

HSRI-71-126

WASHTENAW COUNTY BAC ROADSIDE SURVEY

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September 1971

Prepared
for
Washtenaw County Alcohol Safety Action Program
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NOTICES

Sponsorship. This report was prepared for the Washtenaw County (Michigan) Board of Commissioners under an agreement dated November 4, 1970 between the Board and The University of Michigan.

This report forms part of the Highway Safety Research Institute's evaluation of the Washtenaw County Alcohol Safety Action Program (ASAP). The Board is prime contractor to the National Highway Traffic Safety Administration, Department of Transportation, under Contract Number FH-11-7535 for the Washtenaw County ASAP. The program is administered by the Washtenaw County Health Department, Otto A. Engelke, MD, Principal Investigator, and James Henderson, Program Director.

Contracts and grants to The University of Michigan for the support of sponsored research by the Highway Safety Research Institute are administered through the Office of the Vice-President for Research.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of Washtenaw County.

1. Report No. HSRI-71-126	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Washtenaw County BAC Roadside Survey		5. Report Date September 1971	
		6. Performing Organization Code	
7. Author(s) William L. Carlson, Marion M. Chapman, Cheryl D. Clark, Lyle D. Filkins, Arthur C. Wolfe		8. Performing Organization Report No. HSRI-71-126	
9. Performing Organization Name and Address Highway Safety Research Institute Huron Parkway and Baxter Road The University of Michigan Ann Arbor, Michigan 48105		10. Work Unit No.	
		11. Contract or Grant No. FH-11-7535	
		13. Type of Report and Period Covered July 1, 1970- June 30, 1971	
12. Sponsoring Agency Name and Address Washtenaw County Alcohol Safety Action Program Washtenaw County Health Department Ann Arbor, Michigan 48104		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract A roadside survey of drivers in Washtenaw County, Michigan was conducted in March 1971 as an integral part of the evaluation procedures for the Washtenaw County Alcohol Safety Action Program (WCASAP). The survey was designed to obtain a representative sample of Washtenaw County residents and to obtain data about their drinking and driving patterns. Forty-eight time-location cells were defined throughout the county based on time of night, day of week, traffic volume, and location. Drivers were sampled from 7 P.M. to 9 P.M., 10 P.M. to 12 P.M., and from 1 A.M. to 3 A.M. on each of four nights for four consecutive weeks. The survey consisted of the collection of a breath specimen for determination of blood alcohol concentration (BAC) and a short on-site interview with the driver. The interview obtained data about the driver's general drinking habits, his drinking on the day of the survey, and the specific nature of the drinking episodes prior to the time that he was interviewed. The survey sample size was 748. The distributions of drivers by BAC and selected demographic variables are given, and data about drivers' prior drinking locations by BAC, as well as data about drivers' BAC's with respect to the variables cited are presented. Implications for selective enforcement directed to drinking drivers are also given. Significant overall findings are that 19% of the drivers tested had a positive BAC, 10% were at a BAC of 0.05 or higher, 4% were 0.10 or higher, and 1% were 0.15 or higher.			
17. Key Words		18. Distribution Statement	
19. Security Classif (of this report) Unclassified	20. Security Classif (of this page) Unclassified	21. No. of Pages 76 + vi	22. Price

ACKNOWLEDGMENTS

Many organizations contributed significantly to the success of this project. Members of the Mecklenburg County (North Carolina) ASAP and of the Research Triangle Institute shared with us their experiences in conducting a roadside survey. Their assistance was invaluable in finalizing some of the operating procedures for the survey. Members of the Ann Arbor and Ypsilanti Police Departments and the Washtenaw County Sheriff's Department provided considerable assistance in establishing survey procedures and locations. In addition they performed very capably in the difficult job of stopping vehicles containing drivers who were selected survey subjects. Attorneys representing these three jurisdictions and the University of Michigan offered valuable assistance in defining the legal conditions under which the survey was to operate. The Michigan State Police provided one of the Breathalyzer instruments used in the survey and tested the accuracy of the instrument owned by the Highway Safety Research Institute. The Highway Traffic Safety Center at Michigan State University provided eight hours of instruction in Breathalyzer operation and in the operation of the alcohol breath simulator. The Director of the Washtenaw County Alcohol Safety Action Program contributed significantly to the overall effort.

Without the assistance of these organizations this project would not have been possible. We express our thanks to the individuals within these groups who so capably assisted in this survey.

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1. INTRODUCTION AND SUMMARY OF RESULTS

The Highway Safety Research Institute (HSRI) conducted a roadside survey during the month of March 1971, as part of the evaluation procedures for the Washtenaw County Alcohol Safety Action Program (WCASAP). The major objective of the survey was to measure the nature and extent of alcohol usage within the night-time driving population. A secondary objective was to measure current awareness of and influence of public information campaigns and law enforcement efforts directed toward the alcohol driving problem. These objectives of the survey are essentially baseline measurements of certain of the goals of the WCASAP including a decrease in the number of persons who drink prior to driving, or at least a decrease in the amount consumed prior to driving. In addition, intermediate changes such as an increase or improvement in knowledge, attitudes or behavior related to alcohol and driving are also important. The WCASAP is predicated on the assumption that the attainment of these intermediate goals will favorably affect the long-range goal of reducing the number of alcohol-related crashes.

The survey was conducted over a period of one month on 16 different nights--eight on weekdays and eight on weekends--at three separate geographic locations per night. The survey period included early evening (7-9 P.M.), late evening (10-12 P.M.) and early morning (1-3 A.M.).

Drivers were stopped by law enforcement officers after having been randomly selected from the driving stream by a member of the survey team. Drivers were then asked to take an alcohol breath test and answer a few simple questions. Cooperation was secured from 748 Washtenaw County residents out of 857 contacted, giving a participation rate of 87.3%. Analysis indicates that the results were not significantly biased by the refusals (see Section 3.5).

The survey found that 19% of the drivers tested had a blood alcohol concentration (BAC) of 0.02% W/V (20 mg %)* or higher, 10% were 0.05 or higher, 4% were 0.10 or higher, and 1% were 0.15 or higher.

The highest proportions of drinking drivers were found during the early morning hours and on the less heavily traveled roads. There was a significant interaction between these two variables which resulted in a large proportion of high BAC drivers on medium volume roads during the early morning hours. The proportions of drinking drivers were not significantly different on weekend versus weekday evenings.

Female drivers and drivers under age 21 were under-represented in the drinking driver subgroup. It was found that drivers in all age groups between 21 and 60 were equally involved with alcohol at 0.05 BAC or greater. However, the largest number of drivers who were at or above 0.05 BAC came from the 21-25 age group. This was due to the fact that this age group accounted for the largest number of drivers. Thus, in terms of reaching the bulk of drinking drivers, countermeasures aimed at reducing alcohol-related crashes

*Blood alcohol concentrations in percent weight by volume will hereafter be referred to by the decimal portion only; e.g., "0.15" will indicate "0.15% W/V."

or alcohol consumption prior to driving, should be emphasizing the 21-25 year olds.

Divorced and separated persons were over-involved in drinking and driving. However, the distribution of drivers with positive BAC's was similar over educational levels and over most occupation subgroups.

Higher percentages of drinking drivers were interviewed at sites in Ypsilanti and in rural areas than in Ann Arbor. However, Ann Arbor residents were not under-represented in the group of drinking drivers. These findings indicate that police patrol activities would be productive in Ypsilanti and rural areas, especially during the early morning hours, although public education activities, often household-oriented, should put equal emphasis on all communities.

Of the persons interviewed, 15% said that they never drink alcoholic beverages, 49% said that they do drink, but had not had a drink that day, and 36% said that they had a drink on the day of the survey. A large proportion of drivers with 0.05 BAC or greater had been drinking at a bar and in some cases at more than one bar. This suggests that if high alcohol consumption at public places could be reduced, the proportion of drivers with high BAC would also decrease substantially.

The questions concerning awareness of the roadside survey and knowledge of the general WCASAP program showed that 11% of the participants had heard of both, while a further 24% had heard of one or the other (12% each). This indicates that preliminary publicity efforts had reached some portion of the nighttime driving public. A comparison of awareness between regular readers of the Ann Arbor News and of the Ypsilanti Press indicates that the differential emphases in the news stories in the two papers did have an impact on the activity these respondents had heard about.

A surprisingly high proportion of the respondents (46%) said they had noticed or heard about more police looking for drinking drivers, and almost one fifth of the drinkers said that their drinking and driving behavior had been influenced by this. Nine-tenths of the participants said they had noticed media messages on drinking and driving and more than one-third of the drinkers said these had influenced their drinking and driving behavior. While these proportions were higher than expected in the baseline survey, they can still be used to estimate the incremental impact of the special alcohol patrols and of the local public information and education campaign during the next three years.

A comparison of the results of this survey with that of the Mecklenburg County roadside survey indicates substantial agreement in the factors associated with high BAC's in the driving population.

2. PRE-SURVEY ACTIVITY

This section provides a description of pre-survey activities which should be useful to those contemplating roadside surveys as a part of an ASAP evaluation procedure. In addition it describes the process by which the data and subsequent conclusions were obtained. It basically describes the community liaison activities which were important for successful initiation of a survey of this type (2.1), the rationale for, and development of the experimental design (2.2), the on-site interview and mail-back questionnaire (2.3), and the development of operational guidelines for all members of the survey team (2.4). Sections 2.5 and 2.6 describe publicity and the actual procedures used at the sites.

2.1 COMMUNITY LIAISON ACTIVITIES

Prior to initiating any serious plans for the operation of a roadside survey, key personnel in the community were contacted to discuss their potential willingness to cooperate in the proposed endeavor. A committee was established and met during the period of November 1970 through February 1971. The committee was composed of the director of the WCASAP, the director of WCASAP Public Information Campaign, staff from HSRI, attorneys from the two cities, the county prosecutor, a member of the legal staff from The University of Michigan, the chiefs or their representatives from the three local police departments, a representative from the Michigan Department of State Police, and the Director of the County Health Department.

Early meetings were used to describe the desired objectives of the survey as well as to give a description of similar surveys conducted by other communities. The fact that roadside surveys had been done elsewhere was important in dispelling the initial uneasiness felt by many of the committee members.

In the belief that unresolved operational procedures could be handled, the committee reached a tentative agreement to participate in the survey. Following that agreement, the extensive work of developing the final experimental design and the actual operational procedures was begun.

2.2 EXPERIMENTAL DESIGN

The experimental design model used for the survey had as its objective the representation of the nighttime driving population in Washtenaw County. Previous studies have indicated that most of the serious alcohol-related crashes occur during the evening hours.

The target population chosen for this survey contained as elements the driving trips of all Washtenaw County residents operating motor vehicles during the period of 7 P.M. to 3 A.M. on Washtenaw County roads. Expressways were excluded because of the danger of stopping vehicles, as were roads with "low" traffic volume (less than 3000 vehicles/day), in order to increase the likelihood of obtaining certain minimum sample sizes at each survey site. It is believed that these exclusions did not introduce serious biases since most Washtenaw County residents were likely to drive on the remaining roads designated in the experimental design for some portion of their driving trip.

The target population was stratified by choosing particular roadside locations along selected roads. Survey locations were selected by using a full factorial experimental design model. The basic units of the model are denominated as sites. A site was defined as a two-hour period at a particular roadside location. During this period drivers were randomly selected, tested for alcohol, and interviewed. The experimental design variables stratified the population by time of night, weekday versus weekend, urban versus rural areas, and high versus medium traffic volume. The actual sites were kept confidential. Thus it is believed that serious biases were not introduced because citizens knew about and intentionally avoided passing the roadside locations at which the survey team was stationed.

The experimental design model for the survey is as follows:

$$Y_{ijkl} = \mu + \Delta A_i + \Delta B_j + \Delta C_k + \Delta D_l + \epsilon_{ijkl}$$

where

Y - The dependent response variable that is to be estimated. This variable is unique to the specific analysis performed. For example it is the proportion of drivers sampled who were at or above 0.02 BAC in Table 2. In Table 5 it is the proportion of drivers who were at or above 0.05 BAC.

μ - Base level of the dependent variable. In this model it is equal to the average of Y over all cells in the experimental design model.

The Δ 's indicate differences that are added to (or subtracted from) μ to obtain the value for a particular cell identified by particular values of the indices (e.g., i,j,k,l).

A - Weekday versus weekend. The survey was balanced evenly between weekday (i=1) and weekend (i=2) survey sites. Tuesday and Wednesday evenings were used to represent weekdays while Friday and Saturday evenings were used to represent weekends. These exact nights were not released to the public in order to avoid biases due to citizens changing their drinking and driving behavior from one night to another.

B - Urban versus rural. These were defined by the three major police jurisdictions within the county. Thus rural (j=2) was defined as those areas in which the County Sheriff's Department operated, while urban (j=1) was defined as those areas within the city limits of Ann Arbor and Ypsilanti. These definitions introduce some problems since a number of "rural" sites were actually in built up sections along major state highways just outside of the city limits of the urban areas. This site selection procedure was necessary in order to meet the major objectives of adequately representing the county driving population.

- C - Time during the night. Three separate time periods of approximately two hours duration were established for collecting data. These were k=1, early evening (approximately 7 to 9 P.M.); k=2, late night (approximately 10 to 12 P.M.); and k=3, early morning (approximately 1 to 3 A.M.).
- D - Traffic volume. Roadside sites were chosen with medium l=1 (approximately 3000 to 9000 vehicles per day) and high l=2 (above 9000 vehicles per day) traffic volumes. These traffic volumes are only approximate since the only traffic count data available was that obtained routinely (one day per year) for certain selected routes in the county.
- ϵ_{ijkl} - Unexplained variability or random error for a particular cell value. This is an unexplained difference between the actual observed value of Y_{ijkl} and the value predicted by the model.

The resulting 2 x 2 x 3 x 2 experimental design model was run as a full factorial requiring 24 cells. Appendix A contains data by site, classified by the experimental design model. The entire survey was conducted on 16 different nights over a four-week period from March 9 through April 3, 1971. This resulted in forty-eight sites. Thus the design provided for two observations in each of the cells of the experimental design model. The replications in the cells provided an estimate of error for testing the main effects and interactions occurring in the model. By choosing error in this manner, the assumption is made that there are no differences between the weeks in which the survey was conducted.

2.2.1 SAMPLE SIZE. The sample size of the survey was based upon two factors: the necessity of obtaining a sufficient number of subjects to enable us to identify a change if in fact one occurred and the need to balance the assignment of subjects over the cells in the survey design. The representation of the county driving population was accomplished by means of site selection based upon factors influencing the distribution of drivers across the county and by random selection within each designated site cell in the survey design. As a first approximation the occurrence of alcohol in a particular driver was treated as a binomially distributed random variable--a driver has positive blood alcohol or he does not. If we knew the probability (p) of a driver having positive blood alcohol it would then be possible to define (mathematically) the probability function of any sample we might take. In order to gain some insight we have considered the effect on the sample distribution for populations having a p in the range 0.10 to 0.20. It is well known¹ that the sample drawn from a binomially distributed population can be approximated by a normally distributed random variable, for large N. The mean is the proportion of the sample having the characteristic of interest (e.g., positive blood

¹R.V. Hogg and A.T. Craig, Introduction to Mathematical Statistics, 3d ed., The MacMillan Co., Toronto, 1970, p. 201.

alcohol). When this approximation holds it is possible to establish a confidence interval about the difference between two sample proportions such that the probability of the true difference lying within the interval is known. This confidence interval (C.I.) can be found from the following relationship:

$$C.I. = \hat{p}_1 - \hat{p}_2 \pm z_\alpha \left[\frac{\hat{p}_1(1 - \hat{p}_1)}{N_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{N_2} \right]^{\frac{1}{2}} \quad (1)$$

where \hat{p}_1 = observed proportion in the sample from population 1 (before the program)
 \hat{p}_2 = observed proportion in the sample from population 2 (after the program)
 N_1 = sample size for population 1
 N_2 = sample size for population 2
 z_α = normalized deviation for a $1 - \alpha$ confidence interval

If the assumption is made that both samples contain an equal number of observations, a Minimum Significant Difference (MSD) can be obtained from the following relationship

$$\Delta p^2 = \frac{z_\alpha^2 \hat{p}_1(1 - \hat{p}_1) + (\hat{p}_1 - \Delta p)(1 - \hat{p}_1 + \Delta p)}{N} \quad (2)$$

where $N_1 = N_2 = N$
 $\Delta p = p_1 - p_2 = \text{MSD}$

By appropriate algebraic manipulations and the application of the quadratic formula the MSD can be obtained from

$$\Delta p = \frac{1}{2} \left\{ \frac{z_\alpha^2}{N + z_\alpha^2} + \left[\left(\frac{z_\alpha^2}{N + z_\alpha^2} \right) + \left(\frac{8\hat{p}_1(1 - \hat{p}_1)z_\alpha^2}{N + z_\alpha^2} \right) \right]^{\frac{1}{2}} \right\} \quad (3)$$

Figure 1 indicates the relationship between sample size and the MSD. This figure assumes a one-tailed significance test (e.g., the hypothesis that there is no change in alcohol-related driving is tested against the hypothesis that there is a reduction in alcohol-related driving). Based on these assumptions a sample size of 720 would enable us to detect a change if the observed occurrence of alcohol-related driving dropped from $p = 0.20$ to 0.1635. By the same assumptions a doubling of the survey size from 720 to 1440 observations would enable us to detect a change if the observed occurrence of alcohol-related driving dropped from $p = 0.20$ to 0.1745. These particular values assume an initial p of 0.20. But as can be seen from Figure 1, the relative magnitudes of the MSD

Notice of Correction

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Equation (3) should be

$$\Delta P = \frac{1}{2} \left\{ - \frac{Z_{\alpha}^2}{N + Z_{\alpha}^2} (1 - \hat{P}_1) + \left[\left(\frac{Z_{\alpha}^2}{N + Z_{\alpha}^2} (1 - 2\hat{P}_1) \right)^2 + \left(\frac{8Z_{\alpha}^2 \hat{P}_1 (1 - \hat{P}_1)}{N + Z_{\alpha}^2} \right) \right]^{1/2} \right\}$$

In addition the text below should be modified as follows:
(corrections underlined)

... Based on these assumptions dropped from $p = 0.20$ to
0.1632 alcohol-related driving dropped from $p = 0.20$ to
0.1726.....

Figure 1 on page 7 is not changed by this correction.

