Accident Analysis and Prevention 48 (2012) 353–362

Contents lists available at SciVerse ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Population behavioral scenarios influencing radiological disaster preparedness and planning

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ARTICLE INFO

Article history:
Received 4 August 2011
Received in revised form 6 February 2012
Accepted 8 February 2012

Keywords:
Scenario planning
Multicriteria decision analysis
Emergency response
Disaster planning
Risk management
Preparedness
Public information
Population behaviors

ABSTRACT

Considerable attention is focused on plans for sheltering or evacuating the population of the US national capital region in response to a regional emergency such as a terrorist attack or natural disaster. Such planning engages multiple disciplines spanning infrastructure engineering, emergency management, health care, mass communication, water and food supply, logistics, and others. Knowledge of population behaviors should influence the many dimensions of protection, prevention, response, and recovery. Of particular interest are the behaviors and needs of the resident and non-resident populations in the aftermath of a regional disaster, including those at home, at work, and traveling. The authors deployed a 30-min telephone survey to 2700 residents of the region to gain knowledge of their intended behaviors in the event of a variety of potential dirty bomb attacks. The survey provides a unique foundation for the current paper. The paper will identify and model the assumptions of population behaviors that most affect agency priorities for emergency planning including regional sheltering and evacuation following a radiological disaster such as a dirty bomb. The technical approach assessed several planning initiatives across performance criteria derived from strategic plans and applied combinations of behavioral assumptions to vary the relative importance of each criterion. The results reveal the behavioral scenarios that are most significant to the prioritization of planning initiatives and identify the highest and lowest priority initiatives across the criteria used.

1. Introduction

Emergency planners are confronted with a multifaceted problem for regional disaster recovery in that plans must take agency performance goals and criteria, possible actions, and incident-specific objectives into consideration while accounting for a variety of uncertainties in gathered data and assumptions. Sources of uncertainties that are present for a regional emergency include the emergent and future behaviors of the public who are affected by the incident. In the aftermaths of the Japan earthquake and tsunami, the Katrina hurricane, and the 9/11 attacks, interest in the behaviors and needs of populations has increased significantly, stemming from the belief that failure to address the associated uncertainties may cause emergency plans to become unrealistic or ineffective.

The US Department of Homeland Security collaborated with other federal departments, federal agencies and state, local, and territorial governments to develop fifteen National Planning Scenarios in response to major terrorist attacks, natural disasters and other emergencies that have the greatest risk of mass fatalities, injuries or property loss and major social disruption (DHS, 2007a). Radiological dispersion device (RDD) attacks are considered one of these scenarios. A dirty bomb is a type of radiological dispersion device that combines conventional explosives (e.g., dynamite) with radioactive materials. The terms *dirty bomb* and *radiological dispersion device* are used interchangeably (NRC, 2010). In addition to immediate explosive effects, dirty bombs have radiological effects that usually do not cause immediate fatalities but can cause long term contamination of the affected area and its surroundings. Combined with its physical impacts, the psychological impacts of a dirty bomb on a society should not be underestimated.

This paper will integrate scenario planning with multicriteria analysis for the prioritization of initiatives that comprise regional disaster emergency plans. Primary focus centers around sheltering, evacuation, and related population behaviors and needs in the aftermath of an attack by a radiological dispersion device. Following published methods of the authors among others, a multicriteria analysis tool will be enhanced by scenario planning in order for emergency planners to better understand (i) what the highest priority initiatives are and (ii) which initiatives are robust

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doi:10.1016/j.aap.2012.02.007