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

Progress Report No. 5
January 1, 1976 to December 31, 1976

by

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SUMMARY OF FINDINGS

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 data obtained to measure the project's impact on the selected ultimate performance indicators at the end of the fifth year of project operations, 1976.

Data for 1976 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 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.

Another performance indicator, the average blood alcohol concentration of drivers in the ASAP area, showed little change during the 1972-1974 period. While the mean BAC for 1975 was the lowest in recent years, this figure increased again to 0.157% in 1976. The average number of fatally injured drivers with positive BAC's during the period of the ASAP (1972-1976) 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 0.19% in 1972 to 0.17% in 1976. 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 0.15% to 0.10% 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 20 versus those in quarter 1 confirmed that a statistically significant change occurred. BAC levels were significantly lower in quarter 20 than in quarter 1.

In terms of the cost benefit analysis, the actual societal costs resulting from accidents in Fairfax during 1976 were 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 realized during 1976 were between $254 thousand and $21 million, with total savings over the life of the project being on the order of $40 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 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 project 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 1962-1972 data. Fatal crashes and fatalities declined, but not significantly except in 1974, and overall societal costs 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 period. These trends continued during 1975, the first year of the continuation period.

This report summarizes the data on ultimate performance measures for 1976, the second and final 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 the 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 1972-1976. FIGURES 1 and 2, utilizing semilog paper to smooth out fluctuations in the trend lines, show the same data graphically.

Additionally, data were collected on population, motor vehicle registrations, 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 until 1976, when registrations increased only 1.7% over 1975. Vehicle miles of travel increased at an average annual rate of 12% prior to 1972, but at only about 6% per year from 1972-1976. 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 played a part.

A comparison of FIGURES 1 and 3 shows that crash trends are closely correlated with the growth in the 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.

TABLE 1

Fairfax ASAP Crash Data

1962 - 1976

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	2,525	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
1976	62	74	3,822	5,318	11,036	10	184

SOURCE: Virginia Department of State Police.

TABLE 2

Henrico County Crash Data

1962 - 1976

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
1976	24	29	1,390	2,016	2,440	4	64

SOURCE: Virginia Department of State Police.

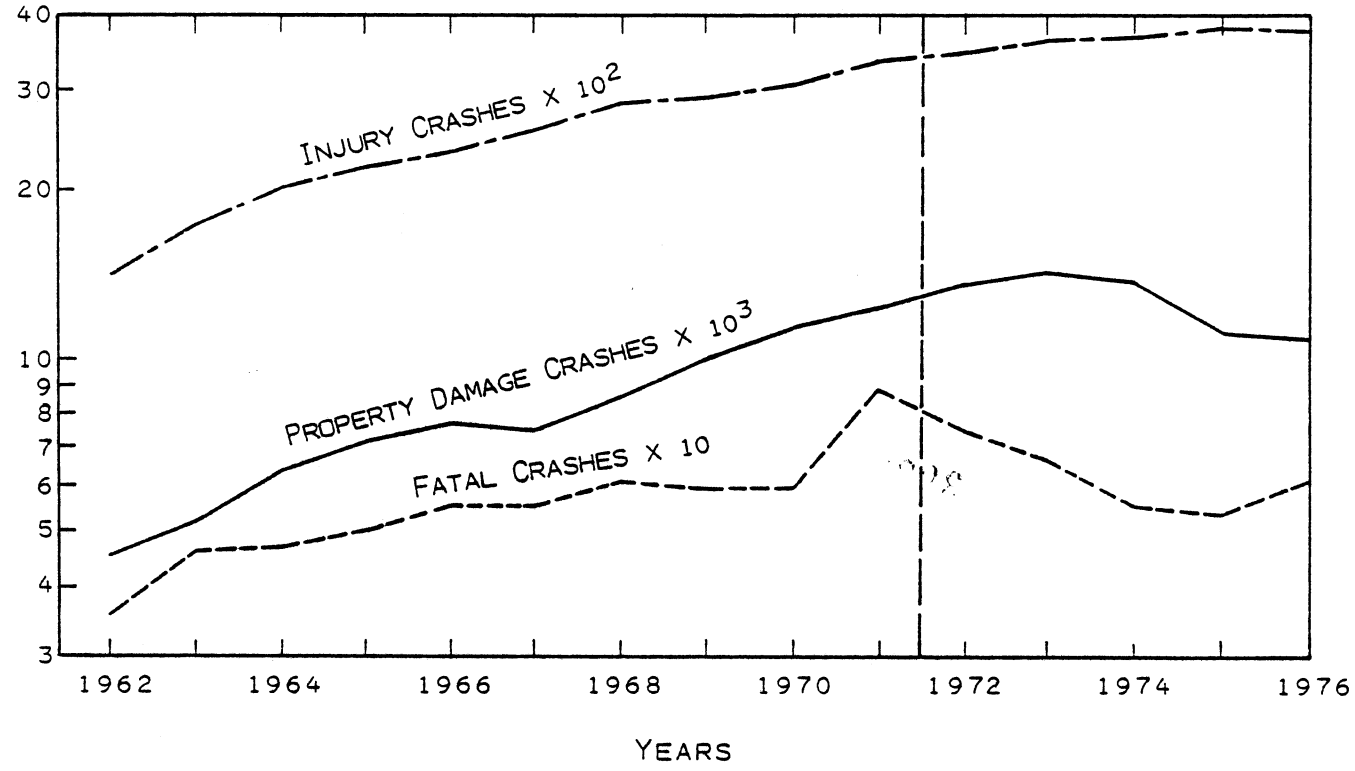

Figure 1. Trends in Fairfax crashes.

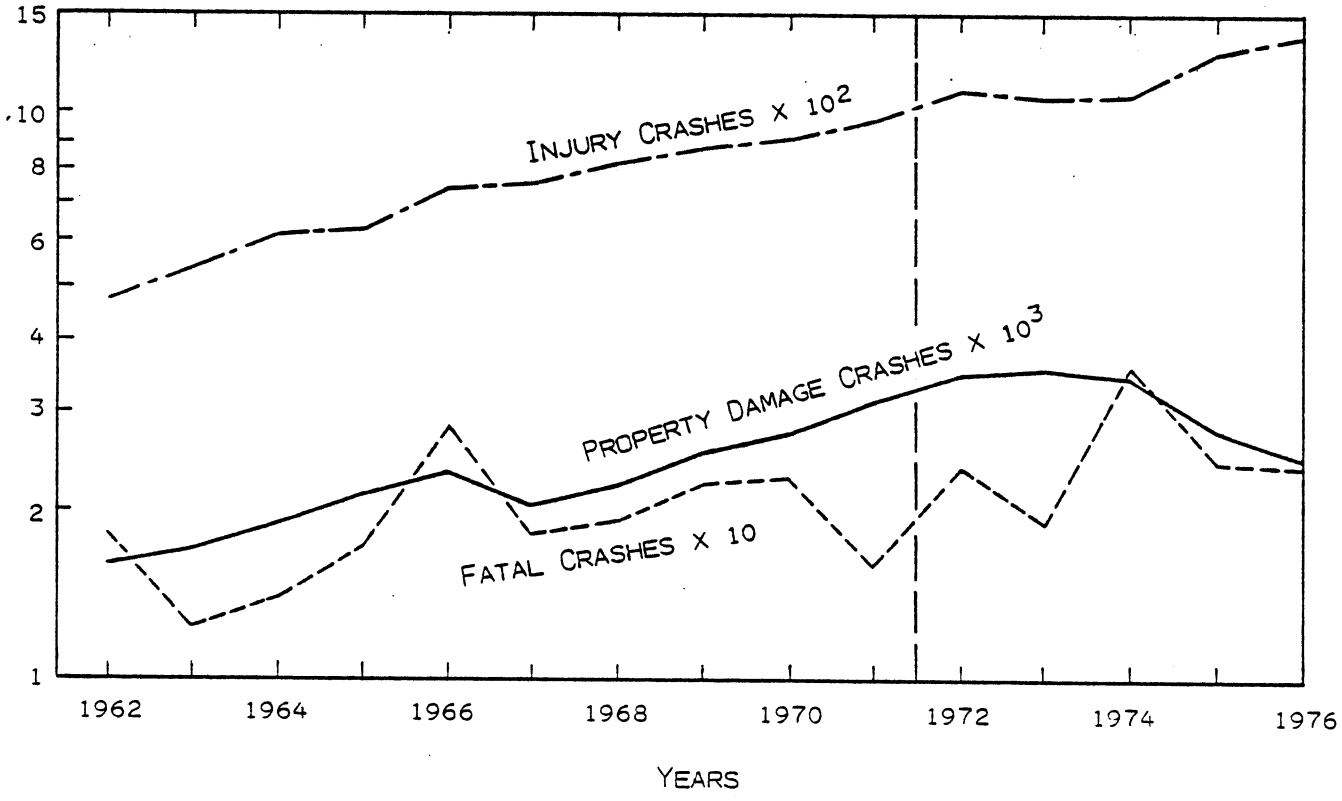

Figure 2. Trends in Henrico crashes.

