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Marital Status and Car Ownership as Related to Sex Differences in Traffic Accidents and Violations in a Two-Year Period*

By CHARLES F. SCHUMACHER AND A. R. LAUER

INTRODUCTION

On the basis of considerable previous work in the collection and tabulation of motor vehicle accidents and traffic violations, the hypothesis that women are better accident risks than men has come to be widely accepted. According to Lauer (3) even when corrections are made for age and amount of driving exposure, women have fewer reported accidents and violations than men.

Using this past information as a basis of approach, the present study was made in order to determine if the same relationships hold when the additional factors of marital status and car ownership are considered. Instead of asking questions of the form, "Do men have more accidents than women?", this study was interested in questions such as, "Do married men who own automobiles have more accidents than married women who own automobiles?" Essentially the purpose of the present study was to control on two variables which had hitherto been uncontrolled in comparisons of traffic accidents and violations between the sexes. The data which were available for use were such that only a partial answer to the problem could be obtained, but the information which was gathered was a start in this direction and suggested important future research to be done in the area.

The hypotheses to be tested in this study may be stated as follows:

- a. Male, married car owners have a significantly greater number of traffic accidents and violations in a given period of time than female, married car owners.
- b. Male, married non-car owners have a significantly greater number of traffic accidents in a given period of time than female, married non-car owners.
- c. Male, single care owners have a significantly greater number of traffic accidents and violations in a given period of time than female, single car owners.
- d. Male, single non-car owners have a significantly greater number of traffic accidents and violations in a given period of time than female, single non-car owners.

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METHOD

In 1950 a sample of approximately 8,000 names was systematically drawn from the driver's license files in the State of Iowa. Later an additional 2,800 driver training records were checked for accidents and violations. Double postal cards were sent to all these individuals requesting information about their driving habits and personal characteristics. A request for information pertaining to marital status, car ownership, and amount of driving done annually was included on these postal cards. A total of 1,459 persons returned the cards which were usable for the present study. Of these 982 were returned by men and 477 by women. The following criteria were arbitrarily established to determine the usability of those postal cards which were returned:

- a. The person had driven for at least two years as of 1950.
- b. All questions on the postal card had been answered and none had obviously been misunderstood by the individual.
- c. The person had designated his marital status as either single or presently married.

For the cases which met these criteria the additional information of age, sex, number of traffic accidents reported in 1948 and 1949, and number of traffic violations reported in 1948 and 1949 was gleaned from official state records.

An accident-violation index (A-V Index) was computed for each individual according to the following formula:

$$\text{A-V Index} = 10 (\text{number of accidents in '48 and '49} + \frac{1}{2} \text{ number of violations in '48 and '49})$$

The two-year period for which accidents and violations were tabulated was chosen on the basis of a previous study by Lauer (3) in which it was found that the reporting indices for both accidents and violations were essentially the same for these two years. In the latter study, using the same sample of drivers as employed in the present investigation, no significant difference was found in the number of postal cards which were returned by drivers with poor accident-violation records and drivers with good accident-violation records.

Individuals were divided into eight groups on the basis of sex, car ownership, and marital status as shown in Table 1. Groups which were compared for differences in A-V Index scores were equated as nearly as possible on age and annual number of miles driven in darkness. Mileage in darkness was chosen as the index of driving exposure on the basis of a previous study by Schumacher and Lauer (4) in which it was found that annual mileage in dark-

Table 1

Comparisons of Mean A-V Index Scores Made Between Groups.

Group 1 (male, married car owners)	vs	Group 5 (female, married car owners)
Group 2 (male, married non-car owners)	vs	Group 6 (female, married non-car owners)
Group 3 (male, single car owners)	vs	Group 7 (female, single car owners)
Group 4 (male, single non-car owners)	vs	Group 8 (female, single non-car owners)
Group 1 (male, married car owners)	vs	Group 2 (male, married non-car owners)

ness had a higher correlation with the A-V Index than either daylight mileage or total mileage. This relationship was found to hold for both sexes.

RESULTS

Table 2 shows the means and standard deviations of the A-V Index for each group. From inspection of this table it appears that the men have somewhat higher mean A-V Index scores than the women in all cases. However, inspection of the standard deviations for the groups which were compared indicates the possibility that the samples do not come from populations having the same variances.

Table 2

Means and Standard Deviations on A-V Index for All Groups.

Group	X	S.D.
1	2.3966	5.0495
2	1.8750	4.6186
3	3.6765	6.3315
4	2.0414	5.8862
5	1.1200	4.0093
6	.4310	1.9274
7	.7692	2.7175
8	.3947	2.2674

Therefore, F values for the equality of variance were obtained for all pairs of groups which were compared. Table 3 shows the results of these tests which indicate that in all cases except one the variances should not be assumed to be equal.