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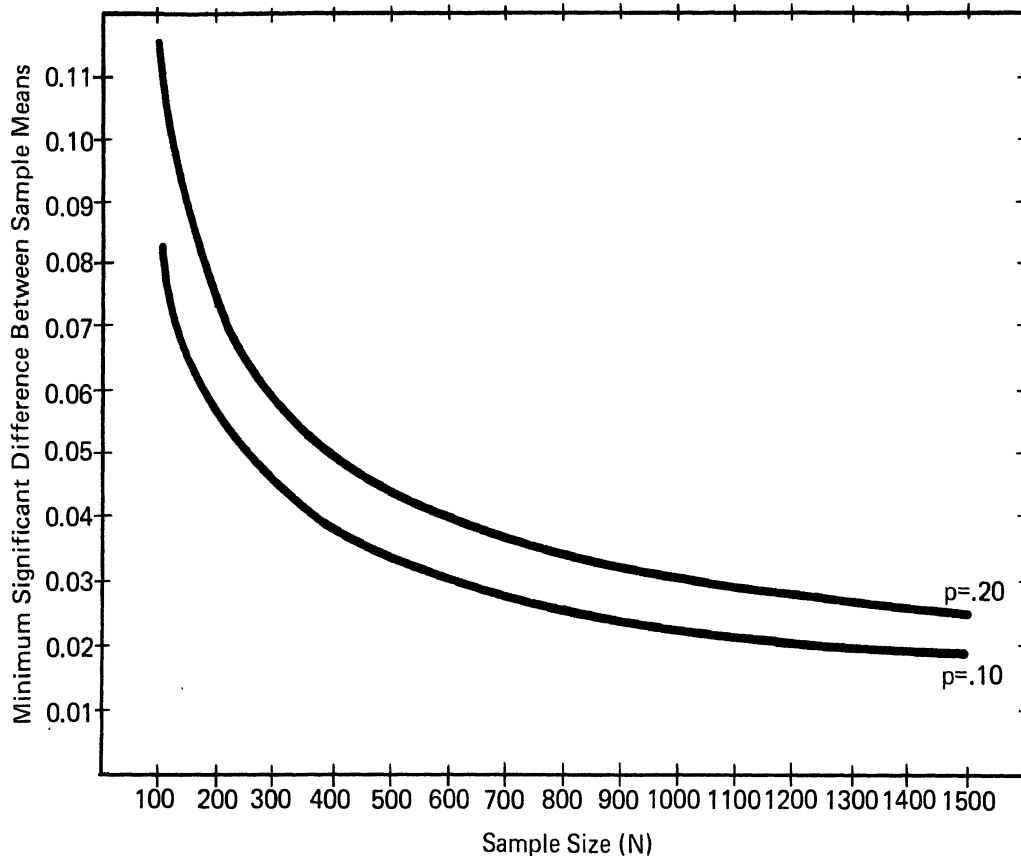


FIGURE 1. RELATIONSHIP BETWEEN SAMPLE SIZE AND MINIMUM DETECTABLE DIFFERENCE BETWEEN SAMPLE MEANS

given other p's will be proportional. Thus it was concluded that the potential improvement resulting from a doubling of the survey size would not be justified, and the survey was designed to obtain approximately 720 observations.

2.2.2 SELECTION OF SITES. The experimental design objective of representing the entire evening driving population depended for its success on the careful selection of the roadside sites. A comprehensive study of evening driving patterns within Washtenaw County had not recently been made nor was it possible to include such a study in the present project. Objective information, however, was obtained from local traffic departments and resource persons familiar with traffic patterns within Washtenaw County.

The Ann Arbor and Ypsilanti traffic departments and the County Road Commission supplied the most recent traffic count data available. Traffic engineers described the major traffic flows within the various areas of the County. Veteran police officers in the traffic sections of the local police departments provided further information.

Approximately 60 road sections were selected as candidates for roadside survey locations. The police command officer responsible for each candidate traffic section participated in reviewing the sections to determine if County traffic patterns were adequately represented and if suitable off-the-road locations for the interviewing team were available on the candidate routes.

Once a road section was chosen to satisfy survey requirements, the safety of the police officers and survey team who would stop traffic for the survey was the primary criterion for choosing specific locations along the selected sections. Locations were required to be along a straight section of road, with a speed limit not exceeding 50 MPH, and, wherever possible, in lighted sections of highway with safe parking areas available.

Locations meeting the stated criteria were sometimes difficult to find in the rural areas. Therefore, a few suitable locations were used more than once. It is believed that this did not introduce serious bias, since the major amount of travel during the nighttime hours tended to be concentrated along the routes chosen.

Upon completion of the tentative selection process, each location was visited by a staff member of HSRI and one of the police officers who was actually going to be stopping cars during the survey. This visit was to insure it met all criteria. Upon approval of each location a detailed map with directions for getting to it was prepared. Wherever possible we attempted to choose locations which contained an off-the-road parking lot. This provided a convenient and safe place to talk with citizens chosen for participation, and in addition resulted in a minimum interruption of traffic flow. This criterion was met in many cases by using private lots belonging to various businesses, schools, churches, etc. Every organization contacted granted us permission for the use of their lot during the survey.

All of the selected locations were placed in groups by traffic volume and police jurisdiction. These locations were then randomly assigned to the particular time and day cells in the experimental design model. The combination of time and geographic location resulted in a basic survey unit defined as a site. In most cases the time restrictions imposed on particular locations, i.e., availability of parking area, did not affect the random assignment. In the few cases where the assignment was affected, the location was returned to the group and a new random selection was made. This procedure minimized the chance for bias resulting from conditions beyond our control.

2.3 DESCRIPTION OF QUESTIONNAIRES

A short (2-6 minutes) interview form was developed for use with participants while waiting for the results of the Breathalyzer test. In addition to this on-site interview, a four-page mail-back questionnaire was given out with the request that it be filled out by the respondent at his home.

The purpose of Questions 1-5 on the interview schedule (see Appendix B.1) was to provide basic demographic information which could be related to the BAC and to the awareness questions. Although not so indicated in the appendix copy of the interview form, the occupational breakdowns were arranged to have comparability with standard census groupings. Students, housewives, retired and unemployed persons were added to those found in the census list. These demographic variables will primarily be used to identify target populations, or sub-groups within them, for the public information campaign.

Because of a concern for the confidentiality of the data and a desire to elicit high rates of cooperation in the survey, all personally identifying data such as name or license number were excluded from the questionnaire. However, identical pairs of numbers were placed on each respondent's interview form and his mail-back questionnaire, so that the data from both sources could be combined for each respondent.

The other questions in the on-site interview had the following objectives. Questions 6-11 were asked in order to provide information on where and when people drink prior to driving. Not only is there a paucity of research data on this subject, but the results have local implications for the WCASAP public information campaign by providing data on where to direct the campaign (e.g., bartenders versus private hosts) with the highest probability of reaching, directly or indirectly, the drivers of greatest concern.

Question 12 asked participants if they had either noticed or heard that there were more police on the alert for drivers who had been drinking. If the answer was positive and the respondent was not an abstainer, he was further asked if this had influenced his driving after drinking behavior. At the time of the roadside survey the newspaper publicity made only a brief mention of additional police patrols as a feature of the Washtenaw ASAP, but there had also been some publicity a few months earlier about this program at the time that the local police agencies agreed to participate in WCASAP. It was recognized that some of the positive responses to these questions might be because of misinformation, their somewhat leading nature, etc.; but still it was hoped that the percentages of positive responses would be useful as baseline data for comparison with answers to future surveys as one type of measure of the effect of WCASAP's expansion of police patrols in order to influence driving after drinking behavior.

The objective of Questions 13-13d was to provide baseline data on the effect of non-WCASAP informational programs dealing with the drinking driver and alcoholism. Effect is used here to mean an answer to the question of whether or not a message was heard; and, if so, the content, through which media source, and if the respondent thought it had an effect on his own drinking/driving behavior. Ideally the messages in the local and the national public information campaigns will be separated in the program and post-program surveys and the effect on behavior will be related and measured to the message best remembered. This is necessary should the intensity and extensity of the national campaign vary over the next three years.

Finally, Questions 14-14c were concerned with whether the respondent had heard of the WCASAP program, and, if so, what he knew about it. Again these questions were intended to provide baseline data for comparison with later survey findings. The respondents were also asked, as part of the introductory talk with them, if they had heard of the BAC roadside survey.

Before leaving, the respondents were also given a four-page self-administered questionnaire along with a stamped and addressed envelope and were asked to mail it back to HSRI within the next few days. This was the same questionnaire (Form B) which was used as a mail-back supplement to the WCASAP general public household interviews (see Appendix B.2). The heart of this questionnaire was 43 statements with which the respondent was supposed to indicate his

personal opinion on the following scale: strongly agree, somewhat agree, somewhat disagree, or strongly disagree. These statements concerned attitudes toward the effects of drinking on driving, appropriate countermeasures to increase highway safety and to reduce driving after drinking, the use of alcohol, and the treatment of alcoholism. It also contained nine questions concerning the reasons people drink, and a final section on the respondent's attention to local newspapers and radio stations, to be used by the local public information campaign.

Unfortunately, when the responses to the mail-back questionnaire were analyzed, it was found that only 47% of the interview respondents had returned it. Comparison of the characteristics of those persons who returned the questionnaire with those persons who did not return it showed some serious biases in the representativeness of the data. In regard to demographic background there were few differences for sex or age, but there was a great over-representation of persons with higher educational levels, with higher occupational statuses, and with residences in Ann Arbor. For example, 63% of the college graduates in the sample returned Form B compared to only 31% of those who didn't finish high school. And in regard to BAC there was a tendency for persons with a high BAC not to return the questionnaire. Only 30% of those at or above 0.10 BAC returned the questionnaire, and only 39% of those in the 0.05 to 0.09 BAC range did so.

Therefore, it was reluctantly concluded that valid analysis of the data could not be carried out. Thus only a brief further mention of these data will be presented in this report. The response rates for the various education, occupation, and BAC categories are shown in Appendix B.3.

2.4 OPERATIONAL GUIDELINES

During the later planning stages of the survey, operational procedures were developed for all members of the survey team. These specifically included operational guidelines to be followed by the police officers, training of and procedures for Breathalyzer* operators, and a pretest of the total procedure prior to the actual survey.

Police operational procedures were prepared by an HSRI staff member and the police traffic command officers. They were subsequently approved by the roadside survey committee. From these meetings it was agreed that no citizen would be arrested based on results of his voluntary participation in the breath-testing program. It was further established that no individual identification

*All of the BAC data was obtained by using a Breathalyzer Instrument (Model #900) manufactured by the Stephenson Corporation. This is the same equipment used by police officers in a large number of jurisdictions throughout the country. Hereafter the term Breathalyzer will be used to refer to this instrument which has the registered trademark Breathalyzer belonging to the Stephenson Corporation.

would be made of any citizen contacted. In particular, names or driver's license numbers would not be recorded. If a citizen's behavior was such that it would normally arouse the suspicion of a police officer, then the officer would contact him and follow normal police procedures without sending him to the survey team. These operating rules are described in Appendix C.1. None of the citizens randomly selected for the survey were subsequently detained by the police. However, in several cases citizens driving past the survey site aroused the suspicion of the officers and were contacted by them.

The HSRI team members who were responsible for the interviewing of subjects also performed the Breathalyzer testing. One Breathalyzer instrument was loaned to the survey team by the Michigan State Police. In addition an instrument owned by HSRI was used. Both Breathalyzer instruments were inspected by specialists from the Michigan State Police. Eight hours of Breathalyzer and simulator training were provided by the Michigan State University Traffic Safety Center. This training was followed by several independent practice runs, both in a laboratory situation as well as at a pretest site. Except when checking the Breathalyzer against the simulator, the reading was rounded down to the nearest 0.01 BAC. This is the same procedure followed by police after making an alcohol-related arrest.

Subsequent to the delineation of these procedures, the survey team went out in the fully equipped van and with the assistance of the police officers made a dry run of the procedures.

Protection of the Rights of Citizens: This survey dealt with personal behavior that in some cases might be illegal and in many cases might be detrimental to the individual if disclosed. Thus considerable effort was devoted to preserving the confidentiality of all information collected as part of the survey. The implications to be drawn from this survey demanded that we achieve a very high degree of cooperation from all citizens. Obviously if seriously intoxicated persons were over-represented in the refusal group, the results would be seriously biased. In order to gain this cooperation we believed that it was important to convince citizens that the information would be kept confidential. The best way of convincing them was to take well designed steps to insure it. As a further measure to guarantee confidentiality, all research personnel were informed that any discussion of individual citizens could be used as grounds for immediate dismissal from employment. As part of this information all interviewers were provided with a copy of the document shown in Appendix C.2.

2.5 PUBLICITY

In order to develop public awareness of the survey and thereby increase the rate of cooperation, a news release and a fact sheet (who, what, where, when, why) was prepared by the WCASAP public information director for use by local newspapers. In addition, photographs were taken of the survey van and the interviewers in order to expose the public to the physical setting of the survey operation.

Stories on the survey were carried in the Ann Arbor News on the Sunday preceeding, and in the Saline Reporter midway through the first week of the survey. One week prior, the Ypsilanti Press carried a general feature on the WCASAP also noting survey

activities. A reporter from this paper, as well as one from the Huron Valley Advisor joined the survey team and carried additional features near the conclusion of the survey.

A tape for use by radio stations was prepared, and frequent announcements concerning the survey were carried by WAAM, the Saturday prior, and by WPAG, the three days prior to the survey.

Perhaps because Washtenaw County is composed of relatively small communities, there also seemed to be considerable information passed by word-of-mouth as people began participating and then telling their colleagues and friends of the experience. In spite of this publicity only 23% of those persons interviewed said that they had heard of the roadside survey.

2.6 DESCRIPTION OF SURVEY PROCEDURE

As indicated previously, our sample procedure was designed to obtain a random, independent, unbiased sample of driver trips conducted on Washtenaw County roads during the evening hours. This was accomplished by setting up the survey for a two-hour period at randomly selected roadside locations. During each night that the survey was conducted, the survey team worked three different sites. Appendix C.3 presents the operating schedule that was established for the survey. There were some small deviations from this schedule resulting from long travel times between particular sites.

The survey team operated from a Winnebago mobile van, which provided a completely self-contained, highly mobile facility for conducting the survey. The van was equipped with its own 110-volt AC generator which provided power for the Breathalyzers and the exterior lights. During the first week some mechanical problems in the generator engine resulted in a failure to obtain data at one of the early morning survey sites. From that point on, a backup power system consisting of a 12 volt DC to 110 volt AC inverter was placed in the van. This backup system was pressed into service at one site later in the survey. Two Breathalyzers were kept plugged in and warm in the van. Both Breathalyzers were pressed into service several times when two interview stations were set up to overcome a late starting time or very low traffic volumes.

The team consisted of a male and female member of the HSRI research staff, a male and female assistant, and two police officers. The HSRI staff members conducted most of the interviews and the Breathalyzer tests, and were drawn from a pool of seven persons. It was decided to use senior personnel for interviews in order to provide persons of known maturity to handle any uncertainties. Also, we anticipated that additional insights could be gained by using competent researchers. We believe that the use of senior personnel proved to be correct since certain adjustments were necessary on an ad hoc basis and these were made without seriously biasing the survey.

The two assistants were hired primarily to drive seriously intoxicated persons home if they were discovered as part of the survey. It was decided to hire mature, responsible students for this task--rather than using volunteers--in order to insure confidentiality for citizens. In addition, we wished to be able to control the driver's activity. The male assistant also drove the van and took care of many assorted tasks that were necessary for the smooth running of the survey. The female assistant checked the interview forms for completeness and performed other miscellaneous tasks. As the survey progressed, the assistants were

also used for some of the initial contacts with citizens and for interviewing. This provided some relief for the regular interviewers. Also, during times of low traffic volumes, it was necessary to have someone ready to obtain the next subject prior to the time that the previous interview was completed.

In addition to the research personnel, the survey team also consisted of two police officers with a patrol car. These officers came from the three major jurisdictions involved in the WCASAP program and had been assigned to the special police patrol activity under the WCASAP program. These officers stopped vehicles and directed them to the survey team. In addition, they maintained a traffic count on a hand counter during the time that the interviews were being conducted. Contact between citizens and police officers was kept at a minimum in order to insure a high rate of cooperation and to maintain confidentiality for all citizens.

Procedure at Survey Site: Upon arrival at a survey site, the van was positioned off the road so that it was convenient for interviewers to approach motorists in a well-lighted area. Exterior lights mounted on the van were turned on and flashing warning signs were placed up the traffic stream from the site. Test ampoules were placed in the Breathalyzer instrument and it was prepared for use following the procedures shown in Appendix C.4. It was not necessary to warm the Breathalyzer since it was kept continually plugged into the 110 volt power supply that operated at all times. The police officers positioned themselves along the road in anticipation of the signal for the first vehicle to be sampled. When the interviewers were ready for a subject, they stepped out of the van, faced downstream in the traffic flow and counted to ten. They then signaled the police officers who directed the next vehicle to the spot where the interviewers were standing--the lighted area near the rear door of the van. The driver was approached by an interviewer of the same sex and the following message was communicated:

Good evening. My name is _____. We are from the Highway Safety Research Institute and are conducting a survey for the Washtenaw County Alcohol Safety Action Program. The information obtained in the survey will be used to make driving safer for you and your family.

Are you a Washtenaw County resident? Yes ___ No ___ (send on)

We are asking each Washtenaw County driver who is stopped at a survey site to spend 3 to 4 minutes with us. Each driver takes an alcohol breath test and answers a few simple questions. All information obtained in the survey is strictly confidential.

Would you like to come in the van?

If the driver was still hesitant about participating, he was again assured of confidentiality, and of a three- or four-minute interview. In some cases we attempted to arouse their curiosity and in other cases stressed the importance for highway safety of obtaining cooperation of all citizens. In all cases, citizens

were treated with respect and in no cases were explicit or implied threats of any kind used. If a citizen could not be persuaded to cooperate within a short period of time, he was thanked and a signal was given for another subject. For all refusals, we noted the time, their sex, and made a subjective estimation of whether or not they had been drinking.

If a citizen agreed to participate, he was invited to step inside of the van. In general, passengers were discouraged from accompanying the driver into the van. However, if the interviewer felt that this was necessary to get the driver's cooperation, the passenger was allowed to come in also. In cases where there were small children in the car, the female assistant was asked to stay with them during the interview. Upon entering the van, the citizen was introduced to the other member of the interview team who administered the breath test. A clean, sterile mouth piece was removed from its wrapper in the presence of the citizen and he was instructed in how to give a proper breath sample. The sample was analyzed while the interview was being conducted by the original contact person. The first page of the interview was completed while the breath sample was being obtained. Since most citizens had not been drinking on the day of the interview, it was usually only necessary to check, and not to reset, the Breathalyzer at the completion of the analysis for these persons. Thus, for non-drinking persons, the process took less than three minutes. Since the Breathalyzer ampoules can be used for cumulative BAC readings of about 0.60, it was decided to change ampoules only after the cumulative blood alcohol readings reached 0.30. In a few cases, a second breath sample was taken if the operator questioned the test result. An alcohol breath simulator--which would give a known reading of 0.10 BAC--was used to test the instrument before and after each night's survey. In addition, the instrument was checked on a few occasions when the operator suspected a reading. In all cases, the instrument checked within 0.004. Several studies¹ have indicated that a small downward bias exists for high BAC readings taken with a Breathalyzer instrument. This bias is cancelled since measurements having the same bias are being compared and our interest is with differences in BAC's rather than absolute values.

Upon completion of the interview, the citizen was presented with a "Thank You" card on which his BAC was written. He was offered some literature concerning breath tests, alcohol and driving and was asked to return a mail-back questionnaire which was given to him at this time. Short questions and explanations were provided on the spot. If the citizen desired to make long comments or ask several questions, he was invited to call the interviewer during the day and was given the interviewer's business card with his phone number. To date, only a few calls have resulted from this source. It is the opinion of the interviewers that a very large percentage of the citizens left the interview happy and with the feeling that they had helped in the overall County program. In addition, many expressed the feeling that they were glad that someone was finally doing something about the problem of alcohol and driving.

¹R.W. Prouty and B. O'Neil, An Evaluation of Some Qualitative Breath Screening Tests for Alcohol Insurance Institute for Highway Safety Research Report, Washington, D.C., May 1971.

Upon completion of each interview with a driver who had been drinking, the interviewer made a judgment of the person's capability to continue driving. This judgment was, of course, influenced by the measured BAC. However, overall behavior during the interview was also used to guide the judgment. If the interviewers concluded that the person should not be driving, an attempt was made to remove him from the driver's seat. He was assured that although he would not be arrested by the survey police officers, it was possible that other officers might notice his driving and arrest him. Even greater emphasis was placed on the fact that the interviewers would feel very responsible if the respondent were subsequently involved in an accident. If there was another person in the car who could drive, a switch of drivers was strongly encouraged. This approach worked in almost every case in which it was used. If the driver was alone, we offered the services of fully insured drivers, one who would drive the respondent's car home, and a second one to follow and return our driver to the survey site. In all cases, the driver of the respondent's car was the same sex as the intoxicated driver. Two of the eight respondents with Breathalyzer readings of 0.15 or higher accepted the offer of the ride. Car license numbers were recorded in the event of any legal proceedings for drivers who were offered a ride and did not accept.

