# AN ANALYSIS OF ULTIMATE PERFORMANCE MEASURES TO DETERMINE TOTAL PROJECT IMPACT OF THE FAIRFAX ALCOHOL SAFETY ACTION PROJECT

Progress Report #4

by

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## ABSTRACT

The Fairfax ASAP, one of 35 federally funded alcohol countermeasure projects designed to attack the problem of drunken drivers on the highways, was implemented at the community level in January 1972. This report summarizes the results of data obtained to measure the project's impact on the selected ultimate performance indicators at the end of the fourth year of project operations, 1975.

Data for 1975 indicate a significant change in trends of several ultimate performance measures in the Fairfax ASAP area. There was a significant decrease in the number of personal injuries, personal injury crashes, fatal injuries, fatal injury crashes and property damage crashes from what would have been predicted by linear regression analysis based upon trends established over the past ten years. These changes are significant at the 95% confidence level. No such change was evident in the control community, Henrico County, in any of the performance categories except property damage crashes. (The reduction in property damage crashes in both Fairfax and Henrico was likely the result of a change in accident reporting criteria, and probably does not reflect a change in the incidence of property damage accidents.)

While another performance indicator, the average blood alcohol concentration of drivers in the ASAP area showed little change during the 1972-1974 period, the mean BAC for 1975 was the lowest in recent years. The mean BAC for fatally injured drivers was .126% in 1975, compared to the previous six year low of .148% in 1973. The average number of fatally injured drivers with positive BAC's during the operational period of the ASAP (1972-1975) was virtually identical to the pre-ASAP average.

The average BAC levels for drivers arrested for driving while intoxicated (DWI) but not involved in crashes declined from .19% in 1972 to .16% in 1975. While this decline might be attributable to a reduction in the "pool" of intoxicated drivers, it should be noted that the presumptive limit for drunk driving was changed from .15% to .10% in 1972. Therefore, intuitively, the average BAC should be lower since the pool of drivers subject to arrest for DWI was increased on the lower end of the BAC scale. An analysis of BAC distributions in quarter 16 versus those in quarter 1 confirms that a statistically significant change occurred. BAC levels were significantly lower in quarter 16 than in quarter 1.

In terms of the cost benefit analysis, the actual societal costs resulting from accidents in Fairfax during 1975 were significantly lower than the projected costs based on pre-ASAP trends.

This is the second year that the actual and projected costs were significantly different. Savings incurred during 1975 were from $3 to $12 million, with a total savings over the life of the project being as much as $32 million. No such cost savings were evidenced in the control site, Henrico County.

While these data are encouraging, caution should be expressed over two confounding factors. The year 1971 was an extraordinary one in Fairfax for fatal crashes. Hence, the trend line for 1972 through 1974 was influenced by the large number of crashes in 1971. Reductions in fatal crashes and fatalities in 1972 and 1973 may reflect a regression to the mean. The second confounding factor was the effects of the energy crisis, which could not be adequately compensated for because all of the effects are not yet known. While the impact of the nationwide 55 mph speed limit is not as influential as in 1974, there may be savings attributable to the energy shortage figured into the total cost savings.

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## INTRODUCTION

The Fairfax Alcohol Safety Action Project (ASAP) was begun in January 1972 as one of 35 federally funded demonstration projects designed to implement and evaluate a comprehensive community alcohol countermeasures program. The Fairfax ASAP was approved for three years and funded with $2.1 million in an attempt to confront and ameliorate the community's drunk driving problem. At the end of 1974, the program was extended for an additional two years.

A principal goal of the Fairfax ASAP was to effect a reduction in the number of alcohol-related fatalities, injuries, and property damage crashes. The goal was approached through a systems oriented program providing countermeasures of increased and extensive enforcement of driving while intoxicated (DWI) statutes, a special judicial countermeasure consisting of a probation and review process, programs of rehabilitation and treatment for persons convicted of DWI, and extensive public information and education projects in the community.

The results of the project after the first three years of operations were encouraging. Data indicated a statistically significant reduction in injury crashes in all three years based on a linear regression model using 1962-1974 data. Fatal crashes and fatalities declined, but not significantly except in 1974, and overall societal costs also declined somewhat. In addition, the incidence of injury accidents, fatal accidents and fatalities declined significantly for the total three-year period as compared to the previous three-year periods.

This report summarizes the data on ultimate performance measures for 1975, the first year of extended operation for the Fairfax ASAP.

# CHANGES IN LEVELS OR DISTRIBUTIONS OF ULTIMATE PERFORMANCE MEASURES

## Fatal, Injury, and Property Damage Crash Trends

Some of the most significant indicators of ASAP project impact are the fatal, personal injury and property damage accident totals, and the percentages of these totals that were alcohol-related in the pre-ASAP and post-ASAP periods. To gauge the influence of ASAP, data from Fairfax County are compared with data collected for a selected control site, Henrico County.

Tables 1 and 2 present comparative crash data for Fairfax and Henrico Counties for the period 1962-1971, and for the ASAP years 1972-1975. Figures 1 and 2 show the same data graphically (utilizing semilog paper to smooth out fluctuations in the trend lines).

Table 1

Fairfax ASAP Crash Data
1962-1975

| Year | Fatal Crashes | Fatalities | Injury Crashes | Injuries | Property Damage Crashes | Pedestrians Killed | Pedestrians Injured |
|---|---|---|---|---|---|---|---|
| 1962 | 36 | 40 | 1,444 | 2,159 | 4,649 | 9 | N/A |
| 1963 | 47 | 56 | 1,663 | 2,530 | 5,354 | 7 | N/A |
| 1964 | 47 | 57 | 1,978 | 2,984 | 6,468 | 9 | 121 |
| 1965 | 51 | 59 | 2,210 | 3,161 | 7,360 | 6 | 132 |
| 1966 | 56 | 65 | 2,359 | 3,424 | 7,720 | 10 | 196 |
| 1967 | 55 | 64 | 2,625 | 3,457 | 7,645 | 14 | 160 |
| 1968 | 60 | 65 | 2,815 | 4,106 | 8,834 | 14 | 170 |
| 1969 | 59 | 60 | 2,916 | 4,165 | 10,331 | 13 | 161 |
| 1970 | 59 | 63 | 3,151 | 4,465 | 11,519 | 17 | 186 |
| 1971 | 90 | 100 | 3,374 | 4,756 | 12,501 | 22 | 187 |
| 1972 | 76 | 85 | 3,405 | 4,795 | 13,850 | 25 | 192 |
| 1973 | 68 | 78 | 3,610 | 5,032 | 14,511 | 11 | 172 |
| 1974 | 55 | 63 | 3,558 | 4,889 | 13,904 | 9 | 182 |
| 1975 | 54 | 60 | 3,776 | 5,206 | 11,178 | 14 | 184 |

Source: Virginia Department of State Police.

Table 2

Henrico County Crash Data
1962-1975

| Year | Fatal Crashes | Fatalities | Injury Crashes | Injuries | Property Damage Crashes | Pedestrians Killed | Pedestrians Injured |
|---|---|---|---|---|---|---|---|
| 1962 | 18 | 21 | 469 | 723 | 1,634 | 1 | N/A |
| 1963 | 12 | 17 | 527 | 813 | 1,704 | 4 | N/A |
| 1964 | 14 | 15 | 623 | 914 | 1,946 | 2 | 56 |
| 1965 | 17 | 25 | 632 | 977 | 2,075 | 4 | 44 |
| 1966 | 28 | 31 | 740 | 1,090 | 2,260 | 10 | 46 |
| 1967 | 18 | 19 | 755 | 1,157 | 1,989 | 1 | 53 |
| 1968 | 19 | 24 | 800 | 1,230 | 2,201 | 4 | 46 |
| 1969 | 22 | 26 | 875 | 1,301 | 2,476 | 9 | 65 |
| 1970 | 23 | 26 | 886 | 1,313 | 2,668 | 3 | 52 |
| 1971 | 16 | 17 | 984 | 1,395 | 3,106 | 4 | 55 |
| 1972 | 24 | 25 | 1,083 | 1,594 | 3,445 | 8 | 67 |
| 1973 | 19 | 22 | 1,070 | 1,503 | 3,555 | 6 | 64 |
| 1974 | 35 | 40 | 1,073 | 1,545 | 3,321 | 7 | 57 |
| 1975 | 24 | 26 | 1,277 | 1,821 | 2,781 | 6 | 74 |

Source: Virginia Department of State Police (both tables 1 & 2)

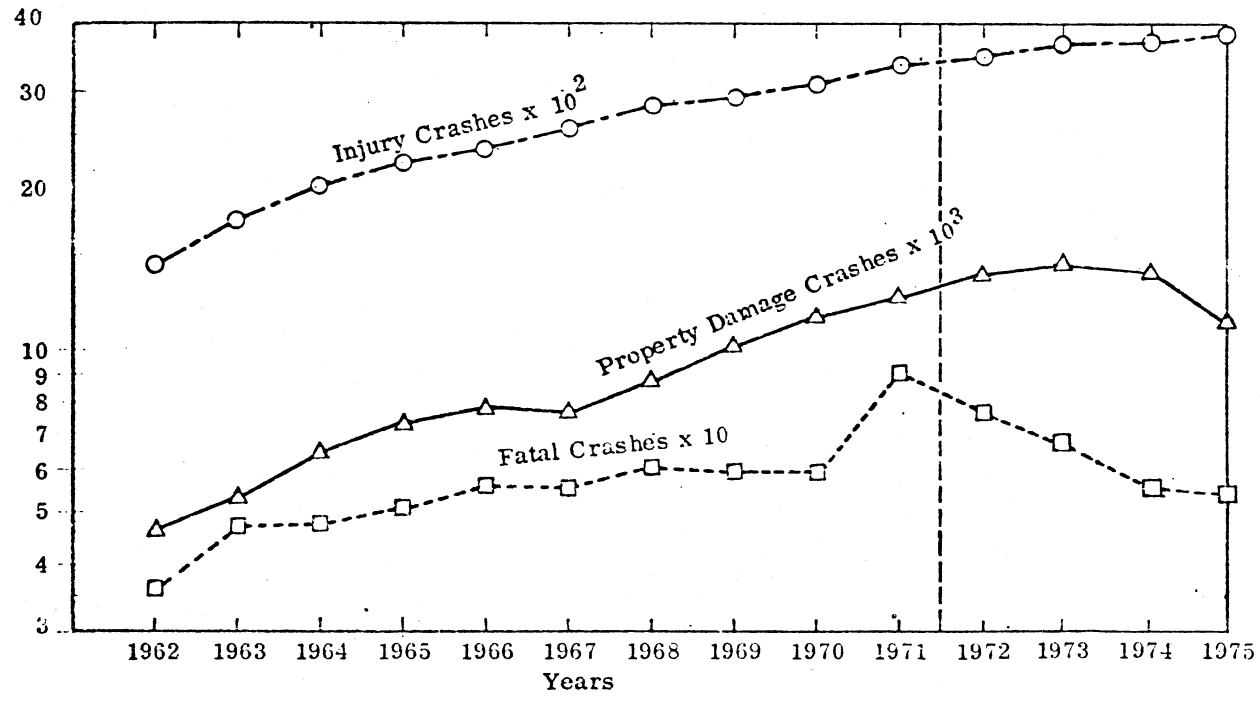


Figure 1. Trends in Fairfax crashes.

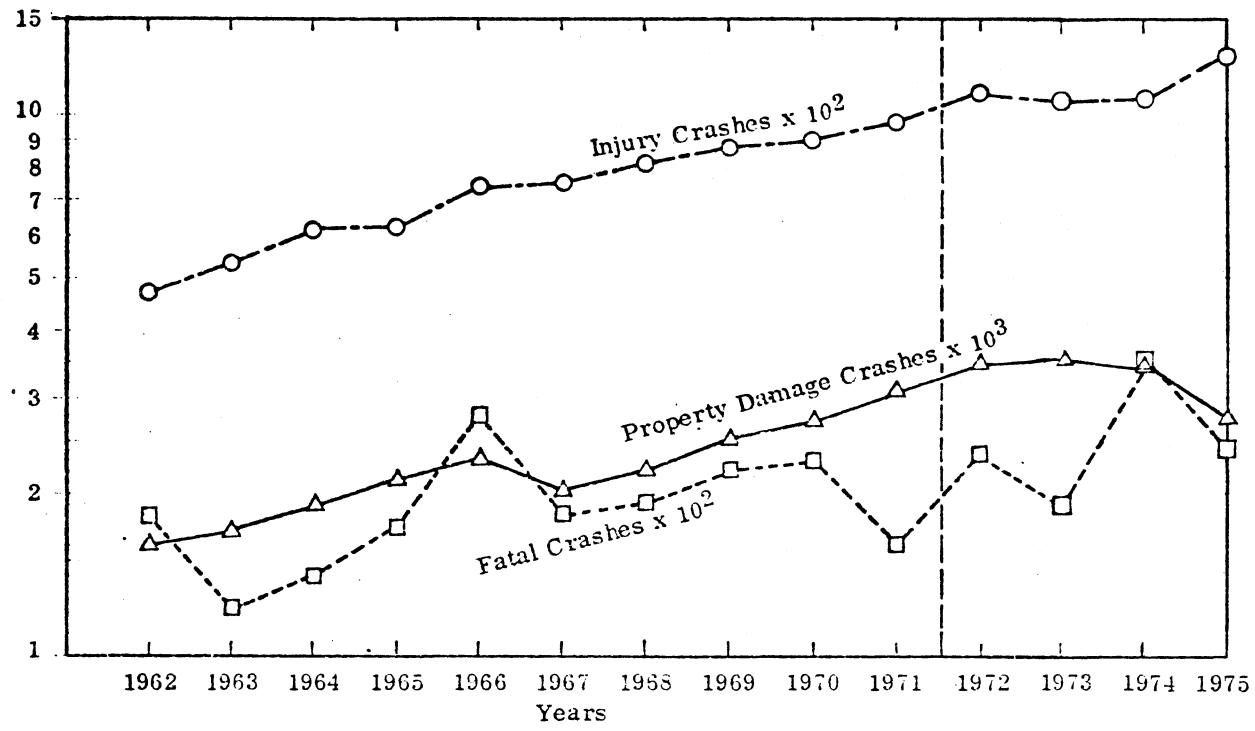


Figure 2. Trends in Henrico crashes.

Additionally, data were collected on population, motor vehicle registration, and annual vehicle miles of travel in order to standardize or normalize accident data according to exposure variables. These data are tabulated in Appendix A and shown graphically in Figures 3 and 4.

The population of Fairfax grew at an average rate of slightly over 6% a year prior to the ASAP and at a rate of 2.5% during the project. Vehicle registrations grew considerably faster, at about a 9.5% annual rate both before and during the ASAP; while vehicle miles of travel increased at an almost 12% annual rate prior to 1972, but at only 6% per year from 1972-1975. Whether the slower increase in miles driven should be attributed to the slower population growth in the area or to the national energy shortage is not clear. It is likely that both play a part. A comparison of Figures 1 and 3 shows that crash trends are closely correlated with the growth in these exposure variables. Fatal crashes, relatively infrequent and low probability events, are the most variable of the data and do not correlate well, but injury and property damage crashes demonstrate growth patterns closely associated with exposure variables, especially with vehicle miles driven.

