UNIVERSITY of VIRGINIA
CENTER for SURVEY RESEARCH

# Population Behaviors in Dirty Bomb Attack Scenarios: A Survey of the National Capital Region

**REPORT OF RESULTS**

**Prepared for:**

**VIRGINIA DEPARTMENT OF EMERGENCY MANAGEMENT**
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# *Population Behaviors in Dirty Bomb Attack Scenarios: A Survey of the National Capital Region*

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## Acknowledgements

This report details the findings of the 2009 Survey of Behavioral Aspects of Sheltering and Evacuation in the National Capital Region.

The survey was originally conceived and described in a 2008 RCPGP grant awarded to a consortium of agencies representing the National Capital Region UASI. Funding for the survey was provided via a contract with the Virginia Department of Emergency Management; the original source of funds was the U.S. Department of Homeland Security. Work began in February 2009, with substantive data collection in September to December of 2009. CSR worked closely on the project with UVa's Center for Risk Management of Engineering Systems in developing the questionnaire and in selected areas of data analysis.

This project received enthusiastic support from Hon. Robert P. Crouch, Jr., Assistant to the Governor for Commonwealth Preparedness; and President, All Hazards Consortium. Janet Clements, Virginia Department of Emergency Management (VDEM), was CSR's primary contact with VDEM. Ms. Clements was instrumental in bringing CSR and CRMES into the consortium of state and agency emergency administrators working under the RCPGP grant. She provided invaluable guidance, resource support and final editing of the report.

Our research partners of the All Hazard Consortium who agreed to be interviewed on Mass Care, Transportation, Modeling and Simulation, Resources, and Preparedness provided a wealth of information to guide further research and analysis.

Jennifer Nugent, Program Management Office, All Hazards Consortium, provided coordination for the many project stakeholders and dissemination of documentation through a Sharepoint portal devoted to the RCPGP project.

The Boar's Head Inn, Charlottesville, VA, provided facilities for a one day workshop attended by 35 stakeholders in the project who traveled from as far away as Pennsylvania to contribute to the group consensus of survey topics. The workshop, jointly hosted by CSR, CRMES and VDEM was a great success thanks to the willingness of the various participants to contribute and the organizing efforts of Deborah Rexrode.

Focus group sites were provided by the Office of Emergency Management in Landover MD, Northern Virginia Educational Center in Falls Church, VA. and XM Radio in DC. The participants were candid and engaged, and we learned much from hearing their reactions to the draft survey questions.

Participants of the January 2010 Gettysburg workshop Cross-Border Coordination Workshop and RCPGP grantee meeting provided enthusiastic feedback to the initial public presentation of results.

Significant input on prior studies of populations under emergency conditions was provided by Dr. Joseph E Trainor, of the University of Delaware Disaster Research Center. Dr. Trainor attended the workshop and focus groups and was able to add background and insight into the thoughts and feelings expressed by participants.

Dr. Thomas Guterbock, Director of CSR and Professor of Sociology, was the principal investigator for the Behavioral Study. He supervised all aspects of the project, including budgeting, questionnaire creation, logistical planning, data analysis, production of this report, and the presentation of the final results. He was CSR's primary liaison to VDEM and primary author of this report.

Robin Bebel, Assistant Director of CSR, served as project coordinator during the development and field phases of this project. She oversaw the data collection and was instrumental in the creation of Power Point presentations and in the production of this report.

James M. Ellis, M.A., Director of Research was crucial in the conception of the survey instrument and in defining the details of the factorial design.

Ms. Bebel and Mr. Ellis worked closely together to create a draft questionnaire from the outline crafted by the group and to finalize the script for production interviewing. They also worked to ensure the accurate post-coding of the collected verbatim data.

Dr. James Lambert, Associate Director**,** Center for Risk Management of Engineering Systems, was co-investigator on the project. He contributed expertise during the development and analysis phases of the project, as well as maintaining liaison with the research partners and reporting on our progress to AHC.

Kien Trung Le, PhD, and Deborah Kermer, M.A. provided expert data analysis. Ms. Kermer wrote several sections of the report, and provided the final formatting

John Lee Holmes, M.A, Survey Operations Manager, oversaw the operation of the CATI laboratory during the interviewing phase of this study. In the interest of time, a portion of data collection was outsourced to NSON Opinion Research of Salt Lake City Utah. Mr. Holmes was also responsible for programming the survey instrument, coordinating the outsourced data collection and drafting the methods report.

Young-Il Kim, M.A., Research Analyst, provided data analysis support. Katherine Coker contributed coding of text variables while Jae Sook Lee assisted with the preparation of tables and figures. Peter Elliott, David Shreve, Kristofer Garriott, Carlos Cueto, and Teja Fuller assisted with report editing.

CSR would like to thank the telephone interviewers for the hours spent asking all those questions and recording all those responses that are the basis of this report.

And finally, all those connected with this project are grateful to the residents of the National Capitol Region who gave their time to answer many questions about behavior and reactions that may be expected during an emergency in the area.

*The Center for Survey Research is responsible for any errors or omissions in this report. Questions may be directed to the Center for Survey Research, P.O. Box 400767, Charlottesville, Virginia 22904-4767. CSR may also be reached by telephone at 434-243-5222; by electronic mail at surveys@virginia.edu, or via the World Wide Web at: http://www.virginia.edu/surveys.*

# Population Behaviors in Dirty Bomb Attack Scenarios: A Survey of the National Capital Region

## Executive Summary

This report details the findings of a telephone survey conducted in the fall of 2009 by the Center for Survey Research (CSR) at the University of Virginia at the request of the Virginia Department of Emergency Management. The 2009 Survey of Behavioral Aspects of Sheltering and Evacuation in the National Capital Region was the culmination of a collaborative effort that included project stakeholders from the Regional Catastrophic Planning Team (RCPT) composed of five states (Virginia, Maryland, Pennsylvania, West Virginia and Delaware) and the District of Columbia, as well as the All-Hazards Consortium (AHC), representatives from the Department of Homeland Security (DHS), and faculty and staff from the University of Virginia's Center for Risk Management of Engineering Systems. Results from this survey are intended to inform the efforts of the RCPT partners in their work in five distinct research areas. They are: (i) Resource Management, (ii) Public Preparedness, (iii): Modeling & Simulation, (iv) Mass Care, and (v) Transportation. This report details the findings of the study and describes its inception, development, execution and analysis phases.

The final survey design was the result of significant input from all stakeholders to ensure that information needs for each group were considered. Questions were included in the final questionnaire that cover a range of topics related to the experiences, attitudes, knowledge and likely behavior of the public in case of a terrorist attack.

The results of the survey will serve the information needs of emergency planners, government and non-government organizations, and community stakeholders.

The instrument was based in part on a survey of the National Capital Region done by CSR in 2005. The "Community Shielding" study provided a framework and example to begin deliberations. A daylong workshop was convened in Charlottesville, VA in March 2009 for all project partners. An early questionnaire draft was tested during focus groups of randomly recruited respondents from each of the three major geographies of the NCR: VA, MD and DC. Successive refinements of this instrument led to pretest calls in August 2009 followed by production calling starting on August 26.

A total of 2,657 interviews were conducted with residents of the NCR localities in Northern Virginia (Alexandria City, Arlington County, Fairfax County, Fairfax City, Falls Church, Loudoun County, Prince William County, and the cities of Manassas and Manassas Park), the two NCR counties in Maryland (Montgomery and Prince George's Counties) and the District of Columbia. These included 35 interviews conducted in Spanish.

A feature of note in this survey is the inclusion of cell-phone respondents. This relatively new methodology is being developed in response to concerns that the increasing growth of cell phone use is a significant factor in the under-representation of some demographic groups. Those users are more likely to be young, male, from a minority, and from a lower socio-economic group. Their inclusion resulted in a more balanced survey that is a better reflection of the population being studied.

Understanding the behavioral responses of residents in an emergency situation is fundamental to the further development of emergency plans and systems for the National Capital Region. Planners have had little reliable guidance as to how they should expect residents to act if a region-wide disaster occurs. If emergency plans for the region are to be realistic, they must be grounded in evidence-based projections of how people obtain their information in an emergency, what sources they trust, the degree to which they have planned or prepared in advance, and the decisions and actions they will make under various possible emergency scenarios. The decision to "stay or go" in the face of a dangerous event is a complicated behavior to forecast. The survey needed to account for a host of variables that could affect the decision to stay or to evacuate, including aspects of the event itself.

The central feature of the survey tested how people would respond to terrorist attacks involving one or more radiological dispersion devices or "dirty bombs". Three hypothetical scenarios were

created, with increasing levels of threat, starting with a single 'dirty bomb', released in the NCR area but not nearby. Threat increased to a maximum level that included multiple radiological dispersion devices released all over the NCR and exposing everyone in the region to an unspecified level of radiation. Each respondent was presented with two of the three scenarios. Events described in the survey escalated to what could be considered a catastrophic level for some respondents.

These three basic scenarios were varied on four key factors: the level of hazard, the location of the respondent (at home or at work), whether there was prior notice of the event given by the attackers, and the source of information and instructions about the event. This created forty-eight distinct scenarios for analysis.

- For those at home during the hypothetical event, seven to eight of ten respondents decided to stay at home.

- Higher numbers of people say they will leave their homes when there is advance notice and a minimal hazard level. In a moderate scenario higher numbers leave their homes when there is no notice.

- In reaction to the minimal hazard, in which the respondent was not instructed to shelter in place, many people will leave their place of work if the event is far away, most intending to head to their homes.

- At all three hazard levels of the at-home scenarios, men are substantially more likely to leave immediately than women are.

- While a person's confidence in the community's ability to manage an attack does not affect their behavior in an at-home scenario, it is significantly correlated with staying in place at the workplace, for both the minimum and moderate scenarios.

Variations in the level of perceived threat served as background for questions that asked about understanding of the potential threat and the level of fear of harm and worry about events such as what was being described.

- Questions about perceived risks from the various events showed that respondents did perceive the 'maximum' hazard scenario (multiple dirty bombs including one just one mile away) as potentially far more hazardous than the minimum scenario (one bomb detonated far away)

- People were more worried about the potential event actually happening after hearing the minimum scenario than after the moderate.

- The scenarios with greater 'hazard' did raise perception of risk of destruction, serious injury or death

The survey collected details about the evacuation plans of respondents, including information on how far they plan to go, the type of destination, the mode of travel, and specific locations and travel distances to their intended locations. If a respondent chose to stay in place for both scenarios presented to them, they were asked these questions in relation to their intentions under mandatory evacuation instructions.

- The choice of destinations depends in large part on where people are initially located, with those starting in Virginia likely to head South, and those in the Maryland or DC area to head north.

- About 90 percent of those evacuating under the mandatory evacuation situation would travel by motor vehicle.

- In the minimum hazard scenario, most of those evacuating would proceed to destinations inside the NCR. The percent heading to destinations outside the region is higher for the maximum hazard scenario and for mandatory evacuation.

- The percentages of evacuees who would head for Pennsylvania, Delaware, or West Virginia are not large, even under the maximum hazard scenario.

In addition, this report covers the critical variables in the survey that may influence behaviors during and after an actual event:

- Higher education increases sheltering compliance.

- Nearly half of all respondents reported that someone in their household took some kind

of prescription medication, with another 22% reporting some other medical or physical condition.

- Events of September 11, 2001 were most often cited as providing motivation to get prepared for an emergency, with about a third of respondents saying they had experienced those events.

- Denial and "not wanting to deal with it" were most likely to keep people from preparing.

- The President was cited as the most trustworthy of sources of information, with the youngest respondents giving the President the highest level of trust.

- Residents expect information from emergency managers in the forty-eight hours after a major local emergency, whether they chose to stay or to evacuate.

- Residents have a great deal of faith that most essential services will continue, with the most confidence in radio.

- Well over half (54%) had prepared a plan, a kit or arranged a meeting place for use if needed.

- Past experience with emergency situations was asked about; to gauge how much effect it would have on future actions in an emergency.

Finally, respondents were asked some questions about themselves that would allow for analysis by specific demographic groups, such as age, race and home location.

The organization of this report is as follows: Section I describes the research methodology and milestones of the behavioral survey. Section II describes a demographic profile of the residents of the NCR, characterizes their special assistance needs for sheltering or evacuation, and their attitudes toward disaster risk, authorities, and their community. Section III describes the construction of forty-eight survey scenarios around radiological dispersion attacks in Tyson's Corner, College Park, and distributed across the NCR and explores the willingness of respondents to shelter in place under the various scenarios. Section IV describes the travel destinations and sheltering and evacuation behaviors by jurisdiction. Section V describes past experiences of the respondents with emergency situations. Section VI describes the levels of personal preparedness of residents. Section VII describes the confidence of residents in infrastructure services following a disaster. Section VIII describes the attitudes of residents toward a variety of sources and channels of information in a disaster. Section IX describes some of the needs for further research and some particular interests of our research partners in the results of the behavioral study. The Appendices provide a complete script of the survey, the procedural methodology for the project, the frequency results for every question, and demographic cross-tabulations of response variables.

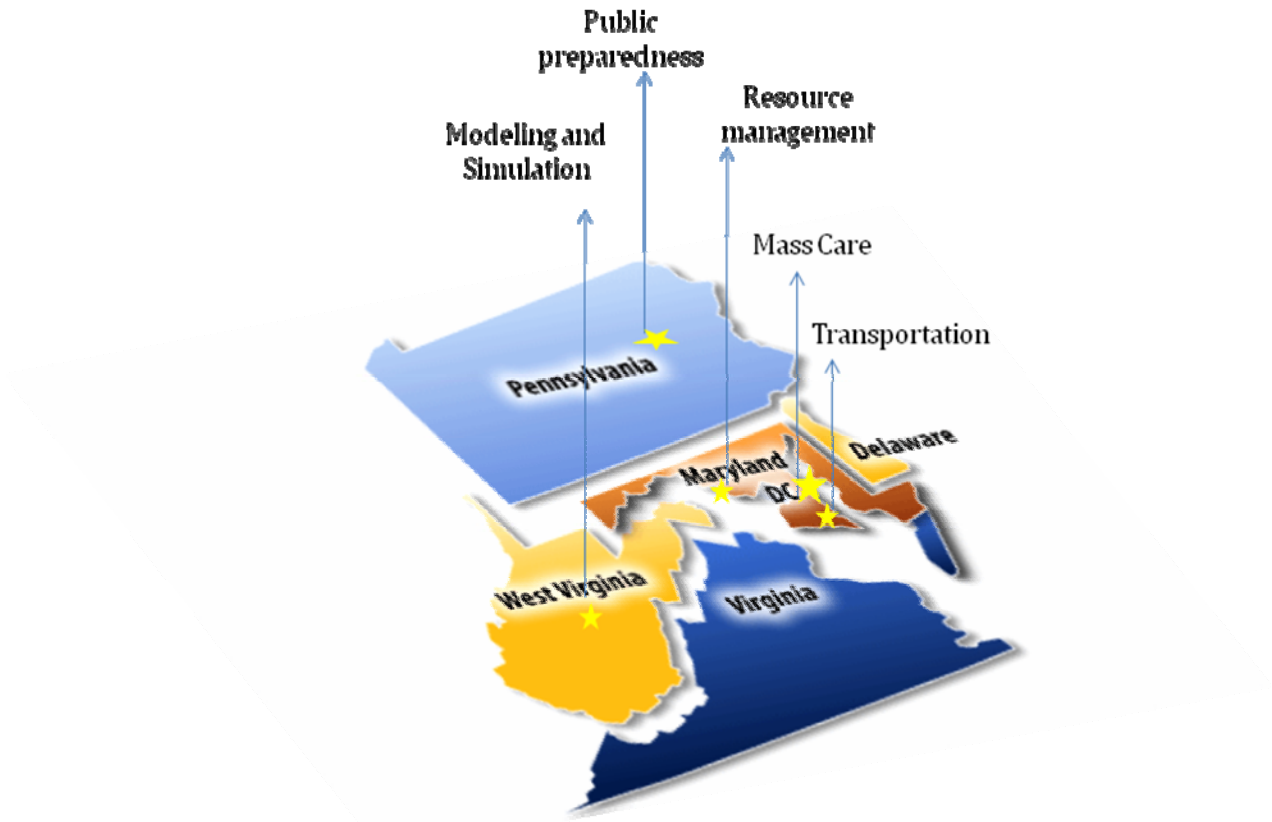
It is hoped that the responses detailed here will be useful to practitioners as they attempt to model how people in the NCR will respond to a wider range of scenarios, and will ultimately help to ensure the safety of area residents and the effectiveness of official response in the event of a real terrorist emergency.

# I. Introduction

## Overview

The 2009 Survey of Behavioral Aspects of Sheltering and Evacuation in the National Capital Region was a collaborative effort involving the Regional Catastrophic Preparedness Grant Program (RCPGP), the All-Hazards Consortium (AHC), the Regional Catastrophic Planning Team (RCPT) composed of five states (Virginia, Maryland, Pennsylvania, West Virginia and Delaware) and the District of Columbia, representatives from the Department of Homeland Security (DHS), and faculty and staff from the University of Virginia's Center for Survey Research (CSR) and Center for Risk Management of Engineering Systems. (CRMES) Led by the Virginia Department of Emergency Management (VDEM), the survey effort was designed to provide data inputs to multiple projects led by the other states and the District of Columbia working under RCPGP funding. The overarching goal is to support truly regional planning for a coordinated response to catastrophic events occurring within the National Capital Region (NCR). See Figure I-1.

**Figure I-1: Regional Catastrophic Preparedness Grant Program partners and projects**




The research questions focused on understanding evacuation behaviors under various event scenarios. Specific research goals included collecting behavioral data that would support estimating the numbers of people who would plan to evacuate the NCR or shelter in place, how evacuees would plan to move, and where they would plan to go. These estimates would serve as inputs to the planning activities in the other projects led by RCPGP team members.

The decision to "stay or go" in the face of a dangerous event is a complicated behavior to analyze. There are many variables that might impact this decision. The survey would need to account for a host of variables that could affect the decision to evacuate, including aspects of the event itself.

## Methodology

There was little doubt early on that a telephone survey with cell phone sampling was the most

appropriate survey mode. This approach would cover the NCR population very well, and the computer-assisted telephone interviewing software would be able to manage the complicated skipping and branching that would likely be required to move through the questionnaire. A web-based survey would not have the reach of a telephone survey that included cell phone sampling, and a mail survey would impose an unreasonable burden of questionnaire navigation on respondents. Door-to-door interviewing would be prohibitively expensive.

Once the questionnaire had been developed and tested, the survey was programmed into the WinCATI computer-assisted telephone interviewing software in English and Spanish. The survey was pre-tested in late July and mid-August, 2009. After final revisions and corrections to the survey programming, interviewing was conducted by trained, paid interviewers under direct supervision at CSR's in-house calling facility. A smaller portion of the interviewing was conducted by trained, paid interviewers under direct supervision at NSØN, Inc., Salt Lake City, UT, to speed the conclusion of the data collection phase of the project.

Respondents contacted by cell phone were offered a $10 gift card to either Target or Wal*Mart stores as partial compensation for any telephone charges incurred by participating in the interview. Telephone numbers were dialed automatically by the WinCATI computer system except for cell phones, which are manually dialed to conform to Federal telecommunications regulations.

Interviewing was conducted from August 28 to December 17, 2009. There were 2,657 total interviews collected for analysis (2,622 in English and 35 in Spanish).

The average length of the survey once a qualified respondent was selected was 29 minutes and the median length was 28 minutes. The estimated response rate for the survey was 16.8% for landlines and 12.2% for cellular telephones.

While the selection of the survey mode was fairly straightforward, creating survey content that would address the complex behavioral issues at hand and provide sound data for planning purposes was more complicated. A multi-step process was used.

## Instrument Development

### *Literature review*

CSR conducted a focused literature review on studies of evacuation behavior that seemed applicable to the NCR behavioral study. The review eventually included ten studies, with summaries of methods and findings. The review was useful in helping CSR survey researchers to get acquainted with the current state of research on the issues. A summary of the review was submitted for posting on the AHC web page.

### *Behavioral-focused workshop with grant participants*

A major impetus to the success of the questionnaire development and ultimately to the success of the study was to bring together representatives from the partner states and organizations. A workshop was convened in Charlottesville, Virginia on March 25, 2009.

The ambitious objective of the workshop was to gain concurrence on a broad outline of the questionnaire content for the 2009 survey. What were the pressing questions that a survey would answer? What level of geographic specificity would be needed? What event scenarios should be presented to survey respondents? What other variables should be included in the survey to help understand evacuation behaviors?

Of course, the workshop was also important in process terms because it helped to establish working relationships and aided continued communication among the survey researchers and the members of the other component teams.

Key decisions made as a result of the workshop included focusing on radiologic dispersion or dirty bombs and on anthrax events. Shelter in place and evacuation behaviors were of interest, particularly focusing on how people made a decision between the two possible choices.

The use of escalating hazard levels described in hypothetical scenarios was presented, providing minimal threat up to what could be considered a catastrophic level for some respondents

CSR issued a summary of the workshop and continued regular communication with the advisory team via periodic telephone conferences throughout the development of the questionnaire.

## Questionnaire design

The process for questionnaire design started with a conceptual outline of the topic areas that might be of interest to the team. A series of e-mails and teleconferences in spring 2009 refined the conceptual outline so that some areas were fleshed out in detail and others were dropped.

Shortly after the workshop the team decided to drop an anthrax scenario because it was too difficult to create one that would be plausible, accurate and simple enough to communicate to respondents in a telephone interview. Thereafter, dirty bomb scenarios were the focus of the survey.

Once the conceptual outline was ratified by the team, CSR developed a draft questionnaire. CSR's 2005 study of community shielding capacity in the NCR[1] was the source of some questions, while other questions came from other surveys or were developed especially for use in this survey.

