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Distribution of Traffic Accident Problems With Respect to Certain Geographical Patterns*

By ELMER B. SIEBRECHT AND CARL J. EIGENAUER

The continued high frequency of automobile accidents in the United States has prompted many and varied studies relating to the general traffic accident problem. Most studies have concerned the distribution of traffic accidents by large age groups, with little attention to the relation of data to specific ages or other factors which might affect results.

Recent investigations tend to follow a more analytical approach. They have concerned the relation of certain accident factors on a county-wide basis (2) and of accident and violation involvement to age, sex, mileage driven and training of drivers (1, 4, 5).

The present report concerns the analysis of traffic accident factors with respect to their distribution among highway patrol districts of the state of Iowa.

METHOD

Data on which this report is based were obtained from the annual summaries on factors related to highway safety and accidents for 1953. From the Department of Public Safety was obtained information regarding 1) all accidents, 2) fatalities, 3) license revocations and 4) license suspensions. Information regarding the number and names of trainees in driver education courses was secured from the Department of Public Instruction. The data were organized with respect to the 13 patrol districts of the state.

For the purpose of this study the following null hypothesis was set up: The distributions of traffic accidents and related problems do not differ significantly from the distribution of population among the patrol districts. The chi-square test was used to determine the level of significance of the distributions.

RESULTS

Originally the study was designed to permit analysis of data with respect to the distribution of both population and registered vehicles in the districts. Preliminary analysis showed results based on the two distributions to be highly comparable and a rank-difference correlation of .963 was obtained between the two distributions. Consequently this report has been restricted to an analysis of accident factors using the population distribution only as the hypothesis for comparable purposes.

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Accidents. In 1953 drivers of motor vehicles in Iowa were involved in 54,842 reportable accidents. These included accidents involving property damage of \$50 or more and injury and/or death.

The accident distribution follows somewhat the concentration of population in the districts. In eight of the 12 districts the frequency of accidents was below expectation whereas in the others the involvement was in excess of expectation. This distribution of accidents among the districts was significant far beyond the 1 per cent level, using population as the basis of the hypothesis.

It is possible that traffic conditions in industrial centers are contributing factors in the accident situation, especially where workers commute some distance to their place of work. This factor merits investigation.

The state of Iowa recorded 600 traffic fatalities in 1953. This was 15 per cent greater than the previous year and placed the Iowa records only slightly below the national average for traffic fatalities.

The distribution of the fatalities according to population in patrol districts was not different from expectations; hence the null hypothesis of significant difference was not rejected. However, in District 1, which includes the city of Des Moines, fatalities were under expectation and were significant at the 5 per cent level.

This distribution of traffic accident fatalities is shown on Figure 1 in terms of fatalities per 100,000 population. The state-wide fatality rate is 23 per 100,000 as compared with the national rate of 24.2.

Revocations and Suspensions

One of the methods used by enforcement officials to reduce traffic accidents is that of withdrawing the privilege of driving from persons involved in an excessive number of accidents and/or violations. The licenses of such persons are revoked permanently until later reinstated or are suspended for a specified period of time.

In 1953 a total of 2532 drivers licenses were revoked in Iowa. Considerable variation exists among the patrol districts with respect to the number of licenses revoked. Districts with low, medium and high concentration of population were among the districts with high and low revocation rates, as is evident from Figure 1. District 1, a high population concentration district, had about one-fifth of all the revocations whereas Districts 10, 11 and 12, also with high population concentrations, had frequencies considerably below expectation. The test of significance of the distribution of revocations among patrol districts according to population was significant beyond the 1 per cent level.

Approximately 13 per cent more drivers' licenses were suspended than revoked in 1953. Altogether, 2858 licenses were suspended.

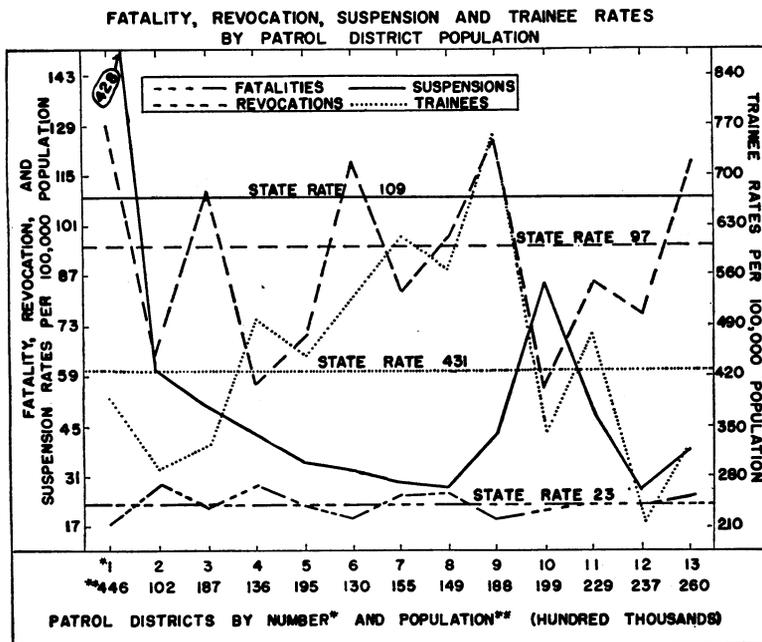


Figure 1.

