MARIJUANA AND DRIVER BEHAVIORS: HISTORIC AND SOCIAL OBSERVATIONS AMONG FATAL ACCIDENT OPERATORS AND A CONTROL SAMPLE

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16. Abstract
Final Report, Part III for DOT HS-310-3-595 is an analysis and evaluation of the data from 1068 motor vehicle operators in the greater Boston area with a focal interest in marijuana use patterns and corresponding demographic, psychosocial, alcohol, and other drug and vehicular variables. The 2 samples contributing to this presentation include 267 (25%) experimental operators who were "most responsible" for a highway accident in the greater Boston area resulting in a personal fatality to an operator, other vehicular occupant or a pedestrian and 801 (75%) operators matched to the experimentals without any fatal accident histories comprising the control sample. The experimental sample included 121 (45%) marijuana smokers and 146 (55%) non-smokers, with the control sample showing 272 (34%) marijuana smokers and 529 (66%) non-smokers. Notable differences were observed between these 4 sub-samples and between the smokers and the non-smokers. In broad terms the control smokers were over-achievers and the experimental smokers under-achievers. The control smokers were more successful with their education and occupation than were the experimental smokers. Other observations were collected from only the control smokers relative to subjective impressions of behavioral alterations when marijuana intoxicated and a number of more objective variables associated with marijuana use patterns. The control operator smoking group presented opinions relative to levels of risk when marijuana influenced and when marijuana sober while operating a motor vehicle. The 43 (16%) of the experimental operators who were evaluated to have been marijuana influenced at the time of the focal accident were analyzed and the findings presented.

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FOREWORD

Each year nearly half of the serious and fatal motor vehicle
accidents that occur on the nation's highways can be directly traced to
the influence of alcohol on the part of the operator who was principally
responsible for the accident. In spite of the efforts by thousands of
highway safety professionals that saw an 18% reduction in the proportion
of traffic fatalities in 1974, the estimated number of alcohol related
accidents did not drop significantly. During the last several years
the problem of alcohol intoxication and its contribution to a broad
spectrum of accident figures has been compounded with the introduction
of another intoxicant in the form of the illegal Cannabis sativa,
commonly known as marijuana. At present there is a great deal of con-
flicting evidence regarding the effects of marijuana intoxication on
driving behaviors and the emotional concomitants that are related to
good driving habits. Most researchers indicate that their findings
support the thesis that marijuana intoxication has less detrimental
effects on driving a motor vehicle than alcohol intoxication. Others
report that its effects are basically the same. The entire issue is
further compounded by the constant difficulties that scientists are find-
ing in their quest to find an inexpensive and readily available method
for detecting marijuana intoxication similar to the blood alcohol concen-
tration or the breathalizer method for ethyl alcohol.

One of the very few studies that has reported marijuana intoxication
as an actual contributing factor to highway accidents is under the aegis

of the Boston University Traffic Accident Research Special Study Team.

In 1975, Sterling-Smith, et al., reported that 16% of the fatal accidents investigated by the special study team were clinically evaluated to have been marijuana related[28]. His report went on to show that 45% of the total Boston sample accident related operators were regular smokers of marijuana during the year prior to the focal accident. During the months following the close of the investigation period for the fatal accidents mentioned above the Boston team was contracted by the National Highway Traffic Safety Administration to collect a closely regulated control sample from the metropolitan area to see if the reported number of marijuana smokers was indeed over-represented in the fatal sample collected earlier.

The combined findings from the 267 operators involved in fatal collisions comprising the Experimental Sample, and the 801 regulated operators with no such accident history making up the Control Sample constitute the essence of this report. Part III of the Final Report for DOT HS-310-595 included herein has focused its attention on the marijuana issue as related to the Experimental and Control Samples. The comparisons and contrasts of the smokers and non-smokers within and between both samples through the appropriate statistical analyses will be represented by the following results.

ABSTRACT

The 1068 motor vehicle operators who have contributed the data
for this analysis centered around marijuana use patterns and attitudes
have come from 2 distinct but interrelated studies stemming from the
Boston University Traffic Accident Research Special Study Team. The
first 267 (25%) operators, comprising the experimental sample, were
selected in complete, sequential order as they became "most responsi-
ble" for a motor vehicle accident in the greater Boston area which
resulted in fatal injuries to: themselves, another vehicular occupant
or a pedestrian. The second group of 801 (75%) operators collected
randomly in the greater Boston area was basically controlled to the
experimental sample for sex, age by decade and township of residence.
None of the control operators was to have been involved in a fatal
vehicular accident. Demographic, psychosocial, alcohol, marijuana and
other drug information was collected on each of the operators. A
number of data points referring to marijuana use patterns and driving
attitudes were scored and computerized on the control marijuana smokers.
Included in the experimental sample were 121 (45%) marijuana smokers and
146 (55%) non-smokers. The control sample included 272 (34%) marijuana
smokers and 529 (66%) non-smokers.

The analyses of the data showed 4 distinct groups. The experimental
non-smokers and the control non-smokers were more alike in that they
were older, married, non-students, with slightly better occupations,
in somewhat poorer health, heavier cigarette smokers, with lighter

alcohol use and, abstainers of street or entertainment drugs when compared with the smoking groups.

The differences between the control marijuana smokers and the experimental marijuana smokers were more pronounced. When these 2 groups were compared the control smokers were the over-achievers and the experimental smokers the under-achievers. The control smoker group was slightly younger, better educated, with more students, much better employed, in better health, smoking fewer cigarettes, with a few more operators with psychological histories, with heavier general drinking patterns but drunken less frequently and with fewer problem drinkers. The control smokers were heavier users of marijuana with a greater proportion of operators smoking several times a week or more. They were exposed to fewer street or entertainment drugs.

The data on the control smokers alone showed that they were experienced users, that they had been smoking for 3-4 years, most frequently several times a week using one joint or less to "relax" and to become high for about 3 hours. They preferred marijuana to alcohol and smoked early in the evenings on weekends and during the week. They felt that a number of mental and physical tasks associated with driving were impaired by smoking marijuana. When presented with 14 hypothetical driving situations they felt that driving on an unfamiliar road, driving in heavy traffic and driving an unfamiliar vehicle involved the greatest comparative, proportionate risk when marijuana intoxicated as opposed to being marijuana sober.

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INTRODUCTION

During the last 10 years, since 1965, the United States has witnessed an historic shift in the distribution, availability, exposure and personal use of a wide variety of intoxicating drugs which are continuing to be dropped, smoked, used, snorted and shot by an increasingly expanding proportion of the American society. The teenager of the 50's, and even the early 60's, knew nothing of mescaline, "acid", MDA, qualudes, "black beauties", "poppers" or even marijuana. He was a child of the one-drug-generation where nearly all of the people he knew used the legitimate drug of commercial alcohol whenever they desired to do something intoxicating. The mysteries of the matron's medicine cabinet which stored a variety of pharmaceuticals such as diet pills, relaxants, mood elevators, pills to get up with and capsules to go to sleep with had not yet made their debute into the mainstream of youthful America. Today all of these drugs are used with varied frequencies by almost every segment of this culture to assist the user in entertainment, relaxation, coping, escape, deterioration and control.

Throughout this period of drug change or development the social smoking of marijuana expanded from within the confines of the lower income sub-cultures to become the second most popular intoxicating or entertainment drug in the English speaking world. It remains surpassed only by ethyl alcohol. Recent estimates purport that 24,000,000 Americans have at least tried marijuana with half of that number currently being users of the drug[19]. Innumerable surveys taken mostly

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among the young adult communities project that half of their samples are marijuana smokers[15,25,37,31] etc. In fact, in 1968 a Boston research team had to conduct hundreds of interviews with potential college male subjects before they could find 9 men who had never smoked Cannabis[32].

Even though marijuana has been used by many cultures for thousands of years it has only been during the past decade and in particular the 1970's that scientific studies performed in closely monitored situations have given more than a purely clinical opinion to the personal effects of the intoxicating substances in marijuana in the general affect of the intoxicated user. A number of recently published findings from thoroughly acceptable research designs have made it abundantly clear that there is a formidable array of biases that appear to be present in many, if not most of the investigations surrounding this drug. Some of these unfortunate theses come from the reading of earlier publications which present results that are not entirely born out by the appropriate data. In other situations the research methodologies have not been consistently scientific. Another observation which has some certain relationship to the designs is the seemingly large number of investigators that appear to approach a marijuana related study with a considerable political position that will find support in the findings. It should also be noted here that Cannabis appears to be an extremely elusive drug which stimulates or creates a substantial variety of differing responses with differing subjects in differing environments. The mere fact of its illegality adds to the bias syndrome.

In spite of these mentioned problem areas a number of earlier studies should be highlighted which focus upon marijuana intoxication

and the subsequent operation of a simulated motor vehicle, the completion of related tasks or performance measures and companion laboratory procedures relevant to driving an automobile. In summary, these studies appear to indicate that the principal effects of operating a motor vehicle while under the influence of marijuana include: a marked delay in the operator's ability to process and act upon signals, passivity, low level of risk, reduced competitiveness and over-compensation.

Crancer and a team of multidisciplinary professionals directed a study in the late 60's where they took experienced marijuana smokers and subjected them to a variety of simulated driving experiences under the influence of alcohol, a placebo and marijuana. Their findings showed that the subjects who had been smoking marijuana had more speedometer errors than the alcohol group but with fewer braking, accelerator, signal and steering errors[5]. The study concluded that the marijuana smoker was a better driver than the alcohol influenced operator. Even though there were some serious errors in the methodology, including problems with drug dosage, this study prompted other researchers to conduct similar investigations to substantiate or disprove the Crancer claims. Another simulator study in Copenhagen reported that there were no significant differences between the alcohol influenced operator and the marijuana intoxicated driver with regard to driving tasks[23]. In 1973 a team of researchers with the South Dakota Human Factors Laboratory tested 96 subjects in 6 groups with low and high doses of THC, 2 placebos and low and high doses of ethyl alcohol. In the laboratory analogs of the passing task they concluded that the marijuana groups significantly

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over-estimated the time necessary to complete a passing task, and
that the alcohol groups were considerably more risky in such behaviors[8].
At just about the same time Keilholz and his team of Basle stationed
researchers conducted a similar experiment with THC and a placebo
where they reported that the THC group of volunteers had been noted with
a marked impairment of attention in the simulator tasks and reduced
concentration capacities when under the influence of low and high
doses of Δ^9-tetrahydrocannibinal. Their principal finding was that
the influenced operators had a consistently recordable prolongation
of reaction time to danger signals[12]. This finding had already been
fully documented by Dott and his associates who went on to support another
hypothesis that chronic or heavy smokers were able to compensate for the
influence of the drug when in a simulator situation and that this sub-
group of subjects were significantly less risky and more cautious in
their driving habits than either the naive smoker or the alcohol user[6].
This latter finding has been further substantiated by a team of Boston
researchers[32] and another southern California evaluation team[3]. Weil
and his Boston team showed with scientific consistency that the naive
smoker deteriorated from his normal scores in laboratory testing when
given marijuana, whereas, the chronic or heavy smoker improved under
such conditions[32].

In 1974 Klonoff and a team of social scientists supported by Crancer,
who had conducted one of the first laboratory experiments reported above[5],
investigated 64 volunteers who drove on a prepared test course, and then
drove the streets of Vancouver in normal and rush hour traffic after

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having been administered social doses of THC, ethyl alcohol and then a placebo in a double blind research design. This study is probably the only thoroughly scientific study that has been conducted in a 'real life' environment. Their findings supported much of the laboratory data and showed that in an actual driving situation the marijuana influenced operator did over-compensate consistently and that he also lacked the ability to process many of the ordinary signals found in a typical traffic pattern. He became easily confused and indecisive under stress[15]. Other studies support the finding of the Klonoff team and report that marijuana smokers are more easily confused than alcohol subjects and that the focus of the drug influence appears to come in the dimension of the information processing behaviors encountered in a laboratory or real life situation. However, there is consistent agreement by many of the same researchers that the smoker, though delayed, appears to have the capacity to make the eventual correct decision more frequently than the alcohol influenced subject[13,16,29].

Many of the current studies involving marijuana use and its effect have asked the subjects if they would ordinarily drive a motor vehicle while under the influence of marijuana. The reports have been varied and relatively incomparable but they do set the basis of a theoretical pattern. Less than half of Crancer's subjects said that they would willingly drive after smoking[5]. A survey with college students in Vermont showed that 49% of the respondents said that marijuana had no effect on their driving behaviors[31] and a similar Toronto survey reported that 62% of the students would willingly drive after smoking[25].

A recent study of fatal accidents in the greater Boston area with

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"most responsible" operators showed that 43 (16%) of the drivers had been clinically evaluated by self or other informant report to have been smoking within 4 hours of the collision[28]. Sterling-Smith, et al., went on to show that 45% of the operators investigated in this study were occasional to heavy smokers during the year before the focal accident. This finding precipitated supplementary funding from the National Highway Traffic Safety Administration to collect a control sample of drivers from the Boston area who had never been involved in a fatal accident as a "most responsible" operator. The control group was to be 3 times as large as the experimental sample and to be randomly drawn from the most predominant residential community clusters reflected in the experimental study mentioned above. Additional controls were initiated for sex and for age by decade. Even though this control sample was to have been collected some time after the experimental subjects had been researched the time span was judged by the team to have been within the acceptable limits for data collection. Information on the experimental or fatally involved operators was collected in sequential order between September 1971 and February 1974. The control subject data were collected during the first 5 months of 1975.

The results of the extended study are presented in 3 related final reports under DOT HS-310-3-595. Part I of the Final Report "Psychosocial Identification of Drivers Responsible for Fatal Vehicular Accidents in Boston", published in September, 1975, presented the findings on the 267 operators included in the experimental sample[28]. The second part, "An Analysis of Drivers Most Responsible for Fatal Accidents Versus a Control Sample", published in December, 1975, compared the 267 experimental operators

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responsible for fatal collisions with 801 control operators with no known fatal motor vehicle accident history[27]. Included herein is Part III of the reporting of the findings from DOT HS-310-3-595, "Marijuana Use and Driver Behaviors: Historic and Social Observations Among Fatal Accident Operators and a Control Sample."

This third report will present a variety of findings within and between the samples with particular reference to the marijuana naive motor vehicle operators and the smoking operator groups.

Profile of the Survey Area

The total geographic area of responsibility included in the field investigations for the Boston University Traffic Accident Research Special Study Team under the direction of Sterling-Smith, 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 square miles designated as the city of Boston. The eastern boundary of the inner city is the Boston Harbor and the Atlantic Ocean with near urban areas to the north, west and south. This core, inner city district and 7 tangent, surrounding communities as seen in Map #1 illustrates the area from which the 801 subjects included in the control sample were drawn. This area was selected because it represented the residential districts of 68% of the operators included in the experimental sample.

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 in a single environment many of the social qualities of town or suburban living together with all of the social amenities 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 team concern there are ready structural evidences 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 more subtle lines of demarcation which would indicate that one is moving from one governmental area to another.

The total team area of responsibility included a population of 1,656,539 persons with 641,071 (39%) living in Boston proper. The psychosocial character of greater Boston is directly influenced by the more than 200 colleges, universities and other institutions of higher learning that are located within 20 minutes of the downtown area attracting more than 200,000 students to the metropolitan area each year. Boston also has the largest complex of hospitals and health care institutions in the world. The supporting professionals that are related

to these educational and medical institutions contribute no small part to the higher than average educational level attributed to the area.

The mean age of the metropolitan population is 29.7 years with 32.1% of the population <18 years of age, another 5.6% between 18 and 20, 6.8% between 21 and 24 and 11.8% between 25 and 34 years. These preceding figures include only in part the transient 200,000 students that come to the colleges and universities each year. Additional statistics show that 11.2% of the population is between 35 and 45 years, 11.6% between 46 and 54 years, 9.6% between 55 and 64 years and 11.3% ≥65 years. It is important to take particular note of these age classifications especially with regard to the present reporting on marijuana use that is most prevalent among the under 30 group.

The ethnic composition of the greater Boston area is very cosmopolitan representing every country in the world. The largest single ethnic group includes first, second and third generation Irish emigrants who represent 21.8% of the inner city and 15.1% of the greater metropolitan populations. The Irish, like many of the other ethnic groups tend to live in clearly designated districts within and near to the inner city. The Italian population includes 19.0% of the inner city residents and 19.7% of the persons in the greater metropolitan area. Persons of African or Caribbean Black extraction include 16.3% of the inner city and 4.6% of the greater metropolitan population. Blacks also tend to live in community clusters together with the growing Puerto Rican population representing about 8% of the urban population. Other Spanish speaking residents make up about 4% of the population.

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During the years of 1972 and 1973 there were 162,911 and 161,674

respective motor vehicle accidents reported to the Massachusetts Registry

of Motor Vehicles. The overlapping statewide categories for these accidents

included 905 (0.6%) fatal injury accidents; 56,478 (35%) personal injury

accidents and 105,528 (65%) property damage accidents for 1972 with

the same percentage figures holding for 1973. The peak days for the

reporting of all kinds of motor vehicle accidents were Friday and

Wednesday and the peak time period between 3:00 and 5:59 p.m. In 1972,

7,776 operators 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 operators were charged with driving a vehicle while

influenced by a controlled drug in 1972 and an increase to 85 in 1973.

Clinical Profile of Marijuana Use

The last 15 years, from 1960 to 1975, have witnessed an amazing

increase in the personal use of marijuana within the urban and near

urban areas of greater Boston. In 1960 the use of marijuana was

largely relegated to antisocial members of specialized, lower income,

minority groups who smoked their "reefers" with little public knowledge

or concern. In the early 1960's the smoking of marijuana began to

penetrate the colleges and universities through the more aesthetic

students committed to music, drama and the fine arts. In a matter of

semesters, marijuana use filtered through the student ranks to a point

where in the mid-60's Cannabis was at least available to any perceptive

collegian on any major Boston campus. During the demonstration era

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marijuana use became a certain mark of identification for the student
who was opposed to the war, racial injustice and the establishment.
At about the same time marijuana use in Boston became a sign of truly
independent thinking and moved out from the campus in both directions.
The identifiable high school student became a smoker, preferring to
use marijuana rather than beer. The avant guarde young professional
included marijuana as one of his discrete preferred intoxicants. Behind
all of this the so-called "hippie" movement transferred marijuana use
to "epidemic" proportions. For many, marijuana then became a temporary
substitute for all alcoholic beverages excepting wines and combined
use of both drugs was rarely seen. The late 60's saw an increasing
number of social parties with a double bar for alcohol and marijuana.
During this era there was evident segregation between the alcohol users
and the marijuana users. Collegiate use continued, until in the late
60's it was virtually impossible to find a male student in one of the
larger universities who had not at least experimented with marijuana.

In the 70's, marijuana use began its emergence from sub-cultic
populations to become a more acceptable part of the Boston way of life.
The smoker was not considered to be a revolutionary, a criminal or a
deviant merely because he used marijuana. Scores of varieties of
devices for preparing and using marijuana became readily available
to the public at first through the boutiques and then through the
large department stores all in the inner city. It should be clearly
noted that public tolerance and acceptance to the new drug has been more
an urban and near urban phenomenon. The attitude of the 60's continues

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to prevail in many suburban communities especially to the south of the metropolitan area where arrests for personal marijuana use continue on the increase each year. In 1972, possession of marijuana in any amount became a misdemeanor and most police arrests for personal use without obvious evidence of intent to sell were either never seen in the courtroom or were summarily discharged with a brief probation sentence to the offender. Marijuana related arrests for personal use do continue in the inner city most frequently associated with other arrests for disturbing the peace, motor vehicle violations or such similar infractions of the law. Frequently public display of marijuana use, such as smoking a joint in the street, is an infraction ignored by discerning policemen. Upon occasion the drug will be taken from the smoker and he will be sent on his way without a citation.

Social marijuana use for the Boston user has become considerably more sophisticated. The price for a "good ounce" has doubled or tripled during the last 3 years. Marijuana that has been treated with another drug such as opium, formaldehyde, "acid", speed or barbiturates has fallen into considerable disrepute. With the onset of the ecological movement, the discriminating smoker will only buy natural marijuana that has not been treated with anything. The user now orders his grass from his established personal dealer by label: "Colombian", "Acapulco Gold", "Home Grown", "tops and flowers", or, if the present supply is low, ordinary Mexican.

RESEARCH DESIGN AND METHODOLOGY

The motor vehicle operators included for analysis in this report
were collected as 2 distinct samples during different periods of time
in the greater Boston area. The 267 operators included in the Experi-
mental Sample were investigated during the 30 month period between
September 1971 and February 1974. The 801 operators in the Control
Sample were subsequently collected during the first 5 months of 1975.
The Experimental Sample was composed of "most responsible" motor vehicle
operators who were involved in a highway accident resulting in a
personal fatality to themselves, another vehicular occupant or a
pedestrian. Each accident-related operator was investigated by the
team immediately after the focal collision. Among the wide variety of
variables collected on each operator were observations regarding his-
torical patterns of marijuana use and clinical evaluations of marijuana
smoking during the 4 hour period prior to the accident under considera-
tion. The findings from this initial investigation of these sequential
fatal accident related operators stimulated sufficient interest with
the National Highway Traffic Safety Administration, whereupon the
Department of Transportation provided supplementary funding so that
the Boston team could collect a control sample of individuals with no
history of fatal motor vehicle accident involvement. The control
protocol was in two parts. Comparable data to the Experimental data col-
lection instrument was scored in the Control Human Factor Index (Appen-
dix A). For each control subject who admitted to having smoked marijuana

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more than three times during the previous year information was collected
for the scoring of the <u>Marijuana Supplement</u> (Appendix B).

Experimental Sample

The 30 month period of experimental field investigation for the
Boston University Traffic Accident Research Special Study Team began
with a pilot study in September 1971. Contract DOT HS-310-595 specified
that the investigations were to be conducted from a human factors
perspective, collecting a wide variety of psychosocial variables of
an historic and focal accident related nature with the primary focus
of the research being with the operator of the vehicle judged by
legal authorities to have been "most responsible" for the fatal acci-
dent. The pilot contract for 50 sequential cases was immediately
followed by a NHTSA request for the team to investigate a total of
300 consecutive fatal motor vehicle accidents in the geographical
area in and around the city of Boston.

The geographical confines of the experimental 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. This over-
lap in areas of responsibility allowed for some ongoing evaluation
between the two teams. The second area of responsibility for the
Boston team included a number of townships and near urban communities
that were tangent to the inner city and considered a part of greater
Boston. The total area of team responsibility was relatively homogeneous

with regard to topography, highway structure and population.

Early in the research the team identified three principal types
of fatal vehicular accident-related "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 briefly characterized as follows: TYPE I --
where the focal operator was killed in the accident; TYPE II -- where
the focal operator survived the collision but where another vehicular
occupant in his or another vehicle was killed; TYPE III -- where the
focal operator struck and killed a pedestrian; TYPE IV -- a TYPE I
accident where the focal operator suffered a fatal seizure precipita-
ting his death and the accident; and, TYPE V -- a TYPE III accident where
the focal operator was never apprehended and designated as hit-and-run.
Parts I and II of these final reports from DOT HS-310-595 present the
findings with regard to these 3 operator type divisions[27,28]. Because
of the confounding nature of the TYPE IV and TYPE V cases they have
been excluded from all analyses and are profiled in the Appendices
of Part I[28]. The TYPE I, TYPE II and TYPE III operators represent the
267 cases considered as a part of the Experimental Sample.