The survey was planned with the objective of obtaining an average of 15 interviews during the two-hour period at a site. This would have given a total sample size of 720 which would provide the desired precision for the survey. Our initial interview form was designed with the objective of being administered in four minutes, including time for the breath sample. Another minute was allowed for contacting subjects and obtaining their cooperation. This would enable us to obtain a maximum of 24 subjects in a two-hour period under ideal conditions, including a continual flow of traffic on the road. The interviewers were instructed to stop after 20 interviews at a site or at the end of a two-hour period, whichever came first. In practice, it required from two to six minutes to administer the questionnaire with most of the interviews requiring the shorter period. The one-minute period for contacting the motorist and explaining the survey was usually adequate. However, it often required a minute for the officer to stop a vehicle and direct it to the interview team. Thus, only under ideal conditions was the upper limit of 20 subjects attained. Except for roads with very low traffic volumes--which tended to occur frequently late at night--it was not difficult to attain the 15 interviews per site established in the initial plan.

However, during the early morning hours there were some locations in which the intervals between cars were as much as ten minutes. This obviously caused some problems in attaining expected sample sizes. Nevertheless, we believe that it was important to sample at these sites during the early morning hours in spite of the operational difficulties, since Michigan law requires that alcohol not be served after 2:00 A.M. and that bars be vacated by 2:30 A.M. We also believe that it was important to obtain data from lower traffic volume roads during these hours. During the entire survey, 748 citizens were interviewed at forty-seven sites. (One of the scheduled sites was lost due to a generator failure.) Thus, the final average was almost 16 interviews per site for the entire survey. The initial plan of obtaining 15 interviews per site proved reasonable using our interview procedure at roadside sites with traffic volumes similar to those used in this study.

3. ANALYSIS OF RESULTS

This section describes the various analyses performed on the roadside survey data. Section 3.1 compares BAC with variables used in the experimental design; Section 3.2 discusses the location of drinking drivers; Section 3.3 describes the relationship of BAC to demographic variables and drinking patterns; and Section 3.4 describes interview responses by the BAC of the respondent and by various demographic characteristics. The remaining sections include an analysis of drivers who refused to participate in the survey (3.5), and a comparison of the Washtenaw County survey with that conducted by Mecklenburg County, North Carolina (3.6).

BAC was obtained on 746 of the 748 roadside survey participants. The proportion of drivers in each category is shown in Table 1. The cumulative distribution appears in Figure 2.

TABLE 1. DISTRIBUTION OF DRIVERS BY BAC ^(a)

BAC:	<u>0</u>	<u>0.01</u>	<u>0.02- 0.04</u>	<u>0.05- 0.07</u>	<u>0.08- 0.09</u>	<u>0.10- 0.14</u>	<u>0.15- 0.19</u>	<u>0.20- 0.22</u>	<u>Total</u>
N:	74.7%	6.3%	8.6%	4.7%	1.5%	3.0%	0.8%	0.3%	100%
P:	559	47	64	35	11	22	6	2	746

(a) N = Number of participants in each category
 P = Proportion of participants in each category

In most of the subsequent analyses, a positive BAC is construed to mean a BAC equal to or greater than 0.02. This was done in order to provide a conservative measure of drinking and to provide a statistic which was directly comparable to the results of the Mecklenburg County BAC survey.

3.1 BAC AND EXPERIMENTAL DESIGN

This section presents an analysis of the relationships between BAC and the variables included in the experimental design model. Thus it indicates where and when drivers with high BAC's are expected to be on the road. An analysis of variance, with four independent variables, was performed to study the effects of the experimental design variables. Statistical significance tests were performed on all direct and interactive effects. The dependent variables used are the proportions* of drivers at a particular

*The use of proportion variables overcomes the difficulties of using the mean BAC's per site which are less sensitive to effects of the independent variables. This insensitivity results from the fact that the distribution of individual BAC's contains a large percentage of persons with zero BAC. Thus the means tend to be small and to be effected greatly by individual BAC's especially if the readings are large. An analysis of variance using mean BAC's per site, presented in Appendix D, illustrates this insensitivity.

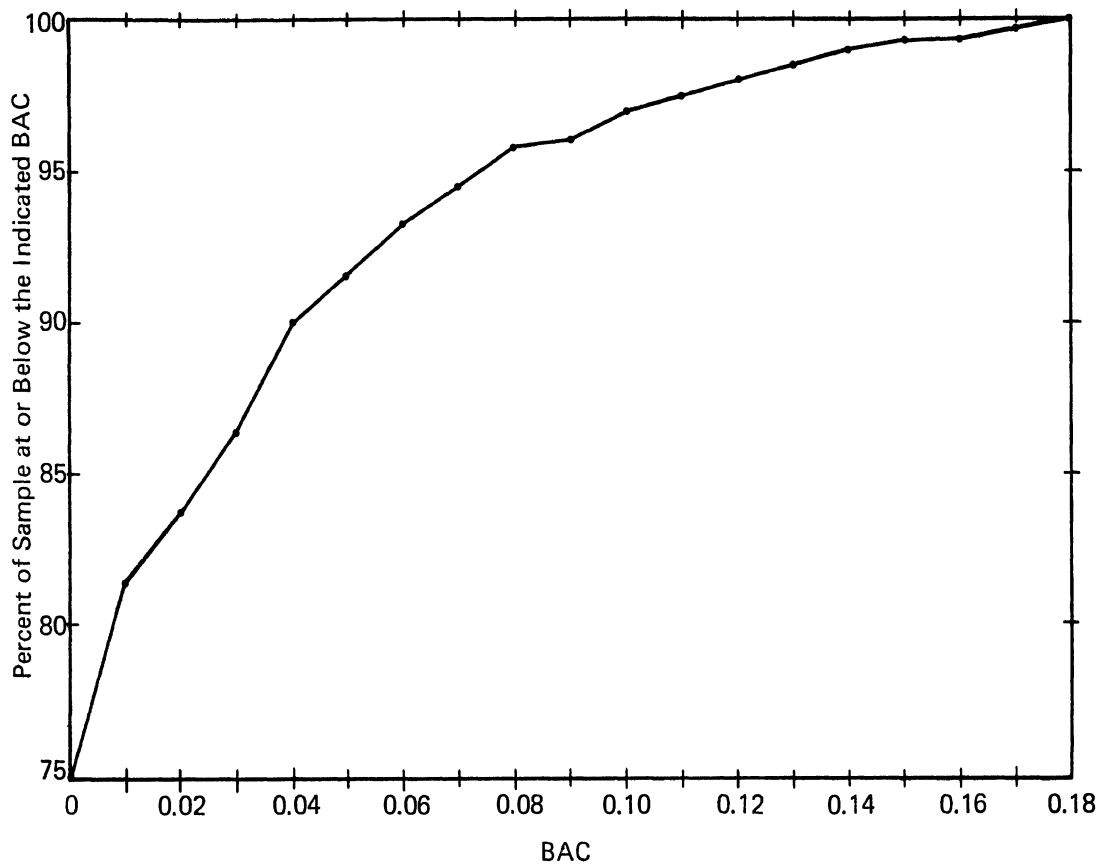


FIGURE 2. CUMULATIVE DISTRIBUTION OF DRIVERS BY BAC FOR ENTIRE SAMPLE

site who were at or above 0.02 BAC and at or above 0.05 BAC. These variables were chosen in order to provide analyses of all drinking and of "heavy" drinking. These particular BAC groupings were also used in the Mecklenburg County survey. Therefore comparisons can be made between the results of the two surveys.

The use of variables which represent sites rather than individuals has the effect of weighting each site equally. Other analyses, based on the total sample, weight each site by the number of persons interviewed at the site. Since the sites occurring earlier in the evening and on high volume roads tended to have more interviews, the proportions from the total sample will be different from those reported in this section. However, the differences were very small (e.g., 10.9% at or above 0.05 BAC for the equal weighting by site case versus 10.2% for the total sample). Thus the potential bias had very little effect.

The significance levels reported for the analysis of variance are approximate since the proportion variables do not completely satisfy the assumptions of the model. However, examination of the data convinced us that any differences would not change the conclusions presented in the following paragraphs.

Tables 2-7 present the results of the analyses of variance applied to the experimental design model. In the 0.02 and the 0.05 cases significant effects resulted from traffic volume, time of night and the interaction between these two. In addition, it should be noted that the average percent of drivers operating at or above 0.02 BAC was 19.7% while 10.9% was the average percent of

drivers operating at or above 0.05 BAC. An analysis of the percentage of drivers with BAC's between 0.02 and 0.04 indicated that they were independent of the experimental design variables. This indicates that the conclusions of this analysis apply specifically to drivers with BAC's at or above 0.05. The various row means for the other design variables are as indicated. Since there is a significant interaction between time and traffic volume, it is possible that their reported main effects may be biased. In order to analyze this question, the two-way tables shown in 3 and 6 were prepared. Inspection of these tables indicates that the difference due to traffic volume appears to occur later at night while the major effect due to time occurs between the 10-12 P.M. and the 1-3 A.M. time periods. In order to test for the significance of these differences Tukey's procedure for obtaining minimum significant differences (MSD) between treatment levels was used.¹

$$\text{Minimum Significant Difference} = K_{\alpha} (S^2/C)^{1/2}$$

- where K_{α} - Normalized factor for the upper α percentage point of the studentized range. This factor is tabulated¹ for various degrees of freedom and number of treatments.
- S^2 - Mean square due to random error.
- C - Number of observations made at each treatment level.

TABLE 2. PERCENTAGE OF DRIVERS WITH BAC GREATER THAN OR EQUAL TO 0.02 AS A FUNCTION OF EXPERIMENTAL DESIGN VARIABLES

<u>Variable</u>	<u>Level</u>	<u>Mean</u>
Traffic Volume	1 Medium	23.1%
	2 High	18.2%
Time of Night	1 (7 P.M.-9 P.M.)	10.9%
	2 (10 P.M.-12 P.M.)	14.0%
	3 (1 A.M.-3 A.M.)	34.1%
Urban vs Rural	1 Urban	17.8%
	2 Rural	21.5%
Weekday vs Weekend	1 Weekday	18.1%
	2 Weekend	21.2%
Grand Mean		19.7%

¹A.H. Bowker and G.H. Lieberman, Engineering Statistics, Prentice-Hall, Englewood Cliffs, N.J., 1959.

TABLE 3. PERCENTAGE OF DRIVERS WITH BAC GREATER THAN OR EQUAL TO 0.02 BY TIME OF NIGHT AND TRAFFIC VOLUME

Time of Night	Traffic Volume		Minimum Significant Difference Between Cell Means
	1 Medium	2 High	
1 (7 P.M.- 9 P.M.)	9.9%	12.0%	13.2%
2 (10 P.M.- 12 P.M.)	17.4%	10.6%	
3 (1 A.M.- 3 A.M.)	42.0%	26.0%	

TABLE 4. ANALYSIS OF VARIANCE FOR PERCENTAGE OF DRIVERS AT OR ABOVE 0.02 BAC

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Squares	Ratio
A (traffic volume)	560	1	560	7.79 (a)
B (time of night)	5049	2	2524	35.10 (a)
AB	648	2	324	4.50 (a)
C (urban vs rural)	161	1	161	
AC	33	1	33	
BC	4	2	2	
ABC	149	2	75	
D (weekday vs weekend)	120	1	120	
AD	21	1	21	
BD	87	2	43	
ABD	23	2	12	
CD	40	1	40	
ACD	8	1	8	
BCD	323	2	161	
ABCD	126	2	63	
Within Cells	1657	23	72	
Total	9009	46		

(a) Significant at $\alpha \leq 0.05$

- NOTE:
1. The missing site was handled by assigning it the same value as the other observation in that cell of the complete factorial model. This results in the replacement of the missing value by its expected value. However, it removes one degree of freedom from the mean square for error.
 2. Table values are rounded to the nearest whole number.

TABLE 5. PERCENTAGE OF DRIVERS WITH BAC GREATER THAN OR EQUAL TO 0.05 AS A FUNCTION OF EXPERIMENTAL DESIGN VARIABLES

<u>Variable</u>	<u>Level</u>	<u>Mean</u>
Traffic Volume	1 Medium	13.8%
	2 High	8.0%
Time of Night	1 (7 P.M.-9 P.M.)	5.3%
	2 (10 P.M.-12 P.M.)	6.1%
	3 (1 A.M.-3 A.M.)	21.1%
Urban vs Rural	1 Urban	9.2%
	2 Rural	12.5%
Weekday vs Weekend	1 Weekday	9.4%
	2 Weekend	12.3%
Grand Mean		10.9%

TABLE 6. PERCENTAGE OF DRIVERS WITH BAC GREATER THAN OR EQUAL TO 0.05 BY TIME OF NIGHT AND TRAFFIC VOLUME

<u>Time of Night</u>	<u>Traffic Volume</u>		<u>Minimum Significant Difference Between Cell Means</u>
	<u>1 Medium</u>	<u>2 High</u>	
1 (7 P.M.-9 P.M.)	5.1%	5.5%	10.2%
2 (10 P.M.-12 P.M.)	9.0%	3.2%	
3 (1 A.M.-3 A.M.)	27.2%	15.0%	

TABLE 7. ANALYSIS OF VARIANCE FOR PERCENTAGE OF DRIVERS AT OR ABOVE 0.05 BAC

<u>Source of Variation</u>	<u>Sums of Squares</u>	<u>Degrees of Freedom</u>	<u>Mean Squares</u>	<u>Ratio</u>
A (traffic volume)	414	1	414	9.55 (a)
B (time of night)	2537	2	1269	29.3 (a)
AB	319	2	159	3.68 (a)
C (urban vs rural)	124	1	124	
AC	2	1	2	
BC	196	2	98	
ABC	156	2	78	
D (weekday vs weekend)	99	1	99	
AD	29	1	29	
BD	27	2	14	
ABD	92	2	46	
CD	1	1	1	
ACD	32	1	32	
BCD	181	2	91	
ABCD	66	2	33	
Within Cells	999	23	43	
Total	5272	46		

(a) Significant at $\alpha \leq 0.05$

- NOTE:
1. The missing site was handled by assigning it the same value as the other observation in that cell of the complete factorial model. This results in the replacement of the missing value by its expected value. However, it removes one degree of freedom from the mean square for error.
 2. Table values are rounded to the nearest whole number.

For this problem we chose $\alpha = .05$. In addition, each cell in the two-way table was assumed to be a treatment level. This resulted in six treatment levels with eight (C=8) observations per level. Using these parameters it was found that the MDS for the 0.02 BAC analysis (Table 3) was 13.2, while for the 0.05 BAC analysis (Table 5) it was 10.2. Therefore any observed differences between cell means that are greater than or equal to these MSD's are in fact statistically significant at a probability level of $\alpha = 0.05$. Applying these factors to both Table 3 and 6 the following conclusions result:

(1) The proportion of drivers who have positive BAC's is significantly higher at both traffic volumes during the 1-3 A.M. time period compared to the other two nighttime periods studied.

(2) The proportion of drivers having positive BAC's is significantly greater at medium traffic volumes (compared to high) during the 1-3 A.M. time period.

(3) There is a difference in the proportion of drivers having positive BAC's at medium and high traffic volumes during the 10-12 P.M. time period. However, this difference is not statistically significant.

An analysis of variance was also performed using average BAC per site as the dependent variable. This analysis, shown in Appendix D, resulted in only time of night having a statistically significant effect. This reinforces the results of the earlier two analyses. This analysis was not as productive as the other two because of a large random error which tended to mask effects due to independent variables. Since the analysis used the mean of 15 for a sample site, the sensitivity would have been greatly increased by increasing the number of observations per cell.

Figure 3 and Appendix E indicate the relationships between time of night and BAC's. There is a slow but steady increase in the percentage of drinking drivers until midnight followed by a rapid upswing between midnight and 1 A.M. This rapid upswing was combined with a dramatic decrease in traffic volume.

An analysis of nighttime single vehicle crashes occurring during the years 1966-1970 was performed using HSRI's accident data banks for Washtenaw County. Figure 4 and Table 8 indicate the proportion of crashes involving alcohol as a function of time of night.* In addition, the proportion of high BAC drivers during similar time periods is shown for comparison. The over-involvement of alcohol in crashes compared to its involvement in the driving population is evident. In particular the increase in the proportion of drivers with BAC's greater than or equal to 0.10 is associated with a large increase in the occurrence of alcohol-involved crashes.

*The determination of alcohol involvement was by police report. Previous studies by HSRI and others have shown a significant under-reporting of alcohol involvement by police officers investigating crashes (Lyle D. Filkins, et al., Alcohol Abuse and Traffic Safety: A Study of Fatalities, DWI Offenders, Alcoholics, and Court Related Treatment Approaches, Final Report, Highway Safety Research Institute, The University of Michigan, Ann Arbor, June, 1970.

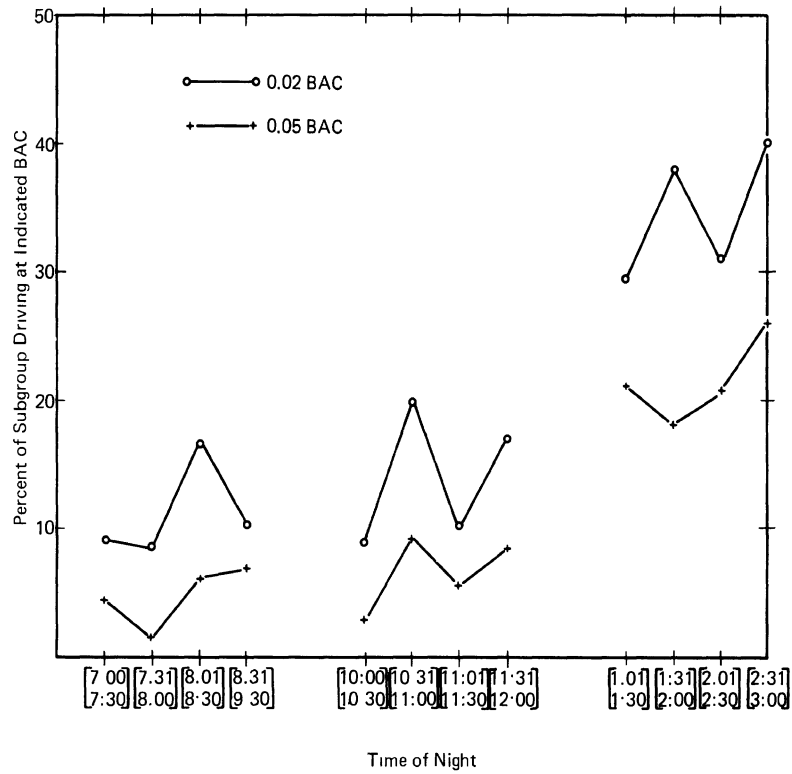


FIGURE 3. BAC VS. TIME OF NIGHT FOR THE ENTIRE SURVEY

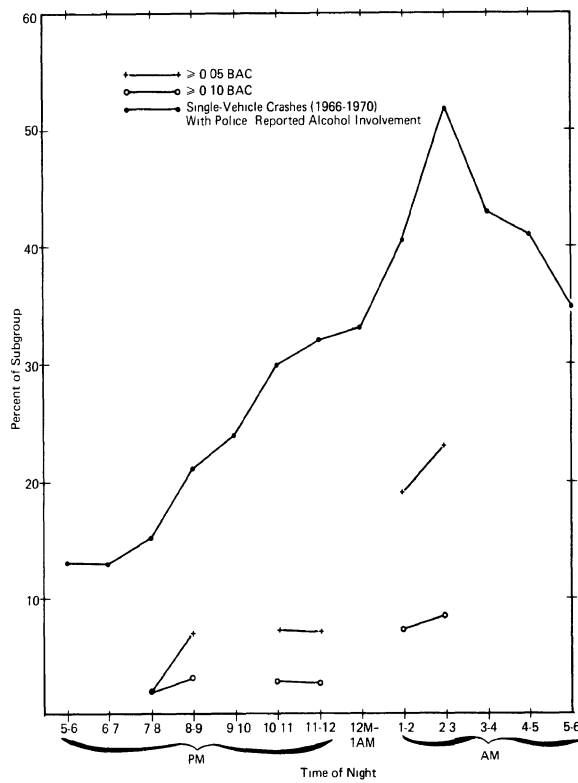


FIGURE 4. COMPARISON OF ALCOHOL-RELATED CRASHES WITH BAC IN THE DRIVING POPULATION

TABLE 8. INVOLVEMENT OF ALCOHOL IN SINGLE VEHICLE CRASHES IN WASHTENAW COUNTY ^(a) 1966-1970 DURING THE NIGHTTIME HOURS

<u>Time</u>	<u>Number of Single Vehicle Crashes Included</u>	<u>Number in Which Police Reported Alcohol Involvement</u>	<u>Proportion Involving Alcohol</u>
5-6 P.M.	198	26	0.13
6-7 P.M.	228	31	0.13
7-8 P.M.	224	34	0.15
8-9 P.M.	175	37	0.21
9-10 P.M.	185	46	0.24
10-11 P.M.	207	64	0.30
11-12 P.M.	231	76	0.32
12 P.M.-1 A.M.	187	62	0.33
1-2 A.M.	182	75	0.41
2-3 A.M.	204	108	0.52
3-4 A.M.	118	51	0.43
4-5 A.M.	77	32	0.41
5-6 A.M.	80	28	0.35
Total	2296	670	0.29

(a) Includes crashes investigated by the Ann Arbor Police and Washtenaw County Sheriff's Department only.