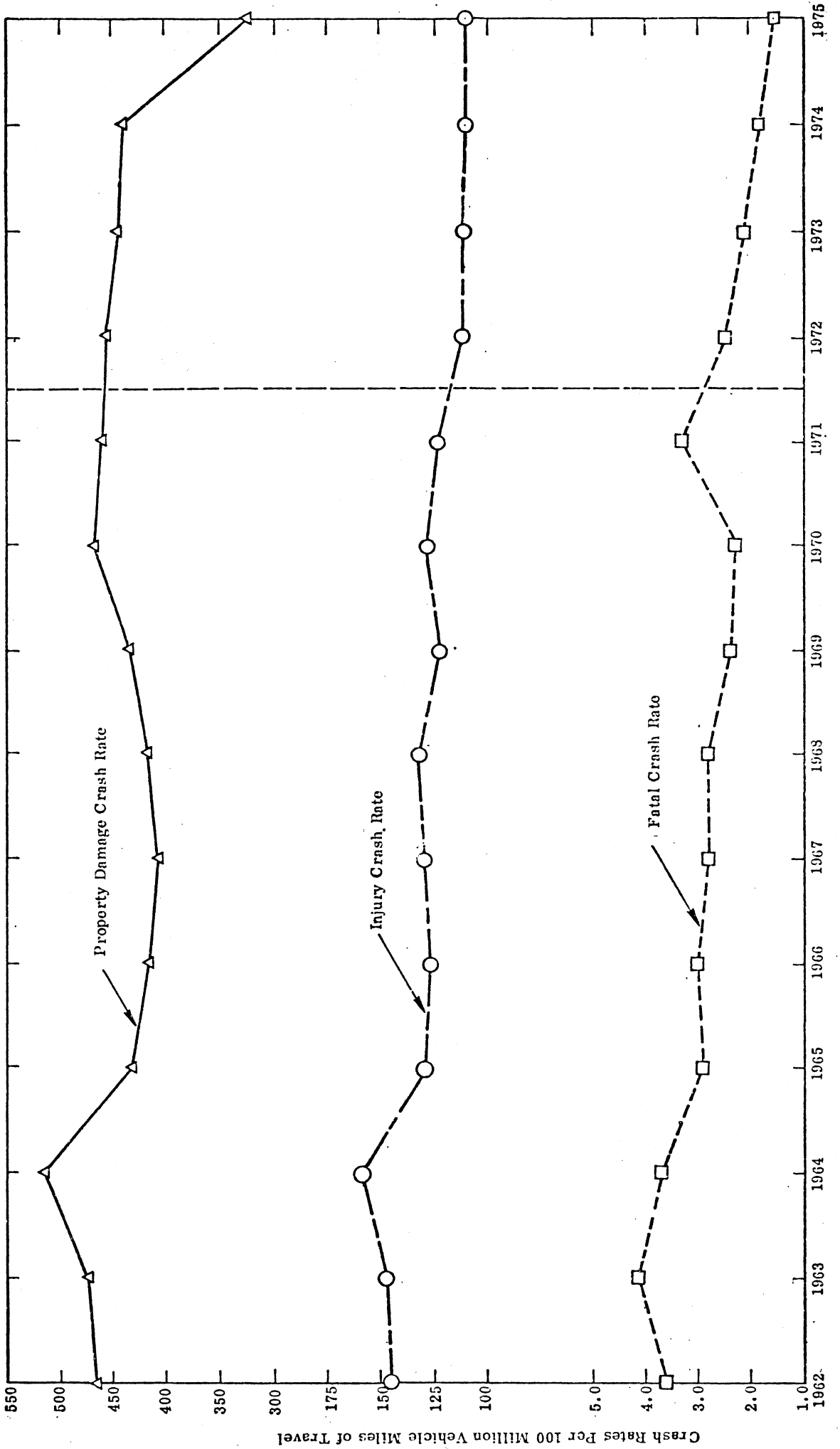


Figure 5. Trends in Fairfax crash rates as a function of miles of travel.

Figure 6 shows the trends in Henrico crash rates per 100 million vehicle miles of travel. As in Fairfax, fatal crash rates showed a long-term decline from 3.4 in 1962 to 1.6 in 1973. In 1974, though, there was an abrupt rise to 2.9, which would seem to belie any effects from the energy shortage. The explanation probably lies in the infrequent and variable nature of fatal crashes, however. Injury and property damage crash rates were almost stable between 1962 and 1971, but then showed definite declines in 1973 and 1974. In 1975, the injury rate rose somewhat to about the previous historical average, while the property damage crash rate dropped considerably, probably because of the accident reporting change noted above.

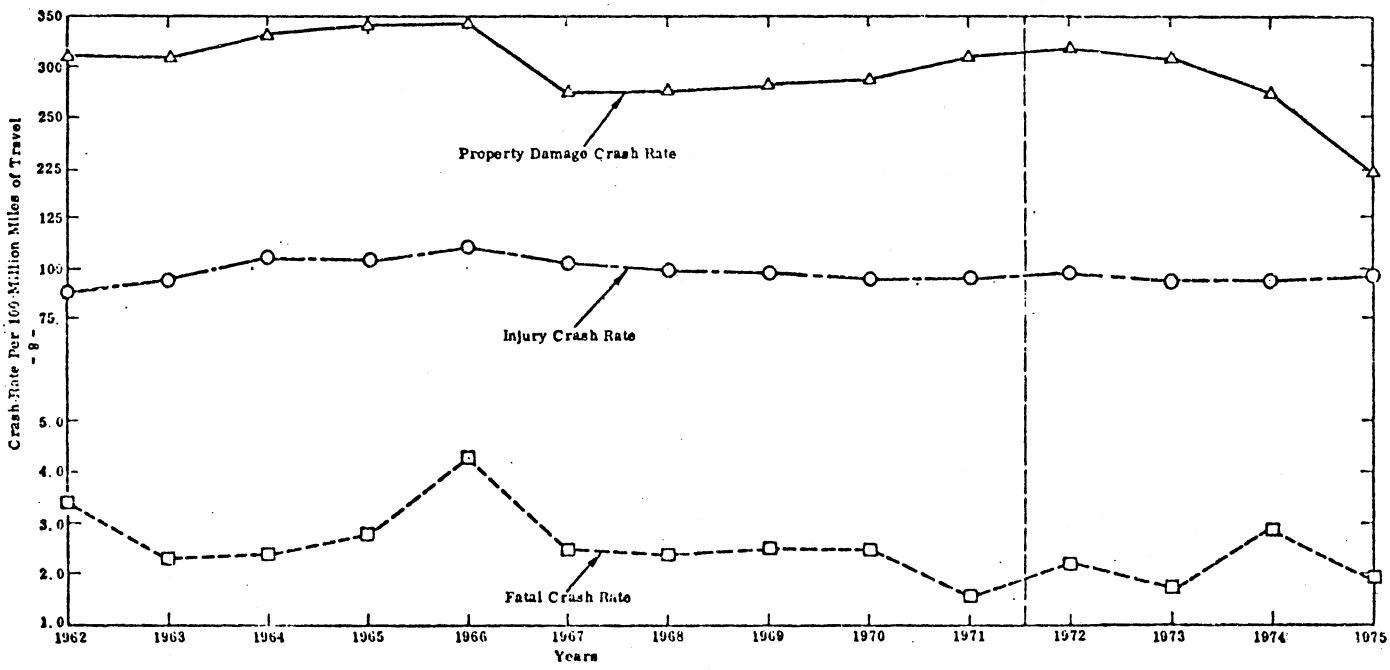


Figure 6. Trends in Henrico crash rates as a function of miles of travel.

## Projections for 1972-1974

The data in Tables 1 and 2 and exposure data in Figures 3 and 4 (and in Appendix A) were used to develop projections of fatal, injury, and property damage crashes in Fairfax and Henrico for the 1972-1975 period. Actual mileage figures for the ASAP operational period were used to make the projections as accurate as possible. The projections provide values upon

which evaluations of ASAP performance may be based. Actual data for 1972-1975 can be compared with these projected estimates for Fairfax, while Henrico data can be reviewed to see if changes in the ten-year trends occur which are independent of any concentrated alcohol countermeasures effort.

Exposure variables in Fairfax and Henrico were projected as a function of time using linear regression analysis. From these projections, million vehicle miles of travel (MVMT) was selected as the independent variable for the projection of expected crash values. Fatal crashes, fatalities, injury crashes, and property damage crashes for each locality were projected as a function of MVMT using linear regression analysis. High coefficients of correlation were obtained from Fairfax injury crashes (.989) and Fairfax property damage crashes (.973). Coefficients of correlation for Fairfax fatal crashes and fatalities were .853 and .812 respectively.

Injury and property damage crash data for Henrico County also correlated closely with projections of MVMT. Injury crashes had a correlation coefficient of .967, and property damage crashes had a correlation coefficient of .934. Correlation coefficients for fatal crashes (.297) and fatalities (.146) were poor. Complete data on the linear regression analyses and projections are given in Appendix C.

Tables 3 and 4 present summary data on the projections for Fairfax and Henrico crashes for the 1972-75 period. These data were used to compare actual data with projections, and in the calculation of estimated project benefits and costs.

Table 3

Fairfax ASAP
1972, 1973, 1974, and 1975 Crash Projections

| Year | Fatal Crashes | Fatalities | Injury Crashes | Injuries | Property Damage Crashes |
|---|---|---|---|---|---|
| 1972 | 80 | 88 | 3,699 | 5,178 | 13,236 |
| 1973 | 85 | 93 | 3,950 | 5,510 | 14,237 |
| 1974 | 84 | 92 | 3,915 | 5,463 | 14,097 |
| 1975 | 88 | 96 | 4,116 | 5,729 | 14,896 |

Table 4

Henrico County
1972, 1973, 1974, and 1975 Crash Projections

| Year | Fatal Crashes | Fatalities | Injury Crashes | Injuries | Property Damage Crashes |
|---|---|---|---|---|---|
| 1972 | 22 | 24 | 1,058 | 1,541 | 3,069 |
| 1973 | 22 | 24 | 1,128 | 1,636 | 3,253 |
| 1974 | 23 | 24 | 1,158 | 1,677 | 3,331 |
| 1975 | 23 | 24 | 1,202 | 1,737 | 3,447 |

## Fairfax Alcohol Related Fatalities

Several of the most significant measures of overall project impact are to be found in the data on alcohol related fatalities. It is to be hoped, of course, that ASAP can reduce fatal crashes and fatalities to levels below the predicted values. If alcohol related fatal crashes can be significantly reduced by ASAP, then the fact should be observed in total crash data.

Data in Table 5 reflect the results of blood alcohol concentration (BAC) tests on persons killed in motor vehicles accidents in Fairfax in the baseline period 1969-71 and after the four years of ASAP, 1972-1975. These data are at best inconclusive. The percentage of positive BAC's was down in 1972 from the two preceding years, but down only to the 1969 level. The percentage then remained constant in 1973 but jumped significantly to 56% in 1974 before dropping again in 1975. Also of significance in 1973 is the fact that in 1973 the mean positive BAC was down to .148%, the lowest level in five years; and though 1974 showed an increase, the level in 1975 (.126%) was the lowest in recent years. As a result, the average for the four-year ASAP period was far lower than that for the three-year baseline period.

Data on the BAC's of fatally injured motorists are the subject of a more intensive analysis in a later section of this report.

Table 5

Fairfax Alcohol Related Fatalities
(Includes Pedestrians)

| Year | Fatalities | Number Tested for BAC | % | Number Positive | % | Number Negative | % | Mean Positive BAC |
|---|---|---|---|---|---|---|---|---|
| 1969 | 60 | 38 | 63 | 16 | 42 | 22 | 58 | 0.152% |
| 1970 | 63 | 47 | 75 | 23 | 49 | 24 | 51 | 0.176% |
| 1971 | 100 | 71 | 71 | 42 | 59 | 29 | 41 | 0.166% |
| Avg. | 74 | 52 | 70 | 27 | 52 | 25 | 48 | 0.166% |
| 1972 | 85 | 65 | 76 | 27 | 42 | 38 | 58 | 0.183% |
| 1973 | 78 | 57 | 73 | 24 | 42 | 33 | 58 | 0.148% |
| 1974 | 63 | 52 | 83 | 29 | 56 | 23 | 44 | 0.159% |
| 1975 | 60 | 50 | 83 | 23 | 46 | 27 | 54 | 0.126% |
| Avg. | 72 | 56 | 79 | 26 | 46 | 30 | 54 | 0.154% |

## Differences in Actual and Projected Crashes

To test the impact of the Fairfax ASAP on fatal, injury, and property damage crashes after four years of project operations, it was determined that actual crashes should be compared with projected crashes both in Fairfax and Henrico.

The actual crash data for Fairfax and Henrico were compared with the projections described earlier. The analysis developed 95% confidence intervals for each data category for 1972, 1973, 1974 and 1975. Summary data are shown in Tables 6 and 7.

In only one category, Fairfax injury crashes, was there a statistically significant improvement over the projected figures for all four years of the project. However, in 1974 Fairfax showed a significant reduction in fatalities and fatal crashes as well as in injury crashes, and in 1975 there was a significant decline in all four categories in Fairfax.* Thus, it is possible

*Note, however, that the decline in property damage accidents which occurred in both Fairfax and Henrico in 1975 was caused by a change in accident reporting introduced in 1975. During that year the reporting limit on accidents was raised from $100 to $250, thereby eliminating many accidents that would otherwise have been reported.

## Table 6

## Actual and Projected Fairfax Crashes

| Fatal Crashes | | | | | Fatalities | | | | Injury Crashes | | | | Property Damage Crashes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Actual | Projected | 95% C.I. | Sig. | Actual | Projected | 95% C.I. | Sig. | Actual | Projected | 95% C.I. | Sig. | Actual | Projected | 95% C.I. | Sig. |
| 1972 | 76 | 80 | 61-99 | No | 85 | 86 | 60-111 | No | 3,405 | 3,699 | 3,459 - 3,938 | Yes Lower | 13,850 | 13,236 | 11,666 - 14,850 | No |
| 1973 | 68 | 85 | 64-105 | No | 78 | 90 | 63-117 | No | 3,610 | 3,950 | 3,696- 4,204 | Yes Lower | 14,511 | 14,237 | 12,571 - 15,903 | No |
| 1974 | 55 | 84 | 64-104 | Yes Lower | 63 | 89 | 62-117 | No | 3,558 | 3,915 | 3,663 - 4,167 | Yes Lower | 13,904 | 14,097 | 12,445 - 15,749 | No |
| 1975 | 49 | 88 | 67-109 | Yes Lower | 55 | 96 | 71-122 | Yes Lower | 3,776 | 4,116 | 3,851- 4,381 | Yes Lower | 11,178 | 14,896 | 13,160- 16,632 | Yes Lower |

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## Table 7

## Actual and Projected Henrico Crashes

| Fatal Crashes | | | | | Fatalities | | | | Injury Crashes | | | | Property Damage Crashes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Actual | Projected | 95% C.I. | Sig. | Actual | Projected | 95% C.I. | Sig. | Actual | Projected | 95% C.I. | Sig. | Actual | Projected | 95% C.I. | Sig. |
| 1972 | 24 | 22 | 10-33 | No | 25 | 24 | 10-37 | No | 1,083 | 1,058 | 946 - 1,170 | No | 3,445 | 3,069 | 2,643 - 3,495 | No |
| 1973 | 19 | 22 | 10-35 | No | 22 | 24 | 10-38 | No | 1,070 | 1,129 | 1,009 - 1,248 | No | 3,555 | 3,253 | 2,798 - 3,708 | No |
| 1974 | 35 | 23 | 9-35 | No | 40 | 24 | 9-39 | Yes Higher | 1,073 | 1,158 | 1,035 1,281 | No | 3,321 | 3,331 | 2,862 - 3,799 | No |
| 1975 | 24 | 23 | 9-36 | No | 26 | 24 | 9-40 | No | 1,277 | 1,202 | 1,074- 1,331 | No | 2,781 | 3,447 | 2,958- 3,936 | Yes Lower |

that the effects of the ASAP may be cumulative, with an increasingly visible impact each year. Henrico accident statistics show no significant decline in any of the four categories for the period 1972-1975, with the exception of 1975 property damage accidents, which is a questionable figure as previously discussed. Thus, the decline in Fairfax may well be attributable to the ASAP.

