Farris
Huntsville

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A COMPARISON OF ALCOHOL INVOLVEMENT IN EXPOSED AND INJURED DRIVERS, PHASES I AND II

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15. Supplementary Notes Total effort consists of three phases. This report covers Phases I and II, which is the basic study. Phase III (collection of additional data of same type) is currently being conducted.

16. Abstract The primary objective of the study was to compare alcohol related data collected from drivers involved in injury-producing automobile accidents with the same type of data collected from drivers who were similarly exposed to these mishaps but who did not have accidents.

Collection of data basically involved: (a) interviewing and measuring Blood/Breath Alcohol Content (BAC) of accident drivers at the scenes of accidents, in hospitals, or at police stations (depending on circumstances); (b) interviewing and measuring BAC's of non-accident drivers at the same location of each accident and at same time of day, day of week, and direction of travel.

The most relevant findings of the study were: (a) drivers involved in injury-producing accidents had significantly higher BAC's than drivers who were exposed to the same environment but who were not involved in accidents; (b) drivers who had a high level of BAC were more likely to become involved in an injury-producing accident than drivers who did not have high BAC's; (c) drivers who were driving with a BAC $\geq$ .030 were found to be at fault more frequently in injury-producing accidents than drivers who were also involved in accidents but who had not been drinking.

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EXECUTIVE SUMMARY

While much information is available on the involvement of alcohol in fatal automobile accidents, little data exist on non-fatal injury-producing accidents. To help fill this relative void of information, a study was conducted for the National Highway Traffic Safety Administration to investigate the role that alcohol plays in automobile accidents involving injury. To achieve the objectives of the study the program called for a comparison of data collected from drivers involved in these type accidents and drivers who were not involved but were similarly exposed to these accidents.

The total study involves three phases. The first two phases, which comprise the basic study, have been completed and the third phase, which involves the collection of additional data, is still being conducted. This report covers those activities conducted during the first two phases. At the completion of Phase III another report will be submitted which will combine activities of all phases and result in a Final Report for the total program.

The first task required in Phase I was the selection of an appropriate city for use in the study. Criteria were established to ensure that a city as representative as possible was selected. After a number of discussions were held with candidate cities across the country, Huntsville, Alabama was chosen. Cooperation was experienced in Huntsville at all levels of the city's administration and, more importantly, cooperation was received from the city's driver population.

The selection of a representative city and obtaining cooperation from city authorities completed the requirements of Phase I.

Phase II included all activities connected with collecting data and analyzing the results obtained.

The collection of data, which lasted approximately six months, basically involved:

- Interviewing and measuring Blood/Breath Alcohol Content (BAC) of drivers involved in non-fatal injury-producing accidents
- Interviewing and measuring BAC's of drivers who were similarly exposed but not involved in these accidents (similar exposure was attained by stopping drivers during normal traffic conditions and interviewing them at the same location of each accident that was investigated, at the same time of day, and same day of week)

Drivers who were involved in accidents were interviewed at the scene of the accident or at the hospital, depending on the seriousness of injury. A small number were interviewed at the police station. Participation of police and hospital personnel amounted to no more than introductions to the researcher. However, these introductions were essential to the success of the program. Without this key act of cooperation, the credibility of the researcher would have been seriously questioned. However, by utilizing these introductions, providing the drivers with written assurance of confidentiality, and by using a personal, informal, warm approach to the interview a 97% rate of success was achieved with 615 drivers involved in accident-producing injuries.

Basically, the same approach was used with the control drivers (those not involved in accidents but who were similarly exposed to those accidents sampled by the research team). A police officer, in uniform, stopped designated cars and introduced the researcher. The researcher used the same interview technique that was utilized with the accident drivers. As a result of these procedures, a 98% success rate was achieved with 821 drivers who were not involved in accidents.

During the interviews, BAC's were obtained with the use of a portable Alcohol Screening Device/Breath Analyzer. Almost all BAC's were obtained by the use of this instrument. A small percentage of measurements was obtained by analyzing the blood of those who could not blow into the machine due to injuries and another small percentage was obtained from the police who had conducted their own BAC measurements. For drivers not involved in accidents, all BAC's were obtained by the portable Alcohol Screening Device/Breath Analyzer.

Data from both groups of drivers were compared and an analysis of these comparisons provided a number of findings. Those results most relevant to the objectives of the study follow:

- Drivers who were not involved in injury-producing accidents had significantly higher BAC's than drivers who were exposed to the same driving environment but who were not involved in accidents. Of the accident drivers sampled, 23% had a BAC equal to or greater than .030. Of the control drivers sampled, only 10% had a BAC equal to or greater than .030. This percent ratio of 2.3 to 1 increased as the BAC level increased. For example, 5% of accident drivers had a BAC equal to or greater than .100 while only 2% of the control drivers had an equivalent BAC level, for a percent ratio of 5 to 2. Further, 8% of accident drivers had a BAC equal to or greater than .150 while only 1% of the control drivers had an equivalent BAC level; a percent ratio of 8:1.

- Drivers who had a high level of BAC were more likely to become involved in an injury-producing accident than drivers who did not have high BAC's. The higher the BAC level, the more likely the involvement. At BAC level .100 the likelihood is approximately twice as great and at BAC .150 the probability is approximately four times higher.

- Drivers who were driving under the influence of alcohol were found to be at fault more frequently in injury-producing accidents than drivers who were also involved in accidents but who had not been drinking. The higher the BAC level, the more likely the driver would be found to be at fault. At BAC .100 the likelihood is four times as great and at BAC .150 the probability is between seven and eight times as great.

In addition to the above primary conclusions, results of the data showed that, when compared to the control drivers, accident drivers as a group:

- Were younger
- Were less educated
- Drove fewer miles annually
- Were over-represented in females
- Were heavier drinkers on normal occasions

Also, the results showed that as education increased drinking decreased, and as seriousness of injury increased drinking drivers were more frequently involved. With respect to age, the percentage of younger drivers who drank while driving was smaller than the percentage of older drivers. However, when drinking, younger drivers were more likely to become involved in injury-producing accidents than older drivers who have been drinking.

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INTRODUCTION

The involvement of alcohol in fatal automobile accidents is a problem well known to those who are charged with the responsibility of reducing the frequency and severity of accidents on the nation's roadways. On the other hand, few studies have been performed to determine the nature and extent of alcohol involvement in non-fatal accidents. Prior to this effort, the most comprehensive study related to this problem was completed in 1963 in Grand Rapids, Michigan under the direction of Dr. R. F. Borkenstein. However, in that study drivers were not sampled who were taken to hospitals nor did the Grand Rapids program address itself to the role that alcohol may have played in precipitating the causes of the accidents.

This study provides a more up-to-date and inclusive effort utilizing more modern breath measuring techniques and includes, among other activities, data obtained from drivers who were injured seriously enough to be taken to a hospital.

Non-fatal but injury-producing accidents provide a good source for collecting data pertaining to the role of alcohol in automobile safety. Even though the drinking driver is often reluctant to be truthful about the role his intoxication may have played in the cause of the accident (and in some cases, he is honestly unaware of any causal relationship), a skillful, experienced investigator is able to project relationships through a total assessment of the accident scene. By talking to the intoxicated driver, the other driver, passengers, the investigating

police officer, and utilizing follow-up interviews where necessary - by accomplishing all of these tasks, the researcher is able to project insights into the determination of driving error in most all cases where error exists.

To achieve the study objectives of determining the incidence of alcohol involvement and the relative risk of being involved in an injury-producing accident as a function of alcohol content, the following was conducted:

- Interviews and Blood/Breath Alcohol Content (BAC) measurements of drivers involved in non-fatal injury-producing accidents
- Interviews and BAC measurements of drivers who were similarly exposed but not involved in accidents (similar exposure was attained by stopping control drivers during normal traffic conditions and interviewing them at the same location of each accident that was investigated, at the same time of day, and same day of week)

By completing the above tasks, data from the two groups were available for analysis with comparisons and relationships being identifiable among a wide range of alcohol related variables, such as age, sex, etc.

The total study was divided into three phases. Phase I involved the selection of a city and the establishment of cooperation from participating departments and agencies of the city. Phase II consisted of collecting data from drivers of the city and conducting an analysis of the data obtained. Phase III involved the expansion of Phase II by collecting more data from the same city plus an additional city and conducting further analysis.

This report will describe all activities completed in Phases I and II. Phase III is presently being conducted and upon its completion a final report will be submitted which will contain a description of all Phases of the study.

SELECTION OF A CITY

An urban city with suitable characteristics had to be selected for use in this study. Concern was given to the size of the city to insure an adequate sample of accidents involving injury would be available. It was advantageous for the emergency wards to be centrally located with ease of access to the researchers. Also, a stable driver population was desired - one that was free of drastic seasonal changes, which would preclude resort type areas.

In addition to the above considerations, a high degree of cooperation had to exist within the city's administration. The principle departments were those of the Mayor's office, the Police Department, the City Prosecutor, and the administrators of the city's hospitals.

Over and above the concern for cooperation of city authorities, thought had to be given to the overall attitude of the driver population. Certain heavily populated metropolitan areas were avoided. For this type study cooperation is required at all levels of the community.

A number of cities were contacted. Those that offered the most promise for eventual success were:

- Houston, Texas
- New Orleans, Louisiana
- San Diego, California
- Huntsville, Alabama
- Alexandria, Virginia

After considerable research and deliberation, it was decided to select Huntsville, Alabama as the city for use in this study because a high degree of cooperation was obtained from all city authorities. As the study progressed, cooperation from the individual city driver was also experienced.

Huntsville is a city of approximately 150,000 population. It is located in the Northeast section of the state of Alabama and is a typical moderately sized city. Alcohol is sold in bars and places of entertainment with some restrictions to sale normally found in most metropolitan areas in the country. The number of automobile accidents involving non-fatal injuries were sufficient in frequency for purposes of this study.

Obtaining cooperation from the city involved contact with the following offices:

- The Mayor's office, to obtain overall acceptance of the program.
- City Prosecutor, to resolve all problems relating to legal matters. Managers of this study believed that each driver had to be granted assurances of confidentiality prior to the commencement of the interview. It was believed that if the driver had been drinking and was in an accident being investigated by police, little chance would be given to his cooperating with this study if he couldn't be assured that the information he gave to researchers would be kept in confidence. While the City Prosecutor could appreciate the necessity of giving some sort of assurance of confidentiality to the driver, he was troubled by another aspect of this grant of immunity. The Prosecutor was concerned that some drivers would use this commitment by the city as an obstacle to any legitmate prosecution the city might want to undertake that related in some way to the accident. After much discussion and compromise, the City

Prosecutor agreed to the wording contained in Appendix A which was signed by the Mayor. This form was used throughout the study without one legal incident of any kind.

- Chief of Police, where one of his assistants was assigned. to supervise the granting of all assistance required from his department. This involved not only an awareness on the part of all police officers that this program was in operation, but also specific participation in the following areas:
    (a) Notifying the researcher by means of the police dispatcher when an accident involving injury occurs.

    (b) Police investigating officers at the scene of the accident introducing the researcher to the driver.

    (c) Police investigating officers reporting an injury to the police dispatcher when the discovery of injury occurred later than the initial report. (Most initial reports originated from the civilian population. The reverse conditions also applied. If the initial report indicated an injury and it was discovered none existed, then the dispatcher had to be notified in order that the researcher was not called out needlessly.)

    (d) After the officer introduced the researcher to the driver, there was a need to make the driver feel comfortable and create a secure feeling for him while he was talking to the researcher. This also applied to the driver who was waiting to talk to the researcher. In addition, when the researcher was late in arriving at the scene of the accident, the officer could play an important role by encouraging the drivers to delay their departure until the researcher arrived and had the opportunity to talk to them.

- Hospital administrators, to obtain approval to interview injured drivers taken to the hospital. There are several hospitals in the Huntsville area, but only two have emergency wards which receive injured drivers. The administration of the largest of these hospitals was visited first. After the program was explained, the nurse-in-charge of the emergency ward was designated to supervise the cooperation required. Again

the program in detail was discussed and all procedures necessary for carrying out the objectives of the study were established. The other hospital in the area, which operated an Emergency Ward, was the Redstone Arsenal Army Hospital located on the Redstone Arsenal Army Base. Cooperation from administrators of this hospital was also obtained. However, the process was much more involved.

- Ambulance service, where the head of the service approved all aspects of the plan and promised full cooperation.

After the approval from each of the above officials was obtained, the Mayor extended a formal written invitation to the effect that the study could be conducted in the City of Huntsville, beginning at a time convenient to those who were managing the program.

METHODOLOGY

The methodology used to collect data will be described in two separate areas of activity. One area involved interviewing accident drivers and the other involved stopping and interviewing control drivers who were not involved in accidents. The actual collection of data from drivers signalled the beginning of Phase II of the study.

Accident Drivers

Since matching control drivers with accident drivers was a basic requirement of the program design, the collection of data from accident drivers preceded collecting data from control drivers.

The selection of drivers of automobile accidents which produced non-fatal injuries was by its nature self-selecting. The procedures involved with collecting data from accident drivers are listed below. Wherever possible, they appear in the sequence of occurrence:

- Accidents that occurred within Huntsville city limits were the only ones researched.
- Accidents that were reported involving injuries and automobiles were the only ones researched. Pedestrian accidents were excluded from this study. Motorcycle accidents that did not involve automobiles were excluded. Any combination of trucks, buses, and trains were also excluded. If more than two automobiles were involved, only two drivers were interviewed. In summary, no more than two drivers were interviewed for any one accident and only drivers of automobiles were interviewed. (Extra large vehicles were excluded from this study because in matching control drivers, buses or trucks would have had to be stopped and that would have created undesirable traffic problems.)
- The criterion for determining if any injury occurred rested with the judgment of the officer on duty who investigated the accident. If in his official Alabama Uniform Traffic Accident Report (Appendix B) he identified an injury, then the accident was subject to be included in the study.

- All accidents reported, that met the above criteria, were investigated on a 24 hour, 7 days a week basis, as long as the total number met the desired daily rate of investigations.

- The overall plan was to interview approximately 80 drivers a month. When this average was exceeded slightly, it was decided to utilize the extra data points.

- When an accident occurred, the police dispatcher determined if there was an injury involved. Such determination required the cooperation of the investigating officer.

- If the accident involved an injury, the dispatcher referred to a schedule provided him and called the researcher on duty, who normally was at his home. It was found that only one researcher was required even when one of the drivers was taken to the hospital.

- The researcher proceeded to the scene in civilian clothes with the Breath Analyzer equipment, mouth inserts, and interview forms. A sample interview form is presented in Appendix C. A description of the Breath Analyzer and mouth inserts is provided in Appendix D.

- When the researcher arrived at the scene and determined that, in the opinion of the officer on duty, no injury had occurred, even though one was reported by the dispatcher, the researcher returned to his home without conducting any interview. If an injury occurred, the researcher conducted interviews performing the following:

    (a) Established contact with the officer on duty and stood by until the officer had completed his investigation with one of the drivers.

    (b) After the investigation of one of the drivers had been completed, the officer on duty introduced the driver (utilizing the language contained in Appendix E)to the researcher who completed the interview form (Appendix C). It will be noted that information contained in Appendix C that was covered in the officer's accident report (Appendix B) did not have to be asked by the researcher. A Xerox copy of the officer's report was available the next day from which information was gathered to complete the interview form. The order of the questions were conducted

in any manner desired by the researcher. If he wished to obtain the BAC last, it was permissible. Any order was satisfactory as long as he obtained desired results. If he preferred to talk to the driver the next day, that was also permissible. However, the BAC had to be obtained at the scene. It was probably more successful to conduct the interview at the scene but, again, whatever the researcher felt about the timing of the interview (not the BAC) was acceptable provided he obtained results. At the outset, the researcher assured the driver that all information given him would be treated as privileged communication, would be computerized immediately utilizing numbers and not names, and that this information could not be used against him. Also, the letter signed by the Mayor (Appendix A) was given to the driver at this time.

(c) After the investigation of the second driver was completed by the officer on duty, the same procedure was followed as with the first driver.

(d) If one of the drivers was being taken to the hospital, the researcher requested the ambulance driver to inform the nurse-in-charge of the emergency room that the injured driver was part of the DOT alcohol study. The researcher interviewed the other driver as above and then drove to the hospital to follow procedures that will be described below. (If the ambulance had already left the scene with one of the drivers by the time the Researcher arrived at the scene, the researcher used the police car radio and notified the ambulance center to inform the ambulance driver to notify the nurse-in-charge accordingly.) If both drivers were taken to the hospital, the researcher notified appropriate personnel as described above depending on each set of circumstances and then proceeded to the hospital to conduct research activity at the emergency room.

(e) At the hospital, the nurse-in-charge would have been notified which injured person was part of the study. If blood had been taken from the injured driver due to his injuries, the nurse would

have already held a sample for alcohol analysis in the event the researcher requested it. (However, prior to the researcher requesting a blood analysis, a form had to be signed by the injured driver giving his permission.) The procedure at the hospital was conducted as follows:

(1) The researcher asked for the nurse-in charge. (The hospital would have received a copy of the schedule so that they could anticipate what hours of each day of the week that they had to be concerned with the study.)

(2) The researcher determined if any blood had been set aside from the driver for alcohol analysis so that he was prepared to act accordingly.

(3) The researcher requested to see the injured driver as soon as possible consistent with the driver's health and after the officer on duty had concluded his investigation. The nurse introduced the researcher in the same manner as at the scene of the accident and the researcher responded in the same manner.

(4) If the driver was physically capable of conducting a breath analyzer test at this time, a request for that type BAC was made rather than a blood test.

(5) If the driver was not physically able to conduct a breath sample and blood had been drawn for reasons other than alcohol analysis, a request for the completion of the consent form would be made. In this way no additional blood was required.

(6) If the driver was not physically able to conduct a breath sample and blood was not drawn previously, the same request was made, but blood would have to be drawn after the consent was given.

(7) If an analysis of the blood was required, the researcher obtained the consent form, and delivered the form to the nurse-in-charge. The nurse then gave the blood to the researcher for analysis. Such blood analysis was conducted by a local firm in Huntsville.

(8) Obtaining a blood analysis was advantageous in those cases where the individual was unconscious and not able to talk for a couple of days. If blood was not taken and held at the time of the accident, taking blood two days later, for example, would have been of no value for alcohol analysis.

(9) Consent forms were available at the emergency room. A copy was kept by the researcher, the nurse and the driver.

- If a driver was arrested or a BAC was required by the police on duty, the researcher attempted only the interview phase. BAC information was then obtained from police records. Sometimes in these situations, follow-up interviews were the only possible method of obtaining information.

- Throughout the entire operation, emphasis was given to obtaining the BAC at a time as near to the accident as possible. Due to this concern and other factors, such as the favorable traffic design of the city which permitted rapid movement by the researcher from one section of the city to another, only 4% of the BAC's obtained were measured at a time greater than one hour and fifteen minutes from the time of the accident.

Control Drivers

In an effort to provide maximum validity to the requirement of similarly exposing the control driver to the accident as the accident driver was exposed, control drivers were sampled at the scene of each accident researched, at the same time of day, same day of week, and in the same direction of travel.

For example, if two drivers had an accident at site A at 12 noon on a Tuesday and driver #1 was driving North and driver #2 was driving East, control drivers would be sampled at site A at 12 noon on a Tuesday traveling North and drivers would be sampled driving East.

To facilitate the administration of matching control drivers with accident drivers, it was decided to conduct control sampling periodically. It was believed that if a control driver was matched with an accident driver within a 30 day period of time, variables such as temperature, road conditions, etc. would be similar for purposes of this study. Therefore, each accident driver was matched with control drivers within 30 days of the date of his accident. Sampling control drivers began on a starting day and continued for a week until all accident drivers who had accidents during the previous 30 day period had been matched on the proper day of the week. Once this operation was completed and all accidents within the 30 day period had been covered, sampling of control drivers ceased until a proper period of time had elapsed at which times the sampling process commenced again for a week to cover all accidents that occurred within the previous 30 days.

Operational procedures involved with carrying out the week's sampling of control drivers are described below:

- Accidents that were researched during the preceding 30 days were identified.
- An "itinerary" was completed for each day of the week utilizing the information obtained from these accidents. The itinerary included: day of week, time of the accident, location of the accident, and direction of travel for each driver involved.
- The itinerary was given to a control team composed of an off-duty policeman in uniform and a researcher.
- Each driver stopped was going in the same direction, past the same location, at the same time of day (within one hour on each side of the actual time of the accident) and same day of the week as the accident driver being matched for similar exposure.

- The off-duty policeman, in uniform, stopped the car and introduced the researcher. The researcher followed the questionnaire, which is depicted in Appendix F. To insure the selection of control drivers was random with respect to conditions other than location, direction, time of day, and day of week, the police officer stopped the very next car each time he was notified by the researcher that the previous interview was concluded. On each occasion, however, the researcher utilized a card of random numbers from 0 to 60 to determine at what time to notify the policeman to stop the next car. For example, when the researcher was ready to begin the next interview, the card was observed and the numbers, in descending order (one for each control driver) were used to determine how many seconds to wait before notifying the policeman to stop the next car. When that number was used (e.g., 34 seconds) it was crossed out and the next number was used for stopping the next control driver. When the proper number of control drivers had been interviewed at that location or site for the proper direction, the team changed positions to select cars at the same location but from a different direction (as the actual accident dictated). When the proper number of control drivers were interviewed at that site from all required directions, the team proceeded to another site and started the procedure all over again.

- Cars were stopped one at a time. No car was stopped until the researcher was ready to begin the next interview. This ensured a minimum amount of inconvenience to the control drivers.

- When stopping drivers in multiple lanes and upon being signalled by the researcher to stop the next car, the policeman did so regardless of what lane the car was in. However, for safety reasons, on those occasions when the next car was on an inside lane and there was a car beside it, or in near enough proximity to create a hazard, the car on the outside lane (nearest the curb) was stopped.

- The researcher did not enter the car of the control driver to conduct the interview unless weather was inclement.

The number of control drivers that was sampled for each accident driver will be discussed in a later section.

QUESTIONNAIRE DEVELOPMENT

Questionnaires or interview forms for both accident drivers and control drivers are presented in Appendix C and F respectively. Much consideration was given to obtaining required information from both groups of drivers in a minimum amount of time.

Accident Driver Questionnaire

Consistent with the concern for time, the procedure was established of not asking questions that could be obtained from the police officer's report. However, if in the opinion of the researcher the driver enjoyed participating and no other factor created a pressure for time, it was permissible for the researcher to ask these type questions from the driver to eliminate the necessity of reviewing the police report.

Previous studies were reviewed and conferences held with representatives of the National Highway Traffic Safety Administration to aid in the final selection of items to be included in the accident questionnaire. Based on results obtained from these activities, it was decided to partition the questionnaire into the following areas:

- Time, place, conditions
  - light, road conditions, weather, etc.
- Social influence
  - age, sex, race, annual mileage, occupation, etc.
- Trip data
  - where coming from, where going to

- Drinking Practices
  - normal habits, related convictions, last time drank, etc.
- Role alcohol played
  - what errors involved, what effect, etc.
- Interviewer remarks
  - estimate of BAC and driver fault

As noted in Appendix C, the actual language in the form is terse. This was purposefully designed to allow interviewers freedom in choice of words to obtain as much rapport as possible with the driver.

Control Driver Questionnaires

The control driver questionnaire, by necessity, followed the outline of the accident driver questionnaire with the exclusion of items related to an accident. If comparisons were to be made between the two groups, there had to be similarities in areas covered. The sequence of items, however, were arranged so that if a driver did not have enough time to complete the questionnaire the information judged to be the most important was obtained first.

INTERVIEW TECHNIQUE

The importance of proper interviewing techniques remains the same regardless of the qualifications of personnel selected to conduct interviews. However, the training involved varies depending upon the background of the researcher employed.

It was originally envisioned that a rare kind of interviewer would have to be selected to be able to obtain confidential information under traumatic conditions which could be legally damaging, where serious injury has occurred, and with the sight of blood visible to both participants. It was believed that such an interviewer had to elicit immediate rapport with a special kind of sincerity, confidentiality, harmlessness (all rolled into one) from the very first visual contact. To obtain such a response, it was thought at first that a young, innocent looking, but competent female would come close to achieving that reaction. However, after much consideration it was believed that experienced judgment in the area of automobile accidents in general, and with intoxicated personnel in particular, outweighed the advantage of instant rapport. By listing all of the characteristics desired for this position and by exercising resultant tradeoffs to arrive at a decision, it was decided to enlist the services of certain off-duty policemen. By selecting this type personnel to fill the position of researcher there would have already existed the following kinds of experience without the necessity of further training:

- Handling precise official documentation
- Participation in emergency situations
- Interviews of drivers in accidents
- Exposure to and perceptiveness of intoxicated personnel

- Judgments with respect to degree of intoxication and to causes of accidents.

From the number of police officers who possessed the above experience a group of candidate researchers were selected utilizing the following criteria in the process:

- Sincerely motivated to participate in the program.
- Recommended by supervisor.
- Neat and pleasant looking in appearance.
- Possess a warm and gentle manner.
- Characteristics of speech clearly indicate residence in or near the local area.

Those selected were thoroughly indoctrinated in all phases of the program. It was stressed that more success would be achieved if their personality was extended across the questionnaire rather than feeling compelled to be guided by it. They were instructed to use the questionnaire more as a checklist rather than as a structured conversation.

Practice interviews were held to insure that a complete understanding of the information required in the forms was achieved and that the desired technique of using the form as a guide and a checklist was mastered.

Field performances of each candidate were closely monitored until it was demonstrated that successful interviews could be consistently obtained.

The outstanding results obtained from the use of these personnel, in concert with the procedures that were established, provide testament to the wisdom of utilizing this approach to accomplish a most delicate and difficult task of data collection.

NEWS MEDIA

The news media were contacted and requested not to publish any information concerning the study until after it was completed. It was explained that responses obtained from drivers would be more reliable if no advance publicity was generated. However, it was also explained to the media that if results were poor, such publicity would be requested in order to stimulate lagging driver cooperation.

The media agreed at the outset to follow this course. The results of the study were very gratifying, so it was desired to maintain a status quo with respect to no publicity. Since the beginning of the study, there have been occasional inquiries from citizens to the city's leading newspaper concerning information about the study. Each time it was explained to the newspaper that it would be in the best interests of all concerned if publishing the story was delayed.

To this date the cooperation of all news media has been maintained. When the study is concluded, all facets of the program will be made available for use as the media desires consistent with the best interests of NHTSA.

PROBLEMS ENCOUNTERED/RESULTS NOT EXPECTED

Procedures have been outlined, equipment described, questionnaires discussed, interview technique described, and relationships with news media explained. Throughout these discussions little has been said of problems that have been encountered in the conduct of the study.

First, it may be said that no serious problem has arisen that has not been resolved. However, it is believed that benefit will be gained by describing some of the problems that have occurred.

Equipment

It was thought that two breath analyzers would be sufficient. Almost immediately, it was determined that to achieve the desired amount of flexibility at least four instruments would be required.

There have been some problems with the batteries of the analyzers. However, the Transporation Systems Center has been most cooperative by giving instructions over the phone and by promptly returning equipment sent for repair.

Personnel

It was believed that two researchers would be required to respond to each accident. However, very shortly it became apparent one could do the job.

It was also expected that researchers would have to monitor radio bands, but with police dispatcher cooperation, no requirement existed for standing by the radio constantly.

Drivers

The high percentage of successful BAC tests of drivers involved in accidents was very surprising.

It was not expected that the requirement for blood analysis would be so small from drivers in the hospital. Almost all drivers in the hospital submitted to the Breath Analyzer test.

There were a few complaints to the Police Department from control drivers concerning their being stopped and bothered by the interviewing. However, this number was very small.

To date, there has been no problem of any kind with any form of litigation or subpoena from either driver group.

Cooperation

In the search for a city to use for the study, it was discouraging to note the number of cities that did not wish to participate. The possibility of legal problems proved to be the largest deterrent.

