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Hazard and Outrage: Developing a Psychometric Instrument in the Aftermath of Katrina

Kenneth A. Lachlan & Patric R. Spence

This article details the development of a psychometric instrument measuring the constructs of hazard and outrage in the aftermath of Hurricane Katrina. The study focused on the interplay of perceived hazard and outrage in relation to evacuation from the New Orleans area, with specific attention to demographic differences. Perceptions of hazard and outrage during Katrina served to illustrate the utility of the scale in examining these responses across different demographic groups. Possible ways that this information can be used to design messages that alert audiences to hazards, yet successfully address the need for outrage, emerged from the study.

Keywords: Hurricane Katrina; Risk; Crisis; Hazard; Outrage

Statement of the Problem and Related Scholarship

On August 29, 2005, Hurricane Katrina hit the Gulf Coast. The center of the storm landed about 35 miles from New Orleans, and proved to be what some have characterized as one of the greatest natural disasters in United States history. Most of the damage occurred in New Orleans and was a result of the failure of the city's levee system (Adams, 2005). However, Katrina went on to cause damage and a great deal of personal tragedy in other parts of the Gulf Coast. Between 374,000 and 400,000 Hurricane Katrina refugees were evacuated to shelters, hotels, homes, and other housing in 34 states (as of September 12). The number dead was over 1000 (Kearney, 2006), and the recovery cost to date projected by the U.S. government was $87 billion as of February, 2006 (Bazinet, 2006).

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The events surrounding Hurricane Katrina taught communication practitioners several important lessons. Possibly the most important is the value of effective risk communication messages in the days leading up to a natural disaster. Perhaps partly, if not largely, a consequence of ineffective pre-crisis messages, thousands of people in the New Orleans metropolitan area failed to evacuate the city in a timely manner.

Information during a major hurricane or similar natural event should address both the nature of the threat and the degree of risk involved. Peter Sandman (2003; Sandman, Weinstein, & Hallman, 1998) suggests that communication in such a circumstance has two facets: "scaring people" and "calming people down." Stated differently, messages should both alert and reassure people. Sandman suggests that responsible communicators ideally should attempt to create a level of outrage that is appropriate to the level of hazard. In creating risk messages, both hazard and outrage need to be addressed. If the public is outraged because it does not understand the hazard, then it needs to be educated. If it does understand the hazard, eliciting an appropriate level of outrage should be the objective. In a crisis situation, however, there is often little time to refine messages. Therefore, both hazard and outrage must be addressed.

According to Sandman (2003), hazard is the technical assessment of a risk, whereas outrage is the cultural assessment. The correlation between the hazard (e.g., how many people are killed or injured by a given risk) and the outrage (how many people are upset or concerned about the given risk) is often low. Both hazard and outrage fall along a high/low continuum. If hazard is high, then the likelihood of risk is high, as is the threat. If hazard is low, then the likelihood of being harmed risk is low, and the threat is not serious. Outrage relates to the cultural seriousness of a risk (Sandman, Weinstein, & Hallman, 1998; Sandman, Weinstein, & Klotz, 1987). We conceive of it more specifically in terms of how people react to the risk information they receive; outrage is, therefore, a state that is specific and non-routine. It can include both specific actions taken and emotional factors such as need for control, trust, and responsiveness. When outrage is high, people can be motivated to act, whereas when it is low, individuals may experience decreased motivation. It is also possible that risk messages can be too high in hazard and, thereby, induce fear or outrage responses that instigate various forms of antisocial behavior (e.g., rioting or looting).

As a model, the Sandman (1998, 2003) formulation, Risk = Hazard + Outrage, differs from previous audience-based crisis communication models, such as the CERC model (Reynolds & Seeger, 1995), the public opinion model (Sturges, 1994), and situational crisis communication theory (Coombs & Holladay, 2002), which have focused primarily on fear. The Sandman model encompasses both cognitive and affective responses to risks. Other models also rest on the assumption that any manipulation of emotion regarding a negative or potentially harmful event can qualify as fear (Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996; Higbee, 1969). Because the Risk = Hazard + Outrage model relies on perceptions of hazard that include not only fear but also alarm, perceptions of magnitude, and probability, it allows for the examination of multi-faceted responses. The inclusion of outrage further allows for the consideration of both emotional and behavioral responses,

which may provide more information for evaluating message effectiveness. Finally, the model permits the specification of cultural and demographic audience characteristics that influence these responses and can inform the tailoring of specific crisis messages for specific audiences.

