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Preparing For The Inevitable: Environmental Risk Perceptions And Disaster Preparedness

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Do risk perceptions of environmental hazards lead to preparing for them? Employing data from a national urban household sample (814) in Israel, the link between risk perceptions and preparedness were examined for natural, industrial, technological, accidental and non/conventional war disasters. A factor analysis generated six risk components conditional on the social familiarity with the potential victim as well as disaster-specific events and four preparedness components reflecting, provisions, skills, planning and protection. The 'risk-preparedness' association based on this matrix of components was inconsistent having few statistically significant correlations, some even negative. Regression coefficients used to predict preparedness actions due to risk perceptions were also only partially successful. Apparently, the impact of risk perceptions on preparedness is limited to specific environmental disasters and strongest for those preparedness behaviors that are more immediate, concrete and easy to achieve. These findings have direct application for disaster managers involved in risk communication and public education of disasters.

Introduction

Perception of the chances of a disaster actually occurring has long been held as a critical factor prompting individuals and families to

both avoid physical threats of disasters as well as prepare for them (Burns and Sullivan, 2000). Common sense dictates that the greater the perceived risk, the more likely preparation will be made to ameliorate the harm (Bradbury, 1989). According to this dictate, our actions are seen as framed by the type of perceived threat and its inevitability. This same underlying assumption linking risk to actual disaster behavior is found in most disaster studies of risk related perceptions. Case studies involving toxic spills, near nuclear meltdowns, and varied natural disasters such as hurricanes, volcanoes and floods have assumed that disaster behaviors such as evacuations or preparedness are prompted primarily by risk perceptions of an impending disaster. Yet, this supposition has rarely been completely verified nor pursued (Sjoberg, 2000). What appears instead is sometimes conflicting evidence from a variety of disciplines as to the veracity and impact that perceived risk has on actual behaviors. In disaster research, the evidence neither fully supports nor challenges this assumption. Despite this, the 'risk-preparedness' link has acted to guide policy makers in formulating disaster policy and planning (Bradbury, 1989).

To a large extent, this assumption stems from the view of "risk" as a rational assessment of environmental dangers, with risk acting as a catalyst for individuals to take preparatory action to minimize harm (Mamun, 1996; Epstein, 1994). This interpretation of perceived risk is sustained and nurtured by the language of public sector bureaucratic disaster agencies that dominate disaster management. (Kirschenbaum, 2003) The term 'rational', however, may be somewhat misleading as there is a complex set of psychological, social and organizational factors that have been found to affect how individuals come to express their risk assessments (Kirschenbaum, 2003; Sjoberg, 2000; Pidgeon and O'Leary, 2000). Indeed, some argue that risk assessment may appear non-rational due to its subjective nature, particularly if contrasted against technical probabilistic analysis (Slovic, 1999). Yet, its subjective nature has been consistently recorded despite the objective physical nature of disasters (Slovic, 1999; Lupton, 1999; Sjoberg, 1997; Grayson and Schwarz, 1999). One telling example occurred in the case of a flood where individuals outside a danger area perceived of the risk of harm at similar levels to those inside the danger zone (Shippee et al, 1982). In another case, a gas farm fire led people far outside the

physical danger zone to evacuate while those closer did not do so (Kirschenbaum, 1992).

The unclear link between risk perceptions and actual disaster preparedness behavior is confounded by a gap in our knowledge of what conditions influence the appearance and intensity of such risk perceptions. Of the several alternative explanations, the general perspective advocated by proponents of the cultural approach (Douglas and Wildavsky, 1982), expressed in the Cultural Model, seems most appropriate in the study of disasters[1]. In our case, a broader modified version of this approach will be employed. This is because, for the individual, disaster related risk assessments are an integral part of their social and cultural environment (Douglas, 1986; Slovik, 1987; Wildavsky, 1990: Earle and Cvetkovich, 1997). What we perceive as risky depends to a great extent on historical experiences that are culturally embedded in various social frameworks such as the community and family. Our view of the social world and its inevitable disasters is to a large extent influenced by subjective perceptions of these objectives events (Slovik, 1999). Such perceptions, for example, are dependent on our ethnic group identity (Fothergill, et al, 1999; Perry and Lindell, 1991; Buckland and Rahman, 1999) as well as by community and social networks (Sherer and Cho, 2003; Kirschenbaum, 2004). Research on response to disaster warnings has likewise stressed how situational perceptions of risk seem to be triggered by the manner in which risk is communicated (Mileti and Sorensen, 1990) and interpreted through social interaction with neighbors (Kirschenbaum, 1992). Thus, from the perspective of the individual, disaster risks are seen and interpreted within a social and cultural milieu. This, in turn, has been said to affect disaster behaviors such as preparedness (Russell et al, 1995), evacuations (Stallings, 1991), mitigation (Cross, 1990), adaptive coping (Faupel and Styles, 1993) and even residential change (Kirschenbaum, 1992). Taking this argument one step further, it would also make sense to examine risk perceptions in terms of the character of those who would be in harms way or as some scholars have termed, the risk target (Sjoberg, 2000); be it the individual, kin, neighbors or acquaintances in their city or even nation. The degree of social familiarity of the potential victim may thus affect both the intensity of perceived risk and the type of actions

taken to avoid the threat. For example, risk perceptions are likely to be more intense when they involve one's immediate family and less so about the general public. The mounting social impact of potential harm due to social familiarity with the potential victim (Kasperson et al, 1988) therefore becomes an important ingredient in how risk might be perceived and how it is acted upon. This same logic applies to focusing on the type of disaster as the physical and social consequences may differ in terms of potential harm and localization (Paton et al, 2000; Johnson, 1992).