Since inequalities in variances were present, a special form of the t-test for significance of differences between sample means, known as the Behrens-Fisher t , was employed in making the comparisons. Using this form of t-test the assumption of equality of sample variances is unnecessary.

Table 4 shows the results of these t-tests and indicates that the differences between the men and the women were significant at

Table 3

F tests Between A-V Index Variances for All Comparisons.

Groups	d.f.	S ²	F	P
1	652	25.4974		
5	124	16.0742	1.586	.01
2	23	21.3315		
6	173	3.7148	5.742	.01
3	135	40.0871		
7	25	7.3846	5.428	.01
4	168	34.6471		
8	151	5.1412	6.739	.01
1	652	25.4974		
2	23	21.3315	1.195	>.05 (not significant)

the one per cent level of confidence or better in all but one case. The case in which no significant difference was found was in the comparison of male, married non-car owners with female, married non-car owners. In all other comparisons the men had significantly higher A-V Index scores than the women.

Table 4

T-tests Between A-V Index Means for All Comparisons.

Groups	X	t	d.f.	P
1	2.3966			
5	1.1200	3.1182	209	.01*
2	1.8750			
6	.4310	1.1536	24	.25*
3	3.6765			
7	.7692	3.8214	90	.001*
4	2.0414			
8	.3947	3.3696	222	.001*
1	2.3966			
2	1.8750	1.5758	675	.25**

*Behrens-Fisher t, assuming population variances to be unknown and unequal.

**t assuming population variances to be unknown but equal.

In the comparison between Group 1 and Group 2, no significant difference in A-V Index scores was found. In this comparison the standard t was used since no significant difference was found between the variances of these two groups.

DISCUSSION

With respect to the original hypotheses of the study, all but hypothesis (b) seem to be confirmed by the results which were obtained. However, these findings can only be applied to a similar population of Iowa drivers and it should be pointed out at this time that stu-

dies using other types of drivers from different areas of the country might yield somewhat different results.

The failure to find a significant difference in A-V Index scores between Groups 2 and 6 might be explained in one of two ways. It may be that no differences exist in the two populations. However, on the basis of the rather large sex differences which were found between the other groups, an alternative explanation seems preferable. Such explanation might be made in terms of the statistic which it was necessary to employ for testing the difference between these groups.

- Referring to Table 4 it may be seen that the degrees of freedom appropriate for the *t* between Groups 2 and 6 were reduced to 24 by using the Behrens-Fisher formula. The reduction in degrees of freedom using this formula is a function of both the sample size and the difference in variance between the two groups. If the number of cases in Group 2 were more nearly equal to the number in Group 6, there is some reason to expect less of a reduction in the degrees of freedom and consequently a better chance for a *t*-value of the magnitude of the one which was obtained to reach significance.

In addition to testing the hypotheses which were set up at the beginning of the study, a suggestion for investigation among the different variables within each sex arose from these results. In order to obtain a better estimate of the effects of car ownership and marital status, studies should be done in which these factors are systematically varied within each sex as well as between the sexes. The comparison of the A-V Indices for Groups 1 and 2 is a beginning step in this direction. The lack of a significant difference in accidents and violations between car owners and non-car owners tends to eliminate car ownership as a significant variable to be considered in future analyses at least insofar as the population to be considered consists of married, male drivers. However, more work is necessary before this conclusion may be generalized to other driving populations.

SUMMARY AND CONCLUSIONS

A total of 1,459 drivers, including 982 men and 477 women were grouped according to sex, marital status, and car ownership and comparisons on traffic accidents and violations for a two-year period were made between males and females for each grouping. All groups which were compared had essentially the same mean ages and amounts of driving exposure.

Men were found to have a significantly greater number of acci-

dents and violations in all cases except in the comparison between male and female married, non-car owners. In this case no significant difference was found in the number of accidents and violations between the sexes.

Considering the characteristics of the sample employed, number of cases available, and the nature of the results obtained, the following conclusions may be tentatively drawn from this investigation:

1. Male, married car owners have a significantly greater number of traffic accidents and violations in a two-year period than female, married car owners.
2. No significant difference in accidents and violations for a two-year period exists between male, married non-car owners and female, married non-car owners.
3. Male, single car owners have a significantly greater number of traffic accidents and violations in a two-year period than female, single car owners.
4. Male, single non-car owners have a significantly greater number of traffic accidents and violations in a two-year period than female, single non-car owners.
5. No significant difference in traffic accidents and violations for a two-year period was found to exist between male, married car owners and male, married non-car owners.

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