Four potential scenarios exist within the framework of the model. First, it is possible that risks exist that may potentially harm people but fail to upset very many. This we refer to as the "high hazard/low outrage" scenario. An example is avoiding taking measures to protect oneself from sexually transmitted diseases. The hazard is high because there is a clear risk for a sexually active person of contracting a sexually transmitted disease through unprotected sex; however, many people perceive the risk as remote and avoid taking preventative steps (Becker & Janz, 1987).

Second, there are potential risks that upset people despite the fact that the likelihood of harm is minimal. This may lead those affected to take unnecessary precautions. This represents a "low hazard/high outrage" scenario. Consider, for example, airline safety shortly after 9/11. At this time, airlines were safer from a terrorist attack than ever before (National Commission on Terrorist Attacks upon the United States, 2004). However, given the events of 9/11, there was a widespread perception that the airlines were unsafe. A hypothetical example of this scenario is a mother in Iowa who keeps her child home from school as a result of a bombing in Washington DC. The hazard for the child in Iowa is low, but the mother experiences a high level of outrage and, in the process, takes an unnecessary precaution. In this instance, outrage has overshadowed hazard and provoked behavior. Ideally, risk messages should induce enough fear that the audience will take the desirable, if not essential, action but not induce so much fear that it lead to panic or the avoidance of low-risk actions. When a hazard is not great, it must be addressed with the goal of reducing inappropriately high outrage. Low hazard/high outrage events can be extremely harmful, in that they have the potential to drain time and resources from other more immediate risks and concerns.

Third, risks may actually be serious, or high in potential harm, and, thereby, create outrage among those at risk. We characterize this situation as the "high hazard/high outrage" scenario. Although a strong outrage response to a highly threatening situation may seem to be warranted, this type of reaction can be problematic. Ideally, if the risk is high and people act, harmful consequences can be avoided. Consider, for instance, a tornado. Often, when a tornado warning is issued, people take precautions. In some extreme instances, however, outrage can extend beyond the optimum level for inducing desirable behavior and become a socially negative source of influence. If people feel that materialization of a risk is likely and they cannot do anything to protect themselves, they may behave in counter-productive ways.

Finally, there is the "low hazard/low outrage" scenario. In this situation, a risk has little chance of causing harm and requires no special actions. Poliomyelitis in the United States is presently a low hazard/low outrage risk. There has not been a case since 1979 (Centers for Disease Control and Prevention, 1994), and, if needed, vaccinations are readily available. Thus, given the fairly benign nature of the threat, hazard and outrage remain low.

To be effective, risk messages must not only be appropriate to the operative scenario, but must also satisfy the affected public's need for control. The messages need to make clear the steps that individuals can take to reduce their susceptibility to risk. Past research has examined responses similar to outrage under the heading of "personal efficacy" (Chu, 1966; Rogers & Mewborn, 1976; Witte, 1992) and revealed that an individual receiving risk messages needs to be convinced that acting in accordance with their recommendations will prevent a threat from materializing or reduce its impact in the event that it does. Additionally, the message recipient must believe that he/she can perform the recommended action successfully for the message to be effective (Bandura, 1997).

It is possible for a message that highlights the public's vulnerability to a risk to create high levels of fear, reduce an individual's ability to interpret the situation (Aspinwall, 1999), and potentially lead the person to perceive the situation as hopeless. The belief that an event is uncontrollable produces not only a sense of helplessness, but a motivational deficit and an absence of self-efficacy (Maier & Seligman, 1976). It is possible that if a perceived hazard is too great, no outrage will occur; alternately, a negative outrage response may occur in the form of anti-social behavior. Thus, when a hazard is viewed at an appropriate level, that can have facilitating effects, but if one perceives it as too great, inhibitive effects may accrue (Janis, 1967). Such responses represent a form of psychological reactance, a state of arousal in opposition to a perceived threat or personal choice (Stewart & Martin, 1994). The corresponding negative outrage can be evident in a mild form through looting and property destruction, or in a more severe behavioral manifestation can be directed at others with an attempt to do harm. If a perceived hazard is too great, as noted above, the perception may also be manifested in inaction (Janis & Leventhal, 1968) as a consequence of extreme feelings of helplessness or loss of control.