RESULTS OF DATA COLLECTION

The prime objective of the study was to determine the role that alcohol plays in injury producing non-fatal automobile accidents.

The overall program design, the method by which data was collected, and the selection of the information to be obtained, all served to provide insights into the answer to this question.

The two principal kinds of information obtained were:

- BAC measurements from two groups of drivers - accident and control.
- Driver evaluations of the influence alcohol plays on driver performance.

Another important type of information obtained was an experienced accident investigator's judgment as to which driver was at fault.

While some of the other data collected did not bear directly upon the prime objective of the study, they do relate to many aspects of the overall problem of accident causation and/or prevention.

Since it was never expected to gain 100% cooperation from all drivers, efforts were made to obtain as much data as possible from those drivers who chose not to submit to a BAC test. These off-duty policemen, who served as researchers, already had experience with making judgments of intoxication prior to working on this study. Included in the interview procedure was the requirement for the researcher to estimate the BAC level of the driver even when a BAC was obtained by a breath or blood analysis. This additional training improved an already attained skill in making judgments in this area. It is not too optimistic to

suggest that these researchers became fairly proficient in judging the BAC of a driver who refused to submit to a test. As a result of attention given in this area, there is available a highly regarded estimate of BAC for almost all drivers who did refuse, or for some reason were unable to submit to a test.

Another item that should be discussed is why a number of accident drivers were not matched by control drivers as data in subsequent presentations will reveal. The reason for this is that originally it was thought that it would be more efficient to wait until a large number of accident drivers had been interviewed and tested prior to matching control drivers. However, it was later determined that it would be better, for purposes of this study, if the control drivers were matched more closely to the month in which the accident occurred. Consequently, the data on accidents drivers who were interviewed and tested during the early months of the study will be treated separately under certain comparative conditions and included with matched accident driver data when statistically suitable.

The results of the data collected and their anaylses will be presented in this section under the following classifications:

- Success rate of driver cooperation.
- General distribution of data.
- Comparison of general data between accident and control groups.
- Comparison of BAC measurement between accident and control groups and measures of risk for higher BAC level.

- BAC measurement across different variables.
- Effect of alcohol on driver performance.
- Conclusions

Success Rate of Driver Cooperation

As indicated earlier, there was some doubt over the kind of cooperation that would be obtained from a driver who had been involved in an automobile accident that produced an injury. This was particularly true for the driver who was at fault and even more so for that same driver who had been drinking beyond the legal limit. Considering these and other factors operating against the inclination of an individual to provide personal information, not a great deal of optimism existed for a very high rate of success with drivers involved in these type of accidents.

However, as Table 1 indicates, the success rate with the accident driver was an exceptionally high 97%. In fact, that rate rivaled the rate of success of 98% that was achieved with the control drivers. Even though it was projected that control driver cooperation would be more than satisfactory (in view of previous successes with other studies) expectations were not too high because of some of the conditions under which interviewing and measurement had to be conducted. Stopping a driver in the heart of busy traffic, as was often required, is not the ideal setting for a roadside survey of any type. Still, as Table 1 shows, the success rate or cooperation rate with the control drivers was very gratifying.

The percentages shown in Table 1 reflect full and partial driver cooperation. Full cooperation was determined to have been received when a BAC measurement and an interview were both obtained from the drivers. Partial cooperation was achieved when interviews were successfully conducted even though BAC measurements were not obtained.

In these cases some drivers were reluctant to have their BAC measured even though they were pleased to cooperate in every other way. Some drivers wanted to provide a BAC but were unable due to reasons beyond their control. For example, one driver was unable to blow hard enough to register on the analyzer and the tube of blood for another driver was inadvertently damaged.

Full cooperation was obtained for all but 19 accident drivers and 17 control drivers. Partial cooperation (successful interview but no BAC) was obtained from 10 of these 19 accident drivers and 8 of the 17 control drivers.

Data on less degrees of cooperation with the remaining 9 accident and 9 control drivers follow:

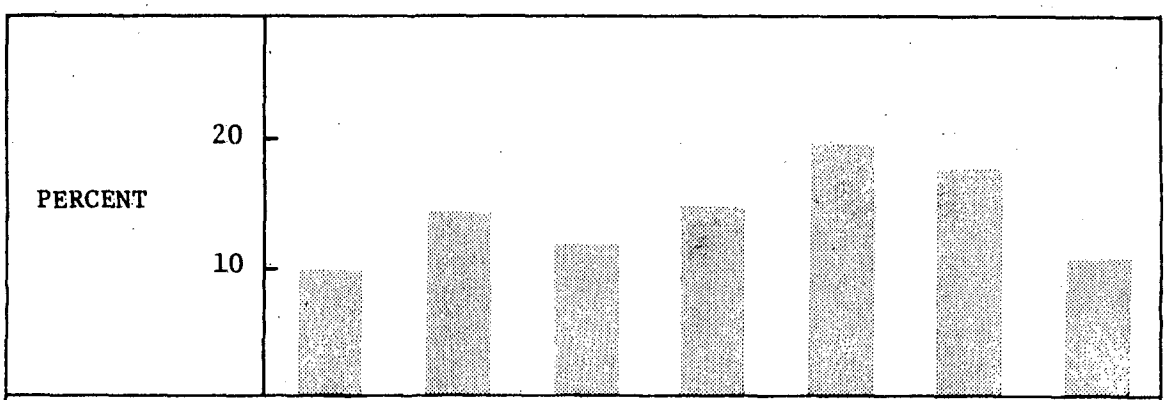
- There were five accident drivers and three control drivers who answered some, but not all, of the questions of the interview (in addition to being unwilling to submit to BAC measurement).
- There were four total refusals in the accident group and six in the control group who did not desire to participate in any way. However, these 10 drivers represent less than one percent of all attempts to interview and test drivers in the total program.

TABLE 1. TOTAL SUCCESS RATE (BAC MEASUREMENT PLUS INTERVIEW) AND INTERVIEW SUCCESS RATE FOR ACCIDENT AND CONTROL DRIVERS

GROUP	TOTAL NUMBER	BAC'S AND INTERVIEWS OBTAINED	TOTAL SUCCESS RATE	INTERVIEWS OBTAINED	INTERVIEW SUCCESS RATE
Accident	615	596	97%	606	98%
Group	821	804	98%	812	99%

General Distribution of Data

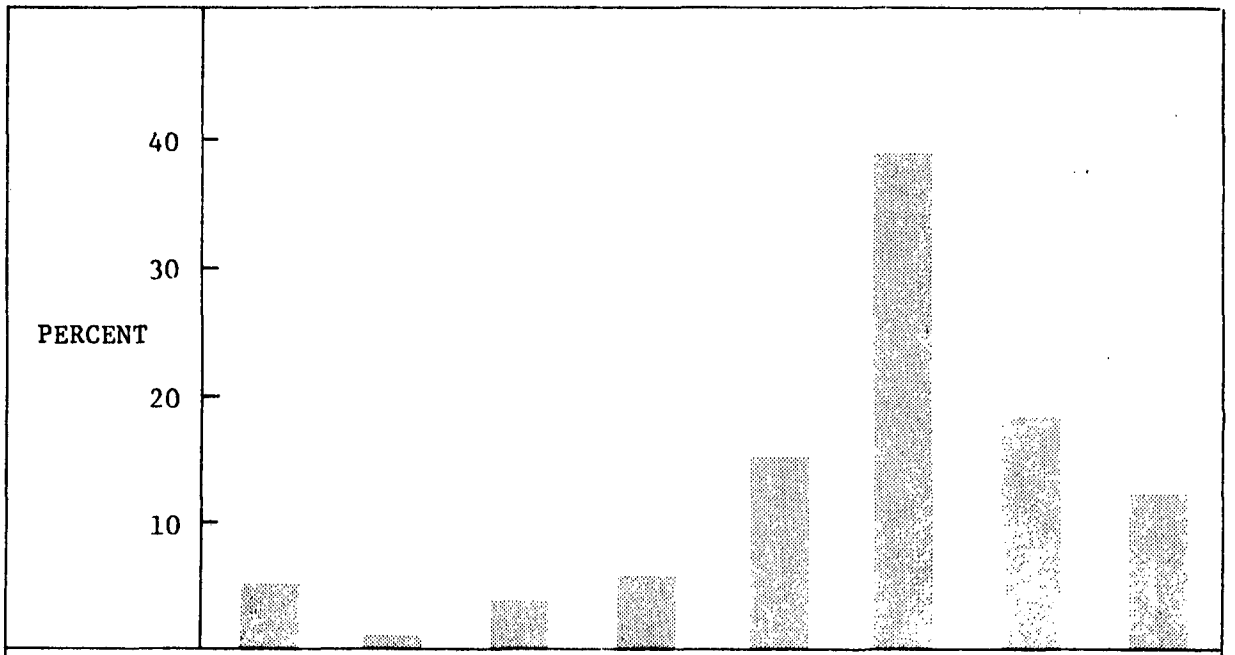
Figure 1 presents a breakdown of accident drivers interviewed by day of the week. Similar to the Grand Rapids Study (conducted by R.F. Borkenstein in 1962-1963) the greatest number of accidents investigated occurred on Fridays and Saturdays.



DAY OF WEEK	MON	TUE	WED	THU	FRI	SAT	SUN
NUMBER OF ACCIDENTS	60	86	75	95	124	110	65

FIGURE 1
NUMBER OF ACCIDENT DRIVERS INTERVIEWED BY DAY OF THE WEEK

Figure 2 shows the number of accident drivers interviewed by hour of the day. The hours were grouped in categories of three beginning at 12 P.M. Again similar to the Grand Rapids study, the greatest number of accidents investigated occurred during the rush hours of traffic going home between 3 and 6 P.M.



CATEGORIES OF TYPE	M-3AM	3-6AM	6-9AM	9-N	12-3PM	3-6PM	6-9PM	9PM-M
NUMBER OF ACCIDENT DRIVERS	32	7	25	34	93	237	111	76

FIGURE 2
NUMBER OF ACCIDENT DRIVERS INTERVIEWED BY HOUR OF DAY

Figure 3 presents information as to where the investigations were conducted. As indicated, most drivers were interviewed at the scene of the accident. Approximately one-third of the drivers were injured seriously enough to be taken to the hospital. A relatively small number were taken to the Police Station for further questioning by the police. When this occurred, researchers proceeded to the Police Station and conducted interviews after the police had concluded their questioning. When police obtained BAC's, results of the measurements were made available to the researchers.

Failure to obtain BAC's by researchers occurred with approximately the same frequency at the scene of the accident as it did at the hospital.

All control drivers were interviewed and tested at the scene of the accident being matched.

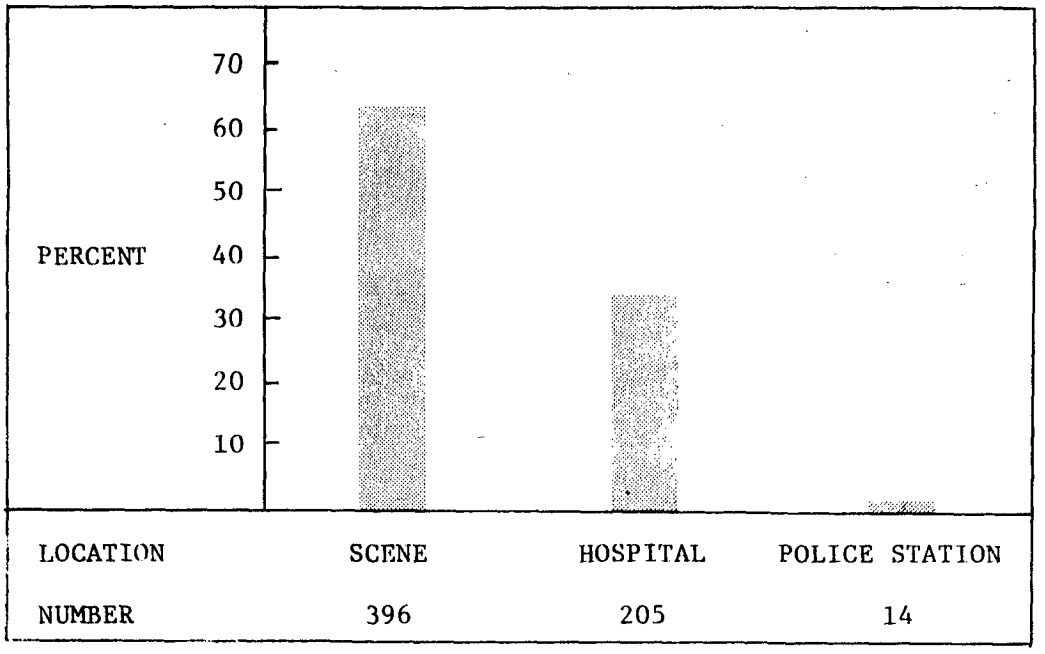


FIGURE 3
WHERE INVESTIGATIONS (BAC MEASUREMENTS AND INTERVIEWS) WERE HELD

The percentage of BAC's obtained by the Breath Analyzer as opposed to blood analysis was surprisingly high for the accident drivers. It was expected that at the hospital, a blood analysis would be the most convenient method, or the only practical means, for a large number of the drivers. However, only 7 out of 205 hospitalized drivers were physically unable to provide a breath test. As Table 2 shows, this resulted in a total of only 1% of all accident drivers.

Table 2 also shows that 17 estimates of BAC were obtained on the 19 accident drivers from whom measurements were not received.

For control drivers all BAC measurements were conducted by the Breath Analyzer. Of the 17 BAC failures experienced with the control group, 13 estimates were obtained.

TABLE 2. TYPE BAC MEASUREMENT

TYPE	NUMBER	PERCENTAGE
Breath	589	95.8
Blood	7	1.1
Estimated	17	2.8
None	2	0.3
TOTAL	615	100%

Based on a research of police files prior to the conduct of the study, it was expected that the greatest number of injuries involved in the accidents sampled would be classified by the police as minor. Figure 4 indicates 62% of the accidents were so classified.

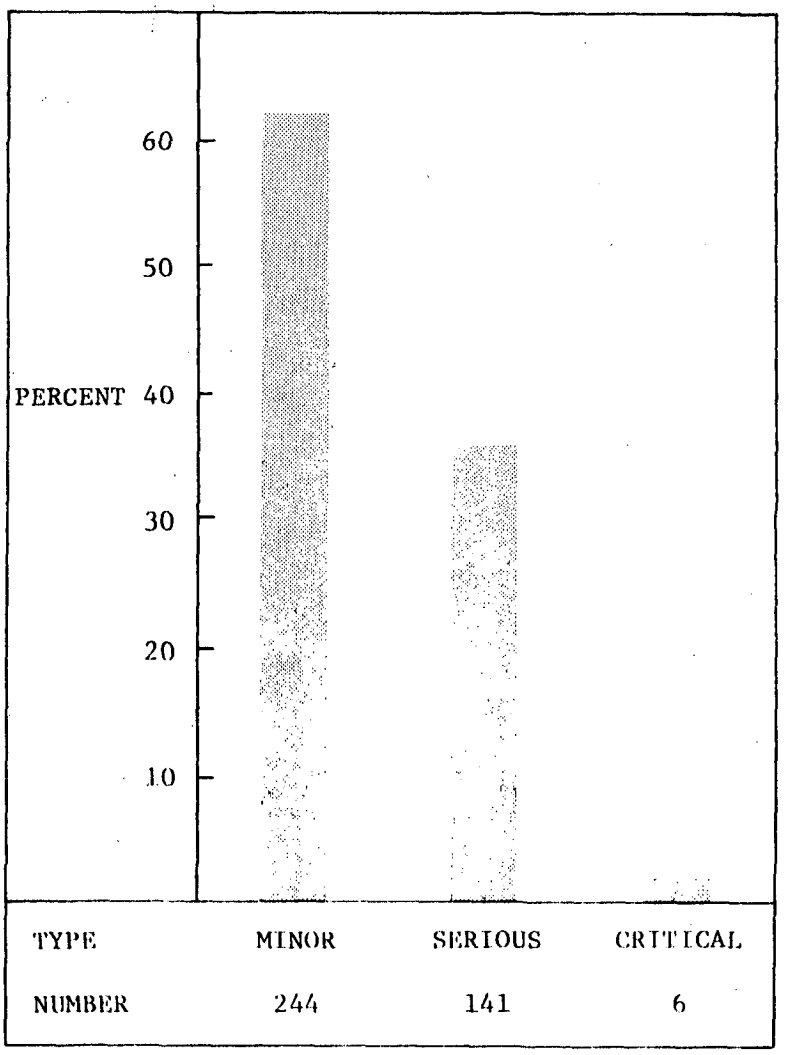


FIGURE 4
WORST TYPE INJURY BY DRIVERS OR PASSENGERS INVOLVED WITH ACCIDENTS INVESTIGATED

Figure 5 presents data on the type of injury incurred by drivers in these accidents. A number of drivers received no injury at all. This was not surprising when considering that accidents were being investigated on the basis of injury being sustained by either driver or by a passenger. However, it is interesting to note that 62% did receive an injury of some type. Although tables are not presented on the injury status of passengers, approximately one-third of all accidents involved passengers with injury.

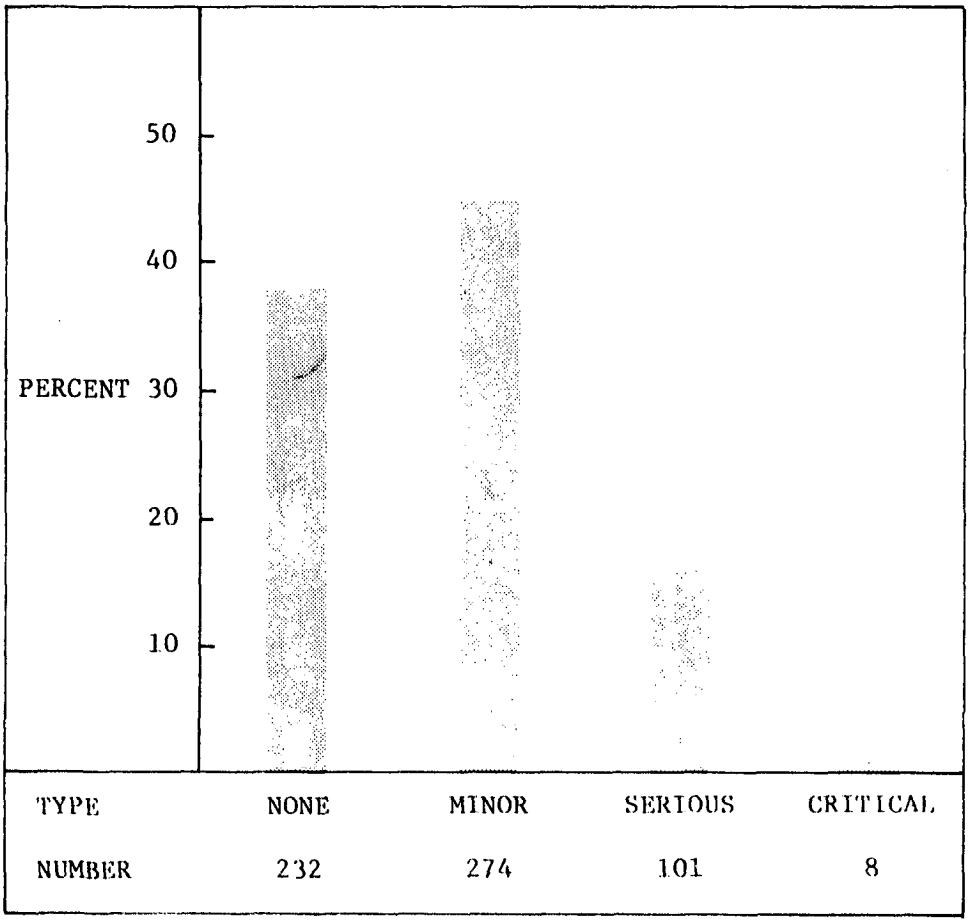
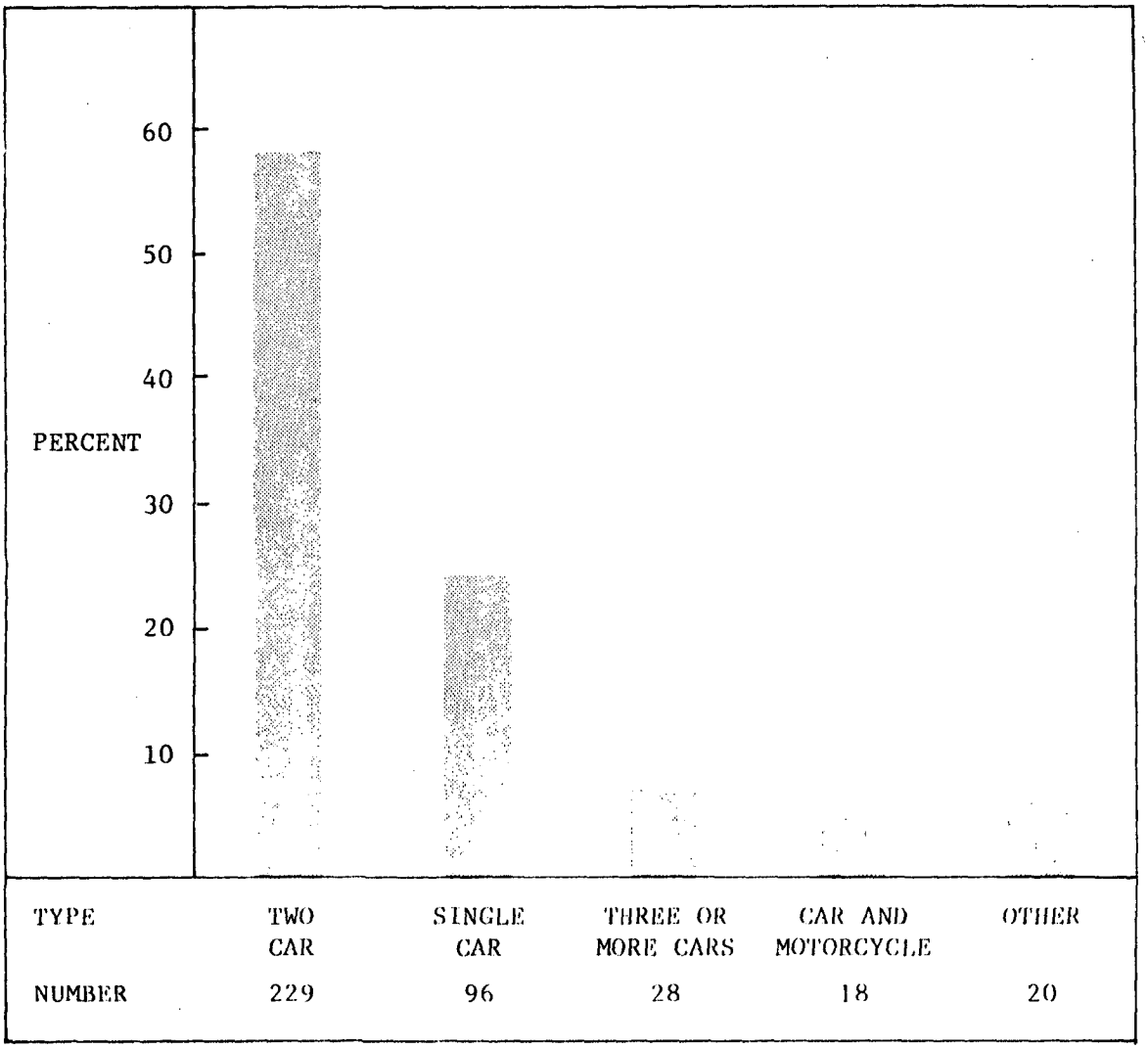


FIGURE 5
TYPE INJURY TO DRIVERS

Figure 6 shows that two car collisions were by far the most frequent type accidents with injury. These data are not inconsistent with those found in the National Safety Council's publication "Accident Facts."



TYPE	TWO CAR	SINGLE CAR	THREE OR MORE CARS	CAR AND MOTORCYCLE	OTHER
NUMBER	229	96	28	18	20

FIGURE 6
TYPE COLLISIONS

Comparison of General Data Between Accident and Control Groups

In the following tables, data will be presented and compared between the accident and the control groups. In Tables 3 through 8 data will be broken down for the accident group into two subgroups. One subgroup will be labeled as "matched," and the other as "non-matched." As discussed earlier on page 33 this differentiation is made because accident drivers interviewed during the first part of Phase II were not matched with control drivers by accident site, time of day, day of week, and direction of travel (as was accomplished with drivers during the last part of Phase II). The purpose of presenting data in this form is to indicate what differences exist between the two subgroups and between the matched subgroup and the control group.

Five variables have been selected to classify all groups of drivers. These are:

- Age
- Sex
- Education
- Reported Annual Mileage
- Occupation

Each of these variables will be considered separately.

Age

Age attained at the last birthday was recorded for all drivers. Table 3 presents nine age classes for both of the accident subgroups and the control group. A Chi-square test of the distribution indicated statistically significant differences between the accident groups and the controls. Significant cell contingencies were found for age groups 14-17 and 18-20, which were over-represented in the accident groups (Table 4 shows the observed and expected frequencies). There were no statistically significant differences between the matched and non-matched accident groups.

TABLE 3. AGE COMPARISON BETWEEN ACCIDENT AND CONTROL GROUPS

AGE GROUP CLASSES	ACCIDENT GROUP				CONTROL GROUP	
	Non-Matched		Matched			
	No.	%	No.	%	No.	%
14-17	34	11	49	16	56	7
18-20	37	12	45	14	77	9
21-24	44	14	36	12	106	13
25-30	48	16	48	15	134	17
31-39	53	18	45	14	162	20
40-50	42	14	50	16	148	18
51-61	23	8	27	9	100	12
≥ 62	20	7	14	4	32	4
TOTAL	301	100%	314	100%	815	100%

TABLE 4. OBSERVED AND EXPECTED FREQUENCIES OF ACCIDENT GROUP AND CONTROL GROUP CATEGORIZED BY AGE

AGE GROUP CLASSES	ACCIDENT GROUP				CONTROL GROUP		TOTALS
	Non-Matched		Matched				
	Observed	Expected	Observed	Expected	Observed	Expected	
14-17	34	29.2	49	30.3	56	79.5	139
18-20	37	33.4	45	34.6	77	91.0	159
21-24	44	39.3	36	40.7	106	106.0	186
25-30	48	48.5	48	50.3	134	131.1	230
31-39	53	54.6	45	56.6	162	148.2	260
40-50	42	50.6	50	52.5	148	196.8	240
51-62	23	31.5	27	32.6	100	85.9	150
Over 62	20	13.9	14	14.4	32	37.7	66
TOTAL	301		314		815		1430

Sex

The sex of each driver was recorded. Table 5 shows that males outnumbered females in all groups. While there was some difference between the matched and non-matched subgroups, a Chi-square test revealed that the matched group is significantly different from the control group in that females are more heavily represented in the matched group.

TABLE 5. SEX COMPARISON BETWEEN ACCIDENT AND CONTROL GROUPS

SEX GROUP	ACCIDENT GROUP				CONTROL GROUP	
	Non-Matched		Matched			
	No.	%	No.	%	No.	%
Male	203	67	189	60	582	71
Female	98	33	125	40	239	29
TOTAL	301	100%	314	100%	821	100%

Education

Researchers attempted to obtain from all drivers of all groups the number of years of education successfully completed. Educational levels were distributed into classes as shown in Table 6. Again, the subgroups were similar. However, a Chi-square test indicated that the matched group in comparison to the control group is over-represented in the 8-11 year educational class and under-represented in the college graduate class.

