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16. Abstract

This is the final report of a four-year study of drinking drivers. On the basis of analyses of over 4,000 cases (approximately 1400 of whom were driver's license applicants who had no convictions for drunk-driving, and the remainder had been convicted at least once of drunk-driving), a simplified prediction model was developed which improves the discrimination between drinking drivers and non-drinking drivers by approximately 10%. A similar level of improvement was achieved for recidivist drunk-drivers compared with one-time drunk-drivers. In addition an experimental evaluation of the effects of different intervention methods, which included AA, an Alcoholic Rehabilitation Center, films and lectures and different forms of group therapy, compared with a control group which were given conventional treatment, was carried out. The results were inconclusive, but suggested that for a short one-year follow-up period, there is little difference between the conventional and the experimental treatment methods, or among different experimental treatment methods. An extended follow-up, now under way, may invalidate this negative conclusion.

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OVERVIEW

Seymour Pollack, M.A., M.D.

This is the final report on the Drinking Driver and Traffic Safety Project initiated in October 1967. Annual Reports, Quarterly Progress Reports, and Special Reports were submitted to the United States Department of Transportation, National Highway Traffic Safety Administration, in 1969 and 1970, and the reader is referred to these documents for full description of the development of this project, discussion of objectives, methodology and details of previous findings. The present Annual Report limits itself to the conclusions of the two major areas of concern to the project: 1) Development of a prediction capability to identify a) driver's license applicants likely to become dangerous drinking drivers (as labeled through their subsequent convictions for drunk driving), and b) convicted drunk drivers likely to be involved in serious automobile crashes or crash fatalities; and 2) Identification of rehabilitative countermeasures that demonstrate their effectiveness in reducing the incidence of dangerous drinking driving and its related traffic crashes and fatalities.

This overview deals largely with the implications of these results and the overall significance of the study. Implicit in this study are two questions of major import. First, is society ready to accept and use a probability design in the control of social misbehavior? Subsumed in this question is the assumption that a reliable prediction system can be developed for the valid prediction of social misbehavior. Second, should the control of social misbehavior be exercised through measures from customary social control systems such as the criminal justice system and administrative agencies, or should measures from other systems be utilized? Subsumed in this second question is the belief that measures from other systems (like the medical system) are demonstrably more effective than those from acknowledged social control systems.

Based partly upon the results from the Drinking Driver and Traffic Safety Project, the following opinions are offered in answer to the above questions: First, the die is cast in favor of using a probability system as an adjunct in directing social control of misbehavior. Society will soon become as acceptant of and involved with the use of probability designs in directive social control measures as it already has become in accepting statistical prediction in business matters, social welfare policies, economic and financial issues, space penetration, insurance, public health, weather forecasting, and medical practice. Because the probability design developed for this project has demonstrated

good possibilities for prediction of the drinking driver, social policy will soon accept this as a tool for directing social control of drinking drivers in spite of possible dangers and untoward results in its misuse or abuse.

Second, results of our study indicated that tested countermeasures from the medical system were no more effective in deterring dangerous drinking driving than were customary sanctions from the criminal justice system. Questions can be raised as to whether social control measures coming from any system other than that of criminal justice can be as effective as are sanctions from the criminal justice system itself. From a theoretical point of view, serious reservations may be held about effecting social control of misbehavior through countermeasures from systems other than acknowledged social control systems such as criminal justice and administrative agencies. From a social policy point of view, control of social misbehavior through measures exercised through the medical system may be ill-advised.

We set out to answer the following questions:

Question 1: Can we reliably identify potential high risk drinking drivers in the general driving population of Los Angeles County? That is, can we reliably differentiate between potential convicted drinking drivers (high risk drinking driver offenders) and those drivers who will probably not be convicted of drunk driving (low risk offenders), albeit recognizing that the vast majority of drivers are drinking drivers at one time or another?

Answer: This question was answered in the affirmative by establishing that there are characteristics typical for drivers convicted of drunk and/or reckless driving in Los Angeles County and that these characteristics significantly differentiate them from drivers never convicted for drunk driving.

A classification model was developed for driver applicants, differentiating the high risk from the low risk drinking driver. Although this classification model contained significant error of both positive and negative nature, nevertheless, it meant that driver license applicants could be screened and categorized into one group or the other; and if society wished, special attention could be directed to those applicants who demonstrated a high risk of becoming dangerous drinking drivers, i.e., to driver license applicants who demonstrated characteristics resembling those of the convicted drunk drivers (see 1969 and 1970 Annual Reports).

We now present an easily operated prediction model. By this means it is possible to identify that driver who, albeit having never been convicted of drunk driving, nevertheless presents a high risk of becoming a dangerous drinking driving offender. In

viewing the complex problems of drinking driving, social policy considerations will have to take into account the implications of this prediction capability for identifying those drivers from the general driving population who are more likely to become dangerous drinking drivers.

Question 2: Can we reliably identify potential recidivist drinking drivers in the population of already convicted drinking drivers appearing before the bench, acknowledging that the vast majority (70%) of drivers convicted for drunk driving are first offenders, that most offenders do not repeat, and that, of those who are reconvicted, approximately 50 percent will be reconvicted in the first year?

Answer: This question was answered in the affirmative by determining that there are typical characteristics for the individual reconvicted for drunk driving by Los Angeles County Courts (identified as the high risk recidivist drinking driver) as compared to different characteristics for that driver who is not again convicted for drinking driving (the low risk recidivist drinking driver). (See 1970 Report.)

A prediction model now identifies those convicted drinking drivers with a high risk of becoming recidivist offenders. This means that a judge can differentiate a potential high risk from a potential low risk recidivist drinking driver at the time when he comes before the court as a first-time offender. Based upon the implications of this predictive capability, policy considerations are significant both for the criminal justice system and for other systems to which the convicted drunk driver may be diverted for treatment.

For those unacquainted with probability theory and unfamiliar with statistics, the following may help clarify the probability design used in this study and the terms employed in this report.

In estimating probabilities (i.e., making predictions about future possibilities) the term "prior probability" (also called a priori probability) refers to that prediction that can be made in the absence of any information about any specific individual. For example, if it is known that 20 percent of persons are drunk drivers, we can then conclude that any one person has one chance in five of being a drunk driver.

Conditional probabilities were estimated for five variables, all readily obtained from the public records of drivers: 1) level of educational attainment, 2) total number of minor traffic violations (excluding all serious violations, felony drunk driving, reckless, misdemeanor drunk driving, and hit and run), 3) age, 4) total number of accidents, and 5) total number of arrests (excluding all reckless and drunk driving arrests).

"Conditional probabilities" are used to modify the prior probabilities. For example, if it is known that 33 percent of recdividist drunk drivers had a history of six or more non-traffic arrests, by contrast with only 10 percent of the non-accident drunk drivers, than we can conclude that a drinking driver offender with six or more non-traffic arrests is three times as likely to be a recidivist as a non-recidivist. This information can be combined with the "prior" probability to produce a posterior probability, using Bayes' Theorem.

Using a complex formula, it is possible to arrive at a predictive index called the "posterior probability." In this case the posterior probability relates the five conditional probabilities (associated with the above five variables) and the prior probabilities in such a manner that we may predict whether an individual with a given age, educational attainment, etc., will become a drunk driver or a recidivist drunk driver; i.e., we can predict his risk of offending or reoffending.

Two separate tables are presented. The first table consists of readily indexed scores that predict the probability that an individual who has never been convicted of drunk driving will be identified as a convicted drinking driver. The second table uses these same scores plus the fact that the individual has already been convicted of drunk and/or reckless driving to predict the probability that he will be identified as a recidivist drinking driver.

By following the simple instructions for computing the individual's index score for the prediction table, one can easily and quickly find the probability value for any one driver from each of the two populations: 1) the general driving population, and 2) the convicted drunk driver court population; and one can immediately determine whether the individual has a "low risk" or "high risk" of becoming a dangerous drinking driver (if he comes from the general driving population and has never had a drunk and/or reckless driving conviction); and whether the individual has a "low risk" or "high risk" of becoming a recidivist drinking driver (if he comes from the court population and has already been convicted of drunk and/or reckless driving).

Values close to zero represent low probabilities or "low risks"; values close to one represent high probabilities or "high risks." We may interpret probability scores as percentages by multiplying the values by 100. For example, a probability of .300 may be interpreted as a 30 percent chance of becoming a convicted drinking driver.

The conservative use of these tables suggests that a threshold value (for example, 75%) be selected and that decisions be made only when an individual's characteristics yield a value above this threshold. (Using a threshold value of 75 percent, our tables would indicate a definitive "high risk" identification

in about eight cases in every hundred. A lower threshold would yield a correspondingly greater number of definitive decisions. It should be recalled that in California approximately 30 of every 100 drinking driver convictions are of recidivist, "high risk," drinking drivers.)

In making predictions we are concerned with the degree of comfort one has with different levels of insecurity. But also we are concerned with policy considerations and the level of uncertainty that society itself will tolerate for decision making about drunk driving. The level of uncertainty that society wishes to accept about drunk driving dispositions is, to a considerable extent, related to the kinds of dispositions available to the courts for "treatment" of the drunk driver. Courts are looking for alternatives to customary sentencing practices, e.g., "probated treatment" for the convicted drunk driver as a substitute for, or in conjunction with, the usual sentence. With more dispositions available to the court, the judge may adopt a higher level of uncertainty for sentencing dispositions other than criminal legal sanctions. Equally important are policy considerations about the degree of social control that may be exercised by administrative agencies in forcing "treatment" upon potential dangerous drinking drivers.

Future social policy for use of this predictive model must take into account many factors. The primary value of this predictive design for identifying the dangerous drinking driver lies in its application to successful countermeasures for the dangerous drinking driver. Such measures must be easily and readily applied to large groups of drivers and must be accepted by society as consistent with our policy of social control. Cost benefit analyses of different programs in different systems will determine the agencies most capable of producing more successful measures.

Disclaimer: It is important to note that these statistics represent a model of the drinking driver and convicted drinking driver populations in Los Angeles County during 1968 and that these predictions may not be reliable in other regions of the United States or at other times. The criterion variables are themselves a reflection of the social state of Los Angeles County drivers in 1968, 1969, and 1970; and these same variables will not necessarily carry the same significance in subsequent years or in different locales. In particular, only an ongoing, updating research effort can accurately establish and sustain the reliability of these predictions.

Question 3: Assuming predictive indices that reliably identify high risk reoffending drinking drivers, will countermeasures currently in vogue or recommended for treatment of the convicted

drinking driver demonstrate their efficacy in reducing the extent of reoffending? And will some countermeasure techniques be more effective than others as deterrents?

Answer: These questions were answered in the negative by analyzing the results of random assignment of convicted drivers to six different countermeasure programs, as compared to results of ongoing court sentences for control groups of convicted drivers. The analyses were based upon records from a one-year follow-up of convicted drivers assigned by courts in 1969 and 1970 to treatment programs conducted by the University of Southern California Drinking Driver Safety Project.

Our findings demonstrated that none of the countermeasure treatments significantly reduced the high risk convicted drinking drivers' tendencies to recidivate. In fact, the trends, although not statistically significant, indicated that the more intensive the countermeasures were, the less effective they generally were to reduce reoffending. The Alcoholics Anonymous program was somewhat more successful than any of the other countermeasures in reducing recidivism in high risk convicted drinking drivers; and the one film-lecture discussion program tended to be somewhat more successful than other countermeasures in reducing recidivism in the low risk convicted drinking driver group.

Observation of the scores in the predictive tables reveals that especially heavy weight for predicting high risk of recidivism results from the interaction of two variables: 1) the total number of arrests, and 2) the total number of accidents (excluding all reckless and drunk driving arrests). Together, these two variables account for most of the high risk recidivist drinking drivers. The highest risk is present with a large number of arrests accompanied by a large number of accidents.

Based upon these findings alone and without aid from the prediction table, on the one hand, a judge is able to identify a convicted drinking driver as a high recidivism risk; on the other hand, increased predictive force results from the complex interrelationship of the five named variables, and by using the individual index scores from the predictive tables, the judge can significantly augment his predictive capabilities.

Findings that our imposed countermeasures did not influence convicted drinking drivers in reducing their recidivist drinking driving must be qualified by the limited (one-year) follow-up of our countermeasure programs. This qualification must take into account, however, the indications from prior studies that at least 50 percent of those who will recidivate do so within the first year after their conviction. A second-year follow-up study is, nevertheless, being planned under the auspices of the National Highway Traffic Safety Administration to provide data for a longer, more significant time period.

These negative results are nevertheless significant for the criminal justice system as well as for administrative agencies. Considerable pressure is being exerted upon courts and agencies to divert treatment of the convicted drunk driver to the medical system, with the belief that "medical" countermeasures will be more successful than customary punitive legal sanctions in reducing recidivist drinking driving. Our results with our countermeasures indicate that this is not so. If confirmed, these results would carry considerable significance for public policy considerations.

They indicate the need to test the efficacy of all countermeasures. They suggest that massive funding of untested countermeasure techniques be avoided. They lead to the recommendation that funding be primarily directed to action research efforts to develop effective countermeasures. They demonstrate the need for all action research to be accompanied by adequate control studies and the careful analysis of results. And finally, they suggest that present court and administrative practices should not summarily be discarded on the basis of belief that there are demonstrably more effective treatment techniques.

The social consequences of continuing with present court practices must be considered as well as the social consequences of change. The results of cost benefit analyses of present court practices as well as similar analyses of other countermeasures hold significance for policy considerations. Most important, however, is the need for countermeasures to demonstrate their efficacy in reducing recidivist drinking driving. Unless changes are suggested by other policy considerations, it appears to this writer that present practices for dealing with the drinking driver should continue until more effective countermeasures have demonstrated their success in deterring drinking driving. The burden of persuasion to divert the convicted drinking driver from the criminal justice system to other systems for treatment falls upon those who can demonstrate that other countermeasures, either alone or in conjunction with court sentences, are more successful in reducing recidivist drunk driving.

Question 4: Will these countermeasure techniques reduce subsequent automobile accidents in "treated" convicted offenders below the accident rates found in "non-treated" convicted offenders?

Answer: This question was answered in the negative by analyses of subsequent driving records of "treated" and "non-treated" convicted drinking drivers for a one-year follow-up period after termination of their treatment program. None of the countermeasure treatment programs significantly affected the subsequent traffic accident rates of treated offenders when these

rates were compared to the accident rate of the control groups given the usual court sentences. Analyses indicated that only offenders treated under the medical auspices of the Los Angeles County Department of Health, Alcoholic Rehabilitation Center, showed a reduction in subsequent automobile crashes, and this result was largely for the low risk convicted drunk driver.

Prior findings indicated that drivers with automobile crashes and those with convictions for drunk and/or reckless driving have different characteristics and appear to be groups independent of each other, except for a small group of offenders who have a large number of both convictions and accidents. (See Thomas, et al, in previous Annual and Special Reports.) Our present analyses suggest that the effects of the countermeasure programs also differ with respect to their influence upon subsequent convictions and their influence upon accidents, i.e., the present analyses suggest that the effects upon convictions and accidents also appear to have separate dimensions. This finding indicates the need to direct remedial attention both to persons who have drunk and/or reckless driving convictions and to persons who have a history of automobile accidents, not just the need to direct attention to the former.

The alleged causal relationship between drinking driving and automobile accidents is the significant one as far as society is concerned. Our results demonstrate that the frequently recommended countermeasures are no more successful than customary criminal-legal sanctions in reducing subsequent automobile crashes. Trends in our study (albeit not statistically significant) do indicate that the results of countermeasures for the high risk population, as against the low risk, are more consistent in the direction of reducing both subsequent accidents and drunk driving convictions, with a greater reduction in the former than the latter.

For policy considerations, these findings suggest the need for continued support of research efforts directed to countermeasure programs that will be successful in reducing both subsequent automobile accidents and recidivist drinking driving. Cost analyses of automobile crashes should be conducted as well as cost benefit analyses of customary court practices and alternative treatment programs. All treatment programs should be checked with control studies. Our results also suggest that caution be exercised in promoting massive funding for treatment programs for the convicted drinking driver with the expectation that successful reduction in drinking driving convictions, per se, will significantly reduce highway accidents.

Question 5: Are the drinking drivers convicted by our courts likely to be the drinking drivers who will be killed in subsequent fatal accidents?

Answer: This question was answered in the negative by a factorial analysis and statistical comparison of characteristics of crash fatality drinking and non-drinking drivers in Los Angeles County during two and one-half years with the characteristics of our court sample of (non-deceased) convicted drinking drivers.

Results indicate that the drinking drivers convicted by our courts are not likely to be those killed in subsequent fatal accidents. Only minimally significant characteristics differentiated the crash fatality drinking driver from the crash fatality non-drinking driver; but much more significant characteristics differentiated the crash fatality drinking driver from our court sample of convicted drinking drivers. These findings support the thesis that for many persons the heavy use of alcohol is related to their way of life; and this way of life includes for many a considerable involvement in serious crimes, many of which were also alcohol-related, as well as their final automobile crash which also was alcohol-related.

Our conclusion from these findings is that drinking driving does not act by itself as a causative agent in fatal automobile crashes but interacts with other variables that characterize the fatal accident-bound driver, even though heavy drinking immediately prior to the fatal crash is a decisive factor in promoting the accident. Nevertheless, because a history of heavy drinking appears to be a significant variable for crash fatality drinking and non-drinking drivers, we believe that the crash fatality drinking driving population is made up largely of individuals who are problem drinkers or persons with heavy drinking habits, even though most have never come to public attention through their drinking driving convictions.

Convicted drinking drivers were markedly over-represented in the crash fatality drinking driving population inasmuch as they represented 12 percent of this population but made up only 1 percent of the total driving population in Los Angeles County. Nevertheless, this finding, plus prior data, strongly supports the conclusion that alcohol-related traffic fatalities will not be substantially reduced at the present time by treatment of the convicted drinking driver. Approximately 88 percent of the crash fatality drinking drivers in Los Angeles County are not visible through a prior drinking driving conviction. The significance of this finding for policy purposes is that society must presently look to other driving groups in order to reach the potential crash fatality drinking driver.

Cost analyses of drinking driving fatalities indicate that each such death costs approximately $200,000. With approximately 30,000 such deaths per year, annual costs to society have already

reached six billion dollars and the figure is steadily rising. This tremendous cost alone calls for innovative programs to reduce highway fatalities; but because the present convicted drinking driver population contributes only a small percentage of candidates to crash fatalities, policy considerations must take this factor into account in the distribution of efforts and allocation of funds directed to this serious social problem.

