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Spontaneous Evacuation Following a Dirty Bomb or Pandemic Influenza: Highlights from a National Survey of Urban Residents' Intended Behavior

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Rural preparedness planning efforts generally focus on the needs of area residents following a local emergency situation. The potential for spontaneous evacuation of urban residents following a disaster or public health crisis is rarely considered. Such an evacuation is a particular concern for rural areas, which would be quickly overwhelmed by the significant population increase. To supplement the Walsh Center's work on urban-to-rural evacuation, a national survey was fielded to assess the evacuation intentions of urban citizens following emergency scenarios. Scenarios included were the detonation of a radiological device (i.e., dirty bomb) and an influenza pandemic. The dirty bomb scenario was chosen as an event likely to cause few casualties, but significant panic and, as a result, a high level of self-evacuation. The pandemic influenza scenario was chosen due to its high profile in the media and the current lack of knowledge of likely individual behavior. For both scenarios, respondents were asked: whether they would be likely to evacuate under various levels of external influence; whether they would be likely to follow governmental instructions to shelter in place; and, to identify travel distances and possible destinations.

KEY FINDINGS & POLICY RECOMMENDATIONS

- Between 77% and 91% of urban residents intend to evacuate if the government suggests or orders an evacuation following a dirty bomb or pandemic influenza.
- If the government advises residents not to evacuate, close to 40% of urban residents intend to evacuate against government advice.
- In the absence of outside influence from government or other sources, 65% will evacuate following a dirty bomb scenario and 40% will evacuate during a pandemic influenza scenario.
- In both scenarios, 55% of respondents indicate that they are likely to travel to a rural destination.
- Black and Hispanic respondents reported a greater intent to evacuate, both following government recommendations to evacuate and government orders not to evacuate. Results were statistically significant as compared to white respondents.
- Given the proportions of evacuees who will likely defy government orders and those that will seek shelter in rural communities, communication and coordination are needed between urban and rural preparedness planners to assure that evacuees' needs are met.
- Effective risk communications strategies are needed to increase the likelihood that citizens will adhere to governmental advice and orders.
- Estimates of the numbers, travel directions, and characteristics of evacuees are needed for effective preparedness planning.

METHODOLOGY

We conducted a review of published and unpublished disaster and evacuation literature. To address those aspects of evacuation—and urban-to-rural evacuation in particular—not covered by the literature, we conducted 17 key informant interviews with urban, rural, and national experts in evacuation and emergency preparedness during the first phase of this project. Interview findings were reported in a prior *Policy Analysis Brief*[1]. Findings from the literature review and key informant interviews were used to develop a 15-item survey

to assess respondents' intentions to evacuate following the detonation of a dirty bomb or during an influenza pandemic under each of the following conditions of external influence:

- The government advises residents not to evacuate.
- Hear reports from television or radio media, yet the government makes no recommendation as to what citizens should do.
- Hear reports from television or radio media, the government makes no recommendation as to what citizens should do, but a trusted friend or relative urges the respondent to evacuate.
- The government suggests that residents evacuate.
- The government orders residents to evacuate.

The survey also included questions relevant to disaster and emergency evacuation, including intended travel distances and destinations, and likelihood of following orders to shelter-in-place.

Survey respondents were a nationally representative sample of 1,505 adults living in metropolitan counties[2]. Respondents were reached by telephone in March 2007 as part of the EXCEL National Telephone Omnibus Study, conducted by International Communications Research (ICR) of Media, PA. The methodology employed is similar to that used for political polling. Up to four attempts were made to call each number, with the calls being made at different times of the day and on both weekdays and weekends. Households that are not reached are replaced. While the short field period does not allow the achievement of a response rate comparable to those of government-sponsored surveys with field periods of several months, survey data are weighted to ensure a survey that is nationally representative with respect to key demographic variables.

