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PSYCHOSOCIAL IDENTIFICATION OF DRIVERS RESPONSIBLE FOR FATAL VEHICULAR ACCIDENTS IN BOSTON

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16. Abstract

This Final Report includes a total human factor data presentation, analysis, evaluation and interpretation of selected variables collected by the Boston University Traffic Accident Research Special Study team during the 30-month period of the experimental sample field investigation. Throughout this research effort the primary focus of investigation has been with the historical and focal human factor variables associated with the operators of motor vehicles initially judged to have been the "most responsible" operators for vehicular accidents resulting in a personal fatality to the focal operator, another vehicular occupant or a pedestrian. The areas of primary interest presented in this report on 300 operators include: demographic and psychosocial variables, historical patterns of alcohol use and focal accident alcohol involvement, historical patterns of marijuana and street/entertainment drug use and focal accident involvement, the Risk Taking Behavior Scale (RTBS) and the focal Human Factor Stress Scale (HFSS). Future reports in this contract will present alcohol, marijuana and psychosocial comparisons between this experimental sample and a forthcoming control sample of fatal accident free operators.

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FOREWARD

Each year in the United States alone in excess of 55,000 people experience a sudden and unanticipated death resulting from injuries sustained in a motor vehicle accident on one of the nation's highways. Each one of these highway fatalities creates immeasurable domestic, community and professional disruption with all of the family, social, political and economic ramifications. Over half of these fatalities are drawn from the male population under 30 years of age. Prior to the sudden highway tragedy these young men represented a substantial proportion of the potential living and working force in this country. The National Highway Traffic Safety Administration and all of its sponsored agencies and research organizations has as one of its primary concerns the clear reduction of these sudden death accidents. During recent years increased research has focused its attention on the operators of motor vehicles which have been principal or causal for a highway accident resulting in a personal fatality.

In September 1971 the Boston University Traffic Accident Research Special Study team was awarded a contract for an extended investigation into the historical and focal human factor data information revolving around the operator of a motor vehicle initially judged to have been the "most responsible" for a highway accident in the greater Boston area resulting in a personal fatality. In its essence this study, which has investigated 300 sequential fatal vehicular accidents, has been experimental in nature. The principal research questions were: to see if there might be psychosocial differences between the major

types of motor vehicle operators included in the Boston sample; to see what psychosocial differences exist between operators with focal accident alcohol influence and those with no alcohol influence; to survey the marijuana and other drug contributions to the focal accident; and, to see if actual differences exist between the operators seen by the Boston Alcohol Safety Action Project (ASAP), the Special Study operators whose accidents took place within the ASAP boundaries and Special Study cases outside of the ASAP area.

ABSTRACT

The 30 month period of field investigation for the Boston University Traffic Accident Research Special Study team began in September 1971 and continued through February 1974. During this time the team investigated 300 motor vehicle operators judged to have been initially "most responsible" for vehicular highway accidents resulting in fatal injuries to: the most responsible operator, another vehicular occupant, or a pedestrian. Over 275 interrelated human factor variables were collected, scored and computerized for each of the 267 operators, whose data has been included in the main body of the Final Report. Within this sample 103 (38%) operators were involved in TYPE I accidents where they were killed in the focal collision, 63 (24%) operators in TYPE II accidents where they survived the collision resulting in fatal injuries to another vehicular occupant and 101 (38%) operators who were driving a vehicle which struck and killed a pedestrian.

The resulting analyses and evaluations of the data showed that the TYPE II operator was significantly different, historically and focally, from the others. His pre-accident life style was characterized as having been multi-problemmatical from domestic, social, legal, and risk taking behavior perspectives. He was also markedly different in his historical and focal use of intoxicating substances, as well as in the stress and tension related variables directly associated with the focal accident. The TYPE I operator was significantly older and showed historical and focal patterns of heavier alcohol use. Unlike

his antisocial TYPE II counterpart, his psychosocial problem areas were more in conformity with the acceptable, acting out behaviors of society. The TYPE III operator was considerably more passive in his human factor histories and in the notable items related to focal accident stress and tension. He was speculated to have been more like the "average" Boston Driver.

The final reporting on this contract will be presented in three sections. Part I, included herein, is a detailed document on the basic findings from the initial study with the operators of motor vehicles judged to have been most responsible for a fatal motor vehicle accident. Part II, "An Analysis of Drivers Most Responsible for Fatal Accidents Versus a Control Sample" will be an alcohol use related comparison between the initial experimental operators involved in fatal accidents and a forthcoming control sample of operators never involved in fatal accidents. Part III, "Marijuana and Driver Behaviors: Historical and Social Observations Among Fatal Accident Operators and a Control Sample", will be a presentation of the marijuana related findings for the experimental and control groups. Parts II and III will be found in forthcoming publications.

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INTRODUCTION

For the past several decades millions of dollars have been spent by a variety of highway safety organizations in the direction of research designed to reduce the growing number of motor vehicle related fatalities and personal injuries. In 1973, 55,800 people were killed on the nation's highways with an additional statistic exceeding 2,000,000 persons who received similar injuries necessitating hospitalization and medical treatment[1]. Innumerable studies have been completed by such men as Selzer, Waller, Zelhart et al., Holcomb and Campbell in an attempt to identify some of the demographic and social variables associated with alcohol related vehicular accidents. Waller's Vermont study sought to identify individuals likely to become involved in an alcohol or other drug related accident[2]. Melvin Selzer has been responsible for a number of similar investigations including a 1969 study in Washtenaw County (Michigan) involving 96 operators responsible for 117 vehicular deaths[3] and more recent research designed to characterize the social and problem drinker and his highway traffic interactions[4]. Zelhart et al. have recently completed a Canadian study which attempted to identify the high risk alcoholic driver who would be prone to become involved in an alcohol related motor vehicle accident[5]. A recent study by Harano, McBride and Peck made some gains in the prediction of accident liability through the use of biographical data and psychometric tests especially applied to drivers in the Sacramento (California) area[6].

In harmony with such companion research the National Highway

Traffic Safety Administration (NHTSA) has recently contracted four traffic accident research teams to conduct a special study into the human factors and psychosocial variables associated with motor vehicle operators involved in a variety of focal traffic accidents. In September, 1971, the Boston University Traffic Accident Research Team began a pilot study under the NHTSA geared to investigate each sequential fatal motor vehicle accident in the greater Boston area with the primary focus of the research on the human factors and historical and focal psychosocial variables associated with the operator of the vehicle judged by legal authorities to have been "most responsible" for the personal fatality. The initial study was continued through February, 1974, until a total of 300 "most responsible" operators had been sequentially collected in the geographical area of greater Boston specified by the NHTSA contractors.

Early in the pilot study the Boston team identified three different types of fatal vehicular accidents which were to represent the majority of the cases to be collected and two other sub-types which were included to assure a total collection of each sequential appropriate accident in the area of responsibility. The three major types of fatal accidents where the "most responsible" operator became the primary focus of investigation included: TYPE I accidents where the focal operator was killed; TYPE II accidents where the focal operator survived but another vehicular occupant was killed; and TYPE III accidents where the focal operator struck and killed a pedestrian. The two sub-types evaluated separately included TYPE I accidents

precipitated by a focal operator's heart attack and TYPE III hit-and-run pedestrian accidents where the focal operator was never apprehended.

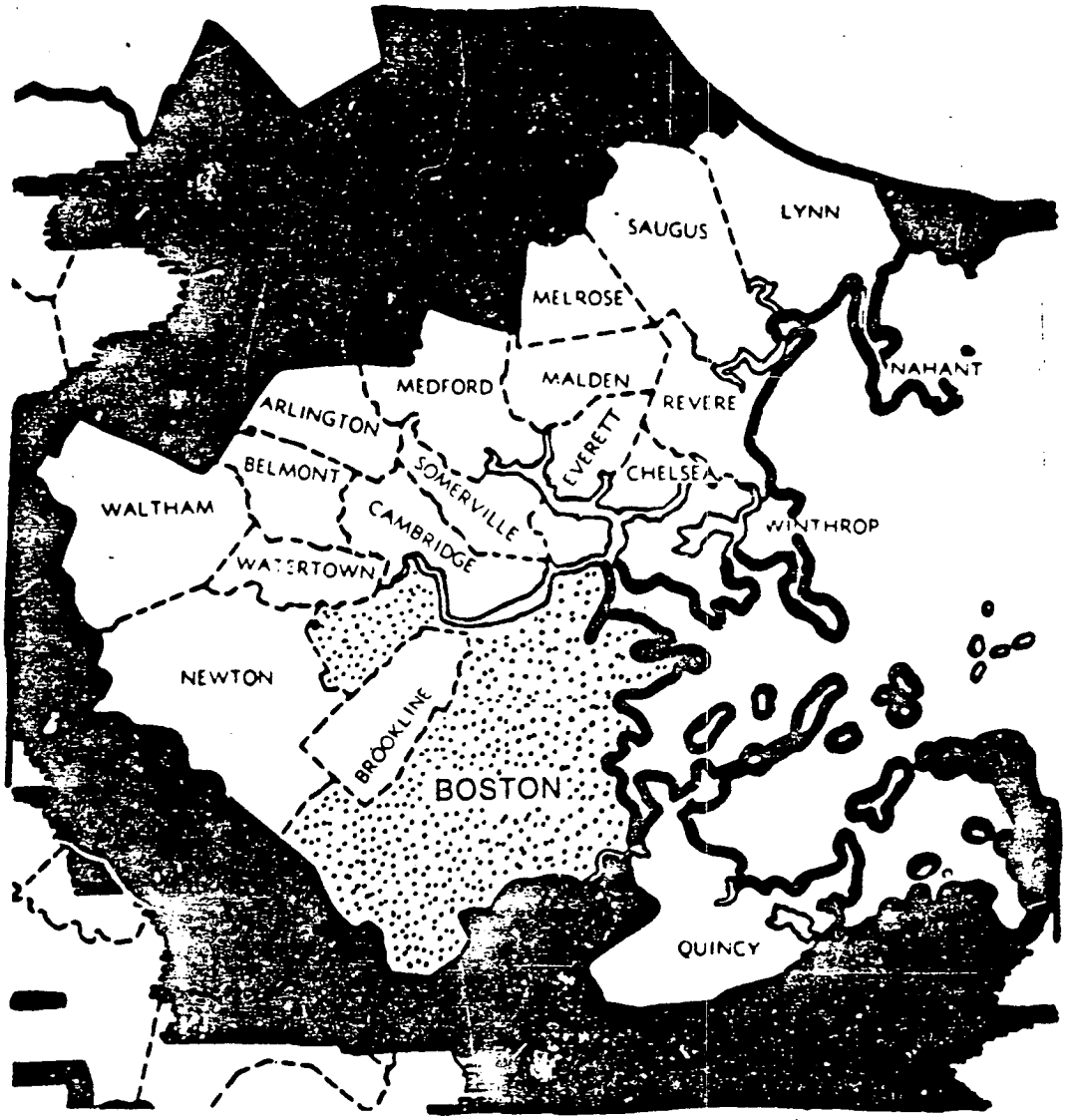
In January, 1973, over halfway through the Boston University study field investigation period the Boston Alcohol Safety Action Project (ASAP) became operational and the two research teams cooperated in their mutual efforts. The Boston University team continued with their investigation of fatal accidents regardless of alcohol or other drug involvement and the ASAP team directed their research and rehabilitation efforts primarily to nonfatal accidents involving the operator's use of alcohol and to other drivers apprehended by the ASAP highway patrols and cited for driving under the influence of alcohol.

In January, 1975, NHTSA awarded the Boston University team a six month contract to collect a random sample of greater Boston operators to be used as a control group for future comparisons with the experimental group included in this report.

Profile of Survey Area

The total geographic area of responsibility included in the field investigations for the Boston University Traffic Accident Research Special Study Team represented 173.22 square miles of urban, near urban and suburban land area in, and around greater Boston. The core of this continuum was the 12 district area of 43.18 (25%) square miles designated as the city of Boston and also under the jurisdiction of the then forthcoming Alcohol Safety Action Project (ASAP). As can be seen in Map #1 on the following page, the Special Study field investigation

MAP # 1



SPECIAL STUDY AREA OF FIELD INVESTIGATION 173.22 sq. miles

ASAP AREA

area also included another 130.04 (75%) square miles, representing 18 townships and communities of similar topographical content to the core ASAP region.

Boston is one of the oldest metropolitan areas in the United States and carries with it many of the characteristics of an historical city that has been relatively resistant to total reurbanization. Bostonians refer to their metropolis as a "city/town" which combines together many of the social qualities of town or suburban living together with all of the social ammenities of a city. The structural makeup of Boston is also very "city/town" in its character. Each township, district or community is composed of moderately high or urban structural development areas right next door to apartment complexes, townhouse development areas and single family residences. Within almost any block represented in the 173.22 square mile area of Special Study concern one can see structural reflections of 1875 and 1975. The greater Boston area has been developed in such a manner over the past 200 years so that one can drive through many of the townships without noticing any particular structural or topographical change, or even any subtile lines of demarcation that would differentiate one from the other.

The Special Study area of responsibility included a total population of 1,056,539 persons with 641,071 (39%) residing in the 12 districts composing the city of Boston, and representing the ASAP patrol area. The remaining 1,015,468 (61%) persons lived in the 18 communities directly related to Boston and not included as a part of the area of

responsibility for the ASAP team. The psychosocial character of greater Boston is directly influenced by the more than 200 colleges, universities and institutions of higher learning within 20 minutes of the downtown district that attract more than 200,000 students each year and the largest complex of hospitals and health care institutions in the world. The mean age of the greater metropolitan population is 29.7 years with 32.1% of the population ≤18 years of age, with 5.6% between 18 and 20 years, 6.8% between 21 and 24 years, 11.8% between 25 and 34 years, 11.2% between 34 and 45 years, 11.6% between 45 and 54 years, 9.6% between 55 and 64 years, and 11.3% ≥65 years. Any evaluation of these figures should take into consideration Boston's unusually high student population which is only included in part in the census statistics.

The ethnic composition of the greater Boston area is very cosmopolitan representing every country in the world. The largest single ethnic groups include 21.8% of the persons in the inner city or 15.1% of the persons in the greater metropolitan area who are predominantly Irish most of whom live in clearly distinguishable development districts. The Italian population includes 19.0% of the inner city residents or 19.7% of the persons in the greater metropolitan area, most of whom also live in Italian neighborhoods. Persons of African or black extraction include 16.3% of the inner city or 4.6% of the persons in the greater metropolitan area. The remaining persons in the inner city and in the greater metropolitan area represent a wide variety of ethnic backgrounds with the largest of

these being among individuals of some English background. Unfortunately the census statistics make no clear delineation of the English community.

The 1970 census statistics show that 46% of the greater metropolitan population is male and 54% female.

An analysis for the educational levels for the population ≥18 years of age shows that 8.5% had less than 7 years of schooling, 8.0% a junior high education only, 17.5% had completed partial high school training, 36.8% had graduated from high school, 11.9% had some college education and 15.8% had graduated from a college or a university at the undergraduate or graduate levels. Occupational attainments as listed in the census statistics are difficult to evaluate. "Clerical and kindred workers" included 22.9% of the population ≥18 years of age, "professional, technical and kindred workers" represented 20.0% of the working population and 24.4% were represented by "craftsmen...and operatives." The median annual income in 1970 was $9,133 for the inner city workers or $11,448 for workers in the greater metropolitan area. A total of 60.1% of the working population received between $5,000 and $15,000 annually and 18.1% earned more than $15,000. The per capita income for persons in the inner city was $3,073 and for persons in the greater metropolitan area $3,688. Registered automobiles were owned by 53.3% of the persons in the inner city and by 76.1% of the persons in the greater metropolitan area ≥18 years of age[8].

During the years of 1972 and 1973 there were 162,911 and 161,674 respective motor vehicle accidents reported to the Registry of Motor

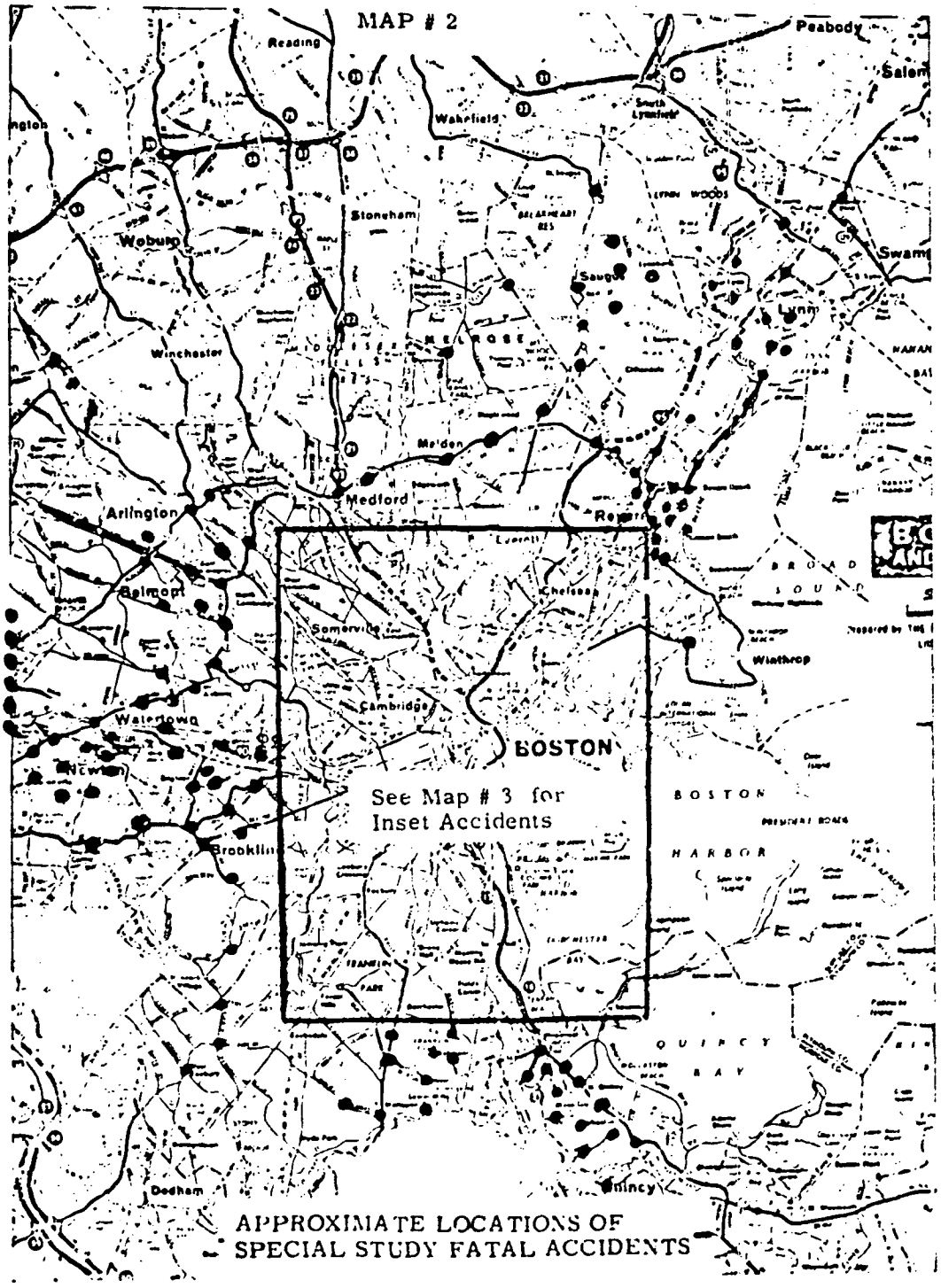
Vehicles from the Commonwealth of Massachusetts' law enforcement agencies. The overlapping categories for these accidents included 905 (6%) fatal injury accidents; 56,478 (35%) personal injury accidents and 105,528 (65%) property damage accidents for 1972; and 928 (6%) fatal injury accidents; 56,118 (35%) personal injury accidents and 104,628 (65%) accidents involving property damage for 1973. The peak days for reported accidents were Friday and Wednesday and the peak time period clearly between 3:00 and 5:59 p.m. During 1972, 56,848 licenses were suspended and 13,698 revoked through the Registry. Companion figures for 1973 included 85,717 suspensions and 13,949 revocations. In 1972, 7,776 persons were arrested for driving a motor vehicle while under the influence of alcohol (DUIL) with an increase to 8,848 in 1973. An additional 52 persons were charged with driving while under the influence of a narcotic or barbiturate drug in 1972 and 85 in 1973. During this same period of time 4,298 persons refused to take the breathalyzer test in 1972 and 5,278 in 1973[9,10].

Within the Special Study area of responsibility there were in 1972, 106 fatal accidents, 14,530 personal injury accidents and 28,644 accidents involving property damage. Comparable figures for 1973 included 157 fatal accidents, 14,068 personal injury accidents and 26,425 accidents involving property damage. These fatal accident figures differ somewhat from the accidents investigated by the Special Study team largely because of a matter of definition. The Special Study team defined a fatal accident as being one where a person died within 48 hours of the crash. The Registry defines such accidents

as those where a person dies at any time from injuries primarily resulting from the crash. Some of these fatal accidents reported by the Registry were recorded weeks or months after the crash. It is for this reason that the Special Study team reported only 92 fatal cases in 1972 and 150 in 1973[9,10].

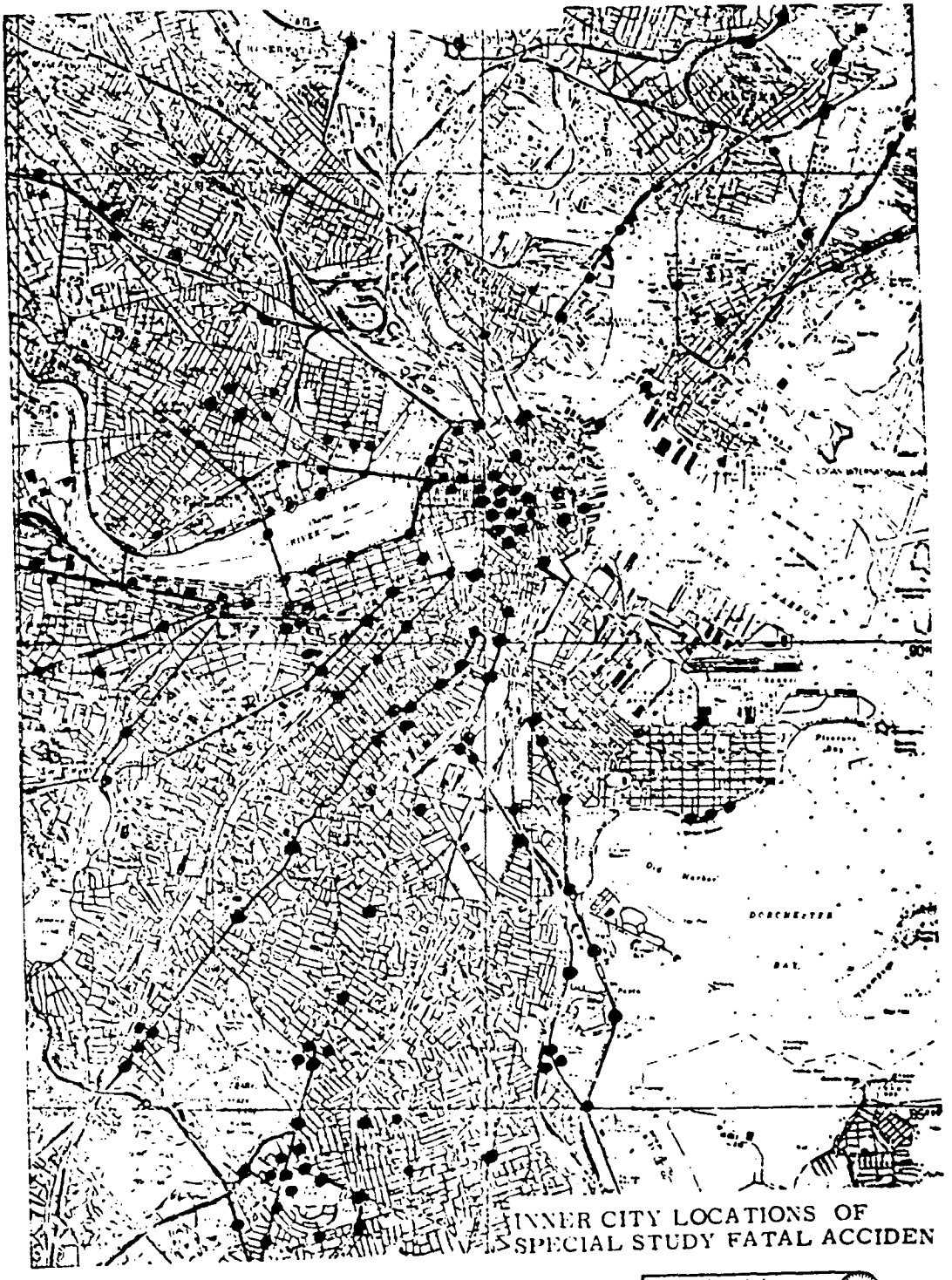
The approximate locations for the 267 fatal accidents investigated by the Boston team during the 30 months of field investigation are seen on Map #2 and Map #3. Map #3 is a subset of the inner city area so designated on Map #2. As can be seen from the maps and from the statistics in Table A-1, 119 (45%) of the Special Study accidents took place within the ASAP patrol area of the inner city, 30 (11%) in areas directly tangent to the ASAP area of responsibility and 118 (44%) in areas not within or directly tangent to the areas covered by the ASAP patrols.

At the time of this report there is no current information available to the Special Study team regarding alcohol sale or use patterns for the greater Boston area. In an attempt to overcome this deficit the team conducted a survey of 13 bars and nightclubs, which are among the most popular in the inner city. Each proprietor was presented with a list of 10 different varieties of commercial alcohol and asked to rank them from 1 to 10 according to their respective sale volume. The tabulated rank of the 5 most popular beverages was as follows in order of judged popularity: beer, vodka, scotch, other whiskies and tequila. Presently the Boston team is in the period of field investigation, the purpose of which is to collect a random sample of 801



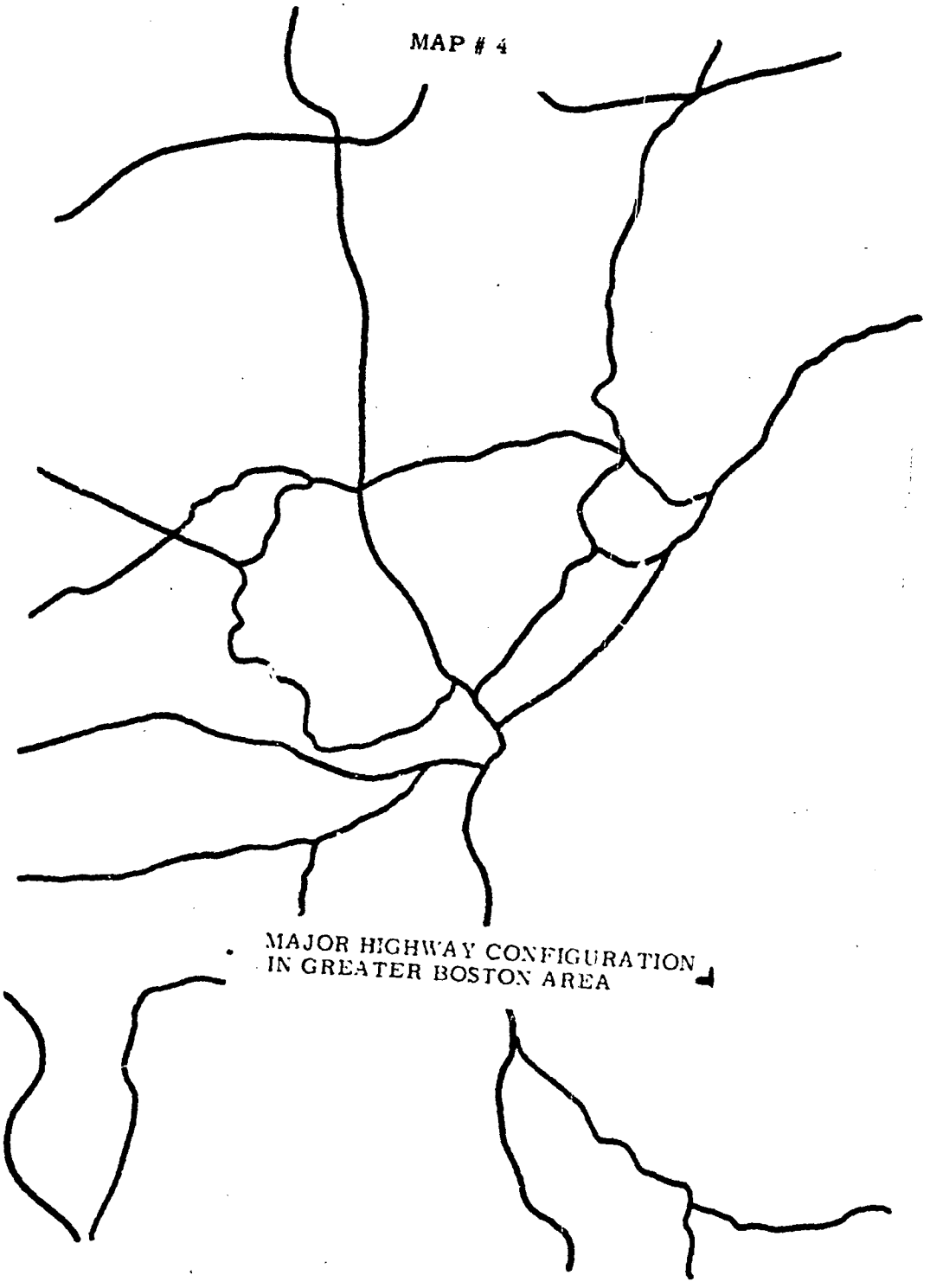
APPROXIMATE LOCATIONS OF
SPECIAL STUDY FATAL ACCIDENTS

MAP # 3



INNER CITY LOCATIONS OF
SPECIAL STUDY FATAL ACCIDEN

MAP # 4



MAJOR HIGHWAY CONFIGURATION
IN GREATER BOSTON AREA

operators who have never been involved in a fatal accident as an operator. The sample is to be used for control purposes with the experimental fatal sample included in this report. From among the first 200 control subjects interviewed the following rank information regarding patterns of alcohol use are available. The ranking choice of the 4 alcoholic beverages includes: beer, vodka (scored with tequila and gin), scotch and other whiskies, and wine. The rank of alcohol use patterns shows that the light and moderate social drinkers include the largest numbers of subjects with the heavy social drinkers and abstainers falling in the middle of the matrix and the alcohol abusers and sporadic binge drinkers showing the smallest numbers of subjects. Less than 20% of the subjects interviewed to date give indications that they are problem drinkers. To date 37% of the sample admit to being smokers of marijuana with the largest number of these subjects being light to moderate social smokers. The data regarding street or entertainment drug use has not been evaluated.

