

# Inventory Speed Responses and Prior Traffic Records as Predictors of Subsequent Traffic Records

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Many traffic authorities consider high speed driving to be a major problem of traffic law enforcement and one of the important contributing factors in motor vehicle accidents and fatalities in their communities. Interpretations of individual driving records and mass statistics provide the basis of numerous important decisions in programs of driver improvement and traffic safety. Underlying these efforts of authorities is the broad assumption that certain features or habits of the driving behavior of individuals are predictable to a considerable extent from previous performance. Therefore, the question is whether simple, yet accurate, predictions of future individual traffic records can be developed which could be useful in various traffic safety and enforcement programs.

● RECENT RESEARCH completed in the Institute of Transportation and Traffic Engineering, University of California, suggests that data on high-speed driving habits and on prior traffic records tend to predict some subsequent traffic records. Early in 1955, 198 students in UCLA completed a personal driving inventory containing various questions on highway driving speeds. The answer to each of four numerical speed questions (based on a median split) was used as a separate predictor of individuals who might be expected to incur records in six traffic citation and/or accident categories, and the sum of these four numerical responses was used as a general speed criterion score for this purpose.

In addition to using the answers to the speed questions as predictor variables, the official traffic records for the three years 1952 through 1954 were obtained for these subjects from the California Department of Motor Vehicles. The six separate (though not fully independent) traffic citation and/or accident categories were used also as predictors of subjects who would incur subsequent traffic records in these same six categories during the next three years. Early in 1958 the official records for the three years 1955 through 1957 were obtained from the Department of Motor Vehicles to test the validity of these predictions for these subjects. Table 1 shows the distribution of citations and accidents for the six categories.

These attempts to predict subjects who might incur subsequent traffic records were based on the following underlying assumptions: Using the speed item answers, it was hypothesized that high-speed habits, in comparison with low-speed habits, would be associated with prior recorded citations and/or accidents. Using the six separate traffic citation and/or accident categories, the assumption was made that these subjects would incur subsequent records in certain categories during an equivalent period of time. All of these hypotheses ( $30 + 36 = 66$ ) were tested by the use of the chi square statistic.

## RESULTS

The results are shown in Tables 2 and 3. Considering both sets of predictor variables together, 35 of the 66 obtained chi squares which were statistically significant at the 0.05 level of probability. Of these 35 significant chi squares, 18 were obtained

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TABLE 1  
BREAKDOWN OF INDIVIDUAL CITATIONS AND ACCIDENTS

	Speeding Citations	Other Moving Citations	Total Moving Citations	Two or More Moving Citations	One or More Accidents	One or More Moving Citations and/or Accidents
Speeding citations	56					
Other moving citations	34	88				
Total moving citations	56	88	110			
Two or more moving citations	39	49	54	54		
One or more accidents	10	24	26	15	40	
One or more moving citations and/or accidents	56	88	110	54	40	124

with the speed variables (Table 2). Of these 18 significant chi squares, three values were significant at the 0.01 level and eleven were significant at the 0.001 level, suggesting real associations between responses to the speed questions and subsequent traffic records. The other significant 17 chi squares were obtained with the traffic record variables (Table 3). Of these, eight values were significant at the 0.01 level and three were significant at the 0.001 level, suggesting real associations between certain prior traffic record categories as predictor variables and subsequent records in these and/or other categories.

TABLE 2  
CHI SQUARES FOR SPEED VARIABLES FROM QUESTIONNAIRE  
(N = 198)

Questionnaire Item	Speed	Traffic Record Categories 1955 Through 1957					
		Speeding Citations N = 56 vs No Speeding Citations N = 142	Other Moving Citations N = 88 vs No Other Moving Citations N = 110	Total Moving Citations <sup>a</sup> N = 110 vs No Moving Citations N = 88	Two or More Moving Citations N = 54 vs One or None N = 144	One or More Accidents N = 40 vs No Accidents N = 154	One or More <sup>b</sup> Moving Citations and/or Accidents N = 124 vs None N = 74
1	Daylight High (N=93) vs Low (N=105)	2.21	3.69	7.10 <sup>c</sup>	3.21	0.08	5.27 <sup>d</sup>
2	Night High (N=119) vs Low (N=79)	4.12 <sup>d</sup>	10.51 <sup>c</sup>	12.08 <sup>e</sup>	7.68 <sup>c</sup>	0.00	6.50 <sup>d</sup>
3	Recent High (N=120) vs Low (N=78)	1.75	2.78	4.57 <sup>d</sup>	1.97	0.19	2.08
4	Fastest High (N=106) vs Low (N=92)	12.11 <sup>e</sup>	15.89 <sup>e</sup>	21.31 <sup>e</sup>	18.85 <sup>e</sup>	0.73	13.77 <sup>e</sup>
Sum	Criterion High (N=98) vs Low (N=100)	12.72 <sup>e</sup>	14.69 <sup>e</sup>	19.91 <sup>e</sup>	15.41 <sup>e</sup>	0.41	11.62 <sup>e</sup>

<sup>a</sup> N=110 includes only once those cases that had both speeding and non-speeding citations. Hence, 56 + 88 - 34 (cases in common) = 110.