TABLE 6. EDUCATION COMPARISON BETWEEN ACCIDENT AND CONTROL GROUPS

EDUCATION CLASS	ACCIDENT GROUP				CONTROL GROUP	
	Non-Matched		Matched			
	No.	%	No.	%	No.	%
Less than 8 yrs.	23	8	15	5	58	7
8-11 yrs.	77	26	92	30	171	23
H.S. Graduate	103	35	118	38	260	32
1-3 yrs. College	54	18	54	17	181	22
College Graduate	25	8	18	6	98	12
Graduate Degree	16	5	13	4	44	4
TOTAL	298	100%	310	100%	812	100%

Annual Mileage

Table 7 presents the data obtained for reported annual mileage broken down into six classes. The hypothesis that the distribution of reported annual mileage was the same for all groups was challenged by means of a Chi-square test and it was found that the matched group was significantly under-represented in the high annual mileage categories and over-represented in the less than 5,000 mile categories.

TABLE 7. REPORTED ANNUAL MILEAGE COMPARISON BETWEEN ACCIDENT AND CONTROL GROUPS

REPORTED ANNUAL MILEAGE	ACCIDENT GROUP				CONTROL GROUP	
	Non-Matched		Matched			
	No.	%	No.	%	No.	%
Up to 1,000	20	7	15	5	9	1
1,001-5,000	36	12	58	19	83	10
5,001-10,000	98	33	103	33	248	31
10,001-15,000	57	19	166	21	212	26
15,001-30,000	64	22	48	16	193	24
Over 30,000	22	7	19	6	66	8
TOTAL	297	100%	309	100%	811	100%

Occupation

For most variables it was possible to define classes quite distinctly. However, for occupational status, this was not true. An extensive effort was required to classify all drivers by occupation, as shown in Table 8 . A chi-square test indicated that the matched group, in comparison with the control group, was over-represented in the student, housewife, and unskilled categories and under-represented in the professional, tradesman, and military categories.

TABLE 8 . OCCUPATION CLASS COMPARISON
BETWEEN ACCIDENT AND CONTROL GROUPS

OCCUPATION CLASS	ACCIDENT GROUP				CONTROL GROUP	
	Non-Matched		Matched			
	No.	%	No.	%	No.	%
Professional	29	10	30	10	118	14
Student	45	15	67	22	94	12
Business and Sales	31	10	37	12	89	11
Office	14	5	28	9	67	8
Unskilled	40	14	53	17	82	11
Tradesman	41	14	21	7	128	16
Military	11	4	7	2	81	10
Housewife	23	8	34	11	53	6
Retired	16	5	6	2	24	3
Unemployed	13	4	11	3	20	2
Other	34	11	17	5	55	7
TOTAL	297	100%	311	100%	811	100%

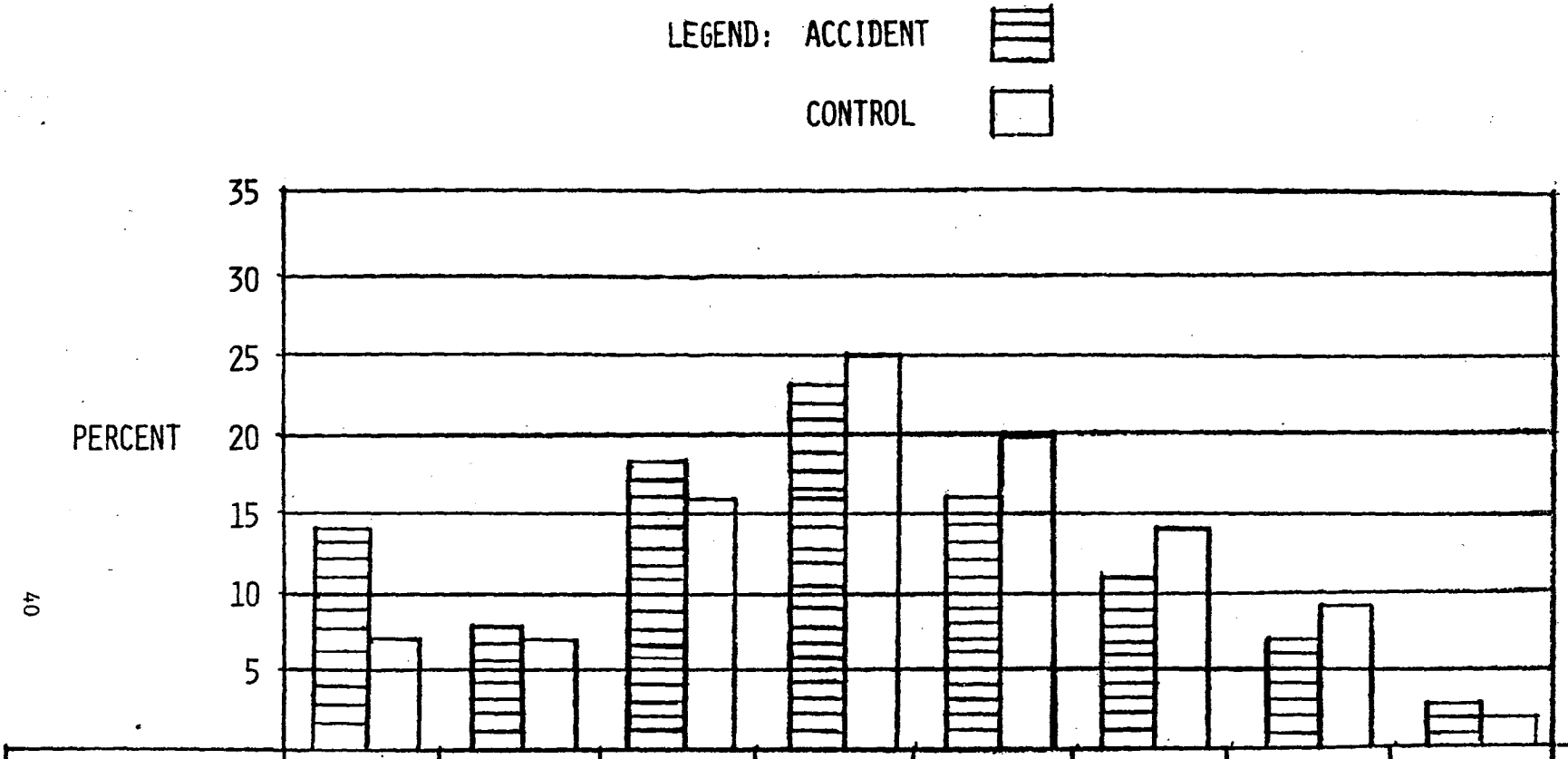
Since statistically, there were no significant differences between the matched and non-matched subgroups of the accident group across these five major variables, Figures 7 through 11 will be presented to graphically show the differences between the total accident group and the control group across these same variables.

Figure 7 shows the age comparison between the total number of accident drivers and the control drivers. Based on data already reviewed in Table 3 it was not unexpected to find that a Chi-square test of the frequency distributions was significant at the .01 level. Also presented in this chart is the use of the statistical measure, "Involvement Index." This measure represents a quantification of the over- and under-involvement or over- and under-representation of a class or category of variables. For example, it will be noted in Figure 7 that accident drivers between the ages of 14 and 17 are over-represented and have an Involvement Index of plus 40. Also, drivers of ages 55 through 64 were under-represented and have an Involvement Index of minus 16.2. Thus, over- and under-representations have appropriate plus or minus signs with a number indicating the amount or degree of representation. This measure was first used by Borkenstein in the report of the Grand Rapids Study.

By observing the relative positions of the bar graphs and noting the Involvement Indexes it is clear that the younger drivers through age 24 were over-represented and the older drivers were under-represented.

Figure 8 shows the sex comparison between accident and control drivers. A Chi-square test of the frequency distributions was significant at the .01 level with females being over-represented.

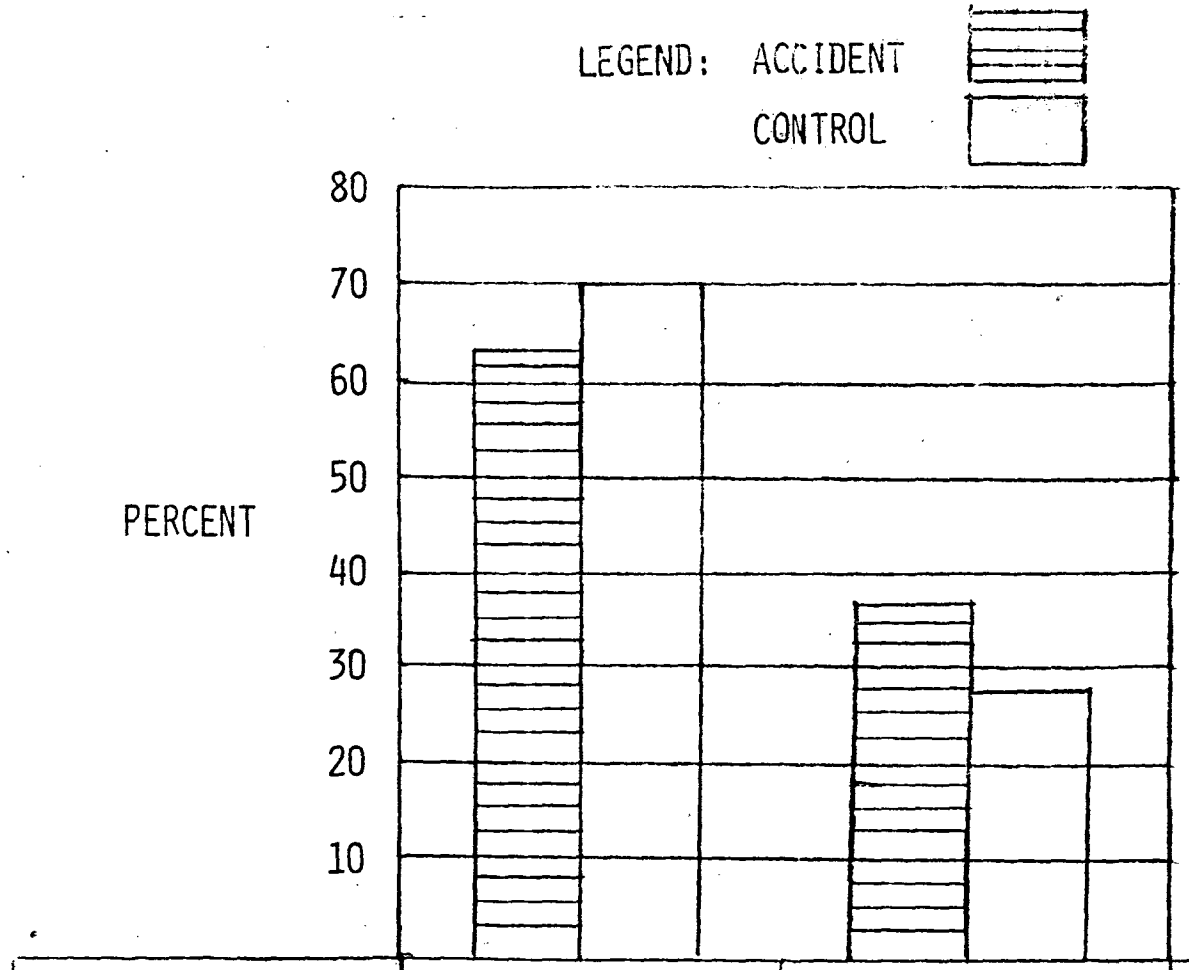
Figure 9 shows the education comparison between accident and control drivers. Again, a Chi-square test of the frequency distributions was significant at the .01 level. With the exception of those drivers with education



AGE CLASS	14-17	18-19	20-24	25-34	35-44	45-54	55-64	≥ 65	TOTAL
N - ACCIDENT DRIVERS	84	51	110	141	98	71	41	19	615
N - CONTROL DRIVERS	56	56	129	207	164	112	74	17	815
INVOLVEMENT INDEX	+ 40.0	+ 10.9	+ 6.8	- 6.0	- 13.3	- 10.1	- 16.2	+ 26.7	

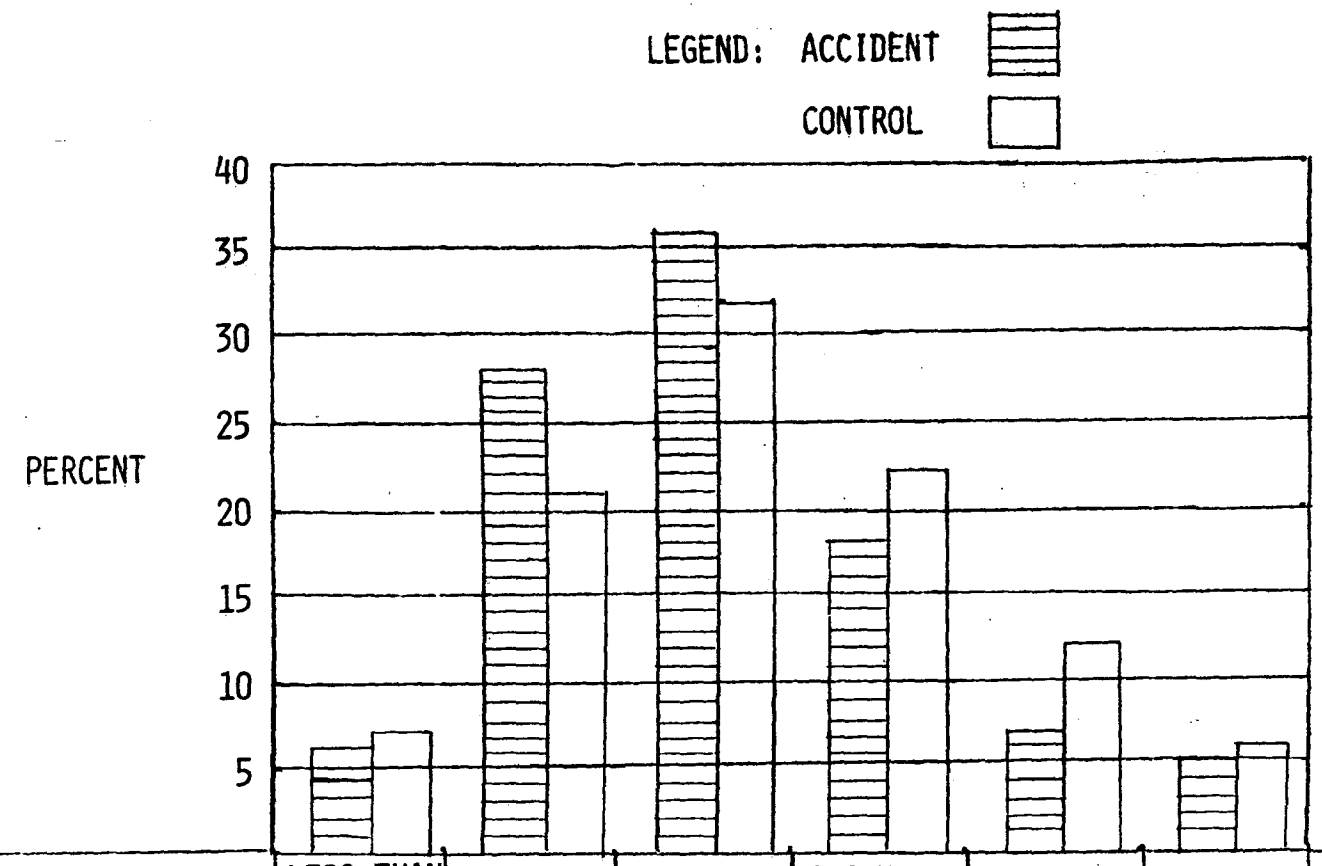
$x^2 = 28.57$
$P < .01$

FIGURE 7 AGE COMPARISON BETWEEN ACCIDENT DRIVERS AND CONTROL DRIVERS



SEX OF DRIVERS	MALE	FEMALE	TOTAL
N-ACCIDENT DRIVERS	392	223	615
N-CONTROL DRIVERS	582	239	821
$x^2 = 8.14$ $P < .01$			

FIGURE 8
SEX COMPARISON BETWEEN ACCIDENT AND CONTROL DRIVERS



EDUCATIONAL LEVEL	LESS THAN 8	8-11	H.S.GRAD	1-3 YRS. COLL.	COLL. GRAD	GRAD DEG.	TOTAL
N-ACCIDENT DRIVERS	38	169	221	108	43	29	608
N-CONTROL DRIVERS	58	171	260	181	98	44	812
INVOLVEMENT INDEX	- 7.3	+ 15.8	+ 7.3	- 12.9	- 23.2	- 9.7	

$X^2 = 17.76$
$P < .01$

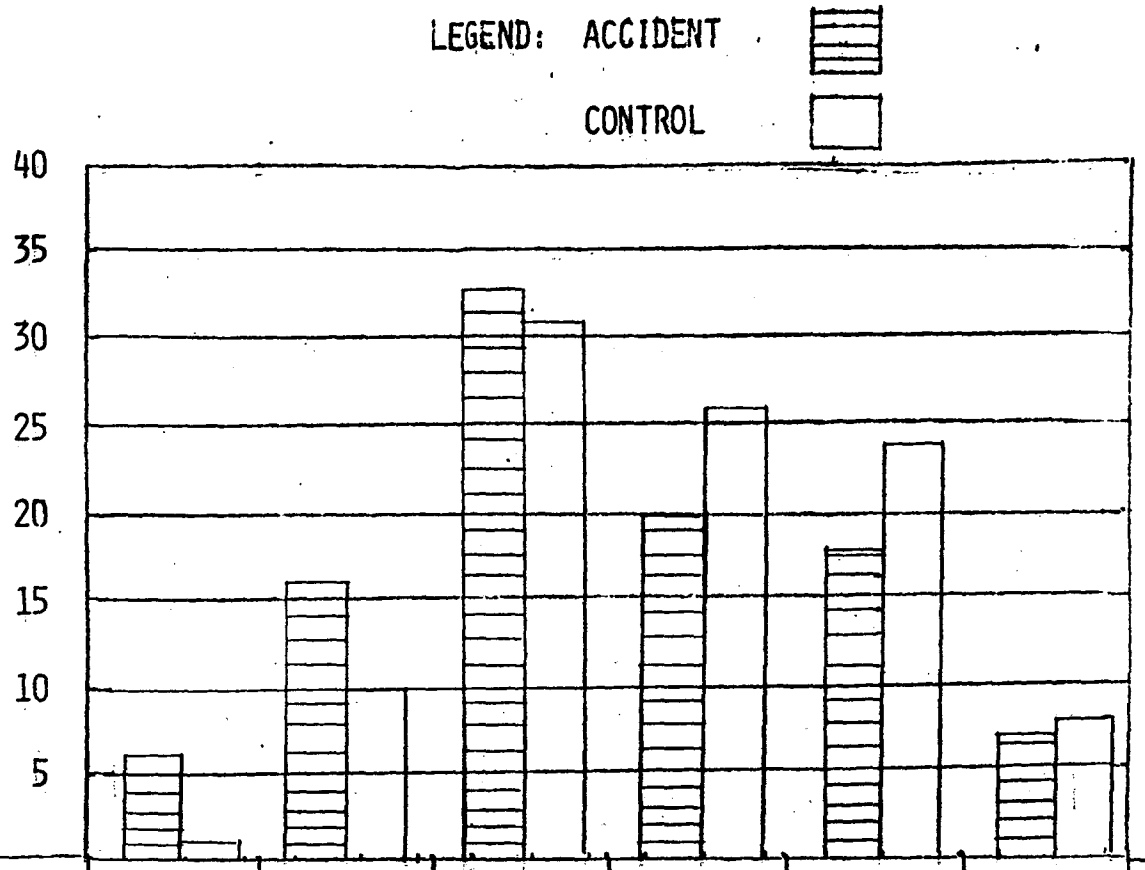
FIGURE 9
EDUCATION COMPARISON BETWEEN
ACCIDENT AND CONTROL DRIVERS

less than 8 years, where only one percentage point separated the two groups of drivers, the trend is consistent. Drivers with education above high school are under-represented.

Figure 10 presents driver reports of annual mileage with a comparison between accident and control drivers. A Chi-square test of the frequency distributions was significant at the .01 level with drivers in the lower mileage categories being over-represented.

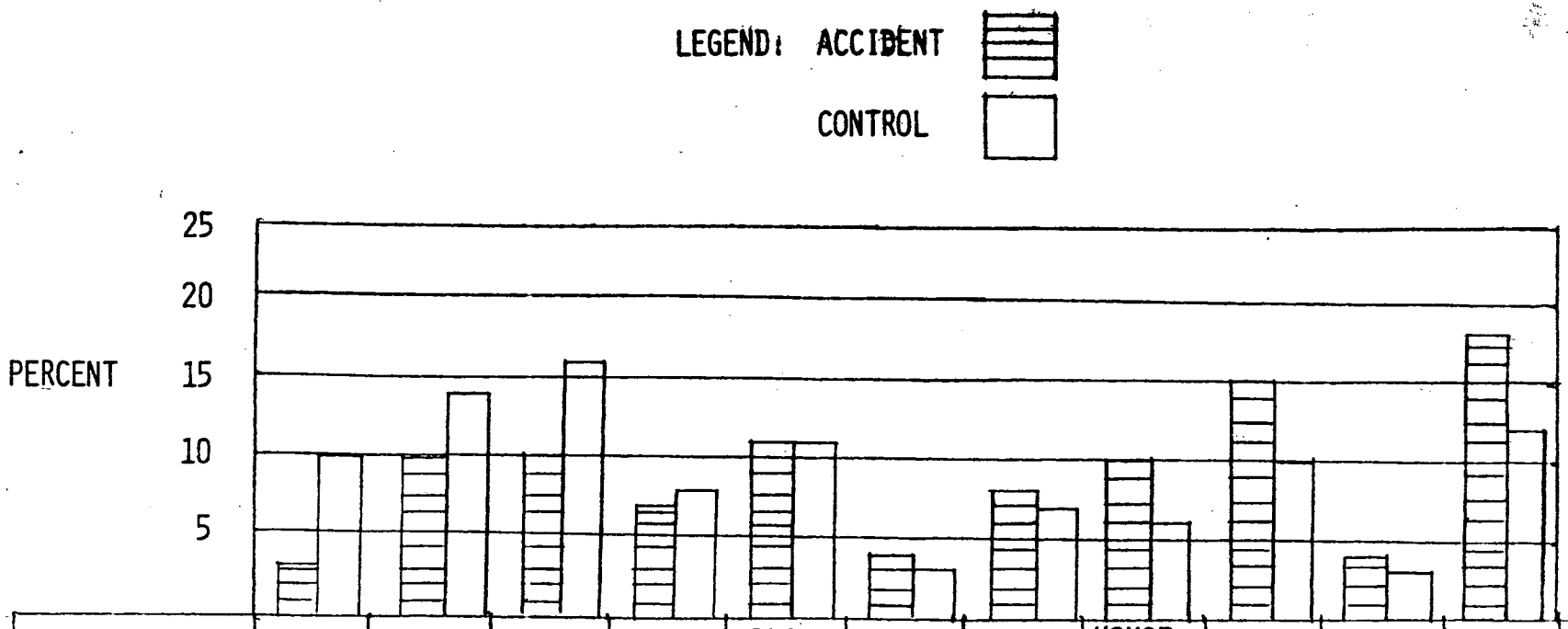
Figure 11 shows occupation comparison between accident and control drivers. As with the previous variables, a Chi-square test of the frequency distribution was significant at the .01 level. The occupations are presented in order of Involvement Index with the most under-represented appearing to the left. It will be noted that military personnel, professionals, and tradesmen lead the under-represented list while housewives, unskilled, unemployed and students are the most over-represented categories.

Table 9 presents comparative data between the accident and control group with respect to whether the drivers normally abstain or drink alcoholic beverages. This data was obtained by questioning drivers and the validity of the results acquired is dependent upon the truthfulness of the answers. It is interesting to observe that the percentage of control drivers who stated they normally drink exceeds by a small margin the percentage of accident drivers who stated that they drink. This difference is not significant, however. The results suggest that drinking as opposed to abstinence, in itself, does not play a major role in accidents which produce injury.



REPORTED MILEAGE	≤ 1000	1001-5000	5001 - 10,000	10,001 - 15,000	15,001 - 30,000	≥ 30,000	TOTAL
N-ACCIDENT DRIVERS	35	94	201	123	112	41	606
N-CONTROL DRIVERS	9	83	248	212	193	66	811
INVOLVEMENT INDEX	+ 84.2	+ 23.7	+ 4.7	- 14.0	- 13.8	- 10.9	
$x^2 = 42.10$ $P < .01$							

FIGURE 10
DRIVER REPORTS OF ANNUAL MILEAGE: COMPARISON BETWEEN ACCIDENT AND CONTROL GROUPS



OCCUPATION	MILI-TARY	PROFES-SIONAL	TRADES-MAN	OFFICE	BUS.-SALES	RETIRED	OTHER	HOUSE-WIVES	UN-SKILLED	UNEM-PLOYED	STUDENT	TOTAL
N - ACCIDENT DRIVERS	18	59	62	42	68	22	51	57	93	24	112	608
N - CONTROL DRIVERS	81	118	128	67	89	24	55	53	82	20	94	811
INVOLVEMENT INDEX	- 57.1	- 22.4	- 23.4	- 10.6	± 0	+ 10.0	+ 13.3	+ 21.3	+ 24.0	+ 26.3	+ 27.3	
$x^2 = 65.9$ $P < .01$												

FIGURE 11
OCCUPATION COMPARISON BETWEEN
ACCIDENT AND CONTROL DRIVERS

TABLE 9. COMPARISON OF ABSTINENCE BETWEEN ACCIDENT AND CONTROL DRIVERS

DRINK OR ABSTAIN	ACCIDENT GROUP		CONTROL GROUP	
	Number	Percentage	Number	Percentage
Drink	348	57	489	60
Abstain	262	43	326	40
TOTAL	610	100	815	100

Table 10 presents data on the normal drinking habits of those drivers who drink. Each driver was asked how many drinks he or she normally has on one occasion. Again, the validity of the information is dependent upon the candor of the drivers. The mean number of drinks was obtained for each group of drivers and compared. While the accident group did not have a greater proportion of drinkers than the control group, Table 10 indicates that when the accident driver did drink, he drank more than the control driver. While this difference is not very large, it is statistically significant.

Also, Figure 12 presents data which further supports the significance of this difference in drinking habits. It is noted that a larger percentage of control drivers are light drinkers while a larger percentage of accident drivers are heavy drinkers.

