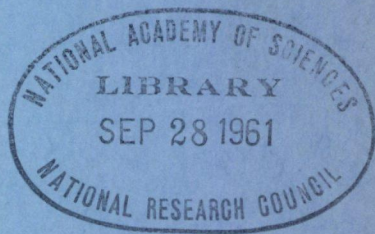


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Bulletin 285

***Driver Personality and Behavior
Characteristics***



**National Academy of Sciences—
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Bulletin 285

***Driver Personality and Behavior
Characteristics***

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Injury-Producing Private Motor Vehicle Accidents Among Airmen

JOSEPH E. BARMACK and DONALD E. PAYNE, Dunlap and Associates, Inc.*

Part I describes some of the important correlates of lost time accidents to 138 Airmen in privately owned vehicles. Some comparative data on 100 controls are also provided. Drinking alcoholic beverages rather than long distance pressure driving appeared to be the primary correlate of this class of accidents. The drinking proportion is within the range of proportions of drinking among nonmilitary personnel involved in accidents, but at the upper end of the distribution. Lines of evidence in support of this view are presented.

Part II compares some biographical correlates of Airmen who were drinking prior to lost time accidents with those who were not and with those of 100 controls. The drinking was not an isolated event. The drinking accident drivers had a higher incidence of remote and recent disrupted home life and a higher involvement in disciplinary infractions.

The Role of Drinking

PRIVATE MOTOR vehicle accidents have been shown to lead all other classes of accidents as a cause of death and injury to servicemen (13). The consequences of private motor vehicle accidents constitute a major medical problem for the military services.

The present study was part of a program of research devoted to the development of accident countermeasures. It focused on the antecedents of personal injury accidents involving private motor vehicles driven by Airmen. The study was restricted to personal injury accidents on the assumptions that this class was different from the property damage type and that the inclusion of large numbers of the latter might well obscure any distinctive characteristics of injury-producing accident drivers.

Although the use of control groups is rare in field investigations of accident phenomena, they are important in clarifying data trends. Consequently, this study was designed to permit certain comparisons of a sample of accident drivers and a sample non-accident control drivers.

Early in the study drinking was found to be a frequent precursor of personal injury accidents. Accordingly, investigation was directed to an appraisal of the role of drinking in private motor vehicle accidents and to an analysis of factors which attend drinking-driving accidents. The role of drinking is discussed in this article; factors in the personal histories of drivers involved in accidents preceded by drinking are discussed in Part II.

The subjects of this study were Airmen. Personnel from other services were excluded for two reasons: (1) the exploratory phase of this study began with Airmen—extension of the research to include members of the other services was planned; and (2) with a limited number of subjects, homogeneity with respect to branch of service seemed desirable to avoid problems of fractionating the samples into ones which would make a statistical treatment of the data impractical.

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Although the subjects are servicemen, the problem of the drinking driver is not limited to the services. A digest of representative studies on the incidence of pre-accident drinking is presented in Table 1.

Table 1 reveals that the incidence of preaccident drinking reported in various studies ranged from 1.3 percent to 69.9 percent. Some of this variability probably can be accounted for on the basis of differing degrees of leniency in the criterion of drinking, differing lengths of time between accident and blood test, and by inevitable random fluctuations due to small sample sizes. Also, as Plymat (16) has pointed out, the validity of reports of extremely low preaccident drinking percentages are often questionable. On the other hand, although the magnitude of the drinking-driver involvement in accidents may have been underestimated generally in the past, there is reason to believe that the significance of the problem is gaining recognition (14).

METHOD

The Accident Sample

The accident population was defined as all Airmen who, while driving a privately-owned motor vehicle, were involved in an accident which resulted in a lost-time injury to the driver or to a military passenger. To secure a reasonably large sample of accident drivers, 14 Air Force Bases were visited.

During the period of the study (January 1, 1958 to June 30, 1959), a total of 239 drivers at these bases were involved in this kind of accident. Of these, 155 (64.9 percent) were interviewed. Seventeen of the interviewed subjects had been riding motor scooters or motor cycles. This number was too small for a separate analysis, and was omitted. Consequently, the final sample of the study comprised 138 interviewed drivers.

Since 35.1 percent of the accident population was not interviewed, the possibility of a biased sample had to be considered. To identify possible sources of bias arising in

TABLE 1
PERCENTAGES OF DRINKING-DRIVER ACCIDENTS IN PUBLISHED STUDIES

Date	Author	Type of Accident	N	Test of Drinking	Criterion	Percent Meeting Criterion
(a) Civilian Subjects						
1934	Heise	Hospitalized	270	Drunkometer	Any alcohol	46.
1934	Hindmarsh and Linda	Hospitalized	113	Blood alcohol	Any alcohol	44.
1938	Holcomb	Personal injury	270	Urinalysis	Any alcohol	46.
1941	Gonzales and Gettler	Fatality (death within 24 hrs)	3471	Brain alcohol	"Under influence"	56.
1951	Smith and Popham	Personal injury	428	Intoximeter	0.01% or more	32.
1954	Lucas, et al.	All reported evening accidents	423	Drunkometer	0.05% or more	22.
1955	Bjerver et al.	Personal injury	71	Blood alcohol	0.01% or more	32.
1955	Coldwell	Fatality	1,755	Unspecified	0.05% or more	45.
1955	Plymat	Fatality	31-3048	Unspecified	"Drunk or drinking"	1.3-64.
1959	Haddon and Bradess	Single vehicle drivers (death within 4 hrs)	83	Blood alcohol	0.05% or more	69.
(b) Military Subjects						
1957	Ribble	Personal injury (Marines)	48	Bogan Test	Any alcohol	64.
1959	This study	Personal injury (Airmen)	138	Interview	Admitted 2 or more drinks within 4 hr of accident	64.

the selection of cases for interview, the reason for the unavailability of each case was determined and a copy of the official accident report (the AF Form 122 Report) for each was also obtained.

Of the uninterviewed cases, the most frequent reason for unavailability was a permanent change of station (28.6 percent of the cases). Death was the next most frequent reason (19 percent). Other reasons included confinement in a remote hospital, discharge, leave, and on the hospital critical list. These events could occur because the average interval between the accident and the interview was 2.4 months.

A comparison of selected data from the official accident reports of the interviewed and uninterviewed is shown in Table 2.

TABLE 2

COMPARISON OF INTERVIEWED AND UNINTERVIEWED ACCIDENT DRIVERS

Characteristic	Interviewed (N = 138)	Noninterviewed (N = 84)
Age (median)	23.5 years	22.3 years
Rank (modal)	Airman Second Class	Airman Second Class
Drinking noted (% of cases)	44.7	52.4
Driver judged responsible, %	84.1	83.8
Multiple vehicle accident, %	42.7	40.3

Note: None of the differences was statistically significant.
Data from AF Form 122.

The differences are small and not significant statistically. The data permit a rejection of the hypothesis that the procedure for getting to the cases filtered out the "worst" ones to be interviewed. If any bias was operating, it was in the direction of understating the drinking involvement in the sample.

Control Sample

To assure randomness the control sample was selected from Air Force personnel whose serial numbers ended in an arbitrarily chosen double number. These numbers are different for each base (for example, xxx-xxx-x22 at one base, xxx-xxx-x33 at another, etc.). From these groups, individuals were chosen who possessed a currently valid driver's license, and who had had no traffic accidents for one year or longer. Of the total number of persons who met these criteria, 40 percent were interviewed. The remainder were unavailable because of leaves, inaccessibility of duty site, high priority duty, and other reasons. The census characteristics of the total interviewed group matched fairly closely the Air Force as a whole, except that the officer population was under-represented. Few of the accident drivers were officers; therefore, the controls were chosen to match the distribution of Air Force personnel in the enlisted grades.

The definition of a control for an accident group poses some difficult problems. The properties of a control group should be dependent on the types of questions addressed to the data. Consequently, no single group can effectively serve as a universal control when the questions asked are varied, as they must be in an exploratory study. The members of the control group selected by this method were older by 2½ years than the members of the accident group, fewer were driving borrowed cars, their cars were older, and had more mileage on them. Although there was no significant difference in the number of miles driven in the last year, the trend suggested a somewhat higher exposure in the accident group. Other differences are discussed in the results but in substance there is no clear evidence that the procedure for selecting the control group singled out the individuals with especially low exposure characteristics.

Correlated with this difference in age are differences in marital status, which in turn relate to the availability of funds for new cars. Finally it should be noted that the accident sample in this study was not selected on the basis of accident repetition, but rather on the basis of a single injury-producing accident which occurred during a given span of time. Similarly, the control sample was not selected because its members were completely accident free, but rather because they were free from property damage or personal injury accidents for a year. Accident repeaters and accident-free individuals are useful in studying accident proneness. However, a study designed to find the causes of personal injury accidents must sample all cases as they occur without excluding the nonrepeaters.

The Interview Procedure

The primary data collection procedure was a semistructured personal interview. The close cooperation of Air Force personnel throughout the study, and their respect for the interview data as privileged communication greatly facilitated the conduct of this study.

Each interview required from two to four hours, and covered: family background, schooling and employment, military service, marital status, future career plans, car ownership, driving and accident history, opinions about accident causation and prevention, recreational activities, drinking practices, and the events of the 48 hours preceding the accident.

Interviews with control subjects covered similar areas except for the events surrounding the accident. In place of a description of the accident, controls were asked to describe in detail their driving (and drinking) activities during the seven days immediately preceding the interview.

The first step in the interview procedure was to explain the nature and purpose of the research program to the subject. He was assured that his communications would be privileged and advised that he could feel free to decline to answer any questions, but was urged to answer frankly. Interviewer bias was minimized by the careful delineation of criteria for categorizing responses and by the use of six interviewers.

RESULTS

The Incidence of Preaccident Drinking

The criterion for preaccident drinking was two or more alcoholic beverages within four hours of the accident. The minimum blood alcohol level of any subject who met this criterion would have been approximately 0.01 percent using a formula for estimation described by Ferguson and Bell (5). Actually, since the interval between last drink and accident averaged 1.4 hours, the average blood alcohol level for those who met the minimum criterion is estimated to have been 0.034 percent.