The draft questionnaire went through several revisions with two main themes at its core: evacuation behavior modeling, and factorial scenario design.

## Evacuation behavior modeling

Research on evacuation behavior suggests that a multi-step process is involved as a person evaluates whether to stay or go in response to an event. These steps include evaluating the risk to one's property and safety, determining the status of family members and loved ones, seeking information to confirm initial reports of an event, judging the accuracy of the information that is available, and assessing the pros and cons of evacuating or sheltering in place. This process is iterative and the decision can change. People may bring to the process not only current information about the event, but also past experiences with events, disaster training they might have, self-perception about their role in the community, socio-economic or contextual or attitudinal attributes, and possibly many other factors.

The questionnaire needed to account for these various steps in the process of making the decision to stay or go.

## Factorial scenario design

In addition to the variables indicated by models of evacuation decision-making, it seemed obvious that attributes of the event itself would impact decisions to stay or go.

A factorial design emerged in which four aspects of the scenario would be randomly varied for the survey respondents so as to test the relative impact of each factor on the evacuation decision.

Whether prior warning of the event had been given varied across two choices: no prior notice, warning of the possibility of a nearby event, or prior warnings from terrorists coupled with dirty bombs having exploded in London and New York already.

The hazard level of the scenario varied across three levels: minimum, moderate and maximum intensity. These levels were determined by the number and proximity of dirty bombs to the respondent. Each respondent received two of the three possible scenarios to avoid undue repetition during the survey.

The location of the respondent varied across two choices: inside and at home, or inside a building but not at home.

The source of messaging about the event varied across four choices: the local emergency manager, the local fire chief, the local chief administrative officer, or the governor/mayor.

This design creates 48 different versions of the dirty bomb scenario.

In addition, because evacuation behavior was important to understand and because the official instructions in all scenarios would be for people to shelter in place, respondents who chose to shelter in place in response to both scenarios presented to them were asked about their evacuation behaviors if they were told by authorities that they had to evacuate.

## Focus groups

Once the questionnaire had been developed sufficiently, three focus groups were held to evaluate it. A group was convened in Fairfax, VA on the evening of Monday, June 15, followed by one during the afternoon on Thursday, June 18 in

[1] Monnica T. Williams, Gregory B. Saathoff, Thomas M. Guterbock, Anna McIntosh, and Robin Bebel. *Community Shielding in the National Capital Region: A Survey of Citizen Response to Critical Incidents.* Center for Survey Research, University of Virginia, June 2005. The study was funded by the Department of Homeland Security via a grant to George Mason University.

Washington, DC and the last one that same evening in Landover Hills, MD. Participants were randomly recruited from residents of the immediate areas in which each group was held, resulting in considerable ethnic diversity across the groups. About 12 people attended each group. Each participant received a $40 incentive as cash in a sealed envelope, plus $5 to cover the transportation costs of attendance.

It is critical to our understanding of potential behaviors in an emergency that we understand the needs and concerns of NCR residents. The three focus groups were an effective aid in making sure the final survey would be relevant to those living in the area and that the questions and answers they elicited were meaningful and unambiguous.

The participants completed a paper version of the survey but in the interest of replicating the telephone interview experience as closely as possible, the description of the fictitious scenarios to be considered was read aloud to them. Afterward, comments about the clarity, relevance to their lives and their ability to answer the questions in a meaningful way were solicited by the CSR/CRMES team.

The participants described the survey language as clear, relevant, and on a topic of significance. "Too long" seemed to be a universal comment, although "thought-provoking," "enlightening" and "important" were also offered. Edits were made to the questionnaire after the first group met, allowing subsequent comment on the new content.

The feedback of participants was effective in the refinement of the survey. Most issues with the questionnaire were related to the assumptions or parameters of the scenarios. Expanding answer choices and including some definitions (in particular, a better definition of the NCR) helped to clarify the intent of some questions. One very significant but unexpected finding was the reaction to the phrase National Capital Region. We were advised to change it because the phrase was not in common use. Members settled on Washington Metro Area, and that phrase was used in the last focus group in Maryland and in the production survey.

## *Questionnaire outline*

Table I-1 on the following page summarizes the contents of the final survey instrument.

**Table I-1: Overview of survey topics**

| | |
|---|---|
| **Community attachment and feelings about the community** | •Time lived in the community<br>•Willingness to live in the same community five years from now<br>•Home owners/renters<br>•Kind /description of place R lives in<br>•Feelings about the area and the people in the community<br>•Importance of living in that particular area<br>•Trust in People, local /state /federal government |
| **Household information** | •Children/teens/adults<br>•Anyone with a disability<br>•Number /type of pets |
| **Emergency Preparedness** | •Plans for what to do in an emergency<br>•Kits to use in an emergency<br>•Emergency meeting place<br>•Motivation to get/not to get prepared |
| **Different hazard levels, source of information and location** | •Perception of risk<br>•Stay-in-place detail<br>  •Duration of remaining at the location<br>  •Reasons to leave the location<br>•Stay leave decisions under different conditions<br>•Evacuation detail<br>  •Reason to evacuate<br>  •Number/type of motor vehicles<br>  •Destination<br>  •Location/description of the destination<br>  •How to get to the destination<br>  •Miles/ hours to destination<br>•Use/ not use designated emergency route |
| **Expected Services** | •Patrolling neighborhoods<br>•Providing information<br>•Giving out food/water/ ice<br>•Providing places to decontaminate/wash out radioactive dust<br>•Providing traffic control<br>•Providing lifesaving or safety supplies |
| **Education efforts** | •Effective ways of informing public to help getting prepared for emergency events |
| **Sources of info channels & people** | •Info sources R would consult in case of terrorist attack<br>•Trustworthiness of information sources |
| **Confidence in utilities and services in case of an emergency** | •Transportation/gas/electricity/water/cell phone/internet/TV/health care/mail etc |
| **Prior experience** | •Events where R had to stay in place<br>•Events where R evacuated<br>•Follow up questions if either is 'yes'<br>  •Time of the event<br>  •Type of event<br>  •Emergency kit usage in case of the event<br>  •How badly R is affected from the event compared to his/her community<br>•Confidence in community's ability to manage a terrorist attack |
| **Demographics** | •Age, sex, languages spoken etc. |

### *Sample design*

The telephone sample for the Survey of Behavioral Aspects of Sheltering and Evacuation in the National Capital Region included three types of telephone numbers. Cell phone numbers were included to increase representation from groups that would otherwise be under-represented. To balance the added cost of the cell phone surveys, the sample was augmented by numbers taken randomly from directory-listed numbers. Listed sample is less expensive to administer because the proportion of numbers that ring in eligible households is much higher and time does not need to be devoted to screening out ineligible or non-working phone numbers. The sample also included random-digit dialing (RDD) numbers that were selected from landline telephone exchanges valid in the target geography. Including this sample is more expensive to administer but is the only way to contact unlisted households. A total of 30,824 telephone numbers were attempted during the calling effort. All samples were purchased from Survey Sampling, Inc. of Fairfield, CT, a commercial sampling company that uses state-of-the-art methodologies.

### *Pretesting and data collection*

CSR conducted a telephone pretest to test the clarity of the questionnaire on the telephone, verify the length of the instrument, and check the integrity of the WinCATI programming. Pretests are intended to follow the protocol for the data collection as closely as possible, to reveal any unforeseen problems. Findings may indicate an adjustment to procedures may be necessary to fulfill expectations. It is also possible for the pretest to indicate the need for altering either the projected outcome or the project budget.

The initial pretest, from July 26-28, confirmed that the instrument was too long, just over 37 minutes on average. The target length was 25 minutes. The number of completions per hour (0.67) was also lower than the expected (0.83), which would be at least partially explained by the increased time it took to conduct an interview. Interviewers offered constructive suggestions for wording changes and posed thoughtful questions based on their experience. Researchers were able to streamline some areas of the script, offer helpful prompts and make some cuts to the script based on interviewer feedback and the findings from analysis of the collected data. The revised instrument was reviewed by the project's survey committee and returned to active data collection on August 14. Although the completions per hour remained lower than the budgeted numbers, the length of the interview was judged to be acceptable and this version of the survey, with minimal editing, was sent to production interviewing on August 26, 2009. Details about the production interviewing can be found in Appendix B – Survey Methodology.

## Weighting

For various reasons, survey datasets are often statistically adjusted to better reflect the population under study. This adjustment is called weighting the data. One reason for weighting is that surveys tend to underrepresent people with lower levels of education and income, those who are more transient, and those who are minorities. Sometimes other demographics are underrepresented depending on the survey topic and population being studied. Weighting brings the demographics of the respondents into line with known parameters for the population.

Another reason for weighting is that surveys are often conducted using samples that are deliberately drawn disproportionately to ensure adequate numbers of respondents from rare populations to support data analysis. Weighting is used to reverse the disproportionate sampling so that overall totals from the survey data are unbiased.

Weighting can also be used to account for different rates of response from groups who answer the survey questions differently, but this is done infrequently (beyond any such effect realized from demographic weighting) because it requires knowing information about survey nonrespondents from data contained in the sampling frame or obtained from follow-up data collection efforts.

The Survey of Behavioral Aspects of Sheltering and Evacuation was weighted on the type of telephone used by the respondent to participate in the survey, gender, county, and home ownership.

### *Margin of error*

The margin of error for a question answered by all respondents is +/- 2.29%. The margin of error will be higher for questions answered by subgroups of respondents, which is particularly important to note in a survey with a factorial design.

Surveys are subject to sources of error other than sampling error that are difficult or impossible to measure. Survey results should be used with that fact in mind.

## Stakeholder/Partner Interviews

In November 2010, interviews were conducted to characterize the particular interests of the research partners and for results of the behavioral study. There are five research partners: (i) Resource Management, (ii) Public Preparedness, (iii) Modeling & Simulation, (iv) Mass Care, and (v) Transportation. The interviews were conducted by telephone and summarized in qualitative form to guide the production and application of survey findings as inputs to the five partner programs.

## Project Milestones

The milestones of the behavioral study, including significant interaction and liaison with the several research partners of the All-Hazards Consortium, are summarized in Table I-2.

**Table I-2: Milestones of the study**

| Date | Milestone |
|---|---|
| Dec 2008-Feb 2009 | Refine scope of work |
| Mar 2009 | Workshop with research partners |
| Mar-Apr 2009 | Development of conceptual outline and draft questionnaire |
| Jun 2009 | Three focus groups |
| Jun-Jul 2009 | Final survey outline, revised questionnaire and feedback |
| Aug 2009 | Telephone pre-test results and feedback |
| Sep 2009 | Fielding of survey |
| Sep 2009 | Preliminary frequencies |
| Oct 2009 | 1,000 survey completions |
| Nov 2009 | 1,600 survey completions and summary report |
| Nov 2009 | Interviews of research partners |
| Dec 2009 | 2,500 completions, preliminary report |
| Jan 2010 | Presentations with research partners |
| Feb 2010 | Draft final report and feedback |
| Mar-Apr 2010 | Final report |

## Summary

The 2009 Survey of Behavioral Aspects of Sheltering and Evacuation in the National Capital Region is a rich, useful source of behavioral data to aid planning for a regional response to catastrophic events. The initial project goals were met successfully. This report describes the results of a remarkable effort and the initial applications of the data. However, the applications for the results of the Survey of Behavioral Aspects of Sheltering and Evacuation will no doubt expand from those currently envisioned and underway.

# II. Community Attachment and Demographic Characteristics

Respondents were drawn from eight main jurisdictions in the Washington Metropolitan Area. Just under half (46.0%) of the respondents live in Virginia, with most (22.4% overall) living in Fairfax County, Fairfax City, or Falls Church. Others from Virginia reside in Arlington County, Alexandria City, Loudoun County, Prince William County, and the cities of Manassas and Manassas Park., Maryland residents, from either Montgomery County or Prince Georges County comprise another 38.1 percent of respondents. The remaining 15.8 percent live in the District of Columbia.

## Community Attachment Indicators

A sense of community can be helpful both in preparing for emergencies and responding to them. The researchers attempted to assess respondents' attachment to their community through several questions, starting with the length of residency.

Over half (58.1%) of respondents had lived in the Washington Metropolitan Area for 20 years or more. However, only 27.6 percent had lived in their current community for that long. Still, many respondents were new to the area, with 15.2 percent moving to this area within the last five years, and 35.0 percent moving to their current community in that time. Of those who had a preference, nearly three-quarters (73.1%) wanted to be living in their community five years from now.

Respondents were queried specifically about their attachment to their community by asking about their agreement with a set of three statements:

> *"I feel at home in the area where I live"*
>
> *"I feel I have a lot in common with the people who live in this community"*
>
> *"It is very important to me to live in this particular area"*

Respondents rated each statement on a scale from 1, strongly disagree, to 5, strongly agree. Nearly seventy percent (69.8%) of respondents *strongly* agreed that they feel at home in the area and another 22.6 percent *somewhat* agreed, totaling 92.4 percent of people who agreed that they felt at home. The high percentage of respondents agreeing with the statement was reflected in the mean rating of 4.6 out of 5.

In comparison, 78.6 percent felt they had a lot in common with the people who lived in the community (an average rating of 4.0), and 62.4 percent felt it was important to live in this particular area (mean = 3.7). For those two statements, approximately equal numbers of people strongly and somewhat agreed with the statements.

### *Community attachment index*

A community attachment index was created by combining the answers to the previously mentioned questions. The primary contribution to the index was how many of the community-oriented statements discussed above the respondent agreed with, either strongly or somewhat. The index also encompassed whether they had lived in the Washington metropolitan area for more than 10 years, and if they wanted to stay in the area for at least five years.

This measure allows the comparison of overall community attachment by various demographic factors. For instance, the area with the highest community attachment ratings was Arlington County, VA.

The longer the respondent had lived in the Washington Metropolitan area or their community, the more "at home" they felt and the more they felt like they had a lot in common with others in the community. Similarly, those who owned their home, were married, had greater educations and incomes, and those in older age groups were more attached. The people who had lived in their community for 20 years or more were significantly more likely to say it was important to them to live in the community than any other group.

## Social Network

### *Community participation*

Participation in community gatherings, such as volunteering and religious activities, is one way that information about preparedness can get transmitted. It also exposes people to a variety of different people and circumstances that may prompt them to make better preparations.

More than half of respondents reported attending local religious services, meetings or ceremonies. Of the 60.5 percent who had, almost half (46.0%)

reported going once per week. About fifteen percent (14.6%) reported going more than once per week or daily, and approximately the same number (15.1%) reported going a few times per year or less. The remaining 24.4 percent of respondents who did attend religious activities reported going once or twice a month.

Nearly two-thirds of respondents indicated they had volunteered within the past twelve months. Of the 61.4 percent who had, about half had contributed six or more hours per month on average. Specifically, over a quarter (26.3%) had contributed their time more than ten hours per month and another quarter (21.8%) had contributed six to ten hours per month. In addition, approximately a quarter of respondents (26.0%) had volunteered for two hours or less a month, with the remaining quarter (25.8%) giving between three and five hours a month.

### *Trust*

Trust is an important component of any government effort and a significant factor in a coordinated response to an emergency. As a measure of the tendency of the general population's inclination to believe messages they may get, a basic question about trust was asked first:

> *"Generally speaking, do you think that most people can be trusted or that you can't be too careful in dealing with people?"*

Then, respondents were asked how much of the time they thought they could trust their local, state, and federal government to do what is right.

Just about half of respondents (49.4%) stated that, in general, they believe they can trust other people. Similarly, about half of respondents said they could trust their local and state government to do what was right most of the time or just about always. However, only 44 percent said they could trust the federal government to do what was right most or all of the time. Not surprisingly, those who said they trust others in general were more likely to trust the government, but the associated demographic factors sometimes differed.

Greater age, education, and income were associated with more general trust, as was being of White or Asian race, being married, male, or having served in the US military. Those with children were more trusting of state and federal government than others. Asian respondents trusted all levels of government more than others. Interestingly, those who volunteered 11 or more hours a month were less trusting in general than other volunteers.

Virginians were more likely to trust others in general than residents of DC or Maryland. Residents of DC trusted their local government less but the federal government more, the opposite of those mean responses which prevailed among Virginia and Maryland residents. Those who lived in urban and suburban areas were more trusting of all levels of government than those who lived in rural areas. Those who would opt to stay at their location in the max-min hazard scenario were also more trusting in general.

### *Places to stay*

One of the issues that must be resolved when deciding to evacuate is where to go. Thus, respondents were asked if they had family or friends outside the metro area that they could stay with. Over 90 percent (90.3%) said they had such a place to stay; most of those locations were in suburban (41.0%) or urban (22.1%) areas.

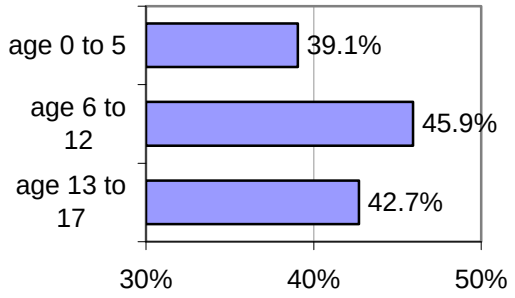
## Special Population Considerations

There are some in the general population who would require extra help in an emergency situation. In an effort to be better prepared to assist this group, researchers were particularly interested in how many residents would need aid and what type of assistance would be required.

### *Children*

About thirty-five percent (35.4%) of respondents reported that there were children under age 18 in the household. Over four-fifths (81.1%) of those households had one or two children (28.7% overall) and the remaining 18.9 percent had three or more. Children under age six often represent a particular challenge. Of the households with children, 39.1 percent had children age 5 or younger. Thus, 14.5 percent of all respondents had children under age six in their household.

**Figure II-1: Ages of children**




### *Pets*

Pets would also make evacuation more challenging. Over forty percent (41.1%) of households had pets. The most common pets were dogs (64.9%) and cats (42.9%). The next most commonly mentioned pet was fish (6.5%). There were a variety of other animals mentioned including snakes and lizards, birds, and many types of small mammals.

### *Family members with special needs*

Other members of a family may also have special needs. Thus, respondents were asked:

> *"Do you or anyone in your household have any of the following conditions that might limit the ability to wait out or evacuate from an emergency?"*

The question specifically asked about all residents of the household, knowing that one member with challenges would most likely affect everyone's response to an emergency. Respondents were offered some fairly broad categories of infirmity and could choose as many categories as were applicable to them, as well as list other things that could hamper their ability to wait out an emergency or evacuate.

Nearly half of all respondents (48.2%) reported that someone in their household took some kind of prescription medication. However, aside from needing medication, less than a quarter (22.6%) reported that someone in their household had a different kind of medical or physical condition. Included in that figure is the 14.6 percent who mentioned one disability and the 8.0 percent who mentioned multiple conditions that might limit the ability to wait out or evacuate from an emergency.

The most common infirmities, mentioned by 14.9 percent of all respondents, were physical, including conditions that limited walking, climbing, reaching, lifting, carrying, or driving. Difficulty breathing (7.8%), difficulties learning, remembering, or concentrating (6.9%), and severe vision or hearing impairment (4.1%) rounded out the specific choices. Respondents had the opportunity to add other things that could hamper their ability to wait out an emergency or to evacuate; the non-categorized responses are listed verbatim in Appendix E.

### *Local relatives*

When relatives live close by, people may attempt to coordinate efforts in an emergency. Less than one fifth (18.6%) of respondents had close relatives within walking distance.

## Subgroup Analysis

### *Variables used in subgroup analysis*

The responses to each survey question were broken out and analyzed by several demographic categories. In discussing the results, we report those instances in which relevant *statistically significant* differences were found among demographic subgroups, such as, for example, between women and men, or between residents of different parts of the region. (Statistically significant differences are those that probably did not result merely from sampling variability, but instead reflect real differences within the National Capital Region's adult population.[2]) The demographic variables listed below were those principally used in our subgroup analysis. In some cases, categories were combined to facilitate comparison.

- Age. Age was divided into five categories for most analyses: 18-25; 26-37; 38-49; 50-64; and 65 or older.

- Education level. Comparisons were made between persons with a high school diploma or less; some college; four-year degrees; some graduate work; and advanced graduate degrees, including professional and doctorate degrees.

[2] Throughout this report, only those differences that reached statistical significance to the degree of $p<.05$ (a 95 percent level of confidence) will be discussed.

- Military service. Respondents who were currently serving or who had once served in the military were compared with those with no military service.

- Volunteer service. Comparisons were made between persons who engaged in four different levels of volunteer service: 2 hours or less per month; 3-5 hours per month; 6-10 hours per month; and 11 hours or more.

- Religious service attendance: Comparisons were made between persons who attended religious services in five different categories, by frequency: more than once per week; once per week; twice per month; once per month; and less than once per month.

- Marital status. Respondents presently married were compared with those in two other categories: single (or "never married"); and "other." (The "other" category includes separated, divorced, and widowed).

- Family status. We compared persons with children under 18 years of age in the household with all others.

- Work status. Persons in the labor force working full-time were compared with those working part-time; looking for work; homemakers; retirees; students; and "other."

- Employment type. Four categories of employment were compared: private sector; not-for-profit; government; and self-employed (including agricultural).

- Household income. Five categories of self-reported annual household incomes were compared: Less than $35,000; $35,000 - $49,999; $50,000 - $74,999; $75,000-$149,999; and over $150,000.

- Vehicle ownership. We compared respondents as automobile owners, in five categories by the number of vehicles owned: zero; one; two; three; and four or more.

- Homeowner status. We compared homeowners with renters.

- Residence type: We compared residents living in single family homes with three other categories: those living in townhomes or duplexes; those living in apartments or condominiums; and those in "other" residences.