## CHARACTERISTICS OF FATAL CRASHES AND FATALLY INJURED DRIVERS IN FAIRFAX IN 1975

Twenty-nine drivers were killed as a result of motor vehicle crashes in Fairfax in 1975. The Chief Medical Examiner of Virginia is authorized to perform autopsies on all fatally injured motorists. If the motorist dies within four hours of the crash, the autopsy will normally include a measure of the blood alcohol concentration (BAC). Of the 29 fatally injured drivers in 1975, the Chief Medical Examiner reported BAC test results for 27. Of the 27 drivers who were tested, 12 were negative, 7 had low levels of alcohol, and 8 had BAC's greater than .10%. These data are shown in Table 8.

Fifty-five percent of the driver fatalities tested were alcohol related in terms of the Office of Alcohol Countermeasures' criterion that any positive level of alcohol should count as an alcohol related fatality. Perhaps more realistically in terms of the alcohol contributing to the cause of the crash, 30% of the fatally injured drivers had BAC's above the presumptive limit of .10%, and their crashes could definitely be considered as being alcohol related.

The reader is cautioned in comparing fatality data for 1974 to data for the previous ASAP years or to the years prior to ASAP operations. Fortunately, traffic fatalities are extremely rare events, but unfortunately for statistical purposes, they exhibit an extremely unstable nature so that it is almost impossible to make reliable statistical inferences from such small and variable numbers. The instability in the data base for fatally injured drivers can easily be demonstrated by the data in Exhibits 1 and 2.

Exhibit 1 depicts the percentages of fatally injured drivers with positive BAC's for the baseline years of 1969, 1970, and 1971, and for the four ASAP operational years of 1972 through 1975. Note that 1972 and 1973 showed an encouraging trend from the 1971 peak. However, as noted in earlier reports, such a drop might indicate only a regression to the mean, an interpretation which seems to be borne out by the large jump in 1974. Thus, the average for the four-year ASAP period was 52.5% compared to the baseline period average of 50.6%, hardly a significant change overall.

Table 8

Distribution of Blood Alcohol Concentrations by Time of Day for Drivers Killed in Traffic Crashes

| Time Interval (Inclusive Hours) | Blood Alcohol Concentration | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Negative | .01 - .04 | .05 - .09 | .10 - .14 | .15 - .19 | .20 - .24 | .25+ | Unknown | Total |
| 12 M - 4 a.m. | 2 | 0 | 2 | 1 | 2 | 1 | 0 | 1 | 9 |
| 4 - 8 a.m. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 12 N - 4 p.m. | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 2 | 3 |
| 8 a.m. - 12 N | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 4 - 8 p.m. | 5 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 7 |
| 8 p.m. - 12 M | 3 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 7 |
| Total | 12 | 2 | 5 | 3 | 2 | 3 | 0 | 2 | 29 |

EXHIBIT 1

Percentage of fatally injury drivers with positive BAC

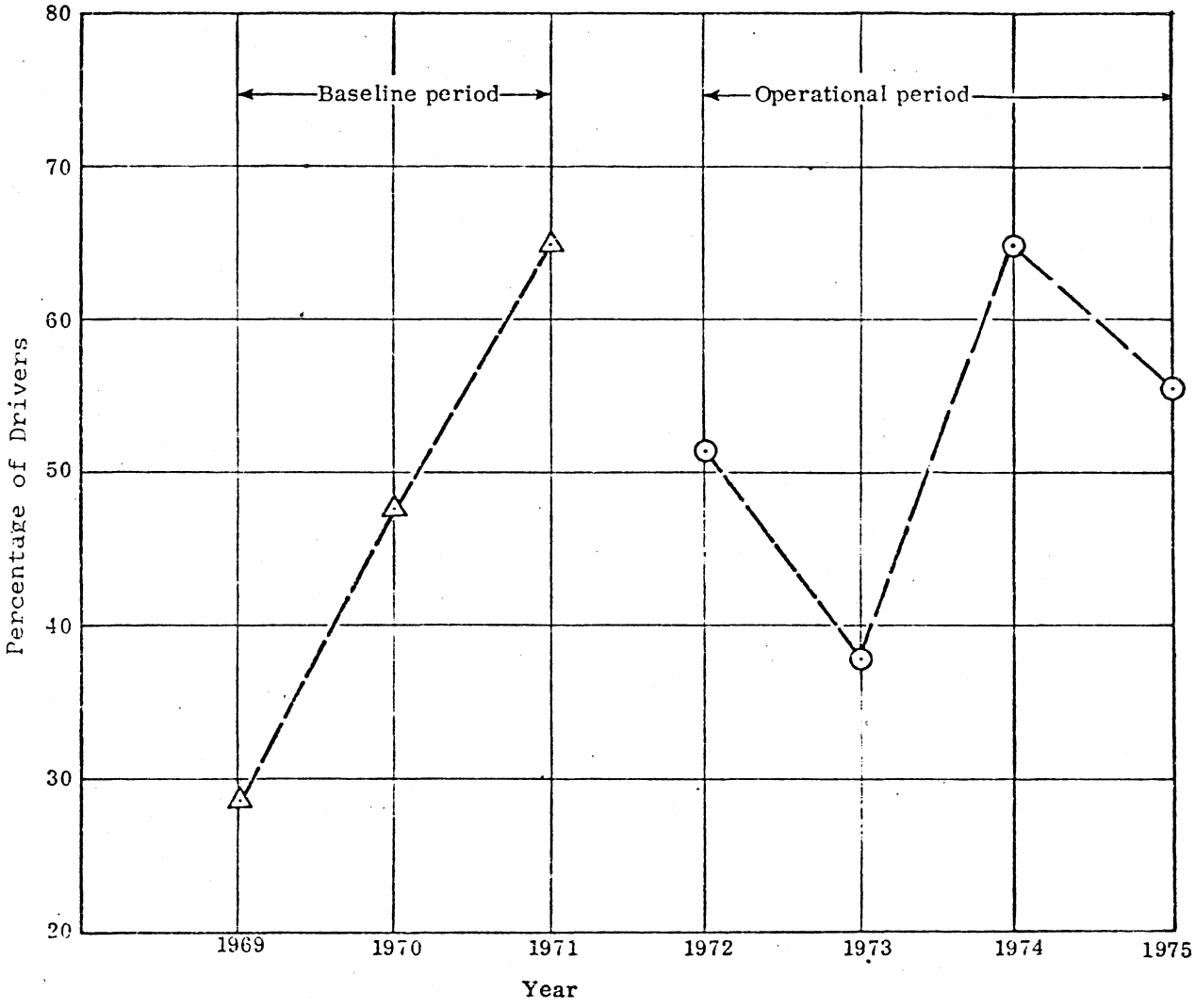
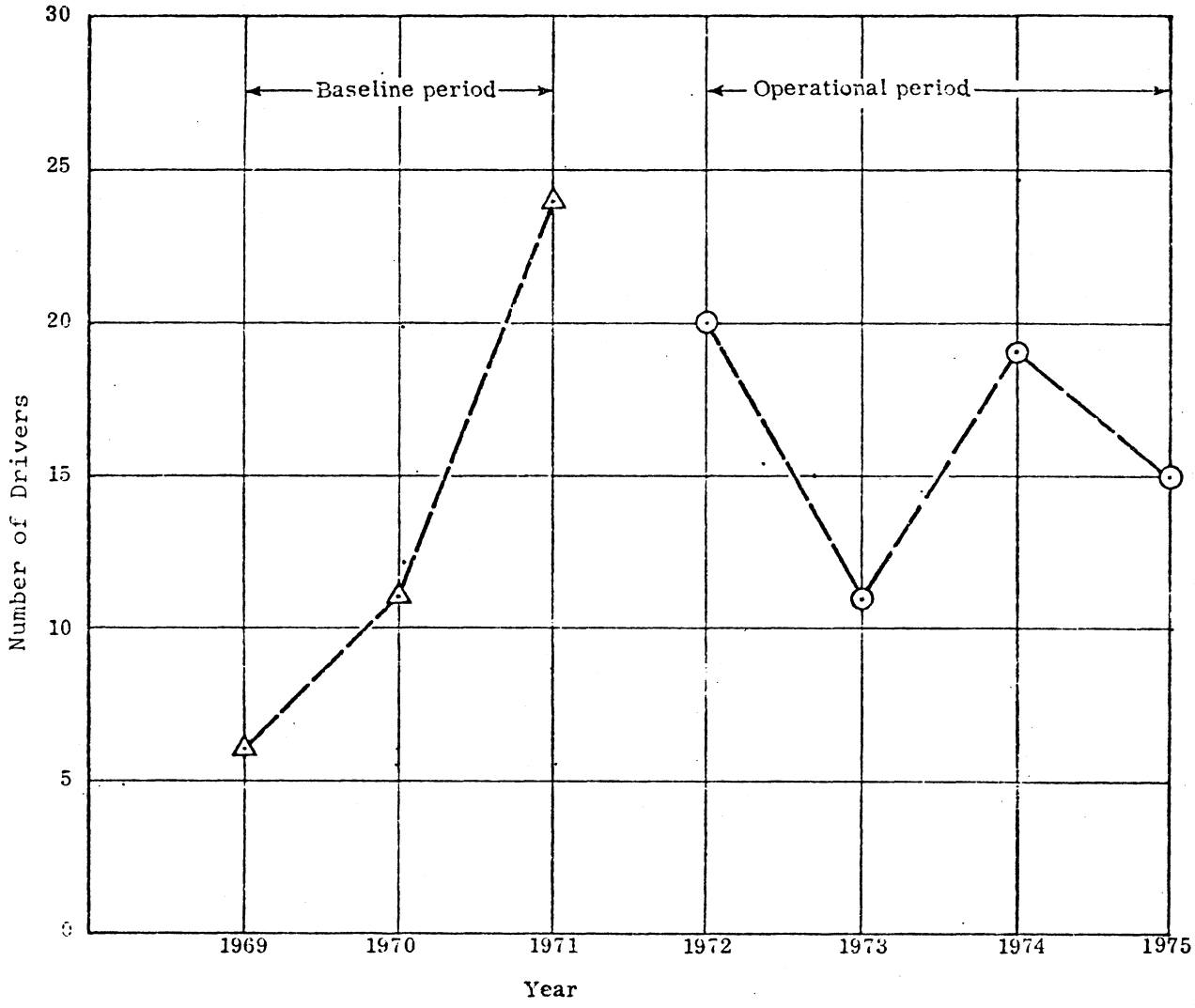


EXHIBIT 2

Number of fatally injured drivers with positive BAC



The data shown in Exhibit 2 suggest that the number of fatally injured drivers with positive BAC's is also extremely variable, and that the drop in 1972 and 1973 probably exhibited only another example of regression to the mean. Note that when the 1975 data are included, the average for the ASAP years is 16.3 (20 in 1972, 11 in 1973, 19 in 1974, and 15 in 1975), while the average for the baseline period was only 13.7 (6 in 1969, 11 in 1970, and 24 in 1971).

Similarly, the mean BAC for all fatally injured drivers fluctuated widely from year to year in the ASAP area. During the baseline period, the mean BAC averaged .085%, but was .046%, .079% and .111% in 1969, 1970, and 1971 respectively. In contrast, the average for the ASAP years was .079%, but the yearly figures were .086% in 1972, .055% in 1973, .114% in 1974 and .062% in 1975.

In examining these data on the fatally injured drivers, the only conclusion that can be supported is that the numbers are so small and the data so variable that any attempts to ascribe any benefits to the Fairfax ASAP are meaningless at the project level. It is suggested instead that data on personal injury crashes, which indicate a much more stable pattern, be used for measuring the effectiveness of an ASAP at the project level. Injury crashes in Fairfax have exhibited stable trends and have occurred in large enough numbers to make statistical testing feasible. Unfortunately, accurate information on the BAC of non-fatally injured drivers is not available, so that severe restrictions on the use of these data also exist. Nevertheless, a new section on characteristics of injury crashes in Fairfax County has been included in this report to supplement the data fatalities.

## BAC's of Fatally Injured Drivers by Time Periods

The BAC's for fatally injured drivers were categorized by four-hour time periods as shown in Table 8. For the time periods of most of the ASAP patrols, which were 8 p.m. to 4 a.m., there were 16 fatally injured drivers, of whom ten had positive BAC's, 5 had negative BAC's, and 1 had an unknown alcohol level. For the other 16 hours of the day, there were 13 fatally injured drivers, with 5 having positive BAC's, 7 having negative BAC's, and 1 having an unknown level. This pattern of positive BAC's occurring most frequently during the late night hours is consistent with earlier findings, both in Fairfax and in other areas with ASAP's. Six of the 10 positive BAC's during late night hours occurred in the period from midnight to 4 a.m., a fact which is consistent with roadside survey findings of the greatest incidence of drunken driving occurring after midnight.

## BAC's of Fatally Injured Drivers by Day of Week

Table 9 shows the BAC distribution of fatally injured drivers by day of week. Most studies have shown a trend toward more fatal accidents on weekends, although in 1974 the Fairfax ASAP showed no such trend. In 1975, the trend toward weekend accidents reappeared, but was not as striking as might be expected.

## BAC's of Fatally Injured Drivers by Age Group

The BAC's of fatally injured drivers in Fairfax in 1975 are broken down by age group in Table 10. More than half of the fatalities, 15 of the 29, were in the 16-24 age group.* This age group also accounted for 11 of the 15 alcohol related fatalities among drivers. Even when adjustments are made for driving exposure, this age group was clearly overrepresented in both the numbers of fatally injured drivers and alcohol related fatalities.

## BAC's of Fatally Injured Drivers by Sex

Of the 29 fatalities which occurred, 23 were males and 6 were females, as shown in Table 11. This result is consistent with the greater driving exposure and risk undertaken by the male. However, 3 of the 7 females who were tested exhibited a positive BAC and 12 of the 23 males tested had been drinking. This finding is mildly inconsistent with the roadside survey findings and the arrest experience in Fairfax which show that about 95% of the drunken drivers are males, since it indicates that half of the fatally injured drivers of both sexes were drinking. However, the very small number of female fatalities may make this statistic less conclusive, especially since none of the females were legally intoxicated.

## Additional Characteristics of Fatal Crashes and Fatally Injured Drivers

Table 12 is a summation of the characteristics of the fatally injured drivers. In addition to some data discussed previously, it also includes information on crash types and on previous traffic convictions of the drivers. As the table shows, 13 of the fatal crashes were multi-vehicle, with 7 of these at night and 6 during the day. The other 16 fatal accidents were single vehicle crashes of which 10 occurred at night and 6 during the day. This is consistent with the usual finding of more single vehicle accidents at night coincident with the period of increased alcohol usage.

