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NOTICES

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Note. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Safety Bureau.

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PREFACE

This report summarizes the research conducted during the period July 1967 to July 1968 by the Highway Safety Research Institute and the Mental Health Research Institute for the National Highway Safety Bureau, Department of Transportation, under Contract FH-11-6555. The basic purpose of the research has been the characterization of problem drinking drivers and development of means to identify such drivers. The NHSB Contract Manager has been Dr. P. Robert Knaff of the National Traffic Safety Institute.

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The assistance and cooperation of many organizations and persons has been invaluable in making this project possible.

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SUMMARY

The over-involvement of drinking drivers and drinking pedestrians in the population of crash-involved persons has been reported and corroborated in an extensive body of domestic and international literature. The incidence of high concentrations of blood alcohol is particularly significant, and is most pronounced in fatal and severe personal injury accidents.

The National Highway Safety Bureau is sponsoring research designed to extend our knowledge of this complex situation. The University of Michigan is participating in this research effort through its Highway Safety and Mental Health Research Institutes.

The Highway Safety Research Institute, which is responsible for over-all program coordination, conducted the projects in sections 1, 2, and 3. The projects appearing in section 4 were conducted by the University's Mental Health Research Institute. The Office of the Medical Examiner of Wayne County was a major participant in the first project. Numerous units of local government as well as community service agencies were involved in all five projects, primarily as suppliers of necessary research data.

Before effective and specific countermeasure programs can be devised and implemented in an effort to ameliorate the alcohol-related part of the traffic safety problem, two sequential steps must be effected. First, the people who drive and get into trouble after drinking must be accurately characterized.

For example, are these drivers merely average social drinkers who are victims of fate? Are they social drinkers who on a very few occasions consume too much alcohol, become completely incapable of handling an automobile, and then become involved in accidents? Or, are they simply persons with chronic drinking problems? Does a chronic drinking problem necessarily imply a coexisting drinking-driving problem? A research program designed to develop adequate and fair countermeasures must direct itself to questions of this type.

The second step is the identification of persons with these characteristics before they become involved in serious accidents. Identification will allow specific countermeasures directed to these persons or groups to be formulated and implemented most efficiently.

The characterization of drinking drivers, which involves answering questions of the type posed above, necessitated the gathering of empirical data. Three populations were selected for this purpose: (1) traffic fatalities, whose alcohol involvement was determined through a retrospective, case-history investigation; (2) known alcoholics, whose crash and violation involvement was initially identified through, and will subsequently be followed in, a prospective, longitudinal study; (3) arrested drinking drivers, who were investigated in order to determine those characteristics common to the other groups.

A comparison of the variables of interest within these sample populations is clearly desirable. These comparisons,

however, must await completion of the data bases. Therefore, each individual population is characterized and summarized in the immediately succeeding paragraphs. The complete findings are arranged in sections 1 and 4 as follows: section 1 - "Wayne County Traffic Fatality Study" (traffic fatality population), section 4 - "A Chronological Study of Chronic Alcoholics" (known alcoholic population), and "A Pilot Study of Arrested Drinking Drivers" (arrested drinking-driver population).

The Wayne County Traffic Fatality Study (section 1) has several specific objectives: (1) to identify the actual drinking involvement of Wayne County fatalities at death; (2) to investigate the possibility of using pathological findings from the Office of the Medical Examiner to confirm drinking histories; (3) to characterize drinking traffic fatality populations by demographic, driving, criminal and case records; (4) to investigate accident conditions and compare and analyze those in which alcohol in involved.

The preliminary findings reviewed below are from data on the 177 traffic fatalities which occured in Wayne County during the period of 15 July, 1967 through 14 January, 1968.

1. Data from this study corroborates similar research which indicates that alcohol is a characteristic feature in many fatal accidents. 46% of the total population had blood alcohol concentrations of 0.10% W/V or greater, and 36% had concentrations of 0.15% W/V or greater. Driver fatalities showed the greatest alcohol involvement; 63% were legally impaired (0.10% or greater) and 49% were legally intoxicated (0.15% or greater).

2. The pedestrians were characterized as having less alcohol involvement than drivers. However, advanced age was a greater factor in pedestrian fatalities.

3. In fatal accidents, occupants of the same car often have very similar blood alcohol concentrations.

4. The hypothesis that early signs of the development of liver pathology (such as "fatty liver") are associated with elevated blood alcohol concentrations at the time of death is not supported by the data. Analysis of the data does not indicate dependency between these variables. However, excessive drinking is clearly associated with those cases in which the pathology has progressed to a cirrhotic condition. The limited number of cases of cirrhosis and the inability to correlate excessive drinking and liver pathology make case-finding techniques based on determination of liver pathology inadequate for the identification of problem drinking in a general population.

5. High alcohol concentrations are over-represented in week-end accidents and in accidents occurring between 9:00 p.m. and 3:00 a.m.

6. Alcohol involvement in excess of that found in social drinking patterns is a characteristic feature of driver-responsible, fatal crashes.

7. The moving traffic violation records of driver fatalities differed significantly from those of a random driving sample. In a 6 1/2 year period, 47% of the sample population, but only 15% of the deceased drivers, had no moving violations. One percent of the sample group had 9 or

more violations, while 11% of all fatalities and 12% of driver fatalities had 9 or more violations.

8. The extent of alcohol involvement in fatal crashes, even for exceptionally high alcohol concentrations (more than 0.25% W/V), would be grossly underestimated if it were based soley on data recorded on the official accident report forms.

9. Elevated alcohol concentrations at death were found to be closely associated with a known drinking or alcoholism problem, drinking convictions and an excess number of moving violations.

A Chronological Study of Chronic Alcoholics (section 4) describes the development of social ramifications of problem drinking in nearly 2,400 patients admitted to a general hospital and diagnosed as alcoholics. This study investigated the criminal and driving patterns as well as the medical history and demographic data of a hospitalized alcoholic population. A mailed follow-up questionnaire was used to update demographic information from hospital records.

The "classic" alcoholic stereotype is presented as a person who is unstable in marriage, residence and employment. Our research indicates that the alcoholic in this sample differs significantly from the stereotype. The study shows that more than half of the alcoholic patients were born in or near Michigan, and have lived in the Flint area, at no more than two residences, for most of their lives. The incidence of separated or divorced persons in the sample population does not seem especially high.

Seventy percent of the patients admitted to the program had at least one hospital admission diagnosis of alcoholism. The most frequent descriptive citation for alcohol-related entries involved intoxication, evidence of drinking, the patient's confirmation of heavy drinking, or an extensive history of alcohol use.

When available criminal and driving records for the sample population were reviewed, it was found that 40% of the population had at least one alcohol-related conviction and 60% had at least one accident. To date, such information has been reviewed for only about 1/2 of the sample. However, it is expected that the completion of the processing will show the final characteristics to be consistent with those already obtained.

A Pilot Study of Arrested Drinking Drivers (section 4) examines a population of persons arrested for alcohol-related traffic offenses. These persons were placed in a seminar which informed the participants of the psychological, sociological, and physical implications of alcohol use and addiction. The seminar was designed to provide the participants with an awareness of the laws, regulations, and responsibilities which are related to drinking and driving.

The research requires a descriptive evaluation of the characteristics of this group and an evaluation of the effects of the treatment program on the participant's attitude and driving behavior. When patterns of drinking-driving interaction which lead to accident involvement or arrest are identified, this knowledge can be applied to prevention and intervention. Data from

this project is still being collected and will be analyzed when records are more complete.

Adequate characterization of problem drinking-drivers must be accompanied by the development of techniques for identification of dangerous drivers prior to crash involvement. Specific means for identifying alcoholics, a group known to contain a high percentage of problem drivers, has been undertaken in two projects: The Michigan Alcoholic Screening Test (MAST) Analysis (section 2), and the Psychological Test Development for Alcoholic Drivers (section 3).

The MAST is being developed with the particular objective of providing law enforcement, licensing, and other personnel with a brief questionnaire that can be used in a structured interview to identify persons with possible drinking problems. The test contains 29 questions, and attempts to uncover behavior directly indicative of drinking problems.

The test was administered to hospitalized alcoholics, persons convicted of drunk driving, problem drivers called in for license review, and a control sample composed of blue-collar workers. The hospitalized alcoholic sample was sub-divided into a group instructed to respond truthfully and a group instructed to disguise its drinking problems. A discriminant analysis model and a multiple regression model were constructed, and the classification capability of the test was measured by differentiating between several sample populations.

The discriminant analysis model correctly classified 97.5% of the hospitalized alcoholics, 97.2% of the university control group, and labeled as alcoholic 83.5% of the alcoholics who were instructed to disguise their drinking behavior.

Percentage results obtained through the multiple regression model were very similar to results obtained using the discriminant analysis model. However, the multiple regression model has the advantage of indicating clusters of persons by questionnaire score. It also permits the choice of a conservative or a more inclusive cut-off point, so that the cut-off point may be consistent with the end use of the results.

In order to validate the usefulness of the MAST in a operational setting, an intensive search of the files of local medical and social agencies and state driver record and police agencies is now being conducted. The purpose of this search is to obtain an assessment of alcohol-related problems which is completely independent of the MAST classification and the specific behavior which it seeks to uncover.

The Psychological Test Development for Alcoholic Drivers (section 3) is a validation study of test questions found in an exhaustive literature search of questionnaires. Items used are those which tend to discriminate alcoholics from other populations. Validity will be assessed on the basis of an item analysis of questions administered to alcoholic and non-alcoholic control samples.

A prototype version of the questionnaire, containing slightly less than 500 items, is now complete. It has been administered to two separate groups of hospitalized alcoholic patients. Arrangements have been made to administer the test to a volunteer control group of blue-collar, secretarial, and lower managerial employees.

Items which are found to be valid will be readministered to new samples in a revised and shortened test. This will be done in order to cross-validate the test's ability to screen alcoholics from a normal drinking population.

Control and alcoholic subjects are presently being interviewed. Items will be analyzed when the sample size is further developed. A detailed review of the literature used for the development of this test is included.

SECTION 1

WAYNE COUNTY TRAFFIC FATALITY STUDY

(PROJECT I)

by

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1.1. INTRODUCTION

The Wayne County Traffic Fatality Study, a joint project of the Office of the Medical Examiner of Wayne County and The University of Michigan's Highway Safety Research Institute, is a case history investigation of traffic fatalities occurring in Wayne County during the period from 15 July 1967 -- 14 January 1968. The subjects in this study are a group of victims examined at the Wayne County Morgue. The case material consists of all drivers, passengers, and pedestrians 16 years of age and older whose bodies were brought to the morgue. In practice, this includes nearly all traffic fatalities; the exceptions are those persons who survive for such an extended period in a local hospital that the attending physician is qualified to sign the death certificate. The cases included for detailed study are persons who died within 24 hours of the crash; certain information is also presented for a few cases in which the victim survived longer than 24 hours.

One hundred seventy-seven fatalities in 160 separate crashes during the first 6 months of the study period are analyzed in this report. Section 1.2 deals with the data sources and data collection procedures, Section 1.3 presents information about the data analysis, and the results are given in Section 1.4. Appendix A, prepared by Drs. Burton and Wetherell of the Office of the Medical Examiner of Wayne County, provides detailed information about the pathological and toxicological methodology.

1.2. DATA SOURCES

Data about each of the fatalities was sought from several different sources. These sources and the method of data collection are discussed in this section.

1.2.1. THE OFFICE OF THE MEDICAL EXAMINER OF WAYNE COUNTY

The case material for this study originates upon entry into the morgue as mentioned in the introduction. There, at the discretion of the Medical Examiner, either an autopsy or certain selected pathological and toxicological tests in lieu of a full autopsy are performed. Detailed data about these tests is given in Appendix A.

A summary report of each case is then prepared and submitted to HSRI. Samples of these reports, both with and without an autopsy, are exhibited in Appendix B. Each report contains brief information about the subject, the accident, the conditions leading to death, toxicological data, particularly alcohol concentration in the various body fluids, and an indication of whether cirrhosis is present.

The pathologist's score sheet is also submitted to HSRI. This is a checklist used by the pathologist during the course of his examination for cirrhosis. A sample score sheet is also included in Appendix B.

1.2.2. THE POLICE ACCIDENT REPORT

More extensive information about the accidents is desired than can be obtained from the summary in the Medical Examiner's report. Therefore, the official police accident reports were collected. Wayne County, non-Detroit, fatal

accident reports are sent to the Wayne County Morgue when the police accident investigation is completed. Wayne County Detroit fatal accident reports are filed at Detroit Police Headquarters. Copies of reports from both these sources were made for 150 accidents involving 165 fatalities. The remaining 10 accident reports were not released because of pending litigation.

Those reports which were available gave information about weather and road conditions, vehicle condition, speed, direction, activity of drivers and pedestrians at the time of the accident, and diagrams and statements of how the accident took place.

The data called for on the reports is indicated by the sample reports shown in Appendix C, This data is frequently supplemented by written reports prepared by the investigating officers. However, since post-accident, on-the-scene investigations were not a part of this study, the recorded data generally can be neither confirmed nor denied. An exception is that the alcohol involvement data can be checked against the later morgue findings for fatally injured drivers and pedestrians.

1.2.3. DRIVING AND CRIMINAL RECORDS

Michigan Department of State and State Police criminal records were collected for as many fatalities as could be located. These records provide one way of identifying the existence of drinking or drinking-driving problems in cases

where such convictions appeared. The driving records also provide us with a means of comparing traffic fatalities, including known problem drinkers, with a sample population of drivers. 109 driving records and 41 criminal records were located matching persons in the population of fatalities. A description and samples of driving and criminal records can be found in Appendix D.

1.2.4. AGENCY RECORDS

In addition to the reports and records previously explained, case records from social agencies and court probation departments were collected.

This was done to seek an assessment of drinking problems from sources other than driver and criminal records or alcohol concentration at the time of death. Other studies have found that only one half of a crash-involved, problem drinking population will also have any drinking-related convictions.* Therefore, it is desirable that methods be found that can assist in the identification of problem drinkers aside from relying on previous convictions for drinking or drunk-driving. Reports were also reviewed to obtain background material which might help characterize the problem drinker.

*Melvin L. Selzer, Nathaniel J. Ehrlich, A Controlled Study of Alcoholism, Psychopathology and Stress in 96 Drivers Causing Fatal Accidents, page 6.

Organizations contacted for case record collection all had jurisdiction over parts or all of Wayne County, all deaths occurred here and it also was the county of residence for 167 of the 177 cases.

Organizations who gave their assistance in this project are the Wayne County Department of Social Services, Probation Department of Wayne County Circuit Court, Detroit Recorder's Court Probation Department (men and women's division) and Detroit Recorder's Court Traffic Division. A description of each organization's files and records can be found in Appendix E as well as the particulars in searching for a case record.

1.3. DATA ANALYSIS

Information and records collected on the fatalities were processed in two different ways. Most of the information was coded directly from the various records and prepared for machine analysis. Other information was reviewed individually and conclusions were then formulated, coded, and incorporated into the total data set on each person. This latter method was utilized when the diversity in the records precluded standardized reporting.

1.3.1. MORGUE REPORTS AND POLICE ACCIDENT REPORTS

All information on the Wayne County Morgue report and the police accident report was coded directly, except for the schematic diagram on the latter. Information coded included demographic data on the individual, dates and time

of crash, time of death, physical conditions leading to death, pathological and toxicological findings and all accident variables contained on the official accident form; supplementary descriptive data forming a part of the official report was not coded for computer analysis.

An accurate determination of responsibility for crashes resulting in fatal injuries and subsequent correlation of these findings with the alcohol concentrations at the time of death is clearly desirable in a continuing effort to more fully delineate the role of alcohol in fatal crashes. Such a determination, even with the aid of in-depth, on-the-scene, post-crash investigations, cannot always be made reliably in each case from the available crash data. Nonetheless, if systematic biases are avoided in making the responsibility determination, then the correlation of such determinations with alcohol concentrations can be meaningful.

With this goal in mind, all morgue and accident reports were carefully reviewed to assign accident responsibility. In making the responsibility evaluation, the concentration of alcohol in the blood or spinal fluid was unknown and therefore had no bearing on the judgment made. Variables such as weather, light condition, road condition, speed, speed limit, vision obstructions, vehicle condition, and drivers' physical condition were considered. The diagram of what happened, the participants' statements and the police officer's statement, the issue of citations for traffic violations, and whether arrests were made were also considered in the determination.

In addition, certain questions were kept in mind as the accident and morgue reports were reviewed: Did the party act in a manner so as to make a crash nearly unavoidable, such as darting out between parked cars, crossing in the middle of a block at night while wearing dark clothing, or driving into oncoming traffic lanes? Did the party violate the law in such a way as to contribute to the crash occurrence?

All fatalities were reviewed in this way. Drivers and pedestrians were then assigned to one of the following categories:

1. Responsibility ascribed to the deceased person.
2. Responsibility ascribed to another person.
3. Responsibility ascribed jointly to the deceased person and to another person.
4. Car failure. This category was used in a single case in which the dynamics of the crash, witnesses, and subsequent examination of the vehicle recorded in the accident report revealed a broken brake line.
5. Illness. This category was used in several cases in which the police and morgue reports indicated that the person was ill or suffered a stroke or heart attack immediately prior to the crash. In all cases the morgue report was used for positive identification of illness.
6. Undetermined responsibility. This category was used in those cases in which the police report was not released because of pending litigation. It was also used for two cases in which the recorded information was so vague that one of the above categories could not reasonably be chosen.

Similarly, passenger fatalities were assigned to one of the following categories:

1. Responsibility ascribed to passenger's driver.
2. Responsibility ascribed to another person.
3. Responsibility ascribed jointly to the passenger's driver and to another person.
4. Undetermined responsibility.

After the individual - driver, passenger, or pedestrian - was placed into one of the categories indicating the extent of his responsibility in the accident, this categorical information was coded.

1.3.2. DRIVING AND CRIMINAL RECORDS

Driving and criminal records were also coded. The driving record code is the same as the one developed by the Michigan Department of State for their computerization process. A similar exhaustive code was developed for criminal offenses. In addition to a code for the type of offense or accident, the dates and place of occurrence were coded as well as the type of conviction and disposition. Disposition includes such things as suspension or revocation of license, fines, probation, and incarceration.

1.3.3. AGENCY RECORDS

Certain information was coded from records collected at the Wayne County Department of Social Services and the probation departments. Coded information included whether a record was located and if so, if there was an indication of a drinking problem either for the deceased or for a member of his family. Other information found in the case records was deleted from the coding procedure as such data

was too diverse or nonuniform to organize by standardized codes.

The definition used here to determine the existence of a drinking problem is that of the World Health Organization: "frequent, excessive drinking that has reached the point of adversely affecting health, social, or economic functioning."

A drinking problem was never assumed to exist unless it was quite clearly mentioned in the case record. It is the policy of Wayne County caseworkers that nothing be included in a case dictation (the caseworker's continuing record of contact with the client) when it is of doubtful validity. Thus if a mention was made of a drinking problem, we can assume it to be a fairly accurate statement.

The Court probation supervisor also had to specifically mention drinking as being excessive and contributory to a problem, before we identified the subject as having a known drinking problem. Identification was possible from such statements as "this person's continued difficulty with the court seems to stem from his excessive drinking and concurrent loss of self-control." Other indicators were statements noting that a marital separation had occurred because of the husband's (or wife's) excessive drinking and abusiveness when drunk.

The coded information from all records was combined under the individual case number. The only exception to this was the driving/criminal records which were analyzed separately due to the type of computer program which was available.

1.4 RESULTS

The results and findings of the foregoing data collection and analysis procedures are presented in this section. They have been grouped into the following categories for presentation purposes:

1. General information
2. Pathological and toxicological findings
3. Time of accident findings
4. Responsibility findings
5. License status and driving record comparison
6. Social and court agency findings

1.4.1. GENERAL INFORMATION

1.4.1.1. DATA FORMAT. For the most part these results are presented in Appendix F in the form of bivariate frequency tables. For each pair of variables (row control variable and column control variable) selected a table is presented in four parts (A, B, C, D) for convenience in interpreting the results. Part A in each table presents the number of cases, Part B in each table presents the percentage expressed as the ratio of the number of cases to the row total, Part C in each table presents the percentage expressed as the ratio of the number of cases to the column total, and Part D presents the percentage expressed as the ratio of the number of cases to the grand total. Part A in each case is labeled as bivariate frequencies and the other three are labeled as bivariate percentages (based on row, column, or grand totals) for ready identification.

Table F-1 illustrates the use of this format and presents some of the first general information. The computer column control variable in this case is status on road (Driver, Passenger, or Pedestrian) and the row control variable is blood group (not taken, 01-04, 05-09, 10-14, 15-24, 25+ and negative). The column headings refer to the alcohol concentration ranges in grams of alcohol per 100 ml of blood. If the columns have no headings no meaning is attached to them.

Part A gives the number of persons by status on road in the various blood group ranges. This shows that a total of 84 drivers were killed; 22 had negative alcohol concentrations in their blood, and 27 had alcohol concentrations in the range of 0.15%-0.24% W/V. The alcohol concentration (hereafter shortened to B.A.L.) of one driver was not determined. Similarly, we see that of a total of 18 persons in the 0.10%-0.14% W/V range, 12 were drivers, 2 were passengers and 4 were pedestrians. Of the 177 fatalities reported, 84 were drivers, 38 were passengers, and 55 were pedestrians.

Part B in each table shows the percentage based on row totals. Thus 32.1% (27 out of 84) of the drivers had B.A.L.'s at the time of death in the range from 0.15-0.24% W/V. Part C shows the percentage of cases based on the column totals. Thus, of the persons with B.A.L.'s of 0.25% and higher (25+), we observe that 60.9% (14 out of 23) were drivers, 4.3% were passengers, and 34.8% were pedestrians. Finally, Part D shows the bivariate percentage

based on the grand total; 1.7% (3 of 177) of all the fatalities in this study are pedestrians in the B.A.L. range from 0.05%-0.09% W/V. It should also be pointed out here that 160 separate accidents produced the 177 fatalities as this figure does not appear in the tables.

1.4.1.2. COMMENTS ON INTERPRETATION. Several comments regarding interpretation of the data are in order. First, there are no sampling errors involved in the 6-month period for which results are presented. All fatalities, subject to the age and time-of-death following crash limitations mentioned earlier, are included. Second, the focus of the study has been on the characterization and identification of problem drinking drivers. For these purposes the definition and sampling of control groups across all variables for which data has been accumulated is neither possible nor necessary, nor has this feature been a part of the research design since the inception of the study. Finally, the usual precautions about inferences from small samples with unknown distributions are applicable here. This is particularly true when looking at some of the bivariate frequency and percentage tables. For example, there exist 7 age ranges and 6 alcohol concentration groups, and hence there are 42 cells defined. Obviously care is called for in drawing inferences about the distribution of 38 passengers throughout these cells.

1.4.1.3. DISTRIBUTION OF ALL FATALITIES BY B.A.L., ROAD STATUS. Several facts are immediately apparent from Table F-1.

Of 177 fatalities:

1. 35.6% (63) had zero B.A.L.'s at time of death.

2. 46% (82) had B.A.L. $\geq$ 0.10% W/V.

3. 36% (64) had B.A.L. $\geq$ 0.15% W/V.

4. 13% (23) had B.A.L. $\geq$ 0.25% W/V.

1.4.1.4. DISTRIBUTION OF DRIVER FATALITIES BY B.A.L., AGE. Table F-2 presents the distribution of age by status on road. When the distribution by B.A.L. and age and road status is obtained, a number of striking facts appear.

Table F-3 shows that of 84 drivers killed:

1. 7 drivers (8.3%) were in the 16-19 age group; 2 of the 7 (28.6%) had negative B.A.L. and 2 had B.A.L. $\geq$ 0.10% W/V.

2. 15 drivers (17.9%) were in the 20-24 age group and only 2 of these (13.3%) had a negative B.A.L., 11 of these (73%) had B.A.L. $\geq$ 0.10% W/V.

3. In the 25-34 year age group, the results are even more striking. One of the 14 (7.1%) had a negative B.A.L., while all others of this group (93%) had B.A.L. $\geq$ 0.10% W/V.

4. From the 35-44 age group on, the trend is clear. The number of negative B.A.L.'s steadily increases, reaching 71.4% for the 65 and older age group, while the number with B.A.L. $\geq$ 0.10% W/V steadily decreases, reaching 14% for the same age group.

5. For the entire group of drivers, 22 (26.2%) had negative B.A.L. and 53 (63%) had B.A.L. $\geq$ 0.10% W/V and 14 (16.7%) had B.A.L. $\geq$ 0.25% W/V.

1.4.1.5. DISTRIBUTION OF PASSENGER FATALITIES BY B.A.L., AGE. Tabel F-4 presents similar data for passengers. Three facts are noteworthy:

1. The percentage of negative B.A.L.'s (50%) is nearly twice that of drivers (20.2%).
2. Conversely, the percentage of passengers with B.A.L.'s $\geq$ 0.10% (21%) is one-third that of drivers (63%) and about one-half that of pedestrians (38%).
3. Although persons in the 16-19 age group represent only 11.9% of the total fatal population (21/177), they represent 28.9% (11/38) of the deceased passengers.

1.4.1.6. DISTRIBUTION OF PEDESTRIAN FATALITIES BY B.A.L., AGE. Table F-5 shows the distribution for pedestrians. The pedestrian fatality experience is seen to be strongly influenced by age.

1. The 65+ age group contains 36.4% (20) of the pedestrian fatalities (55) but only 8.3% of the driver fatalities and 7.9% of the passenger fatalities. The reverse trend is clear for the younger age groups.
2. Of these 20 persons, 65 years and older, 9 (14%) had zero B.A.L.'s and 5 (23%) had B.A.L.'s $\geq$ 0.10% W/V.
3. The next largest group by age in this sample pedestrian population is the 45-54 age group with 12 persons. Of these 12, 2 (16.7%) had zero B.A.L., 10 (83%) had B.A.L. $\geq$ 0.05% W/V, 9 (75%) had B.A.L. $\geq$ 0.10% W/V, 8 (67%) had B.A.L. $\geq$ 0.15% W/V, and 4 (33%) had B.A.L. $\geq$ 0.25% W/V.

1.4.1.7. DISTRIBUTION OF FATALITIES BY MARITAL STATUS. The distribution of fatalities by road status and marital status is given in Table F-6. The high percentages of both single passengers and widowed pedestrians are to be expected based on the road status-age distributions cited earlier. In other words, the expected interaction between age and marital status is exhibited among the fatal cases.

The driver, passenger, and pedestrian fatality distributions are given in Tables F-7, F-8, and F-9 for the road status and alcohol concentration variables. From F-7 we see that:

1. Married drivers constitute 59.5% of the driver fatalities but 77.3% of all driver fatalities with zero B.A.L.'s.
2. Single drivers are 27.4% of the total number of drivers but only 18.2% of the zero B.A.L.'s.
3. The 8 divorced and separated persons together comprise 9.5% of all drivers but none of the zero B.A.L.'s. Of these 8, 7 had B.A.L.'s $\geq$ 0.10% W/V.

The same general trend is present for passengers as shown in Table F-8. The trend is not so strong for the married and single categories, however, the divorced and separated trend

still holds strongly, but since only 3 persons are involved this must be viewed somewhat circumspectly.

1.4.1.8. DISTRIBUTION OF FATALITIES BY MARITAL STATUS, RACE. The distribution of driver, passenger and pedestrian fatalities by marital status and race is given in Tables F-10, F-11, and F-12. Of the 177 total fatalities, 77% (136) are white. Since 71.4% of the drivers, 84.2% of the passengers, and 78.2% of the pedestrians are also white, there seems to be little difference within categories of the accident population with respect to race. Somewhat larger differences hold when the individual marital status categories are considered, but the large differences hold primarily for small sample sizes. The exceptions are that 15 of the 16 single passengers are white and the 8 widowed pedestrians are all white.

The B.A.L. distributions by race are not available as of this writing.

1.4.1.9. ACCURACY OF ACCIDENT REPORT FORM FOR ALCOHOLIC INFLUENCE CATEGORY. Earlier we observed that, in general, the accuracy of data on the recorded accident form could not be verified by the subsequent data collected during this study. One exception is the alcoholic influence category.

Table 1-1 presents the distribution of the driver and pedestrian fatalities for which accident reports were released, with actual B.A.L. groupings of these persons and the categories of alcohol

Table 1-1. Distribution of Driver and Pedestrian Fatalities with respect to Alcohol Concentration Ranges and Accident Form Alcoholic Influence Category.

	Alcohol Concentrations in % W/V							
	Negative	0.01-0.04	0.05-0.09	0.10-0.14	0.15-0.24	0.25+	Not Taken	Total
A:	-	-	-	1	-	1		2
B:	-	-	-	1	-	-		1
C:	2	1	2	2	3	3		13
D:	13	5	-	2	5	2	1	28
E:	11	2	1	4	10	4		32
X:	16	7	2	5	16	10	1	57
Total in alcohol category:	42	15	5	15	34	20	2	133

A = Drinking; under influence, ability impaired.

B = Drinking; not under the influence, not impaired.

C = Drinking; influence not known, not known if impaired.

D = Had not been drinking.

E = Not known if drinking.

X = Missing data.

involvement that were checked on the accident forms. (See Appendix C for sample accident forms.) The following can be inferred:

1. Two persons were identified by the police as having been drinking and under the influence (category A) out of the 38 persons with alcohol concentrations 0.10% W/V or greater on whom a judgment was made about drinking involvement.

2. Nine persons out of the 38 with alcohol concentrations 0.10% W/V or greater were identified on the accident report as having not been drinking (category D).

3. For persons on whom a drinking judgment was made, 18 out of 38 persons with alcohol concentrations 0.10% W/V or greater, and 14 out of 28 persons with concentrations 0.15% W/V or greater were identified on the accident form as not known if drinking (category E).

4. Of 133 persons, data was missing on the accident form for 57. Of these 41 had positive B.A.L.'s, and 31 of the 57 had B.A.L.'s greater than 0.10% W/V.

This example is in no sense an indictment of police investigation practices, for there are several obvious events that can prevent a correct assessment by investigating units:

1. The seriously injured or dead persons may have been removed from the crash scene to a hospital by the time the police arrive.

2. The injured may be unconscious when the police arrive.

3. The police have a first duty to care for the injured rather than try to assess the details of alcohol involvement. Other crash-related duties also remove attention from this detail.

Nonetheless, one obvious and vital conclusion must be drawn from these results: operating and research personnel will be grossly misled if they attempt to deduce the extent of alcohol involvement from existing accident data that is not supplemented by chemical test data. Whether this conclusion extends to less serious personal injury and property damage crashes cannot be determined from the data in this study.

1.4.1.10. ALCOHOL CONCENTRATION AND FATALLY INJURED OCCUPANTS OF THE SAME CAR. Eleven crashes were found with multiple fatalities among occupants of the same car. Of nine accidents where a driver and one or more passengers were killed, there were closely related alcohol concentrations in 6; two had driver/passenger B.A.L.'s of 0.18%/0.25% and 0.19%/0.13%, while four cases were negative/negative or negative/negative/0.01%.

For three accidents where the driver and passenger did not obtain the same close alcohol concentrations, the levels were 0.20%/0.04%, 0.14%/0.01%, and 0.12%/negative; in all cases the driver had the higher alcohol concentration. Of two accidents where only passengers were killed from the same car, alcohol concentrations were 0.15%/0.15% and negative/negative/negative.

The differences in times of death between occupants of the same car were checked, and the amount of alcohol metabolized was negligibly different based on a rate of 0.015% W/V per hour.

These findings suggest that the drinking involvement or non-involvement for occupants of the same car is often very similar in this study for 8 out of 11 cases.

1.4.2 PATHOLOGICAL AND TOXICOLOGICAL FINDINGS

All of the data presented in this section are based on the work of the Office of the Wayne County Medical Examiner. Appendix A contains a description of methodology and Appendix B has samples of their data tabulations.

1.4.2.1. PATHOLOGICAL FINDINGS. Liver abnormalities and cirrhosis were studied using the score sheets compiled at the Medical Examiner's Office. A check in any column other than "soft" was used to determine abnormality. The presence of cirrhosis was also indicated on the score sheet.

The bivariate distribution for the 170 persons on whom a liver examination was made and for whom alcohol concentration was known is given in Table 1-2.

Table 1-2. Distribution of Fatalities with Respect to Alcohol Concentration and Number of Liver Abnormalities

	Number of Abnormalities				
B.A.L.	One	Two	Three or more	One or more	None
Negative	9	4	6	19 (34.5%)	44 (38.2%)
0.01%-0.14%	5	4	3	12 (21.8%)	31 (26.9%)
0.15%+	19	1	4	24 (43.6%)	40 (34.8%)
Total	33	9	13	55 (99.9%)	115 (99.9%)

Persons with no abnormalities and those with one or more abnormalities were compared to see if a relationship existed between drinking history, and the development of an abnormal liver (Table 1-3).

Table 1-3. Distribution of Fatalities with Respect to Alcohol Concentration and Number of Liver Abnormalities Using Chi-Square Test.

	Number of Abnormalities				
	None		One or more		Total
B.A.L.	Expected	Observed	Expected	Observed	
Negative	43	44	20	19	63
0.01%-0.14%	29	31	14	12	43
0.15%+	43	40	21	24	64
Total	115	115	55	55	170

If drinking at time of death is indicative of drinking history, and if heavy drinking leads to the development of an abnormal liver, we would expect an over-representation in the 0.15% B.A.L./one or more abnormality cell and under-representation in the negative B.A.L./no abnormality cell.

Since the observed value of the Chi square is less than 5.99, the 0.05 significance level at 2 degrees of freedom, the results do not indicate dependency between alcohol concentration at death and liver abnormality.