Commercial establishments for the sale of alcoholic beverages are open to the public with varying hours. Package stores are open Monday through Saturday until 11:00 p.m. and are closed on Sunday. Bars and nightclubs located in the inner city may remain open to public liquor sales until 2:00 a.m., 7 days a week, although some close their doors at 1:00 a.m. Monday through Thursday. Most bars and nightclubs outside of the inner city close at 1:00 a.m. 7 days a week, although a few communities permit such establishments to be open until 2:00 a.m. on Friday and Saturday and some bars take advantage of this option.

The Boston Alcohol Safety Action Project officially opened its facilities in 1971. Through a time period ending in December 1972 the ASAP team conducted its home surveys and established their plan of operation for the identification, rehabilitation and education of the proposed operators brought under their jurisdiction because of a current arrest for driving a motor vehicle while under the influence of liquor/alcohol (DUIL). During this time they were able to secure the cooperation of the Boston Police Department and the Courts. The Metropolitan District Commission, a law enforcement agency which functions in designated areas of the inner city, was not able to cooperate in the ASAP effort, thus creating some problems for the team for full city coverage.

In January 1973 the ASAP became fully operational and began the implementation of their enforcement, judicial program, rehabilitation and public information programs. By this time the Special Study team had been conducting its field investigation for 16 months. The ASAP operational period ran a full 24 month period, through December 1974, 10 months after the termination of the Special Study.

Early in 1973 the ASAP released a preliminary profile of the problem drinker brought under the jurisdiction of their rehabilitation programs. This individual was a 21 - 25 year old, Caucasian, married, male, who was permanently employed and earned an annual salary from between $5,000 to $9,000. He had an high school education and was considered to have been in fair to good health at the time of his entry into the ASAP program.

RESEARCH DESIGN AND METHODOLOGY

The field investigation for the Boston University team covered the 30 months between September 1971 through and including February 1974. Within this time span each sequential fatal motor vehicle accident which occurred in the team's total area of responsibility was investigated with the primary research focus being on the operator judged to have been "most responsible" by legal authorities for the collision. The NHTSA contract specified that 300 focal "most responsible" operators were to be researched, in strict sequential order during the field investigations. The geographical confines of the research included two tangent sub-divisions of the greater metropolitan area. The first was the area of the greatest population density, eventually selected as the patrol district for the ASAP countermeasures program, allowing for a convenient, ongoing evaluation between the teams. The second area stands tangent to the first and includes the other metropolitan and near-metropolitan townships and greater Boston suburban communities similar in topography to the others.

Early in the research the Boston team identified three principal types of fatal vehicular accident "most responsible" operators. There also emerged two sub-types of similar focal operators which have been excluded from the main analysis because their presence would have confounded the initial results. The three principal and two sub-types of focal operators have been characterized as follows:

TYPE I - a focal operator fatality. A TYPE I accident is one where the operator of the vehicle judged to have been most responsible for the crash was killed as a direct result of the collision. This accident type included both single and multiple vehicle accidents, accidents where the focal operator was killed alone and crashes where the focal operator was killed along with an operator and/or passenger from one of the involved motor vehicles.

TYPE II - an other vehicular occupant fatality. A TYPE II accident was one where the focal operator survived the crash but where an other vehicular occupant was killed, including the other (nonfocal) operator and/or other passengers.

TYPE III - a pedestrian fatality. A TYPE III accident was one where a pedestrian was struck and killed by a focal operator.

The above three principal types of accidents constitute 89% of the fatal accidents which occurred in the greater Boston area during the field investigation. The remaining 11% of the "most responsible", or focal operators, are described in the following two sub-types, also contained in the investigation:

TYPE IV - a TYPE I accident where the focal operator suffered a fatal seizure precipitating his death and the crash.

TYPE V - TYPE III accident where the focal operator was not apprehended during the field investigations and the case was designated as a hit-and-run pedestrian fatality.

In the interest of statistical clarity it was determined that the TYPE IV and TYPE V data should not be included in the main body of the following results but, rather, outlined in abbreviated profile as an appendix to the main findings. The data relative to the TYPE IV and TYPE V accident groups can be found in Appendix B.

During the pilot study period the Boston team completed the construction of the data collection instrument to be used as the data

storage and scoring device throughout the term of the research. This instrument, referred to as the Human Factor Index (HFI), seen as Appendix A, was modified and revised to include over 300 variables on each focal operator. The collected information sources included records and reports from several cooperating health care and social service institutions, probation and arrest histories on each focal operator from the Massachusetts Registry of Motor Vehicles, appropriate police records (when available), findings from the Registry's Department of Special Investigation and other similar sources appropriate to each individual focal operator. Additional data was submitted to the team from the Office of the Suffolk County Medical Examiner and the Commonwealth Chemistry Laboratory, where the collected blood samples were analyzed. The team also conducted as many personal interviews with surviving operators, relatives, professional peers, social counterparts and others as seemed necessary to each particular case to collect the data necessary for securing the completeness and validity of the data. Each case required from 2 to 23 personal interviews before completion. Telephone interviews were conducted with many persons associated with the focal operator to collect some of the data, and then to validate many of the variables. The accumulated data was scored in each particular HFI, following sanitization and a team review of the information. The variables in the HFI were subdivided into the following eight categories prior to computerization: 1. Basic Demographic Data; 2. Psychosocial History Data; 3. Physical Health History Data; 4. Alcohol, Marijuana and Other Drug Use Patterns; 5. Legal, Arrest and Citation Histories; 6. Focal Accident Data;

7. Focal Human Factor Stress Scale Items; and 8. Risk Taking Behavior Scale Items. As each case was completed the scored data was transferred to computer cards for storage and future analysis.

The field team consisted of three psychosocial professionals who worked closely with each other in the collection of the data and the scoring of the HFI. These team members were all thoroughly trained and instructed in the research goals of the study, the particular interviewing techniques and methods necessary to collect valid data, and the appropriate scoring of the HFI. Particular attention was given to the variables associated with subjective or clinical data to assure the consistent collection and scoring of these items. Each case was discussed and evaluated by the team, with concentrated attention given to the subjective variables, before the individual HFI was computerized.

Initial notification of an appropriate fatal motor vehicle accident in the team's area of responsibility came through the Massachusetts Registry of Motor Vehicles on each Tuesday and Friday. Upon receipt of the basic information each case was reviewed, the record search was initiated and a member of the team was assigned to collect the data on the focal operator. The matter of case assignment was an issue of particular concern and each team member was carefully matched with the prospective interviewees. A letter explaining the purpose of the research, ethical considerations and sanitizing procedures was sent to each prospective informant before any personal contact was initiated. Following the receipt of the letter the respective team member called the prospective informant on the telephone to set up

the details for a personal interview. In such cases where the informants had been advised by legal counsel to talk to no one about the accident an appropriate letter was sent to the respective lawyer. (Copies of the correspondence formats are found in Appendix C.) Upon occasion the team encountered a great deal of legal resistance, and continued correspondence, personal meetings, and frequent support from cooperating lawyers was necessary before the individual lawyer allowed his client to talk with the Boston team member. Any and all means were used to collect the necessary data on each case because of the sequential nature of the research design. This preclusion frequently involved a wide variety of unusual circumstances, oftimes necessitating the full team effort before a particular case was completed and the data satisfactorily verified. Informants included: focal surviving operators, relatives, lovers, friends, non-friends, professional employees and employers, neighbors, health care professionals, clergymen, funeral directors and other individuals appropriate to each case. Some of the more difficult cases required as many as 23 interviews before the HFI could be completed. This total procedure proved to be arduous in its course but the end results were most satisfactory with only six (2%) out of 306 appropriate cases rejected because of inadequate data.

During the course of the individual case investigation the information from the personal and telephone interviews was put together with the data collected from the record search. The case was individually evaluated by the team and the HFI submitted for computerization.

The statistical procedures for analyzing the data included an initial evaluation of the frequency distributions. The Ns, means, medians, standard deviations and total and group percentages for each variable were evaluated. Because of the conservative nature of the methodology, and the necessity of having complete data for future statistical procedures in the final evaluation, any variable containing less than 7% of the group or sub-group scores in any category was re-coded. The appropriate blanks, or missing data scores were re-coded into the negative (0) for quantitative variables and into the modal category for qualitative variables. This manner of re-coding did not confound or significantly alter the final results. The final statistical procedures employed for the analysis of the data were: Chi-square distributions for dichotomous variables, Product-Moment Correlations (Pearson), t-Tests and Simple Analyses of Variance. The levels of significance selected for use have been <.01 and <.05. The percentages seen in most of the tables have, upon occasion, been re-calculated at .01% higher or lower than the base statistic would warrant so the total sum score would always be 100%. Few percentage points have been carried more than two digits.

A number of abbreviations have been used in the text and it would seem appropriate that they be outlined in this section.

OAC = Office of Alcohol Countermeasures, U.S. Department of Transportation
NHTSA = National Highway Traffic Safety Administration
ETOH = ethyl alcohol, of the variety commonly found in commercial beverages
PTA = prior to the accident
ASAP = Boston Alcohol Safety Action Project
HFI = Human Factor Index

RTBS = Risk Taking Behavior Scale
HFSS = Human Factor Stress Scale

Research Hypotheses:

(1) Are there any significant differences between "most responsible" (focal) operators in fatal vehicular crashes: a) who are killed themselves, b) who survive a crash where an other vehicular occupant is killed, and c) those who strike and kill a pedestrian?

(2) Are there any significant differences between focal operators in fatal accidents who have significant Blood Alcohol Concentrations ($\geq$.05 gm/100 mℓ%) or a clinical evaluation of the same and those who have no significant ($\leq$.04 gm/100 mℓ%), or no presence of alcohol.

(3) Are there any significant differences between the focal operators in fatal accidents who have significant alcohol involvement and those drivers who have been arrested by the ASAP patrols for Driving Under the Influence of Alcohol?

(4) Are there any significant differences between focal operators in fatal accidents occurring within the ASAP geographical boundaries and focal operators involved in fatal crashes outside of the ASAP area.

The first two hypotheses were developed during the initial phase of the Boston University field investigations and the last two were added some time later when the Boston ASAP was preparing to become operational.

RESULTS

The following findings represent the analytical results from the evaluation of the data collected on the fatal experimental group of motor vehicle operators investigated by the Boston University Traffic Accident Research Team during the 30 month period of the NHTSA contract. Within this time span the team investigated a total of 306 "most responsible" operators who had been primarily involved in a vehicular accident resulting in a personal fatality to themselves, another operator, a passenger or a pedestrian. Only six (2%) of these cases had to be rejected because of incomplete data. These rejected operators represented two TYPE I cases, two TYPE II cases and two TYPE III cases. The breakdown of the remaining 300 cases showed that 103 (34%) were TYPE I accidents where the principal operator was killed, 63(21%) were TYPE II accidents where another operator or an other vehicular occupant was killed, and 101 (34%) were classified as TYPE III cases where a pedestrian was killed. An additional 33 (11%) cases were investigated by the team representing sub-types of the accidents mentioned above. Of the 33 cases 20 (61%) were involved in what has been designated as a TYPE IV collision where the "most responsible" operator suffered an heart attack prior to the accident resulting in his death. Although this accident type is very similar to the TYPE I accident, where the primary operator was killed, an initial analysis showed that the operators represented a very different population from the classic TYPE I operator. Therefore, an abbreviated analysis of the findings on the TYPE IV operator will be found

under Appendix B and not included with the following results. The remainder of the 33 cases included 13 (39%) operators who were potentially involved in TYPE III accidents but where the operator fled the scene of the accident and was not apprehended during the course of the investigation. Because of the absence of much of the human factor information central to the research, the inclusion of these TYPE V accidents (potential TYPE III accidents) has been excluded from the following result section and will be found under Appendix B. With these considerations the results that follow will be focused on the 267 operators representing the foundation of the study. Of these 267 operators 103 (38%) were represented in TYPE I accidents, 63 (24%) in TYPE II accidents and the remaining 101 (38%) in TYPE III accidents. An abbreviated presentation of the 300 operators involved in the total group and the 267 operators included in the experimental sample can be found under Table 1.

The distribution by sex of the 267 operators selected for inclusion in these results included 236 (88%) male and 31 (12%) female. The TYPE I operator group included 89 (86%) male and 14 (14%) female distributions with the TYPE II operator group showing the same proportion by sex, or 54 (86%) male and 9 (14%) female. The TYPE III sexual distribution was non-significantly different from the other types with 93 (92%) male and 8 (8%) female. (Table 2). The mean age for all of the 267 operators was 32 years with the TYPE I and the TYPE III operators showing respective age means of 34 and 33 years for a non-significant difference between these operator accident

types. On the other hand the TYPE II operator was significantly younger than the other operator types with a mean age of 25 years. Analyses using t-Tests showed that the TYPE II operator was significantly younger in mean age than the TYPE I operator group mean age ($t=3.998$, 164df, $p<.01$) and also significantly younger than the TYPE III operator mean age ($t=3.787$, 162df, $p<.01$). (Table 3). This immediate difference in age means can be seen in the age by decade divisions as represented in Table 3 showing that 50 (79%) of the TYPE II operators were 29 years of age or younger with 35 (55%) of them falling into the 20 - 29 age decade. This is a sharp contrast to the 56 (54%) of the TYPE I operators and the 50 (49%) of the TYPE III operators who were 29 years or younger with 35 (34%) of the TYPE I operators and 37 (36%) of the TYPE III operators falling into the 20 - 29 age division. Collision configurations in the TYPE I and TYPE II accidents, including impact speed, area of impact and compartment intrusion, no doubt influenced probability of death to an operator more than age.

Other age findings showed that 12 (12%) of the TYPE I operators, 10 (16%) of the TYPE II operators and 24 (24%) of the TYPE III operators fell into the decade of the 30's. An evaluation of the age groupings for operators in their 40's presented a marked difference between groups with 17 (16%) of the TYPE I operators, 13 (13%) of the TYPE III operators and a low 2 (3%) of the TYPE II operators which were represented in this decade. The older drivers were also divided, showing a marked absence of TYPE II operators. A full 18 (18%) of

the TYPE I operators were 50 years of age or older with a companion showing from the TYPE III sample of 14 (14%) drivers who fell into the same age groupings. Only 1 (2%) operator from the TYPE II group was 50 years or older.

The reasoning for the significant grouping of TYPE II operators in the twenty decade remains unclear at this stage of the research. As will be seen later in this report a large percentage of these operators were not even hospitalized following the accident and the TYPE II operator was not at all in the habit of wearing the restraints provided in his vehicle. (Tables 37 and 20). Some subjective speculations will be seen regarding this phenomenon under the section for Discussion and Evaluation.

Correlation coefficients related to the matter of age showed that the younger operators in all accident types were significantly related to a lower level of occupational attainment ($r=0.224$, $p < .01$), the more regular a pattern of smoking marijuana ($r=0.474$, $p < .01$), the more frequent use of street or entertainment drugs ($r=0.389$, $p < .01$), and a considerable number of the human factor stress items present psychosocially to the operator during the moments prior to the crash which will be discussed at length later in this paper. The older operator was more likely to have worn correctional lenses ($r=0.178$, $p < .01$), to have had a greater history of the misuse of medical services and facilities ($r=0.257$, $p < .01$), and to have had a fewer number of the focal human factor stress items. Although these findings are of interest they do not present anything out of the

ordinary other than what might have been expected from the results.

An evaluation of the current marital status for the 267 operators included in this research showed that 47 (45%) of the TYPE I operators, 43 (68%) of the TYPE II operators and 45 (45%) of the TYPE III operators were single, or never married, at the time of their focal accident. This finding was closely related to younger age groupings for all accident types as might have been expected (F 8.450, 2df, $p < .01$). As Table 4 shows 39 (38%) of the TYPE I operators, 9 (14%) of the TYPE II operators and 45 (45%) of the TYPE III operators were married at the time of their respective focal accident. Another 15 (15%) TYPE I, 10 (16%) TYPE II and 10 (10%) TYPE III operators were either divorced, separated or widowed. Although this finding is not statistically significant it is of particular interest when evaluating the relatively smaller number of TYPE II operators that were married at the time of the accident (N=9, 14%). A Chi-Square analysis between the married drivers and the never married operators showed significantly ($p < .01$).

The breakdown of the dominant ethnic backgrounds of the operators found in Table 5 is somewhat difficult to evaluate because of the myriad number of ethnic groupings and sub-groupings that make up the greater metropolitan Boston area. The eight category differentiation utilized in the HFI allowed a full comparison only between the three most clearly defined ethnic groups outlined in the 1970 census reports[8]. Individuals with predominantly Irish backgrounds constitute 22% of the population of the inner city and 15% of the greater metropolitan population. Operators with known Irish heritages represented

99 (37%) of the total experimental population investigated by the Boston team, including 45 (43%) TYPE I, 20 (32%) TYPE II and 34 (33%) TYPE III operators. This being the case it would appear that individuals with a predominantly Irish background are considerably over-represented in the fatally involved motor vehicle operator sample collected by the team. (Table 5). This observation is particularly relevant in the case of the TYPE I operator where 45 (43%) of the operators were from Irish backgrounds. Individuals with Italian surnames, or from predominantly Italian backgrounds include 19% of the population of the inner city and 20% of the population in the greater metropolitan area. The HFI category "Southern European" included not only operators with Italian backgrounds but also a small number of individuals with Greek or continental Spanish heritages. This inclusive category in the findings was represented by 47 (17%) of the operators in the experimental sample, including 12 (12%) TYPE I, 14 (23%) TYPE II and 21 (21%) TYPE III operators. This finding would show that operators with predominantly Italian backgrounds were under-represented in the total sample, and, most particularly, with the TYPE I operator group. A similar comparison for the TYPE II and TYPE III operators would show that they were relatively proportionately represented in this ethnic category. Blacks represent 16% of the inner city population and 5% of the total metropolitan area. The comparative ethnic category in the HFI, "African", was exclusively represented by American Blacks with the 8 (3%) of the operators with

Latin American backgrounds having come from predominatly Latin Spanish heritages. The experimental group of 267 operators included 24 (10%) blacks ("African"), with 7 (7%) TYPE I, 7 (11%) TYPE II and 10 (10%) TYPE III operators.

A similar comparison with the census reportings would show that the blacks were considerably under-represented in the fatal experimental sample. At this point it becomes difficult to make a fully comparable evaluation with the Irish and Italian groups because all of the blacks included in the experimental sample came from residential areas within the urban confines. With this inner city bias for the black sample of operators it becomes difficult to make a definitive evaluation of their group representation in fatal accidents during the scope of the Boston research.

An analysis of the educational backgrounds for the 267 operators found in Table 6 was delineated according to the lines of formal training outlined by Hollingshead[7] ranging from less than 7 years of education to graduate levels of education. The findings showed that 192 (72%) of the fatal experimental sample had a high school education or less at the time of the focal accident. An additional 49 (18%) had some college training, with 18 (7%) having received an undergraduate degree from some college or university. Another 8 (3%) had some post graduate training. As seen in Table 7 the TYPE I operator was somewhat better educated than his counterparts with 66 (64%) of that group having received 12 years or less of formal training as opposed to 53 (84%) of the TYPE II operators and 73 (73%) of the TYPE III

operators. Individual t-Tests, taking into consideration the seven point education scale, showed that the TYPE I operator was better educated than the TYPE II operator ($t=2.625$, 164df, $p < .05$) but no different from his TYPE III counterpart ($t=.1681$, 202df, $p = n.s.$). On the other hand, the TYPE II and TYPE III operators were not significantly different from each other ($t=0.947$, 162df, $p = n.s.$). With this series of findings an analysis was made as to whether the respective operators were actively pursuing their education as either part time or full time students at the time of the focal accident to evaluate the transitory educational status of the operator groups. These findings, seen in Table 7, showed a non-significant difference between the three operator accident types with 20 (19%) TYPE I, 13 (21%) TYPE II and 16 (16%) TYPE III operators actively pursuing their educations at or around the time of the focal collision which entered them into the research. Correlation coefficients showed that years of formal education was not related to operator age ($r=0.006$, $p = n.s.$) and was equally unrelated to student status ($r=0.106$, $p = n.s.$). These findings would seem to show that years of formal education did not significantly differentiate between the three operator types within the experimental sample.

Each operator's level of occupational attainment was evaluated according to a seven point scale of differentiation orignally designed by Hollingshead[7] and seen in Table 8. It should be noted that this scale does not take into consideration an individual's income and that the ratings are made with the basic presumption that white

collar workers are better employed than manual or blue collar workers. In spite of these inherent problems with this scale it is currently being used by the team for comparative purposes.

As seen in Table 8 occupational levels 4 and 5 represented 137 (51%) of the total sample with 47 (45%) TYPE I, 34 (54%) TYPE II and 56 (55%) TYPE III operators. Level 4 has included such professions as clerical and sales persons, technicians and owners of very small businesses, bank clerks and tellers, bill collectors, general secretaries, draftsmen, technical assistants and laboratory assistants, as well as some public service employees. This large and very inclusive level of occupational attainment included 67 (25%) of the total sample, or 23 (22%) TYPE I, 20 (32%) TYPE II and 24 (24%) TYPE III operators. Level 5 was made up of a broad range of skilled manual employees including: carpenters, electricians, firemen, policemen, hair stylists, painters, plumbers and other draftsmen in similar skills. This level included 70 (26%) of the total sample with 24 (23%) TYPE I, 14 (22%) TYPE II and 32 (31%) TYPE III operators.

Levels 3, 6 and 7 included 38 (14%), 33 (13%) and 31 (12%) of the entire sample respectively. Level 3 was a more confined category and included individuals who were to some degree administrators of smaller groups of people, owners of medium businesses, legal secretaries, store managers and service managers. In essence it included professionals who were directly responsible for the individuals who fell into level 4. Level 3 was represented by 17 (17%) TYPE I, 5 (8%) TYPE II and 16 (16%) TYPE III operators. Level 6 included all

individuals who were classified as semiskilled employees and all assistants to the skilled manual employees in level 5. This group of lower professionals included 16 (16%) TYPE I, 9 (14%) TYPE II and 8 (8%) TYPE III operators. Level 7 was reserved for individuals who were completely unskilled and persons who had been recipients of government welfare for more than a year. This level included 10 (10%) TYPE I, 12 (19%) TYPE II and 9 (9%) TYPE III operators.

The higher levels of occupational attainment, levels 1 and 2 were represented by 27 (10%) of the experimental sample. Level 2 included a variety of managerial occupations, most frequently associated with directing the activities of professionals in level 3, such as advertising directors, national sales managers, personnel managers and office managers. Also included in this level were owners of larger businesses and corporations as well as accountants, librarians, commissioned military personnel, musicians and research assistants. Level 2 was represented by 6 (6%) TYPE I, 3 (5%) TYPE II and 8 (8%) TYPE III operators. The highest level of attainment included all higher executives, large proprietors and major professionals. This level included 6 (6%) TYPE I, 0 (0%) TYPE II and 4 (4%) TYPE III operators.

Utilizing this seven point scale of differentiation in levels of occupational attainment showed that the mean level for the TYPE I operator was 4.38, with 4.90 for the TYPE II operator and 4.30 for the TYPE III operator. An evaluation by t-Tests showed that the TYPE I and TYPE II operators were non-significantly different from

each other (t=2.131, 164df, p< n.s.) as were the TYPE I and TYPE III operators (t=0.349, 202df, p= n.s.), whereas, there was a significant difference only between the TYPE II and TYPE III operators (t=2.559, 162df, p< .05) showing that the TYPE II operators were employed at levels of lower occupational attainment.

One finding that might help in the evaluation of this finding relative to the level of occupational attainment might come with the scored number of job changes for the operators during the 5 years prior to the focal accident. The mean number of job changes for the TYPE I and TYPE III operators was one as opposed to two job changes for the TYPE II operator group. This additional data item might indicate that the TYPE II operator was in a state of professional flux during the years prior to the focal accident.

The five point Socio-Economic Status divisions seen in Table 9 were the result of mathematical computations also designed by Hollingshead[7] taking into account an individual's level of education and level of occupational attainment. An overall evaluation of this table shows that the TYPE I and TYPE II operators were represented throughout the scale in a comparable manner with no significant difference between them (t=0.203, 202df, p= n.s.). There was, however a significant difference between the TYPE I and TYPE II operator groups (t=2.487, 164df, p< .05) and likewise between the TYPE II and TYPE III operator groups (t=2.807, 162df, p< .05) showing that the TYPE II operator fell into a lower category on the Socio-Economic Scale than did his counterparts in the TYPE I and TYPE III

groups. This difference was apparently a function of higher education and near equal occupation between the TYPE I and TYPE II operator groups. On the other hand, the difference between the TYPE II and TYPE III operator groups was more a function of near equal educational backgrounds with higher levels of occupational attainment for the TYPE III operator group. This reverse in function makes it difficult to clearly evaluate these findings. The only other variable that might make it easier to evaluate these results would be the number of job changes favoring the TYPE II operator which could indicate that this group of subjects was in a state of professional flux or transientness. If this be the case these results could represent more of a temporary finding rather than an historical evaluation.

A general evaluation of the physical health histories of the focal operators with a primary focus during the month prior to the focal accident showed that 207 (78%) of the operators were judged by themselves or others to have been in good to excellent health before their focal accident with 69 (67%) TYPE I, 53 (84%) TYPE II and 86 (85%) TYPE III operators falling into this evaluative category. Less than a quarter of the subjects, or 59 (22%) were evaluated to have been in fair to poor health with 34 (33%) TYPE I, 10 (16%) TYPE II and 15 (15%) TYPE III operators presenting a similar evaluation. This finding strongly favored the TYPE I operator who was, apparently, in less good health than his counterparts during the time prior to the focal accident ($p < .05$). This finding may well have been another reason why the TYPE I operator was killed. He may have been

less able to have sustained the accident shock than his TYPE II counterpart.

One of the general health related variables of particular interest to the team was the collection of data on the use of correctional lenses by the TYPE III operators who struck and killed pedestrians. The elementary findings did show that 40 (40%) of the TYPE III operators did wear either eyeglasses or contact lenses as opposed to 33 (32%) of the TYPE I operators and 9 (14%) of the TYPE II operators. This data shown in Table 11 did prove to approach the .01 level of significance ($p < .05$) favoring the TYPE III operator.

The statistical summaries regarding the psychological or psychiatric histories of the operators did not show any significant differences between the groups even though a somewhat larger number of the TYPE II operators had some known involvement with a health care professional prior to the focal accident. Table 12 shows that 41 (15%) of the entire sample had emotional care history from a professional source with 15 (15%) TYPE I, 13 (20%) TYPE II and 13 (13%) TYPE III operators having some such known history. Even though this finding is not significant it is of particular interest when the younger age of the TYPE II operator group is taken into consideration.

Table 13 is the result of a subjective evaluation made by the teams's chief psychologist regarding the relative multi-problem backgrounds for each of the operators included in the total sample.

This judgment was made after a full evaluation of each operator's domestic, professional and social environment and the relative degree of turmoil and unrest that existed in each of these areas. Taking into consideration the subjective nature of the scoring the findings showed that the TYPE II operator was significantly over-represented in the total sample ($p < .01$). Multi-problemmatical environments were evaluated for 101 (38%) of the entire sample and for 35 (34%) TYPE I, 34 (54%) TYPE II and 32 (32%) TYPE III operators.

