

ASSESSMENT OF BROCHURES & RADIO & TELEVISION PRESENTATIONS ON HURRICANE AWARENESS*

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In the state of Texas, a joint effort among the Texas Coastal and Marine Council, the Texas Catastrophe Property Insurance Association and the Governor's Division of Disaster Emergency Services has resulted in a Hurricane Awareness Program to alert Texas coastal residents of the dangers of hurricanes and the preparations necessary for preventing a major catastrophe. During the 1977 hurricane season, which extends from June through October, this Hurricane Awareness Program consisted of the distribution of 750,000 brochures entitled "Hurricane Survival Checklist and Flooding Map," and the generation of radio and television public service announcements which were made available to the various coastal stations. Radio presentations included 60 five-minute interviews with the director of the National Hurricane Center and other preparedness individuals, as well as with hurricane survivors and others familiar with the potential threat of a hurricane. The television presentations consisted of three 60-second films of various aspects of a hurricane. These were also abbreviated to a series of 30-second versions.

The present study represented an attempt to assess the impact of this Hurricane Awareness Program on residents' knowledge about

hurricanes, their beliefs about hurricanes, and their intended responses when threatened by a hurricane. The research was done on an American population, so extrapolation to to populations with different cultural backgrounds and social characteristics, must be undertaken with great caution.

METHOD

Subjects

Subjects studied included 1,350 residents from 22 Texas coastal cities, who were selected randomly from each city's telephone directory. City directories were not used because they were not available for all cities.

Instrument

A Hurricane Information Questionnaire was constructed to assess the impact of the Hurricane Awareness Program. This questionnaire [1] sought to determine demographic characteristics of respondents' age and sex, prior hurricane experience, whether they had obtained a copy of the brochure and seen the television and heard the radio presentations, and their information, beliefs, and intended responses to hurricanes. The information items included the residents' definition of storm surge, estimation of number of feet of rising

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water produced by a hurricane, estimation of number of miles of coastline affected by a hurricane, and identification of the most destructive part of a hurricane. The belief items assessed subjects' beliefs of the necessity of having flood insurance and hurricane related building codes, the probability of homes and commercial buildings on barrier islands being destroyed by a hurricane, the probability of homes in coastal cities being destroyed, the probability of following evacuation notices, and subjects' estimation of the destructiveness of hurricane winds and storm surge. Subjects answered the information items and then recorded their beliefs by checking the point, on a ten centimeter line, which most accurately reflected their beliefs. This line was anchored on each end by the extreme position of a given belief. For example, the two extreme positions for the flood insurance item were the statements "Is not necessary" and "Is definitely necessary." The intended responses assessed subjects' preparedness in terms of whether they had a pre-planned evacuation route, whether they had knowledge of how to locate a Civil Defense or Red Cross Shelter, and what their predicted response would be during a hurricane.

Procedure

On August 30, 1977, approximately the middle of the hurricane season, the Hurricane Information Questionnaire was mailed out to 1,350 residents of Texas coastal cities. One week following this mailing, subjects were sent a friendly reminder encouraging them to complete and return the Hurricane Information Questionnaire which they had been sent. Linsky (1975) has demonstrated that this is one factor which increases return rates very effectively. Of the 1,350 questionnaires mailed out, 16 percent, or 213, were returned because the selected subjects had moved, and the questionnaire could not be forwarded. One month after the mailing, 363, or 32 per-

cent, of the remaining 1,137 potential respondents had completed and returned the questionnaire.

RESULTS

Analysis of the demographic characteristics revealed that the respondents tended to be older (68.5 percent above 34 years of age) males (79 percent) who had prior hurricane experience (84.3 percent).

Information and intended responses

To assess whether the brochures and the television and radio announcements had any differential impact on residents' information about hurricanes, the subjects were categorized in terms of whether they received the brochure, whether they had heard any of the radio interviews, and whether they had seen any of the television presentations. Each information item and intended response item was then coded [2] (e.g., the definition of storm surge was coded as being correct, partially correct, or wrong) and 2 X K contingency tables were constructed for each dichotomized variable (e.g., whether they had received the brochures) by each information item and by each intended response item. Each of these contingency tables was analyzed by a chi square analysis. Table I depicts the results of these analyses.