Fatty liver pathology was studied specifically from among all possible liver abnormalities or changes indicated on the Medical Examiner's score sheet. The findings on fatty liver pathology for the 177 Wayne County fatalities were compared to 208 driver and pedestrian fatalities studied in San Francisco by Waller and Turkel (1966). Both studies selected two groups from these populations; persons 25 years and older and having alcohol concentrations of 0.15% or greater, and persons 25 years and older and having negative alcohol concentrations. The occurrence of fatty liver was compared

for the two alcohol concentration groups. For the Wayne County study group, the information about fatty livers was taken from the Medical Examiner's score sheet of liver changes.*

In the Wayne County study, 33% of the 51 persons with alcohol concentrations 0.15% and greater had fatty livers. These findings differ considerably from the 62% found in the San Francisco group. Comparing negative alcohol concentrations for the same age group of 25 years and older, we found 26% in Wayne County had fatty livers, whereas 15% were so identified in San Francisco (see Table 1-4). The difference between the latter two figures may be due to sample variation.

Table 1-4. Comparison of Numbers of Persons with Fatty Livers in Wayne County and San Francisco

	Wayne County	San Francisco
	Age 25+, B.A.L. 0.15%+	
Fatty Liver	17 (33%)	62%
Non-fatty	34 (66%)	38%
	Age 25+, B.A.L. Negative	
Fatty Liver	12 (26%)	15%
Non-fatty	34 (74%)	85%

*Percentages from the San Francisco project were taken at face value from the report, "Alcoholism and Traffic Deaths", by Julian Waller and Henry Turkel. The actual number of persons in each B.A.L. group was not clearly indicated, only percentages were given. There also were no qualifying remarks explaining pathological standards for the fatty liver group

In addition, two persons from Wayne County under 25 years had fatty livers. In both cases their alcohol concentration was in the 0.25% or greater range. No abnormal livers were found for this age group in San Francisco at any alcohol concentration. A total of 42 cases of fatty liver were found in the group of Wayne County fatalities. 135 had no fatty liver although they may have had other changes. These two groups are distributed by age and alcohol concentrations in Tables F-13 and F-14.

A further breakdown of fatty and other liver abnormalities in Table 1-5 was made for a comparison with results presented by Waller.* One possible explanation for the fact that fewer normal livers are found in Wayne County than in California counties is that microscopic examinations were made in all cases for the former.

Table 1-5. Comparison of Method of Liver Examination and Liver Diagnosis in California Counties and Wayne County

Method of Liver Examination	Three California Counties	Wayne County	
Gross	75.2%	100%	
Microscopic	21.0%	100%	
Total	2069	177	
Liver Diagnosis			
Normal	73.8%	67.7%	(120)
Fatty Changes	13.3%	23.6%	(42)
Other Changes	9.0%	8.4%	(15)
Not Done	3.9%	0%	
Total Number	2069	177	

*Julian A. Waller. "Holiday Drinking and Traffic Fatalities", paper read at the 95th annual meeting of the Amer. Public Health Assoc., Oct. 1967.

1.4.2.2. CIRRHOSIS. An examination of the liver was made by the Wayne County pathologist who then indicated if he thought there should be a diagnosis of cirrhosis. The method used was first to examine sections of the liver for changes common to cirrhosis and then to make a considered judgment concerning the disease. The presence of cirrhosis was indicated on the score sheet along with the number of liver changes.

Cirrhosis was diagnosed in seven cases (see Table 1-6). Five cases were in the early fatty stages of development and one case was in an intermediate stage. The ages of the cirrhotic persons were between the mid-forties and the late sixties, with the exception of one 21-year old. Two cases had negative alcohol concentrations at the time of death, while the remainder ranged from 0.11% to 0.26% W/V, with the 21-year old having the highest alcohol concentration. From other sources, problem drinking was indicated for three of these cases. Two drinking convictions were found for a fourth case. Police and medical examiner reports indicated that the death of one cirrhotic case was apparently due to a heart attack preceding a collision.

Table 1-6. Findings about Cirrhotic Persons

B.A.L.	Stage	Race	Sex	Age	Road Status	Other Findings
0.26%	Early	Negro	Male	21	Pedest.	Problem Drinking
0.11%	Early	Negro	Male	50	Driver	Drinking Conv.
0.21%	Early	White	Male	57	Driver	Problem Drinking
Neg.	Interm.	White	Male	45	Pedest.	
0.17%	Early	White	Fem.	48	Pass.	
0.24%	Early	White	Male	53	Driver	Problem Drinking
Neg.	-	White	Fem.	66	Driver	Died from heart attack

Although the presence of cirrhosis may be a useful guide for detecting excessive drinking in individual cases, the limited number diagnosed suggests that it will not be a useful tool in determining problem drinking among a general population.

1.4.2.3. TOXICOLOGICAL FINDINGS. The toxicological data of primary interest in this study is alcohol concentration at the time of death. This was determined for all but seven cases and is reported throughout this section. No determination was made for six of the seven cases due to the time which elapsed between the crash and death.

The time elapsed between crash and death is given in Table 1-7. In six cases time exceeded 24 hours. These six cases, and an additional case where it was not possible to obtain a usable blood sample, constitute the seven cases for which alcohol concentration was not measured.

Table 1-7. Time Elapsed Between Crash and Death

Time Elapsed	Number of Persons
0 - 1 hour	123
1 - 2 hours	18
2 - 3 hours	9
3 - 4 hours	6
4 - 5 hours	1
5 - 6 hours	4
6 - 7 hours	3
7 - 24 hours	7
24 - 96 hours	3
4 days or more	3
Total	177

The presence of other drugs was also established, and the results of these tests are given in Table 1-8. Appendix A contains a description of the methodology.

1.4.3 TIME OF ACCIDENT FINDINGS

A number of bivariate frequency tables showing the distribution of fatalities by hours, days, and months have been prepared and are given in Tables F-15 through F-23.

1.4.3.1. DISTRIBUTION OF FATALITIES BY ROAD STATUS, HOURS. This distribution is given in Table F-15 for drivers, passengers, and pedestrians by 3-hour time intervals beginning at midnight, labeled 0:01-3, 3-6, etc. The following statements hold:

1. The 6-hour period from 9:00 p.m.-3:00 a.m. accounts for 49.2% (87/177) of the total number of fatalities.
2. 47.6% (40/84) of the drivers die in the same period, while the 6:00 p.m.-9:00 p.m. period (11.9%) is approimately average with respect to the time average (12.5%); the other time periods are somewhat under represented.
3. 63.2% of the passengers (24/38) die in the same period, 15.8% (6/38) die in the 3:00 a.m.-6:00 a.m. period, and all of the other 3-hour intervals are under-represented.
4. The pedestrian distribution is similar, but the 6-hour period from 6:00 p.m.-midnight now accounts for 50.9% of the deaths. The next most populous 3-hour period is the 3:00 p.m.-6:00 p.m. period containing 12.7% of the pedestrian fatalities.

1.4.3.2 DISTRIBUTION OF DRIVER FATALITIES BY DAYS, HOURS. Table F-16 presents the distribution for driver fatalities by days and hours. Here we see that:

1. 26.2% (22/84) of the driver fatalities occur in the 3-hour period from midnight to 3:00 a.m. Further,

none of the cells for this time period on any day are empty; the Sunday 0:01-3 cell contains 5 fatalities, matched only by the Friday 9:00 p.m.-midnight cell.

2. The 9:00 p.m.-midnight period is the next most dense period, with 21.4% (18/84) of the driver fatalities. Only the Monday component of this cell is empty.
3. The 3:00 a.m.-6:00 a.m. period contains 5 (6%) driver fatalities, and 3 of these occur on Saturday. The noon-3:00 p.m. period also contains 5 driver fatalities.
4. 9 deaths were on Sunday, and all of these in the late evening (6:00 p.m.-9:00 p.m.), night (9:00 p.m.-midnight) or early a.m. (midnight-3:00 a.m.).
5. Saturday accounts for 20.2% of the deaths. None of the 3-hour intervals is empty.

1.4.3.3 DISTRIBUTIONS OF PASSENGER FATALITIES BY DAYS, HOURS. The distribution for passengers is shown in Table F-17. The Saturday and Sunday midnight-3:00 a.m. cells are the most dense with 10 of the 38 deaths.

1.4.3.4. DISTRIBUTION OF PEDESTRIAN FATALITIES BY DAYS, HOURS. This distribution is given in Table F-18. The 9:00 p.m.-midnight period contains 30.9% (17/55) of the pedestrian deaths, and Saturday is the most dense, with 20% (11/55). Not unexpectedly, the Saturday 9:00 p.m.-midnight cell is the single most populous with 5 deaths, or 9.1% of the total. The Friday cell in the same time period is the next most populated with 4 entries.

1.4.3.5. DISTRIBUTION OF FATALITIES BY HOURS, B.A.L. Tables F-19 through F-21 contain these distributions by totals, drivers,

Table 1-8. Toxicological Findings Other Than Alcohol Concentration

Substance	Amount	Time elapsed between crash and death	B.A.L.	Road Status
Carbon Monoxide				
Tested 165				
Found 1				
	10% saturated	none (body burned by electric wires)	0.16%W/V	Driver
Blood Cyanide				
Tested 164				
Found none				
Salicylate, Urine, Spinal, or Blood				
Tested 121				
Found 3				
	positive-urine	34 min.	0.01%W/V	Driver
	positive-urine	1 hr., 15 min.	0.33%W/V	Driver
	0.4mg./100 ml. blood	14 min.	0.15%W/V	Passenger
Blood and Urine Sugar				
Tested 177				
Found 1*				
	152mg./100 ml. blood	22 min.	0.25%W/V	Pedestrian
Blood and Urine Acetone				
Tested 177				
Found 1*				
	Small Amount	22 min.	0.25%W/V	Pedestrian
Barbiturate				
Tested 171				
Trace found 5				
Positive 4				
	trace	43 min.	Negative	Passenger
	trace	1 hr.,55 min.	Negative	Passenger
	trace	1 hr.,40 min.	0.25%W/V	Driver
	trace	25 min.	Negative	Pedestrian
	0.9mg./100ml.	70 min.	Negative	Pedestrian
	1.1mg./100ml.	45 min.	0.20%W/V	Pedestrian
	0.6mg./100ml.	5 hrs.,15 min.	0.12%W/V	Pedestrian
	0.75mg./100ml.	20 min.	0.26%W/V	Pedestrian

*same case

and pedestrians, respectively. These reveal several interesting facts:

1. Table F-19 shows that the distribution of the 63 negative B.A.L.'s and the 17 with B.A.L.'s of 0.01-0.04% W/V are both quite uniform with respect to time, except for 9:00 p.m.-midnight periods which are over-represented. None of the cells in either B.A.L. group is empty.
2. For all fatalities with B.A.L. $\geq$ 0.04% W/V, there is a sharp peak in the distribution centered around midnight. Of these persons, 63.3% (57/90) died in the period from 9:00 p.m.-3:00 a.m., and a glance at F-19 shows that a number of empty time intervals exist for these B.A.L.'s.
3. The driver distribution for B.A.L.'s $\geq$ 0.25% W/V (F 20) also differs markedly from the negative B.A.L. distribution for drivers. In the former the distribution peaks sharply in the mignight-3:00 a.m. period, with 50% (7/14) of the driver deaths occurring. The other 7 deaths occur between 3:00 a.m.-midnight, with none occurring from 3:00 a.m.-3:00 p.m.
4. In the B.A.L. range from 0.15-0.24% W/V, the driver distribution also peaks around midnight, with 9 of the 27 driver deaths occurring in each of the two 3-hour intervals surrounding midnight.
5. For the 12 drivers in the B.A.L. range from 0.10-0.14% W/V, 5 died from midnight-3:00 a.m. The other 7 are scattered throughout the remaining 21 hours.

6. As the B.A.L. ranges decrease, the late-hour peaking vanishes. For the negative B.A.L.'s, in fact, only 2 of 22 (9.1%) died in the 9:00 p.m.-3:00 a.m. interval, and both of these crashed before midnight.

7. The pedestrian distribution by hours and B.A.L. is given in F-21. Again the peak occurs for the higher B.A.L.'s but there is a tendency for the peak to occur earlier. Of the 8 pedestrians with B.A.L. $\geq$ 0.25% W/V, 6 were struck between 6:00 a.m. and midnight, and one between midnight and 3:00 a.m. Six of the 9 pedestrians with B.A.L. in the 0.15-0.24% W/V range were also struck in this time period, with 2 more in the midnight-3:00 a.m. interval. 3 of 4 in the 0.10-0.14% W/V range also occurred in the 9:00 p.m.-midnight period. Altogether 18 of 21 persons (86%) with B.A.L. $\geq$ 0.10% W/V were struck between 6:00 p.m -3:00 a.m., with 15 (71%) in the 6:00 p.m.-12:00 interval. This contrasts sharply with the comparable figures for the negative B.A.L.'s; 8 of 22 (36%) and 7 of 22 (32%). Further, we see that none of the negative B.A.L.'s 3-hour time intervals are empty, whereas 3 of those with B.A.L. $\geq$ 0.10% W/V are empty.

1.4.3.6. DISTRIBUTION OF ALL FATALITIES BY WEEK-END, B.A.L. Table F-22 presents the bivariate distribution of all fatalities by a week-day, week-end variable and B.A.L. For this purpose the week-end is defined as the 57-hour period from 6:00 p.m. Friday to 3:00 a.m. Monday; this is 33.9% of the 168 weekly hours.

It is immediately apparent that the negative B.A.L.'s and those in the 0.01-0.04% W/V range are distributed very nearly uniformly with respect to time. That is, on the assumption of uniformity, we should expect two-thirds of the fatalities during the week-day period and one-third during the period we have defined as week-end, and this is almost exactly true for the negatives and the lowest range of B.A.L.

The same result does not hold true for any B.A.L.'s $\geq$ 0.05% W/V or for the entire sample. The week-end period is over-represented in each case, with significance in each case (Chi-square test) at the 5% level, and for the pooled positives (B.A.L. $\geq$ 0.05% W/V) the significance is 0.1%. This data clearly suggests that week-ends are particularly associated with traffic deaths in which alcohol is a factor, including those in the very high alcohol concentration ranges normally associated with problem drinking or alcoholism.

Further analyses of this type will be undertaken to try to determine whether Michigan's ban on the Sunday sale of liquor results in a lower alcohol-related involvement, and whether the recently passed bill to permit the Sunday sale of liquor by the glass in restaurants has a detectable effect.

1.4.3.7. DISTRIBUTION OF FATALITIES BY MONTH, ROAD STATUS. This distribution appears as Table F-23. It should be noted for this table in particular that the studied period started 15, July, 1967, and only the first 6-month results are reported here. Thus both January and July are half months. Further, the Detroit riots started 23, July, 1967 and a state of civil disorder for 10 days

was proclaimed with curfews, and a ban on liquor sales. These measures obviously caused July to be atypical.

Excluding January and July, the total number of fatalities is quite uniformly distributed over the 5-month period from August-December. Based on a uniform monthly distribution of the 156 deaths, Chi-square = 3.74, giving an attained significance level of 43% and hence supporting the uniform distribution assumption. Similarly, neither the driver nor pedestrian deaths deviate significantly from a uniform distribution at an attained significance level of 22%.

The passenger deaths do deviate significantly, however (Chi-square - significance level 01.7%), due primarily to the large number in October (14) and the surprisingly low number in December (2). The age-passenger status interaction (47.3% of the passengers were in the 16-24 range) and the status-hour interaction (63.2% of the passengers crashed between 9:00 p.m.-3:00 a.m.) might be indicative of an unusual amount of October "joy-riding". This speculation will have to be checked with the accumulation of more data and further processing.

December, on the contrary, is surprisingly low in passenger deaths; this also relates to a low number of driver deaths (9). At the same time there was a high number of pedestrian deaths (17). This latter figure might be explained by the reduced number of daylight hours during December, by the increased pedestrian activity associated with Christmas shopping, and by the increased hazards of snow and ice. There is no ready explanation for

the reduced December driver and passenger fatalities and it will be most interesting to see if these findings have any statistical stability through another year.

1.4.4 RESPONSIBILITY IN ACCIDENT OCCURRENCE.

Information from the Medical Examiner's report and the police accident report was utilized to make a judgment concerning the deceased person's responsibility for the accident. When no accident report was available, the fatality was assigned to the category of "undetermined". There were 12 such cases where reports were unavailable. The individual's alcohol concentration was unknown at the time the judgment of responsibility was made. The number of persons in each category is given in Table 1.9.

Table 1-9. Distribution of Drivers, Pedestrians, and Passengers in Responsibility Categories.

Drivers and Pedestrians	Drivers	Pedest.	Total
Resp. undetermined/No police report	7	7	14 (10%)
Car Failure	1	0	1 (1%)
Illness	6	0	6 (4%)
Both Deceased and Another Person	2	4	6 (4%)
Another Person Responsible	15	13	28 (20%)
Deceased Responsible	53	31	84 (60%)
Total	84	55	139 (100%)

Passengers	
Resp. Undetermined/No police report	2 (5%)
Passenger's Driver Responsible	25 (66%)
Another Person Responsible	10 (26%)
Passenger's Driver and Another Person	1 (3%)
Total	38 (100%)

1.4.4.1. RESPONSIBILITY IN ACCIDENT OCCURRENCE AND ALCOHOL CONCENTRATION. A distribution for the categories of accident responsibility and alcohol concentration was made for both drivers and pedestrians. Certain important differences were evident with respect to the alcohol groups and the responsibility categories.

1. 45% of the deceased responsible pedestrians had negative blood alcohols, whereas only 13.2% of the deceased responsible drivers had negative alcohol concentrations. (Tables 1-10, 1-11, category F)

2. 79% of all deceased responsible drivers had alcohol concentrations above 0.10% and 68% were in the 0.15% or greater range. Comparing responsible pedestrians with their counterpart drivers, we find that 42% of the pedestrians had alcohol concentrations 0.10% or above, and 32% had alcohol concentrations above 0.15%.

3. The lower percentages of alcohol involvement for pedestrians show the interaction of alcohol with age. Only 8.3% of drivers were in the 65 years or older group, while 36.4% of the pedestrians were in this elderly age bracket; and 45% of these older pedestrians had negative alcohol concentrations. When reviewing the accidents of elderly pedestrians, their inattention to the environment, or inattention to where they are walking, is the characteristic feature, not an extensive drinking involvement.

4. In pedestrian fatality accidents where someone other than the deceased was responsible (Table 1-11, category E) we find 3 pedestrians who had an alcohol concentration of 0.10% or greater. None of these pedestrians had alcohol concentrations of 0.25% or above.

5. There were seven driver accidents where another person was at fault although the deceased had an alcohol concentration of 0.10% or over (Table 1-10, category E). Two of these were motorcycle accidents; one motorcycle was reportedly not seen by the car driver, and the other case occurred when an object was thrown at a motorcycle, causing the driver to lose control. Why the object was thrown is not known. In a third case where the driver of a car was not judged responsible but had an alcohol concentration of 0.12%, we find that the second driver, who was responsible for the accident, died with a B.A.L. of 0.14%. Whether the deceased could have avoided or reduced the severity of the resulting crash in a sober state is speculative.

6. Negative alcohol concentrations show a similar distribution for deceased drivers and pedestrians when another person was at fault. 33% of these drivers had a negative B.A.L. and 38% of the pedestrians had a negative B.A.L.

Although age seems to be an important factor in pedestrian responsible accidents, the characteristic feature in driver responsible accidents is alcohol involvement; 68% of all such responsible drivers had B.A.L.'s 0.15% or higher. These high concentrations, presumptive evidence of intoxication, far exceed the concentrations that reasonably can be associated with social drinking patterns.

1.4.4.2. SINGLE-CAR VS. MULTIPLE-CAR CRASHES AND ALCOHOL CONCENTRATION. Table F-26 presents the distribution of single-car and multiple-car accidents by B.A.L. Table 1-12 is derived from this distribution.

Table 1-10. Distribution of Drivers by Alcohol Concentration and Responsibility for Crash.

DRIVERS

Category of Responsibility	Alcohol Concentrations							
	Negative	.01-.04	.05-.09	.10-.14	.15-.24	.25+	Not Taken	Total
A-Undetermined Responsibility	5 (71.4%)			2 (28.5%)				7 (100%)
B-Car Failure	1 (100%)							1 (100%)
C-Illness	3 (50.0%)	2 (33.3%)		1 (16.7%)				6 (100%)
D-Both Deceased and Other Person Responsible	1 (50.0%)				1 (50.0%)			2 (100%)
E-Other Person Responsible	5 (33.3%)	2 (13.3%)		3 (20.0%)	3 (20.0%)	1 (6.6%)	1 (6.6%)	15 (100%)
F-Deceased Driver Responsible	7 (13.2%)	2 (3.8%)	2 (3.8%)	6 (11.3%)	23 (43.4%)	13 (24.5%)		53 (100%)
Total	22 (26.1%)	6 (7.1%)	2 (2.3%)	12 (14.2%)	27 (32.1%)	14 (16.6%)	1 (1.1%)	84 (100%)

Table 1-11. Distribution of Pedestrians by Alcohol Concentration and Responsibility for Crash.

PEDESTRIANS

Category of Responsibility	Alcohol Concentration							
	Negative	.01-04	.05-.09	.10-.14	.15-.24	25+	Not Taken	Total
A-Undetermined Responsibility	2 (28.5%)				3 (42.8%)	2 (28.5%)		7 (100%)
B-Car Failure								0
C-Illness								0
D-Both Deceased and Other Person Responsible	1 (25%)		2 (50%)				1 (25%)	4 (100%)
E-Other Person Responsible	5 (38.5%)	4 (30.8%)	1 (7.7%)	1 (7.7%)	2 (15.4%)			13 (100%)
F-Deceased Pedestrian Responsible	14 (45.2%)	4 (12.9%)		3 (9.7%)	4 (12.9%)	6 (19.4%)		31 (100%)
Total	22 (40%)	8 (14.5%)	3 (5.4%)	4 (7.3%)	9 (16.4%)	8 (14.5%)	1 (1.8%)	55 (100%)

Table 1-12. Alcohol Concentration for Single Car and Multiple Car Fatalities.

	Alcohol Concentration		
	0.00-0.09	+0.10	Total
Single Car	12	21	33
Multiple Car	18	32	50
	30	53	83

If alcohol concentration is not a significant factor in explaining single-car vs. multiple-car accidents, then 33/83 of the 30 fatalities in the 0.00-0.09% range, or 11.9, would be expected to be single-car accidents; 12 is the observed number. Similarly 33/83 of 53 in the 0.10% W/V or greater range, or 21.1, would be single-car crashes; 21 were in fact observed. Therefore the hypothesis that alcohol is not a significant factor in explaining single-car vs. multiple-car crashes would not be rejected by the data in this study. Further, comparing only those cases in the 0.25%+ range (7 in each category) with either the total number or with the negatives does not produce a statistically significant result in rejecting the given hypothesis.

In spite of the lack of statistical significance in these results, we note that 58% of the single-car crash drivers exceeded 0.15% W/V compared to 43% of the multiple-car crash drivers. A larger sample size will help to clarify this relationship in subsequent phases of this study.

1.4.4.3. MARITAL STATUS, ALCOHOL, AND ACCIDENT INVOLVEMENT. Marital status is nearly proportional for drivers and pedestrians judged accident responsible and those not designated responsible.

Table 1-13. Marital Status and Responsibility for Crash Occurrence.

	Responsible	Not Designated Responsible
Married	48.8%	52.7%
Single	29.8%	29.1%
Divorced	8.3%	9.1%
Separated	3.6%	3.6%
Widowed	9.5%	5.5%
Total	100.0%	100.0%

Although we do not know the marital status for all persons using roads, either in cars or on foot, the percentage of persons who were judged accident responsible within each marital group (Table 1-14.) indicates that widowed persons are more likely to be accident responsible (73%) than other marital groups.

Table 1-14. Percentage of Responsible Drivers and Pedestrians in Each Marital Group.

Marital Status	Number	Percentage
Married Responsible	41/70	58.6%
Single Responsible	25/41	60.9%
Divorced Responsible	7/12	58.3%
Separated Responsible	3/5	60.0%
Widowed Responsible	8/11	72.7%

1.4.5. License Status and Driver Record Comparison

License status was checked for the 109 persons on whom driving records were located. Eight persons were found with expired licenses at the time of their death. Four of these persons were drivers. One additional driver, not shown on the table below, was driving with a suspended license.

In this table, figures in the column "data missing" or "no license record" indicate either that a driving record was not located or a driving record was available but the date of license expiration was not listed. This information has been separated for drivers.

Table 1-15. License Status

	Not Expired	Expired	Data Missing	No License Record
Drivers	61	4	8	11
Passengers	8	2	28	
Pedestrians	17	2	36	
Total	86	8	83	

1.4.5.1. NATIONAL DRIVER REGISTER SERVICE OF THE FEDERAL HIGHWAY ADMINISTRATION. The National Driver Register Service compiles a file on persons who have had their driver's licenses revoked, denied, or suspended, using information forwarded to them by the individual states on these actions.

The names of 177 fatalities were sent to the Driver Register for matching with names in their files. Birth date and aliases were included with the name when known. Social security number, the primary search number used by the Driver Register, was not usually available for the fatalities. Results of matching are shown in Table 1-16.

1.4.5.2. BLOOD ALCOHOL CONCENTRATION AND MOVING VIOLATIONS. Alcohol concentration at death and the number of moving violations for a six and one-half year period were compared for 72 driver fatalities with driver records. Drivers with high alcohol concentrations of 0.10% W/V and greater were almost double the number of those with lower (0.04% W/V and less) or negative alcohol concentrations (a ratio of 45:25). 92% (23 of 25) of the persons with alcohol concentrations of 0.04% or less had 3 or fewer moving violations, while only 42% (26 of 45) of the persons in high alcohol groups had 3 or fewer violations. Table 1-17 shows the distribution of the number of moving violations to alcohol concentration at death. Each point in a cell indicates one driver.

1.4.5.3. DRIVING RECORD COMPARISON. Available driving records for all fatalities and for driver fatalities were compared to the driving records of a randomly selected population of Michigan drivers.* Comparison was made by the number of driving convictions in a six and one-half year period. Table 1-18 shows this comparison.

Considerable differences appear between the random sample population and the group of traffic fatalities. 47% of the sample

*William L. Carlson, Identifying the Problem Driver from State Driver Records. H.S.R.I., No. 1., 1968. See also Joseph W. Little, Michigan Driver Profile, H.S.R.I., Internal Report., 1968.

Table 1-16. Results of Matching National Driver Register Files with Fatality Records

Number of Cases	Type of Match	Denial Type and State of Origin
1	Fairly conclusive	Financial Responsibility, Tenn.
1	Probable (birth date differed by 10 days)	Fatal accident, DUIL, Florida
2	Possible	DUIL, Ohio
	Possible (age approximated birth date when subtracted from death date for both persons)	DUIL, Georgia
5	Inconclusive (unknown birth date for persons with common surnames)	
168	No Match	

Table 1-17. Distribution of Blood Alcohol Level and Number of Moving Violations Since 1-1-61. Drivers Only

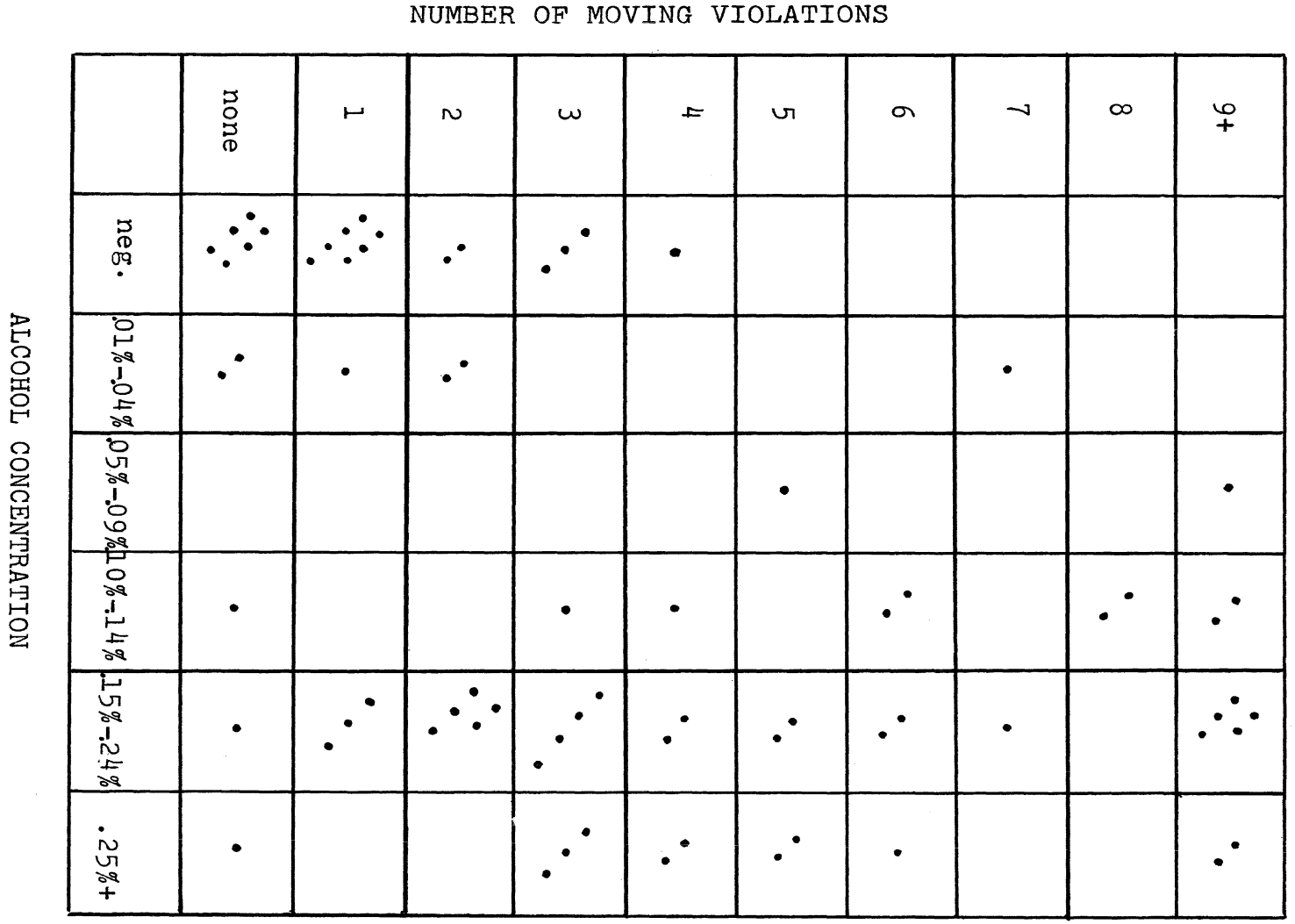

Table 1-18. Comparison of Populations by Moving Violations Since 1-1-61.

No. of Moving Violations	Normal Population (Driver Profile)	All Fatals With Driving Records	All Drivers With Records
0	505 (47%)	23 (21%)	11 (15.2%)
1	246 (23%)	23 (21%)	11 (15.2%)
2	115 (11%)	14 (12%)	9 (12.5%)
3	70 (7%)	11 (10%)	12 (16.7%)
4	44 (4%)	8 (7%)	6 (8.3%)
5	33 (3%)	6 (5%)	5 (6.9%)
6	14 (1%)	6 (5%)	5 (6.9%)
7	10 (1%)	4 (3%)	2 (2.7%)
8	17 (2%)	2 (1%)	2 (2.7%)
9+	14 (1%)	12 (11%)	9 (12.5%)
	Total = 1068	Total = 109	Total = 72

group had no moving violations in the six and one-half year period, while only 20% of all fatalities and 15% of driver fatalities had no violations. The fatal population also has a generally higher percentage of its cases in the 4 and more violation categories than does the random sample population. At the extreme end, nine or more violations, we find 1% of the sample group compared with 11% of all fatalities and 12% of driver fatalities. This indicates, at least on a group basis, that people who are involved in fatal vehicle accidents, especially driver fatalities, have generally poorer driving records than a sample population of drivers.

1.4.6. Case Record Findings

Fifty records were located at the social and court agencies. The number found at each agency is as follows:

Wayne County Department of Social Services	28
Wayne County Circuit Court, Probation Department	7
Detroit Recorder's Court, Probation Department	9
Detroit Recorder's Court, Traffic Division	6
Total	50

These 50 records were on 42 fatalities or members of their immediate families. When separated by road status there were 25 drivers, 6 passengers, and 11 pedestrians. Twelve of these 42 cases were found to be alcoholics or to have serious physical, social, or economic problems stemming from their excessive drinking habits. This problem drinking group is 28.5% of all cases found at the agencies (see data analysis, sec. 1.3.3 for definition of problem drinking).

1.4.6.1. GENERAL INFORMATION ABOUT PERSONS WITH DRINKING PROBLEMS. Of all cases where records were found 7 (17%) were female and 35 (83%) were male. Sixteen (39%) were Negro and 26 (61%) were white. The racial distribution of persons identified as having drinking problems was similar to the total group of cases where records were located; 41% were Negro and 58% were white. Sex distribution was somewhat different. Only one female was identified as having a drinking problem, although females accounted for 17% of the total cases located. The age of persons with drinking problems ranged from 21 years to 67 years with a mean age of 40 years.

Education was not always known, so social class could not be accurately established using education and occupation as the determining factors in social class. However, for those persons with drinking problems, occupational status most commonly was: none, domestic or service, laborer, and factory. No white collar workers, executives, semi-professionals, or professionals were found. The low occupational level of the cases is expected considering the type of agencies which were utilized in record collection. The Wayne County Department of Social Services generally handles cases from lower economic levels since a great part of their function is financial assistance in combination with other types of help. The same type of lower class bias might be true for agencies handling criminal offenders, although this is dependent on one's interpretation of the social and economic factors that encourage criminal and deviant behavior. It may also be that information about the drinking problem is less easily disguised by members of lower socio-economic groups than by those of the middle or upper classes.