Included in the interview protocol for each of the informants associated with any of the "most responsible" operators entered in the total research case load was a question pertaining to the degree of sensitivity or presence of "more than the ordinary" number of high strung behaviors on the part of the particular operator. These subjective findings found in Table 14 favored the TYPE II operator group as having been the most high strung or sensitive when compared to the remaining operators ($p < .05$). Undue sensitivity was evaluated for 109 (41%) of the entire sample and for 38 (37%) TYPE I, 34 (54%) TYPE II and 37 (37%) TYPE III operators.

The final variable related to psychosocial unrest or turmoil in the histories of the motor vehicle operators under consideration had to do with the presence or absence of known suicide attempt histories for each of the subjects included in the research. Known suicide attempt histories during the years prior to the focal accident were noted for 34 (13%) of the total experimental sample and for 12 (12%) TYPE I, 14 (22%) TYPE II and for 8 (8%) TYPE III operators showing a

significant trend favoring the TYPE II operator ($p < .05$) when compared tn each of the other accident groups. (See Table 15). This finding is of particular interest when it is evaluated in the light of the other variables associated with psychosocial unrest seen in Table 12, 13 and 15.

Some caution should be observed with regard to a conclusive evaluation of these findings about known suicide attempt histories. These findings do not represent any known suicidal ideation on the part of any particular operator, or any operator group, during the time immediately prior to the focal collision under investigation. There is substantial information indicating that 6 (6%) of the TYPE I operators might have been seriously considering suicide at the time of their respective focal accidents with an additional 6 (6%) TYPE I and 1 (2%) TYPE II operators for whom suicide was speculated as a possible factor in the crash. Quite contrary to other national and local findings no known suicide ideation was evaluated or speculated for 254 (95%) of the operators included in the fatal experimental sample. An additional caution should be observed with regard to the seemingly small number of TYPE I operators who had previously known suicide attempts. The TYPE I operators were strongly represented by single-vehicle/single-occupant crashes which represented 63 (61%) of the TYPE I sample. (See Table 50). The impression of some people that single-vehicle/single-occupant fatal crashes often represent suicide attempts might have forced the informants to withhold positive information regarding suicide attempt histories because of possible

associations with the focal accident and potential legal, social and insurance ramifications.

Two additional variables were included in the findings which give some indication regarding the operators' social environments. Table 16 presents what was most frequently an "other informant's" evaluation regarding the peer popularity of the operator under investigation by the team. This analysis shows that the TYPE II operator was generally regarded by "other informants" as having been significantly less popular than his TYPE I and TYPE III counterparts and shows that the TYPE I operator was judged to have been significantly more popular ($p < .05$). Table 17 gives an indication as to with whom the operators spent their leisure time. This finding did not show a significant difference between the operator types but did present a trend showing that the TYPE II operator spent somewhat more time with his friends and that the TYPE I and TYPE III operator groups spent more time with their families. This variable is strongly correlated with marital status which might well explain this particular finding ($r=0.471$, $p < .01$). These total results would indicate that the TYPE II operator came from an environment with significantly more personal unrest, social turmoil and psychological distress.

A complete review of the arrest and citation histories registered in the Commonwealth of Massachusetts was performed and computerized to see if there were any significant differences or notable trends that might indicate which operator could have been identified from an historical perspective. As indicated in Table 18 there were

no differences in previous citations for reckless driving. Previous citations for driving under the influence of alcohol showed only 12 (4%) from the total operator group with 7 (7%) TYPE I, 1 (2%) TYPE II and 4 (4%) TYPE III operators having a recorded arrest for this particular violation. Citations for driving under the influence of other drugs also revealed a very small sample. Previous citations for driving to endanger presented 30 (11%) operators representing 14 (14%) TYPE I, 6 (10%) TYPE II and 10 (10%) TYPE III operators but showed no notable trend favoring any particular accident type. The broad citation category identified as operating improperly included previous notations for 66 (25%) of the total sample or 29 (28%) TYPE I, 13 (21%) TYPE II and 24 (24%) TYPE III operators but did not show any trend favoring any operator type group. Citations for speeding included the largest number of notations with 78 (29%) of the total operator group identified with previous notation in their record, including 33 (32%) TYPE I, 30 (32%) TYPE II and 25 (25%) TYPE III operators. There were, however, no significant differences between the operator types. Other drug related charges, which included citations for illegal possession and being found in the presence of illegal drugs, represented only 15 (6%) of the total operators or 5 (5%) TYPE I, 8 (13%) TYPE II and 2 (2%) TYPE III operators. This citation did show a notable trend favoring the TYPE II operator. Previous citations for public drunkenness were noted for 57 (21%) of all operators included in the research or for 32 (31%) TYPE I, 9 (14%) TYPE II and 14 (14%) TYPE III operators.

This citation, which has been recently eliminated from criminal records in the Commonwealth, did show a significant difference between accident types favoring the TYPE I operator ($p < .01$) Other citations for offenses related to larceny included notations for 26 (10%) of the entire sample or 9 (9%) TYPE I, 8 (13%) TYPE II and 9 (9%) TYPE III operators showing a notable trend favoring the TYPE II operator.

Table 19 shows the total number of known arrests in the Commonwealth for all operators for any charge. The results show that 109 (41%) of the operators had never been arrested for any violation representing 32 (31%) TYPE I, 27 (43%) TYPE II and 50 (49%) TYPE III operators. There was not a significant difference between the three operator groups. An analysis of the remaining 158 (49%) operators showed a total range of from 1 to 22 previous arrests for the TYPE I operator group, a comparable range of from 1 to 17 arrests for the TYPE II operator group and a range of from 1 to 22 for the Type III operator group. A Chi-Square between those operators who had never been arrested and those who had been previously arrested did not show a statistical significance between operator types. A following Chi-Square between the operators who had two or less arrests and those with three or more arrests also proved to be nonsignificantly different between the three operator types.

Risk Taking Behavior Scale

During the early period of the research the Boston team began to consider the possibility that there might be some psychosocial, legal

and medical variables that might, when correlated, give a relative degree of risk taking behaviors which might well differentiate between the three accident types under consideration in the present investigation. With this in mind the team developed an experimental Risk Taking Behavior Scale (RTBS) which took into its evaluation 12 related, but distinct, areas of counterphobic behaviors crossing the varied sub-cultural communities found in most urban populations. (See Table 20). These 12 risk factors represent active and/or passive expressions of differing intensities of antisocial behaviors. The original risk hypothesis was precluded by the observation that all people participate in some variety of risk taking behaviors. In essence such conscious and unconscious behaviors are an important element in an individual's ability to cope with his environment. Therefore, in this setting, the term "risk" does not necessarily connote "badness". Instead risky behaviors may indicate coping strategies, acting out mechanisms and other environmental adaptations completely acceptable in any social setting. The number of "risky" behaviors present in any societal community could well make the preparation of a risk taking behavior scale prohibitive by volume. Therefore, from among the many available alternatives the Boston team has selected 12 groups of risk taking behaviors for inclusion in the experimental RTBS. Projected research in the greater Boston area identifying a control sample will include the RTBS in its protocol. The findings from that study may allow for either revision or creedance to the current experimental RTBS.

The RTBS was distributed to 100 highway safety officials, mental health professionals and selected individuals from the general population for the evaluation. Each of the 100 participants was asked to rate the 12 items according to their conception of the relative degree of "riskiness". The results of this exposure survey produced three items of high risk (given a weighting of 3 points), six items of moderate risk (with a weighting of 2 points) and three items of low risk (given a weighting of 1 point). The application of the RTBS to any one of the operators included in the experimental sample would mean that he might receive a risk score ranging from 0 to 24 points. The high risk items included: two or more citations for driving a motor vehicle to endanger or for speeding; the personal use of alcohol to a degree where it becomes a "problem" personally, socially, professionally or domestically, and; having received one or more citations for participation in a violent crime. The moderate risk items included: participation in some variety of dangerous leisure time activity such as automobile or motorcycle racing; a history of one or more known suicide attempts; ignoring the advice of a physician or a medical facility; the abusive use of pharmaceutical drugs; any use of street or "entertainment" drugs, and; employment in a profession that constitutes relative occupational hazardry. The low risk items included: the normal operation of a motor vehicle without the use of restraints; smoking more than two packages of cigarettes daily, and; the smoking of marijuana. The experimentation with or use of street or "entertainment" drugs and the smoking of marijuana were included in the RTBS because their personal use indicated a certain measure of legal risk.

From among the 12 risk items seven items presented findings indicating that there were significant differences between the three types of motor vehicle operator types included in the study. Four risk taking behaviors significantly favored the TYPE I operator group: RTBS-2, Problem drinker history ($p < .05$); RTBS-6, Ignoring medical advice ($p < .05$); RTBS-7, Abusing pharmaceutical drugs ($p < .05$), and RTBS-10, Driving without restraints ($p < .05$). Two additional risk items favored the TYPE I operator but did not pass the levels of statistical significance acceptable in this reporting. RTBS-3, One or more citations for violent crime, and; RTBS-4, Car/cycle racing, scuba diving (dangerous leisure time activities) favored the TYPE I operator group. Three risk items significantly favored the TYPE II operator group: RTBS-5, One or more known suicide attempts ($p < .05$); RTBS-8, Use of street or "entertainment" drugs ($p < .01$), and; RTBS-12, Smoking marijuana ($p < .05$). The remaining three risk items did not favor any operator type: RTBS-1, Two or more citations for driving to endanger or speeding; RTBS-9, Hazardous employment, and; RTBS-11, Smoking 40 or more cigarettes daily.

As previously mentioned each high risk item was given a weighted score of 3 points (RTBS-1,2,3) each moderate risk item was given a weighted score of 2 points (RTBS-4,5,6,7,8,9) and each low risk item a weighted score of 1 point (RTBS-10,11,12). Separate risk scores

were computed for each operation and the individual mean risk scores were evaluated by operator type to produce a mean score for each of the three types. The resulting mean risk scores for the TYPE I and TYPE II operator groups was 6 points with respective weighted risk scores ranging from 0−19 and 0−15 points respectively. The TYPE III operator group received a weighted mean risk score of 4 points and 5 points representing the entire experimental sample. Appropriate t-Tests showed that the TYPE I operator group and the TYPE III operator group were significantly different ($t=3.235$, 202df, $p < .01$) as were the TYPE II and TYPE III operator groups ($t=2.992$, 162 df, $p < .01$). There was not a significant difference between the TYPE I and TYPE II operator groups. These findings would seem to indicate that the RTBS has some research value as an experimental model but that further modification and the collection of a control sample of comparable motor vehicle operators is necessary before a significant conclusion can be established. Additional findings regarding the use of the RTBS will be found later in this section of the results.

Historical Patterns of Alchol Use

The alcohol use histories of the 267 operators included in the experimental sample showed that 22 (8%) of the entire sample were evaluated to have been total abstainers from alcohol, with 9 (9%) TYPE I, 3 (5%) TYPE II and 10 (10%) TYPE III operators. The Light social drinkers, or those individuals who were rarely or never drunken included 105 (39%) of the total experimental sample, with 36 (35%) TYPE I, 25 (40%) TYPE II and 44 (43%) TYPE III operators.

As can be seen from Table 21 the largest number of light social drinkers were found in the TYPE III group with 44 (42%) of the 105 (100%) light social drinkers. The moderate social drinkers, or those individuals who were more frequently drunken, were represented by 56 (21%) of the entire sample, or 19 (18%) TYPE I operators, 13 (21%) TYPE II operators and 24 (24%) TYPE III operators. As was the case with the light social drinkers reported above, the group of 56 (100%) moderate social drinkers was most strongly found to have been in the TYPE III operator group representing 24 (43%) of the drinkers in this alcohol use pattern. The heavy social drinkers, or those individuals who were drunken more in the direction of a weekly pattern, represented 55 (21%) of the experimental sample, including 24 (23%) TYPE I, 14 (22%) TYPE II and 17 (17%) TYPE III operators. With the heavy social drinking pattern the dominant type moved to the TYPE I operator group which included 24 (44%) of the total number of operators in this drinking category, or 55 (100%) of the total sample. The sporadic binge drinkers, or those individuals who drank less frequently than the heavy social drinkers but became drunken whenever they did drink, included 13 (5%) of the total sample, with 4 (4%) TYPE I, 6 (9%) TYPE II and 3 (3%) TYPE III operators. Even with this small number of subjects the TYPE II operator was clearly over-represented in this drinking pattern category. Of the 16 (6%) of the operators in the total sample who were alcohol abusers, 11 (11%) were TYPE I operators, 2 (3%) TYPE II operators and 3 (3%) TYPE III operators with the dominant category clearly being in the direction

of the TYPE I driver. Appropriate t-Tests did not show any significant differences between the operator types.

An evaluation for the frequency of alcohol use found in Table 22 shows that 26 (10%) of the operators never used alcohol (abstainer). Among the 38 (14%) operators who used alcohol more in the direction of monthly 16 (15%) were TYPE I operators, 11 (17%) TYPE II operators and 11 (11%) TYPE III operators. The 103 (39%) operators from the total sample who used alcohol more in the direction of a weekly use pattern, 39 (38%) were TYPE I, 22 (35%) TYPE II and 42 (41%) TYPE III operators. Over one-third, or 100 (37%) of the experimental sample of motor vehicle operators used alcohol more in the direction of a daily use pattern, representing 40 (39%) TYPE I, 27 (43%) TYPE II and 33 (33%) TYPE III operators. Unfortunately a Chi-Square on the findings for the frequency of alcohol use did not appear near the level of statistical significance.

Some significant differences between the operator types was seen in the data scored for the frequency of drunkenness during the year prior to the focal accident found in Table 23. In essence this table shows that the TYPE I and TYPE II operators were very much alike in their intoxication patterns and that the TYPE III operator was significantly noted with a less frequent schedule of drunkenness. This finding was undoubtably strongly influenced by the 29 (28%) of the TYPE III operators who were evaluated to have not been intoxicated during the year prior to their focal accident as opposed to the 18 (17%) TYPE I and 8 (13%) TYPE II operators in the same category. For

those operators who were known to have been intoxicated during this year 23 (22%) TYPE I, 17 (27%) TYPE II and 21 (21%) TYPE III operators were known to have been drunken two or less times. Those who were known to have been intoxicated from three to eight times during that year were less evenly represented but were not significantly different when evaluated between accident types. This category showed 23 (22%) TYPE I, 12 (19%) TYPE II and 26 (26%) TYPE III operators. All three accident types showed that 11% of each operator group had been drunken more in the direction of a monthly pattern with 11, 7 and 11 operators respectively. The subjects who were drunken weekly favored the TYPE I and TYPE II operator groups with 20 (20%) and 12 (19%) of their operators falling into this category as opposed to 12 (12%) of the TYPE III operators. The cluster of operators who were known to have been intoxicated on a more than weekly schedule during the year prior to their focal accident were represented by 8 (8%) TYPE I, 7 (11%) TYPE II and 2 (2%) TYPE III operators.

Interpersonal problems resulting from the use of alcohol were evaluated in conjunction with the data available in Table 24A which indicates the numbers of operators that had been encouraged by others to drink less during the months prior to their focal accident. This finding shows that 24 (23%) TYPE I, 13 (21%) TYPE II and 16 (16%) TYPE III operators had been encouraged by others to drink less. The companion findings in Table 24B show that 15 (15%) TYPE I, 15 (24%) TYPE II and 9 (9%) TYPE III operators were personally aware of some problem associated with their own use of alcohol and had made a personal attempt to drink less during that year. There was, however, no

significant difference between the operator types for this variable.

Table 24C is an analysis of problem drinking histories for the 267 operators included in the experimental sample. These findings show that 106 (40%) of the total group were judged as problem drinkers, representing 49 (48%) TYPE I, 25 (41%) TYPE II and 31 (31%) TYPE III operators. There was a significant showing which indicated that there were considerably more problem drinkers in the TYPE I operator group. (See Appendix D for variables used to score "problem drinkers".)

Table 25A gives some indication regarding professional problems and resulting job losses associated with the use of alcohol. Unlike the previous variables this data was not restricted to the previous year but, rather, to anytime during the lifetime of the operator. These findings show that 15 (15%) TYPE I, 15 (24%) TYPE II and 9 (9%) TYPE III operators were known to have had previous job losses because of the use of alcohol. Even though there was a notable trend favoring the TYPE II operator the final statistical analysis did not prove to be significant.

Many researchers have speculated that there was a rehabilitative link between the first time an individual was arrested for driving under the influence of alcohol and subsequent vehicular accidents involving the operator's use of alcohol. Table 25B presents a review of the correlation between previous arrests for driving under the influence of alcohol and accident type. The findings indicate that only 12 (4%) of the total sample had ever been arrested for driving under the influence, including 7 (7%) TYPE I, 1 (2%) TYPE II and 4

(4%) TYPE III operators. These findings would not seem to bear out the assumptive link between arrest histories and accident histories.

Marijuana Use Patterns

A single question regarding the marijuana use patterns of the included operators was approached very carefully during the interview protocols and has produced the data seen in Table 26. Marijuana use patterns were impossible to ascertain for 13 of the operators and their responses were scored in the negative as marijuana abstainers. The findings show that 127 (48%) of the operators in the total sample were not known to have smoked marijuana at all during the previous year representing 50 (49%) TYPE I, 21 (33%) TYPE II and 56 (55%) TYPE III operators. Those who were considered to have been only experimental users, having smoked marijuana only once or twice, included: 19 (7%) of the total sample, 11 (11%) TYPE I, 2 (3%) TYPE II and 6 (6%) TYPE III operators. This group of experimental smokers were not considered as marijuana users (See Table 27). The remaining 121 (45%) operators were evaluated as users with differing frequencies of use ranging from occasional to daily patterns. This group of users included 42 (40%) TYPE I, 40 (64%) TYPE II and 39 (39%) TYPE III operators. The occasional smokers were represented by only 10 (4%) of the total experimental sample of 267, including 3 (3%) TYPE I, 5 (8%) TYPE II and 2 (2%) TYPE III operators. The light social users, who smoked more in a pattern of once a month included 20 (7%) of the total sample or 6 (6%) TYPE I, 8 (13%) TYPE II and 6 (6%)

TYPE III operators. The moderate social user, or the individual who smoked more in a weekly pattern, most frequently on weekends was represented by 42 (16%) of the total sample, or 17 (16%) TYPE I, 10 (16%) TYPE II and 15 (15%) TYPE III operators. The heavy user, or the individual who smoked marijuana more in the direction of a daily pattern or at least several times a week included 49 (18%) of the total sample and 16 (15%) TYPE I, 17 (27%) TYPE II and 16 (16%) TYPE III operators. An analysis by t-Tests showed no significant difference between the TYPE I and TYPE II operators although the trend strongly favored the TYPE II operator. Similar procedures showed no difference between the TYPE I and TYPE III operators but there was a significant difference between the TYPE II and TYPE III operator groups ($t=2.681$, 152df, $p < .05$).

Table 28 shows a correlation matrix between the alcohol use patterns and the marijuana smoking patterns for the 267 operators. As can be noted from the table, 19 (86%) of the 22 alcohol abstainers were also marijuana abstainers and another 2 (9%) had only experimented with Cannabis. Central points of correlation and identification through the findings show that 6 (60%) of the 10 (100%) occasional marijuana users, who smoked eight or less times during the previous year, were also light social drinkers as were 11 (55%) of the 20 (100%) light smokers, who smoked more in the direction of monthly. This trend favoring the light social drinker was considerably altered with the moderate smoker (who was a weekly, or more likely weekend user), and the findings showing that 16 (38%) of the moderate smokers

were also light social drinkers but that 13 (31%) of the 42 (100%) moderate smokers were also heavy social drinkers. This trend completely collapsed with the introduction of the heavy smoker category which showed that of the 49 (100%) more than weekly users of marijuana 12 (24%) were light social drinkers, 16 (33%) were moderate social drinkers and 15 (31%) were heavy social drinkers with the remaining 6 (12%) having been either sporadic binge drinkers or alcohol abusers. Table 29 presents a correlation between marijuana users and non-users and historical patterns of alcohol use with a significant finding showing that the heavy social drinker is more likely to be a marijuana user ($p < .01$) with a notable trend showing only a slightly less likelihood favoring the moderate social drinker.

An abbreviated analysis for age was conducted with regard to the marijuana question and it was found that the younger operators were far more likely to have been heavier smokers of marijuana ($F=20.885$, 5df, $p < .01$). The mean age for the marijuana abstainers was 39 years; the experimenters, 28 years; the occasional smoker, who had smoked from three to eight times during the previous year, 27 years; the light or monthly smoker, 24 years; the moderate or weekly smoker, 24 years; and, the heavy or more than weekly smoker, 23 years. The total age range for the marijuana users in the Boston study was from 16 to 53 years.

Street or Entertainment Drug Use

During the interview schedule the team members attempted to

collect information regarding the use of street or entertainment drugs on the part of the operator during the year prior to the focal accident. The list of non-prescribed drugs presented to the interviewee included: acid, mescaline, psylicibin, peyote, speed, "ups", amyl nitrate or poppers, "downs" such as barbiturates, sopers, qualudes, cocaine, heroin or opium. A positive response to any of these drugs was indicated by a single positive scoring in the data collection instrument. It was unfortunate that a more definitive scoring method was not utilized. Some positive response was elicted regarding 95 (36%) of the operators including 31 (30%) TYPE I, 35 (56%) TYPE II and 29 (29%) TYPE III operators as seen in Table 30. A Chi-square analysis proved to have been significant favoring the TYPE II operator group as having been the sample with the largest number of known street drug experimenters or users ($p < .01$). Table 31 shows a correlation of street drug experimentation or use and historical patterns of alcohol use showing that the heavy social drinker was likely to have experimented with or used street drugs more frequently than did the other social drinkers ($p < .01$). There were a larger proportion of sporadic binge drinkers in the street drug user category but the small number of these drinkers in the total sample makes any direct evaluation difficult. Table 32 is a comparison of the patterns of marijuana use and the presence or absence of some use of a street drug. It can be noted there is a distinct trend showing that the heavier marijuana smoker is also more likely to have used street drugs at some time ($p < .01$).

Focal Accident Data

Human Factor Stress Scale

During the pilot study period in September, 1971, the Boston team was among the number of highway safety research organizations that were attempting to isolate some of the many human factor stress conditions that faced the operator during the moments prior to his fatal or injury producing collision. With this research aim in mind the team hypothesized that there might be some difference between the three types of accidents under investigation if an evaluation could be made of the presence or absence of a number of human factor related precursor variables which each operator might have brought with him to the scene of the accident. At the onset 16 focal human factors were selected as trial variables for the purpose of centralizing the data collection and estimating the amount of personal stress each operator was under as he approached his focal accident.

These 16 factors have been built without consideration for item weighting into the Human Factor Stress Scale (HFSS) as detailed in Table 33.

The first three factors were geared to evaluate the relative presence or absence of interpersonal tension. Domestic tension (HFSS-1) was defined as present interpersonal problems or disruptions in the operator's home or place of residence of a chronic or an acute nature. Professional tension (HFSS-2) referred to profession or occupation related problems such as pending or actual job loss or marked professional dissatisfaction. Social tension (HFSS-3) was scored when

some interpersonal conflict not associated with a domestic or professional environment was noted to have been potentially present. Clinical depression (HFSS-4) was evaluated by the team psychologist either from the operator's statements, when applicable, or from other informant sources. Fatigue (HFSS-5) was scored when an operator or another informant indicated that this factor was present or when the researchers judged fatigue to have been an obvious factor, such as when an operator had been awake for more than 20 hours. No attempt was made to judge the degree of "tiredness". Chronic physiological problems (HFSS-6) were considered as a valid factor after a full evaluation of the data. In essence this stress item covered acute and more chronic problems associated with physical health and well being. Included in this factor were reports of potential physical distractions from problems such as some disability resulting from leg or arm injuries, epilepsy, severe asthma, known migraine headaches, recent injuries from a fight, and severe reports of influenza.

Chronic emotional problems (HFSS-7) indicated that the operator had been under the care of a mental health professional either at the time of the accident or within the past 30 days. Participation in any variety of encounter groups was not necessarily judged to have been significant and each case was thoroughly reviewed to avoid the abusive scoring of this factor. Tardiness (HFSS-8) was scored when an operator was known to have been late for an appointment in a professional, domestic or social setting. This factor included positive scores for individuals who were tardy for a pre-scheduled professional appointment,

a parental or espousal curiew and/or a domestic or social affair. Passenger distraction (HFSS-9) was scored when an operator or another informant indicated that a passenger had distracted the operator. These cases included situations such as a child falling off the vehicle seat, admitted "back seat driving", an argument within the principle vehicle, and a passenger's calling the operator's attention to something apart from his driving task. Visual distraction or distortion (HFSS-10) was noted with reports of sun blindness, children playing in the street, heavy snow or fog, having been cut off by another vehicle and other similar situations. Excessive speed for the conditions (HFSS-11) scores came from operator's reports, other informants' reports and information from Registry of Motor Vehicles or police sources. Legal pursuit (HFSS-12) was noted when the operator was knowingly being pursued by legal officials at the time of the focal accident. Alcohol use (HFSS-13) was noted with any known presence of alcohol for the focal operator. Other drug use (HFSS-14) came from reports or information indicating the focal use of marijuana and/or street drugs on the part of the operator. Vehicle unfamiliarity (HFSS-15) was coded positively when the operator had not driven the vehicle which he was operating in the focal accident on more than five occasions during the previous month or by self report. Most of the positive scores in this factor resulted from principal operator use of borrowed, stolen or rented vehicles. Road unfamiliarity (HFSS-16) was scored positively when the operator had never driven the roadway in question or when he had driven this particular route on

less than three previous occasions, often with operator report of unfamiliarity.

The results of the analysis showed that the TYPE II operator group was significantly dominant in 10 of the 16 human factor stress items with a non-significant trend favoring one more item. Domestic tension, social tension, chronic emotional problems, tardiness, passenger distraction, excessive speed for conditions, legal pursuit, other drug use, vehicle unfamiliarity and road unfamiliarity all strongly favored the TYPE II operator group with fatigue showing a notable trend in the same direction.

The TYPE I operator group was significantly favored in the three stress items referring to clinical depression, chronic physiological problems and alcohol use with a non-significant trend favoring professional tension. No stress items favored the TYPE III operator group at the level of statistical significance. However, visual distraction or distortion showed a notable trend in the direction of the TYPE III operator group.

When the total group of 267 experimental operators is taken into consideration as their positive human factor stress items are evaluated it is of interest to note that 94 (35%) of the operators came to the scene of the focal accident with identifiable domestic tension as a distracting influence. Employment or professional tensions were present in the lives of 77 (29%) of the total sample and 90 (34%) were known to have had some social interpersonal problems. Some variety of clincial depression could have been identified for 49 (18%) of the

operators and 42 (16%) were, or had recently been under the care of a health service professional.

Some other human factor stress items that could have served to distract the focal operator from his driving task should be pointed out. Tardiness or having been knowingly late for some meeting or appointment influenced 58 (22%) of the operators. Passenger distraction caused 48 (18%) of the drivers to divert their attention from the road. Some variety of visual distraction or distortion was directly contributory to the focal accident for 99 (37%) operators. A small group of 15 (7%) were being pursued by legal officials at the time of the fatal accident. Situational unfamiliarity contributed to the human factor stress for 43 (16%) of the operators who were driving a vehicle with which they were not familiar and 33 (12%) who were operating on an unfamiliar roadway.

Table 34 is a presentation of the number of stress items that were identifiably present for the operators with a classification by accident type. Three or less stress factors were present for 115 (43%) of the total sample or for 31 (30%) TYPE I, 12 (19%) TYPE II and 72 (71%) TYPE III operators. From four to seven stress factors were present for 128 (48%) of the total experimental sample representing 59 (57%) TYPE I, 40 (63%) TYPE II and 29 (29%) TYPE III operators. Another 24 (9%) operators were under the pressure of from eight to eleven stress factors at the time of their focal accident with 13 (13%) TYPE I and 11 (18%) TYPE II operators. Out of a possible 16 stress factors no TYPE III operator had more than seven factors. Both

the TYPE I and TYPE II operator groups had one and two operators respectively that entered the scene of their focal accident with 11 human factor stress items to distract them from their driving task.

A correlation between the day of the week and the type of fatal accident seen in Table 35 shows that the distinct peak for the TYPE I accidents occurred between 12:00 a.m. on Friday (Thursday midnight) and 11:59 p.m. on Saturday. The peak time for the TYPE II accidents covered a three day period, from 12:00 a.m. Friday until 11:59 p.m. on Sunday. There did not appear to be any particular pattern to the TYPE III accidents. There were more TYPE I accidents on Tuesday and Friday than there were TYPE II or TYPE III accidents. The TYPE II accident group was somewhat more heavily represented on Thursday and Saturday and was clearly predominant on Sunday. More TYPE III collisions were recorded on Monday and Wednesday than the TYPE I and TYPE II crashes.