Of the 138 accident drivers, 89 (64.5 percent) were classified as drinking drivers. Although this is at the upper end of the distribution reported for civilians in Table 1, it is almost identical with the 64.6 percent preaccident drinking reported by Ribble (17) for Marines. He used an objective method of measuring blood alcohol.

The percentage of drinking drivers, according to interview results, was higher by one-half than official Air Force accident investigation reports (AF 122) indicate. "Been drinking" was mentioned in the accident reports for only 44.4 percent of the drivers in this sample. There are, however, several reasons for believing that the officially reported incidence of drinking was low:

1. Base accident investigators serve in an official capacity with certain administrative responsibilities toward the driver of the accident vehicle. Consequently, they are unlikely to suggest preaccident drinking in the absence of reasonably conclusive evidence at the time of the investigation. This evidence can be difficult to obtain except in the case of heavy, recent drinking. Sometimes accident drivers cannot be seen until hours, or even days, after the accident. The driver is understandably wary of official investigation and may attempt to conceal or deny preaccident drinking.
2. Blood alcohol tests, if administered routinely within a short time after the ac-

ident, could provide definitive information. However, blood samples were taken from only one-third of the accident drivers. The outcome of the blood alcohol test was not always included in the Air Force accident reports.

3. Military physicians on emergency service are frequently shorthanded: injury treatment takes priority over blood tests. In some instances physicians stated that they hesitated to become involved in the medico-legal aspects of the cases.

4. The blood tests are often administered not to assess drinking involvement but rather to confirm a prior suspicion of drinking.

Interviews of the type used in this study, in spite of their reliance upon the memory and candor of the subject, can be expected to provide more complete information than unsystematically applied objective tests. Consequently, the 64.5 percent incidence of preaccident drinking is judged to represent a reasonably conservative estimate of the true incidence in the population.

Almost equally important as the incidence of preaccident drinking is the amount of drinking. The criterion used in this study would admit as drinking drivers persons with blood alcohol levels below those considered legally significant. Table 3 gives the amount of preaccident drinking reported by the drivers; it does not reflect the a-

TABLE 3

AMOUNT OF PREACCIDENT DRINKING REPORTED BY ACCIDENT DRIVERS

Number of Drinks	Accident Drivers (N = 83) ^a		
	Number	Percent	Cumulative, %
2	8	9.7	100.0
3-5	25	30.2	90.3
6-10	19	22.9	60.1
11-15	9	10.8	37.2
16-20	12	14.4	26.4
21 or more	10	12.0	12.0

^aSix subjects who admitted drinking more than two drinks within four hours of the accident could not specify the amount actually consumed.

amount of drinking in four hours. Rather, it reflects the amount of preaccident drinking, often for longer periods among those who had at least two drinks within four hours of the accident.

Very few (9.7 percent) of the drinking drivers were near the lower limit in the amount they reported drinking. The fact that 60.1 percent of the drivers reported consuming six or more alcoholic drinks suggests that heavy preaccident drinking was common. The percentage of the drinking-driving controls who admitted drinking as heavily was only one-half as large (30 percent).

Drinking, Driving, and Day of the Week

The distribution of drinking and nondrinking accidents is given in Table 4 which indicates that the average number of accidents per day was almost twice as high on weekends as on weekdays (29 per day on weekends versus 16 per day on weekdays). However, the percentage of drinking-driver accidents remained approximately the same on weekends as on weekdays.

The piling up of accidents on weekends was not surprising; similar findings have been reported by many other investigators (1, 2, 7, 8, 16). The consistently high percentage of drinking-driver accidents through the week, however, was somewhat surprising. Although Haddon and Bradess (7) found no difference in percentage drinking between weekend days and weekdays, several other investigators have found a higher

percentage of drinking-driver accidents on weekends (2, 11, 16).

Because the number of cases on any one day was quite small, it was possible that a few cases could produce large apparent percentage differences. For instance, if a number of the weekend cases classified as nondrinking-drivers had been drinking heavily more than four hours before their accident the weekend percentage could be a serious underestimation. To test this possibility, all cases classified as nondrinking, whose accidents occurred between midnight Friday and midnight Sunday, were

TABLE 4
DISTRIBUTION OF ACCIDENTS

Type	Daily Variation							Total Week	Weekday-Weekend Comparison	
	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.	Sun.		Weekdays ¹	Weekend
Drinking-driver	8	10	8	11	15	22	15	89	10.4	18.5
Nondrinking-driver	<u>4</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>9</u>	<u>8</u>	<u>13</u>	<u>49</u>	<u>5.6</u>	<u>10.5</u>
Total	12	13	13	18	24	30	28	138	16.0	29.0
Drinking-driver percentage	66.7	77.0	61.5	61.1	62.5	73.3	53.6	64.5	65.0	63.8

¹Average for Monday, Tuesday, Wednesday, Thursday, Friday.

²Average for Saturday, Sunday.

re-examined. Of the 21 cases, five were marginal, as follows:

1. Five beers, last drink six hours before accident.
2. One beer, two hours before accident.
3. Could not remember whether had been drinking or not.
4. One beer, two hours before accident.
5. Two beers, six hours before accident, visited several bars between second beer and accident, but denied further drinking.

If these five cases had been classified as drinking-driver accidents, the weekend percentages would have been noticeably increased (that is, Saturday 76.7 percent rather than 73.3 percent, Sunday 67.9 percent rather than 53.6 percent). However, the conclusion would not thereby have been changed—the percentage of preaccident drinking on weekend days still would not have been significantly greater than the percentage of preaccident drinking on weekdays.

It remains to be determined whether the drinking-driving experience of the control group during the week parallels that of the accident group. The relation of accident occurrence to control exposure, while not conclusive, should suggest some of the exposure-accident correlates.

The measure of driving exposure among the control subjects was simply the total number of times each respondent reported driving, for any part of each hour of the day, during each of the seven days prior to the interview. The same criterion for drinking-driving exposure was used as had been applied to the accident drivers: two or more drinks within four hours of driving. If the drinking driver was on the road for more than an hour, he was so tallied for each hour or part of an hour that he was driving, unless four hours had elapsed from the time of his last drink. In that case, he was tallied as driving but not drinking.

The driving and drinking-driving exposure of the control subjects is shown in Table 5, which indicates that the total driving activity of the control subjects was only slightly higher on weekends than on weekdays; however, drinking-driving increased substantially on weekends. Although drinking-driving accounted for a significantly large percentage of weekend driving (almost three times as much as weekdays), drinking-driving among the control subjects never accounted for more than a small percentage of all driving. These results are consistent with the findings of Holcomb (11) who found a similar low incidence of drinking-driving in a nonaccident sample of drivers.

TABLE 5
DISTRIBUTION OF DRIVING EXPOSURE AMONG CONTROL SUBJECTS

Number of Driving Hours	Daily Variation							Total Week	Weekday-Weekend Comparison	
	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.	Sun.		Weekdays ^a	Weekend ^b
Drinking-driver	12	5	12	4	6	29	19	87	7.8	24.0
Nondrinking-driver	<u>259</u>	<u>228</u>	<u>188</u>	<u>192</u>	<u>242</u>	<u>210</u>	<u>234</u>	1,553	<u>221.8</u>	<u>222.0</u>
Total	271	233	200	196	248	239	253	1,640	229.6	246.0
Drinking-driver percentage	4.4	2.1	6.0	2.0	2.4	12.1	7.5	5.6	3.4	9.7
									$L_p = 0.0001$	

^aAverage for Monday, Tuesday, Wednesday, Thursday, Friday.
^bAverage for Saturday, Sunday.

The contribution of alcohol to accidents is suggested by the fact that drinking preceded 64.5 percent of the accident trips, but only 5.3 percent of the nonaccident driving. In other words, drinking-driving preceded accidents twelve times more often than would be expected on the basis of the obtained control exposure data.

Accidents and Driving by Time of Day

The frequency of drinking-driver and nondrinking driver accidents by time of day is shown in Figure 1. The distribution of not-drinking accidents was fairly flat throughout the day, and corresponds roughly to the driving experience or exposure for a military population (that is, largest volume of travel early in morning and late in afternoon—going to and coming from the base—see Figure 2). The contingency coefficient for the relationship between the nondrinking accident frequency and driving exposure per hour is $+0.67$ ($p = 0.001$ for a 3×3 table, for which maximum value of C is $+0.82$).

On the other hand, the drinking-driver accidents distributed quite differently from

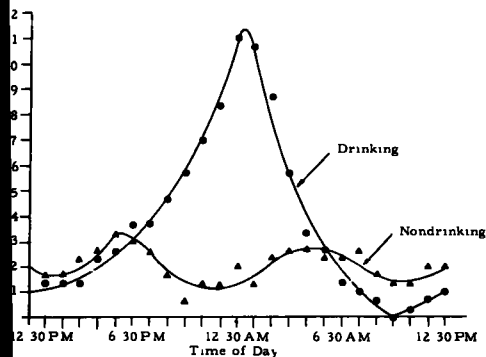


Figure 1. Distribution of drinking-driver and not-drinking-driver accidents by time of day. Figure smoothed by method of moving averages, using average of three points for each point plotted.

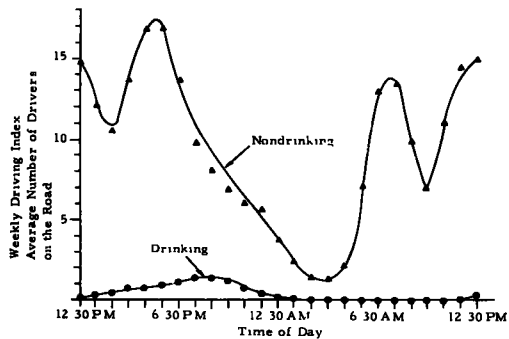


Figure 2. Distribution of driving exposure for 100 control subjects, separated according to whether drinking did or did not precede the driving. Figure smoothed by method of moving averages, using average of three points for each point plotted.

the nondrinking ones. Most of the drinking-driver accidents occurred during the hours of darkness. Between 6:00 PM and 6:00 AM 83.1 percent of the drinking-driver accidents occurred as compared with 5.3 percent of the nondrinking-driver accidents. The difference is statistically significant ($p = 0.0001$). For practical purposes this difference is important, if only to guide the assignment of police patrol activities.

