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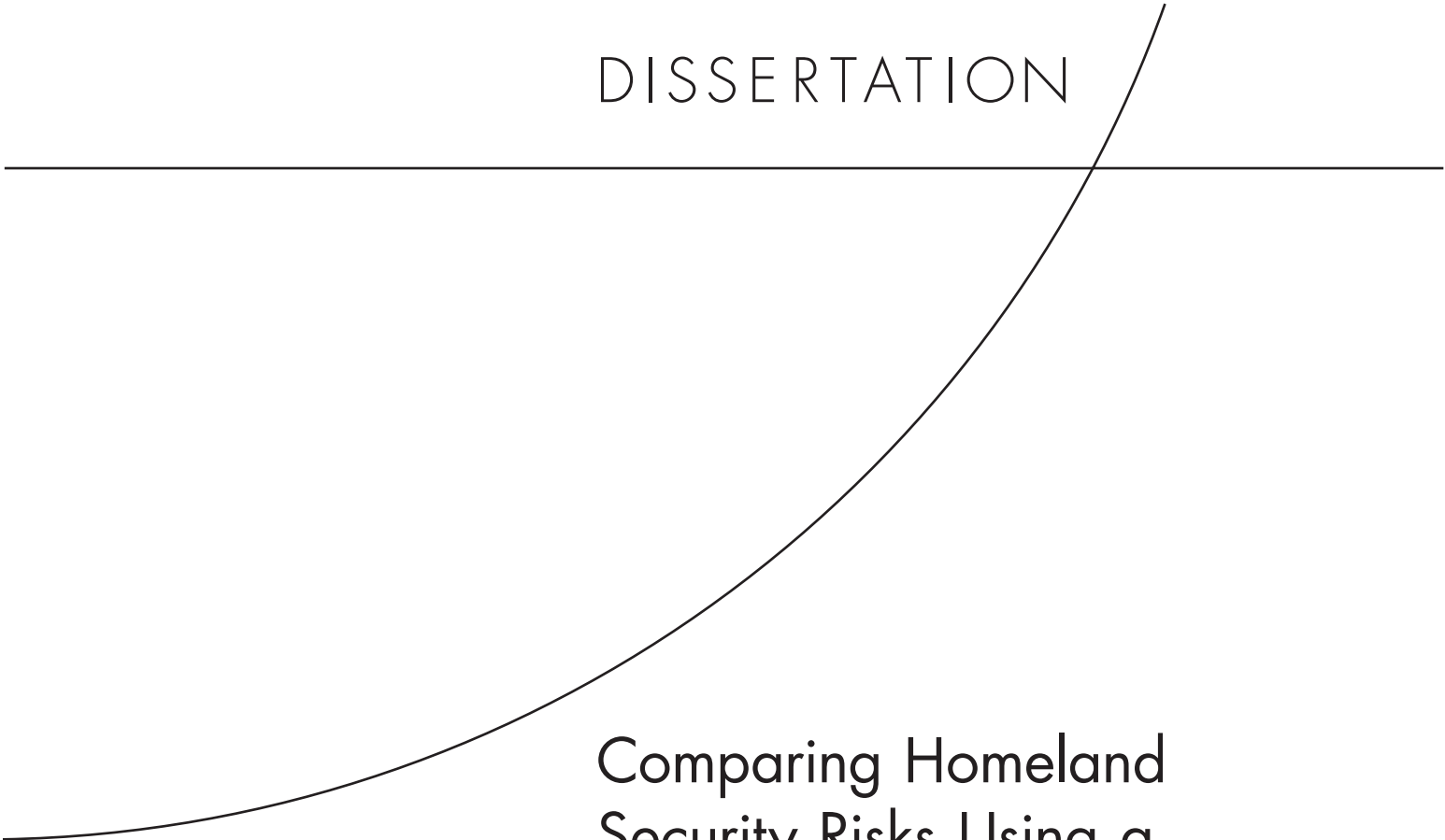
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DISSERTATION



Comparing Homeland Security Risks Using a Deliberative Risk Ranking Methodology

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This document was submitted as a dissertation in September 2013 in partial fulfillment of the requirements of the doctoral degree in public policy analysis at the Pardee RAND Graduate School. The faculty committee that supervised and approved the dissertation consisted of Henry Willis (Chair), Brian Jackson, and Lisa Jaycox.



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Summary

Managing priorities in homeland security requires understanding the risks due to a range of disasters, terrorist events, and accidents. These risks vary greatly in their causes and the kinds and extent of consequences associated with them. This makes comparative risk assessments of homeland security risks a challenging enterprise. A National Academies report on the risk analysis activities of the Department of Homeland Security identified the need to improve comparative risk assessments, particularly suggesting the consideration of non-quantitative comparative methodologies.

This dissertation adopts one such comparative risk assessment methodology, the Deliberative Method for Ranking Risks, and applies it to the homeland security domain. The Deliberative Method for Ranking Risks was developed in the 1980's and 1990's to compare environmental risks that included multiple attributes of concern. The method has been validated in a range of studies of addressing the environmental and health & safety, ranking the concerns of risk experts, government officials, and the lay public. This is the first known attempt to apply this method to homeland security concerns.

The Deliberative Method for Ranking Risks contains five steps. The first two steps, described in the Chapter 3, involve conceptualizing the risk, including classifying the risks to compare and the attributes by which they will be compared. This not only involved selecting attributes that were available but also developing new attributes, including a comparative measure of mental health consequences described in a technical appendix. The third step is to assess the risks individually by describing the risks using the categories and attributes developed in Chapter 3. The result of this assessment— a unique dataset describing a broad set of homeland security risks in comparable and transparent terms— is described in the Chapter 4 and documented in detail in additional technical appendices. The final steps involved conducting risk ranking sessions, where individuals consider the

risks in a structured process designed to encourage analytical thinking, and analyzing the data from those sessions.