Effective communication presumably should embody fear-inducing messages involving the appropriate measures of hazard and outrage, as well as inform affected publics of actions they can take to reduce threat. Failure to communicate risk accurately can impede the ability of individuals to make rational choices. Risk communication ideally serves as a type of uncertainty-reduction mechanism for an audience, but then aims to create an appropriate level of outrage, so as to gain and maintain the audience's attention. If the public can be made to understand that an activity involves risk and becomes appropriately outraged, it might avoid the activity in the future.

It is in events such as hurricanes, earthquakes, and other natural and human-induced disasters that the concerns of crisis communication and risk communication intersect and, in the process, make perceptions of hazard and outrage more salient. The role of risk communication is to provide information to interested parties concerning the nature, significance, probability, and possible prevention of a risk (Coombs, 1999; Seeger, Sellnow, & Ulmer, 2003). Such communication should occur before a harmful event arises. This is distinct from crisis communication, which often comes into play after a largely anticipated, major, and potentially destructive event has surfaced. As communication under such conditions aims at preventing or

lessening the negative outcomes resulting from a crisis, it often serves an informative function. Crisis messages encourage the receiver to take some type of tangible action to avoid a possible threat or harmful effect, and to develop a rational understanding of the risk. The ideal crisis message makes clear the current state of the crisis and what actions one is well advised to take. Another way to think about the difference is that risk communication focuses on what could happen, whereas crisis communication is event-centered (Seeger et al., 2003).

The two types of message also vary in scope. Risk communication involves dangers in activity of a personal nature, such as harmful physical activity, making unhealthy food choices, using drugs, and driving under the influence. It also encourages individuals to avoid these sorts of dangers (Harrington, 1995). Crisis communication, on the other hand, aims at providing information to a community or a geographic region for dealing with particular kinds of events, such as hurricanes, floods, forest fires, and epidemics. Historically, it was often part of public relations operations and served largely as a form of post-crisis response. More recently, researchers have begun to view crisis communication as encompassing messages in pre-crisis and crisis stages and serving functions beyond management. Viewed as a continual process, rather than merely a form of post-crisis response (Coombs, 1999), crisis communication and risk communication are no longer as distinct. The crisis practitioner must pursue matters relating to both hazard and outrage before and during an event to minimize harm and allow the largest possible audience to use pertinent messages to advantage.

Although most crises have a warning period, some, such as many natural disasters, are more obvious and easier to comprehend. The warning period may vary from minutes to days. In some cases, such as tornadoes or hurricanes, the risk is seasonal and, hence, more predictable. In other instances, a crisis can surface without prior expectations, as in the case of Three-Mile Island and 9/11. In the warning stages of a crisis, the affected public needs a set of instructions concerning how to manage the crisis at a personal level. They will then probably have a better understanding of the urgency of the threat (if the hazard is correctly assessed) and will be able to take the appropriate action.

Whether or not messages are received and acted on as intended depends on interpretations of the hazard and the outrage of the targets. Research has revealed that the departure point for thinking about a response is the moment the threat is perceived as viable. If the public does not believe that the hazard is genuine, it is not likely to take protective action (Helsloot & Ruitenberg, 2004; Perry, 1985, Sandman, Miller, Johnson, & Weinstein, 1993).

A substantial body of research has examined how individuals perceive risks and make decisions regarding risks (see Boster & Mongeau, 1984; Douglas, 1985; Sutton, 1982). Far less research has considered how to communicate risks, with the goal of motivating individuals to make appropriate adaptations based on a proper understanding of the seriousness of a risk. However, the extended parallel process model (EPPM) has contributed to strides in this direction (Witte & Allen, 2000; Witte & Morrison, 1995). The EPPM posits that fear interacts with other variables to affect

behavior with respect to perceived threats and response efficacy (Leventhal, 1970). Sandman's (2003) Risk = Hazard + Outrage model builds on this research in considering not only response efficacy, but also the negative actions that recipients might take as a result of the risk messages, as well as the possibility of inaction. Previous research concerning fear has been largely experimental. The study reported here had as its aim the development of an instrument for assessing messages inducing hazard and outrage in the context of actual crises.