TABLE 10. MEAN NUMBER OF DRINKS CONSUMED ON NORMAL OCCASIONS BY ACCIDENT AND CONTROL DRIVERS

DRIVER GROUP	ACCIDENT	CONTROL
Mean Number of Drinks	3.04	2.66

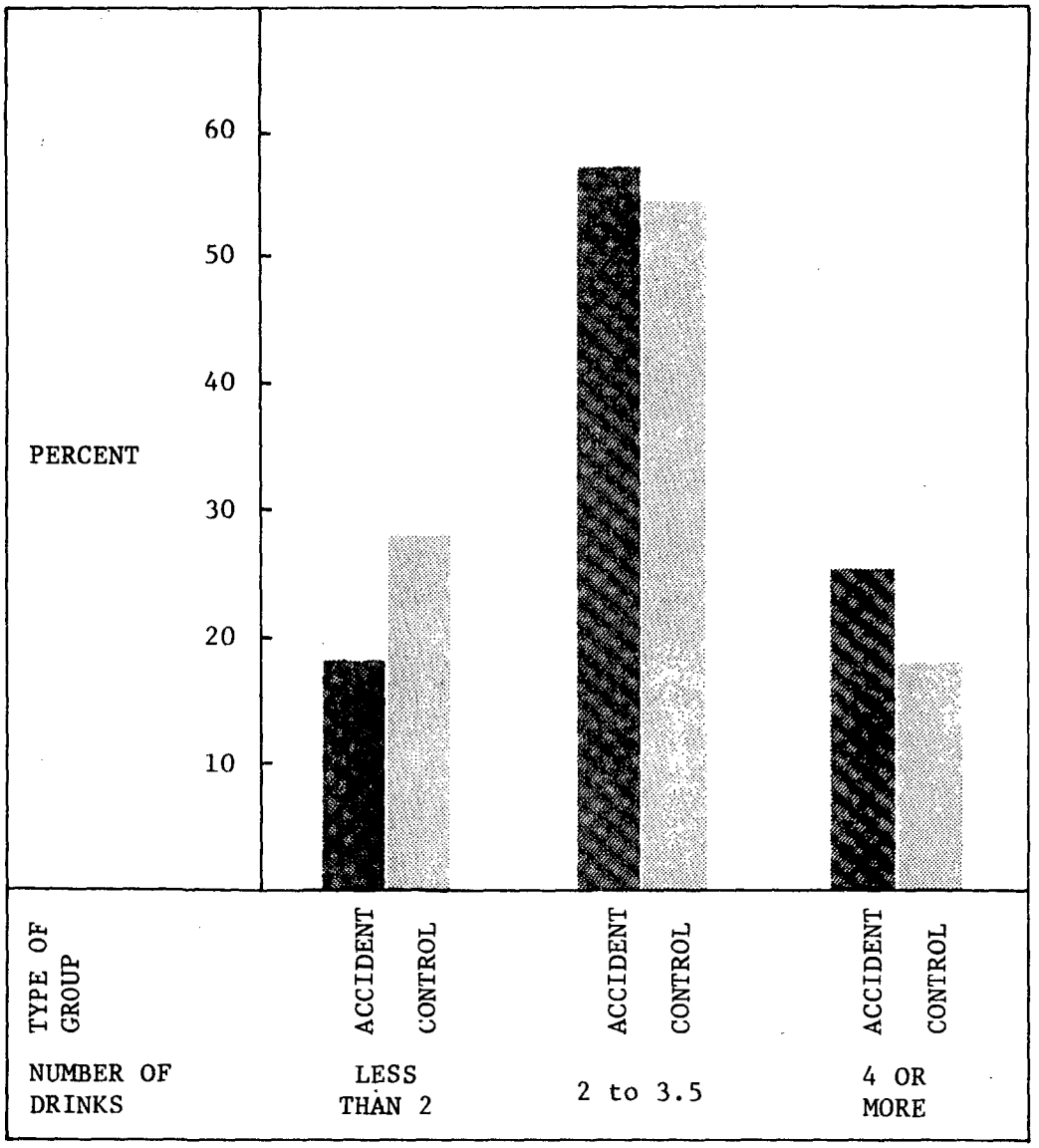


Figure 12. PERCENT OF ACCIDENT AND CONTROL DRIVERS WHO DRINK WITH RESPECT TO DIFFERENT QUANTITIES OF CONSUMPTION

Table 11 presents information on trip purpose for each driver in both groups. As the data indicates, no significant difference was found to exist between the two groups with respect to the percentage of drivers who were driving for pleasure.

TABLE 11. PURPOSE OF TRIP FOR DRIVERS OF ACCIDENT AND CONTROL GROUP

PURPOSE OF TRIP	ACCIDENT GROUP		CONTROL GROUP	
	Number	Percentage	Number	Percentage
Pleasure	296	49	420	51
Business	314	51	398	49
TOTAL	610	100%	818	100%

For those drivers who were driving for pleasure, Table 12 provides a breakdown for both groups in relation to where drivers were coming from at the time of the accident or (in the case of the control drivers) at the time of being stopped for interviewing. Table 13 provides the same type of information with data being presented to indicate driver destination.

While statistically there are some significant differences between the two groups such as an under-representation by the accident group in originating trips from home and in driving to restaurants, there is no basic practical difference between the two groups. In reviewing and analyzing this data it was not possible to identify areas that would serve to aid in the search for meaningful trends and/or relationships.

TABLE 12. PERCENT OF ACCIDENT AND CONTROL DRIVERS WHO WERE DRIVING FOR PLEASURE BY ORIGIN OF TRIP

ORIGIN	ACCIDENT GROUP		CONTROL GROUP	
	Number	Percentage	Number	Percentage
Home	70	24	147	35
Friend's Home	60	21	59	14
Shopping	45	15	59	14
Bar	25	8	26	6
Recreation Area	20	7	29	7
School	17	6	13	3
Restaurant	15	5	26	6
Other	44	14	61	15
TOTAL	296	100%	420	100%

TABLE 13. PERCENT OF ACCIDENT AND CONTROL DRIVERS WHO WERE DRIVING FOR PLEASURE BY DESTINATION OF TRIP

DESTINATION	ACCIDENT GROUP		CONTROL GROUP	
	Number	Percentage	Number	Percentage
Home	165	56	213	51
Friend's Home	34	12	47	11
Shopping	21	7	39	9
Recreation Area	19	6	21	5
School	11	4	3	1
Restaurant	6	2	31	7
Bar	4	1	9	2
Other	36	12	57	14
TOTAL	296	100%	420	100%

Comparison of BAC Measurements between Accident and Control Groups and Measures of Risk for Higher BAC Level

Several analyses have been performed to compare the BAC measurements of the accident and control groups and certain tentative conclusions may be drawn from the results.

In Figure 13 results are presented for the number in each of several BAC groups for the matched and unmatched accident groups and for the control group.

A number of Chi-square tests were performed using these data with the following results:

- A comparison of the two accident groups showed no significant difference (Chi-square = 5.47)
- A comparison of the matched accident group with the control group showed a highly significant difference (Chi-square - 49)
- A comparison of the combined accident groups with the control group showed a highly significant difference (Chi-square - 71)

Thus, there is no significant difference in the distribution of BAC measurements between the two accident groups and there is a highly significant difference between the accident groups and the control group.

For each accident a determination was made as to which driver was at fault. (See discussion on page 1).

Figure 14 presents a comparison of the BAC distribution for the control group with the BAC distribution for both the at-fault and not-at-fault drivers from the matched injury accident group. Figure 15 is similar to Figure 14 except that the comparisons are for the unmatched

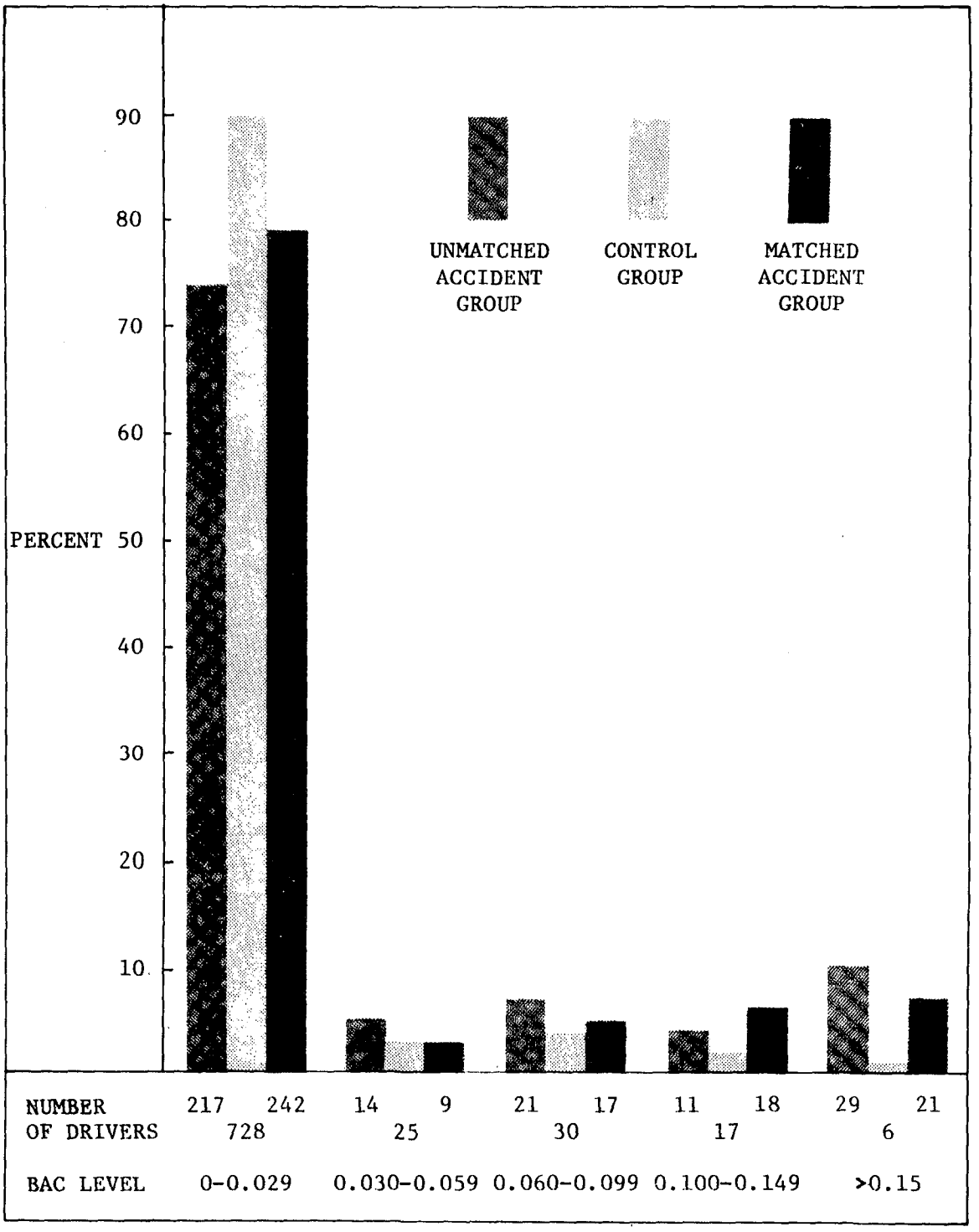


Figure 13. COMPARISON OF BAC DISTRIBUTION FOR THE CONTROL GROUP AND THE INJURY-ACCIDENT GROUPS

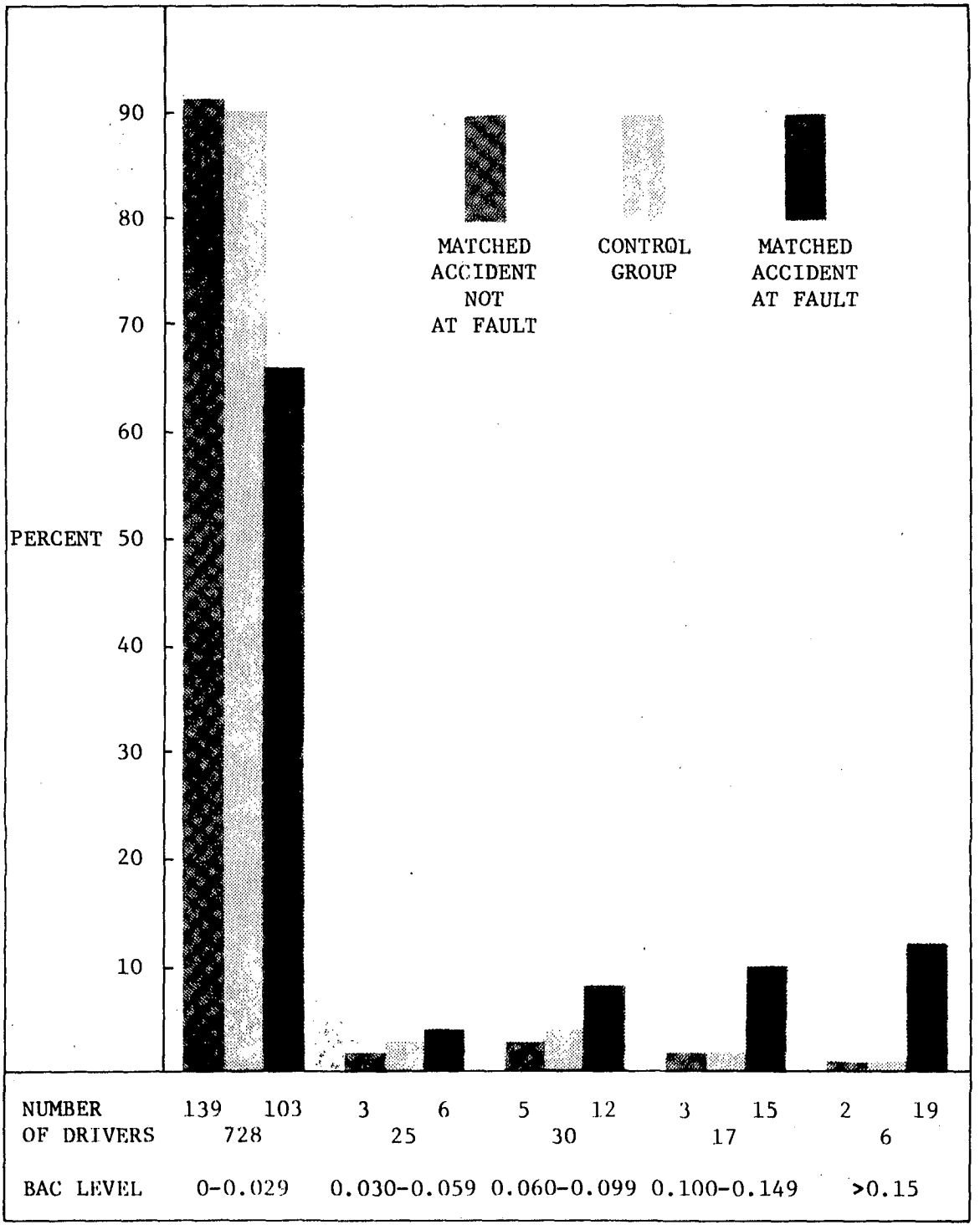


Figure 14 COMPARISON OF THE BAC DISTRIBUTION FOR THE CONTROL GROUP WITH THE BAC DISTRIBUTIONS FOR THE AT FAULT AND NOT AT FAULT DRIVERS FROM THE MATCHED INJURY ACCIDENT GROUP

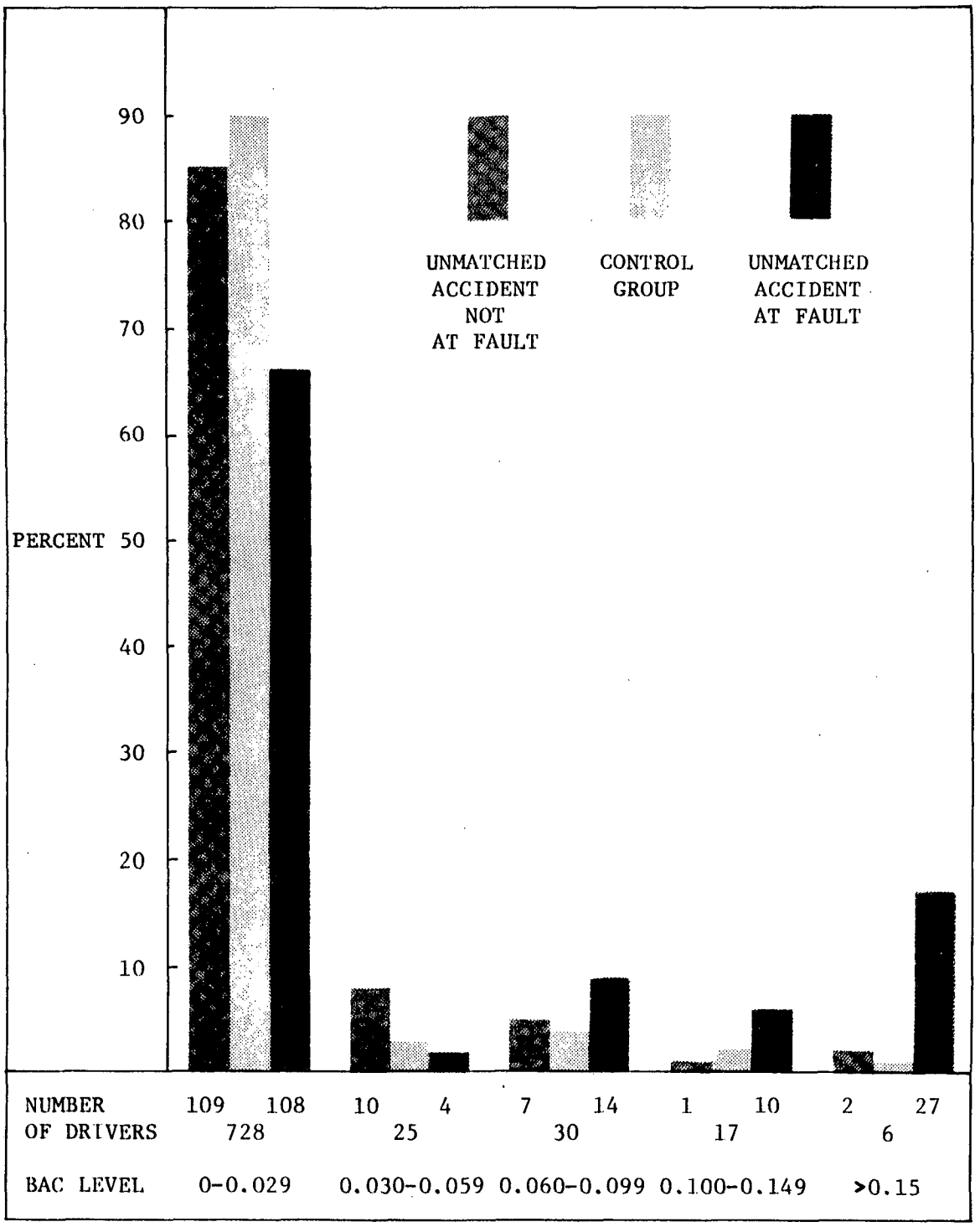


Figure 15. COMPARISON OF THE BAC DISTRIBUTION FOR THE CONTROL GROUP WITH THE BAC DISTRIBUTIONS FOR THE AT FAULT AND NOT AT FAULT DRIVERS FROM THE UNMATCHED INJURY-ACCIDENT GROUP

injury accident drivers. It appears that there is a considerable difference between the at-fault drivers and either the control group or the not-at-fault drivers, while there is very little difference between the control group and the not-at-fault drivers.

Some Chi-square tests were performed using the data presented in Figures 14 and 15 with the following results.

A comparison of the BAC distributions for the control group with the BAC distribution for the matched at-fault accident drivers showed a highly significant difference (Chi-square = 102).

A comparison of the BAC distributions for the matched and unmatched accident drivers showed no significant difference (Chi-square = 2.9).

Due to the relatively small sample sizes and in view of the Chi-square comparisons reported above, it seems reasonable to combine the two injury accident groups. When this is done there is no significant difference between the BAC distributions for the not-at-fault injury accident drivers and the control drivers (Chi-square = 3.2).

A further comparison between the BAC levels was done by performing an Analysis of Covariance using as covariates sex, age and years of education. This provides a test for differences in the mean BAC levels after corrections are made for differences in sex, age and education in the different groups.

While the effect of the covariates was statistically significant, they had very little practical effect as can be seen from the following table:

DRIVER GROUP	MEAN BAC	MEAN BAC ADJUSTED FOR COVARIATES
Matched at-fault	.0509	.0514
Matched not-at-fault	.0268	.0273
Unmatched at-fault	.0530	.0525
Unmatched not-at-fault	.0230	.0232
Control	.0185	.0184

In order to test the hypothesis that the covariates have no effect an F ratio of 5.45 was calculated. Comparison with this value with a table of the F distribution with 3 degrees of freedom for the numerator and 1397 degrees of freedom for the denominator shows this to be statistically highly significant and we conclude that the covariates do have a statistically significant effect. As noted above adjusting for the covariates seems to have little practical effect on the mean BAC's.

In order to test the hypothesis that there is no difference in mean BAC among the different driver groups an F ratio of 16.65 was calculated. This was highly significant (compare to F with 4 d.f. and 1397 d.f.).

In order to investigate further, pairwise comparisons were made between each possible pair of groups with the result that:

(1) Significant differences were found between:

(a) Matched at-fault and matched not-at-fault

(b) Unmatched at-fault and unmatched not-at-fault

(c) Either at-fault group and the control group

(2) No statistically significant differences were found between:

(a) Either not-at-fault group and the control group

(b) The two at-fault groups

(c) The two not-at-fault groups

These results are all in accord with the previous results using the Chi-square tests.

The procedure used in making the comparisons of the group means was Scheffe's method. (The use of simple t-tests for comparing each pair of groups would have given the same conclusions as above for this particular set of data but would be a theoretically incorrect procedure for making multiple comparisons.)

Several calculations have been made which measure the degree of risk or danger for the driver in the higher BAC groups. In all the results presented below, the two accident groups have been combined. This appears to be justified by the results of earlier analyses in this section and is necessary in order to get larger sample sizes for the higher BAC levels. The results in (a) and (b) below are still somewhat unreliable due to the small sample sizes in the higher BAC levels, particularly for the control group.

(a) One measure which has been considered has been termed the "alcohol risk factor." This is defined as the ratio:

$$\frac{\text{Probability of an injury accident for a driver in a specified BAC level}}{\text{Probability of an injury accident for a driver with a BAC} < .03}$$

This ratio will show by how much the risk of being involved in an injury accident is increased for the drinking driver.

Let A_o be the event that a driver has a BAC less than .03;

A_i be the event that a driver has a BAC in the ith BAC level;

and B be the event that a driver has an accident.

The Alcohol Risk Factor can then be stated as

$$\frac{P(B/A_i)}{P(B/A_o)}$$

where $P(B/A_i)$ is the conditional probability of having an accident given that a driver is in the ith BAC level.

From application of elementary probability theory.

$$\frac{P(B/A_i)}{P(B/A_o)} = \frac{P(A_i/B)/P(A_i)}{P(A_o/B)/P(A_o)}$$

The probabilities which are required for the computation of the Alcohol Risk Factor are, of course, unknown. They may be estimated however, from the available data concerning the BAC levels of drivers who were involved in accidents and the BAC levels of non-involved drivers. From the table below it will be noted that $P(A_o)$ is estimated from the control group value for BAC below .03 and $P(A_o/B)$ is estimated from the merged Accident-involved drivers at that BAC level. These values are .7663 and .9032, respectively, and they yield a constant denominator of .8484 for the above formula.

The numerators are determined for each BAC level by dividing the Accident group's proportion at that level by the proportion recorded by the Control group. The Alcohol Risk Factor is then determined by dividing those values by the constant denominator (.8484).

BAC LEVEL	ACCIDENT GROUP (1) $P(A_i/B)$	CONTROL GROUP (2) $P(A_i)$	ALCOHOL RISK FACTOR
.000 - .029	.7663	.9032	1.00
.030 - .059	.0384	.0310	1.46
.060 - .089	.0551	.0372	1.75
.090 - .119	.0234	.0124	2.22
.120 - .149	.0334	.0136	2.88
.150 - .169	.0234	.0062	4.44
$\geq$ .170	.0417	.0037	

(1) The proportions of the drivers in the combined accident groups who are in the specified BAC interval.

(2) The proportion of the drivers in the control group who are in the specified BAC interval.

A plot of the alcohol risk factor versus the midpoints of the BAC intervals used in the calculations is given in Figure 16.

(b) A more important measure of the effect of drinking on driving would be obtained by restricting the accident groups to the at-fault drivers. A calculation similar to that in (a) above enables us to estimate the ratio:

$$\frac{\text{Probability that a driver in a specified BAC level causes an injury accident}}{\text{Probability that a driver with BAC less than .03 causes an injury accident}}$$

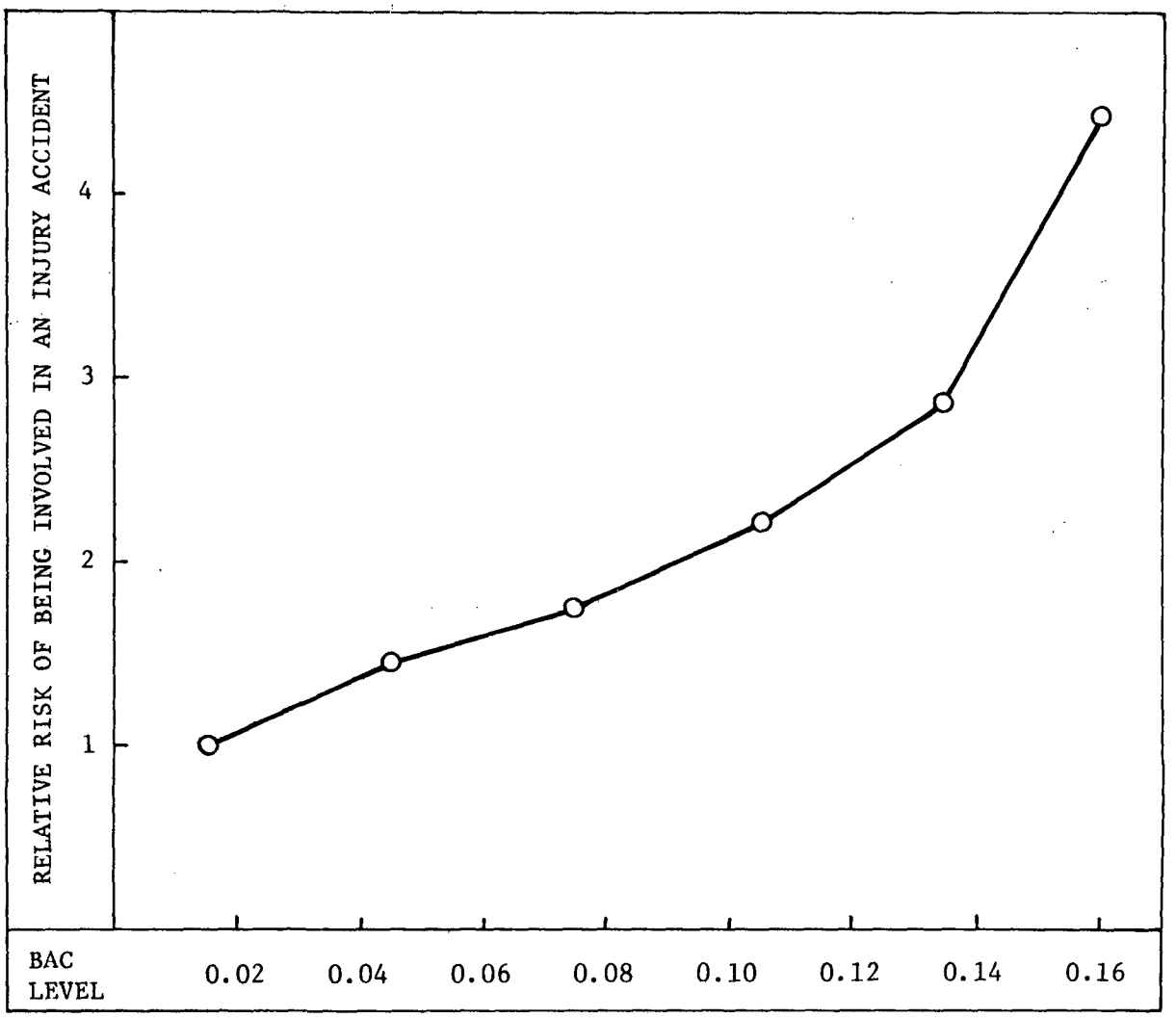


Figure 16. ALCOHOL RISK FACTOR: RELATIVE PROBABILITY THAT A DRIVER IS IN AN ACCIDENT AS A FUNCTION OF HIS BAC LEVEL. THIS PROBABILITY IS RELATIVE TO THE PROBABILITY THAT A DRIVER WITH BAC LESS THAN 0.03 IS IN AN ACCIDENT

For this calculation the same equations are used, but the estimate for $P(A_i/B)$ would be obtained from the combined at-fault drivers.

The results of this calculation are given in Figure 17.

This gives a good indication of the danger to other drivers of the drinking driver. It would tend to indicate that (almost) any amount of drinking will cause a material increase in the danger of causing an accident. As noted previously, the sample sizes in the higher BAC levels are small and better estimates will be available when more data are available.

(c) One further measure of the danger caused by the driver in the higher BAC levels is a comparison of the proportion of accidents caused by drivers in the higher BAC levels to the proportion of drivers in those levels from the control group.

This is shown in Table 14.

