

Technical Report Documentation Page

1. Report No.		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Impact Evaluation of the Traffic Alcohol Program in Lexington, Kentucky				5. Report Date October, 1985	
7. Author(s) J. G. Pigman and K. R. Agent				6. Performing Organization Code	
9. Performing Organization Name and Address Kentucky Transportation Research Program College of Engineering University of Kentucky Lexington, Kentucky 40506-0043				8. Performing Organization Report No. UKTRP-85-26	
12. Sponsoring Agency Name and Address Division of Police Lexington-Fayette Urban County Government 134 East Main Street Lexington, Kentucky 40507				10. Work Unit No. (TRAIS)	
15. Supplementary Notes Study Title: Evaluation of Lexington-Fayette County Traffic Alcohol Program				11. Contract or Grant No.	
16. Abstract This report is an evaluation of increased police enforcement to reduce alcohol-related accidents in Lexington-Fayette County, Kentucky. Three types of data were collected as a means of evaluating the Traffic Alcohol Program; accident data, arrest and adjudication data, and cost-effectiveness data. Results from before-and-after comparisons and time-series analysis show alcohol-related accidents decreased significantly during the study period. When comparing two years before with three years during the increased enforcement, the percent reduction in alcohol-related accidents was 28.1 percent using standard before and after analysis and 29.1 percent using time-series analysis. During the same time period, alcohol related fatal or injury accidents decreased 26.7 percent. Arrests have averaged 3,686 per year for the three years of increased enforcement as compared to 929 the year before. The DUI conviction rate has remained at approximately 90 percent throughout the program. Based on costs associated with the program (enforcement, jail costs, and court costs) and benefits (reduced accident costs, fines for DUI, and fines for other offenses); the benefit-cost ratio was 3.71.				13. Type of Report and Period Covered Final	
17. Key Words Alcohol Cost-effectiveness Accidents Highway safety Arrests Adjudication				14. Sponsoring Agency Code	
19. Security Classif. (of this report)				18. Distribution Statement	
20. Security Classif. (of this page)		21. No. of Pages		22. Price	

Research Report
UKTRP-85-26

IMPACT EVALUATION OF THE
TRAFFIC ALCOHOL PROGRAM
IN LEXINGTON, KENTUCKY

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Federally funded through
Highway Safety Standards Branch
Kentucky State Police
Commonwealth of Kentucky

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October 1985

ACKNOWLEDGEMENTS

Without the assistance and cooperation of other agencies, it would have been very difficult to have obtained the various types of data included in the report. The assistance and guidance from the following individuals were valuable to the completion of the report:

Joe Ann O'Hara - Highway Safety Standards Section
 Kentucky State Police
Charles V. Caldwell - Highway Safety Standards Section
 Kentucky State Police
Larry Ball - Lexington - Fayette Urban County
 Division of Police
Joan Rutledge - Fayette County District Court

Also providing valuable assistance in the performance of time-series analysis of accident data for the study area was Paul Levy with the National Highway Traffic Safety Administration.

For their contributions in data collection, analysis, and preparation of the final report, an expression of appreciation is extended to Carla Crossfield, Mark Isenhour, Ed Medina, and Greg Stallard.

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INTRODUCTION

Driving under the influence of alcohol continues to be one of the nation's most serious health and safety problems. Approximately 50 percent of all drivers killed each year have blood alcohol concentrations in excess of the legal limit of 0.10 percent (1). In single-vehicle fatal crashes, where fault is certain, nearly 65 percent of those drivers who died were legally drunk. Over the past 10 years the number of highway deaths involving alcohol has averaged approximately 25,000 per year. Economic losses due to the alcohol-impaired driver also are staggering. An estimate of the total economic cost of the drinking driver is between 21 and 24 billion dollars per year (2). In Kentucky, the number of alcohol-related accidents has averaged approximately 10,000 per year during a recent five-year period (1980-1984)(3). Alcohol-related fatal crashes have averaged 185 during this period (3). This relatively low number of reported alcohol-related fatal accidents is likely because alcohol involvement is based on an officer's observations at the scene. Subsequent blood tests have shown that alcohol is a factor in approximately 50 percent of all fatal accidents. When considering the cost of fatalities and injuries, the estimated annual cost of alcohol-related crashes in Kentucky is \$78 million (3). The problem has reached the point where it has been estimated that one of every two Americans will be involved in an alcohol-related accident in their lifetime.

Analysis of contributing factors (human, vehicular, and roadway) revealed that alcohol was listed as a contributing factor in 8.0 percent of all accidents and 26.2 percent of fatal accidents. For all Kentucky accident records, alcohol was second to unsafe speed as a contributing factor in fatal accidents and was the fourth most common contributing factor in all accidents.

To identify locations having alcohol-related accident problems that would be candidates for traffic alcohol programs, counties and cities having the highest percentages of accidents involving alcohol for their population categories have been identified (3). Locations having high percentages of alcohol-related accidents and low conviction rates were selected as logical choices for increased enforcement. Lexington-Fayette County was selected as a candidate for a Traffic Alcohol Program (TAP) in a previous study (4).

In Lexington-Fayette County, a Traffic Alcohol Program has been ongoing for approximately three and one-half years and enforcement is the responsibility of the local police. An evaluation of the first-year impact of Lexington-Fayette County Traffic Alcohol Program has been made and summarized as an interim report (5) and the results through the first two years of operation were included in a second report (6). This report summarizes the results of the Lexington-Fayette County Traffic Alcohol Program for the three-year period of May 1982 through April 1985.

LEXINGTON-FAYETTE COUNTY TRAFFIC ALCOHOL PROGRAM

In an attempt to impact the number of fatalities, injuries, and property-damage accidents related to alcohol, a comprehensive program of countermeasures has been implemented in Lexington-Fayette County. The program involves a coordinated effort between the Division of Police, the

judicial system, rehabilitation program administrators, educational institutions, and the local news media. Generally, the program includes the following components: 1) officer DUI training course, 2) deployment of officers for DUI enforcement, 3) public information campaign, and 4) development and administration of an effective alcohol education program.