The time of day pattern for the fatal accidents in the greater Boston area was divided into six four-hour periods for analysis. As can be seen in Table 36 TYPE II accidents were most common from midnight to 4:00 a.m. when 22 (35%) TYPE II accidents were recorded as opposed to a slightly lower type proportion for the 35 (34%) TYPE I accidents. The same basic pattern followed for the 4:00 a.m. through 8:00 a.m. period showing 7 (11%) TYPE II and 10 (10%) TYPE I accidents and for the 8:00 p.m. to midnight period with 19 (30%) TYPE II and 26 (25%) TYPE I accidents. The TYPE III accident was most proportionately represented during the daylight and early evening hours with 11

(11%) accidents occurring between 8:00 a.m. and noon; 19 (19%) between noon and 4:00 p.m. and the largest number of 33 (32%) between 4:00 p.m. and 8:00 p.m. The strongest time for the recording of all accident types was between midnight and 4:00 a.m. when 67 (25%) of the total experimental sample was entered. This period was quickly followed by the 8:00 p.m. to midnight cluster with 65 (24%) fatal accident notations.

One of the variables collected by the Boston team that has been of interest has been the nature of medical care for the respective operators following their focal accident. Of the 103 TYPE I operators that were killed in the focal collision 16 (16%) did receive some medical attention before their demise and 87 (84%) were pronounced dead on the highway or at the emergency ward. Thirteen (21%) TYPE II operators did not require any medical attention, 22 (35%) were only seen in the emergency services and sent home and 28 (44%) were hospitalized. Only 5 (5%) of the TYPE III operators required any medical attention, with 3 (3%) seen in the emergency services and another 2 (2%) having been hospitalized.

Table 38A and 38B present some of the data available on the pedestrians who were struck and killed by the TYPE III operators included in this research. A total of 104 pedestrians were killed in 101 accidents during the period of the field investigation within the geographical limits of the study. As can be seen in Table 38A there was only a slight trend showing that children nine years of age and

younger and people 60 years and older were more likely to have been among the pedestrians killed in the fatal accidents investigated by the team. The mean age for the pedestrian sample was 43 years. Blood for chemical analysis was drawn on only 80 (77%) of the pedestrians included in the sample. From among these 80 subjects 55 (69%) were reported with negative BAC information. The remaining 25 (31%) were known to have been drinking with BAC's ranging from .01 to .34 gm/100ml%. It is of interest to note that only 3 (3%) TYPE III operators who had been drinking, struck and killed pedestrians who had also been drinking.

Focal Operator Alcohol Involvement

Alcohol and how it related to the operator of the motor vehicle under investigation has continued to be the most important human factor variable for most highway safety research professionals. There has been considerable divergence of opinion between states and related research agencies as to how much alcohol an individual needs to have in his blood stream before he becomes inappropriately influenced and should not operate a motor vehicle. Currently, the Office of Alcohol Countermeasures (OAC) has established the criterion that a Blood Alcohol Concentration (BAC) of .05 gm/100ml% or greater, or a clinical evaluation of the same, indicates that a motor vehicle operator has been under the influence of alcohol. The present study shows that 103 (39%) of the operators included in the fatal experimental sample were judged to have been influenced by alcohol at the time of their respective focal accidents. In this section Group A will represent the

103 alcohol involved operators and Group N the 164 operators who were not personally influenced by alcohol at the time of the focal accident. This overall figure included 68 (66%) TYPE I, 28 (44%) TYPE II and 7 (7%) TYPE III accident operators. As indicated in Table 39 an additional 19 (7%) operators had a BAC of .04 gm/100m% or less, or a clinical evaluation of the same, representing 6 (6%) TYPE I, 7 (12%) TYPE II and 6 (6%) TYPE III operators. The remaining 145 (54%) of the operators including 29 (28%) TYPE I, 28 (44%) TYPE II and 88 (87%) TYPE III operators were evaluated to have been clearly without alcohol influence to any degree at the time of the focal accident.

For the purposes of this presentation the OAC guidelines regarding alcohol influence will be observed unless an indication is made to the contrary. Therefore, no alcohol influence was noted for 164 (61%) of the operators, including 35 (34%) TYPE I, 35 (56%) TYPE II and 94 (93%) TYPE III operators. On the other hand significant alcohol was noted for 103 (39%) of the total sample, including 68 (66%) TYPE I, 28 (44%) TYPE II and 7 (7%) TYPE III operators. Clearly, the operator type most strongly influenced by alcohol was the TYPE I operator group ($p < 0.1$) and the TYPE III operator group was the least significantly influenced ($p < .01$).

Table 40 provides a three variable matrix correlation including known problem drinking histories, focal alcohol influence and the day of the week for the focal accident. The vertical columns show that of the 106 (40%) operators with known problem drinking histories 65 (61%)

were judged to have been influenced by alcohol at the time of the focal accident. The remaining 41 (39%) of the operators with problem drinking histories were not involved in alcohol influenced accidents. Of the 161 (60%) operators with no known problem drinking histories 38 (24%) were significantly influenced by alcohol at the time of the focal collision and 123 (76%) were not similarly influenced. An additional Chi-square, not considering the days of the week, found these differences to have been significant. Therefore, the individual with a problem drinking history was more likely to have become involved in an alcohol related fatal accident.

The peak day of the week for alcohol influenced accidents caused by problem drinker drivers was on Saturday from 12:00 a.m. to 11:59 p.m. as indicated in Table 40. It is of equal interest to note that the peak day for accidents without alcohol influence caused by problem drinker drivers was during the 24 hours of Monday. Operators who were not problem drinkers became involved in fatal accidents during a very predominant 48 hour cluster from Friday at 12:00 a.m. (Thursday midnight) through Saturday at 12:00 midnight. On the other hand operators without problem drinking histories were more likely to have become involved in fatal accidents with no known alcohol presence on Wednesdays and Fridays.

Table 41 is another triple matrix correlation showing focal alcohol influence, problem drinker histories and time of day broken into six four hour segments. As seen in Table 36 and 41 the peak time periods for fatal accidents in the Boston experimental sample were

from midnight to 4:00 a.m., followed by 8:00 p.m. to midnight and then by the 4:00 p.m. to 8:00 p.m. time period. The single, most critical hour appeared to have been between 1:00 and 2:00 a.m. Nearly half of the problem drinkers involved in alcohol related accidents, or 28 (13%) of these operators were instrumental in an accident which occurred between midnight and 4:00 a.m. with a very predominant cluster taking place between 1:00 and 2:00 a.m. (It should be noted again that the bars close at 2:00 a.m. in the greater Boston area.) The same four hour cluster from midnight to 4:00 a.m. dominated the group of operators who were not problem drinkers and who were involved in accidents with alcohol influence.

The problem drinker who was involved in a fatal accident without alcohol influence was more likely to have experienced his collision between 8:00 p.m. and midnight, when 13 (32%) of the 41 (100%) appropriate operator crashed. The evident peak time period for the individual with no known problem drinking history who was involved in an accident without alcohol influence was located between 4:00 p.m. and 8.00 p.m.

One of the speculations conjectured by the Boston team was that there might well be some correlation between the distribution of positive scores on the Risk Taking Behavior Scale and the riskiness of operating a motor vehicle while under the influence of alcohol. The results of this hypothesis are seen in Table 42 where a correlation is made between the 164 operators in Group N who were not known to have been drinking significant amounts of alcohol before the focal accident

and the 103 operators in Group A who were known to have been focally influenced by alcohol. These findings show that 6 of the 12 risk items significantly favored Group A including: known problem drinker histories (RTBS-2) ($p < .01$), one or more suicide attempts (RTBS-5) ($p < .01$), abusing pharmaceutical drugs (RTBS-7) ($p < .05$), the experimental or frequent use of street drugs (RTBS-8) ($p < .05$), normally driving without restraints (RTBS-10) ($p < .05$), and the smoking of marijuana (RTBS-12) ($p < .06$). It is unfortunate that all of these risky behaviors are of such a personal and private nature that they become difficult to identify in the population at large.

The data in Table 43 is a cross comparison between the historical patterns of alcohol use with considerations for the 164 operators in Group N and the 103 operators in Group A. It is of particular interest to note the progression of the horizontal percentage points located below the sums for the data items. The proportions in Group N decrease almost sequentially and the same figures increase in much the same order. The evident finding of this analysis is that the more heavily the operator drank alcohol, the more likely he was to become involved in an accident while he was significantly influenced by alcohol. However, caution should be observed with regard to this finding from the present sample because of the relatively small number of entries in the categories for sporadic binge drinkers and alcohol abusers. This general observation of heavier drinking histories associated with a greater likelihood of an alcohol related accident are further speculated with the findings in Table 44. This table

reports that 65 (61%) of the problem drinkers were involved in alcohol related accidents as opposed to 38 (24%) of the operators with no known problem drinker history. The reverse trend continued for Group N showing that 123 (76%) of the operators with no known problem drinking history were involved in focal accidents with no significant alcohol having been personally present as opposed to 41 (39%) of the operators with problem drinking histories having been involved in focal accidents with no known significant presence of alcohol ($p < .01$).

The data in Table 45 is a correlation between Groups N and A and marital status. These findings show that of the 135 single operators 49 (36%) were involved in alcohol related accidents and 86 (64%) were not. The same general comparison holds true for the 93 married operators with 31 (33%) having been involved in fatal accidents with alcohol influence and 62 (67%) who were involved in fatal accidents without alcohol. The relatively small numbers of operators who fell into the remaining four classifications of unmarriedness make it difficult to arrive at a definitive conclusion but there is a notable trend in the opposite direction of the single and married operator groups mentioned above, showing that common law, widowed, divorced and separated operators might have been more likely to have been involved in an alcohol related fatal accident than the single and married operators.

A number of researchers have speculated over the possiblity that one of the better ways to reduce the number of alcohol related fatal or personal injury motor vehicle accidents would be to rehabilitate or

re-educate operators when they have been first arrested for a violation of a regulation or law associated with the improper use of alcoholic beverages, and in particular arrests for driving under the influence of alcohol. As was noted earlier in Table 25B only 12 (4%) of the 267 operators included in this sample had ever been arrested for driving under the influence of alcohol prior to their focal accident. With this in mind Table 46 is a triple matrix correlation between previous citations or arrests for any alcohol related violation, the presence or absence of significant alcohol in the focal accident, and histories of problem drinking. These findings show that 79 (30%) of the operators had been previously arrested for an alcohol related violation and that 40 (51%) of them were known to have been under some alcohol influence at the time of the focal fatal accident. The other 39 (49%) were not known to have been under influence of alcohol at the time of the focal accident. From among the 40 operators with previous citations for alcohol related offenses who were involved in alcohol related focal accidents, 12 (30%) were not known to have been problem drinkers and 23 (70%) did have known problem drinking histories. Within the group of 39 operators who had previous alcohol related citations and who were not involved in alcohol related focal accidents 25 (64%) were not known to have been problem drinkers, whereas, 14 (36%) did have such known problem drinking backgrounds. This finding may not completely bear out the ASAP rehabilitation concept. The final control sample analysis will support or obviate the concept.

Table 47 is a comparison between the operators in Groups N and A and their known marijuana smoking patterns during the year prior to their respective focal accidents. These findings show that 47 (46%) of the operators in Group A either had never smoked marijuana or had only smoked experimentally as opposed to 99 (61%) of the operators in Group N who were likewise not users of marijuana. It is of further interest to note that 30 (18%) of the operators in Group N were more than weekly smokers of marijuana and that an additional 17 (10%) were weekly, or more likely weekend smokers. The comparable categories in Group A show that 19 (18%) of these operators smoked more than weekly and another 25 (24%) were judged to have been weekly, or more likely weekend smokers.

A great deal of other data relative to focal alcohol use can be found in the following result section dealing with DAC Data Requirements.

Focal Marijuana and Other Drug Use

Very little subjective or experimental evidence is available regarding the position of marijuana as an influence in field vehicular accidents. With this in mind, the Boston team attempted to collect reliable subjective data about the use of marijuana during the two hour period prior to the focal accident on the part of the operator under consideration. The data in Table 48 reports that reliable subjective information shows that at least 13 (8%) of the operators in Group N and 30 (29%) of the operators

in Group A had been smoking marijuana at one point during the two hours prior to the focal accident. It was also speculated, but could not be proven to the satisfaction of the team, that an additional 18 (7%) of the operators had also been smoking marijuana, including 10 (6%) of the operators in Group N and 8 (7%) of the operators in Group A. Because of the speculative nature of this data the 18 operators were scored negatively with regard to focal marijuana use. It is of interest to note that 30 (70%) of the 43 operators known to have been smoking marijuana were also drinking alcohol prior to the focal accident

Table 49A gives a breakdown of the 22 (8%) of the focal operators known to have been using drugs other than alcohol or marijuana which could have influenced their driving at the time of the focal accident. As can be seen in this presentation 18 (82%) of the focal operators were using other drugs and alcohol at the same time with only 4 (18%) using only other drugs. The main drugs recognized in the investigation were "downs" such as barbiturates and methaqualone noted for 10 (45%) of the 22 operators. Narcotics such as heroin and Methadone were noted for 5 (23%) of the operators followed by 3 (14%) of the operators using pharmaceuticals (Percodan and antihistamines), 2 (9%) using "speed" or amphetamines and 2 (9%) using hallucinogens, in this case "acid".

The information reported in Table 49B shows that there was considerable variety among the intoxicant combinations available to the focal operator. These findings indicate that 129 (48%) of the

operators were focally influenced by alcohol, marijuana, street or entertainment drugs, or pharmaceuticals, or any combination of these intoxicants as opposed to the 138 (52%) of the operators who were not known to have been influenced by any intoxicant. These findings show that 70 (26%) of the entire sample were influenced by alcohol alone, 25 (9%) by alcohol and marijuana, 13 (5%) by marijuana alone, 4 (1.5%) by street or entertainment drugs alone, 5 (2%) by street or entertainment drugs and marijuana, 4 (1.5%) by pharmaceuticals alone, 3 (1%) by pharmaceuticals and alcohol, 5 (2%) by the threeway combination of street or entertainment drugs, marijuana and alcohol and 138 (52%) were not known to have been influenced by any intoxicant. With the limitations of adequate measuring instruments and subjective data these findings should be regarded with some caution but evaluated as notable results.

Single and Multiple Vehicle Collisions

The following 4 tables present some of the data from the Boston study with regard to the numbers of vehicles involved in the 267 focal accidents. Table 50 considers only the TYPE I and TYPE II accident groups and shows that 63 (61%) of the TYPE I and 26 (41%) of the TYPE II accidents were single vehicle collisions. This data also shows that from among the 89 single vehicle collisions, 63 (71%) were TYPE I accidents where the operator of the vehicle was killed as opposed to the 26 (29%) TYPE II accidents where the operator survived but a passenger in his own vehicle was killed. These

findings significantly favor the single vehicle TYPE I accident grouping.

Table 51 evaluated the numbers of involved vehicles with regard to the variable of alcohol influence to report that 55 (62%) of the single vehicle collisions were alcohol involved as opposed to 51 (53%) of the multiple vehicle collisions. Alcohol was not judged to have been present on the part of the focal operator for 34 (38%) of the single vehicle collisions and for 36 (47%) of the multiple vehicle crashes. There was not a significant difference between the clusters of data.

The TYPE I and TYPE II single and multiple vehicle accidents were correlated with focal alcohol presence and the number of other passengers in the operator's vehicle in Table 52. There are several data points of interest that should be emphasized. Over half, or 29 (53%) of the 55 operators involved in a single vehicle collision, who were under some influence of alcohol, had no other passengers in their vehicle. This figure proportionately corresponds to the 17 (50%) of the single vehicle/no passenger crashes where no alcohol was noted, to the 18 (44%) of the multiple vehicle crashes with alcohol and without passengers and the 17 (47%) of the multiple vehicle collisions without alcohol and without passengers. It has sometimes been speculated that the operator driving alone under the influence of alcohol was more susceptible to being involved in a single vehicle/single occupant collision. Although these results do not approach statistical significance they would not appear to support this conjecture.

Table 53 correlates the single and multiple vehicle configuration with problem drinker histories and reports no statistical significance, or even a notable trend, that would indicate that there is any difference between the problem drinker and his potential for becoming involved in either a single or a multiple vehicle collision.

OAC Data Requirements

During the Special Study period of evaluation and analysis the Office of Alcohol Countermeasures (OAC), which is the NHTSA division primarily responsible for the Alcohol Safety Action Projects, presented the team with a request for specified analyses of the data that the OAC might use for general information and for an evaluation of the Boston site. This section of the Results has been devoted to the presentation of such data. The following findings may represent in part findings previously discussed, with differing analytical approaches to the data and the subsequent interpretations and evaluations as requested by the OAC.

Table 54 (OAC #1) is a presentation of the findings with regard to the type of collision encountered by the vehicle with respect to alcohol involvement. As previously discussed, "alcohol involvement" is scored in the positive when a particular subject is judged to have had a Blood Alcohol Concentration (BAC) of >.05 gm/100ml% at the time of the focal accident or a clinical evaluation of the same. As can be seen in this data the single vehicle collision was dominated by the 40 (69%) alcohol involved operator group. The multiple

vehicle configurations show a near equal distribution between the 46 (52%) of the responsible operators who were judged to have been alcohol involved and the 52 (48%) of the operators in the same division who were not alcohol involved. An analysis for the non-responsible operator in a multiple vehicle collision showed that only 13 (16%) were alcohol involved as opposed to 70 (84%) who were not alcohol involved. It should be noted that the total number of operators under the multiple vehicle category are not equal. Unfortunately, adequate information necessary to make a reliable judgment was not collected on 25 (23%) of the non-responsible operators. Therefore, this entry includes the data on the remaining 83 (77%) non-responsible operators for whom reliable alcohol related data was available. Only 7 (7%) of the operators who struck and killed pedestrians were evaluated to have been drinking significantly as opposed to 22 (21%) of the pedestrians whom they struck and killed. In all, a total of 121 (45%) of the 267 accidents reported known alcohol involvement by a most responsible operator, another operator and/or a pedestrian.

The same basic configuration is presented in Table 55 (OAC #2) with additional considerations for problem drinker histories for the individuals involved. Data to evaluate the non-responsible operators and the pedestrians with regard to their problem drinking histories was not collected during the research. The single vehicle collisions included 35 (39%) problem drinkers who were involved in alcohol related crashes as opposed to 4 (4%) of the problem drinkers who were not. Only 20 (23%) of the comparable operators who were not problem

drinkers were involved in alcohol related crashes as opposed to the 30 (34%) operators who were not problem drinkers and who had not been significantly influenced by alcohol at the time of the focal crash. The same basic pattern can be seen in the multiple vehicle collision/responsible operator group. There is, however, a considerable difference in the distribution of the operators who struck and killed pedestrians principally because 94 (93%) of these drivers were not known to have been significantly influenced by alcohol at the time of the collision.

The following table also deals with the alcohol involved and the non-alchol involved operator groups with regard for the time of day of the fatal collision. The alcohol involved operator group of 103 drivers had its largest concentration of crashes with 50 (48%) of its operators logged in between 12:01 a.m. and 4:00 a.m. The distribution of accidents for the non-alcohol group was bi-modal with 44 (27%) involved in fatal crashes between 4:01 p.m. and 8:00 p.m. and another 39 (24%) between 8:01 p.m. and midnight.

Table 57 (OAC #4) gives consideration to alcohol involvement on the part of the 267 operators included in the main body of the Boston research and their respective licensing status at the time of the focal collision. These results show that 91 (88%) of the alcohol involved operators, 155 (95%) of the non-alcohol involved operators, or 246 (92%) of all operators were driving under a valid license at the time of the focal collision. Only 9 (9%) of the 103 alcohol influenced operators had their licenses under suspension or revocation.

The findings presented in Table 58 are a further development of the licensing status information found in the previous table. The purpose of this analysis was to see if there was any relationship between the operators who were without a valid license at the time of the focal collision and previous citations for operating a motor vehicle without a valid license. Among the 247 operators who had never been cited for operating a motor vehicle without a valid license were 4 (2%) who had a learner's permit, 6 (2%) who had revoked or suspended licenses, and 4 (2%) who had never been licensed. The remaining 233 (94%) had valid licenses with no history of having operated without a valid permit. Of the remaining 20 (7%) operators, 13 (65%) had valid licenses at the time of the focal accident with a recorded history for 12 of these operators of one citation for driving without a proper license, and 6 such citations for one operator. The remaining 7 (35%) operators had either never been licensed or had their licenses suspended or revoked at the time of the focal accident and had previous citations for driving without a valid license ranging from one to five.

The research purpose precipitating Table 59 (OXC #5) was to see if there was any relationship between previous citations for driving under the influence of alcohol and/or for public drunkenness and alcohol involvement in the focal accident. Among the 59 (22%) operators who had a known previous citation for an alcohol related violation 39 (66%) were involved in alcohol related crashes and 20 (34%) were not. Any interpretation of these results should be

made with reference to Tables 18 and 25B which show that 52 (88%) of the 59 operators with previous alcohol related offenses had been only charged with public drunkenness, 2 (3%) only presented with citations for driving under the influence of alcohol, with 5 (9%) having been cited on both violations.

A comparative evaluation between responsible and non-responsible operators with regard to focal alcohol influence in Table 60 (OAC #6) shows that of the 267 operators included in the Special Study research, 103 (39%) were involved in alcohol related collisions. The companion finding for the non-responsible operator group showed 13 (16%) of these drivers significantly influenced by alcohol at the time of the focal crash. Caution should be observed with regard to the interpretation of these results because of limited data available on the non-responsible operator.

Table 61 (OAC #7) presents a sexual distribution of the operators under consideration in the body of this report with correlations for alcohol involvement in the focal crash. The findings show that 91(39%) of the 236 male operators were involved in alcohol related crashes as were 12 (39%) of the 31 female operators. Comparatively, the same proportion of operators were involved in non-alcohol related accidents with 145 (61%) males and 19 (61%) females.

The findings in Table 62 (OAC #8) continue the evaluation between the alcohol related operator group and the non-alcohol related operator group, taken from 267 drivers in the Boston research. These findings show a non-significant difference between groups largely because of the

differing numbers of subjects in each age by decade category. With consideration for the numbers of subjects in each category, no single age division differs significantly from the 39% (103) proportion of alcohol involved operators for the entire group of 267 subjects.

An analysis by marital status as seen in Table 63 (OAC #9) showed that the single and married operators were quite comparable in their proportion of alcohol involved drivers with 51 (38%) single and 29 (31%) married operators significantly influenced by alcohol at the time of the focal collision. Once again, small numbers of subjects make a conclusive evaluation of the once-married operators difficult, but there is a notable trend showing that the separated and divorced operators might have been more likely than the others to have been involved in an alcohol related fatal collision.

Table 64 (OAC #10) presents the data available to the team regarding the use of restraints on the part of the principal operator at the time of the focal collision. Out of the 44 (16%) operators with restraints available and used 9 (20%) of the operators were influenced by alcohol and the remaining 35 (80%) were not. From among the 144 (54%) of the operators with restraints available but not used in the focal accident, 62 (43%) were alcohol influenced and 82 (57%) were not.

The evaluation of alcohol involvement in the focal accident was made either through a Blood Alcohol Concentration (BAC), when available, or by a clinical judgment of alcohol influence taken from a number of related variables when compared with a clinical impression. Chemical

tests (BAC) were performed on only 88 (33%) of the 267 focal accident operators, all of whom were killed in TYPE I accidents. A clinical evaluation was made on the remaining 179 (67%) operators which included 15 (15%) of the TYPE I operators and all of the TYPE II and TYPE III operators.

The TYPE I operators without a BAC and all of the TYPE II and TYPE III operators were evaluated for focal accident alcohol influence by a variety of data. (Table 65B). No alcohol influence was scored when the operator was evaluated not to have had anything to drink with alcoholic content during the hours immediately prior to the focal accident. For the purposes of comparability between the Special Study and the OAC data, the category "none" was expanded to include those operators who had a BAC ≤ 04 gm/100ml% and others who were known to have had no more than one drink with liquor, two bottles of beer or two glasses of wine. This clinical evaluation was considered to have been very conservative. Mild alcohol influence was scored for those operators with a BAC between .05 and .09 gm/100ml%. The comparable clinical evaluation was made either from a mathematical computation of the number of drinks and alcohol content resulting in an estimated BAC. When such data was not available or reliable a conservative, clinical evaluation was made from information regarding the operator's motor control and decision making abilities before the focal accident. Moderate alcohol influence was scored with a reported BAC of .10—.15 gm/100ml% or a clinical evaluation based on either an estimated BAC computed from the estimated amount of alcohol imbibed or

comparable judgment regarding the operator s motor control and decision making powers. Serious involvement was scored with a BAC ≥.16 gm/100mℓ%, a comparable BAC estimate or a clinical evaluation from the known behaviors of the operator. It had been thoroughly understood by the team that any clinical impression of alcohol influence without the verifying presence of a BAC is difficult and often somewhat speculative, especially in a non-laboratory environment. With this basic premise the team made every effort to be consistent and as thorough as possible when making clinical evaluations with regard to the varying levels of alcohol use and influence.

The mean for the 88 available BAC's was .12 gm/100mℓ% with a standard deviation of .11 gm/100mℓ. The range from these chemical results was from .02 gm/100mℓ% to .49 gm/100mℓ%. Table 65A (OAC #11A) is a presentation of these BAC results with consideration for historical patterns of alcohol use for the TYPE I operators. It is of particular interest to note the wide range of BAC's for the light, moderate and heavy social drinkers. It is of equal interest to note that 14 (39%) of the light social drinkers and 10 (53%) of the moderate social drinkers were legally intoxicated in spite of the fact that all informants indicated that they had either never or seldom known the respective operators to have been drunken. Two of these operators had a BAC ≥.25 gm/100mℓ%. Table 65B shows that there was a significant difference between all accident type operators (see statistical footnotes in Table 65B) with 45 (44%) of the TYPE I operators judged to have been severely intoxicated, 35 (56%) of the TYPE II operators not influenced

by alcohol and another 14 (22%) TYPE II operators severely influenced. Only 5 (5%) of the TYPE III operators were evaluated to have been severely influenced at the time of the focal accident.

All of the TYPE I operators were correlated for BAC and known histories of problem drinking in Table 66B (OAC #12C). The known problem drinkers showed a bi-modal peak in BAC's with 10 (21%) operators in the .10—.14 gm/100mℓ% division and another 10 (24%) in the ≥.25 g./100mℓ% division. Nearly half, or 22 (48%) of the operators with no known problem drinking history reported a negative BAC. There was a significant difference between groups indicating that operators with problem drinking histories tended to have higher BAC's in their fatal accident.

All 267 operators were compared for age and problem drinking histories in Table 67 (OAC #12). It is of interest to note that the proportion of problem drinkers begins with 30% (19) operators ≤20 years of age and increases consistently right through the 46—50 age division. There was, however, not a large enough increase to present a significant statistical comparison between groups. With the small numbers of operators receiving a chemical BAC the data in Table 68 (OAC #13) is relatively uninterpretable. It is of interest, however, to note the numbers of operators with a BAC ≥.25 gm/100mℓ% and their respective ages.

The final presentation of data relative to the OAC data requirements is found in Table 69 (OAC Driver Profile) which has taken several selected variables and evaluated them for differences and similarities

that exist between the 103 (39%) operators judged to have been involved in their focal accident while under the significant influence of alcohol and the 164 (61%) operators judged to have not been so influenced by alcohol. The comparative profiles show that the mean age of the groups indicated that the alcohol group was younger than the non-alcohol group by two years with means of 30.2 and 32.4 years respectively. Both groups were composed mainly of males, with an high school education with the alcohol group showing a somewhat lower occupational attainment in the direction of skilled manual employees as opposed to clerks, salesmen and white collar technicians for the non-alcohol group. Because of the sampling procedures used for the Boston study both groups came from near urban residences. With regard to histories of drug use other than alcohol, there was a definite trend showing that the alcohol group tended to be represented by somewhat heavier smokers of marijuana with a larger number of subjects that had used or experimented with street or entertainment drugs. An evaluation of the alcohol use history patterns the non-alcohol group tended in the direction of light social drinkers and the alcohol group in the direction of moderate to heavy social drinkers. They all drank their alcohol primarily in commercial establishments. The alcohol group tended to drive an older motor vehicle in the focal accident and both groups were either alone or with one passenger at the time of the collision. With regard to the type of collision the alcohol group was more likely to have been involved in a single vehicle crash as opposed to a multiple vehicle crash for the non-alcohol group. The peak accident hours for

the alcohol group was between midnight and 4:00 a.m., with a decided cluster in the 1:00 to 2:00 a.m. hour. The non-alcohol group tended to be clustered in the 8:00 p.m. to midnight time period. The day of the week considered to have been most likely for an alcohol related motor vehicle fatal accident was on Saturday. The non-alcohol group was more likely to have been in their respective fatal accidents on Wednesday or Friday.

For a final analysis the items in the previously discussed Human Factor Stress Scale (HFSS) have been evaluated in relation to the known significant presence of alcohol in the fatal accident in Table 70. As mentioned earlier these 16 stress factors have been considered as relevant variables often associated with distraction from a particular task. They have been combined together in the HFSS to evaluate their potential influence on a vehicular accident, and in the case of this study a fatal collision.

