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| 16. Abstract <p>This report is a final evaluation of four years 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.</p> <p>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 four years during the increased enforcement, the reduction in alcohol-related accidents during hours of increased enforcement was 37.3 percent using standard before and after analysis and 36.4 percent using time-series analysis. For all hours of the day, alcohol-related accidents decreased by 30.3 percent. During the same time period, alcohol-related fatal or injury accidents decreased 29.1 percent.</p> <p>Arrests have averaged 3,220 per year for the four years of increased enforcement as compared to 929 the year before. The DUI conviction rate has remained at approximately 90 percent throughout the program.</p> <p>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 3.81. If reduced accident costs were eliminated and only direct income was used as benefits, then the benefit-cost ratio would be 1.20.</p> | | | | | |
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Research Report
UKTRP-86-28

IMPACT EVALUATION OF THE
LEXINGTON - FAYETTE COUNTY
TRAFFIC ALCOHOL PROGRAM (1982 - 1986)

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November 1986

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Division of Police

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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 (3). 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 four 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). Results through the first two years of operation were included in a second report (6) and results for the first three years were included in a third report (7). This report summarizes the results of the Lexington-Fayette County Traffic Alcohol Program for the four-year period of May 1982 through April 1986.

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 were:

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 the Traffic Alcohol Program. Included 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 four years during the Traffic Alcohol Program in Lexington-Fayette County. This included the period of May 1, 1980, through April 30, 1986. 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 three years during TAP (6). Additional data were collected to assess the program's impact during the fourth 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 use of the jail and court. 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 (8, 9). 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 six-year period from May 1, 1980, through April 30, 1986. This included a two-year period before the Traffic Alcohol Program and a four-year period during TAP. Table 1 is a summary of alcohol-related accidents by month for the two years before and four years during TAP. Overall, there was a significant decrease of 30.3 percent between the two-year period before and the four-year period during TAP. The number of alcohol-related accidents has decreased each year during the four-year period since the start of TAP. For a similar time period (1980-81 as compared to 1982-85), there was a 16.2-percent decrease in the statewide total of alcohol-related accidents. Total accidents statewide for this same period increased by 4.9 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 period were tabulated. This summary is presented in Table 2, and the overall decrease was 9.5 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 8.0 percent of all accidents during the six-year study period. When alcohol-related accidents are excluded from each year's total, the decrease is 7.2 percent (significant at 95-percent confidence level) when comparing the two years before with the four-years during TAP. Therefore, a general decrease in total accidents did occur beyond the influence of alcohol-related accidents. The result was a 7.2-percent decrease in all accidents, excluding those related to alcohol, and a 30.3-percent decrease in alcohol-related

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 | | MAY 1985 - APRIL 1986 | |
|-----------|--|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| May | 91 | 8.8 | 96 | 11.7 | 85 | 11.6 | 60 | 8.7 | 62 | 9.5 |
| June | 91 | 8.8 | 48 | 5.9 | 63 | 8.6 | 48 | 7.0 | 59 | 9.1 |
| July | 85 | 8.2 | 73 | 8.9 | 44 | 6.0 | 54 | 7.9 | 44 | 6.7 |
| August | 97 | 9.4 | 65 | 8.0 | 56 | 7.7 | 62 | 9.0 | 65 | 10.0 |
| September | 84 | 8.1 | 73 | 8.9 | 57 | 7.8 | 79 | 11.5 | 56 | 8.6 |
| October | 89 | 8.6 | 85 | 10.4 | 68 | 9.3 | 57 | 8.3 | 57 | 8.7 |
| November | 84 | 8.1 | 58 | 7.1 | 59 | 8.1 | 64 | 9.3 | 53 | 8.1 |
| December | 92 | 8.9 | 76 | 9.3 | 64 | 8.7 | 56 | 8.2 | 50 | 7.7 |
| January | 76 | 7.3 | 61 | 7.5 | 53 | 7.2 | 40 | 5.8 | 40 | 6.1 |
| February | 79 | 7.6 | 65 | 8.0 | 56 | 7.7 | 42 | 6.1 | 62 | 9.5 |
| March | 67 | 6.5 | 66 | 8.1 | 56 | 7.6 | 60 | 8.7 | 59 | 9.1 |
| April | 101 | 9.7 | 51 | 6.2 | 71 | 9.7 | 65 | 9.5 | 45 | 6.9 |
| Total | 1,036 | | 817 | | 732 | | 687 | | 652 | |

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 | | MAY 1985 - APRIL 1986 | |
|-----------|--|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| May | 915 | 8.6 | 858 | 8.7 | 779 | 8.6 | 762 | 8.0 | 849 | 8.5 |
| June | 812 | 7.6 | 754 | 7.7 | 667 | 7.3 | 735 | 7.7 | 776 | 7.8 |
| July | 819 | 7.7 | 809 | 8.2 | 668 | 7.3 | 709 | 7.4 | 822 | 8.2 |
| August | 890 | 8.4 | 826 | 8.4 | 696 | 7.6 | 767 | 8.0 | 887 | 8.9 |
| September | 931 | 8.8 | 796 | 8.1 | 762 | 8.4 | 800 | 8.4 | 804 | 8.1 |
| October | 995 | 9.4 | 925 | 9.4 | 812 | 8.9 | 854 | 8.9 | 903 | 9.1 |
| November | 873 | 8.2 | 883 | 9.0 | 716 | 7.9 | 904 | 9.4 | 995 | 10.0 |
| December | 964 | 9.1 | 927 | 9.4 | 940 | 10.3 | 951 | 9.9 | 994 | 10.0 |
| January | 977 | 9.2 | 730 | 7.4 | 999 | 11.0 | 926 | 9.7 | 651 | 6.5 |
| February | 817 | 7.7 | 756 | 7.7 | 650 | 7.1 | 711 | 7.4 | 683 | 6.8 |
| March | 782 | 7.4 | 742 | 7.6 | 671 | 7.4 | 692 | 7.2 | 775 | 7.8 |
| April | 852 | 8.0 | 813 | 8.3 | 750 | 8.2 | 767 | 8.0 | 832 | 8.3 |
| Total | 10,627 | | 9,819 | | 9,110 | | 9,578 | | 9,971 | |

accidents. It should be noted that, even though the reductions in both alcohol-related and "other" accidents were significant, the magnitude of the reductions in alcohol-related accidents is over four times greater than for "other" accidents. It also was determined that the 30.3-percent decrease was significantly greater than the 7.2-percent decrease.