A second issue linking risk perceptions and actual disaster preparedness behaviors depends on the definition of what preparedness entails. It appears that preparedness has been defined in a variety of ways and in many respects reflects the culture and organizational setting within which it has been defined. Until very recently, no conceptual consensus appeared of preparedness or one that could be derived empirically The diversity of definitions has ranged from physical and technical attributes of being prepared (FEMA, 2000), social psychological processes involved in preparation (Enders, 2001), preparing for worst-case scenarios (Linkie, 2000) to viewing preparedness as a social based event (Norris, et al, 1999). Only recently has a robust empirically derived definition of preparedness been suggested (Kirschenbaum, 2002). This *empirically derived* definition based on collating definitions from numerous disaster research and management sources states that preparedness is composed of four major independent derivative behaviors which reflect actions related to obtaining supplies-provisions, attaining emergency skills, planning for future threats and providing physical protection against various types of potential disasters. These will be discussed at length below. The inference of distinct preparedness components opens up the possibility that risk perceptions may affect only certain types of preparedness behaviors and not others.

In light of this, it is difficult to ignore the implication that to explore the powerful but as of yet problematic 'risk-preparedness' proposition, there is a need to look beyond the varying simplistic definitions previously employed in the disaster risk literature. Thus, it may be that what once appeared as a common sense general proposition is far more complex than meets the eye. To evaluate the robustness of this link to disasters will require a broader evaluation

of perceived risk, incorporate a more subtle use of preparedness and investigate how these risks are affected by social background sources of individuals.

Social Based Risk

In our imperfect world, the physical environment can be conceived as being "risky", with risk level dependent on how we evaluate each situation (Thompson and Mingay, 1991; Ewald, 1991). The implication is that we are almost always consciously and unconsciously making risk assessments. The risk assessments may involve such mundane everyday situations such as what food to eat or complex issues involving health and medical care. For disasters, evaluating risks has long been part of our latent normative behavior that is activated as organized family or community responses when faced by potential harm. (Granot, 1996; Wolensky, 1983). It is rarely an isolated individual activity as it minimally involves close family members and can extend across various social networks (Drabek, 1986; Kirschenbaum, 2004). Such perceptions of risk are not at all random but based on historical patterns of social rationality that have accumulated over time through cognitive, social and cultural media (Slovic, 1987). Disaster related behavior in this paradigm, guided by social rationality, affects how we socially construct a disaster experience and what we learn from it. This perspective has been the modus operandi among social scientists that consider disasters to be social constructs (Quarantelli, 1988), reflecting the social milieu within which they arise and how they are defined. In a sense, this perspective is a consequence of alternative ways of examining risk (Weyman and Kelly, 2000). For this reason, disaster researchers have seriously considered risk based on its perceptions (Weyman and Kelly, 2000; Lupton, 1999; Fothergill, et al, 1999: Dominitz and Manski, 1997; Rosa et al., 1994; Perry and Lindell, 1991; Shippee and Bradford, 1982) and evaluated risks in terms of its social reference points (Kirschenbaum, 1996). For example, a number of disaster researchers have pointed out the relevance of feelings about the community and relationships with neighbors, friends (Perry and Mushkatel, 1984; Brhemer, 1987) and family (Kirschenbaum, 1992) in the development of risk perceptions.

Such a perspective is steeped in the notion that risk perception of an impending disaster and consequent behavior is a collective social phenomenon. Built into this perspective is the notion that an assessment of the likelihood of a disaster occurring also involves taking into account its possible negative consequences. Because disasters are social constructs, their consequences are also evaluated in terms of socially relevant points of reference such as the family, community or society (Quarantelli, 1998). In a sense, it would be difficult to disaggregate the perception of a disaster risk from its consequence, as both are socially constructed experiences and inevitably mesh. Thus, the measure of risk perception would have to incorporate both the likelihood of a disaster and the relevant social unit it would impact upon. The assumption that has been made in many cases is that risk and consequence work in tandem, where perceived high risk of occurrence and severe consequences to oneself, family or community, should lead to specific disaster behaviors (such as evacuation, preparedness etc). This argument, however, has not always been the case. The well-known behavior of flood plain residents or populations under the shadow of an active volcano, or living on active geological faults who remain or return to their former homes after a disaster, has been well documented (Alexander, 2000). In addition is the phenomenon of the unrealistic optimistic bias favoring oneself and family against others in perceiving risks. Thus, the "likelihood-consequence" framework of risk perceptions still remains to be evaluated more closely.

In general, the utility of risk perceptions as predictors of disaster behaviors has been only partially substantiated. This is primarily due to the methodological issues concerning measures of disaster risk perceptions and their specificity to unique disaster events. This should not, however, detract from the relevance of risk perception in explaining various types of disaster behavior. Studies focusing on evacuation, for example are particularly relevant here (Riad et al, 1999; Ellemers and Veld-Langeveld, 1955). Some research has paid particular attention to individual characteristics as a proxy for risk development. This basic tenet has found wide support in the disaster research literature (Briere and Elliot, 2000). For example, individuals collectively categorized by their gender, ethnic and age group have been found to have similar ways of perceiving their social worlds