The findings show seven items in the HFSS significantly favoring the alcohol involved motor vehicle operators and none comparatively favoring the non-alcohol group. Those factors favoring the alcohol group with a significance <.01 were: HFSS-1, Domestic tension; HFSS-3, Social tension; HFSS-4, Clinical depression, HFSS-5, Fatigue; HFSS-11, Excessive speed; HFSS-13, Alcohol use (fatal); and, HFSS-14, Other drug use. The other nine factors did not show a significant difference between the groups but there was a trend favoring the alcohol group for four factors, including: HFSS-7, Chronic emotional problems; HFSS-9, Passenger distraction; HFSS-10, Visual distraction/distortion; and,

HFSS-15, Vehicle unfamiliarity. The only factor showing a trend favoring the non-alcohol group was HFSS-8, Tardiness. Factors not showing any trend included: HFSS-2, Professional tension; HFSS-6, Chronic physiological problems; HFSS-12, Legal pursuit; and, HFSS-16, Road unfamiliarity. There is no doubt from the findings that the alcohol group operator was under considerably more stress than was his non-alcohol counterpart.

The preceding results represent the findings from the analysis of the data collected during the 30 month period of field investigations for the Boston University Traffic Accident Research Special Study team. As the results have shown, the primary focus of the research has been with the historical and focal human factors associated with the operator of the motor vehicle initially evaluated to have been "most responsible" for a highway accident resulting in a personal fatality. A wide variety of variables have been analyzed and evaluated for the 267 operators included in these results, including 103 (38%) TYPE I operators who were killed in the focal collision, 63 (24%) TYPE II operators who survived the crash in which another operator or another vehicular occupant was killed, and 101 (38%) TYPE III accidents where the "most responsible" operator struck and killed a pedestrian.

Some limited data relative to the known correlations between the ASAP and Special Study populations can be found in Appendix E.

DISCUSSION

These presented findings from the analyses of the data collected by the Boston University Traffic Accident Research Special Study Team on 267 motor vehicle operators initially judged to have been the "most responsible" drivers in highway accidents resulting in personal fatalities, fall into 3 basic clusters of information. The first segment of the data deals with the differences and similarities between the 3 types of fatal accident related operators considered in the body of the report showing that the TYPE II operator is a distinct phenomenon, coming from a varied and problemmatical environment, that makes him notably different from the TYPE I driver. The TYPE III operator group remains markedly less at risk and is speculated to be more like the "average" driver than either of the other two types considered in the findings. The analysis goes on to make a variety of correlations between the focal operator influenced by alcohol and the focal operator not known to have been influenced by alcohol. A considerable number of variables have indicated that focal accident alcohol involvement was not an isolated incident, unique in itself, but that it was identifiably correlated with other historical and focal human factor data items. The third basic data cluster remains highly experimental but shows significant and interesting findings associated with the historical and focal use of marijuana and street/entertainment drugs.

The breakdown by accident type showed that 103 (38%) TYPE I operators were "most responsible" for highway accidents resulting in their

death. A smaller sample of 63 (24%) TYPE II operators survived what was basically the same kind of collision which resulted in the death of another vehicular occupant and an additional 101 (38%) TYPE III operators struck and killed a pedestrian.

Before discussing any of the human factor results that indicate a historical and focal difference between the operator types the findings of sample size and age variations must be clearly noted. A total of 166 operators were involved in collisions resulting in the death of some vehicular occupant. Within this group 103 (62%) were killed in the focal accident and 63 (38%) were not, indicating that the TYPE I operator group exceeded the TYPE II operator group by 40 (24%) subjects. This, in itself, is substantial and significant. Now, the mean age for the TYPE I operator was 34 years, as opposed to 25 years for the TYPE II operator, showing a difference of 9 years. A cursory interpretation of this finding would lead the researcher to conclude that the differences existing between the two operator types for a wide variety of variables could well be a function of age. This would mean that the significant differences reported between these groups of operators were not functions related to their psychosocial environments but rather to age. This is not the case. A review of Table 3 shows that 106 operators ≤29 years of age were involved in accidents resulting in the death of a vehicular occupant (TYPE I and TYPE II accidents). This ≤29 year old operator group was nearly equally divided between the two accident types with 56 (53%) having been killed and 50 (47%) surviving but killing someone else. A statistical review of the two sample sizes showing a ratio of 103/63

and the 56/50 ratio of ≤29 year old operators that fall into each of the two accident type samples would make any correction for age, on variables that were not in themselves related to age for all younger operators (i.e., marital status or marijuana and street/entertainment drug use), extremely misleading and open to misunderstanding[11]. The same statistical premise is relevant for an evaluation between the TYPE III and the TYPE II operator groups, which show a 101/63 ratio in sample size and a 50/50 ratio for the ≤29 year old operator group. This analysis continues to hold much the same for the TYPE I and TYPE II operators ≤39 years of age with a sample ratio of 103/63 and a 68/60 ratio for all of these operators ≤39 years of age. This correlation is only somewhat less true when the TYPE III operators are considered, which presents 24 (24%) of its sample in the 30 - 39 year old decade. In essence, this understanding of the data would mean that the differences that exist between the TYPE II operator and either or both of his counterparts, is not a function of age, but, rather of something else.

The primary areas indicating that the TYPE II operator was substantially different from the others come in the dimensions of psychosocial disruption, antisocial acting out behaviors, historical marijuana use patterns and exposure to street/entertainment drugs. The same direction holds true for historical patterns of alcohol use even though the significance favors the TYPE I operator.

The TYPE II operator was significantly less well educated than the TYPE I operator and had attained a significantly lower level of

occupational attainment than the TYPE III operator. These differences placed him somewhat lower on the Index of Social Position. He was also considerably more likely to have come from a multi-problem environment with domestic, social and possibly professional disruptions during the years prior to the focal accident. The TYPE II operator was also evaluated to have been more high strung and sensitive, to have had a history of known suicidal actions, and, though not statistically significant in proportion, he had a somewhat greater tendency to have been under psychological care. These findings are especially interesting in the light of the lower age mean for this operator group, indicating that he had fewer years in which he might have accumulated such a history. He was also more likely to have been a heavier marijuana smoker and to have been exposed to street/entertainment drugs. He had a greater number of previous arrests for drug related offenses and had been cited or arrested for legal violations about 3 times. Because of his age it might have been speculated that the TYPE II operator would have had a less notable alcohol history. However, he knew that he had nearly as much likelihood of having been a problem drinker as his TYPE I counterpart. His alcohol use pattern was in the direction of his having been a social drinker, who drank with a significantly greater frequency than the others and showed a marked trend in the direction of more frequent drunkenness and had a greater history of alcohol related job losses. He was greatly overrepresented in the stress and tension items judged to have been present with the focal operators during the moments prior to the crash

as seen by his dominant position in 10 of the 16 factors in the Human Factor Stress Scale (HFSS).

The question, "Why wasn't the TYPE II operator killed?" remains without a complete answer. It should be emphasized once again that the definition for the TYPE I accident was where the most responsible operator was killed either alone or in combination with other occupant deaths in his vehicle or in the not-most responsible vehicle. The TYPE II accidents included a larger number of multiple vehicle collisions, thus, allowing for a greater chance of compartmental intrusion from a broadside accident configuration, but the operator survived. He did have less focal alcohol involvement than the TYPE I operator and may have been more capable of self-defense. If the sample sizes had been the same would there have been other enlightening comparisons? Could it be that the TYPE II operator was better trained in emotional and psychological conflict warfare which made him capable of instant defense and a life saving response?

The TYPE I operator was profiled as having been much more like the classic fatal accident operator. Throughout much of the results he stood in a midway position between the more antisocial TYPE II operator and the rather bland TYPE III operator. He was somewhat better educated and noted to have been more socially popular than the others. One of the characteristics that set him apart in the Boston sampling was his ethnic background. Nearly half of the TYPE I operators were from an Irish heritage as compared to only 15% of the total population of the greater Boston area. All three accident types were overrepresented by Irish drivers but the TYPE I operator group remained dominant. The TYPE I operator also had a greater number of citations and/or arrests for any violation,

had the largest number of arrests for public drunkenness and was more likely to have ever been arrested when compared to the TYPE II and TYPE III drivers. The Risk Taking Behavior Scale (RTBS) showed, interestingly enough that the TYPE I operator participated in his own variety of risky behaviors which included such leisure time activities as motorcycle racing, scuba diving, skiing, sky diving and the like. He also had an alcohol history pattern that totally set him apart from the others. He was not at all different in what he drank, where he drank, how frequently he drank, or how frequently he was known to have been drunk during the year prior to his fatal accident. Where he did differ was in the numbers of personal and social problem areas that resulted from his drinking. Insignificant differences in drinking patterns and an increased number of alcohol related problem areas pushed nearly half of the TYPE I drinkers into the problem drinker category. Although nearly half of the TYPE I operators did not smoke marijuana, those who did smoke tended to be heavier smokers. However, as was the general pattern with all operator groups the TYPE I light, moderate and heavy social drinker was more likely to have also been a smoker. Abstainers, sporadic binge drinkers and alcohol abusers used marijuana significantly less than the social drinkers. Four significant accident stress items, found in the Human Factor Stress Scale (HFSS), favored his group. It is interesting that clinical depression without any supportive help from a mental health professional was a significant stress item as was the presence of some debilitating physiological health problem. When he approached the scene of his death he was more

likely to have been drinking to any degree than were the others. It is also of interest that there was relatively little chance that he would survive the accident long enough to have died as a patient in the hospital.

The TYPE III operator was notably bland. He scored lower on all variables that evaluated personal, social or professional problem areas. His Risk Taking Behavior Scale (RTBS) and Human Factor Stress Scale (HFSS) scores were significantly lower than the others. He was almost certainly not at all influenced by alcohol or any other drug at the time of the focal accident. It is speculated that he was very much like the "average" Boston driver. Some findings with regard to this speculation will be considered at the conclusion of the current, ongoing research by the Boston team which establishes a control sample for comparison with the experimental group. The single feature that might give some understanding to the nature of the vehicle/pedestrian accident was the operator's use of correctional lenses. The TYPE III operator group was significantly represented by a larger number of persons who wore eye glasses or contact lenses. It may be that there is some correlation between the use of correctional lenses and the dynamics that precede the striking of a pedestrian.

With regard to alcohol involvement in the focal accident the TYPE I operator was twice as likely to have been significantly influenced. The TYPE II operator was also likely to have been drinking and may well have also been smoking marijuana or using some street/entertainment drug. The TYPE III operator was not at all likely to have been

drinking, smoking, or using any street/entertainment drug.

The Boston sample showed only 103 (39%) focal alcohol involved operators -- somewhat less than national averages. However, 121 (45%) most responsible operators, not-most responsible operators and/or pedestrians were alcohol involved in the 267 accidents. The proportion that were influenced by some drug could be increased by the 13 (5%) who were known to have been using only marijuana and the 12 (4%) who had been using only some other drug. This would show that 146 (55%) of the 267 accidents were known to have been intoxicant influenced. This figure could be further increased by adding the 22 (8%) operators and/or pedestrians that had been drinking insignificant amounts of alcohol (≤.04 gm/100ml%) showing a grand total of 168 (63%) intoxicant influenced accidents.

Returning to the original alcohol influenced group of 103 (39%) operators the findings show that the problem drinker scored a 3:2 ratio favoring his likelihood of being involved in an alcohol related accident. He would have come to the accident with a moderate to heavy historical pattern of alcohol use and may possibly have received an earlier citation for public drunkenness. He would have been a single, Irish, male, about 30 years old with an high school education working as a skilled manual employee. He would have lived a relatively risky life style and have received positive scores for six items on the Risk Taking Behavior Scale. He would have most likely been a

marijuana abstainer or only a weekend smoker. If not he would have smoked several times a week. He would have come to the focal accident with about six other stress factors seen in the Human Factor Stress Scale (excluding alcohol), alone in his vehicle or with one other passenger early Saturday morning, somewhere between midnight and 4:00 a.m., most likely between 1:00 and 2:00 a.m. This is of special interest because the bars close at 2:00 a.m. on Saturday morning. The chances would have been very good that he would have killed himself in the focal accident and been pronounced dead at the scene or in the emergency ward of a local hospital.

The operator involved in the non-alcohol related accident would have been about 32 years old, single, with a slightly better than a high school education and a job as a clerk, salesman or a technician. He was most likely a light to moderate social drinker and a light to moderate marijuana smoker, if he wasn't an abstainer. He may have come from a problem drinking background but it is somewhat more likely that he did not. He would have scored very low on the Risk Taking Behavior Scale. If he were a problem drinker he would have approached his accident with a limited number of items on the Human Factor Stress Scale on a Monday evening between 8:00 p.m. and midnight. If he were not a problem drinker involved in a non-alcohol related accident he would have come to the accident site on either Wednesday or Friday between 4:00 and 8:00 p.m The chances would have been better that he would have survived the a cident.

The findings from the present research point to four possible future research efforts that might help to reduce the numbers of highway accidents and traffic fatalities. In Boston, as there might be in many cities, there are a number of problems in traffic safety that are pedestrian oriented. Massachusetts has a law giving the pedestrian the right of way under nearly all circumstances. Over the years this law has become a social custom and pedestrian citations for jaywalking or walking to endanger are virtually unknown. It would seem certain that a change in the current law and some means of enforcement would sharply reduce the numbers of pedestrian injuries and fatalities. Another means which might serve to reduce the numbers of intoxicant related highway accidents would be to recognize the presence of marijuana as real, if not legal. Alcohol does not need to be recognized as real because of its obvious presence. If these two givens could be accepted highway safety officials might launch a massive campaign, with the assistance of local newspapers, and radio and television stations, in the direction of self help assistance. The constant danger of driving under the influence of an intoxicant could be continually emphasized. Programs related to the obvious danger of highway carelessness could emphasize the accident rate from week to week. Along with such programs could be an abundance of information directed to the individual who will drink or smoke and drive under any circumstances, advising him of his reduced motor control and decision making faculties along with ways whereby he might avert a traffic accident if he does choose to drive while

intoxicated. Articles in the news media and pamphlets possibly mailed to each licensed operator could give some helpful instructions on how to drive and survive while under the influence of alcohol and others on how to drive and survive while under the influence of marijuana.

There is some experimental and very exploratory research which give a degree of validity to the concept that there are some circumstances, or even medications, that can abruptly reduce the level of marijuana intoxication. With marijuana smoking continuing on the increase for people under the age of 40, it might well be that some legitimate research investigating the validity of an "anti-stoning" medication might be in order, to the eventual benefit of highway safety.

Finally, the Boston Special Study team is greatly concerned for the need of a number of varying research studies in the area of field investigations dealing with the social use of marijuana. Operating a simulated vehicle under laboratory situations when under the influence of marijuana can tell us a great deal about the human response to this particular drug. There remain continuing needs for laboratory studies with increased numbers of subjects observed over longer periods of time. There is also the very real need of some chemical test that can be easily administered to all operators arrested for improper driving or related offenses which would indicate with reliability not only the presence or absence of marijuana but also that would provide some reliable measure of the degree of marijuana influence in a comparable manner to the Blood Alcohol Concentrations and

Breath Chemical Tests used for levels of alcohol influence. In spite of these laboratory type needs in marijuana research there are also growing needs to understand how this drug performs in a public environment. This is difficult because of the illegal nature of marijuana but such limitations should not prohibit the psychosocial researcher from gathering as much useful information about the use and misuse of marijuana in a public setting and in particular as it relates to the full scope of highway safety.

The forthcoming reports in this contract will be directed to a detailed comparison between the data on the 267 fatally involved experimental operators and the 801 fatal accident naive control operators. Part II, "An Analysis of Drivers Most Responsible for Fatal Accidents Versus a Control Sample", will be a presentation of comparable data between the two samples with a primary focus on alcohol related variables. Part III, "Marijuana Use and Driver Behaviors: Historical and Social Observations Among Fatal Accident Operators and A Control Sample", will include comparable marijuana related data between the two groups and other variables unique to the control sample.

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TABLE 1

Focal Operators by Accident Type

	TYPE I	TYPE II	TYPE III	TYPE IV	TYPE V	ALL TYPES
Total Group	103(34%)	63(21%)	101(34%)	20(7%)	13(4%)	300(100%)
Experimental Group	103(38%) [38.57%]	63(24%) [23.59%]	101(38%) [37.82%]	—	—	267(100%)

TABLE 2

Focal Operators' Sex by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
SEX				
Male	89(86%)	54(86%)	93(92%)	236(88%)
Female	14(14%)	9(14%)	8(8%)	31(12%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 .089, 2 df, p = n.s.

ACCIDENT TYPE DEFINITIONS:

TYPE I -- operator killed
TYPE II -- operator survivied, other occupant killed
TYPE III -- pedestrian killed
TYPE IV -- sudden death/heart attack operators
TYPE V -- hit-and-run operators, not apprehended

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TABLE 3

Focal Operator Age Statistics,
Including Decade Categories by Accident Type

AGE DECADE CATEGORIES	TYPE I	TYPE II	TYPE III	ALL TYPES
10-19	21(20%) 43%	15(24%) 31%	13(13%) 26%	49(19%) 100%
20-29	35(34%) 33%	35(55%) 33%	37(36%) 34%	107(40%) 100%
30-39	12(12%) 26%	10(16%) 22%	24(24%) 52%	46(17%) 100%
40-49	17(16%) 53%	2(3%) 6%	13(13%) 41%	32(12%) 100%
50-59	8(8%) 53%	0(0%) 0%	7(7%) 47%	15(6%) 100%
60-69	4(4%) 44%	1(2%) 12%	4(4%) 44%	9(3%) 100%
70-79	6(6%) 67%	0(0%) 0%	3(3%) 33%	9(3%) 100%
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)
Exact age mean	34.4	25.2	32.8	31.6
S.D.	16.7	8.1	14.4	14.6
Median age	28.0	24.0	29.0	26.0
Modal group	20-29	20-29	20-29	20-29
Age range	16-79	14-61	16-77	14-79

t = I vs II, 3.998, 164 df, $p < .01$; I vs III, 0.684, 202 df, p = n.s.;
II vs III, -3.787, 162 df, $p < .01$. TOTAL F 8.450, 2 df, $p < .01$

TABLE 4

Focal Operator Marital Status by Accident Type

MARITAL STATUS	TYPE I	TYPE II	TYPE III	ALL TYPES
Single	47(45%) 35%	43(68%) 32%	45(45%) 33%	135(51%) 100%
Married	39(38%) 42%	9(14%) 10%	45(45%) 48%	93(35%) 100%
Common law	2(2%) 50%	1(2%) 25%	1(1%) 25%	4(1%) 100%
Widowed	4(4%) 80%	0(0%) 0%	1(1%) 20%	5(2%) 100%
Divorced	6(6%) 35%	4(6%) 24%	7(6%) 41%	17(6%) 100%
Separated	5(5%) 39%	6(10%) 46%	2(2%) 15%	13(5%) 100%
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 24.53, 10 df, $p < .01$

TABLE 5

Dominant Ethnic Backgrounds by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
Anglo Saxon	24(23%)	9(14%)	16(16%)	49(18%)
Irish	45(43%)	20(32%)	34(33%)	99(37%)
No. European	7(7%)	4(6%)	12(12%)	23(9%)
So. European	12(12%)	14(23%)	21(21%)	47(17%)
Latin American	1(1%)	4(6%)	3(3%)	8(3%)
African	7(7%)	7(11%)	10(10%)	24(10%)
Eastern	4(4%)	4(6%)	5(5%)	13(5%)
Other	3(3%)	1(2%)	0(0%)	4(1%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

TABLE 6

Focal Operator Formal Education Backgrounds by Accident Type*

EDUCATION BACKGROUNDS	TYPE I	TYPE II	TYPE III	ALL TYPES
Graduate level	5(5%)	0(0%)	3(3%)	8(3%)
College graduate	10(10%)	2(3%)	6(6%)	18(7%)
Partial college	22(21%)	8(13%)	19(18%)	49(18%)
High school	43(42%)	33(52%)	45(45%)	121(45%)
Partial high school	18(17%)	17(27%)	20(20%)	55(21%)
Junior high	4(4%)	3(5%)	3(3%)	10(4%)
Less than 7 years	1(1%)	0(0%)	5(5%)	6(2%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

t = I vs II -2.625, 164 df, $p < .05$; I vs III -1.681, 202 df, p = n.s.; II vs III 0.947, 162 df, p = n.s. TOTAL F 3.407, 2 df, $p < .05$

* using A. Hollingshead, "Two Factor Index of Social Position".

TABLE 7

Focal Operators' Student Status at Time of Focal Accident by Accident Type

STUDENT STATUS	TYPE I	TYPE II	TYPE II.	ALL TYPES
None	83(81%)	50(79%)	85(84%)	218(82%)
Part time	3(3%)	2(3%)	2(2%)	7(2%)
Full time	17(16%)	11(18%)	14(14%)	42(16%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 .0364, 4 df, p = n.s

TABLE 8

Focal Operator Occupational Level by Accident Type*

	TYPE I	TYPE II	TYPE III	ALL TYPES
OCCUPATIONAL LEVEL				
1.Executives, professionals, large owners, etc	6(6%)	0(0%)	4(4%)	10(4%)
2.Business mgrs., lesser professionals	6(6%)	3(5%)	8(8%)	17(6%)
3.Administrators, medium owners	17(17%)	5(8%)	16(16%)	38(14%)
4.Clerks, technicians, small owners, public employees	23(22%)	20(32%)	24(24%)	67(25%)
5.Skilled manual employees	24(23%)	14(22%)	32(31%)	70(26%)
6.Semiskilled employees	16(16%)	9(14%)	8(8%)	33(13%)
7.Unskilled, welfare, chronic unemployment	10(10%)	12(19%)	9(9%)	31(12%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)
Occupational mean	4.38	4.90	4.30	4.47

t = I vs II -2.131, 164 df, p = n.s.; I vs III 0.349, 202 df, p = n.s.; II vs III 2.559, 162 df, $p < .05$. TOTAL F 3.361, 2 df, $p < .05$.

* using A. Hollingshead, "Two Factor Index of Social Position".

TABLE 9

Focal Operator Socio-Economic Status (SES)
by Accident Type*

	TYPE I	TYPE II	TYPE III	ALL TYPES
SES				
I	4(4%)	0(0%)	3(2%)	7(3%)
II	7(7%)	2(3%)	6(6%)	15(6%)
III	28(27%)	14(22%)	31(31%)	73(27%)
IV	46(45%)	28(45%)	47(46%)	121(45%)
V	18(17%)	19(30%)	14(14%)	51(19%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)
Mean	IV	IV	IV	IV
Mode	IV	IV	IV	IV
S.D.	III-V	III-V	III-IV	III-IV

t = I vs II -2.487, 164 df, $p < .05$, I vs III 0.203, 202 df, p = n.s.;
II vs III 2.807, 162 df, $p < .05$. TOTAL F 4.159, 2 df, $p < .05$.

* using A. Hollingshead, "Two Factor Index of Social Position".

TABLE 10

Focal Operator Physical Health Evaluation
by Accident Type

HEALTH EVALUATION	TYPE I*	TYPE II	TYPE III	ALL TYPES
Poor	9(9%)	2(3%)	1(1%)	12(5%)
Fair	25(24%)	8(13%)	14(14%)	47(17%)
Good/excellent	69(67%)	53(84%)	86(85%)	208(78%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 5.89, 1 df, $p < .05$

* Note. 20 TYPE I operators whose fatal accidents were precipitated by or involved a heart attack have not been included in this analysis. Appendix A includes a brief analysis of the Sudden Death Operators (N = 20)

TABLE 11

Focal Operator's Use of Correctional Lenses by Accident Type

LENSES WORN	TYPE I	TYPE II	TYPE III	ALL TYPES
No	70(68%)	54(86%)	61(60%)	185(69%)
Yes	33(32%)	9(14%)	40(40%)	82(31%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 6.51, 1 df, $p < .05$ (.01 = 6.64)

TABLE 12

Focal Operator Psychiatric Histories by Accident Type

PSYCHIATRIC HISTORIES	TYPE I	TYPE II	TYPE III	ALL TYPES
None known	88(85%)	50(80%)	88(87%)	226(85%)
Outpatient	5(5%)	9(14%)	11(11%)	25(9%)
Inpatient	3(3%)	2(3%)	1(1%)	6(2%)
Both	7(7%)	2(3%)	1(1%)	10(4%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

t = I vs II -0.264, 164 df, p = n.s.; I vs III 1.340, 202 df, p = n.s.; II vs III 1.594, 202 df, p = n.s. TOTAL F 1.204, 2 df, p = n.s.

TABLE 13

Focal Operator Multi-Problem Background
by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
MULTI-PROBLEM BACKGROUND				
No	68(66%)	29(46%)	69(68%)	166(62%)
Yes	35(34%)	34(54%)	32(32%)	101(38%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 6.41, 1 df, $p < .01$

TABLE 14

Informants Reports Regarding Focal Operator's Unusually
High Strung or Highly Sensitive Behavior
by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
BEHAVIOR EVALUATION				
No	65(63%)	29(46%)	64(63%)	158(59%)
Yes	38(37%)	34(54%)	37(37%)	109(41%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 4.64, 1 df, $p < .05$

TABLE 15

Focal Operators' Known Suicide Attempt Histories by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPE
SUICIDE ATTEMPT HISTORY				
No	91(88%)	49(78%)	93(92%)	233(87%
Yes	12(12%)	14(22%)	8(8%)	34(13%
TOTAL	103(100%)	63(100%)	101(100%)	267(100%

x^2 7.32, 2 df, $p < .05$

TABLE 16

Informants' Judgments Regarding Focal Operator's Peer Popularity vs Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPE
PEER POPULARITY				
Low (no)	3(3%)	7(11%)	5(5%)	15(6%
Average (generally)	43(42%)	34(54%)	66(65%)	143(53%
High (yes)	57(55%)	22(35%)	30(30%)	109(41%
TOTAL	103(100%)	63(100%)	101(100%)	267(100%

x^2 6.53, 2 df, $p < .05$

TABLE 17

Where Focal Operators Most Frequently Spent Leisure Time by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
Alone	10(10%)	8(13%)	15(15%)	33(12%)
Family	35(34%)	12(19%)	37(37%)	84(32%)
Friends	58(56%)	43(68%)	49(48%)	150(56%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 2.34, 2 df, p = n.s.

TABLE 18

Focal Operators' Previous Citations for Selected Legal Infractions by Accident Type*

CITATION	TYPE I	TYPE II	TYPE III	ALL TYPES
Reckless driving	1(1%)	1(2%)	1(1%)	3(1%)
Driving under influence of alcohol	7(7%)	1(2%)	4(4%)	12(4%)
Driving under influence of drugs	1(1%)	1(2%)	2(2%)	4(2%)
Driving to endanger	14(14%)	6(10%)	10(10%)	30(11%)
Operating improperly	29(28%)	13(21%)	24(24%)	66(25%)
Speeding	33(32%)	20(32%)	25(25%)	78(29%)
Other drug related citations	5(5%)	8(13%)	2(2%)	15(6%)
Public drunkenness	32(31%)	9(14%)	14(14%)	57(21%)
Larceny related citations	9(9%)	8(13%)	9(9%)	26(10%)

* each percentage statistic indicates the proportion of operators in each subgroup which have received the indicated citation. Hypothetically each citation and each subgroup or total for all groups can have a 0%-100% range.

TABLE 19

Number of Known Previous Arrests for Focal Operators by Accident Type

NUMBER OF ARRESTS	TYPE I		TYPE II		TYPE III		ALL TYPES	
0	32	(31%)	27	(43%)	50	(49%)	109	(41%)
1	21	(20%)	9	(14%)	12	(12%)	42	(16%)
2	15	(14%)	4	(6%)	11	(11%)	30	(11%)
3	9	(9%)	4	(6%)	8	(8%)	21	(8%)
4	4	(4%)	5	(8%)	5	(5%)	14	(5%)
5	3	(3%)	0	(0%)	2	(2%)	5	(2%)
6	3		6		3		12	
7	2		1		1		4	
8	2	9(9%)	1	10(16%)	2	9(9%)	5	28(11%)
9	0		1		1		2	
10	2		1		2		5	
11	2		2		1		4	
12	1		0		0		1	
13	1	5(5%)	0	3(5%)	0	1(1%)	2	9(3%)
14	1		0		0		1	
15	0		1		0		1	
16	0		0		0		0	
17	0		1		1		2	
18	2	4(4%)	0	1(2%)	2	3(3%)	4	8(3%)
19	1		0		0		1	
20	1		0		0		1	
21	0	1(1%)	0	0(0%)	0	0(0%)	0	1(0%)
22	1		0		0		1	
TOTAL	103	(100%)	63	(100%)	101	(100%)	267	(100%)
Mean	3.25		2.74		2.21		2.74	
S.D.	4.81		3.84		3.76		4.24	

χ^2 never arrested × arrested ≥ 1x = 2.37, 1 df, p = n.s.
χ^2 arrested 0-2x × arrested ≥ 3x = 0.11, 1 df, p = n.s.