During the pilot period the team developed a Human Factor Index
(HFI) which scored over 300 historical and focal variables on each of
the 267 operators included in the Experimental Sample. The sources for
the data came from a wide variety of channels. Each Experimental
Sample operator case required from 2 to 23 personal interviews before

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the HFI was considered complete. The interview information came from surviving operators (TYPE II and TYPE III); focal accident passengers and witnesses; friends, relatives and lovers; professional peers, health care professionals and many other individuals particular to each case. This information was supported with other data from: the Office of the Medical Examiner of Suffolk County; the Commonwealth Chemistry Laboratory (blood analyses); the Commissioner of Probation; the Registry of Motor Vehicles; state and local police reports; reports and files from supporting health care institutions; reports from cooperating social service agencies; and, other sources individual to each operator. The data on each case was scored and computerized following total sanitization. Every effort was made to eliminate personal identification possibilities for each of the operators included in the investigations. This highly confidential approach to the data has been in harmony with the ethical principals of the team and has eliminated potential subpoena complications.

The methodological outline for the collection of the data for the Experimental Sample operators began with the initial notification from the Office of Accident Investigation in the Commonwealth Registry of Motor Vehicles that a fatal accident in the team's area of responsibility had occurred. The case was then carefully assigned to one of the team's Human Factor Associates and the focal operator or his survivors were asked to participate in the research effort. Letters of purpose were sent to prospective informants advising them of the nature of the research (Appendix C). Following the receipt of the correspondence the

prospective informant was contacted by telephone to set up an interview time. These telephone contacts were extremely valuable and the team quickly discovered that informants would often be more informative over the telephone with regard to sensitive information than they would be when seen in person at a later date. 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 (Appendix D). 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 to the Boston team. Initial resistance to participate was encountered with many informants often precipitating full team involvement in a particular case. All means were utilized to secure the cooperation of a sufficient number of informants to complete the case to the satisfaction of the team. This procedure frequently included: clandestine informant meetings, extended telephone conversations, delays, innumerable contacts with the informant, and, other means appropriate to each case. This procedure might have been considered to have been extreme but with the basic research design that specified the sequential investigation of each fatal motor vehicle accident in the team's area of responsibility it appeared to have been appropriate. The final result was that only 6 (2%) of the prospective Experimental Sample were rejected because of inadequate or incomplete data.

As each case was finalized it was reviewed by the Research Director, sanitized and computerized in anticipation of the forthcoming statistical analyses.

Control Sample

The Control Sample data was collected in quite a different manner from that of the Experimental Sample. The period of field investigation was completed in less than 5 months, between January and May of 1975. In each of the 801 control cases only the specific operator under investigation was interviewed. This approach was in marked contrast to the multiple informants interviewed to complete an experimental case. This very important bias was clearly noted before the finalization of the control data collection instrument and the instruction period for the Human Factor Associates. Every attempt was made to appropriately compensate for this bias so that the eventual comparisons of the selected data points could be evaluated together.

The population of the Control Sample was designated to be three times the size of the Experimental Sample, or 801 cases. The Boston team felt that this number of control cases would be adequate to statistically compensate for any borderline differences that would appear between the selected variables elected for comparison between the samples, and to provide an additional correction for the biases. Additional controls were specified as follows in an attempt to further reduce the evident biases in the collection procedures.

The first control was that the operators would be randomly selected from four community clusters located within the team's experimental area of responsibility. An analysis of the experimental cases showed that 171 (64%) of these experimental operators lived in one of these community clusters at the time of their focal fatal

MAP # 1

Boston University Special Study Team Area of Responsibility
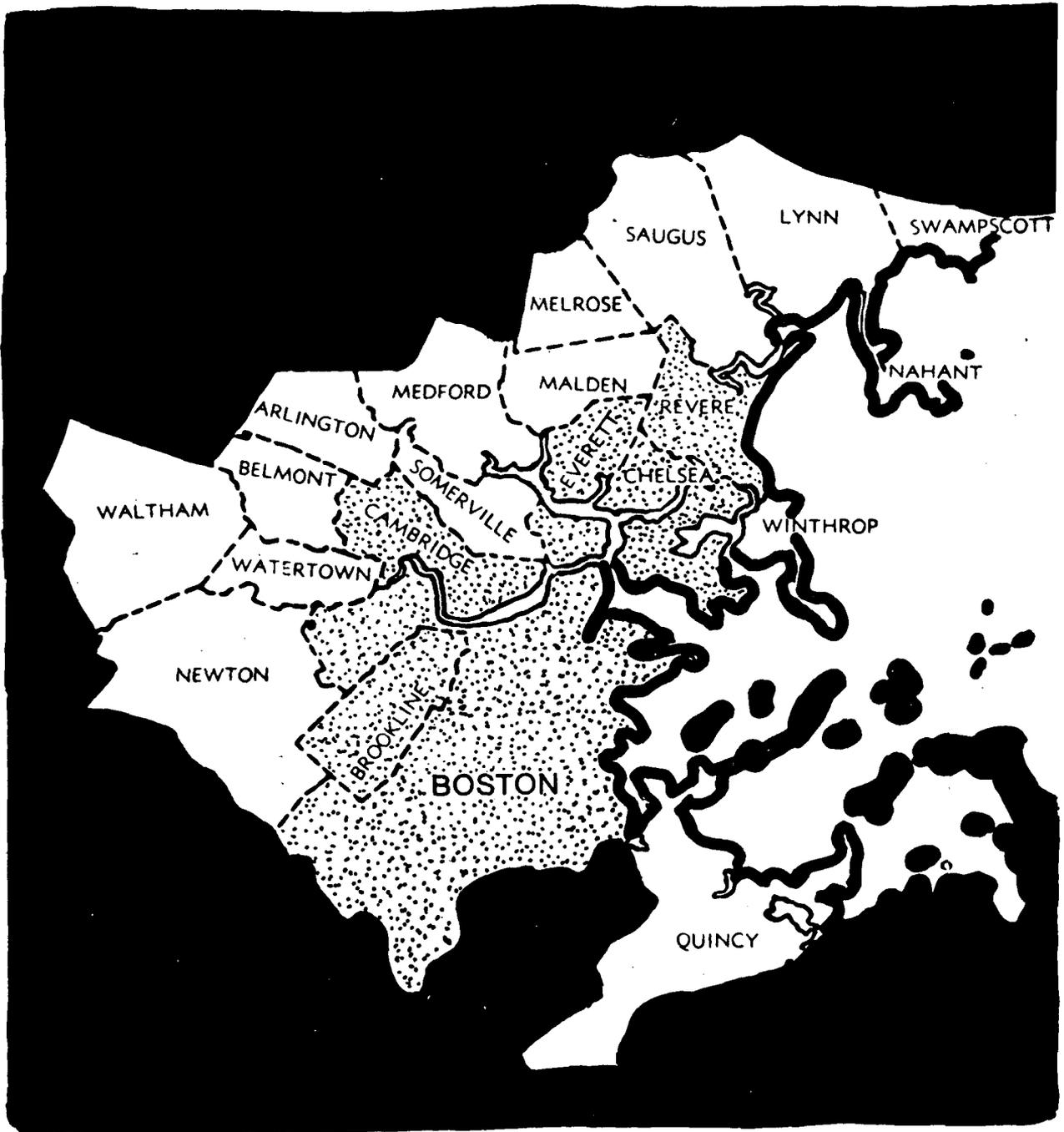
Total area of Experimental Sample catchment. Dotted insert represents Control Sample catchment areas.

accident. The names and addresses of the total population from which
the sample would be drawn were collected from a wide variety of sources
including telephone directories, voter registration lists, town direc-
tories and census reports, Cole's Directory and school registration
lists. The total accumulated potential population from which the
participants were randomly selected at 1:3 intervals included more than
6000 individuals.

The second control was for sex. The Experimental Sample included
88% males and 12% females. The final distribution of the Control Sample
was projected so that it would include the same proportionate distribution
with a projected variance of no more than one percentage point.

The third control was for age. The Experimental Sample age-by-decade-
by-sex matrix was used as a guide for the distribution of the subjects
in the Control Sample. The final distribution of the Control Sample
was progressively projected so that it would include the same propor-
tionate distribution with a projected variance of no more than one
percentage point in any particular cell. The proportionate distributions
for the Experimental Sample and for the final Control Sample are seen
as follows:

AGE	MALE		FEMALE		TOTAL	
	E	C	E	C	E	C
≤19	19%	19%	18%	18%	19%	19%
20-29	40%	40%	35%	36%	40%	40%
30-39	17%	17%	18%	17%	17%	17%
40-49	12%	12%	12%	12%	12%	12%
50-59	6%	6%	9%	8%	6%	6%
60-69	3%	3%	4%	5%	3%	3%
≥70	3%	3%	4%	4%	3%	3%
TOTAL	100%	100%	100%	100%	100%	100%

The fourth control was for the possession of a valid driver's license. This information was most frequently offered by the prospective informant at the point of the telephone contact if he did not possess a valid license to operate a motor vehicle. These reports were periodically substantiated through the files at the Registry of Motor Vehicles. A total of 86 (5%) of the total contacted population were rejected for not meeting this control.

The fifth control was that the operator was to have never been the "most responsible" driver of a vehicle involved in a fatal accident. Actually, throughout the course of the control field investigations only one individual was so identified. Three additional individuals were identified by name as possible candidates and never contacted.

The methodology for the identification and collection of the control cases is most clearly explained through the following flow chart. The design was considerably simplified over the experimental procedure

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because when any potential subject refused to participate or was rejected there was no further attempt to establish contact. The overall flow chart is as follows:

1. Identification of the potential subject from the available population by name and address through an interval random selection of 1:3.

2. Assignment of the case to one of the Human Factor Associates.

3. Letter of purpose and introduction sent to the potential participant (Appendix E).

4. Telephone contact established with some data collected and arrangements made for a personal interview.

5. Interview completed including the Control Human Factor Index (Appendix A) and the Marijuana Supplement (Appendix B) when appropriate and possible.

Throughout the course of the control investigations a total of 1585 potential participants were selected for contact. From this number 316 (20%) were rejected because of a wrong address or because of some reason why they could not be contacted at all by telephone or in person. Another 86 (5%) were rejected because they either possessed no drivers license or had a license under revocation or suspension. An additional 201 (13%) individuals refused to participate in the research for a wide variety of reasons. In the final analysis 181 (11%) completed cases were rejected by random selection because they were not needed to complete the age-by-decade-by-sex matrix described above. The remaining 801 (51%) cases were appropriately proportioned into the Control Sample with corrected considerations for each of the selection control variables.

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As each case was finalized it was reviewed by the Research Director, completely sanitized and submitted for computerization in anticipation of the final analyses.

Experimental and Control Samples

The statistical procedures anticipated for the analysis of the combined data from the 267 Experimental operators and the 801 Control operators with regard to Part III of the Final Report included in this presentation can be summarily outlined as follows. The variables selected for inclusion in the data collection instrument for the Control Sample were drawn from those variables observed in the experimental study as having appeared to have some significance for predictive evaluation. All of the comparable variables have been prepared for interanalysis within and between the samples.

For the contents of this report the data from the 1068 subjects will be approached in the following manner. The sub-sample of marijuana smokers in each of the two major samples will be identified. The single feature that will indicate that an individual is a marijuana smoker or user will be his admission to having smoked Cannabis on three or more occasions during the year prior to his contact with the team. Those individuals who admit to having smoked marijuana only once or twice during the previous year will be considered as "Experimentors" and included with the admitted non-smokers.

Frequency distributions on the common variables within the four sub-groups (Experimental Smokers, Experimental Non-smokers, Control

Smokers, Control Non-smokers) will include proportionate distributions, percentages, means, medians and standard deviations. Procedures for establishing levels of statistical significance between the groups will include Chi-square distributions for the dichotomous variables, Linear Correlations and t-tests. In the event that the initial findings warrant further analyses they will be appropriately performed.

A number of marijuana related observations were collected on the subjects in the Control Smoker group alone. For this group, divisions will be made to distinguish light, moderate and heavy smokers according to frequency of use. These three smoker categories will be subjected to frequency distributions and tests for levels of significant differences appropriate to each variable.

Several related hypotheses have precipitated this investigation and this specialized report:

1. The marijuana smokers from both samples are decidedly more antisocial and competing at a higher level of risk than the non-smokers.

2. The marijuana smokers from both groups have significantly more dominant histories of heavy alcohol use, a larger proportion of street/entertainment drug users and a larger number of cigarette smokers.

3. The Experimental smokers responsible for fatal vehicular accidents will be significantly more notable with regard to levels of antisocial behaviors, suicide attempt histories, psychological treatment histories, heavy alcohol consumption, street drug use and other problem areas.

4. The Experimental smokers will be heavier smokers, that is smoking with greater frequencies than the Control Smokers.

5. Within the Control sample smokers the variables in the Marijuana Supplement will support many of the laboratory findings with regard to vision, hearing, perception, information processing, decision making and motor control through self report.

6. Factors will present themselves that will allow the marijuana smoker to be profiled apart from the non-smoker.

7. An evaluation of the marijuana influenced accident operators will show that this sub-sample of experimental drivers differed from the remaining smoker groups with more active all-drug related histories.

RESULTS

The results included in Part III of this Final Report will investigate the combined data from the 267 experimental motor vehicle operators involved in fatal highway accidents for which they were judged to have been "most responsible" and the 801 randomly selected control operators who were never involved in a fatal motor vehicle accident as principal operator. It should be noted that the 267 operators included in the Experimental Sample were collected over a 30 month period concluding in February of 1974. The findings from the Experimental Sample alone are found in Part I of this Final Report, "Psychosocial Identification of Drivers Responsible for Fatal Vehicular Accidents in Boston", submitted to the NHTSA in September, 1975[28]. The 801 operators were closely controlled to the experimental operators with the exception being that this Control Sample did not include drivers who had ever been involved as a principal operator in a fatal vehicular accident. They were collected during the first 5 months of 1975. Part II of the findings from DOT HS 310-595 (Special Study), "An Analysis of Drivers Most Responsible for Fatal Accidents Versus a Control Sample."[27] is being completed concurrently with Part III and deals with the direct comparison of the Experimental Sample and the Control Sample with particular reference to historic psychosocial variables which indicate that the 2 groups represented differing segments of the greater Boston population. The Part II presentation shows how the unique

operator types in the Experimental Sample are compared and contrasted with the 801 operators in the Control Sample.

Part III deals very specifically with the marijuana question. The common data analyses between the Experimental Sample and the Control Sample constitute the first segment of these results and separate the 1068 operators included in the study into 4 groups. The first group is composed of the 121 (45%) operators from the Experimental Sample that were known to have smoked marijuana. If an individual was reported to have smoked marijuana on 3 or more occasions during the year before the initial team contact, he was evaluated as a marijuana smoker or a marijuana user. Those individuals who smoked only once or twice during that year were not considered as marijuana smokers and were assigned with the marijuana abstainers in the non-smoker group. The second group was composed of the 146 (55%) operators in the Experimental Sample who were evaluated as having been non-smokers.

The same entry criterion held true for the dividing of the Control Sample. The 272 (34%) operators evaluated as smokers were admitted to Group 3 and the 529 (66%) of the marijuana abstainers and experimentors made up Group 4. In each case when any particular operator could not be clearly classified as a smoker through his own self report, or in the case of the 103 (38%) fatally injured operators in the Experimental Sample, in retrospect, he was assigned to the non-smoker group. This initial division of the total sample under consideration is best understood as visualized in the following diagram:

```
                                                         ES
                                                Experimental Smokers
                                    E                    N = 121
                            Experimental Sample    ⟶
                            Fatal Accident Drivers           ENS
                                    N = 267        ⟶ Experimental Non-Smokers
                                                         N = 146
Total Sample of        ⟶
Experimental and
Control Operators                                        CS
      N = 1068                      C                Control Smokers
                       ⟶    Control Sample     ⟶        N = 272
                            Randomly Selected Drivers
                                    N = 801               CNS
                                                 ⟶   Control Non-Smokers
                                                         N = 529
```
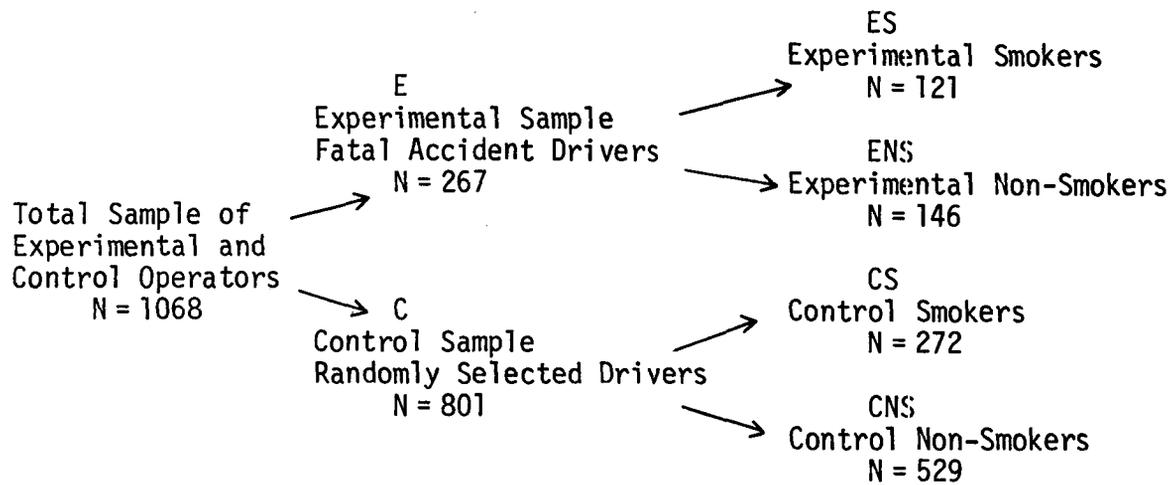
The Experimental Sample included 127 (48%) marijuana abstainers who
had not smoked marijuana at all during the year before their fatal
accident which brought them under the team's investigation. These ab-
stainers together with another 19 (7%) operators who had only used
marijuana experimentally (1 - 2x) during that same year resulted in the
146 (55%) drivers classified by the team as Experimental Non-Smokers
(ENS). The remaining 121 (45%) operators were designated as Experimental
Smokers (ES). The marijuana smoking pattern for these operators varied
from 3 - 8 times a year to more than once a day. As can be seen in
Table 1 only 10 (4%) of these operators were light smokers. Another
62 (23%) were moderate smokers with 20 (7%) smoking about once a month
and another 42 (16%) smoking more in the direction of a weekly basis.
The 49 (18%) operators who smoked more than once a week were evaluated
as heavy smokers.

The Control Sample of 801 randomly selected operators included
480 (60%) of its informants as abstainers from marijuana and an additional

49 (6%) scored as having been only experimentors with the drug. These
2 categories together constituted the Control Non-Smoker (CNS) group
of 529 (66%) operators. The distribution of the operators in the
Control Sample who were marijuana smokers followed somewhat the same
pattern as did those smokers in the Experimental Sample. The 272 (34%)
operators in the Control Smoker (CS) group showed that 24 (3%) of the
controls were light smokers with 62 (8%) monthly and 39 (5%) weekly
smokers combining together to represent the 101 (13%) control operators
evaluated as moderate marijuana smokers. As with the ES group the
largest proportion of smokers fell into the more than once weekly
category of heavy smokers representing 147 (18%) of the entire control
sample.

The marijuana smoking patterns of these 4 groups were submitted
to a t-Test evaluation to see if there were probable differences between
the groups. These results showed that the marijuana smokers from the
experimental group (ES) and the companion smokers in the control sample
(CS) were not significantly different from each other in the matter of
smoking patterns. The same non-significance showed in the proportionate
distribution between the abstainers and experimentors in the ENS and CNS
groups. Any combination of a smoking group with a non-smoking group
showed an obvious difference. When the total numbers of entries in each
of the existing marijuana smoking pattern categories from the experimen-
tal and the control samples were evaluated, a Chi-square showed that the
proportions were significantly different at <.01 from each other with
the Experimental Sample containing a notably larger proportion of smokers.

The breakdown in Table 1 A shows the total distribution with 121 (45%) Experimental Smokers (ES) and 146 (55%) Experimental Non-Smokers (ENS) as contrasted with 272 (34%) Control Smokers (CS) and 529 (66%) Control Non-Smokers (CNS). This explanation of the 4 groups of operators is essential to an understanding of Part III of this research effort. Throughout the first segment of these results the 4 groups, ES, ENS, CS and CNS will be compared and contrasted in relation to the human factor variables that were collected in common for all of these groups. The Control Human Factor Index in Appendix A outlines the common data. The second segment of this result section addresses itself only to the control smokers for whom the Marijuana Supplement in Appendix B has been completed. The final segment compares the 43 ES who had been smoking prior to their focal accident with the other smoking groups.

Demographic and Psychosocial Observations:

The sexual distribution between these 4 groups is presented with a marked, inbuilt bias that obviates the findings in Table 2 as they might be applied to a general population at large. The Experimental Sample was dominated by 236 (88%) males as opposed to only 31 (12%) females. This distribution is very much the same as might be found in any fatal vehicle accident analysis but certainly is not proportionate to the population at large. One of the regulatory controls established prior to the selection of the operators who would compose the control sample was that the sexual proportion be within limits of the same distribution as found in the experimental sample. In the event that there had not been a control for sexual distribution the findings would have

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been notable. Therefore, it is possible to only speculate with regard to what might be the application of this variable to the population at large. The entire sample included by design 12% females. As can be seen in Table 2 larger proportions of this number of females are located in the non-smoking groups than are found in the smoking groups. This might indicate that fewer females by ratio to males are smokers of marijuana.

One of the essential controls set for the criterion of the Control Sample was that the 2 samples be proportionately distributed according to the age-by-decade-by-sex matrix explained earlier. A t-Test performed between the 2 samples showed a result of t = -0.129, or an almost negligible difference between the experimental and control samples for actual age. As with the findings for sexual distribution ENS and CNS did not differ significantly for age nor did ES and CS. The mean age for ES was 23.6 as compared with 23.1 for CS. Nearly the same situation showed for the CNS with a mean of 38.1 and the ENS with a near comparable mean of 36.0. The age range for the ES was 16 - 53 with the modal age falling into the early 20's. The modal distribution for CS was the same with an only slightly wider age range of 17 - 58. Table 3 shows that the smokers were significantly younger at <.01 than the non-smokers regardless of the statistical relationship but that within groups they were relatively the same.

A subsequent analysis for marital status shows that proportionately twice as many operators were single in the smoker groups than were found in the non-smoker groups. The opposite was the case with the

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married operator category where 3 times as many non-smokers were married as were smokers. The ES included 87 (72%) single and 17 (14%) married, following the same direction as the CS which showed 207 (76%) single and 55 (20%) married. On the other hand, the ENS group included 48 (33%) single and 76 (52%) married very much the same as the CNS showing 211 (40%) single and 277 (52%) married. A Chi-Square showed that the differences between the smoking and non-smoking groups were significant on both accounts at <.01.

Quite a different picture is seen in the differences and similarities between the 4 groups with regard to levels of formal education achieved, educational pursuit and occupational attainment. There was a significantly larger number of operators in the Control Sample who had completed college and/or graduate school as opposed to the operators in the Experimental Sample. As can be seen in Table 5 differences approaching a level of significance did not differentiate the ES from the ENS or the CS from the CNS. However, t-Tests consistently show that the Control Sample was significantly better educated at <.01 than the Experimental Sample and that this observation appears to have little or nothing to do with marijuana smoking patterns. An evaluation between smoking groups showed that 37 (21%) ES operators had attended some educational institution after high school graduation, with twice that many, or 167 (62%) CS operators having attended some college or institution. With so many significant differences <.01 between the 2 samples, some consideration must be given to a collection bias even though education was not one of the controls established in the initial research

design. The team has speculated that the differences in education have to do with legitimate differences that do exist between operators "most responsible" for a fatal motor vehicle accident and for operators who have never been so involved. The great disparity, however, has some bias in the manner of data collection. Operators in the Experimental Sample were not offered the opportunity to refuse participation and every effort was made to collect the relevant information on these fatal cases. On the other hand if a potential control operator refused to participate no further attempt was made at contact. This study may support the thesis that individuals with less education are more defensive and, therefore, less likely to participate in survey types of research efforts. If this be the case, and there is a reasonable certainty that it is, it could not normally contribute to such great differences between the samples. Even with considerations for this bias these findings would show significant as can be seen in the substantial t values in Table 5.