No two crisis events are the same; however, information acquired from previous crises may still be of help in the effective creation and dissemination of information to the public. Although Sandman's (1998, 2003) model of risk, hazard, and outrage provides a useful heuristic tool for understanding message design and effectiveness, previous research drawing on it has been predicated on the assumption that these factors are operative in related responses to crisis-related messages and, hence, has failed to develop empirically sound measures (see, for instance, Covello & Sandman, 2001; Sandman, Miller, Johnson, & Weinstein, 1993). As a result, a goal of the current study was to develop a psychometric instrument for assessing the constructs of hazard and outrage. A measure that validly and reliably captures both cognitive and psychological responses to crisis messages, we felt, could prove useful to both practitioners and scholars for crafting messages and ultimately ascertaining which of their characteristics are most responsible for eliciting the desired responses.

Method

Participants and Measures

Our data came from Katrina refugees in the Houston Astrodome and in relief centers in Cape Cod, Massachusetts, Lansing, Michigan, and parts of Indiana and Kentucky, as well as several emergency aid centers in Texas. The questionnaires were self-administered and collected over five weeks following the initial evacuation. Of 964 surveys completed, 935 were usable.

Four items related to demographic variables: age, race (coded as African American, Caucasian, or Other), sex, and income.

Two major considerations influenced the selection of items for assessing hazard and outrage. Length was one, as there were a large number of items in the questionnaire in which issues of hazard and outrage were embedded. There is often a tradeoff between length and reliability, with larger numbers of items typically providing more reliable measures (see Nunnally & Bernstein, 1994). However, since respondent fatigue could be a factor, we opted for a relatively small set. Our aim was a measure of approximately of 15 items that would be both conceptually complete and parsimonious.

We next considered the items most appropriate for indexing hazard and outrage. Using Thorndike, Cunningham, Thorndike, and Hagen's (1991) suggestions for item selection, we identified a relatively small number of items for inclusion and worded them as specifically and unequivocally as possible. Given Sandman's (1998, 2003)

suggestion that hazard represents the technical seriousness of a crisis, relevant items concerned general worry about the storm, potential harm to self and others, seriousness of risk, and willingness to take action based on this risk. With outrage as the affective response to conditions surrounding a crisis, the items chosen pertained to the perceived appropriateness of official responses to the storm, perceptions of preparedness for the storm, perceptions of the extent to which it was taken seriously, and the perceived adequacy of information provided.

The process led to a 13-item measure, with seven tapping the construct of hazard and six tapping outrage. In completing this part of the survey, the participants responded to questions such as, "In the hours before the storm, did you think the risk was serious?" (hazard), and "Were state and local authorities taking the threat of the hurricane seriously?" (outrage). They recorded each response on a five-point scale, with options ranging from "not at all" to "very much." Five-point scales are preferable to three-point or seven-point scales in respect to respondent comprehension (Fowler, 1996; Tourangeau, Rips, & Rasinski, 2000).

Results

Exploratory Factor Analysis

Our measure was developed to assess two dimensions of response to risk communication scenarios: perceived risk and outrage at the conditions and responses to Katrina. An exploratory factor analysis, with principal components extraction, served to reveal whether the expected two- factor structure for the item set would emerge. It did, with eigen values of 4.79 for the hazard items and 2.45 for the items measuring outrage. Factor loadings for all items ranged from .46 to .81. The hazard factor (seven items) accounted for 36.9% of the total variance in the model, whereas the outrage factor accounted for 18.9%. Scale reliability analyses indicated $\alpha = .88$ for the hazard factor items and $\alpha = .80$ for the outrage factor. Both represented acceptable levels for the type of data involved (see Shevlin, Miles, Davies, & Walker, 2000). We took these data as further support for the existence of two factors relating specifically to hazard and outrage.