TABLE 20

Focal Operator's Risk Taking Behavior Scale (RTBS)
Responses by Accident Type*

RISK ITEM	TYPE I N = 103	TYPE II N = 63	TYPE III N = 101	ALL TYPES N = 267	DOMINANT TYPE
HIGH RISK					
1. Two or more citations for driving to endanger or speeding	20(19%)	13(21%)	16(16%)	49(18%)	-- p = n.s.
2. Problem drinking history	49(48%)	26(41%)	31(31%)	106(40%)	I p < .05
3. One or more citations for violent crime	15(15%)	2(3%)	10(10%)	27(10%)	I p = n.s.
MODERATE RISK					
4. Car/cycle racing, scuba diving	26(25%)	15(24%)	12(12%)	53(20%)	I p = n.s.
5. One or more suicide attempts	12(12%)	14(22%)	8(8%)	34(13%)	II p < .05
6. Ignoring medical advice	23(22%)	9(15%)	10(10%)	42(16%)	I p < .05
7. Abusing pharmacy drugs	12(12%)	2(3%)	4(4%)	18(7%)	I p < .05
8. Use of street drugs	31(30%)	35(56%)	29(29%)	95(28%)	II p < .01
9. Hazardous employment	5(5%)	3(5%)	2(2%)	10(4%)	-- p = n.s.
LOW RISK					
10. Driving without restraints	92(89%)	57(92%)	74(73%)	223(84%)	-- p = n.s.
11. Smoking 40 or more cigarettes daily	26(25%)	13(21%)	19(19%)	58(22%)	-- p = n.s.
12. Smoking marijuana ≥9x per annum	39(38%)	35(56%)	37(37%)	111(42%)	II p < .05
Weighted risk	6.087	6.095	4.267	5.401	
Mean range	0-19	0-15	0-15	0-19	

t = I vs II -0.011, 164 df, p = n.s.; I vs III 3.285, 202 df, p < .01;
II vs III 2.992, 162 df, p < .01. TOTAL F 6.340, 2 df, p < .01.

* each percentage statistic indicates the proportion of operators in each subgroup which have been scored as having the particular risk item. Hypothetically each risk item and each subgroup or total for all groups can have a 0%-100% range.

TABLE 21

Collective Informants' Evaluation Regarding Historical Patterns of Alcohol Use by Accident Type

ALCOHOL PATTERN	TYPE I	TYPE II	TYPE III	ALL TYPES
Abstainer	9(9%) 41%	3(5%) 14%	10(10%) 45%	22(8%) 100%
Light social	36(35%) 34%	25(40%) 24%	44(43%) 42%	105(39%) 100%
Moderate social	19(18%) 34%	13(21%) 23%	24(24%) 43%	56(21%) 100%
Heavy social	24(23%) 44%	14(22%) 25%	17(17%) 31%	55(21%) 100%
Sporadic binge	4(4%) 31%	6(9%) 46%	3(3%) 23%	13(5%) 100%
Alcohol abuser	11(11%) 69%	2(3%) 12%	3(3%) 19%	16(6%) 100%
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

t = I vs II 0.414, 164 df, p = n.s.; I vs III 2.333, 202 df, p = n.s. (.062); II vs III 1.767, 162 df, p = n.s. (.078). TOTAL F 2.509, 2 df, p = n.s. (.082).

TABLE 22

Focal Operator Frequency of Alcohol Use Pattern*
During Year Prior to Focal Accident
by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
ALCOHOL USE FREQUENCY				
Never	8(8%)	3(5%)	15(15%)	26(10%)
Monthly	16(15%)	11(17%)	11(11%)	38(14%)
Weekly	39(38%)	22(35%)	42(41%)	103(39%)
Daily	40(39%)	27(43%)	33(33%)	100(37%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 3.10, 1 df, p = n.s.

* scored according to most typical alcohol use trend from available responses. Four (4) light social drinkers are included in the "never" category.

TABLE 23

Focal Operator Frequency of Drunkenness During
Year Prior to Focal Accident by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
FREQUENCY OF DRUNKENNESS				
Never	18(17%)	8(13%)	29(28%)	55(21%)
1-2x	23(22%)	17(27%)	21(21%)	61(23%)
3-8x	23(22%)	12(19%)	26(26%)	61(23%)
Monthly	11(11%)	7(11%)	11(11%)	29(11%)
Weekly	20(20%)	12(19%)	12(12%)	44(16%)
>weekly	8(8%)	7(11%)	2(2%)	17(6%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

t = I vs II -0.574, 164 df, p = n.s.; I vs III 2.529, 202 df, p < .05; II vs III 2.828, 162 df, p < .05.

TABLE 24A

Focal Operator's Known Encouragement by Others to Drink Less During Year Prior to Accident by Accident Type

DRINK LESS ATTEMPT	TYPE I	TYPE II	TYPE III	ALL TYPES
No	79(77%)	50(79%)	85(84%)	214(80%)
Yes	24(23%)	13(21%)	16(16%)	53(20%)
TOTAL	103(100%)	63(100%)	01(100%)	267(100%)

χ^2 .1604, 1 df, p = n.s.

TABLE 24B

Focal Operator's Known Personal Attempt to Drink Less During Year Prior to Accident by Accident Type

JOB LOSS	TYPE I	TYPE II	TYPE III	ALL TYPES
No	88(85%)	48(76%)	92(91%)	228(85%)
Yes	15(15%)	15(24%)	9(9%)	39(15%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 2.25, 1 df, p = n.s.

TABLE 21C

Focal Operator's Problem Drinking History by Accident Type

PROBLEM DRINKER	TYPE I	TYPE II	TYPE III	ALL TYPES
Yes	49(48%) 46%	26(41%) 25%	31(31%) 29%	106(40%) 100%
No	54(52%) 34%	37(59%) 23%	70(69%) 43%	161(60%) 100%
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

x^2 6.15, 2 df, $p < .05$

TABLE 25A

Focal Operators Who Experienced Job Losses
Associated with Alcohol Use by Accident Type

JOB LOSS	TYPE I	TYPE II	TYPE III	ALL TYPES
No	88(85%)	48(76%)	92(91%)	228(85%)
Yes	15(15%)	15(24%)	9(9%)	39(15%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

x^2 2.25, 1 df, p = n.s.

TABLE 25B

Focal Operators Previously Cited for Driving
Under the Influence of Alcohol by Accident Type

NUMBER OF CITATIONS	TYPE I	TYPE II	TYPE III	ALL TYPES
0	96(93%)	62(98%)	97(96%)	255(96%)
1	5(5%)	1(2%)	3(3%)	9(3%)
2	2(2%)	0(0%)	1(1%)	3(1%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

x^2 2.31, 2 df, p = n.s.

TABLE 26

Focal Operator Marijuana Smoking Patterns During the Year Prior to the Accident by Accident Type

MARIJUANA SMOKING PATTERN	TYPE I	TYPE II	TYPE III	ALL TYPES
Abstainer never	50(49%)	21(33%)	56(55%)	127(48%)
Experimental 1-2x	11(11%)	2(3%)	6(6%)	19(7%)
Occasional 3-8x	3(3%)	5(8%)	2(2%)	10(4%)
Light user monthly	6(6%)	8(13%)	6(6%)	20(7%)
Moderate user weekly	17(16%)	10(16%)	15(15%)	42(16%)
Heavy user > weekly	16(15%)	17(27%)	16(16%)	49(18%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

t = I vs II -2.372, 153 df, p = n.s. (.057); I vs III 0.394, 202 df, p = n.s.; II vs III 2.681, 152 df, p < .05. TOTAL F 4.032, 2 df, p < .05.

TABLE 27

Focal Operator Marijuana Smokers and Non-Smokers
by Accident Type

SMOKING PATTERNS	TYPE I	TYPE II	TYPE III	ALL TYPES
Non-smoker*	61(59%)	23(37%)	62(61%)	146(55%)
Smoker†	42(41%)	40(63%)	39(39%)	121(45%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 8.07, 2 df, $p < .01$

* including all operators who were abstainers or experimenters.

† including all operators who smoked 3-8 times or more during year PTA.

TABLE 28

Focal Operator's Historical Patterns of Alcohol Use
by Marijuana Smoking Patterns

ALCOHOL USE PATTERNS	MARIJUANA SMOKING PATTERNS (DURING PREVIOUS YEAR)						
	Never	1-2x	3-8x	Monthly	Weekly	>Weekly	TOTAL
Abstainer	19(14%)	2(10%)	1(10%)	0(0%)	0(0%)	0(0%)	22(8%)
Light social	52(41%)	8(42%)	6(60%)	11(55%)	16(38%)	12(24%)	105(39%)
Moderate social	23(18%)	6(32%)	0(0%)	3(15%)	8(19%)	16(33%)	56(21%)
Heavy social	18(14%)	3(16%)	2(20%)	4(20%)	13(31%)	15(31%)	55(21%)
Sporadic binge	5(4%)	0(0%)	1(10%)	1(5%)	3(7%)	3(6%)	13(5%)
Alcohol abuser	10(8%)	0(0%)	0(0%)	1(5%)	2(5%)	3(6%)	16(6%)
TOTAL	127(100%)	19(100%)	10(100%)	20(100%)	42(100%)	49(100%)	267(100%)

x^2 40.958, 25 df, $p < .05$.

TABLE 29

Focal Operator's Historical Patterns of Alcohol Use by Marijuana Smoking Patterns

ALCOHOL USE PATTERNS	MARIJUANA SMOKING PATTERNS (DURING PREVIOUS YEAR) Non-smoker (Never, 1-2x)	Smoker (≥3-8x)	TOTAL
Abstainer	21(14%) 96%	1(1%) 4%	22(8%) 100%
Light social	60(41%) 57%	45(37%) 43%	105(39%) 100%
Moderate social	29(20%) 52%	27(22%) 48%	56(21%) 100%
Heavy social	21(14%) 38%	34(28%) 62%	55(21%) 100%
Sporadic binge	5(4%) 38%	8(7%) 62%	13(5%) 100%
Alcohol abuser	10(7%) 63%	6(5%) 37%	16(6%) 100%
TOTAL	146(100%) 55%	121(100%) 45%	267(100%) 100%

χ^2 22.56, 4 df, $p < .01$.

TABLE 30

Focal Operator's Street Drug* Use During Year Prior to Accident by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
STREET DRUG USE				
No	72(70%)	28(44%)	72(71%)	172(64%)
Yes	31(30%)	35(56%)	29(29%)	95(36%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 10.58, 2 df, $p < .01$

* Street drug use refers to all drugs excluding prescribed pharmaceuticals, alcohol, and marijuana.

TABLE 31

Focal Operator Known Street Drug Use
by Historical Patterns of Alcohol Use

ALCOHOL USE PATTERN	KNOWN STREET DRUG USE None	Some	TOTAL
Abstainer	21(12%)	1(1%)	22(8%)
Light social	76(44%)	29(31%)	105(39%)
Moderate social	32(19%)	24(25%)	56(21%)
Heavy social	27(16%)	28(29%)	55(21%)
Sporadic binge	5(3%)	8(8%)	13(5%)
Alcohol abuser	11(7%)	5(6%)	16(6%)
TOTAL	172(100%)	95(100%)	267(100%)

χ^2 22.82, 4 df, $p < .01$

TABLE 3.2

Focal Operator Known Street Drug Use
by Marijuana Smoking Patterns During Previous Year

	KNOWN STREET DRUG USE		
	None	Some	TOTAL
MARIJUANA SMOKING PATTERNS			
Abstainer never	124(72%)	3(3%)	127(48%)
Experimental 1-2x	18(10%)	1(1%)	19(7%)
Occasional 3-8x	4(2%)	6(6%)	10(4%)
Light user monthly	8(5%)	12(12%)	20(7%)
Moderate user weekly	12(7%)	30(32%)	42(16%)
Heavy user >weekly	6(4%)	43(46%)	49(18%)
TOTAL	172(100%)	95(100%)	267(100%)

x^2 109.83, 4 df, $p < .01$

TABLE 33

Focal Operator's Accident Stress as Measured by the Human Factor Stress Scale* by Accident Type

	TYPE I N = 103	TYPE II N = 63	TYPE III N = 101	ALL TYPES N = 267	DOMINANT TYPE	
HUMAN FACTORS						
1. Domestic tension	45(44%) 48%	32(51%) 34%	17(17%) 18%	94(35%) 100%	II	p < .01
2. Professional tension	35(34%) 45%	13(21%) 17%	29(29%) 38%	77(29%) 100%	I	p = n.s.
3. Social tension	42(41%) 47%	30(48%) 33%	18(18%) 20%	90(34%) 100%	II	p < .01
4. Clinical depression	28(27%) 57%	11(18%) 23%	10(10%) 20%	49(18%) 100%	I	p < .01
5. Fatigue	48(47%) 47%	30(48%) 30%	23(23%) 23%	101(38%) 100%	II	p = n.s.
6. Chronic physiological problems	25(24%) 71%	4(6%) 12%	6(6%) 17%	35(13%) 100%	I	p < .01
7. Chronic emotional problems	20(19%) 48%	15(24%) 36%	7(7%) 16%	42(16%) 100%	II	p < .01
8. Tardiness	20(19%) 34%	20(32%) 34%	18(18%) 32%	58(22%) 100%	II	p < .01
9. Passenger distraction	13(13%) 27%	28(44%) 58%	7(7%) 15%	48(18%) 100%	II	p < .01
10. Visual distraction/ distortion	34(33%) 34%	21(33%) 21%	44(44%) 45%	99(37%) 100%	III	p = n.s.

TABLE 33 (CONT.)

	TYPE I N = 103	TYPE II N = 63	TYPE III N = 101	ALL TYPES N = 267	DOMINANT TYPE	
HUMAN FACTORS						
11. Excessive speed for conditions	71(69%) 49%	49(78%) 34%	24(24%) 17%	144(54%) 100%	II	p < .01
12. Legal pursuit	5(5%) 33%	7(11%) 47%	3(3%) 20%	15(7%) 100%	II	p < .05
13. Alcohol use†	74(72%)† 60%	35(56%)† 29%	13(13%)† 11%	122(46%)† 100%	I	p < .01
14. Other drug use	24(23%) 41%	27(43%) 46%	8(8%) 13%	59(22%) 100%	II	p < .01
15. Vehicle unfamiliarity	15(15%) 35%	17(27%) 39%	11(11%) 26%	43(16%) 100%	II	p < .05
16. Road unfamiliarity	9(9%) 27%	14(22%) 43%	10(10%) 30%	33(12%) 100%	II	p < .05

* each percentage statistic indicates the proportion of operators in each subgroup which have been scored as having the particular Human Factor stress item and each subgroup, or total, can have a 0%-100% range.

† in this table alcohol use indicates any use of commercial beverages or a BAC ≥ .01mg.%.

TABLE 34

Human Factor Stress Scale Scores
by Accident Type

HFSS SCORES	TYPE I		TYPE II		TYPE III		ALL TYPES	
0	1		0		19		20	
1	7	31(30%)	1	12(19%)	15	72(71%)	23	115(43%)
2	7		5		20		32	
3	16		6		18		40	
4	12		6		15		33	
5	16	59(57%)	13	40(63%)	7	29(29%)	36	128(48%)
6	19		14		5		38	
7	12		7		2		21	
8	7		3		0		10	
9	4	13(13%)	4	11(18%)	0	0(0%)	8	24(9%)
10	1		2		0		3	
11	1		2		0		3	
TOTAL	103(100%)		63(100%)		101(100%)		267(100%)	
Mean	4.9		5.6		2.5		4.1	

(χ^2 90.041, 22 df, $p < .01$)

TABLE 35

Focal Accidents by Day of Week
by Accident Type

DAY OF WEEK	TYPE I	TYPE II	TYPE III	ALL TYPES	DOMINANT TYPE
Monday	14(14%)	6(10%)	17(17%)	37(14%)	III
Tuesday	14(14%)	0(0%)	12(12%)	26(10%)	I
Wednesday	9(9%)	7(11%)	19(18%)	35(13%)	III
Thursday	11(10%)	8(13%)	11(11%)	30(11%)	II
Friday	22(21%)	12(19%)	17((17%)	51(19%)	I
Saturday	23(22%)	16(24%)	11(11%)	50(19%)	II
Sunday	10(10%)	14(22%)	14(14%)	38(14%)	II
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)	

TABLE 36

Time of Day* for Focal Accidents
by Accident Type

TIME OF DAY	TYPE I	TYPE II	TYPE III	ALL TYPES	DOMINANT TYPE
1	8	5	4	17	
2	11	7	3	21	
3	8	8	1	17	
4	8	2	2	12	
	35(34%)	22(35%)	10(10%)	67(25%)	II
	52%	33%	15%	100%	
5	4	1	1	6	
6	2	3	2	7	
7	2	2	5	9	
8	2	1	0	3	
	10(10%)	7(11%)	8(8%)	25(10%)	II
	40%	28%	32%	100%	
9	3	1	4	8	
10	0	0	3	3	
11	1	2	3	6	
12	1	0	1	2	
	5(5%)	3(5%)	11(11%)	19(7%)	III
	26%	16%	58%	100%	
13	3	1	3	7	
14	1	1	3	5	
15	3	2	7	12	
16	3	0	6	9	
	10(10%)	4(6%)	19(19%)	33(12%)	III
	30%	12%	58%	100%	
17	6	4	6	16	
18	4	1	9	14	
19	3	2	9	14	
20	4	1	9	14	
	17(16%)	8(13%)	33(32%)	58(22%)	III
	29%	14%	57%	100%	
21	2	2	7	11	
22	9	4	5	18	
23	6	5	6	17	
24	9	8	2	19	
	26(25%)	19(30%)	20(20%)	65(24%)	II
	40%	29%	31%	100%	
TOTAL	103(100%)	63(100%)	101(100%)	26/(100%)	

χ^2 26.89, 14 df, $p < .05$

* time designation arranged according to 24 hour clock.

TABLE 37

Medical Treatment Services Required of Focal Operators Following Focal Accident by Accident Type

MEDICAL SERVICES	TYPE I	TYPE II	TYPE III	ALL TYPES
None	0(0%)	13(21%)	96(95%)	109(41%)
Emergency ward	0(0%)	22(35%)	3(3%)	25(9%)
Hospitalization	16*(16%)	28(44%)	2(2%)	46(17%)
DOA	87(84%)	0(0%)	0(0%)	87(33%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

* 16 TYPE I operators died following hospitalization and emergency services.

TABLE 38A

Age Categories for Fatally Injured Pedestrians Killed by Focal Operators

AGE CATEGORIES	TYPE III	
0-9	17	16%
10-19	8	8%
20-29	10	10%
30-39	8	8%
40-49	15*	14%
50-59	10	10%
60-69	18	17%
≥70	18	17%
TOTAL	104†	100%

Mean age 43

S.D. 26

* two (2) pedestrians were unidentified both of whom were estimated to have been in their 40's.

† this figure includes 104 pedestrians killed in 101 accidents including 37 (36%) females and 67 (64%) males.

TABLE 38B

Blood Alcohol Concentrations for Fatally Injured Pedestrians

BLOOD ALCOHOL CONCENTRATIONS	PEDESTRIANS
.00	55(69%)
.01 – .04	3(4%)
.05 – .09	4(5%)
.10 – .14	1(1%)
.15 – .19	8(10%)
.20 – .24	3(4%)
≥.25	6(8%)
TOTAL BAC	80(100%)
NO BAC*	24
TOTAL FATALITIES	104

* blood for chemical analysis was not drawn by forensic officials as a matter of informal procedure for the very old and the very young pedestrians.

TABLE 39

Focal Operator Alcohol Influence* in the Focal Accident by Accident Type

	TYPE I		TYPE II		TYPE III		ALL TYPES	
None (No alcohol)	29(28%)		28(44%)		88(87%)		145(54%)	
No influence (BAC .01-.04 or clinical evaluation)	6(6%)	35(34%)	7(12%)	35(56%)	6(6%)	94(93%)	19(7%)	164(61%)
Influence (BAC .05 or clinical evaluation)	68(66%)		28(44%)		7(7%)		103(39%)	
TOTAL	103(100%)		63(100%)		101(100%)		267(100%)	

* The Office of Alcohol Countermeasures (NHTSA) currently specified that any alcohol judgment with a BAC ≤.04 mg% or a similar clinical evaluation is considered to be without significant alcohol influence.

TABLE 39 (Cont.)

Focal Operator Alcohol Involvement*
by Accident Type

	TYPE I	TYPE II	TYPE III	ALL TYPES
GROUP N NO ALCOHOL	35(34%)	35(56%)	94(93%)	164(61%)
GROUP A ALCOHOL	68(66%)	28(44%)	7(7%)	103(39%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

*alcohol involvement is a BAC ≥ .05 gm/100mℓ%, if taken, or a clinical evaluation thereof.

TABLE 40

Focal Operator's Accident Alcohol Involvement* and Problem Drinker Histories by Day of Week

	GROUP A Focal ETOH		GROUP N No Focal ETOH		TOTAL	
	PROBLEM ETOH HISTORY		PROBLEM ETOH HISTORY		PROBLEM ETOH HISTORY	
	NO	YES	NO	YES	NO	YES
Monday	1(3%)	10(15%)	14(11%)	12(29%)	15(9%)	22(21%)
Tuesday	3(8%)	5(8%)	12(10%)	6(15%)	15(9%)	11(10%)
Wednesday	2(5%)	5(8%)	23(19%)	5(12%)	25(16%)	10(10%)
Thursday	3(8%)	8(12%)	14(11%)	5(12%)	17(11%)	13(12%)
Friday	13(34%)	9(14%)	24(20%)	5(12%)	37(23%)	14(13%)
Saturday	12(32%)	16(25%)	16(13%)	6(15%)	28(17%)	22(21%)
Sunday	4(10%)	12(18%)	20(16%)	2(5%)	24(15%)	14(13%)
SUBTOTAL	38(100%)	65(100%)	123(100%)	41(100%)	161(100%)	106(100%)
TOTAL	103		164		267	
	χ^2 9.00, 5 df, p = n.s.		χ^2 7.70, 5 df, p = n.s.		χ^2 11.59, 5 df, $p < .05$	

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

TABLE 41

Focal Operator's Accident Alcohol Involvement*
and Problem Drinker Histories by Time of Day†

TIME OF DAY	GROUP A Focal Alcohol PROBLEM DRINKER NO	GROUP A Focal Alcohol PROBLEM DRINKER YES	GROUP N No Focal Alcohol PROBLEM DRINKER NO	GROUP N No Focal Alcohol PROBLEM DRINKER YES	TOTAL PROBLEM DRINKER NO	TOTAL PROBLEM DRINKER YES
1	6	6	5	0	11	6
2	6	12	3	0	9	12
3	7	5	3	2	10	7
4	3	5	3	1	6	6
	22(58%)	28(43%)	14(11%)	3(7%)	36(22%)	31(29%)
5	1	2	3	0	4	2
6	0	2	4	1	4	3
7	0	1	7	1	7	2
8	0	1	2	0	2	1
	1(3%)	6(9%)	16(13%)	2(5%)	17(11%)	8(8%)
9	0	0	6	2	6	2
10	0	0	1	2	1	2
11	0	0	5	1	5	1
12	0	0	2	0	2	0
	0(0%)	0(0%)	14(11%)	5(12%)	14(9%)	5(5%)
13	1	0	5	1	6	1
14	0	0	5	0	5	0
15	0	3	5	4	5	7
16	0	2	4	3	4	5
	1(3%)	5(8%)	19(16%)	8(20%)	20(12%)	13(12%)
17	0	5	9	2	9	7
18	1	3	8	2	9	5
19	1	2	9	2	10	4
20	0	2	8	4	8	6
	2(5%)	12(18%)	34(28%)	10(24%)	36(22%)	22(21%)
21	2	2	3	4	5	6
22	4	3	6	5	10	8
23	2	3	8	4	10	7
24	4	6	9	0	13	6
	12(31%)	14(22%)	26(21%)	13(32%)	38(24%)	27(25%)
SUB-TOTAL	38(100%)	65(100%)	123(100%)	41(100%)	161(100%)	106(100%)
TOTAL	103		164		267	

x^2 6.69, 3 df, p = n.s. x^2 2.52, 4 df, p = n.s. x^2 3.31, 4 df, p = n.s.

* alcohol involvement is a BAC ≥ .05, if taken, or a clinical evaluation thereof.

† utilizing 24 hour time clock.

TABLE 42

Focal Operator's Risk Taking Behavior Scale*
by Focal Operator Accident Alcohol Involvement†

RISK ITEM	GROUP N No Focal Alcohol	GROUP A Focal Alcohol	TOTAL	FAVORING GROUP
HIGH RISK				
1. One or more citations for driving to endanger or speeding	24(15%)	25(18%)	49(18%)	—
2. Problem drinking history	41(25%)	65(63%)	106(40%)	A, $p < .01$
3. One of more citations for violent crime	12(7%)	15(15%)	27(10%)	—
MODERATE RISK				
4. Car/cycle racing, scuba diving	30(18%)	23(22%)	53(20%)	—
5. One or more suicide attempts	13(8%)	21(20%)	34(13%)	A, $p < .01$
6. Ignoring medical advice	22(13%)	20(19%)	42(16%)	—
7. Abusing pharmaceutical drugs	6(4%)	12(12%)	18(7%)	A, $p < .05$
8. Use of street drugs	49(30%)	46(45%)	95(36%)	A, $p < .05$
9. Hazardous employment	6(4%)	4(4%)	10(4%)	—
LOW RISK				
10. Driving without restraints	129(79%)	94(91%)	223(84%)	A, $p < .05$
11. Smoking more than 40 cigarettes daily	30(18%)	28(27%)	58(22%)	—
12. Smoking marijuana ≥9x per annum	59(36%)	52(51%)	111(42%)	A, $p < .05$
Weighted risk mean	4.05	7.0		A, $p < .01$
Range	0—19	0—19	0—19	

$t = -6.186$, 265 df, $p < .01$

* each percentage statistic indicates the proportion of operators in each group which have been scored as having the particular risk item.

† alcohol involvement is a BAC ≥ .05, if taken, or a clinical evaluation thereof.

TABLE 43

Focal Operator's Historical Patterns of Alcohol Use
by Focal Operator Accident Alcohol Involvement*

ALCOHOL USE PATTERN	GROUP N No Focal Alcohol	GROUP A Focal Alcohol	TOTAL
Abstainer	22(13%) 100%	0(0%) 0%	22(8%) 100%
Light social	78(48%) 74%	27(26%) 26%	105(39%) 100%
Moderate social	36(22%) 64%	20(19%) 36%	56(21%) 100%
Heavy social	23(14%) 42%	32(31%) 58%	55(21%) 100%
Sporadic binge	2(1%) 15%	11(11%) 85%	13(5%) 100%
Alcohol abuser	3(2%) 19%	13(13%) 81%	16(6%) 100%
TOTAL	164(100%) 61%	103(100%) 39%	267(100%) 100%

χ^2 54.18, 5 df, $p < .01$

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

TABLE 44

Focal Operator Problem Drinking Histories by Focal Alcohol Involvement*

ALCOHOL INVOLVEMENT	PROBLEM DRINKER HISTORY: No	Yes	TOTAL
None	123(76%) 75%	41(39%) 25%	164(61%) 100%)
Some	38(24%) 37%	65(61%) 63%	103(39%) 100%
TOTAL	161(100%) 60%	106(100%) 40%	267(100%) 100%

χ^2 36.80, 1 df, $p < .01$

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

TABLE 45

Focal Operator Accident Alcohol Involvement*
by Marital Status

MARITAL STATUS	GROUP N No Focal Alcohol	GROUP A Focal Alcohol	ALL OPERATORS
Single	86(52%) 64%	49(47%) 36%	135(51%) 100%
Married	62(38%) 67%	31(30%) 33%	93(35%) 100%
Common law	1(1%) 25%	3(3%) 75%	4(1%) 100%
Widowed	3(2%) 60%	2(2%) 49%	5(2%) 100%
Divorced	7(4%) 41%	10(10%) 59%	17(6%) 100%
Separated	5(3%) 38%	8(8%) 62%	13(5%) 100%
TOTAL	164(100%) 61%	103(100%) 39%	267(100%) 100%

χ^2 6.49, 4 df, p = n.s.

* alcohol involvement is a BAC > .05, if taken, or a clinical evaluation thereof.

TABLE 46

Focal Operator Analysis for Problem Drinker Histories, Focal Operator Accident Alcohol Involvement* and Previous Alcohol Related Citations†

	GROUP A Focal Alcohol Involvement			GROUP N No Focal Alcohol Involvement			TOTAL PROBLEM DRINKERS	PREVIOUS CITATION TOTAL
	PROBLEM DRINKER NO	PROBLEM DRINKER YES	SUBTOTAL	PROBLEM DRINKER NO	PROBLEM DRINKER YES	SUBTOTAL		
PREVIOUS ALCOHOL CITATION	12(32%) 30%	28(43%) 70%	40(39%) 100%	25(20%) 64%	14(34%) 36%	39(24%) 100%	42(40%)	79(30%)
NO PREVIOUS ALCOHOL CITATION	26(68%) 41%	37(57%) 59%	63(61%) 100%	98(80%) 78%	27(66%) 22%	125(76%) 100%	64(60%)	188(70%)
TOTAL	38(100%) 37%	65(100%) 63%	103(100%) 100%	123(100%) 75%	41(100%) 25%	164(100%) 100%	106(100%)	267(100%)

χ^2 1.33, 1 df, p = n.s. χ^2 3.24, 1 df, p < .05

TOTAL χ^2 9.74, 2 df, p < .01

* alcohol involvement is a BAC ≥ .05, if taken, or a clinical evaluation thereof.