The available data in Table 6 which reports the numbers of operators in both samples that were actively pursuing an education continues to support such a thesis. A Chi-square details what is clearly evident in the proportionate distributions presented in the student matrix. The CS operator group was distinguishable from each of the other 3 groups by its heavy loading of students, part time and full time. The findings in Table 6 show that 133 (49%) of the CS were active students as opposed to only 34 (28%) of the ES, 108 (21%) of their CNS counterparts, and then, 15 (10%) of the ENS (x^2 104.419, p < .01). The same statistical pattern

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can be seen in the differences between the levels of education for
the operators reported in Table 5. The t values show that the CS was
somewhat better educated than the CNS (t = 2.951, 799 df), considerably
better educated than the ENS group (t = -7.224, 416 df), and even better
educated than the ES group (t = -7.417, 391 df). These observations
show with little room for doubt that the CS were not only significantly
better educated in terms of formal training, but that they were also in
the process of becoming even better educated at the time of the team
contact.

The classified schema for occupational attainment as seen in Table 7
shows that the CS and CNS groups held significantly better jobs than
either the ENS or the ES. The reported t-Tests show that the differ-
ences between these groups was significant at <.01 in each equation.
As can be seen in the breakdown the clear modal categories for each of
the 4 groups was primarily in the dimension of skilled manual employees,
which included such professionals as carpenters, electricians, firemen,
policemen, hair stylists, painters, plumbers and other manual occupa-
tions of similar skills. Level 4 was also clearly modal for all groups
and included such individuals as clerical and sales persons, technicians
and owners of small businesses, bank clerks and tellers, and a number
of public service employees. The dissimilarity between the experimental
and control samples begins to show in these modal divisions and becomes
significantly obvious in the levels of occupation that connote "better
employment". These more limited levels of occupational attainment inclu-
ded: lawyers, physicians, psychologists, medium and large business

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owners, management personnel, university professors, administrators and others. The upper 3 levels included 24 (20%) ES operators, 41 (28%) ENS operators, 111 (41%) CS operators and, nearly half, or 223 (43%) of the CNS operators. The tests for statistical significance showed that the control groups were more like each other as were the 2 experimental groups. However, the trend was near significant showing that the ENS group held better jobs than did the ES group. This difference comes with the proportion of the respective operators that fall into the 2 lower levels of occupational attainment including semiskilled/manual employees and those individuals who are unskilled or who are largely supported through welfare services. The ES group was most predominant with 35 (28%) followed by 29 (20%) ENS, 84 (15%) CNS and finally 37 (13%) CS operators. The evident conclusion is that the control sample of randomly selected motor vehicle operators represents more individuals with higher levels of occupational attainment than does the experimental sample of operators "most responsible" for fatal highway accidents. A comparison of occupation levels between the CS and the ES shows that these smokers were from decidedly different segments of the greater Boston population.

One of the variables collected during each phase of the field investigation was related to a self evaluation of physical health. Each respondent was asked to evaluate his personal health as being good to excellent, fair or poor. The findings showed that the CS group was in the best health by self evaluation with 264 (97%) of these operators reporting good to excellent physical health, followed by 483 (91%) CNS,

103 (85%) ES, and 105 (72%) ENS operators. These findings, as presented, indicate a significant difference between the groups showing the largest proportion of operators in poor to fair health in the ENS group, which showed 41 (28%) of its operators in fair to poor health as opposed to 18 (15%) ES operators, 8 (3%) CS operators and 46 (9%) CNS operators similarly evaluated (Table 8). A bias factor could have altered the significance of these findings. All of the experimental operators or informants were under unusual stress and tension at the times of the interviews, whereas, the control operators were more relaxed. Induced tension might have prompted the experimental operators to report poorer health than the control operators. This possible bias should be considered in any evaluation of these findings.

One of the health related variables included in the experimental and control protocols was an evaluation of each operator's cigarette smoking pattern. Three options were offered for scoring; none -- operator did not smoke, light to moderate -- operator smoked less than 2 packages daily, heavy -- operator smoked more than 2 packages of cigarettes daily. The results showed that the control operators smoked significantly fewer cigarettes daily than did the experimental operators. In each level of cigarette use there were significant differences between the groups as indicated by the overall Chi-square of x^2 10.936, p< .01. The CNS group included more than half, or 295 (56%) non-cigarette smokers followed closely by 129 (47%) CS operators who did not smoke cigarettes. Considerably lower proportions of non-cigarette smokers were found in the ENS group with 56 (38%) and then with the ES group showing only

33 (27%) operators. Among those who did smoke cigarettes the ENS and CNS groups showed heavier concentrations of light to moderate cigarette habits. This was of particular interest because the common manner of introducing marijuana into the body is through smoking and yet nearly half of the marijuana smokers did not smoke cigarettes (Table 9).

Two additional variables were scored with regard to psychological health observations, formal treatment for psychological matters and admitted histories of suicide attempts. The analyses showed that 128 (88%) and 466 (88%) of the ENS and CNS groups respectively had no known history of emotional health treatment. Significantly lower figures of 98 (81%) and 215 (79%) ES and CS operators had no known treatment. The levels of known treatment showed that 54 (20%) CS operators, 16 (13%) ES, 56 (11%) CNS and 9 (6%) ENS operators had known histories of outpatient treatment only. Another segment representing 1% of the total population had been hospitalized and 5 (4%) ES and 5 (3%) ENS operators had been treated as both inpatients and outpatients. The CNS and ES comparisons showed significant at <.01 with the CNS and CS comparisons at <.05. All other comparisons were non-significant (Table 10).

The known suicide attempt history responses were of particular interest because proportionately as many operators had made a known attempt in the ES group as had been so reported in all of the remaining 3 groups together. The findings showed that 21 (17%) ES operators and, 13 (9%) ENS, 16 (6%) CS and 9 (2%) CNS operators had known suicide attempts. The evident statistical significance favored the ES group.

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It should be clearly noted that these figures refer to suicide attempt histories and are not to be correlated with precipitants to the focal accident for the experimental operators (Table 11).

A third variable which was certainly psychosocial if not psychological noted where the particular operator most frequently spent his leisure time; alone, with his family, or with his friends. Apparently, the marijuana smokers in both samples spent more time with their friends than did the comparative non-marijuana smokers. The ES group showed 98 (81%) and the CS 191 (70%) of the respective operators spent most of their leisure time with their friends as opposed to 52 (35%) ENS and 230 (44%) CNS operators. On the other hand, the ENS and the CNS groups showed that 71 (49%) and 240 (47%) of these respective operators spent most of their leisure time with their families when compared to only 13 (11%) ES and 53 (20%) CS operators. This finding was significant (x^2 128.523, p < .01) and was strongly correlated with a single marital status favoring the smoking groups (r = 0.498, p < .01) (Table 12).

Alcohol, Marijuana and Other Drug Observations:

All of the tables between 13 and 21 present a variety of inter-correlated findings that relate to the intoxicating drugs that have been observed in the Boston study. Of course, the principal drug is alcohol with the results showing that 939 (88%) of the 1068 operators drank commercial alcohol with some frequency. The second most common intoxicating drug was Cannabis, with 393 (37%) of the 1068 operators having admitted to smoking marijuana on more than 3 occasions during the

year prior to team contact. The third drug area is broadly defined as street or entertainment drugs and included 272 (25%) of the 1068 operators. These are drugs defined as controlled substances, most frequently obtained through "dealers", which are used in a manner generally considered to be non-therapeutic. Most of these street or entertainment drugs can be purchased as legal pharmaceuticals, such as: barbiturates, methaqualone, various amphetamine combinations, amyl nitrate, LIBRIUM, VALIUM, DARVON and a wide spectrum of other drug combinations. However, most frequently these drugs are purchased through illegal sources and this gives them the label of street drugs. When their use is clearly not under the direction of a physician and they are used personally for coping or social interaction they are considered entertainment drugs. Other drugs used most frequently as entertainment drugs are: mescaline, LSD combinations, psylicibin, MDA, cocaine, and heroin available only through illegal channels.

The dependent variables which serve as the basic source of reference in these evaluations are the 4 groups of marijuana smokers and non-smokers central to these results, ES, ENS, CS and CNS.

The alcohol use patterns were broadly defined in 6 levels or varieties of use. The Abstainer classification was reserved for those individuals who never drank alcohol under any circumstances and for those persons who only took a drink at a wedding or only upon very rare occasions. The Light Social Drinker was the individual who drank more in the direction of a monthly or at the most weekly pattern and who was intoxicated upon rare occasion. The Moderate Social Drinker

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was evaluated as an individual who drank alcohol more frequently than the Light Social Drinker and who was drunken more frequently. The Heavy Social Drinker was drunken more in the direction of a weekly pattern with the Alcohol Abuser clearly falling into the more than weekly pattern of intoxication. The Sporadic Binge drinker had no pattern but was most frequently drunken whenever he drank.

The proportionate distributions among these patterns of alcohol use as seen in Table 13 present findings that show non-significant differences in distribution between the Experimental Sample as a whole and the Control Sample in its entirety; between the CNS and the ENS operators, and finally, between the ES and CS operators. The differences occurred when the smokers were compared with the non-smokers. The modal category for both experimental groups, ES and ENS, was with the light social drinker which included 45 (37%) and 60 (41%) operators respectively. This was in contrast to the control group mode which placed 122 (45%) CS operators and 197 (39%) CNS operators into the moderate social drinker category. These differing modal centers were apparently of insufficient degree to allow for a statistically significant result in t values. There was a distinct trend favoring heavier alcohol use patterns among the ES and CS groups followed in decreasing order by the ENS and then by the CNS. The non-smoking groups also had a larger number of alcohol abstainers showing 90 (17%) CNS operators and 21 (14.5%) ENS operators as contrasted with the 17 (6%) CS and 1 (1%) ES abstainers. The significant differences came between the CNS and CS at <.01 and ENS as compared with the ES operators at <.05. This makes it quite evident

then, at least for the operators in the present Boston study, that those individuals who smoke marijuana have drinking patterns that are similar regardless of the population from which they are collected. This, of course, can be a broad generalization which could lead to false assumptions unless further analyses are evaluated on the relationship between alcohol drinking and marijuana smoking.

With this in mind the team concluded that some categorized pattern of marijuana use should be developed so that the drinking and smoking groups could be further compared. For the purposes of this reporting the team has divided the marijuana smokers into 3 differing levels of use patterns. The Light marijuana smoker was so classified if he was known to have smoked marijuana between 3 and 8 times during the previous year. The Moderate marijuana smoker was known to have used this drug between what was evaluated as a more monthly schedule of use and in the general direction of weekly use. The Heavy marijuana smoker used <u>Cannabis</u> more than once a week as an established habit during the year prior to team contact. Taking these pattern divisions into consideration the 393 (37%) of the 1068 operators that were known to have been marijuana smokers were classified. The ES group of 121 operators showed 10 (8%) Light smokers, 62 (51%) Moderate smokers and 49 (41%) Heavy smokers. The CS group of 272 operators showed 24 (9%) Light smokers, 101 (37%) Moderate smokers and 147 (54%) Heavy smokers. All of the statistical procedures used in this study for establishing probability levels showed that there was a non-significant difference between groups. There was, however, a notable trend showing heavier

patterns of marijuana use among the CS operators.

Table 14 diagrams a cross correlation between the historic patterns of alcohol use, utilizing the 6 level scale, and the 3 way classification of marijuana smoking patterns for the ES and CS groups. The 3 patterns of marijuana use applied to the ES group showed strong correlations between light social drinking and moderate marijuana smoking and between moderate social drinking and heavy smoking. The ES operators in the heavy social, sporadic binge and alcohol abuser categories did not present such a clear definition of marijuana smoking patterns with all 3 of these alcohol categories showing a near even distribution between moderate and heavy marijuana smoking patterns. These overall differences were, however, statistically significant at < .05. The CS operators followed a somewhat different pattern of alcohol and marijuana use. The alcohol abstainers, light social drinkers and sporadic binge drinkers all were evenly divided in favoring the moderate and heavy smoking patterns with relatively few light marijuana smokers. The CS moderate social drinkers, heavy social drinkers and alcohol abusers all correlated with trends favoring heavy smoking of marijuana. None of these trends were of sufficient proportion to produce a significant difference within the CS group for marijuana smoking patterns.

The data in Table 15 is a broad presentation of the cross tabulations of frequency of alcohol use and the experimental and control smokers and non-smokers. The numbers of operators that drank alcohol several times each week or daily includes over one-third of the total

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sample. The smokers were similar in proportion with 52 (43%) ES and 116 (43%) CS operators who drank at least several times a week. Unfortunately the type of alcoholic beverage used during these drinking times was not collected even though there was a scored item with regard to the type of alcoholic beverage preferred. There were many operators who drank wine or a beer daily or several times a week who actually chose vodka, whiskey or another stronger alcoholic beverage as their preferred choice. In spite of this data problem there is a real indication in this table's presentation that the marijuana smokers were freer with their use of alcohol and that they drank at least something on a more frequent schedule than the non-smoking operators. The ES operators used some form of alcohol most frequently followed by the CS group operators and then by the CNS and the ENS operators accordingly.

The following 2 tables treat the relationship between alcohol intoxication and marijuana smoking. For the purposes of a better understanding of the interaction of these 2 drugs as used by the greater Boston sample operators these tables are probably the most rewarding. Even though there is presently a great deal of controversy over the degreed relationships between marijuana intoxication and alcohol intoxication there is adequate evidence to indicate that both states of being are under the influence of a drug, even though one may be more intoxicating, per se, than the other. There is also a valid assumption that the smoking of marijuana almost inevitably results in intoxication for the experienced smoker. Granted, there are no chemical tests for marijuana that are comparable to the Blood Alcohol Concentration test

for alcohol but for the present, self reporting and clinical observations support the thesis that marijuana smoking almost inevitably results in intoxication for the individual who has been smoking with some regularity. Such is not the case with alcohol for most persons. The difference between having a drink and drinking to intoxication are usually significant. With these general observations some equivalent measure is attributed to the smoking of marijuana and the drinking of alcohol to intoxication.

The general distribution by group patterns found in Table 16 presents a matrix showing that no pairs of groups are at all similar to each other. The 2 smoking groups, the 2 non-smoking groups as well as the 2 experimental and the 2 control groups are all distinctly different from each other. These differences begin with the operators who report that they were not intoxicated during the previous year. Nearly half of the CNS group, or 237 (45%) reported no personal drunkenness during the previous year followed by the ENS group with 49 (34%) of its operators and at some distance by the CS group with 45 (17%) and then the ES group with only 6 (5%). The modal clusters show that both the CNS and the ENS groups tended in the direction of very few to no reported alcohol intoxications during the previous year, and by definition had not been intoxicated by marijuana. On the other hand, the ES group showed a modal cluster in the drunken with alcohol 3 - 8x category and the CS in the 1 - 2x alcohol intoxicated category. The ES group showed the heaviest alcohol intoxication pattern followed by the CS operator group and then by the ENS and CNS groups. Each of

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these increments was significantly different from the other as can be seen by the t values in Table 16.

The distributions seen in Table 17 present a more refined break-down of the alcohol versus marijuana intoxication thesis. Do people who are classified as Heavy marijuana smokers, that is, individuals who smoke marijuana more than once a week and who are presumably marijuana intoxicated with the same frequency, also have a heavier pattern of alcohol intoxication than the Light or Moderate smokers? In essence there is a non-significant trend reporting that this is true. The Light smokers were alcohol intoxicated relatively infrequently with 3 (30%) ES and 7 (29%) CS operators drunken with alcohol monthly or more frequently. This proportion changes somewhat with the Moderate marijuana smoker showing 27 (43%) ES and 35 (35%) CS operators alcohol intoxicated monthly or more frequently. The Heavy marijuana smokers showed 23 (47%) ES and 65 (44%) CS operators alcohol intoxicated monthly or more frequently. Two findings of interest emerge from these evaluations. The first is that the Heavy marijuana smokers do tend to become alcohol intoxicated more frequently than do the Light or Moderate marijuana smokers. The second is that the ES operators showed a trend toward more frequent alcohol intoxication than the CS operators. Those operators who were drunken with alcohol monthly or better included 53 (44%) of the ES and 107 (40%) of the CS operators. Neither of the 2 conclusions above can be reported as significant but should be noted as strong trends.

A final analysis of the alcohol use and marijuana use patterns is

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found in Table 18 where operators who were scored as problem drinkers or social drinkers are correlated with their known patterns of marijuana use. The general distribution of experimental smokers shows that 59 (49%) were problem drinkers and 61 (50%) were social drinkers with 1 (1%) known abstainer. The control smokers included only 83 (31%) problem drinkers, with 172 (63%) social drinkers and 17 (6%) alcohol abstainers. This distribution showed a near significant difference between the 2 major samples indicating a notable trend of more problem drinkers in the experimental sample and more social drinkers in the control sample.

There was a significant difference in the distribution found in the experimental sample showing that social drinkers tended to favor moderate marijuana smoking patterns and that problem drinkers were quite evenly divided between the moderate and heavy marijuana smoking patterns. No such differences were noted in the control sample where the distribution of problem and social drinkers was quite proportionately distributed through the 3 marijuana smoking patterns with 6 (7%) problem and 15 (9%) social drinkers categorized as light marijuana smokers; 28 (34%) problem and 66 (38%) social drinkers categorized as moderate marijuana smokers and 49 (59%) problem and 91 (53%) social drinkers in the heavy marijuana smoking pattern. It should be noted once again that over half, or 147 (54%) of the control smokers were heavy smokers as opposed to only 49 (41%) of the experimental smokers.

Tables 19 and 19 A show the correlations between marijuana smoking patterns and street or entertainment drug use or experimentation. Fre-

quency of street or entertainment drug use was not collected. Table 19
deals with marijuana smokers only, whereas, Table 19 A presents the cor-
relations for the entire sample of 1068 operators. As in previous
observations when any particular operator refused to answer these
questions relative to street drug use the item was scored negative.
In each of the smoker samples Table 19 shows that there was a signifi-
cant relationship between heavy marijuana use and at least some use of
street or entertainment drugs. This trend was noted at the <.05 level
with the experimental smokers and at the <.01 level for the control
smokers. These significances should be noted as having been a part of
the distribution function of heavy marijuana smokers favoring the
control sample. The dominant correlation was between the experimental
heavy smoker and the use of street or entertainment drugs. The control
correlations were between light marijuana smoking patterns and no other
drug use and then with heavy marijuana smoking patterns and some
other drug use. As can be clearly seen in Table 19 A there was an
overwhelming distribution of the operators who were known to have used
some street or entertainment drug favoring the operator groups of
marijuana smokers. Fully three-quarters, or 91 (75%) of the ES opera-
tors also had used street or entertainment drugs, as well as, 143
(53%) of the CS operators. This was in sharp contrast to the token
34 (6%) of the CNS and the 4 (3%) of the ENS operators who admitted to
some street or entertainment drug use. The differences between ES and
CS for street drug use was significant as were the differences between
any smoker group and any non-smoker group.

Once again this heavy weighting of positive responses not only indicates a significant direction but also indicates that there might have been a marked bias in the collection of the data. The experimental operators were approached with a great deal more caution than were the control operators with regard to the question of street or entertainment drug use. During the experimental field investigations the Boston research team was not aware of the popular terminology used to refer to the broad category of "other" drug use. From the very beginning of the research the term "street drug" was obviously an offensive term to the people who used such drugs so this identification was employed with decreasing frequency by the Human Factor Associates who were responsible for the interviewing procedures. The approach to this data item was multifarious and might possibly have elicited a larger proportion of positive responses. The matter of "other" drug use was approached in a much more matter-of-fact, forthright manner with the control participants including a listing of possible illicit drugs from which to choose. As can be noted in Appendix A the single marijuana question asked to all of the control subjects came before the "other" drug items in the protocol. When a participant responded in an affirmative manner to the marijuana question he was immediately introduced to the Marijuana Supplement (Appendix B) where he was asked a wide variety of questions associated with marijuana use. When the supplement was completed the interviewer returned to the interrupted, initial protocol to ask the questions relative to street or entertainment drug use. By this time the marijuana smoker might have sufficiently

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relaxed, or at least felt that he had committed himself to such a point that additional information could be no more incriminating. Therefore the smoker might have responded more freely to the questions relative to street or entertainment drug use than the non-smoker who did not have the benefit of the distraction offered by the Marijuana Supplement. Regardless of the presence or absence of sufficient bias the findings would most certainly have significantly followed the same direction.

As mentioned above each of the control subjects was presented with a list of possible street or entertainment drugs with which he might have been familiar. Unfortunately questions with regard to frequency of use were not asked so a positive response to any particular drug might have indicated that the drug was used once or scores of times, or even daily, during the previous year. From among the 801 participants in the control sample 108 (13%) admitted to some hallucinogen use such as LSD, mescaline, MDA or psylicibin. A total of 104 (13%) reported some amphetamine use and 91 (11%) said that they had used "downs" such as barbiturates, quaaludes, VALIUM or another sedative. Only 33 (4%) reported the use of some entertainment inhalant and 42 (5%) admitted to "other" drug use. This "other" category was dominated by admitted users of cocaine.

The correlations between marijuana smoking patterns and the use of these drugs strongly favored the heavy marijuana smoker, representing proportions nearing one-half of the street or entertainment drug users in any particular category. Heavy marijuana use correlated most

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strongly with the hallucinogen group representing 46 (43%) of this

category, followed by the category of "downs" including 37 (41%)

of these operators and then in decreasing order to the amphetamines

or "speed", "other" drugs and then inhalants. The single street or

entertainment drug category least affected by marijuana use was that

of the amphetamines where 23 (22%) of the "speed" users did not smoke

marijuana.

The intercorrelated data in Table 21 is a final attempt at cross

tabulating the operators in each of the smoker groups, ES and CS,

together with their use or experimentation with street or entertain-

ment drugs and their corresponding patterns of alcohol use. Four

different distribution matrices present themselves in this table with

the greatest similarities coming between the ES and CS operator groups

that had also used street or entertainment drugs and, in a somewhat

different fashion between the ES and CS operator groups that had not

used street or entertainment drugs. The experimental smoker group (ES)

with some street or entertainment drug exposure showed a distinct trend

in the direction of light alcohol use patterns with 39 (43%) of these

operators classified as light social drinkers. The control smoker

group (CS) that also had some exposure to street or entertainment

drugs showed somewhat the same tendency but stopped at the moderate

social drinker category where 66 (46%) of these operators were located.

The experimental smoker (ES) who did not have personal contact with

street or entertainment drugs presented a very slight trend favoring

heavier alcohol use than did the other 3 sub-groups under consideration

in this table with 12 (40%) of these operators being classified as heavy social drinkers. The control smoker (CS) who did not use street or entertainment drugs presented 56 (43%) of its operators as moderate social drinkers. The modal and mean category for all 4 groups as compared with historic patterns of alcohol use showed that the moderate social drinker was dominant. Significant differences at the <.01 level did present themselves within the experimental smoker groups and the control smoker groups showing lighter drinking patterns for the operators who smoked marijuana and had been exposed to street or entertainment drugs.

The original research design included the hypothesis that discriminating factors between these 4 groups that have been evaluated thus far in this presentation, ES, ENS, CS and CNS might be found in the criminal offender record information that had been coded for the experimental operators. However, a number of difficulties presented themselves that made the collection of historical criminal information on the control operators impossible. Briefly the record system in the Department of Probation for the Commonwealth is several years behind in record updating and a court order is necessary to secure information on any particular operator. All of the operators in the experimental sample were in the process of being charged relative to a fatal vehicular accident and their records were secured as an after-effect of a court order but such procedures were, of course, not available to the participants in the control sample who had not been charged with a fatal motor vehicle accident.