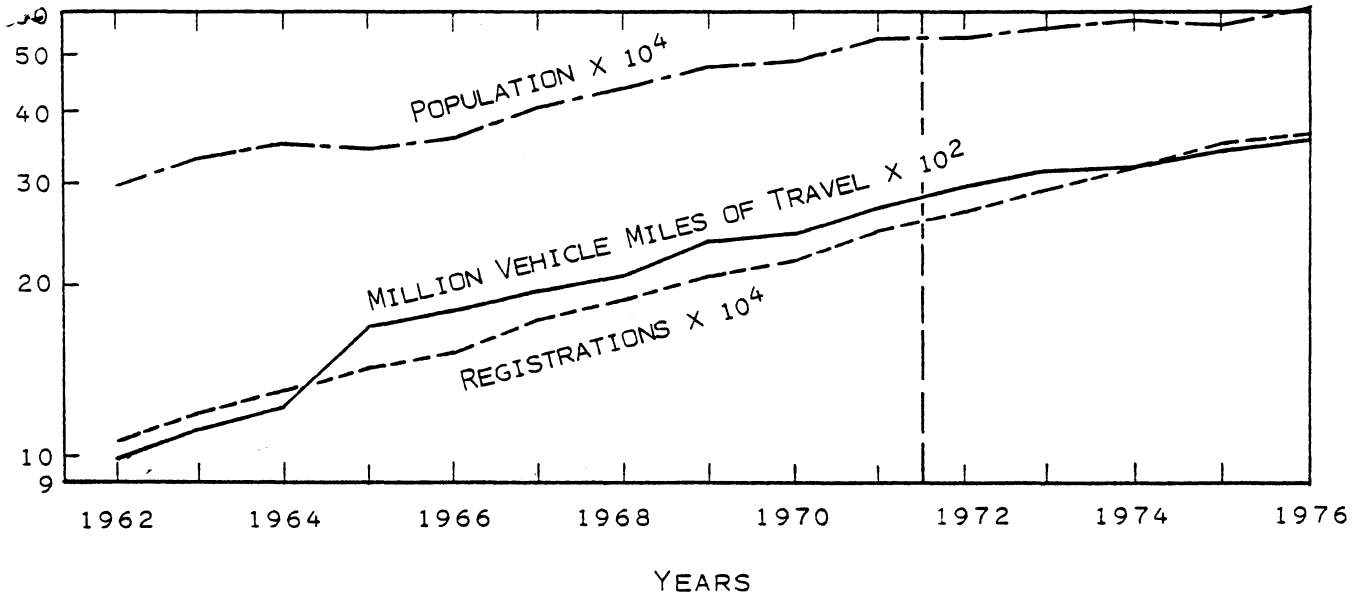

Figure 3. Trends in Fairfax exposure variables.

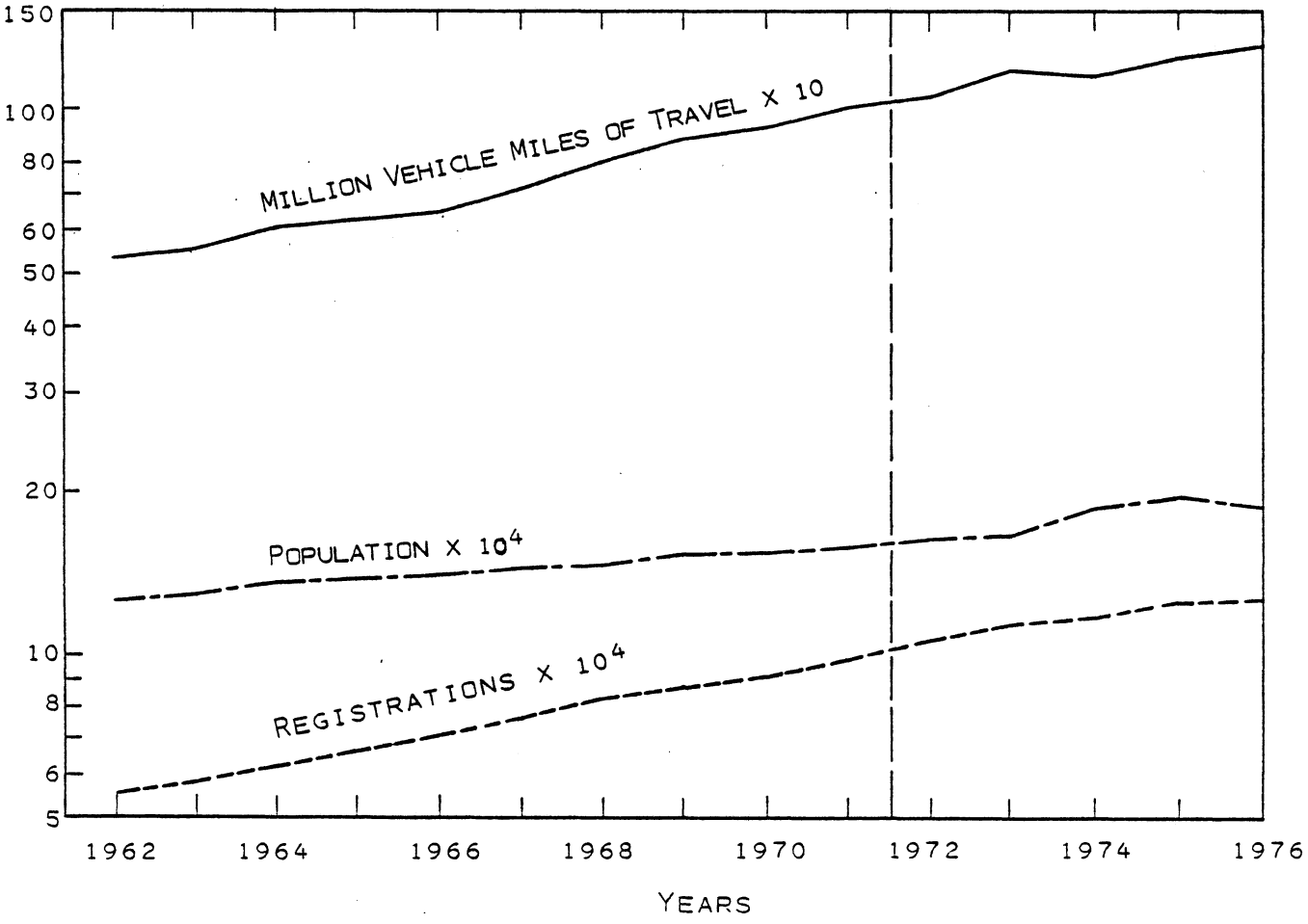

Figure 4. Trends in Henrico exposure variables.

In Henrico County, the control site, the population trend was reversed from that in Fairfax. Prior to 1972, the population increased at an average of only 2.7% a year while the rate of growth jumped to over 4.8% per year between 1972 and 1975. In 1976, however, the population of Henrico County decreased by 2.5%. Thus, the population grew much more slowly than the Fairfax population prior to the ASAP, but much more rapidly during the project until 1976, when the population declined. Vehicle registrations in Henrico increased at a fairly constant rate before and during ASAP, just as they did in Fairfax, though the rate was much lower — about 6.5% compared to 9.5% in Fairfax. In 1976, as in Fairfax, the rate of growth in registrations declined to about 3.0% over 1975. Vehicle miles driven increased at a rate of 7.6% per year prior to 1972 and at a rate of 4.9% annually during the ASAP until 1976, when growth rebounded to 6.5%. Since the rate of growth dropped in 1972-1975 in Henrico as well as in Fairfax, this may indicate that the energy shortage may have had some effect, though the fact that the drop was not as great as in Fairfax may be attributable to the greater population growth during the ASAP years in Henrico.

FIGURE 5 plots Fairfax crash rates per 100 million vehicle miles of travel. These trend lines show that motor vehicle crashes, injuries, and fatalities did not grow quite as fast as exposure per 100 million vehicle miles. The fatal crash rate dropped from 4.1 in 1963 to 2.4 in 1970. In 1971, the year before ASAP, the rate jumped up to a seven-year high of 3.3. During the three initial years of ASAP the rate again declined to 2.5 in 1972 and to record lows of 2.1 in 1973, 1.7 in 1974, and 1.6 in 1975. (It should be noted, however, in conjunction with the figures for 1974 and 1975, that the energy shortage may very well have had some effect. Attempts were made to compensate for such effects, but no satisfactory formula could be devised to cope with the variables, especially the lowered national speed limit.) In 1976, the fatal crash rate increased slightly to 1.71.

FIGURE 5 also shows a steady decline in the injury crash rate from 145 per million miles in 1962 to 110 in 1973, 1974, and 1975, and to 106 in 1976. Property damage crash rates declined slightly from 468 in 1962 to 429 in 1974. The precipitous drop in 1975 to 326 was apparently the result of a change in reporting criteria for property damage crashes. Prior to 1975 any accident involving property damage in excess of $100 was reported; since January 1975 only those accidents with damage in excess of $250 need be reported. Obviously, such a change would be likely to lower the rate of reported accidents since many minor crashes would be eliminated from the data. The fact that a large drop also occurred in Henrico property damage crashes for 1975 supports this explanation. This figure decreased to 306 in 1976.