3.2 LOCATION OF DRINKING DRIVERS

An important question in regard to drinking drivers concerns when and where they are operating their vehicles. The answer has obvious implications for police patrols designed to control the behavior of drinking drivers.

The analysis in Section 3.1 indicates clearly that persons with a positive BAC are a larger proportion of the driving population after midnight. This increase in the proportion of drivers with high BAC is accompanied by an increase in the proportion of single vehicle crashes involving alcohol. The analysis also indicates that drivers with high BAC are more likely to be on the somewhat less heavily traveled roads during the early morning hours. A reasonable explanation might be an attempt on their part to avoid arrest or interactions with other cars. Thus it is recommended that road patrols concentrate on the less heavily traveled routes during the early morning hours. It should be noted that these are the routes that carry medium volume traffic during most of the daytime and early evening hours. We do not imply that road patrols should concentrate on residential or local traffic routes since these may contain little traffic during the early morning hours.

In order to investigate the question of the geographic location of drinking drivers, the survey locations were divided into the following categories: rural county, county near the city of Ypsilanti, county near the city of Ann Arbor, Ypsilanti and Ann Arbor. These designations along with variables for time of night, traffic volume and weekday versus weekend were used as predictors in a dummy variable regression model designed to predict the proportion of drivers with BAC's at or above 0.05. The details of the model are presented in Appendix F. Figure 5 presents graphically the results of that model. The geographic areas of the county were found to divide into three distinct groupings. The city of Ann Arbor had the smallest proportion of drivers with BAC's at or above 0.05. The area adjacent to Ypsilanti was the next lowest. The largest proportions of drivers with high BAC's occurred in the city of Ypsilanti, in the rural county area and in the county area surrounding Ann Arbor.

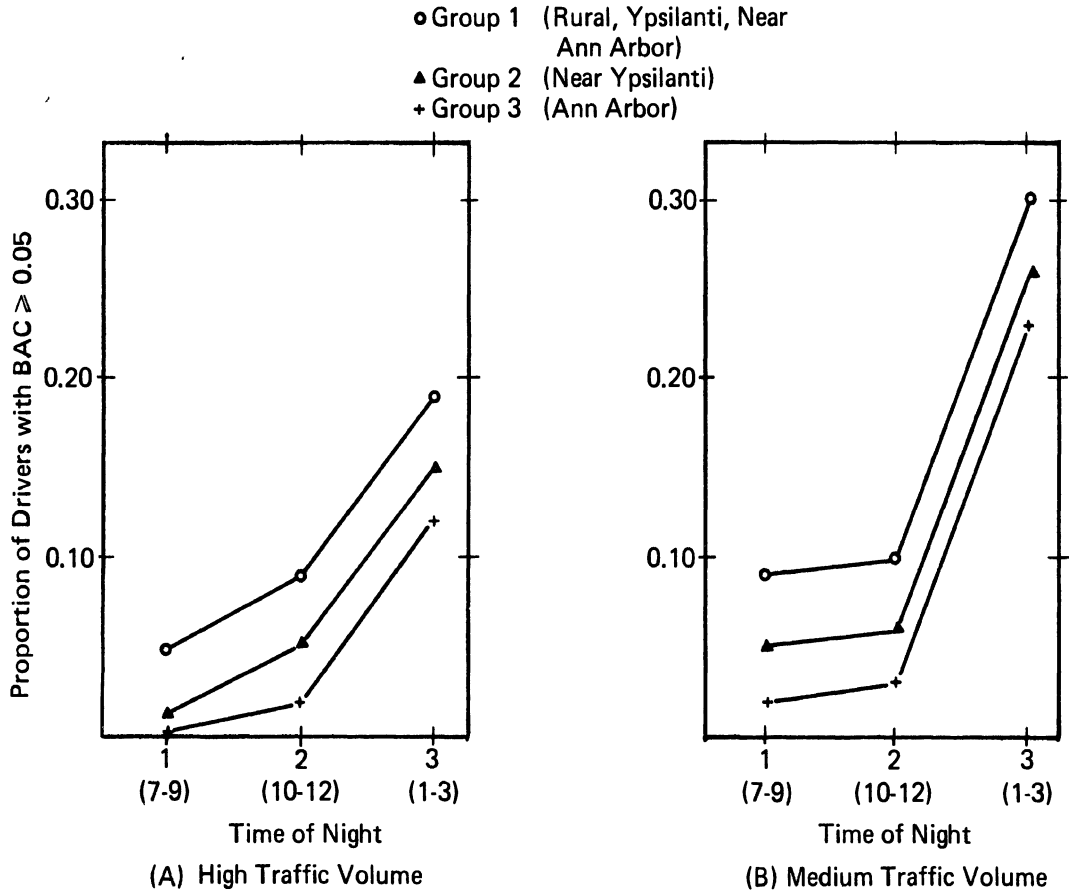


FIGURE 5. LOCATION OF DRIVERS HAVING HIGH BAC's

3.3 BAC, DEMOGRAPHIC VARIABLES AND DRINKING PATTERNS

The following section includes a discussion of the relationship between demographic variables and BAC. Also included are responses to the interview schedule for those questions related to drinking pattern immediately prior to participation in the survey.

3.3.1 DEMOGRAPHIC VARIABLES AND BAC

Age: Figure 6 and Table 9 show the BAC distribution as a proportion of each age group. Except for the two end points (age 16-20 and 61 or older), the curve is generally a flat one. The small peaks which do appear are very likely due to the small number in the age group on which the percentage was based. Figure 6 and Table 9 strongly suggest that drinking drivers (at the three concentrations shown) are involved to the same proportion in all age groups from 21 to 60.

The data in Figure 6 do not compare the exposure of each age group to nighttime driving. This exposure is plotted in Figure 7 as the percentage of the total driving population who are in each age group. In addition, the figure shows the distribution of drivers with BAC >0.05 by age for two groups; drivers who participated in the roadside survey, and drivers who died in traffic crashes in Wayne County¹ (adjacent to Washtenaw County). The inclusion of the Wayne County fatality data requires an assumption that the driving populations of the two counties are the same. The reader is thus cautioned that the similarity of the relationship between the fatal and non-fatal drivers with BAC's at or above 0.05 is not as reliable as other findings in this report. However, a strong trend is suggested: drinking drivers by age group--both crash and non-crash--are a fixed proportion of the age group driving with the exception of the under 21 age group. Since more persons under 25 are both driving and drinking, more will be killed in alcohol-related crashes. All three distributions are strikingly similar. Exposure, involvement in fatal crashes at BAC >0.05 , and driving involvement at BAC >0.05 all peak at age 21-25. The only dissimilarity is the under-involvement of drivers aged 16-20 in fatal crashes or driving at >0.05 BAC compared to their exposure. This clearly suggests that counter-measures aimed at the drinking driver should emphasize reaching the 21-25 year old drivers.

¹Lyle D. Filkins, et al., Alcohol Abuse and Traffic Safety: A Study of Fatalities, DWI Offenders, Alcoholics, and Court Related Treatment Approaches, Final Report, Highway Safety Research Institute, The University of Michigan, Ann Arbor, June, 1970.

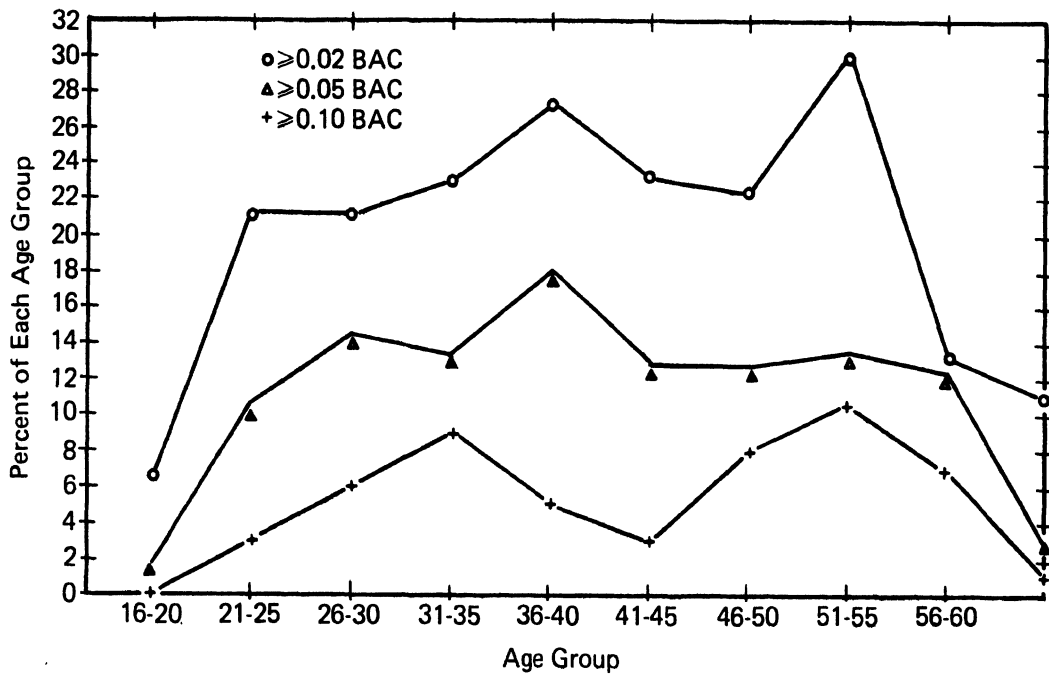


FIGURE 6. PERCENTAGE OF DRIVERS AT OR ABOVE THE INDICATED BAC BY AGE GROUP

TABLE 9. NUMBER AND PROPORTION OF DRIVERS AT OR ABOVE THE INDICATED BAC BY AGE GROUP

Age Group	BAC Subgroups			Number Observed
	>.02	>.05	>.10	
16-20	10 (7%)	2 (1%)	0 ---	150
21-25	44 (21%)	22 (11%)	6 (3%)	210
26-30	27 (21%)	18 (14%)	8 (6%)	126
31-35	16 (23%)	9 (13%)	6 (9%)	69
36-40	12 (27%)	8 (18%)	2 (5%)	44
41-45	9 (23%)	5 (13%)	1 (3%)	39
46-50	9 (23%)	5 (13%)	3 (8%)	40
51-55	9 (30%)	4 (13%)	3 (10%)	30
56-60	2 (11%)	2 (11%)	1 (6%)	18
61+	2 (11%)	1 (5%)	0 ---	19
Total	140 (19%)	76 (10%)	30 (4%)	745

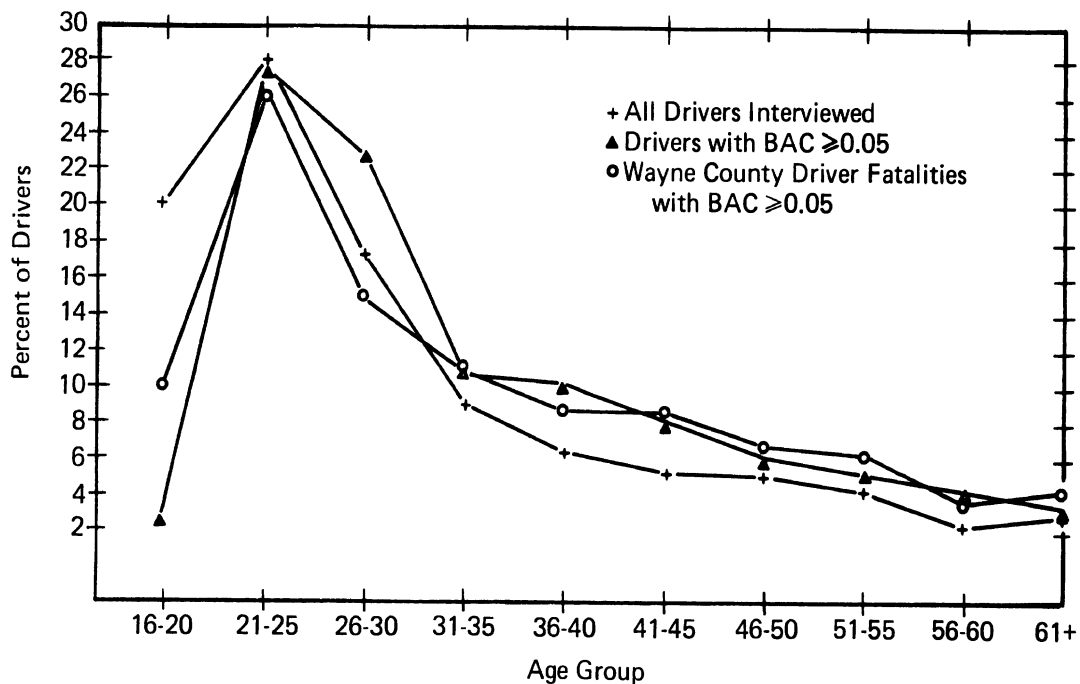


FIGURE 7. DISTRIBUTION BY AGE OF DRIVER SUBGROUPS

Occupation: The BAC's for various occupational subgroups are indicated in Figure 8. A general conclusion is that the proportion of drivers at or above the indicated BAC's do not vary greatly from over the occupational subgroups. The large proportion of drinking drivers in the laborer subgroup is conditional in a sample size of only 20. Students are under-involved in the drinking driver subgroup. However, this probably results from the large number of drivers under age 21 who are also students.

Housewives and retired persons are not shown on the graph due to the fact that no one in either of these categories registered a positive BAC out of the 40 persons tested.

Marital Status: Table 10 contains the BAC groupings by marital status of participating subjects. Marital status groups which are over-represented in the drinking and driving subgroup include the divorced and separated persons. Forty-two percent of the divorced persons had been drinking compared to 27% or less of the other groups. Thirty-seven percent of divorced, and 46% of separated persons were at 0.05 BAC or higher, compared to 15% or less of the remaining groups. Although these BAC's are in the higher ranges it should also be noted that divorced and separated persons comprise only 44 of the 745 persons for whom marital status was ascertained.

Sex: Consistent with other studies on the drinking habits of males and females, it was found that a higher proportion of males were drinking than were females. This also held true for the proportion of drinkers in the higher BAC ranges. Table 11 shows this distribution.

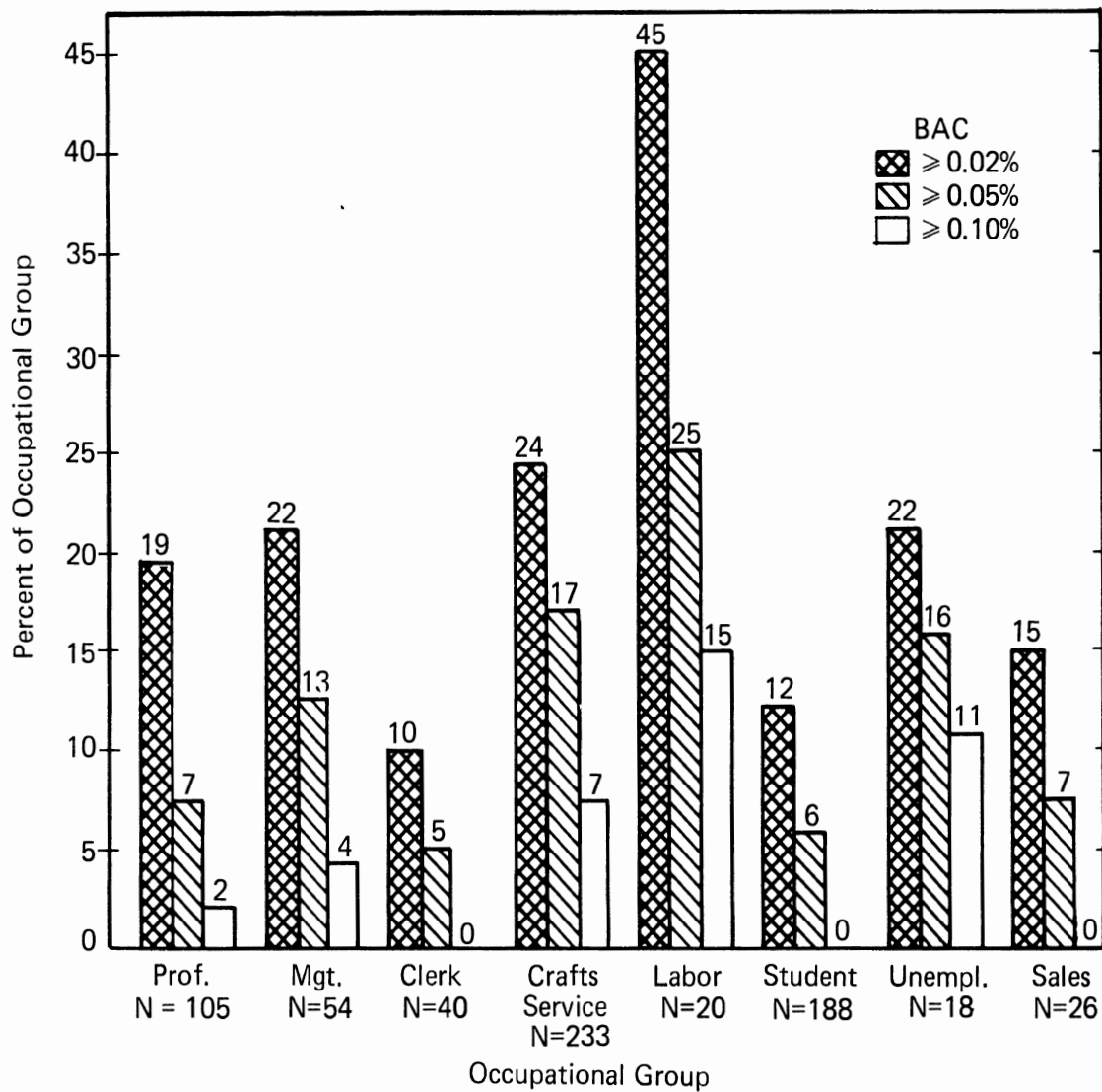


FIGURE 8. PERCENTAGE OF DRIVERS AT OR ABOVE THE INDICATED BAC BY OCCUPATIONAL SUBGROUP

TABLE 10. NUMBER AND PROPORTION OF DRIVERS AT OR ABOVE THE INDICATED BAC BY MARITAL STATUS SUBGROUPS

Marital Status	BAC Subgroups			Number Observed
	≥ .02	≥ .05	≥ .10	
Married	71 (19%)	39 (10%)	18 (5%)	380
Divorced	14 (42%)	9 (27%)	3 (10%)	33
Separated	3 (27%)	3 (27%)	2 (18%)	11
Widowed	1 (10%)	- 0	- 0	10
Single	51 (16%)	25 (8%)	7 (2%)	311
Total	140 (19%)	76 (10%)	30 (4%)	

TABLE 11. NUMBER AND PROPORTION OF DRIVERS AT OR ABOVE THE INDICATED BAC BY MALE AND FEMALE SUBGROUPS

<u>Sex</u>	<u>BAC Subgroups</u>			<u>Number Observed</u>
	<u>≥0.02</u>	<u>≥0.05</u>	<u>≥0.10+</u>	
Male	127 (22%)	70 (12%)	30 (5%)	578
Female	14 (7%)	6 (4%)	- 0	166
Total	141 (19%)	76 (10%)	30 (4%)	744

Educational Attainment: Table 12 indicates the BAC for various educational subgroups. Similar to the occupational subgroups, there are not, in general, large differences in the proportion of drinking drivers over the educational subgroups. The subgroup, of 13 persons, with seven years or less of education had a higher proportion of drinking drivers. The small sample size, however, severely limits the result. There was an under-involvement in the high BAC subgroups for those drivers with one or more years of graduate work.