The only substantial information of this nature that eventually became available was relative to license suspensions which are computerized through the Registry of Motor Vehicles. Table 22 presents the findings relative to this single variable showing that the ES group contained proportionately twice as many operators whose licenses had been suspended as any other with 20 (17%) ES operator license suspensions, 11 (8%) ENS suspensions, 18 (7%) CS suspensions and 28 (5%) CNS suspensions for a significant difference favoring the ES group at <.01.

Summary for Experimental and Control Operator Groups:

This section of the results has dealt with a selected number of demographic, psychosocial and all-drug related variables with particular reference to the operators in the experimental and control samples that smoked marijuana and those that did not smoke marijuana. The total sample of 1068 operators included 267 (25%) experimental subjects that had been "most responsible" for a fatal highway accident and 801 (75%) non-accident operators controlled to the experimental sample for sex, age by decade and for township of residence by clusters. The experimental group included 121 (45%) marijuana smokers and 146 (55%) non-smokers. The control group included 272 (34%) marijuana smokers and 529 (66%) non-smokers. The total sample of 1068 included 393 (37%) operators who were defined as marijuana smokers because they had smoked Cannabis on 3 or more occasions during the year prior to team contact. The total sample included 939 (88%) operators who drank alcohol,

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393 (37%) who smoked marijuana and 272 (25%) who had been exposed to or used some variety of street or entertainment drug.

There was a distinct direction favoring heavy marijuana use, representing smoking patterns of more than once a week, in both the Experimental Smoker (ES) and Control Smoker (CS) samples. When compared for age the ES and CS samples showed a mean age of 24 and 23 years respectively. The Experimental Non-Smoker (ENS) group presented a mean age of 38 years and the Control Non-Smoker (CNS) group of 36 years. The age range for both smoker groups was from 16 years old into the mid-fifties with 19% of the ES and 14% of the CS samples being ≥ 30 years of age. The smoker groups were dominated by single persons as opposed to a married state as the dominant category for the non-smokers. Educational analyses showed that the CS group was the better educated of the 4 groups followed by the CNS and then by the ES and ENS groups. The CS group was also dominated by part time or full time students with nearly twice the proportion as found in either the ES or the CNS groups. Occupationally the CS group also tended to show higher levels of employment followed closely by the CNS group. The ES and ENS groups were much less distinctive in their levels of occupational achievement.

In health related variables there were also differences between the groups. The ENS group included 28% of its operators in fair to poor health as opposed to 15% of the ES, 9% of the CNS, and 4% of the CS group. Cigarette smoking patterns were also very different between the 4 groups with significantly greater patterns of cigarette use among the experimental operator groups, the heaviest being with

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the ES group. The CS group showed 47% of its operators who did not

smoke cigarettes along with 56% of the CNS operators. Known and report-

ed histories of professional psychological treatment favored the CS group

followed closely by the ES group. The CNS and ENS groups showed fewer

mental health treatment notations. Suicide attempt histories known

to the team strongly favored the ES group followed by the ENS opera-

tors.

Patterns of alcohol use showed that the ES and the ENS groups were

strongly represented by light social drinkers and the CS and CNS groups

by moderate social drinkers. There was, however, a significant trend

favoring heavier drinking patterns among the ES and CS operator

groups. Within the ES group there was a distinct trend showing a cor-

relation between light social drinking and moderate marijuana smoking.

The ES moderate social drinkers tended to be heavy marijuana smokers.

The CS group showed a correlation between moderate and heavy social

drinking and alcohol abuse and a corresponding heavy marijuana smoking

pattern. The CS alcohol abstainers and light social drinkers were

equally distributed between the moderate and heavy marijuana smoking

patterns. There were also findings that showed the ES group to have

been alcohol intoxicated more frequently than any of the other 3 groups

followed by the CS group and then by the ENS and CNS groups. In both

the ES and CS groups there was a trend favoring the association of a

problem drinker evaluation with heavy marijuana smoking. The exposure

to street or entertainment drugs showed a very strong correlation to

marijuana use with 75% of the ES and 53% of the CS operators having

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positive response for marijuana and street or entertainment drug exposure. The companion figures for ENS were 3% and for CNS 6%. The street or entertainment drugs most frequently in use were: hallucinogens and "downs". Final correlations showed that there were relationships between the ES group that had been exposed to street or entertainment drugs and light social drinking, whereas, the ES operators who had not used these drugs tended to be moderate to heavy users of alcohol. Somewhat heavier patterns of alcohol use were seen with the CS operators.

Marijuana Smoking Patterns, Driving Behaviors and Traffic Attitudes:

The control research design and methodology outlined earlier included as a part of the interview protocol a Marijuana Supplement which was to be completed by each of the control participants who admitted to smoking marijuana on 3 or more occasions durinq the previous year (see Appendix B). The approach to the marijuana question in the initial data collection instrument was carefully prepared in order to present as comfortable a situation as possible for the participant to respond. The approach included the following statement: "In a study which we just completed here in the greater Boston area we found that 45% of the people interviewed smoked marijuana with some frequency. In order to compare the information with this research we would like to know what your marijuana smoking pattern has been during the past year?" The response to this approach was varied resulting in 242 (30%) of the participants who successfully completed the supplement, 30 (4%) admitted smokers who refused to complete the supplement largely because

of sensitive employment situations (i.e., policemen, lawyers, political figures, etc.), and 14 (2%) obvious non-smokers who were unable to successfully complete the supplement. The protocols for the 14 non-smokers were rejected, the 30 smokers who would not complete the supplement but did answer the questions in the Control Human Factor Index (Appendix A), were accepted as smokers without supplements and the remaining 242 operators who completed the supplements constitute the data base for this second section of these results.

One of the first questions asked of these control sample smokers was a more detailed breakdown of their smoking habits during the previous year. The range of responses was from less than monthly to more than daily with 6 frequency intervals in between. Using the same basic dividing categories as were employed earlier the findings showed 11 (4%) Light marijuana smokers who used the drug on less than monthly occasions; 84 (35%) monthly and weekly smokers classified as Moderate marijuana smokers, and; 147 (61%) Heavy marijuana smokers whose pattern of smoking was more than weekly, daily or more than daily. Table 23 details this breakdown along with the reported levels of marijuana intoxication or influence. With regard to the reported frequencies of use it is of particular significance to note that 107 (44%) of the operators smoked marijuana several times a week but not as frequently as daily. Another 36 (15%) reported daily habits and 4 (2%) reported more than daily smoking. More than weekly, daily and more than daily smokers were all classified as Heavy marijuana smokers. (The 30 operators who refused to complete the Marijuana Supplement included 13 Light,

17 Moderate and no Heavy smokers.)

The information reported in Table 23 was elicited to see if there was any relationship between the reported frequency of marijuana smoking and the estimated levels of influence or intoxication most frequently attained. The greatest proportion of the smokers, or 174 (72%), reported that they most frequently became moderately intoxicated or "quite stoned", as compared with "getting a buzz" or mild intoxication, or on the other hand, "getting wiped out" or severe intoxication. The distribution was obviously significant at <.01. There was also a correlation showing that the Heavy marijuana smokers dominated the severely intoxicated level.

A cross tabulation between the 3 way marijuana smoking pattern and the numbers of years that the operators had been smoking showed that the modal group for the Moderate and Heavy levels was from 3 to 4 years. There was no apparent relationship between the numbers of years that an individual had been smoking marijuana and his marijuana smoking pattern. It was of marked interest to note that 150 (61%) of the control smokers had been smoking marijuana 4 or less years. Only 92 (39%) were smoking in 1970 showing a 163% increase in 4 years (Table 24).

One of the laboratory speculations is that the more an individual smokes, that is, the greater his frequency of use, the less marijuana is necessary to make him intoxicated. Table 25 shows that 190 (79%) of the participants smoked 1 joint or less in order to become intoxicated. There was a significant trend showing that the Heavy smokers required less marijuana in order to become high. It should be noted with regard

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to current laboratory practice that only 52 (21%) of the operators smoked more than 1 joint in order to become intoxicated.

There has been considerable scientific debate with regard to how long an individual remains subjectively intoxicated after smoking a normal amount of marijuana. The respondents in the present study felt overwhelmingly that the full length of their normal, subjective marijuana intoxication was not more than 3 hours. In fact, 224 (92%) reported that 3 hours or less was the maximum length of their high. The only notable difference between the patterns of use was a tendency on the part of the Heavy user to remain on his subjective high for a longer period of time than for his Moderate counterpart. With only 11 (4%) of the smokers reporting Light smoking patterns it is difficult to make any evaluation with regard to this group. Including all patterns only 18 (8%) of the respondents felt that a high lasted more than 3 hours.

Each smoker was given a list of 7 statements or reasons for smoking marijuana and asked to give a positive or negative response if these were any of the reasons why he smoked. The dominant reason for smoking selected by the Boston control subjects was "to relax" where 5 (45%) Light smokers, 46 (55%) Moderate smokers and 113 (77%) Heavy smokers for a total sample of 164 (68%) offered positive responses. The second most notable response came where 113 (47%) operators said that they smoked "to get away from pressures of life or business". The next reason selected by the Moderate smoker group was also "because my friends smoke" with 45 (54%) positive responses. The second most

predominant response for the Heavy smoker group was with the 83 (56%) operators that reported smoking "to get away from the pressures of life or business". Smaller proportions of smokers reported that one of their reasons for using marijuana was "to make themselves more sociable", "because of societal pressures", "to improve their appetite or taste for food", and merely "to enjoy getting high".

With particular concern for countermeasures programs each of the smokers wa s asked about the time of the week and the time of day that they usually were intoxicated with marijuana. A full 198 (82%) said that they preferred no particular time of the week to be stoned or else preferred weekends over weekdays (Table 28). The Moderate smoker group did show a decided preference with 63 (75%) operators selecting weekends only. The time of day selected for preferred marijuana intoxication was also a near total sample response with 229 (95%) preferring to be intoxicated between 6:00 p.m. and midnight, with many of the operators offering the additional information of "around dinnertime" (Table 29).

Tables 30 and 31 were attempts to see the relationship that existed between societal pressures to smoke or drink more or less. Among the 242 smokers 80 (33%) felt societal pressure to drink more than they usually drank, 19 (8%) felt pressures to smoke more and 39 (16%) felt societal pressures to drink more and to smoke more as well. From among those smokers who did feel some societal pressures to use more alcohol and/or marijuana the Heavy and Moderate smokers felt drinking pressures more than smoking pressures. Nearly half or 104 (43%) of the

smokers felt no reportable pressures to smoke or drink more than was their custom. There were even less societal pressures to drink or smoke less, with 157 (65%) of the participants reporting no drinking or smoking less pressures at all. Pressures to drink less were reported more frequently than pressures to smoke less.

With the long range goals of marijuana research in mind the team was interested in seeing if the smokers felt that they were smoking more or less at the time of the interview than they had been a year before. About a third or 89 (37%) felt that they were smoking less, including 8 (73%) of the Light smokers, 40 (48%) of the Moderate smokers and 41 (28%) of the Heavy smokers. Another near third or 89 (37%) felt that they were smoking about the same amounts of marijuana with 3 (27%) Light smokers, 31 (37%) Moderate smokers and 55 (37%) Heavy smokers. Those who felt that they were smoking more included 13 (15%) Moderate smokers and 51 (35%) Heavy smokers or 64 (26%) of the total sample. There was a trend that proved significant at <.01 showing that the Light smokers were smoking less, the Moderate smokers were smoking in the direction of the same or less, and the Heavy smokers were smoking either the same or more than they had been a year before the interview.

With the increasing number of surveys and reports showing combined marijuana and alcohol use becoming more popular the question with regard to combined use was considered appropriate. These findings are very inconclusive and show no trend favoring any particular smoking pattern, but 36 (15%) of the smokers said that they never drank and smoked at the same time; 149 (62%) said that they smoked and drank seldom or rarely;

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another 49 (20%) reported that they frequently smoked and drank alcohol
and only 8 (3%) reported that they always used the two drugs in combina-
tion. Once again the interviewees helped to explain this phenomenon.
Many reported that they would smoke before they went out, or before
they went to a social occasion, or earlier in the evening and that
they drank later in the evening after they felt that they were "coming
down" from their subjective marijuana high. In the interest of counter-
measures this finding might indicate that marijuana smokers would be
found more frequently in the early and mid-evenings on the highways
(Table 33).

The smokers were questioned as to which intoxicant they preferred
if they could choose only one, alcohol or marijuana. The results showed
that 81 (33%) preferred alcohol over marijuana including 10 (91%)
of the Light smokers, 48 (57%) of the Moderate smokers and only 23 (16%)
of the Heavy smokers. The remaining 161 (67%) said that they preferred
marijuana including 1 (9%) Light smoker, 36 (43%) Moderate smokers and
124 (84%) of the Heavy smokers. There was an obvious trend showing that
the more one smoked marijuana the more likely he was to prefer marijuana
over alcohol with the reverse trend showing true for alcohol. The
distributions in Table 34 show that there was a significant trend at the
<.01 level with both the moderate and Heavy smokers indicating that
those with heavier patterns of alcohol use significantly preferred
alcohol to marijuana.

The team had a great deal of apprehension about asking any questions
that had to do with law enforcement or the legality of marijuana use

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with the feeling that the introduction of these issues might initiate a closure for the interviewee. The single question agreed upon was, "Do you ever have any fears or concerns about legal apprehension when you are smoking?" Over half of the smokers, or 157 (65%) reported that they never had any such fears and another 79 (33%) reported that they feared legal apprehension only some of the time and 6 (2%) had constant legal fears. There was no relationship between the number of years that the smokers had been using marijuana and fears or concerns regarding legal apprehension (Table 35).

Table 36 through 46 represent the subjective responses of the control smokers with regard to selected functions or tasks that have some relationship to the proper operation of a motor vehicle. Each smoker was asked if he believed that he could perform the particular function or task with greater ease, the same ease or with more difficulty when marijuana intoxicated as compared to a sober state.

When questioned as to whether they thought they could see more easily, about the same or with more difficulty when marijuana intoxicated 69 (28%) reported easier, 96 (40%) about the same and 77 (32%) with more difficulty. The differences in responses as distributed by the 3 way marijuana smoking pattern showed no significant trends or directions with regard to this particular function (Table 36).

The smokers were asked if they felt that they could hear more easily, about the same or with more difficulty when marijuana intoxicated. Over half or 131 (54%) felt that their hearing was improved and another 55 (23%) felt that it was about the same with 56 (23%) reporting that they heard less well when marijuana intoxicated. There was no difference

in the distribution of responses by marijuana smoking patterns (Table 37).

The third task or function was with regard to <u>creative thinking</u> <u>abilities</u> when influenced by marijuana. Most of the operators or 169 (70%) of the smokers thought that they could think creatively with more ease. Another 35 (14%) felt that no change was effected through smoking and 38 (16%) felt that their creative thinking abilities were hindered through smoking. With regard to this particular function there was a significant trend at the <.01 level showing that the Heavy smokers dominated the sample with their opinion that creative thinking was easier when marijuana intoxicated (Table 38).

Many laboratory studies have indicated that the <u>memory</u> functions are severely impaired when under the influence of marijuana. With this in mind the smokers were asked how well they remembered things when under the influence of marijuana. As can be seen in Table 39 nearly three-quarters or 176 (73%) of the smokers felt that they remembered things less well when stoned. This subjective opinion regarding decreased memory performance did not have any relationship to the marijuana smoking patterns.

The fifth task or function presented to the control smoker was with regard to his comparative ability to <u>concentrate</u> on a job or project when under the influence of marijuana. Concentration was believed to be more difficult for 145 (60%) of the smokers and easier for 47 (19%) with a significant distribution trend showing that the Heavy smokers found less interference in the concentration task than did the others (Table 40).

The smokers were asked if they thought that they found it easier, the same or more difficult to be distracted from something when they were marijuana influenced. Only 56 (23%) found it harder to be distracted, 29 (12%) found it about the same as when sober and 157 (65%) found it easier to be distracted after they had been smoking (Table 41).

Some research has been reported with regard to reduced levels of anger, hostility and aggression when subjects have been under the influence of marijuana. This combined mood state has a great deal to do with driver attitudes on the highway and with this in mind the smokers were asked if they found it easier, the same or more difficult to become angry when marijuana intoxicated. A substantial majority of 190 (79%) said that they believed it to be more difficult for themselves to become angry, or hostile, or aggressive when marijuana intoxicated with another 30 (12%) reporting that it was just about the same as when they were sober and 22 (9%) reporting that it was easier. With the distribution showing such a strong majority in the "more difficult" response there was no notable difference between the smoking patterns (Table 42)

Sudden decisions are an important part of defensive driving and very necessary in response to many kinds of danger signals. With this in mind the smokers were asked if they considered it easier, the same or more difficult to make sudden decisions when marijuana intoxicated. Once again the 3 patterns of use all reported that well over two-thirds of the smokers considered it more difficult to make a sudden decision when marijuana intoxicated including 10 (91%) Light smokers, 61 (73%)

Moderate smokers and 101 (69%) Heavy smokers or 172 (71%) of the total control smoker sample (Table 43). At this point the respondents were asked if they considered it any easier to make a _foolish or impulsive decision_ when marijuana influenced and 183 (76%) reported that it was easier to make such decisions when intoxicated (Table 44).

Certainly a very important function in the driving task is the ability to make _sudden physical movements_ often in response to a danger signal. When presented with this question 179 (74%) of the smokers reported that they considered it more difficult to make a sudden physical movement when marijuana intoxicated than when they were sober. Once again there was no real difference between the distribution of responses between the 3 smoking pattern groups (Table 45).

During the supplementary protocol the smokers were asked if they considered it easier, the same or more difficult to operate a motor vehicle when under the influence of marijuana. In response to this broad question 131 (54%) of the sample said that they considered driving more difficult, 91 (38%) said that driving was about the same as when they were sober and 20 (8%) said that driving was easier when stoned. There was no difference in the distribution of the responses between the groups (Table 46).

In another attempt to arrive at driving behaviors and the smoker's subjective attitudes toward driving when marijuana intoxicated a listing of 14 different driving situations was presented to the control smoker at 2 different points in the interview protocol. When the list was presented for the first time he was asked "Which of the following

driving situations would you consider to be quite risky for you per-
sonally when you are operating a motor vehicle after smoking marijuana?"
The 14 driving situations listed in Table 47 covered a wide scope of
emotional, mental and physical circumstances that could present them-
selves to any driver, sober or marijuana intoxicated. The same list of
driving situations was presented to the interviewee toward the end of
the protocol with the direction of the general question being which
items he would consider risky when driving under normal circumstances
with no reference to marijuana. The first column in the table is
the driving situation. The second column is the number and proportion
of positive responses to the driving situation when not intoxicated
by marijuana and the third column is the distribution of the positive
responses when "marijuana intoxicated". The column headed "Situational
Risk Change" reports the number of operators that considered it less
risky for them to operate a motor vehicle in that particular driving
situation when marijuana intoxicated than when sober; the number of
operators who considered it no more or no less risky when driving after
smoking, and the number of operators who considered it more risky to
operate a vehicle under that particular situation when stoned than
when sober. The final columns present the t value for the changed and
constant responses and the probability of significance.

The most effective means of interpreting this table with its
implications for highway safety and the issue of marijuana intoxication
is to prepare 2 listings for observation. The first list is the rank
order of the positive responses to the driving situations when "sober"

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with the corresponding proportion of the positive responses. The second column is also rank ordered according to positive responses when marijuana intoxicated with the corresponding proportion of positive scores. It should be noted that the 2 situations referring to alcohol use include only responses from the 228 operators who drank alcohol and the single situation associated with street or entertainment drug use includes only responses from the 143 reported users of these drugs.

RANK ORDERED DRIVING RISK
WHEN MARIJUANA SOBER

1.	After drinking too much	94%
2.	After using street drugs	90%
3.	When tired	76%
4.	To let off steam	67%
5.	After an argument	63%
6.	Late for an appointment	60%
7.	After drinking a little	56%
8.	In bad weather	46%
9.	An unfamiliar vehicle	31%
10.	An unfamiliar road	29%
11.	In heavy traffic	28%
12.	Early in the evening	15%
13.	Late at night	14%
14.	Alone	9%

RANK ORDERED DRIVING RISK
WHEN MARIJUANA INTOXICATED

1.	After drinking too much	100%
2.	After using street drugs	97%
3.	When tired	87%
4.	After drinking a little	87%
5.	An unfamiliar road	79%
6.	In heavy traffic	77%
7.	To let off steam	76%
8.	After an argument	75%
9.	In bad weather	74%
10.	An unfamiliar vehicle	74%
11.	Late for an appointment	68%
12.	Late at night	45%
13.	Alone	41%
14.	Early in the evening	31%

A comparison of the rank order and proportion of positive responses shows that there was a significant change between the operators' subjective opinion relative to situational risk in driving conditions when marijuana sober and when marijuana intoxicated. Each of the levels of significance can be found in column 7 of Table 47 which indicates a <.01 significant difference for each of the driving conditions or situations with the exception of "letting off steam" which recorded a <.05 significance. The mean proportionate change was 18% indicating that a mean of 44 more operators considered any driving situation more risky after they had been smoking marijuana as opposed to when they were sober.

With regard to countermeasures efforts that are primarily concerned with alcohol and its influence on highway safety it is of particular interest that 215 (94%) of the drivers in this group of operators considered "drinking too much" and driving a risky situation apart from

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marijuana influence and that 228 (100%) considered it risky if they had been smoking marijuana as well. "Drinking too much" rank ordered first in both analyses. As has been mentioned above only the responses from the 228 users of alcohol were included in this analysis. "Drinking a little" was rank ordered in seventh place when marijuana sober but when combined with marijuana it jumped to fourth place for situational risk. The use of street or entertainment drugs as evaluated by the 143 operators who admitted to using such drugs, held second place in rank order with 129 (90%) operators considering it risky to use these drugs alone and drive. The proportion of those who considered it risky to use street or entertainment drugs and drive rose to 138 (97%) when the element of marijuana intoxication was introduced.

Several of the listed driving situations or conditions generated very large changes as they shifted from the marijuana sober analysis to the marijuana intoxicated analysis. The following rank order listing shows those situations with the greatest proportionate change of increase from the sober to the intoxicated evaluations.

RANK ORDERED DRIVING RISK
PROPORTIONATE CHANGE

1.	An unfamiliar road	50%
2.	In heavy traffic	49%
3.	An unfamiliar vehicle	43%
4.	Alone	32%
5.	Late at night	31%
6.	After drinking a little	31%
7.	In bad weather	28%
8.	Early in the evening	16%
9.	After an argument	12%
10.	When tired	9%
11.	To let off steam	9%
12.	Late for an appointment	8%
13.	After using street drugs	7%
14.	After drinking too much	6%

The first 3 rank items elicited the greatest response from the smokers included in this research. Driving "on an unfamiliar road" showed a 50% increase in the number of positive responses for situational risk when marijuana intoxicated followed closely by driving "in heavy traffic" with a 49% increase and driving "an unfamiliar vehicle" with a 43% change. All of these driving situations or conditions generated a variety of clinical responses from the operators when presented in the hypothetical position of marijuana intoxication. Many reported that they could not function in situations of this nature when they had been smoking. Many others said that they would not drive at all under such conditions if they had been smoking. Others went into greater detail to explain in essence, that there would be too much information to sort and process when these driving situations were combined with marijuana use and that they would only drive under very necessary circumstances. The same sort of response was associated with driving "in bad weather" which appears as item 7 with a 28% proportionate increase. Many of the operators included in the 32% increase for the driving "alone" situation felt it would be less risky if another person were in the vehicle to help with the decision making. It should be noted that each of the 14 driving situations or conditions showed some increase in evaluated riskiness in the move from the marijuana sober analysis to the marijuana intoxicated analysis.

