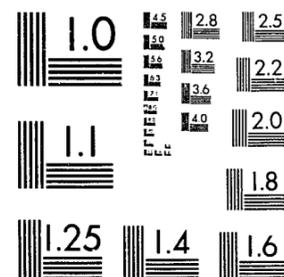


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4-22-84



STATE OF WASHINGTON

John Spellman, Governor

DWI IMPACT STUDY  
STATE OF WASHINGTON  
1977 - 1982

Prepared by  
OFFICE OF FINANCIAL MANAGEMENT  
FORECASTING AND ESTIMATION DIVISION  
JOE TALLER - DIRECTOR

Olympia, Washington  
DECEMBER 1983

92929

DWI IMPACT STUDY  
STATE OF WASHINGTON  
1977-1982

A study of the Relationship  
Between DWI Enforcement and Alcohol-Related  
Driving Accidents

NCJRS

FEB 18 1984

ACKNOWLEDGEMENTS

ACQUISITIONS

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Traffic accident data was supplied by the Washington Department of Transportation and the Washington State Patrol. The Washington Department of Licensing provided the data on court convictions for driving while under the influence of alcohol.

Special thanks are in order for the use of an innovative time-series descriptive technique which was made available through the Illinois Criminal Justice Information Authority. Dr. Carolyn Block of that agency provided a great deal of assistance, insight and enthusiastic support. The transformation of the technique to our use required the unique skills of WSU Systems Analyst Doris Steingraber, who also deserves special recognition and thanks.

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## EXECUTIVE SUMMARY

The purpose of this study is to assess whether or not the implementation of the more stringent driving while intoxicated DWI laws in Washington State has resulted in a general deterrence that has reduced the frequency of alcohol related traffic accidents.

On January 1, 1980 with the implementation of Substitute House Bill 665, a person is presumed to be guilty of driving while intoxicated if the alcohol weight in the blood is found to be at or above 0.10 percent. If found guilty, the DWI offender is sentenced to one day in jail, plus fines, and is required to attend alcohol information school.

It was the stated intention of both the Legislature and the Executive that these changes should act as a deterrent to future acts of driving while intoxicated and, consequently, to increase safety on the public highways.

This report provides a comparison of DWI law enforcement, court, jail, and accident information prior to and after the implementation of the new law. The before period is from January, 1977 to December, 1979. The post-period is from January, 1980 to December, 1982. To a large extent the study depends on detailed information obtained from 41 cities and 15 counties in Washington.

The report does not assess the impact of the recent 1983 changes in the DWI laws or the State Supreme Court decision impacting jury trials in lower courts because information used in this study does not extend beyond 1982.

Important findings are presented below:

- o The stringent 1980 DWI law was implemented efficiently by law enforcement organizations, prosecutors, courts, and jails.
  - oo Arrests for DWI started to rise dramatically in late 1979 after passage of the new DWI law (SHB665).

- oo In the 41 sample cities there has been a steady increase of 6.5 additional arrests per month. At the end of 1979, there were 474 DWI arrests made per month in the 41 sample cities. At the end of 1982, there were 706 DWI arrests made per month in the same cities.
- oo DWI court convictions kept pace with arrests on a statewide basis.
- oo Jailers continue to report a steady influx of more DWI offenders each year since 1980. Data from the Correction Standard Board shows that the number of DWI offenders in jail has doubled since 1981.
- o In spite of a long term decreasing trend in non-DWI traffic accidents, alcohol related accidents continued to climb in the 1977 to 1981 period.
- o After one year of increased enforcement, prosecution, and incarceration, alcohol-related accidents showed a significant decrease for the first time in recent history.
  - oo In the 41 sample cities there has been a 20 percent decrease in the number of alcohol related accidents per month.
  - oo In the 15 sample counties there has been a 28 percent decrease in the number of alcohol related accidents per month.
- o The one year lag in realized effects may be attributed to the time it has taken for DWI offenders to understand the full impact of the tougher DWI laws and start to change their behavior.

o Based on other DWI research, it appears that increasing the severity of punishment without ensuring the certainty of apprehension is futile.

oo DWI law enforcement by cities, counties and the State Patrol has grown more efficient since 1980. That is, more DWI arrests are being made per officer or deputy.

NUMBER OF DWI ARRESTS PER OFFICER PER MONTH

<u>Year</u>	<u>41 Sample Cities</u>	<u>15 Sample Counties</u>	<u>State Patrol</u>
1979	.34	.18	1.73
1982	.47	.24	1.87

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## I. Introduction

On January 1, 1980 the existing penalties for driving while intoxicated in Washington State became more stringent. This was the result of House Bill 665 which became law during the 1979 Legislative session. The law mandated two important changes: the 'illegal per se' section and the mandatory incarceration section. The 'illegal per se' section provided a clear cut definition of driving while intoxicated (DWI), i.e., that a person is assumed to be guilty when the alcohol weight in the blood is found to be at or above 0.10 percent. The mandatory incarceration section mandated at least one day in jail on a finding of guilty. (Note. The 'illegal per se' section was implemented in September 1979 while mandatory incarceration went into effect on January 1, 1980). It was the stated intention of both the Legislature and the Executive that these changes should act as a deterrent to future acts of driving while intoxicated and, consequently, to increase safety on the public highways.

The purpose of this study is to assess whether or not the implementation of the more stringent DWI laws in Washington State has resulted in a general deterrence that has reduced the frequency of alcohol related traffic accidents.

## II. Research Strategy

In order to assess the effects of a major social and legal change, it is necessary to examine the desired effect, namely, changes in traffic safety due to fewer alcohol-related accidents. It is also desirable to analyze the components of that change, that is, those factors which directly affect the desired result. In this case, the questions are: were more DWI offenders arrested and incarcerated after the law went into effect and what change, if any, was experienced in highway safety?

The basic hypothesis adopted at the outset of this examination was that:

- o an equal or increasing number of DWI arrests with a more certain process of proof --illegal per se -- leads to
- o an equal or increased number of DWI convictions, which, in turn, leads to
- o an increased number of persons sentenced to jail.

The combination of these three factors provides:

- o a deterrence to driving under the influence of alcohol, which can be measured by
- o a decrease in the number of DWI or alcohol-related driving accidents.

### Analytical Method

This study uses a general application of a pre-post time-series analysis.

Implicit in the enactment of this law is a modification of existing social policy, viz., a change in emphasis from alcohol education and rehabilitation to punishment and deterrence. The new emphasis shifted the target