At this point it might be appropriate to note that, in their study of social class and mental illness, Hollingshead and Redlich state, "lower class living appears to stimulate the development of psychotic disorders [alcoholism and drug addition are included as psychoses in their study]...the excess of psychoses from the poorer areas are a product of the life conditions entailed in the lower socio-economic strata of the society."*

1.4.6.2. ADDITIONAL INFORMATION ON SPECIFIC CASES. Information on matters other than social class, race, and sex was noted when reviewing the case records. Alcohol was present in the blood of many fatalities. Four case records give clues as to possible reasons for the alcohol factor or the drinking behavior as well as other insights concerning the occurrence of alcohol-related crashes.

The following is a discussion of four fatality cases which may help illuminate the alcohol problem.

Precipitating Crises

Two male fatalities occurred the day following a family crisis. One pedestrian fatality was visiting his wife from whom he was separated. After telling her that he would like the separation to end, she in turn indicated that she was interested in marrying another man. He died the next day with an alcohol concentration of 0.40% W/V.

The second case involved a similar type of situation. An invalid or illegal marriage took place between one man's wife and

*Hollingshead and Redlich, Social Class and Mental Illness: a community study, 1958, p. 242.

another man. The following day, the first husband lost control of his car while driving over a bridge. He died with an alcohol concentration of 0.22% W/V.

Environmental or Family Factors

Two members of one family were found involved in alcohol-related crashes within a short time period. A son died in a motorcycle accident with an alcohol concentration of 0.12% W/V. One month later, the father lost control of his car and died with an alcohol concentration of 0.25% W/V. Father and son both had criminal records. Further inquiry into the family background might reveal that these two accidents, both similar in the alcohol factor and also taking place so close in time, were more than mere coincidence.

1.4.6.3. DRIVING AND CRIMINAL RECORDS OF PERSONS WITH DRINKING PROBLEMS. Driving and criminal records of the 12 persons with known drinking problems were reviewed and checked for convictions concerning drunk-related offenses.

The total number of both general driving and/or criminal convictions for the 12 cases with known drinking problems ranged from 3-38 except for one pedestrian case where no such records were located. Convictions for drunk- or drinking-related offenses were found for 5 of the 11 persons with records, again supporting findings that no more than half of a problem drinking group will have drunk convictions.* No cases with both known drinking problems and cirrhosis had drunk convictions.

*M. L. Selzer and N. J. Ehrlich, Controlled Study of Alcoholism, Psychopathology and Stress in 96 Drivers Causing Fatal Accidents, p. 6.

1.4.6.4. ALCOHOL CONCENTRATIONS FOR PERSONS WITH DRINKING PROBLEMS. The mean alcohol concentrations for this group of 12 was 161 mg/100 ml. Although 3 had negative alcohol concentrations at death, and one case had 0.01%, the remainder had alcohol concentrations ranging from 0.17%-0.40% W/V (Table 1-19).

1.4.6.5. DRINKING-RELATED CONVICTIONS FOR ALL 177 FATALITIES. One hundred and nine driving records and 42 criminal records were located. One hundred thirteen fatalities had either one or both of these records. All such cases were checked for drunk convictions or convictions where drinking was involved with another offense. Twenty-one persons were found with a drinking-related conviction.

These people had a mean number of 14.1 convictions and a mean of 2.1 drinking convictions. The actual number of drinking convictions ranged from 1-12. Studies done by Waller* have led him to the conclusion that 2 or more arrests involving alcohol indicate a serious drinking problem in three-quarters of such cases; however, Selzer believes that one arrest is highly suggestive of a drinking problem. The group with drinking convictions also had a mean alcohol concentration of 159 mg/ml or nearly 0.16% W/V.

1.4.6.6. INFORMATION RELATED TO DRINKING CONVICTIONS AND DRINKING PROBLEMS. In addition to their drinking convictions, 5 cases were known by social agencies to have drinking problems and 1 case had cirrhosis of the liver (see Table 1-20). This indicates

*Julian Waller, Guide for the Identification, Evaluation and Regulation of Persons with Medical Handicaps to Driving, p. 24.

Table 1-19. Convictions and Alcohol Concentrations for Persons with Drinking Problems

Drinking Problem & Cirrhosis	Total Convictions	Number Drunk Convictions	Alcohol Concentration	Status on Road
1	8	0	0.26%	Pedestrian
2	11	0	0.21%	Driver
3	3	0	0.24%	Driver
Drinking Problem Only				
4	26	1	neg.	Pedestrian
5	-	-	0.01%	Pedestrian
6	12	0	neg.	Passenger
7	21	0	0.19%	Driver
8	7	2	0.40	*Pedestrian
9	12	0	0.19%	Driver
10	4	2	neg.	Pedestrian
11	38	11	0.27%	Pedestrian
12	10	3	0.17%	Driver
			Average 161 mg./100 ml.	

Table 1-20. Distribution of Persons with Drinking Convictions, Their Alcohol Concentrations and Drinking Problems

Number	Total Convictions	Drinking Convictions	Blood Alcohol	Status on Road	Other Findings
1	2	2	.02	dr	
2	35	2	.16	dr	
3	18	1	.31	dr	
4	10	1	.09	dr	
5	17	2	.11	dr	Cirrhosis
6	18	2	.04	pass	
7	26	1	0.00	ped	Drinking problem
8	6	1	0.00	pass	
9	6	2	.32	dr	
10	36	1	.12	dr	
11	7	2	.40	ped	Drinking problem
12	14	12	.25	ped	
13	5	1	.22	dr	
14	3	1	0.00	dr	
15	4	2	0.00	ped	Drinking problem
16	12	3	.28	dr	
17	9	2	.23	dr	
18	16	3	.12	ped	
19	38	10	.27	ped	Drinking problem
20	10	3	.17	dr	Drinking problem
21	5	1	.23	dr	
Total 21	Avg. Conv.	Avg. Conv.	Avg. Alc.Conc. 159 mg/ 100 ml.		5 Drinking problems 1 Cirrhosis Case

that 28% (6 of 21) of those persons with drinking convictions also had an identified problem related to drinking; or 41% (5 of 12) of the people with drinking problems also had drinking convictions. Less than one-half of the problem drinking population could be identified using conviction or social agency records alone.

1.4.6.7. CONCLUSIONS FROM DATA ON DRINKING PROBLEMS, CIRRHOSIS, AND DRINKING CONVICTIONS. It is not felt that all problem drinkers were identified by us as such, even when data were combined from all sources which were available.

Thirty-one persons or 17.5% of the fatal population had either cirrhosis, a known drinking problem, or a drinking-related conviction. However, 46% (82 persons) of the total population died with alcohol concentrations of 0.10% W/V or greater and 36% (64) died with 0.15% W/V or greater alcohol concentrations. This latter figure includes twice as many persons as those who might be classified as problem drinkers from evidences of liver disease, drinking convictions, or drinking problems.

Separating drivers from the remainder of the fatal population, we find that 19 or 22.6% of all drivers had either cirrhosis, drinking problems, or drinking convictions. 63.1% (53) of all drivers had alcohol concentrations of 0.10% W/V or greater and 48.8% (41) had alcohol concentrations of 0.15% W/V or greater. These elevated B.A.L.'s have been closely related to excessive moving violations, to drinking convictions, and to drinking problems. Using 0.15% W/V alcohol concentrations as a guideline, our data suggests that present methods are identifying only one-half of the problem drinkers who are also drivers.

SECTION 2

MICHIGAN ALCOHOLIC SCREENING TEST ANALYSIS (PROJECT II)

by

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and

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2.1. INTRODUCTION

Numerous research studies in the 1950's and 1960's have documented the existence of an alcohol-traffic accident relationship. The common conclusion which emerges from these studies is that the "risk of accidents, especially fatal accidents, is significantly increased by alcohol (1)."

Until quite recently, it was generally assumed that social or casual drinkers were responsible for the majority of drinking accidents, as such drinkers comprise the majority of drinking drivers. Many studies, however, have suggested that it is the pathological drinker or the alcoholic, rather than the social drinker, who is responsible for a disproportionate share of drinking accidents, and particularly serious accidents (2). For example, a study of 71 Swedish drivers involved in personal injury accidents indicated that 32%, as opposed to 14% of the general population, were found to be "alcohol misusers" ("excessive drinkers," "alcohol abusers," and "alcohol addicts," as defined by Swedish law) (3). Using statewide data on alcoholism and traffic accidents, Waller (4) has estimated that alcoholics represent 6.5% of California drivers, 10.4% of the annual miles driven, and between 41% and 62% of known drinking accidents. In another study, Selzer (5) concluded that of 65 drivers arrested for drunk driving in Ann Arbor, Michigan, 38 (57%) were alcoholic, 10 (15%) "probably alcoholic," and 4 (6%) "prealcoholic;" thus 54 (78%) of the arrested drivers

were judged to have pathologically serious drinking problems. In a study of 96 drivers responsible for fatal accidents, Selzer found that 37% were alcoholic and 12% were "frequent high quantity users" of alcohol (6).

Although the studies cited summarize or report research done on different populations and utilize somewhat different methods, they all support the conclusion that the alcoholic is involved in a sizable proportion (30%-70%) of alcohol-related accidents. The interests of traffic safety would obviously be furthered by a means of reliably distinguishing between alcoholics and non-alcoholics in the driving population, since there is reason to believe that the alcoholics' driving difficulties will not yield to traditional methodology. Unfortunately, no easily used, clear-cut method exists for diagnosis of alcoholism. Physical and visible indicators of alcoholism are essentially late complications of the syndrome and sometimes do not appear at all. Psychological concomitants of alcoholism, such as "dependency" and "immaturity," are nonspecific and difficult to measure.

The Michigan Alcoholic Screening Test (MAST) was devised to provide a consistent quantifiable interview instrument for the detection of alcoholism. MAST consists of a series of questions most of which have been used previously by investigators in alcoholism surveys (7-9). It is believed that many of the questions are "neutral" enough so that evasive alcoholics will betray their drinking problems.

The questionnaire has already been administered to six different groups; the results of these surveys are reported in a later section of this paper. Additional administration of the MAST is currently in progress.

The MAST findings will be validated by searching social and medical agency sources for independent evidence of drinking problems, a procedure now underway. When this validation is completed, further revision of the MAST can be undertaken in light of the correlation of individual MAST items with the presence of alcoholism in the respondents. At the time, a final scoring system can also be constructed with weights given to the items according to their ability to reveal alcoholism.

Given the apparent relationship between alcoholism and traffic accidents, the development of a reliable and valid instrument for detection of alcoholism is an important step in efforts to reduce traffic accidents. Identification of drivers with drinking problems is a prerequisite for programs aimed at treating the alcoholic and modifying his problematic behavior, including his driving. In addition to its potential utility for traffic safety programs, the MAST can be of use to medical, legal, and psychiatric personnel seeking a generally applicable method of establishing an objective diagnosis of alcoholism.

In the present study, the MAST questionnaire has been administered to six predominantly male groups. Group I con-

sisted of 118 hospitalized male alcoholics who were instructed to answer the questionnaire truthfully to obtain a sample of "pro-alcoholic" responses.

Group II (called University controls) consisted of 104 male University of Michigan Plant Department personnel (ground crew, electricians, plumbers, janitors, etc.) or University Allergy Clinic patients. They were selected to act as a control population and were instructed to respond truthfully to obtain a sample of presumed nonalcoholic responses.

Group III consisted of 99 male, hospitalized "Fake Take" alcoholics who were instructed to answer the questionnaire so as to disguise their drinking problems in an attempt to discover how alcoholics might lie when trying to answer the questionnaire without revealing their alcoholism.

The remaining three groups were: Group IV, 100 "problem drivers" called in by the Driver's Services Division of the Michigan Department of State for re-examination due to 12 or more points incurred as a result of moving violations; Group V, 116 drunk driving offenders, inmates of the Detroit House of Correction; and Group VI, 88 persons from the Ann Arbor Municipal Court (AAMC), convicted for a drinking-related charge such as drunk driving or drunk and disorderly behavior. The MAST was administered to Groups IV, V, and VI to test the instrument in groups where a large number of alcoholics anxious to camouflage their alcoholism might be present.

The majority of all groups consisted of Caucasian males,

with the exception of the Detroit House of Correction group of which 62% were Negro males.

2.2. VALIDATION OF THE MAST

To validate the usefulness of the MAST as a simple and consistent means of identifying alcoholism, an intensive search of all the files of all local medical and social agencies, as well as certain state agencies, is now underway. The purpose of the search is to find independent verification of alcoholism in the subjects interviewed. Thus far, the files of three social agencies and one probation department have been searched for contacts by Group I, II, IV, and (in part) VI. In future months, the files of the remaining social agencies and all medical hospitals in Washtenaw County, as well as those of all state mental hospitals, will be searched for contact by the subjects in this study.

2.2.1. AGENCIES ALREADY SEARCHED

The first agency, Family Service, has been operating in Ann Arbor since 1922; its function is the counseling and treatment of family problems. At present, its records date back to 1954, but personnel are in the process of purging their files, keeping only the most recent ten years. Presently, they have approximately 3,500 records in their inactive files. For the past three years they have served an average of 538 new cases per year and at present have 152 active cases. Statistical file cards are kept for each case

and contain such basic information as names, birth dates and/or ages of subjects, spouses and children, address, occupation, employer, children's school, marital status, education, others in household, and source of application or referral. Other information includes the primary focus of service, the environmental conditions, reason, date and category of service at termination. The majority of this information is repeated on the face sheet of the file report. The remainder of the file contains dated progress notes (by the social worker) and all correspondence pertaining to the case.

The second agency, Catholic Social Services, has been in operation in Ann Arbor since 1959 and performs all types of social services. Since its inception, it has served a total of 1,779 cases. Of these, 1,074 are in the inactive file, with 705 cases still open. An alphabetical card file index is kept for both inactive and active cases. The cards contain usually only minimal information such as name, address, name of spouse, name of caseworker, case number, and dates the case was opened and/or closed. The face sheet of the report contains much more detailed information such as date and place of birth, religion, education, occupation, employer and income, date of marriage, and previous marriages. It also contains information pertaining to children: dates and places of birth, school grade, baptism, and confirmation.

The third agency, the Washtenaw County Department of Social Services, began approximately in 1935. It consists

of four major branches: Old Age Assistance, Aid to Dependent Children, Aid to the Blind, and Aid to the Disabled. The average monthly case load for these four services is 1,366 cases. The agency is financed by state and federal funds. Each case is listed on a master card and kept in an alphabetical index file. The cards contain much the same information as in the other social agencies. In addition to general information, the face sheet has information concerning legal settlements, residences (dates, number of rooms, rent), marriage record, institutional care, and military record. Except for name, address and birth date, the face sheets may be in any state of completion.

The fourth agency, the Washtenaw County Probation Department (including both Circuit and Municipal Courts), began in 1951. At present the Circuit Court has 193 misdemeanor probation cases and 560 felony cases which are active. The Municipal Court currently has 200 felony cases. The face sheet used by the Probation Department contains detailed information concerning the conviction: offense and statute, presiding judge, probation officer and how convicted (plea, jury, court), previous record, disposition of case, and any information received at a reception center (police station, etc.). It also lists personal characteristics including marks and scars, as well as general information such as marital status, military record, occupation and education.

2.2.2. METHOD OF FILE SEARCH

At the social service agencies the card files were examined first. (In the case of the Probation Department, the records were pulled from the files by department staff, thus eliminating the need for a card file search.) The subjects were identified by name, birth date, and address, and then listed. All cards showing the same surname as a subject were also listed in the event that the record was under the name of another family member. When records were pulled from the files, they were examined thoroughly for any mention of a drinking problem on the part of the subject or another family member. A summary of each case was made, whether or not there was any mention of alcohol.

Although progress has been made in devising a scoring system for the MAST, it has not as yet been validated. Because of this it is impossible to compare the results of the social agency file search with the questionnaire results or to verify any diagnosis of alcoholism.

In addition to obtaining information from social agencies, researchers have requested the driving record of each respondent from the Michigan Department of State and his criminal record from the Michigan State Police.

2.3. INTERVIEW TECHNIQUE

A series of four interviewers, three female and one male, all approximately 24 years of age, administered the MAST to the six populations. All interviewers were college

graduate research assistants trained in interviewing and/or with interviewing experience. Continuity was established by having one interviewer deal with each group completely with the exception of the Detroit House of Correction and the University controls, where two interviewers were involved. No difference in response was noted due to the change in interviewers.

In most cases a private office was provided for the interviews. Usually these were clean, comfortable, well-lighted offices favorable to the interview situation. The exception was the University control group interviews, most of which were conducted on job sites; the interviews, however, were still privately conducted.

All interviews were private except for less than 2% of the cases at the Driver's Services Division and the Ann Arbor Municipal Court, where a lawyer or a close relative was present. This did not, however, seem to inhibit the person being interviewed.

All introductory speeches used by the interviewers to explain the research project contained the same basic information, with each situation receiving supplemental information as needed. All individuals were assured that the project was confidential and that refusal to cooperate would in no way be injurious to them. The cooperation level was very high, with less than 2% refusals. It is felt, however, that the official atmosphere may have intimidated some individuals into cooperating. This is especially true of the

Driver's Services Division, where individuals were asked to see the interviewers as if it were a normal part of driver's license re-examination, and the Ann Arbor Municipal Court, where the presiding judge directed the offenders: "Before sentencing I want you to be interviewed in connection with a court project."

2.4. POPULATIONS INTERVIEWED

2.4.1. GROUP I: HOSPITALIZED ALCOHOLICS

The hospitalized alcoholics consisted of 118 patients interviewed at two hospitals. The first, a private, nonprofit hospital for alcohol addiction housing patients who were voluntarily hospitalized, provided 64% of the subjects. The remaining 36% came from a state hospital and were either voluntary admissions or legally committed. At the private hospital, the medical director screened the patients and permitted only those that he knew to be cooperative to be interviewed. He later expanded this to a more random selection, excluding only those who were physically unable to be interviewed. The interviews were held in a private office, and either a secretary or staff member introduced the interviewer to the patient.

At the state hospital, the physician ward director provided a list of new patients and selection was completely random; the interviewer had access to everyone in the alcoholism ward. He was usually introduced by the ward director or, on rare occasions, by the ward orderly. These interviews were also conducted in a private office.

INTRODUCTION. The interviews were initiated as follows:

> I'm (name) from The University of Michigan, and I am currently working on a research project concerning drinking and alcoholism. I would like to ask you some questions about your drinking habits. You are not, however, obligated to answer any questions, and anything you tell me is used only for research purposes and is strictly confidential. If you have no objections, let's get started.

2.4.1.1. GENERAL STATISTICS.

Age. Ages in the hospitalized group ranged from 23 to 73 years, with 87% falling between the ages of 30 to 50. The median age was 44 years (see Table 2-1).

Social Class. The social class was determined in all populations by use of Hollingshead's Two Factor Index of Social Position (10), which is based on education and occupation. The factors are combined by giving weights for each factor which were determined by multiple correlation techniques. Once the scores are determined, social class is assigned by comparison with a range of computed scores which give the score limits for each social class. Social classes range from I, comprised of individuals of the highest socioeconomic and educational level, to V, the lowest level. The majority (69%) of the hospitalized alcoholics fell within the two lowest social classes, IV and V, with 20% in class III and 11% in classes I and II (see Table 2-2).

Table 2-1. Age Range and Median Age of Groups Given the MAST

Group	18 & under	19-29	30-39	40-49	50-59	60-69	70 & over	Median
I - Hospitalized Alcoholics (N = 118)	0	8 (7%)	28 (24%)	44 (37%)	29 (26%)	8 (7%)	1 (1%)	44
II - University Controls (N = 104)	0	19 (18%)	30 (29%)	27 (26%)	20 (19%)	7 (7%)	1 (1%)	40
III - "Fake-Take" (N = 99)	0	4 (4%)	17 (17%)	41 (41%)	29 (29%)	7 (7%)	1 (1%)	47
IV - Driver Service's Division (N = 100)	13 (13%)	69 (69%)	6 (6%)	8 (8%)	2 (2%)	2 (2%)	0	21
V - Detroit House of Correction								
Negro (N = 72)	1 (1%)	7 (10%)	14 (20%)	31 (43%)	15 (21%)	4 (6%)	0	44
White (N = 44)	3 (7%)	13 (30%)	10 (23%)	9 (20%)	6 (14%)	3 (7%)	0	36
Total (N = 116)	4 (3%)	0 (17%)	24 (21%)	40 (34%)	21 (18%)	7 (6%)	0	42
VI - Ann Arbor Municipal Court (N = 88)	5 (7%)	36 (41%)	19 (22%)	18 (20%)	8 (9%)	0	2 (2%)	31

Table 2-2. Social Class of Groups Given the MAST

Group	Class 1	Class 2	Class 3	Class 4	Class 5
I - Hospitalized Alcoholics (N = 118)	7 (6%)	6 (5%)	24 (20%)	49 (42%)	32 (27%)
II - University Controls (N = 104)	17 (16%)	4 (4%)	10 (10%)	45 (43%)	28 (27%)
III - Fake Take (N = 99)	5 (5%)	5 (5%)	26 (26%)	46 (46%)	17 (17%)
IV - Driver Service's Division (N = 100)	0	7 (7%)	7 (7%)	52 (52%)	34 (34%)
V - Detroit House of Correction					
Negro (N = 72)	0	1 (1%)	0	18 (25%)	53 (74%)
White (N = 44)	0	0	2 (5%)	14 (32%)	28 (64%)
Total (N = 116)	0	1 (1%)	2 (2%)	32 (28%)	81 (70%)
VI - Ann Arbor Municipal Court (N = 88)	3 (3%)	4 (5%)	9 (10%)	47 (53%)	22 (25%)*

*3 (3%) unknown.

Marital Status. In Group I, 68% of subjects were married, 15% divorced, 14% single, 2% separated, and 2% widowed (see Table 2-3).

MAST Responses. Of all groups tested, the Hospitalized Alcoholics scored highest in the number of positive responses to the pro-alcoholic questions. There was a wide range in the number of pro-alcoholic responses given to each of the MAST items: for Item 25B only 18 (15%) pro-alcoholic responses were obtained; for Item 6, 107(91%) of the responses were pro-alcoholic (see Table 2-4).

Verification: Traffic and Criminal Records. The hospitalized alcholic group revealed their alcoholism not only by their presence in an alcoholic hospital and by their own admission, but also by traffic records. The records substantiate that alcoholic problems existed for this group. Of the 118 hospitalized alcoholics, 37(31%) had been drunk driving violators: 21(18%) had one such violation, and 16(14%) had two or more violations. Of the 27(23%) non-traffic drunk violators, 10(8%) had one violation and 17(14%) were responsible for two or more violations. This group displayed a higher incidence of nontraffic drunk convictions than drunk driving convictions - 1.0 per individual, as compared to 0.56 per individual. Combining both drinking and drunk driving convictions, there was a total of 48 violators (41%) responsible for 184 violations, or 1.56 per person in the sample (see Table 2-5).

Table 2-3. Marital Status of Groups Given the MAST

Group	Single	Married	Divorced	Separated	Widowed
I - Hospitalized Alcoholics (N = 118)	16 (14%)	80 (68%)	18 (15%)	2 (2%)	2 (2%)
II - University Controls (N = 104)	7 (7%)	95 (91%)	2 (2%)	0	0
III - Fake Take (N = 99)	7 (7%)	79 (80%)	9 (9%)	4 (4%)	0
IV - Driver Service's Division (N = 100)	57 (57%)	36 (36%)	6 (6%)	0	1 (1%)
V - Detroit House of Correction					
Negro (N = 72)	9 (13%)	45 (63%)	6 (8%)	11 (15%)	1 (1%)
White (N = 44)	10 (23%)	24 (56%)	3 (7%)	6 (14%)	1 (1%)
Total (N = 116)	19 (16%)	69 (59%)	9 (8%)	17 (15%)	2 (2%)
VI - Ann Arbor Municipal Court (N = 88)	26 (30%)	47 (53%)	9 (10%)	4 (5%)	2 (2%)

Table 2-4. MAST Pro-Alcoholic Responses

MAST Quest #	Hosp. Alc. N = 118	Univ. Con. N = 104	Fake-Take N = 99	Driv. Svc. Div. N = 100	Detroit House of Correction			Ann Arbor Mun. Court N = 88
					Total 116	Negro 72	White 44	
2	100 (85%)	1 (1%)	58 (59%)	8 (8%)	30 (26%)	18 (24%)	12 (27%)	11 (13%)
3	96 (81%)	18 (17%)	67 (68%)	14 (14%)	56 (48%)	31 (43%)	25 (57%)	39 (44%)
4	101 (86%)[1]	8 (8%)	72 (73%)[5]	18 (18%)	67 (58%)	34 (47%)	33 (75%)	43 (49%)[11]
5	75 (64%)	2 (2%)	42 (42%)	1 (1%)	21 (18%)	9 (13%)	12 (27%)	5 (6%)
6	107 (91%)	7 (7%)	78 (79%)	14 (14%)	71 (61%)	43 (60%)	28 (64%)	49 (56%)
7	96 (81%)[2]	2 (2%)	50 (51%)	10 (10%)	29 (25%)[8]	13 (18%)	16 (36%)	11 (13%)[12]
8	62 (53%)	9 (9%)	60 (61%)	43 (43%)	76 (66%)	55 (76%)	21 (48%)	49 (56%)
9	74 (63%)	2 (2%)	51 (52%)	0	18 (16%)	8 (11%)	10 (23%)	9 (10%)
10	76 (64%)	0	58 (59%)	2 (2%)	28 (24%)	12 (17%)	16 (36%)	16 (18%)
11	35 (30%)	8 (8%)	23 (23%)	18 (18%)	30 (26%)	11 (15%)	19 (43%)	20 (23%)
12	75 (64%)[3]	6 (6%)[4]	65 (66%)[6]	5 (5%)[7]	35 (30%)[9]	18 (25%)[9a]	17 (39%)[9b]	15 (17%)[13]
13	44 (37%)	0	40 (40%)	1 (1%)	3 (3%)	2 (3%)	1 (2%)	9 (10%)
14	53 (45%)	1 (1%)	23 (23%)	4 (4%)	20 (17%)	11 (15%)	9 (20%)	10 (11%)
15	60 (51%)	0	45 (45%)	4 (4%)	31 (27%)	20 (28%)	11 (25%)	6 (7%)
16	46 (39%)	0	21 (21%)	1 (1%)	18 (16%)	8 (11%)	10 (23%)	5 (6%)
17	71 (60%)	0	46 (46%)	2 (2%)	26 (22%)	16 (22%)	10 (23%)	7 (8%)
18	101 (86%)	22 (21%)	72 (73%)	10 (10%)	72 (62%)	48 (67%)	24 (55%)	18 (20%)[14]
19	36 (31%)	1 (1%)	38 (38%)	2 (2%)	5 (4%)	4 (6%)	1 (2%)	3 (3%)
20	57 (48%)	0	38 (38%)	2 (2%)	16 (14%)	9 (13%)	7 (16%)	10 (11%)
23	51 (43%)	0	29 (29%)	1 (1%)	8 (7%)	6 (8%)	2 (5%)	6 (7%)
24	61 (52%)	0	40 (40%)	1 (1%)	5 (4%)	2 (3%)	3 (7%)	4 (5%)
25B	18 (15%)	0	11 (11%)	1 (1%)	2 (2%)	1 (1%)	1 (2%)	2 (2%)
26B	24 (20%)	0	11 (11%)	0	5 (4%)	2 (3%)	3 (7%)	1 (1%)
27	57 (48%)	5 (5%)	29 (29%)	12 (12%)	44 (38%)	20 (28%)	24 (55%)	23 (26%)
31	51 (43%)	1 (1%)	24 (24%)	7 (7%)	54 (47%)[10]	35 (49%)[10a]	19 (43%)[10b]	24 (27%)

[1] 1 (1%) gave no response;
2 (2%) question not applicable.
[2] 3 (3%) gave no response.
[3] 16 (14%) question not applicable.
[4] 7 (7%) question not applicable.
[5] 1 (1%) gave no response;
1 (1%) question not applicable.
[6] 7 (7%) question not applicable.
[7] 57 (57%) question not applicable.
[8] 1 (1%) gave no response.
[9] 1 (1%) gave no response;
19 (16%) question not applicable.
[9a] 10 (23%) question not applicable.
[9b] 9 (13%) question not applicable.
[10] 6 (5%) unknown.
[10a] 2 (5%) unknown.
[10b] 4 (6%) unknown.
[11] 1 (1%) gave no response.
[12] 3 (3%) gave no response.
[13] 27 (31%) question not applicable.
[14] 1 (1%) gave no response.

Table 2-5. Drunk Driving and Drinking Convictions of Groups Given the MAST

Type of Conviction	Group I Hosp. Alc. (N = 118)	Group II Univ. Cont. (N = 104)	Group III Fake Take (N = 99)	Group IV Driving Svc. Div. (N = 100)	Group V Detroit House of Correction† White (N = 40)	Group V Detroit House of Correction† Negro (N = 62)	Group V Detroit House of Correction† Total (N = 102)*	Group VI Ann Arbor Mun. Court† (N = 71)*
Drunk Driving Convictions								
No Violations	81 (69%)	103 (99%)	79 (80%)	93 (93%)	22 (55%)	31 (50%)	53 (52%)	54 (76%)
One Violation	21 (18%)	1 (1%)	15 (15%)	4 (4%)	5 (13%)	20 (32%)	25 (25%)	9 (13%)
Multiple Violations	16 (14%)	0 (0%)	5 (5%)	3 (3%)	13 (33%)	11 (18%)	24 (24%)	8 (11%)
Total Violators	37 (31%)	1 (1%)	20 (20%)	7 (7%)	18 (45%)	31 (50%)	49 (48%)	17 (24%)
Total Violations	66	1	32	15	43	50	93	29
Avg. Viol./Indiv.	0.56	0.01	0.32	0.15	1.08	0.81	0.91	0.41
Non-Traffic Drunk Convictions								
No Violations	91 (77%)	104 (100%)	88 (89%)	92 (92%)	33 (83%)	49 (79%)	82 (80%)	54 (76%)
One Violation	10 (8%)	0 (0%)	6 (6%)	2 (2%)	5 (13%)	8 (13%)	13 (13%)	9 (13%)
Multiple Violations	17 (14%)	0 (0%)	5 (5%)	6 (6%)	2 (5%)	5 (8%)	7 (7%)	8 (11%)
Total Violators	27 (23%)	0 (0%)	11 (11%)	8 (8%)	7 (18%)	13 (21%)	20 (20%)	17 (24%)
Total Violations	118	0	52	19	14	30	44	35
Avg Viol./Indiv.	1.00	0	0.52	0.19	0.35	0.48	0.43	0.49
Total Drinking Related Convictions								
No Violations	70 (59%)	103 (99%)	72 (73%)	90 (90%)	20 (50%)	28 (45%)	48 (47%)	47 (66%)
One Violation	18 (15%)	1 (1%)	17 (17%)	2 (2%)	5 (13%)	17 (27%)	22 (22%)	9 (13%)
Multiple Violations	30 (26%)	0 (0%)	10 (10%)	8 (8%)	15 (38%)	17 (27%)	32 (31%)	15 (21%)
Total Violators	48 (41%)	1 (1%)	27 (27%)	10 (10%)	20 (50%)	34 (55%)	54 (53%)	24 (34%)
Total Violations	184	1	84	34	57	80	137	64
Avg. Viol./Indiv.	1.56	0.01	0.84	0.34	1.43	1.29	1.34	0.90

*31 Records not received.
†Excluding conviction for which subject was seen.

Verification: Social Agencies. Of the 118 hospitalized alcoholics, only nine records were found at the three social agencies and the probation department whose files were searched. This is due in part to the fact that most of these 118 subjects were residents of other counties. In addition, in the case of the Washtenaw County Department of Social Services and the Washtenaw County Probation Department only a sample of 18 subjects' names were used in the search. Of the nine records found, five indicated drinking other than normal on a part of the subject, one indicated abnormal drinking on the part of a family member other than the subject and three made no mention at all of a drinking problem (see Table 2-6).

2.4.2. GROUP II: UNIVERSITY CONTROLS

The University controls consisted of 104 subjects, 65% of whom were employees of The University of Michigan's Plant Department and the remainder patients at the University Hospital Allergy Clinic. Patients from the Allergy Clinic were interviewed in a private office, while the Plant Department personnel were interviewed at their job sites. The latter interviews were nevertheless conducted in complete privacy.

The interviewees in both cases were randomly selected with no prescreening.

2.4.2.1. INTRODUCTION. The introductory speech used for this group was the same as the one for the hospitalized alcoholics.

2.4.2.2. GENERAL STATISTICS.

Age. The ages of this group ranged from 19 to 73 years,

Table 2-6. Records Searched and Located at Three Social Agencies and a Probation Department

Group	Cath. Soc. Svcs.	Family Service	Wash. Co. Prob. Dpt.	Wash. Co. Dept. Soc. Service	Total
I - Hospitalized Alcoholics (N = 118)					
No. Records Searched for	118	118	18*	18*	*
No. Records Found	3 (3)	2 (2)	0	4	9
Alcoholic	2 (2)	1 (1)	0	2	5
Nonalcoholic	1 (1)	1 (1)	0	2	4
II - University Controls (N = 104)					
No. Records Searched for	104	104	0	0	104
No. Records Found	7 (7)	6 (6)	0	0	13 (13)
Alcoholic	1 (1)	0	0	0	1 (1)
Nonalcoholic	6 (6)	6 (6)	0	0	12 (12)
III - Drivers Services Div. (N = 100)					
No. Records Searched For	100	100	0	0	100
No. Records Found	2 (2)	6 (6)	0	0	8 (8)
Alcoholic	1 (1)	2 (2)	0	0	3 (3)
Nonalcoholic	1 (1)	4 (4)	0	0	5 (5)
VI - Ann Arbor Municipal Court (N = 60)					
No. Records Searched For	60	60	60	60	60
No. Records Found	0	3 (5)	12 (20)	6 (10)	21 (35)
Alcoholic	0	2 (4)	8 (13)	2 (4)	12 (20)
Nonalcoholic	0	1 (2)	4 (7)	4 (7)	9 (15)

*No percentages computed because of the small number of records involved.

with the majority (75%) again falling between 30-59 years; the median age was 40 years.