TABLE 12. NUMBER AND PROPORTION OF DRIVERS AT OR ABOVE THE INDICATED BAC BY EDUCATIONAL SUBGROUPS

<u>Education</u>	<u>BAC Subgroups</u>			<u>Number Observed</u>
	<u>≥.02</u>	<u>≥.05</u>	<u>≥.10</u>	
7 years or less	5 (39%)	4 (31%)	2 (15%)	13
8-11	31 (20%)	19 (12%)	7 (5%)	157
High school	32 (17%)	18 (10%)	8 (4%)	184
Business or trade	3 (13%)	2 (8%)	1 (4%)	24
1-3 years college	35 (18%)	19 (10%)	7 (4%)	197
College degree	15 (21%)	8 (11%)	4 (6%)	71
1 or more years graduate work	19 (19%)	6 (6%)	1 (1%)	100
Total	140 (19%)	76 (10%)	30 (4%)	746

Residence: Table 13 shows the distribution of drivers by BAC and the community of residence. The results are rather consistent over communities except for the under-representation of drinking before driving for residents of small cities and towns. This result differs somewhat from the BAC distribution by community where participation in the survey was gained. It has been indicated previously (Section 3.2) that the city of Ypsilanti and the rural county areas had a larger proportion of drinking drivers. Thus BAC is independent of community of residence although persons with high BAC's do tend to be driving in Ypsilanti and in the rural county areas.

TABLE 13. NUMBER AND PROPORTION OF DRIVERS AT OR ABOVE THE INDICATED BAC BY COMMUNITY OF RESIDENCE

<u>Community of Residence</u>	<u>BAC Subgroups</u>			<u>Number Observed</u>
	<u>>.02</u>	<u>>.05</u>	<u>>.10</u>	
Ann Arbor	54 (20%)	26 (10%)	10 (4%)	276
Ypsilanti	29 (20%)	16 (11%)	10 (7%)	144
Ypsilanti Twp.	19 (17%)	11 (10%)	4 (4%)	109
Small cities and towns	6 (11%)	3 (5%)	2 (4%)	55
Townships	32 (20%)	20 (13%)	4 (3%)	159
Total	140 (19%)	76 (10%)	30 (4%)	743

3.3.2 DRINKING PATTERNS. An analysis of drinking patterns is presented in Figure 9. Sixteen percent of the sample said they abstain from alcoholic beverages, and an additional 48% indicated that they did not have a drink on the day interviewed. Of the remaining 36% who had been drinking on the day interviewed, one-half had a BAC below 0.02.

The locations most frequently used for drinking were bars and a person's own home. However, the drinking done in bars resulted in much higher BAC's than that done at home, particularly when more than one drinking location was reported. A comparison of Tables 14 and 15 indicates that of the 30 drivers who were at or above 0.10 BAC, 19 had been drinking at only one location. Thus, the drivers with the highest BAC's tend to come from a group doing all of its drinking at one location, and that location is frequently a bar.

An analysis of trip destination indicated that two-thirds of the drivers at or above 0.10 BAC were going home. At the other extreme, two indicated that they were going to work.

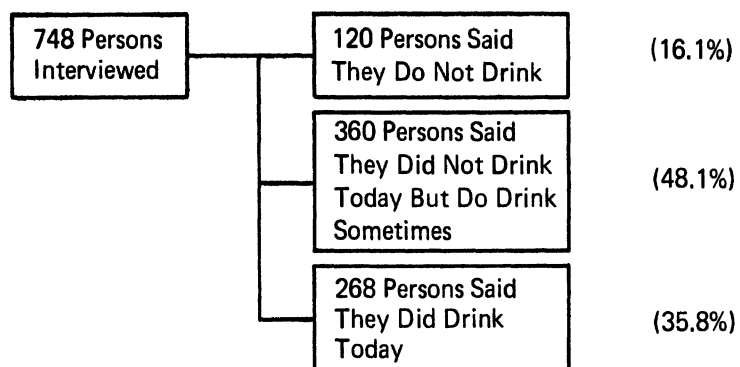
TABLE 14. DISTRIBUTION OF DRIVERS BY BAC AND LOCATION OF FIRST DRINKING EPISODE

<u>Location</u>	<u>BAC Subgroups</u>					<u>Number Observed</u>
	<u><.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10-.14</u>	<u>≥.15</u>	
Bar, club	22 28.2%	25 32.1%	17 21.8%	9 11.5%	5 6.4%	78 100%
Restaurant	11 45.9%	3 12.5%	9 37.5%	1 4.1%	---	24 100%
Own home	45 54.9%	16 19.5%	11 13.4%	8 9.8%	2 2.4%	82 100%
Another home	42 72.5%	10 17.2%	6 10.3%	---	---	58 100%
Other	10 45.4%	5 22.8%	2 9.1%	4 18.2%	1 4.5%	22 100%
Total	130 49.3%	59 22.4%	45 17.0%	22 8.3%	8 3.0%	264 ^(a) 100%

(a) Complete data was missing on four cases

TABLE 15. DISTRIBUTION OF DRIVERS BY BAC AND LOCATION OF SECOND DRINKING EPISODE

<u>Location</u>	<u>BAC Subgroups</u>					<u>Number Observed</u>
	<u><.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10-.14</u>	<u>≥.15</u>	
Bar, club	7 28.0%	3 12%	8 32%	5 20%	2 8%	25 100%
Restaurant	3 75%	1 25%	---	---	---	4 100%
Own home	2 18.2%	2 18.2%	5 45.4%	1 9.1%	1 9.1%	11 100%
Another home	3 27.3%	4 36.3%	3 27.3%	1 9.1%	---	11 100%
Other	---	1 50%	---	---	1 50%	2 100%
Total	15 28%	11 21%	16 30%	7 13%	4 8%	53 100%



Location of Drinking	Drinking Episode					
	1st		2nd		3rd	
1. Bar or Club	78	29%	25	46%	4	44%
2. Restaurant	24	9%	4	8%	2	22%
3. Their Own Home	82	31%	11	21%	1	11%
4. Friends or Relatives	58	22%	11	21%	2	22%
5. Other Location	26	9%	2	4%	-	--
	268	100%	53	100%	9	100%

FIGURE 9. DRINKING PATTERNS OF PERSONS INTERVIEWED IN BAC ROADSIDE SURVEY

3.4 KNOWLEDGE AND EFFECT OF WCASAP ACTIVITIES

Just prior to the beginning of the roadside survey the Ypsilanti Press carried a front-page feature concerning the WCASAP program which mentioned the roadside survey, and the Ann Arbor News carried two articles, one general article on the WCASAP program buried on page 13 and a feature with photographs on the roadside survey on page 3. The weekly Huron Valley Advisor also carried a feature story with photographs on the roadside survey which incidentally mentioned other WCASAP activities. Also local radio stations carried some public service spot announcements concerning the roadside survey in the days preceding March 9. The first question participants were asked after they agreed to take part in the survey was whether they had heard of the BAC roadside survey, and slightly less than one quarter said that they had heard of it. Apparently, this information had gotten across to some of the nighttime driving public, either directly through the media messages or passed on by word of mouth.

Table 16 shows how this proportion varied in relation to BAC group and other demographic variables. It is interesting that drinkers and especially heavy drinkers were more likely to have heard of the survey than were nondrinkers. Students and, concomitantly, younger persons were less likely to have heard of the survey. This is consistent with other studies which have shown such persons less likely to be involved in community affairs. Conversely, persons in higher status occupations--professional, technical, skilled trades, etc.--were more likely to have heard of the survey. These latter persons were also more likely to be drinkers (93 of 105 or 89%) than were persons in lower status

TABLE 16. AWARENESS AND EFFECT OF WCASAP ACTIVITIES AND OF MEDIA MESSAGES CONCERNING DRINKING AND DRIVING, BY BAC, AGE, SEX, RESIDENCE, EDUCATION, AND OCCUPATION (IN PERCENT OF RESPONDENTS ANSWERING THE QUESTION)

BAC Group	Number Observed	Heard of BAC Survey (a)	Heard of WCASAP (a)	Aware of More Police Patrols (a)	Drinkers aware of & Influenced by More Patrols (a)	Noticed Media Messages (a)	Drinkers Noticing & Influenced by Media Messages (a)
Nondrinkers	120	16%	21%	49%	--	89%	--
Drinkers (total)	627 (b)	25	24	46	19%	91	37%
.00-.01 BAC	487	25	23	45	16	91	35
.02-.04 BAC	62	16	18	44	25	90	45
.05-.09 BAC	46	30	35	52	22	91	41
.10+ BAC	30	33%	33%	52%	38%	90%	46%
<u>Age</u>							
16-20	150	15%	18%	51%	28% (112) (c)	92%	45% (110) (c)
21-25	210	21	17	43	16 (188)	90	39 (179)
26-30	126	25	24	44	23 (116)	91	41 (116)
31-40	113	30	30	44	12 (91)	94	33 (87)
41-50	80	28	33	51	17 (59)	90	28 (57)
51-74	68	27%	33%	48%	15% (53)	84%	17% (52)
<u>Sex</u>							
Male	580	24%	24%	48%	20% (490)	90%	37% (475)
Female	164	22%	23%	42%	15% (126)	90%	35% (123)
<u>Residence</u>							
Ann Arbor	277	22%	21%	38%	16% (247)	91%	38% (238)
Ypsilanti	145	21	22	57	22 (111)	92%	35 (107)
Rest of County	323	25%	26%	49%	20% (257)	89%	36% (252)
<u>Educational Attainment</u>							
College Graduate	172	22%	20%	35%	10% (159)	90%	29% (153)
Some Post High School	221	25	22	42	16 (189)	93	38 (182)
High School Graduate	184	23	21	45	22 (148)	87	41 (145)
Grades 1-11	171	22%	31%	65%	30% (123)	91%	41% (121)
<u>Occupational Groups</u>							
Professional, etc.	105	31%	27%	34%	12% (93)	92%	36% (88)
Other White Collar	120	23	21	51	22 (96)	90	34 (94)
Skilled Blue Collar	71	35	37	53	24 (63)	90	33 (63)
Other Blue Collar	182	21	23	58	24 (145)	88	42 (141)
Students	188	16	17	37	14 (158)	91	38 (155)
Other Not Employed	58	28%	35%	44%	16% (42)	91%	31% (42)
<u>Total</u>	748	23% (746)	24% (743)	46% (738)	19% (619)	90% (744)	37% (601)

(a) Two respondents were NA on heard of survey; 5 were NA on heard of WCASAP; 10 were NA on police patrols; 8 were NA on influence of police patrols; 4 were NA on media messages; and 27 were NA on influence of media messages.

(b) One respondent was NA on drinking status; 2 drinking respondents were NA on BAC; 1 respondent was NA on age; 4 were NA on sex; 3 were NA on residence; and 4 were NA on occupation.

(c) Number of drivers in subgroup.

occupations (308 of 373 or 83%). Students as a group fell in the middle (161 of 188 or 86%). Respondents aged 16-20 were much less likely to drink (114 of 150 or 76%) than respondents aged 21-30 (308 of 336 or 92%) and somewhat less likely to drink than respondents aged 31 and above (205 of 261 or 79%), which also seems to be related to the lower awareness of the younger respondents.

At the end of the interview participants were asked if they had heard of "the special new program in Washtenaw County to reduce alcohol-related traffic accidents." Again almost one quarter of the respondents said that they had heard of it. The relationships to the background variables in Table 16 are roughly similar to those for awareness of the roadside survey, except that the group differences tend to be smaller and the less educated group stands out as most likely to have heard of this new program.

Surprisingly, however, there is not a strong relationship between having heard of the roadside survey and having heard of the general program. Persons who had heard of the survey were twice as likely to have heard of the program as persons who had not heard of the survey, but only half of those who had heard of the survey had heard of the program and vice versa. As can be seen in Table 17, 11% of the sample had heard of both, 12% had heard of the roadside survey, 12% had heard only of the general program, and 65% had heard of neither.

TABLE 17. RELATIONSHIP OF HAVING HEARD OF THE ROADSIDE SURVEY TO HAVING HEARD OF THE WCASAP PROGRAM

		Yes	No	Total
Heard of Roadside Survey	Yes	11%	12%	23%
	No	12%	65%	77%
	Total	23%	77%	100%

The Form B (Appendix B) mail-back questionnaire included some questions on the regularity with which respondents read local newspapers. While these data must be treated cautiously because of the poor response rate and the resultant educational bias (see Section 2.3 and Appendix B.3), it is still interesting to compare newspaper readership with the awareness questions. Of the 331 participants who answered the newspaper readership questions, 25% had heard of the roadside survey and 23% had heard of the general program. However, of the 183 respondents who read the Ann Arbor News regularly 32% had heard of the survey and 27% had heard of the program. On the other hand, of 71 respondents who read the Ypsilanti Press regularly 18% had heard of the survey and 27% had heard of the program. This indicates that the difference in emphasis in the articles in the two papers did make a real difference in information acquired by the public. The Ypsilanti Press readers were more likely to have heard of the general program than of the roadside survey, while the Ann Arbor News readers were more likely to have heard of the roadside survey.

Respondents who said they had heard of the general WCASAP program were also asked if they could tell anything about what the program was doing. However, almost half were unable to mention any specific component of the program. The best known feature of the program proved to be the promotion of the use of Antabuse* to prevent drivers from drinking, which was mentioned by 23 respondents. Only 21 respondents mentioned roadside breath tests, indicating either that many people did not recognize the roadside survey as a component of the general program or that they felt it was redundant to mention the activity in which they were presently engaged. However, it is likely that since the survey was being undertaken by the Highway Safety Research Institute of The University of Michigan many people did not automatically connect this with the new county program. Other WCASAP activities mentioned by more than 1% of the respondents were public information campaign (9 persons), special alcohol and driving course (10 persons), and increased police enforcement of drunk driving laws (9 persons).

It is hoped by the WCASAP planners that these baseline figures concerning knowledge of the WCASAP program elements will increase greatly over the three years of the demonstration project, as the public information and education aspect of the WCASAP is stepped up. Future roadside and household surveys will be used to ascertain if this increase in knowledge really takes place.

Of major interest to programs to reduce alcohol-related crashes is the question of how much increased law enforcement activity acts as a general deterrent to driving after drinking too much. Participants were asked if during the last year they had heard about or noticed more police on the alert for drinking drivers, and drinkers who said yes were then asked how much it had influenced their own driving after drinking habits.

When these questions were drafted it was assumed that everyone would answer negatively, and that thus there would be established a near-zero baseline from which to measure future changes during the program. However, as shown in Table 16, 46% of the respondents said that they had heard about or noticed more police on the alert for drinking drivers during the past year, and some 19% of the drinkers said they were both aware of more police patrols and were influenced a lot or some by them.

It is difficult to know how to interpret these results. In point of fact, the special alcohol police patrols did not begin until the same week as the roadside survey, and one wonders how a citizen would distinguish a patrol car on the alert for drinking drivers from other regular police patrol cars anyhow. However, there had been mention in recent newspaper articles of increased police patrolling as an aspect of WCASAP. The newspapers had also mentioned plans for this increased police activity at various times during the previous months when the County obtained the NHTSA contract and when the subcontracts were negotiated with the three police agencies. Thus persons who remembered something about this in the news or heard about it from their friends could also legitimately answer the question affirmatively.

*Registered trademark of the Ayerst Laboratories for the drug disulfurim.

But beyond that is the general problem of acquiescence to a question of this sort in which the wording tends to imply that increased police patrolling for drinking drivers had been taking place (as it had been after the first day of the survey). With such a question it is easy for a respondent to think back to the time he happened to see a police car as he was leaving a bar and to think that that indicated "more police on the alert for drivers who have been drinking." So it is evident that this baseline measure is already somewhat contaminated by previous events and by the leading nature of the question. Nevertheless, this percentage may still increase in future surveys as a result of increased publicity of the special alcohol patrols, and it can still function as a baseline figure for a certain point of time in the demonstration project.

Of more long-term significance is the subquestion concerning the influence on the respondent's behavior of the perceived increased police activity. This, of course, is completely subjective, and without knowing anything about a respondent's former drinking and driving habits it is impossible to judge the validity of an affirmative response. At first glance the data on BAC and police influence in Table 16 may seem anomalous, but it may well be the heavier drinkers who are more likely to have not drunk as much as they would have liked to because of concern over more police on the alert. It should also be mentioned that the answers of partially inebriated respondents may be rather unreliable, and that such respondents may have felt under particular pressure in the interviewing situation to give the answer which would be pleasing to the interviewer.

As baseline data for the police deterrence issue it seems desirable to use figures which take into account subjective influence along with the objective BAC measurement. Thus Table 18 provides baseline data on the interrelationship of these variables. If the WCASAP program is successful in reducing driving after drinking in Washtenaw County, future roadside surveys should find increases in the percentages in the upper left portion of the table and decreases in percentages in the middle and lower right portions of the table.

TABLE 18. RELATIONSHIP OF BAC TO HAVING NOTICED AND BEEN INFLUENCED BY INCREASED POLICE PATROLLING (IN PERCENT OF 619 RESPONDENTS WHO DRINK AND ANSWERED THE QUESTION)

<u>BAC Group</u>	<u>Noticed Police and Influenced</u>	<u>Noticed Police Not Influenced</u>	<u>Didnt' Notice Police</u>	<u>Total</u>
.00-.01	12.8	22.1	43.1	78.0
.02-.04	2.4	1.9	5.5	9.8
.05-.09	1.6	2.3	3.6	7.5
.10+	1.8	.6	2.3	4.7
Total	18.6	26.9	54.5	100.0

When one looks at demographic factors in relation to these two questions one is struck by the strong inverse relationship between both educational attainment and occupational status and the giving of affirmative answers. Other studies have shown that persons with lower educational attainment are more likely to be acquiescent in their interview responses, and the data in Table 16 support the suggestion that acquiescence is an important factor in the high affirmative responses to these questions. Of course it may also be that less educated persons really are more susceptible to the deterrent effect of extra police patrols.