- Length of local residence: Respondents were compared by the length of time in years in which they have resided, first in the greater Washington, D.C. area, and secondly, in the community where they currently reside. In each case, respondents were compared by four categories: less than two years; 3-10 years; 11-19 years; and 20 years or over.

- Race/ethnicity. Whites, Blacks, Asians, and "others" were compared. Hispanic respondents were also compared with non-Hispanic respondents. Three separate questions in the interview ask about race and ethnicity. Respondents are first asked if they consider themselves to be "of Hispanic origin." They are then asked to say what category of race "best describes you," using a list that does not include Hispanic as a race. This follows the definition in the U.S. Census, which considers Hispanic to be an ethnic category and makes clear that Hispanics can be of any race. However, many Hispanic respondents take a different view and when asked to state their "race" insisting that they are Hispanic (or Latino). These respondents are classified in our survey as "other race" on the race question. As a result, the majority of those labeled "other race" in the report are actually self-identified Hispanics. In addition, a question asking if they consider themselves to be of Middle Eastern origin or from a predominately Muslim origin was asked.

- Gender. Women were compared with men.

- Geographic area. We compared respondents under three broad geographical sub-groupings:

  1) by state (Virginia; Maryland; and Washington, D.C.);

  2) by eight county or city categories (Arlington, VA; Alexandria, VA; Washington, D.C.; Fairfax County-Fairfax City-Falls Church, VA; Loudoun County, VA; Prince William

County-Manassas-Manassas Park, VA; Montgomery County, MD; and Prince George's County, MD); and 3) by community type (urban; suburban; small town; and rural).

- Emergency preparedness variables. We also compared respondents in two broad categories connected more directly to the hypothetical emergency situation and their preparedness for such a situation. We first compared respondents by whether or not they have already prepared an emergency plan, kit, or meeting place. Secondly, we compared them by their location at the time of the hypothetical emergency—either at home or at some other place (usually their workplace).

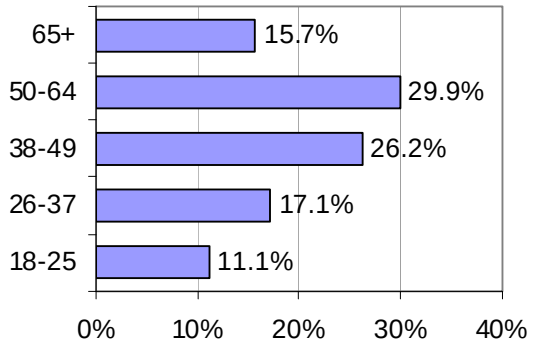
## *Demographic profile*

Respondents were asked questions about themselves and their households to allow for data analysis by personal and social characteristics.

As is often the case, more than half of respondents in the weighted data set were female (52.1%). The remaining 47.9 percent were male.

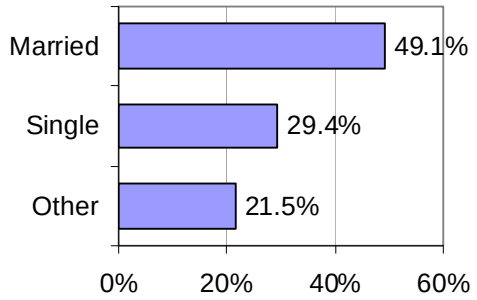
The distribution of age for the respondents was also typical, with over half being ages 38 to 64. As Figure II-2 illustrates, 11.1 percent of the respondents were in the youngest age category of 18 to 25 years old, 17.1 percent were 26 to 37, 26.2 percent were 38 to 49, 29.9 percent were 50 to 64 years of age, and 15.7 percent were 65 and older.

**Figure II-2: Age of respondents**



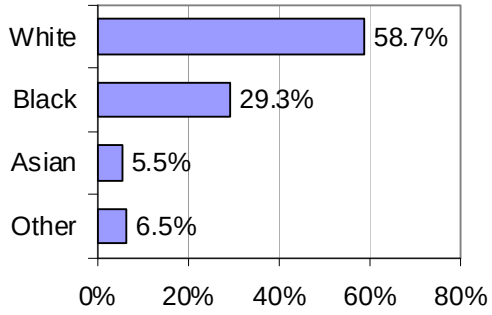

Nearly half of respondents were married (49.1%), 29.4 percent were never married, and the rest (21.4%) were separated, divorced or widowed (see Figure II-3).

**Figure II-3: Marital status of respondents**



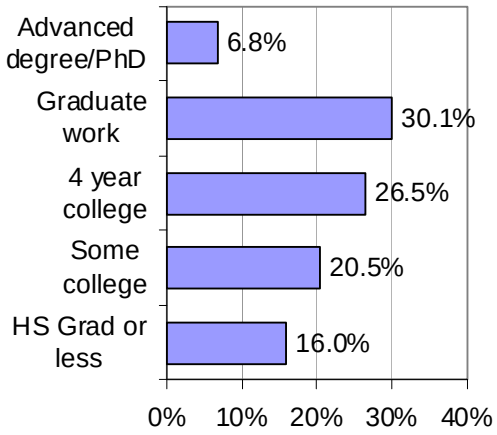

Respondents were asked (in separate questions) what race they considered themselves to be and whether they considered themselves to be Hispanic. As Figure II-4 shows, the majority of respondents, 58.7 percent, identified themselves as White. Another 29.3percent were Black or African American, 5.5 percent Asian, and 8.5 percent were something else (i.e., Native American, Pacific Islander, etc.). Only 6.5 percent of respondents of any race identified themselves as Hispanic. Two percent considered themselves to be of Middle Eastern origin or from a predominantly Muslim culture.

**Figure II-4: Race of respondents**



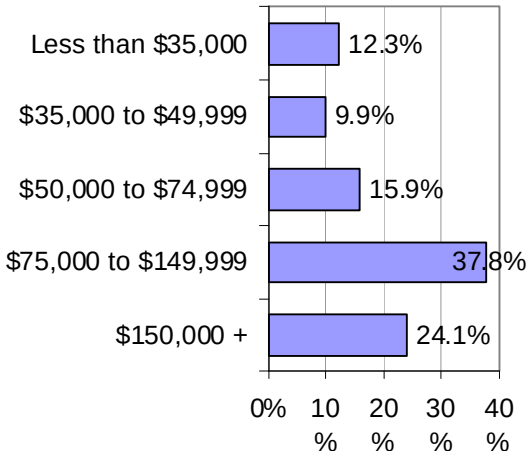

With respect to education, respondents were asked to report their highest level of academic achievement. As illustrated in Figure II-5, 16.0 percent were high school graduates or less. About one-fifth (20.5%) of the respondents had attended some college, whereas 26.5 percent had graduated from a 4-year college. More than one-third (36.9%) of respondents had engaged in graduate work, with 6.8 percent having earned an advanced degree.

**Figure II-5: Education level**



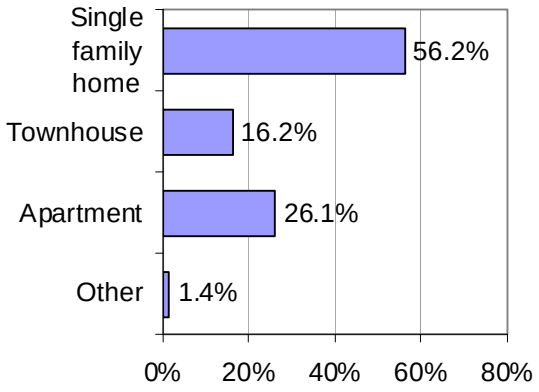

As Figure II-6 shows, the median annual household income reported was between $75,000 and $150,000. Over twelve percent (12.3%) of the sample reported household incomes under $35,000, 9.9 percent fell into the $35,000 to $50,000 range, 15.9 percent fell into the $50,000 to $75,000 range, and almost one-fourth (24.1%) of the sample reported income over $150,000.

**Figure II-6: Household income**



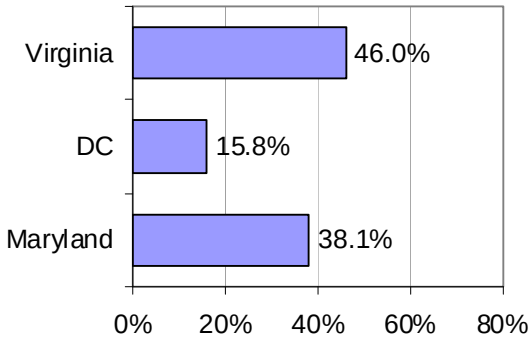

Nearly two-thirds (65.8%) of the respondents reported owning their own home, whereas 34.2 percent reported renting or some other type of living arrangement. As shown in Figure II-7, over half (56.2%) of the respondents lived in a single family home, 16.2 percent lived in a duplex or townhouse, 26.1 percent lived in an apartment or condominium, and 1.4 percent lived in some other type of dwelling.

**Figure II-7: House type**



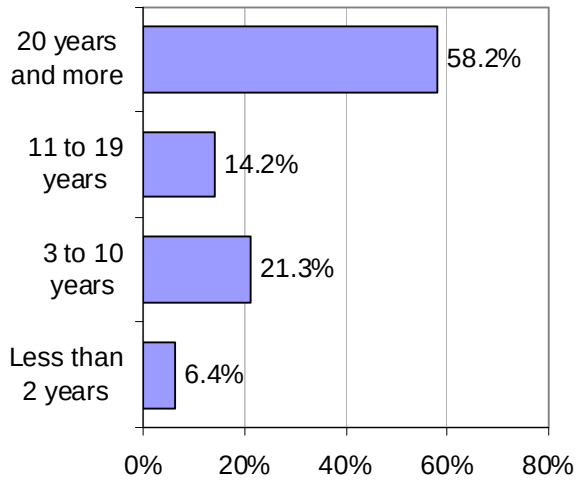

With regard to state, 46.0 percent of the respondents lived in Virginia, 15.8 percent lived in Washington, D.C. and 38.1 percent lived in Maryland.

**Figure II-8: State distribution**



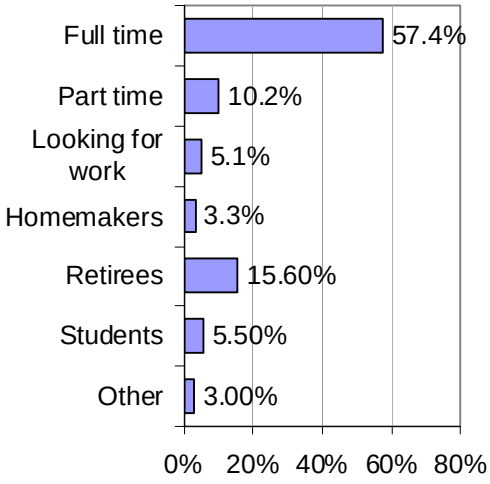

More than half (58.2%) of the respondents reported that they have lived in the Washington Metropolitan area twenty years or more. About six percent (6.4%) of the respondents have lived in the area less than two years, 21.3 percent have lived in the area 3 to 10 years, and 14.2 percent have lived in the area 11 to 19 years (see Figure II-9).

**Figure II-9: Length of residence in the Washington Metropolitan Arena**



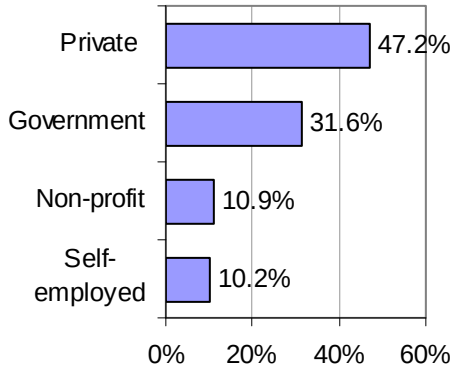

The majority (57.4%) of respondents were working full time, with another 10.2 percent working part time (see Figure II-10). Those who are unemployed but looking for work, students, or temporarily laid off or disabled were designated in the workforce and represented 11.7 percent of the sample. The 20.8 percent of respondents who described themselves as a homemaker, retired, permanently disabled, or any other work status were considered to be out of the workforce.

**Figure II-10: Employment**




As seen in Figure II-11, almost half (47.2%) of working respondents work for a private company and almost a third (31.6%) work for federal, state, or local government. About ten percent each work at a non-profit (10.9%) or are self-employed (10.2%). Respondents were also asked about military service. Current or former members of the military represent 15.6 percent of the respondents.

**Figure II-11: Job type**




## *Impact of cell phone users*

A representative sample should allow contact with a balanced cross-section of the target population, and require minimal adjustment of the final results to appropriately reflect the entire population.

General population surveys have traditionally been conducted using the random digit dialing (RDD) method to contact respondents. RDD samples have the advantage of being the only way to include unlisted land line numbers and for that reason have always been considered the "Gold Standard" way to include all segments of a population. But it is evident that the growth in the use of cell phones in recent years has increasingly been affecting the representation of certain demographic groups.

A pilot study of cell phones, funded jointly by CSR and by Prince William County, VA, was fielded by CSR in January-February 2008.[3] This pilot study demonstrated that the demographics of those reached via cell phone are quite different from those currently reachable via landline phone. Cell phone respondents are markedly younger, more likely to be single and never-married, more likely to be renters, newcomers to the area, low-income, and members of minority groups, especially African-Americans or Hispanics.

A solution is to sample cell phone users in addition to landline phone users. This inclusion of cell phone users has allowed CSR to reach and

[3]Abdoulaye Diop, Young-Il Kim, John Lee Holmes, and Thomas M. Guterbock. *Prince William County Cell Phone Pilot Survey [A Supplement to the 2007 Citizen Satisfaction Survey]: Summary Report of Results.* Center for Survey Research, March 2008.

interview younger respondents at a rate that more closely approximates the number of younger respondents in the NCR, as recorded in the 2000 Census and the 2008 American Community Survey conducted by the Census Bureau.

The inclusion of other groups of interest was also favorably affected by this new method. Cell phone users are more likely to be male, to be less educated, and to have a lower income or to be part of a minority. Examples of these effects are shown in Figure II-12 and Figure II-13, where the distributions of respondent age and race are separated by the method used to contact them.

To balance the added cost of this method, the sample was augmented by numbers taken randomly from directory listings. A listed sample is cheaper to administer because the proportion of numbers that are eligible households is much higher and time does not need to be devoted to screening out ineligible or non-working phone numbers. While RDD remained a significant part of the sample, the proportion of numbers sampled that way was reduced to accommodate the directory listed and cell phone samples.

By design, four-fifths of the interviews were conducted using a landline phone and one-fifth were from a cell phone. Of those who used a landline for the interview, 88.4 percent did have a personal cell phone. Among those completing the survey on a cell-phone, about half (47.6%) used their phone for both personal and business matters and more than half (65.8%) also had a regular telephone at their home. Notably, 33.9 percent of those interviewed via cell-phone did not have a land-line, which grew to 58.9 percent among those aged 26 to 37.

**Figure II-12: Age by phone sample type**

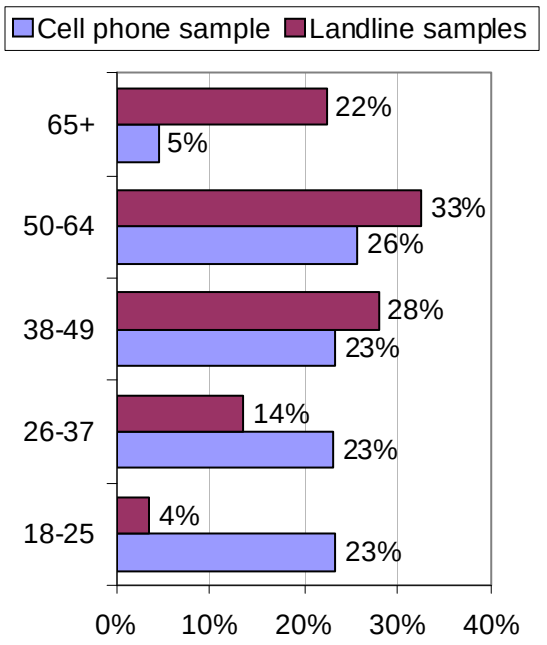
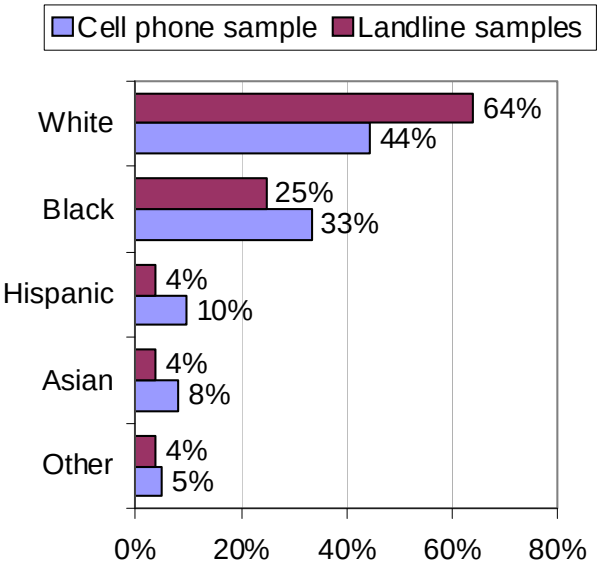



**Figure II-13: Race/ethnicity by phone sample type**



# III. Public Response to a Dirty Bomb Attack

At the heart of the Behavioral Response survey is a series of hypothetical scenarios or 'vignettes' that were read aloud to the respondent. Each of these described a scenario in which a Radiological Dispersion Device (RDD), referred to in the interview as a 'dirty bomb,' is detonated at a specified location. For each scenario, respondents were asked a series of questions about how they would perceive the incident, and whether they would respond by sheltering in place or by evacuating. Additional questions were then asked to gather further detail about their decision and plans, either for sheltering or evacuating. Each respondent was asked to respond to two scenarios, with the second scenario involving a higher level of hazard than the first.

## How the Scenarios Were Varied

The scenarios were systematically varied among the survey respondents in a full factorial design that allowed several different factors to vary independently of one another across the different scenarios. Four factors were varied in the survey: (1) whether or not terrorist groups had given advance public notice of the attack, (2) the level of hazard in the scenario, (3) the location where the respondent was asked to imagine themselves at the time of the incident, and (4) the source of information and shelter-in-place instructions.

Table III-1 summarizes the four factors and shows their levels. The factors were varied as follows:

*Notice:* In the 'notice' scenarios, respondents were told: "Please imagine that three days ago in London a bomb exploded and was confirmed to be a dirty bomb, and two days ago a bomb exploded in New York and was also confirmed to be a dirty bomb. Yesterday (insert message source) reported that the threat level in the National Capital Region area was raised to the highest level." In the 'no-notice' scenarios, no such introduction was given, so that the detonation of a bomb in the DC area was the first indication of an emergency.

*Hazard level and path:* Three levels of hazard were described in the scenarios. For the full wording of each scenario, see the questionnaire script in Appendix A.

- In the 'minimum' hazard level, respondents are asked to imagine that a single dirty bomb has gone off at a location far away from them. (For respondents in Virginia, the distant location is College Park, MD. For those in Maryland, the distant location is Tyson's Corner, VA. For those in DC, the distant location is Tyson's Corner, VA. The danger posed by radioactive dust is described. Residents of the area near the blast have been told to shelter in place, and a state of emergency has been declared for that area, but no instructions have been issued for the area where the respondent is located. The wind is blowing away from the respondent's location.

- In the 'moderate' hazard level, a single dirty bomb has gone off one mile away from the respondent's location. The danger posed by radioactive dust is described. The wind is blowing toward the respondent's location. Authorities have declared a state of emergency and instructed all those in the area to take shelter at home or in a building for 48 hours or until an "all clear" has been given.

- In the 'maximum' hazard level, multiple dirty bombs have gone off in the region, including one a mile away from the respondent's location. As in the moderate scenario, the wind is blowing toward the respondent's location and authorities have instructed all those in the area to shelter in place.

Since each respondent was asked to respond to only two scenarios, the sequence of hazard levels was set to follow one of three paths:[4]

- Path 1: Minimum scenario followed by moderate scenario

- Path 2: Minimum scenario followed by maximum scenario

- Path 3: Moderate scenario followed by maximum scenario

[4] The scenarios, of which over 5,000 were tested, can be sorted into three hazard levels. The respondents (some 2,500 persons) can be sorted according to which path they were assigned. Scenarios at each hazard level can be sorted onto two out of the three possible paths. For example, the minimum hazard level was asked only in paths 1 and 2.

**Table III-1: The four scenario factors**

| **(1)**<br>**Notice**<br>No notice/Notice<br>(2 levels) | **(2)**<br>**Hazard Levels**<br>Pair of Levels given / Path taken<br>(3 levels) | **(3)**<br>**Location**<br>Respondent's location<br>(2 levels) | **(4)**<br>**Source**<br>Source of message<br>(4 levels) |
|---|---|---|---|
| No notice | Min → Mod<br>*Mod with follow-up wording* | Home | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | | Work / other bldg | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | Min → Max | Home | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | | Work / other bldg | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | Mod → Max<br>*Mod with starter wording* | Home | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | | Work / other bldg | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| Prior Notice<br><br>*Please imagine that three days ago in London a bomb exploded and was confirmed to be a dirty bomb, and two days ago a bomb exploded in New York and was also confirmed to be a dirty bomb. Yesterday (insert message source) reported that the threat level in the National Capital Region area was raised to the highest level.*<br><br>*Now please imagine that today, when you are [FACTOR3: location] … [continue with scenario wording]* | Min → Mod<br>*Mod with follow-up wording* | Home | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | | Work / other bldg | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | Min → Max | Home | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | | Work / other bldg | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | Mod → Max<br>*Mod with starter wording* | Home | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |
| | | Work / other bldg | Local emergency manager<br>Local fire chief<br>Local chief administrative officer<br>Governor/mayor |

To avoid repeating scenario features unnecessarily, the description of the moderate scenario was slightly abbreviated when it was presented in Path 1 as the second scenario, and the maximum scenario was similarly abbreviated since it was always presented second.