The significant decrease in alcohol-related accidents of 30.3 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. During the fourth year of the program, TAP enforcement periods were 11:00 p.m. until 3:00 a.m. on Friday and Saturday nights, with one other night per week (the other night was rotated between Monday, Tuesday, Wednesday, and Thursday). Without attempting to delete the effect of the slight variation of enforcement during the third and fourth years, the decrease in alcohol-related accidents during the original hours of TAP enforcement was 37.3 percent (significant at 95-percent confidence level). This is slightly more than the decrease in alcohol-related accidents for all hours (30.3 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 four years during TAP. Saturdays continued to have the highest number of alcohol-related accidents, followed by Fridays. 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 period in which there was not a decrease 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 period having the largest decrease in number of accidents was between midnight and 2:59 a.m.

Alcohol-related accidents for the six-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 four-year period during TAP. The data also indicate a 29.1-percent decrease in alcohol-related fatal or injury accidents when comparing two years before with four years of TAP. There was a large increase in the number of fatal accidents in the May 1985 to April 1986 period; however, also during this same period, the numbers of incapacitating and non-incapacitating injury accidents decreased. This resulted in a decrease in the number of "Equivalent Property-Damage-Only" (EPDO) accidents for the May 1985 to April 1986 period.

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 | | MAY 1985 - APRIL 1986 | |
|-----------|--|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| May | 38 | 8.1 | 32 | 9.8 | 35 | 11.9 | 21 | 7.5 | 25 | 9.1 |
| June | 43 | 9.2 | 26 | 8.0 | 22 | 7.5 | 29 | 10.4 | 28 | 10.2 |
| July | 40 | 8.6 | 34 | 10.4 | 20 | 6.8 | 27 | 9.7 | 18 | 6.6 |
| August | 47 | 10.1 | 29 | 8.9 | 24 | 8.2 | 28 | 10.0 | 30 | 10.9 |
| September | 40 | 8.6 | 27 | 8.3 | 22 | 7.5 | 23 | 8.3 | 27 | 9.9 |
| October | 49 | 10.5 | 33 | 10.1 | 33 | 11.2 | 24 | 8.6 | 23 | 8.4 |
| November | 32 | 6.8 | 22 | 6.8 | 26 | 8.8 | 18 | 6.5 | 22 | 8.0 |
| December | 40 | 8.6 | 33 | 10.1 | 22 | 7.5 | 17 | 6.1 | 15 | 5.5 |
| January | 36 | 7.7 | 25 | 7.7 | 15 | 5.1 | 16 | 5.7 | 11 | 4.0 |
| February | 31 | 6.6 | 25 | 7.7 | 22 | 7.5 | 17 | 6.1 | 24 | 8.8 |
| March | 31 | 6.6 | 19 | 5.8 | 24 | 8.1 | 28 | 10.0 | 32 | 11.7 |
| April | 40 | 8.6 | 21 | 6.4 | 29 | 9.9 | 31 | 11.1 | 19 | 6.9 |
| Total | 467 | | 326 | | 294 | | 279 | | 274 | |

TABLE 4. ALCOHOL-RELATED ACCIDENTS BY DAY OF WEEK

| DAY | TWO-YEAR AVERAGE MAY 1980 - APRIL 1982 | | FOUR-YEAR AVERAGE MAY 1982 - APRIL 1986 | |
|-----------|---|---------|--|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT |
| Sunday | 161 | 15.5 | 100 | 13.9 |
| Monday | 85 | 8.2 | 66 | 9.1 |
| Tuesday | 117 | 11.3 | 79 | 10.9 |
| Wednesday | 118 | 11.4 | 70 | 9.7 |
| Thursday | 126 | 12.2 | 95 | 13.2 |
| Friday | 178 | 17.2 | 131 | 18.1 |
| Saturday | 251 | 24.2 | 181 | 25.1 |
| Total | 1,036 | | 722 | |

TABLE 5. ALCOHOL-RELATED ACCIDENTS BY TIME OF DAY

| TIME OF DAY | TWO-YEAR AVERAGE MAY 1980 - APRIL 1982 | | FOUR-YEAR AVERAGE MAY 1982 - APRIL 1986 | |
|--------------------|---|---------|--|---------|
| | NUMBER* | PERCENT | NUMBER* | PERCENT |
| Midnight - 2:59 am | 300 | 29.1 | 192 | 27.2 |
| 3:00 am - 5:59 am | 65 | 6.3 | 41 | 5.8 |
| 6:00 am - 8:59 am | 17 | 1.7 | 17 | 2.4 |
| 9:00 am - 11:59 am | 26 | 2.5 | 13 | 1.9 |
| Noon - 2:59 pm | 51 | 4.9 | 40 | 5.7 |
| 3:00 pm - 5:59 pm | 111 | 10.8 | 82 | 11.6 |
| 6:00 pm - 8:59 pm | 185 | 17.9 | 133 | 18.8 |
| 9:00 pm - 11:59 pm | 277 | 26.8 | 188 | 26.6 |
| Total | 1,032 | | 706 | |

*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 | MAY 1985 - APRIL 1986 |
| Fatality | 8 | 5 | 2 | 2 | 9 |
| Incapacitating Injury | 96 | 75 | 72 | 75 | 61 |
| Non-Incapacitating Injury | 208 | 153 | 143 | 143 | 116 |
| Possible Injury | 62 | 57 | 52 | 43 | 52 |
| No Injury | 658 | 527 | 463 | 424 | 414 |
| EPDO Accidents* | 2,591 | 2,022 | 1,848 | 1,806 | 1,667 |
| Severity Index** | 2.50 | 2.47 | 2.52 | 2.63 | 2.56 |

* "Equivalent Property-Damage-Only" Accidents. EPDO is equal to 9.5 times the number of fatal or incapacitating injury accidents plus 3.5 times the number of non-incapacitating or possible injury accidents plus the number of "no injury" accidents.