Some expected accomplishments and anticipated long-range results of Lexington's Traffic Alcohol Program are listed below:

1. Reduce alcohol-related fatality/injury accidents by 25 percent.
2. Decrease the average blood alcohol level of those arrested for DUI from 0.20 to between 0.10 to 0.14.
3. Reduce the number of "Reckless Driving - Had Been Drinking" arrests (this notation is used to identify reckless driving arrests in which alcohol was involved).
4. Increase community awareness of the problems created by drinking drivers.
5. Increase voluntary compliance to the DUI and Implied Consent Laws.

DATA COLLECTION PROCEDURES

Three primary types of data were collected as a means of evaluating Traffic Alcohol Programs at the locations selected for study. Those data were accident data, arrest and adjudication data, and cost effectiveness data.

ACCIDENT DATA

Data were collected for alcohol-related accidents and total accidents two years before and three years during the Traffic Alcohol Program in Lexington-Fayette County. This included the period of May 1, 1980, through April 30, 1985. Copies of accident reports having alcohol listed as a contributing factor were obtained from or reviewed at the Division of Police office. Monthly tabulations of total accidents also were obtained from the Lexington-Fayette County Division of Police.

ARREST AND ADJUDICATION DATA

Arrest and adjudication data were the second major data element included in the analysis. Data reflecting a complete summary of the arrest and adjudication history of each DUI case were available from the Administrative Office of the Courts.

For the analysis of Lexington-Fayette County's Traffic Alcohol Program, data had previously been summarized for one year before and two years during TAP (6). Additional data were collected to assess the program's impact during the third year. Again, a 25-percent sample of the DUI arrests was obtained for inclusion in the analysis.

COST EFFECTIVENESS DATA

To determine cost effectiveness of the Traffic Alcohol Program, it was necessary to summarize costs and benefits associated with the program.

Enforcement costs were obtained from the Lexington-Fayette County Division of Police. Included in the enforcement costs were personnel, equipment, mileage, supplies, and training. Other costs were those associated with usage of the jail and court costs. Court costs were obtained from the Administrative Office of the Courts.

Benefits and income associated with the Traffic Alcohol Program included reduced accident costs, DUI fines, and fines resulting from other arrests made by TAP officers. Accident costs were applied to numbers of various types of alcohol-related accidents to determine benefits resulting from reductions in accidents. Income figures from the TAP project, in the form of fines resulting from DUI and other offenses, were obtained from the sample of arrest cases reviewed at the Administrative Office of the Courts.

ANALYSIS OF RESULTS

ACCIDENTS

Accidents were analyzed by means of traditional before-and-after comparisons. To determine significance of accident reductions, the chi-square test was applied and changes were tested for significance at the 95-percent confidence level (7, 8). It should be noted that, when the term significant is applied to a change in accidents, the change has been determined to be significant at the 95-percent confidence level.

As noted previously, accident trends and statistics were one of three primary areas of analysis. Alcohol-related crashes in Lexington-Fayette County were analyzed for the five-year period from May 1, 1980, through April 30, 1985. This included a two-year period before the Traffic Alcohol Program and a three-year period during TAP. Table 1 is a summary of alcohol-related accidents by month for the two years before and three years during TAP. Overall, there was a significant decrease of 28.1 percent between the two-year period before and the three-year period during TAP. For a similar time period (1980-81 as compared to 1982-84), there was a 12.1-percent decrease in the statewide total of alcohol-related accidents. Total accidents statewide for this same time period increased by 2.5 percent.

To determine whether the significant decrease in accidents was a result of TAP or a general decrease in accidents, total accidents for the same time period were tabulated. This summary is presented in Table 2, and the overall decrease was 10.6 percent. This decrease was also significant at the 95-percent confidence level. The question of whether all the decrease in total accidents was attributable to alcohol-related accidents also was addressed. Alcohol-related accidents represented 8.4 percent of all accidents during the five-year study period. If alcohol-related accidents are excluded from each year's total, then the decrease is 8.7 percent (significant at 95-percent confidence level) when comparing the two years before with the three-years during TAP. Therefore, a general decrease in total accidents did occur beyond the influence of alcohol-related accidents. The result was a 8.7-percent decrease in all accidents, excluding those related to alcohol, and a 28.1-percent decrease in alcohol-related accidents. It should be noted that even though the reduction in both

TABLE 1. REPORTED ALCOHOL-RELATED ACCIDENTS BY MONTH

MONTH	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
May	91	8.8	96	11.8	85	11.6	60	8.7
June	91	8.8	48	5.9	63	8.6	48	7.0
July	85	8.2	73	8.9	44	6.0	54	7.9
August	97	9.4	65	8.0	56	7.7	62	9.0
September	84	8.1	73	8.9	57	7.8	79	11.5
October	89	8.6	85	10.4	68	9.3	57	8.3
November	84	8.1	58	7.1	59	8.1	64	9.3
December	92	8.9	76	9.3	64	8.7	56	8.2
January	76	7.3	61	7.5	53	7.2	40	5.8
February	79	7.6	65	8.0	56	7.7	42	6.1
March	67	6.5	66	8.1	56	7.7	60	8.7
April	101	9.7	51	6.2	71	9.7	65	9.5
Total	1,036		817		732		687	

TABLE 2. TOTAL REPORTED ACCIDENTS BY MONTH

MONTH	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
May	915	8.6	858	8.7	779	8.6	762	8.0
June	812	7.6	754	7.7	667	7.3	735	7.7
July	819	7.7	809	8.2	668	7.3	709	7.4
August	890	8.4	826	8.4	696	7.6	767	8.0
September	931	8.8	796	8.1	762	8.4	800	8.4
October	995	9.4	925	9.4	812	8.9	854	8.9
November	873	8.2	883	9.0	716	7.9	904	9.4
December	964	9.1	927	9.4	940	10.3	951	9.9
January	977	9.2	730	7.4	999	11.0	926	9.7
February	817	7.7	756	7.7	650	7.1	711	7.4
March	782	7.4	742	7.6	671	7.4	692	7.2
April	852	8.0	813	8.3	750	8.2	767	8.0
Total	10,627		9,819		9,110		9,578	

alcohol-related and "other" accidents were significant, the magnitude of the reductions in alcohol-related accidents is over three times greater than for "other" accidents. It also was found that the 28.1-percent decrease was significantly greater than the 8.7-percent decrease.