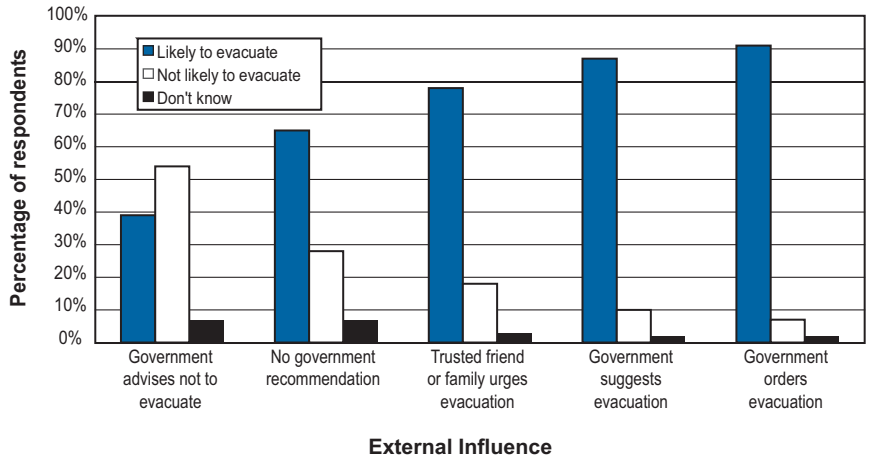
DIRTY BOMB

Experts generally agree that the intended effect of a dirty bomb would be to cause fear and panic and not necessarily to cause a significant loss of life; dirty bombs produce only a fraction of the explosion and radioactive fallout of a nuclear bomb. As such, dirty bombs are considered weapons of mass disruption. If a dirty bomb is detonated, a significant concern is that the general public may confuse the dirty bomb with a nuclear bomb, leading to spontaneous evacuation.

To minimize the possibility that respondents might ask the interviewer for a definition of "dirty bomb," and to ensure that each respondent had the same definition in mind, the dirty bomb question included the following explanation: "A dirty bomb is a conventional bomb that also spreads radioactive material." In designing the question, we felt that this explanation would not only offer each respondent a consistent definition, but would also provide the best approximation to an individual hearing about a dirty bomb for the first time if such an incident were to occur. Figure 1 displays the overall responses for each of the five conditions of external influence.

As external influence to evacuate increases, respondents' stated intentions to evacuate show a corresponding increase. Several results deserve particular attention. When presented with a scenario where the government advises residents not to evacuate, only 54 percent of respondents indicated that they would follow this advice, while 39 percent indicated they would evacuate against the government's advice (7 percent responded that they "don't know"). When presented with a scenario in which the government makes no recommendation, but a trusted friend or family member urges evacuation, 78 percent reported they are likely to evacuate, while in scenarios where the government suggests or orders evacuation, the number of respondents who indicated they are "likely to evacuate" increases to 87 and 91 percent, respectively. This latter pattern suggests that the government may have only a moderately stronger influence than a trusted friend or family member on an individual's decision to evacuate. Perhaps most importantly, in four of the five scenarios, two-thirds or more of urban residents indicated they would evacuate following a dirty bomb, and when advised by the government not to evacuate, nearly two in five urban residents would evacuate anyway.

Fig. 1: Expected Reactions to Explosion of a Dirty Bomb



[1] Meit, M., Kennedy, A. and Briggs, T. 2007. "Urban-to-Rural Evacuation: Planning for Population Surge." NORC Walsh Center for Rural Health Analysis Policy Brief. W Series, No. 9. April. (Available from http://walshcenter.norc.org)

[2] EXCEL uses a fully-replicated, stratified, single-stage random-digit-dialing (RDD) sample of telephone households. For the purposes of this survey, families residing in metropolitan counties (as defined by OMB) were classified as urban and were thus included in the sampling frame. Families residing in non-metropolitan counties were classified as rural and therefore excluded from the sampling frame.

PANDEMIC INFLUENZA

In light of media reporting on avian influenza and its pandemic potential, and coverage of the Severe Acute Respiratory Syndrome (SARS) epidemic in 2002, we were interested in whether urban residents would leave their communities during an infectious disease pandemic. Primed with the statement that "[a] flu pandemic could be the result of bird flu or avian flu," respondents were again asked if they would be "likely to evacuate" or "not likely to evacuate," given each of the five conditions of external influence. Figure 2 presents the results of this question.

Similar to respondents' stated intentions following a dirty bomb, in the event of an influenza pandemic, respondents show increasing intention to evacuate as external influence to evacuate increases. However, evacuation intentions overall are lower for pandemic influenza than for a dirty bomb. Seventy percent of respondents indicated that they would follow the government's advice not to evacuate, but 27 percent indicated that they would still be likely to evacuate despite the government's advice. The percentage of respondents who indicated they would evacuate on the urging of a trusted friend or relative (52 percent) was substantially lower than either a government suggestion or government order to evacuate, with 77 and 86 percent, respectively, indicating they are likely to evacuate.