TABLE 14. PROPORTION OF ACCIDENTS CAUSED BY AT-FAULT DRIVERS

BAC LEVEL	PERCENT OF ACCIDENTS CAUSED BY DRIVERS AT OR ABOVE GIVEN BAC LEVEL (1)	PERCENT OF DRIVERS AT OR ABOVE GIVEN BAC LEVEL IN CONTROL POPULATIONS (2)
Greater than .03	34	10
Greater than .06	31	7
Greater than .10	22	3
Greater than .15	14	1

(1) For the combined at-fault drivers - from Figures 14 and 15

(2) For the control drivers - from Figure 14

This table would indicate by how much accidents could be reduced if drivers above a given BAC level could be prevented from driving.

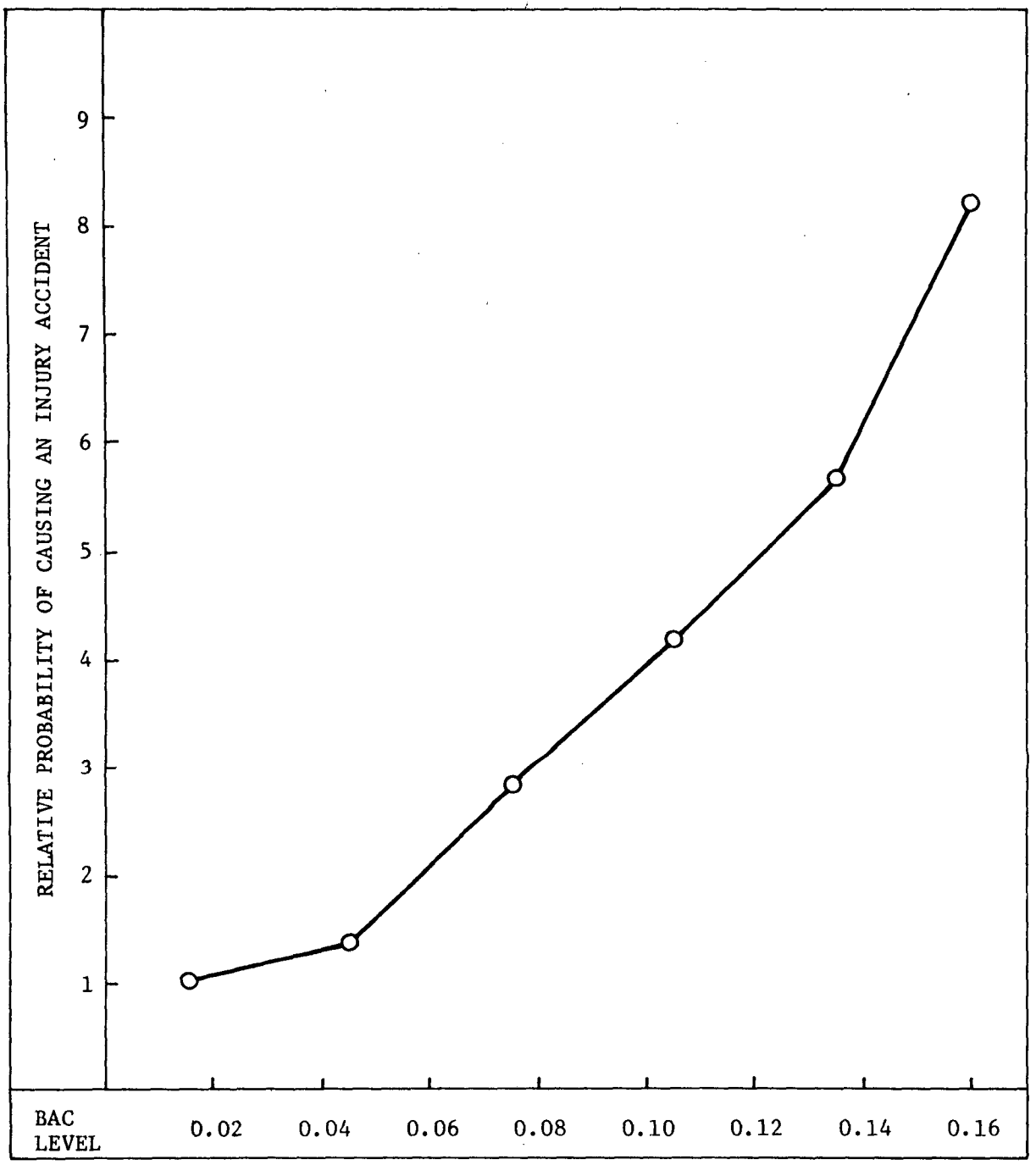


Figure 17. RELATIVE PROBABILITY THAT A DRIVER CAUSES AN ACCIDENT AS A FUNCTION OF HIS BAC LEVEL. THIS PROBABILITY IS RELATIVE TO THE PROBABILITY THAT A DRIVER WITH BAC LESS THAN 0.03 CAUSES AN ACCIDENT

The breakdown of BAC's into the categories referred to above was not an arbitrary action. It was decided that readings up to .029 would be classified as non-drinking because experience proved that many elements other than alcohol could affect a BAC reading and by establishing this level, the chances of improper categorizing would be minimal. For example, smoking and certain types of breath deodorizers sometimes increase the reading of the Breath Analyzer. The amount of increase varies depending upon a number of factors. However, the increase is normally not very large. Still, this factor (plus the normal variability of this instrument) led to the judgment of providing a buffer between indications of alcohol consumption and non-alcohol consumption.

The judgment to draw a line between those obtaining BAC's over .100 and those below was based on the knowledge that a large number of states classify drinking drivers for legal purposes above and below that measurement.

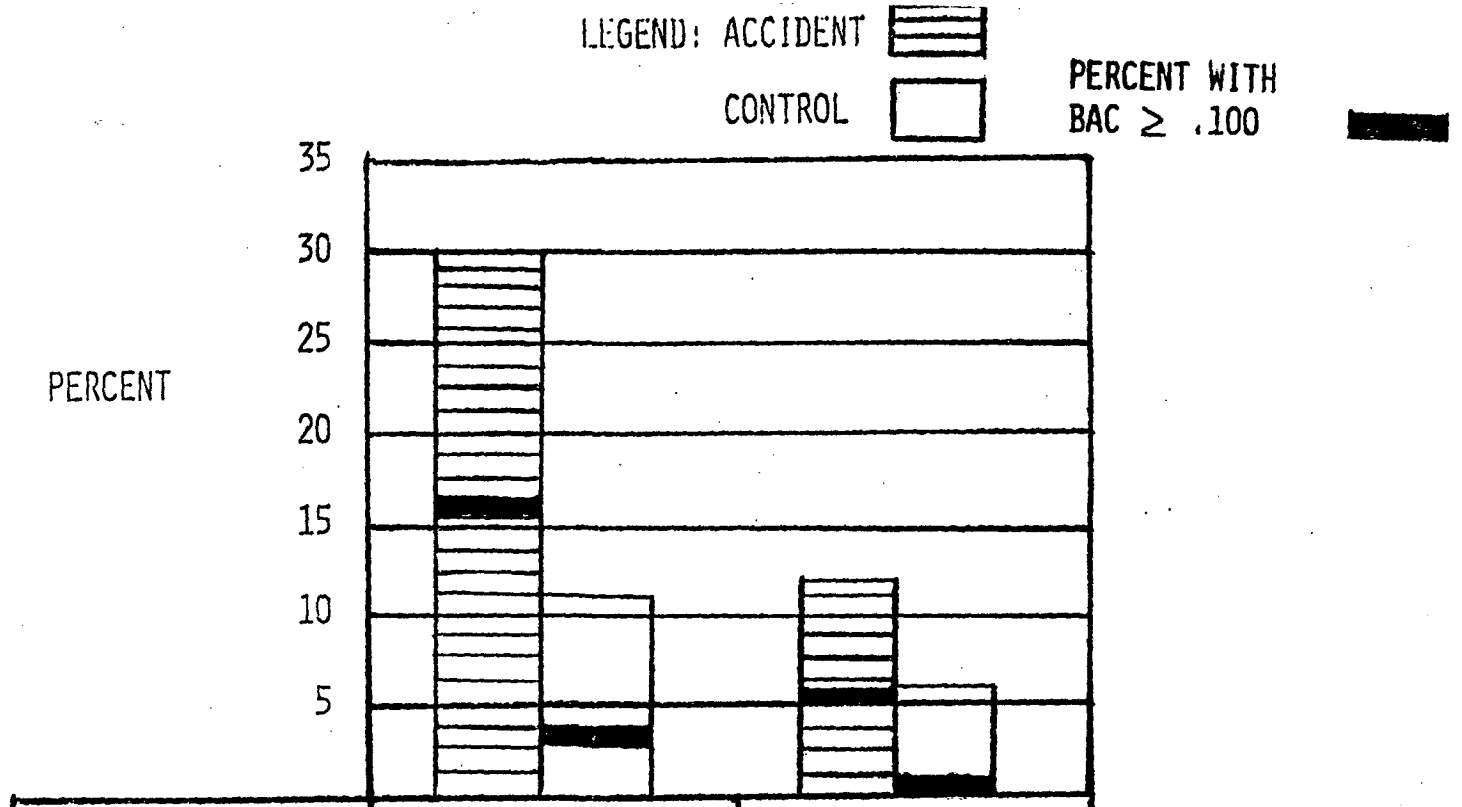
BAC Measurement Across Different Variables

In Figures 18 through 27, which follow, the distribution of BAC measurement classes across some of the variables discussed previously is presented. These data may not relate directly to the role that alcohol played in the accidents but do provide insights into the different factors that may be involved with the drinking driver.

Figure 18 provides data which shows that a higher percentage of male drivers had positive BAC's than female drivers with regard to the total number of drivers in their respective sex category. This higher proportion existed with both the accident and control drivers and the margin of difference was significant in both groups. Also shown in Figure 18 is the percent of males and females with BAC's $\geq$ .100. As noted, the differences in percents with BAC's $\geq$ .100 are very similar to the differences in percent with positive BAC's.

Figure 19 includes data for both accident and control groups and shows the number and percentage of drivers with positive BAC's by educational level. The percent of drivers with BAC's $\geq$ .100 for both groups is also presented. By reviewing these results, consistent trends are not readily apparent.

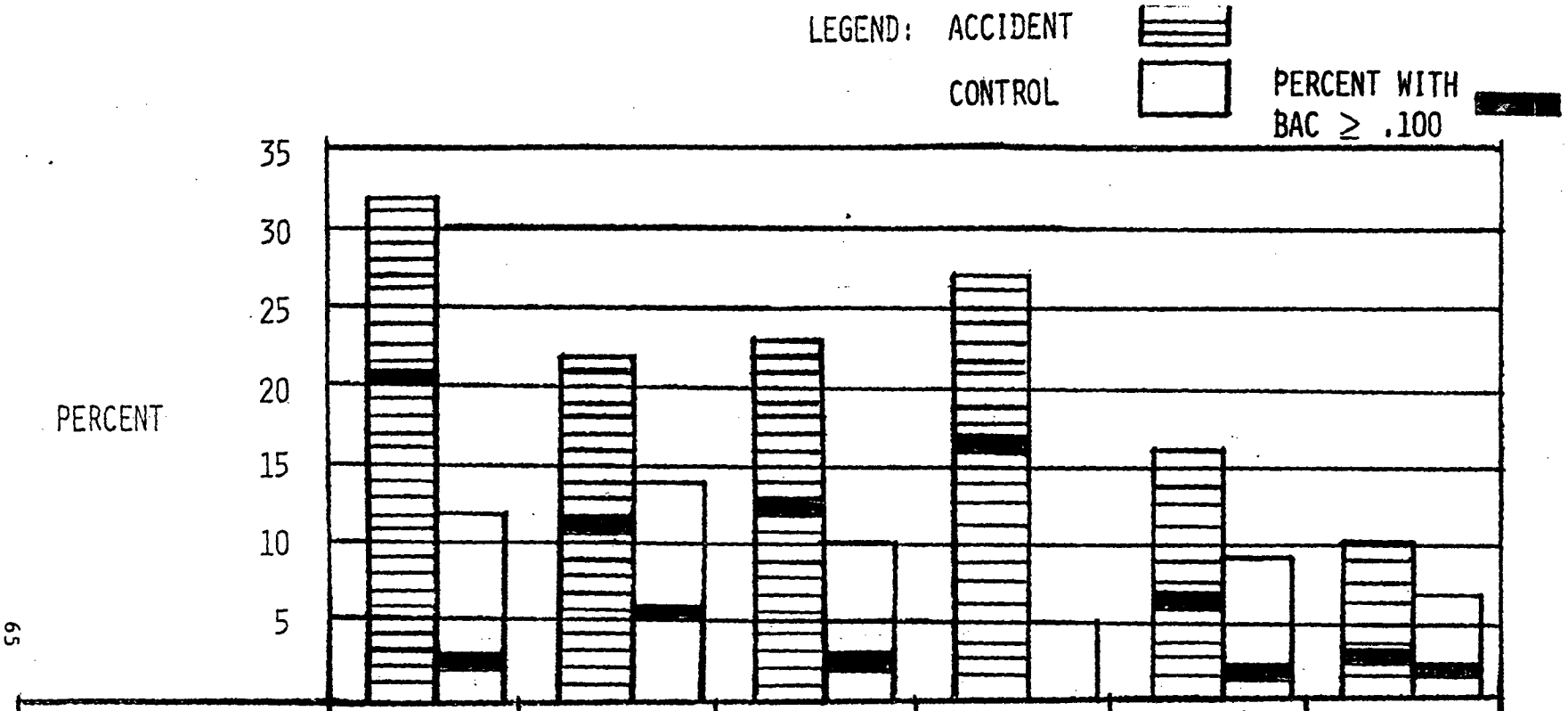
Injury classification for use in this study was standardized by utilizing the Alabama Uniform Traffic Accident Report. This report was filled out by the police officer on duty for each accident sampled in the study. After reviewing this report, injuries were classified by the researcher as none, minor, serious, or critical. An injury in the category of at least minor must have been involved in each accident sampled due to the nature of the requirements of the study. For some accidents, more than one type of injury occurred. For example one



SEX OF DRIVER	MALE		FEMALE	
ALL IN CLASS/NO. ≥ .030 BAC	TOTAL	NO. ≥ .030	TOTAL	NO. ≥ .030
ACCIDENT DRIVERS	375	113	221	27
CONTROL DRIVERS	571	65	223	13

ACCIDENT-C.R. 5.54
CONTROL -C.R. 2.70
$P < .01$

FIGURE 18.
PERCENT OF MALES AND FEMALES WITH POSITIVE BAC IN ACCIDENT AND CONTROL GROUPS

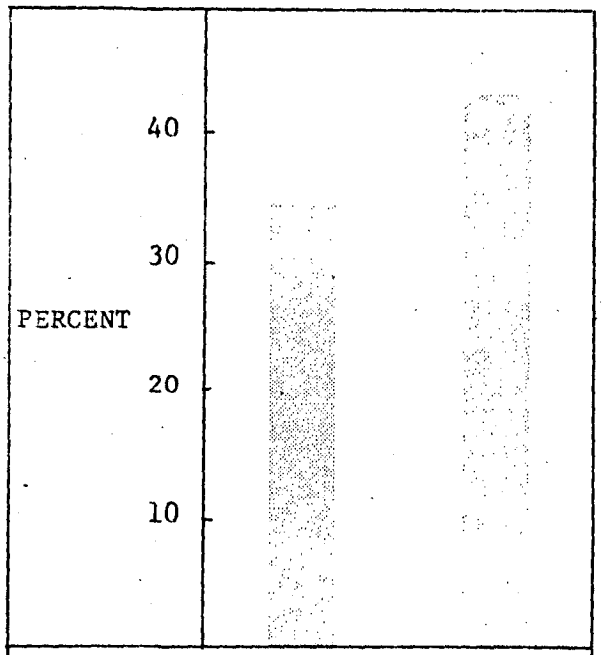


EDUCATIONAL LEVEL	LESS THAN 8		8-11		H.S. GRAD		1 - 3 YRS. COLL.		COLL. GRAD		GRAD DEG.	
ALL IN CLASS/NO. ≥ .030 BAC	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030
ACCIDENT DRIVERS	38	12	169	38	221	51	108	29	43	7	29	3
CONTROL DRIVERS	58	7	169	24	257	26	179	9	98	9	44	3
PERCENT RATIO ACCIDENT/CONTROL	2.7/1		1.6/1		2.3/1		5.4/1		1.8/1		1.4/1	

FIGURE 19. PERCENT OF ACCIDENT AND CONTROL DRIVERS WITH POSITIVE BAC BY EDUCATIONAL LEVEL

driver could have sustained a minor injury while one of the passengers could have been seriously injured in the same accident. For that accident, the worst type of injury would be classified as serious. Data was reviewed to determine the worst type of injury for each accident and the relationship to alcohol involvement.

Figure 20 presents the percentage of worst type of injury accidents with at least one driver having a positive BAC. As shown in Figure 20 the more serious the injury produced by the accident the greater the percent of drivers with a positive BAC.



CATEGORY	MINOR	SERIOUS AND CRITICAL
TOTAL NUMBER	235	136
No ≥ 0.030	79	59

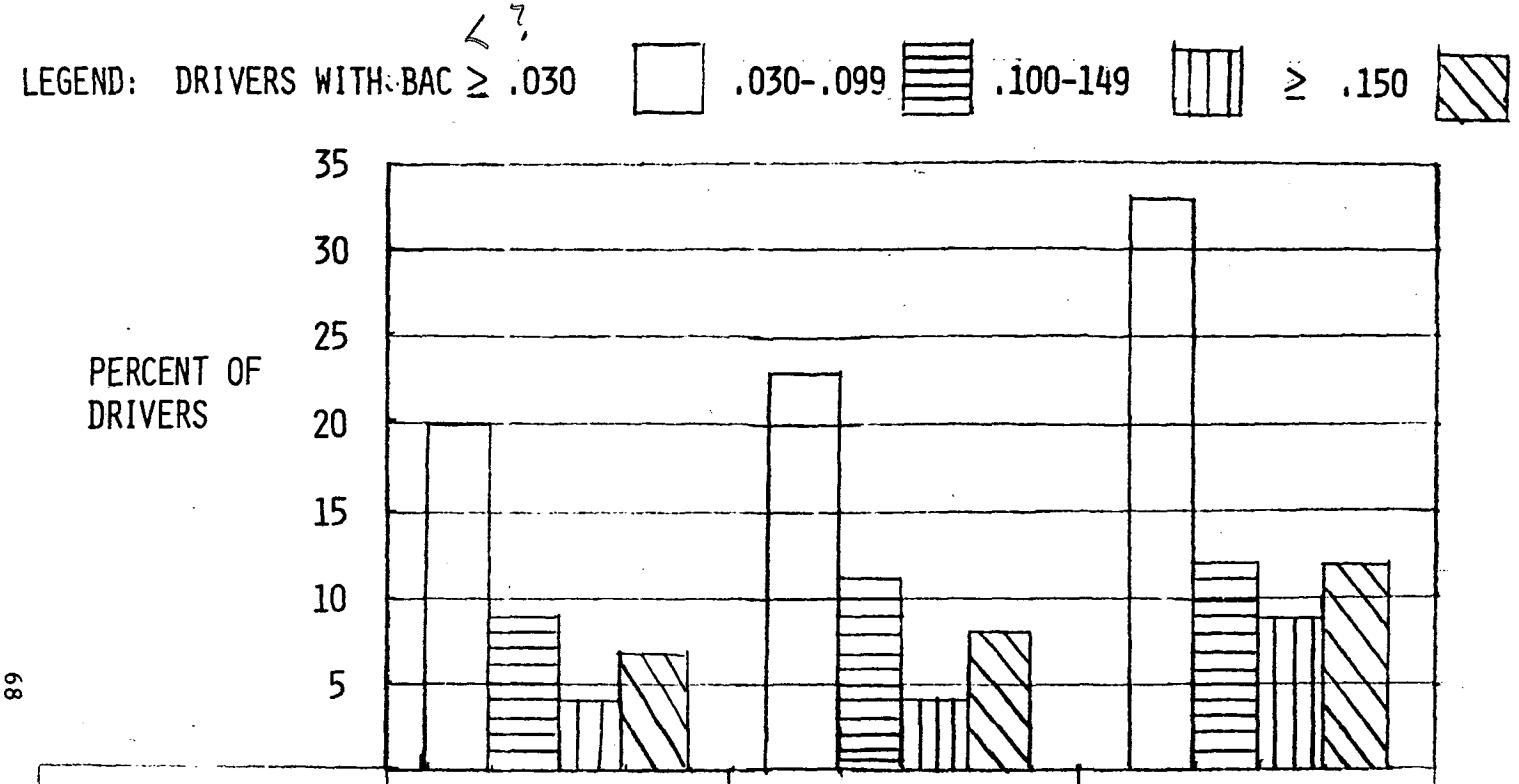
Figure 20. PERCENTAGE OF WORST TYPE INJURY PRODUCING ACCIDENT (BY DRIVERS OR PASSENGERS) WITH AT LEAST ONE DRIVER HAVING A POSITIVE BAC WITH RESPECT TO THE TOTAL NUMBER OF WORST TYPE INJURY PRODUCING ACCIDENTS

Figure 21 provides data which shows the percent of drivers with positive BAC's by the type of injury sustained by the driver. As Figure 21 indicates, the more serious the injury to the driver the greater the proportion of drivers with BAC's of .030 or higher. Also shown is a breakdown of BAC's above .030. The percent of drivers with higher BAC levels more closely approximates those with lower BAC levels as the injury becomes more serious.

Figure 22 provides data which indicates the percentage of accidents by type of collision in which at least one of the drivers had a positive BAC or a BAC $\geq$ .100. As noted, the percentage of accidents with drivers having positive BAC's or BAC's $\geq$ .100 was higher in single car accidents than in any other type collision.

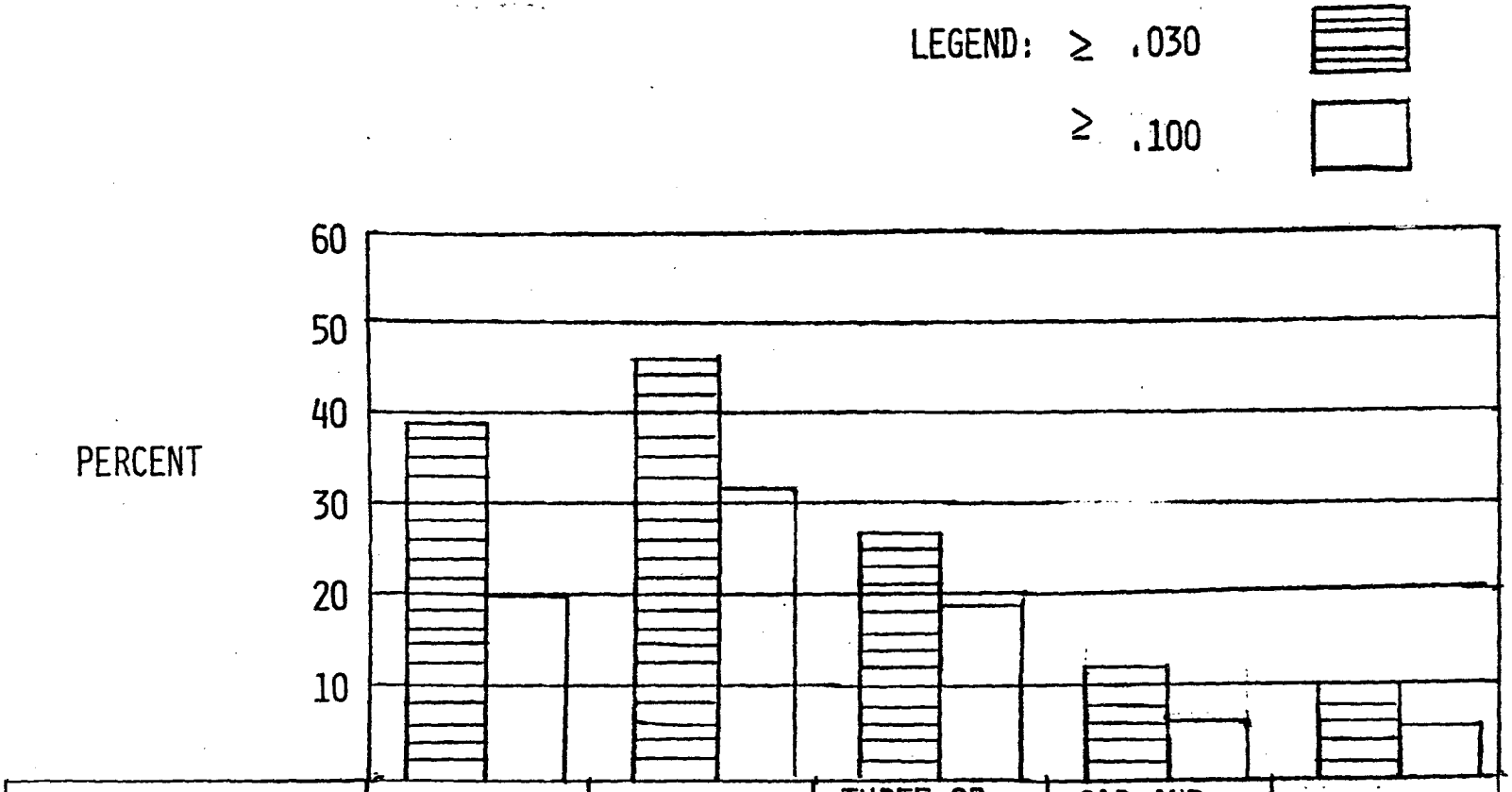
Figure 23 presents the number and percent of accident and control drivers in each age category who had positive BAC's. As can be observed the younger drivers in the accident group as well as those in the control group have a lower percentage of drivers with a positive BAC. The overall trend appears about the same for both groups. Provided also is an indication of the percent of drivers with a BAC $\geq$ .100. As with other variables, the percent ratios are approximately the same between the accident and control groups whether the comparison is between drivers with a positive BAC or with BAC's $\geq$ .100.

In Figure 23 we noted that a smaller percentage of younger drivers had positive BAC's. However, in Figure 24, which shows the relative risk of being involved in an accident for drivers with a positive BAC as a function of age, we see that when the younger driver does drink he is a greater hazard. The statistical method that was used to develop this curve was the same used for the alcohol risk factor curve shown previously in Figure 16.