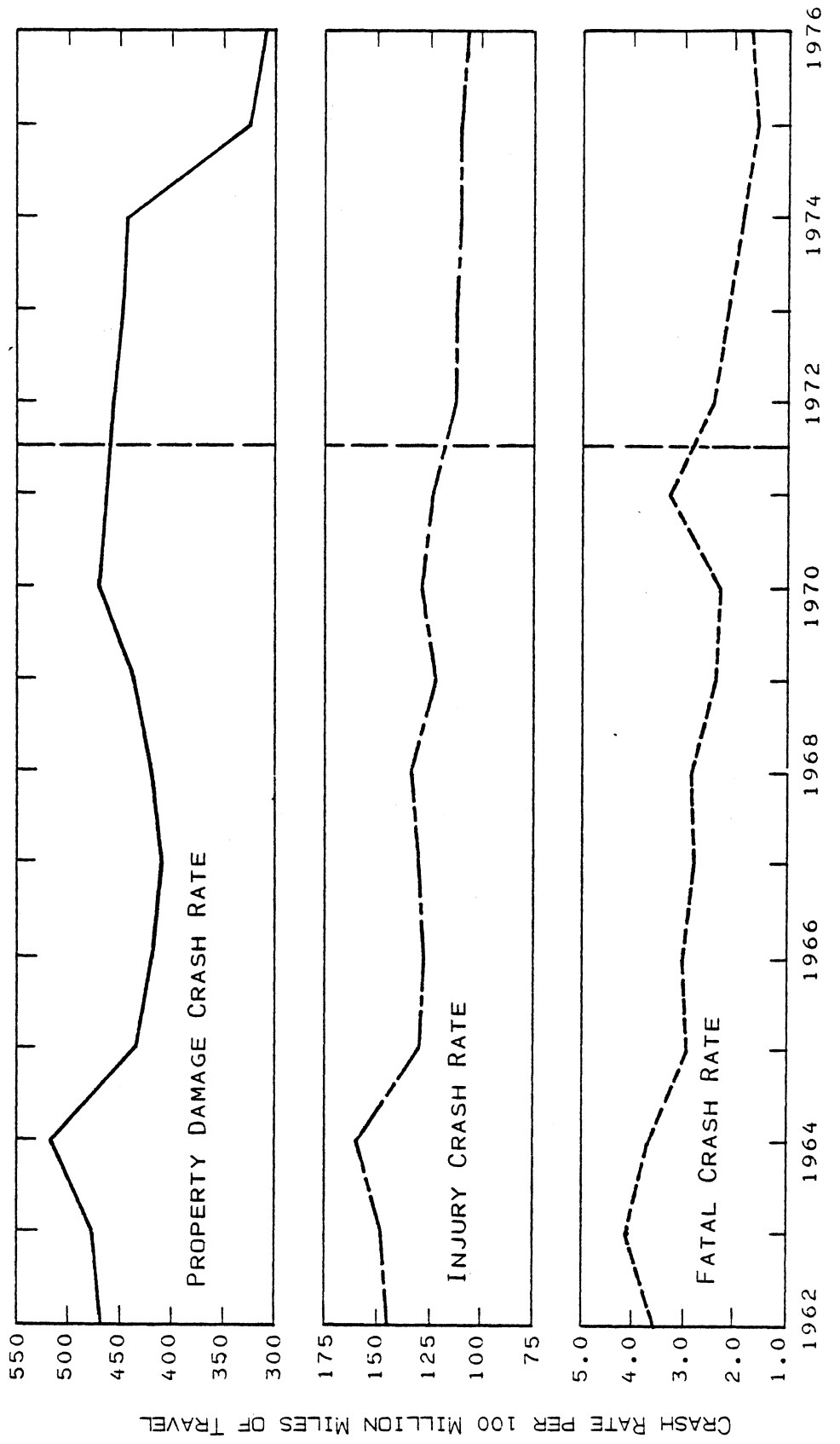

Figure 5. Trends in Fairfax crash rates as a function of miles of travel.

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 and remained there in 1976, while the property damage crash rate dropped considerably, probably because of the accident reporting change noted above.

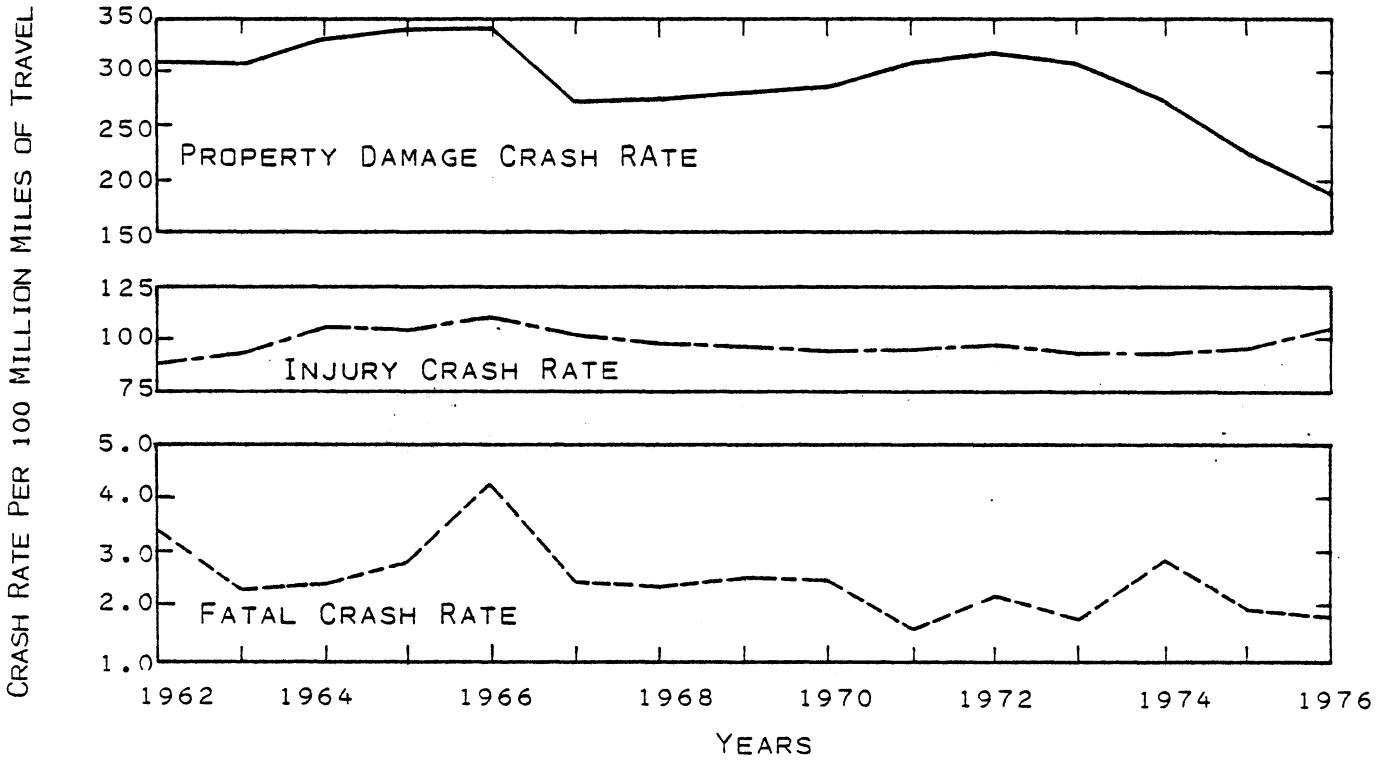

Figure 6. Trends in Henrico crash rates as a function of miles of travel.

Projections for 1972-1976

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 1972-1976 period. Actual mileage figures for the ASAP 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 1972-1976 can be compared with those 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 .852 and .756, 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 B.

TABLES 3 and 4 present summary data on the projections for Fairfax and Henrico crashes for the 1972-76 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
Crash Projections: 1972-1976

Year	Fatal Crashes	Fatalities	Injury Crashes	Injuries	Property Damage Crashes
1972	80	86	3,699	5,178	13,236
1973	85	90	3,950	5,510	14,237
1974	84	89	3,915	5,463	14,097
1975	88	93	4,116	5,729	14,896
1976	92	96	4,307	5,980	15,655

TABLE 4

Henrico County
Crash Projections: 1972-1976

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
1976	23	25	1,277	1,839	3,643

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 was hoped, of course, the ASAP could reduce fatal crashes and fatalities to levels below the predicted values. If alcohol related fatal crashes were 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 vehicle accidents in Fairfax in the baseline period 1969-1971 and after the five years of ASAP, 1972-1976. 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 and 1976. Also of significance is the fact that in 1973 the mean positive BAC was down to 0.148%, the lowest level in five years; though 1974 showed an increase, the level in 1975 (0.126%) was even lower. However, the mean positive BAC again climbed to 0.156% in 1976. As a result, the average for the five-year ASAP period was only 0.01% 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	Percent Tested	Number Positive	Percent Positive	Number Negative	Percent Negative	Mean Positive BAC
1969	60	38	63	16	42	22	58	0.152%
1970	63	47	75	23	49	24	51	0.156%
1971	100	71	71	42	59	29	41	0.166%
Average	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%
1976	74	64	86	26	41	38	59	0.157%
Average	72	58	80	26	45	32	55	0.156%

Differences in Actual and Projected Crashes

To test the impact of the Fairfax ASAP on fatal, injury, and property damage crashes after five 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 the period from 1972 through 1976. 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 five 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.* Significant differences occurred in three of the four categories (fatal crashes, injury crashes, and property damage crashes) in 1976. It is possible that the effects

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*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- 14,805	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	54	88	67-109	Yes Lower	60	93	71-122	Yes Lower	3,776	4,116	3,851 - 4,381	Yes Lower	11,178	14,896	13,160- 16,632	Yes Lower
1976	62		69-114	Yes Lower	74	96	66-126	No	3,822	4,307	4,109 4,584	Yes Lower	11,036	15,655	13,834- 17,476	Yes Lower

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	196 - 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	22	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
1976	24	23	9-38	No	29	25	8-41	No	1,390	1,277	1,138 - 1,416	No	2,440	3,643	3,116 - 4,169	Yes Lower

of the ASAP may be cumulative, with an increasingly visible impact each year. Henrico accident statistics showed no significant decline in any of the four categories for the period 1972-1976, with the exception of 1975-1976 property damage accidents, which are questionable figures 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 1976

Thirty-three drivers were killed as a result of motor vehicle crashes in Fairfax in 1976. 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 33 fatally injured drivers in 1976, the Chief Medical Examiner reported BAC test results for 30. Of the 30 drivers who were tested, 17 were negative, 2 had low levels of alcohol, and 11 had BAC's greater than 0.10%. These data are shown in TABLE 8.

Forty-three 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, 37% of the fatally injured drivers had BAC's above the presumptive limit of 0.10%, and their crashes could definitely be considered as being alcohol related.

The reader is cautioned in comparing fatality data for 1976 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 FIGURES 7 and 8.

FIGURE 7 depicts the percentages of fatally injured drivers with positive BAC's for the baseline years of 1969, 1970, and 1971, and for the five ASAP years of 1972 through 1976. 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 followed by declines in 1975 and 1976. Thus, the average for the five-year ASAP period compared to the baseline period average hardly represents a significant change.