The distribution of driving exposure among the control subjects is shown in Figure 2. The distribution of nondrinking driving among the control subjects exhibited pronounced peaks in the early morning and late afternoon. Drinking-driving accounted for a relatively small amount of the driving exposure of the control subjects. On the other hand, the times during which the drinking drivers were on the road correspond fairly well to the times at which the drinking-driver accidents occurred. The rank-order correlation between accident frequency and control group exposure was + 0.89

($p = 0.001$). Again, the time during which most drinking-driving is to be found on the road is the evening.

Figure 3 shows the percentage of the accident and control groups who were drinking and driving during the day.

The results presented indicate that, although the maximum percentage of drinking drivers on the road (among the control subjects) occurred at about 2:00 AM the maximum percentage of drinking-driver accidents occurred about 2½ hours earlier.

In the absence of exposure data to indicate the times and amount of driving among the drinking accident group (for a week before the accident occurred) the reason for the discrepancy in the peaks cannot be unequivocally stated. It may be that the earlier peaks of the drinking-driver accidents reflect a higher exposure rate during the pre-midnight hours as a result of "bar-hopping." Over half (57.6 percent) of the drivers involved in drinking-driver

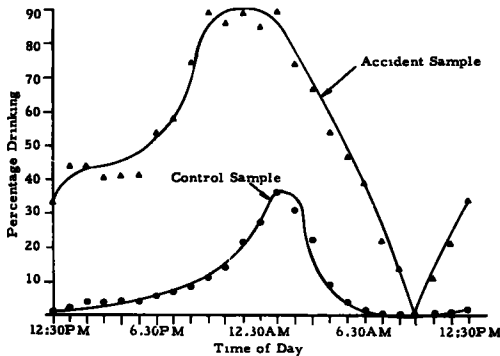


Figure 3. Distribution of percentage of drinking drivers among 138 accident drivers and 100 control drivers by time of day. Figure smoothed by method of moving averages, using average of three points for each point plotted.

accidents had been drinking in more than one place prior to the accident as compared with 10.2 percent among the drinking-driving controls.

One other association between drinking and accidents should be noted. To compare the amount of preaccident drinking and the type of accident, the following classifications were used:

1. Drinking: (a) Heavy drinking—six or more preaccident drinks; (b) Moderate drinking—two to five preaccident drinks; and (c) No drinking—one or no preaccident drinks.
2. Type of accident: (a) Single vehicle—no contact with any other vehicle, noncollision or fixed object collision; (b) Complicated single vehicle—single vehicle accident in which another vehicle was alleged to have contributed (for example, blinding headlights and crowding) but without contact; and (c) Multiple vehicle accident—collision between two vehicles on the roadway (includes one collision with a railroad train and three with parked cars).

The relationship between amount of drinking and type of accident is given in Table 6. Those drivers who drank heavily prior to the accident were involved in single-vehicle accidents almost twice as often as the not-drinking ones. The contingency coefficient between drinking and type of accident was + 0.31 ($p = 0.001$). (Because the heavy drinking drivers included, as multiple vehicle accidents, three individuals who struck parked cars, both the X^2 and the C for Table 6 are conservative estimates. Thus, had the three cases in question been classified as single vehicle accidents, the X^2 for Table 6 would have been 15.84, and the contingency coefficient + 0.33.) In other words, the data indicate a significant association between drinking and single-vehicle accidents.

The data do not include information on the drinking status of the "other" driver in the multiple-vehicle accidents, except in the very few instances where two drivers from a base were involved in the same accident. Conceivably, if such information

TABLE 6
RELATION OF TYPE OF ACCIDENT TO AMOUNT OF DRINKING

Type of Accident	Heavy (N = 50) %	Moderate (N = 34) %	None (N = 49) %
Single vehicle			
Uncomplicated	60.0	44.1	34.7
Complicated	12.0	14.7	4.1
Sub total single	72.0	58.8	38.8
Multiple vehicle	<u>28.0</u>	<u>41.2</u>	<u>61.2</u>
Total	100.0	100.0	100.0

Note: $X^2 = 13.77$, $df = 2$, $p = 0.001$. This value permits rejection of the hypothesis that the three groups, separated on the basis of the amount of drinking, have equivalent distributions of single vehicle accidents.

ere available, the association between heavy drinking and single-vehicle accidents could be attenuated. But assuming that as high as 70 percent of the "other" drivers are drinking (in the ratio of 60 percent "heavy," and 40 percent "moderate") a spread of 19 percent still persists in favor of single vehicle incidence among heavy drinkers over nondrinkers, in spite of the fact that these assumptions are least favorable to the association between drinking and the single vehicle accident. It is much more likely that the proportion of "other" drinking drivers who collided with the multiple vehicle accident drivers here studied was far less than 50 percent if only because these accidents occurred primarily during the day, when drinking-driving was least frequent.

The conclusion is warranted that single-vehicle accident drivers exhibit the highest incidence of preaccident drinking. The National Safety Council (1) has reported substantial increases in single-vehicle accidents during the past ten years. Collisions with fixed objects increased 65 percent from 1947-1957; noncollision accidents increased 55 percent during the same period. Multiple-vehicle accidents increased only 5 percent during this time. With single-vehicle accidents assuming an increasingly large proportion of all accidents, a careful investigation of the role of preaccident drinking seems indicated (7). There is reason to suspect that the drinking-driver problem is increasing rather than decreasing in magnitude.

Driving Distance and Location

It is sometimes suggested that private motor vehicle accidents among servicemen result primarily from driving long distances at high speeds to make the most of a leave or pass. The data do not support this suggestion. In the sample of accidents studied, virtually all (87.0 percent) occurred within 50 miles of the base; slightly less than half (47.8 percent) occurred within five miles of the base. The average distance driven before the accident amounted to only 2.7 miles for the drinking drivers and 6.0 miles for the not drinking drivers.

DISCUSSION

Laboratory studies can demonstrate that alcohol may cause an impairment of many performances important to the control of a vehicle (4). Such studies do not demonstrate that alcohol causes motor vehicle accidents. Field studies such as this cannot prove that alcohol causes accidents either, but there is substantial evidence that drinking is significantly associated with personal injury accidents occurring in privately owned vehicles. The problem of "proving" that alcohol causes accidents, or more generally, the problem of determining the causes of known effects is a formidable one. There are both legal and ethical constraints against obtaining proof by manipu-

lating a cause (alcohol) in such a way as to produce a specific effect (injury-producing accident). Under the circumstances, it is necessary to rely upon the implications of converging lines of evidence. Field studies such as this one provide the necessary link between the laboratory studies and the belief that alcohol may play a causal role in inducing accidents on the highway.

This study has shown that the ratio of preaccident drinking to nondrinking was substantially higher than the ratio of drinking-driving to not drinking-driving among a control sample. Drinking accidents have a different time distribution than nondrinking accidents. While the nondrinking accident distribution paralleled the over-all exposure data for the controls, the drinking accident distribution did not, but rather paralleled the drinking-driving distribution of the controls. The drinking accident driver drank more heavily and was more likely to bar-hop on the day of the accident than the non-accident control. The bulk of the accidents were local, therefore fatigue from long distance driving played a negligible role. There is an association between the amount of drinking and the type of accident. Single-vehicle accidents are more likely to occur with preaccident drinking. This association tends to divorce the drinking accident from the responsibility of others. These diverse characteristics of the drinking accident have a logical consistency if a causal quality is imputed to the drinking.

One paradox emerged from the data. The ratio of drinking to nondrinking accidents was high throughout the week. Even though there were roughly twice as many accidents on Saturday and Sunday as on weekdays, the ratio of drinking to nondrinking accidents for the weekend was the same. This constancy is particularly puzzling in view of the fact that the incidence of drinking-driving for the controls was three times as high on the weekends as on weekdays.

In view of the causal role imputed to alcohol, it is tempting to let alcohol carry the heuristic burden for resolving the paradox. A number of hypotheses can be developed about how alcohol was involved.

It may be assumed that the drinking accidents are "selected," so to speak, from the drinking-driving control population who drink too much. There is evidence that the preaccident drinking was, on the whole, heavier than that of the drinking-driving controls. This assumption can account for the paradox of a constant proportion of drinking accidents throughout the week however, only if it is assumed further that the rise in weekend drinking and driving for the controls is light "social" drinking. A careful study on a larger number of cases is indicated to test this hypothesis.

It may be assumed further that because of the higher proportion of bar-hopping among the preaccident drinkers than among the drinking-driving controls, their frequency of exposure at the time of heavy drinking was greater. This hypothesis would also require fuller investigation than was possible in this study.

Finally, it may be assumed that the control group, in addition to being older, was otherwise different from the accident group in the role that alcohol played in their lives. This hypothesis is discussed more fully in Part II.

IMPLICATIONS FOR COUNTERMEASURE DEVELOPMENT

One of the primary purposes of this investigation was to provide information useful in the development of countermeasures. What countermeasures are suggested by the data here reported? Since drinking was so prominently associated with lost-time accidents, efforts to discourage drinking and driving would appear promising.

The Scandinavian countries have reported notable successes with police programs designed to detect the drinking driver—usually by means of random spot checks among evening drivers, using some form of chemical test for blood alcohol. Detroit is reported to have reduced drinking-driver accidents by an impressive 95 percent through "ten years of rigid enforcement backed by chemical tests (14)." A program of off-base patrolling at a Marine Corps base (12) although not directly aimed at the drinking driver, indicated the feasibility and effectiveness of creating a "sense of surveillance among military personnel driving in the vicinity of their base. A 42 percent reduction in accident frequency was obtained following a ten-week program. The effect lasted nine weeks after the countermeasure was discontinued.

One barrier to applying such countermeasures effectively are legal restrictions on off-base activities of military enforcement personnel. The success of countermeasures specifically designed to affect the drinking driver indicates that the coordination of military and civilian programs in the area of patrolling and supervision of traffic in the vicinity of military bases would pay off handsomely. Initiative in this area should be encouraged.

Another countermeasure which appears promising is a chemical test at the gate combined with an educational program of discouraging drinking and driving and encouraging the driver, at least, to remain sober.