Data from conditional probability Tables 1 and 2 provide values from which reliable profiles of the convicted drinking driver and the recidivist convicted drinking driver can be drawn. These profiles are similar to those previously reported (see 1969 and 1970 Annual and Special Reports). The factorial approach also provides a technique that describes the more vulnerable fatal crash drivers. It should again be noted that the significant factors making up these profiles are also reflections of the Los Angeles County regional population of drivers, and caution must be exercised in applying inferences about Los Angeles County crash fatality drivers to populations of crash fatality drinking drivers from other California counties or other regions of the country.

Nevertheless, the factor analysis approach provides a model for identification of high risk crash fatality drivers in any one region. Such profiles hold significance for policy considerations by administrative authorities, and they provide additional data to the courts for identification of high risk dangerous drivers. The most reliable prediction of the dangerous drinking driver should result from combining the weight of such high risk profiles with the probability values derived from the prediction tables.

Conclusion: National highway statistics repeatedly confirm that between 40 percent and 50 percent of fatal automobile accidents (and thousands of non-fatal automobile crashes) involve alcohol-impaired drivers. It is conservatively estimated that between 2 and 3 percent of all drivers on the road have blood alcohol levels sufficiently high to produce driving impairment. There is no question that removal of these alcohol-impaired drivers from the highways would significantly reduce alcohol-related accidents and fatalities. We are faced with the challenge of how to achieve this goal.

Less than 1 percent of the driving population are convicted of drunk driving in the United States, although we have an estimated nine million problem drinkers and an estimated 120 million drivers. Even in California, where the number of convictions rose from 60,000 convictions in 1969 to 100,000 in 1971, the indications are that these convictions represent only a small percentage of the actual number of alcohol-impaired drivers daily driving on California streets and freeways.

The blood alcohol level of 150.0 mgm% has been set in most jurisdictions for legal definition of the driver presumptively being under the influence of alcohol while driving. This blood alcohol level has been dropped to 100.0 mgm% in some states, and many jurisdictions are considering dropping the blood alcohol level even lower to 80.0 mgm%. This will identify as risk drivers an even greater drinking driving population and improve the level of identification of the dangerous drinking driver.

Changes in police and judicial policy are also needed to improve the identification of the dangerous drinking driver. The average police officer in the United States makes only one or two Driving While Intoxicated arrests per year, and many police officers do not cite for DWI but initially cite for lesser offenses. Plea bargaining reduces many DWI charges to convictions for reckless driving; or the court itself often reduces the DWI charge to a lesser offense. A first conviction for drinking driving generally incurs not only minimal legal sanction but a minimum of social reproof and censure.

If a greater number of drinking drivers were identified as convicted drinking drivers, it is probable that a significantly higher percentage of crash fatality drinking drivers would be found to come from this extended population of convicted drinking drivers.

We can conclude that additional means of identifying the high risk drinking driver will significantly reduce the number of alcohol-related automobile crashes and fatalities. Use of the prediction model can provide additional and substantial aid in identifying the high risk recidivist drinking driver appearing before the court.

Identification, by itself, will not reduce the drinking driving problem and may even compound it. What is needed are effective countermeasures.

Effective countermeasures directed to the drinking driving population can probably be developed in the criminal justice system and administrative agencies through research efforts in these systems. Control studies of the effects of increasing deterrence by means of criminal-legal sanctions, denial of privileges and a system of rewards should be continued.

Ongoing action research programs should explore the efficacy of countermeasures from other systems as well.

We are challenged to develop innovative programs to reduce the drinking driving danger. The most beneficial results will probably come from changing social attitudes and values about drinking and driving. During an adult lifetime,the adult spends many thousands of hours behind an automobile wheel. By the time the teenager finishes high school, he will have spent 15,000

hours in front of a television set. The latter activity presents unparalled opportunity for programs directed to influence attitudes and values about the former task.

SUMMARY

The Drinking Driver and Traffic Safety Project

The Drinking Driver and Traffic Safety Project was carried out at the University of Southern California's Public Systems Research Institute from 1967 through 1972. The final data of the project were acquired in the Spring of 1971, and the final analyses completed in January of 1972. The basic objectives of the project, in its several phases, were:

1. to evaluate differences among a general driving population, convicted drunk drivers, and recidivist drunk drivers, with the goal of developing a prediction model for drunk drivers and recidivist drunk drivers; and

2. to evaluate the relative effectiveness of different intervention methods or countermeasures in deterring convicted drunk drivers from recidivist drunk driving.

To accomplish these objectives several different samples of convicted drunk drivers were selected from courts in Los Angeles County, and a sample of driver's license applicants was selected with the cooperation of the California Department of Motor Vehicles. During the history of the project, the following samples were used:

	Dates Selected	Sample Source	# of Cases	Period of Follow-Up
1.	May 1968 - Aug 1968	Department of Motor Vehicles	1407	two years
2.	May 1968 - Sept 1968	L. A. County Courts	778	two years
3.	Aug 1969 - May 1970	Countermeasures sample from court	1953	one year
4.	Aug 1969 - May 1970	Countermeasures court control sample (no treatment)	209	one year

The data acquired from each of these samples included extensive background information obtained through structured personal interviews, driving records, follow-up driving records, arrest and conviction records, and in the case of the countermeasures project, a variety of psychological tests.

The first objective was approached using different mathematical models to assess the predictive utility of a large number of individual variables and of different combinations of variables. The results of one such prediction model, or more properly, classification model, provided the basis for assignment to different experimental treatment methods in the countermeasures project. The vast majority of low risk convicted drunk drivers were assigned to the treatment labelled "one film-lecture." The remainder of the low risk group were assigned randomly, as were the high risk group, to one of the five remaining treatment programs. These included "four film-lectures," "problem oriented group therapy," "traditional group therapy," an Alcoholics Anonymous program, and an Alcoholic Rehabilitation Center Program.

The Results of the Prediction Model

The development of a usable prediction model was a continuing objective throughout the course of the project. The first versions were based on three different mathematical procedures for combining the predictive utility of single variables. These were the multiple regression, discriminant function, and Bayesian models. As in other comparative analyses, the Bayesian model makes use of more of the available information than does either the multiple regression or the discriminant function model, and was found to perform slightly better than either in discriminating between convicted drunk drivers and driver's license applicants.[1] On the basis of this finding, the final analyses were organized around the application of the Bayesian model to all of the samples in the study.

A series of analyses using frequency data to estimate conditional probabilities for different samples and combinations of samples led to the conclusion that of the eight variables remaining in the analyses (education, minor traffic violations, age, number of accidents, total non-traffic arrests, sex, marital status, and ethnicity) the last three added very little to the prediction (or discrimination) of drunk drivers or drunk driver recidivists. Although it is true that many other variables (for example, questionnaire responses about drinking and driving habits) could have been included in the final prediction model, their

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[1] Pollack, Seymour, et al., Drinking Driver and Traffic Safety Project, Annual Report, July 1970, University of Southern California, Public Systems Research Institute.

contribution would have been marginal and their utility, considering the nature of the groups to which the model might be applied, potentially negative. To put it differently, questioned about his drinking habits in the context of a scientific study in which he is assured anonymity, a convicted drunk driver might well respond differently than he would if he were questioned prior to actual sentencing or treatment assignment.

The five variables used in the final prediction model are all relatively objective, and in the case of the three possibly sensitive items (accidents, traffic violations, and arrests) are readily obtainable from public records. They each contribute to the differentiation between convicted drunk drivers and driver's license applicants and between one-time drunk drivers and drunk driver recidivists.

The drinking driver versus non-drinking driver prediction results in 67 percent overall correct discrimination as compared with 54 percent that would have been obtained on the basis of chance alone without using the prediction model. In differentiating between recidivist versus non-recidivist drinking driver, prediction results show 66 percent overall correct placements as compared with 56 percent obtained on the basis of pure chance. Another way of looking at the results of these models is to determine the specific probability of each case based on the individual's characteristics for the five variables. The prediction models differentiate very successfully between individuals with very high and very low probabilities of being drunk drivers or drunk driver recidivists, but do not differentiate so well for cases in the middle range. For example, of those individuals who received a probability of around .10 of being a drunk driver, only 10 percent were in fact convicted drunk drivers. Similarly, virtually 80 percent of those receiving a probability of .80 were in fact convicted drunk drivers. On the other hand, of those individuals who received a probability of .50, only 50 percent were in the convicted drunk driver group. This undetermined situation, for individuals in the middle range, forces decision making as regards alternate court sentencing to be a very subjective matter.

Tables of posterior probabilities for all combinations of characteristics on the five predictor variables appear in Volume II

The Results of the Countermeasure Project

To evaluate the results of this phase of the overall project, the experimental treatment methods used were compared, in various combinations, with two control groups on three criteria: 1) the number of accidents occurring during the year of follow-up, 2) the number of drunk driving convictions during the same period; and 3) the total number of both reckless and drunk driving convictions. Although more elaborate analyses were carried out, this summary presentation describes only comparisons between means on the following samples: 1) between the two control groups, 2) between the combined treatment groups and the combined control groups, and 3) between each treatment and the combined control group. Similar comparisons were made for high and low risk groups separately.

Two control groups were used for this study because it was anticipated that the extensive interview and testing procedures might have an effect independently of the treatment. One control group (Control I) was contacted by project personnel, interviewed, and tested; the other (Control II) was not. Both were followed for the same period as the treatment groups to determine their performance on the criteria. A comparison of these two groups, both of which were dealt with consistently by the courts, indicates that the difference between the two groups is small and statistically likely to occur by chance. In comparisons between the control groups and the various treatment groups, these two control groups were therefore combined.

The results of comparing the effects of the individual treatment groups with those of the combined control group are presented in Figure 1 (page 36). Bars terminating to the left of the vertical dotted line (which is based on the average number of criterion events for the control group) indicate that the average result for that treatment group was lower than for the control, and bars terminating to the right of the vertical dotted line indicate that the average result for the treatment group was higher than for the control group. Only those averages with asterisks are significantly different, statistically, from the control group.

Results indicate the "one film-lecture" countermeasure treatment is the only one which appears to be more effective in reducing convictions for drunk driving and reckless and drunk driving than are conventional court practices. These findings, however, are inconclusive in that the vast majority of persons assigned to this treatment were deemed "low risk" before they were so assigned. Results further indicate that the Alcoholic Rehabilitation Center program is the only countermeasure which produces statistics significantly lower than those of the controls with respect to reducing subsequent automobile accidents. Here, too, the findings are inconclusive in that the Alcoholic Rehabilitation Center program is the only countermeasure to introduce physical intervention, in the form of the administration of drugs, as part ot the treatment.

This treatment could be expected to influence drinking habits directly (and therefore reduce drinking driver offenses) rather than influence driving habits (and therefore reduce automobile accidents). Such an anticipated reduction in offenses is not, however, corroborated by a reduction in the number of convictions.

In the case of both "significant" findings and "non-significant" findings, the difference between the high and low risk groups should be examined. Figures 2 and 3 (pages 38,39) present the results of comparisons between the first control group (Control I, the only group for which information on the basis of levels of risk could be estimated) and the high and low risk individuals assigned to different treatment programs.

The statistically significant findings again are rare and equally difficult to interpret. Overall, the high risk group do in fact receive more drunk driving convictions and reckless driving convictions than do the low risk for both the control group and the combined treatment group, a result which merely validates to a degree the "high" and "low" risk categorization.

For the low risk category, the only significant difference between results of the control groups and those of the experimental groups was found on the criterion of accidents for those assigned to the Alcoholic Rehabilitation Center program.

Among the high risk category of offenders, the finding that fewer high risk individuals assigned to the "one film-lecture" had accidents than did high risk controls (none in this treatment had subsequent accidents) can be effectively ignored, insofar as policy or other decisions are concerned, since it is based on so few cases (14).

The only other statistically significant finding is that high risk offenders participating in Alcoholics Anonymous are less likely to commit subsequent drunk driving offenses than are the high risk controls. This is marginally significant statistically and even more inconclusive so far as policy decisions are concerned. For example, the difference between Alcoholics Anonymous high risk participants and high risk controls on the criterion of drunk and reckless driving is not statistically significant. However, the difference on the criterion of drunk driving alone (excluding reckless) between Alcoholics Anonymous high risk offenders and high risk controls is statistically significant. The manifold judicial and extra-judicial influences that result in a conviction for "reckless" driving rather than one for "drunk" driving could account for this "statistical" finding and effectively wash out any substantive significance that might be imputed to it.

Conclusions about Countermeasure Project

So far as the countermeasures results are concerned, findings which are significant, either statistically or substantively, appear to offer few guides for future action. The fundamental requirement, either for demonstrating a lack of difference or for demonstrating what may be real differences, would be an extended follow-up of the drunk and reckless driving records of the different risk and treatment groups. The rarity of convictions for the offenses of concern, by contrast with the frequency of the violations, requires a minimum two-year follow-up (only a one-year follow-up was available for treated offenders).

Furthermore, even though "accidents" were not the primary concern in this study, the fact that some differences were found on this criterion, and the fact that the ultimate objective of any program of this kind is highway safety suggest that a very worthwhile follow-up of the samples should include a more careful analysis of automobile accidents than was possible in this study.

Conclusions about Prediction Model

The implications about the prediction model are more clear cut than inferences about the results of the countermeasure project. The probability tables for drinking drivers and for recidivist drinking drivers are usable by decision makers in assessing the likelihood that specific individuals (with particular combinations of characteristics on the variables on which the model is based) will become either drunk drivers or recidivist drunk drivers. The flaw, insofar as decision makers are concerned, is that the items on which the model is based do not include different treatment or sentencing alternatives. If such alternatives could be included in subsequent versions of the model, a tool with direct applicability would be available, a tool whose utility could be directly assessed. Such a model could provide probabilities of success associated with different treatments or sentences and indicate to a decision maker the differential likelihood of a successful outcome. These differences would represent the degree to which the model was contributing to an improved program or to better decisions. The feasibility of implementing such a model in the courtroom or in a treatment or examination center is, of course, a very serious question. The use to which the present prediction model is put will give some insight into the likelihood that a more sophisticated and practical model will hold sufficient utility for the administration of social and criminal justice.

HISTORY AND OBJECTIVES

Numerous research studies have concluded that alcohol is an important factor in traffic crashes. To determine the extent of this relationship and to develop methods to reduce crash incidence wherever possible, the Drinking Driver and Traffic Safety Project was initiated to conduct a study focused on convicted drinking drivers as one important aspect of the drinking and driving problem.

The project was funded in October 1967 by the State of California as a result of a 1967 public law allocating funds for research into accident causation and reduction. Ten months after the project's onset funding was assumed by the U. S. Department of Transportation, National Highway Traffic Safety Administration.

Goals for the project under both funding sources were the following:

1. Development of a prediction capability to identify:

   a) driver's license applicants likely to become convicted drunk drivers,

   b) convicted drunk drivers likely to recidivate,

   c) drivers likely to be involved in crashes where fatalities or serious injuries occur.

2. Identification of countermeasures or rehabilitation procedures which will reduce the incidence of drunk driving and, thereby, the incidence of crash involvement.

To meet these objectives the total Drinking Driver and Traffic Safety Project was divided into three research areas: 1) the operation of a countermeasures program, 2) the development of a prediction model, and 3) the evaluation of deceased drivers killed in traffic crashes in relation to drunk driving. The goals and methods of analysis for each area are delineated below.

The Countermeasures Project

The goal of the first research area was to determine which of several modes of treatment is most effective in reducing the rate of drunk driving recidivation and automobile crashes. Analysis of treatments was to be accomplished by a longitudinal follow-up to ascertain frequencies of drunk driving recidivism.

A total of 1,953 offenders were referred from five courts in Los Angeles County during the first half of 1970. These offenders were divided into five experimental groups: chronic high risk recidivism group, high risk recidivism group, low risk recidivism group, control group I (testing but no treatment), and control group II (neither testing, nor treatment).

Risk categories were determined through the use of a classification questionnaire, scored on the basis of regression weights. The low risk category identified a potential non-recidivist, the high risk category a potential recidivist, and the chronic high risk an individual at the high end of the risk score continuum. Assignment to different treatment modalities or to control group I was made randomly within each risk group category. Control group II contained offenders who received regular court sentencing and had no contact with the project. Information on this latter group was obtained from court records.

Data for the first four groups were gathered from the following sources: 1) psychological, alcoholism, and driver selection tests, 2) demographic questionnaire, 3) criminal records obtained from the Bureau of Criminal Identification and Investigation, and 4) traffic violation reports obtained from the Department of Motor Vehicles. Data on control group II were limited to criminal and traffic violation records.

Drinking Driver Classification and Prediction Model

Objectives of the second research area were the following: 1) to predict potential drunk drivers from the driving population at large, and 2) to predict recidivist drunk drivers from the convicted drunk driver population. The first objective was aimed at the development of a model, for use by the Department of Motor Vehicles in the selection, for a reeducation program, of persons likely to become drunk drivers. The second objective was intended to develop a detection tool, for use by municipal court judges, in determining which convicted drunk drivers were more likely to recidivate. A prediction capability such as this was to be combined with a countermeasure program to present alternatives to the traditional sentencing of convicted drunk drivers.

The development of a probability model was attempted by utilizing three statistical methods -- Multiple Regression, Discriminant Analysis, and Bayes' theorem. Three methods were used initially to determine which methodology would provide the most sensitive and efficient procedure for model development.

The analysis described in the first two annual reports concerned the development of a classification model as a preliminary step to the development of a probability model for prediction. Several sets of variables were tested to determine which would produce the best possible classification of individuals into their respective sample groups. The most predictive set of variables and powerful statistical method was utilized in the final development of a prediction model.

Data for the initial classification model were gathered between March and August of 1968 on a sample of 778 convicted drunk drivers and a sample of 1,407 never convicted drivers. The first sample was selected in three Los Angeles County Courts which typically handle approximately 60 percent of the total county drunk driving case load. The second sample was selected from five Los Angeles County Department of Motor Vehicle Offices. Data on all respondents were gathered from the following sources: a structured questionnaire, traffic violation and criminal records from the Department of Motor Vehicles and the Criminal Investigation and Identification Bureau. Information also was gathered from arrest reports filed in court.

