PERCEPTION OF METEOROLOGICAL HAZARD

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Abstract

Perception of meteorological hazard is discussed and an example of the lack of hazard perception is included. This paper examines the hazard perception of a sample population in northeast Ohio and explains why perception of hazard is not accurate. Suggestions as to how this can be corrected are also discussed.

INTRODUCTION

Perception studies attempt to determine how a person perceives the physical world through mental images. Hazard perception, then, measures a mental image and perception of danger. Perception studies attempt to answer the question: How perceptive is a population of the hazards they encounter and how do they cope with that hazard? (See White, 1974) The usefulness of a perception study lies in the fact that it can measure to what degree a hazard is perceived.

Perception of meteorological hazard would be of vital interest to persons who are required to predict and disseminate hazardous or severe weather occurrences. Two conditions have to be met: (1) confidence in the forecast and (2) correct perception of the hazard. "Correct" in this case means that the danger is perceived as such.

Perception of hazard, and the public's attitude toward a severe weather warning must be positive before the warning commands the proper reaction, since it has been shown that the public does not automatically heed severe weather warnings (Martin, 1972).

The importance of "correct" hazard perception was tragically brought to the fore during the August 2, 1978 floods in Bandera, Kerr, and Kendall Counties, Texas when residents of those counties went to bed knowing that their counties were under a flood warning. A press release issued by WSFO San Antonio in 1978 stated in part: "The problem was, that they (the residents of the counties) did not feel sufficiently threatened (perception!). Previous floods that they had experienced never approached the same severity." (NWS, 1978)

How a person perceives a hazard influences, and perhaps controls, their reaction to it; for if something is not perceived as dangerous, reaction to a warning regarding it will be slow, or perhaps ignored - either one of which is not desirable for those who have to issue the warnings.

This survey was conducted to determine how meteorological hazard is perceived by a sample population in northeast Ohio and how their perception compares with national mortality statistics for five types of meteorological hazard. The average number of annual deaths nationwide (mortality rate) was the standard used to gauge the degree of actual hazard. Although the sample population resided in northeast Ohio, the results could be applied nationwide; because the laws of statistics allow statistical results from a sample population to be applied to the universal population - if the sample population if large enough.

THE SAMPLE POPULATION AND METEOROLOGY

The sample population for this study was randomly selected. Adults 18 and older were questioned, and they represented all socio-economic levels. The educational level was greater than high school; however, some believe that this should not have biased the statistics (Burton, et al, 1972).

The sampling was done by questionnaire during the spring, summer and autumn of 1978. A portion of the questionnaire is reproduced in Exhibit I.

Exhibit I. Replica of questionnaire used in perception study. Indicate by ranking (1 to 5) indicating most dangerous (1) to least dangerous (5) which of the following natural hazards you think is the most hazardous.

_____ Floods
_____ Heat Wave
_____ Lightning
_____ Tornado
_____ Winter Storm/Blizzard.

National statistics published in, or derived from, informational pamphlets published by the National Weather Service are ranked in order from most dangerous to least dangerous and listed in Table I.

Table 1

National place ranking of the five meteorological hazards used in perception study*

1.	Heat wave (175 fatalities per year)
2.	Lightning (150)
3.	Tornado (120)
4.	Winter storm/blizzard (more than 100)
5.	Floods (90)

*All values are mean values. Sources of the data are given in the list of references.

Rank values were used for this study since they are capable of mesuring directly the perception of the sample population. A total of three hundred questionnaires were returned; of these, forty were discarded since they were incorrectly marked, i.e. more than one of the meteorological hazards had the same rank value assigned to them. The remaining 260 were used for analysis.

RESULTS

As may be seen in Table II, heat wave was perceived by only 7% of the sample population to be the most hazardous of the five hazards listed. Table I shows that heat wave is by far the most hazardous. Lightning (actual rank 2) was perceived as most dangerous by only 15% of the population. Tornado (actual rank 3) was perceived as most dangerous by 23% of those responding; while 36% of the respondents perceived floods (actual rank 5) as least dangerous.

Since the heat wave is in fact the most hazardous and floods the least hazardous, an explanation of why this inversion of perception occurred is in order. One explanation (without making this paper a psychological study) is that heat wave fatalities are "masked." Studies of heat mortality rates in several cities show that the great majority of heat-related deaths occur in the urban complex due to heat stress produced by the urban heat island (Clarke, 1972a). Of these deaths due to heat stress, the elderly fall victim to the heat stress much more so than any other age group (Clarke, 1972b). These factors tend to disguise the danger of heat wave since the deaths appear to be from "natural" causes (which they are). However, the types of maladies that cause the fatalities are: stroke, heart attack, and respiratory ailments - all of which are aggravated or caused by heat stress. Statistical analysis, mortality rates and meteorological data show that the heat-wave mortality is indeed statistically significant.