Table I demonstrates that the television presentations had absolutely no effect on subjects' responses to either the questions dealing with the accuracy of information or intended responses. The brochures and the radio spots, on the other hand, did have an impact on selected items dealing with information. On the information items, subjects who had received the brochure versus those who had not were more accurate in their definition of "storm surge" (50 percent vs. 26 percent); in their estimate of the number of persons killed by rising water (17 percent vs. 9 percent); and in

TABLE I

Chi Square Analysis Computed on Responses

Item	Brochure	T.V. spots	Radio spots
<i>Information</i>			
Storm surge			
Storm surge	22.56**(2) ^a	0.92(2)	6.35*(2)
Persons killed	5.13* (1)	0.27(1)	5.10*(1)
Coastline damage	7.12* (2)	1.02(2)	1.18 (2)
Destructive part	3.38 (2)	1.15(2)	1.21 (2)
<i>Intended Response</i>			
Preplanned route	11.15**(1)	0.32(1)	0.91 (1)
Route would take	0.58 (1)	0.14(1)	0.93 (1)
Locate shelters	0.98 (1)	0.06(1)	5.84*(1)

^aRepresents the chi square degrees of freedom.* $p < 0.05$ ** $p < 0.01$

their estimate of the number of miles of coastline that could be damaged by a hurricane (79 percent vs. 69 percent). Thus, it can be seen that the brochure had a significant, positive effect toward increasing the residents' accuracy of information about hurricanes. Concerning intended responses, the residents who had received the brochure were significantly more prone to having a pre-planned evacuation route than were those who had not received the brochure (76 percent vs. 59 percent).

The radio spots had a significant impact on two of the information items. However, it is interesting to note that this was a negative impact since those who had heard the radio spots were significantly more inaccurate in their responses than were subjects who had not heard the radio announcements. Of the subjects who had heard the radio spots, only 37 percent were correct or partially correct in their definition of "storm surge," and only 10 percent were correct in their estimate of the number of persons killed by storm surge. For subjects that did not hear the radio announcements, 48 percent were correct or partially correct in defining storm surge and 18 percent were correct in estimating loss of life by storm surge.

Regarding intended responses, the radio spots had a significant effect on knowledge of how to locate a Civil Defense or a Red Cross Shelter. For those who had heard the broadcasts, a greater proportion said they knew how to locate the nearest Civil Defense or Red Cross Shelter (72 percent) than did those who had not heard the radio spots (57 percent).

Beliefs

Subjects' responses to each belief item was scored by measuring, in centimeters, the distance between the left end of the line and the point which the subject checked on the line. Since the line was ten centimeters in length, the score could ideally range between 0 and 10. However, for ease in scoring, if a check mark fell between the two centimeter readings, it was always rounded to the lower of the two. Consequently, subjects' responses could range from 0 to 9.

To assess whether the brochure and the radio and television presentations had a differ-

ential influence on the subjects' beliefs about hurricanes, analysis of variance (ANOVA) was computed on subjects' responses to each question. The main effect in each ANOVA consisted of: (a) received or did not receive the brochure, (b) did or did not hear the radio spots, or (c) did or did not see the television spots.

The analyses revealed that both the radio presentations and the brochure had no measurable effect upon the respondents' beliefs about hurricanes since none of these analyses were significant. With respect to the impact of television, significant effects were obtained for the questions relating to subjects' beliefs about the possibility of homes on the Texas barrier islands being destroyed, $F(1,269) = 6.9, p < 0.01$; homes in Texas coastal cities being destroyed, $F(1,269) = 3.9, p < 0.05$; and the destructiveness of hurricane winds, $F(1,269) = 3.7, p < 0.055$. In each case, residents who had seen the television presentations were more extreme in their beliefs about the effects of a hurricane ($M = 7.83$ for island homes destroyed; $M = 6.02$ for coastal homes destroyed; $M = 8.69$ for destructiveness of wind) than were residents who had not seen the television presentations ($M = 7.05$ for island homes destroyed; $M = 5.09$ for coastal homes destroyed; $M = 8.22$ for destructiveness of wind).

These results should be viewed in light of the fact that the influence of each of these variables (brochure, radio, and television) were not tested independently. Rather, some of the subjects in each stimulus category, e.g. those that received the brochure, were also exposed to the other stimuli. Some subjects in the brochure category received only the brochure, others received the brochure and heard the radio presentations, others received the brochure and saw the television presentations, and still others received the brochure, saw the television presentations, and heard the radio presentations. The common and dominant element in each category was the

stimulus source being tested (e.g. radio) but it was potentially confounded by the addition of some of the other stimulus sources. Such confounding naturally limits the ability to attribute the observed effects to just one specific stimuli.

To determine if the significant effects noted above are in fact valid and not due to the confounding influence of the addition of some of the other stimulus sources, a comparison was made of the responses of subjects exposed to the various combinations of stimuli. These comparisons were conducted on the questionnaire items that had been found to be significantly affected by exposure to either radio, brochure, or television. Table II depicts the chi square analysis computed between these various stimulus combinations. As can be seen only one significant difference existed. The absence of a significant difference reveals that the subjects receiving the different stimulus combinations did not respond differentially. This strongly suggests that the dominant stimulus was in fact the influential factor in creating the previously observed significant effects. The one significant effect that existed was for the various stimulus combination with radio on the storm surge information item. This significant effect is due to the enhancing effect of combining brochure with radio. Radio by itself or with just television depresses the percentage of respondents who can correctly define storm surge and therefore supports the previous analysis which suggests that the radio, as it was presented, had a negative effect.