Comparison Between Convicted Drunk Drivers and Deceased Drivers

The third research area addressed itself to determine the relationship between convicted drunk drivers and traffic crashes. To aid this study, two distinct analyses were made of a sample of drivers killed in fatal accidents. The first type of analysis was a comparison of convicted drunk drivers and deceased drivers to determine how closely the convicted driver population resembles fatality cases. Such a comparison was made on the assumption that if convicted drunk drivers are dangerous drivers, significant similarities can be found between them and drivers killed in traffic crashes. As a result, a comparison was made of both samples on 14 major offense variables, age, and blood alcohol level, using the following methods: a computation of the mean number of traffic and criminal offenses, derivation of a critical ratio (z score) as a test of significance, and the calculation of the t-test, as a test of significance, to indicate the difference between means for age and blood alcohol level.

The second type of analysis was made by using a factor analysis technique to find if behavioral or situational patterns exist in the fatal accident group and to make a comparison between the patterns of alcohol-involved and non-involved fatalities. An R-type of factor analysis was performed on a common set of 45 variables for three specific groups: a) deceased drinking drivers, b) deceased non-drinking drivers, and c) a combined group of both drinking and non-drinking deceased drivers.

Both types of analysis were based on a sample drawn from all drivers who died in Los Angeles County as a result of fatal automobile crashes between January 1966 and June 1968. This sample consisted of a total of 446 alcohol-involved fatalities and a random sample of 375 drivers selected from 740 fatalities not involved with alcohol. Data for the deceased sample were obtained from four sources: coroner's reports, accident reports, Department of Motor Vehicles records, and criminal identification and investigation records.

The convicted drunk driver sample used for comparison with the deceased driver sample was the same as that used for development of the probability model.

Summary of Earlier Findings

The following is an overview of conclusions and findings reached to date for each research area. Fuller descriptions may be found in the 1969 and 1970 Annual Reports.

Results of the classification model indicated that prediction of future drunk driving convictions may not reach the complete level of accuracy desired. Classification of potential drunk drivers, from the sample of never convicted drivers, resulted in a small percentage of error. However, this proportion would encompass a relatively large number of drivers if the model were used by the Department of Motor Vehicles to select individuals for a State-wide reeducation program. Classification of drunk driving recidivists from a sample of convicted drunk drivers resulted in more classification error than when potential drunk drivers were being predicted. The least amount of error was found in the reckless and first drunk driving category, which is encouraging since this group forms approximately 70 percent of the total drunk driving population. These overall results indicated that even though the prediction capability resulted in a certain degree of error, the model could nevertheless provide a useful supplement to the personal judgment of decision makers in a court setting.

Results from a comparison of the convicted drunk driver and deceased driver population revealed that the convicted drunk driver is over-represented in the fatality population in comparison to the proportion of convicted drunk drivers in the total driving population. Individuals with prior drunk driving convictions make up 12 percent of the total fatality population as opposed to 1 percent of the total driving population. Furthermore, the proportion of deceased drinking drivers with one or more alcohol-related arrests is high, suggesting that the drinking driver who has prior alcohol-related offenses is highly represented in the fatality drinking population.

Comparison of the total fatality drinking driver population with prior accidents and convicted drunk driver population with prior accidents indicated that the latter group has higher mean traffic and criminal violation rates, including previous drinking and driving and alcohol-related offenses, than the former. However, the blood alcohol level of deceased drivers at the time of this fatal accident was higher than the blood alcohol level of convicted drunk drivers at the time of their last arrest. These findings tend to confirm the fact that drinking and driving is an important cause of crashes. However, they also suggest that other driving groups in addition to convicted drunk drivers should be considered in traffic crash studies.

Results from the factor analysis study of deceased drivers indicated four factors or patterns that were very similar for the deceased drinking, the deceased non-drinking, and a third combined group. Two of these factors were behavioral (non-conformity): "criminal record" and "traffic violation record." One factor was descriptive of a class of individuals: "older, lower socio-economic status person," and the fourth factor was situational: "accident liability situation," with emphasis on speeding for both groups and higher blood alcohol levels for the deceased drinking drivers.

An analysis of these factors indicated the following:

1. The fact of drinking or not drinking at the time of the accident did not make a difference in the general factor patterns for the two groups involved in fatal accidents, although past history of drinking appeared as an element in two of the four patterns for the deceased drinking driver.

2. Those in the sample who had a criminal record usually had a traffic violation record of some consequence.

3. The older, lower socio-economic status person who drove an older car was found with relatively high frequency in the deceased non-drinking driver population. This group also had a low frequency of drinking histories or problems, criminal records, or traffic violation records in both the drinking and non-drinking deceased samples.

4. Habitual traffic violators without criminal records did not become involved in fatal accidents as frequently as could be expected by chance. On the other hand, the frequency of both traffic offense records and criminal records was higher than expected.

The countermeasures program was in progress during the time previous annual reports were published; consequently, no earlier findings were reported. Data for this program had been analyzed during the final year and are presented in this report.

COUNTERMEASURES PROJECT

With reduction of the rate of recidivism for drunk driving as its ultimate goal, this program investigated the respective effectiveness of several types of treatment in deterring offenders 1) from re-arrest as drunk and/or reckless drivers, and 2) from becoming involved in automobile crashes. To accomplish this a treatment program was initiated to test various forms of countermeasures. This report outlines the procedures followed in the development and implementation of the treatment program and suggests the relative efficacy of treatment modalities. In addition, the difference between the effects of treatment (regardless of modality) and of no treatment was examined.

Both the development of the specific countermeasures to be employed and the assignment of individuals to the various treatment modes were oriented toward, hopefully, obtaining information about the potential recidivism of drunk drivers ("risk") as based on actual, post-treatment data for convictions and for involvement in automobile crashes.

No reliable predictor variables have, as yet, been identified that will enable us to forecast which offenders are likely to become involved in automobile crashes. However, Coppin and Peck (1967) and Coppin, McBride, and Peck (1967) (see Bibliography, Appendix F) suggest total driving motor vehicle convictions, obtained from either driving record or biographical data, as the "best" predictor. The further fact that charges preferred for drunk driving are frequently reduced to convictions for reckless driving has led to the combination of these two offenses into one category for the purposes of both prediction and evaluation of subsequent convictions.

Accordingly, the countermeasures employed in this program were assessed for their effectiveness in deterring drunk and/or reckless convictions and in deterring crash involvement over a one-year period following the termination of the specific countermeasures.

Previous Work on Countermeasures

The literature on two types of countermeasures previously conducted by others has been cited above. These two studies were concerned with negligent drivers, and the two types of countermeasures employed were group meetings and individual hearings.

Group Meetings:

Comparison was made (Coppin, 1961; Coppin, Marsh, and Peck, 1965) between findings on 196 negligent drivers participating in group meetings and on a random sample of 244 negligent drivers

(control groups) receiving no such treatment. Criteria for the comparison were a) prior convictions, b) subsequent violations (by DMV record), and c) subsequent accidents (by DMV record) examined over a one-year period.

Groups receiving treatment consisted of 15 persons meeting in a single session lasting approximately one hour. Approximately 75 percent of these persons had been sent a letter warning them of the consequences of their negligent driving, and of this population, approximately 50 percent were again sent one or more such letters. Members of the group were given a copy of their past 36 months' driving record and were asked to discuss the reasons for their negligent driving. Emphasis was placed on the view that the factors which result in negligent driving cannot be rationalized and that good driving is a habit that must be acquired.

The results of this first study (Coppin, 1961), in a comparison of treatment groups with control groups, discovered a) no difference in the number of prior convictions; b) a 90 percent improvement in the subsequent driving record of the treatment groups (31 percent had no subsequent accidents and no subsequent violations); c) no difference in the number of subsequent accidents in treatment group as compared to control group. Eighty-five persons (6%) of the treatment group had their driver's license revoked, as against 79 persons (13%) of the control group population. In this study, a differential number of "points" were allowed for the two groups before licenses were revoked. It was also observed that persons under the age of 25 did not improve their subsequent driving record, while persons over 25 did improve their record.

In a second study of this method (Coppin, Marsh, and Peck, 1965), where a greater treatment effort was made in the group sessions, the population examined consisted of 1,440 persons in the group sessions and 610 in the control. The findings showed a reduction in the number of subsequent convictions but no reduction in number of subsequent accidents in the treatment group as contrasted to the control population. (The average number of convictions was .95 per person for the group sessions as against 1.07 for the control; the average number of subsequent accidents was .244 per person for the group sessions and .228 for the control.) A sex difference was noted in the area of convictions, where females showed a lower rate.

Individual Hearings

A second type of study, which employed the countermeasure method of individual hearings for negligent drivers (Coppin, Peck, Lew, and Marsh, 1965), investigated populations of first

time negligent drivers in both hearing and control groups over periods of one and two years.

The hearing consisted of a 30-40 minute contact with an interviewer in which the driver's record was discussed and suggestions for improvement were made. Safe driving habits were emphasized rather than therapy. The legal and social importance of good driving was the major topic for discussion. The driver was put on probation, and his driving record was reviewed after one year. First year findings showed fewer subsequent motor vehicle citations for those who had attended the hearings; second year findings revealed no difference between the treatment groups and the control population. First year findings showed an average of 1.13 citations per person as against 1.44 for the control groups; the treatment group showed an average of .25 accidents per person as against .24 for the control groups. Age was shown not to be a factor.

In summarizing these two types of study on negligent drivers, it appears that both methods (group meetings and individual hearings) reduced convictions and citations but resulted in no statistically significant reduction of accidents. It should, however, be noted that although the difference between the average number of accidents suffered by the treatment groups as compared with the control groups was small, both treatment methods did result in a slight but consistent increase in the number of accidents as compared with accidents of the control groups. Study of the group meeting method revealed the operation of age and sex factors in relation to reduced convictions. Study of the individual hearing method revealed no age factors. Sex differences were not reported because of the small number of cases.

Countermeasures Program of the Drinking Driver and Traffic Safety Project

In contrast to the studies described above, the Countermeasures Program of the Drinking Driver and Traffic Safety Project focused on a population of drivers convicted for drunk and/or reckless driving rather than on negligent drivers. This study also considered a wider range of treatment groups than was considered by the previous studies cited.

Objectives

1. To implement and test various countermeasure treatments for convicted drunk and/or reckless drivers in order to determine their respective effectiveness in deterring offenders from re-arrest as drunk and/or reckless drivers;

2. To determine the effectiveness of such countermeasures in reducing subsequent involvement in automobile crashes; and

3. To determine the effectiveness of such countermeasure treatment modes (regardless of type) upon subsequent conviction rates and automobile crash rates as compared with similar rates for a convicted drunk driver population excluded from treatment.

Outline of Methodological Procedures

a) The project obtained a large sample of convicted drunk drivers, referred from the Los Angeles County Courts.

b) Tests and questionnaires were administered at the University of Southern California in pre-treatment testing.

c) All subjects were assigned to a risk category based on their recidivist classification score.

d) All subjects were then assigned to one of six treatment groups or to a control group. (Eventually there was a total of eight groups, as will be specified later.)

e) All subjects in the treatment groups completed an assigned countermeasure, lasting longer than ten weeks. The entire series of programs extended over an eight-month period. If the assignment was not completed, subject was returned to court.

f) Post-treatment testing of subjects in treatment groups was performed.

g) Subjects were followed up to ascertain actual drunk and/or reckless driving recidivism and crash involvement for a one-year period starting from the termination of the first treatment groups. Follow-up was made through DMV records.

Detail of Procedures

a) Referral from Courts:

A total of 1,953 convicted drunk and/or reckless drivers were referred to the program from five courts in Los Angeles County during the final half of 1969 and the first half of 1970. All were placed, after sentencing on summary probation to the Drinking Driver and Traffic

Safety Project. Sentences of some offenders were deferred for four months. On completion of testing and countermeasures treatment, the full amount of the sentence was usually suspended. If an individual failed to complete the requirements of summary probation, he was returned to court for further disposition.

b) Pre-Treatment Testing:

Following referral to the project, each offender was interviewed in court by a project representative. At this time he completed a Profile Questionnaire (Appendix A) in order to determine his potential risk of recidivism for drunk and/or reckless driving conviction. In addition, an appointment was made for psychological testing at the University of Southern California.

Beginning in August 1969 and continuing through December, all drinking driver offenders placed on summary probation to the Drinking Driver and Traffic Safety Project were administered a battery of tests. The results of these tests have been only partially analyzed to date.

c) Classification to Risk Categories:

Data on which an offender's risk score was assessed were obtained at the time of interview in court. Based on his test score, each offender was assigned to one of three categories of risk as to recidivism for drunk and/or reckless driving: low risk, high risk, and chronic high risk.

The risk category was determined by scoring each individual's questionnaire on the basis of regression weights developed from a stepwise regression program (see Appendix B for procedure followed). The low risk category, which contained approximately two-thirds of the population, suggests a potential non-recidivist; the high risk category suggests a potential recidivist; the chronic high risk category contains all offenders at the high end of the risk score continuum (habitual or chronic drunk driving offenders or chronic alcoholics).

d) Assignment to Treatment Modalities or to Control Group:

After classification as to risk, offenders were assigned either to one of six different countermeasure treatments (experimental groups) or to Control Group I. Assignment to treatment group or control group was randomly determined unless otherwise specified. The eight groups on which this study is based, and which are more fully described later in this section, are:

Treatment Groups:

1) Problem Oriented Group Therapy

2) Traditional Group Therapy

3) Film-Lecture Discussion Meetings (one session only)

4) Film-Lecture Discussion Meetings (four sessions)

5) Alcoholic Rehabilitation Center

6) Alcoholics Anonymous

Control Groups:

7) Control Group I (testing but no treatment)

8) Control Group II (records study only)

The distribution of subjects assigned to each group is displayed on the following page. Also shown is the number of subjects in each group from whom usable data were actually obtained.

General Principles of Assignment by Risk Category

The large bulk of low risk offenders were randomly assigned to the film-lecture discussion meetings. A random sample of the remaining low risk offenders were also assigned to each of the other countermeasure treatments.

All high risk offenders were randomly assigned to one of the six treatment programs or to Control Group I. Subjects were selected until there was a minimum of 70 persons in each treatment or control modality.

Chronic high risk offenders were randomly assigned to the Alcoholic Rehabilitation Center or to Alcoholics Anonymous since it was felt that the film-lecture series and the group therapy sessions conducted by the project would probably be ineffective with these individuals.[1]

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[1] To indicate the "value" implications in terms of the research design, the chronic high risk offenders were considered to have a serious alcoholic problem and to require more extensive treatment for it. The "expected" relationship was that a low risk person would require "less intensive" treatment, while the chronic high risk offenders would require a "more intensive" treatment approach.

GROUP DISTRIBUTION OF SUBJECTS

	Assigned	Actual Data*
Treatment Groups		
1. Traditional Therapy	116	107
2. Problem-Oriented Therapy	141	138
3. Film-Lecture (series of 4 sessions)	114	113
4. Film-Lecture (one time only)	609	612
5. Alcoholic Rehabilitation Center	155	141
6. Alcoholics Anonymous	233	195
Control Groups		
7. Control Group I (participated in testing but no treatment)	239	233
8. Control Group II (no testing/ no treatment--record check only--not referred by courts. High risk could not be determined)	209	209
Returned to court (assigned but did not wish to participate in program)	301	266**
Deleted from study for administrative or personal problems (not returned to court)	45	
Dropped out of program for miscellaneous reasons after assignment to above groups		143**
	2162	2157

* Differences from "assigned" categories are due to missing data.

** These groups were not entered in analyses.

Note that in the following data analysis, both the high risk and chronic high risk groups have been combined because of the relatively small size of the latter group.

1. Problem-Oriented Group Therapy

Both high and low risk offenders, in Groups of 10 to 14, attended 8 two-hour problem-centered group therapy meetings at one-week intervals. These meetings were held during the evening or on Saturday morning and were guided by a staff of therapists which included clinical psychologists, a psychiatrist, professional counsellors, and graduate students in psychology. The focus of all meetings was on drinking and driving. The primary aim was to aid the individual in understanding himself in relation to his drinking and driving and his accident involvement. The offender was encouraged to explore possible alternatives to his present behavior and to change those attitudes and behaviors which appeared related to his driving violation or accident. (A more detailed outline of the group procedure is shown in Appendix C.)

2. Traditional Group Therapy

High and low risk offenders attended 10 one and one-half hour group therapy sessions once a week. These sessions were conducted along traditional lines in which participants were free to raise and explore problems and questions of concern to them. The therapist facilitated the group interaction but did not attempt to guide the discussion to specific problems such as the use of alcohol or drinking and driving unless the participant initiated these areas of his own interest and need. The aim of this effort was to aid the individual to understand himself better.

2. Film-Lecture Discussion Meetings (four sessions)

High and low risk offenders in groups of 25 were referred to 4 two-hour film-lecture discussion meetings. A film dealing with drinking and driving and automobile accidents was used at each meeting as a "springboard" for a brief lecture. Lectures provided information on topics such as the effects of alcohol on driving behavior, statistics related to drunk driving recidivism, and accident probabilities. After each film-lecture, the participant offenders discussed their reactions to the films, clarified their understanding of specific points, and suggested alternatives to behavior depicted in the

films. (A synopsis of films used is shown in Appendix D.)

4. Film-Lecture Discussion Meetings (one session only)

A film-lecture session lasting 90 minutes was given to low risk subjects in groups of approximately 100. This one class session included all the films shown in the four session meetings and covered most of the major items concerning drinking and driving and probability of accidents.

5. Alcoholic Rehabilitation Center (ARC)

A number of offenders from all of the risk categories were referred to the Los Angeles County Department of Health, ARC, for screening, diagnosis, and subsequent treatment. Approximately one-third of the chronic high risk offenders were assigned to this treatment modality. The usual procedure at ARC involved screening by several professionals, including a psychiatrist, a social worker, an internist, a public health nurse, and on occasion, a vocational rehabilitation worker. A diagnosis of alcoholism or non-alcoholism was made, including assessment of severity, chronicity, and activity.

The usual treatment at ARC is "antabuse," although individual or group therapy is also recommended, and persons requiring such treatment are referred to appropriate mental health centers. All persons participated in a series of lectures on alcohol as part of the program. Persons diagnosed as non-alcoholics were usually referred to outside agencies for treatment or referred within ARC to a number of available treatments.