and behaving during disasters (Fothergill et al, 1999). Groups of individuals who have similar backgrounds or characteristics are likely to perceive risk of disasters in a similar light (Cutter et al, 1992). However, in the case of the link between perceived risk and preparedness, fewer studies have attempted to *directly* link the two empirically (Paton, et al 2000; Faupel and Styles, 1993; Mamun, 1996). There have also been a number of studies that have focused on risk communication, particularly the affect of official warnings on specific (mainly earthquake) type preparedness behaviors. The empirical results have been somewhat contradictory, focusing on a restricted number of disaster types and to specific kinds of preparatory behaviors. Some have shown that warnings affect risk perceptions thereby leading (or not) to appropriate preparedness or protective behaviors (Mileti and Sorensen, 1990). Others have found that the level of risk perceptions affect our response to warnings (Mileti and O'Brien, 1992). To complicate these findings are results that suggest that responses to warnings are influenced by a number of social and psychological characteristics of the population (Farley et al, 1993; Sorensen and Mileti, 1989). While the results of these studies have been mixed, they do provide a basis to suggest that such a link exists. Thus, despite the many problems in conceptualizing disaster 'risk perception', the weight of the evidence points to its relevance for disaster behaviors such as preparedness.

Preparedness

The link between the risk perception of an impending disaster and actual preparedness behaviors is unclear. In the disaster literature, the few studies that have either directly or indirectly tried to link the two have shown inconsistent results (Whitehead et al, 2001; Ronan et al, 2001). This can be explained in part by the problematic nature of the predictive robustness of attitudes on actual behavior in general and risk perception on preparedness in particular. Available evidence has shown that a wide range of behaviors is not consistently predicted by risk perceptions (Wogalter et al, 1999). This has included, among others, taking out flood insurance (Zaleskiewicz et al, 2002) or earthquake protection (Edwards, 1993) and it extends to numerous areas of research.[2]

Yet, the notion persists among disaster researchers that disaster risk perceptions predict actual preparedness behaviors. One possible explanation for this may be related to the unclear construct definition of 'preparedness'. Its all-inclusive nature encompassing diverse meanings has provided a fertile ground for researchers to more easily link it with disaster risk perceptions. Some meanings reflect actual behavior while others either attributes, attitudes or virtual states. For example, most definitions of preparedness are categorized in terms of *attributes*, namely their physical or technological components. Others are operationalized in terms of scenario planning. An additional group stress the complex social-psychological processes involved in generating risk perceptions that affect preparedness (Enders, 2001) and how social marketing research may be utilized to not only predict consumer behavior but also possibly preparedness (Andreason, 2003). It is possible that the choice of a definition of preparedness will favor or block its link to risk perceptions. For example, the impact of risk perceptions on preparedness intentions seems much higher than on actual preparedness behaviors (Paton et al, 2005). This lack of consensus also exacerbates attaining external validity and internal reliability. In affect, the definition chosen can lead to different empirical outcomes. If 'preparedness' is composed of a number of independent sub-categories, there is also a good chance of falling into the trap of "misplaced concreteness". Emphasis may be placed on one set of empirical predictor variables to the exclusion of others, consequently constricting the meaning of the concept and, a-priori, determining its empirical outcome.

An attempt to overcome these difficulties has recently appeared in the disaster research literature that tackles the definitional problem in a unique way (Kirschenbaum, 2002). On the basis of definitions of 'preparedness' garnered from alternative sources—disaster experts, disaster management organizations, the research literature and potential disaster victims—Kirschenbaum fashioned a basic list of 31 consensual definitions across all these sources. The basis for these definitions was that they represented actual preparedness behaviors rather than intentions, attitudes or dispositions. He then employed a factor analysis, creating four broad preparedness components, namely having adequate provisions, possessing survival skills, having an emergency plan and providing/having access to protective shelter. To

attest to their independent character, he further ran regression models seeking, from a list of theoretically independent explanatory variables (including demographic background variables, social network measures, past disaster behaviors and actual disaster experiences), if each of these preparedness components could be explained by separate social background sources. The results supported the independent character of each preparedness component. They also provided a clear standard of how and what preparedness is and its basis of measurement. More importantly, it opened up the possibility of explaining the inconclusive link in disaster research between risk perceptions of disasters and actual preparedness behaviors.