Social Class. Of the University controls, 70% fell into social classes IV and V, with 16% in class I, 4% in class II, and 10% in class III. The University controls had the highest percentage of all groups in classes I and II.

Marital Status. Of the 104 subjects, 91% were married, 7% single, and 2% divorced. The percentage of divorced persons was lower for this group than for any of the others.

MAST Responses. In marked contrast to the hospitalized alcoholics, the University controls were the lowest of all groups in number of pro-alcoholic responses, ranging from 0 for several items to 22 (21%) for Item 18.

Verification: Traffic and Criminal Records. Of the 104 University controls, only one person had been convicted of drunk driving (one occasion) and none had been convicted of a nontraffic drunk violation. The other five groups demonstrated a markedly higher percentage of such convictions.

Verification: Social Agencies. For the 104 University controls, 13 records were found at the two social agencies searched (Catholic Social Services and Family Service). One of the records found indicated abnormal drinking on the part of the subject, two reported abnormal drinking on the part of another family member, and ten indicated problems other than drinking, with no mention of alcohol.

2.4.3. GROUP III: "FAKE TAKE" HOSPITALIZED ALCOHOLICS

After giving the MAST to Groups I and II, hospitalized alcoholics and University controls, an attempt was made to discover how an alcoholic might respond to the questionnaire and if it were sensitive enough to diagnose alcoholism even though the subject responded untruthfully. For this portion of the study, 95 patients in alcoholic hospitals and 4 patients on an alcoholic ward of a state hospital were used as subjects. The investigators recognize the limitations of this Fake Take contrivance: virtually all subjects in this group were voluntary admissions to alcoholism hospitals, and all interviewees were selected by the medical director or ward doctor, who excluded only those who were physically unable to participate.

All interviews were held in a private office, and the interviewer was introduced by a secretary or staff member with no further explanation.

2.4.3.1. INTRODUCTION. The introductory speech explained the fake concept but it was impossible to determine whether all patients understood this and completed the questionnaire without giving themselves away by answering truthfully. The introductory speech for this group was longer, as supplemental instructions were needed to explain the concept of the Fake Take.

Hello, I'm __(name)__ from The University of Michigan and I would like to talk to you for a few

moments - would you mind stepping back to the office with me? As I told you, I'm from The University of Michigan in Ann Arbor. Currently, we are conducting a research project concerned with drinking. Today, I am interested in finding out how a person would respond to our questionnaire if he were trying to conceal a drinking problem. So, for the moment, I would like you to pretend that I'm from the Secretary of State's office and you have been called in for re-examination because of too many violations or accidents some of which may have been alcohol-related. I want you to respond to my questions as you would if you were in this "pretend" situation and loss of your driver's license were involved. Of course this is strictly voluntary, and you're under no obligation to answer. Anything you tell me is strictly confidential.

If you have no questions, let's get started.

2.4.3.2. GENERAL STATISTICS.

Age. The ages in this group ranged from 25 to 71 years, with 87% between the ages of 30 and 59 years. The median age was 47 years.

Social Class. The majority of subjects in the "Fake Take" population were in social classes IV and V (63%) with an additional 26% in class III. There were 5% each in classes I and II.

Marital Status. Of the 99 subjects, 80% were married, 9% divorced, 7% single, and 4% separated.

MAST Responses. The MAST responses of this population showed a high percentage of pro-alcoholic answers, which would indicate that the alcoholic could not hide his alcoholism, was unable to understand the objective of the Fake Take or could not pretend in a situation where he knew the interviewer knew he really was an alcoholic. These alcoholics' scores were, however, lower than those obtained from the hospitalized alcoholics, who were trying to answer the MAST truthfully (Table 2-4).

Verification: Traffic and Criminal Records. Of the 99 Fake Take subjects, 20 were drunk driving violators, 15 with one violation each and 5 with two or more.

Eleven were convicted of a nontraffic drunk violation, six with one conviction each and five with two or more. Combining the drunk driving and nontraffic drunk conviction, 27 subjects incurred 84 violations, an average of 0.84 per individual.

It should be noted that individuals hospitalized for alcoholism do not include any greater percentage of multiple violators (i.e., persons having two or more drinking-related convictions) than the remaining four groups. However, multiple violators in Groups I and III account for a higher ratio of offenses than the other four groups (Table 2-7). The multiple violators of the two hospitalized groups average approximately

Table 2-7. Multiple Offenders Ratio of Groups Given the MAST

Group	Number of Multiple Offenders	Drunk Driver Convictions per Multiple Offender	Number of Multiple Offenders	Non-Traffic Drunk Convictions per Multiple Offender	Number of Multiple Offenders	Total Convictions per Multiple Offender
I - Hospitalized Alcoholics*	16	2.8	17	6.4	30	5.5
II - University Controls	0	0	0	0	0	0
III - Fake-Take*	5	3.4	5	9.2	10	6.7
IV - Drivers Services Division	3	3.7	6	2.8	8	4
V - Detroit House of Correction						
Negro	11	2.7	5	4.4	17	3.7
White	13	2.9	2	4.5	15	3.5
Total	24	2.8	7	4.4	32	3.6
VI - Ann Arbor Municipal Court	8	2.5	8	3.3	15	3.7

*Hospitalized alcoholic populations.

6 offenses per individual, as compared to approximately 3.6 for the remaining four groups.

Verification: Social Agencies. A record search has not yet been initiated for Group III.

2.4.4. GROUP IV: DRIVER'S SERVICES DIVISION

The subjects from the Driver's Services Division were 100 drivers called in for re-examination as a result of accumulating 12 or more points (violations and accidents) on their driving records. The interviewees were selected on the basis of availability. This was the first attempt to use the MAST in a potentially applicable "traffic" situation.

2.4.4.1. INTRODUCTION. Interviews were initiated as follows:

> Hello, I'm (name) from The University of Michigan and I would like to ask you some questions about drinking. The information is for a research project concerning highway safety and what you tell me will not affect the rest of your re-examination. Of course, your cooperation is voluntary and anything you tell me is strictly confidential and used only for research purposes. If you have no questions, then let's get started.

2.4.4.2. GENERAL STATISTICS.

Age. Ages in this group ranged from 17 to 69 years, with 16% falling between 30 and 59 years and 82% falling between 17 and 29. The median age, 21, was significantly lower than that of the other groups.

Social Class. The majority (86%) were in social classes IV and V, 7% each were in classes II and III, and none were in class I.

Marital Status. Probably due to the youthfulness of this population, (57%) were single, 36% were married, 6% divorced, and 1% widowed.

MAST Responses. Pro-alcoholic responses to the MAST were only slightly higher than those of the University controls.

Verification: Traffic and Criminal Records. Of the 100 drivers in Group IV, 7 were drunk-driving violators: 4 had one such violation, and 3 had two or more violations. Similarly, 8 had been convicted of a nontraffic drunk charge: 2 had one conviction, and 6 had two or more convictions. Combining both drunk-driving and nontraffic drunk convictions, there were 10 violators. They were responsible for a total of 34 violations, an average of 0.34 violations per person in the sample. Group IV was second lowest in drinking and drunk driving convictions, but this again is probably attributable to the extreme youthfulness of this group.

Verification: Social Agencies. Eight records were found on the subjects in this group at the two agencies (Catholic Social Services and Family Service) thus far contacted. Of the eight records, three indicated abnormal drinking on the part of the subject and one record indicated abnormal drinking on the part of a family member other than

the subject. The remaining four records indicated problems other than drinking.

2.4.5. GROUP V: DETROIT HOUSE OF CORRECTION

The 116 interviews at the Detroit House of Correction represented the second attempt at a preliminary application of the MAST. Seventy-two (62%) of the subjects were Negro and 44 (38%) were Caucasian. All inmates interviewed had been convicted for a drunk-driving violation and were selected on the basis of availability.

2.4.5.1. INTRODUCTION. The introduction speech for this group was essentially the same as the one used at the Driver's Services Division.

2.4.5.2. GENERAL STATISTICS. Although the statistics are broken down into a Negro-Caucasian comparison on the charts, there seems to be no significant difference between the two groups.

Age. The age ranges were very similar for the two groups 17-65 years (Negro) and 18-68 years (Caucasian). Median age was 36 years for the Negroes, 44 years for the Caucasians. The age median for the total group was 42 years; 73% were between 30 and 59.

Social Class. The majority (98%) of the total group fell within classes IV and V, as was true of both the Negro and Caucasian subgroups. None of the subjects was in class I; a total of 3% were in classes II and III.

Marital Status. Of the 116 inmates, 59% were married, 8% divorced, 16% single, 15% separated, and 2% widowed.

MAST Responses. This group does not show as high a percentage of pro-alcoholic responses as the hospitalized or "Fake Take" Alcoholics, but this percentage is significantly higher than that of the University controls and Driver's Services Division groups.

Verification: Traffic and Criminal Records. Information was received for 102 of the 116 interviewees. Since all inmates interviewed were seen because of a drunk-driving conviction, only previous convictions were included in the tallies. Of the 102 inmates for whom records were received, 49 had drunk driving convictions; 25 had one violation and 24 had two or more convictions. The remaining 53 records showed no offense of this nature. It should be mentioned that in all cases the records are at best incomplete. Therefore all figures shown in the tables and mentioned in the text are minimal. This is especially true of the figures for the Detroit House of Correction and the Ann Arbor Municipal Court.

This group included 20 who had been convicted of non-driving drinking offenses; 13 had one violation and 7 had two or more. Combining the nontraffic drunk and drunk-driving convictions, there were a total of 54 violators responsible for 137 convictions - an average of 1.34 per interviewee.

Verification: Social Agencies. There was no social or medical verification for this group.

2.4.6. GROUP VI: ANN ARBOR MUNICIPAL COURT

All subjects interviewed at the Ann Arbor Municipal Court were convicted of drinking-related charges. There have been 88 interviews to date, and the series is still in progress. All persons interviewed were seen after conviction but before sentencing.

2.4.6.1. INTRODUCTION. The introductory speech used for this group was essentially the same as the one used for the Driver's Services Division.

2.4.6.2. GENERAL STATISTICS.

Age. Ages in this group range from 18 to 72, with 51% between 30 and 59 years. The median age, 31 years, was lower than that of all groups except the Driver's Services Division.

Social Class. Social classes IV and V accounted for 78% of this group, with 3% in class I, 5% in class II, and 10% in class III.

Marital Status. Of the 88 subjects, 53% were married, 30% single, 10% divorced, 5% separated, and 2% widowed.

MAST Responses. This group showed a higher percentage of pro-alcoholic responses (Table 2-4) than the University cControls or the Driver's Services Division drivers, but appeared significantly lower than the groups of hospitalized and "Fake Take" alcoholics.

Verification: Traffic and Criminal Records. Information has been received for 71 of the 88 persons in the sample. Since all those interviewed were seen because of a drinking-related conviction (i.e., 31 persons because of a nontraffic

drunk conviction, the remaining 57 because of a drunk-driving charge), only convictions other than the current one are included in the tallies. Of the interviewees for whom records were received, 17(24%) had previously been convicted of drunk driving; 9(13%) had one violation and 8(11%) had two or more. The remaining 54(76%) had no convictions for a drunk driving offense prior to the current one.

Of the 71 interviewees for whom records were received, 17(24%) had a nontraffic drunk conviction; 9(13%) had one violation, and 8(11%) had two or more. Combining drunk driving and nontraffic drunk convictions for the 71 subjects, there were a total of 24(34%) violators with 64 convictions, or 0.90 per interviewee.

Verification: Social Agencies. Of the 88 subjects in this group, only 60 had been interviewed when the records of the social agencies and the probation department were searched. Of these 60 subjects, records were found for 21. Of the 21 records found, 12 indicated a drinking problem on the part of the subject. In addition, one of the 12 records indicated that a family member had a drinking problem. The remaining nine records revealed problems other than drinking. The majority of these records (57%) were found at the probation department.

2.5. DEVELOPMENT OF A CLASSIFICATION MODEL USING MAST DATA

The responses to the MAST were used to develop an alcoholic classification procedure. The objective was to determine whether

a person's responses to the MAST can be mapped into a single alcoholism score which in turn can be used to classify him accurately as alcoholic or nonalcoholic.

A discriminant analysis model and a multiple regression model were constructed, and their classification capability was tested by application to sample populations. On the basis of clinical knowledge of the alcoholic syndrome, alcoholic and nonalcoholic responses were defined for 26 of the MAST questions. (See Section 2.6 for questions used.) The alcoholic response was assigned a value of zero for each question. These dichotomous responses were then used as independent predictor variables which were assumed to be functionally related to a dependent alcoholism variable. In the model development phase, this dependent variable was assigned to unique value for all persons defined as alcoholics and a unique value for all persons defined as nonalcoholics.

2.5.1. MULTIPLE DISCRIMINANT ANALYSIS OF MAST RESPONSES

Our first analysis of the MAST data used the multiple discriminant analysis technique (11) which assumes that an initial sample of individuals can be assigned to one of several groups by some criterion which is independent of the information used in the analysis. An additional requirement is that measured variable levels be available for each individual--in this case, the responses to the questions. Discriminant analysis was then used to determine how effectively subjects could be reassigned to their initial groups on the basis of their responses to the questions. The technique develops a series of classification

functions which can then be used to classify unknown individuals into one of the original groups. This technique, which assumes a multivariate normal distribution of observations within groups, develops an optimal classification, given equal costs of misclassification.

The specific application used the responses to the first 25 questions shown in Section 2.6. Discriminant functions were developed using the program BMD05M which is contained in the Biomedical Computer Program series (12). This FORTRAN IV program was modified for use on the IBM 360 model 67 by the Statistical Research Laboratory of The University of Michigan.

In the first analysis of test results, four groups were used: (I) Hospitalized Alcoholics, (II) University Controls, (III) Fake Take Alcoholics, and (IV) Driver Services Division. The resulting classification of the original data is shown in Table 2-8. In computing the percentage of correct classifications, assignment of a Group I or Group III subject to either of these two groups

Table 2-8. Discriminant Analysis Classification of MAST Data for Four Original Groups

Group Defined	Group Predicted by Discriminant Analysis					Correct Classification
	1	2	3	4		
1. Hospitalized Alcoholics	86	1	3	28	118	96.5%
2. Driver Services	2	59	36	3	100	59.0%
3. University Controls	0	6	97	2	105	92.4%
4. Fake Take Alcoholics	21	4	15	57	97	80.5%
Totals	109	70	151	90		
Correct Classification	98.1%	84.4%	64.2%	94.5%		

was defined as correct. It is notable that 80.5% of the Fake Take group were classified as alcoholic.

A major shortcoming of this first analysis was that subjects from the Driver Services Division were not identified as alcoholic or nonalcoholic by an independent set of criteria. Therefore, another analysis was made omitting that group. The resulting classification of the remaining three groups is shown in Table 2-9.

The percentage of correct classifications, determined as above, was greater in the second analysis. Nonalcoholics and alcoholics who answered honestly were correctly classified 97% of the time, as were 83% of Fake Take alcoholics.

It will be noted that a number of hospitalized alcoholics were classified as Fake Take alcoholics and vice versa. This may indicate that despite the apparent simplicity of the test an alcoholic finds it difficult to answer all questions as if he were a nonalcoholic. On the other hand, it might mean that the subjects did not fake adequately.

Judging from these pilot samples, multiple discriminant analysis appears to be an effective tool for identifying alcoholics. The real test of its discriminating power as shown in this test will be application of the functions to a completely independent population for which there is an independent measure of alcoholism.

2.5.2. MULTIPLE REGRESSION ANALYSIS OF MAST RESPONSES

A second approach to the classification problem involved the fitting of a multiple regression model to the variables generated from the MAST test. For this purpose a dependent alcoholism variable was assigned to each of the hospitalized alcoholics and

University controls (assumed nonalcoholics). Each alcoholic was arbitrarily given a score of 4 and each nonalcoholic a score of 1. It should be noted that the following analysis is robust with respect to the particular scores chosen.

The regression model was computed using the step-wise multiple regression program which is contained in the IBM 1130 Statistical System. The program, which was run on HSRI's 1130 computer, uses the algorithm developed by M. A. Efroymson (13) of Esso Research and Engineering Company.

Table 2-9. Discriminant Analysis Classification of MAST Data for Three Original Groups

Group Defined	Group Predicted by Discriminant Analysis				Correct Classification
	1	2	3	Total	
1. Hospitalized Alcoholics	87	3	28	118	97.5%
2. University Controls	0	102	3	105	97.2%
3. Fake Take Alcoholics	22	16	59	97	83.5%
Totals	109	121	90		
Correct Classification	100%	84.2%	96.8%		

Two models were developed. The first used the 26 questions shown in Section 2.6. The linear models are of the form:

$$Y = Y_0 + b_i x_i, \qquad i=1$$

where Y = alcoholism score

Y_0 = fixed constant

b_i = coefficients development by multiple regression (see Table 2-10)

x_i = responses to individual questions

Table 2-10. Coefficients for Multiple Regress Models Developed from MAST Responses

Constant Question Number	18 Question Model	26 Question Model
	1.04	1.03
2	.48	.47
3	-	-.02
4	.49	.47
5	.25	.25
6	.51	.51
7	.63	.62
8	-	.05
9	-.18	-.20
10	.55	.53
11	-	.03
12	.14	.14
13	-.15	-.14
14	-	.00
15	-	.08
16	-	-.07
17	-.32	-.31
18	.21	.22
19	.18	.18
20	.24	.25
21	.42	.42
22	.17	.18
23	.13	.14
24	-.12	-.09
25B	-	-.08
26B	-	.07
31	.12	.09

The second model selected the combination of questions which gave the smallest prediction variance. This model used the 18 questions shown in Section 2.6.

The results of applying the 26-question model to seven different groups are shown in Table 2-11. The number of persons whose MAST responses mapped into the different alcoholism score intervals is shown for each of the seven groups. By the conventions used in the model, higher scores indicate a stronger tendency toward an alcoholic classification.

Once these individuals have been ranked in this manner, a decision must be made concerning a proper cutting point to separate alcoholics from nonalcoholics. This decision could be made through the use of a utility function which considered the relative penalties for erroneously classifying a nonalcoholic as an alcoholic, or classifying an alcoholic as a nonalcoholic. In addition, the relative value of the two types of correction classification could be considered. A decision model of this type requires some prior knowledge of the intended application and of the value structure imposed by society. For example, if the results are to be used as an initial screening device an aggressive strategy could be used. However, if the results are used in connection with legal proceedings a conservative strategy would be more appropriate.

In order to achieve some evaluation of the regression model's classification power, two cutting scores were chosen. The first, defined as aggressive because it tended to classify more people as

Table 2-11. 26-Question Model: Distribution of Alcoholic Prediction Score

		Groups Tested*							
		1	2	3	4	5	6	7	
↑ Non-Alcoholic	0.2	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
	1.0	0	0	3	1	0	0	0	
		0	41	65	5	4	14	9	
		0	19	19	1	3	6	8	
	1.6	1	7	7	3	1	6	4	Aggressive
		0	18	5	5	9	14	12	Strategy
	2.0	0	2	2	1	2	3	7	
	2.2	2	4	2	4	5	8	8	Conservative
		0	4	2	4	0	7	16	Strategy
		2	2	0	6	2	2	12	
		6	1	0	6	1	3	5	
	3.0	2	0	0	6	3	0	10	
		4	0	0	4	2	0	7	
		6	1	0	5	3	1	4	
		11	0	0	8	0	4	2	
↓ Alcoholic		18	1	0	5	3	2	3	
	4.0	13	0	0	7	2	0	3	
		15	0	0	10	2	0	4	
		21	0	0	12	0	3	0	
		9	0	0	2	0	3	0	
		8	0	0	2	0	0	1	
	5.0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
	6.0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	

*Groups Tested:

1. Hospitalized Alcoholics
2. Driver Services
3. University Controls
4. Fake Take Alcoholics
5. AAMC Non-Traffic Offenses
6. AAMC Drunk Driving
7. Detroit House of Correction

alcoholics, was 1.6. The second, defined as conservative, was 2.2. The results of these two cuts are shown in Tables 2-12(A) and 2-12(B). As can be seen, the conservative strategy obtained essentially the same results as the discriminant analysis application shown in Table 2-9, e.g., the percentages of correct classification were almost identical.

Results of the 18-question model, which was analyzed in the same manner, are summarized in Tables 2-13, 2-14(A), and 2-14(B). The 26-question model gave slightly better results and is therefore considered to be our best regression model at this point. As stated previously, the regression model was developed using only the University controls and the hospitalized alcoholics. The value of the model can be tested by applying it to data which were not used to develop the model. The Fake Take alcoholic group is known to contain a large percentage of alcoholics, and the Detroit House of Correction group is believed to contain a large percentage of alcoholics because of the assignment procedure. It is encouraging to note that a large percentage of these groups were classified as alcoholics. The large number of Ann Arbor Municipal Court drunk and disorderly subjects classified as alcoholic also strengthens the classification results, since this group was also assumed to contain a large percentage of alcoholics.

The next step in evaluation is to apply the classification procedures to individuals who have been identified as alcoholic and nonalcoholic by some independent means. Key questions which must be resolved in the total evaluation of the procedure are:

Table 2-12. 26-Question Model: Classification Results

(A) Conservative Strategy: Cutoff = 2.2

	Non-Alcoholic	Alcoholic	Total	Correct Classification
1. Hospitalized Alcoholics	3	115	118	97.5%
2. Driver Services	91	9	100	
3. University Controls	103	2	105	98.5%
4. Fake Take Alcoholics	20	77	97	79.4%
5. AAMC Non-Traffic Offenses	24	18	42	
6. AAMC Drunk Driving	51	22	73	
7. Detroit House of Correction	48	68	116	

(B) Aggressive Strategy: Cutoff = 1.6

	Non-Alcoholic	Alcoholic	Total	Correct Classification
1. Hospitalized Alcoholics	1	117	118	99.1%
2. Driver Services	67	33	100	
3. University Controls	94	11	105	89.5%
4. Fake Take Alcoholics	10	87	97	89.6%
5. AAMC Non-Traffic Offenses	8	34	42	
6. AAMC Drunk Driving	26	47	73	
7. Detroit House of Correction	21	95	116	

Table 1-13. 18-Question Model: Distribution of Alcoholic Prediction Score

		Groups Tested*							
		1	2	3	4	5	6	7	
Non-Alcoholic	0.2	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
	1.0	0	0	3	0	0	0	0	
		0	53	67	6	6	17	9	
		0	7	17	2	2	3	10	
	1.6	1	9	7	4	1	9	6	Aggressive
		0	15	5	3	8	9	8	Strategy
	2.0	0	3	2	3	2	6	8	
	2.2	2	5	2	1	5	8	9	Conservative
		1	3	2	6	0	6	19	Strategy
		1	2	0	8	3	2	9	
		4	1	0	4	1	3	4	
	3.0	5	0	0	5	2	0	9	
		3	0	0	5	2	0	7	
		9	1	0	5	3	2	4	
		10	0	0	6	1	3	3	
		17	1	0	6	4	2	3	
	4.0	14	0	0	9	1	0	3	
		15	0	0	12	1	3	3	
		19	0	0	8	0	0	1	
		10	0	0	2	0	0	0	
		7	0	0	1	0	0	1	
	5.0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	
	6.0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	

*Groups Tested

1. Hospitalized Alcoholics
2. Driver Services
3. University Controls
4. Fake Take Alcoholics
5. AAMC Non-Traffic Offenses
6. AAMC Drunk Driving
7. Detroit House of Correction

Table 2-14. 18-Question Model: Classification Results

(A) Conservative Strategy: Cutoff = 2.2

	Non-Alcoholic	Alcoholic	Total	Correct Classification
1. Hospitalized Alcoholics	3	115	118	97.5%
2. Driver Services	92	8	100	
3. University Controls	103	2	105	98.5%
4. Fake Take Alcoholics	19	78	97	80.5%
5. AAMC Non-Traffic Offenses	24	18	42	
6. AAMC Drunk Driving	52	21	73	
7. Detroit House of Correction	50	66	116	

(B) Aggressive Strategy: Cutoff = 1.6

	Non-Alcoholic	Alcoholic	Total	Correct Classification
1. Hospitalized Alcoholics	1	117	118	99.1%
2. Driver Services	69	31	100	
3. University Controls	94	11	105	89.5%
4. Fake Take Alcoholics	12	85	97	87.6%
5. AAMC Non-Traffic Offenses	9	33	42	
6. AAMC Drunk Driving	29	44	73	
7. Detroit House of Correction	25	91	116	

1. What percentage of "known" alcoholics are correctly identified?
2. What percentage of "known" nonalcoholics are correctly identified?

In this regard, the search of social agency records for independent evidence of alcoholism has only recently been undertaken and only a small number of records have been located. As shown in Tables 2-15(A) and 2-15(B), most of the records found indicate that classification of these subjects on the basis of the multiple regression model was correct.

Although it is possible to label as incorrect the prediction of "nonalcoholic" for persons for whom a record was found indicating alcoholism, the converse is, of course, not necessarily true.

Both the multiple regression and the multiple discriminant analysis approach produced good classification results when applied to the present data samples. Since the Fake Take alcoholic group was independent of the groups used to develop the regression model, the applicability of the multiple regression model to Fake Take alcoholics is an encouraging indication of the ability to classify an independent sample. Final evaluation of the two techniques will require their application to an independent group from which alcoholics and nonalcoholics can be identified independently by another criterion.

If the final evaluation shows that the multiple discriminant and multiple regression approaches have equal discriminating power, the latter would be recommended for the following reasons:

Table 2-15. Comparson of Results: Multiple Regression Procedure vs. Social Agency Record Search

(A) Conservative Strategy: Cutoff = 2.2

	Records Indicating Alcoholism	Records Not Indicating Alcoholism	Total
Predicted Alcoholics	6	2	8
Predicted Non-Alcoholics	6	21	27
Total	12	23	35

(B) Aggressive Strategy: Cutoff = 1.6

	Records Indicating Alcoholism	Records Not Indicating Alcoholism	Total
Predicted Alcoholics	9	5	14
Predicted Non-Alcoholics	3	18	21
Total	12	23	35

1. Multiple regression is easier to understand both in theory and in application.
2. A multiple regression model provides a number of different classification strategies; thus, value judgment and additional knowledge can be brought into the problem.

The basic idea of discriminant or classification analysis is outlined below. A vector $(x_1, \ldots, x_p)$ of a subject's question responses (in this case, to the MAST) is recorded. On the basis of this vector, we wish to classify him with population A (non-alcoholic) or population A (alcoholic). Ideally, this classification should be based on the probability $P(A|x_1, \ldots, x_p)$ of alcoholism given a subject's MAST responses. This can be calculated using Bayes' theorem

$$P(A|x_1, \ldots, x_p) = \frac{P(x_1,\ldots, x_p)|A)P(A)}{P(x_1,\ldots, x_p|A)P(A) + P(x_1,\ldots, x_p|\bar{A})P(A)}$$

Manipulating this algebraic result, we may calculate posterior odds in favor of alcoholism

$$(A|x_1, \ldots, x_p) = \frac{P(A|x_1, \ldots,x_p)}{1 - P(A|x_1, \ldots, x_p)}$$

In terms of prior odds in favor of alcoholism

$$\Omega(A) = \frac{P(A)}{1 - P(A)}$$

This relationship is

$$\Omega(A|x_1, \ldots, x_p) = \frac{P(x_1, \ldots, x_p|A)}{P(x_1, \ldots, x_p|\bar{A})}\Omega(A)$$

Posterior odds = (prior odds) × (probability ratio of data), given the two events. The problem is solved if this probability ratio is determined. Multiple discriminant analysis assumes that $P(x_1, \ldots, x_p|A)$ has a multivariate normal distribution with mean vector μ_1 and variance-covariance matrix Σ, and that $P(x_1, \ldots, x_p|A)$ has a multivariate normal distribution with mean vector μ_2 and variance-covariance matrix Σ. These parameters are estimated by taking samples of each of the two populations, and the probability ratio is estimated from the parameters. Further, $\Omega(A)$ is assumed to be 1 (no prior information as to person's categorization) and equal costs are assigned to each type of error.

The regression model uses as a score S_i, the weighted average of the responses, with weights W_{ij} determined from the data x_i:

$$S_i = \sum_{j=1}^{P} W_{ij}x_j$$

Then

$$\Omega(A|S_i) = \frac{P(S_i|A)}{P(S_i|A)}\Omega(A)$$

Using subjective cutoff points, we can dichotomize S_i:

S_i = SA if score indicates alcoholism

S_i = $S\bar{A}$ if score indicates nonalcoholism

Then

$$(A|SA) = \frac{P(SA|A)}{P(SA|A)}\Omega(A)$$

where now $\Omega(A|SA)$ are the odds in favor of alcoholism given an alcoholic score on the MAST, and $P(SA|A)/P(SA|A)$ is the probability ration of this event. Suppose that our error rates are such that $P(SA|A) = 1 - P(SA|A) = 0.95$. That is, 95% of alcoholics score alcoholic and 95% of nonalcoholics score nonalcoholic. Then $\Omega(A|SA) = 19\Omega(A)$. To determine $\Omega(A|SA)$ and, equivalently, $P(A|SA)$ it is necessary to determine our prior odds in favor of alcoholism.

Suppose we take a subject at random from the population. Assuming an 8% incidence of alcoholism

$$\Omega(A|SA) = \frac{0.08}{1 - 0.08} = 0.087$$

and

$$\Omega(A|SA) = 1.65$$

or

$$P(A|SA) = \frac{\Omega}{1 + \Omega} = 0.625$$

i.e., the posterior probability of alcoholism given a positive alcoholic score is still small, slightly greater than 0.5. However, 0.625 is still much better than 0.08, our prior probability.

The point of this example is that even if the evidence (based on error rates) in favor of alcoholism is large, the limited prior information possessed by the investigator may be such that very strong posterior odds are not developed. The investigator must assess this prior information carefully and without bias, and also decide the level of $\Omega(A|SA)$ at which he is willing to make the decision that a person is an alcoholic. Clearly, this depends on the relative costs of misclassification by the screening device.

2.6. EXHIBIT: MAST TEST QUESTIONS USED FOR ANALYSIS

2. *Do you feel you are a normal drinker?

3. Have you ever awakened the morning after some drinking the night before and found that you could not remember a part of the evening before?

4. *Does your wife (or parents) ever worry or complain about your drinking?

5. *Can you stop drinking without a struggle after one or two drinks?

6. *Do you feel bad about your drinking?

7. Do friends and relatives think you are a normal drinker?

8. Do you ever try to limit your drinking to certain time of the day or to certain places?

9. *Are you always able to stop drinking when you want to?

10. *Have you ever attended a meeting of Alcoholics Anonymous(AA)?

11. Have you gotten into fights when drinking?

12. *Has drinking ever created problems between you and your wife?

13. *Has your wife (or family member) ever gone to anyone for help about your drinking?

14. Have you ever lost friends or girlfriends because of drinking?

15. Have you ever gotten into trouble at work because of drinking?

16. Have you ever lost a job because of drinking?

17. *Have you ever neglected your obligations, your family, or your work for 2 or more days because you were drinking?

18. *Do you ever drink before noon?

19. *Have you ever been told you have liver trouble? Cirrhosis?

20. *Have you ever had Delirium Tremens (D.T.'s) or severe shaking, heard voices or seen things that weren't there after a drinking bout?

21. *Is driver unable or unwilling to answer questions concerning frequency or amount of drinking?

22. *Have you ever gone to anyone for help about your drinking?

23. *Have you ever been in a hospital because of drinking?

24. *Have you ever been a patient in a psychiatric hospital or in a psychiatric ward of a general hospital because of your drinking?

25B. Have you ever been seen at a psychiatric or mental health clinic or gone to any doctor, social worker, or clergyman for help with a drinking problem?

26B. Have you ever been arrested, even for a few hours, because of drinking and/or distrubing the peace?

31. *Have you ever been arrested for drunk driving (or driving after drinking)?

*Questions used in 18-question model developed by multiple regression analysis.

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SECTION 3

PSYCHOLOGICAL TEST DEVELOPMENT FOR ALCOHOLIC DRIVERS (PROJECT III)

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3.1. INTRODUCTION

A major aspect of the work to be carried out in these studies is the development of a testing device that can detect alcoholics in the driving population. It is hoped that such a tool may be administered upon application for an initial or renewed license. This means that the test must be easily understood by the population and simple to administer, take little time, and be low in cost. These constraints tend to rule out most apparatus and medical tests, and suggest that a psychological test may be required.

During the initial phase of the present study, it was decided that a detailed summary of prior work relevant to this objective would be helpful. The summary would enable the authors to utilize the information, tests, or test items most likely to provide the necessary degree of discrimination. The authors therefore decided to conduct a survey of the literature which attempts to describe the characteristics of alcoholics, especially that dealing with the use of tests to distinguish alcoholics from other groups.

In this phase of the contract studies, the authors have adopted the following approach:

1. Carry out a literature search and provide a detailed review with special emphasis on the identification of tests to distinguish alcoholics from other populations.
2. Based upon the review, select tests or test items that appear to have concurrent or predictive validity

for screening of alcoholics, and compile a prototype test instrument.

3. Administer the test to alcoholic and nonalcoholic control samples.

4. Carry out item analyses and optimize test battery validity.

5. Readminister the revised test to new samples and determine cross-validated discriminability indexes to screen alcoholics from normals, and alcoholic-accident from nonaccident drivers.

3.2. LITERATURE SEARCH

The literature search was concerned with the collection of information relating to behavioral descriptions of alcoholics, and with the results of tests administered to alcoholic and nonalcoholic samples.

A great deal of information was also collected on normal nonalcoholic samples. The latter revealed many studies concerned with sensory, perceptual and motor skills - including driving and driving simulations - such as the effects of alcohol upon cognitive functions, the effect of initial skill level, tolerance as a function of quantity and frequency of drinking, etc.

These studies indicate that skills important to driving are degraded by quite low blood-alcohol levels. This conclusion is supported by studies concerned with accident probability, which have established highly significant relationships to blood-alcohol levels. Most of these studies did not

compare alcoholic with nonalcoholic individuals, and there are far fewer studies available to provide such information. We have specifically limited the literature review to the latter because of pertinence to potential test construction.