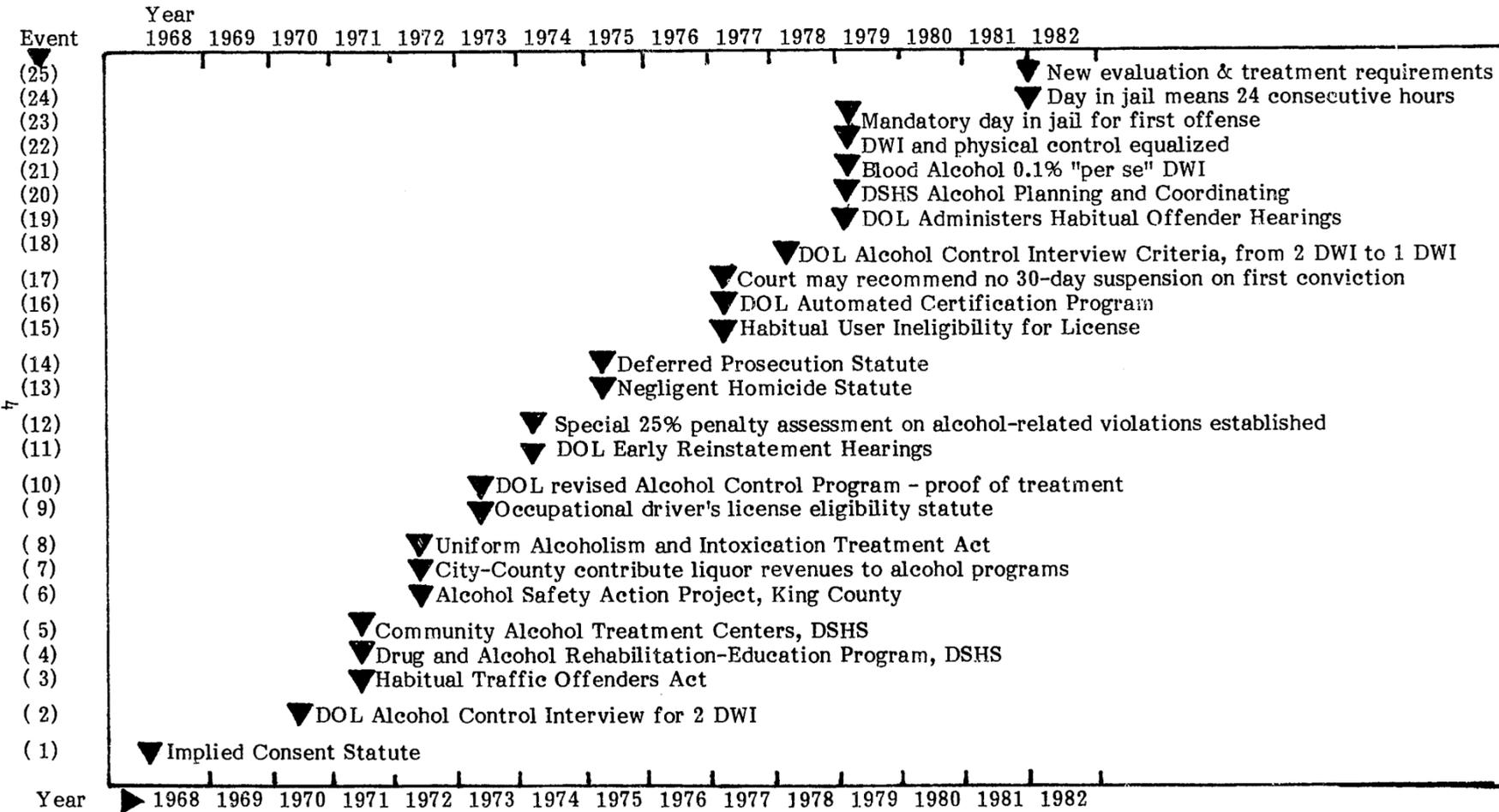
population from the previous, smaller group: those drivers who got caught, to a new broader population: anyone drinking and driving. The effectiveness of the law may be measured in operational terms but the application is as much psychological as literal. In other words, the threat of arrest and incarceration must be perceived as real and credible in order to deter. This introduction of increased threat of certainty and severity of punishment for a DWI offense represents the "experimental treatment" in the research design. A major assumption for this study as to the potential effect of this policy change is that enforcement would be strengthened based on less chance for equivocation with the 'illegal per se' section. This should lead at a minimum to an increase in the number of traffic arrests which are more readily categorized as driving while intoxicated, since borderline cases would no longer be a matter of personal judgement. In line with this assumption of more certain arrest is the logical outcome, that there would be more DWI convictions. And then due to the mandatory jail term, it is expected that more persons would be going to jail. The effectiveness measure (all other external forces being equal) for the above relationships would lie in the changes after January 1, 1980 in the number of alcohol-related driving accidents. See Appendix 1 for a review of statewide traffic statistics.

The chart that follows (Table 1) depicts the incremental steps leading to the passage of SHB 665 and events of significance in the immediate years subsequent to its passage. There has been a sharp change in the character of the DWI laws after 1979. See Appendix 2 for a narrative discussion of these legislative and programmatic changes.

The time series statistical method used to assess the research hypothesis is based upon the work of James E. Ertel and Edward B. Fowlkes of Bell Laboratories (Ertel and Fowlkes 1976). Their original program was subsequently adapted by the Statistical Analysis Center, Illinois Criminal Justice Information Authority, Illinois Law Enforcement Commission (ILEC) and, with ILEC permission, enhanced at the Computer Service Center,

Table 1

DEPARTMENT OF LICENSING ALCOHOL/TRAFFIC SAFETY TIME-EVENT CHART



Source: Research & Technology Division, Department of Licensing (Jan. 1982)

Washington State University. The Ertel-Fowlkes method will optimize the fit for time-series data in an iterative process. With sufficient numbers of data points, the Ertel-Fowlkes method will find the maximum possible number of statistically significant linear fits through the time series, thus depicting the significant turning points and trends in the time series. For this research, the change in direction and slope of the pre-post curves provides the evidence to test the study hypothesis. See Appendix 3 for further discussion and examples of the Ertel-Fowlkes method.

In this analysis, a pre-post time period is hypothesized, i.e., the events that have occurred prior to January 1980 and those that follow. This analysis is very similar to the traditional interrupted time-series analysis, however this analysis does require the assumption that a single point in time be identified when the impact from the change in the law should start. This provides the opportunity to examine anticipatory and/or lagged system responses. The use of the Ertel-Fowlkes method is especially salutary in this regard since it provides a vivid, visual display of the statistically significant moments of change.

The extensive time series data used in this analysis (48 months pre and 36 months post) facilitate the examination of rival or alternative hypotheses (Campbell and Stanley 1963). The possible influence of these rival hypotheses is discussed in Section V.

## Sample

The sites selected for examination in this study provided a serendipitous discovery. The criteria for selection was on the basis of regular monthly reporting to the Uniform Crime Reporting system between 1976 and 1982 rather than as the result of a random or other representative sampling procedure. However, the sample proved to be both adequate and representative. The 41 cities and 15 counties (out of 39 possible) represent 44% of the State's 1980 population. Both the cities and counties offer a wide distribution of size and location in the State, thereby alleviating any concerns as to population density, resources available, and law enforcement patterns.

In the analysis, the 41 cities and 15 counties are aggregated separately. This results from the organizational differences between the city police and the sheriff's departments. They differ in resources and physical environment. In the sample cities, there are an average of 1.6 officers per 1000 persons while there are .9 deputies per 1000 persons in the representative counties. Sheriff's deputies patrol 22.8 square miles per officer on average while the city police average .3 square miles. Overall 1980 population density for the sample cities is 2201 per sq. mile as opposed to 45 per square mile for the counties. The dispersion and diversity of the sample sites are illustrated on the map below. See Chart 1 and Appendix 4 for specifics as to the sample sites.



## Data

The following data were collected to assess the validity of the research hypothesis.

- (a) Arrest information was examined for the four years preceeding the implementation of the 1980 statute and for 3 years following. These historical records were obtained from the U.S. Department of Justice, Federal Bureau of Investigation, for all law enforcement agencies within the State of Washington that had participated in the national Uniform Crime Reporting program. Agencies participate on a voluntary basis and report the incidence of major crime occurring within their area of responsibility. In addition, they may report the number of arrests made on a monthly basis for major and minor crimes. Data for 1982 was obtained from the Washington State Uniform Crime Reporting system under the auspices of the Washington Association of Sheriffs and Police Chiefs in lieu of the FBI. This arrest information is geographically oriented, or site specific, in that county (excluding any municipal law enforcement) activities or city activities can be delineated. Preliminary analysis revealed that 41 city police departments and 15 county sheriffs departments had, in fact, reported monthly arrests continuously since 1976. In addition, the sample city and county arrest information were augmented by data from the Washington State Patrol.
  