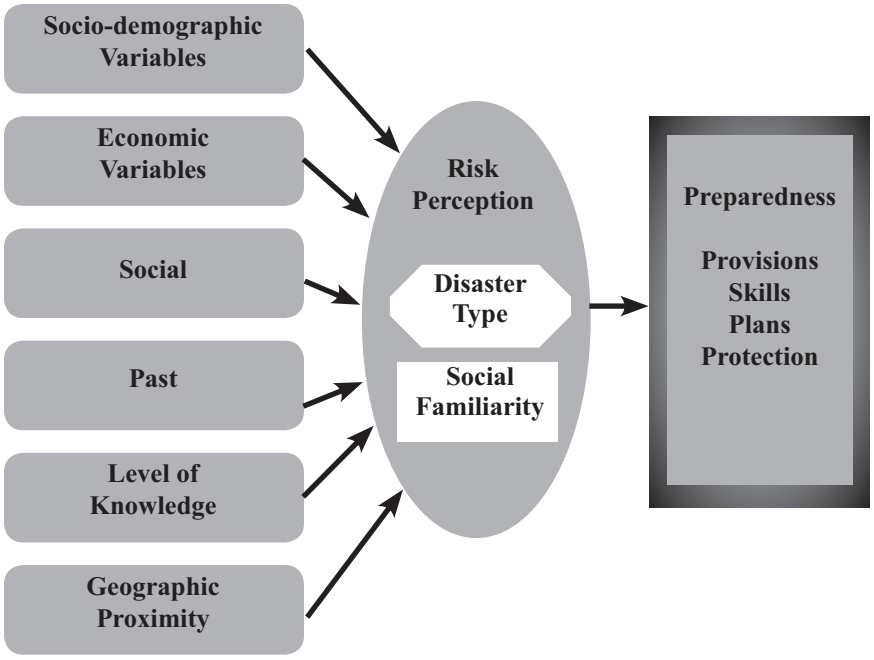
Methods

To assess the 'risk-preparedness' proposition, a theoretical model is proposed along with its derivative propositions. (See Figure 1) The model views being prepared for a disaster in terms of risk perceptions of the disaster(s). Such perceptions are dependent upon both the type of the disaster that is a threat and the context of social familiarity of the potential victim to the person making the risk judgment. How such risk perceptions are developed also finds a place in the model by suggesting a series of potential variables associated with the potential victim's social milieu. Overall, the model allows us to evaluate if (H1) risk perceptions of disasters are *related* to differing types of preparedness behaviors, (H2) the degree to which such risk perceptions can *explain* differing levels of preparedness and (H3) which of the risk perceptions of disasters best *predicts* various preparedness components.

To test the model required a two-staged strategy. The first step led to conceptualizing the concept of risk perceptions. To this end, emphasis was put on seeking an empirical basis of risk perceptions that would allow us to compare it across different types of disasters as well dependent on the familiarity with the potential victims of the threat. The emphasis on "across-disasters" is pertinent, as most work has usually focused on risk related to single disaster case studies, severely restricting comparative analysis. There is also the confounding variable of over/under estimating risks (Weinstein et al, 1988) due to the nature of the threat, making it imperative to specify the disaster type and characteristics of the potential victim.

For this reason, risk perceptions are framed in terms of the social familiarity toward the potential victim to the disaster threat – be it a threat to the respondent, his/her family, neighbors, others in the community or the entire nation.

Figure 1: Proposed Theoretical Model Of The Development Of Risk Perceptions And Its Link To Disaster Preparedness



In the case of measuring preparedness, focus was placed on utilizing a measure of preparedness that has already proven its robustness[3] (Kirschenbaum, 2002). Examining preparedness in terms of its empirically independent components, provisions, skills, planning and protection would likely establish a more detailed picture of the link between perceived risk and disasters and clarify what perceived risks brought about what types of preparedness activities.

As part of the theoretical model, I was also seeking an understanding of risk perceptions by probing into their social and environmental sources. This will not be pursued here due to size constraints of the paper. However, it should be noted that the majority of cases focusing on these issues deal with the medical-health field rather than disasters (Ollenburger and Tobin, 1999;

Minichiello et al., 2001; Kirschenbaum et al, 2000). The literature that is available in the area of disaster research did, however, provide some useful guidelines (Reustemli and Karanci, 1999; Russell et al, 1995; Faupel et al, 1993; Mamum, 1996, Norris et al, 1999). These specific case studies suggest the inclusion of socio-demographic, economic, social network, past experience and knowledge variables as potential predictors of the magnitude of risk perceptions. Here again, the assumption was that perceived risks of disasters was generated and influenced within the social and cultural milieu of the potential disaster victim. This would provide a basis to compare not only the social environmental components affecting risk perceptions but also a means to determine the strength of each competing variable. Finally, the model highlights how risk perceptions; associated with specific types of disasters and the social familiarity of the potential victims, affect the four-preparedness component. Overall, the model provides a general theoretical link between risk and preparedness as well as creating a series of testable potential propositions.

Data Source

The data on risk perceptions and preparedness was derived from a larger study of Israel's national preparedness (2000) for conventional and non-conventional disasters (Israel Government, 2001). The context surrounding the study is of importance as it reflected the experience of the 1991 Gulf War when Israel was attacked by ballistic missiles on its major population centers and the expectation that Iraq would repeat this action in the face of an imminent American invasion 10 years later. Pre 1991 Gulf War preparations by the Israel Homeland Command provided the Israeli public with means to protect itself from both a conventional and non-conventional (biochemical) war as well as post-Gulf War updates of information over time in the media related to the security situation, potential consequences of an attack and expected protective behaviors. Most of the skills learned before the 1991 war were found to be in place just before the Second Gulf War (Kirschenbaum, 2001). In addition, the religious-cultural milieu prevalent in Israel promoted the Homeland Command to encourage family-based preparation that included household family sealed safe-rooms, family based distribution of protective gear (gas

masks and materials), micro-community live exercises and school-job plans for bringing families together. Thus, the general population had not only ample experience of actual attacks by potential WMD weapons but also of conventional war and terror.

The survey was based on a national representative household survey of the Israeli adult urban population residing in areas of 10,000 or more persons. A total of 814 household head interviews in 150 urban areas were conducted over a two-week period with sample size based on each urban area's proportional population size as recorded in the 1999 Israel Census. The survey employed a random-digital-dial, computer-assisted telephone survey of each household head based on interviews that lasted about 20-25 minutes. Only residential household units were included in the population from which the sample was drawn. The only constraint imposed on the sampling design was that the gender of the adult household head be equally distributed (rotated) regardless of marital status. The actual telephone interview relied on a closed-ended structured questionnaire which included, among other questions, those related to risk perceptions and preparedness. Given the subject matter and sponsor (Israel Defense Force Home Front Command), and the trust and high regard for these institutions, refusals were extremely rare. Only 11 households refused to be interviewed with alternatives randomly selected. Included in this survey were questions covering a broad range of areas and variables theoretically linked to risk assessment and preparedness. It should be noted that nearly all the sample had experienced the 1991 Gulf War and missile attack on its major urban civilian population centers. This, along with exposure to other types of disasters, natural (mainly earthquakes), industrial accidents (hazardous materials), technological failures (electric outages), serious road accidents and ongoing terror provided a comparative disaster-type base for analysis of risk perceptions.