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 p.m. - 4 a.m.	2	0	1	0	0	2	1	0	6
4 a.m. - 8 a.m.	3	0	0	0	2	0	0	1	6
8 a.m. - 12 m.	1	0	0	0	0	0	0	0	1
12 m. - 4 p.m.	4	0	0	0	0	0	0	0	4
4 p.m. - 8 p.m.	5	0	0	0	0	3	0	2	10
8 p.m. - 12 p.m.	2	1	0	1	2	0	0	0	6
Total	17	1	1	1	4	5	1	3	33

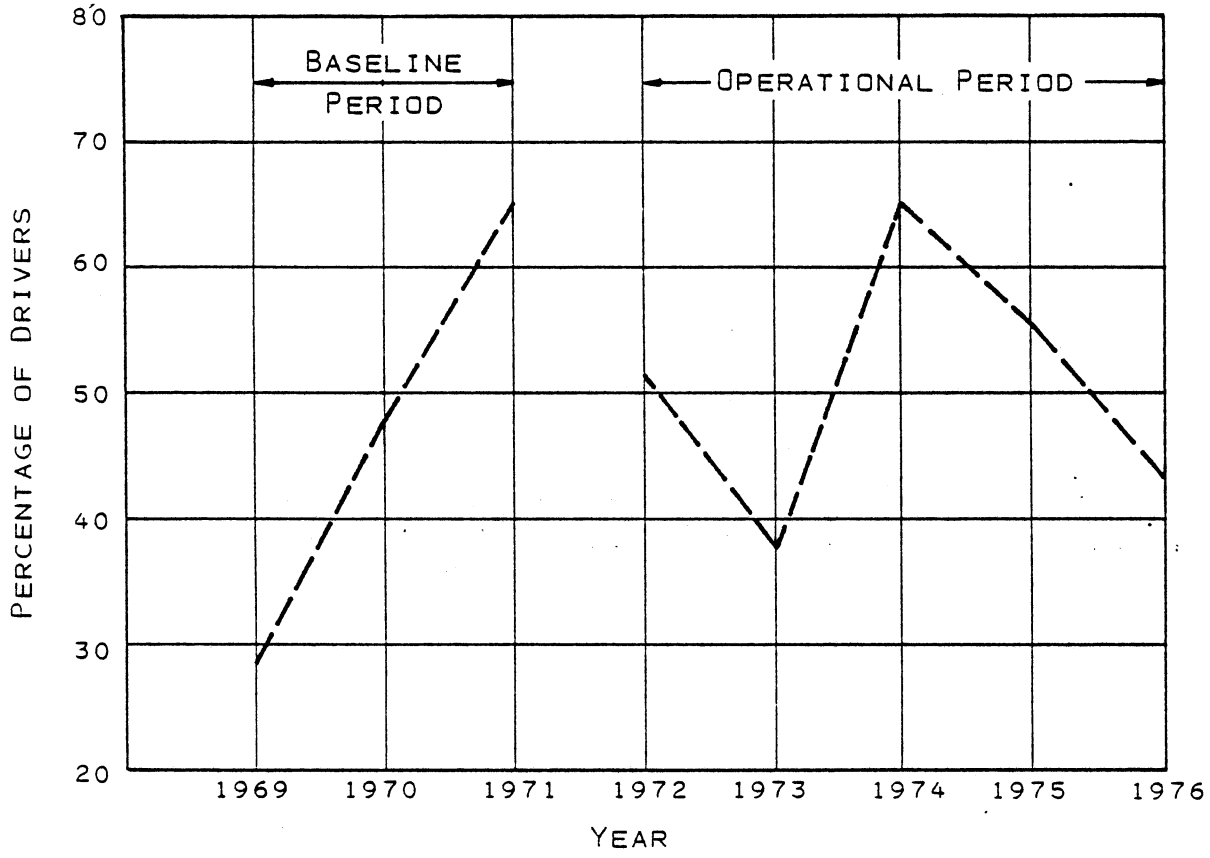

Figure 7. Percentage of fatally injured drivers with positive BAC.

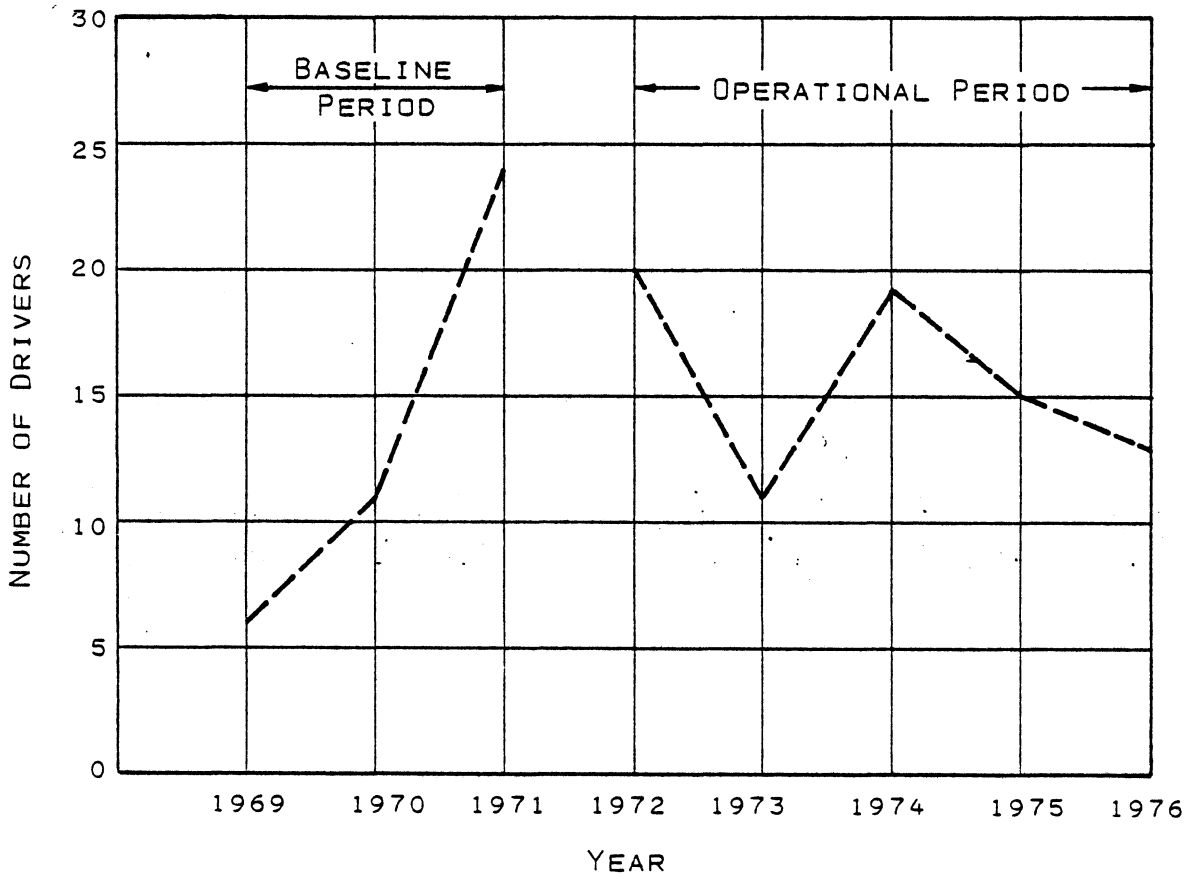

Figure 8. Number of fatally injured drivers with positive BAC.

The data shown in FIGURE 8 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 1976 data are included, the average for the ASAP years is 16 (20 in 1972, 11 in 1973, 19 in 1974, 15 in 1975, and 13 in 1976), 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 0.085%, but was 0.046%, 0.079%, and 0.111% in 1969, 1970, and 1971, respectively. In contrast, the average for the ASAP years was 0.077% but the yearly figures were 0.086% in 1972, 0.055% in 1973, 0.114% in 1974, 0.062% in 1975, and 0.068% in 1976.

In examining these data on the fatally injured drivers, the only conclusion that can be supported is that, although there were positive indications, the numbers are so small and the data so variable that any attempts to ascribe any benefits to the Fairfax ASAP are meaningless. 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. 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 nonfatally injured drivers is not available, so that severe restrictions on the use of these data also exist. Nevertheless, a section on characteristics of injury crashes in Fairfax County has been included in this report to supplement the data on 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 12 fatally injured drivers, of whom 8 had positive BAC's and 4 had negative BAC's.

For the other 16 hours of the day, there were 21 fatally injured drivers, with 5 having positive BAC's, 13 having negative BAC's, and 3 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 12 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 and 1976 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 1976 are broken down by age group in TABLE 10. More than a third of the fatalities, 13 of the 33, were in the 16-24 age group. This age group also accounted for 7 of the 13 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' of Fatally Injured Drivers by Sex

Of the 33 fatalities which occurred, 25 were males and 8 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 10 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 slightly fewer than 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.

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, 21 of the fatal crashes were multi-vehicle, with 11 of these occurring at night and 10 during the day. The other 12 fatal accidents were single vehicle crashes of which 7 occurred at night and 5 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.

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)	Blood Alcohol Concentration								
	Negative	.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	.25+	Unknown	Total
Monday	2	0	0	0	0	0	0	0	2
Tuesday	3	0	0	0	1	1	0	1	6
Wednesday	1	0	0	0	1	1	0	0	3
Thursday	3	0	0	0	0	1	1	0	5
Friday	2	1	0	0	1	0	0	1	5
Saturday	4	0	0	0	1	0	0	1	6
Sunday	2	0	1	1	0	2	0	0	6
Total	17	1	1	1	4	5	1	3	33

TABLE 10

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

Driver Age Group	Blood Alcohol Concentration								
	Negative	.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	.25+	Unknown	Total
16-24	5	1	1	1	2	2	0	1	13
25-34	2	0	0	0	2	2	1	1	8
35-44	4	0	0	0	0	1	0	0	5
45-54	4	0	0	0	0	0	0	0	4
55-64	2	0	0	0	0	0	0	0	2
65+	0	0	0	0	0	0	0	1	1
Unknown	0	0	0	0	0	0	0	0	0
Total	17	1	1	1	4	5	1	3	33

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	13	1	1	1	3	3	1	2	25
Female	4	0	0	0	1	2	0	1	8
Total	17	1	1	1	4	5	1	3	33

TABLE 12

Composite Profile of Fatally Injured Drivers, 1976

Vehicle Operator's Age

	Age	16-24	25-34	35-44	45-54	55-64	65+	Unknown
No of Cases		13	8	5	4	2	1	0

Blood Alcohol Concentration

	BAC	Neg.	.01-.04	.05-.09	.10-14	.15-.19	.20-.24	.25+	Unknown
No. of Cases		17	1	1	1	4	5	1	3

Driver Sex Classification

	Sex	Male	Female
No. of Cases		25	8

Type of Crash

	Type	Multi-Vehicle	Single Vehicle
No. of Cases		21	12

Time of Day

	Time	Night	Day	Night	Day
No. of Cases		11	10	7	5

Previous Criminal Convictions

	Convictions	None	One	Two	Three or More	Unknown
No. of Cases		16	0	2	1	14

Previous Traffic Convictions

	Convictions	None	One	Two	Three or More	Unknown
No. of Cases		15	3	5	5	5

The driving records of the 28 drivers whose records were known showed that 15 had no previous traffic convictions while 13 had prior convictions, including 5 with 3 or more convictions. Thus, 54% had no traffic convictions while 18% had 3 or more. These figures are consistent with the 1973 results, when 22 of the 35 fatally injured drivers had no previous traffic convictions. However, they contrast sharply with 1974 and 1975 results.