6. Alcoholics Anonymous (AA)

Offenders from every risk category were assigned to AA. Two-thirds of the chronic high risk offenders were assigned to this group. Arrangements were made with AA for attendance cards to be signed and returned to the project. The progress of offenders was not evaluated by AA; attendance at the assigned meetings was the single criterion for successful completion of the AA program with regard to this project.

7. Control Group I (tested but no treatment)

This group, the main control group, consisted of convicted offenders who were randomly selected from the high and low risk categories to constitute a comparison or control group within these categories. These subjects were

pre-tested, received no treatment, and were post-tested before the end of the project. Their sentences were suspended by the court through their project participation in the same way as were sentences of subjects assigned to treatment groups.

8. Control Group II (record study only)

Approximately one-ninth of the total sample of court records on sentenced offenders were randomly selected and examined as to data regarding recidivism and traffic accidents for the purpose of comparison with treatment groups and with Control Group I. These offenders were not referred by the courts; they were not put on summary probation to the project; they had no contact with it via either testing or treatment; and they received the customary sentence for conviction of drunk driving and/or reckless driving by the Los Angeles municipal courts. The project's sole concern with this group was for the analysis of their court records. Risk assignments could not be made.

f) Post-testing

Approximately 10 weeks after participation in a particular treatment modality, each subject underwent a brief post-testing procedure to determine if his attitudes and knowledge of relevant information had undergone change as a result of that particular countermeasure. Subjects in Control Group I were also post-tested after approximately the same time period. The test was a retest on the Information and Attitude Survey (Appendix E).

g) Follow-Up

One year after termination of the treatment program, traffic violation records were obtained from the State of California Department of Motor Vehicles for all sample members in order to determine the number of new drunk driving and/or reckless driving offenses and the incidence of new traffic crashes. This information was used in the analysis to be described in the subsequent section.

Results of the Countermeasures Project

To evaluate the results of this phase of the overall project, the experimental treatment methods used were compared, in various combinations, with the two control groups on three criteria: 1) the number of accidents occurring during the year of follow-up; 2) the number of drunk driving convictions during the same period; and 3) the total number of both reckless and drunk driving convictions. Although more elaborate analyses were carried out, this summary presentation describes only comparisons between means on the following samples: 1) the two control groups, 2) the combined treatment groups and the combined control groups, and 3) each treatment and the combined control group. Similar comparisons were made for high and low risk groups separately.

Two control groups were used for this study because it was anticipated that the extensive interview and testing procedures might have an effect independently of the treatment. One control group (Control I) was contacted by project personnel, interviewed, and tested; the other (Control II) was not. Both were followed for the same period as the treatment groups to determine their performance on the criteria. A simple comparison of these two groups, both of which were dealt with consistently by the courts, indicates that there is virtually no difference between these control group populations (Table 1).

The difference between the two groups is small and statistically likely to occur by chance. In comparisons between the control groups and the various treatment groups, these two control groups were therefore combined, resulting in means for the three listed criteria, in the order in which they appear in Table 1, of .127 (one out of eight, on the average); .106 (one out of ten and .137 (one out of seven).

Overall, there were no significant differences between those convicted offenders who were assigned to the experimental treatment groups and those in the combined control group. Combining all of the treatment groups and comparing their means with those of the combined controls resulted in overall mean differences between them on the order of .007 for accidents (or seven out of a thousand); .034 for drunk driving convictions (or 3 out of 100); and .023 for reckless and drunk driving combined (or 2 out of 100). None of these mean differences, on the face of it as well as statistically, has any significance for policy purposes or for purposes of treatment of drunk driving offenders.

The results of comparing the effects of the individual treatment groups with those of the combined control group are presented in Figure 1. Bars terminating to the left of the vertical dotted line (which is based on the average number of criterion events

Table 1

MEANS ON THREE CRITERIA OF TWO CONTROL GROUPS

Criterion	Control Group 1 (tested)	Control Group 2 (not tested)	Student's t
1) Mean number of subsequent accidents	.144(N=233)	.109(N=209)	.921
2) Mean number of drunk driving convictions	.109(N=233)	.104(N=209)	.128
3) Mean number of drunk and reckless driving convictions	.166(N=233)	.104(N=209)	1.409

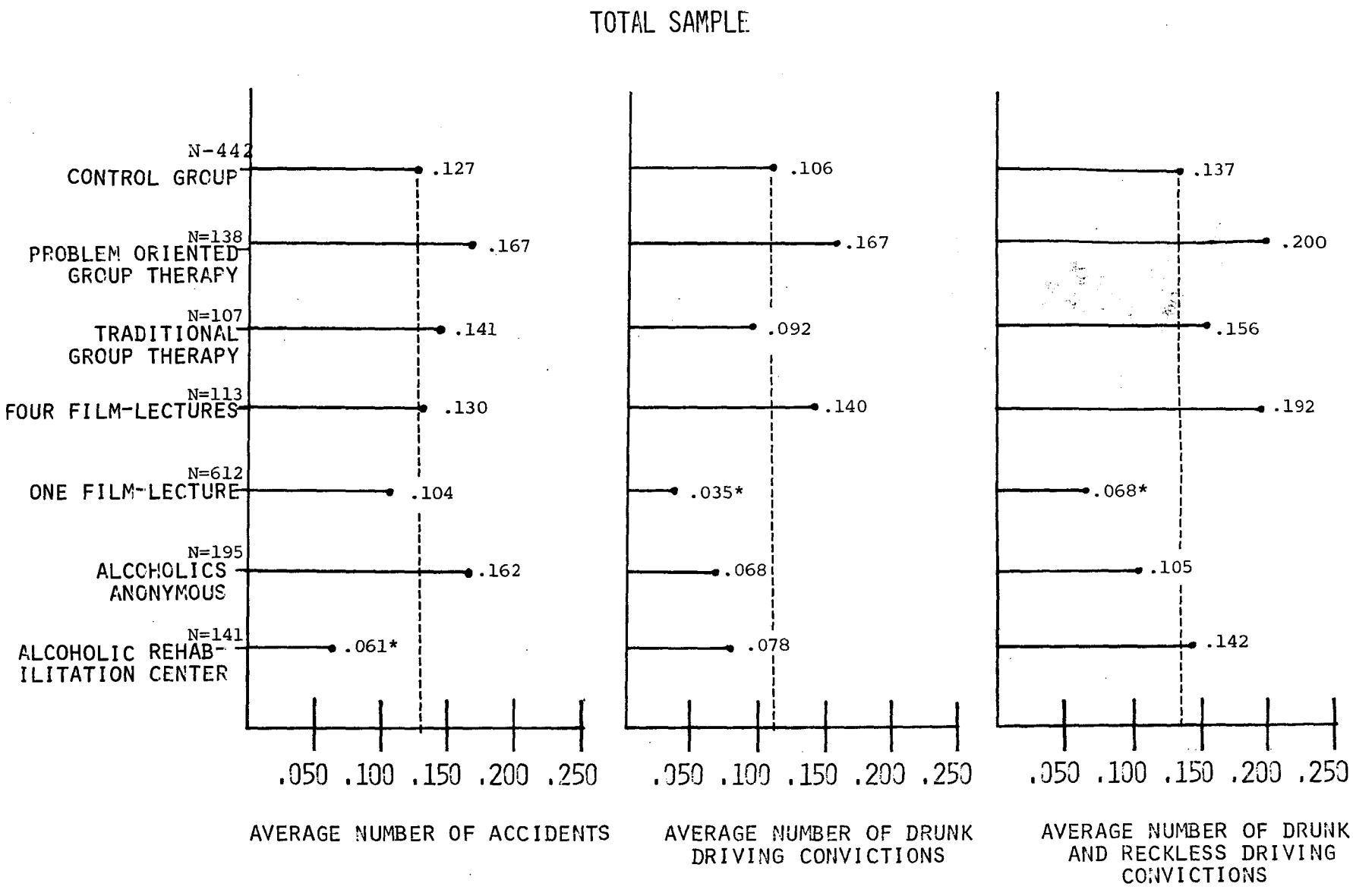

Figure 1. Comparison of Individual Treatment Groups and the Combined Control Groups on Three Variables.

for the control group) indicate that the average result for that treatment group was lower than for the control, and bars terminating to the right of the vertical dotted line indicate that the average result for the treatment group was higher than for the control group. Only those averages with asterisks are significantly different, statistically, from the control group.

Results indicate that the "one film-lecture" countermeasure treatment is the only one which appears to be more effective in reducing convictions for drunk driving and reckless and drunk driving than are conventional court practices. These findings, however, are inconclusive in that the vast majority of persons assigned to this treatment were deemed "low risk" before they were so assigned. Results further indicate that the Alcoholic Rehabilitation Center program is the only countermeasure which produces statistics significantly lower than those of the controls with respect to reducing subsequent automobile accidents. Here, too, the findings are inconclusive in that the Alcoholic Rehabilitation Center program is the only countermeasure to introduce physical intervention, in the form of the administration of drugs, as part of the treatment. This treatment could be expected to influence drinking habits directly (and therefore reduce drinking driver offenses) rather than influence driving habits (and therefore reduce automobile accidents). Such an anticipated reduction in offenses is not, however, corroborated by a reduction in the number of convictions.

In the case of both "significant" findings and "non-significant" findings, the difference between the high and low risk groups should be examined. Figures 2 and 3 present the results of comparisons between the first control group (Control I, the only group for which information on the basis of levels of risk could be estimated) and the high and low risk individuals assigned to different treatment programs.

The statistically significant findings again are rare and equally difficult to interpret. Overall, the high risk group does, in fact, receive more drunk driving convictions and reckless driving convictions than does the low risk for both the control group and the combined treatment group, a result which merely validates to a degree the "high" and "low" risk categorization.

For the low risk category, the only significant difference between results of the control groups and those of the experimental groups was found on the criterion of accidents for those assigned to the Alcoholic Rehabilitation Center program. Among the high risk category of offenders, the finding that fewer high risk individuals assigned to the "one film-lecture" had accidents than did the high risk control (none in this treatment had subsequent accidents) can be effectively ignored insofar as policy

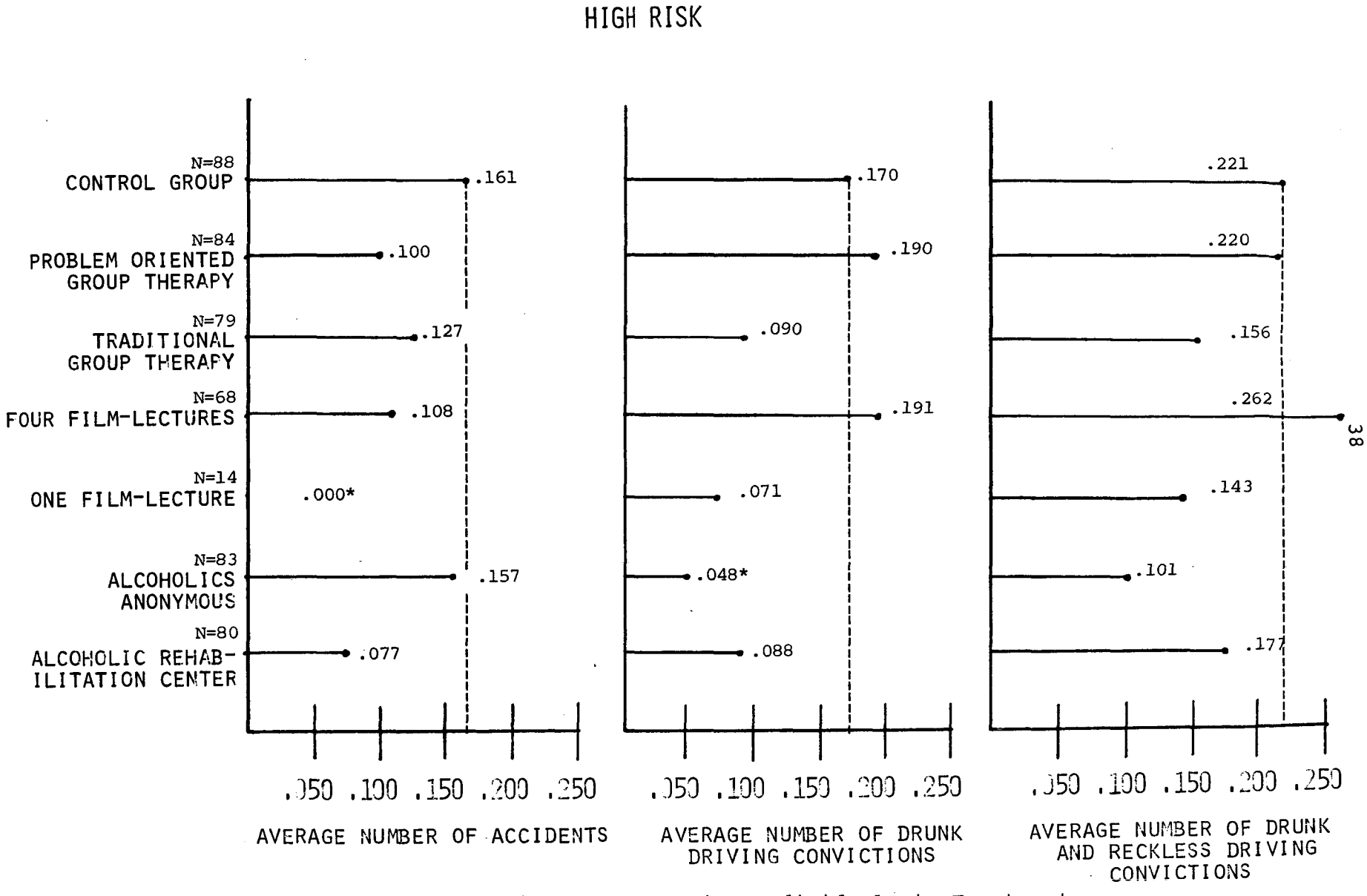

Figure 2. Comparison of High Risk Individuals in Treatment Groups and High Risk Individuals in Control Group I on Three Variables.

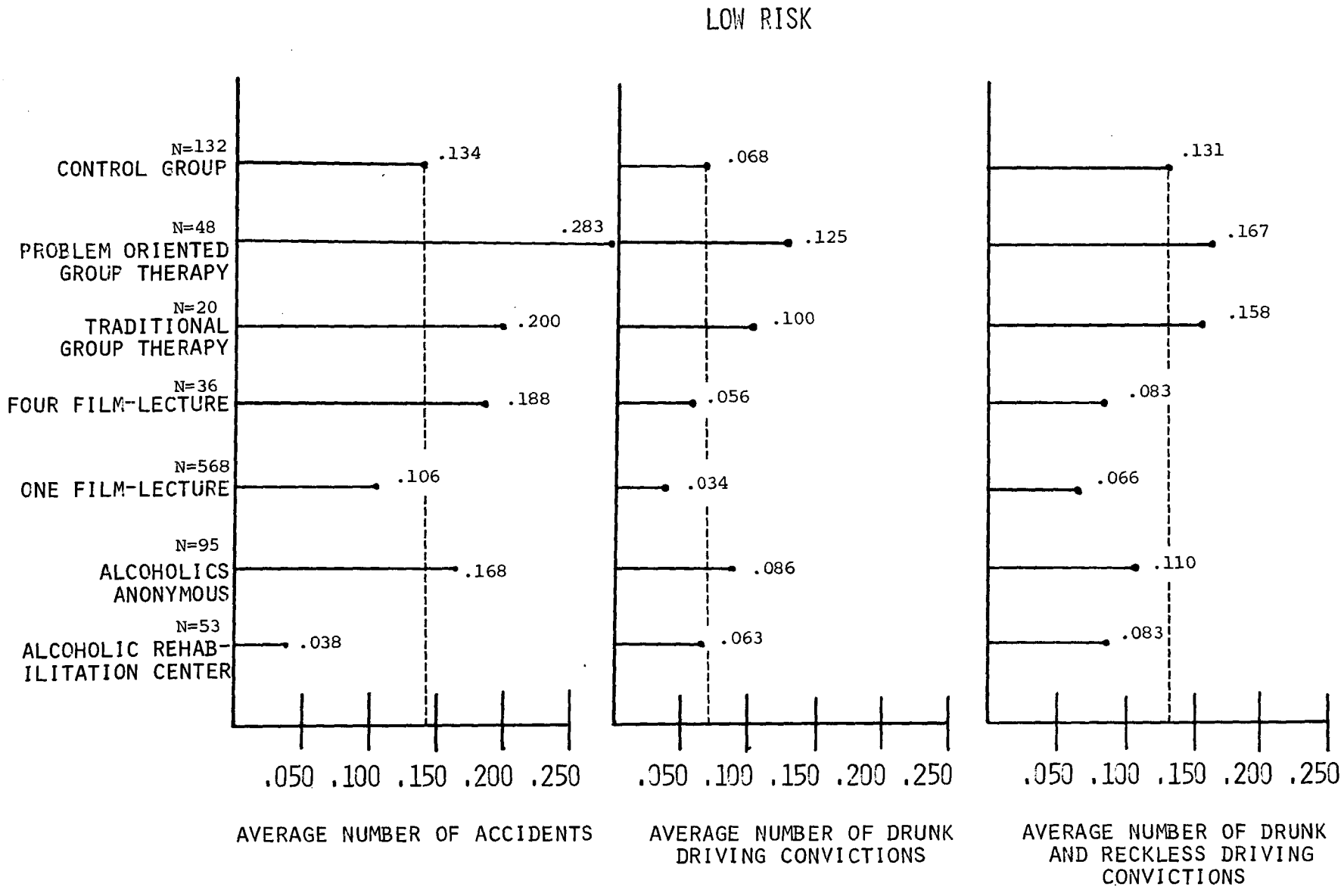

Figure 3. Comparison of Low Risk Individuals in Treatment Groups and Low Risk Individuals in Control Group I on Three Variables.

or other decisions are concerned, since it is based on so few cases (14).