The final sample matched census data on the basic characteristics of the Israeli population living in urban areas. Most of the household sample were married (80%), have 2-3 children (52%), highly educated with a college or more education (44%), lived in dual earning households (60%), in good health (72%), between 40-60 years of age (47%), native born (51%), in the labor force (54%), Jews (87%) and evenly distributed for above/below average income.

Risk Measures

Risk perception measures have a short but arduous history, especially in how they are delineated (Slovic, 1999). This has also been the case in the limited disaster literature on risks (Journal of Social Issues, 1992). Most measures of risk perceptions have developed in response to the psychometric approach to risk perceptions and are usually based on distinctive Likert type ordinal scales. In order to take advantage of these previous measures as well as the large generalized categories individuals generally employ to evaluate risk, a 4-point Likert type scale was employed to measure risk perceptions, ranging from very high risk to absolutely no risk. A series of ten questions were introduced into the interview schedule as independent measures centering on six different types of disaster situations (Quarantelli, 1998). These included conventional and non-conventional war, industrial incidents, technological failures, natural disasters and road accidents involving injured or dead. As nearly all the variables in the survey focused and measured actual behavior, their potential collateral impact on attitudinal responses to risk perception measures was minimized. Given the disaster related context of the survey, where family and community played such a critical role in the population's preparation for a WMD attack, a distinction was made of the potential impact of risk on the respondent, their family, the general community/neighbors, or the entire nation for each disaster threat. In addition, given that various types of war threats (biochemical ballistic missiles or conventional war in general)[4] were considered a variation of similar means to destroy Israel, I was provided with the opportunity to evaluate if such war related disasters are perceived as equally risky by those directly affected, be they family members or anonymous others. In general, in devising these questions, I chose to match them with the realistic context within which the survey was carried out, e.g., war experiences involving WMD, along with other hazards. This follows a cultural and not psychometric approach that led to fitting the question into the social context surrounding the event. For example, a technological accident can be a personal experience but huddled up in a sealed room with your immediate family, as a means of protection against a biochemical missile attack, is a family experience.

In general, the questions centered on asking, "what are the chances" of a specific type of disaster actually occurring? Responses reflected the common meaning of the term 'chance' as a measure of perceived risk. Simply, the greater the chance of a disaster occurring, the greater the risk a person would perceive themselves to be in[5]. And, as it was clear to all in the sample who had experienced nearly all the various types of disasters, and particularly the 1991 Gulf War, the chance of occurrence had a very real, concrete link to expected consequences[6].

This combination of the social familiarity with the potential victim of the threat and specific type of potential disaster formed an interesting risk perception matrix. Basically, it divided social familiarity with the potential victim into two general levels: potential harm against me/my family and to third party national level populations. For example, a question was asked, "What are the chances that non-conventional weapons would be used against (sic, the entire citizenry of) Israel." Another question focused on the chances that conventional weapons would affect those in your neighborhood; that a biochemical weapon would harm you or your family; or that an earthquake would affect you. A total of ten measures were presented to the respondents (See Table 1 for exact wording). The responses to these provide a test of the efficacy of the general 'risk-preparedness' hypothesis by delving more deeply into the mechanisms by which it evolves and the specific incidents that generate such risk perceptions.

Irregularity In Risk Estimations

Response to the risk perception questions, asking the respondents to estimate the chances of specific types of 'disasters' actually occurring, showed a wide range of responses. (See Table 1) Thus, within the general "war" category, composed of five separate questions, there was *no* consistent pattern in the level of perceived risk. Estimated low risks for a chemical or biological missile attack contrasted to the high risk estimates of a general non-conventional weapons (7% vs 28%). Perceptions, in this case, seem to be dependent upon the person the disaster would likely harm, 'yourself', family, neighbors or general public. When references

focus on "self/ family", two divergent threats, biochemical missiles and conventional war, have similar response patterns. Differences also appeared among the remaining measures of non-war categories, industrial, technological, natural and accident type disaster situations. What appeared particularly interesting was the distribution across the risk perception categories. In the case of being involved in an accident, for example, close to a third (31%) thought the risks were high while a similar proportion (26%) thought it extremely unlikely. In the case of industrial disasters, proximity to a toxic plant made all the difference; nearly three quarters of those (73%) living near an industrial plant felt the risks to be medium to high while in contrast, a similar proportion (71%) not within proximity to such a plant, felt the risks to be low or non-existent.

Table 1: Distribution Of Risk Perception Responses To Potential Disaster Situations Based On "What Is The Chance That…"

Risk Perception Question	High	Med	Low	None	Total
Non-conventional weapons be used against Israel	28%	31%	27%	13%	100%
You/Family Hurt by Chemical Missile Nearby	7	33	32	29	100
You/Family Harmed by Biological Missile Nearby	7	34	31	28	100
Citizens are at Great Risk of War in Near Future	20	46	22	12	100
Conventional Weapons Used against You/Family	8	36	31	25	100
An Industrial Disaster Near Your Residential Area	10	19	52	19	100
An Industrial Disaster In a Factory Nearby	34	39	12	15	100
Technological Accident Disrupts Computer Service	8	30	49	14	100
You Are Involved in a Road or Other Accident	31	31	12	26	100
You are Hurt by a Natural Disaster as a Earthquake	12	34	25	29	100