*Location:* Some respondents were asked to imagine that they were at their home on a weekday afternoon when the incident occurred. The questionnaire asked respondents to indicate the county or city of their residence, as well as its 5-digit ZIP code. Other respondents were asked to imagine themselves to be at a non-home location. The alternate location was determined by asking respondents about their employment status. Those who were employed (full- or part-time) were asked if they work indoors. Those who work indoors were asked to imagine that they were at their workplace on a weekday afternoon when the incident occurred. (If the respondent said they work at night, they were asked to just imagine that they were at work during the afternoon). Those who were not employed and those who worked outdoors were asked to imagine that they were at some building (not in their neighborhood) when the incident occurs. Respondents were asked to state whether their non-home location was in DC, Maryland, or Virginia.

*Source:* The information about the hazard and the instructions to shelter in place could come from one of four different sources:

- The local emergency manager
- The local fire chief
- The local chief administrative officer, described in the scenario as 'a top local official'
- The Governor of the state (for those located in Maryland or Virginia) or the Mayor of DC (for those located in DC).

With two levels of notice, three levels of hazard, two types of location and four information sources in the factorial design, there were 48 possible scenarios ($2 \times 3 \times 2 \times 4$) to present. These were randomly distributed across respondents, with the restriction that the notice, location, and source factors were fixed for each respondent, with only the hazard level changing as the respondent moved through the assigned path from the first to the second scenario considered. A total of 5,212 scenarios were thus presented to the respondents. The three paths were not assigned in equal thirds across all respondents; instead, a somewhat higher proportion were assigned to the no-notice version of path 3, in which the moderate hazard was presented as the first scenario. This was to ensure a sufficient number of cases for comparison with the 2005 "Community Shielding" survey, which tested only the moderate scenario on a sample of NCR residents and did not include any advance notice of the event.

Table III-2 shows how many times each of the scenarios was tested in the survey.

**Table III-2. Number of respondents in each condition**

| **Four Factors:** *(48 conditions)* | | **(4) Source of the announcement messages:** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Local emergency manager | | Local fire chief | | A top official | | Governor or DC Mayor | |
| **(3) Location** *when the event occurs* | **(2) Hazard levels** *received by respondent* | **(1) Does respondent receive prior notice for their scenarios?** | | | | | | | |
| | | Prior notice | No notice | Prior notice | No notice | Prior notice | No notice | Prior notice | No notice |
| At Home | Minimum to Moderate | 77 | 64 | 92 | 68 | 96 | 95 | 127 | 106 |
| | Minimum to Maximum | 58 | 89 | 103 | 103 | 101 | 101 | 96 | 68 |
| | Moderate to Maximum | 111 | 271 | 64 | 208 | 104 | 207 | 97 | 290 |
| At Work *( or other building specified by respondent )* | Minimum to Moderate | 85 | 61 | 89 | 103 | 58 | 93 | 76 | 85 |
| | Minimum to Maximum | 100 | 76 | 85 | 97 | 78 | 111 | 63 | 88 |
| | Moderate to Maximum | 97 | 212 | 103 | 168 | 95 | 139 | 87 | 166 |

Each scenario was presented to the respondent in a detailed narrative that was read by the interviewer. One question was inserted into the narrative during the reading of the first scenario: Respondents were asked whether they already knew what a dirty bomb was before this survey. Before asking what the respondent would do, the questionnaire asked (for the first scenario presented) how much they worry about such an incident. For all scenarios, respondents were asked about their perception of the risks the bombing(s) would pose to them or their household. The respondent was next asked where he or she would turn for information about the situation as it was happening. The respondent was asked whether he or she would shelter in place in this situation. A series of questions followed for respondents who said they would stay in place, and a different series of detailed questions followed for those who said they would evacuate. This chapter reports on the scenario questions and the shelter-in-place details. Evacuation behaviors are reported in the next chapter.

## Public Knowledge of A Dirty Bomb

At the first mention of a "dirty bomb" in the first scenario presented to the respondent, we gave a definition:

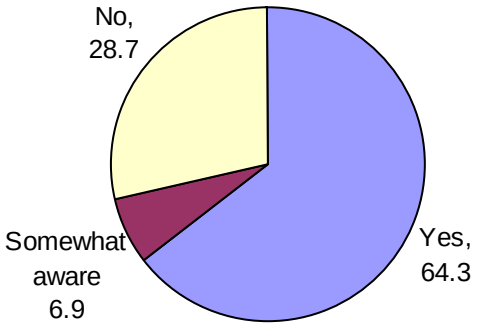
> *A dirty bomb is not an atomic bomb, but an ordinary bomb that has radioactive material mixed in it, so the explosion spreads radioactive material on the ground and into the air.*

We then asked: "Before today, did you know the *difference* between a "dirty bomb" and an atomic bomb?" As seen in Figure III-1, about two thirds of the respondents (64.3%) said they had already known what a dirty bomb is, 6.9 percent said they were somewhat aware of the concept, and the rest said they had not known what it is.

Men rated their prior knowledge of dirty bombs significantly greater than women. On a scale from 1, meaning no prior knowledge, to 3, meaning definitely aware, the mean rating from males was 2.58, but only 2.15 for females. There were also racial differences: the mean for Whites was 2.57; greater than for Blacks (2.06), Asians (2.10), and those identifying themselves as members of other races (2.08).

Awareness of a dirty bomb was a little higher when respondents were first read the moderate scenario (a dirty bomb detonating one mile away) than when they were first read the minimum scenario (a distant detonation); 73 percent were definitely or somewhat aware of what a dirty bomb was in the moderate scenario, compared to 69 percent who heard the minimum scenario.

**Figure III-1: Prior awareness of a 'dirty bomb.'**




## Perceptions of Personal Risk

After each scenario was read, respondents were asked two related questions about risk:

> *What is your perception of the risk of property damage to the place where you live from this event?*
>
> *What is your perception of the risk of death or serious injury to you or members of your household from this event?*

For each of these questions, the respondents could answer that the hazard posed 'no risk,' 'little risk,' 'high risk,' or 'very high risk.' Figure III-2 shows the percentage who perceived a high or very high level of risk of property damage, for each of the scenario levels. It is evident that respondents were attentive to our description of the hazards and did perceive substantial differences in property damage risk between the minimum, moderate, and maximum hazard levels. While only 21.6% thought the risk of property damage was high in the minimum scenario (one dirty bomb far away), 58.6% thought the multiple bomb scenario (maximum hazard) posed large risks. A very similar pattern is seen in the reported perceptions of risk of death or serious injury, as seen in Figure III-3. Risks to life and limb are perceived at about the same level as property damage risk was perceived, again showing a strong contrast across the hazard levels. These results show that the hypothetical scenarios were perceived by respondents in the way that we intended: serious situations that vary in their degree of severity and the risk they pose to the populations affected. Interestingly, the perceptions of risk did not vary significantly according to whether there was advance notice of the event.

There was only one gender difference: females expressed a significantly higher perception of risk in the moderate hazard scenario, both for property and persons. On a scale of 1, "no risk," to 4, "very high risk," the mean perception of risk to property in the moderate hazard scenario was 2.35 for males and 2.51 for females. For the perceived risk to persons, the mean was 2.40 for males and 2.61 for females.

There was also only one difference by educational achievement. Those with the highest level of education (PhD or advanced graduate degree) expressed a lower perception of risk under minimum and moderate hazard conditions. The difference was significant in the minimum and moderate hazard scenarios with respect to the risk to property, and the minimum hazard scenario with respect to the risk to persons.

White respondents also expressed a significantly lower perception of risk in the minimum hazard scenarios. For risk to property and persons, respectively, the mean rating among Whites was 1.95 and 2.03, compared to ratings from Blacks, Asians, and others ranging from 2.13 to 2.37.

**Figure III-2: Percent perceiving high or very high risk of property damage.**

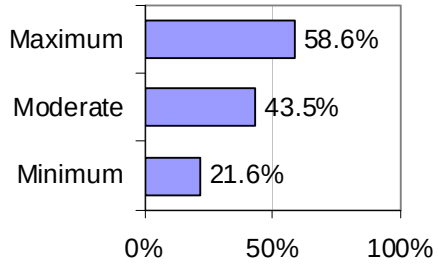
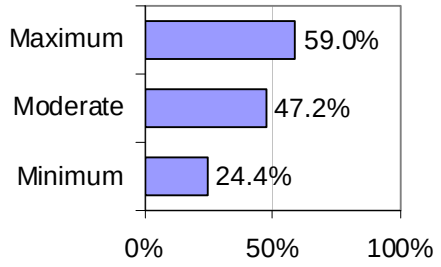


**Figure III-3: Percent perceiving high or very high risk of death or serious injury.**



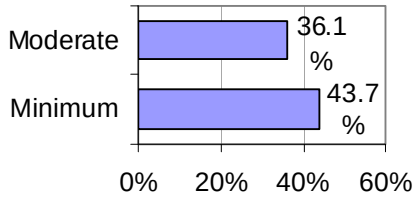

## Predisposition to Worry

For the first scenario asked of each respondent, we asked:

> *People have different levels of concern about how potential events could affect their lives. How much do you worry about an event such as the one described in this scenario?*

Respondents could say they 'never worry,' 'rarely worry,' 'sometimes worry,' or 'worry a lot' about such an event. Since this was asked only on the first scenario presented, it was asked only for the minimum and moderate scenarios; the maximum hazard was never the first one read to the respondent. We expected to see greater levels of worry for the moderate scenario, because it involves a higher level of hazard and personal risk to the respondent. However, as seen in Figure III-4, the results were just the opposite, with 43.7 percent worrying sometimes or a lot about an event like the minimum-hazard scenario and 36 percent worrying about an event like the moderate-level scenario. This result can be explained by understanding that 'worrying' is a reflection not only of the severity of an event but also of its perceived likelihood. People who live in the NCR, especially those who lived through the events of September 11, 2001, are aware that the region presents some prime targets for terrorist or other enemy attack. Most residents do not live very close to the most likely targets, but the possibility that there might be an attack on some important government building or monument far from the respondent's home is a worry to some. Residents are a bit less concerned that terrorists would target a building just a mile from their home.

**Figure III-4: Percent who worry *sometimes* or *a lot* about such a scenario.**




## Check Out the Hazard Needs

For each scenario presented, we asked: "What are some things you would do to check out the hazard in this scenario?" Respondents could give more than one response. The pattern of answers was quite similar for the three scenarios we asked about. As seen in Table III-3, the most common source of information people would consult is, by far, network news on television. The second most common source people would turn to is the Internet, including news and government websites. Family and friends, contacted either in person or by phone, are the third most common source of information people would use in this situation.

**Table III-3. How people would check out the hazard [all scenarios combined].**

| | n | % |
|---|---|---|
| Would Look Listen Outside | 189 | 7.1% |
| News/TV/Radio/Other Info On Traditional Media Emergency Broadcast System | 2115 | 79.6% |
| Check Internet News, Govt, Or Other Websites | 1294 | 48.7% |
| Check Info On Social Media | 124 | 4.7% |
| Contact Family By Phone / Email / Face To Face | 628 | 23.6% |
| Contact Friends Neighbors By Phone / Email / Face To Face | 552 | 20.8% |
| Contact With School System | 23 | .9% |
| Check/Prepare Surroundings For Items That Might Help | 105 | 4.0% |
| Leave The Area | 59 | 2.2% |
| Stay / Do Nothing | 64 | 2.4% |
| Depend On Sups, Employers For Assistance | 138 | 5.2% |
| Check With Authorities (911, Police, Fire, Local Sources) | 120 | 4.5% |
| Other (Specify) | 52 | 2.0% |
| None Of The Above | 42 | 1.6% |
| Total | 2657 | |

## Decision To Stay or Go

For each scenario presented, we asked the respondent: *"Based on this information, would you stay at [your location] or would you leave immediately to go somewhere else?"* (For the minimum scenario, we also offered the choice of "continue with your activities.") This was probably the most important question in the survey from the point of view of planning, because the responses give us an indication of the size of the "shadow evacuation" that might occur if some residents were asked to shelter in place in a scenario similar to the ones tested here.

Table III-4 shows the results for those who were asked to imagine themselves to be at home when the incident occurred. In the moderate and maximum scenarios, it will be recalled, the respondent was told that authorities had directed everyone to take shelter in their home or a building for the next 48 hours. Over three-quarters (77.5%) of respondents said they would stay at home in these scenarios. In the minimum scenario, respondents were told that no instructions had been issued for their area, but nevertheless 71.5% said they would stay at home. The percent who said they would 'leave immediately' was quite similar across the three levels of hazard, with 16.1 percent saying they would leave in the minimum hazard, and 17.1 percent leaving in the moderate or maximum scenarios. That said, we can probably assume that many of those who said they would continue with their activities in the minimum scenario would be leaving home well before the 48 hours had elapsed.

Among those giving reasons for why they would leave, females were more likely to cite the need to find children (21% vs. 14% of males) whereas males were more likely to cite the need to find adult family members (22% vs. 13% of females).

**Table III-4: Shelter or evacuate--at home**

| Home | Hazard Level | | |
|---|---|---|---|
| | Min | Mod | Max |
| Stay at home | 71.5 | 77.4 | 77.7 |
| Leave immediately | 16.1 | 17.1 | 17.1 |
| Continue with activities | 6.6 | -- | -- |
| Something else | 6.1 | 5.5 | 5.2 |

Table III-5 shows the results for those who were asked to imagine that they were at their place of work (or in another building outside their community) when the incident occurred. In this table, those who said they would 'leave immediately' are broken out according to their answers to the follow-up question *"Where would you go?"* with those headed to their homes separated from those who would go to some other destination. Although the responses are quite different from those seen in the scenarios taking place while the respondent is at home, they show fairly small proportions of the respondents who would leave their workplace to go somewhere other than home. However, in the minimum hazard scenario, when no instruction to shelter in place has been issued, only four out of every ten people (41.3%) would stay at their remote location. About a third (32.6%) would head to

their homes while 10.6 percent would leave to go somewhere else. In the moderate hazard scenario, the percentage leaving to go somewhere else stays about the same (10.3%), but far fewer people (only 12.2 %) would leave for home given the shelter-in-place instructions. In the maximum hazard scenario over seventy percent (71.2%) would shelter in place, only one in twenty (4.7%) would head for home, but a more substantial number (17.7%) say they would leave to go to another location.

**Table III-5. Shelter or evacuate--at work or other building**

| Work or Other Building | Hazard Level | | |
|---|---|---|---|
| | Min | Mod | Max |
| Stay at work | 41.3 | 67.8 | 71.2 |
| Go home | 32.6 | 12.2 | 4.7 |
| Go to another place | 10.6 | 10.3 | 17.7 |
| Continue with activities | 3.9 | 9.7 | -- |
| Something else | 11.6 | -- | 6.4 |

## Comparison to Prior Studies

The results above, showing that relatively few people would leave their homes if they receive instructions to shelter in place, may be surprising to some readers, but they are consistent with results from other, similar surveys about responses to man-made disasters. In 2005, the Center for Survey Research conducted a telephone survey similar to this one, on behalf of the Critical Incident Analysis Group at U.Va., led by Dr. Greg Saathoff.[5] The geography of the sample was the same as the present study, including the officially defined National Capital Region. The survey presented three scenarios to respondents, using language similar to that used here. Two of these are comparable to the present study: a single dirty bomb exploding without notice while the respondent is at home, and a single bomb without notice while the respondent is at work or another building. As mentioned above, the design of the current study asked a disproportionate number of respondents about the moderate, no-notice scenarios to allow comparison with the 2005 study.

In the 2005 study, 84.1 percent of the 1,071 respondents asked about the moderate scenario at home said they would follow the directive to shelter in place, while 15.5 percent said they would leave immediately. This result for the percentage that would leave is fairly close to the current result of 17.4 percent who say they would leave under the moderate scenario (if it occurred without prior notice.)

One half of the 2005 respondents were asked about how they would respond if a single dirty bomb went off a mile away, without notice, while they were at work (or another building) in the afternoon. The result: 75.1 percent said they would stay in the building and 24.3 percent said they would leave immediately. In the current study, the percentage who said they would 'leave immediately' if the moderate scenario occurred without notice while at work or another building is 22.5 percent, a quite comparable result.

A more recent survey carried out by Rutgers University again shows comparable results about sheltering in place, although the scenario and the wording of follow-up questions were different from the current study. The 2009 Jersey City/Newark Urban Areas Security Initiative (UASI) Regional Evacuation Planning Study was conducted by telephone between August 12 and October 15 with 1,430 residents of the Jersey City/Newark UASI. Among other things, respondents were asked about their likely behaviors in the case of a coordinated terrorist attack at three local shopping malls. In this case, 63 percent would be "very likely" or "somewhat likely" to voluntarily evacuate, 32 percent would be "not very likely" or "very unlikely" to voluntarily evacuate, and 5 percent did not know. Of those who were likely to voluntarily evacuate (presumably this means the 63 percent who said they would be "very likely" or "somewhat likely" to voluntarily evacuate), 70 percent would be "very likely" to take shelter at home if instructed to do so. These results indicate that 44 percent

[5]Monnica T. Williams, Gregory B. Saathoff, Thomas M. Guterbock, Anna McIntosh, and Robin Bebel. *Community Shielding in the National Capital Region: A Survey of Citizen Response to Critical Incidents.* Center for Survey Research, University of Virginia, June 2005. The study was funded by the Department of Homeland Security via a grant to George Mason University.

overall (70% * 63%) would shelter at home if instructed to do so.

When these 44 percent overall are added to the original 32 percent overall who would be "not very likely" or "very unlikely" to voluntarily evacuate even without instructions to shelter in place, this indicates that 76 percent overall would be likely to shelter in place, 19 percent are likely to voluntarily evacuate even if instructed to shelter in place, and 5 percent are unknown. Leaving out the unknowns and recalculating on a base of 95 percent, it appears that 80 percent are likely to shelter in place and 20 percent are likely to voluntarily evacuate in the UASI study.

This appears to be roughly comparable to the current study, which finds that in the case of dirty bomb attacks with no prior notice and residents are given instructions to shelter in place, 15 percent would leave immediately, 77 percent would shelter in place, and 8 percent would continue with current activities or do something else.

## Facilitation of Sheltering In Place

Returning to the results of the current survey, respondents who said they would follow instructions and stay at their indoor location were asked several follow-up questions to learn more about how long they would shelter and what might make them able to shelter in place for a longer time. They were asked: *"How long would you be willing to remain at [LOCATION], without going outside, in this situation?"* The result varied according to whether they were at home or at work, and also varied by hazard level. The vast majority of those in the home-based scenarios told us they would stay at home for the full 48 hours or more: 94.5 percent in the minimum scenario (where no sheltering instructions have been directed to the respondent's area of residence), 97.3 percent in the moderate scenario, and 95.1 percent in the maximum scenario. Of those who would not stay the full 48 hours, about half say they would stay until the following evening, a period approximating 24 hours. The percentages saying they would shelter for the full 48 hours or more is lower for the work scenario. Only 78.5 percent would stay at work for two days in the minimum scenario, with 14.5 percent not staying there for more than 'a few hours.' In the moderate scenario, however, 92.1 percent would stay at work or another building for the full 48 hours, and 85.3 percent would do so in the maximum scenario.

Those who said they would shelter in place initially but would NOT stay for the full 48 hours were asked to state the reasons why. (Reasons given by those who say they would 'leave immediately are presented below in the section on evacuation.) As can be seen in Table III-6, the most common reasons by far are to find adult family members and to find their children. Other reasons mentioned with some frequency were going out to get food, water, or other supplies. Some respondents explained that they would leave to get to a location where they would feel safer.

**Table III-6. Why people would shelter less than 48 hours [all scenarios].**

| | n | % |
|---|---|---|
| To find adult family members | 72 | 29.1% |
| To find children | 56 | 22.6% |
| Because would feel safer someplace else | 27 | 11.0% |
| To get food or water | 21 | 8.4% |
| To find pets | 11 | 4.4% |
| Because do not feel the situation is dangerous | 10 | 3.9% |
| To get medications | 5 | 2.1% |
| To get other needed supplies | 4 | 1.8% |
| Because does not trust advice of authorities | 4 | 1.5% |
| To take care of other people | 3 | 1.2% |
| To meet job responsibilities | 2 | .8% |
| Because not concerned about getting cancer | 1 | .5% |
| Believes could avoid danger when going outside | 1 | .4% |
| Other (specified) reason | 78 | 31.3% |
| Don't know or refused why | 14 | 5.8% |
| Total | 248 | |

To address these needs directly, respondents who said they would leave to find children or adult family members were asked:

> *If you were informed by authorities that your loved ones were being cared for and kept safe where they were, how long would you be willing to remain at [LOCATION] and wait for the 'all clear' signal?*

About two-thirds of respondents indicated that they would stay for the full 48 hours if they had such assurance: 69.5 percent in the minimum scenario, 66.4 percent in the moderate scenario, and fully 82.8 percent in the maximum hazard scenario.

In similar fashion, we asked those who said they would leave early to get food, water or supplies:

> *If there were people who could safely bring to your [LOCATION] any food, water, or medications you might need in this situation, how long would you be willing to remain at [LOCATION] and wait for the 'all clear' signal?*

The results for this question varied somewhat by scenario. In the minimum scenario, 89.6 percent of the early leavers said they would shelter for the full 48 hours or more if this were the case. But in the moderate and maximum scenarios 100 percent of those who would have left early said they would stay until the 'all clear' was given.