For this reason we have reviewed: (a) tests which attempted to determine whether a person is an alcoholic or not; (b) personality measures of alcoholics and others; (c) sociocultural factors; (d) vocational interest data; (e) background and developmental histories; (f) perceptual elements; and (g) neurological and biochemical factors.

A detailed review of the results of the literature search are presented in the following section.

3.3. LITERATURE REVIEW

3.3.1. ALCOHOLISM TESTS

ALCADD is an overt test for alcoholism devised by Manson (1). The initial questionnaire consisted of 160 questions directly related to alcoholic behavior. After it had been administered to comparable groups of alcoholics and nonalcoholics, 60 items were selected as diagnostic and were cross-validated with other groups. All subjects were white, literate beyond the fourth grade, and free of mental difficulties. Two-thirds of the alcoholic group belonged to Alcoholics Anonymous (AA). Using the Richardson-Kuder formula, the coefficients of reliability were 0.92 and 0.96 for males and females, respectively. Questions were clustered according to five alcohol-addiction traits: (1) regularity

of drinking, (2) preference for drinking over other activities, (3) lack of controlled drinking, (4) rationalization of drinking, (5) excessive emotionality.

The Manson Evaluative Test (2) is a more covert test designed to separate alcoholics and nonalcoholics by personality traits. Of the 470 items on a preliminary questionnaire, 114 were found to be highly diagnostic. Subjects were white, literate adults; all were led to believe that they were taking a personality test. 137 of the alcoholics were members of Alcoholic Anonymous; 58 were hospitalized. There were 124 nonalcoholics. The reliability coefficients of the test, using the Richardson-Kuder formula, were 0.94 with a standard error of 0.006 for males and 0.94 with a standard error of 0.008 for females. Examination of the questionnaire revealed clustering of items characteristic of the alcoholics studied. Three were descriptive of psychoneurotic traits and four of psychopathic personalities.

Fowler and Bernard (3) readministered the ALCADD test to a group of newly admitted outpatients in a alcoholism clinic, feeling that active alcoholics would perform differently than hospitalized alcoholics or AA members. The "hidden alcoholic," it was believed, would be more likely to try to deny his disease or to be unaware of it. The sample of 331 alcoholics included 297 males and 34 females, all white and literate. As a routine clinic admission procedure, the subjects were given ALCADD, the MMPI, the Otis Test of Mental

Ability, a psychiatric examination, a social history interview, and a physical examination. Although many had long drinking histories, the subjects showed varying degrees of willingness to admit that drinking was a problem for them.

The scores obtained were compared with Manson's results by means of the Kolmogorov-Smirnov test. The outpatients showed fairly normal distributions, whereas Manson's data are negatively skewed, with a clustering of high scores probably due to the AA members. The outpatient data cast some doubt on the effectiveness of the ALCADD test in selecting the unrevealed alcoholic.

Murphy (4) attempted to revalidate both of Manson's tests. Four subject categories were set up: active alcoholics, AA members, social drinkers, and abstainers. Active alcoholics were defined as persons under treatment in an alcoholism clinic who had consumed alcohol from 5 to 14 days prior to the test. AA members were required to have at least a six-month abstinence once a year, and abstainers were defined as those who drink no more than once a month. All subjects were female.

On the evaluative test, AA members resembled social drinkers more than active alcoholics, while on the ALCADD test AA members scored higher than active alcoholics. Using the Kuder-Richardson formula, reliability coefficients of 0.92 and 0.97 were obtained for the evaluative and ALCADD tests, respectively. These were almost identical to Manson's established coefficients of 0.94 and 0.96. Murphy's results sug-

gest that although the drinking behavior of the AA member is similar to that of the active alcoholic, the personality traits of the alcoholic are altered after several months of abstinence.

If items from the ALCADD and evaluative tests are used in attempting to select alcoholics for exclusion from the driving population, a likely problem is that drivers taking the proposed test, realizing its purpose, would be extremely defensive in answering the questions. Therefore, it would seem most beneficial to use a covert test such as the Evaluative Personality Test. However, it is questionable whether such a test would distinguish neurotic or psychotic personalities as well as alcoholics. Overt questions pertaining to drinking behavior will have to be included, but, as Murphy found, AA members and social drinkers are much more likely to admit and accurately describe their drinking behavior than the active alcoholics whom it is desired to screen out.

3.3.2. PERSONALITY TESTS

3.3.2.1. INTERVIEW TECHNIQUES. Mulford and Wilson (5) attempted to devise an interview technique in Cedar Rapids, Iowa, to pick out alcoholics in a household health survey. A random sample of households was "loaded" with known alcoholics whose names were obtained from AA leaders, police files, court records, clergymen, judges, etc. Interviewers were unaware of the biased sample. A large questionnaire was used, with the interviewer recording all responses except those in the preoccupation scale and the definition-of-alcohol scale. These

parts of the survey were recorded by the respondents themselves. Responses of all adults (over 21 or married) in the household were obtained personally or through an available respondent such as a spouse. The preoccupation scale was able to select half of the known alcoholics; in an earlier study (Mulford, H. A.: A Study of 432 Hospitalized Alcoholics, Unpublished data, State University of Iowa, Iowa City, Iowa), 90% of a group of hospitalized alcoholics had been selected. When the "trouble due to drinking" scale was broken down by socioeconomic groups it was found that, whereas only 45.8% of known alcoholics earning over $6,000 reported one or more troubles due to drinking, 85.7% of those earning less than $6,000 did so. 35.4% of those earning over $6,000 and 74.3% of those earning under $6,000 received significantly high preoccupation scale scores.

Another interview study to screen alcoholics from a population survey was done by Bailey, Habermand and Sheinberg (6). A preliminary survey (A) conducted in a representative sample of 4,387 households identified 132 probable alcoholics by questions about difficulties resulting from drinking. In the present study (B), these 132 were interviewed with two comparison groups, the "sick" group, and people who had reported themselves free of both drinking and stomach problems. Where married couples were involved both spouses were interviewed, even if neither was a probable alcoholic. All respondents were given to believe that the interviews were connected with a university research project.

In only 74.8% of cases, acknowledgement of a drinking problem was consistent between interviews A and B. This is probably due to the change in design between Study A, in which a single family informant was questioned, and Study B, where both spouses were interviewed. In 25 cases, respondents would not have been classed as alcoholics had only Study B been used. This appears to be due to changes in the subject's circumstances during the interim between studies which cleared up the alcohol problem or allowed him to conceal his drinking problem more easily. On the other hand, 29 persons who had denied drinking problems in A admitted to problems in Study B.

In both surveys, the real purpose of the interview was concealed from the respondent. It is doubtful whether respondents would have been as truthful and open in their responses if they had been in danger of losing their licenses. Another problem is apparent from changes observed in alcoholic behavior over a relatively short time, which indicate a need to devise a method of finding the point at which an inebriate has changed his drinking behavior sufficiently to justify the return of his driver's license.

A third interview method was developed by Stone et al. (7) to distinguish alcoholics from nonalcoholics and determine the level of severity of the disease. Subjects were informed that they were participating in a research project for a respected medical clinic and were therefore made to feel that their contribution was important. The technique used

was an unstructured interview usually lasting about an hour. The interviewer began the session with the critical question, "Do you have a problem with drinking?" The rest of the interview was designed to obtain information to document the answer. The unstructured nature of the interview allowed the interviewer to take advantage of cues given by the respondent. The severity of the drinking problem was rated on a five-point scale (0 to 4) and all information re-evaluated at a conference of all the research staff. In 98% of the sample, a consensus was reached.

The purpose of an interview is very important in determining the reliability of the information gathered. Although the authors did not conceal that they were asking for information concerning the subject's drinking behavior, the research-project setting made the interview appear unthreatened to the subject and therefore not comparable to the interview for drivers.

3.3.2.2. KUDER PREFERENCE RECORD. In a study by Force (8) on the ability of the Kuder Preference Record to identify alcoholics in a group of Air Force prisoners from a rehabilitation center in Amarillo, Texas, a preliminary comparison was made between the test scores of 34 trainees independently diagnosed as alcoholics and 34 independently diagnosed as nonalcoholics. Of the 1,008 items of the test, 179 were found to be significantly diagnostic at the 0.01 level. These items were then referred to as the Kuder Alcoholism (KA) key. The KA key was

administered to 17 men later independently diagnosed as alcoholic, 50 diagnosed as at least problem drinkers and probably alcoholics, and 42 rated as nonalcoholic groups. The mean difference in scores of 8.4 between alcoholic and nonalcoholic groups was significant at the 0.02 level of confidence. In combination with the MMPI and ALCADD tests, the Kuder Alcoholism key does aid in identifying alcoholics.

The items were analyzed by ten judges who then drew inferences as to the personality structure of the alcoholic. The alcoholic group seemed to be characterized by low tolerance of tension; a happy-go-lucky, superficial attitute; low perserverance, hence orientation toward the present; fleeing from abstract relationships; disparity between achievements and goals; insecurity and overdependence; gregariousness and exhibitionism; and low acceptance of responsibility.

3.3.2.3. MMPI. Hoyt and Sedlacek (9) attempted to find items in the Minnesota Multiphasic Personality Inventory (MMPI) that would distinguish alcoholics from nonalcoholics and clinical groups. AA members used in other studies were considered by authors to be a biased sample which might influence the results obtained. "Normal" subjects consisted of Verterans' Administration on-the-farm trainees, "normal" Minnesota males, and VA hospital males. Clinical subjects, all male, were obtained from a mental hygiene clinic and were diagnosed as psychoneurotics, moderate psychoneurotics, psychotics, and various other types. Sixty-eight items of the MMPI were found to

be diagnostic, correctly identifying 76% of the alcoholics and 80% of the normals. Clinical subjects were not significantly different from the alcoholic sample. Alcoholics scored consistently higher on Scale 4, the Psychopathic Deviate Scale, than normal or clinical groups. The authors concluded that the MMPI will prove most effective when used in combination with special "alcoholic" scales.

Hampton (10) found 125 items from the MMPI effective in differentiating alcoholics from nonalcoholics. These items were cross-validated with five populations not clearly defined. The questionnaire was found to differentiate alcoholics from nonalcoholics; secondary alcoholics from weekend alcoholics, social family drinkers, social occasion drinkers, and near or total abstainers; and social family drinkers from social occasion drinkers and near or total abstainers.

In a critique of the Hampton, Hoyt-Sedlacke, and Holmes studies, MacAndrew and Geertsma (11) concluded that although all the authors professed to be studying the distinguishing features of the alcoholic they acutally used their scales only for criterion group comparison. There was no evidence conclusive enough to class the scales as measuring alcoholism itself. MacAndrew and Geertsma readministered the three scales to 300 men in an alcoholism clinic and 300 in a psychiatric clinic to investigate their conclusion that it is more likely that the scales simply measure some sort of personality integration or adjustment. Analysis of the three scales indicated

that they did not differentiate alcoholics from nonalcoholic psychiatric patients.

Although all three scales were derived from the MMPI, only seven items were agreed upon as to significance and scoring directions. Two of these seven items dealt directly with drinking behavior, and when eliminated reduce the discriminating capacity of the tests to almost nothing.

Another analysis by Korman (12) attempted to check on what was actually being measured by the Al scale developed by Holmes and the Ahs test developed by Hoyt and Sedlacek. Both tests were designed to distinguish alcoholics from nonalcoholics and were constructed by item analysis of the MMPI. A 28-item overlap is found between the 59 items in the Al scale and the 60 items of the Ahs.

Korman (12) examined 61 patients in an alcoholic outpatient clinic with medical, psychiatric, and psychological tests and attempted to relate them to the above scales. The two scales appear to be measuring different aspects of alcoholism. Al seems to measure the acute upheaval of the alcoholics, whereas Ahs reflects more of the stabilized process of chronic alcoholism.

Hewitt (13) in his study on the personality of the alcoholic points out the main difficulty of comparing the various tests to discriminate alcoholics or generalizing from them. He states it is impossible to draw a representative sample of alcoholics. Since the contributing factors are so various

what is true of one group of alcoholics will probably not be true of another group chosen at a different time or place. Hewitt administered the MMPI to 35 males and 2 females from AA, 7 females selected by the Minneapolis probation officer, and 12 other subjects (5 male, 7 female) who enjoyed drinking but did not drink to excess, in an effort to investigate their personality characteristics. He found deviance from normal scores on almost all scales, with the highest score on the psychopathic deviate scale for all subjects.

MacAndrew and Geertsma (11) decided to analyze the high psychopathic deviate scores obtained in many studies done with the MMPI to see whether it really discriminates alcoholics from nonalcoholics. When they compared 200 men from a state alcoholism clinic with 200 men from a state psychiatric clinic, the alcoholics, as in previous studies, scored much higher on Scale 4 (Psychopathic Deviate). However, after analyzing the significance of the individual items in the scale and eliminating the three most predictive items ("I have used alcohol excessively" (true), "I have never been in trouble with the law" (false), and "I have not lived the right kind of life" (true), the significant mean difference between the two groups disappears.

Manson (14) in reevaluating the effectiveness of the Psychopathic Deviate Scale of the MMPI, found results contrary to those of MacAndrew and Geertsma. 28 of the 50 questions in the scale significantly separated the alcoholics from the non-alcoholics. The psychopathic characteristics of the alcoholic

were found to be: feelings of inadequacy and insecurity; poor social adjustment; poor interpersonal relations; feelings of persecution; poor sexual adjustment; and periods of unusual cheerfulness with no apparent cause. It is clear that MacAndrew and Geertsma did not obtain such striking differences between groups as Manson had because the former authors compared alcoholics with normal nonalcoholics. Therefore it is still questionable whether the Psychopathic Deviate Scale is differentiating alcoholics or simply psychopathic personalities.

MacAndrew (15), after concluding that the alcoholism scales derived from the MMPI by Hampton, Holmas, and Hoyt and Sedlacek were incapable of differentiating alcoholic outpatients from nonalcoholic psychiatric outpatients, and after finding that the Psychopathic Deviate Scale was unsuccessful in itself in discriminating the above groups, he attempted to construct from the 566 items of the MMPI an alcoholism scale that would effectively discriminate between the groups. He found 51 significant items. After eliminating the 2 items directly dealing with drinking, 49 questions were cross-validated and found to be diagnostic.

Hewitt (13) observed that characteristics of one group of alcoholics cannot be generalized to other alcoholics living in different environments and exposed to different life situations. Whistler and Cantor (16) were aware of the inability to make assumptions concerning one group from results obtained

from a different group and attempted to evaluate the applicability of MacAndrew's (17) alcoholism scale from the MMPI to a group of alcoholics in a chronic institutionalized population. The test was originally constructed using outpatient populations. Subjects were 140 males living in a large veteran facility. The nonalcoholic group also lived in the institution but lacked overt evidence of alcoholism. The MacAndrew scale accurately classified 55%, with 7.9% false negatives and 37.1% false positives, as compared with MacAndrew's report of 81.5% with 8.5% false negatives and 10% false positives. Finding the optimal cutting point raised the accuracy to 61.5%. The findings do show the efficiency of the MacAndrew scale, and it is proposed that the large number of false positives may be due to the presence of undiscovered alcoholics in the nonalcoholic group.

Rotman and Vestre (18) also checked the validity of the three alcoholism scales derived from the MMPI by Hampton (AL), Holmes (Am), and Hoyt and Sedlacek (Ah). All patients in a veterans' neuropsychiatric hospital were split into alcoholic and nonalcoholic groups and scored on the three scales. When a lenient classification of alcoholics was made, none of the tests differentiated the alcoholic from the nonalcoholic group. When several criteria were jointly necessary for admission of a patient to the alcoholic group, and Am and An scales were able to differentiate, but the Al scale was still unsuccessful. It seems that these scales, especially Al, have little or no applicability to psychiatric groups.

Rosen (19) takes a sociological view of the etiology of alcoholism. He believes that when a neurotic person whose emotional conflicts and anxieties are at an optimal level is subjected to certain environmental factors where the availability of alcohol is "fortuitous," he is likely to become an alcoholic. The differences in results obtained in many studies Rosen feels is due not to differences in the personality structure of the subjects but to their different backgrounds. He postulated that the MMPI scores of psychiatric and alcoholic outpatients drawn from similar populations would be more similar than those of patients with the same alcoholic symptoms drawn from different sources. Subjects were outpatients from an alcohol clinic, "skid row" alcoholics, hospitalized alcoholics, and psychiatric patients from an outpatient psychiatric clinic. Rosen's hypotheses were confirmed. Alcoholic outpatients differed greatly from the comparable psychiatric group only on the Psychopathic Deviate Scale, whereas both outpatient groups differed significantly from the hospitalized alcoholics on almost all other scales. The result patterns of the alcoholic and psychiatric outpatients and skid row alcoholics are clustered and higher than those of the hospitalized alcoholics. This clustering could be due to the fact that both clinic groups are more prone to admit their difficulties, since they have voluntaily presented themselves to an agency to change their status, whereas the hospitalized alcoholics are generally under treatment for only

a brief time for physiological disorders, not to change their alcoholic symptoms. The author concludes that alcoholism is not a primary disorder and does not require a unique diagnostic designation. More attention ought to be paid to the reason for choosing alcoholism over other neurotic or psychotic symptomology.

McGinnis and Ryan (20) split 128 male chronic alcoholics at a state hospital into age groups 30-39, 40-49, 50-59, to see whether there was any difference in MMPI scores for different age levels. Six clinical scales and one validity scale decreased significantly after the 30-39 year age level. There was no significant difference between age groups 40-49 and 50-59. Performance on the Barren Ego Strength Scale was lower for older subjects.

The ability of the MMPI to measure denial or defensiveness of inactive and active alcoholics and the relationship between degree of denial and suicidal behavior was investigated by Palola, Jackson, and Kelleher (31) in a study of members of Alcoholics Anonymous who had been sober for at least two years and active alcoholics selected from a hospital psychiatric ward and from a police department rehabilitation project. AA members were rated as more defensive than the active alcoholics.

These findings to not accurately reflect the actual behavior of these groups. AA members are much more willing than other groups of alcoholics to admit that drinking has created a large problem in their lives. However, active alcoholics are quicker to admit to unhappiness and despression

than AA members, a possible factor in their low denial score on the MMPI. The AA members were more willing to admit to suicidal thoughts. For the active alcoholics, the authors conclude, this admission would have revealed too much disruption of their lives by a drinking problem. Replication of the study is needed, as the results are very unclear.

Parke and Walters (22) compared alcoholics and nonalcoholics on emotional responsiveness and ability to learn to avoid a pain-producing stimulus. Criminal and clinic alcoholics were studied with a control group of unemployed workers and one of students. All subjects received a battery of psychological tests including items from Pd, F, K and L scales of the MMPI, in addition to the Manifest Anxiety Scale, Maudsley Personality Inventory (MPI), and Lykkens Activity Preference Scale. During the avoidance learning task, EKG and GSR measures were taken. The alcoholic groups showed higher scores on the PD Scale of the MMPI and the Neuroticism Scale of the MPI. Controls uniformly performed more efficiently than the alcoholics and their control group of unemployed workers performed similarly. Only in the early trials was there a significant difference between these groups. In all cases the pattern of change in performance was the same, showing that alcoholics or psychopathic personalities do learn from experience, although less efficiently than normal. Other authors (see Section 3.7 for references) have found that psychopathic personalities do not learn from experience and

therefore persist in their antisocial behavior. The persistent behavior could be due to the fact that their choice of reference groups reinforces antisocial responses and alternative responses are not offered.

Items from the MMPI will be helpful in selecting neurotic and psychotic personalities from the general public, but the above research on particular alcoholism scales derived from the MMPI implies that reliability of predictions varies greatly. Those persons receiving high PD Scale and alcoholism scale scores would have to be interviewed or questioned further before diagnosis.

3.3.2.4. OTHER PERSONALITY TESTS

Sixteen Personality Factor Questionnaire. DePalma and Clayton (23) administered the 16 PF to alcoholics at a county hospital. Alcoholics differed from the general public on 14 of the factors. They were characterized as unstable, immature, silent, submissive, sensitive, suspecting, undependable, bohemian, anxious, high in ergic tension, and low in superego strength. The alcoholic appeared to be basically immature and governed by the "pleasure principle."

Holt (24) used the 16 PF on a group of Australian "skid row" alcoholics arrested for drunk and disorderly conduct. Other prisoners were also tested and the American norms used as controls. Both prisoner groups deviated from the American norms, the alcoholic group more extremely. The group could be described as low in ego and superego strength, mild and

submissive, glum and silent, timid and shy, sensitive and effeminate, suspecting and jealous, bohemian and unconcerned, insecure, anxious, and tense and excitable.

General Personality Findings. Hampton (25) has surveyed the literature on alcoholism and personality and compiled a four-part report on the naturalistic, clinical, psychometric, and psychoanalytic studies done.

The naturalistic approach is a subjective report of generalizations by an observer familiar with abnormal and normal drinkers. Using this approach, one can dig into the characteristics of alcoholics without postulating a unitary personality.

Cimbal subjected several hundred alcoholics to thorough biographical analysis and split them into five naturalistic categories: (1) "decadent drinkers," pampered, well-bred people who live a life of degeneration, getting old before they've enjoyed their youth; (2) "impassioned drinkers," immature and unable to exhibit libidinal drives, who find when conflict arises that alcohol reduces the tension; (3) "spineless drinkers," unable to withstand temptation, who because of low intelligence do not see the consequences of their acts and may be led by drink to criminal or antisocial acts; (4) "self-aggrandizing drinkers," who, striving beyond their abilities and lacking the energy to reach their ambitions, seek compensation for inferiority by playing the "superior" Don Juan with "inferior" prostitutes, bragging, etc.

Pohlisch made a personality study of alcoholics and morphinists and found differences in the two types of addicts. He concluded that morphine addicts have a high aspiration level but low energy, perseverance, etc. They are weak and helpless from constant indulgence in physical pleasures. On the other hand, Pohlisch feels that alcoholics have a mental and physical robustness, because alcohol removes inhibitions. Alcohol heightens ego feelings, and the alcoholic becomes the "social lion" that he desires to be. Hampton criticizes Pohlisch for implying that all alcoholics are robust introverts. Alcoholics, especially in the chronic stage, have degenerated physically and mentally and are far from robust. Besides Pohlisch, others (Moellenhoff, Gabriel, and Kartzman and Bleuler) agree that different types of addicts exhibit different personality structures. Rado, on the other hand, traces all addiction to a disease he calls pharmacothymia: ego-frustrated individuals reach states of deep depression which are relieved by drugs. If the addict remains continuously in a drug stupor, the depression does not break through the pleasure effects. However, not all addicts reach a pleasurable state by the use of their drugs.

In the area of clinical observation, Tiebout has described the alcoholic personality, studying over 200 alcoholics over a period of 9 years. Egocentrism characterizes the alcoholic personality, he concludes. Six traits form the focal pattern of the alcohol addict's personality: (a) an unconscious drive or need to dominate; (b) a negative, hostile

feeling; (c) a capacity for ecstatic peaks of emotion; (d) a sense of loneliness and isolation; (e) feelings of inferiority and superiority; (f) a striving for perfection.

Case-history analyses have also been done, but they lack the personal contact with the patient that the clinical interview provides. Hart finds deceptiveness, unreliability, fixation, incest complex, inferiority of constitution, marital maladjustment, homosexual tendencies, egocentrism, pampering as a child, want of adaptability, absence of responsibility, and extroversion common traits in the alcoholic. These conditions, he feels, arise from a general constitutional deficiency, partly inherited and partly acquired through bad training in childhood.

Landis compared alcoholics, former alcoholics and non-alcoholics and found the alcoholics: (a) are rebellious toward authority, (b) have little interest in work, (c) show little evidence of ambition, (d) are poorly adjusted sexually, (e) have been repeatedly separated or divorced, and (f) show neurotic trends and episodes. Aggressiveness, submissiveness, religious attitude, homosexuality, emotional ties to parents, and background factors did not distinguish alcoholics from nonalcoholics.

Darbury feels that the alcoholic is an introvert trying to extrovert himself. He also sees superficiality as the most outstanding feature of the alcoholic.

Miles reports that alcoholics have basically the same personality structure as psychopaths, with fewer oral traits.

Miles lists the outstanding characteristics of the alcoholic as: (a) admitting to fewer neurotic tendencies than the average man, (b) emphasizing extroversion, (c) reacting more to social pressure than to real personal goals, (d) expressing more self-confidence than the average man, (e) lacking independence, (f) liking to work where objectives are clearly defined, (g) avoiding complex judgment in work, (h) easily rationalizing his many "escapes."

Wortis, Sillman, and Halpern conclude from their study of the life histories of 50 alcoholics and nonalcoholic controls that no single event is responsible for the onset of compulsive drinking. It is the total effect of environmental stress upon a person with low resistance to alcohol that produces alcoholism. The alcoholic is generally bright intellectually, but his emotions rather than his intellect influence his drinking behavior. Although he presents a hypomanic exterior to the world, the alcoholic really lacks self-confidence. This lack of self-confidence drives him to make enthusiastic plans which he cannot or does not execute successfully. He is also characterized by tremendous anxiety. The Wechsler Vocational Interest Blank revealed the alcoholic's distaste for static, sedentary occupations (office jobs). He prefers active, dynamic occupations with a minimum of mental, social, and physical construction.

Hampton (25) goes on to review both non-projective and projective psychometric studies of alcoholics. Wittman admin-

istered the Humm-Wadsworth Temperament Scale to a group of alcoholics and nonalcoholics and found no homogeneity of temperament among alcoholics. He roughly distinguishes the group by the following traits: (a) alcoholics have less restraint, mental poise and stability, (b) they have difficulty controlling and expressing their moods and desires, (c) they are slightly more selfish and conceited, hence more antisocial, (d) they have pronounced swings of mood and activity, (c) their moods shift from extreme euphoric activity to gloomy apathy, (f) they are not particularly shy, sensitive, or given to daydreaming, (g) they show a strong paranoid tendency.

In a second study, Wittman measured the adjustment of alcoholics. In general, he found, they show poorer adjustment than nonalcoholics. The study also brought out the alcoholic's need for religious security and standards of conduct.

In the third study, Wittman looked at the alcoholic developmentally. The outstanding developmental traits he found were: (a) a domineering but idealized mother and a stern, autocratic father who was feared, (b) strict unquestioning obedience required, (c) insecurity marked by the need for religious security and a strong feeling of guilt and sin, (d) interest in the opposite sex with many love affairs but poor marital adjustment, (e) lack of self-confidence but an ability to get along with and be socially acceptable to others, (f) a keyed-up emotional level, (g) expression of greater love for the mother than for the father.

Hampton feels that the question to be asked of psychometric studies is whether the traits measured reflect the pre- or post-addictive personality. Also, deviations in personality may be only general deviations from the norm rather than specific traits of the alcoholic.

Marshall found that a favorable environment of emotional and economic security characterized the alcoholics he dealt with in psychoanalytic studies. He feels that alcoholism develops not from a lack of security but in an atmosphere where coping with frustration is not learned.

Strecker and Chambers, using the Bernreuter Personality Inventory, found their alcoholic patients to be introverted, (90%) emotionally unstable, lacking self-confidence, self-conscious, sensitive, self-critical, submissive, and unsociable. Alcohol is seen generally as a means to regression.

Lentz administered a questionnaire called the Expressionaire to drinkers and nondrinkers and found that 260 of 1,565 items had discriminative value. The differences in personality between the two groups can be summarized thus: (a) drinkers are more inclined to smoke and drink coffee, (b) they are more liberal except for participation of women in nondomestic activities, (c) they are less optimistic, less happy, and more moody, (d) they are less well adjusted emotionally and socially, (e) they are more tolerant of breaches of generally accepted moral conduct, (f) they are more international in outlook except with respect to race prejudice, (g) they are

more materialistic and selfish, (i) they are more interested in the opposite sex, (j) they are more interested in adventure and active recreational activities, (k) they are less favorable toward church and religious activities, (l) they are more militaristic in the area of projective psychometric testing.

Buehler presents Rorschach protocols for primary alcoholics and neurotic drinkers. The primary alcoholic is characterized by depression and/or psychopathy. His search for pleasure is devoid of self-control, tension, or guilt feelings. He is not anxious and rationalizes his circumstances in a rigid, stereotyped way. The neurotic drinker, on the other hand, is characterized by extreme immaturity. Instinctual drives and self-indulgence are present, but the neurotic drinker has more self-control, and his habits produce strong feelings of anxiety and guilt.

From the finding of Deleger and Rosenberg on the Rorschach test, the alcoholic traits revealed were: (a) a tendency to self-pampering with an inability to tolerate unpleasant states of mind, (b) an instinctual urge for self-expression, unaccompanied by the determination to act, (e) an abnormal craving for emotional experiences calling for removal of intellectual restraints, (d) search for an escape from reality, (e) a demand for continuous happiness and excitement, (f) a craving for feelings of self-confidence, self-importance, calm and poise.

Klebanoff gave the Thematic Apperception Test to 17 chronic alcoholics. Results showed that the alcoholics had

more inadequacy and insecurity feelings than normal. There was also an intense fear of failure: power failure, social failure, and love failure. The alcoholic, Klebanoff concluded, is introverted and shows little physical and non-physical agression, devoting his energy to himself. Alcohol offers him a pseudoextroversial solution.

Hampton feels that because motivation is so important in the study of alcoholism, psychoanalytic studies of the personality of the alcoholic give the deepest insight and most thorough developmental approach to the study of alcoholism.

In one of the first psychoanalytic studies, Rado pointed out two effects of alcohol on the body which he calls the pharmacogenic pleasure effect and the pharmacogenic organism. The first may not produce the second, but if it does a tremendous craving develops and addiction occurs. The individual turns from a love object to alcohol. Inhibition decreases, making trouble for the superego. Guilt causes a need for punishment, and the alcoholic may become sadistic or masochistic. Alcohol finally becomes a regression to the original alimentary organism and a substitute for it.

Simmel emphasizes the oral pleasures of alcohol: with the obsession comes depression. The alcoholic's greatest anxiety is over castration, and drinking itself may be an oral-sadistic fantasy.

Glover sees the main factors in the etiology of alcoholism as: (a) partial fixation of the libido at oral and anal sadistic levels of development; (b) a tendency to regress to the narcissistic stage of ego development, setting action the ego mechanism of projection; and (c) a disordered and severe primitive conscience, leading to fruitless exploitation of some mechanism of projection.

In a comparison of male and female alcoholics, Wall concluded that male alcoholics displayed an Oedipal complex with oral cravings, lack of ambition, irresponsibility, solitary drinking, introversion, and a gradual deterioration of personality. Women alcoholics have much more individual personality pictures. Their most outstanding traits are temper trantrums and tomboyishness. The addiction of the woman can almost always be traced to a postmarital situation which resulted in severe emotional involvement. Beneath these differences, however, both males and females are motivated by an all-enveloping narcissism which incapacitates them for adequate adjustment.

Knight agrees with Wall that alcohol serves to return the inebriate to an early oral stage. In the family background he sees an oversolicitous mother and a stern, harsh father. The alcoholic became too dependent on the mother and fears the father. Because the alcoholic never achieves an integrated personality, alcohol provides him with an escape from the hostile world identified with his father.

Alcohol, according to Robbins, serves the inebriate in three ways: it gratifies oral, bodily, and cellular cravings; it maintains a "personality economy" in which narcissism is vital; and it sustains the existence of a manufactured delusional mother.

Several clinicians have interpreted alcoholism as sexual deviation: since the alcoholic does not have the personality structure adequate for successful sublimation, he turns to perverted sexuality. Drinking eventually takes over for even the perverted substitutions.

Tausk views alcoholism as the expression of sexual preoccupation, a form of sexual forepleasure. The preoccupation takes the form of imaginal gratifications. The alcoholic works himself into a sexual frenzy, fearing that he will not actually be able to complete the sexual act he has imagined. Eventually the fear of impotence becomes psychological impotence.

Sacks thinks of alcoholism as a compromise between sexual substitution - primarily masturbation - and compulsive neurosis. Various manifestations of fetishism precede and are preparatory to the masturbation. The alcoholic becomes a peeping tom of sorts, availing himself of every opportunity to look at female ankles, thighs, etc. Sexual fantasy is substituted when direct fetishism is not available.

Rado shows how pharmacothymia changes the sexual life of the alcoholic:

(1) Continuous alcohol consumption weakens the alcoholic's sexual potency, leading to psychological inpotency. Eventually the alcoholic breaks all love ties.

(2) Pharmacogenic pleasure becomes a substitute for genital pleasure, and the primary sexual urge becomes autoerotic.

(3) Because the pharmacogenic pleasure is not satisfying his basic needs, the alcoholic develops castration fears.

(4) Castration fears lead to further withdrawal from sex. Depression causes the alcoholic to be overpowered by death instincts. The only thing that will help him is the renouncement of his narcissism; however, drinking inflates his narcissistic ego.

(5) Two alternatives to (psychological) destruction are available: (a) continuous intoxication leading to stupor and psychosis, (b) suicide.

The best known and most generally accepted psychoanalytic theory of alcoholism interprets it as repressed homosexuality, Hampton suggests.

Tabori feels that the drinker's inability to realize latent homosexual wishes leads to alcohol addiction. Delusions of persecution may appear. The alcoholic becomes a withdrawn individual who can only forget his homosexual cravings and manifest some degree of extroversion when he is thoroughly drunk.

Juliusburger sees normal sexual development as the winning out of heterosexuality and eventual sublimation of la-

tent homosexuality because of cultural reinforcement. Because alcohol destroys the ability to sublimate, homosexuality breaks through, causing anguish and mental conflict. The conflict leads to more drinking, beginning the vicious cycle of addiction.

Zwerling and Rosenbaum (26) summarize the personality of the alcoholic as described by many psychoanalytic theorists. The alcoholic becomes vulnerable because of early experiences threatening his security. He sees alcohol as a magical fluid which dispels tension and depression, relieves loneliness, gives pleasure, permits mastery and expression of hostile impulses, and provides a built-in set of sufferings and punishments which appease the ego and feed back stress stimuli to continue the cyclic addictive process.