The only other statistically significant finding is that high risk offenders participating in Alcoholics Anonymous are less likely to commit subsequent drunk driving offenses than are high risk controls. This is marginally significant statistically and even more inconclusive so far as policy decisions are concerned. For example, the difference between Alcoholics Anonymous high risk participants and high risk controls on the criterion of drunk and reckless driving is a difference between one in five (.221) for the controls and one in ten (.101) for this treatment group, which is not statistically significant. However, the difference on the criterion of drunk driving alone (excluding reckless) between Alcoholic Anonymous high risk offenders and high risk controls is a difference between one in six (.170) for the controls and one in twenty (.048) for the treatment group; this is statistically significant. The manifold judicial and extra-judicial influences that result in a conviction for "reckless" driving rather than one for "drunk" driving conviction could account for this "statistical" finding and effectively wash out any substantive significance that might be imputed to it.

Conclusions

The findings which are significant, either statistically or substantively, appear to offer few guides for future action. The fundamental requirement, either for demonstrating a lack of difference or for demonstrating what may be real differences, would be an extended follow-up of the drunk and reckless driving records of the different risk and treatment groups. The rarity of convictions for the offenses of concern, by contrast with the frequency of the violations, requires a minimum two-year follow-up (only a one-year follow-up was available for sample members).

Furthermore, even though "accidents" were not the primary concern in this study, the fact that some differences were found on this criterion and the fact that the ultimate objective of any program of this kind is highway safety, suggest that a very worthwhile follow-up of the samples should include a more careful analysis of automobile accidents than was possible in this study.

THE PREDICTION MODEL

The development of a usable prediction model was a continuing objective throughout the course of the project. The first versions were based on three different mathematical procedures for combining the predictive utility of single variables. These were the multiple regression, discriminant function, and Bayesian models. As in other comparative analyses, the Bayesian model makes use of more of the available information than does either the multiple regression or the discriminant function model and was found to perform slightly better than either in discriminating between convicted drunk drivers and driver's license applicants.[1] On the basis of this finding, the final analyses were organized around the application of the Bayesian model to all of the samples in the study.

A series of analyses using frequency data to estimate conditional probabilities for different samples and combinations of samples led to the conclusion that of the eight variables remaining in the analyses (education, minor traffic violations, age, number of accidents, total non-traffic arrests, sex, marital status, and ethnicity) the last three added very little to the prediction (or discrimination) of drunk drivers or drunk driver recidivists. Although it is true that many other variables (for example, questionnaire responses about drinking and driving habits) could have been included in the final prediction model, their contribution would have been marginal, and their utility, considering the nature of the groups to which the model might be applied, potentially negative. To put it differently, questioned about his drinking habits in the context of a scientific study in which he is assured anonymity, a convicted drunk driver might well respond differently than he would if he were questioned prior to actual sentencing or treatment assignment.

The five variables used in the final prediction model are all relatively objective, and in the case of the three possibly sensitive items (accidents, traffic violations, and arrests) are readily obtainable from public records. They each contribute to the differentiation between convicted drunk drivers and driver's license applicants and between one-time drunk drivers and drunk driver recidivists.

A listing of probability estimates for drinking drivers, based on information about the five variables from which an index was created, is contained in Appendix J. For each index,

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[1] Pollack, Seymour, M.D., Drinking Driver and Traffic Safety Project, Annual Report, July 1970.

probability estimates of being a drunk driver and of being a recidivist drunk driver are presented. The prediction tables produced were based on information about all of the subjects in all of the studies, which included 2,226 individuals who had had one or more convictions for drinking and driving (including reckless driving) and 1,916 who had had no record of convictions for drinking and driving or reckless driving.

Development of the Probability Estimates

Once the variables to be used in the prediction tables were identified, the steps taken to develop the specific probabilities for each combination of values of the variables were relatively straightforward. The first step was to estimate the conditional probabilities associated with each category of each variable for the two hypotheses or predicted conditions for each prediction. The estimated conditional probabilities are given in Tables 1 and 2 for both drinking driver and the recidivist drinking driver predictions for each of the variables. These tables also contain the frequencies on which these probability estimates are based. Frequencies are, of course, only one way to estimate probabilities; they are nevertheless the way in which most of us have the greatest confidence for problems of this kind. The next step was to apply an algorithm of some kind which takes the information about each variable for an individual and combines the appropriate conditional probabilities in such a way that a posterior probability can be calculated. The specific algorithm used for this purpose is generally called Bayes' theorem and can be expressed:

$$P(H_i/D) = \frac{P(H_i) \times P(D/H_i)}{\sum_i P(H_i) \times P(D/H_i)}$$

where $P(H_i/D)$ is a posterior probability of a hypothesis given a single datum D.

$P(H_i)$ is the prior probability of that hypothesis

$P(D/H_i)$ is the conditional probability of that datum D, given hypothesis i.

The denominator is a normalizing constant to make the sum of the posterior probabilities over all hypotheses equal to 1.00. Bayes' theorem is applied iteratively to the items of information about each individual, and a posterior probability for that individual for each hypothesis is calculated. In the case of the prediction tables, Bayes' theorem was applied to all possible combinations of categories on the five variables (of which there are 17,280) including cases in which there was no information on

TABLE 1

CONDITIONAL PROBABILITIES FOR FIVE VARIABLES AND DRINKING DRIVERS

EDUCATION IN GRADES COMPLETED

		1-6	7-9	10-12	High School	Some College	Bachelor Degree	Graduate Work	Total
Not Drinking Drivers	1	56	176	282	402	490	143	125	1674
		.033	.105	.168	.240	.293	.085	.075	1.000
Drinking Drivers	2	132	380	585	439	324	42	43	1945
		.068	.195	.301	.226	.167	.022	.022	1.000
	3	188	556	867	841	814	185	168	3619

NUMBER OF MINOR TRAFFIC VIOLATIONS

		0	1	2	3	4	5	6-9	10+	Total
Not Drinking Drivers	1	660	332	196	110	63	49	80	45	1535
		.430	.216	.128	.072	.041	.032	.052	.029	1.000
Drinking Drivers	2	540	422	332	249	168	122	219	133	2185
		.247	.193	.152	.114	.077	.056	.100	.061	1.000
	3	1200	754	528	359	231	171	299	178	3720

TABLE 1 (Continued)

AGE

		Under 21	22-23	24-26	27-29	30-35	36-40	41-45	46-50	Over 50	Total
Not Drinking Drivers	1	138	111	138	144	228	192	226	173	340	1690
		.082	.066	.082	.085	.135	.114	.134	.102	.201	1.000
Drinking Drivers	2	80	115	147	153	351	278	285	229	317	1955
		.041	.059	.075	.078	.180	.142	.146	.117	.162	1.000
	3	218	226	285	297	579	470	511	402	657	3645

NUMBER OF ACCIDENTS

		0	1	2+	Total
Not Drinking Drivers	1	1165	300	70	1535
		.759	.195	.046	1.000
Drinking Drivers	2	1477	542	166	2185
		.676	.248	.076	1.000
	3	2642	842	236	3720

TOTAL NUMBER OF NON-TRAFFIC ARRESTS

		0	1	2-3	4-5	6 or More	Total
Not Drinking Drivers	1	1251	149	88	51	109	1648
		.759	.090	.053	.031	.066	1.000
Drinking Drivers	2	936	299	323	200	430	2188
		.428	.137	.148	.091	.197	1.000
	3	2187	448	411	251	539	3836

TABLE 2

CONDITIONAL PROBABILITIES FOR FIVE VARIABLES AND RECIDIVIST DRINKING DRIVERS

EDUCATION IN GRADES COMPLETED

Number of Drunk Driving Offenses		1-6	7-9	10-12	High School	Some College	Bachelor Degree	Graduate Work	Total
One Only	1	54	207	305	258	206	25	30	1085
		.050	.191	.281	.238	.190	.023	.028	1.000
More Than One	2	78	173	280	181	118	17	13	860
		.091	.201	.326	.210	.137	.020	.015	1.000
	3	132	380	585	439	324	42	43	1945

NUMBER OF MINOR TRAFFIC VIOLATIONS

		0	1	2	3	4	5	6-9	10+	Total
One Only	1	344	258	173	134	79	69	104	58	1219
		.282	.212	.142	.110	.065	.057	.085	.048	1.000
More Than One	2	196	164	159	115	89	53	115	75	966
		.203	.170	.165	.119	.092	.055	.119	.078	1.000
	3	540	422	332	249	168	122	219	133	2185

TABLE 2 (Continued)

Number of Drunk Driving Offenses		AGE									
		Under 21	22-23	24-26	27-29	30-35	36-40	41-45	46-50	Over 50	Total
One Only	1	61	71	107	85	197	149	147	102	175	1094
		.056	.065	.098	.078	.180	.136	.134	.093	.160	1.000
More Than One	2	19	44	40	68	154	129	138	127	142	861
		.022	.051	.046	.079	.179	.150	.160	.148	.165	1.000
	3	80	115	147	153	351	278	285	229	317	1955

NUMBER OF ACCIDENTS

		0	1	2+	Total
One Only	1	848	295	76	1219
		.696	.242	.062	1.000
More Than One	2	629	247	90	966
		.651	.256	.093	1.000
	3	1477	542	166	2185

TOTAL NUMBER OF NON-TRAFFIC ARRESTS

		0	1	2-3	4-5	6 or More	Total
One Only	1	670	164	172	81	134	1221
		.549	.134	.141	.066	.110	1.000
More Than One	2	266	135	151	119	296	967
		.275	.140	.156	.123	.306	1.000
	3	936	299	323	200	430	2188

one or more of the variables. (No information, of course, does not modify the prior probabilities.) The resulting posterior probabilities for being a drunk driver and for being a recidivist drunk driver, given each combination of items of information, were then listed and constitute these prediction tables.

Results for the Samples on Which the Tables Were Generated

Figures 1 and 2 provide information which should help explain what the probability estimates generated by this process mean, at least for the samples from which the conditional probabilities were generated. In Figure 1, the heavy line represents a smoothed curve of the proportion of cases falling in each posterior probability category who were in fact drunk drivers. For example, the dotted lines indicate that of all those whose characteristics on the five predictor variables resulted in a posterior probability of .73, approximately 68 percent were in fact drunk drivers and 32 percent were not. Similarly, of those who had a posterior of .10, about 11 percent were drunk drivers and 89 percent were not. The degree of correspondence between the posteriors and the actual proportions in each category for this sample suggests the degree to which one can have confidence in the posteriors as predictive probabilities. Similar statements and interpretations can be made for Figure 2, in which the proportion of those with particular posteriors on redicidivist drunk driving who were actually recidivists is plotted. The extent to which this correspondence can be generalized beyond the samples on which they are based is a moot question.

How to Use the Prediction Tables

In one view, referring to the accompanying tables as "prediction tables" or as tables of "probability estimates" is the same thing. Predictions can be considered probability statements about future events. If one were to say that a future event will or will not occur, one is merely setting limits on the probabilities one is willing to use: in this case, 1.00 for the condition that it will occur and .00 for the case in which it will not occur. Statements of this kind about the future can be either right or wrong. Statements which allow the use of the whole range of probabilities from zero to one, such as those implied in the accompanying tables, can be reasonable or unreasonable, rather than right or wrong. Selecting the range of probabilities one is willing to use is a matter of choice, and convincing oneself and others that the appropriate selection has been made is a matter of the degree of comfort one has with different levels of uncertainty. The accompanying tables* admit of all levels of uncertainty and should be so interpreted. To use them it is only necessary to find the appropriate index for

* (See Volume II)

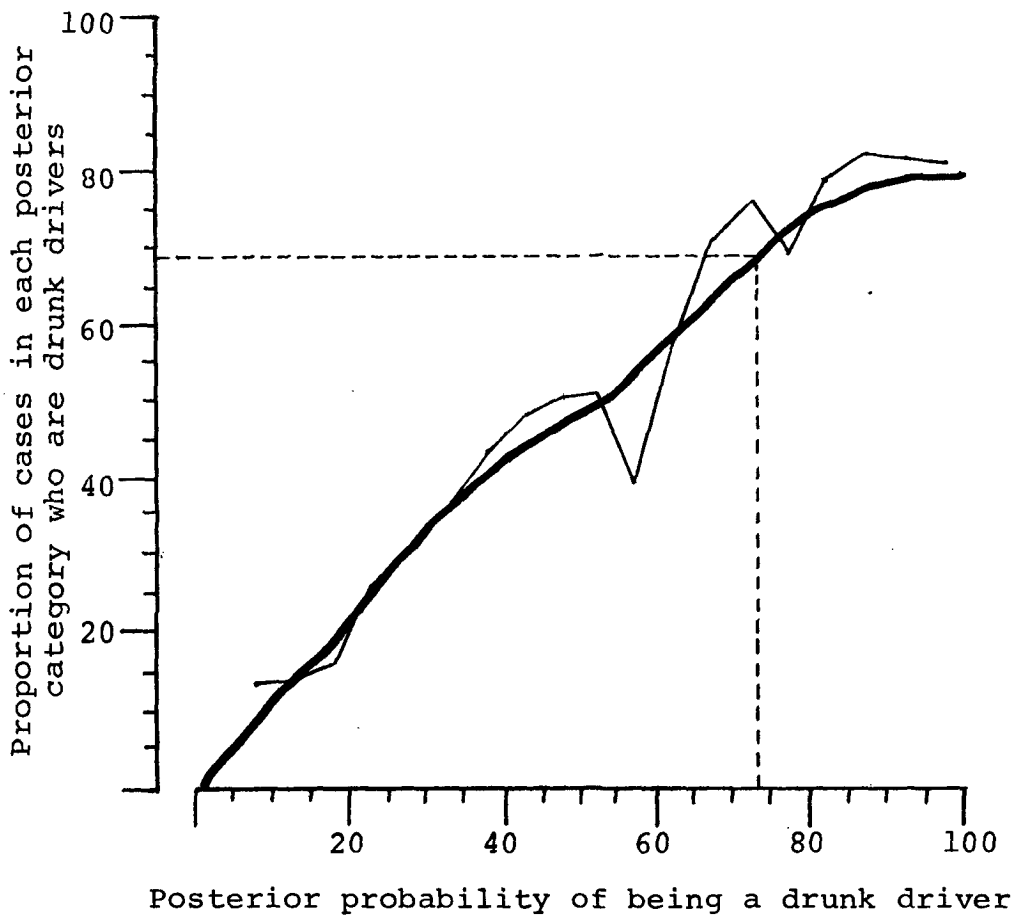

Figure 1. Proportion of Drunk Drivers Correctly Placed by the Probability Model.

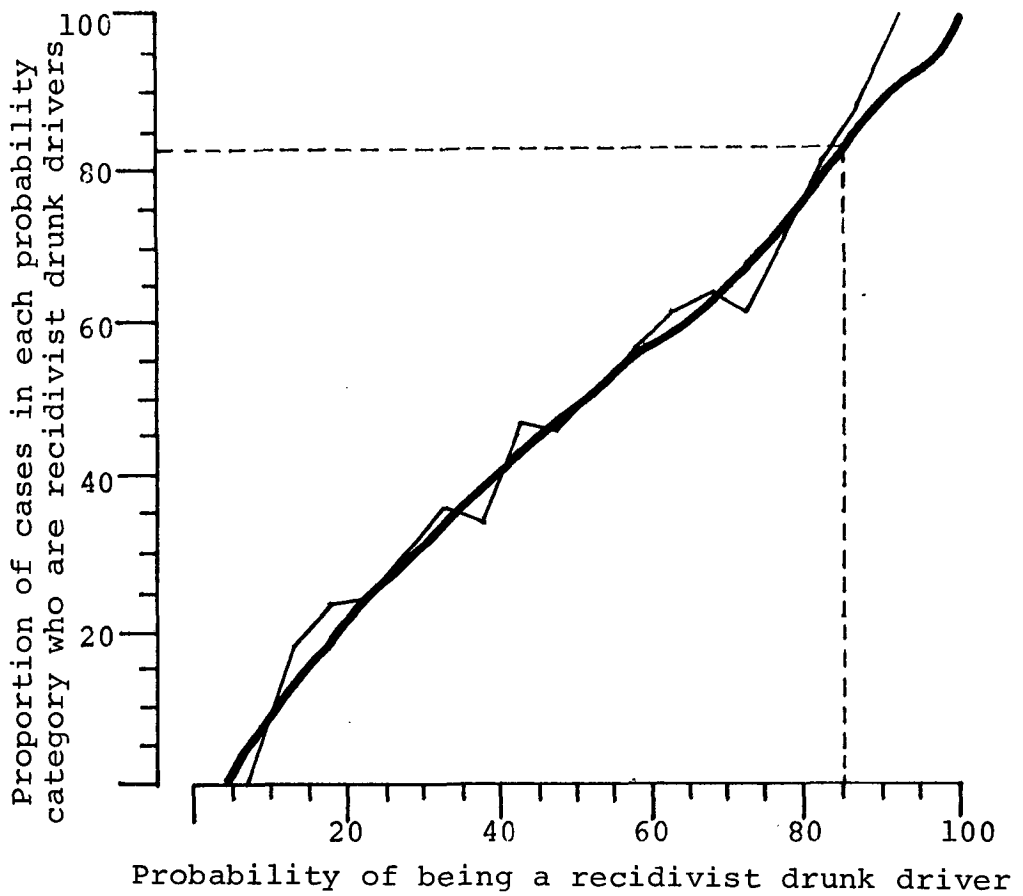

Figure 2. Proportion of Recidivist Drunk Drivers Correctly Placed by the Probability Model.

an individual, either from a general driving population (to predict drunk drivers) or from a drunk driving population (to predict recidivist drunk drivers). The indexes of these tables are made up of digits referring to particular categories on the five variables used to generate the probabilities. The sample form on the following page provides the categories for each variable which define the indexes used. For example, someone who had completed high school (4), had three minor violations on his record (4), was under 21 (1), for whom there was no information available about the number of accidents he had had (0), and had never been arrested (1), would have an index of 44101. The associated probability for being a drunk driver is .495 and for being a recidivist drunk driver (assuming that the individual has already been convicted once for drunk driving) is .134.

Particular caution should be taken in interpreting the probability that an individual is a drunk driver. For example, an individual who had 6 or more arrests but had identical characteristics on the other variables (44105) would have a probability of .845 of being a drunk driver according to these tables. Since these probabilities are based, not on a random sample of the general driving population but on two samples, one of which can be considered a random sample of the general driving population and the other a sample of drunk drivers, the primary utility of these probabilities is in estimating the likelihood that an individual belongs to one or the other of these two classes, or to put it differently, that he has characteristics like those in one or the other of these two classes. The same caution does not apply to the probability estimates for recidivist drunk drivers, in that the conditional probabilities on which they were based were drawn from a random sample of drunk drivers, which is, of course, much more likely to be representative of the population of drunk drivers than the combined sample is likely to be representative of drivers in general.