The answers given to this and the preceding question suggest that appropriate advance planning and provision of services and personalized communication in an emergency situation might substantially facilitate public compliance with instructions to shelter in place. This is the idea behind the "community shielding" concept that has been advanced by Dr. Gregory Saathoff and his colleagues.[6]

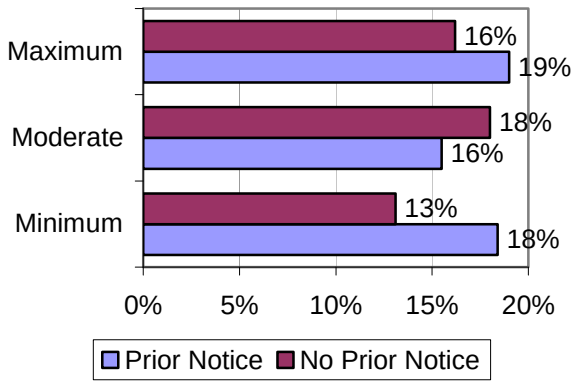
## Key Factors in the Decision To Stay or Go

The design of the survey systematically varied four factors when hypothetical scenarios were presented to respondents: hazard level, location, notice, and the source of information about the event. We have already seen above how responses varied with respect to the hazard level and whether the respondent was located at home or at work or another building at the time of the event. In this section we examine the effects on responses from the other two scenario factors, as well as the effect of key demographic and social variables.

### *Notice*

The presence or absence of advance notice of the hypothetical attack did make a significant difference in responses under some circumstances. The differences are best seen when we again separate the results by location and by hazard level. Figure III-5 shows how the percent 'leaving immediately' varies for those at home according to whether there is advance notice. When there is advance notice of the event, the percent leaving their homes is substantially higher in the minimal hazard scenario: 18 percent would leave if there had been notice of the event, compared to 13 percent if there had not been notice. In the maximum scenario, there also would be more people leaving with notice (19%) than without (16%). However, in the moderate scenario the opposite pattern holds: 18 percent would leave if there were no notice, while 16 percent would leave if they had advance notice.

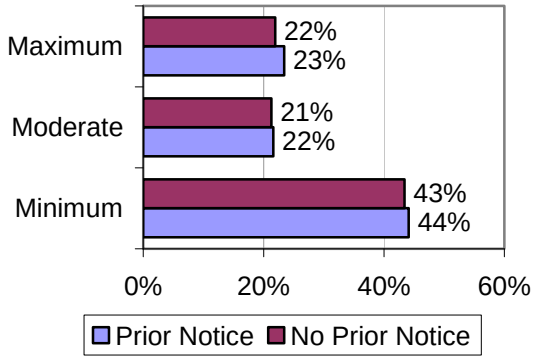
**Figure III-5: Effect of notice/no notice on respondents at home**




In contrast, there are no substantial differences in the percent who say they would leave work immediately according to whether or not prior notice of the attack had been given by the attackers. This result is seen in Figure III-6, where receipt of notice increases the percent leaving only slightly.

[6] Critical Incident Analysis Group. *What is to be Done? Emerging Perspectives on Public Responses to Bioterrorism.* CIAG, University of Virginia School of Medicine, P.O. Box 800657, Charlottesville, VA, 22908-0657, 2002.

**Figure III-6: Effect of notice/no notice on respondents at work or another building**



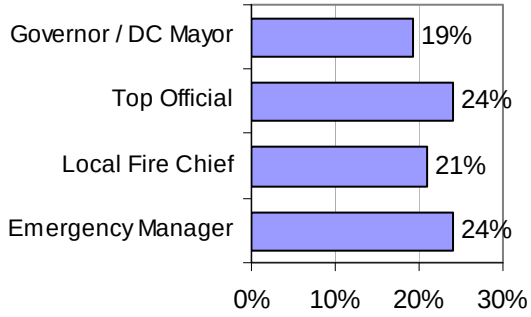

## *Source of message*

Emergency planners have a choice when communicating with the public: who should be the spokesperson that communicates the news and issues instructions or directives to the public when a catastrophic event occurs? Our experiment varied the source of news and instructions systematically across respondents and scenarios. The information about the hazard and the instructions to shelter in place could come from one of four different sources:

- The local emergency manager
- The local fire chief
- The local chief administrative officer, described in the scenario as 'a top local official'
- The Governor of the state (for those located in Maryland or Virginia) or the Mayor of DC (for those located in DC).

Looking across all scenarios (regardless of hazard, location, or notice), a clear difference in responses emerges when different sources are compared (see Figure III-7). The lowest percentage (19.3%) of people leaving their location is achieved when the announcement is made by the Governor of each state (for Virginia and Maryland) and by the Mayor of Washington, D.C. This lower percentage of leavers implies the highest level of compliance with shelter-in-place instructions. If the local fire chief makes the announcement, 21.0 percent would leave immediately. There is a greater tendency to leave the location (24%) if the announcement is made by 'a top local official' or by 'the local emergency manager,' a difference which is small but statistically significant.

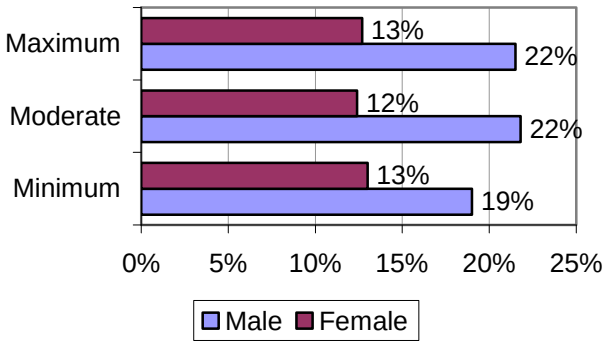
**Figure III-7: Percent leaving immediately, by source (all scenarios combined).**




## *Gender*

Men and women respond somewhat differently to these hypothetical scenarios. Figure III-8 shows the gender difference in response for those who responded to at-home scenarios.

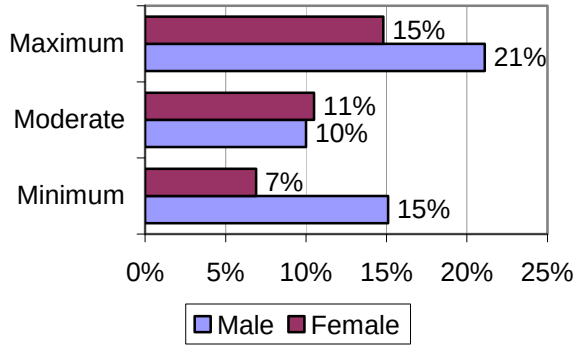
**Figure III-8: Percent leaving immediately, by gender: Home scenario.**




At all three hazard levels of the at-home scenarios, men are substantially more likely to leave immediately than women are. For example, in the moderate at-home scenario 21.7 percent of men say they would leave immediately, compared to only 12.4% of women.

When the hypothetical attack occurs while the respondent is at work or another building, there are substantial gender differences in two of the three hazard levels as seen in Figure III-9.

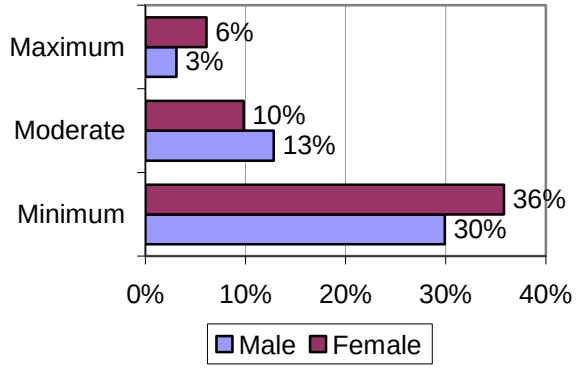
**Figure III-9: Percent who would go somewhere other than home, by gender: at-work scenario**




In the minimum scenario, in which no shelter-in-place directive has been given, men (15.1%) are more than twice as likely as women (6.9%) to say they would leave the workplace or building to go to a location other than their home. In the moderate scenario, there is no significant gender difference in response at the workplace. In the maximum scenario, men are again more likely than women to go to a place other than home (21.1 percent vs. 14.8 percent) while women are more likely to either stay at the workplace or head for home.

Figure III-10 shows the effect of gender on the decision to leave work (or another building) and head for home. In two of the three hazard levels, women are more likely to make this choice. For example, in the minimum scenario women are a bit more likely than men to say they would leave for home: 35.8 percent for women vs. 30.0 for men.

**Figure III-10: Percentage who would leave for home, by gender: at-work scenario.**




## *Education*

The level of education of a respondent was significantly correlated with their likelihood of sheltering in place in response to the scenario. This was especially evident in the at-home scenario. For example, in the maximum hazard-level at-home scenario, 32.9 percent of those with a high school diploma or less said they would leave immediately, compared to 14.9 percent of those with some college, 16.5 percent of those with a four-year college degree, and 12.0 percent of those with at least some graduate education. The effect of education was less pronounced in the at-work scenarios, and not always in the same direction. For example, if the minimum scenario was encountered while the respondent was at work or at another building, respondents with four years of college or graduate education were more likely to leave for a destination other than home.

## *Community attachment*

In this study, our index of community attachment did not correlate significantly with the behavioral response in the scenarios for any hazard level, either at home or at work. In the moderate scenario at work, the percentages varied in the pattern we might expect, with those lowest in community attachment least likely to stay at the workplace and those highest in community attachment more likely to leave to go home; but these differences were not significant at the 95 percent level of confidence.

This lack of correlations was unexpected. In the "Community Shielding" survey of the NCR conducted by CSR in 2005, a respondent's degree of community attachment was positively correlated with his or her likelihood to shelter in place.

## *The effect of prior experience with sheltering in place*

In another part of the questionnaire, respondents were asked if they had any prior experience with a disaster that caused them to shelter in place. They were then asked: "Do experiences in these prior events make you more or less confident in your community's ability to manage a terrorist attack?" Looking only at those who had experienced a prior 'shelter-in-place' disaster situation (51 percent of respondents), there is a significant effect of prior experience on the likelihood of staying at one's location in response to a new event, at least in

some situations. While a person's confidence in the community's ability to manage an attack does not affect their behavior in an at-home scenario, it is significantly correlated with staying in place at the workplace, for both the minimum and moderate scenarios. For example, in the moderate-hazard at-work scenario, 65.9 percent of those whose prior experience made them 'a lot more confident' say they will stay at the workplace (or other building) compared to 42.3 percent of those who are now 'a lot less confident.'

## Summary

This survey tested how people would respond to terrorist attacks involving one or more radiological dispersion devices (dirty bombs) by varying the hypothetical scenarios that were presented to the respondents. There were 48 distinct scenarios tested, varying on four key factors: the level of hazard, the location of the respondent (at home or at work), whether there was prior notice of the event given by the attackers, and the source of information about the event and instructions on how to respond. Questions about perceived risks from the various events showed that respondents did perceive the 'maximum' hazard scenario (multiple dirty bombs including one just one mile away) as potentially far more hazardous than the minimum scenario (one bomb detonated far away).

The great majority of respondents indicated that they would stay at home if the event happened while they were at home. However, if the event were to happen while the respondent was at work, and the bomb was detonated far away from the work location, less than half of respondents would stay at the workplace. Of those leaving work in response to the distant event, most would head to their homes, while some would go to other locations. If the bomb were detonated a mile away from the workplace, the majority would shelter in place at work, although the percentage doing so was less than for those experiencing the event at home.

The great majority of those saying they would stay in place in response to the attack would be able to shelter for a full 48 hours if so instructed. The main reasons people give for leaving earlier are to travel to be with their children or other adult members of their households. Some would leave to get food, water, or other supplies. Most of these people say they would remain at their original location if they were assured that their loved ones were safe, or if the needed supplies could be brought to their location by others.

Each of the factors manipulated in the survey experiment did have an affect on the responses to the event. Decisions to stay or leave varied with the hazard level and the respondent's location at the time of the hypothetical event. If prior notice of the attack was given by the attackers, those in the at-home scenario were more likely to say they would leave. The source of information made a small but significant difference, with the highest rate of sheltering in place occurring if announcements and instructions came from the state governors and DC mayor.

In addition, men and women were found to differ significantly in their response to these scenarios, with men more likely to say they would leave immediately. Respondents with higher education were generally more likely to shelter in place. Surprisingly, community attachment did not significantly affect the decision to stay in place. For those who had experienced a prior event that necessitated sheltering in place, if that prior experience inspired confidence in the community's ability to handle an emergency, then the respondent was less likely to say they would leave immediately in an at-work scenario.

The responses to the scenarios vary in the ways expected, suggesting that the respondents were carefully weighing the elements described in each scenario and reacting accordingly. The variations in these responses will be useful to practitioners as they attempt to model how people in the NCR might respond to a wider range of scenarios.

This section has described and analyzed the scenarios, perceptions of risk, the decision on whether to stay or go, and some details of respondents' plans to shelter in place. The next section analyzes the details of respondents' plans to evacuate the area.

# IV. Evacuation Behaviors

A major purpose of the survey was to gather specific information about what residents might do if they were to evacuate in response to an emergency: where would they go, how far would they travel, how would they get there, and what needs would they have in evacuating. The survey questionnaire therefore included several batteries of questions that sought detail about the evacuation plans of respondents.

As described in the previous section, each respondent was asked to respond to two scenarios in which one or more dirty bombs exploded at locations around the NCR. They were asked whether they would stay at their location or 'leave immediately.' For anyone who said they would leave, we gathered detailed information about their anticipated evacuation behavior, and this information can be separated according to whether it was a response to the minimum, moderate, or maximum scenario. Since the percentages who said they would leave immediately were small for most of the scenarios, this procedure left a large number of respondents who had not been asked about evacuation after they had responded to all questions about the two scenarios they were asked to consider. Each of these respondents was then asked about a hypothetical "mandatory evacuation:"

> *Now I have a few questions about evacuation, which means leaving your community for several days. If your local leadership recommended an evacuation of your community to a location at least five miles away, where would you go?*

Thus, every respondent was asked one series of questions about evacuation, with some responding in reference to one of the specific hypothetical scenarios,[7] and others responding to an evacuation recommendation issued by authorities for an unspecified reason.

## Destinations for Evacuees

### *Type of destination*

The first follow-up question asked of those who would evacuate asked them to indicate the type of destination they would go to. Table IV-1 shows the result for those saying they would evacuate in response to one of the home-based dirty-bomb scenarios. In the minimum scenario, nearly two-thirds (63.9%) of those who would leave home would be headed to the home of a family member, relative, or friend. About five percent (4.9%) stated they would head to a vacation or second home that they own. Nearly four percent would go their work or office; many of these respondents indicated that they are duty-bound to do so in an emergency because they work in military, law enforcement, emergency health or emergency management positions. The percentages of evacuees who would head for a public shelter (5.9%) or go to a hotel and motel (7.1%) are not large, but together they indicate that about one in eight of the evacuees would be relying on public accommodations as their destination in the minimum scenario.

**Table IV-1: At Home: Where would they go?**

| | Min | Mod | Max |
|---|---|---|---|
| A family member or relatives home | 54.5 | 51.0 | 40.2 |
| A friends home | 9.4 | 12.9 | 8.6 |
| A public shelter | 5.9 | 8.9 | 14.4 |
| A motel or hotel | 7.1 | 6.0 | 12.3 |
| Another home I own | 4.9 | 5.0 | 2.7 |
| A place of work or office | 3.8 | 1.3 | 2.5 |
| Other - specify | 14.4 | 14.9 | 19.3 |

The destinations of those leaving their home in the moderate scenario are not greatly different. However, in the maximum-hazard scenario the number going to a family member or relative's home is less, and higher percentages are headed to either a public shelter or a motel, with about one in four of these evacuees expecting to rely on these public accommodations.

For those who experience the scenario at their place of work or another building and say they would leave immediately, the destination choices are somewhat different (Table IV-2).

[7] If a respondent said they would evacuate in both the scenarios they were asked to respond to, the detailed evacuation questions were posed in reference to the first scenario and were not repeated for the second scenario.

**Table IV-2: At Work: Where would they go?**

| | Min | Mod | Max |
|---|---|---|---|
| Home | 76.4 | 67.5 | 60.2 |
| A family member or relatives home | 8.5 | 12.7 | 14.0 |
| A friends home | 1.6 | 1.4 | 8.1 |
| A public shelter | 2.2 | 1.0 | - |
| A motel or hotel | 2.6 | 1.7 | - |
| Another home I own | 0.7 | 1.7 | 2.4 |
| A place of work or office | - | - | 3.1 |
| Other - specify | 7.9 | 14.0 | 12.2 |

**Table IV-3: Mandatory Evacuation: Where would they go?**

| | % |
|---|---|
| Home | 3.5 |
| A family member or relatives home | 46.6 |
| A friends home | 19.5 |
| A public shelter | 6.6 |
| A motel or hotel | 12.1 |
| Another home I own | 3.0 |
| A place of work or office | 1.6 |
| Other - specify | 7.0 |

The vast majority who leave work will head for their homes, from three quarters (76.4%) of those leaving in the minimum scenario to three fifths (60.2%) of those leaving in the maximum scenario. Most notable is that very few of those leaving the workplace in these scenarios plan to go to public accommodations such as a shelter or a motel, especially when the hazard level is above the minimum.

In the case of a mandatory evacuation in which authorities recommend that people get at least five miles out of their community, the choices of destination, seen in Table IV-3, are again somewhat different. Two-thirds (66.1%) would head to a family member, relative, or friend's home to find shelter. About four percent would head to their homes; these presumably are respondents who imagine themselves to be at work and whose homes are more than five miles away. In the mandatory evacuation situation, fairly high percentages would plan to rely on public accommodations, with 12.1 percent saying they will go to a hotel or motel and 6.6 percent expecting to go to a public shelter. Thus, nearly one in five does not have a place of their own to go to if forced to evacuate.

## *Destination: Inside or outside the NCR?*

As part of the detailed information gathered from each respondent in the evacuation question sequence, we asked respondents to identify the specific location where they would be going. Most respondents gave specific names of towns or cities where they would go. Others gave less specific information, and some made clear that they did not have a specific destination in mind (saying, for example, that they would 'head South' or 'get out into the country.') CSR staff examined these responses and related information (such as how far they were planning to go, where they lived, whether they were responding to a scenario imagined at work or at home, etc.) and assigned each response to a city, county or state. If the destination was in Virginia or Maryland, the county or city was specifically coded. These, in turn, could be categorized as lying inside or outside the National Capital Region.

**Figure IV-1. Destinations inside and outside the NCR**

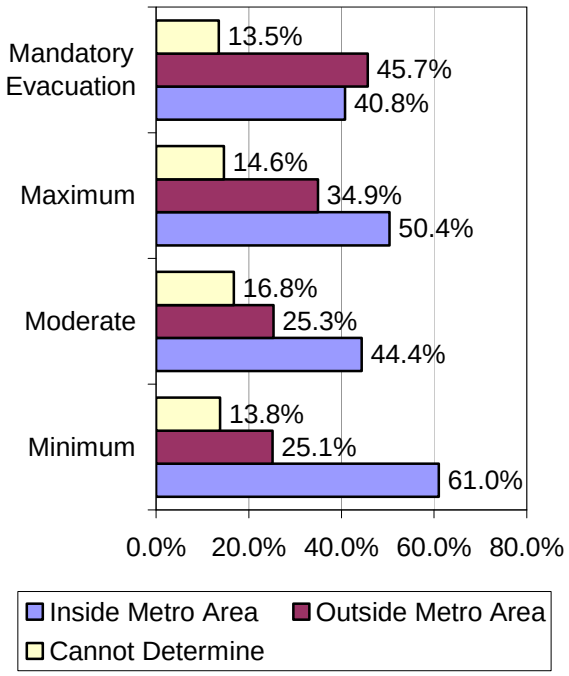



Figure IV-1 shows for each destination whether it was inside or outside the NCR or was not specific enough to be codable. The chart makes quite clear that respondents choose different destinations depending on the level of hazard and the instructions they are given. In the minimum hazard, in which respondents were not given instructions to evacuate, those who did choose to leave immediately were most likely (61.0%) to head for some place within the NCR. About one in four of those who would evacuate in the minimum or moderate scenarios would be headed out of the NCR. In the maximum scenario that percentage rises to 34.9 percent. In the mandatory evacuation situation, in which authorities instruct residents to get at least five miles away from their community, nearly half (45.7%) would be headed to locations outside the region.

It is noteworthy that evacuees headed for different areas will have different needs for public accommodations. About four percent of those headed for a destination inside the NCR expect to go to a public shelter, and another four percent of these would go to a hotel or motel. For those citing a specific destination outside of the NCR, the percentage going to a shelter is near zero while 5.6 percent are headed to a motel. However, for those who could give no specific destination (that is, those who could not be coded as traveling inside or outside the NCR), the need for public accommodation is much higher: 7.2 percent would seek a public shelter and 13.9 percent would look for a hotel or motel.

## *Travel distances*

Each respondent who planned to 'leave immediately' from one of the scenarios, as well as anyone responding to the mandatory evacuation question, was asked *"How far is it from [YOUR LOCATION] to that destination?"* Table IV-4 shows the median reported distances in miles.

There is notable variation in these distances. In the minimum hazard scenario, half the evacuating respondents would be traveling less than 10 miles from the location they were in at the time of the incident (home, work, or another building). In the moderate scenario, where the dirty bomb is just a mile away, evacuees plan to go a longer distance—about 15 miles.

**Table IV-4. Median distance to destination, by hazard level.**

| Disaster Scenario: Hazard Level | Distance Median |
|---|---|
| Minimum | 9.6 miles |
| Moderate | 15 miles |
| Maximum | 23.2 miles |
| Mandatory Evacuation | 25 miles |

In the maximum-hazard scenario, with multiple bombs exploding across the region, and in the case of a mandatory evacuation five miles or more away from the community, the median distance is at or near 25 miles. These data reflect the same pattern as seen above where destinations were classified as inside or outside the NCR. In the more hazardous scenarios, people will travel farther.