The sample population perceived floods as the most hazardous (36%); perhaps the explanation for this is that floods (and most other "active" meteorological hazards) tend to be newsmakers, and attention is focused on them by TV, radio and newspapers on a regional basis, and, if violent enough, on a national basis.

An example of this type of publicity occurred in two newspapers in northeast Ohio in 1978. A heat wave in Dallas, Texas occurred during the summer of 1978 during which at least 24 persons died due to heat stress. The Akron Beacon Jounal and the Cleveland Plain Dealer allocated little space to the heat-related deaths in Dallas. The flood deaths that occurred near San Antonio during the same summer killed 25 persons. The Texas floods had headlines complete with photographs.

This succinctly demonstrates how news media coverage of a meteorological disaster may influence the reader's perception of meteorological hazard. The Akron paper carried the heat-wave disaster story giving it 11 lines one column wide and the flood story 33 lines two columns wide. (See Exhibit II.)

CONCLUSION AND SUMMARY

Seemingly, the news media (printed and electronic) coverage of particular meteorological events tends to unknowingly influence the hazard perception of the public by the amount of coverage given to said events. Considerably more coverage is given to the more active or violent meteorological hazards than the more passive but much more dangerous events. This is so because the active events are more newsworthy.

In this study, heat wave was perceived as least haardous by 97% of the sample population while in fact, heat wave is the most dangerous. Floods, which are second least hazardous, are perceived as most hazardous by 64% of the sample population. This inversion of perception to actual hazard is most likely accounted for by (1) the fact that heat wave deaths are "masked" i.e., they appear to be from other causes, and, (2) news coverage of floods is greater than that for heat wave, since the more active events are by their nature more newsworthy.

A conclusion may be drawn from this study that the public somehow needs to become aware of which meteorological hazard is most dangerous

EXHIBIT II

Replica of the newspaper articles appearing in the Beacon Journal and Plain Dealer

Texas Flood Toll Reaches 25

(Associated Press) Fresh thunderstorms dumped more heavy rains into Texas' already overflowing rivers today. More people were evacuated, flash flood warnings went up and the death toll climbed to 25 with the discovery of four more bodies.

Floodwaters crested early today in the Young County town of Graham, where authorities said at least 150 homes and 20 businesses were damaged when the Brazos River overran its banks. In west Texas, flash flood warnings were issued for several hours when a line of thundershowers poured down on the Davis Mountains to the Lower Concho Valley south of San Angelo. New storms barreled along the coast with heavy thunderstorms reported around Pearland near Houston.

Searchers in Bandera County recovered the bodies of four more people Sunday. Twenty of the 25 victims were found in the hill country, while the rest were recovered near Albany in west Texas.

People along the Brazos from Possum Kingdom Dam to Granbury were urged to move to higher ground early today as a record flood crest headed down river from Possum Kingdom Reservoir.

and which is least dangerous. Since the National Weather Service is the agency that issues warnings regarding hazardous weather, shouldn't it also be the agency that informs the public as to which meteorological hazard is most and least dangerous - and what better tool is there to do this job than NOAA Weather Radio ...?

REFERENCES

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Burton, I., and R. Kates, 1972. "The Perception of Natural Hazard in Resource Management", in Man, Space and Environment: Concepts in Contemporary Human Geography. Edited by P. W. English and R. C. Mayfield. (New York: Oxford University Press) p. 294.

National Weather Service, press release, San Antonio, TX 1300 EST August 10, 1978.

Clarke, J. F., 1972a. "Some Effects of the Urban Structure on Heat Mortality," Environmental Research, March, 1972, p. 93.

Clarke, J. F., 1972b. "Some Climatological Aspects of Heat Waves in the Contiguous United States," Environmental Research, March, 1972, p. 76.

In addition, the figures given in Table 1 were extracted from the following NOAA publications. The numbers correspond to the figures in the table.

1. United States Department of Commerce, 1972. "Heat Wave". NOAA/PA 71010.

2. _____, 1977. "Thunderstorms". NOAA/PA 75009.

3. _____, 1978. "Tornado". NOAA/PA 77027.

4. _____, 1975. "Winter Storms". NOAA/PA 73018 (Rev.).

5. _____, 1973. "Floods, Flash Floods and Warnings". NOAA/PA 71009 (Rev.).