- (b) Data regarding court convictions for alcohol related driving arrests were obtained from the Driver's License System maintained by the Washington State Department of Licensing for the years 1978 through 1982. A 50% sample was drawn for the 41 cities and 100% for the 15 counties indicated above. While this information identifies specific courts by geographic location, it does pose a problem insofar as identifying the geographic site of the arrest which led to the court appearance. For example, if a DWI offender is arrested by a State Patrol officer in whatever locale, that motorist will appear in a District court rather than a Municipal court. Manual examination of individual court records would be required to provide information as to the location of the incident.

Convictions that were selected for specific sample site courts were based on the following criteria:

Any district, municipal or juvenile court convictions for:

- (1) Driving while intoxicated with license suspension.
- (2) Driving while intoxicated without license suspension.
- (3) In physical control of a vehicle while under the influence.
- (4) In physical control - reduced from DWI.
- (5) In physical control with license suspension.
- (6) In physical control with no license suspension.
- (7) Reckless driving-reduced from DWI.
- (8) Negligent driving - reduced from DWI.

(c) Due to constraints of time and resources, new detailed data regarding incarceration in county and/or city jail facilities were not obtained. An earlier study was used as a proxy for this activity. This study, "Assessment of the Implementation and Impact of SHB665: The New DWI Law" (OFM 1980) examined the relationship between DWI court convictions, sentences received and the impact on jails. Although tentative in its conclusions due to the relatively short span (1979-1980) between implementation and data collection, the study, nonetheless, supports the earlier hypothesis that convictees do indeed go to jail per the mandate of the law. In addition, aggregate DWI jail population data were obtained from the State's Correction Standard Board.

(d) Traffic accident data were supplied by the Department of Transportation for the years 1977-1982. The selection criteria limited the information to the same 41 city and 15 county sites and identified all traffic accidents in which the driver(s) were either under the influence of alcohol or not.

Accidents were classified by the data element which was used to select the particular incident, viz., "Driver had been drinking". The term "alcohol-related accident" is used interchangeably with "accidents where driver had been drinking" in this publication.

### III. Changes in Driving While Intoxicated (DWI) Enforcement and Deterrence

This section deals with the relationships between the independent variables that are hypothesized to be related to changes in alcohol-related traffic accidents. The three independent variables are:

1. The number of DWI arrests by the sample cities and counties in the study.
2. The number of alcohol-related traffic court convictions (i.e., DWI and DWI-reduced charges) in the court jurisdictions that are most closely affiliated with the sample cities and counties.
3. The number of persons sentenced to jail for DWI offenses.

The combination of these three variables represents the deterrents that should lead to the reduction in alcohol related traffic accidents after January 1980 (the post period).

The deterrent effect under the new DWI law is hypothesized to be related to the 'illegal per se' section and the mandatory jail section of the law. Therefore, even if the post period of the study shows no increase in DWI arrests and convictions, the deterrent effect should be evident because of greater certainty and severity of punishment.

The deterrent effect would be enhanced if there were an increased number of DWI arrests, convictions, and incarcerations in the post period.

The deterrent effect would be diluted or not existent if arrests do not lead to conviction, or convictions do not lead to incarceration in the post period.

Data is presented in this section for the 41 sample cities, 15 sample counties and, where feasible, statewide, to examine the relationship between the independent variables and the type of deterrent effect that they present.

The following two charts (Charts 2 and 3) depict DWI arrests for the period

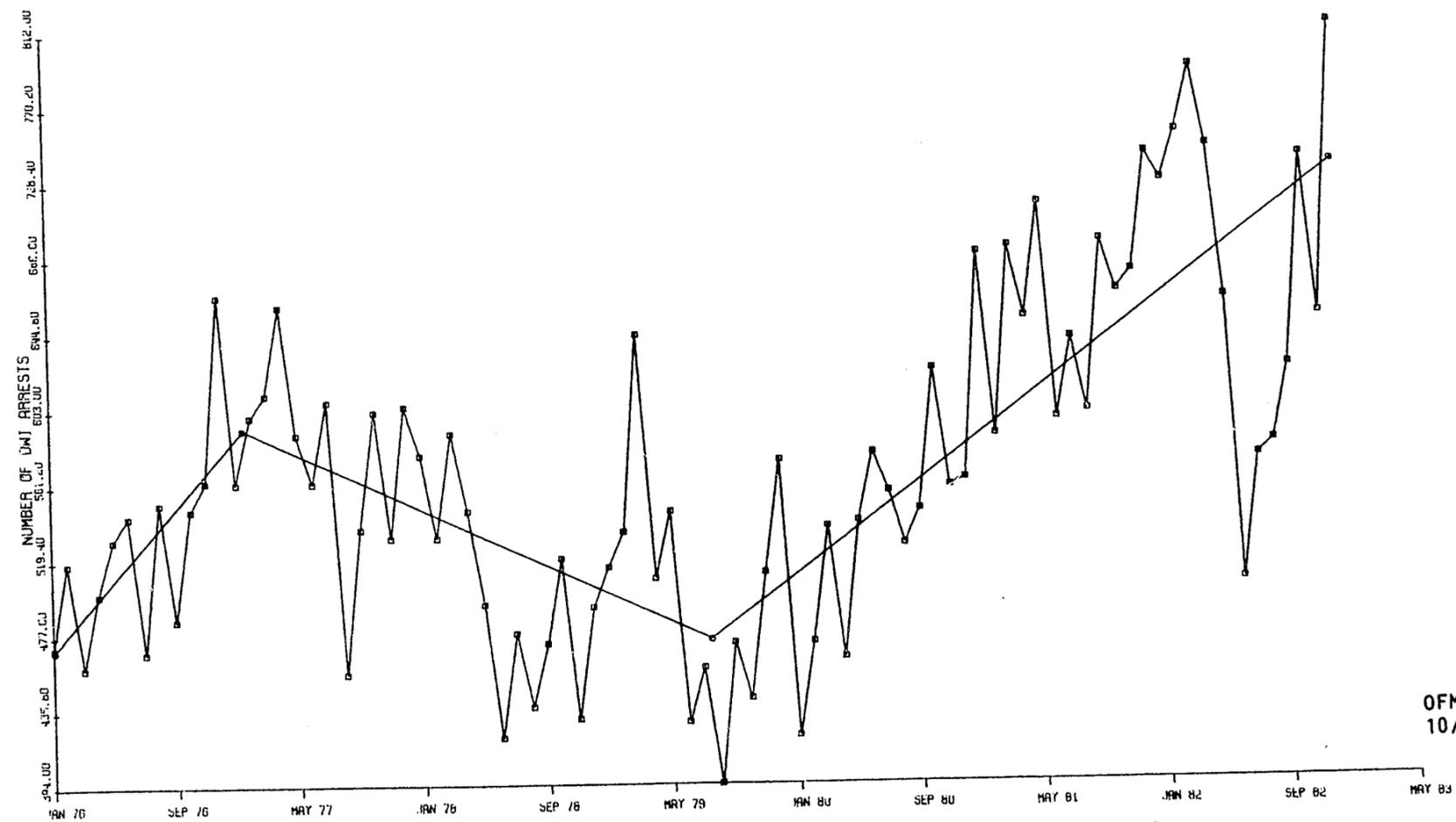
Chart 2

41 WASHINGTON CITIES - DWI ARRESTS, 1976 - 1982

RAW DATA SERIES = □  
MULTI-SEGMENT LINE = ⊙  
SOURCE: WASHINGTON UNIFORM CRIME REPORTS

FIRST SLOPE = 9.77      FIRST TURNING POINT      X: 13.50  
Y ZERO INTERCEPT = 460.20      Y: 592.13  
SECOND SLOPE = -3.95      SECOND TURNING POINT      X: 43.50  
Y ZERO INTERCEPT = 645.40      Y: 473.73  
THIRD SLOPE = 6.44      TOTAL SSR =  
Y ZERO INTERCEPT = 193.40