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*One thirteen-year old, an unlicensed motorcyclist, was also listed as a fatally injured driver in 1975.

Table 9

Distribution of Blood Alcohol Concentrations by the Day of the Week for Drivers Killed in Traffic Crashes

| Time Interval (Day of the Week) | Negative | .01 - .04 | .05 - .09 | .10 - .14 | .15 - .19 | .20 - .24 | .25+ | Unknown | Total |
|---|---|---|---|---|---|---|---|---|---|
| Monday | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Tuesday | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 |
| Wednesday | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 3 |
| Thursday | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 4 |
| Friday | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 5 |
| Saturday | 3 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 8 |
| Sunday | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| Total | 12 | 2 | 5 | 3 | 2 | 3 | 0 | 2 | 29 |

Table 10

Distribution of Blood Alcohol Concentrations by Age Groupings for Drivers Killed in Traffic Crashes

| Driver Age Grouping | Blood Alcohol Concentration | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Negative | .01 - .04 | .05 - .09 | .10 - .14 | .15 - .19 | .20 - .24 | .25+ | Unknown | Total |
| Under 16 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 16-24 | 4 | 1 | 4 | 2 | 1 | 3 | 0 | 0 | 15 |
| 25-34 | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 6 |
| 35-44 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 45-54 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| 55-64 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 65+ | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Unknown | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Total | 0 | 2 | 5 | 3 | 2 | 3 | 0 | 2 | 29 |

Table 11

Distribution of Blood Alcohol Concentrations by Sex for Drivers Killed in Traffic Crashes

| Sex | Blood Alcohol Concentration | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Negative | .01 - .04 | .05 - .09 | .10 - .14 | .15 - .19 | .20 - .24 | .25+ | Unknown | Total |
| Male | 9 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 23 |
| Female | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 6 |
| Total | 12 | 2 | 5 | 3 | 2 | 3 | 2 | 2 | 29 |

Table 12-

Composite Profile of Fatally Injured Drivers, 1974

Vehicle Operator's Age

| | Age | Under 16 | 16-18 | 19-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65+ | Unknown |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Cases | | 1 | 5 | 10 | 4 | 2 | 1 | - | 1 | 1 | 1 | 0 | 2 | 1 |

Blood Alcohol Concentration

| | BAC | Neg. | .01 - .04 | .05 - .09 | .10 - .14 | .15 - .19 | .20 - .24 | .25+ | Unknown |
|---|---|---|---|---|---|---|---|---|---|
| No. of Cases | | 12 | 2 | 5 | 3 | 2 | 3 | 0 | 2 |

Driver Sex Classification

| | Sex | Male | Female |
|---|---|---|---|
| No. of Cases | | 23 | 6 |

Type of Crash

| | Type | Multi-Vehicle | Single Vehicle |
|---|---|---|---|
| No. of Cases | | 13 | 16 |

| | Night | Day | Night | Day |
|---|---|---|---|---|
| No. of Cases | 7 | 6 | 10 | 6 |

Previous Criminal Convictions

| | Convictions | None | One | Two | Three or More | Unknown |
|---|---|---|---|---|---|---|
| No. of Cases | | 8 | 3 | 7 | 6 | 5 |

Previous Traffic Convictions

| | None | One | Two | Three or More | Unknown |
|---|---|---|---|---|---|
| Convictions | | | | | |
| No. of Cases | 8 | 3 | 7 | 6 | 5 |

The driving records of the 24 drivers whose records were known showed that 8 had no previous traffic convictions while 16 had prior convictions, including 6 with 3 or more convictions. Thus, 33% had no traffic convictions, while 25% had 3 or more. This is consistent with the 1974 data, which showed 35% with no prior record of conviction and 39% who had been convicted 3 or more times. However, it contrasts sharply with the 1973 results, when 22 of the 35 fatally injured drivers had no previous traffic convictions.

## Characteristics of Nonfatal Injury Crashes in Fairfax County in 1975

Data on nonfatal injury crashes in the ASAP area unfortunately are not as complete as the data on fatal crashes. BAC's are not routinely taken from injured drivers so that accurate alcohol information is not available. The only indication of whether an injured driver was drinking is the notation of that fact by the reporting officer on the FR300 accident report. Since these notations are simply the officer's opinion, based on personal observation, there is room for considerable error. In addition, injury crash data were available for Fairfax County only, excluding the cities of Fairfax, Falls Church, Herndon, and Vienna. The reader is cautioned to keep in mind the possible inaccuracies of the police officer's report and the fact that only accidents in the county are reported in considering the data presented here.

There were 2,902 injury accidents reported in Fairfax County in 1975. Of these, 660, or 22.7%, were alcohol related according to the observation of the reporting officer. Single vehicle accidents accounted for 846 of the injury accidents, and of these 302, or 35.7%, were alcohol related. In contrast, only 17.9% of the 1,874 multi-vehicle injury crashes were alcohol related, while only 12.1% of the 182 pedestrian accidents involved a drinking driver. These data are shown in Table 13.

Table 13

Percentage of Alcohol Related Injury Accidents in Fairfax County in 1975

| | No. Accidents | No. Alcohol Related | % Alcohol Related |
|---|---|---|---|
| Single Vehicle | 846 | 303 | 35.7% |
| Multi-Vehicle | 1,874 | 336 | 17.9% |
| Pedestrian | 182 | 22 | 12.1% |
| Total | 2,902 | 660 | 22.7% |

## Characteristics of Injury Accidents by Time of Day

Most of the ASAP patrol activity is focused on the late night and early morning hours on the assumption that most accidents, particularly alcohol related accidents, occur during those hours. The data in Tables 14 through 16 seem to support that assumption. As shown in Table 14, 863, or 31.7%, of the injury accidents occurred during the hours 8 p.m. to 4 a.m. These late night accidents account for 51.4% of single vehicle injury crashes and only 22.8% of all multi-vehicle injury crashes. It should be noted that these figures are somewhat higher than those for previous years. For example, the average percentage of all crashes occurring between 8 p.m. and 4 a.m. for the pre-ASAP period (1968-1971) was 30.7%, while 44.4% of all single vehicle accidents and 24.2% of all multi-vehicle accidents occurred during the late night hours. During the previous three ASAP years the average percentage had dropped to 28% of all injury accidents, 42.5% of the single vehicle accidents, and 21.4% of the multi-vehicle accidents. Thus, while it appears that there were fewer nighttime accidents during the first three years of the ASAP than in prior years, that trend was reversed in 1975.

Trends involving alcohol related injury crashes are even more dramatic (see Table 15). For 1975, 71.3% of the alcohol related injury crashes in Fairfax County occurred during the 8 p.m. to 4 a.m. time period. Almost 86% of the single vehicle alcohol related crashes occurred during this period compared to 58.3% of the multi-vehicle crashes. Once again, the figures represent a change from previous years. During the pre-ASAP period only 66.3% of the alcohol related injury accidents occurred during these hours, including 71.8% of the single vehicle crashes and 61.6% of the multi-vehicle accidents. During the first three years of the ASAP these proportions had dropped to 64.5% of the total, 69.8% of the single vehicle, and 59.8% of the multi-vehicle alcohol related injury crashes. Again, the most change appears to have occurred within single vehicle accidents.

Data shown in Table 16 indicate that the proportion of injury accidents that were alcohol related rose considerably in 1975, once again because of a shift in single vehicle crash characteristics; 23.5% of all the injury accidents were alcohol related in 1975 compared to 22.0% in the pre-ASAP period, and 20.1% during the first three years of the ASAP. For the 8 p.m.-4 a.m. accidents, 52.7% were alcohol related in 1975 compared to 47.5% for 1968-1971, and 46.3% from 1972-1974. Most of this change is attributable to single vehicle accidents. The proportion of alcohol related multi-vehicle injury accidents did not change much during those years. For single vehicle crashes however, the proportion that were alcohol related jumped to 35.7% in 1975 compared to an average of 31.6% in prior years; for the 8 p.m.-4 a.m. accidents, the percentage rose to 59.5% compared to 51.0% before the ASAP and 49.0% during the early ASAP years.

Table 14

Porportion of Injury Accidents During ASAP Patrol Hours in Fairfax County 1968-1975

Single Vehicle

| | No. Accidents | Accidents 8 p.m.-4 a.m. | % 8 p.m.-4 a.m. |
|---|---|---|---|
| 1968 | 929 | 404 | 43.4% |
| 1969 | 951 | 433 | 45.5% |
| 1970 | 976 | 421 | 43.1% |
| 1971 | 1056 | 483 | 45.7% |
| 1968-71 Avg. | 978 | 435 | 44.4% |
| 1972 | 981 | 407 | 41.4% |
| 1973 | 1103 | 470 | 42.6% |
| 1974 | 1206 | 525 | 43.5% |
| 1972-74 Avg. | 1097 | 467 | 42.5% |
| 1975 | 846 | 435 | 51.4% |

Multi-Vehicle

| | No. Accidents | Accidents 8 p.m.-4 a.m. | % 8 p.m.-4 a.m. |
|---|---|---|---|
| 1968 | 1847 | 473 | 25.6% |
| 1969 | 1979 | 494 | 24.0% |
| 1970 | 2161 | 509 | 23.5% |
| 1971 | 2277 | 531 | 23.3% |
| 1968-71Avg. | 2066 | 502 | 24.2% |
| 1972 | 2426 | 513 | 21.1% |
| 1973 | 2529 | 528 | 20.8% |
| 1974 | 2312 | 519 | 22.4% |
| 1972-74 Avg. | 2422 | 520 | 21.4% |
| 1975 | 1874 | 428 | 22.8% |

Table 15

Proportion of Alcohol Related Injury Accidents During ASAP Patrol Hours in Fairfax County 1968-1975

Single Vehicle

| | A/R No. Accidents | A/R No. Accidents 8 p.m.-4 a.m. | A/R Crashes % 8 p.m.-4 a.m. |
|---|---|---|---|
| 1968 | 307 | 210 | 68.4% |
| 1969 | 296 | 214 | 72.3% |
| 1970 | 312 | 219 | 70.2% |
| 1971 | 322 | 244 | 75.8% |
| Avg. 1968-71 | 309 | 222 | 71.8% |
| 1972 | 264 | 179 | 67.8% |
| 1973 | 326 | 233 | 71.5% |
| 1974 | 394 | 276 | 70.1% |
| Avg. 1972-74 | 328 | 229 | 69.8% |
| 1975 | 302 | 259 | 85.8% |

Multi-Vehicle

| | A/R No. Accidents | A/R No. Accidents 8 p.m. - 4 a.m. | A/R % 8 p.m. - 4 a.m. |
|---|---|---|---|
| 1968 | 357 | 215 | 60.2% |
| 1969 | 352 | 222 | 63.1% |
| 1970 | 365 | 225 | 61.6% |
| 1971 | 373 | 228 | 61.1% |
| Avg. 1968-71 | 362 | 223 | 61.6% |
| 1972 | 355 | 214 | 60.3% |
| 1973 | 400 | 219 | 54.8% |
| 1974 | 389 | 251 | 64.5% |
| Avg. 1972-74 | 381 | 228 | 59.8% |
| 1975 | 336 | 196 | 58.3% |

Table 16

Porportion of Alcohol Related Injury Accidents in Fairfax County 1968-1975 by Time of Day

Single Vehicle

| | No. Accidents | No. A/R | % A/R | No. Accidents 8 p.m.-4 a.m. | No. A/R | % A/R |
|---|---|---|---|---|---|---|
| 1968 | 929 | 307 | 33.0% | 404 | 210 | 52.0% |
| 1969 | 957 | 296 | 31.1% | 433 | 214 | 49.4% |
| 1970 | 976 | 312 | 32.0% | 421 | 219 | 52.0% |
| 1971 | 1056 | 322 | 30.5% | 483 | 244 | 50.5% |
| Avg. 1968-71 | 978 | 309 | 31.6% | 435 | 222 | 51.1% |
| 1972 | 981 | 264 | 26.9% | 407 | 179 | 44.0% |
| 1973 | 1103 | 326 | 29.6% | 470 | 233 | 49.6% |
| 1974 | 1206 | 394 | 32.7% | 525 | 276 | 52.6% |
| Avg. 1972-74 | 1097 | 328 | 29.9% | 467 | 229 | 49.0% |
| 1975 | 846 | 302 | 35.7% | 435 | 259 | 59.5% |

Multi-Vehicle

| | No. Accidents | No. A/R | % A/R | No. Accidents 8 p.m.-4 a.m. | No. A/R | % A/R |
|---|---|---|---|---|---|---|
| 1968 | 1847 | 357 | 19.3% | 473 | 215 | 45.5% |
| 1969 | 1979 | 352 | 17.8% | 494 | 222 | 44.9% |
| 1970 | 2161 | 365 | 16.9% | 509 | 225 | 44.2% |
| 1971 | 2277 | 373 | 16.4% | 531 | 228 | 42.9% |
| Avg. 1968-71 | 2066 | 362 | 17.5% | 503 | 223 | 44.4% |
| 1972 | 2426 | 355 | 14.6% | 513 | 214 | 41.7% |
| 1973 | 2529 | 400 | 15.8% | 528 | 219 | 41.5% |
| 1974 | 2312 | 389 | 16.8% | 519 | 251 | 48.4% |
| Avg. 1972-74 | 2422 | 381 | 15.7% | 520 | 228 | 43.9% |
| 1975 | 1874 | 336 | 17.9% | 428 | 196 | 45.8% |

## Characteristics of Injury Accidents by Day of the Week

Data in Table 17 indicate that there has been very little change over time in the proportion of accidents which occur on weekends. It appears that slightly over 50% of all single vehicle injury accidents occur on weekends in Fairfax County, while slightly less than 50% of the multi-vehicle crashes occur then. There has been virtually no change during the ASAP period. Nor has there been much change in the proportion of alcohol related injury accidents which occur on weekends as seen in Table 18. The proportion has been slightly over 60% for both single and multi-vehicle crashes since 1968, though there was a rise to 66.2% of the single vehicle accidents in 1975.

Table 19 displays data on the proportion of injury accidents that were alcohol related. It should be observed that a larger percentage of the single vehicle injury crashes in 1975 were alcohol related than in any previous year. This was true both for weekend accidents and for total accidents. Thus, it appears that the ASAP has had no effect in reducing the proportion of alcohol related injury accidents on weekends (or in the late night hours), at least for single vehicle accidents. This is so in spite of the fact that weekends and late night hours are the prime targets for ASAP patrol activity.

