Exposure Risks as a Criterion of Traffic Accidents Hazards in Iowa

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EXPOSURE RISKS AS A CRITERION OF TRAFFIC ACCIDENT HAZARDS IN IOWA

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PROBLEM

Some very unusual conclusions are sometimes drawn regarding accident hazards in specific locations. Insurance rates are frequently calculated on the basis of the density of population, car registrations, and traffic flow. While there is some empirical support for this type of reasoning, little evidence has been presented to indicate the relative importance of the factors involved. A much more scientific method of establishing insurance rates for a given area could be used if underwriters were disposed to make use of it. The following described study was conducted to determine the relative importance of factors relative to fatalities in the state of Iowa.

METHOD AND PROCEDURE

Data from each of the 99 counties for 1940 were obtained from the State Highway Commission and the State Department of Motor Vehicles on the following variables:

A=accidents occuring within the county during the year.
R=total car registrations for each county.
M=mileage as calculated from traffic counts.
P=population of the county.
F=fatalities occuring within the county during the year.

Since traffic-count data was not brought up to date for 1940, the results for 1935 were assumed to be proportional and used for this variable. Since conditions were approximately equal during this period, no great amount of error could be expected from this substitution.

Zero-order correlations were calculated between the variables used. The results are given below in Table I. The relative influences were determined by use of multiple correlation and the analysis made on this basis.

RESULTS

It is obvious that the zero correlations would all be positive and fairly high. This is borne out by inspection of Table I.

TABLE I

Zero-Order Correlations

	A	R	M	P	F
F	+.7055	+.7739	+.8874	+.7373	———
P	+.8525	+.9877	+.7957	———	
M	+.6924	+.8325	———		
R	+.8908	———			
A	———				

Since there is considerable overlapping, it is not so certain that the variable are equally or proportionally contributory as indicated by the order of their relationships with fatalities. Fatalities are used as a criterion since the death certificate must be filed and they are known to be more reliably reported than are accidents. The order of relationship is shown below in Table II.

TABLE II.

Assigned Order of Importance from Zero r's

Correlation	Rank
$r_{FM} = + .8874$	1
$r_{FR} = + .7739$	2
$r_{FP} = + .7373$	3
$r_{FA} = + .7055$	4

A multiple R was next calculated between fatalities as a criterion and the respective variables. This yielded the following result:

$$F.MR_{PA} = + .8602$$

The betas were found to be more illuminating as a basis of evaluation. The inherent relationships are somewhat unmasked by this procedure. Table III gives the results obtained.

TABLE III

Assigned Order of Importance for Beta Values with Suggested Weightings.

Beta values	Order of Rank	Weightings in Percentage
Beta FP	1	46
Beta FM	2	33
Beta FA	3	21
Beta FR	4	00

SUMMARY AND CONCLUSIONS

From the above analysis and from comparison of results, it seems that the following general conclusions may be drawn subject to the limitations of the extent of the data used. The present paper is offered as a method of procedure more than as a basis of final judgment for all locations. It is assumed to be valid for the immediate period of the study and for the section of the country involved.

Insurance companies or others desiring to assign relative importance to factors leading to fatalities would find the relative contributions more or less unequal and should consider the following conclusions in evaluation of hazards for a given area.

1. Greatest weight should be given to population density in a given location.
2. Next in order is the total mileage traveled within the area.
3. The number of accidents is third in importance, but it is relatively low in contribution. Since the reliability of reporting is low, this way may be more important than it first appears.
4. Car registrations are not important as they overlap with other influences.
5. The study suggests a revised system of evaluation in safety contests, as the low index usually shown for states like Connecticut and the relatively high indices shown by many western states may not be a true basis of placement in contests.
6. The risk carried by insurance companies seems to reside more in the territory covered by the insured than by the mileage covered or the number of accidents reported for the locale of residence.
7. In general it suggests the use of much more refined methods in the assignment of risks and efforts in humanconservation.

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