12



OFM/F&E  
10/83

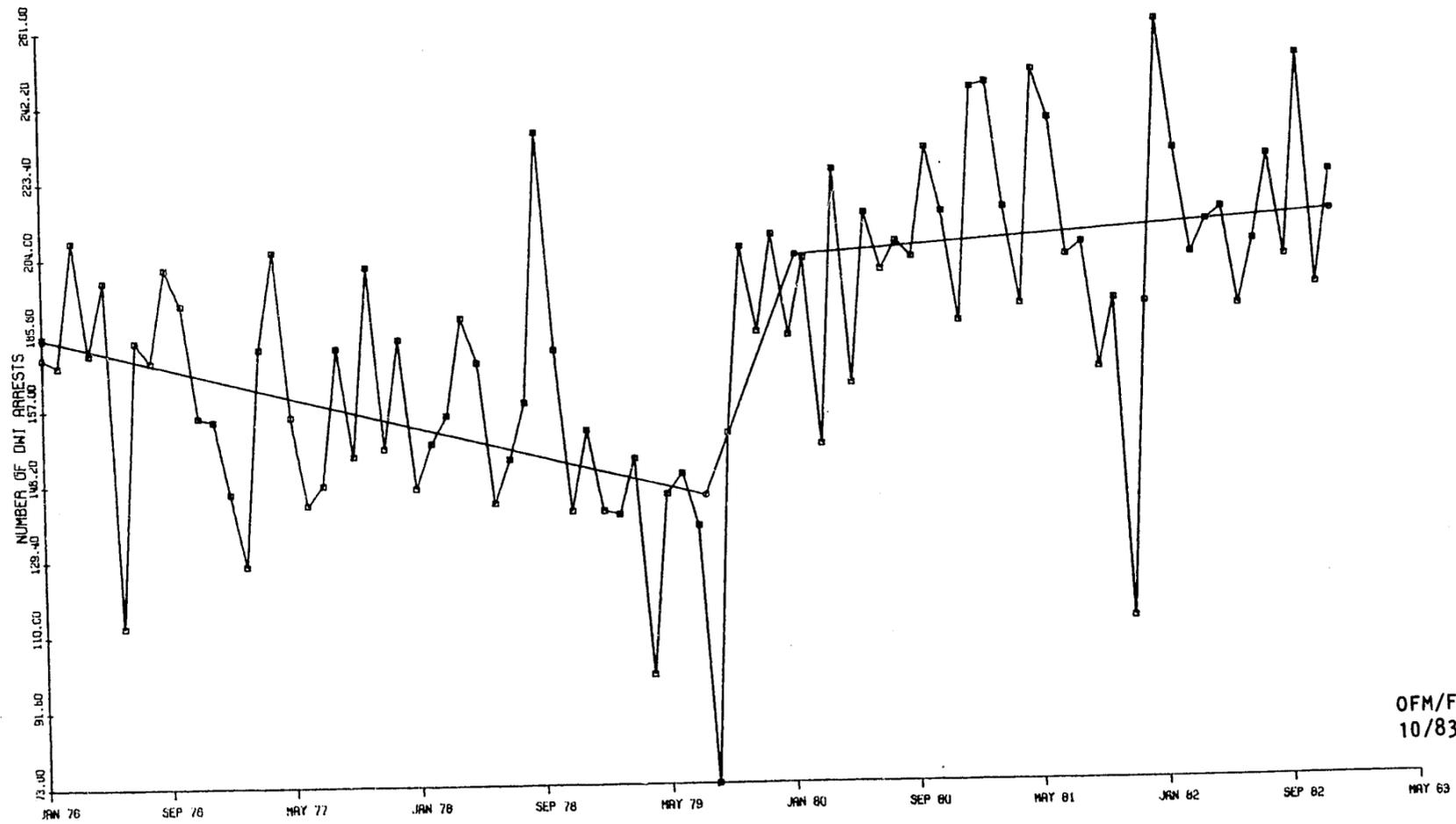
Chart 3

15 WASHINGTON COUNTIES - DWI ARRESTS, 1976 - 1982

RAW DATA SERIES = □  
MULTI-SEGMENT LINE = ⊙  
SOURCE: WASHINGTON UNIFORM CRIME REPORTS

FIRST SLOPE = -0.95      FIRST TURNING POINT      X:43.51  
Y ZERO INTERCEPT = 185.74      Y:144.1  
SECOND SLOPE = 9.91      SECOND TURNING POINT      X:49.51  
Y ZERO INTERCEPT = -286.42      Y:203.1  
THIRD SLOPE = 0.27      TOTAL SSR = 61564.58  
Y ZERO INTERCEPT = 190.61

13



OFM/F&I  
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1976 through 1982 in the sample cities and counties. The spline-regression lines through the data points vividly display the turning points in time when statistically significant changes occurred. These plots were created using the Ertel-Fowlkes time-series descriptive program mentioned earlier. Especially noteworthy in these graphics are the identical turning points in August 1979 for both cities and counties. The upward trend in arrests began after the new DWI law was passed into law but before the mandatory 1 day in jail feature was implemented. The 'illegal per se' section was implemented in September 1979 while the jail portion became effective on January 1, 1980.