Still another countermeasure suggested by the data is a program of alerting base personnel to the hazards of bar-hopping.

Whether or not these latter countermeasures would, in fact, be effective remains to be evaluated.

SUMMARY

An interview study of 138 drivers involved in injury producing accidents and 100 control drivers drawn from a random sample of Airmen revealed:

1. Preaccident drinking occurred in roughly two-thirds (64.5 percent) of the sample of accidents. This figure was at the upper end of the distribution of percentages reported for civilian accident drivers, but consistent with another study of preaccident drinking among military personnel.
2. Official accident reports underestimated the incidence of preaccident drinking.
3. The total number of accidents and the total number of drinking-driver accidents were greater on weekends than on weekdays. However, the percentage of drinking-driver accidents was fairly consistent from day to day.
4. Total driving exposure among the controls was only slightly higher on weekends than on weekdays, but their drinking-driving exposure, though small, trebled on weekends.
5. Drinking-driving accounted for no more than 5.3 percent of the total driving of the control subjects. Accordingly the incidence of drinking-driving among the accident group was twelve times that of the controls.
6. Nondrinking accidents were associated with traffic density, and tended to occur most often during the morning and afternoon "rush" hours.
7. Drinking accidents were primarily night accidents, 83.1 percent occurring between 6 PM and 6 AM.
8. Drinking was associated with single-vehicle accidents.
9. Drinking and nondrinking accidents tended to be local (occur in the vicinity of the base) and occur during short-distance trips. Very few accidents could be attributed to long-distance driving and fatigue.
10. Cooperation of military and civilian personnel for the development and testing of programs to carry surveillance of the drinking driver beyond the base gates seems highly desirable for effective reduction of drinking accidents. A number of promising countermeasures were suggested for evaluation.

1. Background Correlates of the Lost-Time Accident

BECAUSE preaccident drinking was so prominent a characteristic of the class of accidents studied, it is important to know something about the role of drinking in the eyes of the accident victims if effective preventive measures are to be developed. Preventive measures for reducing drinking-driver accidents could be designed to persuade individuals to avoid the combination of drinking and driving. The form of persuasion would depend on whether the bulk of the drinking accident drivers are social drinkers as suggested by Kearney (14) or compulsive drinkers as Popham (24) has

proposed. Rational appeals may have some influence on social drinkers but little or no influence on compulsive drinkers.

However, there are several complications to the apparently simple distinction between the social drinker and the compulsive drinker. Drinking habits do not fit into discrete categories, rather they occupy a broad spectrum of which some of the crucial variables are time, frequency, amount, control, and health and social effects.

Bjerver, Goldberg and Linda, (12) and Goldberg (22) utilized a Swedish system which includes three levels of problem drinkers: (a) addicts—persons confined to institutions for alcoholics (under Article 1 of the Swedish Alcohol Law) at any time during the three years preceding the study; (b) abusers—persons with three or more convictions for offenses involving drinking; and (c) excessive drinkers—persons with one or two convictions involving drinking. Bjerver, et al. (12) found a 32.5 percent incidence of all three classes of problem drinkers in a male accident-injured population; among those victims whose blood tests were positive for alcohol at the time of hospital admission, 69.5 percent were problem drinkers, though only 8.7 percent qualified as addicts.

The drinking habits of a military population, of course, might be expected to differ from those of a civilian one as a result of selection. Overt alcoholics are not accepted by the Armed Forces if their condition is known; if it is discovered subsequent to induction, they are likely to be separated from the service soon after.

Another important issue affecting the development of accident countermeasures is the degree of relationship between accidents and psychopathology. The accident driver is not usually thought of as mentally ill, though the accident repeater may be. Canty (21) for instance, reported that only 9.7 percent of the traffic violation repeaters seen in his clinic were free of major psychopathy. On the other hand, this estimate cannot be applied to accident repeaters in general (much less to the non-repeater accident driver) since the cases seen in the clinic had all been referred by state and municipal judges and officials who presumably had reason to question the mental health of the offenders.

Most studies suggest that accident repetition reflects a pattern of inadequate adjustment which does not readily fit into existing psychiatric diagnostic categories (20, 22, 26, 27, 28). The accident repeater has been described as the product of a broken home, (26, 27) socially immature and impulsively resentful toward authority, (27) with escapist (22) and/or self-destructive tendencies (20). Of course, the primary focus of the present investigation was not on repeaters. It was desired to determine whether the characteristics of repeaters, as cited in the literature, could be confirmed on a representative sample of airmen involved in lost-time accidents in privately owned vehicles. The nature of the adjustment problems and their accessibility to psychiatric treatment are important in assessing the feasibility of countermeasures which would involve psychiatric assistance.

METHOD

The details of procedure were described in Part I. The essential feature of the procedure was an intensive semistructured interview of two to four hours duration. Three groups of drivers were involved:

1. A drinking accident group, consisting of 89 drivers (Airmen) involved in private automobile accidents which resulted in lost-time injuries to themselves or to their passengers. They reported having had at least two alcoholic beverages within four hours of the accident.
2. A not-drinking accident group consisting of 49 drivers involved in lost-time accidents, but who reported they had not been drinking, or at most had a single alcoholic drink within four hours of the accident.
3. A control group, consisting of 100 randomly selected drivers who had not been involved in a lost-time or property damage accident within one year of the interview.

TABLE 7
ACCIDENT HISTORY BEFORE AND INCLUDING CURRENT ACCIDENT

Number of Accidents	Accident Drivers				Control Drivers (N = 100) Any Past Accident Experience %
	Drinking (N = 89)		Not Drinking (N = 49)		
	Present Accident Excluded %	Present Accident Included %	Present Accident Excluded %	Present Accident Included %	
0	47.2	0.0	46.9	0.0	44.0
1	31.4	47.2	30.6	46.9	36.0
2	14.6	31.4	16.3	30.6	12.0
3	3.4	14.6	6.1	16.3	4.0
4 or more	3.4	6.8	0.0	6.1	4.0
Average per man	0.92	1.92	0.82	1.82	0.92

RESULTS

A comparison of the motor vehicle accident histories of the three groups with and without the current accident included is shown in Table 7, which indicates that the accident and control groups were strikingly similar in frequency of accidents before the present one. Of course, inclusion of the current accident markedly changed the distribution. With the present accident included, 52.8 percent of the drinking accident group had two or more accidents, as opposed to 53.0 percent of the not-drinking group, and 20.0 percent of the controls. While the number of repeaters was enlarged, still only half of the accident drivers could be categorized as repeaters. In other words, on the basis of past accident experience, there was no difference between the group who became involved in accidents and the control group who remained accident free for at least one year.

The usual drinking habits of the three groups were compared to determine whether the drinking of the drinking accident sample was an isolated event or part of a recurring pattern. The data are shown in Table 8, and indicate that the distributions of fre-

TABLE 8
REPORTED FREQUENCY OF DRINKING AMONG
ACCIDENT AND CONTROL DRIVERS

Frequency of Drinking	Accident Drivers		Control Drivers (N = 100) %
	Drinking Prior to Accident (N = 58) ¹ %	Not Drinking Prior to Accident (N = 36) ¹ %	
More than once a week	72.4	36.1	44.0
Once a week - once a month	25.9	30.6	21.0
Once a month - once a year	1.7	13.9	17.0
Not at all	0.0	19.4	18.0
Total	100.0	100.0	100.0

Because this line of inquiry was not begun until the study was well under way, this information is reported on two-thirds of the accident cases but on all of the controls.

quency of drinking for the not-drinking accident sample and the control sample resembled each other closely, but that the distribution of the drinking accident group was markedly different from the other two ($p = 0.001$).

The practical significance of the higher frequency of drinking among the drinking accident group is attenuated somewhat by the fact that if one asked individuals selected at random about their drinking habits, and separated them into two groups: (a) those who had been drinking on a recent, randomly selected date, and (b) all others, the drinking frequency distributions would also differ. The "dated" group would be devoid of the 18-19 percent who do not drink at all. Nevertheless, even taking this fact into account, the distribution of the drinking accident group was still skewed toward the high frequency end. The data demonstrate that drinking at the time of the accident was not an isolated or chance event but rather that this type of accident included a high proportion of regular drinkers.

The fact that more members of the drinking accident sample were likely to drink more frequently does not mean they were alcoholic.

In order to quantify the extent to which drinking was a problem the categories and criteria reported by Goldberg (23) were used. Table 9 presents the incidence of problem drinkers in the accident and control samples and indicates that the problem drinkers were very significantly over-represented in the drinking accident driver group. Al-

TABLE 9
INCIDENCE OF PROBLEM DRINKERS AMONG THE ACCIDENT
AND CONTROL DRIVERS

Problem Drinking Habits	Accident Drivers		Control Drivers (N = 100) %
	Drinking (N = 89) %	Not Drinking (N = 49) %	
Addict	0.0	0.0	0.0
Abuser	11.2	2.0	1.0
Excessive	22.5	8.2	8.0
Subtotals			
Problem drinkers ¹	33.7	10.2	9.0
No drinking problem	<u>66.3</u>	<u>89.8</u>	<u>91.0</u>
Total	100.0	100.0	100.0

¹Incidence of problem drinkers among drinking accident drivers significantly higher than among not drinking accident drivers (CR = 3.1, $p = 0.002$), or controls (CR = 4.2, $p = 0.0001$).

though the drinking accident group had a significantly higher percentage of problem drinkers, the hypothesis of Popham that "...traffic accidents involving drivers who had been drinking are to a considerable extent a problem of alcoholism rather than largely a problem of the effects of alcohol on the casual drinker (24, p. 231)," was not completely confirmed. There were no addicts in any of the groups, and the proportion of problem drinkers did not constitute a majority even among the drinking accident drivers.

Adjustment Problems

No psychiatric diagnostic examination was obtained for any of the interviewees, consequently their current psychiatric status cannot be described definitively. However, there was no case of a diagnosed psychotic episode requiring hospitalization reported in the biographical data of any of the three groups. Although it cannot be concluded with confidence that there was none, it is clear that psychosis was not a noteworthy biographical characteristic of the accident groups.