Summary for Marijuana Smoking and Driving:

The information centered in the "Marijuana Supplement" (Appendix B)

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was completed by 242 (89%) of the 272 control marijuana smokers. The remaining 30 (11%) smokers refused to complete the supplementary information but did agree to participate in the basic interview protocol. As stated earlier, a marijuana smoker was defined as an operator who admitted to smoking marijuana on 3 or more occasions during the year prior to team contact. The total marijuana abstainers and individuals who had only experimented with the drug once or twice were evaluated as non-smokers. The 242 smokers were divided into 3 patterns of use to observe any differences in responses. The sample included 11 (4%) Light marijuana smokers who smoked less than monthly, 84 (35%) Moderate marijuana smokers who smoked between monthly and weekly, and 147 (61%) Heavy marijuana smokers. The Heavy smokers included 107 (44%) operators who smoked several times a week, 36 (15%) who smoked daily and 4 (2%) who smoked more than once a day. The very small size of the Light smoker group made it difficult to compare with the other patterns of use.

The mean length of marijuana use for the smokers was between 3 and 4 years. The Moderate smokers tended to become moderately intoxicated, whereas, the Heavy smokers showed a significant trend favoring heavier intoxication. One joint or less was sufficient for intoxication for 79% of the smokers with 92% judging the average length of their marijuana high to be 3 hours or less. The predominant reason for smoking marijuana was "to relax" followed closely by "to get away from the pressures of life or business". The preferred times for smoking showed that 44% preferred weekends with 54% having no preference and a

full 95% indicating that they were most frequently marijuana intoxicated between 6:00 p.m. and midnight. Combined marijuana and alcohol use patterns showed that 77% of the operators either seldom or never used the 2 drugs in combination. Many reported that they smoked earlier in the evening and then began drinking when they came down from their marijuana high. Within this particular sample there was considerably more social pressure regarding patterns of alcohol use than marijuana use. More operators reported that the social pressures to drink more or less were greater than were the comparative pressures to smoke. When compared to a year before team contact 37% of the operators felt that they were currently smoking less frequently, 37% reported that they were smoking at about the same frequency and 26% said that they were smoking more frequently at the time of team contact. When asked with regard to preferred intoxicant 33% reported alcohol as a preference and 67% preferred marijuana. There was a distinct correlation showing that heavier drinkers preferred alcohol and that heavier smokers preferred marijuana.

The smokers reported that when under the influence of Cannabis it was easier for them to: think creatively, to be distracted from a task or project, to hear, and to make foolish or impulsive decisions. On the other hand, it was more difficult for them to: remember things, to concentrate, to become angry, to make sudden decisions and to make sudden physical movements. They reported no subjective change in their vision when marijuana intoxicated.

When the drivers were presented with a variety of driving situations and

were asked to evaluate them for riskiness when marijuana sober and riskiness when hypothetically marijuana intoxicated there was a mean increase of 18% positive responses in each situation between those evaluated as sober and as intoxicated. The situations most affected in the opinions of the operators were: driving on an unfamiliar road, driving in heavy traffic and driving an unfamiliar vehicle. Driving after drinking too much, driving after using street or entertainment drugs and driving when tired were evaluated as the most risky situations when sober and when intoxicated.

Focal Accident Marijuana Intoxicated Operators

Throughout the period of experimental field research the Boston team collected data relative to focal accident marijuana intoxication or influence from among the "most responsible" drivers under investigation. Within the sample of 267 such drivers 43 (16%) were clinically evaluated with a reliable degree of certainty to have been under the influence of marijuana at the time of their respective fatal accident. An additional 18 (7%) were suspected of some pre-accident marijuana involvement, however, a reasonable degree of confidence could not be assured and these experimental operators were not included in this analysis with the 43 operators mentioned above.

The 121 marijuana smokers in the experimental sample included 78 (64%) who had not been known to have been smoking marijuana prior to their focal accidents and 43 (36%) who were known to have been smoking.

Focal marijuana influence was established by either self report from the focal operator or by sufficient evidence provided by other informants

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to indicate that the focal operator had been smoking marijuana within four hours before the focal accident. The Boston team recognizes the limited scientific support with this type of clinical evaluation. For this reason only those 43 cases with high reliability were selected for this analysis. There are admittedly many factors which contribute to the length of a marijuana "high", however, the selection of the 4 hour time criterion was judged to have been adequately conservative.

The 43 operators in this focal marijuana influenced group included 13 (30%) who had been smoking marijuana and had not been using alcohol or any other drug. The remaining 30 (70%) operators had been using alcohol and smoking marijuana with 25 (58%) from the total group of 43 smoking and drinking and an additional 5 (12%) who had been smoking marijuana, drinking alcohol and had taken some pharmaceutical or street/entertainment drug. Within this small sample of 5 operators 2 had been using a pharmaceutical drug and 3 had been under the influence of a street/entertainment drug (Table 48).

The full battery of statistical comparisons was executed using the group of 43 operators as a base for comparison to evaluate the differences and similarities that this sub-sample showed with the others. The experimental sample included 121 (45%) marijuana smokers, ranging from light to heavy in their use patterns. This group, when broken down showed that 43 (36%) of the experimental smokers had been smoking marijuana during the 4 hours prior to their focal accident and 78 (64%) had not been smoking.

It was a point of scientific interest to see if these 43 operators were involved in different types of accidents than the remaining 244 (84%)

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operators without known marijuana influence. There were significant differences particularly between those operators "most responsible" for an accident resulting in the death of another vehicular occupant where 20 (46%) of the 43 operators survived the accident killing another occupant and 43 (19%) of the remaining 224 operators were likewise involved in what has been called a TYPE II accident. The reverse trend was seen in the pedestrian accidents (TYPE III) where only 5 (12%) of the 43 were involved as opposed to 96 (43%) of the non-marijuana involved operators. This finding was significant at the .01 level. (Table 49). Using this small sample of only 43 operators there appears to be an indication that the marijuana involved operator might be more prone to become involved in a strictly vehicular accident as opposed to a vehicle-pedestrian accident.

The question quickly emerged as to whether there were notable differences in the ways in which the smokers involved in marijuana related fatal accidents used Cannabis which might be different from those experimental smokers who were not known to have been involved in a marijuana related focal accident. The findings seen in Table 50 did not show a significant trend favoring any pattern of use with either of the 2 groups. There was a notable trend showing that the moderate smoker, who used marijuana only weekly or monthly, might have been more likely to have been involved in a marijuana related accident within the Boston sample. This slight trend might give some credence to the speculation that the less experienced smoker is more likely to become accident involved after smoking than is the heavier smoker, who may have learned how to use marijuana or to better control its effects on his person (Table 50).

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When a variety of comparisons were made between the 43 marijuana involved operators and the remaining experimental smokers and non-smokers with regard to demographic and psychosocial backgrounds the 43 operators were very much like their smoking counterparts who were not known to have been involved in a marijuana related focal accident. The variables scoring sex, marital status, age, student status, physical health, the smoking of cigarettes, psychological treatment histories, suicide attempt histories and leisure time companions all showed nearly identical distributions within variables with significances over .500. There was a slightly disproportionate representation of blacks in the group of 43 operators which apparently also influenced the trend showing somewhat less education and a lower level of occupational attainment for the sub-sample when compared with the rest of the experimental smokers.

In the matter of alcohol use histories there was a significant trend showing that the group of 43 contained proportionate more light social drinkers and sporadic binge drinkers and few moderate social drinkers when compared with the other experimental smokers. Their patterns of alcohol use were similar but there was a slight trend showing that the 43 were slightly more frequently alcohol intoxicated. There were a few more social and domestic problems associated with alcohol use within the group of 43 and a slightly larger number of job losses with alcohol use overtones. The essence of this alcohol use history analysis is found in Table 51. Here a complete analysis of the experimental and control subjects with problem drinking histories are detailed. The largest single proportion of problem drinkers is found with the 43 experimental operators with 23 (54%)

of the sub-sample showing problem drinking histories. The next largest
proportion was seen with the 36 (46%) experimental smokers not involved in
a marijuana related focal accident followed by the experimental non-smokers
with 47 (32%) problem drinkers and the control smokers with 83 (31%) of
these operators with known problems with alcohol sufficient to evaluate them
as problem drinkers. The group with the smallest number of problem drinkers
was the control non-smoker sample with only 69 (13%) such operators. These
figures support the Office of Alcohol Countermeasures projections relative
to the disproportionate numbers of problem drinkers among the fatal
accident involved operator groups.

The same general hypothesis held true regarding the 43 operator
group and the proportionate use or experimentation with street/entertainment
drugs. The thesis was that the high risk marijuana smoker relative to driving
behaviors would have been a heavier user of alcohol, other drugs and mari-
juana. This was not the case with marijuana even though the hypothesis
held true with alcohol. However, in the case of the use or experimentation
with street/entertainment drugs the differences between the 43 operators
and the remaining marijuana smokers in the experimental sample were negli-
gible (Table 52). As was delineated earlier in this paper there was a
significant difference between the experimental and control smoker samples
when considered totally.

There was some noted interest in evaluating the day of the week and
the time of the day of the 43 marijuana related accidents to see if there was
any correlation between these recordings and the subjective questions
given to the control smoking group. When the 43 operators were compared

with the remaining experimental operators there was a significant distribution showing that Friday and Saturdays were the most predominant nights for marijuana related fatal accidents within the Boston sample (Table 53). The time of the day analysis reported equal numbers of marijuana related focal accidents between 6:00 p.m. and midnight and then from midnight to 6:00 a.m. with each time period showing 17 (40%) of the operators. Only 9 (20%) of the marijuana related fatal accidents occurred during the 12 hours between 6:00 a.m. and 6:00 p.m. (Table 54).

Earlier in this result section there was a report from the 242 control smokers regarding the types of traffic or driving situations that were subjectively judged by the respective operators to be of the highest risk when marijuana influenced. With this in mind the Boston team extracted data from the experimental protocols on the 43 operators to evaluate the actual stressors or risky human factors experienced by these operators as they approached their respective focal accidents under the influence of marijuana. A total of 34 (79%) of these 43 operators were experiencing a situation of letting off steam or driving after an argument associated with domestic, social and/or professional tensions. There was some question as to what might be comparable to the "early" or "late at night" items seen in Table 47 as scored with the control smokers subjective opinions. It was decided that driving early in the evening constituted an acceptable approximation to the hours between 6:00 p.m. and 10:00 p.m. which showed scores for 13 (30%) of the group of 43. Late at night approximated the hours between 10:00 p.m. and 6:00 a.m. and included reports for 21 (49%) of the 43 operators. It is of interest to note that 17 (40%) of the 43 marijuana influenced operators were driving alone at the time of the focal

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accident and that 13 (30%) were tardy for some engagement, appointment or obligation. Only 11 (26%) were driving an unfamiliar vehicle and 7 (16%) were driving on an unfamiliar road (Table 55).

Generally there were fewer differences between the experimental operators involved in marijuana related fatal accidents than the team had expected. The identification of the high risk marijuana smoker who was involved in a fatal vehicular accident while under the influence of marijuana is not necessarily found in demographics or perfunctory psychosocial variables. There is a lighter trend in his smoking patterns and he uses no more nor fewer street/entertainment drugs. The salient variable is that he was more likely to have been a problem drinker of alcohol before his focal accident.

DISCUSSION AND RECOMMENDATIONS

The preceeding results from Part III of the final reporting from the Boston University Traffic Accident Research Special Study Team have highlighted many of the marijuana related observations that have come from the data. The 1068 motor vehicle operators contributing to this report have included 267 (25%) drivers who were "most responsible" for a highway accident resulting in fatal injuries to themselves, another vehicular occupant or to a pedestrian. These operators have constituted the experimental sample. A few months after the close of the experimental field investigations funding became available for the collection of a non-accident related control sample, randomly selected with several control features to be compared with the experimental sample. Because of the many biases already injected into the research design the control sample was projected to include 3 times the number of operators in the experimental sample, or 801 (75%) of the total number of drivers investigated. The sample sizes were projected to minimize any potential statistical irregularities.

The hypothesis that marijuana smokers were over-represented in the experimental sample is without question, true. In comparing the 2 samples the 121 (45%) marijuana smokers in the experimental sample showed a considerable increase over the 272 (34%) smokers in the control sample. This factor is further emphasized by the differing situations of the experimental and control operators. The experimental operators, facing criminal and civil litigations associated with their accident

would have had a significant reason to falsify their responses, particularly with regard to the use of an illegal drug. Such would have been the case with the informants for the deceased operators as well. Also the matter of time lends its support to this over-representation hypothesis. The information from the control smokers indicated that there had been a phenomenal increase in the number of people who smoked marijuana over the past 4 years. In fact the findings show that there has been a 163% increase in the number of smokers in the past 48 months. If applied to the experimental time period this would indicate that marijuana smokers were much more over-represented than the available evaluations indicate.

Were marijuana influenced or intoxicated motor vehicle operators over-represented in the proportion of experimental drivers who had been smoking prior to their fatal accident? The findings detailed in Part I have reported that clinical evaluations judged that 43 (16%) of the experimental operators had been smoking within 4 hours prior to the time of their accident. The report goes on to show that 30 (70%) of these drivers had been drinking alcohol in quantities sufficient to indicate alcohol influence together with the smoking of marijuana during the hours before the accident. A group of 5 out of the 30 had also been using other drugs. An evaluation overview of the control smokers' attitudes toward marijuana smoking and driving would seem to indicate that most of these individuals approached the matter of driving an automobile with unusual caution after they had been smoking. The control smokers were unanimous in their opinion that smoking, drinking and driving was a high risk combination. Over half reported that they

knew that they drove less well after smoking. Three-quarters of the operators said that they seldom or never combined alcohol and marijuana. Many of the other subjective observations included in the results section continue to support the concept that for the most part the control smokers approached driving and smoking in combination with care. This global evaluation of the control smokers' subjective opinions would seem to indicate that the 43 (16%) of the operators in marijuana related fatal accidents would be a marked over-representation. There is no doubt that people continually put themselves in a good light, and that people who smoke regularly have a marked tendency to do the same with marijuana. This preconception of subjective data, particularly sensitive data like marijuana, would most likely mean that there is more smoking, drinking and driving among the control operators investigated than the available statistics would indicate. However, even with this consideration, it would appear to be an appropriate evaluation to clinically report that the number of marijuana smokers involved in marijuana related fatal motor vehicle accidents was an over-representation.

In the first section of the Part III results one of the analyses reported was the comparison and contrast of marijuana smokers and non-smokers. Without consideration for experimental or control sample membership the following observations differentiated between them. The marijuana user was decidedly younger with his chances of being a smoker 2:1 if he was 19 or younger, 1:1 if he was from 20 to 29, and roughly 1:2 if he was between 30 and 39. Marijuana smokers are decidedly

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difficult to find if they are over 40 years old, but they can be found. The smoker was as certain to be single as the non-smoker was to be married. The smoker was better educated and had a much better chance of being some sort of a student. This did not necessarily mean that he was a college or university student. What these results show was that at the time of the team contact he was studying something with formal direction. The smoker and the non-smoker portrayed very much the same picture when compared for occupational attainment. The non-marijuana smokers were somewhat more likely to have been cigarette smokers. The marijuana smokers had a higher incidence of professional treatment for a psychological concern and a higher incidence of known suicide attempts. The non-smoker had a slightly better chance of being an alcohol abstainer and most certainly was not personally exposed to any of the street or entertainment drugs. The alcohol users showed a tendency toward a heavier drinking pattern for the marijuana smokers. Problem drinker histories showed a distinct pattern following very much the original theories of the Office of Alcohol Countermeasures. Only 13% of the non-smoking control operators were problem drinkers. The control smokers and the experimental non-smokers showed nearly a third of these sub-samples were problem users of alcohol, with a 31% and a 32% distribution in the problem drinker category. The experimental smokers without focal marijuana influence included 46% problem drinkers and the experimental smokers with focal marijuana influence a remarkable 54%. Most of the remaining variables observed between the marijuana smokers did not clearly distinguish between them.

If the present findings do not differentiate any more clearly between the smoking operators and the non-smoking operators, the question then comes: Are there any real differences between the experimental operators who smoked marijuana and the control operators who smoked marijuana? In summary, there are distinguishable differences between them which indicate that these 2 groups of smokers come from dissimilar segments of the greater Boston population. The control smokers were the over-achievers and the experimental smokers the under-achievers.

Some of the variables that indicate a commonness between the smokers in the present study show that they are Caucasian males, single -- or at least unmarried -- and that they are young. The control smoker was somewhat younger with more men in their late teens. He was decidedly better educated in terms of formal training, was more likely a student of some sort, and was much better employed in terms of occupational attainment. The control smoker was in better general health and smoked cigarettes less frequently. When he did smoke, however, he was as likely as the experimental smoker to go through more than 2 packages daily. He had just about the same proportion of psychological treatment histories, or a 1:5 chance that he had seen a mental health professional. He had fewer known and reported suicide attempts in his history.

The experimental smokers and the control smokers presented very confusing profiles of alcohol use. Two distinct options appeared to present themselves to the experimental smoker. The first option would have been that he was a light social drinker whose frequency of alcohol use ranged from less than monthly to near daily but who was alcohol

intoxicated rarely or no more than twice a year. The second option would have been that he was a moderate social drinker or even heavier, whose alcohol use tended to be more frequent or more in the direction of several times a week and who was alcohol intoxicated monthly or better. The experimental smoker drank alcohol at about the same frequency as the control smoker but was intoxicated more frequently. The control smoker was a moderate social drinker who drank just about as often as his experimental counterpart but who did not become intoxicated as frequently.

As discussed earlier, there were proportionately twice as many problem drinkers in the experimental sample as a whole when compared with the entire control sample. This distribution was not as marked when the experimental and control smokers were compared but was significantly in the same direction with 49% of the experimental smokers scored as problem drinkers and 31% of the control smokers. This trend was even more accentuated when the 43 focal marijuana smokers from the experimental sample showed that 54% of their membership were coming to their respective accidents with problem drinker histories.

The experimental operator was a much more familiar user of street or entertainment drugs. Unfortunately how familiar he was or the variety of the drugs with which he was associated remain unknown factors. What is known is that if he was familiar with these drugs, there was also a notable pattern of heavier alcohol use and heavier marijuana use that distinguished him from the experimental smoker that did not know street or entertainment drugs. Even though the control smoker was only

slightly less likely to have been familiar with street or entertainment

drugs, there remained the same strong correlation with heavier alcohol

use and a heavier pattern of marijuana smoking. Particular note should

be taken with regard to the nature of the currently available information

about these street or entertainment drugs. The operator only reported

that he had used a street or entertainment drug on one occasion during

the year prior to team contact. These positive scores do not indicate

that he was a user or even if he responded favorably to using the drug

in question.

Throughout the entire investigation, there appeared to be a bi-polar

response to the use of marijuana. People were either total abstainers

or else showed a marked tendency to have been heavy smokers. The experi-

menters and light marijuana smokers were negligible in number. Whether

they had been included as smokers or non-smokers would have produced

few, if any, alterations in the data. The strongest single category

of use came with the smoker who used marijuana several times a week

but who did not use it as frequently as daily. It may well be that

the limited after-effects of marijuana smoking, that distinguish it

from the hangover so frequently associated with alcohol intoxication,

make it a more popular intoxicant for the weeknight.

The available data from the 242 control operators who completed

the Marijuana Supplement provides some very substantial, subjective

information regarding the adult smoker (not necessarily high school

or college smokers). Experimentalists will contend that this data

is invalid because it was not produced in a laboratory or under

stringent laboratory-type circumstances. This contention holds a certain measure of truth particularly with regard to those observations where there was not an overwhelming response in one direction or another. There is also the ready truth that some responses, most notably those of a perfunctory nature, appear to be different in the mind of the individual than they are scientifically. There is also a matter that must be included in any evaluation of these findings and that is the very nature of this drug. With all drugs, including alcohol, there is an important function that the environment or "set" contributes to individual response. This factor of the "set" -- or the immediate physical environment, the emotional attitudes of the user and everyone who is present, mental approach, social circumstances, measure of comfort or ease -- appears to be uniquely contributory to the individual's effective response to the marijuana high. Another factor that must be at least considered in any variety of marijuana related research is the evident control that the chronic smoker has over the drug effect. There are many reports which would indicate that the experienced smoker can dictate, at least to some degree, how he will respond to a marijuana intoxication. In essence these marijuana observations are offered in support of the nature of the data presented on the 242 control smokers. In the long, forthcoming run of marijuana research, it may well be found to be true that subjective, "real life" data is as valid a measurement of effect as laboratory response.

Nearly all of the smokers included in the select control sample were experienced marijuana smokers who had been using the drug for

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several years. Over three-quarters of these smokers felt that they were sufficiently intoxicated to the point of being "quite stoned" after they had smoked one joint or less of the marijuana available on the streets of Boston. This is in sharp contrast to the 2 joints of "government grass" most frequently used in monitored research experiments. It seems unlikely that street marijuana is more potent than the marijuana made available to most researchers through the NIMH. Unless the contrary is true, the "social high" desired by most researchers may be considerably underestimated. Due consideration should also be given to the findings that indicate that the control smokers feel overwhelmingly that their subjective marijuana high is usually of no more than a 3 hour duration.

There are a number of these reports and personal observations that have an immediate relationship to countermeasures. Many of the smokers indicated that they smoke earlier in the evening and reserve their drinking of alcohol until they feel that they are coming down from their marijuana high. Others have reported that they smoke before they go out to some social affair. Both of these clinical observations would seem to support the thesis that the interception of marijuana smokers on the highway would be far more likely earlier in the evening. It may even be that the same operator would be apprehendable later in the evening after he had supplemented his descending marijuana high with alcohol. The data would also lend support that the weekend nights would be those evenings most likely to produce a marijuana smoker operating a motor vehicle. This would be particularly true if he were

a moderate marijuana smoker. The heavy smoker would not be as easily identified as a weekend-only user and could be driving any evening of the week.

Many of the research teams that have conducted simulated and 'real life' driving investigations with marijuana and motor vehicle operators have reported that one of the main effects of the drug on the driving stiuation is its apparent ability to make the influenced operator confused and indecisive particularly when faced with immediate or multiple signals. One of the central areas of driver behavior that is most readily influenced by marijuana intoxication is that of information processing. These findings, cited earlier in this report, are supported through the subjective responses of the Boston control smokers. These experienced marijuana users reported in the majority that when under the influence of Cannabis: they found it more difficult to concentrate on a job or project (i.e., a driving task), that it was considerably easier to be distracted (i.e., from the driving task), that they found it more difficult to make sudden decisions (i.e., in response to danger signals, traffic lights, etc.), that they found it easier to make foolish or impulsive decisions (i.e., wrong decisions for danger signals), that they found it more difficult to make sudden physical movements (i.e., braking, turning) and that they found it harder to remember things (i.e., highway directions, vehicle instrumentation, etc.).

These subjective opinions of the control smokers relative to particular behaviors are placed clearly into the driving state with their responses to the 14 driving situations. Those driving situations which

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changed the most in their relative riskiness when sober and when mari-
juana intoxicated were: driving on an unfamiliar road, driving in
heavy traffic and driving an unfamiliar vehicle. Nearly one-half of
the smokers felt that these driving situations were in an element of
risk after they had been smoking but not when they were sober.