CHARACTERISTICS OF NONFATAL INJURY CRASHES IN FAIRFAX COUNTY IN 1976

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 FR-300 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 2,950 injury accidents reported in Fairfax County in 1976. Of these, 620, or 21.1%, were alcohol related according to the observation of the reporting officer. Single vehicle accidents accounted for 873 of the injury accidents, and of these 290, or 33.2%, were alcohol related. In contrast, only 16.2% of the 1,903 multi-vehicle injury crashes were alcohol related, while only 12.1% of the 194 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 1976

	Number Accidents	No. Alcohol Related	% Alcohol Related
Single Vehicle	873	290	33.2
Multi-Vehicle	1,903	309	16.2
Pedestrian	194	21	21.1
Total	2,950	620	21.1

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, 807, or 29.1%, of the injury accidents occurred during the hours 8 p.m. to 4 a.m. These late night accidents account for 46.6% of single vehicle injury crashes and only 21.0% of all multi-vehicle injury crashes. It should be noted that these figures are similar to 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 ASAP years the average percentage had dropped to 29% of all injury accidents, 44.8% of the single vehicle accidents, and 21.6% of the multi-vehicle accidents.

Trends involving alcohol related injury crashes were even more dramatic (see TABLE 15). For 1976, 71.6% of the alcohol related injury crashes in Fairfax County occurred during 8 p.m. to 4 a.m. time period. Eighty-two percent of the single vehicle alcohol related crashes occurred during this period compared to 61.8% of the multi-vehicle crashes. 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 five years of the ASAP these proportions had dropped to 67.0% of the total, 75.2% of the single vehicle, and 59.8% of the multi-vehicle alcohol related injury crashes.

Data shown in TABLE 16 indicate that the proportion of the injury accidents that were alcohol related declined slightly in 1976 as compared with 1975 figures. Twenty-two percent of all the injury accidents were alcohol related in 1976 compared to 23.5% in 1975, and to 10.1% during the first three years of the ASAP. For the 8 p.m. - 4 a.m. accidents, 53.1% were alcohol related in 1976 compared to 52.7 for 1975 and 46.9% from 1972-1974. This change is attributable to both single and multi-vehicle crashes.

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TABLE 14

Proportion of Injury Accidents During ASAP Patrol Hours in Fairfax County 1968-1976

Year	No. Accidents	Accidents 8 p.m. - 4 a.m. Number	Percentage
Single Vehicle			
1968	929	404	43.4
1969	951	433	45.5
1970	976	421	43.1
1971	1,056	483	45.7
1968 - 71 Avg.	978	435	44.4
1972	981	407	41.4
1973	1,103	470	42.6
1974	1,206	525	43.5
1975	846	435	51.4
1976	873	407	46.6
1972 - 76 Avg.	1,002	449	44.8
Multi-Vehicle			
1968	1,847	473	25.6
1969	1,979	494	24.0
1970	2,161	509	23.5
1971	2,277	531	23.3
1968 - 71 Avg.	2,066	502	24.2
1972	2,426	513	21.1
1973	2,529	528	20.8
1974	2,312	519	22.4
1975	1,874	428	22.8
1976	1,903	400	21.0
1972 - 76 Avg.	2,209	478	21.6

TABLE 15

Proportion of Alcohol Related Injury Accidents During ASAP Patrol Hours in Fairfax County 1968-1976

Year	No. Accidents	Accidents 8 p.m. - 4 a.m. Number	Percentage
Single Vehicle			
1968	307	210	68.4
1969	296	214	72.3
1970	312	219	70.2
1971	322	244	75.8
1968 - 71 Avg.	309	222	71.8
1972	264	179	67.8
1973	326	233	71.5
1974	394	276	70.1
1975	302	259	85.8
1976	290	238	82.1
1972 - 76 Avg.	315	237	75.2
Multi-Vehicle			
1968	357	215	60.2
1969	352	222	63.1
1970	365	225	61.6
1971	373	228	61.1
1968 - 71 Avg.	362	223	61.6
1972	355	214	60.3
1973	400	219	54.8
1974	389	251	64.5
1975	336	196	58.3
1976	309	191	61.8
1972 - 76 Avg.	358	214	59.8

TABLE 16

Proportion of Alcohol Related Injury Accidents in Fairfax County 1968 - 1976 by Time of Day

Year	Alcohol Related Accidents: Total Accidents	Alcohol Related Accidents: Number	Alcohol Related Accidents: Percentage	Accidents 8 p.m. - 4 a.m.: Total Accidents	Accidents 8 p.m. - 4 a.m.: Number	Accidents 8 p.m. - 4 a.m.: Percentage
Single Vehicle						
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	1,056	322	30.5	483	244	50.5
1968-71 Avg.	978	309	31.6	435	222	51.1
1972	981	264	26.9	407	179	44.0
1973	1,103	326	29.6	470	233	49.6
1974	1,206	394	32.7	525	276	52.6
1972-74 Avg.	1,097	328	29.9	467	229	49.0
1975	846	302	35.7	435	259	59.5
1976	873	290	33.2	407	238	58.5
Multi-Vehicle						
1968	1,847	357	19.3	473	215	45.5
1969	1,979	352	17.8	494	222	44.9
1970	2,161	365	16.9	509	225	44.2
1971	2,277	373	16.4	531	228	42.9
1968-71 Avg.	2,066	363	17.5	503	223	44.4
1972	2,426	355	14.6	513	214	41.7
1973	2,529	400	15.8	528	219	41.5
1974	2,312	389	16.8	519	251	48.4
1972-74 Avg.	2,422	381	15.7	520	228	43.9
1975	1,874	336	17.9	428	196	45.8
1976	1,903	309	16.2	400	191	47.7

Characteristics of Injury Accidents by Day of the Week

Data in TABLE 17 indicate there there was very little change over time in the proportion of accidents which occurred on weekends. It appears that slightly over 50% of all single vehicle injury accidents occurred on weekends in Fairfax County, while slightly less than 50% of the multi-vehicle crashes occurred then. There was virtually no change during the ASAP period. Nor was there much change in the proportion of alcohol related injury accidents which occurred on weekends as seen in TABLE 18. The proportion was slightly over 60% for both single and multi-vehicle crashes since 1968, though there was a rise to 66.2% of the multi-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. In 1976 the figures decreased slightly, although they were still as high or higher than in previous years.

TABLE 17

Proportion of Injury Accidents Occurring on Weekends
In Fairfax County 1968 - 1976

Year	Total Accidents	Accidents Fri., Sat., & Sun. Number	Percentage
Single Vehicle			
1968	929	501	53.9
1969	951	503	52.9
1970	976	487	49.9
1971	1,056	565	53.5
1968 - 71 Avg.	978	514	52.6
1972	981	489	49.8
1973	1,103	557	50.5
1974	1,206	640	53.1
1975	846	445	52.6
1976	873	458	57.5
1972 - 76 Avg.	1,002	518	51.7
Multi-Vehicle			
1968	1,847	908	49.2
1969	1,979	972	49.1
1970	2,161	978	45.3
1971	2,277	1,071	47.0
1969 - 76 Avg.	2,066	982	47.5
1972	2,426	1,158	47.7
1973	2,529	1,137	45.0
1974	2,312	1,048	45.3
1975	1,874	857	45.7
1976	1,903	868	45.6
1972 - 76 Avg.	2,209	1,014	45.9

TABLE 18

Proportion of Alcohol Related Injury Accidents Occurring on Weekends in Fairfax County 1968 - 1976

Year	Total Accidents	Accidents Fri., Sat., & Sun. Number	Percentage
Single Vehicle			
1968	307	194	63.2
1969	296	185	62.5
1970	312	190	60.9
1971	322	203	63.0
1968 - 71 Avg.	309	193	62.5
1972	264	169	64.0
1973	326	201	61.7
1974	394	241	61.2
1975	302	200	66.2
1976	290	183	62.7
1972 - 76 Avg.	315	199	53.2
Multi-Vehicle			
1988	357	222	62.2
1969	352	227	64.5
1970	365	221	60.5
1971	373	234	62.7
1968 - 71 Avg.	362	226	62.4
1972	355	241	67.9
1973	400	249	62.3
1974	389	249	64.0
1975	336	203	60.4
1976	309	202	65.3
1972 - 76 Avg.	358	229	64.0

TABLE 19

Proportion of Injury Accidents That Were Alcohol Related
In Fairfax County 1968 - 1976 by Day of Week

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Year	Total Accidents	Alcohol Related Accidents Number	Alcohol Related Accidents Percentage	Weekend Accidents	Alcohol Related Accidents Number	Alcohol Related Accidents Percentage
Single Vehicle						
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	1,056	322	30.5	565	203	35.9
1968 - 71 Avg.	978	309	31.6	514	193	37.5
1972	981	264	26.9	489	169	34.6
1973	1,103	326	29.6	557	201	36.1
1974	1,206	394	32.7	640	241	37.7
1972 - 74 Avg.	1,097	328	29.9	562	204	36.3
1975	846	302	35.7	445	200	44.9
1976	873	290	33.2	428	183	42.7
Multi-Vehicles						
1968	1,847	357	19.2	908	222	24.4
1969	1,979	352	17.8	972	227	25.0
1970	2,161	365	16.9	978	221	22.6
1971	2,277	373	16.4	1,071	234	21.8
1969 - 71 Avg.	2,066	362	17.5	982	226	23.0
1972	2,426	355	14.6	1,158	241	20.8
1973	2,529	400	15.8	1,137	249	21.9
1974	2,312	389	16.8	1,048	249	23.8
1972 - 74 Avg.	2,423	381	15.7	1,114	246	22.1
1975	1,874	336	17.9	857	203	23.7
1976	1,903	309	16.3	868	202	23.3