** Severity Index (SI) is calculated by dividing the number of EPDO accidents by the total number of accidents. As average accident severity increases, the SI increases.

Additional data showing total injuries resulting from alcohol-related accidents during the six-year study period are presented in Table 7. When total fatalities and injuries for the two-year before period were compared to the four years during TAP, the result was a 35.8 percent decrease. This decrease was apparently a direct result of the decrease in accidents. Accident severity remained unchanged over the six-year period. The Severity Index (SI), as shown in Table 6, was 2.51 before TAP compared to 2.54 during TAP.

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

About midway through the four-year TAP project, it became apparent that there was a lack of coordination among the police agency, the coroner's office, and the judicial officials that resulted in a failure to bring charges against alcohol-impaired drivers for offenses such as reckless homicide or manslaughter. Reasons for this lack of coordination and failure to charge and convict for the more serious offenses included incomplete BAC records from the coroner's office and a general reluctance by police officers and prosecutors to press the more serious charges. Because of the realization that improvements could be made, a recent goal of the comprehensive Traffic Alcohol Program was to achieve consistent prosecution of criminally negligent alcohol-impaired drivers. To achieve this goal, a three-step approach was undertaken; 1) creation of an "accident reconstruction team", 2) obtain BAC's in all fatal accidents through coordination between the Division of Police and the coroner, and 3) development of a working partnership between the Division of Police and the Fayette County Commonwealth Attorney's Office. Results of these recent efforts have been significant in terms of accident investigations that have resulted in prosecution. Over a two-year period beginning in November 1984, there have been six convictions for reckless homicide, three convictions for second degree manslaughter, one conviction for assault, one conviction for criminal facilitation to commit murder, and one conviction for murder. There are four other cases pending with charges varying from assault to murder.

As noted previously, the analysis of accident data was dependent upon information provided on the accident report prepared by the investigating officer. The data presented in Tables 6, 7, and 9 reflect summaries of the severity of accidents and the associated BAC's of drivers involved in accidents. Because of incomplete reporting and a failure to bring charges for the more serious alcohol-related offenses, the result was a lower reported number of alcohol-related fatalities in the beginning years of TAP. It was apparent that insufficient BAC data were available to confirm the magnitude of the alcohol problem in fatal accidents. In order to investigate this problem further, an additional analysis was made that

included separately compiled records from the coroner's reports. These data were obtained from the Lexington-Fayette Urban County Division of Police, who now routinely report BAC data for all fatal accidents. A summary of data from that analysis is presented in Table 10 for the years 1980 through nine months of 1986. Included are numbers of fatal accidents, numbers of fatalities, and BAC levels for fatally injured drivers or pedestrians, or other drivers in fatal accidents. BAC's for fatally injured passengers are not included. It may be noted there are differences between the number of alcohol-related fatalities in Table 7 and the number of fatalities with BAC's greater than 0.10 in Table 10. The reporting times were different in the two cases; calendar years were used in Table 10 while a "May-through-April" period was used in Tables 6 and 7. However, the differences are not completely explained by this variance in reporting times. Information available from the Division of Police indicated that differences may be attributed to supplemental information obtained from the coroner's report not being added to the initial accident report that is eventually entered into the computer accident file. It is clear from the data in Table 10 that a more complete reporting effort is now being made for fatal accidents as compared to the period 1980 through 1982. For the period of 1980 through 1982, only 22 percent of fatal accidents had a known BAC. This percentage increased dramatically to 80 percent for the 1984 through 1986 period.

A comparison of the age and sex of alcohol-involved drivers with all drivers involved in accidents is shown in Table 11. There was a higher percentage of alcohol-involved drivers compared to all drivers in the age categories from 20 to 34 years. In the other age categories, especially 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 the 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 data 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

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 | MAY 1985 - APRIL 1986 |
| Fatalities | 8 | 6 | 2 | 2 | 11 |
| Incapacitating Injuries | 134 | 97 | 92 | 75 | 86 |
| Non-Incapacitating Injuries | 320 | 236 | 210 | 157 | 178 |
| Possible Injuries | 110 | 89 | 89 | 63 | 75 |
| Total | 572 | 428 | 393 | 297 | 350 |

TABLE 8. ENFORCEMENT ACTION IN ALCOHOL-RELATED ACCIDENTS

| TIME PERIOD | 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 |
| May 1985 - April 1986 | 304 | 46.6 | 33 | 5.1 | 1 | 0.2 |

* Percent of all alcohol-related accidents.

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 |
| May 1985 - April 1986 | 168 | 94.6 | .19 |

TABLE 10. SUMMARY OF FATAL ACCIDENT DATA WITH SUPPLEMENTAL INFORMATION FROM THE CORONER'S REPORT

| YEAR | NUMBER OF FATALITIES | NUMBER OF FATAL ACCIDENTS | BAC* | | | |
|--------|-------------------------|------------------------------|----------|----------|------|---------|
| | | | .00-.049 | .05-.099 | >.10 | UNKNOWN |
| 1980 | 48 | 43 | 1 | 1 | 1 | 40 |
| 1981 | 21 | 20 | 3 | 2 | 2 | 13 |
| 1982 | 37 | 32 | 3 | 1 | 7 | 21 |
| 1983 | 22 | 21 | 1 | 2 | 6 | 12 |
| 1984 | 27 | 22 | 6 | 3 | 7 | 6 |
| 1985 | 35 | 31 | 8 | 1 | 19 | 3 |
| 1986** | 31 | 28 | 7 | 3 | 11 | 7 |

* BAC's are for fatally injured drivers or pedestrians, or other drivers in fatal accidents. (BAC's for fatally injured passengers are not included.)