The significant decrease in alcohol-related accidents of 28.1 percent was for all hours of the day. Further analysis was required to determine if variations in accidents for the hours of TAP enforcement were different from all hours of the day. For the first two years of the program, TAP hours of enforcement were from 10:30 p.m. until 3:30 a.m. except Sunday night and Monday morning. During the third year of the program, regular TAP enforcement was from 10:30 p.m. until 3:30 a.m., Wednesday through Saturday nights, with enforcement being alternated each week for Monday and Tuesday nights. Without attempting to delete the effect of the slight variation of enforcement during the third year, the decrease in alcohol-related accidents during the hours of TAP enforcement was 35.8 percent (significant at 95-percent confidence level). This is slightly more than the decrease in alcohol-related accidents for all hours (28.1 percent); however, the impact of TAP extended to hours other than those of special enforcement because of increased public awareness and an increased level of enforcement during non-TAP hours. A summary of alcohol-related accidents during TAP hours by month is presented in Table 3.

Additional time distributions of alcohol-related accidents are presented in Tables 4 and 5. The summary of alcohol-related accidents by day of week in Table 4 shows that distribution was very similar for the two-year period prior to TAP and the three years during TAP. Fridays and Saturdays continued to have the highest number of alcohol-related accidents. The distribution of alcohol-related accidents by time of day is presented in Table 5. When comparing three-hour periods, it was noted that the only increase in the number of accidents from before to during TAP occurred between 6:00 a.m. and 8:59 a.m. The largest number of alcohol-related crashes occurred between midnight and 2:59 a.m. and between 9:00 p.m. and midnight. The time period having the largest decrease in number of accidents was between midnight and 2:59 a.m.

Alcohol-related accidents for the five-year study period were classified by the most severe injury in Table 6. Data from this summary show the percentage of alcohol-related fatal or injury accidents was almost identical (36 to 37 percent) when comparing the two-year before period with the three-year period during TAP.

Additional data showing total injuries resulting from alcohol-related accidents during the five-year study period are presented in Table 7. When total fatalities and injuries for the two-year before period were compared to the three years during TAP, the result was a 34.8 percent decrease. This decrease was a direct result of the decrease in accidents. Accident severity remained unchanged over the five-year period.

The enforcement action resulting from the alcohol-related accidents is summarized in Table 8. The number and percentage of alcohol-related accidents which have resulted in citations for driving under the influence have increased each year while the number and percentage of public

TABLE 3. ALCOHOL-RELATED ACCIDENTS DURING TAP HOURS BY MONTH

MONTH	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
May	38	8.1	32	9.8	35	11.9	21	7.5
June	43	9.2	26	8.0	22	7.5	29	10.4
July	40	8.6	34	10.4	20	6.8	27	9.7
August	47	10.1	29	8.9	24	8.2	28	10.0
September	40	8.6	27	8.3	22	7.5	23	8.2
October	49	10.5	33	10.1	33	11.2	24	8.6
November	32	6.9	22	6.7	26	8.8	18	6.5
December	40	8.6	33	10.1	22	7.5	17	6.1
January	36	7.7	25	7.7	15	5.1	16	5.7
February	31	6.6	25	7.7	22	7.5	17	6.1
March	31	6.6	19	5.8	24	8.2	28	10.0
April	40	8.6	21	6.4	29	9.9	31	11.1
Total	467		326		294		279	

TABLE 4. ALCOHOL-RELATED ACCIDENTS BY DAY OF WEEK

DAY	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982		THREE-YEAR AVERAGE MAY 1982 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT
Sunday	161	15.6	102	13.7
Monday	85	8.2	68	9.1
Tuesday	117	11.3	83	11.1
Wednesday	118	11.4	69	9.2
Thursday	126	12.2	97	13.0
Friday	178	17.2	140	18.8
Saturday	251	24.2	187	25.1
Total	1,036		746	

TABLE 5. ALCOHOL-RELATED ACCIDENTS BY TIME OF DAY

TIME OF DAY	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982		THREE-YEAR AVERAGE MAY 1982 - APRIL 1985	
	NUMBER*	PERCENT	NUMBER*	PERCENT
Midnight - 2:59am	300	29.1	198	27.2
3:00am - 5:59am	65	6.3	41	5.6
6:00am - 8:59am	17	1.7	18	2.5
9:00am - 11:59am	26	2.5	13	1.8
Noon - 2:59pm	51	4.9	40	5.5
3:00pm - 5:59pm	111	10.8	84	11.5
6:00pm - 8:59pm	185	17.9	141	19.3
9:00pm - 11:59pm	277	26.8	194	26.6
Total	1,032		729	

*Does not include accidents in which time of day was not reported.

TABLE 6. ALCOHOL-RELATED ACCIDENTS CLASSIFIED BY MOST SEVERE INJURY

MOST SEVERE INJURY	NUMBER OF ACCIDENTS			
	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982	MAY 1982 - APRIL 1983	MAY 1983 - APRIL 1984	MAY 1984 - APRIL 1985
Fatality	8	5	2	2
Incapacitating Injury	96	75	72	75
Non-Incapacitating Injury	208	153	143	143
Possible Injury	62	57	52	43
No Injury	658	527	463	424

TABLE 7. NUMBER OF INJURIES AND FATALITIES RESULTING FROM ALCOHOL-RELATED ACCIDENTS

MOST SEVERE INJURY	NUMBER OF INJURIES OR FATALITIES			
	TWO-YEAR AVERAGE MAY 1980 - APRIL 1982	MAY 1982 - APRIL 1983	MAY 1983 - APRIL 1984	MAY 1984 - APRIL 1985
Fatalities	8	6	2	2
Incapaciting Injuries	134	97	92	75
Non-Incapaciting Injuries	320	236	210	157
Possible Injuries	110	89	89	63
Total	572	428	393	297