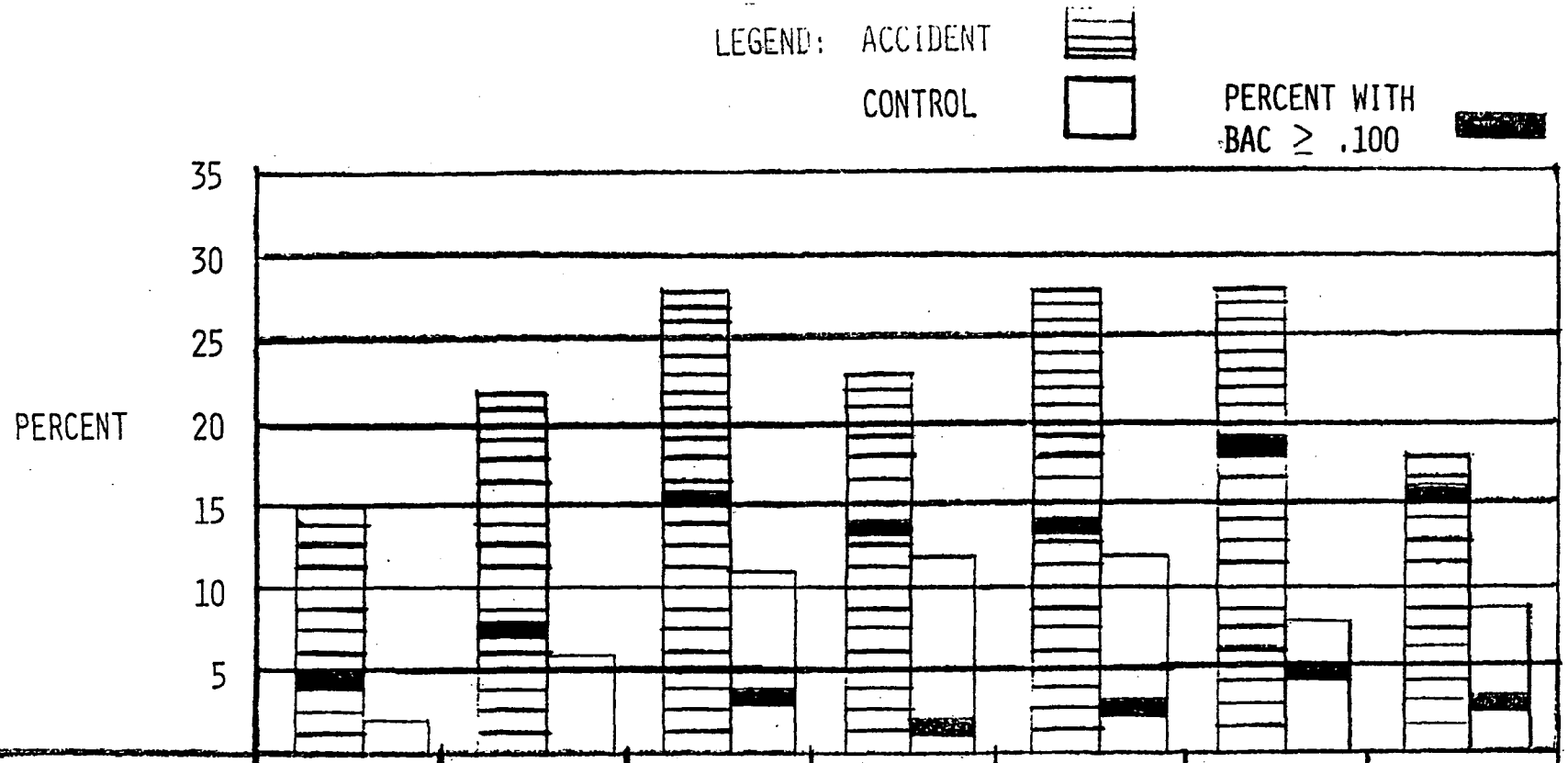
TYPE INJURY	NONE		MINOR		SERIOUS CRITICAL	
NO. DRIVERS IN EACH TYPE	228		267		101	
NO. ≥ .030 IN TYPE	46	(20%)	61	(23%)	33	(33%)
NO. .030 - .099 IN TYPE	21	(9%)	20	(11%)	12	(12%)
NO. .100 - .149 IN TYPE	10	(4%)	11	(4%)	9	(9%)
NO. ≥ .150 IN TYPE	15	(7%)	21	(8%)	12	(12%)

FIGURE 21. PERCENT OF ACCIDENT DRIVERS WITH DIFFERENT BAC LEVELS BY TYPE OF INJURY TO THE DRIVERS



CATEGORY	TWO CAR	SINGLE CAR	THREE OR MORE CARS	CAR AND MOTORCYCLE	CAR AND OTHER TYPE
TOT. ACCIDENTS IN EACH CATEGORY	219	90	26	17	20
NO. ≥ .030 IN CATEGORY	86	41	7	2	2
NO. ≥ .100 IN CATEGORY	43	28	5	1	1

FIGURE 22. PERCENT OF TYPES OF ACCIDENTS WITH AT LEAST ONE DRIVER HAVING A POSITIVE BAC OR A BAC ≥ .100 WITH RESPECT TO THE TOTAL NUMBER OF ACCIDENTS IN EACH CATEGORY



AGE CLASS	14-17		18-19		20-24		25-34		35-44		45-54		≥ 55	
ALL IN CLASS/NO. ≥ .030 BAC	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030	TOT.	≥ .030
ACCIDENT DRIVERS	83	12	51	11	104	29	138	32	93	26	70	20	57	10
CONTROL DRIVERS	56	1	55	3	129	14	204	24	163	19	109	9	88	8
PERCENT RATIO ACCIDENT/CONTROL	7.5/1		3.7/1		2.5/1		1.9/1		2.3/1		3.5/1		2/1	

FIGURE 23. PERCENT OF ACCIDENT AND CONTROL DRIVERS WITH POSITIVE BAC'S IN DIFFERENT AGE CATEGORIES

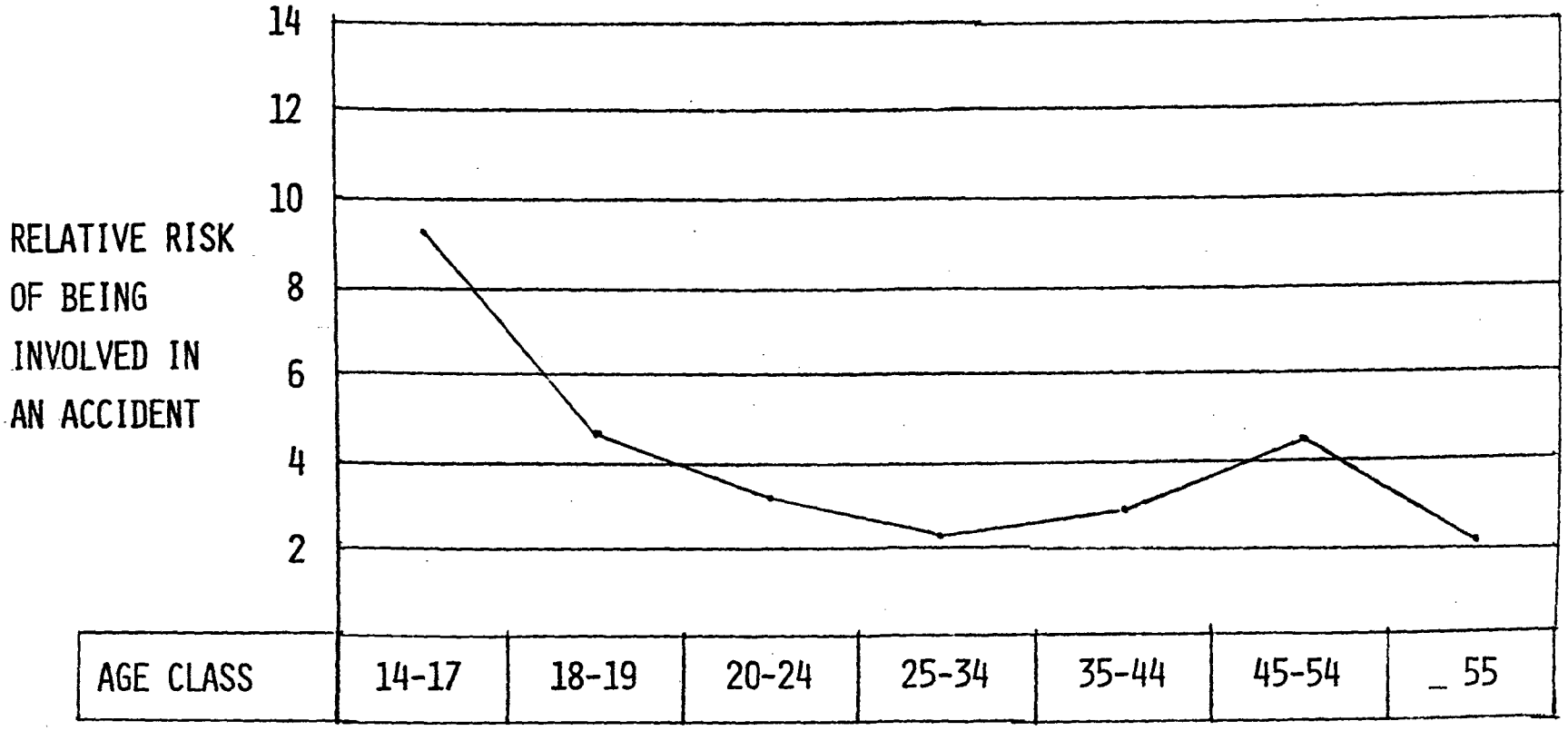


FIGURE 24.

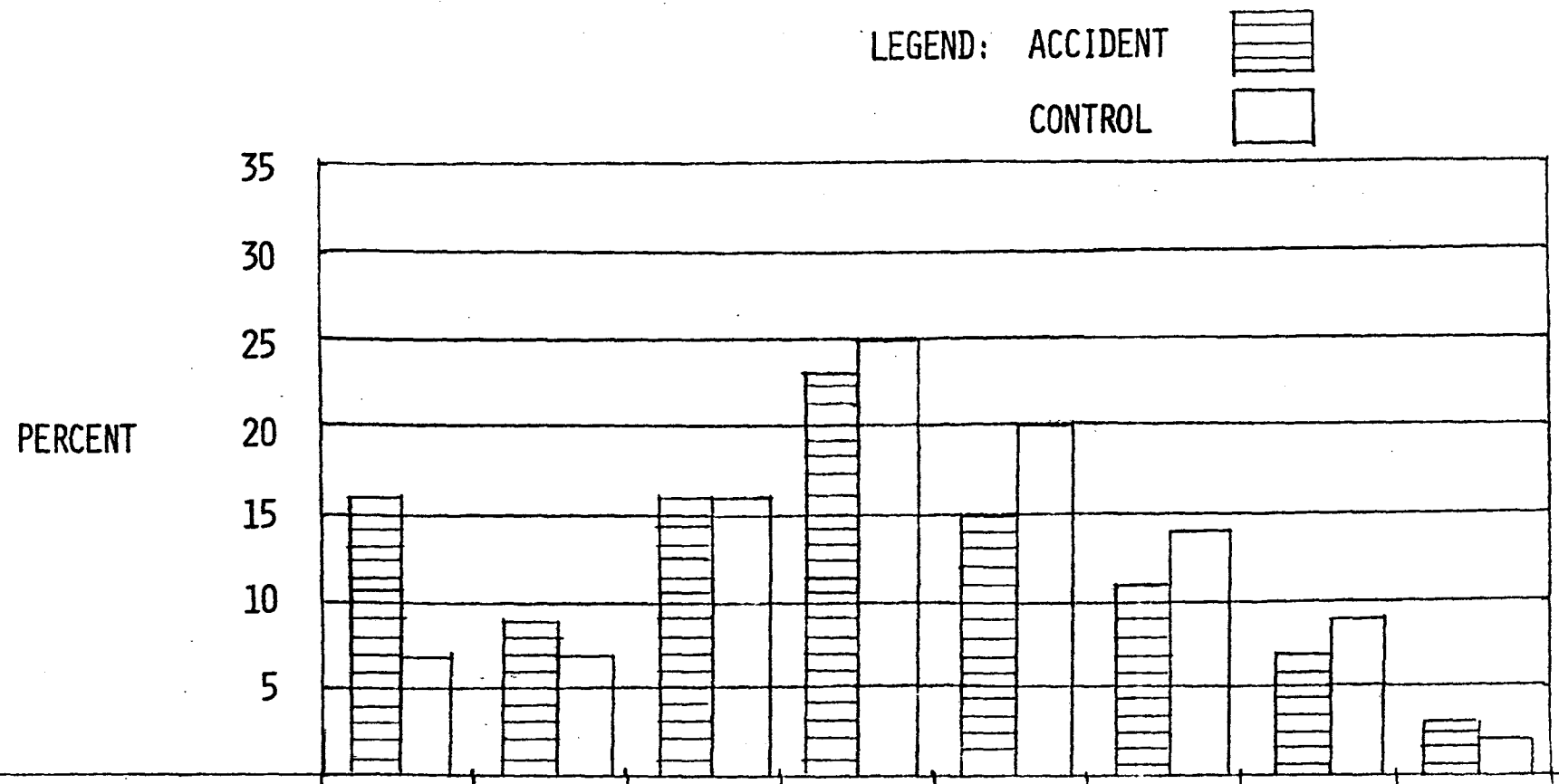
RELATIVE RISK OF BEING INVOLVED IN AN ACCIDENT FOR DRIVERS WITH A POSITIVE BAC AS A FUNCTION OF AGE

Figure 25 shows the percent of accident and control drivers with BAC less than .030 by age classifications. The data in this figure excludes all drinkers. Therefore, by comparing the Involvement Indexes in this presentation with those of Figure 7, where the drinkers and non-drinkers were included, the effect of alcohol can be noted. It is interesting to observe that the Indexes changed very little. In fact, for the younger drivers, the Index rose slightly. This lack of impact on the general over-or under-representation (when excluding the effect of alcohol) suggests that factors in addition to drinking cause over-involvement by youths (such as driver inexperience or driver attitude).

Additional attention was given to determining the differences that existed between youths and adults by analyzing more deeply the data associated with annual mileage and the probability of involvement in an injury-producing accident.

Figure 26 presents the average reported annual mileage by age groups of accident and control drivers. The data shows that the trend is basically the same for both groups of drivers with the younger drivers driving less.

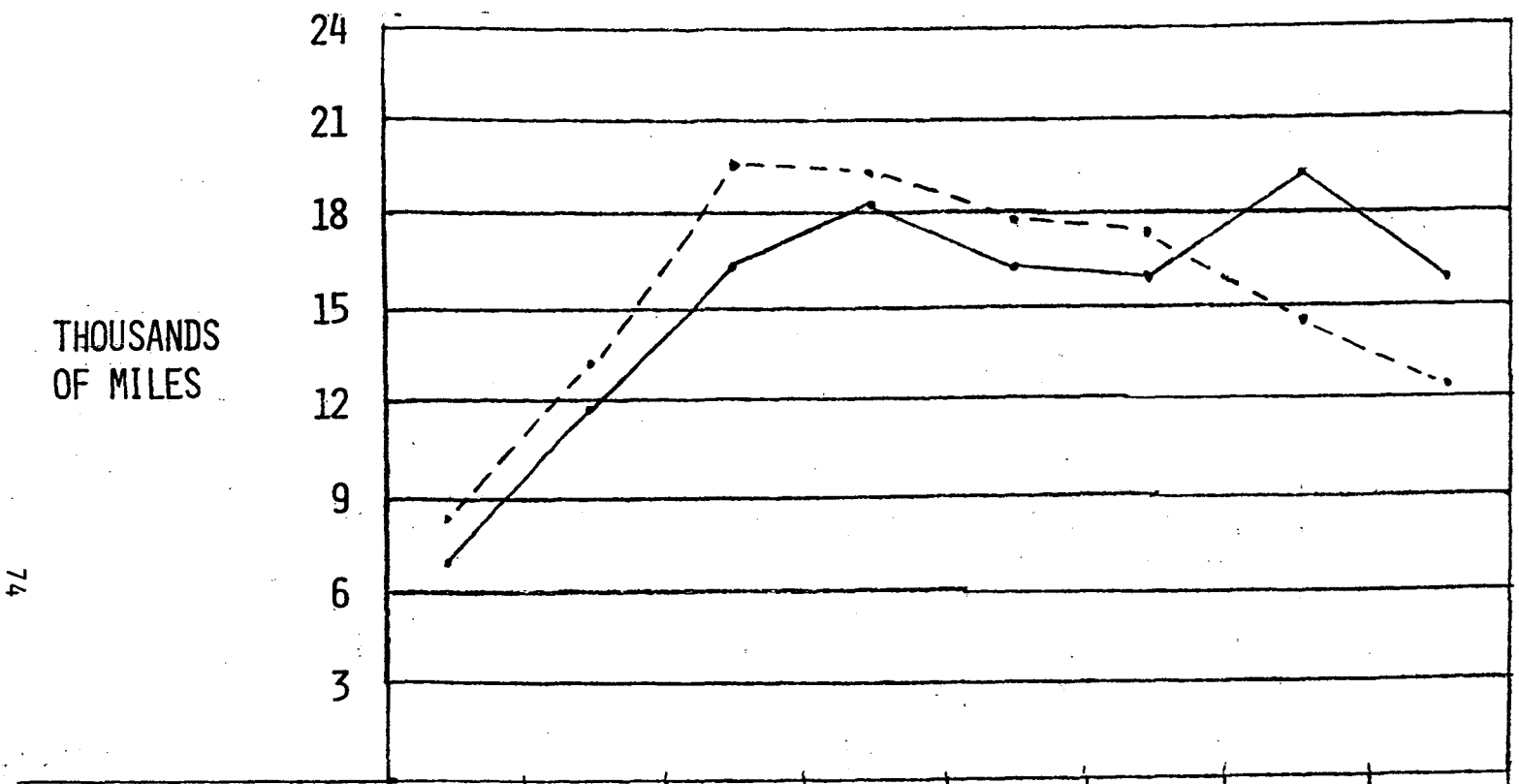
Figure 27 shows the relative probability by age group of being involved in an accident by BAC level relative to a driver with a BAC less than .030. This presentation is a breakdown by age group of the basic alcohol risk factor chart shown previously in Figure 16. While the N's are relatively small, which provide for the "saw-tooth" effect observed, the trend is not unclear. The younger drivers fall, however unevenly at or above the composite curve projected from Figure 16, while the older drivers fall at or below.



AGE CLASS	14-17	18-19	20-24	25-34	35-44	45-54	55-64	≥ 65	TOTAL
N-ACCIDENT DRIVERS	71	40	75	106	67	50	34	13	456
N-CONTROL DRIVERS	55	52	115	180	144	100	64	16	726
INVOLVEMENT INDEX	+ 44.9	+ 14.3	+ 2.7	- 3.6	- 17.3	- 13.8	- 10.5	+ 18.2	

$x^2 = 23.03$
$P < .01$

FIGURE 25. PERCENT OF ACCIDENT AND CONTROL DRIVERS WITH BAC LESS THAN .030 BY AGE CLASSIFICATIONS



AGE CLASS	14-17	18-19	20-24	25-34	35-44	45-54	55-64	≥ 65
ACCIDENT AVERAGE	7,000	11,890	16,820	18,170	16,520	16,260	19,280	16,150
CONTROL AVERAGE	8,550	13,880	19,950	19,260	17,960	17,410	14,650	12,130

FIGURE 26. AVERAGE REPORTED ANNUAL MILEAGE BY AGE GROUPS OF ACCIDENT AND CONTROL DRIVERS

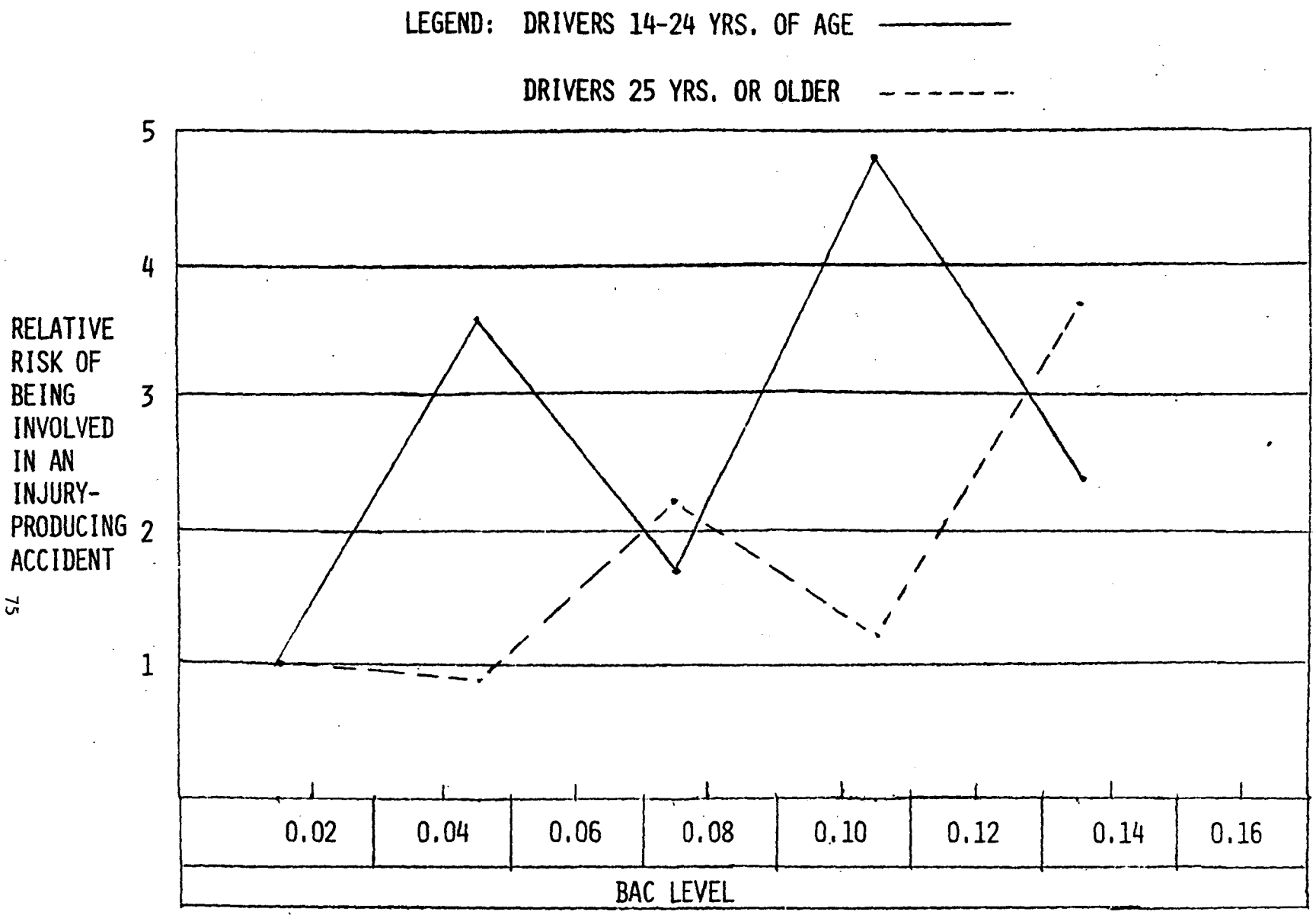


FIGURE 27. RELATIVE PROBABILITY BY AGE GROUP OF BEING INVOLVED IN AN ACCIDENT BY BAC LEVEL RELATIVE TO A DRIVER WITH A BAC LESS THAN .030

Tables 15 and 16 present the numbers and percent of accident and control drivers with positive BAC's by time of day and day of week with respect to drivers who did not have positive BAC's at the same times of day and day of week.

Much data is contained in these tables and a number of relationships may be determined. However, the most significant relationships are depicted in Figures 28 and 29. Presented in these figures are percentages (taken from the tables) of accident and control drivers with positive BAC by hour of the day and day of the week.

As indicated in both figures the trends are the same for both groups but more pronounced for the accident drivers. In Figure 28 it is apparent that the percentage of drivers with positive BAC's for both groups becomes much higher as evening approaches and increases past midnight to a point where it begins to level and then decreases through noon where a leveling again occurs. In Figure 29 there is a slow increase of positive BAC frequency beginning at a low on Monday and reaching the high point on the weekend. In both figures there is an unevenness in the movement of the lines connecting the percentage points. For example, in Figure 29 the percentage of accident drivers with positive BAC's rises sharply on Thursday and in Figure 28 the percentage of control drivers with positive BAC's increases markedly between the hours of 3 to 6 A.M. However, the overall trends are consistent in their direction.

TABLE 15. PERCENT OF ACCIDENT DRIVERS WITH POSITIVE BAC BY TIME OF DAY AND DAY OF WEEK WITH RESPECT TO ACCIDENT DRIVERS WHO DID NOT HAVE A POSITIVE BAC AT SAME TIMES OF DAY AND DAY OF WEEK

TIME / DAY	M-3 A.M.			3-6 A.M.			6-9 A.M.			9-N			12-3 P.M.			3-6 P.M.			6-9 P.M.			6-M			TOTAL		
	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%	TOT	≥ .030	%
MONDAY	1	1	100	0	-	-	4	0	0	4	1	25	13	1	8	20	2	10	12	3	25	6	2	33	60	10	17
TUESDAY	3	3	100	0	-	-	4	0	0	2	0	0	10	3	30	30	5	17	22	2	9	9	3	33	80	16	19
WEDNESDAY	1	1	100	1	0	0	4	0	0	4	0	0	14	1	7	26	2	8	19	3	16	4	1	25	73	8	11
THURSDAY	4	3	75	0	-	-	3	0	0	7	1	14	10	3	30	41	5	12	13	3	23	17	13	76	95	28	29
FRIDAY	2	0	0	0	-	-	2	0	0	2	0	0	21	2	10	60	9	15	21	6	29	15	9	50	123	26	21
SATURDAY	7	4	57	5	1	20	4	0	0	12	2	17	13	4	31	36	6	17	11	5	45	12	5	42	100	27	27
SUNDAY	12	10	83	3	0	0	4	1	25	1	0	0	10	3	30	22	5	23	8	4	50	5	2	40	65	25	38
TOTAL	30	22	73%	9	1	11%	25	1	4%	32	4	13%	91	17	19%	235	34	14%	106	26	25%	68	35	51%	596	146	23

TABLE 16. PERCENT OF CONTROL DRIVERS WITH POSITIVE BAC BY TIME OF DAY AND DAY OF WEEK WITH RESPECT TO CONTROL DRIVERS WHO DID NOT HAVE A POSITIVE BAC AT SAME TIMES OF DAY AND DAY OF WEEK

TIME / DAY	M-3 A.M.			3-6 A.M.			6-9 A.M.			9-N			12-3 P.M.			3-6 P.M.			6-9 P.M.			6-M			TOTAL		
	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%	TOT	≥.030	%
MONDAY	2	1	50	0	-	-	4	0	0	12	1	8	2	0	0	25	3	12	19	0	0	1	0	0	65	5	8
TUESDAY	4	2	50	0	-	-	2	0	0	3	0	0	21	1	5	32	1	3	19	1	5	15	4	27	96	9	9
WEDNESDAY	7	3	43	0	-	-	4	0	0	8	0	0	10	0	0	25	1	4	29	5	17	5	0	0	88	9	10
THURSDAY	2	0	0	0	-	-	4	0	0	5	0	0	26	1	4	62	2	3	29	4	14	14	1	7	142	8	6
FRIDAY	8	2	25	0	-	-	0	-	-	0	-	-	23	1	4	75	2	3	62	9	15	28	5	18	196	19	10
SATURDAY	15	2	13	5	2	40	9	0	0	7	0	0	42	3	7	50	5	10	13	2	15	20	7	35	161	21	13
SUNDAY	3	1	33	10	4	40	7	1	14	0	-	-	14	0	0	19	1	5	2	0	0	1	0	0	56	7	12
TOTAL	41	11	27%	15	6	40%	30	1	3%	35	1	3%	138	6	4%	288	15	5%	173	21	12%	84	17	20%	804	78	10