The above authors also discuss the contributions of learning theory to the study of alcoholism. Skinner's conditioning paradigm can be easily seen as relating to the development of alcoholism. The pattern "anxiety → alcohol → relief from anxiety" becomes overlearned. Alcoholic reinforcement is immediate; alternative methods for handling anxiety provide only delayed reinforcement.

A study by Masserman showed that cats given alcohol failed to develop the "experimental neurosis" of a control group when subjected to conflicting fear and hunger motivations.

Some studies have been done to estimate the importance of certain physiological conditions on the development of alcoholism. Williams holds that genetically determined partial

enzymatic defects render carbohydrates less readily metabolized and consequently inadequate as sources of rapid energy, and that alcohol, once experienced as a replacement source, is craved for this effect. His theory explains the difference in incidence of alcoholism among different cultural groups. (Lester and Greenberg, however, demonstrated that rats given a choice of alcohol or sucrose solution consistently chose the latter.)

Fleetwood and Diethelm report evidence for "anxiety," "tension," and "resentment" factors in the blood of all humans. Over a period of days or weeks, they found that the "resentment" factor rose with no conscious awareness on the patient's part. Eventually when it reached an intensity of 25 g or higher, the alcoholic would drink and the "resentment" factor would disappear within an hour.

The problem with most physiological studies to date is that they usually demonstrate a certain psychopathic state that produces a preference, rather than a craving for alcohol. In animal studies where an atypical food preference is created, the animal usually alters his preference because of a change in response to taste and smell sensations. The alcoholic who swallows hair tonic or shaving lotion is showing not an altered taste or smell sensation but a craving for the effects of alcohol.

Very few sociocultural studies of alcoholism rates have been done, although there is substantial indication that re-

liable differences exist in male-female rates. The World Health Organization has estimated prevalence rates for 12 countries. Different theories which have been postulated for explaining these estimates are of interest.

Horton, analyzing the data available on alcohol consumption in 56 "primitive" societies, found a correlation between the amount of alcohol consumed and the degree of subsistence anxiety: where greater anxiety over crop failure, floods, food supply, etc., existed, more drinking occurred. Horton concluded that alcohol has the property of reducing anxiety and will be differentially used among different societies, depending upon their basic security and anxiety levels and the availability of alcohol.

Bales proposed a theory relating social organization and cultural practice to alcoholism. The bases for the relationship he sees as: (1) the degree to which the culture causes acute inner tension or need for adjustment in its members, (2) the set of attitudes toward drinking in the society, and (3) the extent to which the culture provides substitute means of satisfaction. He goes on to describe four cultural attitudes: abstinent, ritual, convivial, and utilitarian.

Moslem cultures illustrate the abstinent or prohibitive attitude. Bales notes, however, that breaking the taboo becomes an ideal way to express dissent and aggression. High and low alcoholism rates will prevail depending upon the pressure of anxiety.

The pattern of the orthodox Jew illustrates the ritual attitude: because wine is sacred and intimately connected with many religious rituals, counteranxiety is produced by the thought of drinking merely for the sake of getting drunk.

Convivial and utilitarian drinking are similar enough to be grouped together. In this set of attitudes, drinking is part of economic transactions or a way to celebrate principal occasions in life, but it is not part of a religious ritual. Another example would be drinking to get over a hangover. In such cases the inebriate is treated well, as illustrated by the Irish mother's attitude toward her drunken son when she says "the poor boy."

Mowrer and Mowrer, taking an ecological view of alcoholism, see alcoholism rates as related to varying rapidity of social change and disorganization in the different areas of society. The rates are inversely related to the distance from the center of the community.

Gordon sees alcoholism as a medical problem. Consumption of any alcohol he considers "alcoholism," and addiction and alcohol psychosis are merely end states of the total process.

Velman studied the differences in the memory of the first drink among alcoholics and nonalcoholics. The alcoholic more frequently remembered the event, as it had more often occurred in an unusual place and at a later age, with some remarkable effect. If nonalcoholics are tabulated according

to percent recalling their first drink, the descending rank order is Irish, English, Scandinavian, Jewish, French, German, and Italian, which corresponds closely to the rank order of incidence of alcoholism in the population.

Willken did some perceptual field dependency studies with alcoholics who had been sober for two or more years and a control group of college students. The alcoholics produced an unusual perceptual pattern, significantly different from all other groups tested and consistent despite differences in their psychiatric diagnoses. On the two tests where it was necessary to control an external object against the influence of the field, the alcoholics yielded to the field in an extreme way. On the other hand, in the body adjustment situation where the body is surrounded by a tilted field and must be righted, alcoholics performed as well as the other group. This performance was interpreted as a manifestation of a passive-dependent attitude, coupled with a primitive insulating narcissism through which the field is not resisted so much as the body and its sensations are responded to.

Sutherland, Schroeder, and Tordella (27) surveyed 37 studies done on personality traits of alcoholics; the findings are merely repetitions of those already covered in this paper.

Two studies on measurement of brain waves by Davis, Gibbs, Davis and Jetter, and Kessler are of some interest. Both studies found that alcoholics deviated from normals in their

electroencephalograms in the direction of fast activity and reduced amplitude. The second article implied that the differences were due to the effect of alcohol. A third study of this kind done by Greenblatt, Levin, and DeCori was conducted with more attention paid to variables. Alcoholics were compared with hospital employees and the results showed 24% of the alcoholics and 10% of the normals having abnormal electroencephalograms. When the comparison was limited to a single age group (20-30), the controls had a higher rate of abnormal electroencephalograms than the alcoholics. The authors of the above survey conclude that, although there is some evidence to show that alcoholics deviate from normals in brain-wave testing, the other research reviewed in the area of personality characteristics does not justify any conclusion about the type of person most likely to become an alcoholic. There seems to be no alcoholic personality type prior to alcoholism.

Gunther, Presher, and McDonald (28) tested alcoholics using Leary's Interpersonal System of Personality, which analyzes the subject's relationships to others. The 50 subjects were all alcoholics admitted to the South Carolina State Hospital during a four-month period. The data show that these people impress others as managerial, responsible, and cooperative, which is consistent with self-images emphasizing generous or leadership qualities. Two-thirds of the sample demonstrated competitive or aggressive characteristics.

Fantasy heroes were mostly aggressive or distrustful whereas fantasy "others," such as parents or spouses, were responsible, managerial, cooperative people. The ideal ratings show that these individuals don't really want to be leaders, competitors, or aggressors; their ideals seem to be friendly, passive, and dependent.

Subjects saw their mothers as generous and responsible, their fathers as competitive and rejecting. Wives were rated more like fathers; however, many of the men were divorced or separated, which might have affected their reactions negatively. The low actualization scores of 64% of the sample show that they do not act as they would like to.

On a conscious level the majority of alcoholics identify with their parents or spouses; however, on a preconscious level they strongly disidentify. This finding suggests that, although excessive drinkers speak about their love for their parents, most really reject them. Healthy symptomatic behavior was presented by 78% of the alcoholics and 82% described themselves as responsible, generous, and managerial. Those who present "healthy" facade scores are termed "help rejectors" by Leary and would be unwilling to stay in treatment.

White (29) investigated whether members of Alcoholics Anonymous with varying lengths of sobriety had been shifted from the "tunnel vision" of earlier days to a broader perceptual range acquiring the ability to shift patterns, modes and judgments.

Cattell's 16 PF test was administered to a group of alcoholics with 1-2 years and a group with 3 or more years of sobriety to test for differences in personality. The Gelb-Goldstein-Weige-Sheerer Object Sorting Test was used to test cognitive functioning. Results show that the groups differed on 9 of the 16 personality factors. On the sorting tests, subjects did not differ significantly. However, when asked to sort 31 objects into meaningful groupings, only 50% of the short-sobriety group were able to complete the task. When subjects were asked to respond with abstract concepts only one in the short-sobriety group was able to do it, differing significantly from the success of the long-sobriety group. Concrete concept formation was not significantly different; however, abstract thinking was more impaired in the alcoholics with a brief sobriety period. These results indicate that more attention ought to be paid to length of sobriety in alcoholism studies.

Johnson (30) has summarized the reasons why the literature in the area of the alcoholic personality is so confusing and inconclusive. He lists the factors involved as: (1) alcoholics used as subjects come from a variety of settings and at different stages of the disease; (2) it is rare that a researcher knows the person before he starts drinking to excess; (3) diagnostically, the alcoholic cuts across fields showing evidence of neurosis, character disorders and sometimes psychosis; (4) there is difficulty in the basic termin-

ology and concepts used: (5) since we cannot consider the personality in a vacuum, cultural differences will cause variations in the characteristics of the drinker.

3.3.3. CLINICAL TESTS

3.3.3.1. RORSCHACH. Weinlander (31) investigated the ability of the SORT to discriminate between normals and alcoholics. Fifty veterans diagnosed as alcoholics were compared with the data for normals in the SORT manual. Of the 15 SORT variables alcoholics differ significantly from normals on 6: poor form resemblance, human movement, color-and-form resemblance, shading, modal responses, and rare responses. The author sees the major finding of the study support for the classification of the shading variable as a measure of anxiety.

3.3.3.2. BENDER-GESTALT. Twenty-five male alcoholics from AA and twenty-five male nonalcoholic social drinkers were given the Bender-Gestalt test by Curnutt (32). The results show a significant 20-point difference between the mean scores of the two groups. The author concludes that alcoholics can be differentiated from nonalcoholics using a certain pattern of responses. The validity of the results must be questioned, however, since the author knew when he was scoring an alcoholic or nonalcoholic record. Using Curnutt's study as a model, Seiden (33) attempted to replicate the experiment comparing AA members with alcoholics who were not AA members. Investigators in this study scored all protocols "blind." Again a significant difference was found between the mean

scores of the two groups. In discussing the results, Seiden notes that since the Bender-Gestalt requires that the subject cope with a sample of reality, those people with greater ego strength would do better. Since AA members obtained significantly lower scores, they appear to have a less disturbed attitude towards reality. Comparing the present results with those found by Pascal and Suttell on psychiatric groups, the non-AA alcoholics resembled the scores of the inpatients and the AA alcoholics, whereas the other group did not. Perhaps the differences in scores reflected the difference between those who had recovered from alcoholism and those who had not. In all cases, AA members seem to be "healthier" than the non-AA group. This makes the use of AA members in alcoholism studies of questionable value for revealing true alcoholic personality characteristics.

Story (34) believes that the alcholic displays a wide range of neurotic symptoms besides obsessive alcoholic behavior. These symptoms may appear to a greater or lesser degree in alcoholics, overlap with other psychiatric groups, or be specific to only a small percentage of those addicted to alcohol. Story attempted to make some specific hypotheses regarding the reproductions expected on the Bender-Gestalt test as related to the psychodynamic functioning usually attributed to male alcoholics. Since ego functions are considered poor in the alcoholic, it was proposed that a significant difference would be found between the mean scores of alcoholics

and the nonpsychiatric control group with alcoholics earning the higher scores. It has been observed that alcoholics are extremely anxious people. Therefore, on the compulsive, meticulous task of counting dots in a design, it was proposed that alcoholics would manifest this anxiety by counting out loud, or with a finger or pencil. The low tolerance for tension in the alcoholic and his withdrawal from interpersonal relations led the author to postulate a unique pattern of behavior in response to designs with intersecting, overlapping, joined lines. The author feels that alcoholics will separate intersecting designs as it is the least demanding way of modifying the design and reflects the stress over "interpersonal overlapping." A much harder hypothesis to substantiate experimentally is that the separation of the two phallus-like hexagons is a response to threatening homosexual urges. The suppression of affect, Story believes, will cause alteration of emotion-producing designs. Slanted or free-flowing designs will be reproduced in a more controlled way by rotation of the design to a more vertical position.

The subject groups were 30 male inpatient alcoholics from an alcoholic clinic and 30 male nonpsychiatric teachers. All hypotheses were confirmed. One criticism of the study suggested by the author is that the results may be attributable not to alcoholism but a low tolerance of tension, which had led these subjects to enter a clinic.

3.3.3.3. ROSENZWEIG PICTURE FRUSTRATION. Three groups of

subjects: a "normal" group of university students and hospital personnel, a "chronic alcoholic" group of females from Alcoholics Anonymous and males from a hospital, and a paranoid schizophrenic group, were given the Rosenzweig PF test by Brown and Lacy (25). The test can differentiate between groups in three possible ways; (1) direction of aggression expressed: extrapunitive, intropunitive or impunitive; (2) the type of response given: ego defensive, dominated by the obstacle, or need to find a solution to the frustrating problem; (3) the Group Conformity Rating obtained by comparing each record with a pattern of responses which has been found to occur in a sufficiently high number of records to permit its adoption as a norm. The only significant differences between classes were found between the percentages of extrapunitive responses and in the percentages of obstacle dominance responses. In all cases, the difference between sexes is of greater significance than the difference between classifications. The discrimination capacity of the Rosenzweig PF does not justify its use as a diagnostic instrument.

Murphy (36) administered Rosenzweig's PF test to three groups to try to discriminate between social classes: white native-born alcoholics of middle class social status background and 50 white native-born male alcoholics of lower class background from Manteno State Hospital in Illinois were initially compared. Later, a third group of white, native-born, lower class males, at least third generation

Americans, was also tested, as the initial lower class group was heavily weighted with individuals of European parentage. The mean profile of each group was compared with Rosenzweig's norms.

The obstacle-dominance category was underweighted in the three alcoholic groups. This category is considered to be the least adaptive, as the individual is unable to deal with frustration except to be aware of it. Therefore, the alcoholics make a more than average effort to adapt to frustration arising in everyday life. The mean of the middle class group, however, was overweighted in the ego defensive category, which is said to represent a tendency to ignore all else in the defense against the ego threat caused by the frustration. Compared with Rosenzweig's norms, the profiles of both lower class groups were significantly unconventional. Both were overweighted in the impunitive and need-persistence factors and underweighted in the extrapunitive and group-conformity rating categories. This suggested a more than average concern for solving frustrating problems by assuming personal responsibility for them, minimizing aggression, and smoothing things over. The extreme differences between Rosenzweig's norms and the lower class pattern may have been due to the fact that Rosenzweig's norms were standardized on a predominantly middle class group. The results of the study appear to indicate that the overt frustration patterns of alcoholics reflect a background of cultural training and the socializing effects of organized training programs such as Alcoholics Anonymous.

3.3.3.4. BODY IMAGE. Cleveland and Sikes (37) compared the body image of chronic alcoholics and nonalcoholic psychiatric patients. All subjects were hospital patients and were tested upon admission. Alcoholics were retested after their intensive 90-day treatment program.

Various procedures were used to assess body attitude and perception which had been found useful in previous studies. The Holtzman Inkblot Technique (HIT) was administered and scored for body image. It was also scored for indexes of barrier and penetration, deterioration and decay in body image. All direct references to the word "water" were counted on the HIT. Subjects were also required to make some estimates of their body size. Finally a Body Experience Questionnaire (BEQ) was given to find out how many distorted body feelings had been experienced.

Alcoholics did not differ significantly from the other subjects on barrier responses but did score higher on penetration, deterioration and decay, and water responses of the HIT. With respect to the judgment of their body size, alcoholics exceeded controls on the estimates of head, foot and stomach size. On the BEQ, alcoholics admit to more strange body experiences and score higher on items involving body contamination.

Retesting of the alcoholics showed no change in HIT scores. Body size estimates dropped considerably, however, and fewer abnormalities were admitted to on the BEQ.

The results suggest that the alcoholic's fantasied perception of the deterioration of his body mirrors the debilitation actually taking place on a physical level. The conclusion that overestimation of body size seems to coincide with a vague diffuse body image has been arrived at in many previous studies. Schizophrenic groups characteristically overestimate body size. The present alcoholic results fall somewhere between the overestimation of schizophrenics and the estimates of normals.

3.3.3.5. DRAWING PREFERENCE. Wisotsky and Birner (38) studied the incidence of animal drawings in a normal population of subjects instructed to draw either a person or an animal, attempting to determine whether the incidence of animal drawings in a pathological group given the same instructions would be significantly different.

A group of 416 college students acted as controls for the two experimental institutional groups of 750 chronic alcoholics and 205 narcotics addicts. Of the normals 92.4% drew the person first; of the chronic alcoholics 80.7% drew the person first. The differences between the normal and addictive groups were significant; the differences between the addictive subgroups were not significant.

In Rorschach analysis, animal responses show underdeveloped emotionality. Similarly, the drawing of an animal first suggests a high degree of infantilism and immaturity.

3.3.3.6. SEX TEMPERAMENT. Parker (39) attempted to compare male alcoholics and moderate drinkers by degree of

masculinity. Sexual deviation in the alcoholic has been noted by many psychologists and psychiatrists; however, despite the wealth of literature, there are very few psychometric investigations supporting or negating these findings and interpretations. Parker's study attempted to determine whether male alcoholics differ from moderate drinkers with respect to sex temperament defined in terms of performance on a psychometric test.

The Terman-Miles Masculinity-Feminity test was administered to 50 male inpatient alcoholics and a control group of 50 male moderate drinkers matched by age and education. Parker hypothesized that: (1) alcoholics would show a lower degree of masculinity than moderate drinkers, (2) alcoholics and moderate drinkers who expressed a preference for the maternal parent would have a lower degree of masculinity than those who did not, (3) alcoholics who had been separated or divorced would show a lower degree of masculinity than those with unbroken marriages, (4) alcoholics and moderate drinkers with a higher percentage of older male siblings would show a higher degree of masculinity than those with a higher percentage of older females, (5) alcoholics and moderate drinkers from broken homes would differ in degree of masculinity from those in unbroken homes.

1. Hypothesis 1 was confirmed: the mean score of the alcoholics was significantly lower than the M-F norms, and that of the moderate drinkers was considerably above.

2. The 32% of alcoholics who preferred their maternal parent had an extremely low masculinity score as compared

with the opposite extreme for moderate drinkers preferring the maternal parent. Then the scores of those with no preference for a particular parent are included, no significant difference in mean score can be found between alcoholics and moderate drinkers.

3. The mean score of married alcoholics was 34.1 as compared with 12.2 for separated or divorced alcoholics. Only one broken marriage was reported among the moderate drinkers.

4. As to the hypothesis concerning the sex distribution of siblings, the findings were entirely contrary to the expectations. In none of the three situations - older brothers but no older sisters, excess of older brothers over older sisters, or only male older and younger siblings - do the alcoholics or moderate drinkers show a lower masculinity score than those with opposite sibling patterns. In fact, the opposite, though not statistically significant, is suggested by the findings.

5. The mean score of alcoholics coming from broken homes is one-third that for alcoholics from unbroken homes. Although the difference in mean scores of the moderate drinkers runs in the opposite direction, it is not statistically significant.

Differences in M-F scores were not found for either drinking group in high or low ordinal positions. Instead, a curious pattern was observed in that those with low M-F scores usually occupied odd-numbered ordinal positions; 12 of the 16

alcoholics professing mother preference were also odd-numbered children.

The author concludes that one must not assume that alcoholics are necessarily homosexual because they are more feminine in temperament. No exclusive relationship is evident between sexual deviation and alcoholism.

3.3.3.7. OTHER TESTS, SURVEYS, AND DESCRIPTIONS. Machover and Puzzo (40) did three studies to obtain information on the personality factors of alcoholics in general, the possible difference in personality characteristics of alcoholics who have achieved sobriety as opposed to those who are still active drinkers, and homosexual trends in alcoholics.

To ascertain the personality characteristics of the alcoholics, clinical, descriptive, and comparative statistical summaries were made of 23 remitted and 23 unremitted alcoholics. All subjects were given the Rorschach, 11 cards of the TAT, the Blacky Pictures Test, the Wechsler-Bellevue, a word association test, the MMPI, the California F-Scale, the Allport-Vernon-Lindzey Scale of Values, Animal Choice, and the Sims SCI Occupational Rating Scale. The data from these tests were used projectively and integratively in the development of clinical interpretations. A minimum incidence of 60% was arbitrarily chosen as a criterion for presence of a trait in a particular group. Twenty-three attributes met this criterion and present the author's composite picture of the alcoholic personality. These are:

1. Schizoid character deviation
2. Mother involvement
3. Father involvement
4. Oral dependence, demandingness, or sadism
5. Castration problems
6. Castration anxiety
7. Feelings of insufficiency
8. General ambivalence
9. Sex-role ambivalence
10. Low self-esteem
11. Depression
12. Social withdrawal
13. Female identification
14. Homosexuality trends
15. Narcissism
16. Feelings of frustration
17. Hostility
18. Difficulty in expression of hostility
19. General guilt feelings
20. High level of tension or anxiety
21. Denial
22. Generally defensive attitudes
23. Obsessiveness-compulsiveness

It is not possible, since no control groups were used, to know whether these traits are specific to alcoholics or characteristic of the group studied. The authors believe that these personality traits were causes in the development of alcoholism; however, no evidence can be presented, since the study was performed after long addiction.

Machover and Puzzo went on in their second study to compare personality traits of remitted and unremitted alcoholics. (Additional characteristics were considered in the second study.) The results showed most findings to be remarkably similar for both groups of alcoholics. Remitted alcoholics exceeded unremitted alcoholics in incidence of feminine identification, identification with the mother, general ambivalence, overcompensation, rationalization, reaction formation, ob-

sessive-compulsive character traits, overcontrol, and fear of psychosis. Unremitted exceeded remitted alcoholics in the number of individuals showing hostility toward the mother, identification with the father, and social inhibition. Most of these differences, however, were merely trends.

The third paper, by Machover, et al. (41), attempted to investigate the hypotheses that alcoholics in general show more homosexual trends than their nonalcoholic peers, and that the trends will be more evident in remitted than unremitted alcoholics.

The same groups of 23 remitted and 23 unremitted alcoholics were used with a criterion group composed of 23 practicing male homosexuals. The Rorschach and Machover Figure Drawing Test (MFDT) were administered and scored "blind" by the judges. Ten scales of the Rorschach have been shown to discriminate homosexuals from nonhomosexuals. Alcoholics, however, did not achieve a significantly different score than the nonhomosexual control group, showing no more evidence for homosexual trends. The second hypothesis was confirmed as the remitted alcoholics scored 14.87 while the unremitted alcoholics scored only 7.23 on the homosexual scale. This evidence suggests that alcoholics cannot be regraded as a homogeneous group with regard to homosexual trends.

Twelve homosexual scale items from the MFDT were also administered to alcoholics. The mean score of the alcoholics was 5.21 and that of the nonhomosexual controls 3.33, with a

difference significant at the 0.01 level. As with the Rorschach data, however, homosexual trends among the alcoholics are completely attributable to the remitted ones.

It seems that remission or the capacity for remission segregates a subgroup of alcoholics in whom homosexual trends are more prevalent than in nonalcoholic, nonhomosexual controls or in unremitted alcoholics.

Subjects were also given the M-F scale of the MMPI, using a T score of 70 as the diagnostic cutting point. The T score was at least 70 for 18 homosexuals, 10 remitted alcoholics, 5 unremitted alcoholics, and 3 controls. Although femininity of interest pattern cannot be equated with homosexuality, the M-F scale does clearly differentiate overt homosexuals from the heterosexual control group. Again, as in the Rorschach and MFDT, remitted alcoholics show more feminine trends than the remitted, although their scores are significantly below those of the actual homosexuals.

LeVann (42) has given a clinical picture of the alcoholic from observation and study of 32 patients. The patients were divided into two subgroups, (a) primary and (b) reactive or secondary alcoholics. Analysis was made on the basis of a battery of tests administered including the Wechsler-Bellevue Intelligence Scale, Rorschach, TAT, Blacky Pictures, and the MMPI.

On the Rorschach records the primary alcoholics seemed lower in mental capacity. Their responses were simple, with

little fantasy or organizational activity. Typical signs of anxiety were infrequent. The reactive or secondary alcoholics, in contrast, showed the cardinal signs of neurosis with much anxiety.

On the TAT primary alcoholics gave brief, unreflective, "cliché" stories with little identification or empathy with the characters. The reactive alcoholics, on the other hand, became very much emotionally involved in the TAT. Neurotic behavior was evident in their responses.

The MMPI profiles of primary alcoholics were generally flattened with fewer peaks than are charateristic of the normal personality. These patients had no enthusiasm for the task and finished as soon as possible. Reactive alcoholics, however, who regarded the test as of possible benefit to them, worked conscientiously. Hysteria, hypochondriasis, and psychasthenia scales were high. The Pd scale was abnormally high, which is probably due to the unconventional behavior that is a feature of the alcoholic symptomatology.

Early in the study, psychotherapy sessions were conducted with each patient. Here, too, a contrast is seen between the two groups of alcoholics. The primary group resented the therapist and had an air of complete control over the situation. Fixation on the mother tinged with sadism and antagonism toward the father appeared in the histories. Suggestions that they try a course of Disulfiram were vigorously rejected.

The secondary alcoholic group showed pressing and unresolved emotional, marital, or socioeconomic difficulties. Ambitions were unfulfilled and frustrating problems unsolved. Affect was depressive, with strong indications of anxiety and hysteria. When asked whether they would take Disulfiram they showed eager acceptance.

Group studies, termed seminars, were also conducted with the alcoholics. The staff members played passive roles, encouraging the patient group to solve their own problems. It was the primary alcoholics who showed the greatest interest in these meetings. There was marked competition among them to speak. They often led the discussion away from alcohol. These patients vied for leadership and apparently felt very important to be involved in these discussions. Secondary alcoholics developed little participation in the meetings. They only responded to direct questions, seemed a bit awestruck by the verbosity of the other patients, and showed no empathy with them.

Sexual interests and activities of all the alcoholics were explored. Male primary alcoholics had little interest in women, among female primary alcoholics, sexual frigidity was common. Sexual interest seemed to have been low since puberty. Among the reactive alcoholics there was often a marked sexual drive, but it was connected with many feelings of guilt and anxiety.

LeVann feels that the most important finding is the non-

acceptance of a father figure by alcoholics: the Oedipal problem has not been properly solved. He notes that Alcoholics Anonymous, which has marked success in dealing with alcoholics, has a program which is based on the acceptance of God (the father) as the most important factor in effecting a cure.

Kaldegg (43) observed and evaluated a group of clinic alcoholics with analysis of their scores on Rorschach, Wechsler-Bellevue, and Bender-Gestalt Tests. The patients were 21 men and 3 women, all from comfortable economic backgrounds with good education and good social status. They therefore did not represent a random sample of alcoholics. Some of the group had deteriorated in social relationships, but this was an effect rather than a cause of their addiction. According to their own statements, they drank to compensate for feelings of inferiority; to facilitate business transactions; to be in the company of others; to be alone; to celebrate; to find solace after an emotional upheaval; to overcome fatigue; to overcome tensions; to fight boredom; to feel better able to deal with the problems of life; to withdraw from the problems of life; to tone down aggression; to be less shy and more aggressive; for no conscious reasons whatsoever. All patients were tense, and some were openly depressed.

Psychological tests were administered according to individual clinical problems. The three tests given to the

majority were the Wechsler-Bellevue Intelligence Test (20 patients), the Bender-Gestalt test (18 patients), and the Rorschach test (15 patients).

IQ's ranged from 88 to 132, with more than half the patients scoring above 120. Disturbance in intellectual function was evidenced by the considerable differences in verbal and performance scores on the test.

Deviations from the mean scores were noteworthy, especially the unpredictable deviations in mental arithmetic, positive deviations in picture completion, and minus deviations. This jigsaw puzzle task was a "productive" test. Faced with bits and pieces and a problem without guidance, the alcoholics could not succeed.

On the Bender-Gestalt Test, tremor was the most widespread manifestation. Other deviations observed were:

1. Overwork
2. Compression or micrography
3. Macrography
4. Changes in size
5. Dots instead of circles made in Design #2
6. Difficulty with Design #7 - Hexagon
7. Parts missing, asymmetry
8. Rotations

The results indicate some behavior which appears to be due to cortical damage. Most of the failures, however, were due to a neurotic pattern of behavior.

On the Rorschach test not one patient gave a completely normal record, but no uniformity was found that would suggest an "alcoholic personality." Irregularities were attributed

to variations in personality, with neurotic symptoms being expressed differently according to basic makeup. Some common features were (a) potentialities not fully used; (b) passivity and lack of drive; (c) inhibition and blocking in emotional situation; (d) quick incapacitation in the face of personal difficulties; (e) fear of "going to pieces;" (f) tension, anxiety, and depression.

Fox (44) gave a battery of psychological tests to 300 private patients all of whom showed gross disturbances. Although they did not conform to one personality type, the patients showed some conformity in character traits. Characteristic of all were low frustration tolerance, inability to endure anxiety or tension, depression, withdrawal, low self-esteem, sensitiveness and a masochistic type of self-punishing behavior. Frustration of dependency strivings led to depression or hostility and rage. Most showed impulsive repetitive acting out of conflicts on a superficial level. Hostility and rebellion against authority figures were apparent, as well as sexual problems.

Fox gives a summary of the different approaches to therapy used for alcoholics. Included in her discussion are Alcoholics Anonymous, Antabuse therapy, psychoanalysis, group therapy, psychodrama, LSD, and hypnosis.

Manson (45) administered the psychometric Cornell Selectee Index Form N (CSI), a questionnaire containing 64 psychoneurotic and psychosomatic items, to 404 nonpsychotic,

nonchronic alcoholics and 474 nonalcoholics. His aim was to find individuals likely to develop psychoneurosis and those who already possessed these trait patterns in a group of alcoholics.

The mean score obtained on the CSI was 18.1 for male alcoholics and 8.4 for male nonalcoholics. Female alcoholics showed a mean of 20.5, as compared to female nonalcoholics' 8.9. Thus, the female group appears to possess slightly more psychoneurotic symptoms. Of the male alcoholics, 37.2% were free of psychoneurotic and psychosomatic symptoms: of the female alcoholics, 28.8%. On the other hand, 18.1% of male and 18.2 % of female nonalcoholics were classed in the "mild" and "severe" groups. The differences between alcoholics and nonalcoholic scores, however, was significant, showing the CSI to be a valid instrument for detecting maladjusted individuals.

As indicated by the CSI, the alcoholic reveals his anxiety by identifying himself as a nervous, easily discouraged person who is likely to worry about his health, tremble frequently, dream a great deal with occasional nightmares, have difficulty in sleeping, have tics, spend time in mental hospitals, consider himself the "worrying type," become easily upset or irritated, walk in his sleep, sweat without exercise, often feel miserable and sad, have unusual fears, and feel uneasy in public toilets.

The significant psychosomatic signs in the alcoholics were frequently getting up tired in the morning, poor appe-

tite, tiring easily, difficulty in breathing, thumping of the heart, exhaustion or fatigue, dizziness, pains in the stomach, severe itching, constipation, frequent attacks of nausea, vomiting blood, urinating frequently, hot or cold spells, and generally feeling unhealthy and unhappy.

Responses suggestive of emotional sensitivity in the alcoholic were a feeling of being treated unfairly, finding it hard to forget unpleasant experiences, often feeling misunderstood, considering himself as touchy or sensitive, feeling that he was being watched at his work, not doing his best work when watched, feeling that people were talking about him, and being disturbed over his shyness.

The questions which pointed to psychopathic behavior were those which indicated serious trouble or loss of jobs due to drinking, frequent loss of jobs, having been sent to reform school, drinking more than two quarts of whiskey a week, and having been arrested more than three times.

Comparing the CSI with Manson's Evaluative test, we find that the CSI predictions of alcoholism were 73.7% accurate in a sample of 513 males and 78.6% accurate in a group of 365 females. Manson's Evaluative Test made predictions which were 78.8% accurate for a sample of 339 males and 84.1% accurate for a sample of 195 females. The two tests correlated highly, suggesting that alcoholics and psychoneurotics or psychosomatics have similar personality characteristics.

Haberman (46) compared alcoholics with two other groups on the extent and type of reported psychophysiological symp-

toms. One comparison group consisted of persons with ulcers or chronic stomach trouble; the other had neither alcoholic nor stomach problems. The initial identification of the pathological groups was made in a community research project, the Master Sample Survey. In the present investigation, the alcoholics and matched comparison groups were interviewed again with the hope of confirming and elaborating upon the earlier findings.

The major ethnic groups in the Washington Heights Health District were Negroes, Puerto Ricans, Irish, and Jewish. Two-fifths of the alcoholic group and one-fourth of the comparison groups were Negro. Two-fifths of the stomach trouble group, one-fourth of the general group, and one-tenth of the alcoholics were Jewish. The stomach trouble group included proportionately fewer Puerto Ricans and Irish. Twenty-two questions about symptoms associated with mental disturbance were selected from the MMPI and the United States Army's Neuropsychiatric Screening Adjunct and were administered to the three groups.

In general the alcoholics reported more symptoms than the comparison groups. When only married subjects were analyzed a systematic ranking was demonstrated, with alcoholics reporting the most symptoms, the general comparison group the fewest, and the stomach trouble group between. The only items that did not follow this pattern were frequent anger and periods of depression, reported most and least often,

respectively, by the stomach trouble group. Persons from the general comparison group attributed health difficulties to emotional problems significantly less often than the other two groups.

The data suggest that psychological impairment has some direct relationship to stomach trouble and more marked association with alcoholism.

Kates and Schmolke (47) investigated the Bender Gestalt scores of the alcoholic and his verbalizations about himself and his parents to try to distinguish alcoholics from other behavior disorder groups. Eighteen male alcoholics without mental disorders from a state hospital were compared to eighteen control subjects, custodial workers employed in the hospital who denied abnormal drinking. An interview schedule of 122 questions was given. On the basis of the interviews, subjects were grouped into eight categories. The Bender Gestalt test was then administered. Three categories distinguished between alcoholics and controls at the 0.01 level: No. 2, hard-working father who was a good provider; No. 5, self-sacrificing mother; and No. 7, lack of awareness of weakness and inadequacy. A fourth category, No. 8, passive experiencing of the past 6 months of life as opposed to need to achieve, differentiated between subjects just short of the 0.05 level of significance. No significant differences in total Bender Gestalt scores were found between the alcoholic and control subjects. However, both alcoholic and

control subjects who said that they had strict fathers and were closely attached to their mothers earned better scores.