Interpretation of the Probability Estimates

Probabilities are numerical ways of expressing uncertainty. Sometimes these numbers are based on historical data (as in the case of the probability estimates included in these tables), sometimes they are based on subjective judgments or the combination of subjective judgments (as in the case of odds at the race track), and sometimes they are based on theory (another form of subject judgment) combined with historical data (as in the case of odds that certain combinations of dice will occur). No matter where the numbers come from, their meaning is a matter of individual judgment: the same numbers can mean quite different things to two different individuals, and to the same individual at different times or under different circumstances. If the

VARIABLES USED IN DEVELOPING PROBABILITY ESTIMATES FOR DRINKING DRIVERS

A. Education

0. No information available

1. Grades 1 to 6

2. Grades 7 to 9

3. Grades 10 to 12

4. High school diploma

5. Some college

6. Bachelor's degree

7. Graduate work or professional degree

B. Total Number of Minor Violations
(Excluding all serious violations, felony drunk driving, reckless, misdemeanor drunk driving, hit and run.)

0. No information

1. None

2. One

3. Two

4. Three

5. Four

6. Five

7. Six to nine

8. Ten or more

C. Age

0. No information

1. 21 or under

2. 22 - 23

3. 24 - 26

4. 27 - 29

5. 30 - 35

6. 36 - 40

7. 41 - 45

8. 46 - 50

9. Over 50

D. Number of Accidents

0. No information

1. None

2. One

3. Two or more

E. Total Number of Arrests
(Excluding all reckless and drunk driving arrests.)

0. No information

1. None

2. One

3. Two - three

4. Four - five

5. Six or more

probability is .20 that your automobile will receive a minor scratch in a carelessly laid out parking lot, you might hesitate to park there. If the same probability or odds of 1 to 4 applied to your being killed on a particularly dangerous roadway, you would not only hesitate, you would probably avoid it at all costs. Just as the circumstances would influence the meaning these numbers have for your behavior, so would the source of the probability estimates. If you knew that a local police department had provided these estimates based on careful records, you would have more confidence in them than if you knew they came from a timorous elderly lady from Pasadena who had not ventured beyond her corner store for many years, and on foot at that.

The meaning of probabilities, therefore, is conditioned by what is to be done (what decision will be influenced by them) and where they came from. What decisions will be influenced by these tables is a matter of individual, official, or judicial judgment, for which the present data can provide no guidance. It seems intuitively reasonable, nevertheless, that knowledge that a convicted drunk driver has characteristics which result in a posterior probability of .87 of his being a recidivist, and that in the sample on which the model is based 85 percent of the individuals who received such a probability actually were recidivists, should influence recommendations or dispositions for that individual.

Conclusions

The prediction model has some practical application. The probability tables for drinking drivers and for recidivist drinking drivers are usable by decision makers in assessing the likelihood that specific individuals (with particular combinations of characteristics on the variables on which the model is based) will become either drunk drivers or recidivist drunk drivers. The flaw, so far as decision makers are concerned, is that the items on which the model is based do not include different treatment or sentencing alternatives. If such alternatives could be included in subsequent versions of the model, a tool with direct applicability would be available, a tool whose utility could be directly assessed. Such a model could provide probabilities of success associated with different treatments or sentences and indicate to a decision maker the differential likelihood of a successful outcome. These differences would represent the degree to which the model was contributing to an improved program or to better decisions. The feasibility of implementing such a model in the courtroom or in a treatment or examination center is, of course, a very serious question. The use to which the present prediction model is put

will give some insight into the likelihood that a more sophisticated and practical model will hold sufficient utility for the administration of social and criminal justice.

A FACTORIAL STUDY OF FATAL CRASH DRIVERS

The fatal crash driver (particularly the crash-responsible driver) is considered by many to be an individual with special characteristics that predispose him toward a serious accident. However, the hunt for a profile that is uniquely characteristic of the fatal-accident bound individual will result in relevance to only part of the population. There are probably a number of different biographical profiles and situational patterns that can be ascribed to the fatal driver population. To determine the dominant patterns that existed in a sample of this population was the goal of this study.

The method of factor analysis was used to isolate and identify the primary factors or patterns in the mass of data collected on fatal crash drivers. Although factor analysis is essentially a descriptive technique, the results have implications for prediction and ameliorative action.

The pervasive role of the drinking driver in fatal crashes has already defined one of the dominant groups, if not the most dominant, in this population. However, there is a question whether this group is characteristically different (from a non-drinking group) and more predisposed to serious crash involvement because of the drinking. It is possible that, in the main, drinking correlates and interacts with other variables rather than acts as a causative agent in serious automobile crashes. With this possibility in mind, two factor analyses were performed to compare the factors or patterns derived from a group of fatal crash drivers who had been drinking just prior to the event with the factors from a group of fatal crash drivers who had not been drinking. If heavy drinking, or implied habitual heavy drinking, is a predisposing influence in fatal crashes, then the kinds of factors emerging in the analysis should be different for the drinking group. Most likely, the factors would be dominated by the alcohol-related variables. If the factors for the two groups are similar, then there is reason to believe that there are significant patterns common to both groups in which alcohol plays an enhancing role, but not a necessary one. The third possibility, and the most probable, is that there will be similar and different factors for both groups. In that case, the importance of the differences will have to be judged by the kinds of variables making up the factors and their respective factor weights.

This report first describes the population from which the groups were drawn, and the methodology and variables used in performing the analyses. The interpretation of the factors for the two analyses is then presented, followed by a discussion of the implications of the results.

Fatal Crash Driver Groups

The groups analyzed were made up of the drivers who died as a result of automobile accidents that occurred in the two and one-half year period, January 1966 to July 1968, in Los Angeles County. The total number of deceased drivers according to the Coroner's Report was 1,186. Of this number, 446 had been drinking, as determined by blood alcohol content (BAC). BAC's varied from .02 percent to .45 percent. The mean BAC level was .17 percent with a standard deviation of .08 percent. The entire group of 446 was used in the factor analysis of the "deceased drinking drivers."

It was felt that the remaining 740 deceased drivers with no report of blood alcohol could be reduced by one-half and still offer a sufficiently large sample for factor analysis. By random selection, 375 became the "deceased non-drinking drivers" in the factor analysis. The only intended difference from the previous group was the zero BAC level for this group.

Methodology

An R-type of factor analysis was performed on a common set of 40 variables (except for the BAC variable in the deceased non-drinking group) for each of the two groups and the combined group. The procedures in arriving at this set of variables and the application of the factor-analytic technique are briefly discussed below.

Variables

There were 222 variables in the initial set of data, but these were reduced to 40 variables because of the very low frequencies of occurrence in many of them. Variables such as "crossing or not crossing the center line in the road at the time of the accident," "number of burglary convictions," "number of automobile theft convictions," were too specific and resulted in too few positive entries.

The reduction process consisted of combining variables that were closely associated and of simply eliminating others that could not be combined logically. Even with this reduction procedure, some of the variables have a very uneven distribution or a very high "no response" frequency.

A listing of the 40 variables used in the factor analyses is given in Appendix G. Where appropriate, the scale values for a variable are indicated.

Factor Analysis Procedure

Factor analysis essentially is a method that seeks to identify the factors or patterns that underlie a set of correlations between variables. An elementary kind of factor analysis is performed whenever one inspects a group of correlations to identify clusters of variables that correlate highly with each other. Factor analysis is a systematic, statistical procedure for isolating these clusters of factors and scaling each variable's importance in each factor.

The factor analysis starts with the calculation of correlations between variables on which data have been collected for a specific population. The resulting correlation matrix is then mathematically analyzed to pull out the principal factors that produced the correlations. These factors are then interpreted in terms of the nature of the variables that have high "factor loadings," i.e., are heavily weighted on each factor.

Correlation Matrix. Normality and linearity may not fully characterize these data, but it was assumed that the ruggedness of the correlation statistic used (the Pearson r) would still permit a reliable and meaningful analysis of the correlation matrix. The calculation of the correlation matrix had to take into account the difference in the N that existed among 40 variables because of the "no responses." Computer programs for doing factor analyses usually involve a fixed N in computing the intercorrelation matrix from which the factors are extracted. This problem was resolved by first using a separate variable-N correlation program to get the matrix and then inputting this matrix in the factor analysis program.

Number of Factors to be Interpreted. The first two analyses were made by extracting 20 and 15 factors, respectively. However, there were several non-interpretable factors with too few significant loadings. Since the optimal number of factors to be extracted seems to be a matter of trial and error, it was decided to use 10, 6, 5, and 4 factors in obtaining the final factor matrices. The percentages of total variances represented by these numbers of factors were approximately 55 percent, 40 percent, 35 percent, and 30 percent. Although these are low proportions of the total variance, they probably represent little of the error variance that may be distributed over the later factors and obscure the interpretation.

The four-factor solution for each of the two groups was the most easily interpretated and was presented in a previous report.[1] The six-factor solution appeared to have some additional meaningful elements and is presented in this report.

Results

Identification of the Factors of Patterns

The factors were identified by inspection of the variables that clustered together on each factor (see Appendices H and I). Variables that have factor loadings or weights that are .25 or greater were considered to be significant. The value of .25 was somewhat arbitrary but well above the 5 percent level of significance for a factor loading in view of the relatively large N's of the groups.

The patterns of variables can be clearly named on the first two factors appearing in the list below, criminal record and traffic offenses record. The patterns of variables on the other factors were not easily characterized, but tentative identifications were given to facilitate comparisons.

The factors are presented in broad categories to facilitate the interpretations and the comparisons of the factors for the two groups. The significantly weighted variables that make up each factor are listed in order from the top weighted first to the lowest weighted.

The criminal record and traffic offenses record factors appear as primary patterns in both groups regardless of the presence or absence of alcohol involvement at the time of the fatal crash. The similarity in these factors for both groups is greater than the difference, but certain specific differences are noteworthy.

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[1] Annual Report, July 1970, Drinking Driver and Traffic Safety Project, University of Southern California, for NHSB, Department of Transportation, Contract No. FH-11-7099. The four-factor solutions used in the previous report differ in some respects from the six-factor solutions given here. A sizable proportion of the data on some variables was not processed by the computer for the four factors, and the inclusion of the missing cases in the six-factor solution resulted in some changes in the factors beyond the two primary factors. The criminal records and traffic offenses records factors remain essentially unchanged, indicating their stability.

FACTORS RELATING TO PAST OFFENSES

Deceased Drinking Driver Group

Factor A_1: Criminal Record

1. Serious crimes against person
2. Non-alcohol related arrests
3. Vagrancy (non-drunk)
4. Thefts
5. Sex offenses
6. Crimes - property
7. Narcotics
8. Less serious crimes - person
9. Birthplace
10. Alcohol-related arrests
11. DMV license offenses

Factor B_1: Traffic Offenses Record

1. Habitual violation
2. Speed law offenses
3. Mechanical violations
4. Failure to appear
5. DMV license offenses
6. Moving violations
7. Prior accidents
8. Non-moving violations
9. Age (toward younger)
10. Birthplace
11. Alcohol-related violations

Factor C_1: Drinking Driver Violator

1. Alcohol-related violations
2. BAC (toward higher)
3. Alcohol-related arrests
4. Age (toward older)
5. Birthplace
6. Driving companion (none)
7. Marital status (toward married)

Deceased Non-Drinking Driver Group

Factor A_2: Criminal Record

1. Non-alcohol related arrests
2. Thefts
3. Serious crimes against person
4. Vagrancy (non-drunk)
5. Alcohol-related arrests
6. Crimes - property
7. Birthplace
8. Narcotics
9. Sex offenses

Factor B_2: Traffic Offenses Record

1. Habitual violation
2. Speed law offenses
3. Mechanical violations
4. Moving violations
5. Failure to appear
6. DMV license offenses
7. Age (toward younger)
8. Sex (male)
9. Birthplace
10. Non-alcohol related arrests

Factor C_2: Careless driver - alcohol violations

1. Hour of accident (night)
2. Alcohol-related violations
3. Lighting conditions (darkness)
4. DMV license offenses
5. Prior accidents
6. Race (toward non-Caucasian)
7. Alcohol-related arrests

(Negative weights were shown for "less serious crimes - person" and "sex offenses")

In the criminal record factor, "serious crimes against person," the top-weighted variable for the drinking group, was relatively lower for the non-drinking group. Similarly, "sex offenses" had a higher weight in the drinking group. "Less serious crimes against person" was not significantly weighted for the non-drinking group. There seems to be a slight tendency for crimes against people to be more heavily weighted in the criminal record factor for the drinking group. It is interesting that "alcohol-related" appears as a significant variable in the factor for both groups, but it is more significant that the criminal record factor is defined primarily by non-alcohol related crimes for both groups.

The traffic offenses record factor is practically the same for both groups in the ordering of the highest six variables. The pattern seems to suggest an individual who is a habitual traffic offender, has a record of speed law offenses, is young, and is irresponsible. "Prior accident record" is a significant variable on this factor for the drinking group but not for the non-drinking group. Another difference occurs in that "alcohol-related traffic violations" appears as a low-weighted but significant variable for the drinking group, and "non-alcohol related arrests" appears as a low-weighted but significant variable for the non-drinking group. Although the pattern for negligent driving habits leading to fatal accident involvement was established for the non-drinking group as well as for the drinking group, the "prior accident record" for the drinking group nevertheless indicates that alcohol enhances the vulnerability of the younger negligent driver with respect to a serious or fatal crash. However, the relatively low weights of the above variables indicate that the factor should not be interpreted as differentiating between drinking and non-drinking groups. The similarities are much greater than the differences.

The third factor involving past alcohol-related offenses was different in some respects for the two groups. In the drinking group the factor was named drinking driver violator because it appeared to be determined by the kind of individual who had prior drinking driver convictions and other alcohol-related arrests. His past and present appeared to be steeped in alcohol. The significant weight for the older person on this factor fits in with this kind of individual.

In the non-drinking group, the occurrence of "alcohol-related traffic violations" and "alcohol-related arrests" indicates a similar factor pattern to that described for the drinking group, but with some important differences. The presence of the "nighttime condition" at the time of the fatal crash and the "record of prior accidents" point to the possibility that two factors had merged. One factor may be more like the drinking driver violator, except that this individual had not been drinking just prior to time of the fatal crash; the other factor may simply be the "accident-liable" individual

who is irresponsible or careless in his driving, and who, under nighttime conditions, becomes involved in a fatal crash.

Treating the careless driver-alcohol violations factor as a meaningful single pattern, one gets the picture of a subgroup of individuals who, having acquired a record of alcohol-related violations and prior accidents, abstain from drinking while driving but still are dangerous drivers at night. The reason for this is subject to easy speculation, but perhaps the important implication is that drivers with alcoholic violations and accident records should be restricted to daytime driving (if they are permitted to drive at all).

FACTORS RELATING TO SPEEDING

Deceased Drinking Driver Group

Factor D_1: Speeding and Single Vehicle Crash

1. Crash speed violation
2. Crash responsibility
3. Accident type (single vehicle)
4. BAC (toward higher)
5. Registered owner (yes)

Deceased Non-Drinking Driver Group

Factor D_2: Speeding and Single Vehicle Crash

1. Accident responsibility
2. Crash speed violation
3. Accident type (single vehicle)
4. Distance: crash to home (toward greater)
5. Non-moving violations record (none)

Factor E_2: Freeway Speeding

1. Driver's license (yes)
2. Traffic control (yes)
3. Driving companion (yes)
4. Freeway vs. non-freeway (freeway
5. Lighting condition (daytime)
6. Registered owner (yes)
7. Speed (too fast)
8. Accident responsibility

The second grouping of factors was primarily defined by the element of excessive speed just prior to the fatal crash. No other background or individual characteristics that would give the interpretation of these patterns more depth show up on these factors, except the association with a higher BAC in the drinking group (Factor D_1: Speeding and single vehicle crash). The fact that the same factor pattern occurs in the

non-drinking group indicates that alcohol has an augmentation role for the component of the fatal crash population involved in this pattern.

The lack of descriptive biographical variables in these factors suggests that there are variables not studied in the present investigation that may be significant determiners of this pattern of fatal crash drivers. The nature of these missing variables can only be hypothesized at the present time. Some of them may pertain to temperament traits and recent stressful incidents. The significant tendency toward "single-vehicle crash (hitting a fixed object or out of control)" suggests that some drivers may have been governed by strong emotional impulses (perhaps suicidal) in driving their cars at dangerous speeds. It is possible that alcohol was used in the drinking group to boost their courage in such a situation.

This speculation goes considerably beyond the data, and a more parsimonious interpretation would be simply that "this factor represents a group of speeders." However, such an interpretation ignores the importance of what is missing. If the people represented by the factor were merely incurable speeders, the "previous speed-law violations" and probably other traffic violation variables would have had significant loadings here. A factor analysis on data including information on recent significant personal events and states of mind would clarify this issue.

Factor E_2: Freeway speeding was interpreted primarily from the lower ranked variables listed. Here again, it is possible that data not included in this analysis could have clarified the pattern. At present, this factor represents those individuals who were "solid citizens" traveling on freeways during the day, but driving in a manner that was judged to be too fast and directly responsible for the fatal crash that occurred.

The high weight for "possession of a driver's license" probably arises from its greater statistical consistency than is evidenced by the other variables appearing on the factor. It does not offer a central theme for defining the factor, but it does point very strongly to the type of individual involved. Habitual traffic offending by the subgroup represented in this factor is contra-indicated and leaves unanswered the means of possible control to curb speeding and other dangerous practices on the freeways.

FACTORS RELATING TO DRIVERS' CHARACTERISTICS

Deceased Drinking Driver Group

Factor E_1: Young, Single, Weekend Driver

1. Marital status (single)
2. Driver's license (no)
3. Age (toward younger)
4. Race (toward non-Caucasian)
5. Speed (too fast)
6. Weekday vs. weekend (weekends)
7. Driving companion (yes)

Factor F_1: Low-Level Occupation Older Car

1. Lighting condition (daytime)
2. Hour of crash (daytime)
3. Occupation (lower levels)
4. Age of car (older)
5. Freeway vs. non-freeway (non-freeway)
6. Registered owner (no)

Deceased Non-Drinking Driver Group

Factor F_2: Young, Single, Weekend Driver

1. Age (toward younger)
2. Marital status (single)
3. Occupation (lower levels)
4. Weekday vs. weekend (weekends)
5. (Barely significant negative weight for variable 34)

Factor F_2 seems to be a combination of the two factors (E_1 and F_1) appearing in the drinking group. However, the "lower level occupation" variable in F_2 may really reflect the student status of the young, single individuals rather than the unskilled occupation level implied in F_1.