† including lifetime span citations for driving under the influence of alcohol and/or public drunkenness.

TABLE 47

Focal Operator's Marijuana Smoking Patterns
by Focal Operator Accident Alcohol Involvement*

	GROUP N No Focal Alcohol	GROUP Y Focal Alcohol	TOTAL
MARIJUANA SMOKING PATTERNS			
Abstainer never	88(54%)	39(38%)	127(48%)
Experimental 1-2x	11(7%)	8(8%)	19(7%)
Occasional 3-8x	6(4%)	4(4%)	10(3%)
Light user monthly	12(7%)	8(8%)	20(8%)
Moderate user weekly	17(10%)	25(24%)	42(16%)
Heavy user >weekly	30(18%)	19(18%)	49(18%)
TOTAL	164(100%)	103(100%)	267(100%)

χ^2 11.22, 5 df, p = .05

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

TABLE 48

Focal Marijuana Use and Focal Alcohol Influence

FOCAL MARIJUANA USE	GROUP N No Focal Alcohol	GROUP A Focal Alcohol	TOTAL
Yes	13(8%) 30%	30(29%) 70%	43(16%) 100%
No*	151(92%) 65%	73(71%) 35%	224(84%) 100%
TOTAL	164(100%) 61%	103(100%) 39%	267(100%) 100%

χ^2 2.561, 1 df, $p > .05$

* a total of 18 operators were believed to have been smoking marijuana before the focal accident (Group N = 10, Group A = 8) but there was not sufficient evidence to warrant a positive score.

TABLE 49A

Focal Street/Entertainment Drug Use, Pharmaceutical Use and Focal Alcohol Influence

FOCAL OTHER DRUG USE	GROUP N No Focal Alcohol	GROUP A Focal Alcohol	TOTAL
Hallucinogens	0(0%)	2(11%)	2(9%)
"Downs"	2(50%)	8(44%)*	10(45%)
Narcotics	2(50%)	3(17%)	5(23%)
Amphetamines	0(0%)	2(11%)*	2(9%)
Pharmaceuticals	0(0%)	3(17%)	3(14%)
TOTAL	4(100%) 18%	18(100%) 82%	22(100%) 100%

* Marijuana use also present

TABLE 49B

Focal Marijuana, Street/Entertainment Drug, Pharmaceutical and Alcohol Use

FOCAL USE PATTERNS	GROUP N No Focal Alcohol	GROUP A Focal Alcohol	TOTAL
Alcohol only	0(0%)	70(68%)	70(26%)
Marijuana and alcohol only	0(0%)	25(24%)	25(9%)
Marijuana only	13(9%)	0(0%)	13(5%)
Street/Entertainment drug only	4(2%)	0(0%)	4(1.5%)
Street/Entertainment drug and marijuana	5(3%)	0(0%)	5(2%)
Pharmaceuticals only	4(2%)	0(0%)	4(1.5%)
Pharmaceuticals and alcohol	0(0%)	3(3%)	3(1%)
Street/Entertainment drug, marijuana and alcohol	0(0%)	5(5%)	5(2%)
No intoxicants	138(84%)	0(0%)	138(52%)
TOTAL	164(100%) 61%	103(100%) 39%	267(100%) 100%

Operators without any intoxicating influence numbered 138 (52%) with 129 (48%) noted to have been influenced by some intoxicant.

TABLE 50

Focal Single and Multiple Vehicle Accidents
by Accident Type

	TYPE I	TYPE II	TYPES I & II
NUMBER OF VEHICLES			
Single	63(61%) 71%	26(41%) 29%	89(54%) 100%
Multiple	40(39%) 52%	37(59%) 48%	77(46%) 100%
TOTAL	103(100%)	63(100%)	166(100%)

x^2 6.22, 1 df, $p < .05$

TABLE 51

Type I and II Single and Multiple Vehicle Fatals
by Focal Operator Accident Alcohol Involvement*

	SINGLE VEHICLE	MULTIPLE VEHICLE	ALL CRASHES
Focal alcohol	55(62%)	41(53%)	96(58%)
No focal alcohol	34(38%)	36(47%)	70(42%)
TOTAL	89(100%)	77(100%)	166(100%)

x^2 1.24, 1 df, p = n.s.

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

TABLE 52

Type I and II Single and Multiple Vehicle Fatals
by Focal Operator Accident Alcohol Involvement*
by Number of Other Passengers in the Focal Vehicle

NUMBER OF PASSENGERS	SINGLE VEHICLE FOCAL ALCOHOL	SINGLE VEHICLE NO FOCAL ALCOHOL	MULTIPLE VEHICLE FOCAL ALCOHOL	MULTIPLE VEHICLE NO FOCAL ALCOHOL	ALL CRASHES FOCAL ALCOHOL	ALL CRASHES NO FOCAL ALCOHOL
0	29(53%)	17(50%)	18(44%)	17(47%)	47(49%)	34(49%)
1	15(27%)	9(26%)	14(34%)	13(37%)	29(30%)	22(31%)
2	7(13%)	4(12%)	3(7%)	4(11%)	10(11%)	8(11%)
3	4(7%)	1(3%)	2(5%)	2(6%)	6(6%)	3(5%)
4	0(0%)	2(6%)	3(7%)	0(0%)	3(3%)	2(3%)
5	0(0%)	0(0%)	1(3%)	0(0%)	1(1%)	0(0%)
6	0(0%)	1(3%)	0(0%)	0(0%)	0(0%)	1(1%)
SUBTOTAL	55(100%)	34(100%)	41(100%)	36(100%)	96(100%)	70(100%)
TOTAL	89		77		166	
	χ^2 .0020, 2 df, p = n.s.		χ^2 .0011, 2 df, p = n.s.		χ^2 .0018, 2 df, p = n.s.	

* alcohol involvement is a BAC = .05, if taken, or a clinical evaluation thereof.

TABLE 63

Type I and II Focal Single and Multiple Vehicle Fatals
by Focal Operator Problem Drinking Histories

	SINGLE VEHICLE	MULTIPLE VEHICLE	ALL CRASHES
PROBLEM ETOH			
Yes	39(44%)	36(47%)	75(45%)
No	50(56%)	41(53%)	91(55%)
TOTAL	89(100%)	77(100%)	166(100%)

x^2 .14, 1 df, p = n.s.

TABLE 54 (OAC #1)

Focal and Non-Focal Operator Accident Alcohol Involvement*
by Collision Type for Focal Operators

		MULTIPLE VEHICLE		PEDESTRIAN		
	SINGLE VEHICLE	Responsible Driver	Non-responsible Driver	Driver	Pedestrian	TOTAL
Alcohol Involved	40(69%)	56(52%)	13(16%)	7(7%)	22(21%)	138(30%)
	29%	41%	9%	5%	16%	100%
Non-alcohol Involved	18(31%)	52(48%)	70(84%)	94(93%)	82(79%)	316(70%)
	6%	16%	22%	30%	26%	100%
TOTAL	58(100%)	108(100%)	83(100%)	101(100%)	104(100%)	454(100%)
	13%	24%	18%	22%	23%	100%

χ^2 93.41, 3 df, $p < .01$

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

TABLE 55 (OAC #2)

Total Subject Alcohol Influence* in Focal Crash by Problem Drinker Histories by Collision Type

			MULTIPLE VEHICLE				
		SINGLE VEHICLE	Responsible Driver	Non-responsible Driver	PEDESTRIAN Driver	Pedestrian	TOTAL
ALCOHOL INFLUENCED	Problem Drinker	35(39%) 54%	26(34%) 40%	NC	4(4%) 6%	NC	65(24%) 100%
	Not Problem Drinker	20(23%) 53%	15(19%) 39%	NC	3(3%) 8%	NC	38(14%) 100%
NON-ALCOHOL INFLUENCED	Problem Drinker	4(4%) 10%	10(13%) 24%	NC	27(27%) 66%	NC	41(16%) 100%
	Not Problem Drinker	30(34%) 24%	26(34%) 21%	NC —	67(66%) 55%	NC —	123(46%) 100%
	TOTAL	89(100%) 33%	77(100%) 29%	NC	101(100%) 38%	NC	267(100%) 100%

* alcohol influence is a BAC ≥.05, if taken, or a clinical evaluation thereof.

+ Not Collected

TABLE 56 (OAC #3)

Focal Operator Accident Alcohol Involvement*

by Time of Day

	12:01 AM-4:00 AM	4:01 AM-8:00 AM	8:01 AM-12:00 PM	12:01 PM-4:00 PM	4:01 PM-8:00 PM	8:01 PM-12:00 AM	TOTAL
Alcohol Involved	50(75%) 48%	7(28%) 7%	0(0%) 0%	6(18%) 6%	14(24%) 14%	26(40%) 25%	103(39%) 100%
Non-alcohol Involved	17(25%) 10%	18(72%) 11%	19(100%) 12%	27(82%) 16%	44(76%) 27%	39(60%) 24%	164(71%) 100%
TOTAL	67(100%) 25%	25(100%) 10%	19(100%) 7%	33(100%) 12%	58(100%) 22%	65(100%) 24%	267(100%) 100%

χ^2 61.01, 4 df, $p < .01$

* alcohol involvement is a BAC ≥ .05, if taken, or a clinical evaluation thereof.

TABLE 37 (OAC #4)

Focal Operator Accident Alcohol Involvement*

by Focal Licensing Status

	VALID DRIVER'S LICENSE	INVALID DRIVER'S LICENSE (Suspended/Revoked)	NONE	LEARNER'S PERMIT	TOTAL
Alcohol Related	91(37%) 88%	9(90%) 9%	3(43%) 3%	0(0%) 0%	103(39%) 100%
Non-alcohol Related	155(63%) 95%	1(10%) 1%	4(57%) 2%	4(100%) 2%	164(71%) 100%
TOTAL	246(100%) 92%	10(100%) 4%	7(100%) 3%	4(100%) 1%	267(100%) 100%

χ^2 7.85, 1 df, $p < .01$

* alcohol involvement is a BAC ≥ .05, if taken, or a clinical evaluation thereof.

TABLE 58

Focal Operator's Licensing Status at Time of Focal Accident by Previous Citations for Operating a Motor Vehicle Without Being Properly Licensed

NUMBER OF CITATIONS	FOCAL LICENSE STATUS: Valid	Learner's	Suspended/ Revoked	Never Licensed	TOTAL
0	233	4	6	4	247 (92%)
1	12	0	2	2	16 (6%)
2	0	0	1	0	1
3	0	0	0	1	1
4	0	0	0	0	0 (2%)
5	0	0	1	0	1
6	1	0	0	0	1
TOTAL	246	4	10	7	267 (100%)
	92%	1%	4%	3%	100%

TABLE 59 (OAC #5)

Focal Operator Accident Alcohol Involvement*
by Previous Alcohol Related Citations†

	Driver had No Previous Alcohol Related Citations	Driver had Previous Alcohol Related Citations	TOTAL
Alcohol Involved	64(31%) 62%	39(66%) 38%	103(39%) 100%
Non-alcohol Involved	144(69%) 88%	20(34%) 12%	164(61%) 100%
TOTAL	208(100%) 78%	59(100%) 22%	267(100%) 100%

χ^2 24.22, 1 df, $p < .01$

* alcohol involvement is a BAC $\geq$ .05, if taken, or a clinical evaluation thereof.

† including citations, and/or arrests, for driving under the influence of alcohol and/or public drunkenness during operator's lifetime.

TABLE 60 (OAC # 6)

Focal and Non-Focal Operator's Accident Alcohol Involvement*

	Focal Responsible Operators	Focal Non-Responsible Operators	TOTAL
Alcohol Involved	103(39%) 89%	13(16%) 11%	116(33%) 100%
Non-alcohol Involved	164(61%) 70%	70(84%) 30%	234(67%) 100%
TOTAL	267(100%) 76%	83(100%) 24%	350(100%) 100%

χ^2 15.00, 1 df, $p < .01$

* alcohol involvement is a BAC ≥.05, if taken, or a clinical evaluation thereof.

TABLE 61 (OAC #7)

Focal Operator Accident Alcohol Involvement* by Sex of Driver

	MALE	FEMALE	TOTAL
Alcohol Involved	91(39%) 88%	12(39%) 12%	103(39%) 100%
Non-alcohol Involved	145(61%) 88%	19(61%) 12%	164(61%) 100%
TOTAL	236(100%) 88%	31(100%) 12%	267(100%) 100%

χ^2 .0011, 1 df, p = n.s.

* alcohol involvement is a BAC ≥ .05, if taken, or a clinical evaluation thereof.

TABLE 62 (OAC #8)

Focal Operator Accident Alcohol Involvement*
by Driver Age

CATEGORIZED AGE	ALCOHOL INVOLVED	NON-ALCOHOL INVOLVED	TOTAL
≤20	24(38%)	39(62%)	63(100%)
21-25	23(39%)	36(61%)	59(100%)
26-30	20(48%)	22(52%)	42(100%)
31-35	9(36%)	16(64%)	25(100%)
36-40	6(40%)	9(60%)	15(100%)
41-45	6(45%)	11(65%)	17(100%)
46-50	7(50%)	7(50%)	14(100%)
51-55	2(25%)	6(75%)	8(100%)
56-60	4(44%)	5(56%)	9(100%)
≥ 61	2(13%)	13(87%)	15(100%)
TOTAL	103(39%)	164(61%)	267(100%)

x^2 2.86, 8 df, p = n.s.

* alcohol involvement is a BAC ≥ .05, if taken or a clinical evaluation thereof.

TABLE 63 (OAC #9)

Focal Operator Accident Alcohol Involvement*
by Operator's Marital Status

	MARITAL STATUS							
	Single	Married	Common law	Separated	Divorced	Widowed	Unknown	TOTAL
Alcohol Involved	51(38%) 49%	29(31%) 28%	3(75%) 3%	8(62%) 8%	10(59%) 10%	2(40%) 2%	0 0%	103(39%) 100%
Non-alcohol Involved	84(62%) 51%	64(69%) 39%	1(25%) 1%	5(38%) 3%	7(41%) 4%	3(60%) 2%	0 0%	164(61%) 100%
TOTAL	135(100%) 51%	93(100%) 35%	4(100%) 1%	13(100%) 5%	17(100%) 6%	5(100%) 2%	0 0%	267(100%) 100%

χ^2 10.26, 4 df, $p < .05$

* alcohol involvement is a BAC ≥.05, if taken, or a clinical evaluation thereof.

TABLE 64 (OAC #10)

Focal Operator Accident Alcohol Involvement*
by Operator Restraint Usage

	RESTRAINTS NOT AVAILABLE	RESTRAINTS AVAILABLE† Used	Not Used	UNKNOWN	TOTAL
Alcohol Involved	30(39%)	9(20%)	62(43%)	2(67%)	103(39%)
Non-alcohol Involved	46(61%)	35(80%)	82(57%)	1(33%)	164(61%)
TOTAL	76(100%)	44(100%)	144(100%)	3(100%)	267(100%)

χ^2 7.32, 1 df, $p < .01$

* alcohol involvement is a BAC $\geq .05$, if taken, or a clinical evaluation thereof.

† type of restraints available not collected.

TABLE 65A (OAC #11A)

Type I Focal Operator Historical Pattern of Alcohol Use by
Focal Accident Blood Alcohol Concentrations

ALCOHOL PATTERN	BLOOD ALCOHOL CONCENTRATIONS							TOTAL BAC	NO BAC	TOTAL OPERATORS
	.00	.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	≥.25			
Abstainer	9(33%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	9(10%)	0(0%)	9(9%)
Light social	12(45%)	1(20%)	2(33%)	4(24%)	7(47%)	2(29%)	1(9%)	29(33%)	7(46%)	36(35%)
Moderate social	4(15%)	2(40%)	1(17%)	6(35%)	1(7%)	2(29%)	1(9%)	17(19%)	2(13%)	19(18%)
Heavy social	1(3%)	2(40%)	3(50%)	5(29%)	2(13%)	2(29%)	6(54%)	21(24%)	3(20%)	24(23%)
Sporadic binge	0(0%)	0(0%)	0(0%)	0(0%)	3(20%)	1(13%)	0(0%)	4(5%)	0(0%)	4(4%)
Alcohol abuser	1(3%)	0(0%)	0(0%)	2(12%)	2(13%)	0(0%)	3(27%)	8(9%)	3(20%)	11(11%)
TOTAL	27(100%)	5(100%)	6(100%)	17(100%)	15(100%)	7(100%)	11(100%)	88(100%)	15(100%)	103(100%)

x^2 178.59, 140 df, $p < .05$

TABLE 65: (OAC #11B)

Chemical and Clinical Evaluations Reporting Degrees of Alcohol Influence for Focal Operators

Focal Alcohol Evaluation	BAC gm/100ml%	TYPE I	TYPE II	TYPE III	ALL TYPES
None	.00-.04	35(34%)	35(56%)	94(93%)	164(61%)
Mild	.05-.09	9(9%)	4(6%)	1(1%)	14(6%)
Moderate	.10-.15	14(13%)	10(16%)	1(1%)	25(10%)
Severe	>.16	45(44%)	14(22%)	5(5%)	64(23%)
TOTAL		103(100%)	63(100%)	101(100%)	267(100%)

t = I vs II 3.318, 162 df, $p < .01$; I vs III 10.738, 202 df, $p < .01$; II vs III 5.904, 162 df, $p < .01$; $F = 53.203$, 2 df, $p < .01$

TABLE 66 (OAC #11c)

Type I Focal Operator Blood Alcohol Concentrations
by Alcohol Problem Drinker Operator Histories

	BLOOD ALCOHOL CONCENTRATIONS							TOTAL BAC	NO* BAC	TOTAL OPERATORS
	.00	.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	≥.25			
No Known ETOH Problem	22(81%) 48%	2(40%) 4%	2(33%) 4%	7(41%) 15%	8(53%) 18%	4(57%) 9%	1(9%) 2%	46(52%) 100%	8(15%)	54(100%)
Known ETOH Problem	5(19%) 12%	3(60%) 7%	4(67%) 9%	10(59%) 24%	7(47%) 17%	3(43%) 7%	10(91%) 24%	42(48%) 100%	7(14%)	49(100%)
TOTAL	27(100%) 31%	5(100%) 6%	6(100%) 7%	17(100%) 19%	15(100%) 17%	7(100%) 8%	11(100%) 12%	88(100%) 100%	15(15%)	103(100%)

χ^2 BAC only 15.52, 6 df, $p < .01$

* the 15 operators with no BAC indicates those drivers from whom no blood was drawn or blood was drawn too late for accurate analysis.

TABLE 67 (OAC #12)

Focal Operator Problem Drinking Histories by Driver Age

	AGE									
	<20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	≥56	TOTAL
No Problem Drinking History	44(70%)	37(63%)	22(52%)	13(52%)	8(53%)	10(59%)	5(36%)	6(75%)	16(67%)	161(60%)
Problem Drinking History	19(30%)	22(37%)	20(48%)	12(48%)	7(48%)	7(41%)	9(64%)	2(25%)	8(33%)	106(40%)
TOTAL	63(100%)	59(100%)	42(100%)	25(100%)	15(100%)	17(100%)	14(100%)	8(100%)	24(100%)	267(100%)

x^2 8.85, 7 df, p = n.s.

TABLE 68 (OAC #13)

Type I Focal Operator Age by Focal Accident Blood Alcohol Concentrations*

BLOOD ALCOHOL	AGE <20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	≥61	TOTAL
.00	6(24%)	5(25%)	2(15%)	0(0%)	0(0%)	3(33%)	2(25%)	2(67%)	2(33.3%)	5(62.5%)	27(26%)
.01-.04	2(8%)	1(5%)	0(0%)	0(0%)	1(16%)	0(0%)	0(0%)	0(0%)	0(0%)	1(12.5%)	5(5%)
.05-.09	2(8%)	0(0%)	1(8%)	1(20%)	0(0%)	0(0%)	1(12.5%)	0(0%)	1(16.6%)	0(0%)	6(6%)
.10-.14	4(16%)	3(15%)	4(31%)	0(0%)	2(33%)	3(33%)	1(12.5%)	0(0%)	0(0%)	0(0%)	17(17%)
.15-.19	4(16%)	3(15%)	3(23%)	0(0%)	1(16%)	2(23%)	0(0%)	0(0%)	1(16.6%)	1(12.5%)	15(14%)
.20-.24	0(0%)	2(10%)	2(15%)	0(0%)	0(0%)	1(11%)	1(12.5%)	0(0%)	0(0%)	1(12.5%)	7(7%)
.25	2(8%)	3(15%)	1(8%)	2(40%)	2(33%)	0(0%)	0(0%)	0(0%)	1(16.6%)	0(0%)	11(11%)
No BAC	5(20%)	3(15%)	0(0%)	2(40%)	0(0%)	0(0%)	3(37.5%)	1(33%)	1(16.6%)	0(0%)	15(14%)
TOTAL	25(100%)	20(100%)	13(100%)	5(100%)	6(100%)	9(100%)	8(100%)	3(100%)	6(100%)	8(100%)	103(100%)

* because of the number of small scores in this table, some of the percentage statistics are near approximate figures.

TABLE 69 (OAC Driver Profile)

Focal Alcohol and No Alcohol Operator Profiles

	NO FOCAL ALCOHOL	FOCAL ALCOHOL
Age:		
Mean	32.4	30.2
Median	26	26
sd	15.7	12.5
Sex:	Male	Male
Occupation:	Clerk, salesman technician (Level 4)	Skilled manual employee (Level 5)
Education:	High School+	High School+
Income:	N/A	N/A
Race:	Caucasian	Caucasian, Irish
Residence:	Metropolitan, near urban	Metropolitan, Near urban
Other drug Involvement:		
Marijuana-	Abstainer to occasional	Occasional to light social
Street drugs-	None	None
Alcohol history:		
Pattern-	Light social	Moderate to heavy social
Beverage-	Vodka, wine	Beer, whisky
Frequency-	Weekly	>Weekly
Drunkenness-	<8 x annually	Monthly
Annual mileage:	N/A	N/A
Place of drinking:	Commercial	Commercial
Year of automobile Involved:	1970-1972	1969-1970
Number of passengers In vehicle:	0-1	0-1
Type of collision:	Multiple vehicle	Single vehicle
Time of day:	8:00 p.m. to midnight	Midnight to 4:00 a.m. (1:00-2:00 a.m.)
Day of week:	Wednesday or Friday	Saturday

TABLE 70

Focal Operators with Alcohol Influence* as Measured by the Human Factor Stress Scale†

HUMAN FACTORS	GROUP N (No Focal Alcohol) N=164	GROUP A (Focal Alcohol) N=103	TOTAL N=267	DOMINANT GROUP
1. Domestic tension	39(24%)	55(54%)	94(35%)	A p < .01
2. Professional tension	42(26%)	35(34%)	77(29%)	—
3. Social tension	38(23%)	52(51%)	90(34%)	A p < .01
4. Clinical depression	21(13%)	28(27%)	49(18%)	A p < .01
5. Fatigue	46(26%)	59(57%)	101(38%)	A p < .01
6. Chronic physiological problems	20(12%)	15(15%)	35(13%)	—
7. Chronic emotional problems	20(12%)	22(21%)	42(16%)	—
8. Tardiness	39(24%)	19(18%)	58(22%)	—
9. Passenger distraction	25(15%)	23(22%)	48(18%)	—
10. Visual distraction, distortion	53(32%)	46(45%)	99(37%)	—
11. Excessive speed for conditions	57(35%)	87(85%)	144(54%)	A p < .01
12. Legal pursuit	8(5%)	7(7%)	15(6%)	—
13. Alcohol use**	19(12%)	103(100%)	122(46%)	A p < .01
14. Other drug use	25(15%)	34(33%)	59(22%)	A p < .01
15. Vehicle unfamiliarity	22(13%)	21(20%)	43(16%)	—
16. Road unfamiliarity	21(13%)	12(12%)	33(12%)	—

* alcohol influence = >.05 BAC, if taken, or a clinical evaluation thereof
† percentage figures for each item have a potential range of 0% to 100%. Vertical totals are not computed.
**item 13 includes any alcohol use >.01 BAC or a clinical evaluation thereof

APPENDIX A

CASE # _____

HUMAN FACTOR INDEX (HFI)

TRAFFIC ACCIDENT RESEARCH, TASK I

BOSTON UNIVERSITY (NHTSA)

Index:

Basic Demographic Data,
Psychosocial History PTA,
Physical Health History PTA,
Alcohol/Drug/Marijuana History and Use,
Legal/Arrest History,
Focal Arrest Data,

ACCIDENT TYPE:

____1 Operator vehicle #1 fatality

____2 Passenger and/or other operator fatality

____3 Pedestrian fatality

BASIC DEMOGRAPHIC DATA

Case # _____

01. Sex:
____1 Female
____2 Male

02. DOB _____

03. Date of death _____ NA

04. Age: _____
____1 10-19
____2 20-29
____3 30-39
____4 40-49
____5 50-59
____6 60-69
____7 70-79
____8 80+

05. Race: NI
____1 Caucasian
____2 Latin American
____3 Negro
____4 Oriental
____5 Other: _____

06. Current Marital Status:
____1 Single
____2 Married
____3 Common Law/Homosexual
____4 Widowed
____5 Divorced
____6 Separated
____7 Other: _____

07. Operator's Education _____
_____
____1 Graduate, professional trg.
____2 College, Univ. graduate
____3 Partial College trg.
____4 High School graduate
____5 Partial High School trg.
____6 Junior High School
____7 Less than 7 yrs. schooling

08. Operator's Occupation:
_____
____1 Higher executive, prop. of large concerns, mjr. professionals
____2 Business mgrs., prop. of medium business, lesser professionals
____3 Adm. personnel, small indep. business, minor professionals
____4 Clerical, sales, technicians, owners of little businesses
____5 Skilled manual employees
____6 Machine operators, semiskilled employees
____7 Unskilled employees, Relief, no occupation

09. Two Factor Index of Social Position (Hollingshead)
____1 Class I (11-17)
____2 Class II (18-27)
____3 Class III (28-43)
____4 Class IV (44-60)
____5 Class V (61-77)

10. Parents' Origin: NI
____1 Neither foreign born
____2 Mother foreign born
____3 Father foreign born
____4 Both foreign born

11. Dominant ethnic background: NI
____1 Anglo Saxon
____2 Irish
____3 Northern European
____4 Southern European
____5 Latin American
____6 African
____7 Near/Far Eastern
____8 Other: _____

BASIC DEMOGRAPHIC DATA

12. If foreign born pt. to USA:
___ ___ years old NA

13. Number of siblings: ___ ___

14. Any step siblings: NI
____0 No
____1 Yes

15. Any step parents: NI
____0 No
____1 Yes

16. Family of origin cohesiveness: (family members close, supportive) NI
____1 Low, not close at all
____2 Moderate
____3 High, very close

17. Divorce in parental history: NI
____0 No
____1 Yes, more than 5 yrs PTA
____2 Yes, less than 5 yrs PTA

18. How many times married: NA NI
____1 Single, never married
____2 Married, first marriage
____3 Married, second marriage
____4 Married, third marriage
____5 S D W from first marriage
____6 S D W from second marriage
____7 Other: _____

19. If W S D how many years: NA
___ ___ years
(less than 1 yr = 01)

20. Age when first married: ___ ___

21. If more than one marriage, how have they terminated: NA NI
____1 1st marriage S D W (NASH)
____2 2nd marriage S D W (NASH)
____3 3rd marriage S D W (NASH)
____4 Other: _____

22. Length of most recent marriage:
___ ___ years NA NI

23. Spouse's age for last marriage:
___ ___ years old NA NI

24. Difference in age: NA NI
___ ___ years

25. Separation during this marriage for marital friction: NA NI
____0 None, none contemplated
____1 Contemplated
____2 Yes, very recently
____3 Yes, more than 2 yrs. ago
____4 Yes, more than 5 yrs. ago
____5 Other: _____

26. Conflict areas currently existing in the marriage (what they fight about): (0=none, 1=yes)
NA NI
____a Money, material objects
____b Sex, infidelity, homosexuality, incompatibility
____c Lack of consideration and affection
____d Failure to fulfill role expectations
____e Relatives, in-laws
____f Children
____g ETOH abuse, drug abuse
____h Illness
____i Other: _____

27. Amount of overt, detectable marital discord: NA NI
____0 Low, very little
____1 Moderate, considerable
____2 High, almost constant

28. What was the extent of the spouse's emotional involvement in the operator: NA NI
____1 Emotionally isolated
____2 Limited emotional contact
____3 More genuine but implicit
____4 United, support, genuine

29. Number of children: ___ ___ NI

30. Number of step children: ___ ___ NA NI

31. Number of people in present household: (excluding operator) ___ ___ NI

32. Was there any change in the relationship between the operator and other SKOs within the last 6 months: NI
(0 = no, 1 = yes)
____a New boy/girl friend
____b Plans to marry/engage
____c Dropping plans to marry/ engage
____d Separation: _____
____e Death: _____
____f Pregnancy: _____
____g Other: _____

