6.7 %)	13.45 (2)**	50 (6.0 %)	5.15 (1) *
Vague advice	35 (4.2 %)		11 (1.3 %)	
Confusing incidents	286 (34.3 %)	9.71 (4)*	224 (26.9 %)	
COMPARABILITY	523 (62.8 %)	39.33 (12)**	310 (37.2 %)	
Risk explanations	277 (33.3 %)		150 (18.0 %)	
Specific advice	83 (10.0 %)	3.61 (1)*	54 (6.5 %)	
Antidotes/preventives	249 (29.9 %)		179 (21.5 %)	
Process explanations	66 (7.9 %)		49 (5.9 %)	
Definitions	414 (49.7 %)	49.08 (14)**	273 (32.8 %)	24.32 (7) **
Transmission vectors	390 (46.8 %)	34.57 (5) **	270 (32.4 %)	
Total sample	523 (62.8 %)		310 (37.2 %)	

** = p<.01; * = p<.05; n = 833

Most stories, about 61%, mentioned an unconfirmed anthrax incident, hoax, false alarm, negative test result, mysterious pathway of exposure, or a media organization receiving suspicious letters. Nearly half of all stories mentioned hoaxes or false alarms, 21% mentioned media organizations receiving suspicious letters, and 13% of stories stated that the source of anthrax was mysterious. Stories mentioning a confusing incident often included uncertainty factors: fear, conflicting reports, and speculation including a 9/11 link and aerosol dispersion.

Comparability factors associated with this coverage included risk comparisons, antidotes/preventives, anthrax testing, methods for identifying perpetrator strains, preparedness, and cutaneous infection. Stories covering confusing incidents such as false alarms were likely to mention anthrax transmission vectors, including dissemination via mail and office equipment. Broadcast media were more likely than print media to devote attention to journalists receiving suspicious letters. Only 7% of stories that mentioned media organizations receiving suspicious letters discussed suspects. Stories that mentioned hoaxes or false alarms were more likely to mention fear, speculation about aerosol dispersion of spores, process explanations, transmission vectors, mysterious infections, and anthrax testing. Newspapers were more likely than other media to cover hoaxes and false alarms, while NPR offered the least amount of this coverage (Table 1).

Comparability factors, which appeared in all coverage, included explanations to help audiences understand a hazard and put it into context. Elucidating explanations included descriptions of relative risk, antidotes/preventives, and processes, as well as transmission vectors, specific advice, and definitions of key terms. Coverage did not begin to emphasize that anthrax was a threat to citizens until the third week of the crisis; afterward the risk was framed as moderate to serious. Nearly half of stories mentioned that an average person is at general risk of anthrax exposure, and half of the general risk coverage appeared in the first three weeks of the crisis. More than a third of coverage mentioned that an average person is at risk of exposure from handling personal mail, and 43% of this coverage appeared in the first three weeks of the crisis. Three-fourths of stories stating that citizens were at no risk of exposure appeared in the first three weeks of the scare.

Among the stories mentioning that citizens were at risk, more than half addressed both general risk and the

specific risk of handling postal mail. NPR was the most likely channel to provide a variety of risk explanations and to mention that an average person is personally at risk of anthrax exposure from handling mail. Television also covered mail risk frequently, but wire stories and newspapers were least likely to mention this risk. However, the general risk of handling mail was mentioned most often in the AP wire stories, followed by TV, NPR, and newspapers. Only 5% of stories included a risk comparison. However, these stories were twice as likely to mention terrorism and fear as transmission vectors. Newspaper stories were more likely than broadcast stories to include risk comparison. Stories containing risk comparisons were more likely to speculate about aerosol dispersion, food/water contamination, and economic consequences, mention mysterious infections, media organizations receiving suspicious letters, vaccines, and process explanations about spore dormancy, anthrax testing, perpetrator strains, and preparedness (Table 1). Stories containing risk comparisons were more likely to mention infection by inhalation than skin contact.

Process explanations appeared in 14% of the coverage. These stories were more likely to mention speculation about food/water contamination and aerosol dispersion, risk explanations, antidotes/preventives, transmission vectors including air currents, natural sources and definitions including anthrax definitions. About 16% of stories contained specific advice. For example, an Oct. 25 NPR story reported that "people need to be vigilant. If they receive a package or an envelope that looks suspicious, they should not open it. Set it down, wash yourself off, and call law enforcement officials." Stories containing specific advice also often mentioned vague advice, in addition to speculation about suspects and crop dusters, key definitions, and transmission vectors. Stories that mentioned anthrax infection antidotes/preventives accounted for 51% of the coverage. These stories often mentioned confusing incidents, and definitions including anthrax definitions. These stories also were more likely to mention incubation and dormancy of spores, and anthrax testing. Stories mentioning antibiotics were somewhat more likely to mention infection from skin contact than inhalation. A fourth of all stories specifically mentioned Cipro-brand antibiotic. NPR was more likely than print media or television to mention vaccines.