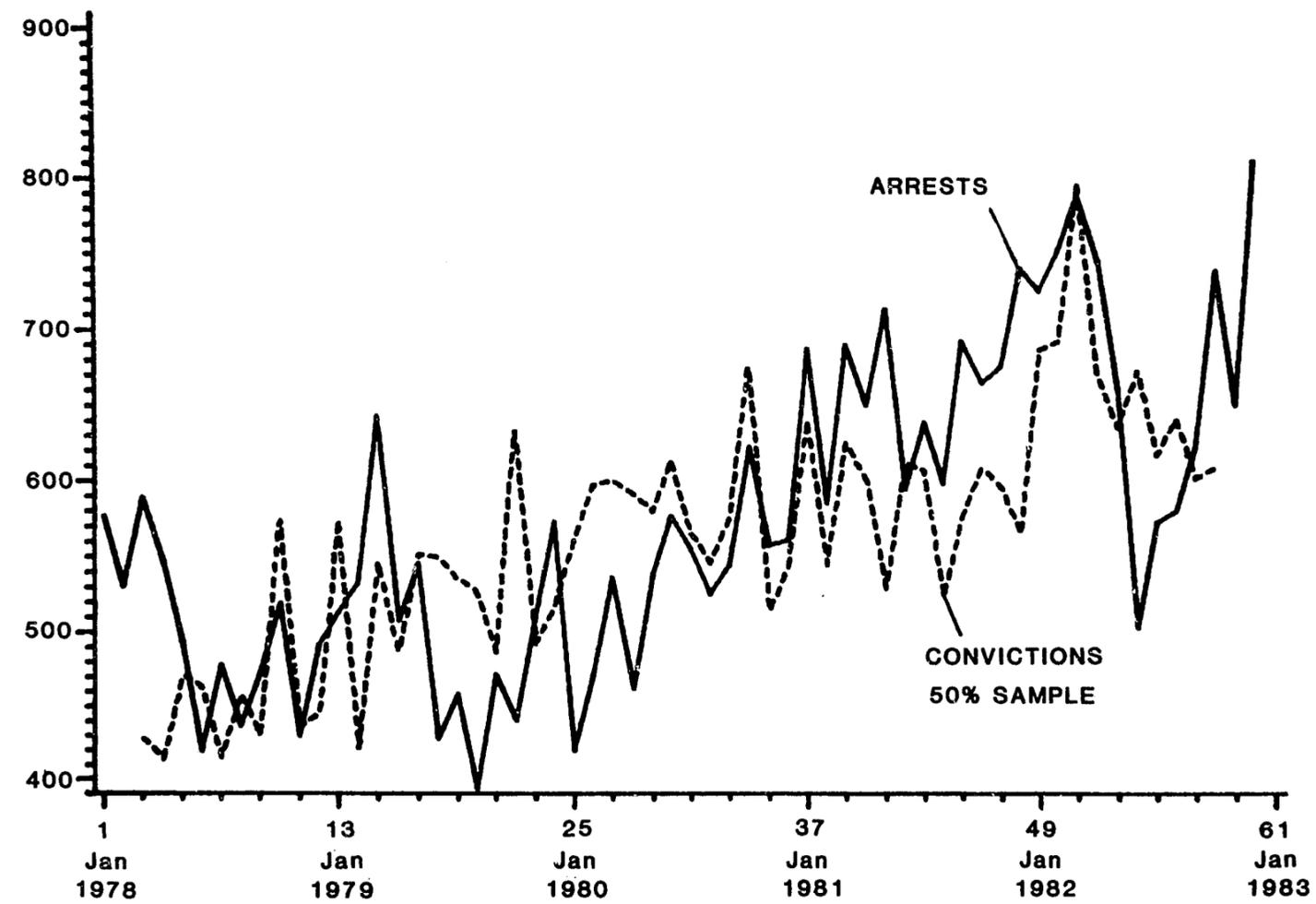
Both the cities and the counties arrest trends after August 1979 indicate a potentially strong deterrent effect. Prior to the new DWI law, arrest patterns were declining or unstable. On average in the 41 sample cities, 474 DWI arrests were made per month at the turning point in August 1979. Since that time the number of DWI arrests has been increasing steadily by 6.5 arrests per month. This trend has continued for over 36 months. The 15 county sample shows a much sharper increase after the turning point, but then that settles down after six months into slow but continual increase in DWI arrests. Between the turning point and the first six months of the post period the average monthly number of DWI arrests in the 15 sample counties increased from 145 arrests to 204 arrests per month.

Has this strong increase in arrest activity been translated into an increase in DWI convictions? The following charts (Charts 4 and 5) illustrate the relationship between arrests and convictions, the second of the three independent variables to be examined. Note that frequency plots were used to emphasize the similarity in the relationship between arrests and convictions.

In examining the graphs, it is important to note the pattern of change as opposed to the literal value of the number of arrests and convictions, because, the conviction data are samples based on an admixture of city and

Chart 4

41 WASHINGTON CITIES



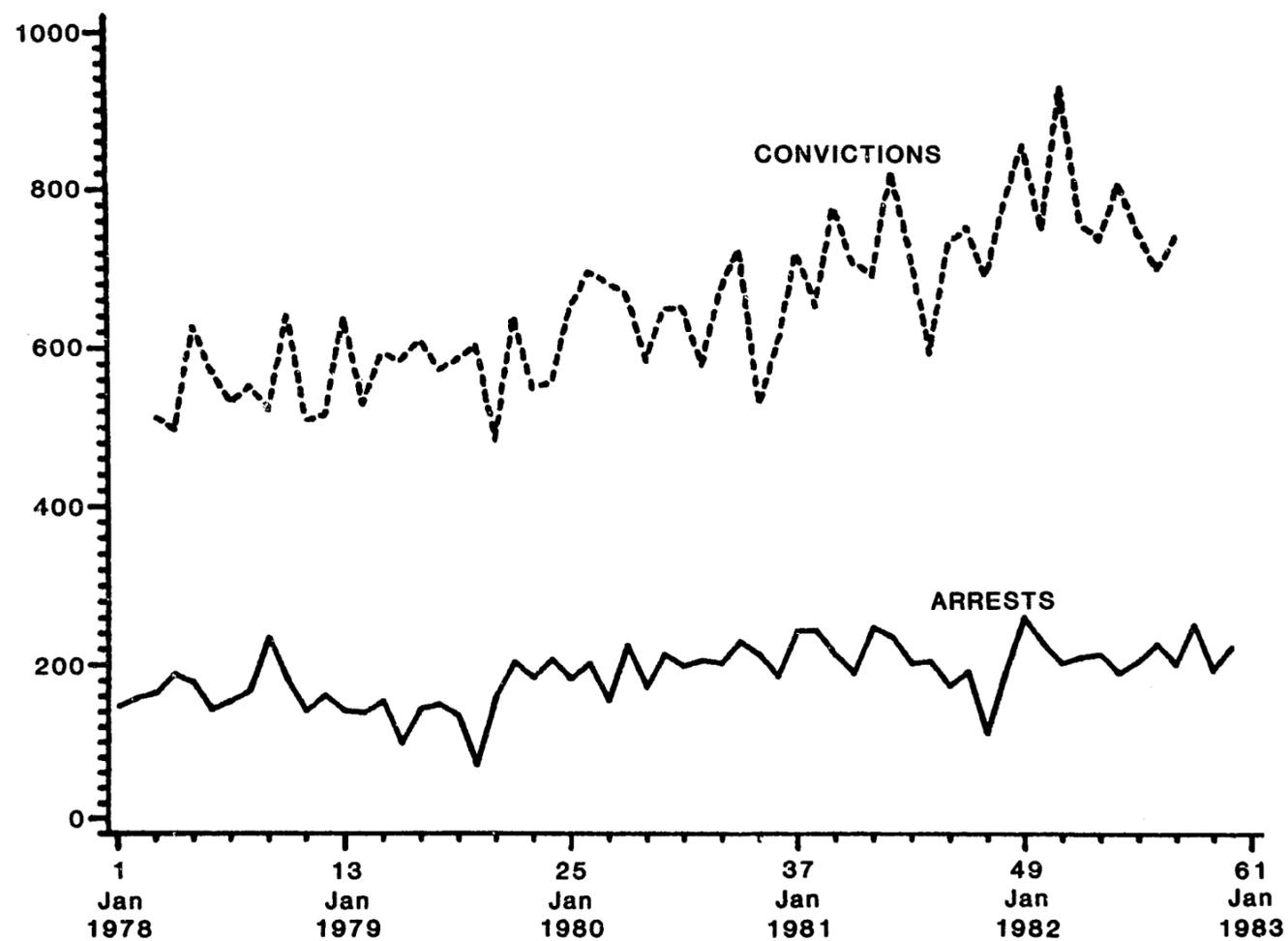
Note: See page 13 for discussion

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15

Chart 5

15 WASHINGTON COUNTIES



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Note: See page 13 for discussion

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county arrestees and are not, therefore, a completely accurate indicator. The 41 cities and 15 counties were matched as closely as possible to their respective court districts but overlap is unavoidable. The problem of matching cities and counties to court districts is further aggravated because Washington State Patrol DWI arrests are included in the convictions but not the arrests. Therefore convictions appear to have a greater volume than arrests. While it is difficult to determine specific points in time in this graph, it does provide dramatic evidence of a concurrent rise in DWI convictions with arrests over time.