Confirmatory Factor Analyses

Centroid analysis. To add another level of confidence to the findings from the exploratory factor analysis, we subjected the data to a confirmatory factor analysis using a centroid solution (CFA.BAS; see Hunter & Gerbing, 1982) (see Table 1). A critical consideration at this point was establishing a minimum factor loading criterion for accepting individual items. Norman and Streiner (1994) suggest a minimal factor loading criterion calculated as 5.152/[SQRT (N − 2)]. For the current data, this yielded a minimal factor loading of .17; however, the cutoff point may have been substantively attenuated by the size of the sample. Given this consideration, we adopted Comry and Lee's (1992) more stringent recommendation of a minimum factor loading of .45 for the current analysis. This criterion is more conservative than

Table 1 Item Factor Loadings and Alpha Reliabilities in Centroid Analysis

	Factor 1	Factor 2
Hazard items		
How worried were you in the hours before the storm hit?	**.49**	.13
In the hours before the storm hit, did you think the risk was serious?	**.75**	.27
How willing were you to evacuate?	**.52**	.18
In the hours before the storm hit, did you think you would be badly affected?	**.83**	.33
In the hours before the storm hit, did you think friends or loved ones would be badly affected?	**.84**	.28
In the hours before the storm hit, did you think your life might be in danger?	**.78**	.23
In the hours before the storm hit, did you think friends or loved ones lives might be in danger?	**.82**	.24
	α = .88	
Outrage Items		
Did you feel the information provided by the media in the days leading up to the storm was appropriate?	.29	**.50**
Did you feel the government's preparation before the storm was appropriate?	.23	**.63**
Did you feel as though state and local authorities were taking the threat posed by the hurricane seriously?	.16	**.66**
Did you think that enough was being done in the hours leading up to the hurricane making landfall?	.15	**.68**
Did you receive enough information in the hours leading up to the hurricane making landfall?	.21	**.65**
Did you believe the government responded quickly enough?	.21	**.69**
	α = .81	

other benchmarks for minimal factor loadings, which typically call for a minimum loading of .30 and identify strong factor loadings as those greater than .4 (Hair, Anderson, Tatham, & Black, 1998; Merenda, 1997; Peterson, 2000).

The confirmatory factor analysis provided fairly strong support for the two-factor model. The factor loadings exceeded the acceptance criterion, in ranging from .49 to .84, with most exceeding .60. Calculations of residuals performed to obtain estimates of the error terms associated with the model showed them, in general, to be low (less than .2) and indicative of a relatively stable two-dimensional model. A test for parallelism also provided evidence of two orthogonal factors, χ^2 (6) = 11.96, $p < .06$. Finally, reliability analyses yielded coefficients (Cronbach's alpha) of .88 for the hazard factor and .81 for outrage.

Maximum likelihood analysis. We additionally subjected the data to another confirmatory factor analysis utilizing a maximum likelihood solution via AMOS 4.0 (Arbuckle, 1999). The results relating to the individual factor loadings and goodness of fit tests lent additional support to the findings in the centroid analysis. Factor loadings were generally consistent with the previous analysis (see Table 2). Goodness of fit measures for the two-factor model were also fairly supportive, TLI = .95, CFI = .96, and RMSEA = .11. While the RMSEA value was slightly above the commonly accepted criterion of less than or equal to .08 (Browne & Cudeck, 1993), others have suggested that an RMSEA figure close to .10 is indicative of adequate model fit,

Table 2 Standardized Regression Weights in ML Model

	Regression weight
Hazard Items	
How worried were you in the hours before the storm hit?	.42
In the hours before the storm hit, did you think the risk was serious?	.68
How willing were you to evacuate?	.47
In the hours before the storm hit, did you think you would be badly affected?	.87
In the hours before the storm hit, did you think friends or loved ones would be badly affected?	.91
In the hours before the storm hit, did you think your life might be in danger?	.79
In the hours before the storm hit, did you think friends' or loved ones' lives might be in danger?	.83
Outrage Items	
Did you feel the information provided by the media in the days leading up to the storm was appropriate?	.45
Did you feel the government's preparation before the storm was appropriate?	.72
Did you feel as though state and local authorities were taking the threat posed the hurricane seriously?	.58
Did you think that enough was being done in the hours leading up to the hurricane making landfall?	.70
Did you receive enough information in the hours leading up to the hurricane making landfall?	.56
Did you believe the government responded quickly enough?	.77

inasmuch as RMSEA as a test of model fit tends to be hypersensitive when evaluating CFA models and frequently leads to the erroneous rejection of valid models (Yu, 2002). Together with the Tucker-Lewis and comparative fit indices, we present it here as evidence of adequate model fit.