TABLE 10
INCIDENCE OF EARLY FAMILY TRAUMA¹ AMONG
ACCIDENT AND CONTROL DRIVERS

Family Background	Accident Drivers		Control Drivers (N = 100) %
	Drinking (N = 89) %	Not Drinking (N = 49) %	
Traumatic	39.3	16.3	28.0
Nontraumatic	60.7	83.7	72.0
Total	100.0	100.0	100.0

Note: Chi square = 8.19, df = 2, p = 0.02. This value permits rejection of the hypothesis that the two accident groups and control have the same distribution of family backgrounds.

The traumatic category includes those who were separated from one or both parents before age 13 for reasons of parental death, desertion, separation, divorce, imprisonment, or commitment to a mental hospital. Also included were those who were separated and were raised by others for at least six months while both parents were still alive. The nontraumatic category included all others. It is not implied that the members of the nontraumatic group were free from emotional trauma, but rather that they did not meet certain criteria of trauma. The particular criteria were selected because they could be clearly identified in biographical data.

There was evidence, however, that the drinking accident tended to select those persons who had early family environments identified as emotionally traumatic. Table 10 compares the incidence of early family trauma among the three groups. The most striking finding is the lack of homogeneity among the two accident groups. (The difference in incidence of trauma between them was 23.0 percent, CR = 2.7, p = 0.02.) This difference remained fairly stable from the first few cases throughout the collection of the entire sample.

In view of the studies by Tillman (27), Schulzinger (26) and others associating accident repetition with a history of a broken home, the question may be raised as to how much this association owes to the intervention of alcohol as a palliative for the feelings of loneliness, rejection, resentment, etc., generated by the broken home experience.

Table 10 also shows that while an incidence of 39.3 percent broken homes seems high it is only 11.3 percent higher than that of the control group (CR = 1.7, p = 0.09) and 14.5 percent higher than the figure (24.8 percent) reported by Ryan (25) for 2,262 unselected Army recruits. Accordingly, this characteristic is meaningfully and differentially associated with a relatively small subgroup of the drinking accident sample.

There is evidence that some of the criteria of trauma are more heavily associated than others with the drinking accident. One quarter of the 35 drinking drivers who came from broken homes had been exposed to socially stigmatized parental separations (for example, felony conviction of parent, suicide, hospitalization of parent for mental illness, or desertion). Only one of the eight not-drinking accident drivers from broken homes and one of the 28 controls from broken homes had experienced socially stigmatized separations. The number of cases involved is small, however, and the differences not statistically significant.

Another clue to the quality of the home life of a substantial proportion of the drinking drivers is provided by the incidence of problem drinking among the drivers' parents. A problem drinking parent was defined as one who drank heavily to a point impairing health or job stability and resulting in medical advice to stop, and/or quarreling with the other parent about stopping drinking. The data in Table 11 suggest that the thread in the etiology of this type of accident may be that the drinking accident

TABLE 11
INCIDENCE OF PROBLEM DRINKERS AMONG THE PARENTS
OF THE ACCIDENT AND CONTROL DRIVERS

Parental Drinking	Accident Drivers		Control Drivers (N = 100) %
	Drinking Prior to Accident (N = 89) %	Not Drinking Prior to Accident (N = 49) %	
Father a problem drinker	21.3	14.3	9.0
Mother a problem drinker	1.1	0.0	0.0
Both problem drinkers	7.9	2.0	1.0
Total ¹	30.3	16.3	10.0

¹Incidence of problem drinkers among parents of drinking accident drivers is significantly higher than their incidence among the parents of the not-drinking accident drivers ($p = 0.05$) or the controls ($p = 0.0001$).

driver has acquired, through parental example in some cases, the mode of using alcohol to deal with tension or other unpleasant feelings. Still another explanation might be that a problem drinking parent generates a variety of family disturbances of which drinking by the offspring may be one expression.

The data on parental characteristics (Tables 10 and 11) do not prove that the three groups of offspring are different in their ability to cope or to adjust. They merely indicate that the drinking accident population is moderately over-represented with individuals who had more to cope with as children. As Ryan (25) has shown, this circumstance does not necessarily impair coping ability. In his study, the vast majority (88 percent) of the men who came from broken homes were effective in the service. However, the remaining 11.5 percent contributed disproportionately to the usual criteria of non-effectiveness (involvement in company punishment, courts martial, and civil difficulties). To these criteria might be added on the basis of this study, the drinking lost-time accident.

TABLE 12
MARITAL STATUS OF ACCIDENT AND CONTROL DRIVERS

Marital Status	Accident Drivers		Control Drivers (N = 100) %
	Drinking Prior to Accident (N = 89) %	Not Drinking Prior to Accident (N = 49) %	
Single ¹	51.7	44.9	34.0
Married: living apart ²	22.5	16.3	8.0
Subtotal: living alone ³	74.2	61.2	42.0
Married: living together	25.8	38.8	58.0
Total	100.0	100.0	100.0

¹Difference between accident groups not significant, but drinking accident group significantly different from controls ($p = 0.02$).

²Difference between accident groups not significant, but drinking accident group significantly different from controls ($p = 0.01$).

³Difference between accident group not significant, but drinking accident group significantly different from controls ($p = 0.001$).

There is evidence that the accident groups (and the drinking accident particularly) were selective of individuals with no immediate home ties. Table 12 compares the marital status of the three groups. Nearly three quarters (74.2 percent) of the drinking accident drivers and 61.2 percent of the not-drinking drivers were living alone as compared with 42 percent of the controls. The difference between the accident groups was not statistically significant, but the difference between the drinking accident group and the control was significant (at the 0.001 level) as was that between the not-drinking group and the control (at the 0.03 level).

One may assume that Airmen who are living alone are more likely to spend leisure time drinking and bar or party hopping; they become more vulnerable to accidents as a consequence.

It could be postulated that the differences in incidence of living alone are an adventurous function of the age differences of the three groups. The average age in years of the drinking accident sample was 23.7; of the not-drinking accident sample, 23.1; and of the controls, 26.1. These age differences occur in a period during which many young men marry. However, single status, regardless of its relationship to age, could contribute more directly to accidents than other correlates of age by virtue of the social factors mentioned previously. Support for this view is found among the reports of some of the married controls who cited a relatively high frequency of drinking and driving before marriage, followed by a "settling down" in which this pattern either diminished or disappeared entirely.

Table 12 also shows a surprising difference between the drinking accident sample and the controls in their proportions of married Airmen living apart from their wives, 2.5 percent vs 8.0 percent. The difference is more striking than shown since the percentages do not take into account the different proportions of married individuals in the two populations. When this is done it is clear that 46.6 percent, or almost one-half the married men in the drinking accident group, and 29.5 percent of the not-drinking accident group are not living with their wives as compared with 12.1 percent of the married controls.

The small number of cases among the married men not living with their wives prohibits statistical comparisons of the reasons for living apart. "Economic" reasons were most frequently cited by all three groups, but marital conflict turned up proportionately more frequently among the drinking accident group.

These data lend support to the view that the drinking accident may be selective of individuals with a current marital adjustment problem; however, additional data are needed. It would be desirable to match the drinking accident group with a control group having the same age distribution and the same proportion of married men, and explore more intensively the nature of the marital adjustments of the two groups.

If "living apart" is used as a coarse index of marital adjustment, it is appropriate to ask whether early traumatic family experiences contribute disproportionately to marital problems. Although the numbers involved are small, the trend for all three groups is that those with early family traumatic backgrounds are over-represented in the samples of married men living apart from their wives. The percentage of drivers who were married, but currently living alone and who reported broken childhood homes was higher among the drinking accident drivers (35.0 percent) than among the not-drinking accident group (14.3 percent) or the controls (0.0 percent). Because of the small number of cases involved, the differences were not statistically significant. If these trends are confirmed, it would appear that the drinking accident population is selective of different subpopulations who are drinking in response to recent as well as remote sources of unhappiness.

Until confirmatory information is available, the most conservative inference to be drawn from the present data is that the drinking accident group draws most heavily from a population without immediate or local home ties. These are the individuals who are most likely to spend part of their leisure in varying combinations of drinking and driving. In this way they are most likely to become involved in an accident.

Still another area in which adjustment problems might be reflected is in relation to authority. Are the groups different in their prior experiences of nonconformity? To answer this question, the groups were compared with reference to preaccident

TABLE 13
DISCIPLINARY HISTORY: ALL INFRACTIONS¹

Disciplinary History	Accident Drivers		Control Drivers (N = 100) %
	Drinking Prior to Accident (N = 89) %	Not Drinking Prior to Accident (N = 49) %	
Reported one or more infractions ²	87.6	73.5	50.0
Reported no infractions	<u>12.4</u>	<u>26.5</u>	<u>50.0</u>
Total	100.0	100.0	100.0

¹Includes civil jail incarceration, moving vehicle violation, article 15, and/or court martial. Disciplinary actions resulting from the present accident were not included.

²Percentage of drinking accident drivers who committed infractions significantly higher than percentage among: not-drinking accident drivers (CR = 2.1, p = 0.04) or control (CR = 5.5, p = 0.0001). Similarly, the not-drinking accident group had a higher proportion of offenders than the controls (CR = 2.7, p = 0.007).

civil jail incarcerations, motor vehicle (moving) violations, minor military infractions (Article 15), and major military infractions (courts martial). The results are presented in Table 13.

With few exceptions group differences were not significant for any single class of infractions. However, the general trend was consistent. For each class of infractions, the drinking driver accident group exhibited: (a) a greater percentage of persons who had committed the infraction than either the not-drinking accident group or the controls; and (b) a higher number of infractions per man than either of the other groups. The not-drinking driver accident group was generally equal to, or only slightly more often involved than the control group. Consequently, if authority conflict is not limited to specific classes of infractions, but rather is assumed to be reflected in all kinds of infractions, then it is the total disciplinary history that is relevant.

DISCUSSION

There are two characteristics of this study which suggest caution in accepting the findings:

1. Although the present investigation utilized more case histories, obtained by lengthy qualitative interviews, than is characteristic of studies in the accident field, the numbers involved by other standards are small.

2. This report presents only a portion of the information collected. Findings have been selected which appear relevant to the drinking-accident problem. Most of these findings are statistically significant. However, through selection from a mass of data it is possible to be misled into assuming that all statistically significant findings are replicable. This may not be true.