Based on the similarities in the patterns of DWI arrests and convictions in the sample cities and counties, we will make the assumption that this artifact can be extrapolated to the entire State and, therefore, statewide alcohol-related traffic convictions fluctuate over time generally in consonance with DWI arrests. As Table 2 below shows, the statewide experience with alcohol-related convictions is very similar to that of the sample jurisdictions. Statewide alcohol-related traffic convictions were on a decline prior to January 1980. Thereafter, they have been increasing.

Table 2  
STATEWIDE ALCOHOL-RELATED CONVICTIONS

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
Number Convicted of DWI	26,308	25,855	30,920	32,979	38,774
Number Convicted of Physical Control	2,220	2,193	2,585	1,854	1,459
Physical Control Reduced from DWI	8,302	7,445	1,575	142	36
Negligent Driving Reduced from DWI	1,340	1,356	2,501	3,565	4,369
Reckless Driving Reduced from DWI	<u>36</u>	<u>16</u>	<u>79</u>	<u>73</u>	<u>88</u>
Total Alcohol-Related Convictions	38,206	36,865	37,660	38,613	44,726

Source: Washington Traffic Safety Commission

The third independent variable to be examined is the number of persons sentenced to jail for DWI offenses. This poses the most difficult measurement problem due to the expense in collecting the data. Therefore, existing data was utilized as a proxy measure of this variable, specifically, the earlier evaluation entitled, "The Implementation of SHB665, The New DWI Law", Office of Financial Management, 1980. Although somewhat tentative in its conclusions due to the fairly short lapse of time from implementation to evaluation, that study concluded that DWI offenders were being sent to jail in 1980 per the mandate of the law. While detailed data has not been collected to augment the earlier study, there is supplemental information available on an aggregate statewide basis. The best consistent series that reflects jail experience subsequent to 1980 is as follows in Table 3.

Table 3  
Statewide-Average Daily Population of Sentenced for DWI  
(less King, Pierce and Island Counties)

1981 1st 6 months	93
2nd 6 months	103
1982 1st 6 months	135
2nd 6 months	144
1983 1st 6 months	182

Source: Washington Corrections Standards Board

Considering the data available from the earlier study and the subsequent jail experience in Table 3 above, it appears reasonable to assume that convicted DWI offenders are going to jail in thus-far increasing numbers during the 1980's.

### Summary

- DWI arrest data appear to accurately portray the activities in the sample cities and counties both prior to and after the January 1, 1980 DWI law implementation date. There is no adequate measure of DWI arrests for the entire State due to partial reporting.
- Court convictions for persons arrested for DWI can be measured generally for the sample but not specifically due to the mix of offenders in district courts. There is statewide, annual conviction data available for alcohol-related traffic offenses.
- Jail data are not available for the sample sites or on a statewide basis without additional manual data collection. DWI jail data are available for a certain few cities in 1979 and 1980 from the earlier DWI study, and can also be obtained as an aggregate average for the period since 1981.

Despite the data incongruities, there are obvious compatible trends observed in the above comparisons. For the remainder of this study it will be prudent, therefore, to use the measure of DWI arrests as a proxy for the other independent variables (convictions & incarceration). The upward trends in both DWI arrests and convictions (certainty of punishment) with the mandatory jail sentence (severity of punishment) provide evidence of a strong deterrent effect that should result in a reduction of alcohol related traffic accidents.

### IV. Accident Deterrence

The basic question posed at the outset of this study concerns the relationships, if any, between enforcement, punishment and alcohol-related traffic accidents. Can we expect to see a decrease in accidents by increasing enforcement and/or certainty and severity of punishment? There are, of course, additional factors to be considered such as changes in overall arrests, total accidents, and/or others that may lead to changes in alcohol-related accidents. These additional factors will be discussed in the section that follows. For the sake of clarity, this section will consider only the data concerning the original postulates.

#### Findings - 41 Sample Cities

The Ertel-Fowlkes graph, Chart 2 on page 12, shows monthly DWI arrests for 1976/1982. The monthly number of alcohol-related accidents for 1977/1982 for the 41 sample cities is shown below in Chart 6. As discussed in the preceding section, DWI arrests in the 41 sample cities showed remarkable improvement. That is, the number of DWI arrests in the sample cities has been increasing on average (average here refers to best linear fit not arithmetic mean) of about six additional arrests each month since the new DWI law was implemented. At the beginning of the increasing trend, the police in the sample cities were making 474 DWI arrests per month. By December 1982, the same departments made an average 717 DWI arrests per month.

It is also important to notice that the turning point preceded the implementation of the mandatory jail section of the law by about two months. However the new DWI law passed and was signed by the Governor in the spring of 1979, which raises the possibility of law enforcement anticipation of the implementation of the law with the turnabout in DWI arrests.

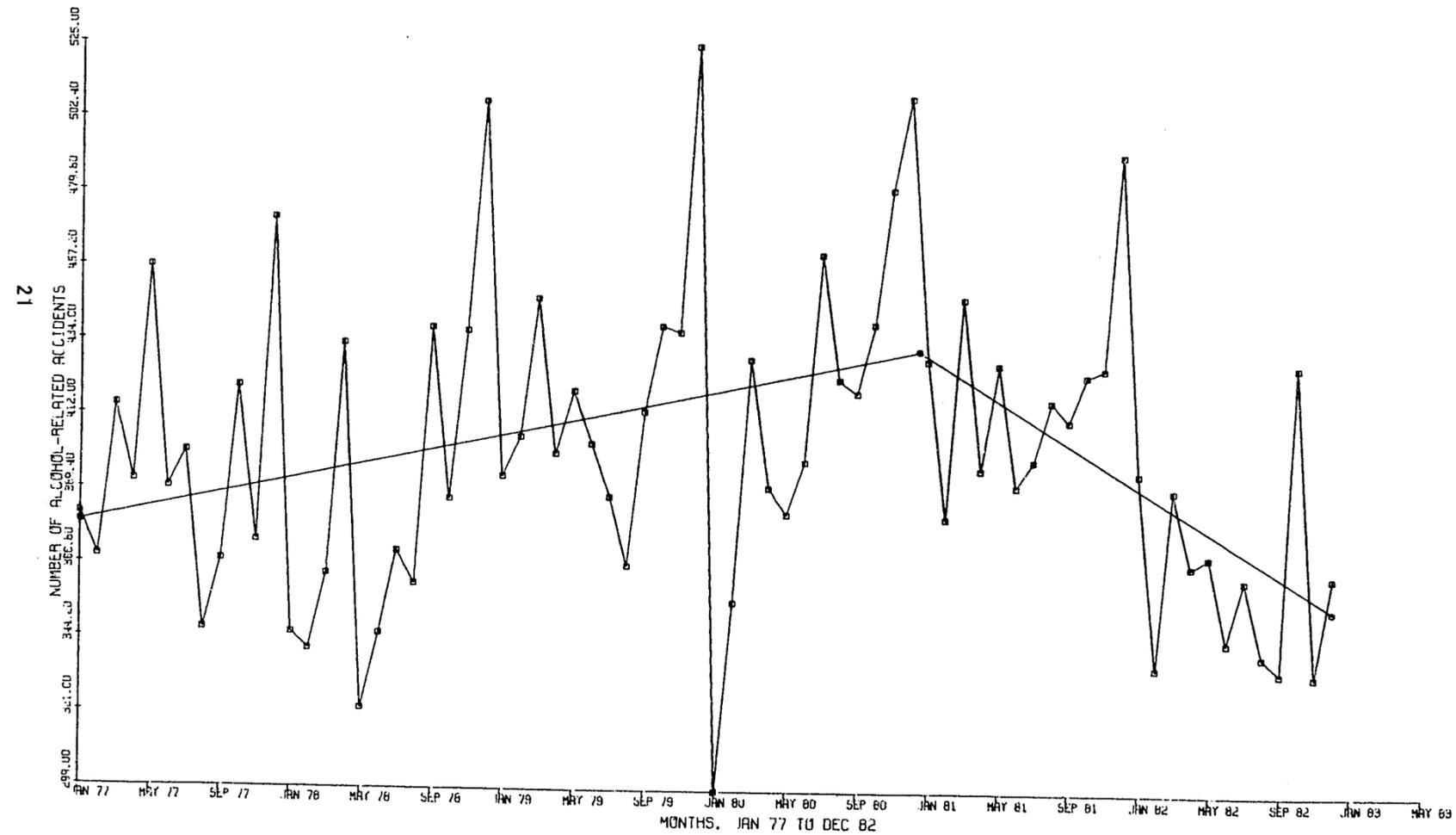
For nearly a year following the implementation of the new DWI law, alcohol related accidents continued on an increasing trend. Except for seasonal