## *Travel to other states*

Table IV-5 gives more specific information on where respondents would go. Here, we separate destinations in Maryland and Virginia into those that lie within the NCR and those that lie outside it. (DC, of course, is entirely within the NCR and the other states are entirely outside the NCR.) Again, the pattern of traveling further way in more hazardous conditions is evident, in that the percentages heading for locations in Virginia and Maryland that are inside the NCR are lower for the

maximum-hazard scenario and for mandatory evacuation. In general, the states outside of DC, Maryland and Virginia will receive higher percentages of the evacuees when the hazard level is greater or the evacuation is mandatory. While these states would receive 20.8 percent of all evacuees in the minimum scenario, they could expect to receive 30.1 percent in the case of the maximum-hazard scenario.

## *Destinations by origin*

It is also possible to look at destinations by state of origin, as seen in Table IV-6. In these data, the influence of the limited number of bridges over the Potomac River and the resulting highway congestion at or adjacent to the Potomac River/Maryland-Virginia border on travel patterns in the region can clearly be seen. Residents of Maryland and DC are far less likely to head into Virginia than are the residents of Virginia, and Virginia residents are less likely to head North or into Maryland. DC residents are more likely to head to Maryland and points northward than are the residents of Virginia

The Total column refers to the number of respondents who chose to evacuate, either under any hazard level or from any NCR location, Differences between totals for evacuation under differing hazard level and totals for evacuees by location are due to respondents who were not able to give clear, usable location information.

**Table IV-5. State destinations of evacuees, by hazard level**

| State destination during evacuation (%) | Hazard Level | | | | |
|---|---|---|---|---|---|
| | Minimum | Moderate | Maximum | Mandatory | Total Evacuees |
| District of Columbia | 9.6 | 1.7 | 13.8 | 5.1 | 6.6 |
| Virginia—inside NCR | 32.2 | 31.3 | 26.2 | 22.6 | 25.1 |
| Virginia—outside NCR | 3.9 | 8.5 | 5.8 | 13.8 | 11.0 |
| Virginia—not determined | 2.2 | 2.8 | 2.5 | 3.1 | 2.9 |
| Maryland—inside NCR | 27.4 | 21.6 | 16.4 | 14.8 | 17.2 |
| Maryland—outside NCR | 2.2 | 9.1 | 3.3 | 12.4 | 9.6 |
| Maryland—not determined | 1.7 | 5.7 | 1.8 | 6.2 | 5.0 |
| Delaware | 1.7 | 0.0 | 0.4 | 1.3 | 1.1 |
| Pennsylvania | 2.6 | 4.0 | 6.5 | 5.2 | 5.0 |
| West Virginia | 2.2 | 2.3 | 4.0 | 2.5 | 2.7 |
| Other states—North | 3.9 | 5.7 | 6.5 | 5.4 | 5.4 |
| Other states—South | 7.8 | 4.0 | 6.9 | 5.0 | 5.5 |
| Other states--West | 2.6 | 3.4 | 5.8 | 2.5 | 3.1 |

**Table IV-6: Evacuation destinations by state of origin.**

| | State location of home or work | | | |
|---|---|---|---|---|
| | VA | DC | MD | Total Evacuees |
| DC | 1.2 | 22.4 | 4.4 | 6.8 |
| VA-inside NCR | 40.6 | 12.3 | 7.5 | 23.1 |
| VA-outside NCR | 22.6 | 3.5 | 5.0 | 12.4 |
| VA-not determined | 2.0 | 5.0 | 3.1 | 3.0 |
| MD-inside NCR | 3.6 | 14.8 | 30.1 | 15.2 |
| MD-outside NCR | 3.5 | 12.6 | 19.0 | 10.8 |
| MD-not determined | 2.7 | 8.5 | 6.9 | 5.4 |
| DE | 0.6 | 1.6 | 1.5 | 1.1 |
| PA | 4.4 | 7.3 | 5.6 | 5.4 |
| WV | 4.5 | 0.3 | 1.5 | 2.6 |
| Other state-North | 4.7 | 5.4 | 6.9 | 5.6 |
| Other state-South | 4.8 | 6.0 | 5.8 | 5.4 |
| Other state-West | 4.7 | 0.3 | 2.7 | 3.1 |
| | 100 | 100 | 100 | 100 |

## Other Evacuation Details

The detailed follow-up questions asked of evacuees reveal several useful insights. About 90 percent of those evacuating under the mandatory evacuation situation would travel by motor vehicle, either their own or someone else's (see Table IV-7). About five percent plan to use public transportation, and two percent would either walk or use a bicycle to evacuate.

**Table IV-7. Means of travel (mandatory evacuation)**

| | n | % |
|---|---|---|
| My own or family's vehicle | 1344 | 87.1% |
| Someone else's vehicle | 42 | 2.7% |
| Public transportation | 73 | 4.7% |
| Police ambulance emergency transportation | 6 | .4% |
| Hitch a ride | 4 | .3% |
| Walk or ride a bicycle | 26 | 1.7% |
| Other Specify | 48 | 3.1% |
| Total | 1544 | |

Respondents were asked whether their evacuation destination was an urban area, suburban, a small town, or rural (Table IV-8). In the mandatory evacuation, over two-thirds were headed for urban or suburban areas, but the other third were headed for less populated regions—small towns, rural villages, or just 'out in the country.' We can infer that such areas are perceived by many to be safe havens from terrorist attack.

**Table IV-8. Respondent's description of destination area (mandatory evacuation)**

| | n | % |
|---|---|---|
| an urban area like in a city | 236 | 19.1% |
| a suburban area | 603 | 48.7% |
| small town | 172 | 13.9% |
| a rural community or | 153 | 12.4% |
| out in the country | 74 | 6.0% |
| Total | 1238 | |

Evacuating respondents were also asked:

> *Would you use an emergency route designated by emergency managers, or would you avoid a designated route?*

The response varied somewhat by the nature of the evacuation. For those who said they would leave immediately in one of the scenarios, responses were fairly consistent across the hazard levels, with 43 to 47 percent saying they would use a designated route, 24 to 30 percent saying they would avoid those routes, and others saying their decision would depend on circumstances. Those who were asked about the mandatory evacuation, however, were more observant of the official designations, with 61 percent saying they would take the designated route and only 20 percent saying they would avoid those routes. In interpreting these results, it should be borne in mind that the mandatory evacuation questions were asked only of those who did NOT say they would leave immediately under either of the dirty bomb scenarios they were asked to imagine; by definition, then, this was a more compliant or cautious group of respondents. In a real situation of mandatory evacuation, both these more compliant respondents and the 'leave immediately' group would be on the roads at the same time.

## Summary

The survey provides detailed information about the evacuation plans of respondents, including information on how far they plan to go, the type of

destination, how they might get there, and specific locations and travel distances to their intended locations. Not surprisingly, most would use their own motor vehicles to evacuate, with only small proportions planning to use public transportation. While the scenarios tested in this survey did put some people on the move (leaving their locations) even when they were directed by authorities to shelter in place, many of these "shadow evacuees" were not planning to travel very far. In the minimum-hazard scenario, the median travel distance of the evacuees would be less than ten miles, and only 25 percent would be headed outside of the NCR. On the other hand, the response to the more hazardous multi-bomb scenario (the maximum-hazard scenario) or to a mandatory evacuation directive would not only put more people on the move but also cause them to travel longer distances, with nearly half heading to locations outside of the NCR. In the latter case, more of the evacuees would be relying on public accommodations—hotels, motels, or public shelters—for themselves or their families. About a third of evacuees would be planning to find safe haven in a largely rural area or small town.

The choice of destinations depends in large part on where people are initially located. Those who reside or work in the Virginia portion of the NCR are most likely to head to locations in Virginia, and those in the Maryland or DC portion are likely to head for Maryland locations. The prospects of gridlock and the limited means of crossing the Potomac River have a clear effect on people's evacuation decisions.

The detailed information from the survey on people's decision to stay or leave in the case of each specific scenario, together with the information gathered on their destinations can be used in conjunction with population and other related data to generate some reasonable estimates of the absolute numbers of people who might evacuate from the region and how many would be heading to each of the neighboring states. This estimation task, although already begun, is outside the scope of the present report. The study team expects to generate several such estimates as we continue to work with the rich data that this survey has generated. These will be reported in a separate document as part of a planned later phase of the project.

# V. Past Experience with Disaster

In this chapter, we will examine the results of questions that looked at past experiences during emergency situations and the effects that experience may have had on respondent projections of future behavior.

This section of the survey started with the statement:

> *In recent years, there have been several emergency situations in the Washington Metropolitan Area, some of them weather-related and some man-made emergencies.*

## The Past Decision to Shelter In Place or To Evacuate

Respondents were then asked if they had personally ever experienced an event or emergency that caused them either to stay where they were and wait it out or to evacuate out of the affected area. Just over half of those asked (50.8%) said they had stayed in place during an event, with only a quarter (25.8%) having prior experience with evacuation. In total, just over sixty percent (60.7%) had experienced such an event or emergency. Those who had experienced both types of event were asked to concentrate on the most recent event and were fairly evenly split between sheltering and evacuating. About a third (33.1%) of these experiences took place in the last five years, while about eight out of ten (81.7%) cited an event in the last ten years.

When asked about the type of event they had experienced, about a third (33.7%) of respondents referred to the attacks of September 11, 2001 with 43.1 percent citing some terrorist event. Another twenty-five percent said they had been through a hurricane; taken as a group, some type of natural disaster, including storms, flooding and wildfire, formed the largest proportion of responses (47%). Interviewers coded responses as they were given, putting anything that did not immediately fall into a prelisted category into *Other*. Those *Other* responses were coded after the initial data collection and some additional categories emerged. Efforts were made to separate natural events from those that were man-made. Table V-1 shows the total list of responses given.

**Table V-1: Types of events experienced**

| Event type | % |
|---|---|
| September 11 Attacks | 33.7 |
| Hurricane | 25.0 |
| Winter Storm | 13.4 |
| Tornado | 6.9 |
| NCR Sniper Attacks | 4.2 |
| Other Terrorist Threat | 3.1 |
| Utility Problem – Heater, Boiler, Gas | 2.9 |
| Natural Event | 2.6 |
| Bomb Threat | 2.1 |
| House Fire | 2.0 |
| Flooding | 1.4 |
| Transportation - Accident, Traffic | 1.3 |
| Man-made disaster | 1.1 |
| Wildfire | .3 |

If the event they had chosen to focus on occurred in the past ten years, respondents were asked if the event had taken place in the Washington Metro Area. Eight of ten (82.3%) assured us that the event had been local to the area.

Respondents were given the choice of saying they felt safer or more comfortable because of their decision or they could say that the decision put them at greater risk. As shown in the following Table V-2, whether they had decided to shelter in place or to evacuate out of the area, the vast majority of respondents (86.2% of those staying, 83.5% of those who evacuated) reported that they felt safer or more comfortable as a result of their decision. Relatively small numbers of respondents volunteered that they felt both safer and more at risk because of their decision (5-7%).

**Table V-2: Comfort with decision**

| | Stay in Place | Evacuate |
|---|---|---|
| | % | % |
| Feel safer or more comfortable | 86.2 | 83.5 |
| Put at greater risk | 8.7 | 9.6 |
| Both | 5.1 | 6.9 |

*Asked of those who had experienced an emergency event in the past 10 years*

As a follow-up to a question asked earlier about an emergency kit, respondents who had already

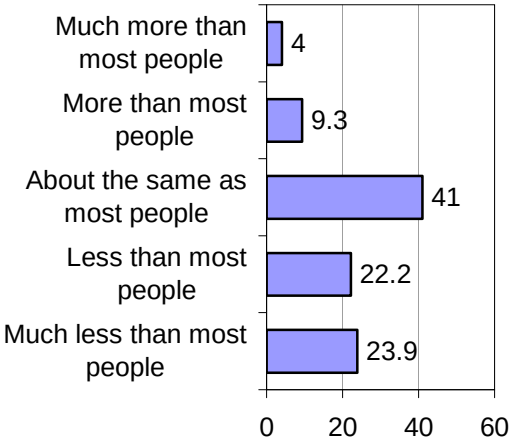
offered that they had a kit were asked if they had made the kit before or after this event in the past. Of this number who had experienced an emergency event and reported that they had prepared a kit at some point, well over half (54.3%) said that the kit had been done before the event. Only about a quarter of that number (25.9%) said that they had used the kit during the emergency situation.

## Effects on Confidence

The next section looks at the effect the event had on those who had been involved and how that past experience might affect reactions in the future.

To start, respondents were asked how badly they were affected by the event compared to others in their community. The largest percentage (40.6%) perceived that they had been affected about the same as other community members. Figure V-1 shows that many more residents thought they had been less affected (22.2%) or much less affected (23.9%) than the percentages who thought they had been affected more than most.

**Figure V-1: How people were affected by past emergency events**



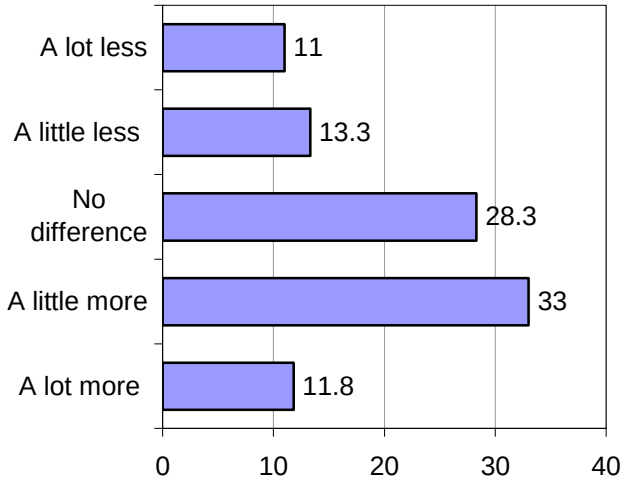

When asked if they thought that their experiences during this past event had affected their reactions to the imaginary events described earlier, respondents were divided in their thoughts. Not quite half, or 46.7 percent, thought their responses to the scenarios had been affected.

Respondents reporting a past event were then asked:

> *Do experiences in these prior events make you more or less confident in your community's ability to manage a terrorist attack?*

Confidence in their community's abilities was high, with 44.8 percent reporting that their prior experience made them feel a little or a lot more confident in their community's ability to manage a terrorist attack. Figure V-2 shows that another 28.3 percent thought that prior emergencies made no difference in their level of confidence. About a quarter of the respondents were a little or a lot less confident.

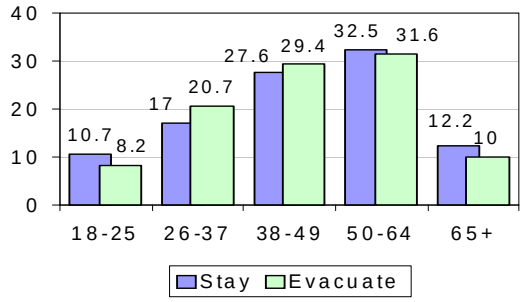
**Figure V-2: Percentage confidence in the ability of the community to manage a terrorist attack**




### *Significant demographic observations*

With a mean response of 1.81 out of 2, Hispanics are significantly more likely to use the kit they have prepared than others are. Respondents of Asian background were less likely to say they had used their emergency kits, but they are more likely to have confidence in the ability of their community.

**Figure V-3: Age distributions of those who experienced an emergency event**




All respondents were asked if they had ever experienced an event that caused them to stay at home and wait it out as well as their experience with evacuation. A definite pattern for these two questions can be seen when considering the age of those interviewed. The Figure V-3 shows that the oldest (65+) and the youngest (18-25) respondents were the least likely to have experienced either kind of event. The difference is statistically significant for the older respondents when considering the stay experience and for both the older and younger groups when considering evacuation events.

Respondents of limited income, thirty-five thousand or less, were more likely to feel safer as a result of their decision than those of higher income. Those working for a private company, compared to a non-profit organization, federal, state or local government or to the self-employed, also were likely to feel safer.

Those who are single think their past experience is less likely to affect any future decisions.

Respondents who attend religious services more than once a week perceive that they are more affected by past experiences than others.

Those who say they would go home from work in the event of an emergency also report a higher level of confidence in their community's ability to manage a terrorist event. The youngest respondents also had more confidence in their community's abilities. Those with no vehicle are less confident of their community's ability to manage a terrorist attack.

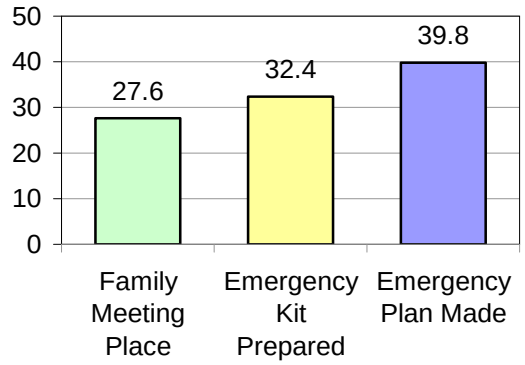
Those who have only lived in their community for two years or less are more confident in their community than longer term residents of three to ten or twenty or more years. Respondents from a household that had someone who had trouble communicating in English reported more faith in their community's efforts to manage after an attack. These same respondents also felt more at risk because of a past decision to evacuate.

Gender did not seem to be a significant factor in the results for these variables. Location, either by where the respondent lived or by location at the time of the imagined event scenario, did not make a difference either.

# VI. Current Levels of Emergency Preparedness

Before they heard any of the specific scenarios all respondents were asked about measures they may have already taken to prepare for an emergency. About forty percent (39.8%) of them reported having some plan or plans for what they would do in an emergency situation. The same people were then asked if they had a kit prepared that they could take if they had to leave quickly (32.4% said yes) and whether they had designated a meeting place for themselves and family in case of separation in an emergency (27.6% said yes). A kit was described as medicines, food, money, items for babies or people with special care needs, and so forth.

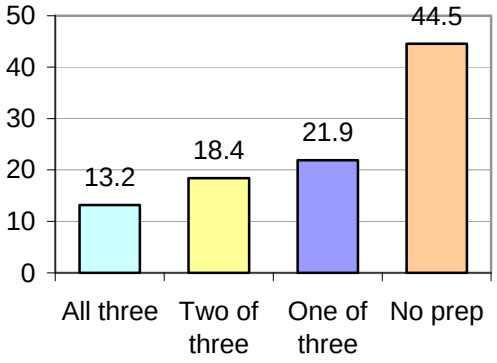
**Figure VI-1: Current levels of preparedness**




Over 54% of respondents reported having done at least one of the specified actions in preparation for an emergency situation: they had either developed a plan, prepared a kit or specified a meeting place to be used in the event of an emergency.

About 13 percent of the people we spoke to were well prepared with an emergency plan, a meeting place and a kit, but nearly half (44.5%) were not prepared at all. Just over two percent were unable to answer the question.

**Figure VI-2: Percentage of respondents reporting either a plan, kit or meeting place prepared in emergency readiness**




## *Significant demographic observations*

Analysis by demographic group helped to reveal some detail about who is getting prepared and in what ways.

Those who had experienced some past event that caused them to stay and wait out a situation or to evacuate were significantly more likely to report some level of preparedness. Levels of reported volunteerism were also significant. Those who volunteered their time for 6 hours a month or more were more likely to also have a plan in readiness, but those who estimated their contribution at 3-5 hours or at more than 11 hours were more likely to use the kit they had ready.

Those with two or more vehicles were more likely to say they had a plan in place for an emergency event. Respondents with no car were just as likely to say they had agreed on a meeting place as others with multiple vehicles, but those with one were significantly less likely to have a place to meet.

Those who had lived three years or more in the area tended to indicate more preparedness than those who had been in the area only two years or less. And perhaps not surprisingly, those either currently in the military or with some military background also were more likely to be prepared.

Respondents with more education, some college or higher, were more likely to report having a plan for what to do in an emergency situation, but those with a high school education or less were more likely to have prepared a kit than all other categories of respondents except for those with *some* college education.

Some demographic groups seemed to go together, for instance married respondents, those with children under 18, in single family homes and those in older age groups were significantly more likely to report some preparedness. Other markers, such as race, geographic location and income, did not show any pattern of significant difference in preparedness.

## Preparation for an Emergency

Every respondent was asked whether or not they had done any of the three things already discussed to prepare for an emergency event.

Many respondents reported that they had done at least one of the three things; either formed a plan, prepared a kit, or decided on a family meeting place. In an effort to further investigate their motivation for these actions, those respondents were asked:

> *Many people have not done anything to get ready for an emergency situation. What motivated you to start getting prepared?*

In recording the answers, care was taken to differentiate between man-made and natural events. In addition, many cited potential threats or feelings of wanting to be prepared for whatever may come.

Our postcard announcing the upcoming survey apparently prompted at least one household to consider preparations. That respondent comment served as an indicator of the many respondents who took some event as the impetus for action. The attacks of September 11, 2001 made preparedness a priority for over thirty percent of those interviewed. That number rises to just over half (50.2%) of our respondents when other experiences with disaster or emergency events are considered.

The experiences of some as an employee or volunteer also provided motivation.

A significant number of respondents (9.1%) did not or could not tell us what had prompted their actions. In that case, we did not try to offer any possible reasons.