Table III depicts the ANOVA computed on the previously identified belief responses that had been found to be significantly affected by television. For these three belief items there was no significant difference in the responses of subjects who were exposed to just television or to television and one or more of the other stimulus items. This suggests that the presence of the other stimulus items had no significant effect over and above that produced by television alone.

TABLE II

Chi Square Analysis of Responses to the Various Stimulus Combinations

Item	Dominant stimulus	Stimulus combinations	χ^2	df	Categories		
					Correct	Partially correct or incorrect	
Definition of storm surge	Radio present	Radio	15.52*	3	7%	93%	
		Radio & brochure			55%	45%	
		Radio & television			28%	72%	
		Radio & brochure & television			47%	53%	
	Brochure present	Brochure	3.41	3	71%	29%	
		Brochure & radio			55%	45%	
		Brochure & television			59%	41%	
		Brochure & radio & television			47%	53%	
					9 out of 10	1-8 of 10	
Persons killed by rising water	Brochure present	Brochure	4.71	3	40%	60%	
		Brochure & television			36%	64%	
		Brochure & radio			43%	57%	
		Brochure & radio & television			20%	80%	
	Radio present	Radio	2.72	3	11%	89%	
		Radio & television			14%	86%	
		Radio & brochure			43%	57%	
		Radio & brochure & television			20%	80%	
					Blank	Under 50 miles	Over 50 miles
Miles of coastland damaged	Brochure present	Brochure	5.11	6	14%	0%	86%
		Brochure & television			6%	0%	94%
		Brochure & radio			18%	0%	82%
		Brochure & radio & television			15%	8%	77%
						Yes	No
	Pre-planned evacuation route	Brochure present	Brochure	4.37	3	86%	14%
			Brochure & television			94%	6%
			Brochure & radio			73%	27%
Brochure & radio & television			73%			27%	
					Yes	No	
Civil defense shelter		Radio present	Radio	7.37	3	69%	31%
			Radio & television			68%	32%
			Radio & brochure			91%	9%
	Radio & television & brochure		72%			28%	

* $p < 0.01$.

TABLE III

ANOVA of Responses to the Various Stimulus Combinations

Stimulus combination	Homes on barrier islands destroyed by hurricane	Homes on Coastal cities destroyed by hurricane	Destructiveness of hurricane winds
	Mean	Mean	Mean
Television	6.58(12) ^a	4.67(12)	8.08(12)
Television & brochure	7.78(14)	7.78(13)	8.88(16)
Television & radio	7.75(104)	7.75(95)	8.62(115)
Television & radio & brochure	7.97(111)	6.23(98)	8.72(110)
	$F = 1.53$ $P = 0.21$	$F = 0.93$ $P = 0.43$	$F = 1.30$ $P = 0.27$

^aN = number between parentheses.

DISCUSSION

Analysis of survey results regarding the impact of the Texas Hurricane Awareness Program reveals that radio presentations had virtually no effect in producing hurricane awareness or preparedness and may have produced a negative effect. On the other hand, the results also indicate that the brochure had a positive impact on increasing the accuracy of subjects' information about hurricanes; and that television spots were beneficial in enhancing subjects' beliefs about the destructiveness of hurricanes.

This pattern of results is not unexpected when the contents of each of these three components are inspected. The brochure gave extensive coverage to the definition and consequence of storm surge as well as illustrating in a pictorial manner the extent of damage that a hurricane could generate. According to the questionnaire, these were the items most significantly affected by the brochure. Likewise, the television presentations depicted rather vividly the force and destructiveness of hurricane winds, as well as showing that homes could be completely destroyed by hurricanes. Again, these were the items

which were significantly affected by the television presentations. The numerous radio announcements, on the other hand, did not focus on a specific aspect of hurricanes, but conveyed many items of information. These were ineffective in having any overall beneficial impact on coastal residents with respect to information assessed by the Hurricane Information Questionnaire.

The present study seems to indicate that the effectiveness of a program such as the Hurricane Awareness Program is a function of the information presented to the public. Any Hurricane Awareness Program has as its goal the generation of a set of specific, appropriate responses. The results of the present study reveals that, to be effective, these specific responses must be identified, and material and information presented to the public must directly bear on these responses. To insure an increase in the accuracy of information about hurricanes, terms must be defined and residents must be told explicitly what they should know. If the goal is to generate a given type of behavior when a hurricane is approaching, residents must be informed about what they are to do during a hurricane watch and warning.