Chart 6

41 WASHINGTON CITIES: ALCOHOL-RELATED ACCIDENTS, 1977/1982

RAW DATA SERIES - □  
MULTI-SEGMENT LINE - ⊙  
SOURCE: WASHINGTON DEPT. OF TRANSPORTATION

FIRST SLOPE = 1.13      FIRST TURNING POINT    X:46.50  
Y ZERO INTERCEPT = 378.07      Y:433.10  
SECOND SLOPE = -3.31      TOTAL SSR =  
Y ZERO INTERCEPT = 593.74



21

variation, alcohol related accidents had been increasing at least since January 1977 on average by just over one additional accident a month. In January 1977 there were an average of 378 alcohol related accidents occurring per month in the 41 sample cities. By December 1980 this figure had increased to 433 alcohol related accidents per month.

In January 1981, the trend for alcohol related accidents took a turn for the better. Between January 1981 and December 1982 alcohol related accidents decreased by more than 3 alcohol related accidents each month. By December 1982 the number of alcohol related accidents had dropped to 354 per month in the 41 sample cities.

With all things held equal, the deterrence hypothesis is supported in the 41 sample cities with a delayed effect of one year.

#### Findings - 15 Sample Counties

The Ertel-Fowlkes graph, Chart 3 on page 13, shows monthly DWI arrests for the 1976-1982 period while the monthly number of alcohol related accidents for the 15 sample counties is depicted below in Chart 7. As discussed in the preceding section, DWI arrests in the 15 sample counties show considerable change. As with the sample cities, it appears that county sheriffs may have anticipated the actual start date for mandatory jail terms (January 1980) with a sharp increase in DWI arrest activity. In the seven month period starting in August 1979, county DWI arrests turned around from a declining trend to an increasing trend of just over eight additional DWI arrests each month. On average there were 145 DWI arrests per month just prior to the turn around and 204 DWI arrests per month by April 1980. Since April 1980, DWI arrests have continued to increase, albeit at a very slow rate--about one DWI arrest per each four months.

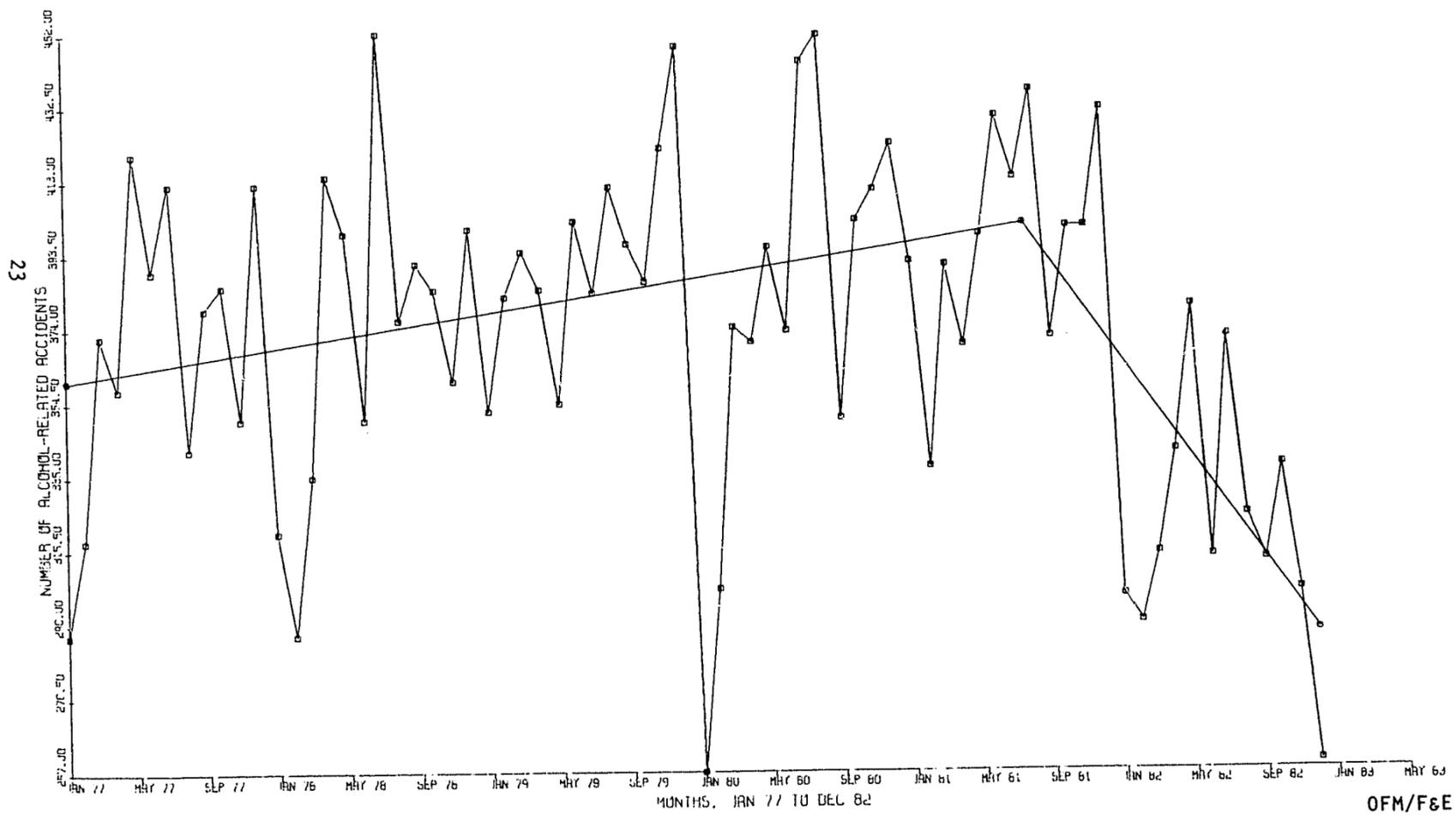
For about the first year and one-half after the implementation of the new DWI law, alcohol related accidents continued on an increasing trend. Except for seasonal variation, alcohol related accidents have been increasing at least since January 1977. In January 1977 there were an

Chart 7

15 WASHINGTON COUNTIES: ALCOHOL-RELATED ACCIDENTS, 1977/1982

RAW DATA SERIES - □  
MULTI-SEGMENT LINE - ○  
SOURCE: WASHINGTON DEPT. OF TRANSPORTATION

FIRST SLOPE = 0.74      FIRST TURNING POINT      X: 55.50  
Y ZERO INTERCEPT = 359.50      Y: 400.74  
SECOND SLOPE = -0.52      TOTAL SSR =  
Y ZERO INTERCEPT = 762.39



average of 360 alcohol related accidents per month in the 15 sample counties. By June 1981 this average had increased to 401 alcohol related accidents per month.