These variations in the patterns of responses provide some essential first clues that risk perceptions may be linked to the type of potential disaster individuals faced as well as the geographic proximity of the threat and social familiarity of the potential victim. To further explore this possibility, the original questions were run through a factor analysis. (See Table 2) Given the existing literature on perceived disaster risks that joined risk and consequences, it was expected that the type of disaster would be the predominant facilitator generating the components. The results revealed, however, that the social familiarity with the potential victim was a decisive discerning marker for war

related risk perceptions. Risk perceptions built on their impact to oneself, family and neighbors formed a single factor (α = .93) while a more anonymous national level risk perception formed a second component (α. = .58). In each case, there was a mix of conventional and non-conventional threats suggesting that the type of threat itself was not as important as to whom the threat was directed. In addition, the factor analysis showed that non-war type disasters—even if threatening individuals or their families – retain their independence as separate components affecting risk perceptions. This could be interpreted to mean that the more common environmental threats (i.e., natural, industrial, technological) still retained their historical uniqueness in affecting how we evaluate threats to our survival. Overall, these components, based on their Eigenvalues, explained 89.7% of the total variance with the significant independence of each component assured by an ANOVA analysis ($p<0.001$)[7].

Table 2: Summary Of Factor Analysis Of Potential Perceived Risk Measures By Disaster Type And Social Familiarity Of Potential Victim

Disaster Type	Closensss Level	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Chemical Weapons	Self and Family	.883					
Biological Weapons	Self and Family	.887					
Conventional Weapons	Family & Neighbors	.849					
NonConventional	National Level		.852				
Future War	National Level		.762				
Natural Type Disasters	Earthquakes			.970			
Industrial Disasters	Industrial Accidents				.978		
Accidents	Road and Work					.938	
Technological	Power Outage Computer						.948
% Variance		26.3	15.7	12.3	12.0	11.9	11.6
Cumulative %		26.3%	42%	54.2%	66.2%	78%	89.7%
Cronbach Alfa		.93	.58				
Eigenvalues		3.58	1.26	1.06	0.81	0.71	0.65

*Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Risk-Preparedness Link

Taking these results a step further should allow a more detailed look at how perceived environmental risk perceptions are related

to preparedness actions. Distinguishing disaster risk perceptions into primary categories based on the social familiarity of the potential victim somewhat simplified this complex issue. On the one hand it concentrated disaster risk perceptions into meaningful and manageable categories. On the other, such categorization inevitably means a loss of information. Yet, given this constraint, such categorization of perceived disaster risk provided a reasonable heuristic means of examining its relationship to preparedness. In addition, it should be recalled that preparedness is based on objective behavioral measures and reflect four basic preparedness components; (1) levels of provisions stocked in the home, (2) knowledge of and ability to utilize survival and first aid skills, (3) having evacuation and family plans at the ready, and (4) protective physical shelters or sealed room.

To ascertain if greater perceived levels of risk led to increased actions to prepare for a disaster, a Pearson correlation analysis was initially performed. (See Table 3) Overall, the correlation coefficients are fairly low with only four of the 24 combinations statistically significant. In addition, focusing on the direction of the relationship reveals that increases in disaster risk perceptions are *not* always related to increased levels of preparedness. In some cases judging the risk of an imminent disaster to be highly likely led to a *decline* of preparedness activities. In every risk category (except national level risk perceptions), at least one type of preparedness component is negatively related to increased risk. In the case of family level disaster risk perceptions, the correlation is actually negative for both the planning and protection components of preparedness. A closer examination of the data shows that the majority of the negative relationships appear in those categories related to having protective shelters or in having an adequate supply of provisions in case of an emergency. Apparently, when disaggregating disaster risk perceptions by type of disaster faced and social familiarity with the victim, and matching them against empirically derived components of preparedness, the assumed positive generalized link between them comes into question. One possible explanation for these findings is that the present singular measures of risk perception and preparedness in the disaster literature simply masked a great deal of internal variance.

Table 3: Pearson Correlation Coefficients Of Perceived Disaster Risk Factors And Preparedness Components.

	Preparedness Components			
Risk Factors	Supply	Skill	Planning	Protection
Self Family	.07	.02	-.04	-.02
National Level	.10**	.05	.01	.03
Natural	.04	.08*	.06	-.02
Accident	-.12**	.10**	.06	.01
Industrial	.06	.03	.06	-.02
Technology	-.03	.06	.03	.02

** Significant at 0.05 (2 tailed); **Significant at 0.01 (2 tailed)*

Even more intriguing are the concentration of the four statistically significant correlations in the supply and skill preparedness component categories. The data suggest that risk perceptions of a national level disaster are significantly and positively related to being prepared by making sure adequate supplies are available in the household. For perceptions of the risk of an impending natural disaster, the significant link was to increase survival skills such as first aid. A third risk category, the perception of being involved in a serious automobile accident showed it to affect preparedness behaviors by decreasing actions aimed at having adequate supplies (negative) but by increasing acts at gaining various emergency skills (positive). These results suggest that the correlation link between disaster risk perceptions and preparedness components are not unidirectional, are related primarily to the supply and skill preparedness components, and found for only half of the disaster threats.

Predicting Being Prepared

These correlation results raise serious question as to the veracity of the common sense notion that whenever disaster risk perceptions grow in intensity, individuals go out and prepare themselves. To obtain a finer tuned analysis of these relationships, and seek the predictive ability of risk on preparedness actions, regression models of each of the disaster risk perception categories were run against each preparedness component. Here too, the results suggest that risk perceptions have only a *diluted* impact in predicting the variance of actual preparedness behaviors.