Descriptive Analyses

In addition to evaluating the internal consistency and reliability of the measures of hazard and outrage, we conducted descriptive analyses we believed could help to establish their utility for crisis practitioners. Despite widespread criticism of media and government responses to the storm, among the respondents, hazard ($M = 3.45$) appeared to be a more central consideration than outrage ($M = 2.38$). This makes sense in light of (1) the fact that outrage responses are more typically associated with organizational and political crises, for which blame can be attributed to a group or an individual (Fitzpatrick & Rubin, 1995; Freedy, Kilpatrick, & Resnick, 1993) and (2) the apparent inaction of many New Orleans residents. The data revealed no significant differences attributable to respondent gender for either hazard, $t\ (928) = .635$, or outrage, $t(924) = .447$. One-way ANOVA for ethnicity revealed significant difference in the case of both perceptions of hazard, $F(2, 918) = 4.77$, $p < .01$, and outrage, $F(2, 914) = 10.06$, $p < .001$. Bonferroni post-hoc tests indicated that African-Americans perceived less hazard than other non-whites, $p < .01$. African-Americans respondents ($p < .001$) and Caucasian respondents ($p < .035$) were more likely to express outrage than other non-whites.

Discussion

This project was motivated by the desire to develop an instrument for use in testing the model of crisis response proposed by Sandman (1998, 2003) and to do so under the conditions of an actual crisis. The procedures in the study provided evidence of a fairly strong, orthogonal two-factor structure capturing hazard and outrage. The emergence of this structure leads to considerations of its potential utility to scholars and crisis and risk practitioners alike in the design and assessment of message effectiveness.

Assessing Hazard and Outrage

Messages before a natural disaster (or other crisis events with prolonged triggers) must first establish that a genuine hazard exists. These messages must also address individuals' needs for specific information about the hazard (Sandman, 2003). The instrument emerging from the current study may allow crisis practitioners to assess informational needs during various types of crises. Hazard, according to Sandman, is the technical seriousness of a risk. What most people are looking for during a crisis are cues concerning how to react and what actions to take. In the natural laboratory of Hurricane Katrina, these messages took the form of storm warnings and notices to evacuate. Often, after an individual has obtained the desired information, he or she will continue to scan the media, seeking repetition of the message, additional clarification, or new information. In fact, monitoring the media is something that emergency management professionals typically recommend. FEMA, for instance, encourages the public to include battery-operated radios in emergency kits. In a study of the 9/11 attacks, affected publics watched an average of eight hours of television and reported television as a useful means for obtaining information on the day of the event (Seeger, Vennette, Ulmer, & Sellnow, 2002; Spence et al., 2006).

Such media exposure may act as a calming agent to reduce uncertainty or dissonance. By evaluating the level of hazard experienced by crisis victims, message producers may more effectively inform the public about the technical seriousness of the risk, and guage the degree to which repetition is necessary. For example, the current data suggest that perceptions of hazard during Katrina were higher among evacuees, which suggests a possible need for crisis messages to address issues of hazard with specific and repeated behavioral recommendations concerning appropriate actions.

Sensitivity to Audience Characteristics

Using the instrument developed for the assessment of hazard and outrage may also help to shed light on differences in cognitive and affective responses across subpopulations. For example, the current data suggest that African-Americans experience higher levels of outrage than other ethnic groups. Differences in outrage may be a manifestation of cultural differences and, thus, would be important for risk message design. The data are also consistent with past research in intercultural

communication suggesting that African-Americans may be more prone to extreme communicative responses (Bachman & O'Malley, 1984), less likely to obtain uncertainty reduction from interrogation (Gudykunst & Hammer, 1987), and indicate greater satisfaction in communication when another accepts or confirms their feelings (Hecht, Ribeau, & Alberts, 1989). Further, African-Americans reportedly are more likely to emphasize emotional expressiveness, such as verbalizing and expressing ideas and opinions.