** 9 months of the year

$$Y_t = b_0 + b_1 X_t + A_t$$

in which Y_t = value of the dependent variable at time t ,
 X_t = value of the independent variable (the
intervention effect) at time t , and
 b_0, b_1 = variable coefficients, and
 A_t = white noise or residual error.

The time-series analysis was first performed for (with the dependent variable being alcohol-related accident data during TAP hours) the period of May 1980 through April 1986, a total of 72 months. The result was the following equation:

$$Y_t = -14.0X_t + A_t$$

This equation reflects a decrease in alcohol-related accidents of 14.0 accidents per month over the four-year period of TAP enforcement. This equation characterizes the TAP enforcement as being operated at the same level for approximately four years beginning in May 1982. With the equation shown, the result would be a reduction of 672 alcohol-related accidents over the four-year period, or a reduction of 36.4 percent during TAP hours.

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

$$Y_t = -11.9X_t + A_t$$

This equation reflects a decrease of 571 accidents or a 25.0-percent reduction of alcohol-related accidents during non-TAP hours. With data available for both TAP hours and non-TAP hours, it may be shown that the reduction in alcohol-related accidents during all hours of the day would be 30.1 percent.

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 TAP hours revealed reductions of 36.4 percent from the time-series analysis and 37.3 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 five-year period between May 1, 1981, and April 30, 1986. A sample of 25 percent is sufficient to insure that the confidence level or reliability is 95 percent and that the error range of the observed values is between two and three percent. Total DUI arrests by month are presented in Table 12. 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

TABLE 11. COMPARISON OF AGE AND SEX OF ALCOHOL-RELATED DRIVERS WITH ALL DRIVERS

| PERCENT | | | |
|----------|-------------|--------------------------|---------------|
| VARIABLE | CATEGORY | ALCOHOL-INVOLVED DRIVER* | ALL DRIVERS** |
| Age | 16-19 | 12.4 | 14.5 |
| | 20-24 | 25.9 | 18.6 |
| | 25-34 | 31.9 | 26.6 |
| | 35-44 | 13.6 | 16.0 |
| | 45-54 | 8.6 | 9.5 |
| | 55-64 | 5.6 | 7.6 |
| | 65 and Over | 2.1 | 7.2 |
| Sex | Male | 82.8 | 64.4 |
| | Female | 17.2 | 35.6 |

* Alcohol-involved drivers in Lexington from May 1980 through April 1986.

** All drivers involved in accidents in Kentucky in 1984 and 1985.

TABLE 12. DUI ARRESTS BY MONTH

| MONTH | MAY 1981 - APRIL 1982 | | MAY 1982 - APRIL 1983 | | MAY 1983 - APRIL 1984 | | MAY 1984 - APRIL 1985 | | MAY 1985 - APRIL 1986 | |
|-----------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| May | 71 | 7.6 | 406 | 9.2 | 336 | 8.3 | 259 | 10.0 | 187 | 10.2 |
| June | 51 | 5.5 | 346 | 7.8 | 281 | 6.9 | 250 | 9.7 | 179 | 9.8 |
| July | 45 | 4.8 | 352 | 7.9 | 338 | 8.4 | 212 | 8.2 | 153 | 8.4 |
| August | 62 | 6.7 | 331 | 7.5 | 367 | 9.1 | 223 | 8.6 | 156 | 8.6 |
| September | 66 | 7.1 | 393 | 8.9 | 461 | 11.4 | 267 | 10.3 | 191 | 10.5 |
| October | 56 | 6.0 | 519 | 11.7 | 377 | 9.3 | 256 | 9.9 | 181 | 9.9 |
| November | 67 | 7.2 | 317 | 7.2 | 330 | 8.2 | 212 | 8.2 | 179 | 9.8 |
| December | 60 | 6.5 | 318 | 7.2 | 320 | 7.9 | 200 | 7.7 | 129 | 7.1 |
| January | 87 | 9.4 | 320 | 7.2 | 265 | 6.6 | 132 | 5.1 | 105 | 5.8 |
| February | 116 | 12.5 | 320 | 7.2 | 309 | 7.6 | 158 | 6.1 | 112 | 6.1 |
| March | 119 | 12.8 | 376 | 8.5 | 325 | 8.0 | 239 | 9.3 | 126 | 6.9 |
| April | 129 | 13.9 | 429 | 9.7 | 337 | 8.3 | 176 | 6.8 | 126 | 6.9 |
| Total | 929 | | 4,427 | | 4,046 | | 2,584 | | 1,824 | |

(4,427 arrests in the first year, 4,046 arrests in the second, 2,584 in the third, and 1,824 in the fourth). From the data presented in Table 12, it may be noted that there was a substantial reduction in arrests during the third year compared to the first and second years. This decreasing trend continued during the fourth year. This reduction in DUI arrests could be related to the reduction in hours of TAP enforcement during the third and fourth years but would also indicate that there has been a reduction in the number of alcohol-impaired drivers on the highway. The number of arrests during the fourth year was still double the number recorded for the year before TAP. The monthly distribution shows the highest number of DUI arrests was in April before TAP. The highest number of arrests has been in either October or September during the four years of TAP. During the past two years, May had the second highest number.

Additional time distributions are shown for day of week and time of day in Tables 13 and 14, respectively. Most arrests were made on Saturdays 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. This was generally confirmed by data presented in Table 14. The period between midnight and 2:59 a.m. had by far the highest percentage of DUI arrests for the five years of analysis. As shown in Table 5, this period also had the highest percentage of alcohol-related accidents. The percentage of arrests during this period increased substantially after TAP.