For these reasons this study needs to be followed up. It is believed desirable that further studies include personnel from the other two services as well.

It should be noted that this sample of accident cases does not represent all types of automobile accidents, but rather a specific class of accidents having special properties of medical interest—injuries to Airmen, resulting in loss of duty time for 24 hours or more as a result of privately-owned vehicle accidents. Accidents with these properties "select" individuals with certain other characteristics. This group is at least occupationally different from Airmen having accidents in government-owned vehicles

It has been shown that if single-vehicle accidents had been studied, there would have been a higher proportion of drinking-accidents, etc. What has been described in quantitative terms are some of the accident-correlated properties of a group which this class of accidents selects.

It is clear that the group is more heterogeneous than homogeneous.

The findings of this study are consistent with results reported by Tillman (27) and Canty (21), both of whom have stressed the social difficulties of the chronic offender. The social difficulties seem to characterize not only the chronic offender, but a disproportionate of all personal injury accident drivers.

There are other important implications from the findings of the present study. The data suggest that some part, or all, of the relationship between biographical data or personality measures and accidents reported in other studies owes its existence to drinking as an intervening variable. The validity and importance of previously reported findings are not in question. Rather, the position is taken that, if the nature of the processes that lead to accidents is to be understood, it is important to clarify the inter-relations between psychic trauma, drinking, and accidents.

There are at least three possibilities:

1. The accident is in some way related to some personality trait or psychic trauma. Drinking is incidental to the accident though it may also be a consequence of the psychic trauma.
2. The accident is an outcome of heavy drinking. The drinking is used as a palliative for the psychic trauma.
3. The accident is selective of those who for reasons of trauma are sensitized to behave maladaptively behind a wheel even with a moderate amount of alcohol.

Admittedly, information on preaccident drinking is difficult to obtain. Nevertheless, it is important for future research on the relationship between personality and accidents to give particular attention to obtaining valid drinking data to avoid contaminating the properties of drinkers with other properties of those involved in accidents.

One other finding which is particularly important for countermeasure development is that problem drinking is more common among drivers who were drinking before the accident than among controls or among those who were not drinking at the time of the accident. There is a disproportionately high incidence of early and recent disruptions of home life among them. These facts suggest that this group has a greater dependency on drinking, perhaps as a tranquilizer. The dependency suggests, in turn, that logical appeals to dissuade drinkers from driving, or vice versa, would have limited value. Other approaches are indicated. Those which involve surveillance and punitive action have already been discussed in Part I. The findings in this study would suggest that some form of psychiatric assistance might be useful.

Consideration has been given recently to the prospect of treating alcoholism in the services as an illness, that is, medically rather than as a crime to be dealt with punitively. If this change were to come about, one of the adventitious consequences might be a reduction in lost-time automobile accidents.

Another approach might be to use group therapy among drivers to reduce tensions which lead to drinking. Any mass approach of this kind, although it might be justified on the grounds of morale or efficiency, would require more convincing evidence than is currently available that it reduces accidents. Research on group psychotherapy with chronic offenders, currently being conducted by Tillman may provide leads on the value of this approach.

Because of the scarcity of adequately trained psychiatrists, any approach using psychiatric personnel must be highly selective. Perhaps such selectivity could be achieved if psychiatric screening (and therapy, if indicated) were applied only to drivers of vehicles involved in injury producing accidents. However, the data indicate that roughly three-quarters (73.3 percent) of these accidents are the driver's first since entering the service. Assuming that each driver would receive psychiatric attention at the time of his first accident after entering the service, and assuming further that this attention completely prevented any future accidents among these drivers, would at most reduce lost-time accidents by only 26.7 percent.

These facts suggest that efficiency and economy of psychiatric intervention can be obtained only if the military psychiatrist functions in a nontraditional role. With this in mind, the authors devised a psychiatrically oriented countermeasure which involved the psychiatrist both in the conventional role of diagnostician and therapist and as a group behavior modifier. The latter was attempted through an educational program to undercut the social tolerance and even support that young men give each other in relation to drinking and speeding. This countermeasure was put into operation at Lackland AFB for a year for experimental evaluation. The results of the experiment are described elsewhere (19).

SUMMARY

This study compares some background correlates of the three groups of Airmen: (a) 89 drivers who had been drinking prior to a lost-time accident in a privately owned automobile, (b) 49 drivers who had not been drinking prior to a similar accident, and (c) 100 driver controls who had not been involved in an accident for at least a year.

1. There were no significant differences in the accident histories of the three groups prior to the current accident.

2. Drinking at the time of the accident was not an isolated event. (a) The percentage of those who drank more than once a week was significantly higher among the drinking accident drivers than among the not-drinking accident drivers or the controls (b) The percentage of problem drinkers, using Goldberg's criteria of problem drinking, was significantly higher among the drinking accident drivers than among the not-drinking accident drivers or the controls.

3. None of the Airmen in any of the groups reported ever having been hospitalized for psychiatric reasons.

4. Members of the drinking accident group were more likely to be exposed to remote and/or recent disruptions of home life than either of the other groups. (a) The drinking accident group had a significantly higher incidence of broken homes in childhood than the not-drinking group. Drinking may be an important intervening variable in the relationship reported in the literature between accidents and childhood psychic trauma. (b) The drinking accident group had a significantly higher incidence of problem drinking parents than the other groups. (c) The drinking accident group contained a higher percentage of married Airmen living apart. (d) The drinking accident group contained a significantly higher percentage of single persons than the controls.

5. Both accident groups had a significantly higher incidence of involvement in disciplinary infractions than the controls.

6. Problems and prospects in the development of psychiatrically oriented methods for preventing accidents which involve problem drinkers were discussed.

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Personality Characteristics as a Selective Factor in Driver Education

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Research was undertaken to examine the crucial question: "Are students who elect to take driver education different in significant ways from students who do not elect to take such training?"

The driver education study was carried out as an integral phase of a long-term "pre-driver study" previously reported, in which 6906, 15½-year-old high school sophomores were administered a selected battery of personality and attitude tests prior to the onset of their legal driving experience, which in the research locale begins at age 16.

Through arrangement with local driver education instructors, those male subjects subsequently electing driver education were identified and matched proportionally in schools with a non-driver education control group. Both groups were then compared with regard to the personality tests administered before either group had the opportunity to elect or decline driver education.

Statistical analysis of the pre-driver education personality data revealed that the driver education and non-driver education groups differed significantly in the following:

1. General activity. The driver education group appears less active; more deliberate and restrained; less prone to rapid and hurried action ($p = 0.001$).

2. Ascendance. The driver education group appears significantly less concerned with dominating or persuading others; less concerned with being conspicuous; and more likely to be serious and subdued ($p = 0.005$).

3. Sociability. The driver education group displays significantly more shyness and avoidance of social contacts, is more inner-directed, and in general is more reserved and less spontaneous in social participation ($p = 0.005$).

These findings strongly suggest that those students who elect to take driver education are, in essence, a selected group, and that the nature and significance of these selective characteristics must be considered in weighing the total contribution driver education makes to traffic safety.

DRIVER EDUCATION programs in recent years have expanded to the point where they now involve a very substantial annual investment of time and money. The justification for this expansion rests, of course, on the premise that driver education is effective in reducing motor vehicle accidents and violations.

In the early stages of the development of these programs, this premise appears to have been primarily the product of enthusiastic, if uncritical, faith, stemming from the need to "do something" about the growing accident problem. Most efforts during

¹ Now at San Fernando Valley State College.

this period were directed toward getting programs accepted and adopted, rather than toward establishing their scientific validity.

More recently, as increasing information on the driving records of trained drivers became available, this early enthusiasm appeared to have been vindicated by a number of actuarial comparisons indicating that trained drivers sustained a significantly fewer number of accidents and violations than untrained drivers (1, 4). These studies have been widely interpreted as demonstrating that driver education "works," that it does, in fact, produce safer drivers.

Currently, however, serious students of the accident reduction value of driver education are beginning to question whether such a conclusion is the only one possible from the available data. Is it not possible, for example, that students who elect driver education may be significantly different in their personal characteristics from those who do not elect such training; and, if so, that these differences may be a contributing if not the primary factor, associated with subsequent differences in accident and violation records? In other words, is it not possible that one characteristic of the kind of person who is likely to become a safe driver is that he will be more likely than his peers to elect driver training? At the very least, it would appear that such a possibility deserves serious investigation.

As a contribution to this problem, the present research was designed to examine the question, "Are students who elect to take driver education significantly different in important personal characteristics from students who do not elect to take such training?"

PROCEDURE

The investigation of the relationship of personal characteristics to election of driver education was undertaken as one phase of a large scale continuing study of 6,906 15-year-old "pre-drivers," initiated in 1956 at the University of Colorado School of Medicine. The general plan of this project has been described in previous reports (2, 3). In brief, its over-all aim is to study the relationship of pre-driver attitudes and personality characteristics to subsequent driving records.

For purposes of the present study, a driver education group was selected, consisting of all male students in the described population who, in the period 1957 to 1959, had taken formal driver education (N = 52). A control group of male non-driver education students (N = 104) was then selected from the same population, and matched with the driver education group on the following variables:

1. Socio-economic status (residence area).
2. Proportion of driver education and non-driver education subjects within each school.
3. Proportion of graduates to non-graduates within schools and within driver education conditions, in order to control for equivalence of opportunity to take driver education (Table 1).
4. Proportion of students within each group owning or having ready access to cars in order to control for the possibility that students may elect driver education because of the lack of a family car on which to practice. (In addition, while not used as a selection criterion, individual estimates of miles driven per year were independently obtained for both the driver education and non-driver education groups. No significant differences were found between the distributions of the two groups.)

Within the limits of these requirements, the selection of these male non-driver education students from the total population was random.

Driver education and non-driver education groups were then compared on a number of personality, attitude, and temperament measures. It is important to emphasize that all measures were obtained at an average age of 15½ years, and before the students had the opportunity to either elect or reject driver education. The method of data analysis selected was a double classification analysis of variance design which permits the following comparisons:

1. Over-all personality differences between the driver education and the non-driver education groups.

2. Specific between-school personality differences in either the driver education or non-driver education groups.
3. Interaction effects between schools and driver education conditions.