Summary of Findings

Public Concern over Hazards Suggests Balancing Natural and Terrorist Priorities

The participants ranked the set of risks from the hazards about which they were most concerned to those about which they were least concerned. While the nature of the convenience sample of risk ranking session participants limits my ability to make claims as to its representativeness, there is some evidence that people are able to set aside their personal biases and focus on the expected consequences of the risks. The hazards about which there is the least consensus are terrorist nuclear detonations and toxic industrial chemical accidents, reflecting high consequence, uncertain likelihood events with the greatest uncertainty in the expected consequences. The rank order of hazards, from most concerning to least concerning, is:

- | | |
|----------------------------------|--|
| 1. Pandemic Influenza | 6. Terrorist Explosive Bombings |
| 2. Hurricanes | 7. Toxic Industrial Chemical Accidents |
| 3. Earthquakes | 8. Oil Spills |
| 4. Tornadoes | 9. Anthrax Attacks |
| 5. Terrorist Nuclear Detonations | 10. Cyber-attacks |

Natural disasters are generally of greater concern than those of human-induced events. While there is a wide-ranging literature suggesting that all things being equal, people care more about terrorist events than natural disasters, all things are not equal. The natural risks in this set are generally associated with greater consequences, something that is reflected in the rankings. These results should be interpreted with caution, as the sample involved in this study is not representative of the nation as a whole. These results should be confirmed with a broader set of rankings designed to examine

hypothesized differences in populations. Still, this finding suggests that DHS should examine the balance between natural disasters and terrorist risks.

Individuals Are Concerned about Multiple Aspects of Risk

Individuals were concerned about a large number of attributes of homeland security risks. While these include first and foremost aspects of physical health and economic damage, it also included psychological harms, societal and government disruption, environmental damage, and non-consequence aspects of the risk including aspects of how the risk is perceived. Comparative risk assessments in the homeland security domain should be compared using multiple attributes to describe this entire range of concerns. In particular, aspects of psychological consequences, environmental damage, and societal disruption, which are not commonly included in risk assessments, should be integrated in a comparable fashion. This may indicate a need for greater surveillance of psychological damage associated with homeland security events.

The Deliberative Method for Ranking Risks is Effective for Comparative Risk Assessments in the Homeland Security Domain

The Deliberative Method for Ranking Risks was appropriate to elicit a useful ranking of homeland security risks from the hazard of greatest concern to the hazard of least concern.

The objective of these workshops was to elicit informed, reliable judgments of the participants' concerns. Whether this objective was met was examined in two ways: by asking the participants directly and by revealing the participants' considerations indirectly through an analysis of their rankings. Participants reported learning information from all stages of the process, learning from the risk summary sheets, the calculated ranking exercise, and the group discussion. Additionally, participants reported that their current knowledge of homeland security risks was based more on what they learned in the risk ranking workshop than what they had known prior to the exercise. In addition to the

reported learning, an analysis of the rankings provides additional support that the rankings were based on informed judgments. The rankings were consistent within and across ranking sessions. The degree of consensus grew throughout the process as people learned about the risks. There is evidence that this was not forced consensus, as individuals reported finding the workshop to be open, engaging, and encouraging of different points of view. Instead, the data suggests that the individuals' rankings were taking the attributes of risk into account, with the individuals' rankings becoming more like the rankings based on the attributes of risk. This provided a measure of *convergent validity*. These findings of informed, reliable judgments are comparable to those found in previous studies using the Deliberative Method for Ranking Risk applied in other domains.

Participants were also satisfied with both the process and the results. Satisfaction with the results represents a measure of *face validity*. Additionally, risk rankings where participants are satisfied with the results are more useful to policymakers, and as a result are more likely to be adopted and used. Individuals reported being satisfied with the group's ranking and would approve the rankings being used for decisions in a real organization. While most individuals saw the group rankings as representative of their own concerns, even those who did not see the rankings as representative of their own concerns were supportive of the rankings.

Based on the results of this study, the use of the Deliberative Method for Ranking Risks should be expanded for use in homeland security in several ways.

First, the method should be extended to include other DHS risks. While the set of hazards was selected to cover an interesting and useful set, it was not comprehensive and would be strengthened by including a wider set of hazards. At a minimum, this would include expanding the set of hazards of the types of punctuated events identified here, adding hazards such as floods, wildfires, tsunamis, chemical

weapons attacks, and others. However, the method could be expanded to include more chronic concerns, such as drought, or non-hazards concerns, such as illegal immigration.

Second, the method should be extended through a purposeful examination of additional participants. The initial workshop participants were a non-representative sample of the general public, and additional studies should be selected to examine hypothesized concerns of bias. Additional studies of rural areas and populations with different risks or different experiences with these hazards can be useful to identify possible biases. The concerns of other stakeholders, particularly policymakers, should also be identified.

Finally, the risk assessment priorities are only a starting point for strategic planning. Priorities should be based not on which risks are of greatest concern, but on which policies can reduce the risk to the greatest extent for a given cost. These rankings do not prioritize risk reducing policies or activities but can be used to inform existing processes to select risk reduction methods. The Deliberative Method for Ranking Risks could be useful to generate informed rankings representative of the DHS concerns by focusing on selected groups of risk experts, including potentially the Risk Steering Committee, to inform the selection of risk reduction methods in the Quadrennial Homeland Security Review. Additional potential applications can be made on the national or sub-national levels, both within the U.S. and foreign countries.