The summary of sampled data in Table 15 shows the number of DUI arrests during TAP hours increased from 141 before TAP to 939 during the first year of TAP. This number then decreased slightly to 811 during the second year and decreased substantially to 446 during the third year of TAP. The decreasing trend also continued in the fourth year of TAP with 330 arrests during TAP hours. The percent of all DUI arrests 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 shown in Table 16. 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. In the fourth year, the percentage of arrests during TAP hours increased slightly to 70 percent. The percentage of arrests during TAP hours by non-TAP officers has increased each year (from 29 percent during the first year of TAP to 60 percent during the fourth year). This increase would be related to the reduction in the number of hours of TAP enforcement during the third and fourth years of the program compared to the original hours of enforcement that was used in the analysis as TAP hours. Another factor would be the increased awareness of all police officers to the alcohol-impaired driver that would result in more arrests by non-TAP officers. Experience gained by police officers during TAP enforcement would also be a factor during their duty time as non-TAP officers. It should be noted that the shift to increased percentages of arrests by non-TAP officers is very favorable and is consistent with the goal of a local agency enforcement program with federal funding.

One of the first items of concern to the police officer and, later, the judicial system is whether the DUI offender has a valid driver's license.

TABLE 13. SAMPLE DUI ARRESTS BY DAY OF WEEK

| DAY OF WEEK | MAY 1981 - APRIL 1982 | | MAY 1982 - APRIL 1986 | |
|-------------|-----------------------|---------|-----------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT |
| Sunday | 34 | 14.4 | 533 | 16.5 |
| Monday | 20 | 8.5 | 136 | 4.2 |
| Tuesday | 36 | 15.3 | 315 | 9.7 |
| Wednesday | 29 | 12.3 | 375 | 11.6 |
| Thursday | 30 | 12.7 | 456 | 14.1 |
| Friday | 40 | 16.9 | 544 | 16.8 |
| Saturday | 47 | 19.9 | 875 | 27.1 |
| Total | 236 | | 3,234 | |

TABLE 14. SAMPLE DUI ARRESTS BY TIME OF DAY

| TIME OF DAY | MAY 1981 - APRIL 1982 | | MAY 1982 - APRIL 1986 | |
|--------------------|-----------------------|---------|-----------------------|---------|
| | NUMBER* | PERCENT | NUMBER* | PERCENT |
| Midnight - 2:59 am | 98 | 43.2 | 1,948 | 61.6 |
| 3:00 am - 5:59 am | 25 | 11.0 | 190 | 6.0 |
| 6:00 am - 8:59 am | 6 | 2.6 | 14 | 0.6 |
| 9:00 am - 11:59 am | 1 | 0.4 | 54 | 1.7 |
| Noon - 2:59 pm | 16 | 7.1 | 70 | 2.2 |
| 3:00 pm - 5:59 pm | 8 | 3.5 | 72 | 2.3 |
| 6:00 pm - 8:59 pm | 19 | 8.4 | 112 | 3.5 |
| 9:00 pm - 11:59 pm | 54 | 23.8 | 699 | 22.1 |
| Total | 227 | | 3,164 | |

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

TABLE 15. 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 | | MAY 1985 - APRIL 1986 | |
|-----------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| May | 12 | 8.5 | 85 | 9.1 | 72 | 8.9 | 39 | 8.7 | 36 | 10.9 |
| June | 7 | 4.9 | 80 | 8.5 | 56 | 6.9 | 44 | 9.9 | 34 | 10.3 |
| July | 7 | 5.0 | 79 | 8.4 | 74 | 9.1 | 40 | 9.0 | 26 | 7.9 |
| August | 7 | 5.0 | 75 | 8.0 | 83 | 10.2 | 42 | 9.4 | 29 | 8.8 |
| September | 8 | 5.7 | 82 | 8.7 | 89 | 11.0 | 35 | 7.9 | 29 | 8.8 |
| October | 6 | 4.2 | 109 | 11.6 | 68 | 8.4 | 47 | 10.5 | 36 | 10.9 |
| November | 9 | 6.4 | 66 | 7.0 | 71 | 8.8 | 35 | 7.8 | 35 | 10.6 |
| December | 9 | 6.4 | 67 | 7.2 | 61 | 7.5 | 39 | 8.7 | 13 | 3.9 |
| January | 12 | 8.5 | 61 | 6.5 | 49 | 6.0 | 23 | 5.2 | 20 | 6.0 |
| February | 19 | 13.5 | 65 | 6.9 | 62 | 7.7 | 29 | 6.5 | 25 | 7.6 |
| March | 24 | 17.0 | 80 | 8.5 | 65 | 8.0 | 41 | 9.2 | 23 | 7.0 |
| April | 21 | 14.9 | 90 | 9.6 | 61 | 7.5 | 32 | 7.2 | 24 | 7.3 |
| Total | 141 | | 939 | | 811 | | 446 | | 330 | |

TABLE 16. 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 |
| May 1985 - April 1986 | 70.4 | 60.0 |

In approximately 80 percent of the arrests during the year before TAP and approximately 80 to 90 percent during the four years of TAP, 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 8.6 percent of the DUI offenders in the first year of TAP, 7.6 percent in the second year, 3.9 percent in the third year, and 4.3 percent in the fourth year. A summary of DUI arrests by license status for all years of analysis is presented in Table 17.

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 18 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. During the fourth year of TAP, there was a shift in the adjudication processing time with lower percentages in the 21- to 40-day range and higher percentages in the ranges of 41 to 50 days and over 50 days. The adjudication processing period over 50 days was dominant during the last two years of TAP. For the first three years of analysis, 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 and became 41 percent during the fourth year of TAP. This increase could be related to Kentucky's revised DUI law that became effective in July 1984. Increased penalties associated with the revised DUI law have resulted in delayed processing due to additional appearances in court.

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 19 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 20. There was a large increase in the percentage of fines over \$300 during the third year of TAP and another increase during the fourth year. This percentage has increased from 2.5 percent before TAP to 90.9 percent the fourth year of TAP. This apparently is related to revisions in the DUI law that became effective in July 1984. The minimum fine for first offense was increased from \$100 to \$200 and a service fee of \$150 was added to each offender's fine for increased enforcement, upgrading jails, license processing, education and treatment. 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 and fourth years (Table 19). It should be noted that a general policy during the four years of TAP has been to amend charges for those arrested with BAC's less than 0.10 to a reduced charge such as reckless driving or other related traffic offense.