Menaker (48) in his study on anxiety about drinking in alcoholics proposed that alcoholics would increase in anxiety in either case.

Thirty normals, thirty alcoholics, and thirty schizophrenics participated in the study. Changes in anxiety level were measured with the Nowlis-Green Mood Adjective Check List (MACL).

In a preliminary interview all subjects were told that participation in the experiment was voluntary. If they chose to participate they were told that there would be two sessions about a week apart, and that some but not all subjects would be given one ounce of whiskey at the second session. The ones to receive the whiskey would be chosen by the flip of a coin.

The first session was the same for all subjects. All subjects were given the MACL. For the second session, each subject within each diagnostic group was assigned randomly to one of three treatment groups. In the control condition, subjects were told that they would not receive a drink. The MACL was then readministered. Subjects assigned to the experimental group were given a drink. The MACL was then readministered. For the anticipatory condition, subjects were told that they would get a drink at the end of the experiment. After the MACL was given, they were given the drink.

Both psychopathic groups were significantly higher in anxiety on the MACL than the normal group. Alcoholics in the ancitipatory condition increased in anxiety, those in the experimental group remained constant, and those in the control group decreased in anxiety. Nonalcoholics did not show any significant increase in anxiety under any of the conditions. Therefore alcoholics increased in anxiety when anticipating a drink but not after having one. The author interprets these results as indicative of a conflict over drinking which is activated by anticipation of drinking. A decrease in anxiety after drinking was attributed to secondary reinforcement.

Drinking Pattern. The possible relationship between social isolation and alcoholism was studied by Singer, Blane, and Kasschaw (49). Past studies were criticized for using alcoholic patients who because of their hospitalization were already isolated, for using indexes of social isolation (such as employment status) that were not appropriate, etc. In the present study, alcoholic subjects were patients admitted to the emergency service of a general hospital who had been diagnosed as alcoholic by the admitting physician or by a special set of criteria established for the purpose of this study. The control group was made up of patients not diagnosed as alcoholic.

The source of data was the emergency ward records for the day the patient was admitted. Consideration was first given to the amount of current social contact the patient had.

It was assumed that married patients would have a greater amount of such contact than single, divorced, widowed, or separated patients. Patients who lived with a close relative were similarly assumed to have more frequent social contact. Finally, if an employer was named, it was assumed that the patient had more possibility of regular social contact on the job.

Social stability, defined as the ability to maintain social involvements, was also measured. Patients who had been able to maintain a marriage were considered to be more stable than those who had not. Patients who were employed when possible were also considered more stable.

The third aspect of social isolation considered was the use of social resources. It was assumed that people integrated into their community would be more aware of its characteristic methods of dealing with medical and financial problems. One such resource is medical insurance. Another is the hospital itself. Patients who had entered the hospital on their own or had been referred by an agency were assumed to be better integrated into the community than those brought in by the police.

The results showed that alcoholics were more socially isolated than the nonalcoholic control group. The only exception was an insignificant difference in the use of medical insurance by alcoholics and nonalcoholics.

Negrete, MacPherson, and Dancey (50) compared arrested and active alcoholics with a control group in an effort to find

out if extended sobriety is really a "cure" for alcoholism. Looking at the total number of problem areas, the arrested alcoholic is closer to the active alcoholic than the control. Analyzing the individual areas, the arrested alcoholic shares the problem areas of personality, home and family, and sex with the active alcoholic. In all others, he is more like the control. Arrested alcoholics have half as many problems as their active counterparts in the areas of health, economic security, and religion. The principal factor increasing the difference between the arrested alcoholics and the control group is that of personality problems.

The authors conclude that although society helps the alcoholic in the areas of physical health, religion, and social functions, problems related to personality are untouched. This would indicate that sobriety should not be considered the only goal in therapy of the alcoholic.

Selzer, et. al. (51) attempted to document further the extent of alcoholic drivers' responsibility for traffic accidents and to determine whether personality factors have any meaningful relationship to those accidents.

Subjects consisted of 50 alcoholic male drivers serially admitted to a veterans' readjustment center and 50 emotionally ill nonalcoholic male veterans serially admitted to the same facility. All subjects were interviewed by one of the authors to obtain histories of all convictions for moving traffic violations and traffic accidents caused by the patient which re-

sulted in an injury or at least $100 damage, and to determine whether drinking had occurred prior to the incident. All were treated with psychotherapy 3 hours a week for periods ranging from 2 to 12 months. Psychopathological traits that could contribute to the cause of traffic accidents were formulated and subjects were rated by their psychotherapist on these variables. These traits were then correlated with the accident histories to see which had the greatest influence on lifetime accident totals.

The alcoholics were responsible for twice as many accidents and twice as many moving violations as the nonalcoholics. The significant differences between the two groups were due to traffic incidents which occurred when the alcoholics had been drinking. The number of accidents and violations occurring when the subjects were sober was almost identical for alcoholics and nonalcoholics.

The highest degree of relationship was found between "paranoid ideation" and traffic accidents, with a correlation of 0.50. Significantly correlated variables indicating depression were "thoughts of self-destruction," "serious suicidal preoccupation or attempts," "feelings of sadness and despondency," and "self-loathing, self-deprecation." Three significant variables associated with aggression were "low frustration tolerance," "chronic or recurrent rage or resentment towards others," and "aggressive behavior when drunk." Excessive preoccupation with fantasy was significantly correlated

in the variables of "obsessional rumination" and "marked affective liability."

Only three of the predictor variables were significantly related to the frequency of accidents in the nonalcoholic group. These were "obsessional rumination," with the highest correlation, "serious suicidal preoccupation or attempts," and "heterosexual adjustment." The authors noted that, since the personality variables were designed with the alcoholic in mind, findings in the control group do not accurately reflect the role of personality in the etiology of traffic accidents incurred by nonalcoholics. The control group data should be used only for comparison.

Self-concepts. MacAndrew (17) did a dimensional analysis of the responses of diagnosed alcoholics and nonalcoholic psychiatric outpatients to the 49 items of his alcoholism scale derived from the MMPI. The purpose of the analysis "was to determine whether their responses to these items are unidimensional or multidimensional, and if the latter, to determine whether the obtained item subclustering, when construed as dimensions of differential self-representation, provides useful insights concerning the differences between these two classes of psychiatric patients."

Thirteen factors were extracted from the items. Interpretations of the factors are as follows:

Factor I. Alcoholics are more likely to claim to be outgoing and interpersonally competent than a comparable group of nonalcoholic psychiatric outpatients.

Factor II. Alcoholics are less likely than nonalcoholic psychiatric outpatients to complain either of difficulties in concentration or of lack of self-confidence.

Factor III. Alcoholics are less likely to claim that they frequently dream of or are worried about "sex matters."

Factor IV. Alcoholics are more likely to profess having been disciplinary problems in school.

Factor V. Alcoholics are more likely to claim that they have been independent and free from family rule.

Factor VI. Alcoholics more often claim a close childhood attachment to a woman than do nonalcoholic psychiatric outpatients. They also are more likely to profess that they currently suffer from consequences of prior wrongdoings.

Factor VII. Alcoholics are more likely to show general dissatisfaction with what they've made of their lives. At the same time they do not want to be taken as prudes and they say, in effect, "Who am I to criticize others?"

Factor VIII. Alcoholics are more likely to profess agreement with religious doctrines. Although they accept the responsibility for their transgressions, there is some intimation that they feel they have been playing against a stacked deck.

Factor IX. Alcoholics are more prone to claim knowledge of the source of their difficulties. They tend to hold themselves responsible.

Factor X. Four out of five alcoholics, compared with one-third of the nonalcoholic psychiatric group, claim to

have been in trouble with the law and assert that they have coughed up blood.

Factor XI. Alcoholics are likely to claim blackouts when they commit blameworthy acts that they neither intended or remember.

Factor XII. Alcoholics are more prone to complain about sleeping problems and bodily pains.

Factor XIII. Alcoholics are more likely to profess that they enjoy the excitement of gambling even when the stakes are minimal. This factor may suggest a general dimensions of boredom with and disdain for everyday life.

The above factors, clearly differentiating alcoholics from nonalcoholic outpatients, clearly contradict the assumption that alcoholics are simply "neurotics-who-also-happen-to-drink-too-much," says MacAndrew.

Williams (52) in a previous study used Gough's 300-word Adjective Check List (ACL) to determine the relationship between problem drinking and self-evaluation. In the present study, the same subjects were reevaluated along with two new sets of subjects. College problem drinking is related to need scales developed by Heilbrun. Study of drinking problems at a college level is undertaken in view of the possibility that college drinkers are in the prealcoholic stage.

The extent of problem drinking was measured by a scale developed by Park which is interpreted as measuring predisposition or proneness to alcoholism.

Forty-five subjects (A) comprising the top and bottom thirds of the problem-drinking distribution in William's previous study were used in the present study. They were male volunteers from four fraternities at a New England men's college. A second sample (B) of male subjects obtained from a different New England college had been used in a study by Kalin. A third sample (C) was composed of male students from five fraternities at two men's colleges in New York State. All subjects were given the ACL and problem drinking measure. The ACL was scored from Heilbrun's need scale.

The results indicated that problem drinkers were significantly higher than nonproblem drinkers in autonomy, change, and agression, and significantly lower in deference, order, affiliation, interaction, endurance, and nurturance. Tendencies were observed for problem drinkers to be high in exhibitionism and low on achievement and dominance.

The problem drinkers seem to characterize themselves as independent, although in Sample A there was a combination of independent and dependent responses. McCord and McCord in another study (see reference 53) found prealcoholics characterized by dependence-independence conflict. Lisansky (see reference 53) says that when alcoholism develops, the conflict has been resolved in the direction of dependency.

Prealcoholics seem to be unconcerned about others, which is consistent with their independence and tends to isolate them from primary group relationships. These characteristics

are like those of alcoholics. Low scores on endurance and order achieved by problem drinkers are also consistent with the lack of perseverance found to be characteristic of alcoholics by many investigators.

3.3.4. STATISTICAL SURVEYS OF BACKGROUNDS, ETC.

A sample of 109 alcoholics admitted to Elgin State Hospital was studied by Wahl (54) to find family and environmental conditions that characterized their backgrounds.

Analysis of sibling position revealed 25% to be ordinal children, 21% ultimate, 13% penultimate, 13% only children, and 27% all other placements. No clustering at any one position was revealed. The families of 49% of the alcoholics included 4 or more children. The contemporary American family average is 1.6 children; in those families that have children, the national average is still only 2.2 per family, while only 13.7% have 4 or more children. Stresses such as increased difficulty in identifying with parents may be present in large families that might be influentialy in the development of alcoholism.

The religious affiliations of the group were 44% Roman Catholic, 35% Protestant, 1% Jewish, and 20% "none." The religious composition of the inhabitants of the area in which the hospital is located was not available, so it is not known whether the percentages are abnormal. The author suggests that organized religion sometimes overemphasizes concepts such as the innate wickedness of man, etc., that adversely affect healthy personality development.

Investigation revealed that 62% of subjects were from homes where there was extreme parental rejection or overprotection. Rejection was more frequently encountered, and rejection by the father (39%) was more prevalent than rejection by the mother (27%).

The incidence of loss of parents before the age of 15 was 24% losing one or both parents by death, and 13% losing a parent by separation. Thus, 37% had lost one or both parents by the age of 15. Fourteen percent of the cases have evidence of both overprotection or rejection by parents and loss of one or both parents by the age of 15. These cases were extremely severe in their alcoholic symptoms. Since only 9% had neither of these traumas, it seems that pathological parental attitudes and parental loss are most significant in the pathogenesis of alcoholism. Pathological parental attitudes also appear in the history of schizophrenics, but schizophrenics' parents show more vacillation between rejecting and overprotecting attitudes; parents of alcoholics were more consistent in their attitudes.

Moore and Ramseur (55) studied all the alcoholic admissions to a veterans' readjustment center between 1945 and 1956 to look for patterns in family background and relationships and previous adjustment. Their findings were as follows:

3.3.4.1. FAMILY STRUCTURE

Broken Homes. In 45 of the 100 cases, the family was

disrupted by the loss of one or more parents before the patient's early adolescence.

Parents. Although it was not possible to determine the personality structure of all the parents, in 17 families the father seemed clearly dominant, while in 20 the mother was more dominant. Obvious paternal rejection of the patient was seen in 22 cases and maternal rejection in 13 cases. Twenty-six mothers and two fathers seemed overindulgent. In five cases the father was definitely passive. Overt aggression was displayed toward the father in 14 cases, toward the mother in 15 cases.

Family Maladjustment. Alcoholism and mental illness were frequently characteristic of the family background. Thirty-five fathers and six mothers were alcoholics. Of the 87 patients who had siblings, 11 had one or more alcoholic siblings. Ten fathers, eleven mothers, and one or more siblings in ten families showed serious problems ranging from severe antisocial behavior to psychosis.

Socioeconomic Background. Socioeconomic information was obtained for 69 cases. Families of 20 patients were above average, 28 clearly below, and 21 in the broad average range. In 32 of 41 cases, fathers had steady employment records.

Father's Occupation. Of the 50 fathers whose occupations were known, 11 were professional men, 16 businessmen, 16 factory workers, 5 farmers, and 2 were in politics.

Sibling Position. Thirteen of the patients were only children, but there was an average of four children per family. Of the patients with siblings, 39 were oldest or next to oldest children and 27 were youngest or next to youngest.

3.3.4.2. LIFE HISTORY.

Early Adjustment. Of 78 patients for whom a history of early behavior was obtained, 52 had had serious problems as adolescents. Childhood problems such as marked hostility and open rebelliousness toward parents, extreme jealousy of siblings, bed-wetting, extreme loneliness, sleeping and feeding problems, or speech defects were reported. As adolescents 58 patients began drinking to excess; others did not complete high school, were chronic school truants, failed grades, were delinquent, ran away from home, showed withdrawn behavior, or had a lack of heterosexual activity.

Education. Of 85 adequate records, an average of 12.1 years of schooling was found with a median of 11.0 and a range from 7 to 20.

Intelligence. IQ scores of the 67 patients tested ranged from 84 to 132, with a mean of 114.6 and a median of 118.

Work History. An adequate work history was obtained from 85 patients, of whom 9 were professionals, 14 were in sales and business, 31 did factory work, 9 were usually unemployed, and others were in miscellaneous fields. Out of

79, 11 were able to maintain steady and consistent job adjustment. Twelve others had shown some stability. In 56 cases there was a marked history of instability.

Military Adjustment. Eighty patients served in World War II and twelve in the Korean War. Two had received decorations of valor and twenty-six had been court-martialed. Dishonorable discharges were received by three (one was changed later to honorable), six had general discharges either for "bad conduct" or as "undesirable," fourteen had medical discharges of which four were for neuropsychiatric disorders, and twelve were discharged with a service-connected disability.

Civilian Legal Difficulties. Forty-six patients had been arrested at least once. Eighteen had been arrested in both military and civilian life. Five of the patients had been imprisoned from 15 months to 5 years.

Marital Adjustment. When admitted, 43 were married, 27 single, 24 divorced and 6 separated. The average length of 62 marriages was 6.8 years with a range from 1 to 21 years.

Religion. Of the 83 cases where a religious preference was stated, 55 were Protestant, 26 Catholic, and 2 denied religious affiliation. There were no Jews in the group.

Physical Health. Upon admission 73 patients revealed no major physical abnormalities; 20 had minor physical defects, 27 showed evidence of severe pathology, 5 had residues of severe trauma, 6 had hypertension, 7 had enlarged livers,

and 21 had histories of earlier serious illness. Electroencephalograms taken of 16 of the patients showed 11 abnormal rhythms. However, 7 of these were borderline and not diagnostic.

3.3.4.3. ALCOHOLIC HISTORY.

Type of Alcoholism. Alcoholics were classed in 3 groups: addictive, reactive, and symptomatic. "Addictive" was used when alcoholism had developed gradually, and "reactive" when alcoholism had followed a definitely stressful precipitating event and had been used as a means to cope with the stress. Alcoholics suffering from a severe mental illness with alcoholism as an additional symptom were termed "symptomatic." Of the 100 subjects, 85 were addictive alcoholics, 6 reactive, 8 symptomatic, and 1 unclassified.

Age of Onset. The age of onset was determined in 93 cases. The average age was 21.6 years, the median 20 and the range from 13 to 45.

Type of Beverage. The majority of patients preferred whiskey or beer. Beer was somewhat more popular. Only two patients gave a history of repeatedly using nonbeverage alcohol.

Drinking Pattern. Of 59 cases, 26 were steady daily drinkers, 3 primarily weekend drinkers and 30 spree or periodic drinkers. The majority had not been able to remain abstinent for more than 6 months, but a few had gone as long as 3 years without alcohol.

Precipitation of Excessive Drinking. In 63 cases it was possible to find a significant factor in the patient's life history which he correlated with the onset of excessive drinking. Loss of a close relative or friend, a major change in a life situation, physical or mental trauma, etc., were often reported.

Source of Referral. Psychiatrists referred 24 of the 100 patients, other physicians 16, veterans' service agencies 20, and social agencies 6. Legal authorities sent 11 patients. Another 9 were brought by family or friends, and 14 sought help themselves.

Chief Complaints on Admission. When admitted, 78 patients named excessive drinking as their major reason for seeking help. Additional complaints mentioned in order of frequency were anxiety (25), somatic disturbances (24), inability to work (23), legal trouble (21), aggressive behavior (19), marital trouble (15), depression (11), insomnia (10), and other complaints (61).

Bates (53) observed and analyzed 124 consecutive male alcoholics admitted to a hospital in Lansing and obtained statistics and impressions which he feels make diagnosis of the alcoholic by a physician simple and almost foolproof.

Upon first approaching a patient, information about marital status, street address, and employment will be helpful. An unemployed, single male from a downtown address is fair game. Many details of dress, hygiene, and self-confi-

dence make the patient just "look" like an alcoholic. Some components of the "look" are red face, untidy appearance, lack of self-confidence, "hang-dog" countenance, and some puffiness around the eyes. Tensions, depression, psychoneurosis, hypochondria, hostility, self-centeredness, and immaturity, although not exclusive alcoholic traits, may be crucial to diagnosis. A family history showing the patient to be the child or sibling of an alcoholic or cirrhotic gives him a 50% change of being an alcoholic himself. An ulcer patient who admits to drinking regularly is suspect, as are patients with a history of tuberculosis, since tuberculosis is five times as frequent among alcoholics as in the general population.

Fifty-six percent of the patients Bates observed had dropped out of school before getting a diploma. One of the most significant statistics Bates observed was that 55% of the patients were not living with their wives. (He estimates that between 50% and 75% of all divorces are caused in part by alcoholism.) Bates suggests that physicians ask about the patient's smoking, coffee drinking, sleep, diet, and work habits; a record of overindulgence is characteristic of alcoholics. A person maintaining his weight but eating only a few hundred calories a day is suspect as getting additional calories from alcohol.

Checking into the patient's alcohol history, any hint that he drinks too much or that his wife thinks he drinks

too much demands follow up questioning. If the patient gives a barrage of defenses and alibis, he is probably feeling guilty about his drinking habits. Roughly, a person who admits to eight drinks in an evening is probably an alcoholic.

Only a fifth of the patients observed had never been arrested and booked for being drunk and disorderly or for drunk driving.

The physical examination can reveal many clues to alcoholism. Multiple bruises in unusual places can suggest carelessness in moving about because of drunkenness. Alcohol on the breath in the morning is particularly diagnostic. People with green tongues from chlorophyll lozenges are worried about their breath, possibly about alcohol on the breath.

One out of six patients was tattooed, and one out of five had bitten fingernails, suggesting masculinity problems, immaturity, and oral fixation.

Tremor of the outstretched hand is common during withdrawal, as is a pulse rate over 100.

Bates finds women alcoholics harder to diagnose. Women alcoholics, he feels, fall into three categories: young, immoral women with no visible means of support, housewives near menopause, and masculine women who smoke, work, dress, and drink like men. Accidents occurring at home present a clue to the physician. Particularly suspect is the woman who is injured at home and fails to report for medical attention for hours or days after. It may be because she was

waiting to sober up. Heavy smoking is even more significant in a woman than in a man.

Alcoholic males tend to marry alcoholic females, especially on the second marriage. Therefore, the drinking habits of the spouse should be checked.

Maxwell (56) has done a study focusing on the early signs of problem drinking as they appear on the job in industry. Data were collected through questionnaires submitted to male alcoholics who had "recovered" or were under treatment and who had been employees in some business in industry during their drinking years.

Duration of the Problem Drinking Period. Respondents were asked how long it had been before their drinking problem began to show on the job. In 28%, the drinking problem and the first signs on the job reportedly appeared within a year of each other. However, half the men claimed to have hidden any sign of a problem for a year or more, 30% for 3 years or more, and 22% for 5 years or more. It seems that even after home and social life begin to deteriorate, an enormous effort is made to protect the job.

Judging from 400 respondents' records, it appears that job holding capacity is excellent despite drinking problems. Forty-seven percent were still at the same job as when their drinking problem began. Another 22%, although at a different job, had kept the same job for a year or more after seeking help.

On-the-Job Signs of Drinking. Hangovers led the list of signs of problem drinking. The author was surprised that absenteeism ranked 24th on the list of 44 signs, and all forms of partial absenteeism ranked even lower on the list. Physical signs seemed to appear first, such as increased nervousness, red or bleary eyes, hand tremors, etc. If the signs ranked with the highest percentages of serious, moderate, and mild degrees of occurrence are reranked, the six most frequent signs are (1) increased nervousness, (2) hangovers, (3) making mistakes, (4) red or bleary eyes, (5) greater irritability, (6) hand tremors. Additional signs were volunteered by some of the respondents. In order of frequency, they were: decline in ambition (17), decline in mental ability (13), dishonesty (11), working harder to cover up (10), cover-up talk (10), decline in confidence (7), decline in physical skills (15), excessive spending (4), asking for more pay (2), and displays of vulgarity (2).

Each respondent was also asked to check in rank order the first five signs which appeared on the job in his case. Hangover was listed in almost twice as many cases (66%) as the next sign, drinking in the morning before going to work (36%). Among the earliest signs in about one-fourth of the cases were absenteeism (27%), increased nervousness (25%), and drinking at lunch (27%), followed closely by hand tremors (21%), drinking during work hours other than at lunch time (19%), and being late to work (19%).

Sequence Patterns Among the First Five Signs. An examination of the first five signs for sequence patterns revealed only three patterns with as many as five cases. Leading was the three-sign sequence of hangover + drinking in the morning before going to work + drinking at lunch indicated by ten respondents. Five of these added "other drinking during working hours" as the fourth sign. Another three-sign pattern given by five respondents was only a slight variation of the first: hangover + morning drinking + drinking (other than lunch) during working hours.

Maxwell has predicted a scaling of signs of absenteeism (A), alcohol in the blood (B), physical or personality behavioral signs (P), and hangover (H) showing a basic relationship between them. A predicts the presence of substantial B, P, and H; substantial B predicts the substantial presence of P and H; and substantial P predicts the presence of frequent H.

The most observable signs of drinking before or during the work day are the aroma of alcohol or breath purifiers on the breath, avoidance of supervisors or associates, and striking mood changes during the day. Physical or behavioral signs include red or bleary eyes, flushed face, hand tremors, increased nervousness, greater irritability, more spasmodic work pace, procrastination, and neglecting details.

3.3.4.4. CHARACTERISTICS OF ALCOHOLIC WOMEN. Senseman (57) has summarized the characteristics of the alcoholic woman by

making a detailed study of 166 female alcoholics admitted to a sanitarium.

The female alcoholic usually starts drinking in her teens and begins as a social drinker. She usually waits many years after drinking has become a problem to seek help. Although rarely seen intoxicated, she is often incapacitated by "sickness." She excuses her drinking as a result of marital troubles, loneliness, boredom, and depression.

A physical clue in the female is scarring of the arms as a result of tremor burns from the edge of the oven. She may be underweight, with thin red legs, and have a waxy transparency of the ears and finger webs. Shaking hands and excessive smoking are excellent signs. Flagrant absenteeism from work may be a sign of an advanced alcoholic state; in the early states, an alcoholic will try to maintain a good attendance record.

Alcoholic women are notoriously secretive about their drinking habits, using denial as their main defense. The reasons given for drinking in order of frequency are marital problems, loneliness, boredom, and depression. It is also of interest to note the 66.7% of female alcoholics show a family history of alcoholism.

Fort and Porterfield did a study of 32 native-born white alcoholic women, reared in the South, who had been asked to respond to a questionnaire with questions pertaining to their social background. An oral interview was also given

to obtain more information and to confirm that which was gathered in the questionnaire.

Analysis of the data, looking at single factors that might be responsible for the onset of the illness, reveals that in 15% of the alcoholics' homes the conditions could be said to have been unfavorable, and in 14% the conditions were favorable to highly favorable. Four families had an organization that could be termed neutral in its socializing influences. To one family these descriptions do not apply.

Two of the women had alcoholic fathers and one an alcoholic mother. Eleven had one or two alcoholic siblings, and nine reported at least one alcoholic husband. Eight of the women had abstaining parents.

The onset of alcoholism took place before the age of 30 in 18 women and later in 16. In 17 women the onset was sudden, and in 16 it was insidious. In one it was indefinite. The type of drinking was "periodic" in 6 women, "irregular" in 10, and "steady" in 18. The time between onset and full development of the late chronic stages was 4 to 17 years, development being much faster than for men.

The social repressions of alcoholism in women are much different than they are with men. Women are rarely exposed to jailing or brawls. Ostracism and social discrimination against their children are more common social repressions. Twelve of the 34 women suffered from social ostracism. Three became self-isolated in anticipation of ostracism. Twelve

others, although not ostracized, had suffered such serious social consequences as being literally picked up from the gutter, arrest, or sexual humiliation. In seven cases, social repressions were very mild or nonexistent.

Eighteen of the subjects were not well adjusted before the beginning of their heavy drinking. These represented various "neurotic reaction types." The most conspicuous feature common to the eleven women without prealcoholic maladjustment was that all but one developed their alcoholism immediately following some well-defined, highly emotional stress which they recognized as such. On the other hand, in only three of the eighteen "neurotic" women did the alcoholism connect with such an event. It seems that, because of the greater restrictions on female drunkenness, women are not able to become alcoholics unless they are handicapped by neuroticism or are under the impact of strong emotional stimuli.

3.3.4.5. CHRONIC ALCOHOLISM IN DRIVERS RESPONSIBLE FOR FATAL ACCIDENTS. Selzer and Weiss (51) attempted to determine the incidence of chronic alcoholism in drivers responsible for fatal nonpedestrian traffic accidents. All deceased and surviving drivers responsible for fatal accidents in Washtenaw County, Michigan, from 29, October, 1961, to 31, December, 1964 were included in the study.

Some months after the accident, interviews were conducted with the driver's family, friends, employer, etc. The

driver himself was also interviewed if he survived. The interviews were meant to determine whether the driver was alcoholic or not. In addition, the driver's arrest and driving records were obtained and studied.

Of the 72 drivers studied, 64 were men. Only 13 (18%) of the drivers survived. Thirty-five (47%) of the accidents occurred between 6 p.m. Friday and 6 a.m. Monday.

Of the 72 drivers, 29 (40%) were alcoholics, 7 (10%) were prealcoholic, and 36 were nonalcoholic. Although the nonalcoholic group was generally made up of persons in the 16- to 21-year age group, most alcoholic drivers were between 22 and 41.

Interviews and blood alcohol levels revealed that 46 (65%) of the drivers had been drinking prior to the accident. Only one alcoholic was completely sober at the time of the accident whereas 24 of the 36 nonalcoholics had not been drinking.

Hollingshead's social class categorization of five classes, from I (highest) to V (lowest), were used to break down the driver group. Of the 72 drivers, 77% were in classes IV and V. Of those who were known to be drinking (but not alcoholic), 7.2% were in classes IV and V. Of the 36 alcoholics and prealcoholic drivers, 83% were in classes IV and V.

At least 42 drivers (58%) suffered from a classifiable psychiatric disorder. All the alcoholics were considered

mentally disturbed, whereas only 13 of the 36 nonalcoholics were diagnosed as such.

The alcoholic and prealcoholic drivers averaged 1.7 accidents and 3.5 moving violations each prior to the fatal accident, compared to 0.8 accidents and 1.8 moving violations for the 36 nonalcoholic drivers. Of particular interest was the number of prior convictions for intoxicated driving. The 29 alcoholics had 17 such convictions, whereas the 7-driver prealcoholic group had 1 as did the 36-driver nonalcoholic group.

Of the 29 alcoholics, 10 had been convicted for drunk and disorderly behavior at least once. Only one driver in the nonalcoholic group had a similar conviction. Forty-five percent of the alcoholics had at least a drunk driving or drunk and disorderly conviction, suggesting that these records should alert authorities to possible alcoholic drivers.

Waller (59) analyzed the previous contact with community agencies, particularly contact involving drinking problems, comparing 150 drunken drivers, 33 accident-involved drivers who had been drinking but were not arrested, 117 sober drivers involved in accidents, 131 drivers with moving violations, 19 drivers with citations plus arrest warrants, and 150 incident-free drivers. The screening criteria for problem drinkers with two or more previous arrests involving drinking, or identification by a community agency as problem drinkers, were met by 63% of the drunken drivers, 50% of the

drivers with an accident after drinking, 30% of the drivers with warrant, 14% of the nondrinking drivers with an accident, 8% of the persons with driving violations and 3% of the drivers with an accident, 8% of the persons with driving violations and 3% of the drivers with no incidents. A high correlation was found between two or more arrests involving drinking and an impression of problem drinking. Eighty-seven percent of the drunken drivers were known to community agencies, most with multiple contacts starting before age 30.

3.3.5. INTELLIGENCE

Fitzhugh, Fitzhugh, and Reitan (60) compared the performance of patients hospitalized for alcoholism with hospitalized patients exhibiting or not exhibiting organic brain damage on the Wechsler-Bellevue and several measures of adaptive ability. The 3 groups of 17 men each were matched for age, race, education, and handedness.

The specific tests used were the Wechsler-Bellevue, MMPI, the Trail Making Test, an aphasia examination developed by Heimburger and Reitan, and seven of the ten tests proposed by Halstead as measures of biological intelligence. The seven parts of Halstead's test were chosen for this study because they have proven most sensitive in differentiating brain damaged from non-brain damaged subjects.

The Wechsler-Bellevue results show the brain damaged group performing at a lower level than the alcoholic and control groups, with the latter two groups performing at

approximately comparable levels. The mean full IW scores for the alcoholics, brain damaged, and controls were 108.17 (SD 17.17), 100.64 (SD 11.00), and 111.35 (SD 8.86), respectively. It should be noted that the mean scores for all three groups were well within the average range.

In contrast with the Wechsler-Bellevue results, the scores of alcoholics more closely resembled those of the brain damaged group on the Halstead measures and the Trail Making Test, with the controls performing at superior levels.

Mean difference scores between the performances of the controls and brain damaged groups on the Halstead measures produced several significant differences.

Comparisons between the control and brain damaged groups on the Trail Making Test yielded results in keeping with Reitan's finding that this test discriminates between subjects with and without brain damage.

Mean difference scores for the controls and brain damaged subjects were significant on the Wechsler-Bellevue but generally not significant on the Halstead measures.

The results indicate that psychometric measures such as the Wechsler-Bellevue may provide misleading notions about the capabilities of some alcoholic groups.

Jonsson, Cronholm, and Izikowitz (61) compared the intellectual performances of three groups of males by means of a series of psychological tests in an attempt to measure the impairment of intellectual functions as a con-

sequence of prolonged alcohol consumption. The three groups included: (I) 30 alcoholics hospitalized in connection with a period of abuse of alcohol who were tested immediately after the alcohol had disappeared from their blood; (II) 30 analogous cases examined after a period of total abstinence in the hospital; (III) a control group of 29 psychiatric patients with no history of alcohol abuse. The alcoholics in group I and II were considered to be psychopathic or neurotic personalities. Tests of verbal understanding, verbal fluency, reasoning ability, spatial thinking, memory, and other tests were administered.

The results showed that in most of the test variables the performances were worse for the group tested at the beginning of their stay in the hospital than in the group investigated at the end. Differences were significant in many variables but not in the tests of verbal understanding and verbal fluency. The differences in several performance scores between groups II and III suggest that some intellectual deterioration still persists after hospitalization.

Bauer and Johnson (62) also studied deterioration of intellectual functions as a consequence of alcoholism by comparing 34 chronically alcoholic patients with 34 emotionally disturbed patients without alcoholism on the Wechsler-Adult Intelligence Scale and the Raven Progressive Matrices. No significant differences were found between the groups. The Wechsler Memory Scale did differentiate the groups sign-

ificantly but this was largely due to the superior retention of personal and current information in the alcoholic group.

Smart (63) attempted to find a relationship between intellectual deterioration, extraversion, and neuroticism among chronic alcoholics. Using Eysenck's Maudsley Personality Inventory, he predicted high extraversion scores but low neuroticism scores.

The subjects were a representative sample of all males who had received at least 3 convictions for drunkenness in Toronto during a 12-month period. Complete data were obtained for 150 persons. The group was split into two subgroups on the basis of the VIQ-PIQ difference on the WAIS. Offenders with VIQ-PIQ difference above 18 were put into the "deteriorated" group (N=24), and those whose VIQ-PIQ difference was $\pm$ 5 points were placed in the "undeteriorated" group (N=49). The data for subjects not falling into these categories were not used.

The deteriorated group showed significantly greater extroversion, but there was no difference in neuroticism or age. The results support the hypothesis that intellectual deterioration is related to high extroversion but not to neuroticism or age. Since it has been observed (64) that extroverts are characterized by slow learning and fast extinction, rehabilitation involving relearning should be more difficult with deteriorated than with undeteriorated alcoholics.