Finally, similar questions were asked about noticing any messages in the mass media on the effects of drinking on driving and their influence on behavior. It was desired to obtain responses to these questions as baseline data prior to the start of the WCASAP public information and education campaign. Of course changes in the future on the responses to these questions could result from the national mass media campaign sponsored by NHTSA or from other national campaigns as well as from the local campaign, but it is hoped that analysis of the content of the messages remembered will assist in determining which campaigns have had the greatest incremental impact.

As can be seen in Table 16, some 90% of the respondents remembered noticing messages on drinking and driving. Television was by far the main source mentioned, followed by radio and newspapers. There is very little variation on this question among the different groups in Table 16, and with such a high baseline there is not much room left for increase in percent of persons aware as a result of the new mass media campaigns.

But of course there is still considerable room for change in regard to the subquestion on the influence of the media on the drinking respondent's drinking and driving behavior. A surprisingly high proportion of drinking respondents, some 37%, do already claim that their behavior has been influenced a lot or some by the media messages. To be sure, this subjective question is open to the same reservation as the question on the influence of more police patrols, but it can still function as a baseline for measuring changes during the three-year program.

Again, the heavier drinkers and lower status respondents are more inclined to say they have been influenced. The interrelationship of BAC and media influence is shown in Table 19. As with Table 18, a successful WCASAP program should result in future roadside surveys finding larger proportions of the sample in the upper left portion of the table and smaller proportions of the sample in the middle and lower right portions of the sample.

TABLE 19. RELATIONSHIP OF BAC TO HAVING NOTICED AND BEEN INFLUENCED BY MEDIA MESSAGES ON DRINKING AND DRIVING (IN PERCENT OF 601 RESPONDENTS WHO DRINK AND ANSWERED THE QUESTION)

<u>BAC Group</u>	<u>Noticed Messages and Influenced</u>	<u>Noticed Messages Not Influenced</u>	<u>Didn't Notice Messages</u>	<u>Total</u>
.00-.01	27.6	43.1	7.8	78.5
.02-.04	4.3	4.3	1.0	9.6
.05-.09	3.1	3.8	.7	7.6
.10+	<u>1.8</u>	<u>1.7</u>	<u>.5</u>	<u>4.0</u>
Total	36.8	52.9	10.0	99.7

3.5 ANALYSIS OF DRIVERS REFUSING TO PARTICIPATE

A survey of this type requires that one be concerned about subjects who refuse to participate. Since the BAC is potentially incriminating and possibly a source of personal embarrassment it is reasonable to ask whether or not a bias exists because of the refusals. Persons at BAC >0.10 comprised 4% of the participating sample, but that statistic could be greatly altered if the refusal group contained a much larger proportion of high BAC persons than the participating group. It was impossible to tell exactly the BAC level of the refusers. However we did collect data that allows us to make some judgments about these persons.

The first and probably the most important fact is that 87.3% (748 out of 857) of the citizens contacted agreed to participate. Thus the maximum potential effect of refusal bias is small. In order to analyze the refusals, the interviewers were asked to make a subjective estimate of whether or not the subject had been drinking. The possible classifications were: "Had not been drinking," "Had a little," "Had a lot," and "Not known if drinking." These estimates were made for all drivers, refusers and participators, during the initial contact with the subjects. In all, 800 subjects were classified in one of the first three categories; 697 of the 748 participants and 103 of the 106 refusers.

For those persons who agreed to participate the measured BAC was available subsequently. This provided a calibration of the subjective alcohol estimation criteria. Table 20 indicates that distribution of measured BAC's for the various subjective classifications and the number of participants in each subjective classification. It is apparent that the interviewer's judgments were far from perfect, as 10% of those classified "had not been drinking" did have a BAC >0.02 ; while 57% of those classified "had a little" and 18% of those classified "had a lot" did not have a BAC >0.02 . Thus there was a somewhat greater tendency for the interviewers to estimate drinking incorrectly (false positive) than to estimate not drinking incorrectly (false negative). Nevertheless, the two types of errors did tend to balance each other out, especially if one considers that most of the persons at 0.01 BAC had also been drinking that day.

TABLE 20. DISTRIBUTION OF DRIVERS BY BAC AND PRETEST INTERVIEWER CLASSIFICATION

Interviewer Classification	BAC SUBGROUPS			Number Observed
	Less than 0.02	0.02-0.09	Greater than or equal to 0.15	
1. Had not been drinking	472 (90%)	45 (9%)	6 (1%)	523 (75%)
2. Had a little	90 (57%)	52 (33%)	15 (10%)	157 (23%)
3. Had a lot	3 (18%)	6 (35%)	8 (47%)	17 (2%)
Total	565 (81%)	103 (15%)	29 (4%)	697

In order to determine the potential effect of the refusers on the final outcome, an analysis using Figure 10 was performed. The first step was to take the entire sample of 800 persons who had been subjectively classified--both refusers and participants--and to divide them into the three subjective classification subgroups. It was then possible to compute the probabilities of accepting or refusing to participate, conditional on the subjective classification. The "had not been drinking" and "had a little," drinking subgroups had approximately the same fraction of citizens participating. These groups contained about 95% of the persons classified. However, half of the subjects estimated as having been drinking a lot did refuse to participate, indicating a considerable underrepresentation of this small group.

In order to extend the analysis further it is necessary to make some assumptions concerning the subgroups of refusals. For this analysis we have assumed that the distribution of BAC within each subjective classification is independent of whether or not the person accepted or refused to participate in the breath test. We believe that this is a reasonable assumption since the person was observed and classified prior to the time that the interviewer knew whether or not he was going to participate. Based upon this assumption it is possible to obtain an estimate of the distribution of BAC's for each classification of subjects who refused to participate in the survey. This was done and is also shown in Figure 10. All of the 800 persons who were subjectively classified are now assigned a particular BAC category.

Thus it is possible to obtain an estimate of the distribution of BAC for the combined population of refusers and participants. Table 21 presents such an estimate and compares it with the observed distribution of those persons who participated in the survey. The major difference occurs in the estimation of persons above 0.10 BAC. Using the participants only this estimate would be 4%, while including the refusals would raise it to 5.2%.

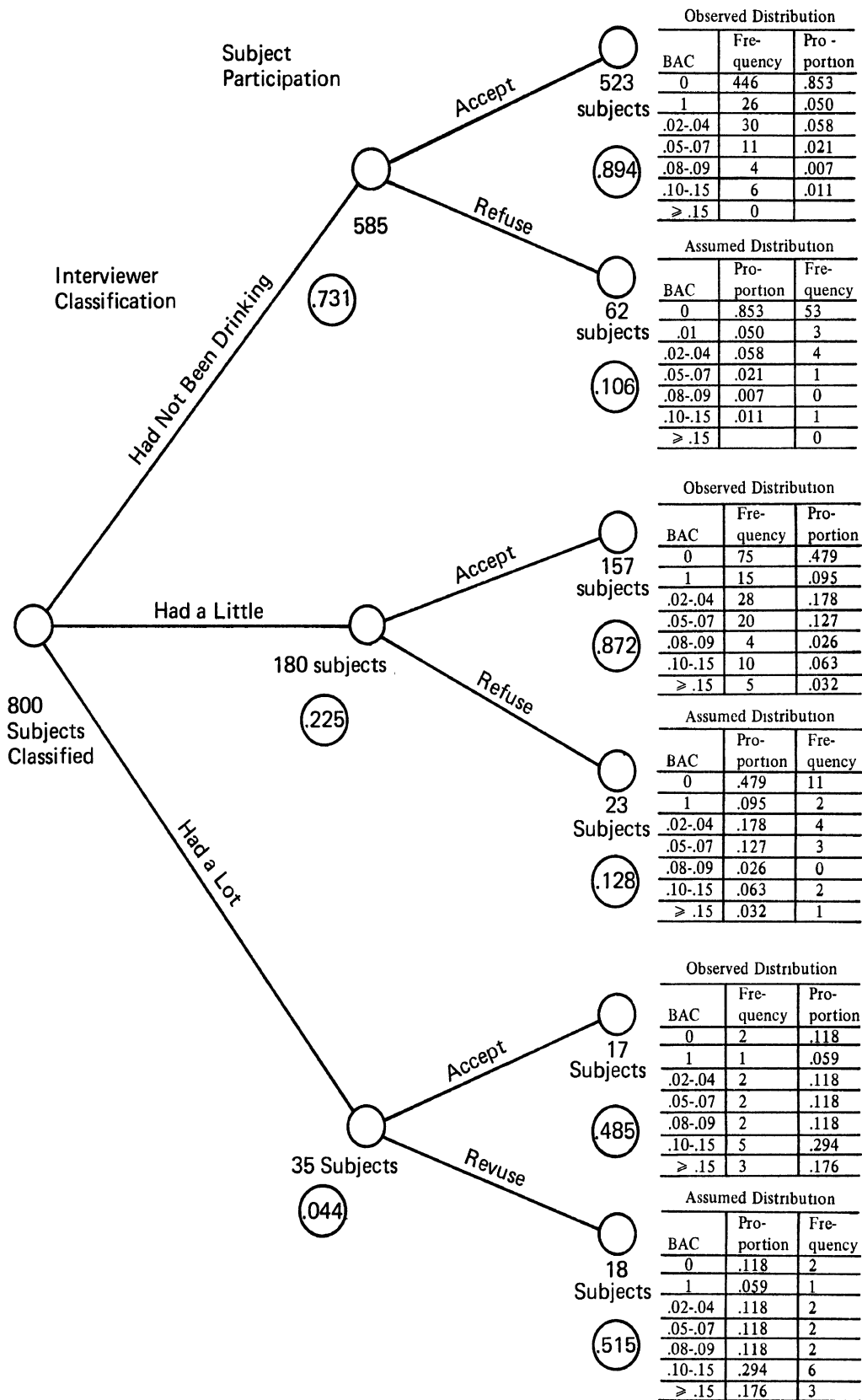


FIGURE 10. ANALYSIS OF REFUSALS

TABLE 21. DERIVED DISTRIBUTION OF BAC's INCLUDING REFUSALS

<u>BAC</u>	<u>Sample Only</u>		<u>Sample and Refusals</u>	
	<u>Percentage</u>	<u>Cumulative Percentage at or Above BAC</u>	<u>Percentage</u>	<u>Cumulative Percentage at or Above BAC</u>
.02-.04	8.5%	18.8%	8.8%	20.4%
.05-.07	4.8%	10.3%	4.9%	11.6%
.08-.09	1.5%	5.5%	1.5%	6.7%
.10-.15	2.9%	4.0%	3.8%	5.2%
>.15	1.1%	1.1%	1.4%	1.4%

Table 22 indicates how the refusals who were judged as having "had a lot" were classified using the experimental design variables. As indicated, they are concentrated in the early morning hours and on weekends. If they had participated and if our derived distribution of BAC's is correct, the difference between the early morning hours and other time periods would have been widened. However, this difference is already statistically significant. In the case of weekend versus weekday the difference in the sample, which was not significant, would also have been increased. However, even if all of these refusers had participated and if they all had had high BAC's, the difference between weekday and weekend would still not have been statistically significant. The "had a lot" refusals were uniformly distributed over the medium and high traffic volume sites early in the morning. Thus their participation would not have had an effect on the statistically significant interaction already observed using only the sample data.

TABLE 22. TIME LOCATION OF PERSONS WHO REFUSED TO PARTICIPATE AND WHO WERE SUBJECTIVELY JUDGED AS "HAD A LOT"

<u>Time of Night</u>	<u>Weekday</u>	<u>Weekend</u>
7 P.M.-9 P.M.	2	1
10 P.M.-12 P.M.	-	1
1 A.M.-3 A.M.	4	9

3.6 COMPARISON BETWEEN WASHTENAW COUNTY AND MECKLENBURG COUNTY ROADSIDE SURVEYS

A roadside survey having similar objectives and of comparable size was conducted in Mecklenburg County, North Carolina, during the fall of 1970. The Mecklenburg study obtained breath samples from 766 subjects with a participation rate of 92%. The Washtenaw study obtained breath samples from 746 subjects with a participation rate of 87%. Both studies represented the involvement of alcohol in the general nighttime driving population, in contrast to other studies which have represented the alcohol involvement at

crash locations.^{1,2} Both studies also examined a number of environmental and personal factors thought to be associated with driving after drinking. The survey was conducted in both cases by locating a team at a particular roadside site for a period of two hours and sampling from the traffic stream.

There were some major differences in the design of the two surveys. The Mecklenburg study was conducted on nine consecutive nights at 27 sites. In contrast the Washtenaw survey was conducted on 16 separate nights over a period of four weeks at 48 separate sites. Both studies included early evening, late night and early morning time periods which were of approximately two hours duration. Mecklenburg used two survey teams at each survey site while Washtenaw used only one. Washtenaw attempted to obtain an average of 15 subjects per two-hour period at a site while Mecklenburg obtained approximately twice this number during their time at a site. Mecklenburg used a Greco-Latin square experimental design while Washtenaw used a full factorial design with two replications to estimate error.

Table 23 presents a comparison of BAC readings and the variables considered in the experimental design models. The overall distributions of BAC in the two studies are almost the same. The Mecklenburg sample has a slightly higher percentage of positive BAC readings, but these tend to be concentrated in the 0.02 to 0.04 BAC range. The most consistent agreement between the two studies occurs in the relationship between time of night and BAC. In regard to the weekday versus weekend variable Mecklenburg had a significantly higher percentage of positive BAC readings on weekends, while this difference was not strong enough to be statistically significant in the Washtenaw County sample. On the other hand, the Washtenaw County sample had a significantly higher percentage of high BAC readings on medium traffic volume roads, while this difference was very slight in the Mecklenburg sample. However, as indicated previously this difference in the Washtenaw sample was associated with a strong interaction between time and traffic volume. Thus the medium volume roads had a much larger fraction of drinking drivers during the early morning hours than did high traffic volume roads. This difference did not occur during the other time periods. It is not possible to test for such a result in the Mecklenburg study due to its experimental design.

The data from the Washtenaw and Mecklenburg surveys were also comparable on some demographic characteristics of participants. In general the survey results tend to support each other. In both cases males are over-involved in drinking and driving. However the differences between males and females (see Table 24) were not as great in the Mecklenburg survey, which reported a higher percentage of women drivers with a positive BAC.

¹R.F. Borkenstein, et al., The Role of the Drinking Driver in Traffic Accidents, Dept. of Police Administration, Indiana University, Bloomington, 1969.

²M.W. Perrine, J.A. Waller and L.S. Harris, Alcohol and Highway Safety: Behavioral and Medical Aspects, Project ABETS, Final Report Project 14, RFP 173, Burlington, Vt., May 1970.

TABLE 23. COMPARISON OF BAC DISTRIBUTIONS IN THE WASHTENAW AND MECKLENBURG SAMPLES

A. Comparison of Total Population						
	<u><.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10-.14</u>	<u>>.15</u>	<u>Total</u>
Washtenaw	606 81.2%	64 8.6%	46 6.2%	22 2.9%	8 1.1%	746
Mecklenburg	596 77.8%	80 10.4%	58 7.6%	23 3.0%	9 1.2%	766
B. Time of night						
	<u><.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10-.14</u>	<u>>.15</u>	<u>Total</u>
7-9 P.M.	226 89.0%	15 5.9%	7 2.8%	5 2.0%	1 0.3%	254
Washtenaw						
10-12 P.M.	225 82.8%	23 8.5%	16 5.8%	5 1.8%	3 1.1%	272
1-3 A.M.	155 70.5%	26 11.8%	23 10.4%	12 5.4%	4 1.8%	220
7-9 P.M.	264 85.1%	26 8.4%	14 4.5%	3 1.0%	3 1.0%	310
Mecklenburg						
10-12 P.M.	198 76.8%	30 11.6%	21 8.1%	6 2.3%	3 1.2%	258
1-3 A.M.	134 68.7%	24 12.1%	23 11.6%	14 7.1%	3 1.5%	198
C. Weekday vs. weekend						
	<u><.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10-.14</u>	<u>>.15</u>	<u>Total</u>
Weekday	300 83.3%	30 8.3%	14 3.9%	13 3.6%	3 0.8%	360
Washtenaw						
Weekend	306 79.2%	34 8.7%	32 8.3%	9 2.5%	5 1.3%	386
Weekday	346 84.4%	36 8.8%	22 5.4%	5 1.2%	1 0.2%	410
Mecklenburg						
Weekend	250 70.2%	44 12.4%	36 10.1%	18 5.1%	8 2.2%	356

TABLE 24. COMPARISON OF SEX AND BAC

<u>Sex</u>	<u>Less than 0.02</u>	<u>BAC Subgroup I</u>			<u>Number Observed</u>
		<u>.02-.04</u>	<u>.05-.09</u>	<u>.10+</u>	
<u>Washtenaw</u>					
Male	78%	10%	7%	5%	578
Female	92%	4%	4%	0	166
<u>Mecklenburg</u>					
Male	76%	12%	8%	4%	606
Female	87%	6%	6%	1%	160

Both surveys are in general agreement concerning the BAC distributions of the marital status groups. Those persons who have had marital problems or were widowed were over-represented in the high BAC subgroups in both studies. However, the Washtenaw survey indicated that widowed persons as a separate subgroup were under-represented in the high BAC group. This suggests that in Mecklenburg County, those persons who are separated or divorced are probably even more over-represented in the drinking driver population than indicated in Table 25.

TABLE 25. COMPARISON OF MARITAL STATUS AND BAC

<u>Sex</u>	<u>Less than 0.02</u>	<u>BAC Subgroup II</u>			<u>Number Observed</u>
		<u>.02-.04</u>	<u>.05-.09</u>	<u>.10+</u>	
<u>Washtenaw</u>					
Single	84%	8%	6%	2%	311
Married	81%	8%	6%	5%	380
Wid/Sep/Div	67%	11%	13%	9%	54
<u>Mecklenburg</u>					
Single	81%	9%	6%	4%	237
Married	78%	11%	7%	4%	466
Wid/Sep/Div	69%	11%	14%	6%	63

The BAC distributions for various educational subgroups (see Table 26) do not differ significantly between the Washtenaw and Mecklenburg surveys. The Washtenaw study does suggest that persons with less than eight years of education are over-involved in the high BAC subgroups. However, that conclusion is based upon a sample size of 13 and is thus not statistically significant. The Washtenaw study indicates that persons with graduate degrees are under-involved in the BAC subgroup above 0.10. Similar data are not available for Mecklenburg. Both studies indicate that the occurrence of drinking and driving is not unique to any particular educational subgroups.

TABLE 26. COMPARISON OF EDUCATIONAL LEVEL AND BAC

<u>Educational Level</u>	<u>BAC Subgroup</u>				<u>Number Observed</u>
	<u>Less than 0.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10+</u>	
<u>Washtenaw</u>					
7 years or less	61%	8%	16%	15%	13
8-11 years	80%	8%	7%	5%	157
12 years	83%	7%	6%	4%	184
12-15 years	82%	8%	6%	4%	221
16	79%	10%	5%	6%	71
More than 16	81%	13%	5%	1%	100
<u>Mecklenburg</u>					
0-8 years	76%	9%	11%	4%	55
9-11 years	81%	10%	7%	2%	161
12 years	75%	13%	7%	5%	233
12-15 years	80%	8%	9%	3%	188
16 or more	76%	10%	6%	8%	129

The data on BAC distributions by age in Table 27 indicate that drivers 20 years old and younger are under-involved in drinking and driving. This difference was much greater in the Washtenaw survey. Both studies indicate that the age groups from 31 through 40 have the highest involvement with drinking and driving at the higher BAC's followed closely by the 21-30 age group. It will also be noted from the numbers in the right column that a somewhat larger proportion of Washtenaw participants than Mecklenburg participants were in the younger age categories, influenced no doubt by the presence of two large universities in Washtenaw County.