It may be beneficial to assess the magnitude of the arrest and adjudication statistics for the TAP study area by comparing with statewide and national data (10). The DUI arrest rate per licensed driver (percent) in Fayette County was 0.7 during the year before TAP and 3.3, 3.1, 1.9, and

TABLE 17. 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 | | MAY 1985 - APRIL 1986 | |
|-------------------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER* | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| In Force | 160 | 79.2 | 767 | 79.6 | 652 | 82.2 | 594 | 91.8 | 406 | 87.9 |
| Expired | 4 | 2.0 | 13 | 1.4 | 8 | 1.0 | 3 | 0.5 | 2 | 0.4 |
| On Probation | 0 | 0.0 | 6 | 0.6 | 5 | 0.6 | 1 | 0.2 | 1 | 0.2 |
| Suspended/Revoked | 16 | 7.9 | 64 | 6.6 | 59 | 7.5 | 25 | 3.9 | 19 | 4.1 |
| Learner | 0 | 0.0 | 7 | 0.7 | 4 | 0.5 | 3 | 0.5 | 5 | 1.1 |
| Not KY Driver | 17 | 8.4 | 88 | 9.1 | 64 | 8.1 | 21 | 3.3 | 28 | 6.1 |
| No License | 5 | 2.5 | 19 | 2.0 | 1 | 0.1 | 0 | 0.0 | 1 | 0.2 |

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

TABLE 18. NUMBER OF DAYS BETWEEN DUI ARREST AND ADJUDICATION

| DAYS | MAY 1981 - APRIL 1982 | | MAY 1982 - APRIL 1983 | | MAY 1983 - APRIL 1984 | | MAY 1984 - APRIL 1985 | | MAY 1985 - APRIL 1986 | |
|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER* | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| Zero | 5 | 2.1 | 30 | 2.7 | 24 | 2.4 | 4 | 0.6 | 3 | 0.6 |
| 1 - 10 | 24 | 10.2 | 89 | 8.0 | 82 | 8.2 | 40 | 6.1 | 22 | 4.8 |
| 11 - 20 | 40 | 16.9 | 172 | 15.5 | 91 | 9.1 | 63 | 9.7 | 45 | 9.7 |
| 21 - 30 | 79 | 33.5 | 411 | 37.0 | 317 | 31.6 | 158 | 24.2 | 65 | 14.1 |
| 31 - 40 | 39 | 16.5 | 237 | 21.4 | 293 | 29.2 | 98 | 15.0 | 52 | 11.3 |
| 41 - 50 | 13 | 5.5 | 68 | 6.1 | 63 | 6.3 | 39 | 6.0 | 48 | 10.4 |
| Over 50 | 36 | 15.3 | 103 | 9.3 | 133 | 13.3 | 250 | 38.3 | 227 | 49.1 |

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

TABLE 19. SAMPLE DUI ARRESTS BY TYPE OF ADJUDICATION

| ADJUDICATION | MAY 1981 - APRIL 1982 | | MAY 1982 - APRIL 1983 | | MAY 1983 - APRIL 1984 | | MAY 1984 - APRIL 1985 | | MAY 1985 - APRIL 1986 | |
|-----------------------|--------------------------|----------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT* | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| Dismissed | 6 | 2.5 | 19 | 1.7 | 18 | 1.8 | 35 | 5.4 | 22 | 4.8 |
| Amended | 29 | 12.3 | 103 | 9.2 | 85 | 8.4 | 19 | 2.9 | 14 | 3.0 |
| Fine | 221 | 93.6 | 1,060 | 95.2 | 946 | 93.8 | 596 | 91.4 | 422 | 91.3 |
| ADE School** | 159 | 67.4 | 692 | 62.1 | 505 | 50.0 | *** | *** | *** | *** |
| Jail | 32 | 13.6 | 159 | 14.3 | 216 | 21.4 | 126 | 19.3 | 73 | 15.8 |
| Warrant | 2 | 0.8 | 23 | 2.1 | 41 | 4.1 | 0 | 0.0 | 0 | 0.0 |
| Probated | 0 | 0.0 | 1 | 0.1 | 17 | 1.7 | 2 | 0.3 | 0 | 0.0 |
| Total Sampled Arrests | 236 | | 1,114 | | 1,009 | | 652 | | 462 | |

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

** Alcohol Driver Education School - Referral

*** Information not available.

TABLE 20. 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 | | MAY 1985 - APRIL 1986 | |
|-----------------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| Less than \$100 | 18 | 7.6 | 60 | 5.4 | 63 | 6.2 | 49 | 7.5 | 34 | 7.4 |
| \$100 - \$150 | 68 | 28.8 | 196 | 17.6 | 109 | 10.8 | 24 | 3.7 | 7 | 1.5 |
| \$151 - \$200 | 65 | 27.6 | 376 | 33.8 | 332 | 32.9 | 55 | 8.4 | 0 | 0.0 |
| \$201 - \$300 | 79 | 33.5 | 448 | 40.2 | 456 | 45.2 | 71 | 10.9 | 1 | 0.2 |
| Over \$300 | 6 | 2.5 | 34 | 3.0 | 49 | 4.9 | 453 | 69.5 | 420 | 90.9 |

1.3 during the four years of TAP. In comparison, the rate in 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 19 show the DUI conviction rate (as charged) is in the range of 90 percent. Charges were dismissed in only 2.9 percent of the DUI cases. It appears 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 (10).

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 21 show that BAC levels decreased during the first year of TAP and then increased slightly during the last three years. The percentage arrested having 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, 24.5 during the third year, and 22.5 during the fourth year. Those arrested having BAC levels between 0.10 and 0.15 increased from 26.4 before TAP to 37.7, 36.4, 32.6, and 35.3 percent during the four 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 during the second, third, and fourth years of TAP.