Table 17

Proportion of Injury Accidents Occurring on Weekends
In Fairfax County 1968-1975

Single Vehicle

| | No. Accidents | No. Accidents Fri., Sat. & Sun. | % Fri., Sat., &Sun. |
|---|---|---|---|
| 1968 | 929 | 501 | 53.9% |
| 1969 | 951 | 503 | 52.9% |
| 1970 | 976 | 487 | 49.9% |
| 1971 | 1056 | 565 | 53.5% |
| Avg. 1968-71 | 978 | 514 | 52.6% |
| 1972 | 981 | 489 | 49.8% |
| 1973 | 1103 | 557 | 50.5% |
| 1974 | 1206 | 640 | 53.1% |
| Avg. 1972-74 | 1097 | 562 | 51.2% |
| 1975 | 846 | 445 | 52.6% |

Multi-Vehicle

| | No. Accidents | No. AccidentsFri., Sat. & Sun | % Fri., Sat., & Sun. |
|---|---|---|---|
| 1968 | 1847 | 908 | 49.2% |
| 1969 | 1979 | 972 | 49.1% |
| 1970 | 2161 | 978 | 45.3% |
| 1971 | 2277 | 1071 | 47.0% |
| Avg. 1968-71 | 2066 | 982 | 47.5% |
| 1972 | 2426 | 1158 | 47.7% |
| 1973 | 2529 | 1137 | 45.0% |
| 1974 | 2312 | 1048 | 45.3% |
| Avg. 1972-74 | 2423 | 1114 | 46.0% |
| 1975 | 1874 | 857 | 45.7% |

Table 18

Proportion of Alcohol Related Injury Accidents Occurring on Weekends in Fairfax County 1968 to 1975

Single Vehicle

| | No. A/R Accidents | A/R No. Accidents Fri., Sat., & Sun. | % A/R Accidents Fri., Sat., & Sun. |
|---|---|---|---|
| 1969 | 307 | 194 | 63.2% |
| 1969 | 296 | 185 | 62.5% |
| 1970 | 312 | 190 | 60.9% |
| 1971 | 322 | 203 | 63.0% |
| Avg. 1968-71 | 309 | 193 | 62.5% |
| 1972 | 264 | 169 | 64.0% |
| 1973 | 326 | 201 | 61.7% |
| 1974 | 394 | 241 | 61.2% |
| Avg. 1972-74 | 328 | 204 | 62.2% |
| 1975 | 302 | 200 | 66.2% |

Multi-Vehicle

| | No. A/R Accidents | A/R No. Accidents Fri., Sat., & Sun, | % A/R Accidents Fri., Sat., & Sun. |
|---|---|---|---|
| 1968 | 357 | 222 | 62.2% |
| 1969 | 352 | 227 | 64.5% |
| 1970 | 365 | 221 | 60.5% |
| 1971 | 373 | 234 | 62.7% |
| Avg. 1968-71 | 362 | 226 | 62.4% |
| 1972 | 355 | 241 | 67.9% |
| 1973 | 400 | 249 | 62.3% |
| 1974 | 389 | 249 | 64.0% |
| Avg. 1972-74 | 381 | 246 | 64.6% |
| 1975 | 336 | 203 | 60.4% |

Table 19

Proportion of Injury Accidents That Were Alcohol Related In Fairfax County 1968-1975 by Day of Week

Single Vehicle

| | No. Accidents | No. A/R | % A/R | No. Weekend | No. A/R Weekend | % A/R Weekend |
|---|---|---|---|---|---|---|
| 1968 | 929 | 307 | 33.0% | 501 | 194 | 38.7% |
| 1969 | 951 | 296 | 31.1% | 503 | 185 | 36.8% |
| 1970 | 976 | 312 | 32.0% | 487 | 190 | 39.0% |
| 1971 | 1056 | 322 | 30.5% | 565 | 203 | 35.9% |
| Avg. 1968-71 | 978 | 309 | 31.6% | 514 | 193 | 37.5% |
| 1972 | 981 | 264 | 26.9% | 489 | 169 | 34.6% |
| 1973 | 1103 | 326 | 29.6% | 557 | 201 | 36.1% |
| 1974 | 1206 | 394 | 32.7% | 640 | 241 | 37.7% |
| Avg. 1972-74 | 1097 | 328 | 29.9% | 562 | 204 | 36.3% |
| 1975 | 846 | 302 | 35.7% | 445 | 200 | 44.9% |

Multi-Vehicle

| | No. Accidents | No. A/R | % A/R | No. Weekend | No. A/R Weekend | % A/R Weekend |
|---|---|---|---|---|---|---|
| 1968 | 1847 | 357 | 19.2% | 908 | 222 | 24.4 |
| 1969 | 1979 | 352 | 17.8% | 972 | 227 | 25.0 |
| 1970 | 2161 | 365 | 16.9% | 978 | 221 | 22.6% |
| 1971 | 2277 | 373 | 16.4% | 1071 | 234 | 21.8% |
| Avg. 1968-71 | 2066 | 362 | 17.5% | 982 | 226 | 23.0% |
| 1972 | 2426 | 355 | 14.6% | 1158 | 241 | 20.8% |
| 1973 | 2529 | 400 | 15.8% | 1137 | 249 | 21.9% |
| 1974 | 2312 | 389 | 16.8% | 1048 | 249 | 23.8% |
| Avg. 1972-74 | 2423 | 381 | 15.7% | 1114 | 246 | 22.1% |
| 1975 | 1874 | 336 | 17.9% | 857 | 203 | 23.7% |

## TRENDS IN BLOOD ALCOHOL CONCENTRATIONS OF DRIVERS ARRESTED FOR DRIVING WHILE INTOXICATED

The Fairfax ASAP initiated its enforcement countermeasures on February 1, 1972. Throughout its first year, the number of drivers arrested for driving while intoxicated increased steadily. During the 11 months 2,976 drivers were arrested for DWI, with the numbers of arrests being 506, 669, 767, and 1,034, respectively, for the four quarters of 1972. During 1973, the number of arrests increased over 1972, but gradually declined each quarter. Of the 3,777 persons arrested, 3,245 had BAC tests. The quarterly totals for arrests were 1,061, 943, and 885, respectively. In 1974 BAC tests were given to 3,051 of the 3,531 drivers arrested. The quarterly arrest figures were 871, 829, 859, and 972. Finally, in 1975, 3,334 of the 3,615 drivers arrested took BAC tests, the total quarterly arrest figures being 969, 900, 754, and 711, respectively. The distribution of BAC's of those arrested for DWI by arrest category is shown in Table 20. It should be noted that between 87% and 92% of the arrests for which BAC's were available were in the non-crash category, and it is this category which is used as the basis for determining any trends in BAC's of arrested drivers.

The average BAC's for the non-crash arrests were determined for each month of the ASAP operations. These monthly averages are shown in Table 21.

Table 20

Distribution of Driver BAC's by Arrest Category

| Arrest Category | BAC's - 1972 | BAC's - 1973 | BAC's 1974 | BAC's 1975 |
|---|---|---|---|---|
| Fatal Crash | 1 ( 0%) | 1 ( 0%) | 0 ( 0%) | 9 ( 0%) |
| Injury Crash | 57 ( 2%) | 82 ( 2%) | 114 ( 4%) | 113 ( 3%) |
| Property Damage | 150 ( 6%) | 220 ( 7%) | 289 ( 9%) | 335 (10%) |
| Non-Crash | 2,347 (92%) | 2,942 (91%) | 2,648 (87%) | 2886 (87%) |

Table 21

Average BAC's of Non-Crash Arrests — Yearly Average

| Month | 1972 | 1973 | 1974 | 1975 | Month | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|---|---|---|---|
| January | - | .17% | .17% | .16% | July | .19% | .17% | .17% | .16% |
| February | .19% | .19% | .18% | .16% | August | .20% | .17% | .16% | .15% |
| March | .17% | .18% | .18% | .16% | September | .21% | .17% | .17% | .16% |
| April | .20% | .18% | .18% | .16% | October | .19% | .17% | .17% | .16% |
| May | .19% | .16% | .19% | .17% | November | .20% | .16% | .18% | .16% |
| June | .19% | .17% | .18% | .16% | December | .19% | .17% | .19% | .17% |

The presumptive level for DWI was lowered from 0.15% to 0.10% on July 1, 1972. Even with the lowering of the presumptive level and the increased enforcement contributing to greater numbers of DWI arrests each quarter, the average BAC remained about the same in 1972. In 1972 the average BAC was .19% compared with .17% in 1973, .18% in 1974, and .16% in 1975.

The distributions of BAC's for the first and twelfth quarters of ASAP operations are shown in Table 22. The distribution of BAC's for Quarter 1 was compared with that of Quarter 16 through the use of the chi-square technique. The hypothesis that the two distributions did not differ must be rejected since the calculated chi-square of 90.20 greatly exceeded the value necessary for statistical significance at the 99% confidence level. This calculation confirms the previous conclusion that the BAC's of arrested drivers were significantly lower during Quarter 12 than in Quarter 1. However, the lowering of the average BAC of arrested drivers by .02-.03% must be interpreted in the proper perspective, which considers that the presumptive limit for DWI was statutorily lowered .05% during the same period.

Table 22

BAC Distribution by Quarter

| BAC Category | Quarter 1 | Quarter 16 |
|---|---|---|
| 0% - .14% | 61 | 341 |
| .15% - .19% | 149 | 273 |
| .20% - .24% | 128 | 135 |
| .25% + | 55 | 92 |

$X^2 = 90.20$, $p < .001$

## TRENDS IN PUBLIC INFORMATION AND AWARENESS OF ASAP AND THE DRINKING DRIVING PROBLEM

One of the countermeasures in the Fairfax ASAP is Public Information and Education. There have been numerous media events specifically dealing with the Fairfax ASAP, but in addition, the national advertising of "Get the Problem Drinker Off the Road" has received broad exposure in the Fairfax area. As a result, there is a confounding factor which makes it difficult to separate the effect of the local ASAP publicity from the national publicity.

The sources of information concerning public information in the past have been the ASAP roadside and household surveys. However, during 1975 the household survey was dropped in favor of a telephone survey. Because the telephone survey was designed for a different purpose than the household survey, the questions asked were not the same as had been asked in the household survey. Consequently, a comparison between the results of this year's survey with the pre-ASAP survey; used in earlier reports to ascertain the effectiveness of the information campaign, cannot be used for 1975. Instead, the results of this year's telephone survey are presented simply to show the areas that still need improvement. In addition, results of some of the information oriented portions of the roadside survey are included to give some idea of the change across time that may have occurred during the ASAP information campaign and to buttress the findings of the telephone survey.

### Telephone Survey Results

Though most of the questions asked in the telephone survey had not been included in the earlier household surveys, there were two questions that were the same. The first was "Have you heard of a program that is trying to reduce alcohol related traffic deaths." The answers to this question, shown in Table 23, indicate that awareness of the ASAP has not increased significantly from the baseline period, and has actually decreased somewhat since 1974. During the year before the ASAP began in Fairfax county 47% of the respondents had heard of some sort of alcohol countermeasures campaign. By 1974 this proportion had risen to 53%. However, in June 1975 only 48% had heard of a program, and in December a similar proportion answered "Yes." When questioned concerning sponsorship of the program, the largest group of respondents in each survey could not recall the name (see Table 24). In all but the baseline household survey, the next largest group of respondents named the ASAP, while between 11% and 16% named some other alcohol program. However, the percentage of respondents naming the ASAP has been decreasing across time, from 19% in 1974 to 13.2% in December of 1975. This decrease in awareness of the ASAP program would indicate that the public information and education countermeasure has become less successful in publicizing the existence of the Fairfax ASAP.

Table 23

"Have You Heard of a Program that is Trying to Reduce Alcohol Related Traffic Deaths?"

| Response | Household Surveys 1971 | | Telephone Surveys 1974 | |
|---|---|---|---|---|
| Yes | 236 (47%) | 263 (53%) | 240 (48.0%) | 243 (48.6%) |
| No | 262 (52%) | 237 (47%) | 258 (51.6%) | 257 (51.4%) |
| Refused | - | - | 2 (0.4%) | - |

Table 24

"Do You Recall What Agency or Organization Is Sponsoring the Program?"

| Response | Household Surveys 1971 | Household Surveys 1974 | Telephone Surveys June 1975 | Telephone Surveys December 1975 |
|---|---|---|---|---|
| ASAP | 15 (3%) | 78 (19%) | 82 (16.4%) | 66 (13.2%) |
| Other | 77 (15%) | 82 (16%) | 55 (11.0%) | 58 (11.6%) |
| Can't recall | 109 (22%) | 101 (20%) | 100 (20.0%) | 188 (23.6%) |
| Had not heard of a program | 264 (53%) | 238 (48%) | 263 (52.6%) | 258 (51.6%) |
| No response | 35 (7%) | 1 (0%) | - | - |

Most of the questions in the telephone survey were aimed at the attitudes of the respondent toward alcohol and drinking drivers rather than at his knowledge level. For example, the respondents were asked whether they agreed with the statement: "It's a person's responsibility as a good citizen to stop a friend or relative from driving when drunk." Over 98% of the respondents in both surveys agreed with that statement while nearly 90% agreed that "when friends are involved, a person should be willing to take even physical action to stop the person from driving drunk."

To check these attitudes the respondents were also asked whether they had been in a situation in which a friend was about to drive after drinking too much and, if so, whether they had stopped him from driving. Twenty-five percent (254 of 1,000) said that they had been in such a situation and 70% of these (179 of 254) said they had stopped the driver. The most often used method for stopping the person from driving was to drive him home, though offering a room for the night and taking away his keys were also frequently used methods (see Table 25).

Table 25

"What Action Did You Take to Stop the Driver?"

| | Number | Percent | Rank |
|---|---|---|---|
| Drove the person home | 75 | 42.4% | 1 |
| Offered to drive | 20 | 11.3% | 2 |
| Offered a room for the night | 20 | 11.3% | 3 |
| Called a taxi | 4 | 2.3% | 8 |
| Took the persons keys | 17 | 9.6% | 4 |
| Restrained the person | 12 | 6.8% | 7 |
| Got another to help restrain the person | 13 | 7.3% | 6 |
| Gave the person coffee | 0 | - | |
| Gave the person food | 0 | - | |
| Other | 16 | 9.0% | 5 |
| Had not been in a drinking situation | 823 | | |

It is interesting that the actions taken by respondents actually in a drunk driving situation varied somewhat from the actions which most of the respondents in the survey said they would be likely to take. Each respondent was asked how likely he would be to take a particular action if he were confronted with the situation of a friend about to drive after having too much to drink (those respondents who had not been in a drinking situation in the past 3 months were excluded from the results). A choice of four answers — extremely likely, very likely, somewhat likely, and not at all likely — was given. In order to rank the possible actions by preference a mean response was calculated for each question. The results, shown in Table 26, indicate that most respondents would prefer to drive the person home or to ask him to spend the night, a result consistent with the actions taken by respondents who had been in the situation. However, the preference

expressed for calling a taxi is inconsistent with actions taken; and the apparent distaste for the physical actions of taking away keys or restraining the person is not supported by the fact that when actually faced with the situation almost 10% of the respondents did take away the person's keys and over 14% either restrained the person or got help to restrain him. Whether these variations are due to the slightly different group responding to the questions is not clear.

Finally, the respondents were asked whether they would support various actions to alleviate the drunk driving problem. The replies indicated overwhelming support for greater police enforcement of drunk driving laws and for public information campaigns about drunk driving, and strong support for more severe penalties for drunk drivers (see Table 27).

Table 26

Preference for Actions to Stop Drinker From Driving

| Method | Mean Response | Order of Preference |
|---|---|---|
| Drive person home | 3.64 | 1 |
| Ask person to stay overnight | 3.32 | 2 |
| Call a taxi for the person | 2.56 | 3 |
| Take the person's keys away | 2.33 | 4 |
| Get assistance to restrain the person | 2.21 | 5 |

Table 27

Support for Actions to Alleviate Drunk Driving Problems

| | Support | | | | No |
|---|---|---|---|---|---|
| | Yes | % | No | % | Response |
| Greater police enforcement of drunk driving laws | 919 | 91.9% | 79 | 7.9% | 2 |
| Public information campaigns about drunk driving | 905 | 90.5% | 94 | 9.4% | 1 |
| More severe penalties for drunk drivers | 722 | 72.2% | 252 | 25.2% | 26 |

## Roadside Survey Results

While most of the questions contained in the roadside survey questionnaire are aimed at determining total project impact, three questions are aimed at determining the respondent's knowledge of the drinking and driving laws in Virginia and how they relate to drinking. Since these questions have remained the same through the five annual roadside surveys, the answers should give some indication of the information campaign's effectiveness over time.