**Table VI-1: Factors that might motivate people to get prepared for an emergency event.**

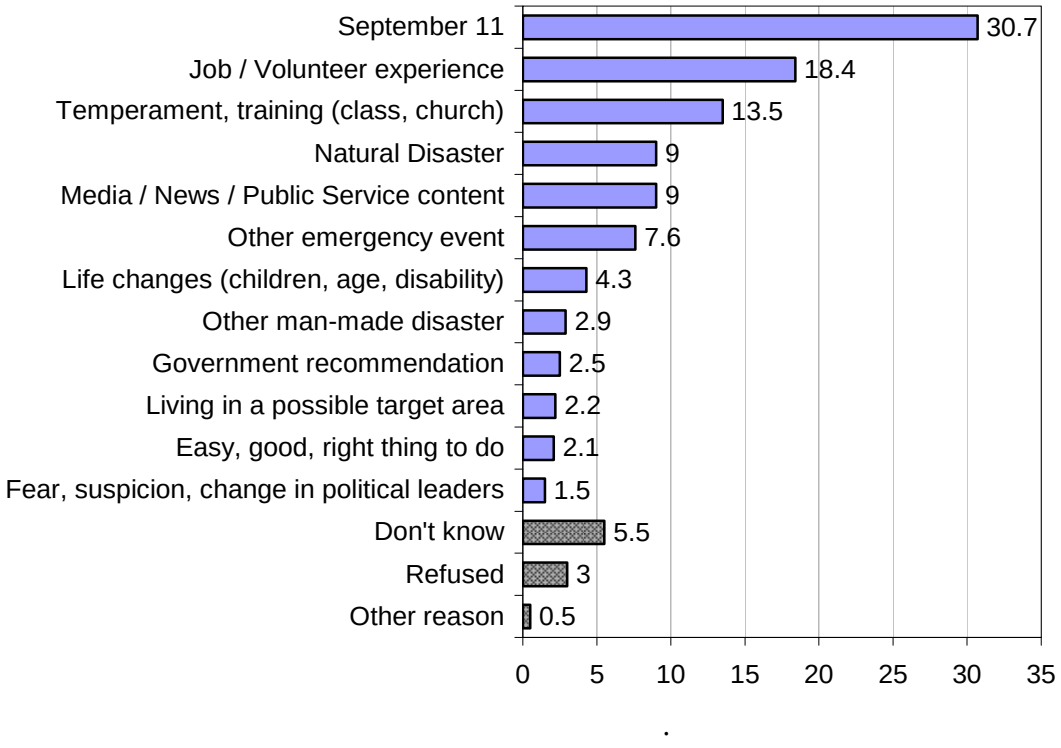



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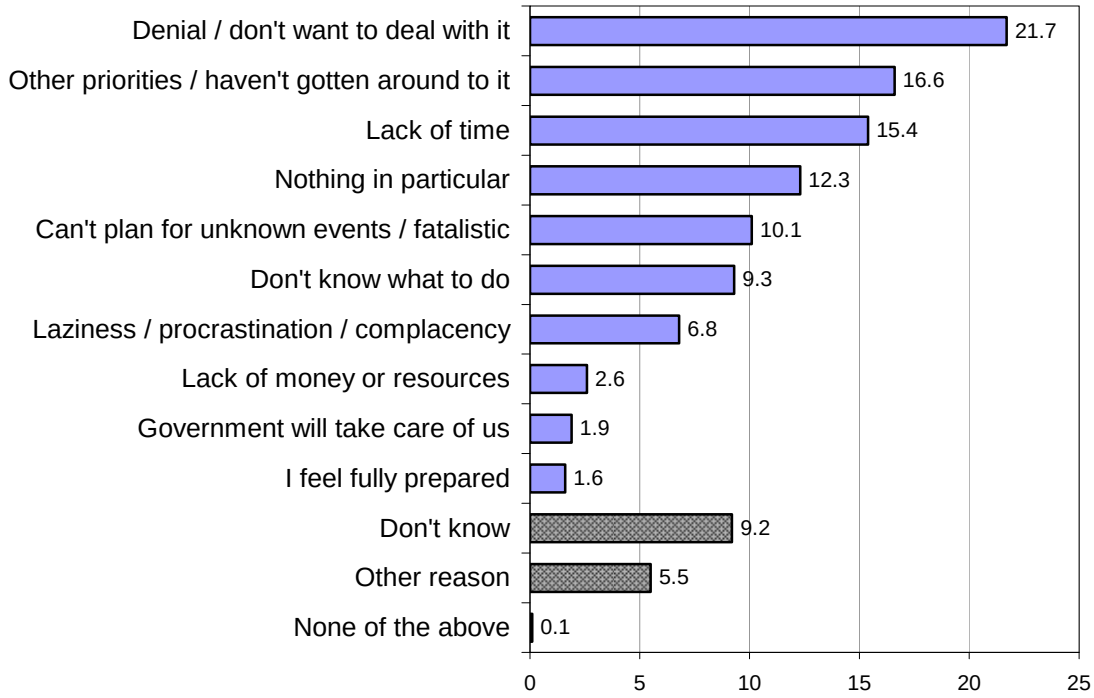
**Table VI-2: Things that might hold people back from being prepared.**




Those who had not done any of the three things we asked about heard the following statement and question.

> *Many things might hold people back from being more prepared for an emergency event. What would you say is stopping you from taking the next steps towards being more prepared?*

Respondents could offer their own thoughts in answer to our questioning. As can be seen from Table VI-2, most responses centered on the lack of a clear sense of need. "Don't want to deal with it", "Nothing in particular" and other expressions of procrastination or complacency were common.

Possible responses to the question were not offered to respondents; interviewers used a preset list of possibilities to code from the responses given. Interviewers did not spend extra time trying to categorize the answers given, but recorded the text of what was not easily coded during the interview and those responses were coded after data collection. Additional categories were added as appropriate. *Other* responses that were too diverse to categorize are printed in Appendix E.

## Summary

Before being presented with any of the imagined events of the scenarios, respondents were asked about anything they may already have done to prepare for a possible event. Interviewers began with very simple and superficial questions that asked if they had prepared a plan, a kit or arranged a meeting place for use if needed. Almost 40 percent of respondents had a plan in place and well over half (54%) had done at least one of the three things.

It is clear that some demographic factors make it significantly more likely that someone might have made some effort toward preparedness. People who have experienced some event in the past, who report volunteering time for six hours or more a month, or have some connection to the military were more likely to have made some preparation. Other factors include longer residency in the area, being married, higher education, having children under 18 and being in one of the older age groups. Those with no vehicle also tended to have prepared a kit or a plan.

These questions set the stage for exploring further into what may motivate people into making preparations for some emergency or

what may stand in their way. These questions were open-ended, that is, respondents could answer the question in their own way and the interviewer coded from the response.

For those who had answered "yes" to any of the three possibilities, the question posed was what motivated them to take some action. Responses showed clearly that past events were a major factor, including 30 percent who cited the September 11 attacks. In addition to events, experiences from the workplace or from volunteering were a significant contributor.

If the person interviewed had made no effort to have a plan, make a kit or arrange a meeting place, then they were asked what was stopping them. Reaction showed that many felt a lack of a sense of need, citing denial, lack of time and procrastination as reasons.

These text responses, along with the detailed analysis of demographic groups, can provide a more in-depth understanding of the underlying impulses that might drive emergency preparedness.

# VII. Confidence in Critical Infrastructure

## Support Services in the First 48 Hours

Emergency personnel must make difficult decisions on how to spend resources within the first 48 hours of an emergency. It can be helpful to examine the priorities residents would assign to the services they might expect from those officials. After having heard the scenario events, respondents were read this introductory statement:

> *We'd like to know what you would want emergency management services to do in the first 48 hours of an event like this one.*

Those responding to the list of services could specify that they felt each one was extremely important, very important, somewhat important, or not important for the authorities to be providing in the first 48 hours. A mean importance rating was computed by scoring these responses as 4, 3, 2, and 1, respectively. Figure VII-1 shows the items in rank order, based on this calculation. First priorities, information with which to make further decisions (3.58) and provisions for decontamination, (3.46) top the list, with neighborhood patrols to prevent fighting or looting (2.76) and giving out food (2.72) getting the lowest ratings.

### *Significant demographic observations*

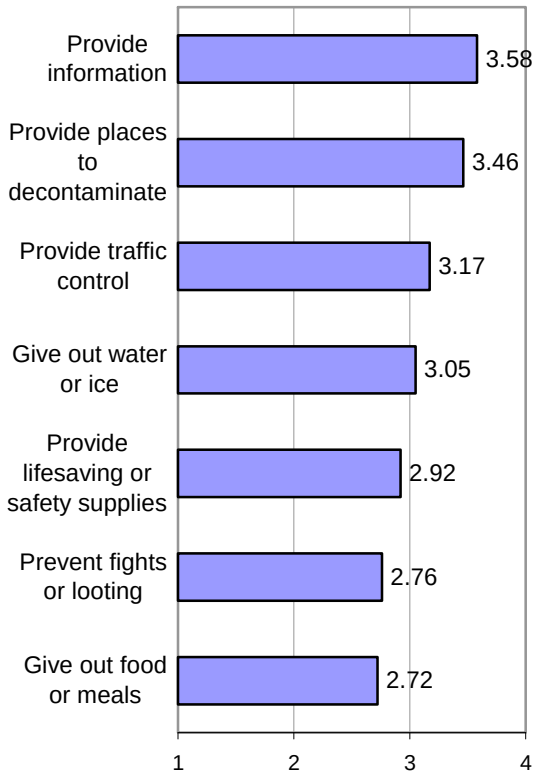
There were not as many variations in expectations that could be ascribed to demographic differences as might have been predicted. Whether respondents chose to stay in place or to evacuate in an emergency did not seem to alter expectations. Neither volunteerism, religiosity, marriage status, job type nor location had an effect either.

The level of a respondent's income was important to several items. There was a marked difference between those of lower income, that is under $75,000, and those of higher income. Those of lower income had higher expectations for emergency management services to patrol neighborhoods to prevent looting, to give out food, and to provide supplies. Expectations for these three services declined as income rose across the five income categories.

Those with a high school education or less placed less importance on information, as well as those from rural areas and eighteen to twenty-five year olds.

Whites were less likely to emphasize patrols to prevent fights or looting. They also have lower expectations for the provision of safety or lifesaving supplies than persons of other races.

**Figure VII-1: Support service priorities in the first 48 hours**




## Confidence in Infrastructure Services

Of course, the availability of the desired support will depend heavily on the continued availability of infrastructure services. Resident confidence in the continuation of normal service was explored with a list of services presented one by one to each respondent, then asking:

> *"In the event of a major local emergency, such as a natural disaster or terrorist attack, how confident are you that this service would still be available to you?"*

Respondents rated each item on a four point scale: 1=not at all confident, 2=not so confident, 3=somewhat confident, 4=very confident. Results are shown in Figure VII-2, sorted by scores for

"very confident". Confidence is denoted by shades of green, with lack of confidence shown in red.

These items were offered to respondents in random order, to minimize any effect one rating might have on another.

Examination of Figure VII-2 shows that residents have a great deal of faith that essential services will continue for many, even in the aftermath of a natural disaster or terrorist event. Of the thirteen items that were cited, only three earned a rating that indicated a lack of confidence. Respondents rated their confidence in public transportation, mail delivery, and local financial institutions under sixty percent (or a mean lower than 2.4). Although transportation and financial institutions have a similar rating, showing 2 in 10 reporting a complete lack of confidence, mail delivery has about three in ten giving that rating.

Similarly, confidence in local broadcast TV and health care facilities seems about even, distinguished only modestly by the slightly more numerous "very confident" ratings accorded health care facilities. It is of note that health care facilities were more likely to inspire respondents to say they were "very confident" (36.4%) than local TV (29.2%). A higher percentage indicated that they were "somewhat confident" that TV broadcasts would remain in service (52.3%), as compared to health care facilities (45.9%).

Sorting by relative levels of "very confident" ratings, cable service (18.2) comes out slightly above cell phone service (17%). But because "somewhat confident" ratings are higher for cell phone service (47.9%) than they are for cable TV (42.3%) a combined percentage gives cell phone service a better overall assessment. The same modest anomaly is repeated again for public water and electricity, where respondents give water service a higher "very confident" rating (17%) than electricity (16%), with the order reversed relative to the percentage who registered a "Somewhat confident" rating for these services (43.8 percent for water service and 48 percent for electricity).

Another way to think about the meaning of these ratings is to consider the average rating score or mean. A mean importance rating was computed for each by scoring these responses from very confident (4) to not at all confident (1). Means are a comprehensive way to consider these values that allow us to see how the confidence items would be ranked.

Figure VII-3 below shows the results of this calculation. Items are listed in rank order by the value of the mean.

With a mean rating of 3.48 on a four point scale, people had the most confidence in continued radio broadcasts. Health care facilities (3.15) and local broadcast TV (3.05) also rated highly. Respondents were least confident that mail delivery (2.18) and public transportation (2.30) would continue in the event of a natural disaster or terrorist attack.

**Figure VII-2: Confidence in the availability of services**

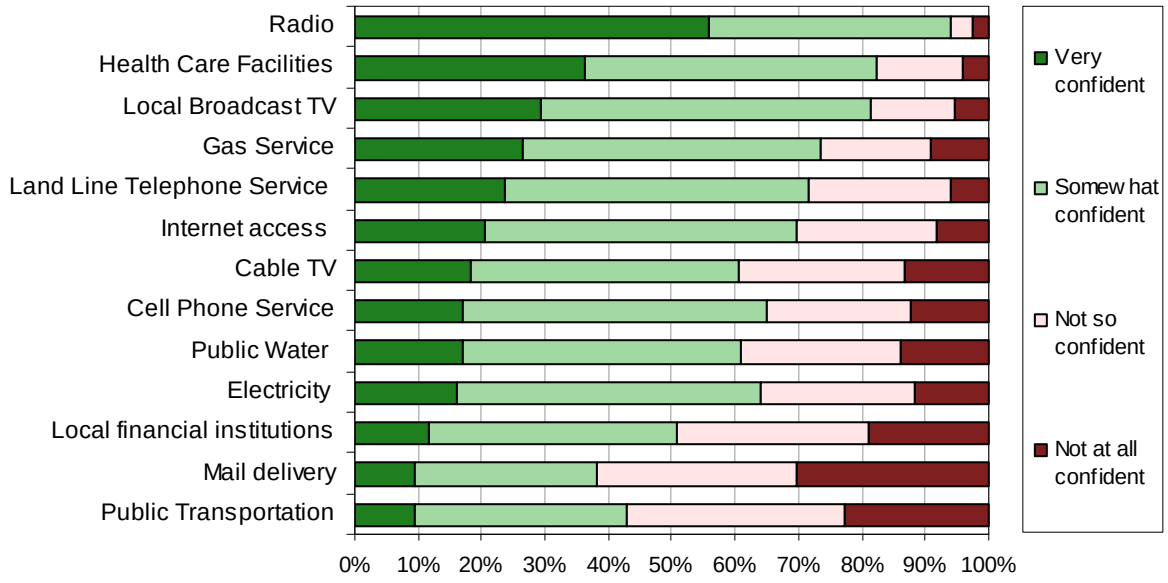
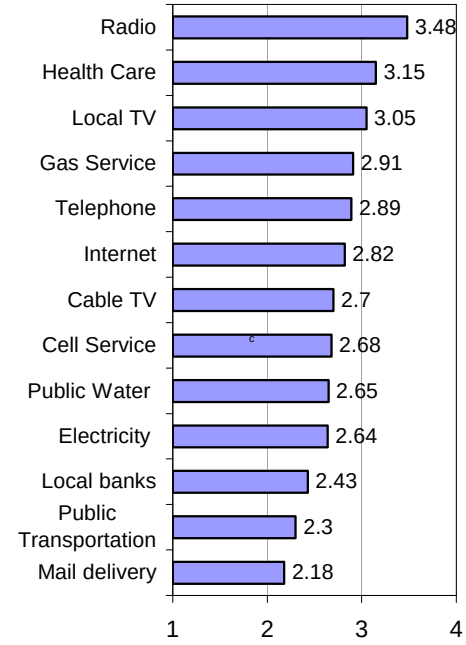


**Figure VII-3: Mean scores showing resident confidence in continued service**




## Summary

Several questions in the survey attempted to assess the expectations residents would have in the first 48 hours after a major local emergency event, specifically a terrorist attack. To start, they were asked what they would like emergency personnel to do in the first 48 hours. Responses were clearly ranked, with information and decontamination services deemed the most important. Traffic control, providing water and providing supplies received moderate ratings, with preventing fighting and looting and providing food at the bottom of the public's priority list. However, these items were of greater importance to low-income respondents.

Questions about critical infrastructure were addressed by presenting different services residents would be accustomed to receiving and asking their level of confidence that the service would continue in the aftermath of an event. Presentation of the services was randomly varied to prevent one item's response from affecting the response to another. Respondents had by far the most confidence in continued radio transmission (3.48). Confidence was also high in the continued operation of health care facilities (3.15) and local TV (3.05).

It is noteworthy that respondents rated their confidence in continued Internet access through their local provider more highly (2.82) than they did electricity to their homes (2.68), even though one is a prerequisite for the other.

# VIII. Perception of Information Sources

Transmitting information to the public about how to prepare for or respond to emergencies is a crucial element of any emergency response plan. Citizens may be active or passive in obtaining information, and they must find it credible or trustworthy.

## Seeking Information

To better understand citizen expectations about information regarding emergency preparedness, a sample of respondents was asked:

> *What sources would you consult now to get more information about what you should do in the event of a terrorist attack in the future?*

Respondents could select multiple sources, which were categorized by the interviewer or post-interview coders. The top source, mentioned by 27.6 percent of respondents, was the internet in general, such as information accessed through a web search. Other popular sources, each mentioned by over one fifth of respondents, were local television news (25.2%), government websites (21.3%), local radio (21.2%), and news websites (21.2%). Only a few people (less than 2%) mentioned sources such as their healthcare provider, the Centers for Disease Control, or social media sites. Figure VIII-1 lists each source and the percentage of respondents mentioning it.

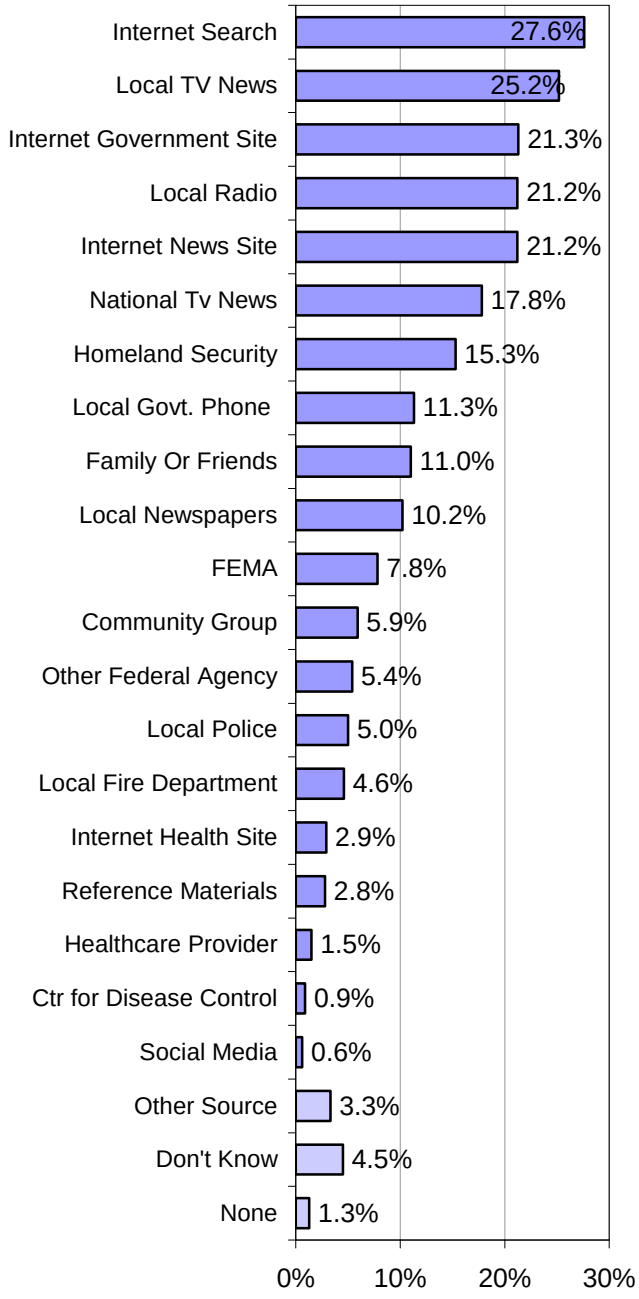
In determining which sources to focus on when providing information, it can be useful to parcel out the overlap in responses. For instance, more than half (60.4%) of the people who mentioned local radio also mentioned local TV news and 44.4 percent of those who mentioned local TV news mentioned national TV news. This information can be used to answer the hypothetical question: What minimum combination of communication channels could be used to reach the maximum number of area residents?

To start with, over half of respondents (51.5%) mentioned either internet searches in general or local TV news. So, these two channels alone potentially reach half of the population. Then, amongst the people who did not mention either of those, the most popular sources were internet government and news sites, which include another 23.4 percent of respondents. To reach at least 90 percent of the respondents, it would be necessary to disseminate information using eight sources: the four previously mentioned plus the Department of Homeland Security, local radio, community groups, and family or friends. Given the overlap, it is not surprising that national TV news is absent from this list. For the same reason, both FEMA and the fire department completely disappear as they were only mentioned along with more popular sources. Interestingly, community groups rose to the seventh place, because they are able to reach people who are hard to reach through other channels.

Internet searches were, not surprisingly, mentioned more often by younger people, including 40.4 percent of those 18-25 and 32.7 percent of those 26-37. Only 10.0 percent of those with incomes of less than $35,000 mentioned internet searching, but there was no further relationship with income. On the other hand, those with household incomes of $75,000 and above were more likely to mention internet news sites than others. Also, 39.5 percent of respondents living in rural areas mentioned internet searches whereas only 14.9 percent of DC residents mentioned them.