The pattern of the young, single joyrider, driving too fast and recklessly, usually on the weekend, is well known, but the presence of the factor in the non-drinking group indicates that alcohol is not always part of the pattern. The "record of narcotics violations" did not appear as a significant variable in either group. However, more information regarding the use of drugs by fatal crash drivers should be collected before ruling this element out of any pattern other than criminal record.

The appearance of "non-Caucasian" drivers on factor E_1 does not mean that young non-Caucasians are predominant in this subgroup. The fatal non-Caucasian group of all ages is not more than one-fifth the size of the total Caucasian group, but the proportion of young, single individuals of the non-Caucasian group is probably greater than the proportion of young, single individuals of the total Caucasian group. This could account

for the significant weighting "toward non-Caucasian" although in absolute numbers it could be much less. The tendency for non-Caucasian fatal crash drinking drivers to be overrepresented in this age group and in this factor does have predictive implications, however.

Factor F_1: Low-Level occupation - older car is characterized by the unskilled or semi-skilled worker (perhaps unemployed), driving an older car, who had been drinking and became involved in a fatal crash during the day on a surface street. The immediate elements contributing to a fatal crash most likely were the intoxicated state of the driver and the mechanical condition of the older car. Other elements such as deficient driving skill, language or reading problems, and feelings of frustration were possibly present but can only be conjectured. The significant weight for "daylight occurrence" does not rule out the fatal crash occurrence at night for this individual (i.e., intoxicated and driving an older car); it simply means that those fatal crashes that do occur during the day involve a significant subgroup that can be distinguished by the characteristics weighted in the factor.

Discussion

The results of the factor analysis of a deceased drinking group and a deceased non-drinking group, respectively, are summarized first and are followed by a general discussion of their implications.

Factors relating to past offenses: There are at least three important factors in both groups that emerge from the records of criminal violations, traffic violations, and alcohol-related violations on or off the roads. Two of the factors are quite similar for the two groups, indicating the existence of patterns of behavior that are potentially dangerous and are not necessarily dependent on the triggering effect of drinking. A third factor does point to the dangerous pattern of past alcohol-related violations for both groups. In the case of the drinking group, high BAC's potentiated the fatal crash even without necessarily being related to nighttime or speeding conditions.

Factors relating to speeding: One factor is common to both the drinking and non-drinking groups. This factor has two main components: speed violation just prior to the crash, and a single-vehicle type of accident. The drinking group is further characterized by a tendency toward a higher blood alcohol level. The absence of any other defining elements in either group encourages the hypothesis that there are certain systematic variables not included in this investigation which would have made the factor more complete. It is hypothesized further that these variables have to do with emotional states. This notion is reinforced by the absence of significant prior speed violation or accident record variables on the factor.

Similarly, a second speeding factor that appears in the non-drinking group (freeway speeding) seems to be incomplete because it lacks any real predisposing variables. There may be correlated circumstances such as commuting distance, holiday traffic, and/or personality traits (e.g., high need for achievement or low tolerance for frustration) that helped determine this factor pattern.

Factors relating to drivers' characteristics: The only factor that can be clearly associated with immediately identifiable driver's characteristics is the young, single, weekend driver. Drinking or not drinking, the subgroup represented in this factor is a distinctive part of the fatal crash population. More information, of course, is needed to predict those young, single drivers who are most likely to drive recklessly and end up in a serious crash. Another factor in the drinking group appears to be related to a driver characteristic (low-level occupation-older car), but the relative importance of occupational status itself is not clear. There is probably an interaction of the driver's status in life, state of mind, condition of the car, driving ability, and daytime drinking that forms a more complete pattern.

Implications

Factor analysis is a powerful method for isolating the underlying dimensions and patterns in a body of data, but it is limited by the nature and extent of the data that are used. The interpretations of the factors found in the analysis of fatal crash driver groups sometimes went beyond the manifest patterns so that more specific hypotheses could be formulated for further investigation. There are, however, several recommendations arising out of the analysis that can be made for consideration in traffic fatality programs.

1. The drinking driver involved in a fatal crash should not be regarded as a distinctively different type from the non-drinking driver in the fatal crash population. The similarity of the factor patterns (except for the drinking variable) is quite striking. Applications of effort should be directed toward all types of drivers likely to become involved in a serious crash, not just those with past drinking offenses.

2. Heavy drinking prior to the fatal crash was an important (perhaps decisive) element in at least two patterns found in the factor analysis of deceased drinking drivers. A record of past alcoholic violations was also found in one of the patterns for the deceased non-drinking drivers. The evidence is quite clear that a way of life that involves heavy use of alcohol is potentially dangerous even when there is no drinking prior to driving. Programs directed to-

ward the convicted drinking driver should, perhaps, increase the emphasis on controlling driving habits rather than drinking habits. A record of prior accidents and traffic violations should be cause for limiting the driving of a convicted drinking driver completely or to daytime driving only. The fact that many of these drivers violate their license restrictions points to the need for expanding the programs that help the convicted drinking driver with his transportation problems.

3. Excessive speeding was an important causal element in fatal crashes whether or not the driver had been drinking. The use of the speeding violations record as a means of identifying those who would be most likely to be in the subgroup that drives too fast prior to the fatal crash would only be a part-way measure. At least two (possibly three) patterns emerged in which speeding was a causal or contributing element in the crash, but in which previous speed offense records were not significant. The means of predicting this type of behavior pattern lies in the immediate situational, temperament, and stress variables that are involved in the fatal crash context. Until more definitive studies are made, the focus can only be on policing speeding excesses even more stringently. Personal appearance and no previous speed violations should not be reasons for modifying penalties.

4. The emergence of the young, single (drinking or not drinking) driver pattern was not surprising. However, it must be remembered that this was only one of the several patterns that emerged for the fatal crash groups. It would be difficult to legislate against being young and single, or even for restricting the licensing of this group. The control of drinking will not eliminate this pattern either. The heavier policing of highway and street traffic, especially at night and on weekends, constitutes a short-term program, and massive education programs for the young driver in general and counseling for the young traffic violator specifically should be implemented. It is recognized that such programs are already in existence or in planning; the recommendations here are meant to be supportive of such programs, while urging the implementation of programs when they do not exist in areas.

5. The deceased drinking driver subgroup that was characterized by a low-level occupation and by driving an older car presents the same problem as the young, single subgroup. One cannot restrict the driving

privileges of unskilled or unemployed persons or even of a person driving an older car. However, checking the mechanical condition of all cars used by all groups would be one partial measure to reduce subsequent vehicular fatalities. Since this subgroup tends to get involved in a fatal crash on a surface street and during daylight hours, driving skills, including knowledge of traffic rules and ability to understand traffic signs, could be checked more stringently. Drinking during the day is certainly a contributing element, but the control of daytime drinking is practically unenforceable for individuals who believe that they have to drink to get through the day.

Further Studies and Methods

The factor-analytic technique should be applied to additional groups, and especially recent groups of fatal crash drivers in selected areas of the country. It is necessary, however, to collect more personal data about the fatal crash driver from people who knew him and from his work, health, and insurance records.

A systematic comparison of patterns, variables, and groups should be made within the factor analysis and across several factor analyses. In this way, those dimensions that are common to all fatal crash driver groups and those profiles that are specific to special groups could be identified.

Factor scores can be useful in providing indices for predicting involvement in each of the fatal crash patterns. Factor scores are calculated by applying factor weights to the raw data for each individual. The identification of factor patterns and individual factor scores can be of great value in action programs for traffic safety.

APPENDIX A -- PROFILE QUESTIONNAIRE

CARD 13 (1-2) GROUP _____ (3) FORM 7 (4) I.D. _____ (5-8)

Name _____ Birthdate __ __ / __ __ / __ __ (9 10 / 11 12 / 13 14)

Age _____ (15) / Sex _____ (16)

1. What is your marital status?

_____1) Married, living with spouse

_____2) Married, not living with spouse (Separated this year_____ 1-2 years ago_____ 3 or more years ago_____) 17

_____3) Divorced (this year_____ 1-2 years ago_____ 3 or more years ago_____)

_____4) Widowed (this year_____ 1-2 years ago_____ 3 or more years ago_____) 18

_____5) Never married

2. Number of times married_____ 19

3. Education completed:
_____1) Grade school
_____2) High school
_____3) 1 or 2 years of college
_____4) 3 or more years of college 20
_____5) Trade school

4. How many moving traffic violations other than drunk driving in the last 3 years?_____ 21-22

5. How many convictions have you had for drunk driving (do not include the present one)?_____ 23

6. What year was the last drunk driving conviction?_____ 24

7. How many automobile accidents have you had in the last 10 years?_____ 25-26

8. How many of these caused over $200 worth of damage to the car? _____ 27-28

9. How many times have you been arrested for other than traffic violations since 1965?_____ 29-30

10. About how many drinks can you handle in one sitting? (Circle approximate number.) 31-32

1 2 3 4 5 6 7 8 9 10 11 12

11. How often do you drink in the morning?
    _____1) Often
    _____2) Once in a while
    _____3) Seldom
    _____4) Never
    33

12. Do you think that liquor is cutting into your budget?
    _____1) Very much
    _____2) Some
    _____3) Not very much
    _____4) Not at all
    _____5) Do not drink
    34

13. How often do you usually drive after drinking at least 2 drinks of alcohol or 3 beers?
    _____1) Daily
    _____2) Several times a week
    _____3) On the average of once a week
    _____4) On the average of every two weeks
    _____5) On the average of once a month
    _____6) 5 or 6 times a year
    _____7) Once or twice a year
    _____8) Never
    35

14. Has your spouse or a close friend ever said anything about your drinking or been worried or upset about your health or money problems because of it?
    _____1) Often
    _____2) Sometimes
    _____3) Seldom
    _____4) Never
    _____5) Never married
    36

15. How would you describe your present health?
    _____1) Very good
    _____2) Good
    _____3) Fair
    _____4) Poor
    37

16. How much stress and strain is there in your present job?
    _____1) A lot
    _____2) Some
    _____3) Very little
    _____4) None at all
    38

Address of someone who will always know your whereabouts:

Name_____ Relationship_____

Address_____ Phone_____

R_____ T_____ Set 1 Format 09
76 77 78 79-80

APPENDIX B

Development of the Classification Profile for the Countermeasures Project

A model was developed to classify drunk drivers as to recidivism potential. Classification is based on several assumptions: 1) the first offender who will not recidivate can be distinguished from the potential recidivist on the basis of specific criteria; 2) these criteria will remain stable over time because of the basic consistency of personality and behavioral patterns of individuals; 3) such patterns, while not holding for every individual case, are emergent in the analysis of a large sample; and 4) the answers to questions by the person will be relatively accurate (pencil and paper questionnaire) and can be used in developing the potential "risk" criteria.

The model indicates the probability of overlap between groups; i.e., some individuals who do not recidivate will possess those characteristics exhibited in the recidivist population and vice versa. It is the intent of this project to reduce the degree of overlap to a minimum.

The actions below were taken in developing a classification scheme for recidivists:

1. Questions found to discriminate between types of drunk driving offenders (i.e., first offenders, second, and third offenders) were placed into the recidivist classification questionnaire.

2. Information obtained through questionnaire administration in the court was checked against the DMV and CII reports on each individual to determine the reliability of the responses.

3. A stepwise regression program was run to obtain regression weights for selected variables for both the subjective questionnaire data and the subjective responses to arrest and traffic information (step 2).

4. The regression determined weights along with subjectively determined weights were used to determine the degree of prediction of types of drunk driving offenders categories.

5. A final set of recidivist classification questions was compiled based on that weighting system which gave the best differentiation.

6. According to the distribution of scores for all individuals, a low risk category (probable nonrecidivist), a high risk category (probable recidivist), and a high high risk category (chronic recidivist) were devised.

As described above, the classification of potential recidivism was attained through the use of a subjective (questionnaire weighting system and an empirical (DMV, CII) weighting system derived from a stepwise regression program using answers to demographic, criminal and traffic, and alcoholism questions. The scores were based on variables found to be significant in the prediction model study described by Didenko, 1970.

The variables listed below discriminated between the general driver population and drunk drivers and were used in calculating the risk score. The calculation is dependent upon the response to the question and the "weight" was determined by the linear regression analysis.

Scoring Scale for Risk Level

Score	Weight	Code	Questions
		Actual Number	Total Number of traffic violations other than drunk driving in last 3 years.
_____	2		
		Actual Number	Number of times arrested for violations other than traffic in the past 5 years.
_____	2		
			What was the year of your last drunk driving conviction?
	6	a)	3 years or less ago
_____	4	b)	more than 3 years ago & 6 years or less
			How would you describe your present health?
	1	a)	very good
	2	b)	good
	3	c)	fair
_____	4	d)	poor
			How often do you drink in the morning?
	2	a)	often
	2	b)	once in awhile
	0	c)	seldom
_____	0	d)	never
			Do you think that liquor is cutting into your budget?
	1	a)	very much*
	1	b)	same
	1	c)	not very much
	0	d)	not at all
_____	0	e)	do not drink
			Has your spouse or a close friend ever said anything about your drinking or been worried or upset about your health or money problems because of it?
		a)	often
		b)	sometimes
		c)	seldom
		d)	never
_____	_____	e)	never married

* Omitted

Score	Weight	Code	Question
			How often do you usually drive after drinking at least 2 drinks of alcohol or 3 beers?
	8	a)	daily
	7	b)	several times a week
	6	c)	on the average once a week
	5	d)	on the average of every two weeks
	4	e)	on the average of once a month
	3	f)	5 or 6 times a year
	2	g)	once or twice a year
	1	h)	never
Sum of Weighted Score			

Risk Category

Scale	Title	Sum of Weighted Score
Risk 1	Low	0-15
2	High	16-31
3	Chronic High	32+

APPENDIX C

Synopsis: Content of Problem-Centered Group Therapy Meetings*

Session I

This meeting included a discussion of the circumstances surrounding each individual's arrest for drinking and driving and provided an opportunity to discuss his drinking pattern, feelings about arrest, reactions of family members or others, previous experiences with police, jail, etc. Subjects were encouraged to explore their drinking and driving behavior pattern and their reactions to arrest, to conviction and to this study, as well as make tentative suggestions for altering their behavior.

Session II

The leader initiated a discussion of the effects of alcohol on intellect, body function, mental alertness, driving practices, etc. Included was a discussion of the amount of alcohol which a person can drink without impairment of his ability to drive safely and of the time it takes to assimilate and metabolize alcohol.

The session also included a discussion of the different effects of drinking on people, depending upon personality, mood, and physical state, and attempted to relate the drinking, the psychological and the physiological state to driving behavior.

Session III

The laws of California concerning drinking and driving were discussed, including the penalties which may be incurred while "driving under the influence of alcohol." As with the other sessions, persons were encouraged to explore their attitudes toward these laws and to find ways of living with and within them.

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* Schaeffer, Barbara, "Countermeasure Effort - Design Modification of Countermeasures Effort Phase II Plan, Drinking Driver and Traffic Safety Project, September 1969 (unpublished-revised).

Session IV

The role of stress in drinking and alcoholism problems, the kinds of stresses people are under in our society, and how they handle these stresses were discussed. The leader encouraged group members to explore their feelings and behavior on the use of alcohol as a means of stress control.

Session V

A continuation of Session IV, where the leader attempted to involve the group members in the discussion of the particular stresses they feel to find alternatives and to relate these changes to drinking or driving performance. This session included a discussion of community resources available for help.

Session VI

Exploration of the magnitude of the drinking driving problem in terms of costs to the public for arrests and convictions, personal costs in terms of time, money, embarrassment, etc., and the relation of drinking driving to fatal and injurious accidents. The leader provided statistical material relating mortality to frequency of accidents in drinking and nondrinking states, etc.

Session VII

The group leader initiated a discussion of some practical alternatives: to avoid driving when intoxicated or to avoid becoming intoxicated.

The leader attempted to involve the group in arriving at a decision to try to change certain behavior so that they would not be arrested again or have an accident.

Session VIII

A summary and recapitulation by the group of what had been discussed, what impressed them most, and what suggestions for change had been offered by group members. Group members were helped to make a list of behaviors they would like to change and which they believed would minimize the danger of arrest or accident. The leader attempted to reinforce the group decision (Session VII) to try out different behaviors which had been suggested and appeared to have group support.

APPENDIX D

Synopsis: Films Used in Four Film-Lecture Series

Survey 62

Produced by: National Broadcasting Company

An in-depth look at the effects of alcohol on reaction time, judgment, visual acuity as measured by various psychomotor and sensory instruments. An officer explains the "police road test" for intoxication. An interview with the parents of a boy killed by a drinking driver is included.

None for the Road

Produced by: Cahill & Associates

The dramatization of a social drinker, in the first person, who "accidently runs into a child. Presents the consequences of loss of judgment and reaction control due to ingestion of alcohol.

The Bottle and the Throttle

Produced by: Cid David Productions

Presents drinking in a social situation attended by young adults and the effects of drinking on the probability of accidents.

Highball Highway

Produced by: Cahill & Associates

A dramatization of what happens to the personality when an individual drinks and how it affects driving abilities.

The Final Factor

Produced by: The AAA Foundation for Traffic Safety

Shows how emergency situations develop from a build-up of commonplace factors until that one-too-many "final factor" results in accidents. Shows five separate accidents, each resulting from a combination of inattention, poor car care, improper signaling, and other factors.

General Comments on Films

The films on traffic safety and alcohol presently available were produced during the era when the emphasis was on the social drinker as the highway menace. Not reflected is the change of focus to the problem drinker and the alcoholic as the major single cause of accidents as shown through current research. For this reason, the films are not totally adequate in providing current information or as a medium where a member of the drunk driving audience might identify himself. The films were therefore utilized only to trigger discussion related to personal problems, causes of accidents, and drunk driving, and a general discussion of laws and safety measures related to drunk driving and accidents.