Respondents were first asked to define the term "Blood Alcohol Concentration" (see Table 28). The distribution of correct and incorrect answers to this question has changed significantly across surveys ($X^2 = 88.42$, $p < .001$) and the percentage of correct responses noted during the most recent survey is significantly higher than that noted during the fourth ($X^2 = 23.66$, $p < .001$). However, while the 1975 percentage of correct responses is significantly higher than that during the baseline survey, it is not as high as the percentage answering correctly during the third survey in 1973.

Table 28

Definition of Blood Alcohol Concentration
1971-1975

| Definition | Baseline Survey | Second Survey | Third Survey | Fourth Survey | Fifth Survey |
|---|---|---|---|---|---|
| Substantially Correct | 1,075 (68.3%) | 1,066 (72.6%) | 1,230 (80.8%) | 1,960 (70.3%) | 1,312 (76.9%) |
| Wrong or Don't Know | 499 (31.7%) | 402 (27.4%) | 293 (19.2%) | 830 (29.7%) | 394 (23.1%) |

After being told the correct definition of Blood Alcohol Concentration, respondents were asked to identify the BAC level which constituted the presumptive limit for drunk driving in Virginia (see Table 29). Again, the distribution of answers has changed significantly over time ($X^2 = 610.91$, $p < .001$). As with the previous item, the peak in the percentage of respondents answering correctly occurred during the third survey and tapered off during the fourth. However, whereas knowledge of BAC definition increased between 1974 and 1975, knowledge of the presumptive limit decreased slightly.

Table 29

Presumptive Level for Drunken Driving in Virginia
1971-1975

| BAC Level | Baseline Survey | Second Survey | Third Survey | Fourth Survey | Fifth Survey |
|---|---|---|---|---|---|
| Any Trace | 29 ( 1.8%) | 23 ( 1.6%) | 30 ( 2.0%) | 34 ( 1.2%) | 41 ( 2.4%) |
| .05% | 182 (11.6%) | 242 (16.4%) | 212 (13.9%) | 432 (15.4%) | 358 ( 20.7%) |
| .08% | 98 ( 6.2%) | 159 (10.8%) | 156 (10.2%) | 206 ( 7.4%) | 207 (12.0%) |
| .10% | 161 (10.2%) | 308 (20.8%)* | 394 (25.9%)* | 684 (24.4%)* | 406 (23.5%)* |
| .12% | 81 ( 5.1%) | 102 ( 6.9%) | 57 ( 3.7%) | 85 ( 3.0%) | 105 ( 6.1%) |
| .15% | 299 (19.0%)* | 106 ( 7.2%) | 72 ( 4.7%) | 120 ( 4.3%) | 86 ( 5.0%) |
| .20% | 48 ( 3.1%) | 54 ( 3.6%) | 40 ( 2.6%) | 64 ( 2.3%) | 52 ( 3.0%) |
| Don't Know | 676 (43.0%) | 484 (32.7%) | 563 (37.0%) | 1,175 (42.0%) | 472 (27.3%) |

In the third question, respondents were asked how many drinks they would have to consume in order to be above the presumptive limit (see Table 30). The mean estimation for the baseline survey was 4.77 drinks. The estimated number of drinks needed decreased across time until 1974, when it was estimated that 3.54 drinks would put the subject over the legal limit of .10%. During the 1975 survey, essentially the same estimation was made. While this mean estimation is indicative of changes over time, it leaves an additional unaccounted for source of variance in the responses. Since the question is phrased personally ("How many drinks do you think you would have to have..."), the correct answers would be different for each person depending on his weight. In order to remove this variance, each respondent's weight was checked and the correct answer calculated and compared to the respondent's answer. These results are shown in Table 31. A majority of the respondents in each category underestimated the number of drinks needed while very few answered correctly or overestimated the number. The most variance appeared in the respondents' willingness to admit that they didn't know how many drinks were necessary. Although this underestimation may be preferable in terms of avoidance of drinking and driving, the public is still operating under a misconception. This misconception may reduce the ASAP's credibility when the drinker assesses his ability to drive after only 3½ drinks and is then told that he should be unable to drive when over the legal limit, which he interprets as being more than 3½ drinks.

Table 30

Drinks Necessary for Respondent to Reach Presumptive Level

| Drinks | Baseline Survey | Second Survey | Third Survey | Fourth Survey | Fifth Survey |
|---|---|---|---|---|---|
| 1 or Less | 85 ( 5.4%) | 136 ( 9.2%) | 112 ( 7.4%) | 245 ( 8.7%) | 145 ( 8.4%) |
| 2 | 136 ( 8.6%) | 214 (14.5%) | 221 (14.5%) | 487 (17.4%) | 353 (20.4%) |
| 3 | 207 (13.2%) | 235 (16.0%) | 245 (16.1%) | 600 (21.4%) | 413 (23.9%) |
| 4 | 202 (12.8%) | 149 (10.1%) | 197 (12.9%) | 395 (14.1%) | 254 (14.7%) |
| 5 | 125 ( 7.9%) | 106 ( 7.2%) | 87 ( 5.7%) | 168 ( 6.0%) | 107 ( 6.2%) |
| 6 | 131 ( 8.3%) | 121 ( 8.2%) | 88 ( 5.8%) | 149 ( 5.3%) | 130 ( 7.5%) |
| 7 | 47 ( 3.0%) | 27 ( 1.8%) | 24 ( 1.6%) | 27 ( 1.0%) | 24 ( 1.4%) |
| 8 | 58 ( 3.7%) | 32 ( 2.2%) | 52 ( 3.4%) | 28 ( 1.0%) | 29 ( 1.7%) |
| 9 | 23 ( 1.5%) | 4 ( 0.3%) | 12 ( 0.8%) | 15 ( 0.5%) | 6 ( 0.3%) |
| 10 or More | 122 ( 7.8%) | 72 ( 4.9%) | 56 ( 3.7%) | 93 ( 3.3%) | 58 ( 3.3%) |
| Don't Know | 438 (27.8%) | 377 (25.6%) | 428 (28.1%) | 597 (21.3%) | 209 (12.1%) |
| Average = | 4.77 drinks | 3.94 drinks | 3.92 drinks | 3.54 drinks | 3.50 drinks |

Table 31

Correct Number of Drinks Needed to Achieve a BAC ≥ .10%
(By Weight) by the Correctness
of the Respondent's Answer

1975

RESPONDENT'S ANSWER

| Correct Number of Drinks by Weight | Less Than The Correct Number | Correct Number | More Than The Correct Number | Don't Know |
|---|---|---|---|---|
| 4 | 297 (66.3%) | 60 (13.4%) | 49 (10.9%) | 42 ( 9.4%) |
| 5 | 531 (67.8%) | 51 ( 6.5%) | 114 (14.6%) | 87 (11.1%) |
| 6 | 268 (65.5%) | 45 (11.0%) | 42 (10.3%) | 54 (13.2%) |
| 7 | 51 (58.6%) | 2 ( 2.3%) | 8 ( 9.2%) | 26 (29.9%) |
| Of The Total | 66.4% | 9.2% | 12.3% | 12.1% |

## Societal Costs in Fairfax

In order to qualify as a completely successful undertaking, the Fairfax ASAP project will not only have to produce a measurable improvement in traffic crash data but such quantified benefits will have to outweigh the cost of producing them.

CY 1972 = $796,243.
CY 1973 = 858,119.
CY 1974 - 880,496.
CY 1975 = 896,945.
Total 4 Year Cost = $3,431,803

Societal costs of motor vehicle crashes computed for the baseline period and for the three years of project operations are shown in Table 32.

Table 32

Fairfax ASAP Societal Costs of Autc Crashes

| Year | Fatalities | Injuries | Property Damage Crashes |
|---|---|---|---|
| 1969 | 60 | 4,165 | 10,331 |
| 1970 | 63 | 4,465 | 11,519 |
| 1971 | 100 | 4,756 | 12,501 |
| 1972 | 85 | 4,795 | 13,850 |
| 1973 | 78 | 5,032 | 14,511 |
| 1974 | 63 | 4,899 | 13,904 |
| 1975 | 61 | 5,206 | 11,178 |

Societal Costs for Each Year

$1969_{L1}$ = 60 x ($201,000) + 4,165 x ($7,300) + 10,331 x ($300) = $45,563,800
$1970_{L2}$ = 63 x ($201,000) + 4,465 x ($7,300) + 11,519 x ($300) = $48,713,200
$1971_{L3}$ = 100 x ($201,000) + 4,765 x ($7,300) + 12,501 x ($300) = $58,569,100
$1972_{L4}$ = 85 x ($201,000) + 4,795 x ($7,300) + 13,850 x ($300) = $56,243,000
$1973_{L5}$ = 78 x ($201,000) + 5,032 x ($7,300) + 14,511 x ($300) = $56,764,900
$1974_{L6}$ = 63 x ($201,000) + 4,899 x (7,300) + 13,904 x ($300) = $52,596,900
$1975_{L7}$ = 60 x ($201,000) + 5,206 x (7,300) + 11,178 x ($300) = $53,417,200

One of the most simple methods of benefit/cost analysis is a calculation of the "break-even" rate. The break-even rate is computed as the ratio of benefits to costs necessary to effect a "break-even" point. Using 1969, 1970, and 1971 data (which reduces the significance of the extraordinary high fatality figure of 1971) to estimate the break-even point for 1972, 1973, and 1974 yields the following figures:

$$\text{Approximate ASAP Costs} = \frac{2,534,858}{152,846,100} = 0.0166$$

Thus the ASAP in the four-year (1972-1975) period would have to achieve a reduction in total accident costs of 1.66% to "break-even" in the business sense. In fact, however, it was found that total accident costs increased slightly in 1972-1974 over the 1969-1971 period. Costs for the latter were $51 million per year while the 1972-1975 costs were almost 55 million per year a cost increase of some $4 million per year.

Break-even analysis, however, does not account for the increases in accident exposure that occurred in the 1972-1975 period. Hence, even though costs were greater during the ASAP period than during the baseline period, it is possible that accident costs were less than otherwise would have been expected. Hence projections of expected accident figures based on the 1962-1971 crash trends, shown in the first section of this report, should be used in estimating accident costs and program benefits, if any, from the Fairfax ASAP.

Table 33 shows estimated societal costs of traffic crashes in Fairfax based upon projections made from the linear regression model of section one.

Table 33

Estimated Fairfax Societal Costs Based on Linear Regression Model

$1972_{L4} = 88 \times (\$201,000) + 5,178\ (\$7,300) + 13,236 \times (\$300) = \$59,458,200$

$1973_{L5} = 93 \times (\$201,000) + 5,510\ (\$7,300) + 14,237 \times (\$300) = \$63,187,100$

$1974_{L6} = 92 \times (\$201,000) + 5,463\ (\$7,300) + 14,097 \times (\$300) = \$62,601,000$

$1975_{L7} = 96 \times (\$201,000) + 5,729\ (\$7,300) + 14,896 \times (\$300) = \$65,586,500$

It can be seen from the data in Table 33 that projected 1973-1975 costs in Fairfax, based on the ten-year trend, would be over $250 million if that trend were uninterrupted.

If, in fact, it can be demonstrated that reductions in traffic crashes are attributable to the Fairfax ASAP project, then savings in societal costs to the community are approximately $32 million, using a total projected cost for the four years of $251 million compared to the actual total cost of $219 million. Unfortunately, it is not possible to attribute the full $32 million savings to ASAP. Since few of the reductions in crashes were statistically significant it is not possible to demonstrate a positive benefit/cost ratio for any year except 1974 and 1975. For example, the figure $458,200,600 for 1972 was based on a projection at the 95% confidence interval; that projection of course covered a range of possible results, not just a single point. Using the same calculations shown in Table 33 for the lower and upper limits of the projected range shows that the 1972 projected cost could have fallen anywhere between $51,079,200 and $67,836,900 at the 95% level. Thus no definite benefit can be demonstrated even though the actual cost of $56 million was in the lower end of the range. The 1973 actual costs of $56 million also fell within the projected range of $54 million to $72 million. In 1974 the actual cost fell below the projected range at $52,596,000 actual compared to $53,828,500 at the lower end of the range. Thus at least a 1 million decrease was seen in 1974. In 1975, there was again a significant change as the actual cost of $53,618,200 was considerably below the $56,405,300 lower limit of the 95% interval. It is possible that the improvement from ASAP may be a delayed one; that is, since the positive benefits have appeared in later years, it is possible that the impact of the project is cumulative and is just now achieving full strength.

## Societal Cost in Control Community

Societal costs of motor vehicle crashes in Fairfax must be tested against trends in societal costs of crashes in a matched control community to provide indications of the impact of ASAP on the overall crash picture.

Societal costs of auto crashes in Henrico County are shown in Table 34.

It can be seen from Table 34 that while the trend in societal costs of crashes in Henrico is upward, the rate of increase is much more modest than in Fairfax, and it may be seen that in three years of the five for which data were obtained, costs actually declined over year earlier levels. Total societal costs for the years 1972 to 1974 were almost $74 million.

Table 34

Henrico County Societal Costs of Auto Crashes

| Year | Fatalities | Injuries | Property Damage Crashes |
|---|---|---|---|
| 1969 | 26 | 1,301 | 2,476 |
| 1970 | 26 | 1,313 | 2,668 |
| 1971 | 17 | 1,395 | 3,106 |
| 1972 | 25 | 1,594 | 3,445 |
| 1973 | 22 | 1,503 | 3,555 |
| 1974 | 40 | 1,545 | 3,321 |
| 1975 | 26 | 1,821 | 2,781 |

Societal Costs for Each Year

$1969_{L1}$ = 26 x ($201,000) + 1,301 x ($7,300) + 2,476x($300) = $15,466,100

$1970_{L2}$ = 26 x ($201,000) + 1,313 x ($7,300) + 2,668x($300) = $15,611,300

$1971_{L3}$ = 17 x ($201,000) + 1,395 x ($7,300) + 3,106x($300) = $14,532,300

$1972_{L4}$ = 25 x ($201,000) + 1,594 ($7,300) + 3,445x($300) = $17,694,700

$1973_{L5}$ = 22 x ($201,000) + 1,503 x ($7,300) + 3,555x($300) = $16,460,400

$1974_{L6}$ = 40 x ($201,000) + 1,545 x ($7,300) + 3,321x($300) = $20,314,800

$1975_{L7}$ = 26 x ($201,000) + 1,821 x ($7,300) + 2,781 x ($300) = $19,353,600

Table 35, again using the linear regression model of section one, shows the projected societal costs of motor vehicle crashes in Henrico for 1972-1974 based on prior crash trends.

Table 35

Estimated Henrico County Societal Costs Based on Linear Regression Model

$1972_{L4} = 24 \times (\$201,000) + 1,541 \times (\$7,300) + 3,069\ (\$300) = \$16,994,000$

$1973_{L5} = 24 \times (\$201,000) + 1,636 \times (\$7,300) + 3,253\ (\$300) = \$17,742,700$

$1974_{L6} = 24 \times (\$201,000) + 1,677 \times (\$7,300) = 3,331\ (\$300) = \$18,065,400$

$1975\ L_7 = 24 \times (\$200,000) + 1,737 \times (\$7,300) + 3,447 \times (\$300) = \$18,538,200$

Since the actual cost exceeded the projected cost in Henrico in every year except 1973 (and even in that year, the actual cost exceeded the lower range of the 95% confidence interval by almost $3 million), it is apparent that no cost benefit occurred in the control site.