The distribution of these suspensions among the patrol districts by the criterion used was significant beyond the 1 per cent level.

More than two-thirds of all the suspensions occurred in District 1, the number exceeding expectation by almost four times. In all other districts the observed frequencies were considerably below expectation. Figure 1 shows the distribution of license suspensions in patrol districts in terms of rates per 100,000 population.

The variation among the patrol districts with respect to the revocation and suspension of licenses possibly may reflect a difference in enforcement policy from district to district. This hypothesis merits study at a later time.

Driver Education Trainees

Each year the state of Iowa reports an increase in the number of students completing the driver education courses in the public high schools. In 1953, more than 11,000 students received such instruction. The distribution of these trainees among the patrol districts is given in Figure 1. In general, more future drivers of motor vehicles are being trained in the districts with medium population concentrations, that is in districts with population ranging from 130,000 to 190,000. In only one heavily populated district, Number 11, does the enrollment in such courses rise above the state rate of 431 per 100,000 population.

Distribution of the number of driver education trainees among the patrol districts was significant beyond the 1 per cent level when tested by chi square.

The relationship between the distribution of driver education trainees and all accidents in patrol districts is shown graphically on Figure 2. In districts 2, 3, 4, 5, 9, 10, and 13 there is a fairly close correspondence between number of trainees and accidents per 100,000 population. In the others the relationship is not clear.

Great variation exists in the districts with respect to the distribution according to population of trainees. In general, the higher the concentration of population, the lower the trainee rate per 100,000 population. Three of the four most heavily populated districts fall below the state rate of 431 trainees per 100,000 population. On the other hand most low-medium population districts, have rates considerably above the state rate. This condition points up the fact that greater effort to reduce traffic accidents through education is characteristic of the patrol districts which may be classified as rural.

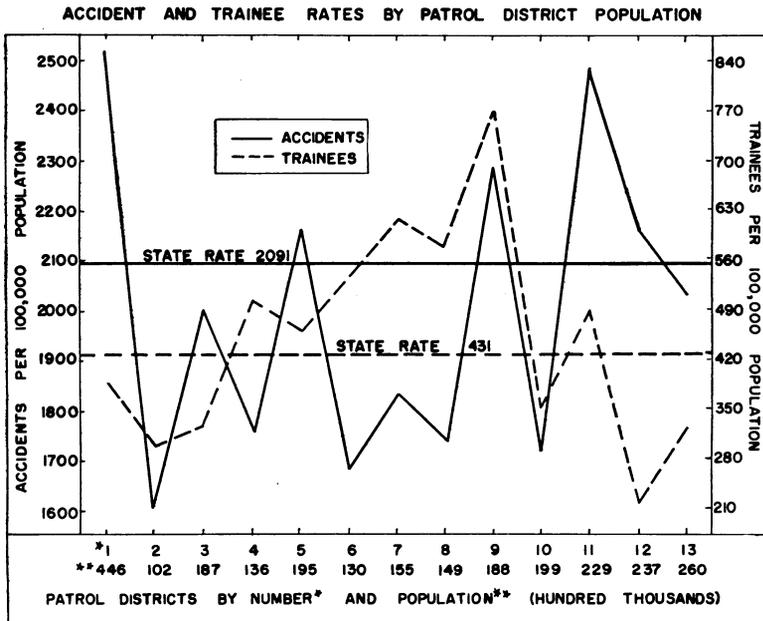


Figure 2.

SUMMARY AND CONCLUSIONS

Faced by the continuing high frequency of traffic accidents, educators and others are investigating the factors related to the problem of highway accident prevention.

The present study concerns the distribution of some of these factors in relation to the population within the patrol districts of the state of Iowa. In the light of the scope of this investigation and its limitations and methods used, the following tentative conclusions are drawn:

1. The null hypothesis was not rejected with respect to the distribution of traffic fatalities but was rejected with respect to the following factors: 1) all types of accidents, 2) license revocations, 3) license suspensions and 4) trainees of driver education courses. In all instances, these rejections were significant far beyond the 1 per cent level.

2. The distribution of the factors studied does not appear to be a direct function of population concentrations but is somewhat related thereto. The single exception is the factor of traffic fatalities which seems to parallel the population density curve among the districts.

3. In patrol districts of low concentration of population—the more rural districts—greater effort seems to be made to control accident involvement through driver education courses. A higher percentage of students is being trained to drive in such districts than in those with high population concentration.

4. Considerable variation exists between patrol districts with respect to the number of drivers' licenses being revoked and suspended. This is possibly a reflection of enforcement policy which prevails from one district to another.

In summary, it may be concluded that the traffic accident problems studied are somewhat related to the concentration of population within the patrol districts of the state of Iowa. However it appears that the interrelations of these problems, one with another, may be of importance and that further research should be undertaken to determine these interrelationships.

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