TRENDS IN BAC'S 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 DWI increased steadily. During the 11 months 2,976 drivers were arrested for DWI, with the number 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, 888, 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. 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. Finally, in 1976, 2,888 of the 3,176 drivers arrested were tested, the quarterly arrest figures being 935, 802, 661, and 778. The distribution of BAC's of those arrested for DWI by arrest category is shown in TABLE 20. It should be noted that between 85% 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	BAC's-1976
Fatal Crash	1 (0)	1 (0)	0 (0)	9 (0)	0 (0)
Injury Crash	57 (2)	82 (2)	114 (4)	113 (3)	114 (4)
Property Damage	150 (6)	220 (7)	289 (7)	335 (10)	318 (11)
Non-Crash	2,347 (92)	2,942 (91)	2,648 (87)	2,886 (87)	2,456 (85)

TABLE 21

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

Month	1972	1973	1974	1975	1976
January	-	.17	.17	.16	.16
February	.19	.19	.18	.16	.17
March	.17	.18	.18	.16	.17
April	.20	.18	.18	.16	.17
May	.19	.16	.19	.17	.16
June	.19	.17	.18	.16	.16
July	.19	.17	.17	.16	.16
August	.20	.17	.16	.15	.17
September	.21	.17	.17	.16	.16
October	.19	.17	.17	.16	.16
November	.20	.16	.18	.16	.18
December	.19	.17	.19	.17	.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 0.19% compared with 0.17% in 1973, 0.18% in 1974, 0.16% in 1975, and 0.17% in 1976.

The distributions of BAC's for the first and twentieth quarters of ASAP operations are shown in TABLE 22. The distribution of BAC's for Quarter 1 was compared with that of Quarter 20 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 32.77 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 20 than in Quarter 1. However, the lowering of the average BAC of arrested drivers by 0.02% - 0.03% must be interpreted in the proper prespective, which considers that the presumptive limit for DWI was statutorily lowered 0.05% during the same period.

TABLE 22

BAC Distribution by Quarters (Number and Percentage)

BAC Category	Quarter 1	Quarter 20
0% - .14%	61 (15.5)	234 (33.8)
.15% - .19%	149 (37.9)	229 (33.1)
.20% - .24%	128 (32.6)	160 (23.1)
.25% +	55 (14.0)	69 (10.0)

$X^2 = 32.77 = 3$
$p < .01$

TRENDS IN PUBLIC INFORMATION AND AWARENESS OF ASAP

One of the countermeasures in the Fairfax ASAP is public information and education. Several pieces of survey type research were conducted each year to help ascertain the effectiveness of the public information effort in Fairfax. The roadside survey was conducted over a ten-day period each October for the last five years. Respondents were randomly selected from the population of drivers passing survey sites between the hours of 7 p.m. and 3 a.m. and asked to give a breath sample to determine the BAC and to answer questions concerning their knowledge and awareness of alcohol problems and countermeasures. Similar questions were asked on the biannual telephone surveys, which were conducted for the last two years, and on its predecessor, the household survey, conducted between 1971 and 1974.

Findings from these surveys provide some evidence as to the impact of the numerous events specifically dealing with the Fairfax ASAP. In addition, however, the national advertising of "Get the Problem Driver Off the Road" and "Friends Don't Let Friends Drive Drunk" 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 findings of the various reports dealing with the effectiveness of the public information countermeasure fall into four major categories. In terms of awareness of alcohol problems and countermeasures, while there was little change in the respondent's perception of drunk driving as a problem and in their exposure to alcohol advertising, there was a radical decline in awareness of programs designed to reduce alcohol related traffic deaths and in awareness of the ASAP in particular. As seen in TABLE 23, awareness of alcohol countermeasures rose from 47% in 1971 to 53% by 1974. By December of 1976, however, this percentage had declined to 39%, significantly lower than even pre-ASAP levels. Awareness of the Fairfax ASAP also declined significantly in 1975 and 1976 (see TABLE 24).

TABLE 23

"Have You Heard of a Program That is Trying to Reduce Alcohol Related Traffic Deaths?" (Response in Percent)

	Household Surveys		Telephone Surveys			
Response	1971	1974	June 75	Dec.75	June 76	Dec.76
Yes	47	53	48	48.6	40.2	39.4
No	52	47	52	51.4	59.6	59.8

TABLE 24

"Do You Recall What Agency or Organization is Sponsoring the Program?" (Response in Percent)

	Household Surveys		Telephone Surveys			
Response	1971	1974	June 75	Dec.75	June 76	Dec.76
ASAP	3	16	16.4	13.2	10.0	7.6
Other	15	16	11.0	11.6	12.6	10.4
Can't Recall	22	20	20.0	23.6	17.4	21.4
Not Heard of Program	53	48	52.6	51.6	60.0	60.6
No Answer	7	—	—	—	—	—

Regarding alcohol knowledge, level of awareness reached a peak during the mid years of the project, declined in 1975, and recovered to 1973-74 levels in 1976. Large numbers of the respondents in 1976 were not able to answer questions correctly, especially in terms of the presumptive legal BAC limit and the number of drinks necessary to reach that limit.

As seen in TABLE 25, a small minority of respondents could correctly recall how many drinks it would take to give them a BAC of 0.10%. Most subjects underestimated the number while a few overestimated. Thus, there were a substantial number of persons who lacked the basic knowledge necessary to make reasonable decisions concerning how much they could drink and still drive.

TABLE 25

Number of Drinks Necessary for a BAC ≥ .10% Adjusted For Respondent's Weight (Response in Percent)

	Telephone Survey	
Response	June 1976	December 1976
Correct	12.3	11.5
Too Low	61.6	65.8
Too High	26.1	22.7

Attitudes toward intervening in a drunk driving situation became less positive over time, while the probability of using various techniques to keep a friend from driving drunk remained relatively constant. Socially oriented behaviors of a host/hostess at a hypothetical party changed significantly. In 1976, respondents were more likely to close the bar at a given time and serve food and nonalcoholic beverages than in former years, while they were less likely to ask who was driving home, to not serve drinks to an intoxicated guest and to delegate driving responsibilities at the beginning of the party. Finally, fewer respondents reported ever having driven after having something to drink. The maximum number of drinks respondents would have and still continue to drive decreased significantly, along with the percentage of respondents reporting that they had at some time driven when they felt that they shouldn't have. While these responses on self-reported behavior were significantly different from that reported on the 1974 household survey, there were not significant differences between the June and December 1976 telephone surveys.

In general, there is little evidence to indicate that the public information countermeasure was effective in increasing awareness, increasing overall knowledge or improving attitudes on the problem of drunk driving. This lack of general improvement during 1976 could have been the result of diminished efforts in the area of public relations. The post of public information director was abolished midway through 1976 and, as indicated in TABLE 26, public information activities were drastically curtailed. While this lack of activity could easily have produced short-term deficiencies, it cannot explain previously existing negative or neutral trends. It must be concluded, then, that the public information countermeasure did not meet all of its objectives.

TABLE 26

Summary of Public Information Activities
1972 — 1976

Public Information & Education Activities	Previous Year Totals				Report Year 1976				1976 Totals
	1972	1973	1974	1975	1st. Qtr.	2nd. Qtr.	3rd. Qtr.	4th. Qtr.	
TV Spot	0	32	8	38	4	2	0	0	6
TV Special	72	84	81	13	2	0	0	0	2
Radio	126	99	115	93	1	3	0	0	4
Speakers	113	160	127	147	18	16	1	2	37
Newspaper	114	213	186	141	14	4	1	11	30
Other	29	NA	47	41	8	5	0	2	15
TOTAL	454	588	564	473	47	30	2	15	94

BENEFIT/COST ANALYSIS

Societal Costs in Fairfax

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

Societal costs of motor vehicle crashes computed for the baseline period and for the five years of project operations are shown in TABLE 27. These dollar costs are based on crash data taken from TABLE 1.

TABLE 27

Fairfax ASAP Societal Costs of Auto Crashes

1969_{L1}=60x($201,000)+4,165x($7,300)+10,331x($300)=$45,563,800

1970_{L2}=63x($201,000)+4,465x($7,300)+11,519x($300)=$48,713,200

1971_{L3}=100x($201,000)+4,765x($7,300)+12,501x($300)=$58,569,100

1972_{L4}=85x($201,000)+4,795x($7,300)+13,850x($300)=$56,243,000

1973_{L5}=78x($201,000)+5,032x($7,300)+14,511x($300)=$56,764,900

1974_{L6}=63x($201,000)+4,899x($7,300)+13,904x($300)=$52,596,900

1975_{L7}=60x($201,000)+5,206x($7,300)+11,178x($300)=$53,417,200

1976_{L8}=74x($201,000)+5,318x($7,300)+11,036x($300)=$57,006,200

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. Use of the 1969, 1970, and 1971 data (which reduces the significance of the extraordinarily 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 five-year (1972-1976) 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 the operational period over the 1969-1971 period. Costs for the latter were $51 million per year while the 1972-1976 costs were almost $55 million per year, a cost increase of some $4 million each year.

Break-even analysis, however, does not account for the increases in accident exposure that occurred in the 1972-1976 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 28 shows estimated societal costs of traffic crashes in Fairfax based upon projections made from the linear regression model mentioned earlier.