When the items of potential risk when driving under the influence of
marijuana were evaluated from the subjective opinions of the control
smokers the likely question was: "How did these situations match up with
the focal accident human factor stress items experienced by the 43 opera-
tors from the experimental sample who were known to have been smoking before
their respective focal and fatal accidents?" Two of the 3 risk/stress
items most clearly emphasized as being risky when under the influence of
smoking were driving on an unfamiliar road and driving an unfamiliar
vehicle. Interestingly enough these 2 items could be reasonably compared
to the Human Factor Stress Scale (HFSS) items from the experimental sample
and each showed light responses. Only 7 (16%) of the 43 operators were
driving on an unfamiliar road and 11 (26%) were driving an unfamiliar
vehicle (in most cases also a stolen vehicle).

Marijuana continues to be the second most commonly used drug in
contemporary American society preceded only by commercial alcohol.
However, very little is known about marijuana apart from isolated labora-
tory situations or limited experiments with limited facilities and few
subjects. Only a handful of research studies have been addressed to mari-
juana intoxication and the driving task and these are apparently in conflict
with their results. Granted, there are many scientific problems that

confront the potential researcher in a marijuana related situation. Not
the least of these is the continuing problem of measurements, correlations
with alcohol levels (Blood Alcohol Concentrations), and sample sources
from living subjects not to mention the illegality of the drug. In
spite of these problems, however, the very important tasks confronting
the social interaction of marijuana use must not be delayed any longer.
Millions of dollars are spent each year by federal and state agencies
to research and re-research the effects of alcohol on the automobile
operator with limited funding available for field or even laboratory
investigations. It is an accepted fact that research in alcohol related
studies is easier to execute, measure, compare and report in scientific
objectivity than studies related to the elusive marijuana. In spite of
these drawbacks the social investigation of marijuana use must be
accelerated particularly as is related to highway safety. Highway safety
professionals will soon be called upon to answer the questions of how
marijuana smoking affects the driving situation, driving behaviors and the
driver himself. It is our social responsibility to provide an adequate
response.

BIBLIOGRAPHY AND SELECTED REFERENCES

BIBLIOGRAPHY AND SELECTED REFERENCES

1. Abel, E. L. "Marijuana and Memory", _Nature_, 227:1151-1152, 1970.

2. Bialos, D. S., "Adverse Marijuana Reactions: A Critical Examination of the Literature with Selected Case Material", _American Journal of Psychiatry_, 127:819-823, 1970.

3. Brill, Norman Q., (ed) "The Marijuana Problem", _Annals of Internal Medicine_, 73:449-465, 1970.

4. Commissioner of Probation, "OCP Continues Drug Monitoring Study for 1974", Office of the Commissioner of Probation, Commonwealth of Massachusetts, Boston, 1975.

5. Crancer, A., Dille J., Wallace, J. & Hakin, M., "Comparison of the Effects of Marijuana and Alcohol on Simulated Driving Performance". _Science_, 164:851-854, 1969.

6. Dott, Andrew B., "Effect of Marijuana on Risk Acceptance in a Simulated Passing Task". U.S. Department of Health, Education and Welfare, ICRL-RR-71-3, Publication No. (HSM 72-10010, 1972.

7. Duckman, Robert H. "Marijuana: How it Affects Vision Perception and Memory". _Journal of the American Optometric Association_, 43:2:160-163, 1972.

8. Ellingstad, V. S., McFarling, L. H., and Struckman, D. L. "Alcohol, Marijuana and Risk Taking." DOT-HS-191-2-301, National Highway Traffic Safety Administration, Washington, D.C., 1973.

9. Fisher, Gary, "Milieu of Marijuana Use." _International Journal of Social Psychiatry_, 20:1-2:45-55, 1974.

10. Helper, Robert S., Ira M. Frank & J. Thomas Ungerleider. "Pupillary Constriction After Marijuana Smoking." _American Journal of Opthamology_, 74:6; 1185-1190, 1972.

11. Jones, R., Stone, G. "Psychological Studies of Marijuana and Alcohol in Man." _Psychopharmacologia_, 18 (1971) 108.

12. Kielholz, P., Hobi, V., et al. "An Experimental Investigation About the Effect of Cannabis on Car Driving Behaviour." _Pharmakopsychiat_, 6:91-103, 1973.

13. Kiplinger, G. F., J. E. Manno. "Dose-response Relationships to Cannabis in Human Subjects." Pharmacological Reviews, 23:339-47, December, 1971.

14. Klein, A. W., Davis, J. H. & Blackbourne, B. D. "Marijuana and Automobile Crashes." Journal of Drug Issues, 1:18-26, 1971.

15. Klonoff, H. "Marijuana and Driving in Real Life Situations." Science, 186:317-324, 1974.

16. Manno, J. E., G. F. Kiplinger, I. F. Bennett, S. Haine, & R. B. Forney. "Comparative Effects of Smoking Marijuana and Placebo on Human Motor and Mental Performance." Clinical Pharmacological Therapeutics, 11:808-815, 1970.

17. Marijuana and Health, A Report to Congress from the Secretary U.S. Department of Health, Education, and Welfare. Subcommittee on Alcoholism and Narcotics of the Committee on Labor and Public Welfare, United States Senate, Washington, D.C., U.S. Government Printing Office, May, 1972.

18. Marijuana and Health. Second annual report to Congress from the Secretary of Health, Education and Welfare. Subcommittee on Alcoholism and Narcotics of the Committee on Labor and Public Welfare, United States Senate, Washington; U.S. Government Printing Office, March, 1972.

19. Marijuana and Health. Third annual report to the U.S. Congress from the Secretary of Health Education and Welfare. (National Institute of Mental Health), U.S. Government Printing Office, 1973.

20. Moskowitz, H. "A Comparison of the Effects of Marijuana and Alcohol on Visual Function." 129-150, in: Lewis, M. R. (ed), Current Research in Marijuana, Academic Press, 1972.

21. Moskowitz, H., McGlothlin, W., and Hulbert, S. "The Effects of Marijuana Dosage on Driver Performance." DOT HS-150-2-236, National Highway Traffic Safety Administration, Washington, 1973.

22. Nie, Norman H., C. Hadlai Hull, Jean G. Jenkins, et al. Statistical Package for the Social Sciences, 2nd ed. McGraw Hill, Inc., 1975.

23. Rafaelsen, Ole J., Per Bech, et al. "Cannabis and Alcohol: Effects on Simulated Car Driving." Science, 173:920-923, 1973.

24. Schwin, Robert , S.Y. Hill, D.W.Goodwin and B. Powell. "Marijuana and Critical Flicker Fusion: Evidence for Perceptual Sharpening." Journal of Nervous and Mental Diseases, 158:2:142-144, 1974.

25. Smart, Reginald G. "Marijuana and Driving Risk Among College Students," Journal of Safety Research, 6:4:155-158, 1974.

26. Smart, Reginald G. and Dianne Fejer. "Marijuana Use Among Adults in Toronto." British Journal of Addiction, 68:2:117-128, 1973.

27. Sterling-Smith, Robert S. "Psychosocial Identification of Drivers Responsible for Fatal Vehicular Accidents in Boston." DOT HS-310-3-595, National Highway Traffic Safety Administration, Washington, 1975.

28. Sterling-Smith, Robert S. and David D. Graham. "An Analysis of Drivers Most Responsible for Fatal Accidents Versus a Control Sample." DOT HS-310-3-595, National Highway Traffic Safety Administration, Washington, 1975.

29. Tart, Charles T. "Work With Marijuana: Sensations." Nature, 226:5247:701-704, 1970; and Psychology Today, 41-44, May, 1971.

30. Waller, J.A. "Drugs and Highway Crashes - Can We Separate Fact From Fancy?" Journal of the American Medical Association, 215:1477-1482, 1971.

31. Waller, Julian A. and Kathleen R. Lamborn. "Marijuana and Driving Among Teenagers: Reported Use Patterns, Effects and Experiences Related to Driving." Accident Analogs and Prevention, 6:141-161, 1974.

32. Weil, A.T., Zinberg, N.E. and J.M. Nelson. "Clinical and Psychological Effects of Marijuana in Man." Science, 162:1234-1242, 1968.

33. Zinberg, N.E. and A.T.Wekkm. "A Comparison of Marijuana Users and Non-users." Nature (London), 226:119-123, 1970.

TABLES

TABLE 1

Marijuana Smoking Patterns for Experimental and Control Samples During Previous Year

MARIJUANA SMOKING PATTERNS	EXPERIMENTAL		CONTROL		TOTAL	
	S^*	NS^{**}	S^*	NS^{**}	S^*	NS^{**}
Abstainer (none)	—	127 (48%)	—	480 (60%)	—	607 (57%)
Experimental (1-2x)	—	19 (7%)	—	49 (6%)	—	68 (6%)
Light (3-8x)	10 (4%)	—	24 (3%)	—	34 (3%)	—
Moderate (monthly)	20 (7%)	—	62 (8%)	—	82 (8%)	—
(weekly)	42 (16%)	—	39 (5%)	—	81 (8%)	—
Heavy (≥2x weekly)	49 (18%)	—	147 (18%)	—	196 (18%)	—
Subtotal	121 (45%)	146 (55%)	272 (34%)	529 (66%)	393 (37%)	675 (63%)
TOTAL	267 (100%)		801 (100%)		1068 (100%)	

C vs. E, $t = 4.118$, 1066 df, $p < .01$
CNS vs. CS, $t = -79.958$, 799 df, $p < .01$
CNS vs. ENS, $t = -1.333$, 673 df, $p = $ n.s.
CNS vs. ES, $t = -81.373$, 648 df, $p < .01$
CS vs. ENS, $t = 43.534$, 416 df, $p < .01$
CS vs. ES, $t = -2.412$, 391 df, $p = $ n.s.
ENS vs. ES, $t = -46.740$, 265 df, $p < .01$
$F = 2913.700$, 3 df, $p < .01$

*S = marijuana smokers
**NS = marijuana non-smokers

TABLE 1 A

Marijuana Smokers for Experimental
and Control Samples

	EXPERIMENTAL	CONTROL	TOTAL
Non-Smokers	146 (55%)	529 (66%)	675 (63%)
Smokers	121 (45%)	272 (34%)	393 (37%)
TOTAL	267 (100%)	801 (100%)	1068 (100%)

x^2 24.097 $p < .01$

TABLE 2

Sexual Distribution for Experimental
and Control Samples by Marijuana Use

SEX	EXPERIMENTAL		CONTROL		TOTAL	
	_S_	_NS_	_S_	_NS_	_S_	_NS_
Male	110 (91%)	126 (86%)	252 (93%)	453 (86%)	362 (92%)	579 (86%)
Female	11 (9%)	20 (14%)	20 (7%)	76 (14%)	31 (8%)	96 (14%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267 (100%)		801 (100%)		1068 (100%)	

x^2 9.801, p < .05

(total males equalled 941 (88%) with 127 (12%) females)

TABLE 3

Age Evaluations for Experimental
And Control Samples by Marijuana Use

AGE	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
≤19	31 (26%)	18 (12%)	100 (37%)	52 (10%)	131 (33%)	70 (10%)
20-29	67 (55%)	40 (27%)	134 (49%)	186 (35%)	201 (51%)	226 (33%)
30-39	20 (16%)	26 (18%)	33 (12%)	103 (20%)	53 (13%)	129 (19%)
40-49	2 (2%)	30 (21%)	4 (2%)	89 (17%)	6 (2%)	119 (18%)
50-59	1 (1%)	14 (10%)	1 (0%)	50 (9%)	2 (1%)	64 (10%)
60-69	—	9 (6%)	—	26 (5%)	—	35 (5%)
70-79	—	9 (6%)	—	23 (4%)	—	32 (5%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267 (100%)		801 (100%)		1068 (100%)	
Mean age	23.6	38.1	23.1	36.0	23.3	36.8
Median age	22.0	35.5	21.0	32.0	21.0	33.1
Standard Deviation	6.3	16.2	6.0	14.9	6.2	15.1
Range	16-53	16-79	17-58	17-78	16-58	16-78

C vs. E, t = -0.129, 1066 df, p = n.s.
CNS vs. CS, t = 13.668, 799 df, p < .01
CNS vs. ENS, t = -1.434, p = n.s.
CNS vs. ES, t = 8.955, 648 df, p < .01
CS vs. ENS, t = -13.533, 416 df, p < .01
CS vs. ES, t = -0.720, p = n.s.
ENS vs. ES, t = 9.233, 265 df, p < .01
F = 90.774, 3 df, p < .01

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TABLE 4

Marital Status Distribution for Experimental
and Control Samples by Marijuana Use

MARITAL STATUS	EXPERIMENTAL		CONTROL		TOTAL	
	_S_	_NS_	_S_	_NS_	_S_	_NS_
Single	87 (72%)	48 (33%)	207 (76%)	211 (40%)	294 (75%)	259 (38%)
Married	17 (14%)	76 (52%)	55 (20%)	277 (52%)	72 (18%)	353 (52%)
Common law	3 (2%)	1 (1%)	1 (0%)	—	4 (1%)	1 (1%)
Widowed	—	5 (3%)	—	16 (3%)	—	21 (3%)
Divorced	7 (6%)	10 (7%)	8 (4%)	18 (4%)	15 (4%)	28 (4%)
Separated	7 (6%)	6 (4%)	1 (0%)	7 (1%)	8 (2%)	13 (2%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267 (100%)		801 (100%)		1068 (100%)	

χ^2 80.647, p < .01 χ^2 101.854, p < .01

TABLE 5

Educational Levels for Experimental and Control Samples by Marijuana Use

EDUCATIONAL LEVEL	EXPERIMENTAL		CONTROL		TOTAL	
	S	*NS*	*S*	*NS*	*S*	*NS*
1. Graduate level	1 (1%)	7 (5%)	41 (15%)	78 (15%)	42 (11%)	85 (13%)
2. College graduate	6 (5%)	12 (8%)	59 (22%)	98 (19%)	65 (16%)	110 (16%)
3. Partial college	30 (25%)	19 (13%)	67 (25%)	87 (16%)	97 (25%)	106 (16%)
4. High school	51 (42%)	70 (48%)	77 (28%)	171 (32%)	128 (33%)	241 (36%)
5. Partial high school	27 (22%)	28 (19%)	25 (9%)	56 (11%)	52 (13%)	84 (12%)
6. Junior high school	5 (4%)	5 (3.5%)	1 (0%)	23 (4%)	6 (1%)	28 (4%)
7. ≤7 years	1 (1%)	5 (3.5%)	2 (1%)	16 (3%)	3 (1%)	21 (3%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	
Educational Mean:	3.9	3.9	2.9	3.3	3.2	3.4

C vs. E, $t = 7.626$, 1066 df, $p < .01$
CNS vs. CS, $t = 2.951$, 799 df, $p = $ n.s.
CNS vs. ENS, $t = -4.522$, 673 df, $p < .01$
CNS vs. ES, $t = -4.507$, 648 df, $p < .01$
CS vs. ENS, $t = -7.224$, 416 df, $p < .01$
CS vs. ES, $t = -7.417$, 391 df, $p < .01$
ENS vs. ES, $t = -0.244$, 265 df, $p = $ n.s.
$F = 22.745$, 3 df, $p < .01$

TABLE 6

Student Status for Experimental and
Control Samples by Marijuana Use

STUDENT STATUS	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
None	87 (72%)	131 (90%)	139 (51%)	421 (79%)	226 (58%)	552 (81%)
Part time	5 (4%)	2 (1%)	44 (16%)	36 (7%)	49 (12%)	38 (6%)
Full time	29 (24%)	13 (9%)	89 (33%)	72 (14%)	118 (30%)	85 (13%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

x^2 104.419, p < .01

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TABLE 7

Occupational Attainment for Experimental and Control Samples by Marijuana Use

OCCUPATIONAL ATTAINMENT	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
1. Executives, professionals, large owners, etc.	1 (1%)	9 (6%)	41 (15%)	78 (15%)	42 (11%)	87 (13%)
2. Business managers, lesser professionals	7 (6%)	10 (7%)	40 (15%)	73 (14%)	47 (12%)	83 (12%)
3. Administrators, medium owners	16 (13%)	22 (15%)	31 (11%)	72 (14%)	47 (12%)	94 (14%)
4. Clerks, technicians, small owners	31 (26%)	37 (25%)	56 (21%)	111 (21%)	87 (22%)	148 (22%)
5. Skilled manual employees	31 (26%)	39 (27%)	67 (25%)	111 (21%)	98 (25%)	150 (22%)
6. Semiskilled employees	15 (12%)	18 (12%)	23 (8%)	50 (9%)	38 (9.5%)	68 (10%)
7. Unskilled, welfare	20 (16%)	11 (8%)	14 (5%)	34 (6%)	34 (8.5%)	45 (7%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	
Occupational Mean:	4.7	4.3	3.7	3.7	4.0	3.8

C vs. E, $t = 6.220$, 1066 df, $p < .01$
CNS vs. CS, $t = 0.211$, 799 df, $p = n.s.$
CNS vs. ENS, $t = -3.297$, 673 df, $p < .01$
CNS vs. ES, $t = -5.728$, 648 df, $p < .01$
CS vs. ENS, $t = -3.248$, 416 df, $p < .01$
CS vs. ES, $t = -5.599$, 391 df, $p < .01$
ENS vs. ES, $t = -2.482$, 265 df, $p = n.s.$
$F = 14.567$, 3 df, $p < .01$

TABLE 8

Physical Health Histories for Experimental and Control Samples by Marijuana Use

PHYSICAL HEALTH	EXPERIMENTAL		CONTROL		TOTAL	
	_S_	_NS_	_S_	_NS_	_S_	_NS_
Good/ Excellent	103 (85%)	105 (72%)	264 (97%)	483 (91%)	367 (93%)	588 (87%)
Fair	14 (12%)	33 (23%)	7 (3%)	41 (8%)	21 (5%)	74 (11%)
Poor	4 (3%)	8 (5%)	1 (0%)	5 (1%)	5 (2%)	13 (2%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

x^2 71.594, p < .01

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TABLE 9

Cigarette Smoking Patterns for Experimental and Control Sample by Marijuana Use

CIGARETTE SMOKING PATTERNS	EXPERIMENTAL		CONTROL		TOTAL	
	S	*NS*	*S*	*NS*	*S*	*NS*
None	33 (27%)	56 (38%)	129 (47%)	295 (56%)	162 (41%)	351 (52%)
≤39 daily	57 (47%)	63 (43%)	90 (33%)	167 (31%)	147 (37%)	230 (34%)
≥40 daily	31 (26%)	27 (19%)	53 (20%)	67 (13%)	84 (22%)	94 (14%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

χ^2 3.891, p < .05 χ^2 4.685, p < .05

χ^2 10.936, p < .01

TABLE 10

Psychological Treatment Health Histories for Experimental and Control Samples by Marijuana Use

PSYCHOLOGICAL HISTORIES	EXPERIMENTAL		CONTROL		TOTAL	
	_S_	_NS_	_S_	_NS_	_S_	_NS_
None known	98 (81%)	128 (88%)	215 (79%)	466 (88%)	313 (80%)	594 (88%)
Outpatient	16 (13%)	9 (6%)	54 (20%)	56 (11%)	70 (18%)	65 (10%)
Inpatient	2 (2%)	4 (3%)	3 (1%)	6 (1%)	5 (1%)	10 (1%)
Both	5 (4%)	5 (3%)	—	1 (0%)	5 (1%)	6 (1%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

C vs. E, $t = 2.510$, 1066 df, $p < .05$
CNS vs. CS, $t = -2.824$, 799 df, $p < .05$
CNS vs. ES, $t = -3.313$, 648 df, $p < .01$

All other pairs non-significant.

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TABLE 11

Known Suicide Attempt Histories for Experimental and Control Samples by Marijuana Use

SUICIDE HISTORY	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
None known	100 (83%)	133 (91%)	256 (94%)	520 (98%)	356 (91%)	653 (97%)
Attempts known	21 (17%)	13 (9%)	16 (6%)	9 (2%)	37 (9%)	22 (3%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

χ^2 51.053, p < .01

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TABLE 12

Leisure Time Companions for Experimental and
Control Samples by Marijuana Use

LEISURE COMPANIONS	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
None	10 (8%)	23 (16%)	28 (10%)	50 (9%)	38 (10%)	73 (11%)
Family	13 (11%)	71 (49%)	53 (20%)	249 (47%)	66 (17%)	320 (47%)
Friends	98 (81%)	52 (35%)	191 (70%)	230 (44%)	289 (73%)	282 (42%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

χ^2 128.523, p < .01

TABLE 13

Alcohol Use Patterns for Experimental and
Control Samples by Marijuana Use

ALCOHOL USE PATTERNS	EXPERIMENTAL		CONTROL		TOTAL	
	S	*NS*	*S*	*NS*	*S*	*NS*
Abstainer	1 (1%)	21 (14.5%)	17 (6%)	90 (17%)	18 (4%)	111 (16%)
Light social	45 (37%)	60 (41%)	38 (14%)	158 (30%)	83 (21%)	218 (32%)
Moderate social	27 (22%)	29 (20%)	122 (45%)	197 (37%)	149 (38%)	226 (34%)
Heavy social	34 (28%)	21 (14.5%)	74 (27%)	66 (12%)	108 (28%)	87 (13%)
Sporadic binge	8 (7%)	5 (3%)	6 (2%)	3 (1%)	14 (4%)	8 (1%)
Alcohol abuser	6 (5%)	10 (7%)	15 (6%)	15 (3%)	21 (5%)	25 (4%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

C vs. E, t = 1.491, 1066 df, p = n.s.
CNS vs. CS, t = -7.625, 799 df, p < .01
CNS vs. ENS, t = -1.218, 673 df, p = n.s.
CNS vs. ES, t = -5.178, 648 df, p < .01
CS vs. ENS, t = 4.075, 416 df, p < .01
CS vs. ES, t = 0.354, 391 df, p = n.s.
ENS vs. ES, t = -2.905, 265 df, p < .05
F = 22.185, 3 df, p < .01

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TABLE 14

Historic Alcohol and Marijuana Use Patterns for Smokers during Previous Year

ALCOHOL USE PATTERNS	EXPERIMENTAL SMOKERS			CONTROL SMOKERS			TOTAL SMOKERS		
	Light	Moderate	Heavy	Light	Moderate	Heavy	Light	Moderate	Heavy
Abstainer	1 (10%)	—	—	3 (13%)	7 (7%)	7 (5%)	4 (12%)	7 (4%)	7 (3%)
Light social	6 (60%)	27 (43%)	12 (24%)	2 (8%)	18 (18%)	18 (12%)	8 (23%)	45 (28%)	30 (15%)
Moderate social	—	11 (18%)	16 (33%)	13 (54%)	47 (46%)	62 (42%)	13 (38%)	58 (35%)	78 (40%)
Heavy social	2 (20%)	17 (27%)	15 (31%)	5 (21%)	22 (22%)	47 (32%)	7 (21%)	39 (24%)	62 (32%)
Sporadic binge	1 (10%)	4 (7%)	3 (6%)	1 (4%)	2 (2%)	3 (2%)	2 (6%)	6 (4%)	6 (3%)
Alcohol abuser	—	3 (5%)	3 (6%)	—	5 (5%)	10 (7%)	—	8 (5%)	13 (7%)
TOTAL	10 (100%)	62 (100%)	49 (100%)	24 (100%)	101 (100%)	147 (100%)	34 (100%)	163 (100%)	196 (100%)

χ^2 21.637, p < .05 χ^2 9.752, p = n.s. χ^2 13.580, p = n.s.