Table 4: Summary Of Regression Model Results Predicating Preparedness Components By Risk Perception Factors

	Supply		Skills		Plans		Protection	
Risk Factor								
	p	β	**p**	β	**p**	β	**p**	β
Self -Family	0.05	.072	0.57	.020	0.29	-.039	0.63	-.018
National	0.00	.099	0.18	.049	0.83	.008	0.36	.034
Natural	0.25	.042	0.03	.078	0.09	.063	0.55	.022
Accident	0.00	-.119	0.01	.102	0.12	.057	0.95	.002
Industry	0.11	.057	0.40	.030	0.12	.058	0.52	-.024
Technology	0.42	-.030	0.08	.064	0.44	.029	0.58	.020
Model p	0.00		0.00		0.16		0.90	
R	0.18		0.15		0.11		0.05	

The model's' preparedness components ('plans' and 'protection') are not significantly predicted by any of the risk perception factors (p=0.16, 0.90). Neither war nor other disaster related risk perceptions could be linked directly to actual preparedness behaviors. In contrast, two models are found to be significant (p= 0.00, 0.00) where risk perceptions directly affect preparedness behaviors; namely, its impact on stocking provisions (supply) and attaining skills that would increase chances of survival during emergencies or disasters. But even here the influence is restricted to a number of specific types of disasters. For example, the level of war related risk perception—both at the personal; and national levels—significantly predict the respondent's actual amount of accumulated provisions and supplies. Both are positive indicating that as risk perceptions rise so do actual preparations for stocking up. A reverse pattern of preparedness appears in the case of accidents (□ -.119) where stocking up, primarily on safety equipment (e.g., first aid kit in car, fire extinguisher in home), does not match increased concern of a serious accident occurring. From the viewpoint of preparedness, only two of the four components have any relevance to the level of perception of risks. Of the four preparedness components, 'skill level', along with 'provisions' also seem to be significantly influenced by level of risk perception. In this case, however, the link is significant for natural, technological and accidental disasters. In these cases, the incentives to be prepared come in reaction to a rise in concern that these types of disaster are imminent.

Summary And Conclusions

A basic underlying assumption in the study of disasters is that individuals and social groups can recognize, assess and act upon what they perceive to be a threat to their well-being. This perception of "risk" is seen as the principal catalyst instigating actual mitigating behaviors and is evident in various forms of disaster preparedness. But, is this really the case? From a methodological perspective, only scant empirical evidence is available to confirm the 'risk-preparedness' link; and even this is undermined by divergent definitions of risk and preparedness. Yet, there seems to be historical common sense logic in linking risk and preparedness. This logic set the stage for a closer examination of both 'risk' and 'preparedness' that would attempt to overcome some of the more glaring methodological and substantive problems.

In the case of risk perceptions, it appeared that a great deal of emphasis has been put on seeking what best explained the development of risk perceptions. Underlying the arguments was an assumption that risk perceptions directly influence decisions affecting behavioral actions, such as being physically prepared for an impending disaster. Yet, this assumption can, at best, be only partially confirmed in the disaster research literature. Thus, while the arguments concerning the generic origins of risk perceptions have engaged many researchers, little effort was put into actually verifying their link to actual disaster behaviors such as preparedness. It was this concern that formed one core issue examined here.

The second interdependent issue related to preparedness. Here, a solution to the problematic methodological issues surrounding its definition was sought in utilizing an empirically based definition that was conditional on actual behavioral actions and a consensual agreement among disaster researchers and managers. The disaggregating of preparedness into four basic components, provisions, skills, planning and protection, provided a springboard to evaluate if these separate independent components of preparedness had a link to risk perceptions and if each (or all) could be predicted by such perceptions.

To this end, I adopted some of the more salient points discussed by risk perception scholars, particularly the need to be sensitive to specific risk events (disaster type) and toward whom the threat is

directed (social familiarity with the victim). This was accomplished by framing the risk perception measures within the social and cultural context of post Gulf War behavior, linking the likelihood of various disasters occurring with their consequences. A factor analysis provided confirmation that who the victim is, a family member or an anonymous third party, is a potent factor in differentiating risk perceptions. This distinction was prevalent for various war related disasters where risk perceptions were dominated by either personal (family, friends or neighbors) or national level considerations. For the remaining disasters, natural, accidental, technological and industrial, risk perceptions retained their singularity based on self-assessment of risk. Together, cross-referencing the social familiarity with the potential victim with specific risk events formed a fruitful paradigm for examining risk perceptions. There seems, in addition, partial confirmation for the influence of the unrealistic optimism bias that ascribes a lower risk perception for self and higher for others.

In testing the three basic hypotheses, namely (H1) that risk perceptions of disasters are *related* to differing types of preparedness behaviors, (H2) that such risk perceptions are positively related to levels of preparedness and (H3) and that risk perceptions of disasters all *predict* various preparedness components, the results were not particularly supportive of the assumed "risk-preparedness' proposition. For *Hypothesis 1*, the data revealed that there was, indeed, a diffuse link between risk and preparedness but this link was very shaky as only four of the potential twenty-four correlation matrix links were statistically significant. In response to *Hypothesis 2*, it became apparent that the relational risk-preparedness link was not always positive. In some cases rising levels of disaster risk perceptions were related to a reduction in preparedness actions. In fact, at least one preparedness action in every perceived risk category was found to be negative. This was particularly glaring for risk perceptions based on family level familiarity which proved to be negative when respondents were queried about providing protective shelter and stocking up on supplies. Of the four statistically significant risk-preparedness correlations coefficients, three were positive and one negative. Once it was clear that disaster risk perceptions and preparedness did not necessarily go hand-in-hand, and in some cases were negatively related, the stage was set to seek confirmation of its predictive ability. Testing *Hypothesis 3*

meant utilizing the preparedness components, namely supplies, skills, plans and protection, as distinct dependent variables. The regression analysis revealed that only two of the four preparedness components could be predicted by risk perceptions, and of these, only partially.