Internet government sites seem to attract a more specific audience: those with greater education and income. Only 1.6 percent of those who had not attended college mentioned a government site, whereas they were mentioned by over a quarter (26.8%) of those with a college degree and 30.2 percent of those who attended graduate school. Similarly, those who reported a household income over $75,000 were more likely to mention government internet sites than others. Finally, as with other internet sources, only 9.8 percent of those over age 64 mentioned a government internet site, although 20.4 percent of those age 50 to 64 did.

**Figure VIII-1: Sources of information**




## Trust in Information Sources

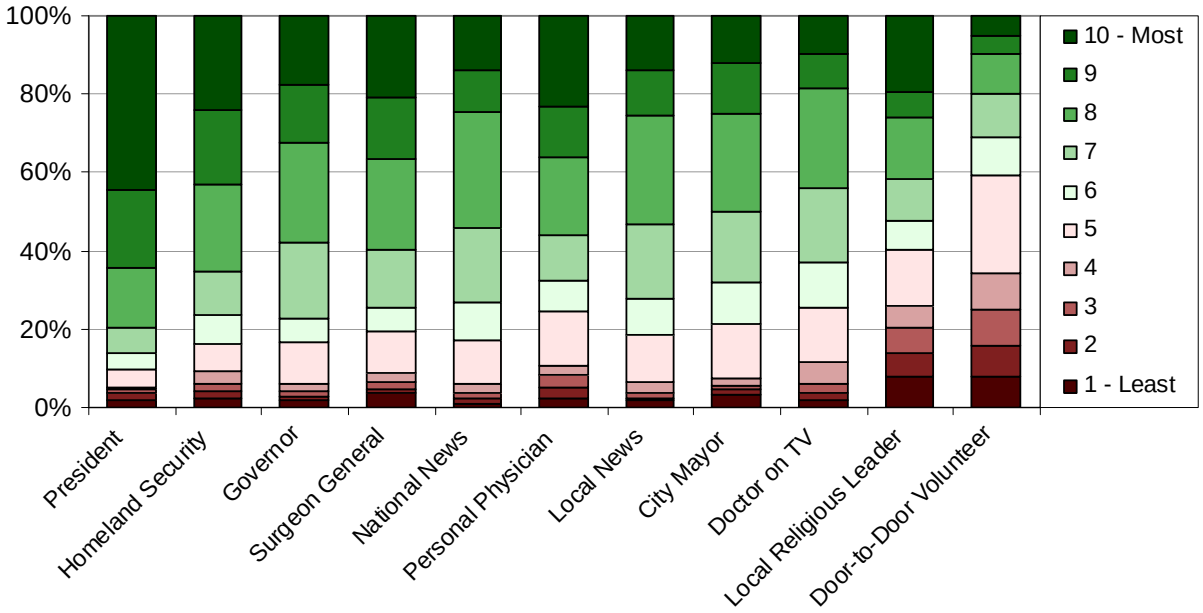
In addition to finding or receiving information, citizens must trust the source for communication to be effective. For each of several specific sources of information, respondents were asked to rate the trustworthiness of that source on a 1 (least trustworthy) to 10 (most trustworthy) scale. The most trustworthy of the given sources was the President of the United States with an average rating of 8.5. The Office of Homeland Security was ranked second, with an average rating of 7.7.

Other trustworthy sources were the State Governor, the US Surgeon General, national news programs, personal physicians, and the local news, each with an average rating between 7.32 and 7.54. Somewhat surprisingly, the least trustworthy source was a volunteer knocking on the door and providing a service, with an average rating of 5.2.

It is also helpful to look at the percent of respondents who issued particular ratings. For example, the high average trust in the President reflects the high percentage of respondents who issued a top rating of 10 (44.5%). In comparison, the Office of Homeland Security had the second highest average rating but only 24.2 percent of respondents gave it the highest possible trustworthiness rating. Figure VIII-2 shows the distribution of trustworthiness ratings across sources. The height of each segment in a bar represents the percentage of respondents giving that rating. When stacked, these segments total 100 percent, indicating that the bar includes all possible responses. The segments are stacked in order with least trustworthy ratings at the bottom and most trustworthy ratings at the top.

This type of graph highlights divergence in attitudes. For example, as Figure VIII-2 illustrates, a quarter (24.9%) of respondents gave the door-to-door volunteer (the lowest rated source) a rating of 3 or below indicating low trustworthiness, but 20.0 percent gave an 8 or above, indicating high trustworthiness. (It will be seen below that many residents believe that disseminating emergency preparedness information via volunteers would be highly effective.) Similar divergence was found with ratings for a local pastor or religious leader, which had the second lowest average rating (6.31). About 20 percent (20.1%) of respondents indicated that the religious leader was in the three least trustworthy categories, but twice that many (41.4%) indicated he or she was in one of the three most trustworthy categories.

**Figure VIII-2: Trustworthiness of sources**




Not surprisingly, those who attend religious services or activities more than once per week were significantly more likely to trust their local pastor than others. In addition, religiously active respondents gave higher trustworthiness ratings to a door-to-door volunteer, significantly greater than those who go to religious services less than once a month (6.11 vs. 4.70).

Although there was a relatively small number of respondents receiving this question who lived in rural areas, they reported being significantly less trusting of a volunteer knocking on the door (3.79 vs. 5.10 overall) and more trusting of their own personal doctor (8.32 vs. 7.31 overall).

Also as expected, education and related factors such as income were associated with differences in trustworthiness ratings. People with higher levels of education were less trusting of both local and national news, local medical professionals on television, local religious leaders, a personal physician, and a door-to-door volunteer. For instance, those without a college education trusted a volunteer significantly more than those who had attended graduate school (5.93 vs. 4.90).

As with general levels of trust in government, Black respondents were more trusting of certain of these sources than White respondents. They were higher in trust toward the office of homeland security, local and national news, a personal physician, and a local medical professional on television. Also, females tended to give higher trustworthiness ratings than males.

There were several sources for which trust declined over age. Compared to respondents over age 64, the youngest respondents (age 18-24) had higher levels of trust for the President (9.03 vs. 8.16), the national news (8.11 vs. 7.05), and the office of homeland security (8.43 vs. 7.41). For each of these, there was a linear decrease in trust throughout the age categories, but the only statistically significant differences were between the oldest and youngest respondents.

## Effectiveness of Methods

Respondents were asked to judge the effectiveness of various advertising and educational efforts that could be undertaken to promote emergency preparedness. The information sources could be rated from 1, meaning not at all effective, to 4, meaning very effective.

Respondents indicated that the most effective preparation for an emergency was having lived through a prior emergency or disaster (mean = 3.58). While obviously not really "an effort" that could be instituted by any entity in order to prepare the public for future emergencies, it does seem to indicate, nonetheless, that the prevalence of such an experience can be recognized as an important factor. As seen in Part V above, 60.7 percent of current NCR residents have had prior experiences with emergency events.

The next most effective methods were internet sites, and media or advertising campaigns. Other

effective alternatives included disseminating information through volunteers, statements from government leaders, and in-home visits by experts. The least effective information distribution platforms, each with an average rating below 3 on the 4-point scale, were mailings, social networking sites, and community meetings.

Figure VIII-3 shows the distribution of effectiveness ratings across methods. The height of each segment in a bar represents the percentage of respondents giving that rating. When stacked, these segments total 100 percent, indicating that the bar includes all possible responses. The segments are stacked in order with not at all effective at the bottom and very effective at the top. As the figure illustrates, although in-home visits had only the 6th highest average rating, 44.9 percent of respondents rated them as very effective, compared to the 33.7 and 34.3 percent who rated information from volunteers and government leaders as very effective.

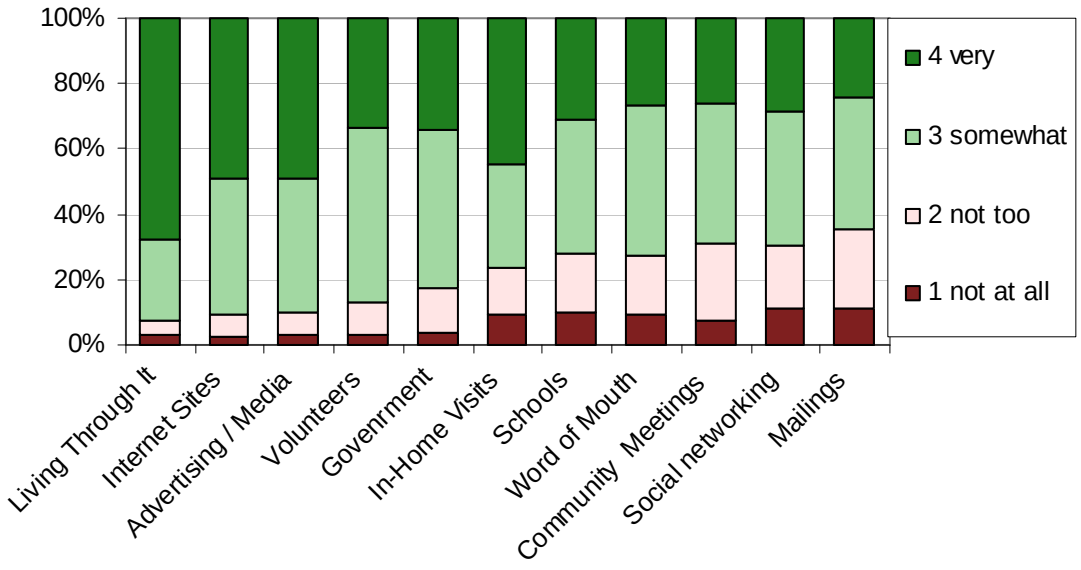
This suggests that in-home visits may be a more effective approach than the average rating suggests. Specifically, over 50 percent (50.8%) of those age 37 and under rated in-home visits as a very effective method, compared to just 37.3 percent of those over 64 years of age. Also, 60.0 percent of black respondents indicated in-home visits would be very effective whereas only 39.9 percent of white respondents felt the same.

In addition to age differences regarding in-home visits, there were significant age differences in the rated effectiveness of other methods. Respondents in the 18 to 25 year old category were more likely to think that media campaigns, materials from the schools, word of mouth, internet sites, and social networking sites would be effective. Respondents age 64 and older, on the other hand, did not believe internet sites and social networking would be effective. Beliefs about the efficacy of word of mouth varied the most amongst all age groups. Overall, younger respondents believed it would be more effective, whereas older respondents were more split with many believing it would be effective and many believing it would be not at all effective.

The rated effectiveness of many methods also differed significantly by race. In particular, Black respondents were more likely to believe that many of the methods would be effective, such as statements from government leaders, community meetings, word of mouth, and in home visits. This tendency persists even when accounting for the fact that black respondents were younger on average than white respondents.

Finally, effectiveness ratings also differed by income. People with higher incomes were less likely to find statements from government leaders and community meetings effective. The effectiveness ratings of other methods differed by income, but not in a linear fashion. Notably, those with incomes less than $35,000 were significantly more likely to believe that receiving materials from the schools is very effective.

**Figure VIII-3: Effectiveness of education methods**



# IX. Directions for Further Analysis

## Overview of Individual Stakeholder Interests

The NCR Urban Area Security Initiative's Department of Homeland Security (DHS) 2008 RCPGP grant includes five discrete research areas. They are: (i) Resource Management, (ii) Public Preparedness, (iii): Modeling & Simulation, (iv) Mass Care, and (v) Transportation.

In November 2009, while the survey was in the field, research associates of UVA's Center for Risk Management of Engineering Systems conducted telephone interviews with stakeholders likely to have a critical interest in these research categories.

These interviews were designed to isolate and characterize the particular ways in which the findings of the behavioral study could be exploited by each of the research partners. Those interviewed were reminded of the main survey topic areas and asked to try to match their most critical information needs to these areas. This was a chance for stakeholders to underscore, refocus, or deemphasize goals expressed at the time of questionnaire development and to allow specifically for more extensive analysis in key areas. The interviews also allowed the stakeholders to describe research needs that go beyond the data available from the current survey, or would require collection of supplementary data to be used in conjunction with the survey results. The following is a summary of these interviews.

### *Resource management*[8]

The Resource Management partners expressed a desire to identify specific resource gaps in the National Capital Region and its surrounding states. The scope of the effort in this regard included three general parts: Evacuation, mass care and medical surge. Specific examples of potential resource gaps included shelter availability and shelter capacity and, with respect to mass care, capacities for mass care, hospitalization, and the provisioning of food and sleeping accommodations.

[8] Lori Romer, Megan Timmins and Christina Crue of the "Research Management" partner were interviewed on 24 November 2009.

Among the relevant questions addressed by the behavioral study were:

1. How many people will need to be sheltered?
2. How many will likely evacuate?
3. What will be the expected behaviors under a mandatory evacuation scenario?

Additional questions and analysis of relevance to Resource Management partners included:

1. The depth of community attachment and feelings about the community.
2. Correlations between evacuation behaviors and trust in government with socio-economic status and geographic circumstances.
3. The numbers and types of pets that would both complicate evacuation and necessitate the provision of pet shelters.
4. A numerical and qualitative estimate of community members with disabilities, to determine related evacuation, communication, and sheltering efforts.
5. The prior interest in and provision for emergency kits among community members (medicines, water, food and related supplies).
6. The number of people who would stay and who would not stay at specific locations if they are told to shelter in place under the minimum, moderate and maximum-hazard scenarios.
7. The number of vehicles available to area residents in the event of an evacuation order
8. How and when a resident might choose to evacuate or stay in place and the numbers of those likely to evacuate if asked to shelter in place
9. The length of time various residents would be willing to shelter in place
10. The relative likelihood of delayed evacuations due to traffic.
11. The correlation between the level of preparedness and preference for public shelters at a potential destination.
12. The locations and proximity of likely destinations and the routes by which residents would reach these points
13. The percentage of people traveling to neighboring states (MD, PA, VA, WV) who

will prefer public shelters or private accommodations at their destinations.

14. The percentage of the area population likely to modify their current assumptions of evacuation/sheltering under an order for mandatory evacuation
15. The types of and extent of specific services expected at different hazard levels and under mandatory evacuation.
16. Demographic information such as languages spoken by evacuees.

The Resource Management partners were less interested in survey questions related to public confidence in utilities and services.

## *Public preparedness*[9]

The public preparedness partner, located in Pennsylvania, expressed an interest in three specific questions:

1. "How many people are going to evacuate to Pennsylvania?"
2. "How long are they going to stay in Pennsylvania?"
3. "Are these evacuees going to be home owners or renters?"

This partner expressed a particular interest in the study results relating to community attachment, household information (including information about the number of children, teens and adults), the number of evacuees expected to travel to Pennsylvania (under minimum, moderate and maximum scenarios), prospective sheltering and long term housing needs, the level of expected services (including utilities), and the sources of evacuee information and the trustworthiness of these information channels.

Beyond the scope of the current study, the research group was interested in the long term behaviors of the evacuees, including how long they would likely remain in the destinations to which they might evacuate, and whether they plan to rent or own homes there in the event of potential plans for long-term evacuation.

[9] Pam Weeks of the Pennsylvania Public Preparedness group was interviewed on 20 November 2009.

## *Modeling and simulation*[10]

This partner expressed an interest in the impacts of a mass evacuation from the National Capital Region on four West Virginia counties: Jefferson, Berkley, Morgan, and Hampshire. Their focus is on these specific resources:

1. Fuel (including locations and amounts).
2. Water (including locations and amounts, retail inventories and area purification capacities).
3. First aid locations and shelter beds (including hospitals, nursing homes and other health care facilities, and the numbers of required beds, staffing, real time blood supply, and other resources related to the provisioning of this care).

Relative to this study, this modeling and simulation partner described the ongoing evolution in modeling and simulation efforts that included the understanding of available technology, the identification and adoption of applicable standards, and the scalability of the tools for different scenarios.

They noted also how they have approached these efforts in several key layers, defined by data, "consequence management," and "presentation". The partner noted relative sufficiency in the data and presentation layers, provided chiefly under current arrangements by the federal government. They noted more obvious deficiencies, however, in the middle "consequence management" layer tied specifically to interdependencies of resources, plans, procedures and the effects of simulation inputs on roadways and resources.

With respect to the behavioral study, this partner was interested in "how many people are moving in which direction and with what capacity," and "whether temporary fuel locations, shelter space, and/or supplement commercial food vendors are needed along these routes and at the ultimate destinations."

In particular, this partner was interested in several topics of the behavior study, including community attachment (especially the number of home owners versus renters), information about trust in

[10] David Hoge of the West Virginia Department of Military Affairs and Public Safety was interviewed on 20 November 2009; he was working in collaboration with Brian Abey and Patrick Farrell from Computer Sciences Corporation

government; and information related to household characteristics such as age, the number and types of pets, and the number of evacuees with special needs due to disability or age.

This partner was very much interested in the likely destinations of the evacuees and the expected distances to prospective destinations under minimum, moderate and maximum-hazard scenarios, as well as the number of vehicles in likely evacuee households.

### *Mass care*[11]

This partner expressed an interest in the survey data and analysis relative to two specific projects:

- The sheltering of special needs populations, and
- The behavioral mental health requirements of the expected evacuee population.

This partner described the ongoing project relative to the sheltering of special needs evacuees that would be expected to identify gaps for each jurisdiction in terms of sheltering assets, special needs definitions and shelter capacity.

The behavioral mental health component was focused on an operational plan, training on that plan, and standardized procedures for mental health and emotional wellbeing. The partner described the performance of a February and March 2009 gap-analysis survey conducted with all behavioral and mental health agencies in nine counties in Maryland, Virginia and the District of Columbia. Conducted to ascertain the expected gaps in behavioral and mental health services in the event of a regional catastrophic event, this survey addressed the status of training in different areas of disaster services, and the relative level of planning within the community. Finding few agency community members with all-hazards plans or, more specifically, with behavioral and mental health plans, this gap-analysis survey also indicated that there were relatively few cases in which lead agencies had been designated for different emergency support functions.[12]

This partner explained that out of these preliminary efforts came a detailed scope of work to provide all-hazards template plans for the National Capital Region and to develop training plans for the expected catastrophic scenarios. While these efforts have garnered much information about the expected role of critical agencies and professionals, they have relatively little information about citizens and their prospective needs and behaviors. This partner expressed a critical interest in additional survey data relative to this information gap.

The partner described how the detailed information on household characteristics would potentially be useful in obtaining a crisis counselor planning grant. Knowledge of mental health prescription medication needs and age demographics were deemed especially critical to this goal and mission. Related survey information on confidence in the delivery of health care, emergency plans within families of disabled citizens, and the expectations for mental health services were also deemed especially useful.

The partner also described an interest in information related to varying scenarios and catastrophic events and the way in which such information might assist planning for evacuation assistance, prospective counseling, and the delivery of services to the affected special needs population. Because this partner considered communication to be a critical part of their ongoing mission, they noted the relevance and significance of survey data related to trustworthiness of information sources and service providers to the past disaster-related experiences of regional citizens, and to the ways in which community members typically seek information during a catastrophic event.

[11] Ellen Cornelius from DC Homeland Security and Emergency Management Agency (HSEMA) was interviewed on 20 November 2009; Julia Maxwell, Director of Disaster Mental Health Service, Department of Mental Health, DC was interviewed on 2 December 2009.

[12] Emergency Support Functions are outlined by the federal response framework. There is a national plan defining how to respond to disasters and what is needed in order to sustain communities in an emergency. For example, mass sheltering is ESF-6.

### *Transportation*[13]

This partner described an effort at developing the transportation plans, including plans for needed resources and personnel (state police, federal assistance, etc.) for evacuating the National Capital Region in case of a major emergency (dirty bomb, hurricane, etc.). The partner indicated that all states, including WV, VA, PA, MD, and DC, were involved in these plans.

From a behavioral perspective, this partner was interested in ascertaining the potential number of evacuees, the jurisdictions from which they will evacuate and to which they will likely travel, and the routes by which they are most likely to evacuate.

They also expressed an interest in the number and type of vehicles in regional households and the number of citizens expected to utilize area roads and mass transit during various evacuation scenarios. They described an ongoing disaster/emergency related transportation modeling and planning effort that was relatively early in its execution, and expressed a related interest in validating early assumptions about the prospective number of evacuees and the transportation modes and routes that they would be likely to utilize. This partner did not have a significant interest for the time being in household characteristics, expected public services, or information channels.

### *Summary*

Table IX-1 summarizes the particular interests of the research partners in the results of the behavioral study. The results summarized in this report will go a long way in fulfilling some of these research needs. Some of the listed research needs call for data that are not available from the present survey, but might well be incorporated as survey questions in future surveys of behavioral responses to emergencies in the region. Other needs will require more specialized analyses of the present survey data, analyses which the authors are hoping to undertake in a future phase of this project. The 2010 NCR Behavioral Response Survey is a large and rich data set, and it is our hope that our RCPGP research partners and other emergency planning professionals will continue to mine the results for key answers as they develop plans to enhance the security of the National Capital Region and the safety of its residents.

[13] John Molnar of the All Hazards Consortium was interviewed on 17 December 2009

**Table IX-1: Interests of resource partners**

| | Resource Manage-ment | Public Prepared-ness | Mass Care | Modeling and Simulation | Transporta-tion |
|---|---|---|---|---|---|
| Community attachment and feelings about the community | ● | ● | ● | | |
| Trust in people, local /state /federal government | | | | ● | |
| Household information (ages, special condi-tions, pets) | ● | ● | ● | | |
| Emergency preparedness | ● | | ● | | |
| Stay- leave decisions under different conditions | ● | ● | ● | | ● |
| Evacuation detail (vehicles, destination) | ● | ● | ● | | ● |
| Use/ not use designated emergency route | ● | | | | ● |
| Mandatory evacuation | ● | | ● | | |
| Expected services | ● | ● | ● | ● | |
| Education efforts | | | | | |
| Consulted sources of info channels & people | | ● | ● | | |
| Confidence in utilities and services (rationed) | ● | ● | ● | | |
| Prior experience | | | ● | | |
| Demographics | ● | | ● | | |