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TABLE 15

Frequency of Alcohol Use During Previous Year for
Experimental and Control Samples by Marijuana Use

ALCOHOL FREQUENCY	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
Never	3 (3%)	23 (16%)	16 (6%)	96 (18%)	19 (5%)	119 (18%)
Monthly	11 (9%)	27 (18%)	36 (13%)	86 (16%)	47 (12%)	113 (17%)
Weekly	55 (45%)	48 (33%)	104 (38%)	163 (31%)	159 (40%)	211 (31%)
Daily	52 (43%)	48 (33%)	116 (43%)	184 (35%)	168 (43%)	232 (34%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

x^2 49.942, $p < .01$

C vs. E, $t = 6.301$, 1066 df, $p < .01$

TABLE 16

Frequency of Alcohol Intoxication
During Previous Year

FREQUENCY ALCOHOL INTOXICATION	EXPERIMENTAL		CONTROL		TOTAL	
	S	*NS*	*S*	*NS*	*S*	*NS*
Never	6 (5%)	49 (34%)	45 (17%)	237 (45%)	51 (13%)	286 (42%)
1-2x	29 (24%)	32 (22%)	67 (25%)	154 (29%)	96 (24%)	186 (28%)
3-8x	33 (27%)	28 (19%)	53 (19%)	62 (12%)	86 (22%)	90 (13%)
Monthly	18 (15%)	11 (8%)	63 (23%)	48 (9%)	81 (21%)	59 (9%)
Weekly	26 (22%)	18 (12%)	35 (13%)	21 (4%)	61 (15%)	39 (6%)
>Weekly	9 (7%)	8 (5%)	9 (3%)	7 (1%)	18 (5%)	15 (2%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

x^2 49.942, $p < .01$

C vs. E, $t = 6.301$, 1066 df, $p < .01$
CNS vs. CS, $t = -10.296$, 799 df, $p < .01$
CNS vs. ENS, $t = -4.689$, 673 df, $p < .01$
CNS vs. ES, $t = -11.381$, 648 df, $p < .01$
CS vs. ENS, $t = 2.766$, 416 df, $p < .05$
CS vs. ES, $t = -2.963$, 391 df, $p < .05$
ENS vs. ES, $t = -4.729$, 265 df, $p < .01$
$F = 56.542$, 3 df, $p < .01$

TABLE 17

Frequency of Alcohol Intoxication and Frequency of Marijuana Smoking During Previous Year for Experimental and Control Smokers Only

ANNUAL FREQUENCY ALCOHOL INTOXICATION	EXPERIMENTAL SMOKERS			CONTROL SMOKERS			TOTAL SMOKERS		
	Light*	Moderate*	Heavy*	Light	Moderate	Heavy	Light	Moderate	Heavy
Never	2 (20%)	3 (5%)	1 (2%)	4 (17%)	22 (22%)	19 (13%)	6 (18%)	25 (15%)	20 (10%)
1-2x	3 (30%)	16 (26%)	10 (20%)	10 (42%)	28 (27%)	29 (20%)	13 (39%)	44 (27%)	39 (20%)
3-8x	2 (20%)	16 (26%)	15 (31%)	3 (12 %)	16 (16%)	34 (23%)	5 (15%)	32 (20%)	49 (25%)
Monthly	—	10 (16%)	8 (16%)	6 (25%)	23 (23%)	34 (23%)	6 (18%)	33 (20%)	42 (21%)
Weekly	1 (10%)	12 (19%)	13 (27%)	1 (4%)	10 (10%)	24 (16%)	2 (5%)	22 (14%)	37 (19%)
>Weekly	2 (20%)	5 (8%)	2 (4%)	—	2 (2%)	7 (5%)	2 (5%)	7 (4%)	9 (5%)
Subtotal	10 (100%)	62 (100%)	49 (100%)	24 (100%)	101 (100%)	147 (100%)	34 (100%)	163 (100%)	196 (100%)
TOTAL	121 (100%)			272 (100%)			393 (100%)		

x^2 12.19, p = n.s. x^2 15.556, p = n.s. x^2 13.986, p = n.s.

* Light = 3-8x; Moderate = Monthly-Weekly; Heavy = >Weekly

TABLE 18

Marijuana Smoking Patterns and Problem Drinker Evaluations During Previous
Year for Experimental and Control Sample Smokers

PROBLEM DRINKER EVALUATIONS

MARIJUANA SMOKING PATTERNS	EXPERIMENTAL			CONTROL			TOTAL		
	Prob.	Social	Abst.	Prob.	Social	Abst.	Prob.	Social	Abst.
Light	3 (5%)	6 (10%)	1 (100%)	6 (7%)	15 (9%)	3 (18%)	9 (6%)	21 (9%)	4 (22%)
Moderate	29 (49%)	33 (54%)	—	28 (34%)	66 (38%)	7 (41%)	57 (40%)	99 (42%)	7 (39%)
Heavy	27 (46%)	22 (36%)	—	49 (59%)	91 (53%)	7 (41%)	76 (54%)	113 (49%)	7 (39%)
Subtotal	59 (100%)	61 (100%)	1 (100%)	83 (100%)	172 (100%)	17 (100%)	142 (100%)	233 (100%)	18 (100%)
TOTAL	121 (100%)			272 (100%)			393 (100%)		

χ^2 12.851, p < .05 χ^2 3.090, p = n.s.

TABLE 19

Street/Entertainment Drug Use or Experimentation and Marijuana Smoking

Patterns for Experimental and Control Sample Smokers

MARIJUANA SMOKING PATTERNS

STREET/ENTER- TAINMENT DRUG USE	EXPERIMENTAL SMOKERS			CONTROL SMOKERS			TOTAL SMOKERS		
	Light	Moderate	Heavy	Light	Moderate	Heavy	Light	Moderate	Heavy
None known	4 (40%)	20 (32%)	6 (12%)	17 (71%)	64 (63%)	48 (33%)	21 (62%)	84 (52%)	54 (28%)
Some known	6 (60%)	42 (68%)	43 (88%)	7 (29%)	37 (37%)	99 (67%)	13 (38%)	79 (48%)	142 (72%)
Subtotal	10 (100%)	62 (100%)	49 (100%)	24 (100%)	101 (100%)	147 (100%)	34 (100%)	163 (100%)	196 (100%)
TOTAL	121 (100%)			272 (100%)			393 (100%)		

x^2 7.231, p < .05 x^2 28.433, p < .01

TABLE 19 A

Street/Entertainment Drug Use and Marijuana Use
for Experimental and Control Samples

STREET DRUG USE	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
Yes	91 (75%)	4 (3%)	143 (53%)	34 (6%)	234 (60%)	38 (6%)
No	30 (25%)	142 (97%)	129 (47%)	495 (94%)	159 (40%)	637 (94%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

CS vs. ES, χ^2 16.881, p < .01
CS vs. CNS, χ^2 219.542, p < .01
CS vs. ENS, χ^2 101.307, p < .01

TABLE 20

Street/Entertainment Drug Use or Experimentation Breakdown
and Marijuana Smoking Patterns for Control Sample

MARIJUANA SMOKING PATTERNS	STREET/ENTERTAINMENT DRUG USE-EXPERIMENTATION				
	LSD, Mescaline, Psylicibin	Speed	Downs, Bar-biturates, Quaaludes	Amyl Nitrates	Other Drugs
None	5 (5%)	16 (15%)	6 (7%)	1 (3%)	1 (2%)
Experi-mental (1-2x)	4 (4%)	7 (7%)	4 (4%)	2 (6%)	1 (2%)
Light (3-8x)	7 (6%)	5 (5%)	6 (7%)	1 (3%)	1 (2%)
Moderate (Monthly)	7 (6%)	9 (8%)	9 (10%)	4 (12%)	4 (10%)
Moderate (Weekly)	39 (36%)	31 (30%)	29 (31%)	12 (36%)	12 (29%)
Heavy (≥2x weekly)	46 (43%)	36 (35%)	37 (41%)	13 (40%)	23 (55%)
TOTAL	108 (100%)	104 (100%)	91 (100%)	33 (100%)	42 (100%)
	x^2 36.283, p < .01	x^2 19.701, p < .01	x^2 19.998, p < .01	x^2 5.992, p = n.s.	x^2 21.430, p < .01

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TABLE 21

Marijuana Smokers' Alcohol Use Patterns and Street/Entertainment Drug
Use or Experimentation for Experimental and Control Samples

ALCOHOL USE PATTERNS	EXPERIMENTAL SMOKERS		CONTROL SMOKERS		ALL SMOKERS	
	Street Drugs Yes	No	Street Drugs Yes	No	Street Drugs Yes	No
Abstainer	—	1 (3%)	10 (7%)	7 (6%)	10 (4%)	8 (5%)
Light social	39 (43%)	6 (20%)	17 (12%)	21 (16%)	56 (24%)	27 (17%)
Moderate social	18 (20%)	9 (30%)	66 (46%)	56 (43%)	84 (36%)	65 (41%)
Heavy social	22 (24%)	12 (40%)	34 (24%)	40 (31%)	56 (24%)	52 (33%)
Sporadic binge	8 (9%)	—	6 (4%)	—	14 (6%)	—
Alcohol abuser	4 (4%)	2 (7%)	10 (7%)	5 (4%)	14 (6%)	7 (4%)
Subtotal	91 (100%)	30 (100%)	143 (100%)	129 (100%)	234 (100%)	159 (100%)
TOTAL	121		272		393	
	χ^2 13.916, $p < .01$		χ^2 18.871, $p < .01$		χ^2 16.881, $p < .01$	

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TABLE 22

License Suspensions for Experimental and Control Samples by Marijuana Use

SUSPENSIONS	EXPERIMENTAL		CONTROL		TOTAL	
	S	NS	S	NS	S	NS
None	101 (83%)	135 (92%)	254 (93%)	501 (95%)	355 (90%)	636 (94%)
Some	20 (17%)	11 (8%)	18 (7%)	28 (5%)	38 (10%)	39 (6%)
Subtotal	121 (100%)	146 (100%)	272 (100%)	529 (100%)	393 (100%)	675 (100%)
TOTAL	267		801		1068	

x^2 18.778, p < .01

TABLE 23

Detailed Breakdown of Reported Frequency of Marijuana
Use and Estimated Level of Usual Intoxication for
Control Sample Smokers*

USUAL LEVEL OF INTOXICATION

FREQUENCY:	Mild "a buzz"	Moderate "quite stoned"	Severe "wiped out"	TOTAL
Light Smokers:				
<Monthly	7 (20%)	4 (2%)	—	11 (4%)
Moderate Smokers:				
Monthly	14 (40%)	30 (17%)	7 (21%)	51 (21%)
Weekly	4 (11%)	27 (16%)	2 (6%)	33 (14%)
Heavy Smokers:				
>Weekly	8 (23%)	87 (50%)	12 (37%)	107 (44%)
Daily	2 (6%)	24 (14%)	10 (30%)	36 (15%)
>Daily	—	2 (1%)	2 (6%)	4 (2%)
TOTAL	35 (100%)	174 (100%)	33 (100%)	242 (100%)

x^2 48.453, p < .01

* 30 admitted smoking operators included in the total control
sample refused to answer questions in the Marijuana Supple-
ment and are excluded from this table.

TABLE 24

Number of Years Using Marijuana and
Current Smoking Patterns for Control Sample Smokers

# YEARS SMOKING	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
<1	—	4 (5%)	4 (3%)	8 (3%)
1-2	3 (27%)	19 (23%)	25 (17%)	47 (19%)
3-4	3 (27%)	28 (33%)	64 (43%)	95 (39%)
5-6	1 (9%)	20 (24%)	32 (22%)	53 (22%)
7-8	1 (9%)	10 (12%)	10 (7%)	21 (9%)
9-10	2 (19%)	2 (2%)	8 (5%)	12 (5%)
11-12	—	—	1 (1%)	1 (1%)
>13	1 (9%)	1 (1%)	3 (2%)	5 (2%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

All tests for probability were non-significant.

Mean # years	5-6	3-4	3-4	3-4

TABLE 25

Amount of Marijuana Currently Judged Necessary
for Intoxication and Smoking Patterns
for Control Sample Smokers*

ESTIMATED AMOUNT FOR INTOXICATION	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
<1 joint	3 (27%)	13 (16%)	43 (29%)	59 (25%)
1 joint	5 (46%)	47 (56%)	79 (54%)	131 (54%)
2 joints	2 (18%)	23 (27%)	24 (16%)	49 (20%)
>2 joints	1 (9%)	1 (1%)	1 (1%)	3 (1%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

L vs. M, $t = -0.838$, 93 df, $p = $ n.s.
L vs. H, $t = -2.085$, 156 df, $p = $ n.s.
M vs. H, $t = -3.492$, 229 df, $p < .01$
    $F = 3.809$, 2 df, $p < .05$

* local amounts change depending on varying strengths of available supply.

TABLE 26

Length of Marijuana Intoxication and
Smoking Patterns for Control Sample

LENGTH OF INTOXICATION BY HOURS	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
<1	3 (27%)	5 (6%)	2 (1%)	10 (4%)
1-2	5 (46%)	45 (54%)	55 (38%)	105 (43%)
2-3	1 (9%)	32 (38%)	76 (52%)	109 (45%)
3-4	2 (18%)	2 (2%)	10 (7%)	14 (6%)
4-5	—	—	2 (1%)	2 (1%)
>5	—	—	2 (1%)	2 (1%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

L vs. M, t = -0.838, 93 df, p = n.s.
L vs. H, t = -2.085, 156 df, p = n.s.
M vs. H, t = -3.492, 229 df, p < .01
    F = 7.373, 2 df, p < .01

TABLE 27

Some Reasons for Smoking Marijuana and
Smoking Patterns for Control Sample Smokers*

SOME SMOKING REASONS	MARIJUANA SMOKING PATTERNS			TOTAL N-242
	Light N=11	Moderate N=84	Heavy N=147	
1. To relax	5 (45%)	46 (55%)	113 (77%)	164 (68%)
2. To make me more sociable	2 (18%)	33 (39%)	46 (31%)	81 (33%)
3. To get away from pressures	4 (36%)	26 (31%)	83 (56%)	113 (47%)
4. Because my friends smoke	4 (36%)	45 (54%)	47 (32%)	96 (40%)
5. To improve appetite/taste of food	3 (27%)	4 (5%)	17 (12%)	24 (10%)
6. Because of social pressure	3 (27%)	21 (25%)	24 (16%)	48 (20%)
7. Enjoy getting high	3 (27%)	16 (19%)	31 (21%)	50 (21%)

* only positive responses scored

TABLE 28

Time of Week Preferred for Smoking and Current Smoking
Patterns for Control Sample Smokers

TIME PREFERRED	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Weekends	5 (45%)	63 (75%)	38 (26%)	106 (44%)
Weekdays	1 (10%)	3 (3%)	44 (30%)	48 (20%)
Both	5 (45%)	18 (22%)	65 (44%)	88 (36%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

χ^2 84.942, p < .01

TABLE 29

Time of Day Preferred for Marijuana Intoxication
and Smoking Patterns for Control Sample Smokers

| PREFERRED TIME OF DAY | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
6 a.m. - Noon	—	1 (1%)	3 (2%)	4 (2%)
Noon - 6 p.m.	—	2 (3%)	4 (3%)	6 (2%)
6 p.m. - Midnight	11 (100%)	80 (95%)	138 (94%)	229 (95%)
Midnight - 6 a.m.	—	1 (1%)	2 (1%)	3 (1%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

x^2 136.081, p < .01

TABLE 30

Social Pressures to Smoke or Drink More and Smoking Patterns for Control Sample Smokers

SOCIAL PRESSURES	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Drink more	2 (18%)	21 (25%)	57 (39%)	80 (33%)
Smoke more	2 (18%)	11 (13%)	6 (4%)	19 (8%)
Both	2 (18%)	20 (24%)	17 (12%)	39 (16%)
No pressures	5 (46%)	32 (38%)	67 (45%)	104 (43%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

χ^2 19.861, p < .01

TABLE 31

Social Pressures to Smoke or Drink Less and
Smoking Patterns for Control Sample Smokers

| SOCIAL PRESSURES | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Drink less	2 (18%)	19 (23%)	30 (20%)	51 (21%)
Smoke less	1 (9%)	6 (7%)	11 (8%)	18 (7%)
Both	2 (18%)	6 (7%)	8 (5%)	16 (7%)
No pressures	6 (55%)	53 (63%)	98 (67%)	157 (65%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

χ^2 13.869, p < .05

129

TABLE 32

Changes in Smoking Frequency Over Past Year and
Smoking Patterns for Control Sample Smokers

MARIJUANA SMOKING PATTERNS

SMOKING CHANGES	Light	Moderate	Heavy	TOTAL
Smoke less	8 (73%)	40 (48%)	41 (28%)	89 (37%)
Smoke same	3 (27%)	31 (37%)	55 (37%)	89 (37%)
Smoke more	—	13 (15%)	51 (35%)	64 (26%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

χ^2 20.506, p < .01

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TABLE 33

Self Reports of Combined Alcohol and
Marijuana Use and Smoking Patterns
for Control Sample Smokers

SELF REPORTS OF	MARIJUANA SMOKING PATTERNS			
COMBINED USE	Light	Moderate	Heavy	TOTAL
Never	3 (27%)	17 (20%)	16 (11%)	36 (15%)
Seldom	5 (46%)	53 (63%)	91 (62%)	149 (62%)
Frequently	3 (27%)	10 (12%)	36 (24%)	49 (20%)
Always	—	4 (5%)	4 (3%)	8 (3%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

x^2 10.349, p = n.s.

TABLE 34

Preferred Intoxicant, Current Smoking Pattern and Pattern of
Alcohol Use for Control Sample Smokers

ALCOHOL USE PATTERN	ALCOHOL PREFERENCE MARIJUANA SMOKING PATTERNS			MARIJUANA PREFERENCE MARIJUANA SMOKING PATTERNS			PREFERENCE TOTAL	
	Light	Moderate	Heavy	Light	Moderate	Heavy	Alcohol	Marijuana
Abstainer	—	—	—	1 (100%)	6 (17%)	7 (6%)	—	14 (9%)
Light social	1 (10%)	6 (13%)	1 (4%)	—	7 (19%)	17 (14%)	8 (10%)	24 (15%)
Moderate social	7 (70%)	20 (42%)	4 (18%)	—	17 (47%)	58 (47%)	31 (38%)	75 (47%)
Heavy social	2 (20%)	15 (31%)	12 (52%)	—	6 (17%)	35 (28%)	29 (36%)	41 (25%)
Sporadic binge	—	2 (4%)	1 (4%)	—	—	2 (1%)	3 (4%)	2 (1%)
Alcohol abuser	—	5 (10%)	5 (22%)	—	—	5 (4%)	10 (12%)	5 (3%)
TOTAL	10 (100%)	48 (100%)	23 (100%)	1 (100%)	36 (100%)	124 (100%)	81 (100%)	161 (100%)
	N = 81 (33%)			N = 161 (67%)			N = 242 (100%)	

Light x^2 N/C; Moderate x^2 15.785, p < .01; Heavy x^2 19.791, p < .01

TABLE 35

Fears of Legal Apprehension by Number of Years
Smoking for Control Sample Smokers

| LEGAL FEARS | NUMBER OF YEARS SMOKING | | | | TOTAL |
	1 - 2	3 - 4	5 - 6	≥7	
None	31 (57%)	66 (70%)	34 (64%)	26 (67%)	157 (65%)
Some of the time	20 (36%)	28 (29%)	18 (34%)	13 (33%)	79 (33%)
Always	4 (7%)	1 (1%)	1 (2%)	—	6 (2%)
TOTAL	55 (100%)	95 (100%)	53 (100%)	39 (100%)	242 (100%)

χ^2 6.216, p = n.s.

TABLE 36

Comparative Vision When Marijuana Intoxicated
by Smoking Patterns by Control Smokers' Self Reports

| COMPARATIVE VISION | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Easier to see	1 (9%)	24 (29%)	44 (30%)	69 (28%)
The same	4 (36%)	32 (38%)	60 (41%)	96 (40%)
Harder to see	6 (55%)	28 (33%)	43 (29%)	77 (32%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = 0.992, p = n.s.

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TABLE 37

Comparative Hearing Capacities When Marijuana Intoxicated by Smoking Patterns by Control Sample Smokers' Self Reports

| COMPARATIVE HEARING | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Hear better	6 (55%)	47 (56%)	78 (53%)	131 (54%)
The same	2 (18%)	17 (20%)	36 (25%)	55 (23%)
Hear worse	3 (27%)	20 (24%)	33 (22%)	56 (23%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = -0.089, p = n.s.

TABLE 38

Evaluations of Comparative Creative Thinking Abilities
When Marijuana Intoxicated by Smoking Patterns
by Control Smokers' Self Reports

| CREATIVE THINKING ABILITIES | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Easier to think creatively	3 (28%)	51 (61%)	115 (78%)	169 (70%)
The same	4 (36%)	15 (18%)	16 (11%)	35 (14%)
Harder	4 (36%)	18 (21%)	16 (11%)	38 (16%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = 3.481, 240 df, p < .01

TABLE 39

Comparative Memory Function When Marijuana Intoxicated
by Smoking Patterns by Control Smokers' Self Reports

MEMORY FUNCTION EVALUATIONS	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Easier to remember	1 (9%)	10 (12%)	6 (4%)	17 (7%)
The same	1 (9%)	12 (14%)	36 (25%)	49 (20%)
Harder	9 (82%)	62 (74%)	105 (71%)	176 (73%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = -0.524, p = n.s.

137

TABLE 40

Comparative Ability to Concentrate on a Job or a Project
When Marijuana Intoxicated by Smoking Patterns
by Control Smokers' Self Reports

COMPARATIVE CONCENTRATION ABILITY	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Concentrate easier	2 (18%)	12 (14%)	33 (23%)	47 (19%)
The same	1 (9%)	15 (18%)	34 (23%)	50 (21%)
More difficult	8 (73%)	57 (68%)	80 (54%)	145 (60%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = 2.089, 240 df, p < .05

TABLE 41

Comparative Distraction Ease When Marijuana Intoxicated
by Smoking Patterns by Control Sample Smokers' Self Reports

| DISTRACTION EASE | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Distracted easier	9 (82%)	52 (62%)	96 (65%)	157 (65%)
The same	1 (9%)	11 (13%)	17 (12%)	29 (12%)
Harder	1 (9%)	21 (25%)	34 (23%)	56 (23%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

$t = 0.101$, $p = $ n.s.

TABLE 42

Comparative Susceptibility to Personal Anger,
Hostility or Aggressiveness When Marijuana Intoxicated
by Smoking Patterns by Control Sample Smokers' Self Reports

| ANGER SUSCEPTIBILITY | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Angered easier	—	8 (9%)	14 (9%)	22 (9%)
The same	3 (27%)	10 (12%)	17 (12%)	30 (12%)
Harder	8 (73%)	66 (79%)	116 (79%)	190 (79%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = 0.010, p = n.s.

140

TABLE 43

Comparable Ability to Make Sudden Decisions When
Marijuana Intoxicated by Smoking Patterns by
Control Sample Smokers' Self Reports

SUDDEN DECISION MAKING ABILITY	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Easier to make sudden decisions	—	11 (13%)	21 (14%)	32 (13%)
The same	1 (9%)	12 (14%)	25 (17%)	38 (16%)
Harder	10 (91%)	61 (73%)	101 (69%)	172 (71%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = 0.929, p = n.s.

TABLE 44

Comparative Tendency to Make Foolish or Impulsive
Decisions When Marijuana Intoxicated by Smoking Patterns
by Control Smokers' Self Reports

IMPULSIVE DECISION EASE	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Easy to make impulsive decisions	7 (64%)	68 (81%)	108 (73%)	183 (76%)
The same	—	8 (9.5%)	19 (13%)	27 (11%)
Harder	4 (36%)	8 (9.5%)	20 (14%)	32 (13%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = -0.692, 240 df, p = n.s.

TABLE 45

Comparative Ability to Make Sudden Physical Movements When
Marijuana Intoxicated by Smoking Patterns by
Control Smokers' Self Reports

SUDDEN PHYSICAL MOVEMENT ABILITY	MARIJUANA SMOKING PATTERNS			TOTAL
	Light	Moderate	Heavy	
Easier to make sudden physical movements	—	5 (6%)	16 (11%)	21 (9%)
The same	1 (9%)	14 (17%)	27 (18%)	42 (17%)
Harder	10 (91%)	65 (77%)	104 (71%)	179 (74%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

t = 1.662, p = n.s.