TABLE 8. ENFORCEMENT ACTION IN ALCOHOL-RELATED ACCIDENTS

	ENFORCEMENT ACTION					
	DRIVING UNDER THE INFLUENCE		PUBLIC INTOXICATION		RECKLESS DRIVING HAD BEEN DRINKING	
	NUMBER	PERCENT*	NUMBER	PERCENT*	NUMBER	PERCENT*
May 1980 - April 1981	84	8.2	303	29.1	21	2.0
May 1981 - April 1982	92	8.8	281	34.4	15	1.8
May 1982 - April 1983	108	13.2	192	23.5	8	1.0
May 1983 - April 1984	131	17.9	159	21.7	6	0.8
May 1984 - April 1985	270	39.3	48	7.0	3	0.4

* Percent of all alcohol-related accidents.

intoxication and "reckless driving-had been drinking" citations have decreased. Also, as shown in Table 9, there has been an increase in the number of BAC tests for drivers involved in alcohol-related accidents. While the percent of drivers tested having a BAC of 0.10 or above has increased, the average BAC has remained fairly constant.

A comparison of the age and sex of alcohol-involved drivers with all drivers is shown in Table 10. There was a higher percentage of alcohol-involved drivers in the age categories from 20 to 34 years. In the other age categories, especially 65 years and over, the percentage of alcohol-involved drivers was below the corresponding percentage for all drivers involved in accidents. There was also a higher percentage of males involved in alcohol-related accidents compared to all accidents.

In addition to the traditional before-and-after analysis of accident data, trends over a period of time were investigated by means of time-series analysis. The relationship between number of accidents and time, in months, was analyzed. The purpose of time-series analysis was to determine whether alcohol enforcement programs had a significant impact on alcohol-related accidents. A time-series is defined as a sequence of data elements recorded over equally spaced time periods. Typical before-and-after studies of the effect of a new safety program may be invalidated by failure to detect and eliminate within-series relationships (autocorrelation) in the accident data. Examination of data over a period by time-series analysis often reveals within-series relationships existing between the data points. Frequently, this is the result of annual cycles or seasonality in accident data. Autocorrelation also may result from long-term trends such as population growth or decline or changes in vehicle-miles traveled.

Classical regression analysis is not applicable when the data are time dependent or correlated. A time-series regression approach can determine the dependence of each datum point in a series with its own history and then determine the relationship between the independent variable input time-series and the dependent variable output time-series. Using the time series method of intervention analysis, models of the following form were developed to determine if a change took place coincident with implementation of the TAP program. A typical transfer function may be of the form

$$Y_t = b_0 + b_1 X_t + b_m X_{t-m} + A_t$$

in which Y_t = value of the dependent variable at time t ;
 X_t = value of the independent variable at time t ;
 X_{t-m} = value of the independent variable at time $t-m$, or the input series lagged by m periods;
 b_0, b_1, \dots, b_m = variable coefficients; and
 A_t = white noise or random variable

The time-series analysis was first performed for all hours of alcohol-related accident data for the time period of May 1980 through April 1985, a total of 60 months. The result was the following equation:

$$Y_t = -25.5X_{t-1} + A_t$$

TABLE 9. BAC OF DRIVERS INVOLVED IN ALCOHOL-RELATED ACCIDENTS

TIME PERIOD	NUMBER OF BAC TESTS	PERCENT WITH BAC OF 0.10 OR ABOVE	AVERAGE BAC
May 1980 - April 1981	57	84.2	.17
May 1981 - April 1982	72	94.4	.19
May 1982 - April 1983	70	88.6	.19
May 1983 - April 1984	121	91.0	.19
May 1984 - April 1985	173	96.6	.18

TABLE 10. COMPARISON OF AGE AND SEX OF ALCOHOL-RELATED DRIVERS WITH ALL DRIVERS

VARIABLE	CATEGORY	PERCENT	
		ALCOHOL INVOLVED DRIVER*	ALL DRIVERS**
Age	16-19	13.3	14.6
	20-24	25.8	18.7
	25-34	31.0	26.5
	35-44	13.4	15.9
	45-54	8.8	9.4
	55-64	5.5	7.6
	65 and Over	2.2	7.3
Sex	Male	83.0	64.7
	Female	17.0	35.3

* Alcohol involved drivers in Lexington from May 1980 through April 1985.

** All drivers involved in accidents in Kentucky in 1984.

This equation reflects a decrease in alcohol-related accidents of 25.5 accidents per month over the three-year period of TAP enforcement. It appears the program's effect lagged the beginning of the program by about one month; however, the result would be a reduction of 918 alcohol-related accidents over the three-year period, or a reduction of 29.1 percent.

A similar analysis was performed for alcohol-related accidents during TAP hours over the five-year period. The result was the following equation:

$$Y_t = -13.7X_t + A_t$$

This equation reflects a decrease of 493 accidents or a 35.4-percent reduction of alcohol-related accidents during the TAP hours.

Overall, results from the time-series analysis were very similar to results obtained from the before-and-after analysis. This tends to validate the before-and-after analysis as being relatively free of within-series relationships that may prevent conclusive results from being obtained. For example, results from the analysis of alcohol-related accidents during all hours revealed reductions of 29.1 percent from the time-series analysis and 28.1 percent from the before-and-after analysis.

ARREST AND ADJUDICATION

Results from the analysis of arrest and adjudication data were based on a 25-percent sample for the four-year period between May 1, 1981, and April 30, 1985. A sample of 25 percent is sufficient to insure that the confidence level or reliability is 95 percent that the error range of the observed values is between two and three percent. In Table 11 are total DUI arrests by month. The impact of TAP on the number of DUI arrests occurred immediately after the program began on May 1, 1982 and has continued. A large increase in the total number of DUI arrests is noted when comparing the year before (929 arrests) with the three years during TAP (4,427 arrests in the first year, 4,046 arrests in the second, and 2,584 in the third). From the data in Table 11, it may be seen that there was a substantial reduction in arrests during the third year compared to the first and second years. The number of arrests during the third year was still three times the number recorded for the year before TAP. The monthly distribution shows the highest number of DUI arrests were in April before TAP. The highest number of arrests has been in either October or September during the three years of TAP.