33. Where did the operator usually spend his leisure time: NI
____1 Alone
____2 With family
____3 With friends
____4 Other: _____

34. What does the operator usually do in his leisure time: (0 = no, 1 = yes)
____a Watch TV
____b Read
____c Play cards
____d Engage in sports: _____
____e Sew
____f Cook
____g Hunt
____h Water sports
____i Drive an automobile
____j Drink ETOH
____k Fly
____l Domestic duties
____m Social club
____n Civic clubs
____o Other: _____

35. No. job changes past 5 yrs: ___ ___ NI

PSYCHOSOCIAL HISTORY PRIOR TO ACCIDENT

01. Received psychiatric Rx: NA NI
____0 None
____1 Outpatient only
____2 Hospitalization only
____3 Both

02. Known treatment involved: (0 = none, 1 = some)
____a Psychotherapy
____b Drug therapy
____c ECT, insulin shock
____d Other: _____

03. Length of outpatient Rx: NA NI
__ __

04. Length of inpatient Rx: NA NI
__ __

05. History of depression: NI
____0 No
____1 Yes

06. Age of earliest Dx mental health problem: NA NI
__ __ years old

07. Mental illness in family of origin: NI
____0 No
____1 Yes

08. Personality/Character: NI
____1 Oral, (dependent, demanding)
____2 Compulsive, (orderly, controlled)
____3 Hysterical, (dramatizing)
____4 Narcissistic (superior feelings)
____5 Masochistic, (long-suffering, self-sacrificing)
____6 Paranoid, (guarded)
____7 Schizoid, (aloof)

09. Was the operator well liked by his peers: NI
____0 No
____1 Generally liked
____2 Always liked

10. Did the operator have many friends: NI
____0 None
____1 1-5
____2 6-10
____3 11-20
____4 More than 20

11. Did the operator exhibit any of the following characteristics: NI (0 = no, 1 = yes)
____a Political activism
____b Anti-religious
____c Extremely religious
____d Anti-establishment/ authoritarian
____e Chronic unemployment
____f Chronic risk taking
____g Regular party/bar activity
____h Racial prejudice
____i Civic involvement
____j Home body
____k Great concern for others
____l Professional stability

12. Did the operator come from a multi-problem environment: NI
____0 No
____1 Yes

13. Was the operator unusually high-strung or sensitive: NI
____0 No
____1 Yes

PSYCHOSOCIAL HISTORY PRIOR TO ACCIDENT

14. Does the operator have any known history of suicide attempts: NI
    ____0 No
    ____1 Yes: _____

15. What were the operator's recent observable life styles: NI
    (past 6 months)
    (*0 = no, 1 = yes*)
    ____a Happy-go-lucky
    ____b Anxious, nervous, depressed
    ____c Industrious, hard working
    ____d Given up, lethargic "don't care"
    ____e "Making it", none of the above

PHYSICAL HEALTH HISTORY PRIOR TO ACCIDENT

01. Physical health PTA: NA NI
____1 Poor
____2 Fair
____3 Good/Excellent

02. Any change in physical health just before accident: NA NI
____0 No
____1 Yes

03. Generally the operator regarded his health PTA with: NA NI
____1 Under concern
____2 Normal concern
____3 Over concern

04. Did the operator neglect medical advice of medication: NA NI
____0 No
____1 Yes

05. Last LMD visit: NA NI
___ ___ months

06. Surgery immediately PTA: (within 6 months) NA NI
____0 No
____1 Yes: _____

07. Physical handicaps/disabilities: NA NI
____0 None
____1 Some: _____

08. Does the operator receive veterans compensation: NA NI
____0 No
____1 Yes

09. Does the operator smoke cigarettes: NA NI
____0 No
____1 Yes(How much: _____)

10. Was the operator pregnant at the time of the accident: NA NI
____0 No
____1 Yes

11. Did the operator have a chronic physical illness: NA NI
____0 No
____1 Yes: _____

12. Does the operator wear correctional lenses: NA NI
____0 No
____1 Yes

ALCOHOL/DRUG HISTORY AND USE

01. The operator considers himself to have been: NI
___0 An abstainer
___1 A moderate social drinker, seldom drunk
___2 Heavy social drinker, frequently drunk
___3 Sporadic drinker, excessive binge drinker
___4 An alcohol abuser, alcoholic
___5 Operator dead

02. Other sources consider the operator to have been: NI
___0 An abstainer
___1 A light social drinker
___2 A moderate social drinker, seldom drunk
___3 Heavy social drinker, frequently drunk
___4 Sporadic drinker, excessive binge drinker
___5 An alcohol abuser, alcoholic

03. When the operator gets together with the people from work, how often are drinks containing ETOH served: NA NI
___0 Never
___1 Once in a while
___2 Less than half of the time
___3 More than half of the time
___4 Nearly all of the time

04. How many of the operator's working friends drink quite a bit: NI
___0 None
___1 Only a few
___2 Less than half
___3 More than half
___4 Nearly all

05. When the operator gets together with friends socially how often is ETOH served: NI
___0 Never
___1 Almost never
___2 Once in a while
___3 Fairly often

06. What has been the operator's ETOH preference: NI
___0 None, abstainer
___1 Wine
___2 Beer
___3 Whiskey, scotch
___4 Other: _____

07. Why has the operator usually used ETOH: (0 = never, 1 = sometimes/usually)
___a To relax
___b To be sociable
___c Like the taste
___d Because the people I know drink also
___e To forget
___f To celebrate
___g To forget worries
___h To improve appetite for food
___i Because it is polite
___j To cheer me up
___k To calm nerves

08. During the past year did anyone try to get the operator to drink less: NI
___0 No
___1 Yes

09. During the past year did anyone try to make the operator drink more: NI
___0 No
___1 Yes

ALCOHOL/DRUG HISTORY AND USE

10. Has the operator ever attended any meetings of AA: NI
    ____0 No
    ____1 Yes

11. Was the operator a reformed alcoholic: NI
    ____0 No
    ____1 Yes

12. Did the operator ever try to stop drinking: NI
    ____0 No
    ____1 Yes

13. Did the operator ever lose a job for alcoholic abuse: NI
    ____0 No
    ____1 Yes

14. How frequently did the operator use ETOH: NI
    ____0 Never
    ____1 Once a month or less
    ____2 Weekly
    ____3 Daily

15. How frequently did the operator get drunk: NI
    ____0 Never
    ____1 Once or twice a year
    ____2 2-8 times a year
    ____3 Monthly
    ____4 Weekly
    ____5 More than once a week

16. Where did the operator usually drink: NI
    ____0 An abstainer
    ____1 At home
    ____2 At a friend's home
    ____3 At a favorite bar
    ____4 At several bars
    ____5 All of the above

17. Was the operator ever arrested for non-vehicular ETOH abuse: NI
    ____0 No
    ____1 Yes

18. Was the operator ever arrested for DUIL: NI
    ____0 No
    ____1 Yes

19. Was the operator ever convicted for DUIL: NI
    ____0 Never
    ____1 Once
    ____2 Twice
    ____3 Three times
    ____4 Four or more times

20. The operator's known drug use was: NI
    ____1 Rx only
    ____2 Street drugs only
    ____3 Both of the above

21. Did the operator smoke marijuana:
    ____0 Never or NI
    ____1 Once or twice a year
    ____2 3-8 times a year
    ____3 Monthly
    ____4 Weekly
    ____5 More than once a week

22. Did any member of the operator's family have a known Hx of ETOH abuse: (0 = no, 1 = yes)(NA = -1)
    ____a Mother
    ____b Father
    ____c Siblings
    ____d Spouse
    ____e Children
    ____f Other: _____

ALCOHOL/DRUG HISTORY AND USE

23. Did the operator feel guilty about his ETOH use: NI
    ____0 No
    ____1 Yes

24. Has the operator's ETOH use ever caused known social problems: NI
    ____0 No
    ____1 Yes

25. Has the operator ever been hospitalized for ETOH abuse: NI
    ____0 No
    ____1 Yes

26. Clinical historic ETOH Dx: (PTA)
    ____0 No ETOH related problems
    ____1 Mild ETOH related problems
    ____2 Moderate ETOH related problems
    ____3 Severe ETOH related problems

27. Was the operator observed to have been under the influence of ETOH at the time of the accident: NI
    ____0 No, not at all
    ____1 Yes, somewhat
    ____2 Yes, considerably

28. How many drinks was the operator known to have had before the accident (6 hours PTA): NI
    ____0 None
    ____1 1-2
    ____2 3-4
    ____3 5-6
    ____4 More than 7

29. If there were other passengers in the vehicle at the time of the accident did any of them give evidence of ETOH use: NA NI
    ____0 No
    ____1 Yes, somewhat
    ____2 Yes, considerably

30. How long PTA did the operator have his last drink: NA NI
    ____0 No alcohol use
    ____1 Greater than 1 hour
    ____2 30-60 minutes
    ____3 15-30 minutes
    ____4 Less than 15 minutes

31. What was the operator's BAC:
    .___ ___% NI
    ____0 0%
    ____1 .01-.05%
    ____2 .06-.10%
    ____3 .11-.15%
    ____4 .16-.20%
    ____5 Greater than .21%

32. Were drug evidences found in the operator's blood analysis: NI (0 = no, 1 = yes)
    ____a Barbiturates: _____
    ____b Salicylates: _____
    ____c Doriden: _____
    ____d Carbon monoxide: _____
    ____e Organic bases: _____

33. The clinical assessment of the operator #1 ETOH involvement in this accident is:
    ____0 No involvement
    ____1 Minimal involvement
    ____2 Moderate involvement
    ____3 Serious/severe involvement

ALCOHOL/DRUG HISTORY AND USE

34. The clinical assessment of the operator #1 Drug involvement in this accident is:
____0 No involvement
____1 Minimal involvement
____2 Moderate involvement
____3 Serious/severe involvement

35. Other ETOH/Drug involvement was found with the:
(0 = none, 1 = yes, NA = -1)
____a Other passengers of his vehicle
____b The other operator
____c Other passengers
____d A pedestrian

36. Was a pedestrian killed in this accident:
____0 No
____1 Yes

37. If a pedestrian was killed complete the following:
Sex:
____1 Female
____2 Male

38. Age: ___ ___

39. BAC: .___ ___% NI
____0 0%
____1 .01-.05%
____2 .06-.10%
____3 .11-.15%
____4 .16-.20%
____5 Greater than .21%

LEGAL/ARREST HISTORY

		Column A		Column B
01.	Had the operator ever been cited for a crime/violation?		110	
	___0 No			
	___1 Yes		111A	
			111B	
02.	How many years has the operator had a license? ___ ___		112A	
			113	
03.	Has his license ever been suspended or revoked?		114	
	___0 No			
	___1 Yes: _____		114B	
			114F	
04.	What was the status of his license at the focal accident?		115	
	___1 Valid		116A	
	___2 Learners			
	___3 Suspended/revoked		116B	
	___4 Never given		116C	
	___5 Other: _____		117	
05.	Number of separate arrests:		121	
	___ ___		123	
06.	Number of citations: ___ ___		124	
07.	Review of record:		A&B	
	Column A = number of times cited for this offense		DWC	
	Column B = time of most recent citation coded as follows:		Drugs	
	1 = 0-6 mos PTA		DK	
	2 = 7-12 mos PTA		Gam	
	3 = 13-18 mos PTA		N.S.	
	4 = 19-24 mos PTA		Tres.	
	5 = 25-36 mos PTA		ETOH	
	6 = 3-5 yrs PTA		VEH	
	7 = 6-8 yrs PTA		Lisc	
	8 = 6-8 yrs PTA		DP	
	9 = More than 9 yrs PTA			

FOCAL ARREST DATA

09. Case resulting from:
____1 A single vehicle fatality
____2 A multivehicle fatality
____3 A vehicle/pedestrian fatality

10. How many vehicles were involved in this accident:
____1 One
____2 Two
____3 Three

11. Why is this case being investigated:
____1 An operator fatality
____2 An other passenger fatality
____3 A pedestrian fatality

12. Time of day: am/pm
____1 Midnight to 6 am
____2 6 am to noon
____3 Noon to 6 pm
____4 6 pm to midnight

13. Who was killed in this accident:
____a The principal driver
____b Another driver
____c One passenger
____d Two or more passengers
____e A pedestrian
____f Other: _____

14. Operator condition following accident:
____1 Not hospitalized
____2 E/W only
____3 Hospitalized
____4 Dead

15. Disposition of charge to operator:
____0 Operator not charged
____1 Acquitted
____2 Dismissed
____3 Continued
____4 Convicted: _____
____5 Dead

16. Legal result of disposition:
____0 None, operator cleared
____1 License revoked
____2 Suspended sentence
____3 Incarcerated
____4 Pending
____5 Dead

17. The operator was formally charged with:
____0 No charge
____1 DUIL
____2 Driving to endanger
____3 Manslaughter
____4 Both 1 and 2
____5 All of 1, 2 and 3
____6 Other: _____

18. Was the operator driving on a familiar road: NI
____0 No
____1 Yes

19. How often did the operator use this road: NI
____0 Never before
____1 Several times a year
____2 Monthly
____3 Weekly
____4 Daily

20. What was the purpose of the operator's trip: NI
____1 Business
____2 Social
____3 Other: _____

21. Approximately how close was the operator to his home at the time of the accident:
____1 Over 50 miles
____2 30-50 miles
____3 15-30 miles
____4 5-15 miles
____5 Within 5 miles
____6 Less than 1 miles
____7 Less than ½ mile

FOCAL ARREST DATA

22. Was the operator insured:
____0 No
____1 Yes

23. Were there seat belts in the operator's vehicle:
____0 No
____1 Yes

24. If there were seat belts, was the operator using them: NI
____0 No
____1 yes

25. Did the operator normally use seat belts: NI
____0 No
____1 Yes

26. Was the operator's vehicle modified for speed:
____0 No
____1 Yes

27. During the 24 hours PTA the operator was:
____a Working at job: _____
____b Working around house: _____
_____
____c In school: _____
____d On vacation: _____
____e Partying, drinking: _____
celebrating: _____
____f Loafing around, "doing nothing in particular":
_____
____g Other: _____

28. Number of passengers in vehicle #1, excluding operator: ___ ___

29. Number of people killed: ___ ___

30. Human factors related to this accident (operator #1):
____a Domestic tension/anxiety
____b Professional tension/anxiety
____c Social tension/anxiety
____d Depression
____e Fatigue
____f Chronic physiological problems: _____
____g Chronic emotional/mental problems: _____
____h Tardiness for an appointment
____i Passenger distraction
____j Blindness, visual obstruction/distortion
____k Excessive speed for conditions of road, weather, etc.
____l Legal pursuit
____m Drug use
____n Alcohol use
____o Road familiarity
____p Vehicle familiarity

31. Year, make and model of vehicles:
#1 _____
#2 _____
#3 _____
#4 _____

32. Day of the week:
____1 Monday
____2 Tuesday
____3 Wednesday
____4 Thursday
____5 Friday
____6 Saturday
____7 Sunday

FOCAL ARREST DATA

33. Occasion:
____1 Weekend (6:00 pm Fri.-6:00 am Mon.)
____2 Holiday
____3 Payday
____4 Weekday
____5 Other: _____

34. Risk Taking Behavior Scale (RTBS): (0 = no, 1 = yes or some)
____1 Two or more citations for speeding or driving to endanger
____2 Normal non-use of seat belts
____3 Auto racing, motorcycle racing, scuba diving, mountain climbing
____4 One or more suicide attempts
____5 Abusing advice of LMD or hospital
____6 Smoking more than 40 cigarettes daily
____7 Problem drinker history (ETOH)
____8 Abusive use of pharmaceutical drugs
____9 Using any variety of street drugs (excluding marijuana or ETOH)
___10 Use of marijuana (3×+ annually)
___11 Employment hazard
___12 Recorded arrest for a violent crime

APPENDIX B

PROFILE OF THE TYPE IV OPERATOR

During the course of the field investigation 20 (7%) of the operators suffered heart attacks while operating a motor vehicle that resulted in their own death. For the clarity of the data analysis these operators were not included in the main body of this report but are briefly presented in profile in this Appendix.

The TYPE IV or sudden death operator was most likely to have been a 63 year old, married, Caucasian male with an high school education, employed as a clerk, salesman or technician. He came from a relatively calm domestic environment and spent most of his leisure time with his wife or family. He had no known psychiatric history, was not considered to have been unusually high strung or sensitive, had no outstanding domestic, social or professional tensions and was generally a quiet type of person. He was most likely to have been under a physician's care for a heart related problem, drank very little, if at all, and did not smoke cigarettes. He had never smoked marijuana. On the day of his death he was driving alone during the daylight hours, with no alcohol influence of any nature. He was likely to have appeared tired or commented on his fatigue to someone earlier in the day. He died either directly before or in a single vehicle/single occupant collision without medical intervention.

PROFILE OF THE TYPE V ACCIDENT

The TYPE V accident was a potential TYPE III accident where the operator of the vehicle that struck and killed the pedestrian was never apprehended. Each of these 13 (5%) cases were reviewed weekly through the remaining course of the project. Another 6 (2%) of the TYPE III cases were initially hit-and-run, where the operator was later apprehended and interviewed by the team. The hit-and-run accident was likely to have taken place on Monday or Friday during the early evening hours between 4:00 p.m. and 8:00 p.m. About half of the cases were witnessed by other persons and the others were in isolated situations where the pedestrian was discovered after his death. There was very little evidence that the pedestrian had been drinking alcohol, and nothing is known about the operator.

APPENDIX C

BOSTON UNIVERSITY
CENTER FOR LAW AND HEALTH SCIENCES
TRAFFIC ACCIDENT RESEARCH
141 Bay State Road, Boston, Massachusetts 02215. (617) 353 3020

Michael A. Luongo, M.D., Director
George G. Katsas, M.D., Co-director

TYPE I LETTER

17 December 1974

Mrs. John Doe
51 California Street
Arlington, Massachusetts 02174

Dear Mrs. Doe:

Each year the National Highway Traffic Safety Administration, under the sponsorship of the U.S. Department of Transportation in Washington, D.C., conducts a confidential in-depth survey into every fatally involved motor vehicle accident in the greater Boston area. The goal of this research is not to determine the degree of guilt or innocence on the part of any of the individuals involved but rather to collect information, mostly of a historical nature, pertaining to the operators of accident-related motor vehicles, and through this to assist in the nationwide effort for increased highway safety.

It is with this goal in mind that the Boston University Traffic Accident Research Project has been considering the recent motor vehicle accident involving the late John Doe. All of the collected information that we have secured on this case will be completely sanitized before the final reports are forwarded to the Washington office of Highway Safety. "Sanitized" means that all of the identifying features such as names, addresses, etc. will have been deleted prior to finalization. In brief, this is a completely confidential Ralph Naderish-type research effort.

During the next few days, one of the research psychologists from the Boston Team will be in touch with you to collect some additional information. May I once again stress to you the confidential nature of this important research and encourage your cooperative participation.

In the event that you have any questions which you find to be unanswered by our researcher, please feel free to call me at (617) 262-4256.

In the interest of highway safety,

Robert S. Sterling-Smith, Ph.D.
Research Director

RSSS:nwc

BOSTON UNIVERSITY
CENTER FOR LAW AND HEALTH SCIENCES
TRAFFIC ACCIDENT RESEARCH
141 Bay State Road, Boston, Massachusetts 02215. (617) 353-3021

Michael A. Luongo, M.D., Director
George G. Katsas, M.D., Co-director

TYPE II LETTER

2 December 1974

Mr. John Doe
35 Main Street
Lexington, Massachusetts 02173

Dear Mr. Doe:

Each year the National Highway Traffic Safety Administration, under the sponsorship of the U.S. Department of Transportation in Washington, D.C., conducts a confidential in-depth survey into every fatally involved motor vehicle accident in the greater Boston area. The goal of this research is not to determine the degree of guilt or innocence on the part of any of the individuals involved but rather to collect information, mostly of a historical nature, pertaining to the operators of accident-related motor vehicles, and through this to assist in the nationwide effort for increased highway safety.

It is with this goal in mind that the Boston University Traffic Accident Research Project has been considering your recent motor vehicle accident. All of the collected information that we have secured on this case will be completely sanitized before the final reports are forwarded to the Washington office of Highway Safety. "Sanitized" means that all of the identifying features such as names, addresses, etc. will have been deleted prior to finalization. In brief, this is a completely confidential Raiph Naderish-type research effort.

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In the event that you have any questions which you find to be unanswered by our researcher, please feel free to call me at (617) 262-4256.

In the interest of highway safety,

Robert S. Sterling-Smith, Ph.D.
Research Director

RSSS:nwc

BOSTON UNIVERSITY
CENTER FOR LAW AND HEALTH SCIENCES
TRAFFIC ACCIDENT RESEARCH
141 Bay State Road, Boston, Massachusetts 02215. (617) 353-3020

Michael A. Luongo, M.D., Director
George G. Katsos, M.D., Co-director

TYPE III LETTER

4 February 1974

Mr. John Doe
88 Center Avenue
Waltham, Massachusetts 02154

Dear Mr. Doe:

Each year the National Highway Traffic Safety Administration, under the sponsorship of the U.S. Department of Transportation in Washington, D.C., conducts a confidential in-depth survey into every fatally involved motor vehicle accident in the greater Boston area. The goal of this research is not to determine the degree of guilt or innocence on the part of any of the individuals involved but rather to collect information, mostly of a historical nature, pertaining to the operators of accident-related motor vehicles, and through this to assist in the nationwide effort for increased highway safety.

It is with this goal in mind that the Boston University Traffic Accident Research Project has been considering your recent motor vehicle-pedestrian accident. All of the collected information that we have secured on this case will be completely sanitized before the final reports are forwarded to the Washington office of Highway Safety. "Sanitized" means that all of the identifying features such as names, addresses, etc. will have been deleted prior to finalization. In brief, this is a completely confidential Ralph Naderish-type research effort.

During the next few days, one of the research psychologists from the Boston Team will be in touch with you to collect some additional information. May I once again stress to you the confidential nature of this important research and encourage your cooperative participation.

In the event that you have any questions which you find to be unanswered by our researcher, please feel free to call me at (617)262-4256.

In the interest of highway safety,

Robert S. Sterling-Smith, Ph.D.
Research Director

RSSS:nwc

BOSTON UNIVERSITY
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TRAFFIC ACCIDENT RESEARCH
141 Bay State Road, Boston, Massachusetts 02215. (617) 353-3000

Michael A. Luongo, M.D., Director
George C. Katsas, M.D., Co-director

LAWYER LETTER

7 February 1974

Attorney John J. Smith
One Central Square
Somerville, Massachusetts

Dear Mr. Smith:

Each year the National Highway Traffic Safety Administration, under the sponsorship of the U.S. Department of Transportation in Washington, D.C., conducts a confidential in-depth survey into every fatally involved motor vehicle accident in the greater Boston area. The goal of this research is not to determine the degree of guilt or innocence on the part of any of the individuals involved but rather to collect information, mostly of a historical nature, pertaining to the operators of accident-related motor vehicles and through this to assist in the nationwide effort for increased highway safety.

It is with this goal in mind that the Boston University Traffic Accident Research Project, within the Boston University Law School, has been considering the recent motor vehicle accident involving one of your clients, Mr. John Doe. We have talked with Mr. Doe and he has advised us to contact you for your clearance before proceeding with a personal interview.

The information we would like to secure from your client is mostly of a historical nature, including demography, medical history and so forth, as well as some human factor information regarding feelings, attitudes and conjectured causalities during the moments prior to the crash. Our research is primarily human factor oriented. Our interview policy is that any individual of course has the right not to answer any of our questions in the event that he so chooses. All material collected is immediately

sanitized of all identifying features such as names, addresses, etc.

Because of the nature of this research and its projected impact on vehicular safety in this country, it is very important that we be able to obtain the essential data on each and every fatal accident that takes place within our geographical boundaries. With this in mind, we would like to have your clearance to see your client.

Should you have any further questions, please feel free to call me at (617)262-4256. During the next few days, one of our researchers will contact your office for your advice.

May I once again stress the confidential nature of this important research and encourage your cooperative participation.

In the interest of highway safety,

Robert S. Sterling-Smith, Ph.D.
Research Director

RSS:nwc

APPENDIX D

PROBLEM DRINKER DATA GENERATION

The scheduled period of field investigation for the Boston team was well under way with more than half of its experimental population collected when the Office of Alcohol Countermeasures presented to the team the essential data items necessary for identifying the "problem drinker". Unfortunately, the team had not collected some of the necessary data in the same manner, had collected other data not essential to the problem drinker identification and had not collected other information. This being the case the team attempted to use the data available and make an identification that would be compatible with the OAC standards. This was approved by the OAC.

The Boston team scored an operator as a problem drinker if he received positive responses to four or more of the following data items:

a. _____ self identification as heavy social drinker, sporadic binge drinker or an alcohol abuser, or

_____ other informant identification as a heavy social drinker, sporadic binge drinker or an alcohol abuser

b. _____ a drinking pattern in the direction of several times weekly or daily

c. _____ a drunkenness pattern in the direction of weekly or several times a month

d. _____ personal attempts to drink less

e. _____ encouragement by others to drink less

f. _____ personal guilt regarding the use of alcohol

g. _____ five or more drinks before the focal accident

h. _____ a BAC >.15 gm/100mℓ% or a clinical evaluation of the same in the focal accident

i. _____ hospitalization for alcohol related problems within a year of the focal accident and a continuing drinking habit

j. _____ a previous arrest or citation for driving under the influence of alcohol or for public drunkenness

APPENDIX E

ASAP TABLES

At the time of this report there is no final data available from the operational phase of the Boston Alcohol Safety Action Project that can be meaningfully correlated with the results of the Boston University Traffic Accident Research Special Study. When comparable results become available it may be possible for the teams to correlate their findings. The following three tables briefly outline the location of the Special Study accidents in their relationship to the geographical boundaries covered by the Boston ASAP.

TABLE A-1

Focal Special Study Accidents in ASAP Area by Accident Type

In ASAP	TYPE I	TYPE II	TYPE III	ALL TYPES
No	54(52%)	25(40%)	39(39%)	118(44%)
Tangent	11(11%)	5(8%)	14(14%)	30(11%)
Yes	38(37%)	33(52%)	48(47%)	119(45%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

χ^2 6.26, 4 df, p = n.s.(.181)

TABLE A-2

Focal Special Study Operators Living in ASAP Area by Accident Type

LIVING AREA	TYPE I	TYPE II	TYPE III	ALL TYPES
Outside ASAP area	70(68%)	34(54%)	59(58%)	163(61%)
Tangent to ASAP area	7(7%)	7(11%)	12(12%)	26(10%)
In ASAP area	26(25%)	22(35%)	30(30%)	78(29%)
TOTAL	103(100%)	63(100%)	101(100%)	267(100%)

x^2 4.22, 4 df, p = n.s.

TABLE A-3

Focal Special Study Operators With Accident Alcohol Involvement*
by ASAP Geographical Boundaries by Accident Type

ASAP BOUNDARIES	TYPE I		TYPE II		TYPE III		ALL TYPES	
	Focal Alcohol	No Focal Alcohol	Focal Alcohol	No Focal Alcohol	Focal Alcohol	No Focal Alcohol	Focal Alcohol	No Focal Alcohol
Outside ASAP	32(47%)	22(63%)	13(46%)	12(34%)	2(29%)	37(39%)	47(46%)	71(43%)
Tangent to ASAP	9(13%)	2(6%)	2(7%)	3(9%)	0(0%)	14(15%)	11(11%)	19(12%)
SUBTOTAL	41(60%)	24(69%)	15(53%)	15(43%)	2(29%)	51(54%)	58(57%)	90(55%)
Inside ASAP	27(40%)	11(31%)	13(47%)	20(57%)	5(71%)	43(46%)	45(43%)	74(45%)
TOTAL	68(100%)	35(100%)	28(100%)	35(100%)	7(100%)	94(100%)	103(100%)	164(100%)

* alcohol involvement is a BAC ≥ .05 gm/100mℓ% or a clinical evaluation thereof

Note: A total of 148(55%) of the Boston accidents occurred outside of or tangent to the ASAP area of field operation. Only 58(39%) of these accidents reported alcohol involvement with the most responsible operator. In comparison 119(45%) of the Boston accidents took place within the ASAP boundaries with 45(38%) reporting most responsible operator alcohol involvement.

TABLE A-4

Focal Accident Distribution During
Course of Field Investigation

	FOCAL ALCOHOL	NO FOCAL ALCOHOL	TOTAL
*September–December 1971	3 33%	6 67%	9 100%
January–April 1972	12 52%	11 48%	23 100%
May–August 1972	8 47%	9 53%	17 100%
**September–December 1972	22 42%	30 58%	52 100%
***January–April 1973	17 33%	35 67%	52 100%
May–August 1973	15 31%	34 69%	49 100%
September–December 1973	18 37%	31 63%	49 100%
****January–February 1974	8 50%	8 50%	16 100%
TOTAL	103	164	267

* Incomplete accident survey, including only 5 townships

** Boston ASAP becomes operational

*** Drinking age lowered to 18

****

END

DATE

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