TABLE 27. COMPARISON OF AGE AND BAC

<u>Age Group</u>	<u>BAC Subgroup</u>				<u>Number Observed</u>
	<u>Less than 0.02</u>	<u>.02-.04</u>	<u>.05-.09</u>	<u>.10+</u>	
<u>Washtenaw</u>					
16-20	94%	5%	1%	--	150
21-30	79%	9%	8%	4%	336
31-40	75%	10%	8%	7%	113
41+	79%	10%	6%	5%	146
<u>Mecklenburg</u>					
16-19	85%	10%	5%	0	127
20-29	75%	12%	8%	5%	266
30-39	73%	11%	9%	7%	172
40 or more	80%	9%	7%	4%	201

Appendix A
OBSERVED FRACTIONS OF SUBJECTS AT OR ABOVE
.02 AND .05 BAC CLASSIFIED BY CELLS
IN THE EXPERIMENTAL DESIGN MODEL

Appendix A
OBSERVED FRACTIONS OF SUBJECTS AT OR ABOVE
.02 AND .05 BAC CLASSIFIED BY CELLS
IN THE EXPERIMENTAL DESIGN MODEL

		WEEKDAY				WEEKEND			
		Medium		High		Medium		High	
		Traffic	Volume	Traffic	Volume	Traffic	Volume	Traffic	Volume
		Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Urban 7-9 P.M.	$\frac{\%}{\geq}$.02	.07	.07	.15	.12	.05	.00	.13	.11
	$\frac{\%}{\geq}$.05	.00	.00	.05	.06	.00	.00	.07	.00
	N	15	15	20	17	20	15	15	18
10-12 P.M.	$\frac{\%}{\geq}$.02	.14	.18	.16	.10	.12	.25	.05	.00
	$\frac{\%}{\geq}$.05	.07	.06	.11	.05	.00	.25	.05	.00
	N	14	17	19	19	16	20	20	17
1-3 A.M.	$\frac{\%}{\geq}$.02	.33	---	.06	.35	.47	.44	.20	.40
	$\frac{\%}{\geq}$.05	.20	---	.06	.06	.35	.31	.07	.20
	N	15	---	16	17	17	16	15	15
Rural 7-9 P.M.	$\frac{\%}{\geq}$.02	.14	.08	.20	.06	.07	.31	.12	.07
	$\frac{\%}{\geq}$.05	.07	.08	.07	.06	.07	.19	.06	.07
	N	15	12	15	17	15	16	16	14
10-12 P.M.	$\frac{\%}{\geq}$.02	.20	.05	.14	.00	.20	.25	.19	.21
	$\frac{\%}{\geq}$.05	.07	.00	.00	.00	.07	.20	.00	.05
	N	15	19	15	15	15	20	16	19
1-3 A.M.	$\frac{\%}{\geq}$.02	.50	.41	.17	.33	.50	.38	.31	.27
	$\frac{\%}{\geq}$.05	.40	.24	.08	.27	.25	.23	.19	.27
	N	10	17	12	15	12	13	16	11

Appendix B
ROADSIDE SURVEY QUESTIONNAIRES AND
MAIL-BACK RESPONSE RATES

- B.1. Washtenaw County BAC Roadside Survey Questionnaire
- B.2. Washtenaw County General Public Questionnaire (Form B)
- B.3. Response Rates to Form B Mail-back

B.1. WASHTENAW COUNTY BAC ROADSIDE SURVEY

(Survey page 1)

Questionnaire # _____

_____ Time subject entered van (Four digit military time)

_____ Breathalyzer Reading

Time of Breath test

(1) _____ Before interview

(2) _____ After interview

Estimate of drinking

(1) _____ Had not been drinking

(2) _____ Had a little

(3) _____ Had a lot

(4) _____ Not known if drinking

Evidence of drinking (Check only if "Had a little" or "Had a lot" was marked)

(1) _____ Glassy, bloodshot eyes

(2) _____ Slurred speech

(3) _____ Odor of alcohol

(4) _____ Open bottle

(5) _____ Other reason

Sex

(1) _____ Male

(2) _____ Female

Heard about BAC Roadside Survey

(1) _____ Yes

(2) _____ No

(3) _____ Doesn't know

1. In which city or township do you live?
 - (01)___Ann Arbor City
 - (02)___Ypsilanti City
 - (03)___Saline City
 - (04)___Milan City
 - (05)___Chelsea Village
 - (06)___Dexter Village
 - (07)___Manchester Village
 - (08)___Ann Arbor Twp
 - (09)___Augusta Twp
 - (10)___Bridgewater Twp
 - (11)___Dexter Twp
 - (12)___Freedom Twp
 - (13)___Lima Twp
 - (14)___Lodi Twp
 - (15)___Lyndon Twp
 - (16)___Manchester Twp
 - (17)___Northfield Twp
 - (18)___Pittsfield Twp
 - (19)___Salem Twp
 - (20)___Saline Twp
 - (21)___Scio Twp
 - (22)___Sharon Twp
 - (23)___Superior Twp
 - (24)___Sylvan Twp
 - (25)___Webster Twp
 - (26)___York Twp
 - (27)___Ypsilanti Twp

2. How old are you?
_____years

3. What is the highest educational level you've obtained?
 - (1)___Less than 7 grades
 - (2)___8-11 grades
 - (3)___High school diploma
 - (4)___Business, trade school
 - (5)___1-3 years college
 - (6)___College degree
 - (7)___1 year or more graduate work
 - (8)___Refused to answer

4. What is your marital status?
 - (1)___Married
 - (2)___Divorced
 - (3)___Separated
 - (4)___Widowed
 - (5)___Single
 - (6)___Refused to answer

5. What kind of work do you do? (Refer to occupation check list)

(01)___Professional

(02)___Managerial

(03)___Clerical

(04)___Craftsman

(05)___Operative

(06)___Service

(07)___Laborer

(08)___Housewife

(09)___Retired

(10)___Student

(11)___Unemployed

(12)___Refused to answer

write in for later coding

6. Do you ever drink alcoholic beverages?

(1)___No

(2)___Yes

▼
(GO TO
Q. 12)

6b. Have you had anything to drink today?

(1)___No

(2)___Yes

▼
(GO TO
Q. 9)

LOCATION CODES	EPISODE TIME CODES	MISSING DATA CODES
01 Bar, club	Round back to nearest military hour (6:30PM= 6:00PM= 18)	
02 Restaurant		
03 Own home	1:00PM= 13 7:00PM= 19	97 Refused to answer
04 Friend's or relative's	2:00PM= 14 8:00PM= 20	98 Doesn't know
05 Sport or rec. building	3:00PM= 15 9:00PM= 21	
06 In vehicle	4:00PM= 16 10:00PM= 22	
07 Outdoors	5:00PM= 17 11:00PM= 23	
08 Other--write in	6:00PM= 18 12:00PM= 24	

7. Where did you first begin drinking today?
 - a. Approximately what time did you arrive? Leave?
 - b. What kind of beverage were you drinking and how many drinks did you have of each?
 - c. Did you drive after your last drink?
 - d. After your last drink, how long was it before you drove?
8. Where else did you drink today? (Repeat 7a-7d)
 - PROBE: Anywhere else? (Continue to probe until negative response)

	Location	Episode	Time	Quantity/Kind	Drive	How long
1st Episode	___	___	___	___Beer___Spirit ___Wine___Total	(1)___No (2)___Yes	___hr___min
2nd Episode	___	___	___	___Beer___Spirit ___Wine___Total	(1)___No (2)___Yes	___hr___min
3rd Episode	___	___	___	___Beer___Spirit ___Wine___Total	(1)___No (2)___Yes	___hr___min
4th Episode	___	___	___	___Beer___Spirit ___Wine___Total	(1)___No (2)___Yes	___hr___min
5th Episode	___	___	___	___Beer___Spirit ___Wine___Total	(1)___No (2)___Yes	___hr___min
6th Episode	___	___	___	___Beer___Spirit ___Wine___Total	(1)___No (2)___Yes	___hr___min

9. Where are you going now?
- (01)___Bar, club
 - (02)___Restaurant
 - (03)___Own home
 - (04)___Friend's or relative's
 - (05)___Sport or recreation
 - (06)___Work or school
 - (07)___Shopping, errand, appointment
 - (08)___Driving around, joy riding
 - (09) Other _____
write in
 - (10)___Refused to answer
10. Do you think you will be drinking there?
- (1)___Yes
 - (2)___No
 - (3)___Don't know
11. Will you be driving afterwards?
- (1)___Yes
 - (2)___No
 - (3)___Don't know
12. During the last year have you heard about, or noticed more police on the alert for drivers who have been drinking?
- (1)___No (2)___Yes
- (SKIP Q.12b IF R IS NON-DRINKER)
- 12b. Has it influenced your own driving after drinking habits a lot, some, not at all?
- (1)___A lot
 - (2)___Some
 - (3)___Not at all
 - (4)___Don't know
 - (5)___Refused to answer

(Survey page 6)

13. Do you remember seeing or hearing any recent advertisements, spot commercials, articles, films, or other items about the effects of drinking on driving?

(1) No (2) Yes

13b. Where did you see or hear these?

(1) TV

(2) Newspapers

(3) Magazines

(4) Radio

(5) Billboards

(6) Pamphlets

(7) Other _____

(8) Don't know

13c. What do you remember most?

(SKIP Q.13d IF R IS NON-DRINKER)

13d. Has that information influenced your own driving after drinking habits a lot, some, not at all?

(1) A lot

(2) Some

(3) Not at all

(4) Don't know

14. Have you heard of the special new program in Washtenaw County to reduce alcohol-related traffic accidents?

(1) No (2) Yes

14b. Do you happen to know what group is in charge of this program?

(1) No

(2) Yes What group? _____

(Survey page 7)

14c. Can you tell me anything about what this program is doing? (Check all that are mentioned)

- (1) No, nothing
- (2) Increased police enforcement
- (3) Roadside breath tests
- (4) Disulfiram (Antabuse)
- (5) Public information campaign
- (6) Treatment services for problem drinkers
- (7) Strict court sentences
- (8) Strict driver license rules
- (9) Alcohol and driving safety education course
- (10) Other _____

THANK YOU VERY MUCH FOR YOUR COOPERATION. YOUR BREATHALYZER READING IS READY IF YOU WOULD LIKE TO SEE IT.

_____ Time interview completed

B.2. WASHTENAW COUNTY GENERAL PUBLIC QUESTIONNAIRE FORM B (MAIL-BACK)

There are a number of statements on the next three pages that we would like your opinion about. Please write the number for your feeling about each statement on the line in front of it, according to the following code.

1. AGREE STRONGLY
2. AGREE SOMEWHAT
3. DISAGREE SOMEWHAT
4. DISAGREE STRONGLY

- ___ 1. No person should be denied the right to drive if he needs his car to get to work.
- ___ 2. A person should be permitted to drive only as long as he doesn't abuse his privilege.
- ___ 3. Far too much fuss is made about the dangers of drinking and driving.
- ___ 4. Many people drive better after one or two drinks.
- ___ 5. Having even one drink will make a person a poorer driver.
- ___ 6. Driver licensing standards should be made stiffer to keep bad drivers off the highway.
- ___ 7. Every driver should be required to have his car safety inspected each year.
- ___ 8. Completion of an approved driver education course should be required in order to get a driver's license.
- ___ 9. Persons with poor driving records should be issued special license plates.
- ___ 10. The number of fatal accidents would go way down if those persons who drive after drinking were more strongly punished.
- ___ 11. Persons who drive after drinking too much should lose their licenses.
- ___ 12. Persons who drive after drinking too much should go to jail.
- ___ 13. Taverns and bars should be required to provide transportation for customers who get too drunk to drive safely.

- ___ 14. Bartenders should limit the number of drinks that they will serve to customers who plan to drive.
- ___ 15. Drivers who drink should be taught to understand and follow their own safe consumption levels.
- ___ 16. The police should patrol more around bars and taverns at night.
- ___ 17. The police should patrol more around places where people are having parties at night.
- ___ 18. A good host at a party will try to see that his guests who must drive home do not drink too much.
- ___ 19. All alcohol-related convictions should be entered on a driver's record whether or not they are related to driving (e.g., "drunk and disorderly").
- ___ 20. Drivers convicted of alcohol-related traffic accidents should have special license plates on their cars so they can be easily identified.
- ___ 21. The license plates of vehicles owned by persons convicted of drunk driving should be suspended or revoked.
- ___ 22. Breath tests to determine blood alcohol concentrations should be required in all reported accidents.
- ___ 23. The police should carry out random road checks to catch drivers who have drunk too much, and anyone stopped should be required to take a breath test.
- ___ 24. There should be more police enforcement of drinking-driving laws at times and places where alcohol-related accidents are most likely to happen.
- ___ 25. Drivers convicted of drunk driving and found to be problem drinkers should be required to submit to medical treatment.
- ___ 26. Drivers convicted of drunk driving should be required to take pills which cause them to be sick if they drink alcohol.
- ___ 27. Drivers convicted of drunk driving should be required to take a special driver education course which teaches about the effects of alcohol on driving ability.
- ___ 28. Insurance companies should cancel the collision insurance policies of drivers convicted of drunk driving.
- ___ 29. Information on the relationship of alcohol to driving ability should be included in driver education courses and driver license examinations.

- ___ 30. It's all right to get drunk whenever you feel like it.
- ___ 31. It's all right to get drunk once in a while, but not as a regular thing.
- ___ 32. It's all right to drink as often as you want as long as you don't get drunk.
- ___ 33. Alcoholism is a disease.
- ___ 34. Since a drunk person is not in full control of his actions he should not be held responsible for violating the law while drunk.
- ___ 35. It is better to place those arrested while driving "under the influence" on probation and into a counseling or treatment program than it is to put them in jail.
- ___ 36. Alcoholics could stop drinking if they really wanted to.
- ___ 37. Most drunk driving is not detected by the police.
- ___ 38. The use of alcohol is a custom which should be given up by society.
- ___ 39. Alcoholic beverages are harmless when used in moderation.
- ___ 40. The physician who attempts to treat an alcoholic is wasting his time.
- ___ 41. If alcoholics could be cured by proper treatment, the cost would be more than it's worth.
- ___ 42. The government's job is to catch and punish drunk drivers; anything further that is done for problem drinkers should be by private organizations such as Alcoholics Anonymous or special clinics.
- ___ 43. The government should help keep drunk drivers off the roads even if it means spending money to provide medical and psychological help.

44. People drink wine, beer, or liquor for different reasons. Here are some statements people make about why they drink. Please check how important you think each of the following is to people as a reason for drinking--very important, fairly important, or not important at all

<u>Very</u>	<u>Fairly</u>	<u>Not</u>	
___	___	___	"It makes social occasions more enjoyable."
___	___	___	"It helps people to relax."
___	___	___	"It livens things up when they are dull and boring."
___	___	___	"It makes people feel good."
___	___	___	"It is a way of being sociable."
___	___	___	"It helps people to cool off when they're feeling angry."

- "People drink because their friends drink."
- "People drink because they like the taste."
- "It helps people to celebrate special occasions."

45. Newspapers. Please answer parts a and b.

- a. In the list below, please CHECK ANY local newspaper that you sometimes read:
- b. For each paper checked at left about HOW OFTEN did you read it in the past month? CHECK ONE answer

	3-7 days a week	1-2 days a week	Less often
Ann Arbor News.....	_____	_____	_____
Ypsilanti Press.....	_____	_____	_____
Huron Valley Advisor....	_____	_____	_____
Other (write in):	_____	_____	_____

46. Radio stations. Please answer parts a and b.

- a. In the list below, please CHECK ANY local radio station that you sometimes listen to:
- b. For each station checked at the left, about HOW OFTEN did you listen in the past month? CHECK ONE answer?

	3-7 days a week	1-2 days a week	Less often
WAAM.....	_____	_____	_____
WPAG.....	_____	_____	_____
WNRS.....	_____	_____	_____
WUOM.....	_____	_____	_____
WYSI.....	_____	_____	_____
Other _____	_____	_____	_____

47. For the local radio stations you checked in Question 46, at what times of the day do you generally listen? CHECK ANY that apply:

- 7:00-9:00 A.M.
- 9:00 A.M.-3:00 P.M.
- 3:00-5:00 P.M.
- 5:00-7:00 P.M.
- 7:00-9:00 P.M.
- 9:00-11:00 P.M.
- Later
- Seldom or never listen

B.3. RESPONSE RATES TO FORM B MAIL-BACK QUESTIONNAIRE BY BAC,
EDUCATION, OCCUPATION, AND RESIDENCE

<u>BAC Group</u>	<u>Number in Category</u>	<u>Response Rate (%)</u>
Nondrinker	120	47%
Drinker (total)	628	47%
.00-.01 BAC	487	50%
.02-.04 BAC	62	40%
.05-.09 BAC	46	39%
.10+ BAC	30	30%
<u>Educational Attainment</u>		
College Graduate	172	63%
Some Post High School	221	49%
High School Graduate	184	45%
Grades 1-11	171	31%
<u>Occupation</u>		
Professional, etc.	105	68%
Other White Collar	94	48%
Skilled Blue Collar	97	43%
Other Blue Collar	182	35%
Student	188	52%
Other Not Employed	58	43%
<u>Residence</u>		
Ann Arbor	227	56%
Ypsilanti	145	41%
Rest of County	323	44%
<u>Total</u>	748	47%

Appendix C
INSTRUCTIONAL MATERIAL RELATED TO THE
IMPLEMENTATION OF THE SURVEY

- C.1. Operational Procedures for ASAP Roadside Survey
- C.2. Directive with Respect to Confidentiality
- C.3. Operational Schedule
- C.4. Breathalyzer Operational Checklist

C.1. OPERATIONAL PROCEDURES FOR ASAP ROADSIDE BAC SURVEY

This document provides the objectives, purpose, and operational guidelines for the roadside survey to measure the involvement of alcohol in the population of Washtenaw County drivers. This survey will be conducted during the period of Tuesday, March 9 through Saturday, April 3, 1971. The survey will operate on the evenings of Tuesday, Wednesday, Friday and Saturday during the period from 7 P.M. to 3 A.M. The survey will operate for a period of two hours at a particular site and one hour will be provided for moving from one site to the next. Thus three sites per night will be surveyed. It is planned that we will obtain an average of 15 drivers per site over the length of the survey. Your cooperation in making this study a success will be greatly appreciated.

C.1.1. PURPOSE OF UNIFORM OPERATIONAL STANDARDS. The success of this survey is dependent upon the voluntary cooperation of the driving citizens of Washtenaw County. To insure this cooperation it is important that all persons associated with the project deal with citizens in a professional manner consistent with proper research and law enforcement practice. In particular it is important that the information gathered be kept confidential and that the survey not be used for unrelated surveillance of the citizens of Washtenaw County. To insure that these goals are attained the following uniform operating procedures have been established and agreed to by the participating groups (e.g., Highway Safety Research Institute, Washtenaw County Sheriff's Department, Ypsilanti City Police Department, and Ann Arbor City Police Department).

C.1.2. SUMMARY OF WASHTENAW COUNTY ALCOHOL SAFETY ACTION PROGRAM (WCASAP). The objective of the proposed three-year program is reduction in the number of alcohol-related traffic crashes and fatalities in Washtenaw County, Michigan. It is to be demonstrated that this objective can be achieved through a number of different approaches to control of drinking drivers. The countermeasure components comprising the program will be designed, implemented, and evaluated both to impact the problem at hand locally and to prepare for more widespread adoption of the successful program components subsequently throughout the country.