Fig 2: Expected Reactions to a Flu Pandemic

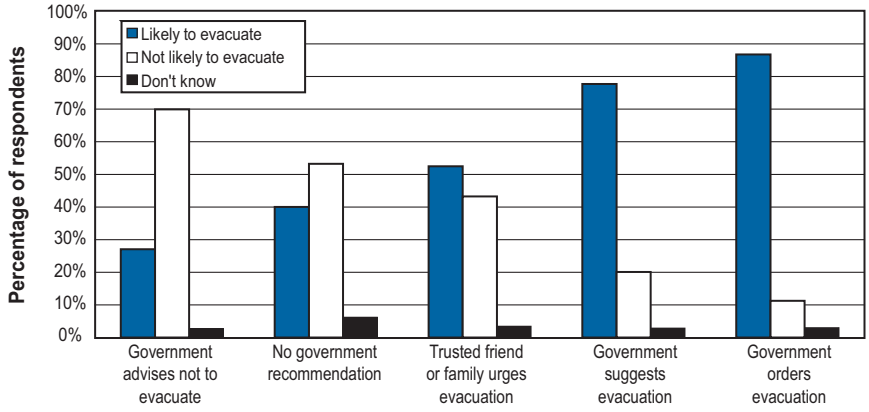
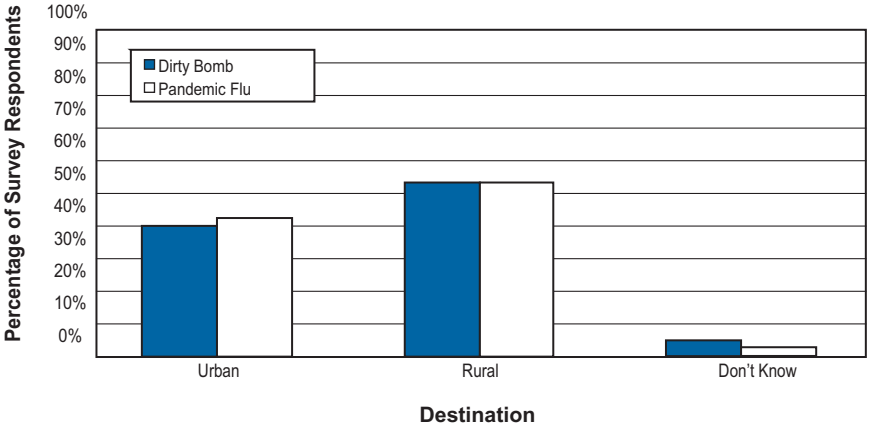


Fig 3: Expected Destinations of Survey Respondents in Evacuation Scenarios



LIKELY EVACUATION DESTINATION

To determine likely evacuation destinations, respondents were asked "if you evacuate, are you more likely to travel to an urban or rural area?" In this instance, urban and rural were self-defined based on the perceptions of the respondents; specific destinations were not captured and verified as urban or rural. Whether this may bias results is unclear, as is the direction of the potential bias. In both scenarios, 55 percent of respondents indicated that they would likely travel to a rural destination. For the dirty bomb scenario 40 percent indicated that they would likely travel to an urban destination, while 42 percent indicated that they would likely travel to an urban destination in the pandemic influenza scenario. Figure 3 displays likely evacuation destination by scenario.

SHELTERING IN PLACE

The dirty bomb and pandemic influenza questions were each followed by a question intended to assess whether respondents would follow governmental instructions to shelter in place. Respondents were asked, "If a [dirty bomb explodes/ a flu pandemic is affecting your community] and the government instructs citizens to stay in their homes or workplaces—known as 'sheltering-in-place'—would you be likely or not likely to follow these instructions?" Figure 4 displays the overall responses to this question. For comparison, findings are again presented showing the percentages of respondents reporting whether they would evacuate if the government advises against evacuation. Given the similarity in intent of these two messages, the differences are noteworthy.

Following a dirty bomb or during an influenza pandemic, 76 and 80 percent of respondents indicate they would likely follow government instructions to shelter in place. This rate of compliance with official directives is higher than the reported intention to comply with government advice not to evacuate, to which 54 and 72 percent of respondents indicated they would not be likely to evacuate. A possible explanation is that people are more compliant when told

what to do rather than what not to do, which may suggest an important risk communications strategy in helping to limit evacuation or exposure.