Hecht et al. (1989) discuss the issue of communication authenticity, which can be characterized as directness or being genuine in communication. This suggests that those preparing messages knowingly directed at primarily African-American audiences (such as many of the citizens of New Orleans) should consider cultural differences in communication response to maximize effectiveness in the reduction of outrage. By using the instrument developed in the present study to detect differences in outrage across subpopulations (such as subpopulations defined by race, age, sex, and/or socioeconomic status), crisis practitioners may be better able to tailor messages that are effective for those most at risk.

Our measures of hazard and outrage may further allow for the pre-testing of risk messages. This could aid in the development of messages that provide the appropriate level of hazard information, with the concomitant goal of inducing the desired level of outrage. If people believe a hazard is serious while at the same time being convinced that they can take action to prevent or minimize possible harm, they should be more receptive to information concerning actions to take.

Limitations

As with any study, there are important limitations one should consider in interpreting the results. First, the data were collected over an uneven timeframe; some participants responded hours after they were evacuated, while some responded days or weeks later. This was, however, purely a result of the complex and time-consuming process of locating and interviewing hurricane evacuees. Future research evaluating hazard and outrage responses should entail concerted efforts to obtain audience responses at one time point and as quickly as possible, so as to reduce the likelihood of hindsight bias and memory-distorted responses.

Second, and more importantly, are limitations concerning the hazard and outrage items themselves. Although our items may be adapted for use in other crisis situations, in their original wording they were highly specific to Hurricane Katrina. It may be useful for those developing other instruments for measuring these responses to include items general enough to be consistent across events, but that also necessitate a minimal number changes in wording to make the measures crisis-specific. For example, a series of items in which only the name of the crisis has to be changed could be used interchangeably across different crisis scenarios. With respect to our instrument and items, all crisis and risk messages related to Katrina. Hence, generalizability of our findings to other crisis venues lacks justification. Incidentally, the lack of a random sample raises other questions concerning generalizability.

Because of the applied nature of the research context, it was not possible to assess the effects of individual messages. Future research should examine the effectiveness of specific messages in producing the needed levels of hazard and outrage to motivate respondents to engage in positive actions. This may first need to be done in an experimental setting and then tested subsequently in an actual crisis situation.

Finally, although the study had evidence of construct validity, we were unable to acquire evidence pertinent to other related concerns, such as criterion and discriminant validity in the applied setting. Future research involving the further development of this and other such assessment tools needs to be responsive to such matters. As it stands, the construct validity, internal consistency, and reliability data pertaining to our measures of hazard and outrage, while important, are still only preliminary indicators and not sufficient to be confident of the value of the instrument we have described.

Conclusion

Our hope is that these results and the lessons learned from the present study may inform future risk communication and disaster response. Risk, hazard, and outrage are common concepts in crisis and risk message design. Using fear appeals in the explanation of a hazard is an appropriate way to motivate the public to desired action. Combining this type of message with further communication designed to maintain outrage at a functional level may facilitate appropriate actions by members of the affected public. Many existing messages and risk/crisis communication plans contain these elements in some form (Witte & Allen, 2000; Witte & Morrison, 1995). The present study presents some evidence that the concepts of hazard and outrage are tangible, measurable elements and relevant components of the public's perception of risk/crisis events.

Given the high levels of outrage identified in this study, one might hypothesize that members of marginalized audiences would be reluctant to respond positively to risk messages concerning preparation for future disasters. Hence, campaigns addressing these problems should be considered before another disaster to minimize casualties and promote crisis preparedness.

Sandman's (1998, 2003) model of risk, hazard, and outrage has until now relied on heuristics for support. Past message design and attributions concerning the effectiveness of the model in the preparation of messages have rested largely on the assumption that these factors are operative and account for message recipients' actions. This study attempted to further this line of inquiry by developing appropriate measures of relevant constructs and establishing that they can be used not only in assessing the effects of crisis and risk-related messages, but in creating them as well.

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