Key features of the program are the following: identification of alcohol abusers who drive, by increased police patrolling and selective searches of driving records; more effective handling of persons thus detected by innovative and vigorous action on the part of the courts and licensing authorities; and implementation of a broad-based information and education campaign directed to the drinking-driving public at large and to selected key groups within the community.

Three separate, but interrelated, projects make up the entire program in which the above key features are made operational: (1) control of problem drinkers who drive through use of the protective drug "Antabuse"--use of the drug essentially guarantees society of an alcohol-free driver while he is on this medication, and it further buys therapeutic time so that the underlying problems can be approached without the complications of frequent drinking relapses, thus considering together both the long-term problems of the problem drinking driver as well as the short-term effects;

(2) control of other alcohol abusers who drive, both problem and social drinkers, through early detection of such persons by review of police and driving records and subsequent remedial action under the umbrella of existing licensing statutes; (3) a comprehensive information and education campaign designed to (a) favorably alter the driving-after-drinking behavior of the public at large and (b) alter the attitudes and knowledge of the following groups so that they may more effectively deal with alcohol abusers: court personnel, prosecutors, defense attorneys, police officers, physicians, public health and social workers.

Overall program responsibility will be vested in the Washtenaw County Board of Commissioners. The administration of the program will be lodged in its associated units, particularly the Washtenaw County Board of Health. Consultation and program evaluation will be contracted to The University of Michigan's Highway Safety Research Institute. Operating personnel will be working in a number of existing community agencies, both public and private, either under contract with the Board of Health or other suitable arrangements.

C.1.3. OBJECTIVE OF THE BAC ROADSIDE SURVEY. The ultimate objective of the Washtenaw County ASAP program is the reduction of the number and severity of alcohol-related crashes. This objective, which we hypothesize will be influenced positively by the program, is also influenced by a large number of additional variables which are not controllable by the project. Therefore it is possible that a true improvement might be masked by other factors (e.g., the number of alcohol-related crashes might increase due to a deterioration of the road system). Thus we believe that it is necessary to measure certain intermediate objectives--in addition to the ultimate objective--in order to determine whether or not there is a causal chain of events leading from the project to the ultimate objective. If there is such a chain then we hypothesize that an important intermediate variable in this chain is the percentage of drivers who are operating their vehicles while under the influence of alcohol.

Thus a major portion of the evaluation deals with the question of the number and percent of drivers operating under the influence of alcohol. Therefore a measure of the amount of alcohol-related driving is needed both before and after the program has taken effect. The following discussion presents a strategy for performing this measurement.

The measurement will be performed using a probability sample designed to represent the drivers in Washtenaw County during the evening and early morning hours. This time period was chosen based upon the fact that a larger number of alcohol-related arrests and crashes occur during this time period. In order to increase our likelihood of detecting a change--if one occurs--it is best to work with the subpopulation in which a change has the greatest likelihood of occurring. In addition we can argue that it is during these hours that the largest amount of damage resulting from alcohol-related crashes has been observed.

The actual measurement points will consist of a number of roadside locations at which drivers will be stopped and asked to provide a breath sample and the answers to a few questions. The

collection of data from the drivers is completely dependent upon their voluntary cooperation. This cooperation will be improved if everyone associated with the project operates in a professional manner.

C.1.4. NONDISCRIMINATORY IMPLEMENTATION OF THE SURVEY. The objective of the roadside survey is to provide an estimate of the degree of alcohol usage by the drivers in Washtenaw County. This objective is to be attained through the use of a sampling procedure whose design is based upon sampling and experimental design techniques which are generally accepted by professional statisticians. The objective of these procedures is to enable every driver in the county to have an equal chance of being in the sample of drivers who are being tested. Therefore the study is designed to avoid any discrimination or unequal inclusion of any subgroup within the county. In particular the study is not directed at any subgroup of the county population as identified by socio-economic level, ethnic background, geographic location, type of automobile or any other unique subgroup characteristics. The survey is not part of any control action directed against any private or public business or organization within the county. In addition no part of the survey is to be directed to any specific individual.

C.1.5. ACKNOWLEDGMENT OF POLICE RESPONSIBILITY TO THE COMMUNITY. This program acknowledges that whenever the service of a law enforcement officer is requested, the actions are controlled by statutes. For by statute he must at all times fulfill his responsibilities to the community he serves. A police officer's fundamental duty is to serve mankind; to safeguard lives and property; to protect the innocent against deception, the weak against oppression or intimidation, and the peaceful against violence or disorder; and to respect the constitutional rights of all men to liberty, equality and justice. These are, of course, the desires of all mankind, but a police officer is a person duly appointed and sworn to uphold the laws of the city, state, and federal governments to assure all persons these rights.

C.1.6. RESPONSIBILITIES OF POLICE PERSONNEL:

1. Layout of the Survey Site. The physical arrangement of the survey site including placement of markers and location of the survey van will be established by the law enforcement officers supporting the survey team. The primary objective of the site arrangement will be the assurance of maximum safety for the drivers and all personnel associated with the survey.

2. Police Contact Procedures:

(a) The police officer assigned to the survey will direct a motorist to proceed to the point at which the member of the survey team is located. The officer will receive a hand signal from the researcher when another motorist is desired as a survey subject. At this point the officer will direct the next car, pickup truck or small van to the survey. Under normal circumstances the officer will not directly communicate with the motorist. If the motorist asks a question the officer will politely give an appropriate short response. This response should include the statement that the survey team member will be happy to answer questions concerning the survey.

(b) If the police officer observes a motorist engaging in behavior that would normally result in a police stop for questioning and/or subsequent arrest the police officer may follow his normal procedures in such a circumstance. Cases calling for such action include:

1. Obvious equipment violations on the vehicle.
2. Obviously illegal or erratic driving behavior.
3. Failure to stop for initial police signal. The officer is directing traffic and thus his traffic directions should be followed.
4. Recognition of a person in the vehicle who has a warrant outstanding for his arrest. Recognition of a vehicle that is wanted in connection with some offense or for questioning.
5. Upon request by a member of the survey team or when the survey team member is threatened or subjected to some form of danger.

(c) Since the BAC survey requires voluntary cooperation on the part of motorists it is not possible to make a contact with the driver or to perform surveillance operations directed toward the driver that are not directly related to the survey as indicated above. This is necessary in order to guarantee the driver complete confidentiality regarding the information collected as a result of the survey.

C.1.6. SURVEY TEAM RESPONSIBILITIES. The survey team will contact the motorist, explain the purpose of the survey, request the driver's cooperation, and conduct the breath test and interview. If as a result of the interview and breath test the survey team member concludes that the driver should not be operating his vehicle he will strongly encourage the driver to accept an alternate driver. This driver, to be furnished by the Highway Safety Research Institute, will drive the motorist's car to his residence or other desired destination, with consent of the motorist.

In no case will any individual identification be associated with either the breath test or the interview information collected. All information collected concerning individuals will become the property of HSRI and will be kept strictly confidential through the use of accepted procedures for the safeguarding of personal information. Results of analyses of the data will be made available upon request to the participating agencies in the WCASAP project, consistent with policies and procedures established by the WCASAP Coordinating Council and administered by the WCASAP Program Director.

C.2. DIRECTIVE WITH RESPECT TO CONFIDENTIALITY

MEMO TO: Carlson, Chapman, Clark, Compton, Jones, McNaughton,
Wessling, Wolfe and all other HSRI Washtenaw ASAP
Personnel
FROM: Lyle D. Filkins, William E. McCormick
XC: Saalberg, Epstein, F. Clark, Kerlan, Rosenblatt
SUBJECT: Directive with Respect to Confidentiality of Personal
Information.

The nature of the Washtenaw County Alcohol Safety Action Program in general, and BAC Roadside Survey in particular, is such that personal information is being gathered concerning individual citizens of Washtenaw County. In the cases of the BAC Roadside Survey and the Public Survey, these persons will be randomly selected.

It is the policy of HSRI to safeguard the confidentiality of all information concerning specific individuals gathered or observed during the program, and particularly that related to the two surveys. This includes all recorded data and other information, opinions, and impressions obtained by personal observation of any participants in the overall program or surveys by any and all survey team members.

Accordingly you are hereby directed not to divulge any such data or information to anyone not connected with the survey, whether employed by HSRI or not, either during business or non-business hours. Violation of this directive is grounds for immediate dismissal from HSRI and the University.

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C.3. OPERATIONAL SCHEDULE

HSRI Personnel Arrive	6:30 P.M.
Police Arrive	6:40
Depart HSRI	6:45
Arrive at Site	7:00
Set-up	
Begin Survey at 1st Site	7:15
End Survey at 1st Site	9:15
Move and Set-up	
Start Survey at 2nd Site	10:00
End Survey at 2nd Site	12:00
Lunch Break	12:00-12:30
Move and Set-up	
Start Survey at 3rd Site	1:00 A.M.
End Survey at 3rd Site	3:00
Arrive at HSRI	3:15
End of Shift	3:30

C.4. BREATHALYZER OPERATIONAL CHECK LIST

1. Turn power switch to ON--wait until thermometer shows 47°-53° C.
2. Release Galvanometer Lock.
3. Rotate Galvanometer Adjustment to mechanically zero galvanometer needle.
4. Gauge one ampoule and insert it, unopened, into Reference Ampoule Holder.
5. Gauge second ampoule, open it while still in gauge, insert bubbler tube into ampoule, place ampoule into Test Ampoule Holder, connect rubber sleeve to bubbler tube, turn on Balance Light Switch, balance electrically with BALANCE Wheel, disengage Blood Alcohol Pointer and set to Start Line. (NOTE: Always balance from left to right; if galvanometer needle is off center to right, first return it to left of center to bring needle into final balance position from the left.)
6. Turn Selector Valve to TAKE, flush out, turn to ANALYZE (listen for bubbles in ampoule; if no bubbles, flush again to TAKE and return to ANALYZE).
7. When red Empty Indicator Light comes on, begin timing, wait 1 1/2 minutes, turn on LIGHT and balance electrically.
8. Disengage Blood Alcohol Pointer and set to Start Line.
9. Turn to TAKE, take breath sample, turn to ANALYZE, record time on BREATHALYZER TEST REPORT. If subject does not give a good sample, have him blow again--no need to re-purge.
10. When red empty signal appears, begin timing, wait 1 1/2 minutes, balance.
11. Record BAC from Blood Alcohol Scale on BREATHALYZER TEST REPORT. NOTE: Use test ampoule only to cumulative BAC readings of 0.40, then discard, following steps 1, 2 and 4 in Appendix C.4.1., and replace with new ampoule, following steps 5 through 8 above.

12. Prepare for next test by following steps 6 through 8 above, unless subject blows 0.00, then just go to TAKE! and re-set pointer and balance.
13. Record test results on card and test report--staple to questionnaire.

C.4.1. BREAK-DOWN PROCEDURES AT END OF EACH SITE:

1. Disconnect rubber sleeve from instrument. (Leave rubber sleeve attached to bubbler tube of test ampoule.)
2. Purge - (TAKE, atomize, ANALYZE).
3. Remove reference ampoule and replace in supply box.
4. Remove test ampoule. (Leave bubbler tube and rubber sleeve attached.) Disconnect rubber sleeve from bubbler tube. Dispose of test ampoule and bubbler. Replace rubber sleeve on instrument. (Remember that the test ampoule contains a potentially damaging potassium dichromate-sulfuric acid solution.)
5. Rebalance instrument without ampoules.
6. Disengage pointer and set to 0.40. Turn pointer back to 0.00 by rolling BALANCE wheel.
7. Turn Selector Valve to OFF position. Gauge galvanometer by turning the Galvanometer Lock clockwise. Do not tighten too tightly.
8. Verify that galvanometer is locked by turning Balance Light Switch ON and check to see that galvanometer needle does not deflect.

C.4.2. BREAK-DOWN PROCEDURES AT END OF EACH NIGHT:

1. Follow Operational Check List steps 6 (or 5 as necessary) through 8 given in Appendix C.4.
2. Use simulator solution and follow steps 9 and 10 of Operational Check List given in Appendix C.4.
3. Record BAC result on SIMULATOR TEST REPORT and file with night's survey results.
4. If BAC is not within tolerance, re-check by following steps 1, 2, and 3 above.
5. If BAC is not within tolerance on second test, write a memo recording same with instrument number, file memo with night's survey results so that instrument may be repaired.
6. Follow BREAK-DOWN PROCEDURES AT END OF EACH SITE listed in Appendix C.4.1.
7. Discard simulator solution, rinse jar in distilled water, dry jar and store in safe place for transit.
8. Blow out INTAKE TUBE on simulator assembly. Do not wipe simulator assembly, but let it air dry. Store in safe place for transit.
9. Store atomizer and ampoule gauge within instrument storage compartment.
10. Replace cover on instrument.

Appendix D
ANALYSIS OF VARIANCE USING AVERAGE
BAC AS DEPENDENT VARIABLE

Appendix D

ANALYSIS OF VARIANCE USING AVERAGE
BAC AS DEPENDENT VARIABLE

AVERAGE BAC PER DRIVER PER SITE AS A
FUNCTION OF EXPERIMENTAL DESIGN VARIABLES

<u>Variable</u>	<u>Level</u>	<u>Mean</u>
Traffic Volume	1 Medium	1.65
	2 High	1.36
Time of Night	1 (7-9 P.M.)	0.71
	2 (10-12 P.M.)	1.11
	3 (1-3 A.M.)	2.70
Urban vs Rural	1 Urban	1.19
	2 Rural	1.83
Weekday vs Weekend	1 Weekday	1.59
	2 Weekend	1.42
Grand Mean		1.51

DIVISION OF VARIANCE

FACTOR CODES

A	EQUALS	TRAFFIC VOLUME
B	EQUALS	TIME OF NIGHT
C	EQUALS	URBAN VS RURAL
D	EQUALS	WEEKDAY VS WEEKEND

<u>Source of Variation</u>	<u>Sums of Squares</u>	<u>Degrees of Freedom</u>	<u>Mean Squares</u>	<u>Ratio</u>
A (Traffic Volume)	1	1	1	6.37 ^(a)
B (Time of Night)	35	2	18	
AB	2	2	1	
C (Urban vs Rural)	5	1	5	
AC	1	1	1	
BC	1	2	0	
ABC	6	2	3	
D (Weekday vs Weekend)	0	1	0	
AD	4	1	4	
BD	1	2	0	
ABD	1	2	1	
CD	3	1	3	
ACD	1	1	1	
BCD	7	2	4	
ABCD	0	2	0	
Within Cells	64	23	3	
Total	131	46		

(a) Significant at $\alpha \leq 0.05$

NOTE: Table values are rounded to the nearest whole number; however all significance tests were performed prior to rounding.

Appendix E
NUMBER OF PERSONS WITH POSITIVE BAC BY
TIME SUBJECT STARTED INTERVIEW

Appendix E
NUMBER OF PERSONS WITH POSITIVE BAC BY
TIME SUBJECT STARTED INTERVIEW

<u>Time</u>	<u>Number</u>	<u>>.02 BAC</u>		<u>>.05 BAC</u>	
7:00-7:30 P.M.	22	2	9.0%	1	4.5%
7:31-8:00	61	5	8.2%	1	1.6%
8:01-8:30	66	11	16.7%	4	6.1%
8:31-9:00	76	8	10.5%	6	7.9%
9:01-9:30	30	3	10.0%	1	3.3%
10:00-10:30	67	6	9.0%	2	3.0%
10:31-11:00	82	16	19.5%	8	9.8%
11:01-11:30	71	7	9.8%	4	5.6%
11:31-12:00	58	10	17.2%	5	8.6%
1:00-1:30 A.M.	48	14	29.2%	10	20.8%
1:31-2:00	56	21	37.5%	10	17.8%
2:01-2:30	59	18	30.5%	12	20.3%
2:31-3:00	50	20	40.0%	13	26.0%

Appendix F
DUMMY VARIABLE REGRESSION MODEL

Appendix F
DUMMY VARIABLE REGRESSION MODEL

In order to estimate the geographic and time locations of drinking drivers a dummy variable regression model was fitted. This model computed an expected value for the dependent variable for each survey site, based upon the location in the county, the type of day, the nominal traffic volume and the time of night. The dependent variable chosen was the proportion of drivers with BAC's at or above 0.05. Thus the dependent variable relates closely to the subset of drinking drivers who are potentially dangerous.

INDEPENDENT PREDICTOR VARIABLES

GEOGRAPHIC

The survey sites were grouped into the following five identifiable areas within the county:

1. Rural County
2. Ypsilanti
3. Near Ypsilanti
4. Ann Arbor
5. Near Ann Arbor

These five areas were used to generate a combination of four independent or predictor variables which uniquely identify each as follows:

	<u>X₁</u>	<u>X₂</u>	<u>X₃</u>	<u>X₄</u>
1. Rural County	0	0	0	0
2. Ypsilanti	1	0	0	0
3. Near Ypsilanti	0	1	0	0
4. Ann Arbor	0	0	1	0
5. Near Ann Arbor	0	0	0	1

TYPE OF DAY

This variable had only two levels--weekday and weekend. Thus it can be uniquely described by one independent variable:

	<u>X₅</u>
Weekday	0
Weekend	1

TRAFFIC VOLUME AND TIME OF NIGHT

Previous analysis indicated a strong interaction between these two variables. Thus it was decided to generate a new variable which described uniquely all combinations. This resulted in a six level independent variable, which required five levels to define.

<u>Traffic Volume</u>	<u>Time of Night</u>	<u>X₆</u>	<u>X₇</u>	<u>X₈</u>	<u>X₉</u>	<u>X₁₀</u>
High	1 (7-9 P.M.)	0	0	0	0	0
	2 (10-12 P.M.)	1	0	0	0	0
	3 (1-3 A.M.)	0	1	0	0	0
Medium	1 (7-9 P.M.)	0	0	1	0	0
	2 (10-12 P.M.)	0	0	0	1	0
	3 (1-3 A.M.)	0	0	0	0	1

Each site was identified by a combination of these ten predictor variables and its measured dependent variable (proportion ≥ 0.05 BAC). The advantage of using dummy variable regression is that the regression coefficients are in effect additive adjustments which combine to obtain the expected or predicted value for each site. Therefore it is not necessary to make any assumptions concerning the relationships between the "true" predictor variables and the dependent variable.

The regression model was fitted by using The University of Michigan Constat Statistical package. The regression model is as follows:

$$\begin{aligned}
 Y &= 0.04 + 0.01X_1 - 0.04X_2 - 0.07X_3 + 0X_4 + 0.02X_5 \\
 &\quad + 0.04X_6 + 0.14X_7 + 0.04X_8 + 0.05X_9 + 0.25X_{10} \\
 R^2 &= 0.715 \\
 S &= 0.064
 \end{aligned}$$

The residuals from the model were examined and found to be independent of the observed dependent variable. In addition they approximate a normal distribution.

The only coefficients that are significantly greater than zero (at >0.05) are B_3 (Ann Arbor), B_7 (High Volume, 1-3 A.M.) and B_{10} (Medium Volume, 1-3 A.M.). Thus it can be concluded that there is a smaller proportion of drivers with BAC's greater than or equal to 0.05 in Ann Arbor. In addition there is a larger proportion during the early morning hours. Further examination of the regression model indicates that the coefficients for variables X_1 and X_4 are zero or very small and hence they can be removed without effecting the model. Therefore the rural county area, Ypsilanti and the county area near Ann Arbor have the same proportion of drivers with high BAC's. The coefficient for variable X_5 is also small indicating only a small increase in the proportion of drinking drivers on the weekend. By combining all of these observations it is possible to obtain the graphical presentation of the model shown in Figure 5.