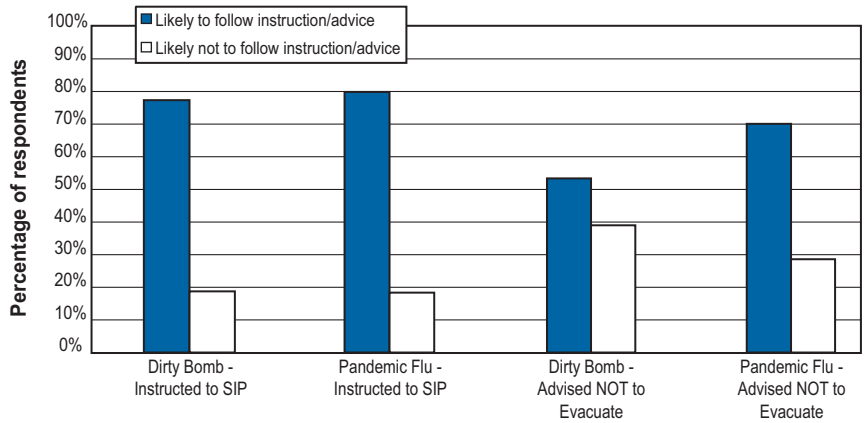
RACIAL DIFFERENCES IN PROPENSITY TO EVACUATE

We also examined the data to investigate the possibility of differences in propensity to evacuate based on respondent characteristics. The data reveal that under both the dirty bomb and pandemic influenza conditions, respondents who identified themselves as Black or Hispanic are significantly more likely to evacuate:

- Blacks and Hispanics are almost twice as likely as Whites to evacuate in a dirty bomb scenario.
- Blacks are more than three times as likely as Whites, and Hispanics are 2.5 times as likely as whites, to evacuate in a pandemic influenza scenario.

Although the data indicate that Black and Hispanic respondents are less likely to follow government advice not to evacuate, they also indicate that they are more likely to follow a government suggestion or order to evacuate, suggesting an overall greater propensity to evacuate. Each of these findings was statistically significant. There was no significant difference between White and Black respondents in their intentions to follow government instructions to shelter in place. One hypothesis for the observed results is that Black and Hispanic evacuation intentions may reflect a post-hurricane propensity towards evacuation among racial and ethnic populations most affected by Hurricanes Katrina, Wilma and Rita.

Fig 4: Likelihood of Following Instructions to Shelter-in-Place and Advice Not to Evacuate



CONCLUSIONS

Many urban residents will evacuate their homes and communities following a disaster or public health emergency. Nearly forty percent of urban residents intend to evacuate against governmental advice, and 77 and 91 percent of urban residents, respectively, intend to evacuate if the government suggests or orders evacuation. In each scenario, 55 percent of respondents indicated that they would be likely to travel to a rural destination. The challenges posed by an evacuation of any urban area could be daunting, particularly so for surrounding communities with limited infrastructure, which would quickly be overwhelmed by even a small fraction of an evacuating urban population. The high likelihood of evacuation following an infectious disease scenario such as pandemic influenza only heightens these concerns. Given the proportions of evacuees who will likely evacuate against government advice, and those that will seek shelter in rural communities (or pass through en masse on their way to other urban centers), communication and coordination are needed between urban and rural preparedness planners to assure that evacuees' needs are met.

The mass exodus of such a large number of people, potentially similar to that which occurred during Hurricanes Katrina, Wilma and Rita, presents a multitude of challenges. Roads and highways are not designed to accommodate such a large percentage of the vehicle population at any one time, and can become backed up for miles, trapping evacuees in areas where they may be vulnerable to natural or manmade dangers. Gas stations, rest stops, grocery stores, restaurants, and sanitary facilities are also not designed to handle so many travelers at once, resulting in shortages of fuel, food, and hygienic facilities. Evacuees who eventually reach destinations away from the affected urban area will require water, sanitation, food, shelter, medicine, treatment for chronic conditions, and may require immediate medical attention for acute needs related to the incident that prompted their evacuation.

Policymakers and emergency preparedness planners at the local/community, county, state, regional, and national levels should collaborate to develop adequate emergency plans for each phase of possible disasters and emergency scenarios that could prompt an evacuation. Specifically, both official and media communications should utilize effective risk communication principles and resources should be pre-deployed at strategic locations along evacuation routes and in evacuation destinations that will experience significant increases in population. Future research should seek to better anticipate evacuee distribution and destinations.

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