Rogers and Mewborn (1976), in support of such a recommendation, found that the primary influence on intended responses was the knowledge of a coping response that could eliminate the threat. Even more important was the fact that subjects had to believe that this coping response would be effective. Projecting this to the Hurricane Awareness Program, any recommended coping response must be presented in such a way that it will appear to minimize the threat produced by a hurricane, and its effectiveness must be believed by the residents. To do this would create the maximum possibility of obtaining the desired objective, an effective Hurricane Awareness Program.

There are several additional issues which must be considered regarding the validity and generalizability of the responses to this survey. One of these concerns self-selection (Campbell and Stanley, 1963) into the various survey groups. Since subjects could not be assigned randomly to the groups that did or did not receive the brochure, or that did or did not encounter a radio or television announcement, possibly it was not these variables but some others which created the observed differences.

While this is a possibility, it does not seem to be extremely likely – particularly with the media presentations. The radio and television broadcast times were determined by the individual radio or television stations; whether a person was exposed to them depended on whether he or she happened to be listening to the radio or watching television at that given time. The important point is that the subjects did not have total control over whether they were exposed to this information.

The brochures were a slightly different matter since residents had to make some effort to obtain them, even if this effort would seem to have been rather minimal. In most cases, the brochures were placed in display stands in retail outlets such as food stores throughout many coastal communities; subjects could ob-

tain them while engaging in everyday activities without expending much additional effort. For these reasons, a significant self-selection bias is viewed as being rather improbable.

A second possible bias exists in that results may not be generalizable to the total population because a 100 percent return rate was not achieved. However, it is important to remember that the question asked in this study was whether a differential impact existed between individuals who had and who had not been exposed to the brochure and radio and television spots. The concern was not with the estimation of a population parameter from a sample distribution. Most of the research on the effect of non-response to mailed questionnaires has been directed toward this latter issue.

The existence of bias in survey studies that attempt to estimate population parameters when obtaining less than 100% response has been well documented and is accepted as fact. However, the crucial question in the present study is not one such as “Are there too many people with hurricane experience in the sample?” but “Does hurricane experience affect the impact of the brochure, radio, and television presentation?” As Suchman (1962) has stated “The problem there changes from, ‘Is it biased?’ to ‘How does the bias affect the test of our hypotheses?’ (Suchman (1962) investigated this very issue. He analyzed the relationship between variables where an obvious bias existed in the sample and found no effect on the observed relationship between different waves of sample data. He concluded that there was an “...overemphasis upon 100 percent response to a survey when one is concerned with the study of relationships rather than the description of frequency distributions” (p. 108).

Goudy (1976) investigated the same question and provided strong support for Suchman’s conclusion. Goudy investigated the effect of nonresponse bias on variable relationships in a panel study of older Iowa residents.

In this study, he investigated the changes that occurred on the relationship between variables across three waves data. He concluded that the initial wave of about twenty-five percent of the eligible replies produced results that would have undergone "... limited changes... with the addition of later responses..." (p. 368). Such studies reveal that, although a sample may be biased, the effect of this bias depends upon the question being asked. If the research question is directed toward determining the influence of a set of variables on a given response or the relationship between a set of variables the effect of the sample bias is minimal and would influence only the magnitude but not the direction or significance of the relationship. Based on the results of such studies it would seem as though the results of the present study are valid and would have been replicated if a higher response rate had been achieved.

A third factor which must be considered is the response behavior that would occur during an actual hurricane. Any discrepancy in this area may have been minimized by the fact that Hurricane Anita crossed the Gulf of Mexico, from east to west, at the time in which the residents received the Hurricane Information Questionnaire. This hurricane

was such that it threatened every Texas coastal area, and many cities were under a hurricane watch. The residents were actually having to make hurricane decisions at the time in which they were asked to complete the questionnaire. This should ensure that a maximum degree of reality is depicted by the questionnaire responses.

NOTES

- 1 A copy of the questionnaire can be obtained from the authors.
- 2 The format for coding each question can be obtained from the authors.

REFERENCES

- Campbell, D.T. and Stanley, J.C. (1963). *Experimental and quasi-experimental designs for research*, Rand McNally: Chicago.
- Goudy, W.J. (1976). "Nonresponse effects and relationships between variables". *Public Opinion Quarterly* 40: 360-369.
- Linsky, A.S. (1975). "Simulating responses to mailed questionnaires: A review." *Public Opinion Quarterly* 39: 82-101.
- Rogers, R.W. and Mewborn, R.C. (1967). "Fear appeals and attitude change: effects of a threat's noxiousness, probability of occurrence, and the efficacy of coping responses". *Journal of Personality and Social Psychology* 34: 54-61.
- Suchman, E.A. (1962). "An analysis of 'bias' in survey research". *Public Opinion Quarterly* 26: 102-111.