Additional time distributions are shown for day of week and time of day in Tables 12 and 13, respectively. Most arrests were made on Saturdays both before and during TAP. Other days having high percentages were Fridays and Sundays. The lowest percentage of arrests occurred on Monday. Even though there were no liquor sales on Sunday, the high percentages of arrests on that day were during the first few hours after midnight on Saturday. This was generally confirmed by data presented in Table 13. The time period between midnight and 2:59 a.m. had by far the highest percentage of DUI arrests for the four years of analysis. The percentage of arrests during this time period increased substantially after TAP.

TABLE 11. DUI ARRESTS BY MONTH

MONTH	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
May	71	7.6	406	9.2	336	8.3	259	10.0
June	51	5.5	346	7.8	281	6.9	250	9.7
July	45	4.8	352	8.0	338	8.4	212	8.2
August	62	6.7	331	7.5	367	9.1	223	8.6
September	66	7.1	393	8.9	461	11.4	267	10.3
October	56	6.0	519	11.7	377	9.3	256	9.9
November	67	7.2	317	7.2	330	8.2	212	8.2
December	60	6.5	318	7.2	320	7.9	200	7.7
January	87	9.4	320	7.2	265	6.5	132	5.1
February	116	12.5	320	7.2	309	7.6	158	6.1
March	119	12.8	376	8.5	325	8.0	239	9.2
April	129	13.9	429	9.7	337	8.3	176	6.8
Total	929		4,427		4,046		2,584	

TABLE 12. SAMPLE DUI ARRESTS BY DAY OF WEEK

DAY OF WEEK	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT
Sunday	34	14.4	469	16.9
Monday	20	8.5	97	3.5
Tuesday	36	15.3	278	10.0
Wednesday	29	12.3	326	11.7
Thursday	30	12.7	404	14.6
Friday	40	16.9	467	16.8
Saturday	47	19.9	734	26.5
Total	236		2,775	

TABLE 13. SAMPLE DUI ARRESTS BY TIME OF DAY

TIME OF DAY	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1985	
	NUMBER*	PERCENT	NUMBER*	PERCENT
Midnight - 2:59am	98	43.2	1,689	62.4
3:00am - 5:59am	25	11.0	160	5.9
6:00am - 8:59am	6	2.6	17	0.6
9:00am - 11:59am	1	0.4	46	1.7
Noon - 2:59pm	16	7.0	59	2.2
3:00pm - 5:59pm	8	3.5	53	2.0
6:00pm - 8:59pm	19	8.4	96	3.5
9:00pm - 11:59pm	54	23.8	588	21.7
Total	227		2,708	

*Does not include arrests in which hour was not reported.

The summary of sampled data in Table 14 shows the number of DUI arrests during TAP hours increased from 141 before TAP to 939 during the first year during TAP. This number then decreased slightly to 811 during the second year and decreased substantially to 446 during the third year of TAP. The percent of DUI arrests by all officers during TAP hours and the percent of arrests during TAP hours made by non-TAP officers (officers not participating in the DUI enforcement program) are given in Table 15. In the first and second year of TAP, about 80 percent of the arrests were made during TAP hours but this percentage decreased to 67 percent in the third year. The percent of arrests during TAP hours by non-TAP officers has increased each year.

One of the first items of concern of the police officer and, later, the judicial system is whether the DUI offender has a valid driver's license. In approximately 80 percent of the arrests during the first three years of the analysis and 90 percent the fourth year, the person arrested for DUI had a valid license. In 10.4 percent of the DUI arrests before TAP, the person arrested either had no license or the license was suspended or revoked. This compares with 8.7 percent of the DUI offenders in the first year of TAP, 7.6 percent in the second year, and 3.9 percent the third year. A summary of DUI arrests by license status for all years of analysis is presented in Table 16.

With the overflow of DUI arrests that had to be processed through the judicial system as a result of TAP, considerable concern was expressed about the potential delays between arrest and adjudication. Data presented in Table 17 show the number of days between arrest and adjudication during the first two years of TAP was very similar to before TAP. However, this time period increased the third year of TAP. For the first three time periods, about 80 percent of the cases were brought before the court within 40 days after arrest; this percentage decreased to 56 percent in the third year of TAP. This increase could be related to Kentucky's revised DUI law which became effective in July 1984.

The outcome of the adjudication process is a critical element to any alcohol enforcement program. This process serves as the primary means for the judicial system to have an opportunity to rehabilitate and/or deter the offender. Table 18 is a summary of the types of adjudication resulting from DUI arrests. Education is offered in the form of the Alcohol Driver Education (ADE) School. Penalties are generally in the form of fines and jail sentences. Over 90 percent of the arrests resulted in fines for the offender. The distribution of fines is given in Table 19. There was a large increase in the percentage of fines over \$300 during the third year of TAP. This apparently is related to revisions in the DUI law that became effective in July 1984. Cases dismissed or amended were approximately 15 percent before TAP, 11 percent during the first year of TAP, 10 percent during the second year, and 8 percent during the third year.