Essentially, this design permits an answer to the following relevant questions:

1. In general, does the student who elects driver education have personality characteristics different from those of the student who does not elect such formal training?
2. If so, are these differences consistent across all schools (with their varied socio-economic composition and possible differences in the appeal of driver education programs), or does the picture vary from school to school?

Guilford-Zimmerman Temperament Survey

This is an objective paper and pencil test designed to measure a number of significant aspects of the total personality of the student. It is divided into ten scales: Gen-

TABLE 1

DISTRIBUTION OF GRADUATES AND NON-GRADUATES WITHIN SCHOOLS AND DRIVER EDUCATION CONDITIONS

Subjects	Status	Schools					N
		A	B	C	D	E	
Driver education	Graduates	7	1	11	16	6	41
	Non-graduates	0	2	5	4	0	11
Non-driver education	Graduates	14	2	22	32	12	82
	Non-graduates	0	4	10	8	0	22

eral activity, restraint, ascendancy, social interest, emotional stability, objectivity, friendliness, thoughtfulness, personal relations, and masculinity. A high score on any scale presumably indicates that an individual possesses the trait involved to a significant degree, while a low score is indicative of the polar opposite of that trait.

Thorpe-Vernon-Lindzey Study of Values (Levy Modification)

This test represents a modification (for a lower reading level) of the 1951 version of the Study of Values, and was devised by Jerome Levy, formerly of the project staff. Essentially, this test aims to measure the relative prominence of six basic interests or motives in personality: The theoretical (characterized by a "cognitive" attitude toward the discovery of truth), the economic (characterized by an interest in what is useful and "practical"), the esthetic (characterized by an interest in what is beautiful and pleasing for its own sake, rather than primarily because it is "true" or "practical"), the social (characterized by an interest in the welfare of others), the political (characterized by an interest in competition, power, and prestige), and the religious (characterized by an interest in man's relation to the cosmos; "his highest value... may be called unity"). The Study of Values yields a profile showing the relative strengths of the individual's preferences for each of these interests.

California Mental Health Analysis

This test is intended as an objective method of assessing mental health. Two general sorts of measures may be derived from administration of the survey: Mental health liabilities (subdivided into five specific types of liabilities) and mental health assets (divided into five specific types of assets). The five liability scales include: behavioral immaturity, emotional instability, feelings of inadequacy, physical defects, and nervous manifestations. The five asset scales include: Close personal relationships, interpersonal skills, social participation, satisfying work and recreation, and

adequate outlooks and goals. A high score for both the asset scales and the liability scales is indicative of better mental health, that is, a high asset score suggests that an individual has many assets, while a high liability score indicates freedom from liabilities.

RESULTS

Results of all analyses are summarized in Tables 2 and 3. Four of the ten scales of the Guilford-Zimmerman Temperament Survey significantly discriminated driver

TABLE 2
PERSONALITY TEST MEASURES SIGNIFICANTLY DISCRIMINATING
DRIVER EDUCATION AND NON-DRIVER EDUCATION GROUPS¹

Test	Driver Education (N = 52)		Non-Driver Education (N = 104)		Level of Significance (below 0.05)
	M	SD	M	SD	
Guilford-Zimmerman Temperament Survey					
General activity	16.25	4.40	18.72	5.00	p < 0.005
Ascendance	13.88	4.32	16.78	4.93	p < 0.001
Social interest	18.12	5.58	21.03	5.95	p < 0.005
Masculinity	19.88	4.20	21.34	3.95	p < 0.05
Allport-Vernon-Lindzey Study of Values (Mod.)					
Esthetic	35.50	6.27	32.33	6.22	p < 0.005
California Mental Health Analysis					
Feelings of inadequacy	13.33	4.77	15.38	3.30	p < 0.005
Physical defects	18.02	2.96	19.17	1.45	p < 0.005
Nervous manifestations	15.56	3.56	17.06	2.27	p < 0.005

¹All comparisons made by analyses of variance techniques with 1 and 146 degrees of freedom used to determine the level of significance.

education from non-driver education subjects at the 0.05 level of significance or below. Non-driver education subjects revealed a higher general activity level, more ascendant leadership (as opposed to submissive, or follower) behavior, more interest in social participation, and stronger masculine interests. For the remaining six variables, no differences significant below the 0.05 level were found, although there were suggestive trends ($p < 0.10$) on two of these variables. In addition, no significant between-school differences or interaction effects were found on any of the ten scales.

Of the five scales of the Levy modification of the Allport-Vernon-Lindzey Study of Values, only the esthetic scale proved discriminating, with driver education subjects showing significantly higher esthetic values than their non-driver education peers. However, there was a suggestive trend ($p < 0.10$) on the religious scale, with the non-driver education group scoring slightly higher. As with the Guilford-Zimmerman, no significant between-school differences or interaction effects were found on any of the five scales.

On the California Mental Health Analysis, three of the five liability scales, but not of the five asset scales, proved discriminating below the 0.05 level of significance. In general, driver education subjects, in comparison to their non-driver education peers, tended to report greater personal feelings of inadequacy, greater concern with or presence of physical defects, and a higher incidence of nervous manifestations.

TABLE 3

PERSONALITY TEST MEASURES FAILING TO DISCRIMINATE SIGNIFICANTLY
DRIVER EDUCATION AND NON-DRIVER EDUCATION GROUPS
BELOW 0.05 LEVEL OF SIGNIFICANCE¹

Test	Driver Education (N = 52)		Non-Driver Education (N = 104)		Level of Significance (below 0.10) ²
	M	SD	M	SD	
Guilford-Zimmerman					
Temperament Survey					
Restraint	15.62	4.35	14.87	4.36	-
Emotional stability	18.08	5.31	19.56	5.01	p < 0.10
Objectivity	17.60	6.19	19.52	5.47	p < 0.10
Friendliness	15.62	6.34	16.18	5.61	-
Thoughtfulness	16.56	4.89	16.66	4.61	-
Personal relations	18.73	4.82	19.56	4.80	-
Allport-Vernon-Lindzey					
Study of Values (modified)					
Theoretical	45.12	7.26	45.09	6.56	-
Economical	42.10	6.06	42.79	6.01	-
Social	39.12	5.76	37.65	7.46	-
Political	39.58	5.16	40.82	5.55	-
Religious	38.62	9.32	41.32	7.19	p < 0.10
California Mental					
Health Analysis					
Close personal relation- ship	17.37	2.07	17.61	2.87	-
Inter-personal skills	14.83	2.49	15.07	2.74	-
Social participation	14.67	2.98	15.36	3.55	-
Satisfying work and recre- ation	15.25	2.87	14.46	3.29	-
Outlook and goals	17.58	1.93	17.76	1.74	-
Behavioral immaturity	15.04	3.79	15.56	3.07	-
Emotional instability	13.90	4.47	14.86	3.53	-

All comparisons made by analyses of variance techniques with 1 and 146 degrees of freedom used to determine the level of significance.

All others fail to meet, or fall below the 0.10 level.

It should be emphasized, however, that while the differences between the two groups were clear cut, that the liability scores of the driver education group did not tend to be extreme. Again, as in previous analyses, no significant between-school differences, or interaction effects were found on any of the ten scales of this test.

SUMMARY AND CONCLUSIONS

Male driver education students and a matched control group of non-driver education students were found to differ significantly ($p < 0.05$) on eight of a total of 26 personality measures. In general, as compared with their non-driver education peers, driver education subjects appeared to be somewhat more introspective, more sensitive and more esthetic in their interests, and to feel somewhat more inadequate and concerned with their physical and mental health. In contrast, non-driver education subjects tended to be more active generally, more ascendent and interested in leadership, and more oriented toward gregarious, outgoing, masculine social interests. Furthermore, despite differences in the socio-economic and cultural areas served by the var-

ious schools involved in this study, the above picture emerges consistently, and does not change significantly from school to school. However, it should be emphasized that while the personality differences reported above are clear cut, in neither group were the particular traits which characterized it present in extreme form.

Although it is possible that on cross-validation, one or more of the discriminating personality measures may prove insignificant. Nevertheless, in view of the proportion of significant to insignificant differences, the consistency of the picture they paint and the levels of confidence of the significant differences obtained, it appears extremely unlikely that the over-all picture would change radically on cross-validation with additional samples from this general population. Thus, it would appear that initial personality differences between students electing and taking driver education training, on the one hand, and those not taking it, on the other hand, may be a contributing (in fact, could conceivably be a primary) factor in accounting for obtained differences in accident and violation rates between students electing driver education and those not electing it.

Further investigation of this possibility will be undertaken in future research on this project. The accident and violation rates over a three year period of students electing and taking driver education training will be compared with those of students electing, but not taking driver education, and those of students not electing and not taking driver education. If it should be true that personality differences between driver education and non-driver education groups, such as those found in the present study, constitute a primary reason for the safer records generally reported for students having had driver education, then it might be anticipated that the safety records of students electing but unable to take driver education training will prove more similar to those of students electing and taking driver education training than they will to those of students not electing and not taking driver education.

Of course, it may prove that both "selective bias" in the formation of driver and non-driver education groups and the effects of driver training itself may contribute jointly to the apparently safer driving records of driver education groups. At any rate, it would appear that the possibility cannot be safely ignored that factors other than driver training itself may be contributing significantly to reported differences in accident and violation rates between driver education and non-driver education groups.

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Attitude Trends in Relation to High School Grade and Driving Experience

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Three groups of high school students were administered a questionnaire consisting of 80 driving and non-driving items. The three groups were 10th grade pre-drivers (N = 119), 10th grade drivers (N = 169), and 12th graders (N = 216), all drivers. For each item three tests of significance for response differences between the three groups were determined. Differences significant at the 0.01 level were found for 21 items, and for 12 of these items the percentage of agree response of the 12th graders was more extreme than either of the 10th grade groups. Interest focused on these 12 items.

For seven of these items the 12th graders differed significantly from the 10th grade pre-drivers, but not from the drivers, and for each of these items the 12th grade response was the least socially recommended. For the remaining five items the 12th graders differed significantly from the 10th grade drivers, but not from the pre-drivers, and for each of these items the 12th grade response was the most socially recommended. Thus, there appear to be two distinct attitude trends during high school.