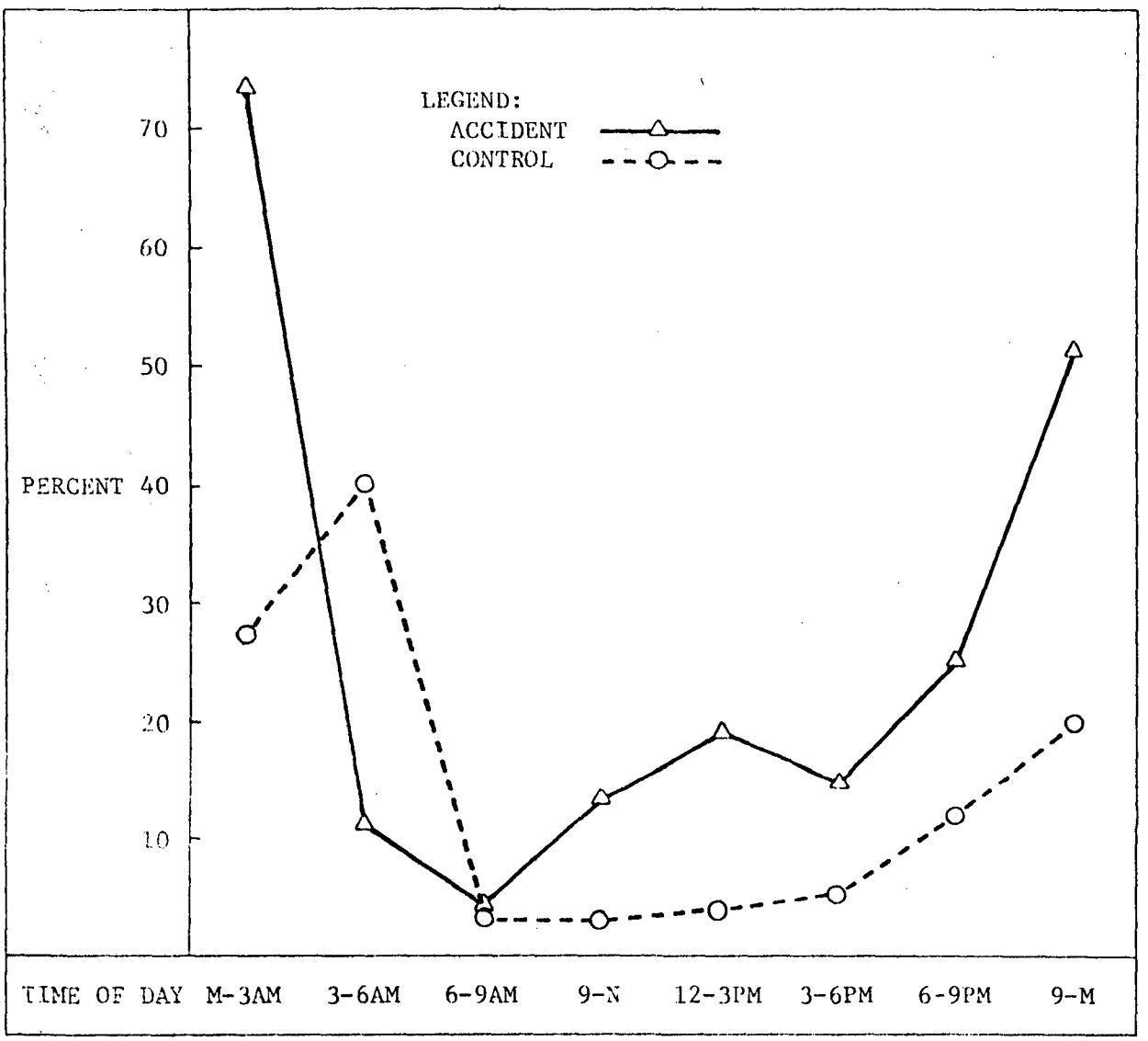


Figure 28. PERCENTAGE PLOTS OF ACCIDENT AND CONTROL DRIVERS WITH POSITIVE BAC BY HOUR OF DAY

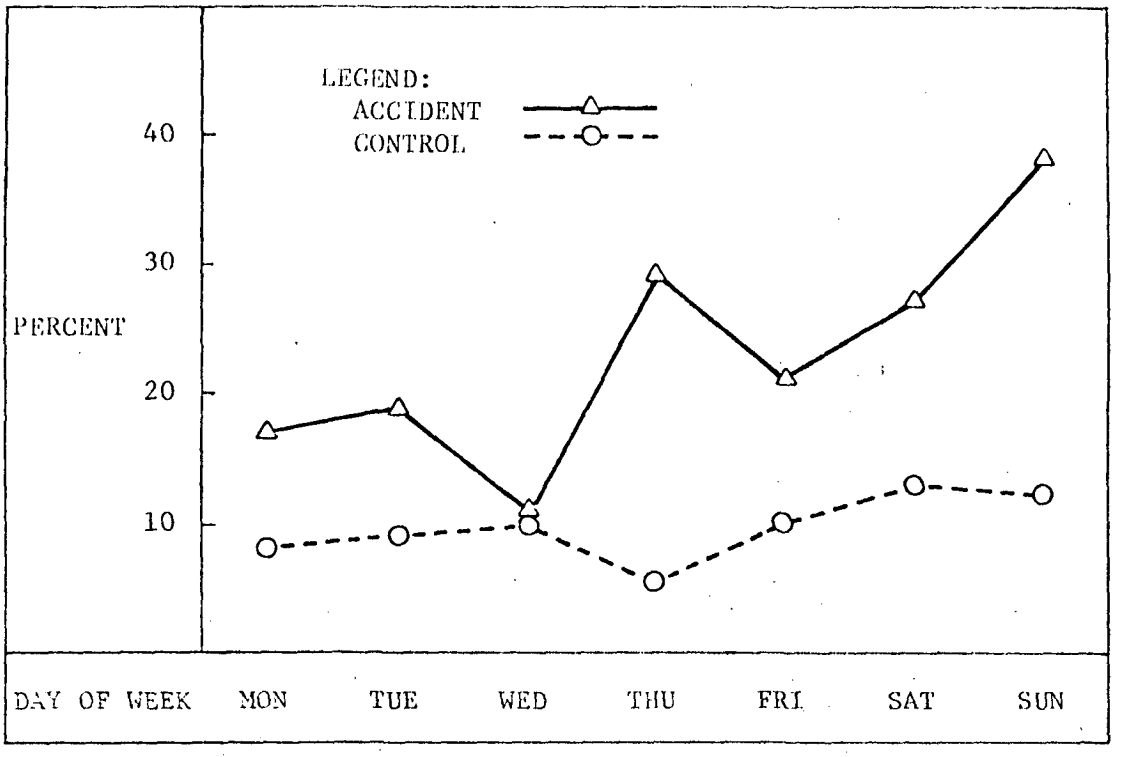


Figure 29. PERCENTAGE PLOTS OF ACCIDENT AND CONTROL DRIVERS WITH POSITIVE BAC BY DAY OF WEEK

As discussed earlier, BAC estimates were made for those drivers for whom BAC measurements were not able to be obtained. In the accident group a majority of these drivers were judged to have positive BAC's. This was not true of the control group. Another significant difference was that refusals in the accident group were almost all male, whereas for the control group there was an approximately equal number of males and females. There were no other characteristics that distinguished the accident group of BAC failures from the control group of BAC failures.

Also included in this report are some comparisons made with other studies. Although this is the first study that has dealt directly with the involvement of alcohol in injury-producing accidents, other studies have produced data with which some comparisons can be made. For example, in the Grand Rapids study focus was placed on all types of automobile accidents. However, from the data presented some statistics were available on 1,420 injury-producing and fatal accidents. Since only 15 fatals of the total number of 1,420 are reflected in the percentages provided and since it was not possible to extract the 15, they are included in the percentages shown in Figure 30. As can be seen, the percent of injured drivers who had been drinking in the Huntsville study was almost twice as high as those in the Grand Rapids study. The reasons for this difference are not totally clear. However, the size of the difference does not appear as significant when considering the Grand Rapids study was conducted approximately 12 years ago, in a different locale, and with the use of different breath alcohol content measuring devices. Also, the percent of control drivers who were drinking in the Huntsville study was also much higher than the control drivers in the Grand Rapids

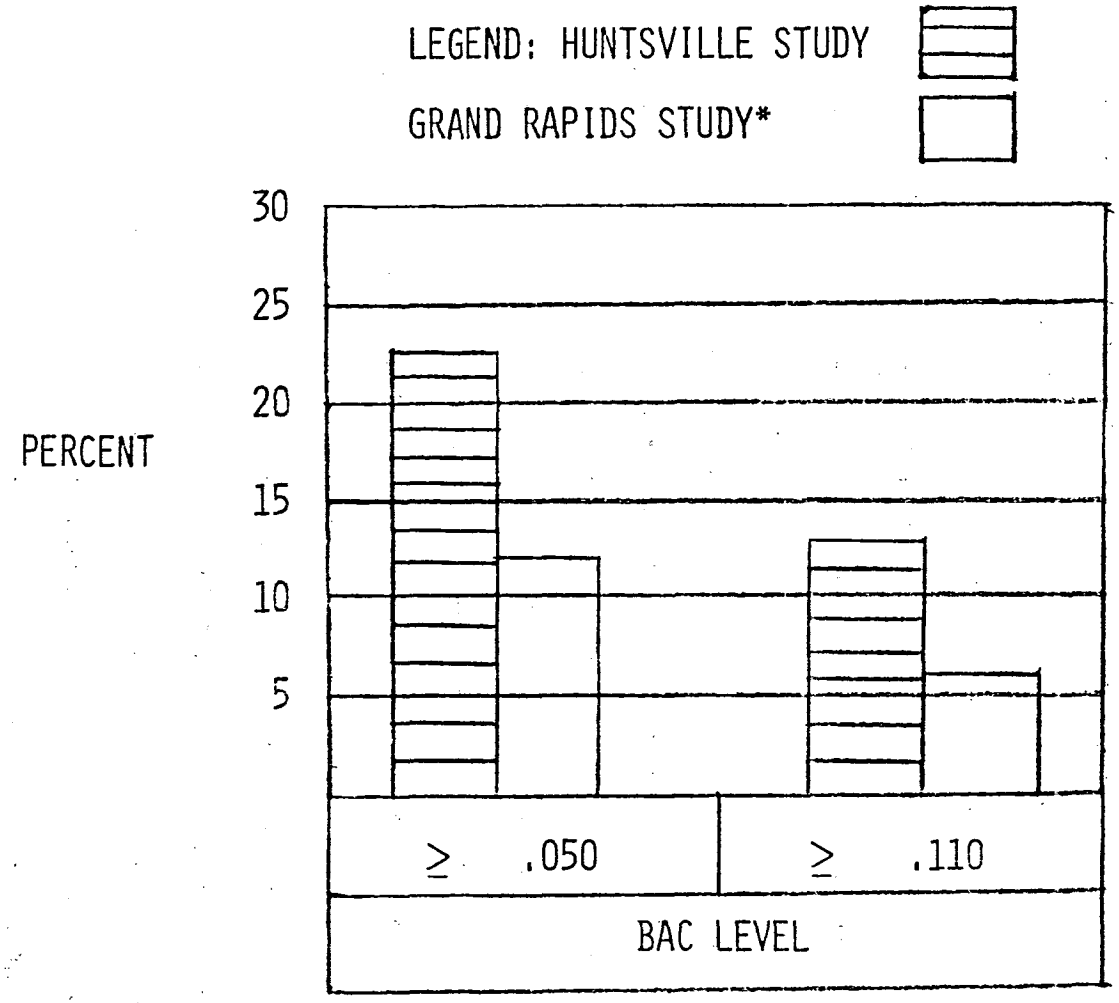


FIGURE 30. PERCENT OF INJURED DRIVERS WHO HAD BEEN DRINKING COMPARED TO PERCENT OF INJURED DRIVERS FROM GRAND RAPIDS STUDY WHO HAD BEEN DRINKING

* BORKENSTEIN, ET AL, 1963

study. In fact, approximately three times as high. In making comparisons of this type it should also be stated that of the more current roadside surveys that have been conducted (which resemble the type of samples obtained in the Huntsville and Grand Rapids control groups) the percent of drivers with positive BAC's are much closer to those obtained in the Huntsville control group than with the Grand Rapids control group.

A comparison was also made with studies which involved only fatalities. Figure 31 shows the percent of injured drivers in the Huntsville study who had been drinking compared to the percent of fatal drivers from the University of Michigan and Wisconsin studies who had been drinking. The data presented shows the percent of injured drivers in the Huntsville study who were drinking is lower than the percent of fatal drivers who had been drinking, in both of the other studies and at all BAC levels.

The results of these comparisons are not inconsistent with the results of data presented in Figure 20. It will be recalled that the data presented in Figure 20 suggested that the more serious the injury produced by an accident the greater the percent of drivers with a positive BAC.

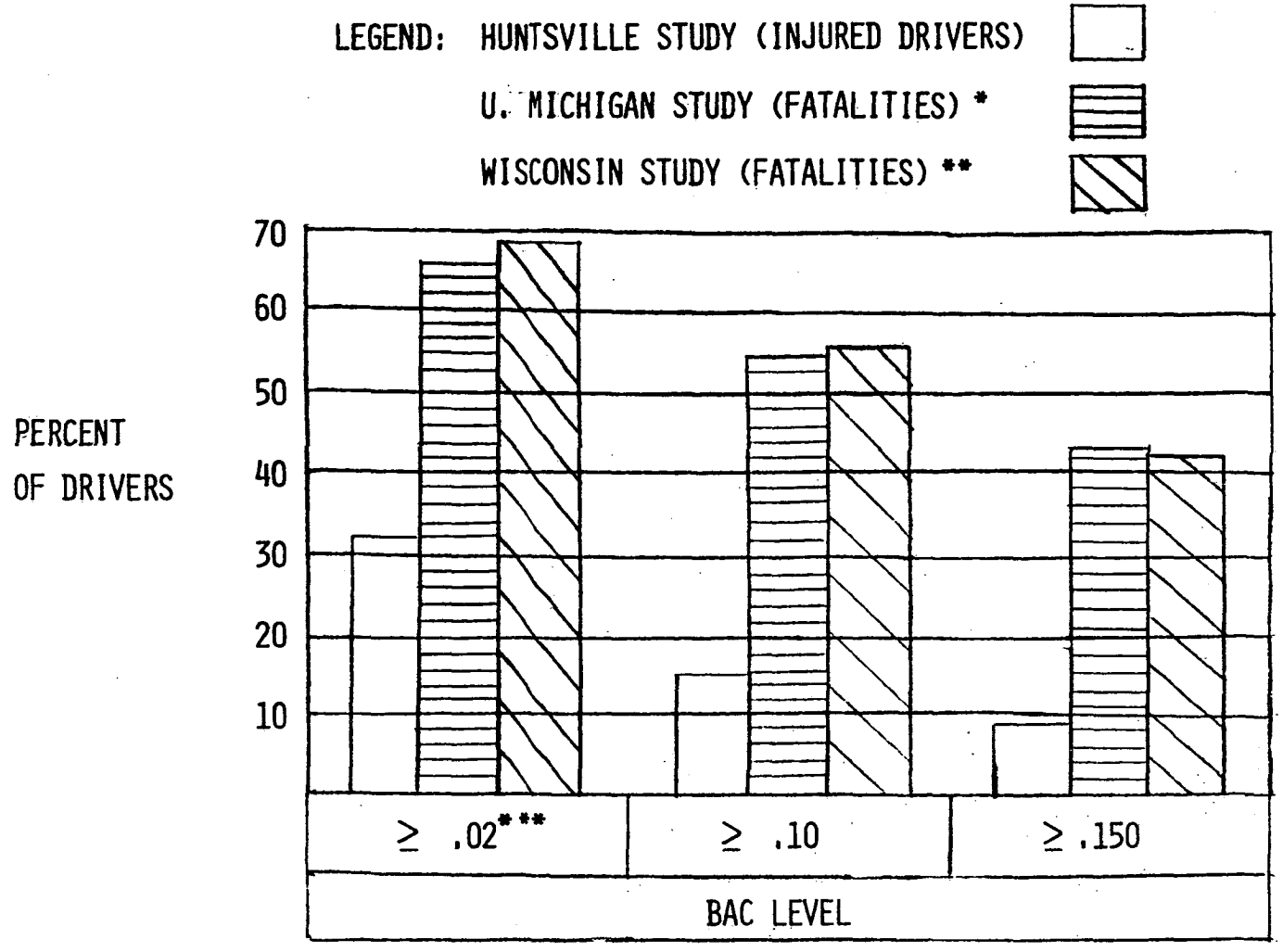


FIGURE 31 PERCENT OF INJURED DRIVERS WHO HAD BEEN DRINKING COMPARED TO PERCENT OF FATAL DRIVERS (DATA FROM OTHER STUDIES) WHO HAD BEEN DRINKING

* FILKINS, ET AL, 1970
** ROSENBERG, ET AL, 1971
*** FOR FATAL STUDIES THESE PERCENTAGES REPRESENT BAC'S ≥ .01

Effect of Alcohol on Driver Performance

In the effort to determine the role that alcohol played in the accidents that were investigated, one of the major tasks of the study was to interview drivers who had been drinking and obtain from them their judgments as to the effect that alcohol had on their driving which led to or was associated with the cause of the accident.

The objective of gaining the confidence of involved drivers and carrying out this phase of the interview was achieved. However, there is doubt that the information received in a number of these interviews could be useful if applied to a preventive program. The reason that much of the data obtained may lack a reflection of actual events or occurrences is twofold. One cause is the expected reluctance to be candid about the effect that alcohol has on one's driver performance. This is not an uncommon phenomenon observed in normal social circumstances. The other cause is that given the driver is not reluctant to be candid about his deteriorated ability to perform, he or she is often not aware of this fact and consequently does not report on something that, to the driver, does not exist.

Recognizing that this source of data may provide misleading conclusions, the study was designed to provide another data source that would add to the reliability and objectivity of the information received. The added source of data, as previously discussed, was the judgment of an experienced automobile accident investigator.

The information obtained from the drivers with respect to the effect that alcohol had on their driving is presented in Tables 17 and 18 and in subsequent paragraphs. While it becomes obvious, in light of driver fault

frequencies discussed previously, that some of the data presented will not be reviewed with a great deal of confidence, some additional insights may be gained from the results obtained.

Table 17 presents the frequency of responses obtained from the drivers interviewed with respect to how the accident could have been prevented. It is noted that only a small percentage related the accident cause directly to their drinking. However, a substantial proportion made reference to the improvement of their own driving which may indirectly relate to their drinking. It is also interesting to observe that a large percentage had no idea as to how the accident could have been prevented.

TABLE 17. RESPONSES FROM DRIVERS WITH POSITIVE BAC'S ON HOW THE ACCIDENT COULD HAVE BEEN PREVENTED

RESPONSES	NUMBER	PERCENTAGE
Does not know	36	26
Does not drive when drinking	13	9
Improve personal driving	38	27
Improve performance of others	37	26
Improve traffic signals	6	4
Improve road conditions	5	4
Improve vehicle performance	5	4
TOTAL	140	100

Drivers were asked when they last drove under the same degree of influence of alcohol and did not have an accident. Of those that indicated they had previously driven under these same conditions, the question was asked what caused the accident to occur this time. Table 18 presents the frequency of answers given to that question. While only two drivers suggested that they drank too much this time, a representative number referred to their own driving error.

TABLE 18. RESPONSES FROM DRIVERS WITH POSITIVE BAC'S WHO HAD PREVIOUSLY DRIVEN UNDER SAME CONDITIONS TO THE QUESTION: WHAT WAS DIFFERENT THAT CAUSED THIS ACCIDENT?

RESPONSE	NUMBER	PERCENTAGE
Nothing	9	7
Does not know	14	11
Own driving error	59	44.5
Other driver's error	44	33
Unclear signals or signs	2	1.5
Too much to drink	2	1.5
Vehicle maintenance problems	2	1.5
TOTAL	132	100%

Information obtained from drivers with respect to the effect that alcohol had on their driving showed that over 75% of the drivers with a positive BAC stated that alcohol did not "lead to a driving error" in connection with their accident. These statements do not appear to be supported by the at-fault curve shown in Figure 17, which suggests that drivers with positive BAC's were much more likely to be at fault in an injury producing accident. Also, of approximately 70 drivers with high BAC's only 30% indicated a belief that alcohol contributed to a driving error while over 85% were judged to be at fault.

To the general question "What effect did alcohol have on your driving?", over 70% stated there was no effect. Again, these statements do not appear to be supported by the data mentioned above.

In summary, the data presented in Tables 17 and 18 and information contained in subsequent paragraphs should not be reviewed independently. The contribution that this information makes is to provide assistance in the formation of an overall analysis of the role alcohol plays in automobile accidents. It also exemplifies that drinking drivers involved in accidents have very little insight into the relation of their drinking and the accident and, for practical considerations, are of little value as a source of accident causation.

CONCLUSIONS

Based on an analysis of data presented in the previous sections, the following conclusions were reached for automobile drivers in the City of Huntsville, Alabama.

Primary Conclusions

With respect to incidence of BAC, those drivers who were involved in injury-producing accidents had significantly higher BAC's than drivers exposed to the same environment but who did not have accidents. Figure 32 summarizes the comparison of percent of drinking accident drivers to drinking control drivers.

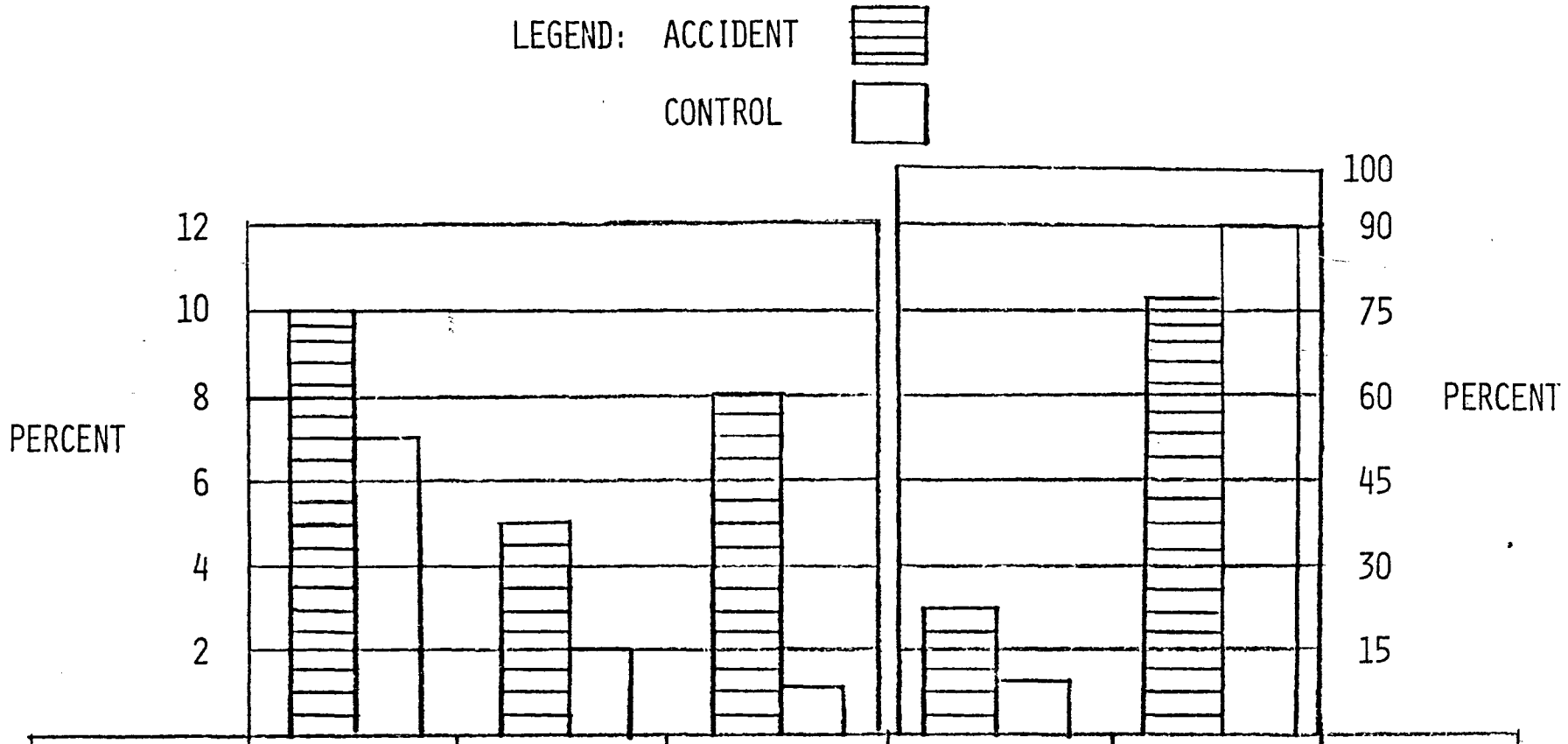
The right side of Figure 32 provides an overall picture of the difference. The left side provides a blow-up of this difference at increasing BAC levels, showing that as the level of BAC rises the difference between the percents becomes larger to the point of an 8 to 1 ratio at BAC level .150 or greater.

Results of data obtained during Phase II of this study also show that:

- Drivers who had positive BAC's were more likely to become involved in an injury-producing accident than drivers who did not have positive BAC's. The higher the level of BAC the more likely the involvement.
- Those who were driving with a BAC $\geq$ .030 were found to be at fault more frequently in injury-producing accidents than drivers who were also involved in these type accidents but who had not been drinking. The greater the amount of BAC, the more likely the driver was at fault.

Additional Conclusions

In addition to the above primary conclusions, results of the data show that, when compared to the control drivers, accident drivers as a group:



BAC LEVEL	.030-.099	.100-.149	≥ .150	≥ .030	≤ .029	TOTAL
ACCIDENT DRIVERS	61	29	50	140	456	596
CONTROL DRIVERS	55	17	6	78	726	804

FIGURE 32.
PERCENT OF DRINKING ACCIDENT DRIVERS
COMPARED TO DRINKING CONTROL DRIVERS

- Were younger
- Were less educated
- Drove fewer miles annually
- Were over-represented in females
- Were heavier drinkers on normal occasions

Also, results showed:

- The percentage of younger drivers, who drank while driving, was smaller than the percentage of older drivers
- However, when drinking, younger drivers were more likely to become involved in injury-producing accidents than older drivers who have been drinking
- As education increased drinking decreased
- As seriousness of injury increased, drinking drivers were more frequently involved

Comparisons between accident and control drivers failed to show practical significant differences in the areas of drinking or abstinence, purpose of trip, origin of trip, or destination of trip.

The data contained in this report will be added to the data that will be collected during Phase III to form the base for an overall analysis and final report.

APPENDIX A

Dear Motorist,

You have been selected to participate in a study being conducted for the U. S. Department of Transportation to evaluate alcohol involvement among a sample of drivers in the city of Huntsville, Alabama.

The purpose of this study is designed to benefit the public-at-large and has my full support as well as that of other city officials.

INFORMATION GIVEN TO THE RESEARCH TEAM IN CONNECTION WITH THIS STUDY, RELATED TO DRIVER PERFORMANCE, IS PRIVILEGED COMMUNICATION. IT WILL BE CONSIDERED COMPLETELY CONFIDENTIAL, AND WILL NOT BE USED AGAINST YOU AS EVIDENCE BY THE CITY OF HUNTSVILLE. THIS INCLUDES ANY TYPE OF ALCOHOL MEASUREMENT TAKEN BY THE RESEARCH TEAM.

Thank you very much for your cooperation in this survey.