It may be beneficial to assess the magnitude of the arrest and adjudication statistics for the TAP study areas by comparing them with statewide and national data (9). The arrest rate per licensed driver (percent) in Fayette County was 0.7 during the year before TAP and 3.3, 3.1, and 1.9 during the first three years of TAP. In comparison, the rate in

TABLE 14. SAMPLE DUI ARRESTS DURING TAP HOURS BY MONTH

MONTH	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
May	12	8.5	85	9.1	72	8.9	39	8.7
June	7	5.0	80	8.5	56	6.9	44	9.9
July	7	5.0	79	8.4	74	9.1	40	9.0
August	7	5.0	75	8.0	83	10.2	42	9.4
September	8	5.7	82	8.8	89	11.0	35	7.8
October	6	4.3	109	11.6	68	8.4	47	10.5
November	9	6.4	66	7.0	71	8.8	35	7.8
December	9	6.4	67	7.1	61	7.5	39	8.7
January	12	8.5	61	6.5	49	6.0	23	5.2
February	19	13.5	65	6.9	62	7.6	29	6.5
March	24	17.0	80	8.5	65	8.0	41	9.2
April	21	14.9	90	9.6	61	7.5	32	7.2
Total	141		939		811		446	

TABLE 15. SAMPLE DUI ARRESTS DURING TAP HOURS

TIME PERIOD	PERCENT OF ALL DUI ARRESTS DURING TAP HOURS	PERCENT OF ARRESTS DURING TAP HOURS BY NON-TAP OFFICERS
May 1981 - April 1982	59.0	DNA
May 1982 - April 1983	80.3	28.9
May 1983 - April 1984	78.2	35.7
May 1984 - April 1985	66.6	46.5

TABLE 16. SAMPLE OF DUI DRIVERS BY LICENSE STATUS

LICENSE STATUS	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER*	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
In Force	160	79.2	767	79.6	652	82.2	594	91.8
Expired	4	2.0	13	1.4	8	1.0	3	0.5
On Probation	0	0.0	6	0.6	5	0.6	1	0.2
Suspended/Revoked	16	7.9	64	6.6	59	7.5	25	3.9
Learner	0	0.0	7	0.7	4	0.5	3	0.5
Not KY Driver	17	8.4	88	9.1	64	8.1	21	3.3
No License	5	2.5	19	2.0	1	0.1	0	0.0

*Does not include arrests in which license status was not reported.

TABLE 17. NUMBER OF DAYS BETWEEN DUI ARREST AND ADJUDICATION
(SAMPLE DATA SET)

DAYS	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER*	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Zero	5	2.1	30	2.7	24	2.4	4	0.6
1 - 10	24	10.2	89	8.0	82	8.2	40	6.1
11 - 20	40	17.0	172	15.5	91	9.1	63	9.7
21 - 30	79	33.5	411	37.0	317	31.6	158	24.2
31 - 40	39	16.5	237	21.4	293	29.2	98	15.0
41 - 50	13	5.5	68	6.1	63	6.3	39	6.0
Over 50	36	15.3	103	9.3	133	13.3	250	38.3

*Does not include arrests in which days between arrest and adjudication were not known.

TABLE 18. SAMPLE DUI ARRESTS BY TYPE OF ADJUDICATION

ADJUDICATION	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT*	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Dismissed	6	2.5	19	1.7	18	1.8	35	5.4
Amended	29	12.3	103	9.2	85	8.4	19	2.9
Fine	221	93.6	1,060	95.2	946	93.8	596	91.4
ADE School**	159	67.4	692	62.1	505	50.0	***	***
Jail	32	13.6	159	14.3	216	21.4	126	19.3
Warrant	2	0.8	23	2.1	41	4.1	0	0.0
Probated	0	0.0	1	0.1	17	1.7	2	0.3
Total Sampled Arrests	236		1,114		1,009		652	

* Percentages were determined by dividing adjudication type by the total sampled arrests for each year.

** Alcohol Driver Education School - Referral

*** Information not available.

TABLE 19. DISTRIBUTION OF FINES FOR DUI OFFENSE (SAMPLE DATA SET)

FINE	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Less than \$100	18	7.6	60	5.4	63	6.2	49	7.5
\$100 - \$150	68	28.8	196	17.6	109	10.8	24	3.7
\$151 - \$200	65	27.5	376	33.8	332	32.9	55	8.4
\$201 - \$300	79	33.5	448	40.2	456	45.2	71	10.9
Over \$300	6	2.5	34	3.1	49	4.9	453	69.5

Kentucky was 1.8 in both 1979 and 1980 and the national rate averaged 1.0 for the period of 1978 through 1980. One of the most revealing statistics associated with the handling of drunk-driving cases in Fayette County is the conviction rate. Sampled data presented in Table 18 show the DUI conviction rate (as charged) is in the range of 90 percent. Only 2.6 percent of the DUI arrests were dismissed. It appears that the conviction rate is significantly higher than either the state or national averages. For all of Kentucky, the conviction rate was 52 percent in 1980. The national average for 1978 through 1980 was 56 percent (9).

One of the objectives of the Traffic Alcohol Program was to reduce the blood-alcohol level (BAC) of those arrested for DUI. Data in Table 20 show that BAC levels decreased during the first year of TAP and then increased during the second and third years. The percentage arrested with a BAC level of 0.16 or more (excluding those drivers who refused a test) was 27.9 percent before TAP, 17.8 percent during the first year of TAP, 26.4 percent during the second year, and 24.5 during the third year. Those arrested with BAC levels between 0.10 and 0.15 increased from 26.4 before to 37.7, 36.4, and 32.6 percent during the three years of TAP, respectively. The average BAC level dropped from 0.17 the year before TAP to 0.15 the first year of TAP and increased to 0.16 the second and third years.

Another important consideration when attempting to deal with the drunk-driving problem is the driving record of those arrested for DUI, specifically the number or percent of drivers arrested for DUI who have a previous DUI conviction on their driving record. Table 21 is a listing of the percentage of drivers arrested for DUI who had previous DUI convictions on their driving record during a five-year period. The percentage of drivers arrested who had a previous DUI arrest was 18 percent before TAP and the first year of TAP; however, it increased to 23 percent during the second year of TAP and 28 percent the third year of TAP.

Information related to the arrested DUI driver's age, race, and sex is presented in Tables 22 and 23. About two-thirds of the drivers were between the ages of 21 and 39. A primary difference between the year before and the three years during TAP was the higher percentage in the 21-to-24-age category. The cumulative percent, excluding drivers under 21 years of age, shows that almost one-half of the drivers were under 30 years of age. The summary of age and sex of the DUI driver shows that about 80 percent were white males during the years of analysis. White females make up the next largest group, and this percentage increased during each year from 7.3 percent before TAP to 19.7 percent the third year of TAP.