Roos and Albers (65) attempted to answer the question: Do alcoholics differ from normals in orientation toward the past, present, and future? They compared 35 patients (31 males and 4 females) hospitalized with a psychiatric diagnosis of alcoholism with 24 psychiatric aid applicants and 3 hospital volunteers who did not manifest symptoms of psychiatric derangement (5 males and 22 females). The Time Reference Inventory was administered to all subjects. The TRI is a paper and pencil test on which the subject indicates whether each item most appropriately refers to his past, present, or future. The first ten statements refer to pleasant events, the second ten to unpleasant events, and the last ten to affectively neutral events.

Normals differed significantly from alcoholics in having much greater future extension. No significant difference was found with regard to past extension. Alcoholics differed from normals in selecting more positive items referring to the past. With regard to present orientation, alcoholics selected fewer positive items and fewer neutral items.

The finding that alcoholics have a shorter future extension is compatible with the view that alcoholics are primarily concerned with short-range gratification and have difficulty maintaining long-range goals. The fact that alcoholics chose more positive past items suggests a yearning for the past as a fantasied period of happiness and is consistent with the interpretation of the dynamics of alcoholism as involving

regressive fantasies. The results also show the alcoholic's perception of the present as a source of unhappiness.

3.3.6. PERCEPTION AND MOTOR SKILLS

Talland and Kasschaw (66) had done a study on the effects of induced chronic intoxication on the performance of alcoholics in several tests of motor skill and attention. Even with daily rations of 30 oz of whiskey, no detrimental effects in performance were produced. In view of other experiments and casual observation of the damaging influence of alcohol on motor skill and intellectual performance, they felt that the contrary results had been obscured by an artifact. Therefore, the present study is a replication of the earlier experiment done in the absence of alcohol. A slower rate of improvement, rather than reduced efficiency, was hypothesized.

Nine men serving sentences for offenses of drunkenness were compared to nine similar men used in the previous study. Subjects were given several tests of reaction time and other manual skills. These were followed by two tests of attention or immediate memory. This was followed by the Stroop Test, in which color names printed in conflicting hues are read as fast as possible, first in accordance with the printed words and last according to the color of the ink.

Very little difference was found between the improvements in performance of the experimental and control groups. In general, the mean measures of improvement with practice were

higher in the control than in the experimental group; but within the relatively small samples of subjects there was sufficient variability to render these trends unreliable. In other words, performance in both experiments tended to improve other repeated trials, supporting the conclusion that men with a history of alcoholism do not deteriorate in the performance of simple manual skills and nonmanual tasks requiring certain components of attention when under the influence of repeated doeses of alcohol that add up to the equivalent of 30 oz of whiskey per day.

3.3.7. TEST COMPARISON: MEN VS. WOMEN

Wide discrepancies exist between the number of institutionally treated male and female alcoholics. The ratio of male to female hospital alcoholics is six to one; for alcoholics being treated in social agencies and clinics this ratio changes to four to one; in jailed alcoholics there are approximately eleven males to one female. Therefore, Zelen, et al. (67) have studied male and female alcoholics comparing measurable personality and intellectual variables to see if differences appear.

Two studies were performed. The first used the MMPI and the Shipley-Hartford Scale; the second employed a different group of subjects and made use of the Rorschach. The subjects for the MMPI Shipley-Hartford Study were divided into 4 equal groups of 20 each. These consisted of a male hospitalized alcoholic group, a female hospitalized alcoholic

group, a male alcoholic-clinic group, and a female alcoholic-clinic group. In the Rorschach study 60 consecutively selected hospital admissions, 30 males and 30 females, were used. Rorschach tests were administered one month after admission, using the Klopfer method.

Females achieved a mean IQ of 102.2, SD 20.5, and males an IQ of 110.5, SD 17.9 on the Shipley-Hartford Test. These differences were significant at the 0.05 level. There were no differences between clinic and hospitalized alcoholics.

The mean male Shipley Conceptual Quotient was 82.8, SD 14.0. The mean CQ for females was 78.8, SD 14.1. Although slight differences in IQ and CQ can be observed, no significant differences between intellectual impairment were found between the sexes.

The MMPI showed the females as significantly more neurotic than the males. The neurotic trend of the Hs, D and Hy scales was almost uniformly higher for females than males. Although not significant, there was a trend reaching very close to the 0.05 level of significance. The women were also more suspicious than the men, achieveing a higher score on the L Scale. Males presented a more psychosomatic picture than the females on the MMPI.

In general, male and female hospitalized alcoholics were very similar, with variance attributed to clinic alcoholics. Hospital and clinic males differed significantly

on four of the eight clinical scales of the MMPI (D, Pt, Sc, Ma) and on the F scale. Regardless of sex, hospitalized alcoholics were more homogeneous.

In analyzing the mean differences in the scoring categories of the Rorschach, only one difference on the human response category was significant at the 0.05 level. Tests on mean differences for Rorschach indexes did not produce any significant differences. The differences in male and female variances on the scoring categories of use of M, Fc, CF, W, D, H and total number of H were significant ranging from 0.001 to 0.05. All variance differences were in the same direction, that is, larger for females.

The absence of statistically significant differences between the means with respect to sex differences is a very significant finding. Differences between the sexes have been observed in clinically normal populations. Therefore, it seems that sex-contingent differences are obliterated when a group of males and females share alcoholism as a symptom. Dynamically, the alcoholics seem to be driven by a common problem of chronic resentment against parents, parental surrogates, or authority figures.

3.3.8. NEUROLOGICAL AND BIOCHEMICAL COMPARISON

Coopersmith and Woodrow (68) in an earlier study tried to determine whether the difficulties alcoholics have with stress and tension are due to a basically high level of anxiety or to inadequate means of controlling responses aroused when stimulation occurs. The results indicated that

the latter is true. In their study Coopersmith and Woodrow examined the arousal level of alcoholics in the absence of any identifiable, explicit environmental stimulation. The point under consideration is whether the Basal Skin Conductance (BSC) is significantly higher for alcoholics than nonalcoholics. If so, it would show that alcoholics are more aroused even under quiescent conditions.

Eight alcoholic and twelve nonalcoholic adult males served as subjects. They were seated in a quiet, dark room, and three BSC measurements were taken at 1.5-minute intervals. The mean of these three readings was used as the subjects' BSC.

The comparison between the mean BSC levels of the alcholics (1.45, SD 0.21) and nonalcoholics (1.51, SD 0.17) indicated no difference between the arousal levels of the two groups, suggesting that the greater responsiveness of alcoholics stems from greater difficulty in modulating responses. The alcoholic responds maximally to all stimuli, affective and neutral, and therefore is stimulated into greater and presumably distressing reactivity. Alcohol consumption reduces the basic arousal level but increases responsiveness, which is what the alcoholic needs least. However, two possible explanations are given for the reason behind repeated alcohol ingestion: (1) the initial, immediate effect of alcohol is to reduce arousal prior to the onset of specific environmental stimulation; (2) increased

responsiveness in an extreme form may actually be pleasurable to the alcoholic.

Martin (69) measured the erythrocyte sedimentation rate (ESR) by the standard Westergren technique on some hospitalized alcoholics. This test is frequently used as a screening test for organic disorders. A control group was selected by matching each alcoholic with a psychiatric patient of the same age and sex. There were 98 males and 23 females in each group. ESR levels showed a range of 1 to 100 (mean 20.3) for alcoholics and 1 to 25 (mean 6.3) for nonalcoholic controls. The range for female controls was 1 to 25 (mean 6.1). There was a tendency for alcoholics of longer standing to have a higher ESR. These standing results indicate that alcoholism is associated with a raised ESR.

3.4. SELECTION OF TEST ITEMS

After the review, a listing was made of complete tests or particular items in tests, and other information that could be used to construct test items, using a criterion of exhibited validity for selection of alcoholics from other populations.

The list of questionnaires, tests, and test items with potential for a prototype alcoholic screening instrument is given below.

Potentially Predictive Items

1. ALCADD Test (34)
2. Manson Evaluative Test (36)
3. Cedar Rapids Health Survey Questionnaire (42)

4. The Iowa Scale of Definitions of Alcohol (42)
5. Washington Heights Health Survey Questionnaire (1)
6. Kuder Alcoholism Key (10)
7. Hoyt and Sedlacek items from MMPI (20)
8. Hampton's 125 items from MMPI (17)
9. Manson's 28 items of the 50 in the Pd scale of the MMPI (33)
10. MacAndrew's Scale from the MMPI (28)
11. Sixteen Personality Factor Questionnaire (8, 20)
12. Lentz' Expressionnaire (18)
13. Velman time and place of first drink (70)
14. Witkin Rod and Frame Test (70)
15. Rorschach Test (24, 64)
16. Bender Gestalt Test (7)
17. Rosenzweig Picture Frustration Test (4)
18. Alcholics overestimate body size (5)
19. Alcoholics more often perfer to draw an animal than a person (68)
20. Terman-Miles M-F Test (48)
21. Cornell Selectee Index, Form-N (35)
22. Alcoholics are more socially isolated (56)
23. Mooney Problem Check List (45)
24. Traffic violations and accidents (54)
25. Social and background history (41, 62)
26. Hangover on the job (38)
27. Halstead Test (9)
28. Trail Making Test (9)
29. Time Reference Inventory (49)
30. Raised ESR (37)

It is important to note that most of the studies from which the list of predictive items was made did not cross-validate the tests that were used. This means that the validity coefficients that were reported were almost certainly overestimates of true values.

3.5. DEVELOPMENT OF A PROTOTYPE TEST

The prototype of the alcoholic screening instrument was developed by taking test items and other information contained in the listing of potentially predictive items and inserting them in nonconsecutive order or as appropriate for ease of comprehension and scoring.

A Driving Record Questionnaire was also attached to the

test to measure the individual's traffic violation and accident experience.

The first test format was administered to five individuals from lower socioeconomic-educational backgrounds and five female secretaries. The purpose of this administration was to discern items that are difficult to understand or ambiguous and to estimate the time needed to fill out the test. Subsequently, some items were revised and the test re-administered to three other persons. No further difficulties were experienced by the subjects.

3.6. TEST ADMINISTRATION

The Background and Driving Record Questionnaire in its prototype version consisted of slightly less than 500 items and required approximately 1 1/2 to 2 hours of testing time.

Alcoholic and Control Groups. The first administration of the test was intended to determine whether it would show any predicitive capability in discriminating known alcoholics from assumed nonalcoholic control groups. We have therefore administered the test to 65 alcoholic patients at Brighton Hospital, Milford, Michigan, and to patients at Ypsilanti State Hospital, Ypsilanti, Michigan.

We have also made arrangements to administer the test to a volunteer group of blue collar, secretarial, and lower management employees of an industrial organization as one control group. These individuals will take the test at the plant either prior to the start of their work shift or at

the end of it, on their own time, and will be paid for their participation.

Other control groups may also be used as required for the initial data analysis.

Item analysis and cross-validation. The discriminability of test items will be measured and those indicating no validity will be discarded. Assuming that there is some residual validity, a revised, shortened version of the test will then be compiled and administered to alcoholic and control groups to obtain cross-validated discrimination indexes.

Subsequently, further analyses are proposed using the driving record to try to enhance prediction of the alcoholic-accident-violation driver.

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SECTION 4

A CHRONOLIGICAL STUDY OF CHRONIC ALCOHOLICS (PROJECT IV)

AND

A PILOT STUDY OF ARRESTED DRINKING DRIVERS (PROJECT V)

by

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4.1. INTRODUCTION

Research on the relationship between driving, drinking, and traffic accidents seems to have established that the first two variables in combination have a high correlation with the third (1,2,3,4,5). There is even good evidence that a large portion of traffic accidents caused by drivers who drink can be attributed to the alcoholic population (6,7,8,9). When one moves beyond these generalities, however, it becomes obvious that questions rather than answers are the order of the day (10). If our goal is to reduce the number and severity of traffic accidents associated with alcohol consumption, we must be able to identify, much more accurately than is currently possible, the characteristics of the particular drinking drivers who are responsible for accidents. Before we can hope to develop adequate screening measures, or to influence these people prior to the occurence of accidents, we must know enough about the population or populations to which we are addressing our efforts to be able to devise effective intervention measures.

This investigation grew from research primarily concerned with alcohol problems and their manifestation in our society. Within this framework we have conducted a number of studies attempting to delineate and understand problem drinking and its ramifications in the society at large. Two of these efforts, ongoing at the time, appeared to have high relevance to HSRI's proposed comprehensive research program. One of

these studies was concerned with the education of drivers involved in alcohol-related traffic accidents; the other was a comprehensive examination of the chronic alcoholic, studying longitudinally the characteristics he manifests in the progression of his illness.

In Projects IV and V of this contract, we are combining data obtained in the above researches in an attempt to define conditions under which driving problems and drinking problems interact to result in traffic accidents. This definition is being accomplished by examining the chronological development of drinking drivers who have accidents in the two sample populations mentioned above and analyzing those characteristics which differ meaningfully, or at least predictably, from those of non-accident-prone drinking drivers. Once those differences are defined and better understood, we will be equipped to design more appropriate and effective detection and intervention measures than presently exist.

Project IV examines the extent to which alcoholics are involved in traffic accidents; Project V looks at populations of accident-causing drivers and strives to evaluate the extent to which they have problems with alcohol consumption. We are focusing our analysis on the point of intersection of the two factors in accident situations (i.e., the point at which the combination of driver and drinker results in an accident). The information thus obtained should influence the design and execution of further projects orient-

ed beyond an understanding of causal factors toward a prevention of accident occurrence.

4.2. PROJECT IV: A CHRONOLOGICAL STUDY OF CHRONIC ALCOHOLICS

This chronological study of the development and social ramifications of alcoholism covered 2,370 known alcoholics hospitalized at least once in a large general hospital. In the course of this research we collected all of the following kinds of information on a group of subjects who are known alcoholics:

1. Hospital admittance records for all admittances of each subject to this hospital (ranging from one to 156 admissions).
2. Hospital medical records for all admittances of each subject to this hospital.
3. Michigan Department of Health death certificates for those who have expired.
4. Group therapy general information, and
5. Group therapy performance evaluations for those attending the hospital's alcoholism therapy program.
6. Department of State driving records (photostatic copies).
7. Michigan State Police violation records (photostatic copies).
8. Mailed follow-up questionnaires on the current drinking, socioeconomic, job, and marital status of all who returned the questionnaire.

From the first five record sources listed above, we gathered about 75 different kinds of background information. Additional variables, collected from the several sources of follow-up swelled this number to well over 100. Collection

of these data began early in 1965. We have just completed transfer of coded information onto IBM data cards. This has allowed progress only up to to the point of producing frequency distributions of our variables, which are cited in this report.

The major time-consuming task involved information from the medical records and the two types of conviction records (driving and criminal). Each record of each admission to the hospital for each patient and each entry for each violation was carefully examined and all material was recorded which might be needed in the later computer analysis. Many subjects had extensive records of one or both kinds. (One patient had been admitted to the hospital 156 times.)

Medical records are kept by a variety of people with differing administrative skills and medical concepts, and the initial records had to be transcribed almost verbatim in order to get the facts needed to code them effectively. This was done at the hospital by the "front" contingent of our research group, which numbered seven employees at the height of its active period. Most of these people had previous experience in working with hospital records in other contexts (as nurses, ward receptionists, etc.). It was necessary to carry out this operation at the hospital, since the medical records had to be constantly available to hospital personnel in case of need. All data, once transcribed, were sent to our research office at The University of Michigan where data

coding assistants transferred them to IBM Punch Cards for use in the computer analysis. Conviction records, too, displayed a variability in content and mode of entry which presented a real challenge to our coders in their efforts to systematize the data processing without losing or distorting the information contained in the original records.

Because we have access to the entire medical histories at the hospital for our subjects (not just records about their alcoholism), we can extract excellent "pre-alcoholism development" data from information routinely collected by the hospital over the years in its role as a major family hospital in a metropolitan community. By chronological analysis of these and other data, we should be able to effectively trace the development of alcoholism and concurrent life experiences for many of our patients and generate reliable evidence about relevant variables for alcoholism development under longitudinally defined environmental conditions.

Combinations of the above information with similarly chronological data on traffic and other violations collected from independent sources on the same subjects should allow us to see how drinking and driving problems develop in relation to each other, and in which parts of our total alcoholic population this is most likely to occur. We may also get an indication from the follow-up questionnaires and violation records of the extent to which hospitalization and group therapy at this hospital have influenced the later development of both the subjects' alcoholism and their violation patterns.

The following summaries of findings are offered as samples of the kind of information being quantified. They are taken primarily from simple frequency counts of the variables under examination. Completion of this first step of our computer analysis will allow us to proceed to more complex interaction analyses where we will address ourselves to: (1) deriving characteristics of each individual from the combination of all of his records, and defining subpopulations of the total alcoholic population; (2) studying the chronological interactions of drinking histories and violation histories. In this process, we will also look at the chronological relevancy of job history, marital history, education, and treatment variables. Then we will compare the above relationships for problem drivers, nonproblem drivers, and nondrivers, and extract a battery of variables differentially associated with high-risk and low-risk subpopulations with respect to traffic safety.

Results. A limited set of preliminary observations can be made regarding the frequency data now available. Table 4-1 describes demographic characteristics of these subjects, expressed in percentages of the total sample.

As might be expected, the age distributions from the different record sources are generally similar, shifting toward an older population in the death records and a younger group for first admissions. Subjects are predominately white Protestant middle-age males.

Table 4.1 Demographic Variables

Expressed in percentage of total sample.

A. AGE	TOTAL SAMPLE (in 1966) n = 2370 %	AT DEATH n=317 %	AT TIME OF FIRST ADMISSION %	AT TIME OF LAST ADMISSION %	CONVICTION RECORDS (1966) n=1071 %
Over 66	7.0	12.6	1.2	3.8	7.7
57 - 66	19.9	29.3	3.7	12.5	20.0
47 - 56	30.4	33.1	13.6	27.3	32.4
37 - 46	26.0	11.7	24.2	29.2	25.4
27 - 36	11.9	5.1	24.4	18.5	13.0
17 - 26	1.3	0.6	14.1	4.0	1.2
1 - 16	0.0	0.0	.1	3.1	0.0
No Information	3.5	7.6	15.7	4.6	0.3

B. SEX	TOTAL SAMPLE n=2370 %	CONVICTION RECORDS n=1071 %
Male	81.7	61.0
Female	16.5	10.1
No Information	1.8	28.9

C. RACE	TOTAL SAMPLE n=2370 %
Caucasian	85.6
Negro	11.9
No Information	2.5

D. RELIGION	TOTAL SAMPLE n=2370 %
Catholic	19.5
Protestant	75.0
Jewish-Moslem	0.1
All Others	5.4

The stereotype of the alcoholic paints him as highly unstable in such characteristics as place of residence, employment, and marriage. Tables 4-2, 4-3, and 4-4 examine these variables for this sample.

Table 4.2 Residence

Percent of total sample

A. BIRTHPLACE	TOTAL SAMPLE n=2370 %
Michigan	42.5
Other Midwest	14.3
Non-Coast. South	15.3
Costal South	12.0
East	4.9
West and Foreign	6.0
No Information	5.0

B. PERIOD AT LAST RESIDENCE	TOTAL SAMPLE n=2370 %
10 or more years	57.1
2 mos. - 10 yrs.	11.7
Less than 2 mos.	16.1
No Information	15.1

C. LAST KNOWN RESIDENCE	TOTAL SAMPLE n=2370 %
Flint Vicinity	75.1
Thumb Area(Det.)	19.7
Balance of Mich.	2.2
Out of State or No Information	3.0

D. PLACE OF DEATH	DEATH SAMPLE n=317 %
Flint Vicinity	86.8
Thumb Area (Det.)	0
Balance of Mich.	0
Out of State or No Information	13.3

Table 4.2 Residence (cont.)

E. NUMBER OF PREVIOUS ADDRESSES	TOTAL SAMPLE n=2370 %
NONE	45.1
1	22.4
2	13.6
3	7.9
4	4.5
5	6.5

F. LOCATION OF PREVIOUS ADDRESSES	TOTAL SAMPLE n=2370 %
In or Near Flint	89.1
Thumb Area (Detroit)	9.0
Bal. of Michigan & Out of State	1.9

G. LONGEST TIME AT PREVIOUS ADDRESS	TOTAL SAMPLE n=2370 %
20 or more years	3.5
12-19 years	4.8
8-11 years	5.3
4-7 years	13.0
1-3 years	18.6
Less than 1 year	5.5
No Information	49.3

Table 4.3 Employment

Percent of total Population

A. OCCUPATION	TOTAL SAMPLE (in 1966) n=2370 %	AT DEATH n=317 %
Unskilled labor	33.8	24.9
Semi- and Skilled Labor	7.7	29.0
Supervisory	6.0	3.8
Sales and Service	9.5	19.6
Chauffeuring	3.6	3.8
Professional	2.7	5.1
Retired or No Information	36.7	13.8

B. LENGTH OF TIME AT PRESENT JOB	FOLLOW UP SAMPLE n=719 %
20 or more years	10.6
12-19 years	16.1
4-11 years	8.9
0-3 years	8.3
No Information	56.1

C. CURRENT JOB STATUS	FOLLOW UP SAMPLE n=719 %
Working full time	42.8
Not working	10.4
Part time or housewife	7.5
Retired or disabled	10.8
No Information	28.5

D. LONGEST TIME WITH A SINGLE EMPLOYER	TOTAL SAMPLE n=2370 %
20 yrs. or more	18.7
12-19 years	18.7
8-11 years	15.4
4-7 years	15.6
1-3 years	11.6
Less than one year	7.9
No Information	12.1

E. NUMBER OF JOBS SINCE LEAVING HOSPITAL	FOLLOW UP SAMPLE n=719 %
Same job as before admission	44.7
1-2 jobs	6.4
3 or more jobs	3.5
No Information	45.4

Table 4.4 Marital History

A. MARITAL STATUS	TOTAL SAMPLE (in 1966) n=2370 %	AT DEATH n=317 %
Married	53.7	51.7
Never Married	8.7	7.6
Widowed	3.6	8.5
Separated or Divorced	18.1	18.0
No Information	15.9	14.2

B. CHANGES IN MARITAL STATUS	TOTAL SAMPLE n-2370 %
None over all admissions	50.3
More than 1 status	30.2
One admission only	18.7
No Information	0.8

The stereotype differs from our sample in terms of residency; over half the sample were born in or near Michigan and have lived in or near Flint most of their lives at no more than two residences.

The picture with employment is not so clear, partly because of the admitted inadequacies of a mailed follow-up questionnaire in providing either complete or unbiased information on the full group being sampled. Only about a third of our subjects responded, and many of these didn't answer all the questions. We will, however, be able to extract some more of this kind of information from subtle consideration of other kinds of records when our analysis has progressed somewhat further.

Again, with marital status, our present figures allow very few useful speculations. About all we can say until we have available some comparable figures for a "nonalcoholic"

population is that percentages of separated or divorced persons do not seem strikingly high in our sample, nor do the marriages existing appear to evidence marked instability.

The hospitalization process is also susceptible to useful examination by consideration of frequencies. Table 4-5 categorizes some important variables related to this process.

The largest number of admissions for a single individual was 156. One third of the sample had 7 or more admissions during the period of their association with this hospital. For 53% of them this period of association was at least seven years. 70% were diagnosed as alcoholics on at least one admission, and the next most frequent categories under which they were admitted were trauma and mental or neurotic illness. Three-quarters of this group were referred by their doctors to the Alcoholism Group Therapy program on at least one admission. While all the records of our sample will be checked again for consistent evidence that they were, indeed, demonstrably chronic alcoholics; the data in Table 4-5 certainly support such an assumption.

Frequency data for driver records and criminal convictions have only been processed for about half the sample. Table 4-6 describes the data obtained so far.

These data ought to be considered at this time only as demonstrating the kinds of information we have gathered and the variability contained therein. We have no reason to think that the balance of the sample will differ significantly

Table 4.5 Hospitalization Characteristics

TOTAL SAMPLE N=2370

A. NUMBER OF ADMISSIONS	%
1	18.7
2-3	24.4
4-6	23.4
7-10	16.6
11-30	15.3
31-156	1.6

B. NUMBER OF YEARS FROM FIRST TO LAST ADMISSION	%
1	4.5
2-3	9.7
4-6	11.6
7-10	13.1
11-20	23.7
21-30	12.2
Over 30	3.5
1 admission only	18.7
No Information	3.0

C. NUMBER OF DIFFERENT DIAGNOSES	%
1 Admission Only	18.7
1 diagnosis-on multiple admissions	13.7
2	21.6
3	16.0
4	12.7
5-6	12.2
7-16	5.0
No Information	0.1

D. MOST FREQUENT DIAGNOSIS	%
Alcoholism	35.7
Trauma or Surgery	11.3
Hepatic, Circulatory, Pulmonary	5.6
Neurological Emotional	5.4
Gastrointestinal	4.9
Assorted Others	4.5
None most frequent (ties)	24.5
No Information	3.1

E. DIAGNOSED ALCOHOLIC ON AT LEAST ONE ADMISSION

Yes	70.3%
No	29.7%

Table 4.5 Hospitalization Characteristics (cont.)

Total Sample N=2370

F. NUMBER OF ADMISSIONS FOR:	ALCOHOLISM %	TRAUMA %	MENTAL & NEUROSIS %
None	29.7	59.9	72.7
1	37.8	20.7	18.0
2	12.7	9.1	5.3
3	6.7	4.3	1.8
4-6	7.4	4.7	1.7
7-10	3.4	1.2	0.4
11-45	2.3	0.1	0.1

G. NUMBER OF REFERRALS TO GROUP THERAPY	%
None	25.2
1	43.3
2	14.1
3 or more	17.4

H. TOTAL HOURS OF INPATIENT GROUP THERAPY	%
None	25.6
1-3	9.9
4-9	11.8
10-18	11.2
19-27	9.3
28-54	16.0
55-81	6.3
82-472	9.9

I. TOTAL HOURS OF OUTPATIENT GROUP THERAPY	%
None	90.1
1-3	3.0
4-9	1.6
10-18	1.6
19-27	1.0
28-54	1.2
55-248	1.5

Table 4.6 Conviction Characteristics

n=1071

A. TYPE OF DRIVER'S LICENSE	%
Operator	58.1
Chauffeur	6.2
No Information	35.8

B. TYPE OF OFFENSE	%
Violation	86.4
Accident	6.1
Criminal or Other	7.3
No Information	0.2

C. OFFENSES INVOLVING ALCOHOL USE	%
Offenses specifically alcohol related:	40.4
Offenses not specifically alcohol related:	50.6
No Information:	9.0

D. NUMBER OF OFFENSES	FINANCIAL RESPONSIBILITY %	DRIVER VIOLATION %	CRIMINAL %
None	76.8	50.1	49.9
1	14.9	16.6	10.5
2	4.7	11.3	7.5
3	2.3	7.4	6.2
4	0.7	4.7	4.6
5-9	0.3	8.0	11.0
10-71	0.3	1.9	10.0

E. LOCATIONS OF VIOLATIONS	%
City limits of Flint	59.1
Other Michigan Locations	29.9
No Information	11.0

F. NUMBER OF ALIASES	%
None	86.7
1	7.9
2-6	5.3

Table 4.6 Conviction Characteristics (cont.)

G. MEAN NUMBER OF ACCUMULATED CONVICTIONS FOR VIOLATIONS (n=1339)*

CATEGORY	% OF SAMPLE	MEAN NUMBER OF VIOLATIONS			
		FINANCIAL RESPONSIBILITY	TRAFFIC	CRIMINAL	TOTAL
TOTAL SAMPLE:	100.00	0.37	1.46	4.17	6.00
SEX:					
Male	65.5	0.46	1.90	5.74	8.10
Female	14.4	0.16	0.59	2.70	3.45
No Information	20.1	0.21	0.67	0.09	0.97
AGE:					
56-65	21.0	0.24	0.57	4.65	5.46
47-56	35.0	0.37	1.20	3.74	5.31
37-46	28.1	0.43	1.76	4.80	6.99
27-36	14.0	0.45	2.68	3.50	6.63
17-26	1.9	0.13	3.50	1.06	4.69

*Includes only subjects born after 1900.

in its characteristics from those already coded, but this is certainly possible. More importantly, error checks and comparisons with other sources of data for the same group cannot be accomplished until the coding is completed.

The National Driver Register (NDR), a computerized file of drivers in the United States whose licenses have been suspended, was searched for all our Hurley subjects (N = 2380) to determine whether Michigan or any other State had revoked or suspended their driver licenses. This file is available to all states wishing to determine whether applicants for drivers' licenses have had their licenses suspended by other states.

Table 4-7 summarizes the results of the search. To provide a basis for comparison, figures for the total sample submitted for search by the State of Michigan in 1967 are included in this table. This State routinely queries the NDR on all persons applying for new or renewal licenses. Michigan's criteria for matches between their applications and the NDR records require:

1. First and last name the same
2. Birth date the same
3. Withdrawal actions occurring within the last three years

Table 4.7 License Suspensions Listed with the National Driver Register

	All Hurley Subjects		Hurley Subjects with license suspensions within last 3 years		1967 Michigan Driver Applicants	
	Number	Percent	Number	Percent	Number	Percent
Name & Birthdate Match	196	8.2%	96	4.0%	7,759	.6%
Name Match and Small difference in Birthdate	30	1.3%	26	1.1%	----	----
Name Match only	5	0.3%	4	0.2%	----	----
No Match	2149	90.2%	2254	94.7%	1,314,365	99.4%
TOTAL SAMPLE	2380		2380		1,322,124	

The 4.0% (96) of the Hurley group who have been suspended within the last three years compares directly with the 0.6% suspensions for all submissions made be Michigan in 1967. Of the 196 Hurley subjects whose matches met the Michigan criteria except for the recency of their suspensions, 192 had been suspended for DUIL, and 168 of the suspensions occurred in Michigan.

4.3 PROJECT V: A PILOT STUDY OF ARRESTED DRINKING DRIVERS

This study involves drinking drivers who were subjects for a pilot demonstration seminar on alcohol-related traffic offenses. The present investigator was research consultant to the project, sponsored jointly by the Macomb County Health Department, the Oakland County Health Department, and the Michigan Health Department Alcoholism Program, in cooperation with the Michigan Secretary of State's office. For a one year period, all drivers in Oakland and Macomb Counties convicted of DUIL received with their notice of license revocation from the Secretary of State's office a letter requesting that they attend a weekly seminar on alcohol-related traffic offenses for four weeks. The seminar was intended to inform the participants about the psychological and sociological history of alcohol use, physiological action of alcohol in the body, the phases of alcohol addiction, and laws and regulations relative to drinking, driving, and citizen responsibility. Notice of participation in the seminar was sent to the Secretary of State's office at the end of the four week session to be included in the violators' records. Included as a control group were a matched sample of DUIL'S from Wayne County who were not asked to attend the seminar.

Driving records for this sample were made available to us by the Secretary of State's office. We also procured from each county's corrections department other violation records on the same sample. We are in the process of collecting other relevant information on these subjects from such sources as social agencies,

hospitals, and particularly, alcoholism treatment and referral centers in the three counties. Realizing that existing records from these sources might not contain all the information we needed, we developed, for those attending the seminar, a questionnaire sheet to fill out during their first session in class. A sample of this questionnaire appears in Appendix H.

The kinds of data which allow us to describe our sample adequately are driving records, other police records, social histories, education level, occupation status and stability, medical history, and personal characteristics such as age, sex, marital status, and religious preference. Such variables, when obtainable, define the general characteristics of our sample, give us some information about the extent of their alcohol problems, and allow us to analytically tease out chronological violation histories (both alcohol related and non-alcohol related).

All information about that portion of our sample who did not attend the seminars must come from the auxiliary resources previously suggested. For some subjects it will be difficult, for others, impossible to obtain. However, since the alcoholism information centers for Macomb and Oakland Counties conducted the seminars, we have access to their records on all alcoholics in the sample who have ever interacted with the agencies about their drinking problems. We also expect the alcoholism programs in Wayne County to make their records on our sample accessible to us.

The demonstration project which produced our sample began early in 1967 and was only recently completed. Our main analytic

activity this year has concentrated on the chronic alcoholics in Project IV, since information about the outcome of Project V cannot be processed until assorted records for all subjects have been collected and coded. The sample size of this group numbers under 500 (with less than 100 ever actually attending the seminars), but available records will be subjected to the same kind of analysis as in Project IV. These data will be less comprehensive, but comparisons should be possible on the two samples in most of the critical areas under study.

Projects IV and V involve two populations selected in very different ways from different geographical locations. Similarities in patterns of drinking-driving interaction leading to accident involvement, as well as demographic characteristics held significantly in common by the two groups, should improve our confidence that these patterns and characteristics and the populations defined by them are important components of alcohol-related traffic problems. Once we have identified the relevant patterns and characteristics, this knowledge can be applied to screening instruments being developed for discriminating dangerous drinking drivers, for selecting future populations for study, and for controlling relevant variables in a prevention program.

The Macomb-Oakland demonstration project served an additional function beyond providing us with descriptive data on the nature of drinking drivers who get into trouble. Because the objective of the project was to explore a rehabilitation-oriented method

of handling violators, it contained within its design both an attempt to evaluate the short-term effects of the seminar on those attending, and a potential for measuring at some future date how effectively the program motivated problem drinkers to seek treatment and/or to change their driving patterns to avoid re-arrest for alcohol-related violations. This information should prove useful at a later phase in our total alcohol and traffic safety program, once methods exist for identifying high risk populations. At the time we will be ready to turn our attention to discovering effective strategies for accident prevention. If a check of our sample's post-project driver records shows that the arrest patterns of the seminar attendants have improved more than those of the non-attendants, or more than their own pre-seminar patterns, we will already have some empirical evidence to suggest why this is so. This investigator is conviced that only through such long-term, step-by-step processes, involving studies not only of the same high risk populations over time but also of the resources of their communities for coping with their problems, will appreciable progress be made in reducing alcohol-related traffic accidents.

4.4. REFERENCES

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