Sincerely yours,

Joe W. Davis

gf

APPENDIX B

ALABAMA UNIFORM TRAFFIC ACCIDENT REPORT

SHADED AREAS TO BE USED BY DATA PROCESSING ONLY — SHEET ___ OF ___ SHEET(S)

LOCATION & TIME

DATE | COUNTY CODE NUMBER | TIME (AM / PM) | DAY OF WEEK (M T W Th F S Sun; 1 2 3 4 5 6 7) | HIGHWAY CLASSIFICATION (1 – Interstate 2 – U.S. 3 – State 4 – County 5 – City 6 – Other)

Total No. Vehicles | ACCIDENT INVOLVED (Circle One or More): 1 – SINGLE MOTOR VEHICLE 2 – OVERTURNED IN ROAD 3 – RAN OFF ROAD 4 – PEDESTRIAN 5 – PEDALCYCLE 6 – MOTORCYCLE 7 – TWO OR MORE MOTOR VEHICLES 8 – RAN OFF ROAD & OVERTURNED 9 – OTHER ___ | 0 – FIXED OBJECT ☐ IN ROADWAY, OR ___ (FT.) FROM EDGE OF ROADWAY

ON STREET, ROAD, OR HIGHWAY | AT INTERSECTION OF OR BETWEEN | AND | TYPE | MILE POST NUMBER

STREET OR ROAD CODE ← | STREET OR ROAD CODE → | FEET ___ MILES N E S W OF ___

CITY OR TOWN | CONTROLLED ACCESS HWY. LOCATION (Circle One): 1 – MAIN ROAD 2 – FRONTAGE RD. 3 – MAIN ROAD AT INTERCHANGE 4 – ENTRANCE RAMP 5 – EXIT RAMP | N E S W | 1 – BOUND LAN 2 – SIDE

UNIT #1 — DRIVER

DRIVER'S FULL NAME | STREET OR R.F.D. | CITY & STATE | ZIP | DATE OF BIRTH | SEX | RACE

DRIVER LICENSE NUMBER | STATE | TYPE: 1 – AUTO 2 – REG. TRUCK 3 – MOTORCYCLE 4 – OTHER TRUCK 5 LEARNER 6 – NONE | LICENSE RESTRICTION(S) | Complied With YES NO

OCCUPATION | DRIVER'S TELEPHONE NO. | DRIVER CONDITION (Circle One): 1 – NO APPARENT DEFECTS 2 – APPARENTLY ASLEEP 3 FATIGUED 4 ILL 5 – UNKNOWN 6 – PHYSICAL DEFECTS ___

DRIVER SOBRIETY: DRINKING: YES NO UNKNOWN; DRUGS: YES NO UNKNOWN | TYPE TEST GIVEN | TEST RESULTS POS. NEG. | REFUSED TEST YES NO | CONTRIBUTING CIRCUMSTANCE(S)

UNIT #1 — VEHICLE

YEAR | MAKE | BODY | V.I.N. | INSPECTION CERTIFICATE: 1 – CURRENT 2 – EXPIRED 3 – NONE 4 – UNKNOWN | LICENSE TAG NUMBER | STATE | YEA

OWNER'S NAME | STREET OR R.F.D. | CITY & STATE | ZIP | SPEED LIMIT MPH | ESTIMATED SPEED MPH

TYPE: (Circle One) 01 – AUTO 02 – PEDALCYCLE 03 – STA WAGON 04 – PANEL · PICKUP 05 – TR. TRACTOR 06 – OTHER TRUCK 07 – COMM. BUS 08 – SCHOOL BUS 09 – OTHER BUS 10 – M-CYCLE 11 – FARM MACH. 12 – OTHER ___ | SAFETY EQUIP. USED: YES NO

SPECIAL USE: (Circle One) 01 – NONE 02 – TAXI 03 – MILITARY 04 – AMBULANCE 05 – FARM USE 06 – POLICE 07 – WRECKER 08 – FIRE FIGHTING 09 – DRIVER TRAINING 10 – GOV'T 11 – OTHER ___

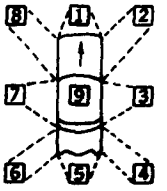
ATTACHMENT: (Circle One) 1 – NONE 2 – MOBILE HOME 3 – SEMI-TRAILER 4 – UTILITY TRAILER 5 – FARM TRAILER 6 – TRAILER WITH BOAT 7 – CAMPER TRAILER 8 – TOWED MOTOR VEH. 9 – PETROLEUM TANKER 0 – OTHER ___

DEFECTS: (Circle One or More) 1 – NONE 2 – BRAKES 3 – LIGHTS 4 – HORN 5 – STEERING 6 – WIPERS 7 – TURN SIGNALS 8 – TIRES 9 – NOT KNOWN 0 – OTHER ___ | DEFECT CODES | Contributed To Acc.

DAMAGE SEVERITY: 1 – SLIGHT 2 – MODERATE 3 – SEVERE | AREA(S) DAMAGED (Use Codes) | APPROXIMATE COST TO REPAIR $ ___ | VEHICLES TOWED AWAY: YES NO

VEHICLE TOWED BY WHOM: | TO WHERE: | TOTAL OCCUPANTS THIS UNIT:

CIRCLE POINT OF INITIAL IMPACT



☐ UNIT # 2 OR ☐ PEDESTRIAN — DRIVER

DRIVER OR PEDESTRIAN'S NAME | STREET OR R.F.D. | CITY & STATE | ZIP | DATE OF BIRTH | SEX | RACE

DRIVER LICENSE NUMBER | STATE | TYPE: 1 – AUTO 2 – REG. TRUCK 3 – MOTORCYCLE 4 – OTHER TRUCK 5 – LEARNER 6 – NONE | LICENSE RESTRICTION(S) | Complied W YES NO

OCCUPATION | DRIVER OR PED'S PHONE NO. | DRIVER OR PED. CONDITION: (Circle One) 1 – NO APPARENT DEFECTS 2 – APPARENTLY ASLEEP 3 – FATIGUED 4 – ILL 5 – UNKNOWN 6 PHYSICAL DEFECT ___

DRIVER OR PED. SOBRIETY: DRINKING: YES NO UNKNOWN; DRUGS: YES NO UNKNOWN | TYPE TEST GIVEN | TEST RESULTS POS. NEG. | REFUSED TEST YES NO | CONTRIBUTING CIRCUMSTAI

☐ UNIT # 2 OR ☐ PEDESTRIAN — VEHICLE

YEAR | MAKE | BODY | V.I.N. | INSPECTION CERTIFICATE: 1 – CURRENT 2 – EXPIRED 3 – NONE 4 – UNKNOWN | LICENSE TAG NUMBER | STATE | Y

OWNER'S NAME | STREET OR R.F.D. | CITY & STATE | ZIP | SPEED LIMIT MPH | ESTIMATED S MPH

TYPE: (Circle One) 01 – AUTO 02 – PEDALCYCLE 03 – STA WAGON 04 – PANEL-PICKUP 05 – TR. TRACTOR 06 – OTHER TRUCK 07 – COMM. BUS 08 – SCHOOL BUS 09 – OTHER BUS 10 – M-CYCLE 11 – FARM MACH. 12 – OTHER ___ | SAFETY EQUIP. USED: YES NO

SPECIAL USE: (Circle One) 01 – NONE 02 – TAXI 03 – MILITARY 04 – AMBULANCE 05 – FARM USE 06 – POLICE 07 – WRECKER 08 – FIRE FIGHTING 09 – DRIVER TRAINING 10 – GOV'T 11 – OTHER ___

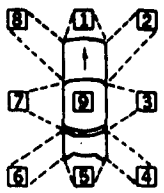
ATTACHMENT: (Circle One) 1 – NONE 2 – MOBILE HOME 3 – SEMI-TRAILER 4 – UTILITY TRAILER 5 – FARM TRAILER 6 – TRAILER WITH BOAT 7 – CAMPER TRAILER 8 – TOWED MOTOR VEH. 9 – PETROLEUM TANKER 0 – OTHER ___

DEFECTS: (Circle One or More) 1 – NONE 2 – BRAKES 3 – LIGHTS 4 – HORN 5 – STEERING 6 – WIPERS 7 – TURN SIGNALS 8 – TIRES 9 – NOT KNOWN 0 – OTHER ___ | DEFECT CODES | Contributed to Acc.

DAMAGE SEVERITY: 1 – SLIGHT 2 – MODERATE 3 – SEVERE | AREA(S) DAMAGED (Use Codes) | APPROXIMATE COST TO REPAIR $ ___ | VEHICLES TOWED AWAY YES NO

VEHICLE TOWED BY WHOM: | TO WHERE: | TOTAL OCCUPANTS THIS UNIT:

CIRCLE POINT OF INITIAL IMPACT



ACTIONS

(Circle One For Each Vehicle)

1	2		1	2		1	2		1	2	
01	01	01 – Going Straight Ahead	05	05	05 – Passing	09	09	09 – Avoiding Animal or Vehicle	13	13	13 – U-Turn
02	02	02 – Slowing or Stopping	06	06	06 – Start From Parked	10	10	10 – Turning Right	14	14	14 – Merging
03	03	03 – Start in Traffic Lane	07	07	07 – Remain Parked - Legally	11	11	11 – Turning Left	15	15	15 – Parking
04	04	04 – Remain Stopped in Lane	08	08	08 – Remain Parked - Illegally	12	12	12 – Backing			

DRIVER

PEDALCYCLE: 01 – Riding With Traffic; 02 – Riding Against Traffic; 03 – Riding Across Street; 04 – Unknown

PEDESTRIAN

ROAD: 1 – DARK, 2 – LIGHT | CLOTHING: 1 – DARK, 2 – LIGHT | RETRO-REFLECTIVE MATERIALS: 1 – CLOTHING 2 ITEMS 3 NONE

01 – Crossing or Entering Intersection; 02 – Crossing or Entering Other; 03 – Walking in Rdwy. with Traffic; 04 – Walking in Rdwy. Against Traffic; 05 – Standing in Roadway; 06 – Getting Off or On Vehicle; 07 – Pushing or Working on Vehicle; 08 Other Working in Rdwy.; 09 – Playing in Roadway; 10 – Other in Roadway; 11 Not in Roadway; 12 – OTHER ___

DAMAGE TO PROPERTY OTHER THAN VEHICLE (Name, Object, Show Ownership & Damage) | Approx. Cost to Repair $

WIT.

WITNESS FULL NAME | ADDRESS | PHONE NO. | AGE | SEX

WITNESS FULL NAME | ADDRESS | PHONE NO. | AGE | SEX

AST NO. 27 REVISED 1 JAN 71

CODES

SEATING

1	2	3
4	5	6
7	8	9

M – Motorcycle
B – Pedalcycle
O – Other
U – Unknown
P – Pedestrian

SEAT BELTS

LAP BELT ONLY
N – None Installed
F – Fastened
U – Unfastened
D – Not Reported

LAP & SHOULDER BELT
E – Not Used
G – Lap Belt Only Used
M – Both Belts Used
L – Not Reported

EJECTED

Y – Yes
P – Partially
N – No
U – Unknown

INJURY

K – Killed
A – Visible signs of injury, as bleeding wound or distorted member, or had to be carried from scene.
B – Other visible injury, as bruises, abrasions, swelling, limping, etc.
C – No visible injury but complaint of pain or momentary unconsciousness.

FIRST AID BY

P – Police
A – Amb. Attend
D – Doctor
O – Other
U – Unknown
N – None

VICTIMS

	NAME	ADDRESS	Age	Sex	Veh. No.	Seating	Seat Belts	Ejection	Injury	First Aid By
1	TAKEN TO	TAKEN BY								
2	TAKEN TO	TAKEN BY								

DIRECTION OF TRAVEL – VEHICLE 1 – N E S W VEHICLE 2 – N E S W MILES N E S W TO

NARRATIVE & DIAGRAM

DESCRIBE WHAT HAPPENED (REFER TO VEHICLES BY NUMBER)

ROADWAY & ENVIRONMENT

LIGHT
(Circle One)
1 – DAYLIGHT
2 – DAWN
3 – DUSK
4 – DARKNESS
5 – DARKNESS, RD. LIGHTED

WEATHER
(Circle One)
1 – CLEAR
2 – CLOUDY
3 – RAINING
4 – FOG
5 – SNOWING SLEETING
6 – HAILING

LOCALE
(Circle One)
1 – OPEN COUNTRY
2 – RESIDENTIAL
3 – SHOP'G OR BUSINESS
4 – MFG. or INDUSTRIAL
5 – SCHOOL or PLAY'D
6 – OTHER

DEFECTS
(Circle One or More)
1 – SHOULDERS LOW
2 – SHOULDERS HIGH
3 – HOLES, BUMPS, ETC.
4 – LOOSE MATERIAL ON SURFACES
5 – ROAD UNDER CONST.
6 – NONE
7 – OTHER

CONSTRUCTION
(Circle One For Each Vehicle)

1	2	
1	1	– ASPHALT
2	2	– CONCRETE
3	3	– BRICK
4	4	– DIRT
5	5	– OTHER

CONDITION
(Circle One For Each Veh.)

1	2	
1	1	– DRY
2	2	– WET
3	3	– SNOWY, ICY
4	4	– MUDDY
5	5	– HAZARDOUS MATERIAL

VISION OBSCURED
(Circle One For Each Veh.)

1	2	
01	01	– NOT OBSCURED
02	02	– RAIN, SNOW, ICE, ETC. ON WINDSHIELD
03	03	– TREES, CROPS, BUSHES, ETC.
04	04	– BUILDING(S)
05	05	– EMBANKMENT
06	06	– SIGNBOARD
07	07	– HILLCREST
08	08	– PARKED VEHICLE(S)
09	09	– MOVING VEHICLE(S)
10	10	– BLINDED BY HEADLIGHTS
11	11	– BLINDED BY SUNLIGHT
12	12	– OTHER
13	13	– UNKNOWN

CHARACTER
(Circle One For Each Veh.)

1	2	
1	1	– Straight – Level
2	2	– Straight – Down Grade
3	3	– Straight – Up Grade
4	4	– Straight – Hillcrest
5	5	– Curve – Level
6	6	– Curve – Down Grade
7	7	– Curve – Up Grade
8	8	– Curve – Hillcrest

Vehicles Traveling Same Roadway. Yes No (Circle One)

TRAFFIC CONTROL
(Circle One For Each Vehicle)

1	2	
1	1	– STOP SIGN
2	2	– STOP & GO SIGNAL
3	3	– YIELD SIGN
4	4	– OFFICER OR FLAGMAN
5	5	– RR CROSSING GATES
6	6	– RR FLASHING LIGHTS
7	7	– NONE
8	8	– OTHER

Yes Yes / No No } FUNCTIONING

ROADWAY LANES
(Circle One For Each Vehicle)

1	2	
1	1	– ONE LANE
2	2	– TWO LANES
3	3	– THREE LANES
4	4	– FOUR LANES
5	5	– FIVE LANES
6	6	– SIX LANES OR MORE
7	7	– UNPAVED (Any Width)
8	8	– ALLEY

Yes Yes / No No } ONE-WAY STREET:

ROADWAY DIVIDED BY:
(Circle One For Each Vehicle)

1	2	MEDIAN CONSTRUCTION
1	1	– CONCRETE
2	2	– ROUGH SURFACE
3	3	– EARTH
4	4	– PAINTED MEDIAN BARRIER
5	5	– CONCRETE
6	6	– METAL GUARDRAIL
7	7	– FENCE
8	8	– OTHER

Yes Yes / No No } MEDIAN

INVESTIGATION

SUMMONS NUMBER | NAME OF PERSON CHARGED | CONTRIBUTING CIRCUMSTANCE(S)

SUMMONS NUMBER | NAME OF PERSON CHARGED | CONTRIBUTING CIRCUMSTANCE(S)

POLICE AGENCY NOTIFIED	POLICE ARRIVED	AMBULANCE ARRIVED	TRAFFIC FLOW RESTORED	NAME OF PHOTOGRAPHER
: A.M. P.M.	: A.M. P.M.	: A.M. P.M.	: A.M. P.M.	

NAME OF INVESTIGATING OFFICER | BADGE NUMBER | POLICE AGENCY

NAME OF OTHER OFFICER(S) AT SCENE | BADGE NUMBER(S) | POLICE AGENCY

THE DATA ON THIS REPORT REFLECTS MY BEST KNOWLEDGE, OPINION AND BELIEF COVERING THE ACCIDENT, BUT NO WARRANT IS MADE AS TO THE FACTUAL ACCURACY THEREOF

SIGNATURE OF INVESTIGATING OFFICER | DATE:

CONTRIBUTING CIRCUMSTANCE(S)

10 – No Improper Driving
11 – Violations Unknown
12 – Imp. Backing
13 – Changing Lanes Imp.
14 – Parking Improperly
15 – Failure to Dim Lights
16 – Lights Improper
17 – Veh. Unsafe Cond.
18 – Driving in Wrong Lane
19 – No Sig. Imp. Sig.
20 – Following Too Closely
21 – Defective Brakes
22 – Exceeding Speed Limit
23 – Exceeding Safe Speed
24 – Disregard Sign Sig.
25 – No Right of Way
26 – Wrong Side of Road
27 – Passing On Hill
28 – Passing on Curve
29 – Other Improper Passing
30 – Turning Unlawfully
31 – Driving in Safety Zone
32 – Pass Stpd. School Bus
33 – Inattention
34 – Other Moving Viol.
35 – Exc. Wt. Ht. Lt. Wh.
36 – Pedestrian Drunk
37 – Faulty Equipment
38 – Walking Violation
39 – Min. Speed Law
40 – Racing On Hwy.
41 – Driv. under inf.

APPENDIX C

ACCIDENT DRIVER WORKSHEET

1. Date _____ Time _____ Temperature _____

2. Location _____

3. Name _____ Age _____ Sex _____ Race _____

4. Occupation _____ Education _____

5. Miles drive per year _____ Year with drivers license _____

6. Vehicle Type _____ Year _____ No. Passengers _____

7. Injuries to driver:

   None [ ] Minor [ ] Serious [ ] Critical [ ]

8. Extent of worst case of injury involved in accident:

   Minor [ ] Serious [ ] Critical [ ]

   Driver [ ] Passenger [ ] Other _____

   This Auto [ ] Second Auto [ ] Other _____

9. Road Conditions:

   Dry [ ] Wet [ ] Snow [ ] Ice [ ] Mud [ ]

   Daylight [ ] Dusk [ ] Dawn [ ] Dark [ ] (Well lit [ ]
   Poorly lit [ ])

10. Road Type:

    Number of lanes _____

    Separation between lanes, such as railing: Yes [ ] No [ ]

    Curved [ ] Straight [ ]

11. Collision Type:

    Single Car [ ] 2 Car [ ] 3 Car [ ] Other _____

12. Direction of Travel this driver:

    North [ ] South [ ] East [ ] West [ ] on _____
    (Street)

13. Purpose of trip:

    Business [ ] Pleasure [ ] Other _____

14. If trip was for pleasure:

    Where coming from: Home [ ] Friend's Home [ ] Restaurant [ ]
    Work [ ] Bar [ ] Bar and Dance [ ]
    Other _____

    Where going to: Home [ ] Friend's Home [ ] Restaurant [ ]
    Work [ ] Bar [ ] Bar and Dance [ ]
    Other _____

15. Prior to obtaining BAC, Researcher indicate estimate of BAC for driver:

.00 to .03 [ ] .03 to .10 [ ] .10 to .15 [ ] Over .15 [ ]

16. BAC reading _____

Time obtained _____

Where: Accident scene [ ] Huntsville Hospital [ ]

Redstone Hospital [ ] State Toxicologist [ ]

Other _____

Type: Breath [ ] Blood [ ]

If Researcher's Instrument used, Instrument Serial Number _____

17. Do you drink:

Yes [ ] Abstain [ ]

18. If drink:

Number of drinks on one occasion (normally) _____

Ever been arrested for drinking or related offenses:

No [ ] DWI [ ] Public Drunkenness [ ]

Highway Intoxication [ ] Other _____

19. If BAC positive (.03 or more)

a. How long since last drink _____

b. How many at that time _____

c. Type drinks:

Mixed [ ] Beer [ ] Wine [ ] Other _____

d. When was last time you had this much to drink and did not have an accident while driving under similar conditions?

1) days _____

2) weeks _____

3) months _____

e. What happened this time that did not happen before to cause the accident?

_____

_____

_____

_____

f. What effect do you think the alcohol had on you leading up to the accident (reactions, judgment, visual ability, etc.)?

_____

_____

_____

g. In your opinion, do you think alcohol led to any driving error on your part? _____

h. If so, what driving error? _____

_____

i. If you think alcohol contributed to the cause of the accident in any any way, please explain how: _____

_____

_____

20. What do you think could have been done to prevent this accident?

_____

_____

_____

These questions need to be answered by the researcher.

21. In researcher's opinion, who was at fault and why do you think so?

_____

_____

_____

22. Now that interview is completed, in researcher's opinion, what level of alcohol would be estimated for driver?

.00 to .03 [ ] .03 to .10 [ ] .10 to .15 [ ] Over .15 [ ]

(If BAC reading taken by Researcher disagrees considerably with his estimate, another reading should be taken - just to double-check.)

APPENDIX D

EQUIPMENT USED

The essential equipment used in this study is listed below:

- Portable Alcohol Screening Device (Breath Alcohol Analyzer)
- Simulator for Calibration
- Mouthpieces for Breath Analyzer

The above equipment formed the necessary package that was required to obtain reliable BAC's from accident and control drivers. The Breath Analyzer was the basic tool that was used with each driver and the simulator was used to initially calibrate the analyzer and periodically maintain its calibration. Mouthpieces were inserted into the analyzer and for sanitary reasons disposed of after BAC's were obtained.

Breath Analyzer

This instrument is formally referred to as an Alcohol Screening Device Series 400, and it was obtained on loan from the Department of Transportation, Transportation Systems Center, Cambridge, Massachusetts.

The Breath Analyzer is a portable, battery powered instrument for measuring breath alcohol content. The alcohol detector is a chemoelectric cell which generates an electric signal by oxidizing alcohol in the breath sample. This electric signal is amplified and read out on the instrument panel as a PASS, WARN or FAIL or as a direct number reading of alcohol content.

Features incorporated into the Analyzer are:

(a) Electronic control of breath sample - to prevent subject from "cheating" and to ensure a deep-lung breath sample

(b) Selectable readout - a switch allows the operator to read the test results in PASS-WARN-FAIL lights or as a number which is the blood alcohol level

(c) Zero check - a front panel button allows readout of alcohol background level before the test measurement is made

(d) Access door - to easily adjust calibration and for charging batteries

(e) Internal battery charging circuit - allows direct cable connection to any 12-volt battery source without interface box

(f) Sample hold circuit - internal circuit allows calibration without external calibration unit

Figure D-1 provides an outline of the front side of the Analyzer with a mouthpiece inserted.

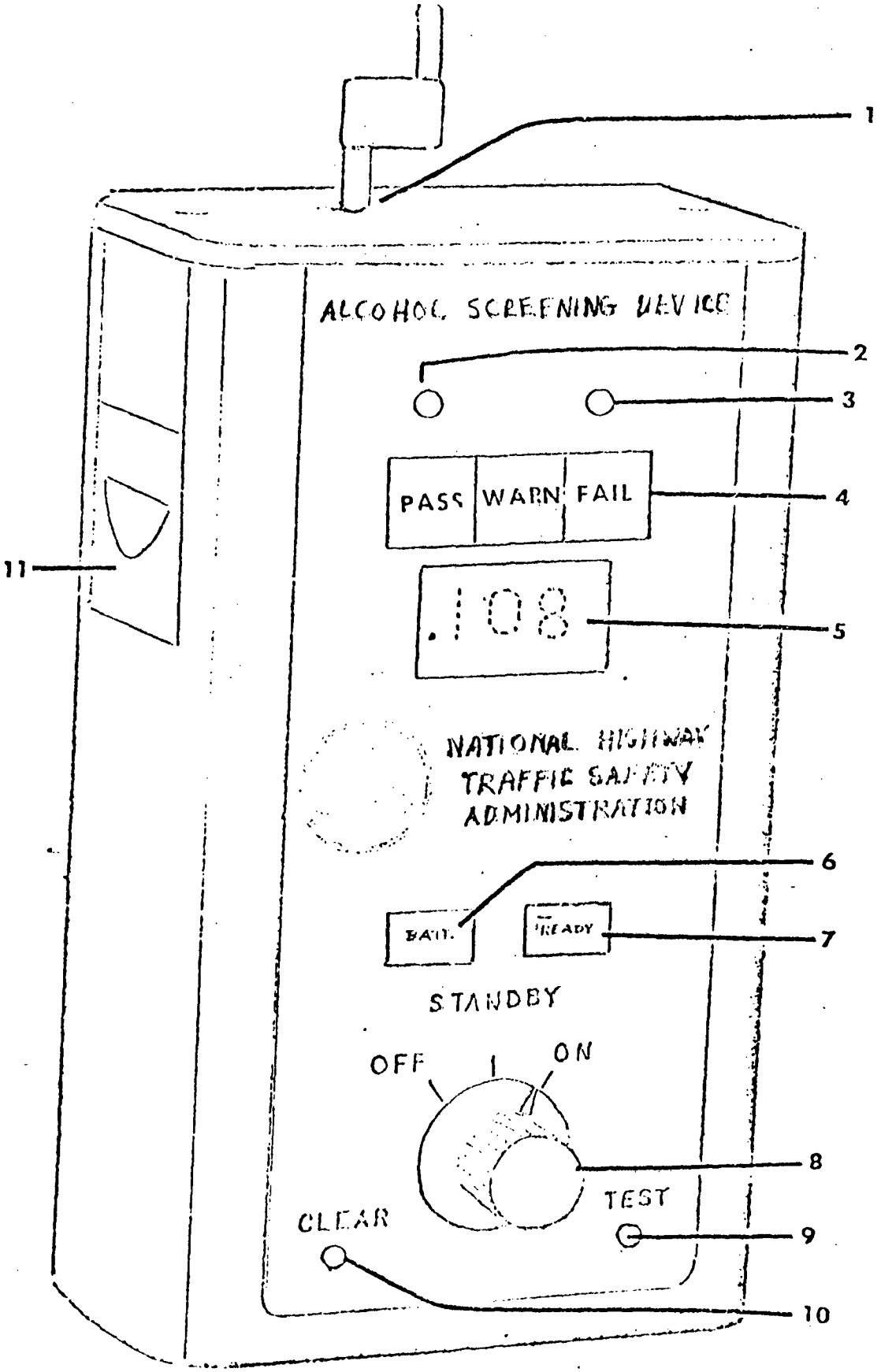
All BAC's obtained during this study utilized the direct number readout rather than the PASS, WARN, or FAIL feature.

The unit can be easily carried in one hand and operated relatively maintenance free. To facilitate calibration requirements, down time for maintenance, transfers between researchers, and other considerations, four units were obtained from the Transportation Systems Center and used throughout Phase II of the study.

Simulator MK-II-A

This device was used to calibrate the Breath Analyzer and was manufactured by Smith & Wesson Electronics Company, Eatontown, New Jersey. Certain chemical containers had to be purchased to utilize the equipment properly. However, it was more feasible to purchase a stock solution from the same company rather than attempt to procure 100% pure alcohol for mixing with parts of distilled water.

By the use of the stock solution and by following instructions provided with the equipment, no maintenance problems or operational problems occurred during Phase II of the study.



FRONT PANEL

FIGURE D-1

Mouthpieces

An indication of what this item looks like and how it is used is depicted in Figure D-1. It can be seen inserted on the top of the Analyzer. Each mouthpiece is individually wrapped and may be purchased from Intoximeters, Inc., St. Louis, Missouri.

APPENDIX E

"This is Mr. _____ who is conducting research for the Department of Transportation to help reduce automobile accidents in the United States. The Police Department and the City of Huntsville are cooperating with this study. We hope you will be kind enough to answer Mr. _____ questions."

CONTROL DRIVER WORKSHEET

APPENDIX F

1. Date _____ Time _____ Temperature _____

2. Location _____

3. Road Conditions:

   Dry [ ] Wet [ ] Snow [ ] Ice [ ]

   Daylight [ ] Dusk [ ] Dawn [ ] Dark [ ]

4. Driver Identification Number _____ Number of Passengers _____

5. Estimate of: (a) Sex _____ (b) Race _____

---

6. BAC _____

7. Age _____ Occupation _____

8. Do you drink? Yes [ ] Abstain [ ]

   (a) If yes:

   (1) Number of drinks on one occasion, normally _____

   (2) Type: Mixed [ ] Beer [ ] Glasses Wine [ ] Other _____

   (3) Ever been arrested for drinking related offense?

   No [ ] DWI [ ] Public Drunkedness [ ] Highway Intoxication [ ]
   Other _____

9. Purpose of Trip:

   Business [ ] Pleasure [ ] Shopping [ ] To and From Work [ ]
   Long Trip [ ] Other _____

   (a) If trip for pleasure:

   (1) Where coming from: Home [ ] Friend's Home [ ] Restaurant [ ]
   Work [ ] Bar [ ] Bar and Dance [ ] Other _____

   (2) Where going to: Home [ ] Friend's Home [ ] Restaurant [ ]
   Work [ ] Bar [ ] Bar and Dance [ ] Other _____

10. If BAC positive (.03 or more):

    (a) How long since last drink? _____

    (b) How many at that time? _____

    (c) Type: Mixed [ ] Beer [ ] Glasses Wine [ ] Other _____

11. Education _____

12. Type Vehicle (Ford, Chevrolet, Mustang, etc.) _____
    Year _____

13. Miles drive per year _____ Years with driver's licence _____

14. In researcher's opinion, what BAC would be estimated for driver?

    .00 to .03 [ ] .03 to .10 [ ] .10 to .15 [ ] Over .15 [ ]