TABLE 28

Projected Fairfax Societal Costs Based on Linear Regression Model

1972_{L4}=86 x ($201,000)+5,178($7,300) + 13,236 x ($300) = $59,056,200

1973_{L5}=90 x ($201,000)+5,510($7,300) + 14,237 x ($300) = $62,584,100

1974_{L6}=89 x ($201,000)+5,463($7,300) + 14,097 x ($300) = $61,998,000

1975_{L7}=93 x ($201,000)+5,729($7,300) + 14,869 x ($300) = $64,983,500

1976_{L8}=96 x ($201,000)+5,980($7,300) + 15,655 x ($300) = $67,646,500

TOTAL $316,268,300

It can be seen from the data in TABLE 28 that projected 1972-1976 costs in Fairfax, based on the ten-year trend, would be over $316 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 $40 million, using a total projected cost for the five years of $316 million compared to the actual total cost of $276 million. Unfortunately, it is not possible to attribute the full $40 million savings to

ASAP. Since until 1974 few of the reductions in crashes were statistically significant it is not possible to demonstrate a positive benefit/cost ratio for any years except 1974 through 1976. For example, the figure $59,056,200 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 28 for the lower and upper limits of the projected range shows that the 1972 projected cost could have fallen anywhere between $49,873,200 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 $57 million also fell within the projected range of $53 million to $72 million. In 1974 the actual cost fell below the projected range at $52,596,900 actual compared to $52,622,500 at the lower end of the range. Thus at least a slight decrease was seen in 1974. In 1975, there was a significant change as the actual cost of $53,417,200 was below the $54,998,300 lower limit of the 95% interval. There was only a slight difference again in 1976, comparing the projected figure of $57,259,800 with the actual figure of $57,006,200. This change was probably due to the increased numbers of fatalities experienced during 1976. Since these small numbers are notoriously variable events, it is possible that the cumulative effect of the ASAP, as hypothesized in 1975, may reappear.

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 29.

It can be seen from TABLE 29 that while the trend in societal costs of crashes in Henrico was upward, the rate of increase was much more modest than in Fairfax, and it may be seen that in three of the years for which data were obtained, costs actually declined over year earlier levels. Total societal costs for the years 1972 to 1976 were almost $95 million.

TABLE 29

Henrico County Societal Costs of Auto Crashes

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

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

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

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

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

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

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

1976_{L8}=29 x ($201,000)+2,016 x ($7,300) + 2,440 x ($300)=$21,277,800

TOTAL $95,101,300

TABLE 30, again using the linear regression model mentioned earlier, shows the projected societal costs of motor vehicle crashes in Henrico for 1972-1976 based on prior crash trends.

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.

TABLE 31 compares the results of the cost benefit analysis for Fairfax and Henrico and Figures 9 and 10 summarize these results graphically. The actual cost to society of auto accidents in Fairfax was about $40 million less than would have been expected had pre-ASAP trends continued. (One must consider, however, that based upon the 95% confidence interval, the savings could fall within the range of no savings to $88.4 million.)

TABLE 30

Projected Henrico County Societal Costs Based On Linear Regression Model

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

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

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

1975_{L7}=24 x ($201,000) + 1,737 x ($7,300) + 3,447 ($300) = $18,538,200

1976_{L8}=25 x ($201,000) + 1,839 x ($7,300) + 3,643 ($300) = $19,542,600

TABLE 31

Projected vs. Actual Costs of Crashes in the ASAP and Control Communities

	Fairfax	Henrico
1972-76 Projected Costs	$316,268,300	$90,882,900
1972-76 Actual Costs	-276,028,200	-95,101,300
Savings	$ 40,240,100	
(Losses)		($ 4,218,400)

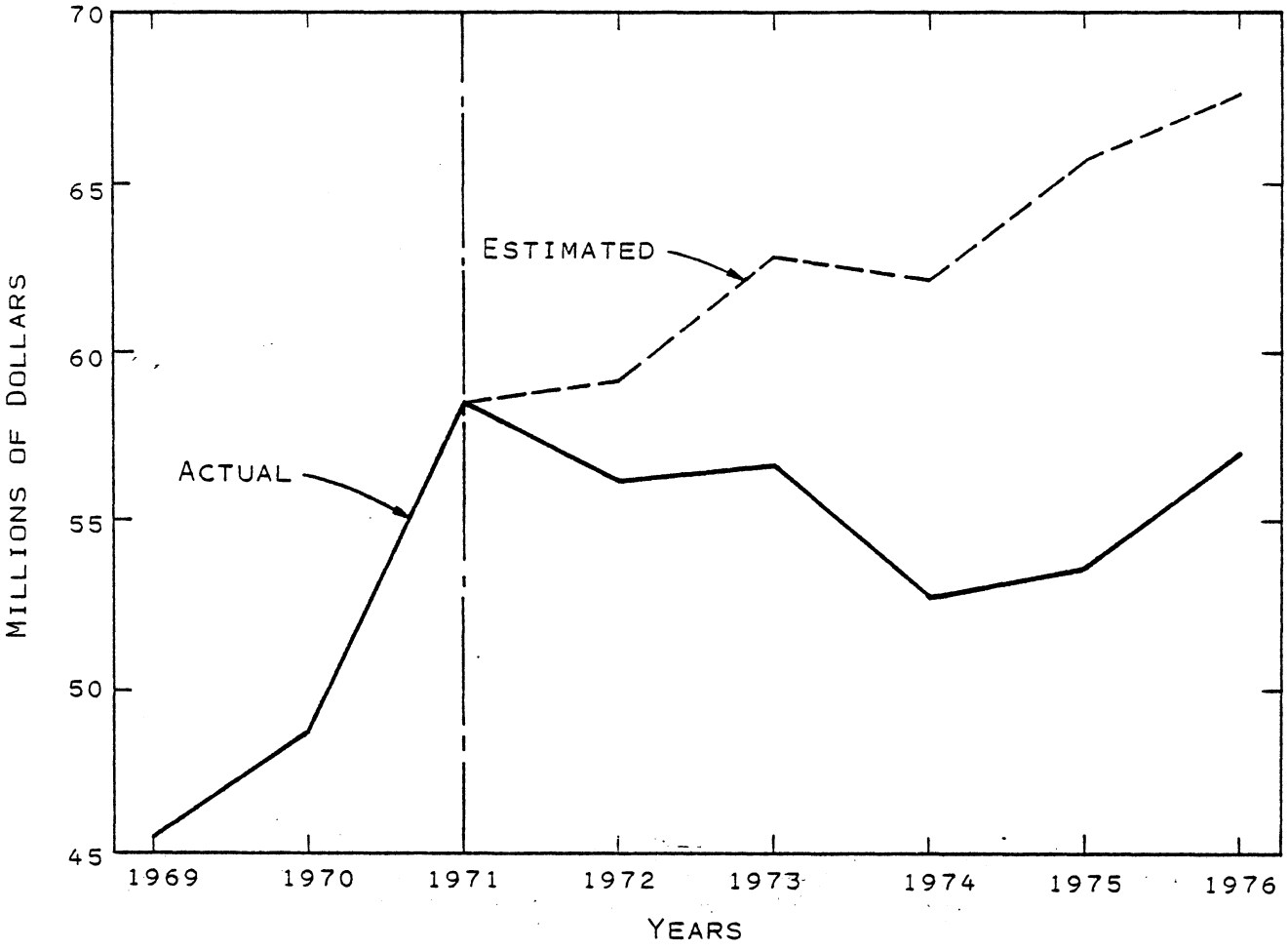

Figure 9. Actual and estimated societal cost of auto crashes in the Fairfax ASAP area.

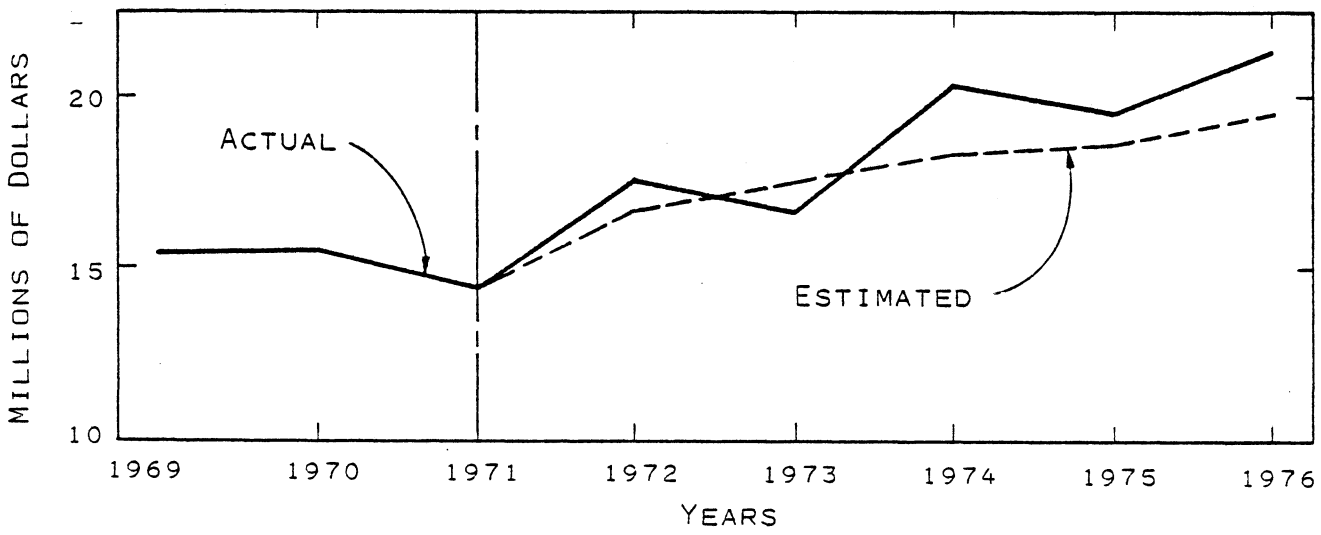

Figure 10. Actual and estimated societal cost of auto crashes in the Henrico area.

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
1976	600,421

Sources:

1960-64 Statistical Abstract of Virginia 1966
1965-69 Bureau of Population and Economic Research, U.Va.
1970 1970 Census; Commonwealth of Virginia, Virginia Department of Highways
1971-73 Planning Department, 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

1976 Department of Research and Statistics, Fairfax County, Planning Department of 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
1976	363,496

Sources:

Fairfax County: Mr. Ray Birch, Division of Finance, Fairfax County, 1962-1973. 1974 and 1976— Miss Ann Davis, Division of Finance.

Fairfax City : Mrs. Frances Cox, City of Fairfax, 1968-1976; 1962-1967 estimated by Virginia Highway and Transportation Research Council.