The percentage of DUI drivers that were male (86 percent) was much higher than the percentage of male drivers in the general driving population (56 percent) (10) but was close to the percentage of males involved in alcohol-related accidents (83 percent). The age distribution of DUI drivers showed a higher percentage of drivers under 25 years of age (approximately 36 percent) compared to the general driving population (24 percent) and a much lower percentage of drivers 50 years or older (approximately 9 percent) than the general driving population (28 percent) (10). The percentages of drivers between 25 and 49 years of age were similar.

TABLE 20. SAMPLE DUI ARRESTS BY BLOOD ALCOHOL CONTENT

BAC (PERCENT)	MAY 1981 - APRIL 1982			MAY 1982 - APRIL 1983		
	NUMBER*	PERCENT	CUM**	NUMBER*	PERCENT	CUM**
Zero	4	1.8	2.0	13	1.2	1.3
0.01 - 0.04	2	0.9	3.0	22	2.0	3.5
0.05 - 0.09	5	2.3	5.5	80	7.3	11.4
0.10 - 0.15	58	26.4	34.3	413	37.7	52.2
0.16 - 0.19	76	34.5	72.1	303	27.7	82.2
0.20 - 0.24	43	19.6	93.5	149	13.6	96.9
0.25 - 0.29	9	4.1	98.0	28	2.6	99.7
0.30 - 0.34	3	1.4	99.5	2	0.2	99.9
0.35 - 0.39	1	0.4	100.0	1	0.1	100.0
0.40 And Up	0	0.0	100.0	0	0.0	100.0
Refused	19	8.6	DNA	83	7.6	DNA

BAC (PERCENT)	MAY 1983 - APRIL 1984			MAY 1984 - APRIL 1985		
	NUMBER*	PERCENT	CUM**	NUMBER*	PERCENT	CUM**
Zero	7	0.7	0.8	8	1.3	1.5
0.01 - 0.04	6	0.6	1.5	11	1.8	3.5
0.05 - 0.09	30	3.2	4.5	26	4.3	8.3
0.10 - 0.15	346	36.4	44.1	197	32.6	44.6
0.16 - 0.19	261	27.5	73.6	168	27.8	75.5
0.20 - 0.24	186	19.6	94.7	95	15.7	93.0
0.25 - 0.29	40	4.2	99.2	29	4.8	98.3
0.30 - 0.34	5	0.5	99.8	8	1.3	99.8
0.35 - 0.39	2	0.2	100.0	1	0.2	100.0
0.40 And Up	0	0.0	100.0	0	0.0	100.0
Refused	67	7.1	DNA	61	10.1	DNA

* Does not include arrests in which BAC was not reported.

** Cumulative percent which does not include arrests for which BAC was refused or not reported.

TABLE 21. SUMMARY OF PRIOR DUI CONVICTIONS

TIME PERIOD	PERCENT WITH PREVIOUS DUI CONVICTION
May 1981 - April 1982	18.4
May 1982 - April 1983	18.3
May 1983 - April 1984	23.3
May 1984 - April 1985	27.8

TABLE 22. SAMPLE DUI ARRESTS BY DRIVER'S AGE

AGE (YEARS)	MAY 1981 - APRIL 1982			MAY 1982 - APRIL 1983		
	NUMBER*	PERCENT	CUM**	NUMBER*	PERCENT	CUM**
16 - 20	30	12.7	DNA	156	14.1	DNA
21 - 24	46	19.5	22.3	283	25.5	29.7
25 - 29	51	21.6	47.1	192	17.3	49.8
30 - 39	47	19.9	69.9	259	23.3	76.9
40 - 49	31	13.1	85.0	123	11.1	89.8
50 - 59	24	10.2	96.6	74	6.7	97.6
Over 60	7	3.0	100.0	23	2.1	100.0

AGE (YEARS)	MAY 1983 - APRIL 1984			MAY 1984 - APRIL 1985		
	NUMBER*	PERCENT	CUM**	NUMBER*	PERCENT	CUM**
16 - 20	123	12.2	DNA	45	6.9	DNA
21 - 24	234	23.3	26.5	157	24.1	26.0
25 - 29	206	20.5	49.9	118	18.2	45.5
30 - 39	253	25.2	78.6	184	28.3	75.9
40 - 49	112	11.1	91.3	85	13.1	89.9
50 - 59	51	5.1	97.1	44	6.8	97.2
Over 60	26	2.6	100.0	17	2.6	100.0

*Does not include arrests in which the driver's age was not reported.

**Cumulative percent, not including drivers under 21 years of age.

TABLE 23. SAMPLE DUI ARRESTS BY DRIVER'S RACE AND SEX

SEX	MAY 1981 - APRIL 1982				MAY 1982 - APRIL 1983			
	WHITE		NON-WHITE		WHITE		NON-WHITE	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Male	203	87.1	12	5.2	901	81.5	49	4.4
Female	17	7.3	1	0.4	151	13.5	4	0.4

SEX	MAY 1983 - APRIL 1984				MAY 1984 - APRIL 1985			
	WHITE		NON-WHITE		WHITE		NON-WHITE	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Male	800	80.6	64	6.4	470	73.6	41	6.4
Female	127	12.8	2	0.2	126	19.7	2	0.3

The summary of DUI arrests by location of residence is presented in Table 24. The data show there was an increase in the percentage of drivers arrested for DUI whose residence was outside Fayette County the first and second year of TAP, but this percentage during the third year of TAP was very similar to that before TAP.

COST EFFECTIVENESS

A summary of costs and benefits associated with the Traffic Alcohol Program in Lexington-Fayette County is presented in Table 25. Primary cost components included in the analysis were 1) police enforcement, administrative, and support costs; 2) jail costs; 3) DUI court costs; and 4) court costs for other violations and arrests made by TAP officers. Jail costs were based on an average of \$25.00 per day per prisoner. Estimates of numbers of days served were made from the 25-percent sample of arrest and adjudication data obtained from the Administrative Office of the Courts.