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 22 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. During the fourth year of TAP, there was a decrease to 23 percent for those having a previous DUI conviction. With the new DUI law requiring jail sentences for repeat offenders, a check was made to determine if the adjudication records reflected this outcome in all cases. Results from the sampled data for May 1985 through April 1986 indicate that 80 percent of those arrested having a previous DUI conviction did receive a jail sentence.

Information related to the arrested DUI drivers' age, race, and sex is presented in Tables 23 and 24. About two-thirds of the drivers were between the ages of 21 and 39. A difference between the year before and the four years during TAP was the higher percentage in the 21-to-24 and 30-to-39 age categories. During the past three years, the age group having the highest percentage of drivers arrested for DUI was 30 to 39 years old. The cumulative percent shows that approximately 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. White females made up the next largest group, and this percentage increased from 7.3 percent before TAP to 19.7 percent the third year of TAP, and then decreased to 12.5 percent during the fourth year of TAP.

TABLE 21. 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 | | | MAY 1985 - APRIL 1986 | | |
|------------------|-----------------------|---------|-------|-----------------------|---------|-------|-----------------------|---------|-------|
| | NUMBER* | PERCENT | CUM** | NUMBER* | PERCENT | CUM** | NUMBER* | PERCENT | CUM** |
| Zero | 7 | 0.7 | 0.8 | 8 | 1.3 | 1.5 | 6 | 1.3 | 1.5 |
| 0.01 - 0.04 | 6 | 0.6 | 1.5 | 11 | 1.8 | 3.5 | 5 | 1.1 | 2.8 |
| 0.05 - 0.09 | 30 | 3.2 | 4.5 | 26 | 4.3 | 8.3 | 9 | 2.0 | 5.1 |
| 0.10 - 0.15 | 346 | 36.4 | 44.1 | 197 | 32.6 | 44.6 | 158 | 35.3 | 45.5 |
| 0.16 - 0.19 | 261 | 27.5 | 73.6 | 168 | 27.8 | 75.5 | 125 | 28.0 | 77.5 |
| 0.20 - 0.24 | 186 | 19.6 | 94.7 | 95 | 15.7 | 93.0 | 63 | 14.1 | 93.6 |
| 0.25 - 0.29 | 40 | 4.2 | 99.2 | 29 | 4.8 | 98.3 | 21 | 4.7 | 99.0 |
| 0.30 - 0.34 | 5 | 0.5 | 99.8 | 8 | 1.3 | 99.8 | 2 | 0.5 | 99.5 |
| 0.35 - 0.39 | 2 | 0.2 | 100.0 | 1 | 0.2 | 100.0 | 0 | 0.0 | 99.5 |
| 0.40 And Up | 0 | 0.0 | 100.0 | 0 | 0.0 | 100.0 | 1 | 0.5 | 100.0 |
| Refused | 67 | 7.1 | DNA | 61 | 10.1 | DNA | 56 | 12.5 | DNA |

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

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

TABLE 22. 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 |
| May 1985 - April 1986 | 22.6 |

TABLE 23. 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 | 12.7 | 156 | 14.0 | 14.1 |
| 21 - 24 | 46 | 19.5 | 32.2 | 283 | 25.5 | 39.6 |
| 25 - 29 | 51 | 21.6 | 53.8 | 192 | 17.3 | 56.9 |
| 30 - 39 | 47 | 19.9 | 73.7 | 259 | 23.3 | 80.2 |
| 40 - 49 | 31 | 13.1 | 86.8 | 123 | 11.1 | 91.3 |
| 50 - 59 | 24 | 10.2 | 97.0 | 74 | 6.7 | 98.0 |
| Over 60 | 7 | 3.0 | 100.0 | 23 | 2.1 | 100.0 |

| AGE (YEARS) | MAY 1983 - APRIL 1984 | | | MAY 1984 - APRIL 1985 | | | MAY 1985 - APRIL 1986 | | |
|----------------|-----------------------|---------|-------|-----------------------|---------|-------|-----------------------|---------|-------|
| | NUMBER* | PERCENT | CUM** | NUMBER* | PERCENT | CUM** | NUMBER* | PERCENT | CUM** |
| 16 - 20 | 123 | 12.2 | 12.2 | 45 | 6.9 | 6.9 | 40 | 8.7 | 8.7 |
| 21 - 24 | 234 | 23.3 | 35.5 | 157 | 24.1 | 31.0 | 98 | 21.4 | 30.1 |
| 25 - 29 | 206 | 20.5 | 56.0 | 118 | 18.2 | 49.2 | 98 | 21.4 | 51.5 |
| 30 - 39 | 253 | 25.2 | 81.2 | 184 | 28.3 | 77.5 | 113 | 24.6 | 76.1 |
| 40 - 49 | 112 | 11.1 | 92.3 | 85 | 13.1 | 90.6 | 68 | 14.8 | 90.9 |
| 50 - 59 | 51 | 5.1 | 97.4 | 44 | 6.8 | 97.4 | 26 | 5.6 | 96.5 |
| Over 60 | 26 | 2.6 | 100.0 | 17 | 2.6 | 100.0 | 16 | 3.5 | 100.0 |

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

TABLE 24. 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 | 902 | 81.6 | 49 | 4.4 |
| Female | 17 | 7.3 | 1 | 0.4 | 151 | 13.6 | 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 |

| SEX | MAY 1985 - APRIL 1986 | | | |
|--------|-----------------------|---------|-----------|---------|
| | WHITE | | NON-WHITE | |
| | NUMBER | PERCENT | NUMBER | PERCENT |
| Male | 370 | 82.0 | 24 | 5.3 |
| Female | 56 | 12.5 | 1 | 0.2 |

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) (11) 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 35 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) (11). The percentages of drivers between 25 and 49 years of age were similar.

The summary of DUI arrests by location of residence is presented in Table 25. 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 years of TAP, but this percentage during the third year of TAP was very similar to that before TAP. The percentage of drivers with residences outside Fayette County increased again in the fourth year of TAP to a level near that during the first and second years of TAP.