Falls Church : Mr. Eckert, City of Falls Church— 1962-1971; 1972 data estimated by Virginia Highway and Transportation Research Council; 1974 and 1976— Falls Church Treasurers Office.

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

1957	688.7
1958	703.9
1959	789.1
1960	785.1
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
1976	3,606.9

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	154,365
1971	158,066
1972	161,768
1973	165,470
1974	183,118
1975	190,106
1976	185,237

Source: 1960-1970 Census Data. 1962-69 data are interpolated from the Census data; 1971-73 are extrapolated from 1970. 1974-76— Mr. Winter, Office of Advance Planning, Henrico County.

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

1957	428.1
1958	447.1
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
1976	1,320.4

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
1976	126,891

Source: Mr. Dotson, County of Henrico, 1962-1971. 1972 data estimated by Virginia Highway and Transportation Research Council. Mr. Carroll, County of Henrico, 1974-1976.

APPENDIX B

FAIRFAX FATAL CRASHES

LINRG 11Ø/77 1637

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 -

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 = .727212
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 7.73629

UNASSOC SUM OF SQUARES= 485.Ø13
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, Ø=PROJECTIONS, 2=STOP PROGRAM
?1
INDEPENDENT VARIABLE (X) DATA:
MEAN = 1359.36
STANDARD DEVIATION = 583.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 56
STANDARD DEVIATION = 14.Ø554

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	-.Ø62	1.Ø6605	4.5413
1134.1	47	41.236	.1397	.877361	4.Ø3525
1254.5	47	43.6369	.Ø753	.929509	3.62925
1713.5	51	52.9697	-.Ø372	1.Ø3862	2.54317
1359.4	56	56.ØØØ3	-.ØØØ1	1.ØØØØ1	2.46224
1954	55	57.9266	-.Ø5Ø6	1.Ø5321	2.49733
2117.1	6Ø	61.2468	-.Ø2Ø4	1.Ø2Ø78	2.71172
2392.1	59	66.3449	-.1174	1.13296	3.4Ø254
2461.6	59	68.2597	-.1357	1.15694	3.62Ø77
2716.6	9Ø	73.4507	.2253	.816119	4.51Ø15

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		
3Ø36.6	79.969	6Ø.6163	--	99.3212
3272.3	84.7732	64.2298	--	1Ø5.317
3239.9	84.1Ø35	63.7347	--	1Ø4.472
3428.1	87.9346	66.5331	--	1Ø9.336
3606.9	91.5744	69.122	--	114.Ø27

4024

FAIRFAX INJURIES

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 = 533.796

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	185.535
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	3523.76	-.0275	1.02826	57.22
1954	3457	3653.39	-.0539	1.05696	53.0354
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	104.311

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
3606.9	5980.13	5453.36	--	6501.91

FAIRFAX INJURY CRASHES

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= 3.62034E+06
T-STATISTIC= 19.548 DEG. OF FREEDOM= 3

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 = 2443.5
STANDARD DEVIATION = 634.254

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	1520.53	-.0504	1.05303	56.1394
1134.1	1663	1670.26	-.0044	1.00437	49.923
1254.5	1973	1798.63	.0997	.909316	44.9046
1710.5	2210	2254.79	-.0025	1.03354	31.5285
1859.4	2359	2443.54	-.0346	1.03554	30.4652
1954	2525	2544.4	-.0077	1.00763	30.5994
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		
3036.8	3698.83	3459.35	--	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
3606.9	4306.64	4023.84	--	4534.44

4026

LINRG 11/7/77 1354

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 = 27.1795 + 1.92112E-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 = .755612

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 = .57095
STANDARD ERROR OF ESTIMATE OF THE POPULATION = 10.4004

UNASSOC SUM OF SQUARES= 865.355
TOTAL SUM OF SQUARES= 2016.9
T-STATISTIC= 3.26279 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 = 538.796

DEPENDENT VARIABLE (Y) DATA:
MEAN = 62.9
STANDARD DEVIATION = 14.97

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	40	46.2697	-.1356	1.15674	6.06598
1134.1	56	48.9669	.1436	.874409	5.39003
1254.5	57	51.2799	.1115	.899643	4.84773
1710.5	59	60.0402	-.0174	1.01763	3.40369
1359.4	65	62.9008	.0333	.967734	3.23891
1954	64	64.7182	-.0111	1.01122	3.33573
2117.1	65	67.3515	-.0421	1.04337	3.62214
2392.1	60	73.1346	-.1796	1.21891	4.5449
2461.6	63	74.4697	-.1541	1.13206	4.3364
2716.6	100	79.3686	.2599	.793686	6.82403

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	85.32	59.6705	--	111.369
3272.3	90.0533	62.6132	--	117.494
3239.9	89.4218	62.2144	--	116.629
3428.1	93.0373	64.4504	--	121.624
3606.9	96.4723	66.4317	--	126.463

FAIRFAX PD

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 -

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

UNASSOC SUM OF SQUARES= 3.19084E+06
TOTAL SUM OF SQUARES= 5.93964E+07
T-STATISTIC= 11.8703 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 = 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	4564.02	.0186	.98172	368.363
1134.1	5354	5159.91	.0376	.963749	327.316
1254.5	6468	5670.92	.1405	.876765	294.384
1710.5	7360	7606.3	-.0324	1.03346	206.693
1859.4	7720	8238.27	-.063	1.06713	199.723
1954	7645	8639.73	-.1152	1.13012	202.569
2117.1	8834	9332.02	-.0534	1.05637	219.959
2392.1	10331	10499.2	-.0161	1.01628	275.994
2461.6	11519	10794.2	.0671	.937074	293.696
2716.6	12501	11876.4	.0525	.95004	365.337

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
3272.3	14237.1	12570.7	--	15903.5
3239.9	14097.5	12445.3	--	15749.7
3423.1	14896.2	13160.3	--	16632.2
3606.9	15685.1	13833.9	--	17476.3

4028

HENRICO FATAL CRASHES

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 = 12.8331 + 3.01983E-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 = .296637

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 = 171.838

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	17.0983	.0532	.949458	2.35395
556.4	12	17.3004	-.3064	1.4417	2.17368
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	.647256	1.62531
733.6	18	18.7215	-.0386	1.04008	1.48764
800.9	19	19.2612	-.0136	1.01375	1.61862
881.3	22	19.91	.1049	.905002	2.02647
932.4	23	20.3158	.1321	.883295	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	9.43115	--	35.3693
1240	22.7828	9.23277	--	36.3328
1320.4	23.4276	8.83311	--	38.022

HENRICO FATALITIES

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 = 171.388

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	2.13396
659.1	31	21.7879	.4223	.702837	1.85227
733.6	19	22.1116	-.1408	1.16377	1.69537
800.9	24	22.4041	.0712	.933503	1.34464
861.8	26	22.7556	.1425	.875214	2.30945
932.4	26	22.9754	.1316	.883671	2.69449
1022.7	17	23.3673	-.2726	1.37488	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	--	38.8847
1240	24.312	8.36986	--	39.7541
1323.4	24.6613	8.02839	--	41.2937

4030

HENRICO INJURY CRASHES

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 -

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

UNASSOC SUM OF SQUARES= 16018.5
TOTAL SUM OF SQUARES= 245877.
T-STATISTIC= 10.7153 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 = 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.
530.2	469	542.48	-.1355	1.15667	22.44
556.4	527	566.84	-.0703	1.0756	20.7251
585.4	623	593.803	.0491	.953134	18.9644
606.7	632	613.606	.0299	.970896	17.7374
659.1	740	662.325	.1172	.895034	15.4611
733.6	755	731.592	.0319	.968996	14.1514
800.9	800	794.164	.0073	.992705	15.3975
881.8	875	869.381	.0064	.993578	19.2772
932.4	886	916.426	-.0333	1.03434	22.4912
1022.7	984	1000.38	-.0164	1.01665	29.3037

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	1058.31	946.122	--	1170.49
1160.5	1123.5	1008.64	--	1248.36
1192.3	1153.37	1034.7	--	1231.44
1240	1202.42	1073.52	--	1331.31
1320.4	1277.17	1133.34	--	1416.

HENRICO INJURIES

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 -

.05 PROBABILITY THAN AN R OF .63 WILL OCCUR RANDOMLY

.01 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= 3

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 = 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	-.0654	1.06994	32.1011
585.4	914	906.661	.008	.99197	29.374
606.7	977	933.687	.0463	.955667	27.5503
659.1	1090	1000.17	.0393	.91759	23.9477
733.6	1157	1094.7	.0569	.946154	21.9191
800.9	1230	1180.09	.0422	.959425	23.8491
881.8	1301	1282.74	.0142	.985965	29.8584
932.4	1313	1346.94	-.0252	1.02585	34.8365
1022.7	1395	1461.52	-.0456	1.04765	44.9233

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	1540.56	1366.3	--	1714.33
1160.5	1636.36	1450.71	--	1822.02
1192.3	1676.71	1485.62	--	1867.8
1240	1737.23	1537.58	--	1936.88
1320.4	1839.25	1624.21	--	2054.28

4032

HENRICO PD

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 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 = .934173

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

UNASSOC SUM OF SQUARES= 230504.
TOTAL SUM OF SQUARES= 1.81033E+06
T-STATISTIC= 7.40492 DEG. OF FREEDOM= 5

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 = 171.583

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.
530.2	1634	1716.65	-.0482	1.05058	85.1265
556.4	1704	1780.51	-.043	1.0449	78.6211
585.4	1946	1851.2	.0512	.951284	71.942
606.7	2075	1903.12	.0903	.917165	67.4765
659.1	2260	2030.84	.1128	.898602	58.6521
733.6	1989	2212.43	-.101	1.11233	53.6838
800.9	2201	2376.47	-.0739	1.07973	58.4105
881.8	2476	2573.67	-.038	1.03945	73.1235
932.4	2668	2697.	-.0108	1.01057	85.3208
1022.7	3106	2917.11	.0647	.939134	110.026

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	3068.96	2643.39	--	3494.53
1160.5	3252.99	2798.29	--	3707.69
1192.3	3330.5	2862.49	--	3798.51
1240	3446.77	2957.3	--	3935.74
1320.4	3642.74	3116.08	--	4169.41