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TABLE 46

Operators' Self Evaluations Regarding Driving Abilities When
Marijuana Intoxicated and Smoking Patterns
for Control Sample Smokers

| DRIVING EVALUATION | MARIJUANA SMOKING PATTERNS | | | TOTAL |
	Light	Moderate	Heavy	
Drive better	2 (18%)	4 (5%)	14 (10%)	20 (8%)
Drive the same	4 (37%)	31 (37%)	56 (38%)	91 (38%)
Drive worse	5 (45%)	49 (58%)	77 (52%)	131 (54%)
TOTAL	11 (100%)	84 (100%)	147 (100%)	242 (100%)

L vs. M, t = 1.336, 93 df, p = n.s.
L vs. H, t = 0.743, 156 df, p = n.s.
M vs. H, t = -1.230, 229 df, p = n.s.
    F = 1.221, 2df, p = n.s.

TABLE 47

Control Smoker Self Evaluations Regarding Driving Risk When Marijuana Sober and When
Marijuana Intoxicated for Selected Driving Situations

DRIVING SITUATION	Positive Responses "when sober"	Positive Responses "when intoxicated"	SITUATIONAL RISK CHANGE			t=	Change Probability
			Less Risk(-)	Same Risk(±)	More Risk(+)		
1. To let off steam	162 (67%)	183 (76%)	26	169	47	2.484	p < .05
2. After drinking a little**	127 (56%)	210 (87%)	7	131	90	10.134	p < .01
3. After drinking too much**	215 (94%)	228 (100%)	4	207	17	2.882	p < .01
4. After using street/enter- tainment drugs*	129 (90%)	138 (97%)	3	123	12	2.362	p < .01
5. In bad weather	111 (46%)	178 (74%)	11	153	78	7.966	p < .01
6. Early in the evening	36 (15%)	76 (31%)	9	184	49	5.568	p < .01
7. Late at night	35 (14%)	108 (45%)	7	155	80	9.037	p < .01

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TABLE 47 (CONT.)

DRIVING SITUATION	Positive Responses "when sober"	Positive Responses "when intoxicated"	SITUATIONAL RISK CHANGE				
			Less Risk(-)	Same Risk(±)	More Risk(+)	t=	Change Probability
8. Alone	22 (9%)	98 (41%)	2	162	78	10.123	p < .01
9. In heavy traffic	67 (28%)	187 (77%)	2	118	122	14.911	p < .01
10. After an argument	153 (63%)	181 (75%)	25	164	53	3.232	p < .01
11. When late for an appointment	146 (60%)	165 (68%)	24	175	43	2.343	p < .01
12. When tired	183 (76%)	211 (87%)	14	186	42	3.847	p < .01
13. On an unfamiliar road	71 (29%)	190 (79%)	3	117	122	14.564	p < .01
14. An unfamiliar vehicle	75 (31%)	178 (74%)	3	131	107	12.861	p < .01

* basic figure includes only operators who admit to having used street/entertainment drugs.

** basic figure includes only operators who admit to using alcohol.

TABLE 48

Breakdown of Experimental Smokers With Respect for

Categories for 43 Operators With Focal Marijuana Influence

EXPERIMENTAL SMOKERS WITH NO KNOWN FOCAL MARIJUANA INFLUENCE		78 (64%)
EXPERIMENTAL SMOKERS WITH KNOWN FOCAL MARIJUANA INFLUENCE		43 (36%)
	TOTAL	121 (100%)

FOCAL MARIJUANA DISTRIBUTION

Only focal marijuana		13 (30%)
Only focal marijuana and alcohol*		25 (58%)
Only focal marijuana and alcohol* and other drugs**		5 (12%)
	TOTAL	43 (100%)

*focal alcohol influence is a BAC $\geq$.05 gm/100ml %, if available, or a clinical evaluation of the same

** "other drugs" include pharmaceutical and/or street or entertainment drugs

Note: The experimental sample included 121 (45%) marijuana smokers and 146 (55%) non-smokers

TABLE 49

Accident Type for 43 Operators With Focal Accident

Marijuana Influence and Other Experimental Operators

ACCIDENT TYPE	EXPERIMENTAL SAMPLE		TOTAL
	Focal Marijuana	No Focal Marijuana	
TYPE I focal operator killed	18 (42%)	85 (38%)	103 (38%)
TYPE II other vehicular occupant killed	20 (46%)	43 (19%)	63 (24%)
TYPE III pedestrian killed	5 (12%)	96 (43%)	101 (38%)
TOTAL	43 (100%)	224 (100%)	267 (100%)

χ^2 20.851, p<.01

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TABLE 50

Marijuana Smoking Patterns for 43 Operators With Focal

Marijuana Influence and Other Experimental and Control Smokers

MARIJUANA SMOKING PATTERNS	EXPERIMENTAL SMOKERS		CONTROL SMOKERS	TOTAL
	Focal Marijuana	No Focal Marijuana		
Light Smokers 3-8X	4 (9%)	6 (8%)	24 (9%)	34 (9%)
Moderate Smokers monthly to weekly	23 (54%)	39 (50%)	101 (37%)	163 (41%)
Heavy Smokers ≥2X weekly	16 (37%)	33 (42%)	147 (54%)	196 (50%)
TOTAL	43 (100%)	78 (100%)	272 (100%)	393 (100%)

$\chi^2 4.766$, p=n.s. (.093)

Problem Drinker Evaluations for 43 Operators With Focal Marijuana

Influence, Other Experimental Operators and Control Operators

ALCOHOL HISTORIES	EXPERIMENTAL SAMPLE				CONTROL SAMPLE			TOTAL
	Focal Marijuana Smokers	Non-focal Marijuana Smokers	Not Marijuana Smokers	Sub-Total .	Marijuana Smokers	Not Marijuana Smokers	Sub-Total .	
Problem Drinkers	23 (54%)	36 (46%)	47 (32%)	106 (40%)	83 (31%)	69 (13%)	152 (19%)	258 (24%)
Social Drinkers	19 (44%)	42 (54%)	78 (54%)	139 (52%)	172 (63%)	370 (70%)	542 (68%)	681 (64%)
Abstainers	1 (- 2%)	0 (0%)	21 (14%)	22 (8%)	17 (6%)	90 (17%)	107 (13%)	129 (12%)
TOTAL	43 (100%)	78 (100%)	146 (100%)	267 (100%)	272 (100%)	529 (100%)	801 (100%)	1068 (100%)

χ^2 3.413, p=n.s. (.065)
(excluding abstainers)

χ^2 5.285, p<.05
(excluding abstainers)

χ^2 54.669, p<.01
(excluding experimental
and control abstainers)

TABLE 52

Street/Entertainment Drug Familiarity for 43 Operators With

Focal Marijuana Influence, Other Experimental Operators and

Control Smokers

STREET/ ENTERTAINMENT DRUG FAMILIARITY	EXPERIMENTAL SMOKERS		CONTROL SMOKERS	TOTAL
	Focal Marijuana	No Focal Marijuana		
None known	10 (23%)	20 (26%)	129 (47%)	159 (40%)
Some known	33 (77%)	58 (74%)	143 (53%)	234 (60%)
TOTAL	43 (100%)	78 (100%)	272 (100%)	393 (100%)

χ^2 3.912, p=n.s. for experimental smokers only

χ^2 13.176, p<.01 between samples

TABLE 53

Day of Week of Fatal Accident for 43 Operators

With Focal Accident Marijuana Influence

| DAY OF WEEK | EXPERIMENTAL SAMPLE | | TOTAL |
	Focal Marijuana	No Focal Marijuana	
Monday	4 (9%)	33 (15%)	37 (14%)
Tuesday	1 (2%)	25 (11%)	26 (10%)
Wednesday	2 (5%)	33 (15%)	35 (13%)
Thursday	3 (7%)	27 (12%)	30 (11%)
Friday	12 (28%)	39 (17%)	51 (19%)
Saturday	13 (30%)	37 (17%)	50 (19%)
Sunday	8 (19%)	30 (13%)	38 (14%)
TOTAL	43 (100%)	224 (100%)	267 (100%)

χ^2 13.676, p<.05

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TABLE 54

Time of Day of Fatal Accident for 43 Operators

With Focal Accident Marijuana Influence

TIME OF DAY	EXPERIMENTAL SAMPLE Focal Marijuana	No Focal Marijuana	TOTAL
midnight to 6:00 AM	17 (40%)	68 (30%)	85 (32%)
6:01 AM to noon	4 (9%)	29 (13%)	33 (12%)
noon to 6:00 PM	5 (11%)	53 (24%)	58 (22%)
6:01 PM to midnight	17 (40%)	74 (33%)	91 (34%)
TOTAL	43 (100%)	224 (100%)	267 (100%)

χ^2 4.194, p=n.s.

TABLE 55

Human Factor Stress Items Known to Have Been Influencing

the 43 Operators With Focal Accident Marijuana Influence

HUMAN FACTOR STRESS ITEM	OPERATORS INFLUENCED
1. To let off steam or after an argument	34 (79%)
2. After drinking a little (BAC .01 to .04 gm/100ml % or a similar clinical evaluation)	3 (7%)
3. After drinking too much (BAC ≥.05 gm/100ml % or a similar clinical evaluation)	30 (70%)
4. After using street or entertainment drugs	3 * (7%)
5. Early in the evening (6:00 to 10:00 PM)	13 (30%)
6. Late at night (10:00 PM and following)	21 (49%)
7. Driving alone	17 (40%)
8. When late for an appointment/ tardiness	13 (30%)
9. When tired or fatigued	16 (37%)
10. Driving on an unfamiliar road	7 (16%)
11. Driving an unfamiliar vehicle	11 (26%)

* 5 operators were using "other drugs"
  including 2 with pharmaceuticals that
  had been prescribed and 3 with street/
  entertainment drugs

APPENDIX A

CASE # _____

HUMAN FACTOR INDEX
CONTROL SAMPLE DATA COLLECTION
BUTAR, 1975

Letter sent   _____
P & R rec'd   _____
HFI completed   _____
HFI checked   _____
HFI computerized   _____
By   _____
Supplement   _____

01. Sex:

   ___1 Female
   ___2 Male

02. Age: ___ ___

03. Categorized age:

   ___1 $\leq$19
   ___2 20-29
   ___3 30-39
   ___4 40-49
   ___5 50-59
   ___6 60-69
   ___7 70-79

04. Race:

   ___1 Caucasian
   ___2 Latin American
   ___3 Negroid
   ___4 Oriental
   ___5 Other: _____

05. Dominant ethnic background:

_____

   ___1 Anglo
   ___2 Irish
   ___3 Northern European
   ___4 Southern European
   ___5 Latin American
   ___6 African
   ___7 Near/Far Eastern
   ___8 Other: _____

06. Current marital status:

   ___1 Single
   ___2 Married
   ___3 Common law/Homosexual
   ___4 Widowed
   ___5 Divorced
   ___6 Separated
   ___7 Other: _____

07. How many times married:

   ___1 Single, never married
   ___2 Married, 1st marriage
   ___3 Married, 2nd marriage
   ___4 Married, 3rd marriage
   ___5 S D W from 1st marriage
   ___6 S D W from 2nd marriage
   ___7 Other: _____

08. Number of children: ___ ___

09. Highest level of education:

   ___1 Graduate, professional
        training
   ___2 College, university
        graduate
   ___3 Partial college
        training
   ___4 High school graduate
   ___5 Partial high school
        training
   ___6 Junior high school
   ___7 $\leq$7 years education

10. Student status:

   ___0 None
   ___1 Yes, part time
   ___2 Full time

11. Occupational attainment:
    (R11) _____

   ___1 Higher executive, etc.
   ___2 Business managers, etc.
   ___3 Administrators, etc.
   ___4 Clerical, sales, etc.
   ___5 Skilled manual employees
   ___6 Machine operators,
        semiskilled
   ___7 Unskilled, welfare,
        chronic unemployed

12. Number of job changes in past five years: ___ ___

13. Two Factor Index of Social Position

    Education × 7
    Occupation × 4

    ___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)

14. Number of siblings: ___ ___

15. Number of people living in present household (excluding interviewee):

    ___ ___

16. General physical health:

    ___1 Poor
    ___2 Fair
    ___3 Good/excellent

17. General practice re: medical advice (ever neglected MD advice or prescription directions)(R8):

    ___0 No
    ___1 Yes:_____

18. Cigarette smoking: (R6)

    ___0 None
    ___1 Some: ___(2 ppd___)

19. Chronic physical illness (heart, asthma, epilepsy, etc.)

    ___0 None
    ___1 Yes: _____

20. Correctional lenses for driving:

    ___0 No
    ___1 Yes

21. Leisure time usually spent: (R3)

    ___1 Alone
    ___2 With family
    ___3 With friends
    ___4 Other: _____

22. Number of close friends:

    ___0 None
    ___1 1-5
    ___2 6-10
    ___3 11-20
    ___4 21

23. Well-liked by peers:

    ___0 No
    ___1 Generally liked
    ___2 Always liked

24. More high strung or sensitive than most people

    ___0 No
    ___1 Yes

25. Received psychiatric treatment: _____

    ___0 None
    ___1 Outpatient only
    ___2 Inpatient only
    ___3 Both

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26. Reported suicide attempts: (R4)

___0 None
___1 Some: _____
_____

ALCOHOL:

27. Preferred alcoholic beverage:

___0 None, abstainer
___1 Wine
___2 Beer
___3 Whisky, scotch
___4 Other:_____
___5 Vodka
___6 No specific preference

28. Frequency of alcohol use:

___0 Never, very rarely
___1 1x per month or less
___2 Weekly
___3 Daily

29. Frequency of alcohol
influence (Dk):

___0 Never
___1 1-2x per year
___2 3-8x per year
___3 Monthly
___4 Weekly
___5 >1x per week

30. Parental alcohol problems:

___0 Neither
___1 Mother
___2 Father
___3 Both

31. Any guilt regarding alcohol
use:

___0 No
___1 Yes

32. Any social problems over
alcohol use:

___0 No
___1 Yes

33. Any personal attempt to
drink less:

___0 No
___1 Yes

34. Others encouraging to
drink less:

___0 No
___1 Yes

35. Others encouraging to
drink more:

___0 No
___1 Yes

36. Alcohol related job loss:

___0 No
___1 Yes

37. General alcohol use pattern:

___0 Abstainer
___1 Light social drinker
never drunken
___2 Moderate social drinker
seldom drunken
___3 Heavy social drinker
frequently drunken
___4 Sporadic, excessive
binge drinker
___5 Alcohol abuser (alcoholic)

38. (Problem drinker:)(R7)

___0 No
___1 Yes

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39. Boston Alcohol Safety
Action Project:

___0 Never heard of,
no contact
___1 Television, radio,
newspaper
___2 ASAP contact

40. Marijuana smoking pattern:
(R10)

___0 Never
___1 1-2x per year
___2 3-8x per year
___3 Monthly
___4 Weekly (___ weekend)
___5 >Weekly

41. Street/Entertainment drug
use:

___0 No, no answer
___1 Yes

42. Street/Entertainment drugs
used:

___a Hallucinogens (LSD,
mescaline, psylicibin,
peyote)
___b Amphetamines (speed, etc.)
___c Downs (barbiturates,
sopers, quaaludes, etc.)
___d Inhalants (amyl nitrate)
___e Other street drugs: _____
(heroin, cocaine, etc.)

43. Ever cited/arrested for
anything:

___0 No
___1 Yes

44. Number of years with a license
to operate a motor vehicle:

___ ___

45. License ever suspended/
revoked:

___0 No
___1 Yes: ___x

46. Ever arrested for DUIL:

___0 No
___1 Yes

47. Have you ever been the driver
of a car through which there
was an accident where someone
was injured and required
hospital care?

___0 No
___1 Yes: _____
_____

48. Formal driver's education:

___0 No
___1 Yes

49. Do you own a car or regularly
drive one automobile:

___0 No
___1 Yes

50. Normal use of seat belts/
restraints: (R2)

___0 No
___1 Yes

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51. Which of the following items would you consider to be high risk items for you personally, when driving a car?

___a Driving to let off steam
___b Driving after drinking a little
___c Driving after drinking too much
___d Driving after smoking marijuana
___e Driving after using other drugs
___f Driving in bad weather
___g Driving early in the evening
___h Driving late at night
___i Driving alone
___j Driving in heavy traffic
___k Driving after a serious argument
___l Driving when late for an appointment
___m Driving when tired or fatigued
___n Driving on an unfamiliar road
___o Driving an unfamiliar car/vehicle

52. Risk Taking Behavior Scale:

___1 $\geq$2 citations for speeding or driving to endanger
___2 Normal non-use of seat belts
___3 Auto/motorcycle racing; scuba diving; mountain climbing, etc.
___4 $\geq$1 suicide attempts
___5 Abusing advice of LMD or hospital
___6 Smoking $\geq$40 cigarettes daily
___7 Problem drinker history
___8 Abusing pharmaceuticals
___9 Using street drugs
___10 Marijuana use ($\geq$3x)
___11 Employment hazardry

53. Rater evaluation:

___0 Totally unreliable
___1 Apparently reliable
___2 Very reliable

54. Human Factor Associate:

___1 Graham
___2 Selfridge
___3 Sterling
___4 Wallace
___5 Yellin

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APPENDIX B

MARIJUANA SUPPLEMENT

01. Number of years smoking marijuana:

    ___1 <1 yr   ___5 7-8 yrs
    ___2 1-2 yrs   ___6 9-10 yrs
    ___3 3-4 yrs   ___7 11-12 yrs
    ___4 5-6 yrs   ___8 >13 yrs

02. Frequency of marijuana use:

    ___1 Less than monthly
    ___2 Monthly
    ___3 Once a week
    ___4 Several times a week
    ___5 Daily
    ___6 More than once a day

03. Time of week:

    ___1 Weekends only
    ___2 Weekdays only
    ___3 Weekends and weekdays
    ___4 No preference

04. Preferred intoxicant:

    ___1 Marijuana
    ___2 Alcohol

05. Marijuana source:

    ___1 Purchase own
    ___2 Smoke others

06. Price per ounce:

    ___1 <$15   ___5 $31-35
    ___2 $16-20   ___6 $36-40
    ___3 $21-25   ___7 $41
    ___4 $26-30

07. Main reasons for using marijuana:

    ___a. To relax or reduce tension
    ___b. To make myself more sociable
    ___c. To help get away from pressures of life or business
    ___d. Because many of my friends are smokers
    ___e. To improve my appetite for food or to help food to taste better
    ___f. Because it is socially expected of me
    ___g. Other:_____

08. Amount of marijuana necessary to "get stoned":

    ___1 <1 joint
    ___2 1 joint
    ___3 2-3 joints
    ___4 >4 joints

09. Pressures to smoke MORE:

    ___0 No
    ___1 Yes

10. Pressures to smoke LESS:

    ___0 No
    ___1 Yes

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11. Past year smoking pattern:

___1 Less frequently
___2 About the same
___3 More frequently

12. Fear of legal apprehension:

___0 None
___1 Some of the time
___2 Always

13. Time of day most frequently "stoned":

___1 6 AM to noon
___2 Noon to 6 PM
___3 6 PM to midnight
___4 Midnight to 6 AM

14. Length of marijuana "high":

___1 <1 hr
___2 1-2 hrs
___3 2-3 hrs
___4 3-4 hrs
___5 4-5 hrs
___6 5-6 hrs
___7 >6 hrs

15. Marijuana smoking effects on driving:

___1 Drive less well
___2 Drive about the same
___3 Drive better

16. Combined marijuana and alcohol use:

___0 Never
___1 Upon occasion
___2 Frequently
___3 Always

17. When driving a car after smoking which items considered "most risky":

___a. Driving to let off steam ...
___b. Driving after drinking a little
___c. Driving after drinking too much
___d. Driving after using other drugs
___e. Driving in bad weather
___f. Driving early in the evening
___g. Driving late at night
___h. Driving alone
___i. Driving in heavy traffic
___j. Driving after a serious argument
___k. Driving when late for an appointment
___l. Driving when tired or fatigued
___m. Driving on an unfamiliar road
___n. Driving an unfamiliar car/vehicle

18. After smoking generally:

___1 Slightly stoned
___2 Somewhat/moderately stoned
___3 Very stoned

After you have been smoking marijuana do you generally find that it is easier or more difficult for you:

19. To make sudden decisions:

___1 Easier
___2 The same
___3 More difficult

20. To remember things:

___1 Easier
___2 The same
___3 More difficult

21. To think creatively:

___1 Easier
___2 The same
___3 More difficult

22. To see as clearly:

___1 Easier
___2 The same
___3 More difficult

23. To hear as well:

___1 Easier
___2 The same
___3 More difficult

24. To be distracted:

___1 Easier
___2 The same
___3 More difficult

25. To make sudden physical movements:

___1 Easier
___2 The same
___3 More difficult

26. To become angry, hostile or aggressive:

___1 Easier
___2 The same
___3 More difficult

27. To make foolish or impulsive decisions:

___1 Easier
___2 The same
___3 More difficult

28. To concentrate on a job or a project:

___1 Easier
___2 The same
___3 More difficult

29. To be concerned about how people see you socially:

___1 Easier
___2 The same
___3 More difficult

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 sponsorhip of the U.S. Department of Transportation in Washington,
D.C., conducts a confidential in-depth survey into every fatally in-
volved 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 identi-
fying 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 stree 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) 353-3020

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 sponsorhip 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 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.

Page Two
Mr. John Doe
2 December 1974

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. Katsas, 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 sponsorhip 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 <u>operators</u>
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.

Page Two
Mr. John Doe
4 February 1974

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

APPENDIX D

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 sponsorhip 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 inthe 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

RSSS:nwc

APPENDIX E

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

CONTROL SAMPLE LETTER OF INTRODUCTION

For the past several years the National Highway Traffic Safety Administration has been conducting a confidential research study in the greater Boston area into many of the issues related to the reduction of traffic accidents and the general increase in automobile safety. This Ralph Naderish study has come up with some amazing result which tell us that the Boston area driver is very different from drivers in other parts of the country.

With this in mind the Boston University Traffic Accident Research Team has been asked to conduct a general survey, involving hundreds of people in the greater Boston area, so that we can get some good ideas about how the "average" person feels about certain things which are directly and indirectly related to traffic safety. Right now this survey is, in a very real way, dependent upon you. We need your help. Your name has been selected through a procedure known as random sampling from thousands of names made available to the team from updated telephone listings, public records, voting lists and other available documents. Within the next few days one of the members of the interviewing team listed at the bottom of this letter will be in touch with you to make arrangements for an interview. It certainly isn't necessary for us to tell you how very much we would appreciate your cooperation.

During the past years, and particularly for this survey, we have adopted a highly confidential approach to all of the information that we collect from people like you. This procedure is known as total sanitization. What this means in practice is that after our team member has talked with you and filled in the interview form, your name and address are destroyed so that there is no way your answers can be tied in with your name. This may seem to be very unnecessary to you but this procedure allows us to operate with complete ethical freedom in knowing that we have not been disrespectful of any person's individual privacy.

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In the event you have any questions please feel free to call me on my direct telephone (247-1017) and either I or one of the team members will be happy to talk with you.

Thank you in advance for your cooperation. We sincerely appreciate your help.

In the interest of highway safety,

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

Team Members: David Graham, Arthur Wallace, Calvin Selfridge, Michael
                Yellin

P.S. If your telephone is either unlisted or listed under someone else's name would you give us a call at either 247-1017 or 353-3019 and let us know when would be the best time to contact you. Thanks.

APPENDIX F

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/100 ml % 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