DO NOT WRITE IN THIS SPACE	1. CARD NUMBER	2. GROUP	3. FORM	4. NUMBER

APPENDIX E

CONFIDENTIAL

INFORMATION AND ATTITUDE SURVEY

This questionnaire is part of a study on traffic safety conducted by the University of Southern California. All information will be held strictly confidential. Please answer each question carefully. Your cooperation is greatly appreciated.

DATE_____

NAME_____
Last First Middle

ADDRESS_____
Number Street City Zip Code

Please check: ____1) Male ____2) Female Age _____

PART I

Below, you will find a number of statements about alcohol, and the effect of alcohol on the body and on driving. If the statement is correct in your opinion, check "True". If the statement is incorrect in your opinion check "False".

True	False		
____	____	1.	Alcohol is a stimulant.
____	____	2.	The amount of alcohol in the blood depends solely on the amount you have drunk.
____	____	3.	A heavy person can drink slightly more alcohol than a thinner one without becoming intoxicated.
____	____	4.	You can always detect alcohol on a person's breath.
____	____	5.	You will get as drunk on beer as by drinking the same amount of alcohol in stronger drinks.
____	____	6.	Small amounts of alcohol may sharpen your driving skills.
____	____	7.	Alcohol improves your vision.
____	____	8.	Even a small amount of alcohol in the blood tends to make you perform certain tasks more poorly than if no alcohol were present.
____	____	9.	You will get drunker by switching drinks than by taking the same amount of alcohol in one form, such as bourbon only.

___ 10. The law says that you can receive a jail sentence or a large fine for drinking and driving, even on a first conviction.

___ 11. Vision is generally poorer after drinking alcohol.

___ 12. The amount of alcohol in the blood may be affected by body weight, or time since eating.

___ 13. Small amounts of alcohol makes your reaction quicker.

___ 14. The ability to judge distance is affected by alcohol.

___ 15. Loss of judgment and self-control occurs before there are obvious symptoms of intoxication.

___ 16. Drinking water in the morning after you have been drunk the night before will make you drunk all over again.

___ 17. Your coordination is usually improved by small amounts of alcohol in the blood.

___ 18. Alcohol decreases your ability to respond quickly to an unexpected driving situation.

___ 19. Because it loosens you up, a few drinks might improve your total driving behavior.

___ 20. The amount of alcohol in the blood can be correctly estimated by knowing only the amount of alcohol a person has drunk.

___ 21. When a person is intoxicated he thinks less clearly and has less self-control than normally.

___ 22. Alcohol often makes drivers feel over-confident at the same time that their judgment and reactions are poorer.

___ 23. A blood alcohol level of 0.10% is sufficient to cause you to be charged with drunk driving in Los Angeles.

___ 24. Alcohol depresses the central nervous system and is a member of the anaesthetic series of drugs.

___ 25. With 0.25% of alcohol in the blood , you are probably very drunk.

True	False		
_____	____	26.	California law says that a motorist with 0.10% or more blood alcohol content, is presumed to be legally drunk.
____	____	27.	Alcohol in small quantities, like a couple of drinks, makes a person more alert and quicker to react.
____	____	28.	A person can have as much as 0.15% of alcohol in blood and still drive normally.
____	____	29.	The penalty for a first drinking and driving conviction can be as much as 30 days in jail or not less than $250 or more than $500 fine.
____	____	30.	A person may refuse to take a blood test or breath test when asked to by an officer, without any penalty.
____	____	31.	Alcoholism is a disease which can be controlled.

32. The alcohol in two average highballs will take approximately 1 2 3 4 5 6 7 hours to disappear from the body.
(circle one)

33. Alcohol is involved in approximately 25% 30% 50% 80% of traffic fatalities in Los Angeles County.
(circle one)

34. There is a mandatory 2 5 7 9 day jail sentence for a second drinking and driving offense.
(circle one)

35. A person weighing 150 pounds might be intoxicated with as few as 1 2 3 4 5 6 one-ounce shots of whiskey.
(circle one)

36. Alcohol is a stimulant, depressant to the central nervous system.
(circle one)

PART II

Below, you will find groups of three statements which represent some of the ways people feel about a number of subjects. Please circle the letter of the statement in each group which most nearly expresses your feeling, attitude or belief.

This is a study which is trying to understand how a great many people feel about these things, so please try to answer as honestly as you can.

38. (Circle One)

A. One should never drink anything and drive.

B. Two or three beers or a couple of normal highballs will not usually affect driving safely.

C. A person can usually drink fairly large quantities of alcohol and still drive safely.

39. (Circle One)

A. I never, or almost never, drink enough to feel my driving is not safe.

B. I have sometimes felt that I have drunk a little too much to drive safely.

C. I often feel I have drunk too much to drive safely.

40. (Circle One)

A. I do not feel I need to change anything about my present drinking and driving habits.

B. I could change some things about my present drinking and driving habits, and be better off for it.

C. I am very dissatisfied with my present drinking and driving habits, and need to change a great deal.

41. (Circle One)

A. If we had stricter laws we would have less crime.

B. Laws are for the protection of people and, in general, they seem fair and reasonable.

C. Laws are too strict now and most of them are unreasonable and unnecessary.

42. (Circle One)

A. The police are doing a good job and are reasonable and fair.

B. The police are usually reasonable, but they sometimes take advantage of their authority.

C. The police are generally unreasonable and mean and they go out of their way to make trouble in any way they can.

43. (Circle One)

A. Drinking and driving is a dangerous practice and a very important factor in highway accidents.

B. Drinking and driving is sometimes a factor in highway accidents.

C. There are many more important causes of highway accidents than drinking and driving.

44. (Circle One)

A. When I drive, I am always aware of trying to drive safely and obeying all the safety rules.

B. When I drive, my mind sometimes wanders to other things, which makes me less aware of the way I'm driving.

C. When I drive, I don't often think about it, because driving is automatic for me.

45. (Circle One)

A. We should always obey the law.

B. We should obey most laws, but occasional minor infractions are unavoidable.

C. There are many useless laws which unnecessarily interfere with personal freedom, and should not be obeyed.

46. (Circle One)

A. I think the amount and frequency of my drinking is normal.

B. I feel I may occasionally drink too much.

C. I feel I have problems with alcohol.

PART III

On the following pages you will find a number of statements which reflect some of the goals people have for themselves and their lives.

Each person is different in how satisfied or dissatisfied he feels about his own situation. For example, a person might feel very unhappy with his job and very satisfied with his marriage. For someone else, it might be the other way around. There are no right or wrong answers. Try to be as honest as you can.

Please circle the letter of the statement which most nearly expresses how you feel in each of these areas.

47. A harmonious family life - peaceful, friendly feeling between family members. A pleasant home atmosphere.

    A. satisfied
    B. moderately satisfied
    C. dissatisfied

48. A happy marriage - love, stability, not too much friction in your marriage.

    A. satisfied
    B. moderately satisfied
    C. dissatisfied

49. Able to perform good work - respected for your abilities on your job. Make a contribution to your field of work.

    A. satisfied
    B. moderately satisfied
    C. dissatisfied

50. Work enjoyment - you like your job, and have pleasant relations with people you work with.

    A. satisfied
    B. moderately satisfied
    C. dissatisfied

51. Acceptance by others - you feel generally liked and accepted by most people, have friends and are not lonely most of the time.

    A. satisfied
    B. moderately satisfied
    C. dissatisfied

52. Vacations and leisure - travel and rest are possible. You have time to spend with the family and on hobbies or interests.

A. satisfied
B. moderately satisfied
C. dissatisfied

53. Health - freedom from worry over the health of yourself and family members. Physically able to do what you need to and have to do.

A. satisfied
B. moderately satisfied
C. dissatisfied

54. Financial security - few or no desperate money worries. Income is sufficient to care for the basic physical needs of yourself or your family.

A. satisfied
B. moderately satisfied
C. dissatisfied

55. Self-satisfaction - a general feeling of liking yourself, and feeling you are O.K.

A. satisfied
B. moderately satisfied
C. dissatisfied

56. Personal adequacy - the feeling that you have the ability within yourself to master obstacles, and to achieve your goals.

A. satisfied
B. moderately satisfied
C. dissatisfied

APPENDIX F

BIBLIOGRAPHY

Berger, Raymond M. "Factor Analysis of Fatal Crash Drivers" in Drinking Driver and Traffic Project, Annual Report 1970, University of Southern California, Public Systems Research Institute, Chapter 6, 1970.

Coppin, R. S. A Controlled Evaluated of Group Driver Improvement Meetings, State of California, Department of Motor Vehicles, October 1961.

Coppin, R. S., W. C. Marsh, and R. C. Peck. A Re-evaluation of Group Driver Improvement Meetings, State of California, Department of Motor Vehicles, January 1965.

Coppin, R. S., R. C. Peck, A. Lew, and W. C. Marsh. The Effectiveness of Short Individual Driver Improvement Sessions, State of California, Department of Motor Vehicles, October, 1965.

Coppin, R. S., A. Lew, and R. C. Peck. The 1964 California Driver Record Study, "The Relationship Between Types of Convictions and Accidents," Part 7, State of California Department of Motor Vehicles, March 1966.

Coppin, R. S. and R. C. Peck. The 1964 California Driver Record Study, "The Prediction of Accident Involvement Using Concurrent Driver Record Data," Part 8, State of California Department of Motor Vehicles, January 1967.

Coppin, R. S., R. S. McBride, and R. C. Peck. The 1964 California Driver Record Study, "The Prediction of Accident Involvement from Driver Record and Biographical Data," Part 9, State of California Department of Motor Vehicles, April 1967.

Didenko, Oksana R. "Descriptive Report of Drinking Drivers and DMV Population," Section III, the Drinking Driver and Traffic Safety Project Annual Report, University of Southern California, Public Systems Research Institute, July 1969.

Didenko, Oksana R. "The Drinking Driver Classification and Prediction Model," in Drinking Driver and Traffic Project Annual Report 1970, University of Southern California, Public Systems Research Institute, Chapter 3, 1970.

Drinking Practices Study, State of California Factors Related to Amount of Drinking in an Urban Community. Supplement to Report #6, State of California, reprinted, 1967, Mental Research Institute of Palo Alto, California, 1963.

Foley, Donald. "Urban Daytime Population: A Field for Demographic-Ecological Analysis," Social Forces 32 May pp. 323-330, 1954.

Highway Patrol, State of California. Report of Fatal and Injury Motor Vehicle Traffic Accidents, State of California Transportation Agency, 1966.

Thomas, J. Morgan. "Automobile Crashes and Stress: Discussion and Implications drawn from the Relevant Literature." University of Southern California, Public Systems Research Institute, 1970.

Thomas, J. Morgan and Chang Kun Hyun. "A Comparison of Drinking Fatality Population and a Convicted Drunk Driver Sample," in Drinking Driver and Traffic Project Annual Report, University of Southern California, Public Systems Research Institute, Chapter 5, 1970.

APPENDIX G

Factor Analysis of Deceased Drinking Driver Group

Table of Significant Factor Loadings

Variables	Factors					
	A_1	B_1	C_1	D_1	E_1	F_1
1. Sex						
2. Marital Status			.25		-.65	
3. Age		-.29	.42		-.44	
4. Birthplace	.42	.28	.38			
5. Registered owner				.25		-.27
6. Occupation						-.45
7. Age of car						.45
8. Driving companion			-.35		.25	
9. Habitual violator		.70				
10. Negligent operator		.52				
11. Driver's license					-.54	
12. Distance: crash to home						
13. Crash speed violation				.74		
14. Crash responsibility				.66		
15. Accident type				-.63		
16. Weekday vs. Weekend					.26	
17. Hour of accident						-.60
18. Freeway vs. non-freeway						-.39
19. Traffic control						
20. Lighting condition						-.69
21. Speed (fast vs. slow)					.28	
22. Blood Alcohol Level			.52	.31		
23. License violations	.25	.58				
24. Non-moving violations		.40				
25. Speed violations record		.66				
26. Prior accidents		.41				
27. Moving violations		.56				
28. Mechanical violations		.59				
29. Alcohol-related violations		.26	.59			
30. Failure to appear		.58				
31. Theft arrests	.64					
32. Sex arrests	.63					
33. Serious crimes-person	.74					
34. Less serious crimes-person	.43					
35. Crimes-property	.62					
36. Vagrancy/disorderly conduct	.64		.26			
37. Alcohol-related arrests	.40		.50			
38. Narcotics arrests	.60					
39. Non-alcohol related arrests	.81		.27			
40. Race					.43	

APPENDIX H

Factor Analysis of Deceased Non-Drinking Driver Group

Table of Significant Factor Loadings

Variables	Factors					
	A_2	B_2	C_2	D_2	E_2	F_2
1. Sex		.28				
2. Marital Status						-.64
3. Age		.31				-.68
4. Birthplace	.53	.26				
5. Registered owner					.68	
6. Occupation						-.56
7. Age of car					.51	
8. Driving companion					.71	
9. Habitual violator		.77				
10. Negligent operator						
11. Driver's license					.81	
12. Distance: crash to home				.41		
13. Crash speed violation				.66		
14. Crash responsibility				.69	.28	
15. Accident type				-.62		
16. Weekday vs. Weekend						.29
17. Hour of accident			.62			
18. Freeway vs. non-freeway					.70	
19. Traffic control					.73	
20. Lighting condition			.48		.68	
21. Speed (fast vs. slow)					.55	
22. Blood Alcohol Level						
23. License violations		.51	.33			
24. Non-moving violations				-.26		
25. Speed violations record		.69				
26. Prior accidents		.30	.27			
27. Moving violations		.66				
28. Mechanical violations		.66				
29. Alcohol-related violations			.51			
30. Failure to appear		.54				
31. Theft arrests	.80					
32. Sex arrests	.26					
33. Serious crimes-person	.73					
34. Less serious crimes-person			-.37			-.25
35. Crimes-property	.53					
36. Vagrancy/disorderly conduct	.62					
37. Alcohol-related arrests	.60		.25			
38. Narcotics arrests	.51					
39. Non-alcohol related arrests	.85	.25				
40. Race			.25			

APPENDIX I

Variables in the Factor Analysis

1. SEX:
   1) female 2) male

2. MARITAL STATUS:
   1) single 2) married

3. AGE OF DRIVERS:
   1) 19 years or less
   2) 20-29 years
   3) 30-39 years
   4) 40-49 years
   5) 50-59 years
   6) 60 years or more

4. PLACE OF BIRTH:
   1) non-California
   2) California

5. REISTERED OWNER OF VEHICLE
   1) no 2) yes

6. OCCUPATION:
   1) lower (laborers, household workers, etc.)
   2) middle (clerical, skilled workers, foremen, etc.)
   3) higher (professional, manager, etc.)

7. AGE OF CAR:
   1) 2 years or less
   2) 3-4 years
   3) 5-6 years
   4) 7-8 years
   5) 9 years or more

8. DRIVING COMPANION:
   1) driving alone
   2) driving with someone

9. HABITUAL VIOLATORS:
   (Defined as 3 or more traffic offenses)
   1) no 2) yes

10. NEGLIGENT OPERATORS:
    (defined by DMV)
    1) no 2) yes

11. POSSESSION OF DRIVER'S LICENSE:
    1) no 2) yes

12. DISTANCE BETWEEN PLACE OF ACCIDENT AND HOME:
    1) 4 miles or less
    2) 5-19 miles
    3) 20 miles or more

13. SPEED VIOLATION AT THE TIME OF THE ACCIDENT:
    1) none or non-speed violation
    2) speed law violation

14. ACCIDENT RESPONSIBILITY:
    1) not responsible
    2) responsible

15. TYPE OF ACCIDENT:
    1) single vehicle
    2) multiple vehicle

16. DAY OF ACCIDENT:
    1) weekday
    2) weekend (Fri. - Sun.)

17. HOUR OF ACCIDENT:
    1) 6 a.m. to 5:59 p.m.
    2) 6 p.m. to 5:59 a.m.

18. TYPE OF ROADWAY:
    1) non-freeway 2) freeway

19. PRESENCE OF TRAFFIC CONTROL:
    1) no 2) yes

20. LIGHTING CONDITIONS:
    1) daylight, dusk or dawn
    2) darkness

21. SPEED LIMIT VIOLATION:
    1) driving too slow
    2) not exceeding speed limit
    3) driving too fast

22. BLOOD ALCOHOL LEVEL:
    1) .01% to .04%
    2) .05% to .09%
    3) .10% to .14%
    4) .15% to .19%
    5) .20% to .25%
    6) .25% or higher

23. DRIVER'S LICENSE VIOLATIONS RECORD:
    0) no offense
    1) 1 offense
    2) 2 offenses
    3) 3-4 offenses
    4) 5-6 offenses
    5) 7 or more offenses

24. NON-MOVING, NON-MECHANICAL VIOLATIONS RECORD:
    same as variable 23

25. SPEED LAW VIOLATIONS RECORD:
    Same as variable 23

26. PRIOR ACCIDENTS RECORD:
    0) no prior
    1) 1 prior
    2) 2 prior
    3) 3-4 prior
    4) 5-6 prior
    5) 7 or more

27. MOVING VIOLATIONS RECORD:
    Same as variable 23

28. MECHANICAL VIOLATIONS RECORD:
    Same as variable 23

29. ALCOHOL RELATED MOVING VIOLATIONS (incl. drunk driving):
    Same as variable 23

30. RECORD OF FAILURE TO APPEAR AFTER CITATION:
    Same as variable 23

31. THEFT ARRESTS:
    0) no arrests
    1) 1 arrest
    2) 2 arrests
    3) 3-4 arrests
    4) 5-6 arrests
    5) 7 or more

32. SEX CRIME ARRESTS:
    Same as variable 31

33. SERIOUS CRIMES AGAINST PERSONS: (arrests)
    Same as variable 31

34. LESS SERIOUS CRIMES AGAINST PERSONS: (arrests)
    Same as variable 31.

35. CRIMES AGAINST PROPERTY: (arrests)
    Same as variable 31

36. VAGRANCY AND DISORDERLY CONDUCT (non-drunk arrests):
    Same as variable 31

37. ALCOHOL RELATED ARRESTS: (excl. traffic offenses)
    Same as variable 31

38. NARCOTICS ARRESTS:
    Same as variable 31

39. NON-ALCOHOL RELATED CRIMINAL ARRESTS:
    Same as variable 31

40. RACE:
    1) Caucasian
    2) non-Caucasian