<sup>b</sup> N=124 includes only once those cases that had both moving citations and accidents. Hence, 110 + 40 - 26 (cases in common) = 124.

<sup>c</sup> Significant at the 0.01 level.

<sup>d</sup> Significant at the 0.05 level.

<sup>e</sup> Significant at the 0.001 level.

TABLE 3  
CHI SQUARES FOR TRAFFIC RECORD VARIABLES  
(N = 198)

Traffic Record Variables, 1952 Through 1954	Traffic Record Categories 1955 Through 1957					
	Speeding Citations N = 56	Non-Speeding Citations N = 88	Total Moving Citations N = 110	Two or More Citations N = 54	Accidents N = 40	Citation or Accident N = 124
Speeding citations	0.34	5.39 <sup>a</sup>	4.24 <sup>a</sup>	4.86 <sup>a</sup>	0.01	3.24
Non-speeding citations	0.85	3.43	3.17	7.14 <sup>b</sup>	0.58	1.42
Total citations	0.78	6.80 <sup>a</sup>	4.42 <sup>a</sup>	8.65 <sup>b</sup>	0.02	2.82
Two or more citations	1.52	2.88	2.04	8.04 <sup>b</sup>	0.11	1.42
Accidents	9.76 <sup>b</sup>	2.73	9.42 <sup>b</sup>	3.89 <sup>a</sup>	1.72	12.08 <sup>c</sup>
Citation or accident	6.72 <sup>b</sup>	10.58 <sup>b</sup>	11.38 <sup>c</sup>	12.46 <sup>a</sup>	0.74	10.35 <sup>b</sup>

<sup>a</sup> Significant at the 0.05 level.

<sup>b</sup> Significant at the 0.01 level.

<sup>c</sup> Significant at the 0.001 level.

Using the individual's estimate of his driving speed in answer to four separate questions, the six traffic record categories in Table 2 show that predictions of subsequent total moving citations yielded higher chi squares than those of subsequent speeding citations, other moving citations, citations considered together with accidents, or accidents alone. These results suggest that, for these subjects, high speeds or speeds too fast for conditions may contribute more often to moving traffic offenses in general than to specific categories of offenses. Table 2 shows that all of the chi squares were negligible for subjects classified with regard to subsequent recorded traffic accidents. These results suggest that information on an individual's driving speed habits, without other traffic behavior and/or accident information, has no value in predicting whether certain individuals will eventually (that is, in three years for these subjects) become involved in one or more accidents. Perhaps these simple findings verify the commonly accepted belief that the fact of accident involvement in itself is inadequate for most research purposes.

Using the individual's three-year recorded traffic record in six categories, the subsequent traffic record categories in Table 3 show that predictions of subsequent total moving citations again yielded higher chi squares than predictions of other categories. This finding also holds for those subjects who incurred two or more citations compared with those who incurred one or no citations during the three years. As with Table 2, Table 3 shows that all of the chi squares for subjects who incurred subsequent records of accidents were negligible. Perhaps this lack of relationship can be explained in the same manner as in Table 2 or by reference to certain inadequacies of recorded accident information and to the smallness of the sample.

## DISCUSSION

In considering these results, it should be kept in mind that this study was essentially a pilot one and is being reported here in the hope that the relatively simple methodology can be of use in attacking these problems on a larger scale.

The study tends to show that, contrary to some opinions, highway driving speeds reported by individuals in response to carefully prepared questionnaires can be useful in making predictions of subsequent traffic records of these individuals. It should be noted in this connection that although, in general, the responses to the questionnaire yielded chi squares of higher statistical significance in relation to subsequent traffic records than did prior traffic records to subsequent traffic records, no special importance should be attached to this fact since it is known that questionnaires, when used in critical personal situations (this was not one) can be expected to be more subject to error than past traffic citation records.

The lack of predictability of accidents may be accounted for on the basis of failure to report small accidents, the problem of near-accidents not being measurable, the fact that the individual involved may not be at fault, and the smallness of the actual number involved in accidents in the sample. A further study might readily reveal that the degree of severity, the conditions surrounding the occurrence, the speed involved, and other such variables may be associated with individual driving speed and with certain features of traffic records.

On the other hand, the consistency with which both the questionnaire and the prior traffic record seem to relate to subsequent total moving citations may lend substance to the procedure of taking remedial action when an individual's citation record reaches a certain level. Individual state motor vehicle authorities may find it useful to determine their own predictive variables for their own state driving population on the basis of using the simple chi square technique.

#### SUMMARY

This report has illustrated briefly a pilot study of a simple statistical method for prediction of individuals as future members of certain traffic citation and/or accident categories in terms of available information about their driving records. The results of this study indicate that several of the associations between driving speed as reported by the individual, prior traffic records, and subsequent traffic records are much greater than would be expected by chance.

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