COST EFFECTIVENESS

A summary of costs and benefits associated with the Traffic Alcohol Program in Lexington-Fayette County is presented in Table 26. 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 the following sources: reduction in accident costs, court costs, service fees, 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 (12), savings resulting from reduced accident costs were determined. Income in the form of DUI fines was determined from the sample of arrest and adjudication data. Additional income was 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 and resulted in a decrease in other offenses during the hours of TAP enforcement.

Results of the cost-effectiveness analysis as presented in Table 26 show that the Traffic Alcohol Program had a benefit-cost ratio of 1.20 when only direct income from fines and court costs was used. This reflects income of \$3,923,286 and costs of \$3,270,976. The benefit-cost ratio increased to 3.81 when the reduction in accident costs was included. Reduced accident costs totaled \$8,535,860; therefore when this was combined with direct income from fines and court costs, the total benefits and income were \$12,457,146.

An alternative approach to determining the costs associated with accidents has been developed by the Granville Corporation under contract

TABLE 25. SAMPLE DUI ARRESTS BY LOCATION OF RESIDENCE

| LOCATION | MAY 1981 - APRIL 1982 | | MAY 1982 - APRIL 1983 | | MAY 1983 - APRIL 1984 | | MAY 1984 - APRIL 1985 | | MAY 1985 - APRIL 1986 | |
|---------------------------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|
| | NUMBER* | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT | NUMBER | PERCENT |
| Fayette County | 178 | 78.8 | 774 | 72.0 | 684 | 68.4 | 508 | 77.9 | 325 | 70.5 |
| Outside Fayette County | 48 | 21.2 | 301 | 28.0 | 316 | 31.6 | 144 | 22.1 | 136 | 29.5 |
| Within Kentucky | 40 | 17.7 | 232 | 21.6 | 242 | 24.2 | 112 | 17.2 | 102 | 22.1 |
| Outside of Kentucky | 8 | 3.5 | 69 | 6.4 | 74 | 7.4 | 32 | 4.0 | 34 | 7.4 |

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

TABLE 26. SUMMARY OF COSTS AND BENEFITS

| | |
|---|-------------|
| A. COSTS | |
| 1. Police Enforcement, Administrative and Support Costs | \$1,553,701 |
| 2. Jail Costs | 1,072,650 |
| 3. DUI Court Costs | 389,743 |
| 4. Court Costs - Other Violations and Arrests | 254,882 |
| 5. Total | 3,270,976 |
| B. BENEFITS AND INCOME | |
| 1. Reduced Accident Costs | 8,535,860 |
| 2. DUI Fines (Including Court Costs and Service Fees) | 3,338,776 |
| 3. Other Traffic Violations and Public Intoxication Arrests (Including Court Costs) | 584,510 |
| 4. Total | 12,457,146 |
| C. BENEFIT - COST RATIO* | 3.81 |
| D. BENEFIT - COST RATIO** | 11.67 |
| E. DIRECT INCOME/COSTS | 1.20 |

* Benefits from Reduced Accident Costs based on National Safety Council costs (Reference 12).

** 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 13).

with the Federal Highway Administration (13), and it may be useful to compare results of the new approach with results obtained when using National Safety Council accident costs (12). As shown in Table 26, the benefit-cost ratio calculated using National Safety Council accident costs was 3.81. When using the alternative accident cost concept, the benefit-cost ratio increased to 11.67. 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.

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 27 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 four years during TAP. Results indicate a 37.3-percent reduction during TAP hours of enforcement and a 30.3 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 36.4 percent during TAP hours of enforcement. The number of alcohol-related accidents has continued to decrease each of the four years of TAP.

DUI arrest and adjudication is another important measure of a Traffic Alcohol Program's success. Also presented in Table 27 is a comparison of several measures of effectiveness based on arrest and adjudication data. The increase in average number of DUI arrests during the four years of TAP as compared to the year before TAP was approximately 250 percent. However, the number of arrests decreased substantially the third and fourth years compared to the first two years. The finding that, while DUI arrests have decreased in the third and fourth years of TAP, the number of alcohol-related accidents have also continued to decrease is of particular importance. This finding indicates that TAP has reduced the number of alcohol-impaired drivers on the highway such that the number of alcohol-related accidents and arrests have both decreased. 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 was anticipated that BAC's should decrease with increased enforcement. The BAC's before and during TAP presented in Table 27 show, however, 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 1.20 was calculated using only direct income as benefits. When accident savings were included, the benefit-cost ratio increased to 3.81 and 11.67 using two sources for the costs of accidents. It should be noted that Federal funding of TAP was discontinued as of October 31, 1986, and since then there has

TABLE 27. SUMMARY OF VARIOUS CRITERIA OF SUCCESS

CRITERIA

| | |
|--|-------|
| Percent reduction in alcohol-related accidents (all hours) | 30.3 |
| Percent reduction in alcohol-related accidents during TAP hours | 37.3 |
| Percent reduction in alcohol-related accidents during TAP hours (Time-Series Analysis) | 36.4 |
| Percent reduction in alcohol-related fatal or injury accidents | 29.1 |
| Percent increase in DUI arrests | 247 |
| DUI conviction rate (percent) | 90 |
| Average BAC before TAP (DUI arrests) | .172 |
| Average BAC during TAP (DUI arrests) | .159 |
| Benefit-cost ratio of program* | 3.81 |
| Benefit-cost ratio of program** | 11.67 |

* Benefits based on National Safety Council costs (Reference 12).

** Benefits based on cost data presented in report titled "Alternative Approaches to Accident Cost Concepts," FHWA Contract DTFH61-82-C-00042 (Reference 13).

been a commitment by the local government to continue a program of increased enforcement. A six-man TAP force was approved and now operates Wednesday through Saturday from 10:30 p.m. to 3:00 a.m. This special enforcement, along with the increased activity of regular-duty officers during TAP hours has resulted in a continued high level of DUI enforcement.

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