These results are testimonies to the fact that risk perceptions have, at best, only a partial explanatory effect on actual preparedness behaviors. And they do so only for those preparedness behaviors that are more immediate and concrete for survival or involve evoking existing skill resources. Stocking up on essential goods and materials is a relatively straightforward act as is making use of survival skills already attained. This does not appear to be the case in terms of planning, which takes coordinated effort among family members or providing physical protection that encompass utilizing capital or other material resources. What this seems to indicate is that specific risk-event perceptions induce individuals to perform preparedness behaviors that are in general relatively easy to achieve. Households seem, in the face of a looming disaster threat, to stockpile provisions and hone their emergency skills. For more complex coordinated preparedness acts, such as planning and providing protective shelter, risk perceptions apparently have little influence.

Implications

The 'risk-preparedness' tie provides a reconfirmation of how we have adapted to a hostile natural and human-made environment so as to increase our ability to survive. The actual mechanisms by which we do so, however, are not straightforward or simple. The sometimes-contradictory conclusions found in the literature, especially concerning risk communications on preparedness, reflect this complex association. From the analysis, risk perception appears to be generically biased by the type of disaster individuals face, and derived through a complicated, socially based mechanism conditional on the person that faces the disaster threat. The "us" and "others" distinction appears to be crucial in how we perceive war related disaster risks but not so for more familiar and accepted natural, technological, industrial and accidental disasters. We apparently take for granted these destructive events as being part of our hazardous environment. Because of this distinction our

preparation for war (and likely global terror) related events and socially accepted disasters differ. The crucial difference appears to be our tendency to prepare ourselves by acting in the short term and through means that are at our disposal and under our control, such as stockpiling provisions and sharpening survival skills. The implication of these behaviors for policy makers is that when resources are put into increasing the long-term awareness of certain environmental or disaster risks, they are likely to be dissipated and have little impact on actual preparedness behaviors.

Notes

1. The controversy over the best way to explain perceived risk has been propagated by proponents of the Psychometric (Fischhoff et al, 1978) and Cultural Models (Douglas and Wildavsky, 1982). Several attempts have been made to reconcile (Marris et al, 1998) or improve on these models (Sjoberg, 2000). The Psychometric Model is basically cognitive in nature with risk perception dependent on the hazard faced. The Cultural Model takes a different perspective by emphasizing the social context impeding individual perceptions. Thus, the measures are more aligned with variables that reflect the social context of behavior than individual cognitive experiences. Despite the criticisms of these models, both technical and substantive, they remain powerful explicators of perceived risk.

2. Some examples include perceptions of health risks for treatment of chronic illness, cancer and ulcers (Fiandt and Walker1999; Leventhal and Leventhal, 1999; Arnold, 1994) as well as risk perceptions of HIV on condom use (Baume, 2000), risk of injuries on fighting behavior among students (George and Thomas, 1997) and risk of substance abuse on use of drugs (Gerrard et al, 2002). In some cases where such a link has been found, it has been indirect or related to behavioral intentions. For example, the impact of knowledge or communications on building risk perceptions affecting pesticide safety (Arcury et al, 2002) or in purchasing genetically modified food (Finucane, 2002). It has also included broader attitudinal constructs in the area of organizational attitudinal behavior such as intentions to leave on employee turnover (Kirschenbaum and Weisberg, 1990) and levels of satisfaction on work performance (Ramsay et al, 2000).

3. The factor component "provisions" included having spare batteries, an operating radio, three days' water and food, availability and materials to seal a safe room, emergency light, copies of documents andand emergency numbers, and family being organized. The second factor component "skill level" was composed of having taken an advanced first aid course, first aid material, and knowledge to extinguish a fire, inject atropine, put on a gas mask and seal a room. The third factor component, "planning" contained having an evacuation plan, having discussed actions in case of a disaster and have a family emergency plan. The fourth factor component, "protective actions" was based on having a gas mask available, access to a public shelter and having a safe room nearby.

4. It should be noted that as early as the Yom Kippur War (1973), both short and long-range missiles have been used against both Israeli military and civilian targets by Egypt, Syria and Lebanon.

5. The use of the term "chances of occurring" rather than "risk" was aimed at avoiding the connotative negative bias that the term 'risk' carried with it and the possibility that it weighted responses in a negative direction. 'Chances of occurring' reflected a more neutral expression and put the evaluation in a probabilistic framework. See Sandman et al, 1994 for how assigning risk can affect threat perceptions.

6. A recent study of adaptive behavior to terror acts revealed that the assessment of its consequences matched to a large degree the damage of the actual events (See Kirschenbaum, 2005)

7. In general, eigenvalues are important indicators of the robustness of the variance explained so that the closer an eigenvalue gets to 0, the more concern about the error matrix being singular. As some of the components have eigenvalues below the 1 but still closer to 1 than 0 (.65, .71, .81), they are presented and the results interpreted accordingly. On a substantive basis, this allows for a more diverse analysis of how various specific types of hazards played a role in the risk-preparedness link.

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