The content of the 12 items led to an interpretation of the two attitude trends: (a) the lower ethical values developed during high school tend to be anticipated by the 10th grade drivers, and (b) the greater acceptance of social controls tends to be anticipated by the 10th grade drivers.

ALTHOUGH the relationships between attitudes and driving have not been firmly established, it is believed that attitudes affect driving (1, 2, 3, 4). If this is so, then one might search for differences in attitudes as a partial explanation of differences which exist in quality of driving. One approach would be to investigate attitudinal differences among groups known to differ in driving ability. Since changes in driving ability are known to differ during the first few years of driving, it would seem fruitful to explore attitudinal differences in this period.

The present study considers differences in driving and non-driving attitudes among three groups of high school students: (1) sophomores with no driving experience, (2) sophomores with some driving experience, and (3) seniors, all of whom reported some driving experience. Attitudes were inferred from responses to questionnaire items. Although all statistically significant differences are reported, this report concentrates on an interpretation of those items which reveal a decided attitudinal trend.

PROCEDURE

The procedure consisted of comparing the questionnaire responses of three groups of students. Comparisons were made for each item, and the conclusions drawn were based on those items for which significant differences emerged.

Subjects

The subjects were students in two high school classes: 10th grade students (288

sophomores) and 12th grade students (216 seniors).

The 10th grade students, most of them 15 years old, were enrolled in a required course in driver education during the Fall 1958 semester. Responses to the questionnaire were obtained during the first week of the course. The 119 students who indicated that they had no driving experience will be referred to as the 10th grade pre-drivers; the other 169 students who indicated that they had some driving experience will be referred to as the 10th grade drivers. The 10th grade students consisted of 136 females and 152 males.

The 12th grade students, most of them 17 years old, were enrolled in required courses in U.S. Government or senior problems during the Spring 1959 semester. All of the 216 students (98 females and 118 males) indicated that they had some driving experience. (There were six 12th graders who took the questionnaire, but had no driving experience; they were not included in the study.)

All students attended the same high school, located in the Los Angeles metropolitan area in a neighborhood which includes both middle and upper socio-economic classes. Since there have been no dramatic changes in this neighborhood during the past few years, there is every reason to believe that the 12th graders, when they were in the 10th grade, were similar to the 10th graders used in this study.

Data

Data consisted of responses (agree or disagree) to each of the 80 items of the Wilson Attitude Test (5), a questionnaire which consists of both driving and non-driving items.

Analysis

For each item the percentage of students who agreed with the item was determined for 10th grade pre-drivers, 10th grade drivers, and 12th graders. Tests of significance were determined for percentage differences between the three groups, the three groups allowing three such tests for each item. All 240 tests of significance were referred to the 0.01 level.

The error term for these tests was based on an estimate of the population percentage, as advised by Fisher and described by Guilford (6). If the smallest product of p_e and q_e times N_1 or N_2 was less than 10, the difference between the sample percentage was reduced by the correction factor given in Guilford (6). When this product was less than 5, and in any other case in which the test result was equivocal, the exact probability test as described by Kendall (7) was employed.

RESULTS

Initially, for each of the 80 items the difference in percent of agree response between the 10th and 12th graders was tested for significance. Significant differences emerged for six items (2, 13, 14, 22, 30, 60); yet for five of these items the 12th graders differed from either the 10th grade pre-drivers or drivers, but not both. Thus, to continue to consider the 10th grade as a combination of pre-drivers and drivers would only conceal the obvious response differences which exist between 10th grade pre-drivers and drivers. Therefore, the response differences considered are between (a) 10th grade pre-drivers and 10th grade drivers, (b) 10th grade pre-drivers and 12th graders, and (c) 10th grade drivers and 12th graders.

Of the 240 tests of significance (3 tests for 80 items), 28 proved to be significant at the 0.01 level. These significant differences involved 21 items, and for each of these items Table 1 lists (a) the percent of students in each of the three groups who agreed with the item, and (b) significant differences between group pairs. The 21 items are given in Table 2.

The following comparisons between the three groups will be on the basis of percent of agree response to individual items. One response to each item was evaluatively designated as the socially recommended response. Thus, if two groups differ on an item with respect to percent of agree response, they must also differ with respect to percent of socially recommended response.

TABLE 1
PERCENT OF AGREE RESPONSE FOR ITEMS
SHOWING SIGNIFICANT DIFFERENCES

Item	Percent of Agree Response			Significant Differences		
	10th Grade Pre-Drivers	10th Grade Drivers	12th Graders	1	2	3
2	7.56	16.56	21.31		- ¹	
4	100.00	91.12	90.75	- ¹	- ¹	
10	0.00	5.93	2.31	- ¹		
13	11.75	14.81	4.18			- ¹
14	5.87	20.68	29.62	- ¹	- ¹	
16	10.06	14.18	6.00			- ¹
21	51.25	64.50	69.00		- ¹	
30	45.37	53.25	38.87			- ¹
31	79.81	64.43	79.62			- ¹
37	3.37	8.87	12.93		- ¹	
45	75.62	57.37	71.75	- ¹		- ¹
49	6.75	16.56	17.56	- ¹	- ¹	
55	26.87	34.31	21.75			- ¹
56	47.87	62.12	52.75	- ¹		
57	15.93	38.43	35.62	- ¹	- ¹	
59	78.12	63.87	72.68	- ¹		
60	42.00	47.31	32.87			- ¹
61	8.37	31.93	22.68	- ¹	- ¹	
62	89.06	81.06	75.93		- ¹	
73	10.06	26.62	14.81	- ¹		- ¹
75	18.50	35.50	24.56	- ¹		

Significant at 0.01 level.

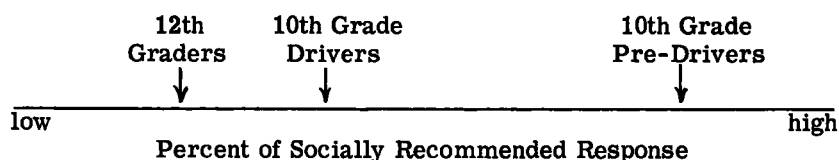
Column 1: 10th grade pre-drivers vs 10th grade drivers.

Column 2: 10th grade pre-drivers vs 12th graders.

Column 3: 10th grade drivers vs 12th graders.

Significant differences between the 10th grade pre-drivers and the 10th grade drivers emerged for 11 items (4, 10, 14, 45, 49, 56, 57, 59, 61, 73, 75), and for each of these items the pre-drivers gave the higher percent of socially recommended response. (Admittedly there may not be complete consensus on which response is the more socially recommended, particularly for certain items.)

Significant differences between the 12th graders and the 10th grade pre-drivers emerged for 9 items (2, 4, 14, 21, 37, 49, 57, 61, 62), and for each of these items the 12th graders gave the lower percent of socially recommended response. Of these 9 items emphasis will be given to those seven (2, 4, 14, 21, 37, 49, 62) for which the percent of agree response of the 12th graders is more extreme than either of the two 10th grade groups. For each of these seven items the 12th graders gave the lowest percent of socially recommended response, the 10th grade pre-drivers the highest, while the 10th grade drivers were intermediate. These differences are indicated diagrammatically:



school. Such attitude changes are referred to as attitude trends in order to emphasize the fact that the attitude measurements were not of attitude changes of individuals over time, but rather of attitudes of groups at a given point in time. The inference of an attitude trend over time is based on the assumption that the attitudes of the 10th graders, if measured two or three years later, would be similar to the attitudes of the 12th graders used in this study.

Two types of items were identified on the basis of significant response differences between the 12th graders and the two 10th grade groups. Yet these quantitative differences were consistently matched by qualitative differences: For each item of the first type, the 12th graders gave the lowest percent of socially recommended response, whereas for each item of the second type, the 12th graders gave the highest percent of socially recommended response. Such consistency would seem to indicate two attitude trends, trends which could be determined by an analysis of the content of the items within each type.

Of the seven items of the first type, two pertain to driving and five to non-driving. Of the five items of the second type, three pertain to driving and two to non-driving (item 16 might be considered ambiguous). Thus the distinction between the two types of items is not with respect to driving and non-driving content.

What other element might be common to the items representative of each type? Items of the first type seem to pertain to ethics and expediency; items of the second type appear to deal mainly with social control. If these interpretations are valid, then the first trend indicates a change in group attitudes during high school toward greater acceptance of realism, toward expediency, toward less emphasis on ethical considerations. The second trend indicates a change toward greater acceptance of social controls.

Although it is hardly surprising to find that changes in realism and socialization are part of the developmental process, it is satisfying to know that such changes can be indicated by a statistical analysis of verbal responses.

The results indicate that (a) the 10th grade drivers, in comparison to the pre-drivers, consistently gave less socially recommended responses to all items, (b) the attitude toward ethical values of the 10th grade drivers is more indicative of the attitude which 10th graders as a group can be expected to have when they reach the 12th grade, and (c) the attitude toward social control of the 10th grade pre-drivers is indicative of the attitude which 10th graders as a group can be expected to have when they reach the 12th grade.

Because of the design of the study, the results are not amenable to causal interpretation. The results should not be interpreted to mean that as a student learns to drive he develops a lower code of ethical values and a greater acceptance of social control; it is entirely reasonable to expect that 10th grade drivers and pre-drivers also differ with respect to other variables associated with attitudes. Furthermore, the results in no way indicate that attitude changes (magnitude and direction) toward ethical values and social control are the same for both drivers and pre-drivers; the diagrammatic presentations of the trends show that the two arrows representing the attitudes of 10th grade drivers and pre-drivers can be changed to a variety of positions while allowing the 12th grade arrow to act as a fulcrum.

Although the response differences were interpreted crudely as attitude trends, recognition should be given to the possibility that these response differences may reflect, at least in part, differences in perception and interpretation of the items. Quite aside from dissimulation and measurement error, response differences can be interpreted as attitude differences only if such phrases as "high speed driving" have the same meaning for all three groups used in this study. The recognition that meanings were not measured directly in this study should be used to temper any interpretation of the results.

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