Figures 7 and 8 show the yearly actual and projected costs graphically.

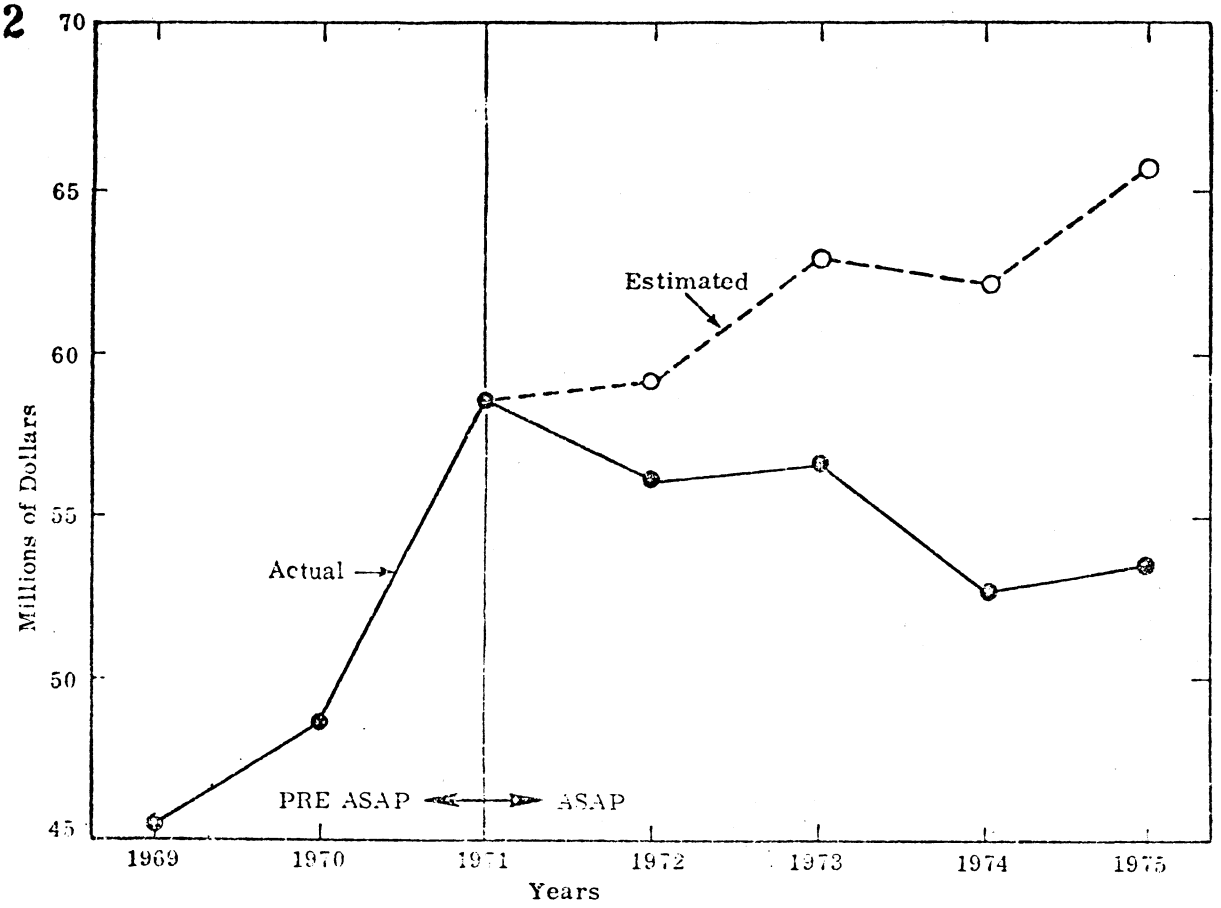


Figure 7. Actual and estimated societal cost of auto crashes in the Fairfax ASAP area.

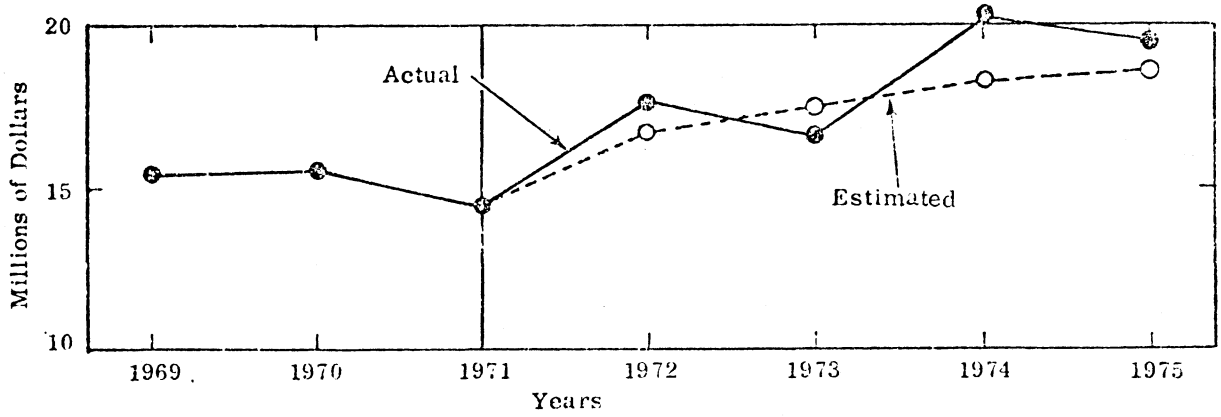


Figure 8. Actual and estimated societal cost of auto crashes in the Henrico area.

# APPENDIX A

## FAIRFAX ASAP AREA POPULATION

(Fairfax County, Fairfax City, Falls Church, Vienna, Herndon)

| | |
|---|---|
| 1962 | 304,021 |
| 1963 | 340,766 |
| 1964 | 360,587 |
| 1965 | 356,146 |
| 1966 | 376,149 |
| 1967 | 419,446 |
| 1968 | 453,396 |
| 1969 | 475,074 |
| 1970 | 487,763 |
| 1971 | 530,527 |
| 1972 | 535,872 |
| 1973 | 567,172 |
| 1974 | 572,641 |
| 1975 | 588,400 |

Sources:

1960-64 Statistical Abstract of Va. 1966

1965-69 Bureau of Population and Economic Research, U. Va.

1970 1970 Census; Commonwealth of Virginia; Virginia Department of Highways

1971-73 Planning Departments, Fairfax County and Fairfax City. Falls Church 1971 data are same as 1970 census.

1974-75 Statistics Department, Fairfax County. Planning Departments Fairfax City and Falls Church.

## FAIRFAX ASAP AREA MOTOR VEHICLE REGISTRATIONS

| | |
|---|---|
| 1962 | 109,463 |
| 1963 | 121,682 |
| 1964 | 132,776 |
| 1965 | 146,092 |
| 1966 | 156,353 |
| 1967 | 177,359 |
| 1968 | 191,649 |
| 1969 | 211,478 |
| 1970 | 224,016 |
| 1971 | 250,010 |
| 1972 | 277,339 |
| 1973 | 294,098 |
| 1974 | 322,624 |
| 1975 | 357,078 |

Sources:

Fairfax County; Mr. Ray Birch, Division of Finance Fairfax County, 1962-1973. 1974 and 1975, Miss Ann Davis, Div. of Finance.
Fairfax City; Mrs. Frances Cox, City of Fairfax, 1968-1975; 1962-1967 estimated by VH&TRC.
Falls Church; Mr. Eckert, city of Falls Church, 1962-1971; 1972 data estimated by VH&TRC, 1974 and 1975, Falls Church Treasurers Office

FAIRFAX ASAP AREA ANNUAL VEHICLE MILES OF TRAVEL
(000,000)

| | |
|---|---|
| 1957 | 688.7 |
| 1958 | 703.9 |
| 1959 | 789.1 |
| 1960 | 785.8 |
| 1961 | 859.3 |
| 1962 | 993.7 |
| 1963 | 1,134.1 |
| 1964 | 1,254.5 |
| 1965 | 1,710.5 |
| 1966 | 1,859.4 |
| 1967 | 1,954.0 |
| 1968 | 2,117.1 |
| 1969 | 2,392.7 |
| 1970 | 2,461.6 |
| 1971 | 2,716.6 |
| 1972 | 3,036.8 |
| 1973 | 3,272.8 |
| 1974 | 3,239.9 |
| 1975 | 3,428.1 |

Source:

Traffic and Safety Division, Virginia Department of Highways

HENRICO COUNTY POPULATION

| | |
|---|---|
| 1962 | 124,743 |
| 1963 | 128,445 |
| 1964 | 132,147 |
| 1965 | 135,849 |
| 1966 | 139,551 |
| 1967 | 143,253 |
| 1968 | 146,955 |
| 1969 | 150,651 |
| 1970 | 154,364 |
| 1971 | 158,066 |
| 1972 | 161,768 |
| 1973 | 165,470 |
| 1974 | 183,118 |
| 1975 | 190,106 |

Source:

1960-1970 Census Data. 1962-69 data are interpolated from the Census data; 1971-73 are extrapolated from 1970. 1974 Mr. Winter, Office of Advanced Planning, Henrico County.

HENRICO COUNTY ANNUAL VEHICLE MILES OF TRAVEL
(000,000)

| | |
|---|---|
| 1957 | 428.1 |
| 1958 | 447.0 |
| 1959 | 472.8 |
| 1960 | 487.9 |
| 1961 | 508.1 |
| 1962 | 530.2 |
| 1963 | 556.4 |
| 1964 | 585.4 |
| 1965 | 606.7 |
| 1966 | 659.1 |
| 1967 | 733.6 |
| 1968 | 800.9 |
| 1969 | 881.8 |
| 1970 | 932.4 |
| 1971 | 1,022.7 |
| 1972 | 1,085.0 |
| 1973 | 1,160.5 |
| 1974 | 1,192.3 |
| 1975 | 1,240.0 |

Source:

Traffic and Safety Division, Virginia Department of Highways

HENRICO COUNTY MOTOR VEHICLE REGISTRATIONS
(Rounded to Nearest 100)

| | |
|---|---|
| 1962 | 54,000 |
| 1963 | 57,000 |
| 1964 | 60,000 |
| 1965 | 65,000 |
| 1966 | 70,000 |
| 1967 | 75,000 |
| 1968 | 81,000 |
| 1969 | 85,000 |
| 1970 | 90,000 |
| 1971 | 96,000 |
| 1972 | 104,000 |
| 1973 | 111,000 |
| 1974 | 118,500 |
| 1975 | 123,196 |

Source:

Mr. Dotson, County of Henrico, 1962-1971. 1972 data estimated by VH&TRC. Mr. Carroll, County of Henrico, 1974 and 1975.

# APPENDIX B

## EFFECTS OF THE ENERGY SHORTAGE ON 1974 CRASH DATA

One of the most troublesome confounding factors in evaluating the ASAP program in 1974 and 1975 is the effect that the energy shortage might have had on the crash rates. Unfortunately no compensation could be made for these effects in the Fairfax area simply because no justifiable formula could be devised.

The most obvious effect — a reduction in the number of miles driven — is compensated for automatically by the statistics in the report, which use vehicle miles traveled as the variable. However, the other obvious factor, the national 55 mph speed limit, has not been compensated for. Though the lowered speed limit would obviously have an effect on crash rates, and especially on the severity of accidents, no formula could be devised to quantify that effect so that it could be considered in the data.

It was thought at one time that a less obvious result of the energy shortage, a shift in day/night driving patterns, might be a factor in the ASAP area. However, further checking indicated that the apparent shift was only an aberration at one traffic count station while most of the ASAP area showed no significant change. Though revised crash projections were made to compensate for this apparent shift, these were abandoned when the shift was found to be unique in the one count station. It is possible that the shift was nevertheless significant, but it was not quantifiable, and thus could not be used.

# APPENDIX C

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 12.8381 + 8.01988E-03 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .296837

THERE IS A -

0.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

0.01 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = 8.81121E-02
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 4.70369

UNASSOC SUM OF SQUARES= 176.997
TOTAL SUM OF SQUARES= 194.1
T-STATISTIC= .879209 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, 0=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 730.92
STANDARD DEVIATION = 171.888

DEPENDENT VARIABLE (Y) DATA:
MEAN = 18.7
STANDARD DEVIATION = 4.64399

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 530.2 | 18 | 17.0903 | .0532 | .949458 | 2.35895 |
| 556.4 | 12 | 17.3004 | -.3064 | 1.4417 | 2.17868 |
| 585.4 | 14 | 17.5329 | -.2016 | 1.25235 | 1.99359 |
| 606.7 | 17 | 17.7038 | -.0398 | 1.0414 | 1.86986 |
| 659.1 | 28 | 18.124 | .5449 | .647286 | 1.62531 |
| 733.6 | 18 | 18.7215 | -.0386 | 1.04008 | 1.48764 |
| 800.9 | 19 | 19.2612 | -.0136 | 1.01375 | 1.61862 |
| 881.8 | 22 | 19.91 | .1049 | .905002 | 2.02647 |
| 932.4 | 23 | 20.3158 | .1321 | .883298 | 2.36433 |
| 1022.7 | 16 | 21.04 | -.2396 | 1.315 | 3.04895 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 1085 | 21.5397 | 9.74668 | -- | 33.3327 |
| 1160.5 | 22.1452 | 9.54493 | -- | 34.7454 |
| 1192.3 | 22.4002 | 9.43118 | -- | 35.3693 |
| 1240 | 22.7828 | 9.23277 | -- | 36.3328 |

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# APPENDIX C

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 18.9241 + 4.34502E-03 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .14619

THERE IS A -

0.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

0.01 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = 2.13714E-02
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 5.36051

UNASSOC SUM OF SQUARES= 229.88
TOTAL SUM OF SQUARES= 234.9
T-STATISTIC= .417977 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, 0=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 730.92
STANDARD DEVIATION = 171.888

DEPENDENT VARIABLE (Y) DATA:
MEAN = 22.1
STANDARD DEVIATION = 5.10882

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 530.2 | 21 | 21.2279 | -.0108 | 1.01085 | 2.68835 |
| 556.4 | 17 | 21.3417 | -.2035 | 1.25539 | 2.48291 |
| 585.4 | 15 | 21.4677 | -.3013 | 1.43118 | 2.27198 |
| 606.7 | 25 | 21.5603 | .1595 | .862411 | 2.13096 |
| 659.1 | 31 | 21.7879 | .4228 | .702837 | 1.85227 |
| 722.6 | 19 | 22.1116 | -.1403 | 1.16377 | 1.69537 |
| 800.9 | 24 | 22.4041 | .0712 | .933503 | 1.84464 |
| 881.8 | 26 | 22.7556 | .1425 | .875214 | 2.30945 |
| 932.4 | 26 | 22.9754 | .1316 | .883671 | 2.69449 |
| 1022.7 | 17 | 23.3678 | -.2726 | 1.37458 | 3.4747 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 1085 | 23.6385 | 10.1987 | -- | 37.0782 |
| 1160.5 | 23.9665 | 9.6068 | -- | 38.3263 |
| 1192.3 | 24.1047 | 9.32469 | -- | 38.3847 |
| 1240 | 24.312 | 8.86986 | -- | 39.7541 |

# APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 49.527 + .92975 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .966883

THERE IS A -

Ø.Ø5 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

Ø.Ø1 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .934862
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 44.7448

UNASSOC SUM OF SQUARES= 16Ø18.5
TOTAL SUM OF SQUARES= 245877.
T-STATISTIC= 1Ø.7153 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, Ø=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 73Ø.92
STANDARD DEVIATION = 171.888

DEPENDENT VARIABLE (Y) DATA:
MEAN = 729.1
STANDARD DEVIATION = 165.287

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 53Ø.2 | 469 | 542.48 | -.1355 | 1.15667 | 22.44 |
| 556.4 | 527 | 566.84 | -.Ø7Ø3 | 1.Ø756 | 2Ø.7251 |
| 585.4 | 623 | 593.8Ø3 | .Ø491 | .953134 | 18.9644 |
| 6Ø6.7 | 632 | 613.6Ø6 | .Ø299 | .97Ø896 | 17.7874 |
| 659.1 | 74Ø | 662.325 | .1172 | .895Ø34 | 15.4611 |
| 733.6 | 755 | 731.592 | .Ø319 | .968996 | 14.1514 |
| 8ØØ.9 | 8ØØ | 794.164 | .ØØ73 | .992705 | 15.3975 |
| 881.8 | 875 | 869.381 | .ØØ64 | .993578 | 19.2772 |
| 932.4 | 886 | 916.426 | -.Ø333 | 1.Ø3434 | 22.4912 |
| 1Ø22.7 | 984 | 1ØØØ.38 | -.Ø164 | 1.Ø1665 | 29.ØØ37 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 1Ø85 | 1Ø58.31 | 946.122 | -- | 1170.49 |
| 1160.5 | 1128.5 | 1ØØ8.64 | -- | 1248.36 |
| 1192.3 | 1158.Ø7 | 1Ø34.7 | -- | 1281.44 |
| 1240 | 12Ø2.42 | 1Ø73.52 | -- | 1331.31 |

## APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 163.891 + 1.26882 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .957932

THERE IS A -

Ø.Ø5 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

Ø.Ø1 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .917634
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 69.305

UNASSOC SUM OF SQUARES= 38424.4
TOTAL SUM OF SQUARES= 466514.
T-STATISTIC= 9.4407 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, Ø=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 730.92
STANDARD DEVIATION = 171.888

DEPENDENT VARIABLE (Y) DATA:
MEAN = 1091.3
STANDARD DEVIATION = 227.673

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 530.2 | 723 | 836.622 | -.1359 | 1.15715 | 34.7572 |
| 556.4 | 813 | 869.865 | -.Ø654 | 1.Ø6994 | 32.1Ø11 |
| 585.4 | 914 | 906.661 | .ØØ8 | .99197 | 29.374 |
| 6Ø6.7 | 977 | 933.687 | .Ø463 | .955667 | 27.55Ø8 |
| 659.1 | 1Ø9Ø | 1ØØØ.17 | .Ø898 | .91759 | 23.9477 |
| 733.6 | 1157 | 1Ø94.7 | .Ø569 | .946154 | 21.9191 |
| 8ØØ.9 | 123Ø | 118Ø.Ø9 | .Ø422 | .959425 | 23.8491 |
| 881.8 | 13Ø1 | 1282.74 | .Ø142 | .985965 | 29.8584 |
| 932.4 | 1313 | 1346.94 | -.Ø252 | 1.Ø2585 | 34.8365 |
| 1Ø22.7 | 1395 | 1461.52 | -.Ø456 | 1.Ø4768 | 44.9238 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 1Ø85 | 1540.56 | 1366.8 | -- | 1714.33 |
| 116Ø.5 | 1636.36 | 145Ø.71 | -- | 1822.Ø2 |
| 1192.3 | 1676.71 | 1485.62 | -- | 1867.8 |
| 1240 | 1737.23 | 1537.58 | -- | 1936.88 |

# APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 424.301 + 2.43747

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .934173

THERE IS A -

Ø.Ø5 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

Ø.Ø1 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .872678
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 169.74

UNASSOC SUM OF SQUARES= 23Ø5Ø4.
TOTAL SUM OF SQUARES= 1.81Ø33E+Ø6
T-STATISTIC= 7.4Ø492 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, Ø=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 73Ø.92
STANDARD DEVIATION = 171.888

DEPENDENT VARIABLE (Y) DATA:
MEAN = 2205.9
STANDARD DEVIATION = 448.495

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 53Ø.2 | 1634 | 1716.65 | -.Ø482 | 1.Ø5Ø58 | 85.1265 |
| 556.4 | 17Ø4 | 178Ø.51 | -.Ø43 | 1.Ø449 | 78.6211 |
| 585.4 | 1946 | 1851.2 | .Ø512 | .951284 | 71.942 |
| 6Ø6.7 | 2Ø75 | 1903.12 | .Ø9Ø3 | .917165 | 67.4768 |
| 659.1 | 226Ø | 2Ø3Ø.84 | .1128 | .898602 | 58.6521 |
| 733.6 | 1989 | 2212.43 | -.1Ø1 | 1.11233 | 53.6838 |
| 8ØØ.9 | 22Ø1 | 2376.47 | -.Ø739 | 1.Ø7973 | 58.4105 |
| 881.8 | 2476 | 2573.67 | -.Ø38 | 1.Ø3945 | 73.1285 |
| 932.4 | 2668 | 2697. | -.Ø1Ø8 | 1.Ø1Ø87 | 85.32Ø8 |
| 1Ø22.7 | 3106 | 2917.11 | .Ø647 | .939184 | 11Ø.Ø26 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 1Ø85 | 3Ø68.96 | 2643.39 | -- | 3494.53 |
| 1160.5 | 3252.99 | 2798.29 | -- | 37Ø7.69 |
| 1192.3 | 3330.5 | 2862.49 | -- | 3798.51 |
| 1240 | 3446.77 | 2957.8 | -- | 3935.74 |

## APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 13.1492 + 2.03569E-02 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .852767

THERE IS A -

0.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

0.01 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .727212
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 7.78629

UNASSOC SUM OF SQUARES= 485.018
TOTAL SUM OF SQUARES= 1778
T-STATISTIC= 4.61809 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, 0=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 1859.36
STANDARD DEVIATION = 583.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 56
STANDARD DEVIATION = 14.0554

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 993.7 | 36 | 33.3779 | -.062 | 1.06605 | 4.5413 |
| 1134.1 | 47 | 41.236 | .1397 | .877361 | 4.03525 |
| 1254.5 | 47 | 43.6869 | .0758 | .929509 | 3.62925 |
| 1710.5 | 51 | 52.9697 | -.0372 | 1.03862 | 2.54817 |
| 1859.4 | 56 | 56.0008 | -.0001 | 1.00001 | 2.46224 |
| 1954 | 55 | 57.9266 | -.0506 | 1.05321 | 2.49733 |
| 2117.1 | 60 | 61.2468 | -.0204 | 1.02073 | 2.71172 |
| 2392.1 | 59 | 66.8449 | -.1174 | 1.13296 | 3.40254 |
| 2461.6 | 59 | 68.2597 | -.1357 | 1.15694 | 3.62077 |
| 2716.6 | 90 | 73.4507 | .2253 | .816119 | 4.51015 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 3036.3 | 79.969 | 60.6168 | -- | 99.3212 |
| 3272.8 | 84.7732 | 64.2298 | -- | 105.317 |
| 3239.9 | 84.1035 | 63.7347 | -- | 104.472 |
| 3428.1 | 87.9346 | 66.5331 | -- | 109.336 |

## APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 25.2222 + 2.07479E-02 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .811897

THERE IS A -

0.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

0.01 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .659177
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 9.31706

UNASSOC SUM OF SQUARES= 694.465
TOTAL SUM OF SQUARES= 2037.6
T-STATISTIC= 3.93352 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, 0=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 1859.36
STANDARD DEVIATION = 588.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 63.8
STANDARD DEVIATION = 15.0466

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 993.7 | 40 | 45.8394 | -.1274 | 1.14598 | 5.43411 |
| 1134.1 | 56 | 48.7524 | .1486 | .870578 | 4.82857 |
| 1254.5 | 57 | 51.2504 | .1121 | .89913 | 4.34276 |
| 1710.5 | 59 | 60.7115 | -.0282 | 1.02901 | 3.04914 |
| 1859.4 | 65 | 63.8008 | .0187 | .981551 | 2.94631 |
| 1954 | 64 | 65.7636 | -.0269 | 1.02756 | 2.9883 |
| 2117.1 | 65 | 69.1476 | -.06 | 1.06381 | 3.24484 |
| 2392.1 | 69 | 74.8532 | -.0782 | 1.08483 | 4.07148 |
| 2461.6 | 63 | 76.2952 | -.1743 | 1.21104 | 4.33261 |
| 2716.6 | 100 | 81.5859 | .2257 | .815859 | 5.39684 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 3036.8 | 88.2294 | 65.0726 | -- | 111.386 |
| 3272.8 | 93.1259 | 68.5437 | -- | 117.708 |
| 3239.9 | 92.4433 | 68.0701 | -- | 116.817 |
| 3428.1 | 96.3481 | 70.739 | -- | 121.957 |

## APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 461.141 + 1.06615 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .989694

THERE IS A -

0.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

0.01 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .979494
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 96.3396

UNASSOC SUM OF SQUARES= 74232.3
TOTAL SUM OF SQUARES= 3.62084E+06
T-STATISTIC= 19.548 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, 0=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 1859.36
STANDARD DEVIATION = 588.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 2443.5
STANDARD DEVIATION = 634.284

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 993.7 | 1444 | 1520.58 | -.0504 | 1.05303 | 56.1894 |
| 1134.1 | 1663 | 1670.26 | -.0044 | 1.00437 | 49.928 |
| 1254.5 | 1978 | 1798.63 | .0997 | .909316 | 44.9046 |
| 1710.5 | 2210 | 2284.79 | -.0328 | 1.03384 | 31.5285 |
| 1859.4 | 2359 | 2443.54 | -.0346 | 1.03584 | 30.4652 |
| 1954 | 2525 | 2544.4 | -.0077 | 1.00768 | 30.8994 |
| 2117.1 | 2815 | 2718.29 | .0355 | .965645 | 33.552 |
| 2392.1 | 2916 | 3011.48 | -.0318 | 1.03274 | 42.0996 |
| 2461.6 | 3151 | 3085.58 | .0212 | .979238 | 44.7998 |
| 2716.6 | 3374 | 3357.45 | .0049 | .995094 | 55.804 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 3036.3 | 3698.83 | 3459.38 | -- | 3938.27 |
| 3272.8 | 3950.44 | 3696.26 | -- | 4204.62 |
| 3239.9 | 3915.36 | 3663.34 | -- | 4167.39 |
| 3428.1 | 4116.01 | 3851.21 | -- | 4380.81 |

# APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 903.894 + 1.40737 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .979458

THERE IS A -

0.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

0.01 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .959337
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 180.945

UNASSOC SUM OF SQUARES= 261946.
TOTAL SUM OF SQUARES= 6.44194E+06
T-STATISTIC= 13.7383 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, 0=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 1859.36
STANDARD DEVIATION = 588.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 3520.7
STANDARD DEVIATION = 846.032

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 993.7 | 2159 | 2302.4 | -.0623 | 1.06642 | 105.535 |
| 1134.1 | 2530 | 2499.99 | .012 | .988139 | 93.7751 |
| 1254.5 | 2984 | 2669.44 | .1178 | .894584 | 84.3401 |
| 1710.5 | 3161 | 3311.2 | -.0454 | 1.04752 | 59.217 |
| 1859.4 | 3424 | 3520.76 | -.0275 | 1.02826 | 57.22 |
| 1954 | 3457 | 3653.89 | -.0539 | 1.05696 | 58.0354 |
| 2117.1 | 4106 | 3883.44 | .0573 | .945795 | 63.0176 |
| 2392.1 | 4165 | 4270.46 | -.0247 | 1.02532 | 79.0716 |
| 2461.6 | 4465 | 4368.27 | .0221 | .978337 | 84.1431 |
| 2716.6 | 4756 | 4727.15 | .0061 | .993935 | 104.811 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 3036.8 | 5177.79 | 4728.07 | -- | 5627.52 |
| 3272.8 | 5509.93 | 5032.52 | -- | 5987.34 |
| 3239.9 | 5463.63 | 4990.28 | -- | 5936.98 |
| 3428.1 | 5728.5 | 5231.15 | -- | 6225.85 |

## APPENDIX C (CONTINUED)

L I N E A R  R E G R E S S I O N  A N A L Y S I S

THE REGRESSION EQUATION IS:
Y = 346.5 + 4.24426 X

S T A T I S T I C S  O F  T H E  S A M P L E

COEFFICIENT OF CORRELATION = .972766

THERE IS A -

Ø.Ø5 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

Ø.Ø1 PROBABILITY THAT AN R OF .76 WILL OCCUR RANDOMLY

COEFFICIENT OF DETERMINATION = .946274
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 631.578

UNASSOC SUM OF SQUARES= 3.19084E+Ø6
TOTAL SUM OF SQUARES= 5.93964E+Ø7
T-STATISTIC= 11.8703 DEG. OF FREEDOM= 8

DO YOU WANT A FULL PRINTOUT OR PROJECTIONS ONLY
1=FULL PRINT, Ø=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 1859.36
STANDARD DEVIATION = 588.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 8238.1
STANDARD DEVIATION = 2568.97

S.E.P. = STANDARD ERROR OF ANY POINT ON REGRESSION LINE

| X-ACTUAL | Y-ACTUAL | Y-FOR | (A-F)/F | FOR/ACT | S.E.P. |
|---|---|---|---|---|---|
| 993.7 | 4649 | 4564.Ø2 | .Ø186 | .98172 | 368.363 |
| 1134.1 | 5354 | 5159.91 | .Ø376 | .963749 | 327.316 |
| 1254.5 | 6468 | 5670.92 | .1405 | .876765 | 294.334 |
| 1710.5 | 7360 | 7606.3 | -.Ø324 | 1.Ø3346 | 206.693 |
| 1859.4 | 7720 | 8238.27 | -.Ø63 | 1.Ø6713 | 199.723 |
| 1954 | 7645 | 8639.78 | -.1152 | 1.13Ø12 | 202.569 |
| 2117.1 | 8834 | 9332.Ø2 | -.Ø534 | 1.Ø5637 | 219.959 |
| 2392.1 | 10331 | 10499.2 | -.Ø161 | 1.Ø1628 | 275.994 |
| 2461.6 | 11519 | 10794.2 | .Ø671 | .937Ø74 | 293.696 |
| 2716.6 | 12501 | 11876.4 | .Ø525 | .95ØØ4 | 365.837 |

P R O J E C T I O N S

95 PCT. CONFIDENCE INTERVAL = PROJECTION + OR - 2 STANDARD ERRORS

| INDEPENDENT VARIABLE | PROJECTION | 95 PCT. CONFIDENCE INTERVAL | | |
|---|---|---|---|---|
| 3036.8 | 13235.5 | 11665.7 | -- | 14805.2 |
| 3272.8 | 14237.1 | 12570.7 | -- | 15903.5 |
| 3239.9 | 14097.5 | 12445.3 | -- | 15749.7 |
| 3428.1 | 14896.2 | 13160.3 | -- | 16632.2 |