Definitions of key terms appeared in 83% of the coverage. Three-fourths of stories defined anthrax. AP defined anthrax more often than broadcast media or newspapers, while the broadcast media defined weaponization more often than print media. TV mentioned cutaneous anthrax more often than any other medium. Among newspapers, 44% of stories mentioned inhalation infection, while 28% mentioned skin infection. Stories containing key definitions were more likely to contain specific advice. They more frequently included off-record attribution and mentioned speculation about aerosol dispersion and suspects, mysterious infections, antibiotics, perpetrator strains, and media organizations receiving suspicious letters (Table 3).

Stories that mentioned transmission vectors accounted for 79% of the coverage; 66% of these stories mentioned mail as a vector, 24% mentioned equipment residue, 13% mentioned air currents, and 11% mentioned a natural source. These stories often contained confusing incidents, conflicting reports, and speculation about food/water contamination, aerosol dispersion, and crop dusters. These stories were more likely to include definitions and risk explanations including risk comparisons. TV mentioned these vectors more often than print media; TV was also the most likely to mention mail as a vector. AP mentioned equipment residue as a vector more often than TV, and NPR was the least likely to mention transmission vectors in its coverage (Table 1).

4. Conclusions

The variables that comprised the uncertainty and comparability factors were statistically clustered, and linkages among the factors revealed complex patterns of reporting; overall anthrax reporting was both scary and beneficial. Much of the anthrax coverage was characterized by outrage rhetoric, speculation, and confusing incidents, which ultimately framed the attacks as an involuntary hazard controlled by others – a perception that often leads to public outrage and irrational risk decisions. However, overall coverage also promoted comparability, primarily through definitions and explanations about risk, transmission vectors, and antidotes/preventives. Risk comparisons, specific advice, and process explanations were sparse – key weaknesses in the coverage.

Much of the outrage rhetoric in the coverage was characterized by references to terrorism and fear. Outrage coverage was particularly linked to worries about the economic impact of the attacks. However, many stories that contained coverage that could spark outrage also contained explanatory information. Official advice was relatively rare, but stories offering vague advice were more common than those containing practical advice and were more likely to mention fear, contagion, or speculation. Stories mentioning terrorism often contained many uncertainty factors, but also were likely to explain risks and anthrax testing. Mentions of fear, as a form of outrage rhetoric, were more likely to appear in coverage of other outrage-provoking coverage including mentions of contagion, journalists receiving suspicious letters, hoaxes, and conflicting reports. However, fear content also was more likely to appear alongside practical advice and explanations of transmission vectors. Similarly, stories that mentioned contagion were more likely to discuss both known and hypothetical routes of anthrax dissemination.

Stories that speculated about "what if" scenarios were more likely than not to include risk comparisons and explanations about processes, transmission, and prevention. Conflicting reports commonly accompanied scary rhetoric and scenarios, including coverage of hoaxes, but they also were more likely than not to include explanations and risk comparisons. Off-record attribution was strongly linked to overall uncertainty (Table 3). Stories that covered confusing incidents such as hoaxes were more likely than not to promote uncertainty by mentioning fear, speculation, and conflicting reports, but they frequently included comparability factors as well, including risk comparisons and process explanations.

Stories that reported hoaxes and false alarms promoted high outrage but often did include explanatory content about processes and transmission vectors. The shift in news coverage from an emphasis on outrage rhetoric to more balanced explanations of risk, coincided with increasing public knowledge about anthrax. The chaos of conflicting information about anthrax subsided after the first few weeks, and once audiences learned more about anthrax from different media, the fearful news content gradually subsided.

Uncertainty factors were mentioned twice as often during the crisis phase of the coverage than during the outbreak phase, and eight times more often during the crisis phase than during the post-crisis phase. Similarly, explanatory content was mentioned nine times more often during the crisis phase than during the post-crisis phase and nearly three times as often during the crisis phase than during the outbreak phase. Anthrax stories included outrage rhetoric, speculation, conflicting reports, vague advice, or coverage of confusing incidents 33 percent more often than they included explanatory content.

Future research could examine news coverage of speculation, conflicting reports, and confusing incidents during a disaster, to determine whether there is a causal relationship between this coverage and actual outrage among audience members. A study also might identify risk comparisons that effectively promote rational risk decisions in disasters, particularly when a risk is perceived as more threatening than everyday, comparable risks because of public dread and catastrophic potential.

The findings highlight the need for journalists to build greater trust with the official and independent authorities they may need to interview in the midst of a high-threat crisis. When officials suppress information, the balance between over- and under-estimating threats suffers. In light of the outrage sparked by media coverage of the anthrax attacks, this study also highlights the necessity for journalists to provide context when discussing uncertainties and speculation, provide elucidating risk explanations, offer practical advice, and clarify contradictions. Improved risk coverage of similar crises could strive to connect daily events to larger issues, emphasize facts over drama, and avoid amplifying or ignoring risks. Pre-event coverage about bioterrorism preparedness could help audiences anticipate what they might encounter in different scenarios and ways to avoid exposure. These stories also might explain unfamiliar concepts, explore tradeoffs needed to reduce the threat, and address common misconceptions and speculation.

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