Benefits and income were derived from two sources: reduced accident costs and fines from DUI convictions and other violations. A commonly used measure of the benefits of a highway safety program is an estimate of accident costs that will not be incurred as a result of reduced accidents. Using accident data as previously discussed and accident costs reported by the National Safety Council (11), savings resulting from reduced accident costs were determined. Income in the form of DUI fines were determined from the sample of arrest and adjudication data. Additional income were derived from fines resulting from other types of arrests and citations issued by TAP officers. It was noted that TAP's impact on crimes, other than DUI offenses, was major during the hours of TAP enforcement. An additional impact on alcohol-related fatal accidents has resulted since an accident reconstruction team has been formed. Investigations resulted in prosecution of five reckless homicide cases (where the defendant was driving under the influence) and five convictions in 1984. There have been two convictions in 1985, with three other cases pending.

Results of the cost-effectiveness analysis as presented in Table 25 show that the Traffic Alcohol Program had a benefit-cost ratio of 1.15 when only direct income from fines and court costs was used. The benefit-cost ratio increased to 3.71 when the reduced accident costs were included.

An alternative approach to determining the costs associated with accidents has been developed by the Granville Corporation under contract with the Federal Highway Administration (12), and it may be useful to compare results of the new approach with the results obtained when using National Safety Council accident costs (11). As shown in Table 25, the benefit-cost ratio calculated using National Safety Council accident costs was 3.71. When using the alternative accident cost concept, the benefit-cost ratio increased to 10.86. The primary difference between the two accident cost concepts is a much higher cost for severe injuries and fatalities when using the approach reported by the Granville Corporation.

TABLE 24. SAMPLE DUI ARRESTS BY LOCATION OF RESIDENCE

LOCATION	MAY 1981 - APRIL 1982		MAY 1982 - APRIL 1983		MAY 1983 - APRIL 1984		MAY 1984 - APRIL 1985	
	NUMBER*	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Fayette County	178	78.8	774	72.0	684	68.4	508	77.9
Outside Fayette County	48	22.2	301	28.0	316	31.6	144	22.1
Within Kentucky	40	17.7	232	21.6	242	24.2	112	17.2
Outside of Kentucky	8	3.5	69	6.4	74	7.4	32	4.0

*Does not include arrests in which location of residence was not reported.

TABLE 25. SUMMARY OF COSTS AND BENEFITS

		FAYETTE COUNTY
<hr/>		
A. COSTS		
1. Police Enforcement, Administrative and Support Costs		\$1,276,402
2. Jail Costs		964,450
3. DUI Court Costs		340,491
4. Court Costs - Other Violations and Arrests		262,912
5. Total		2,793,041
B. BENEFITS AND INCOME		
1. Reduced Accident Costs		7,156,560
2. DUI Fines (Including Court Costs)		2,642,008
3. Other Traffic Violations and Public Intoxication Arrests (Including Court Costs)		558,228
4. Total		10,356,767
C. BENEFIT - COST RATIO*		3.71
D. BENEFIT -- COST RATIO**		10.86
E. DIRECT INCOME/COSTS		1.15

* Benefits from Reduced Accident Costs based on National Safety Council costs (Reference 11).

** Benefits from Reduced Accident Costs based on cost data presented in report entitled "Alternative Approaches to Accident Cost Concepts," FHWA Contract DTFH61-82-C-00042 (Reference 12).

SUMMARY OF FINDINGS

An impact evaluation of the Traffic Alcohol Program in Lexington-Fayette County was performed. The following types of data were collected and analyzed: accident, arrest and adjudication, and cost effectiveness.

Table 26 is a summary of major findings of the evaluation. The findings are shown in terms of various criteria of success for the types of data collected. The study area experienced significant reductions (at the 95-percent confidence level) in alcohol-related accidents when comparing two years before with three years during TAP. Results indicate a 35.8-percent reduction during TAP hours of enforcement and a 28.1-percent reduction during all hours of the day.

Results from the time-series analysis of alcohol-related accident data showed a decrease in accidents of 29.1 percent during all hours. The number of alcohol-related accidents has continued to decrease each of the three years of TAP.

DUI arrest and adjudication is another important measure of a Traffic Alcohol Program's success. Also presented in Table 26 is a comparison of several measures of effectiveness based on arrest and adjudication data. The increase in average number of DUI arrests during the three years of TAP as compared to the year before TAP was approximately 300 percent. However, the number of arrests decreased substantially the third year compared to the first two years. The DUI conviction rate was about 90 percent.

Another useful measure of an alcohol enforcement program's impact is the BAC levels of those arrested for DUI. It is anticipated that BAC's should decrease with increased enforcement. The BAC's before and during TAP presented in Table 26 show only a slight decrease during TAP.

A basic measure of any program's success in terms of its probability of continuance is the cost effectiveness. A benefit-cost ratio of 1.15 was calculated using only direct income as benefits. When accident savings were included, the benefit-cost ratio increased to 3.71 and 10.86 using two sources of the cost of an accident.

TABLE 26. SUMMARY OF VARIOUS CRITERIA OF SUCCESS

CRITERIA	LEXINGTON- FAYETTE COUNTY
Percent reduction in alcohol-related accidents (all hours)	28.1
Percent reduction in alcohol-related accidents during all hours (Time-Series Analysis)	29.1
Percent reduction in alcohol-related accidents during TAP hours	35.8
Percent reduction in alcohol-related fatal or injury accidents	26.7
Percent increase in DUI arrests	297
DUI conviction rate (percent)	90
Average BAC before TAP (DUI arrests)	.172
Average BAC during TAP (DUI arrests)	.158
Benefit-cost ratio of program*	3.71
Benefit-cost ratio of program**	10.86

* Benefits based on National Safety Council costs (Reference 11).

** Benefits based on cost data presented in report titled "Alternative Approaches to Accident Cost Concepts," FHWA Contract DTFH61-82-C-00042 (Reference 12).

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