In July 1981, the trend for alcohol related accidents for the 15 sample counties changed significantly. Between July 1981 and December 1982, alcohol related accidents decreased by almost seven fewer alcohol related accidents each month. By December 1982 the number of alcohol related accidents had dropped to an average of 290 in the 15 sample counties.

With all things held equal, the deterrence hypothesis is supported in the 15 sample counties, with an 18 month delayed effect.

#### Findings - Statewide Data

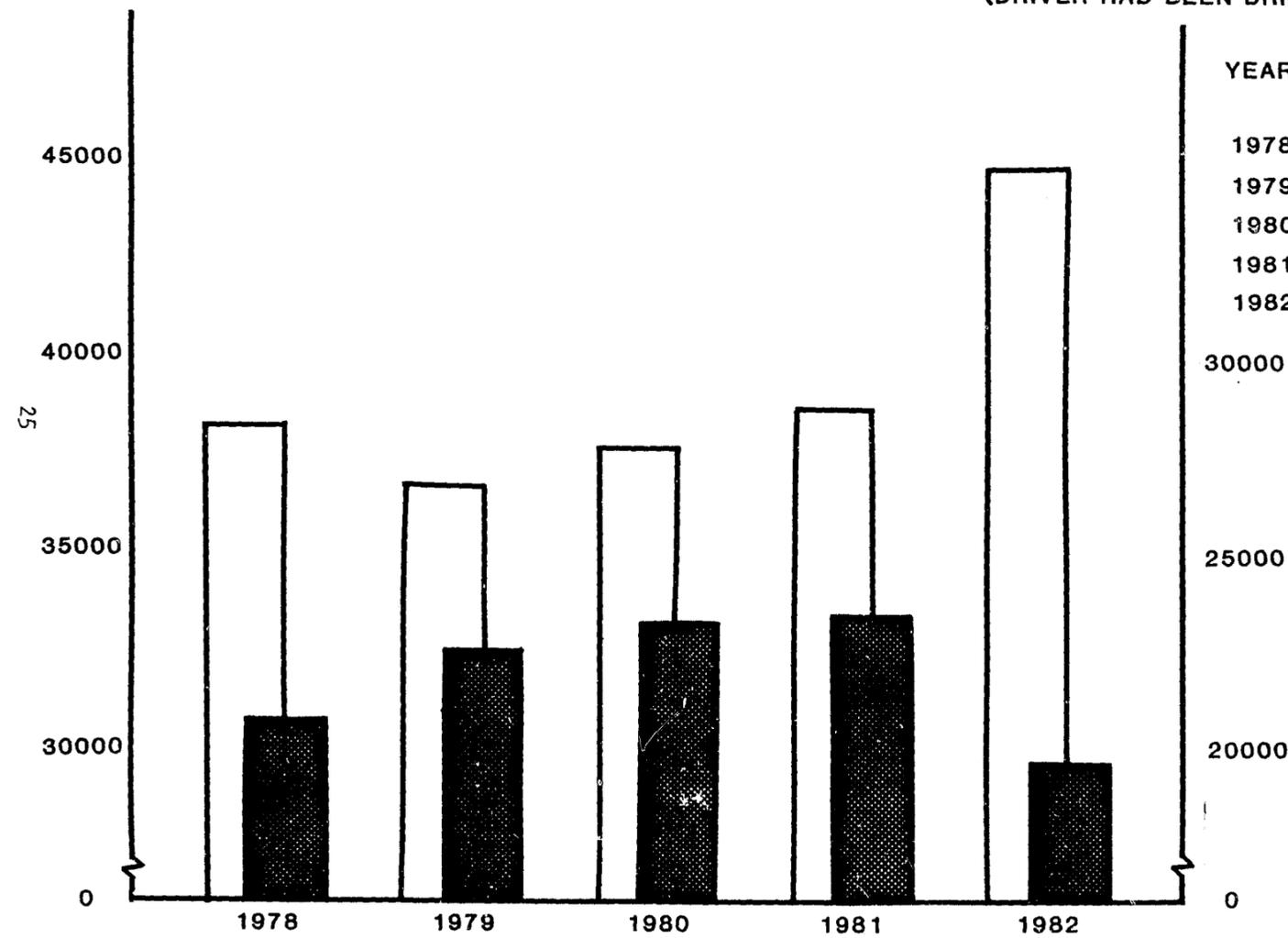
The following chart (Chart 8) depicts the incidence of annual statewide DWI and alcohol related traffic offense convictions and alcohol related accidents -1978/1982. Statewide DWI arrests data are not available.

As was shown in Section Three, alcohol related convictions closely follow the changes in DWI arrests. Therefore, the statewide changes in convictions can be seen as an enhanced deterrent effect. This annual statewide alcohol related conviction and accident data provide the same general results that are provided by the more detailed analysis of sample cities and counties. That is, prior to the implementation of the new DWI laws in 1980, alcohol related convictions were on a decline. During the same period alcohol related accidents increased. With the implementation of the new DWI laws the alcohol related convictions increased -- as was the case with DWI arrests in sample cities and counties. However, the apparent impact of the enhancement of the deterrent effect was not evident until 1982, which may represent the amount of lag time that is necessary for the deterrent effect to actually impact the general populace drinking/driving behavior.

Chart 8  
**DRINKING AND DRIVING**

CONVICTED TRAFFIC OFFENDERS

ACCIDENTS  
(DRIVER HAD BEEN DRINKING)



YEAR	CONVICTIONS	ACCIDENTS
1978	38206	20959
1979	36865	22594
1980	37660	23047
1981	38613	23228
1982	44726	19557

LEGEND:

CONVICTIONS



ACCIDENTS



STATEWIDE DATA: SOURCE - WASHINGTON HIGHWAY TRAFFIC SAFETY COMMISSION

9FM/F&E  
10/83

## Summary

With all things held equal, the evidence at hand appears to show:

1. The new DWI laws have been efficiently implemented. That is, those convicted of DWI offenses are very likely to serve the mandatory jail time. Thus, both the certainty and severity of punishment for a DWI offense has increased.
2. The increase in DWI arrests and convictions after the implementation of the new DWI law are congruent indicators of an enhanced deterrent effect.
3. After a lag of one to one and one half years the impact of the enhanced deterrent effect has caused the alcohol related accidents to begin to decrease in Washington State.
4. The nature of the deterrent is not clear, i.e., whether deterrence occurs as the result of the threat to arrest, convict and incarcerate or as a result of actually being arrested and punished. However, the year lag in realized effects may be attributed to the time it has taken for DWI offenders to understand the full impact of the tougher DWI laws and start to change their behavior. Recidivism data may help to clarify this.

## V. Alternative Explanations

The analysis of the impact of social programs is rarely straightforward. In many situations, evidence is only circumstantial or indirect. In this case, the results of the preceding comparison of DWI enforcement with alcohol-related traffic accidents appear positive. Regardless of how tantalizing this preliminary finding may be, it assumes that all other influences were held constant.

Since these processes are not intrinsically free of external influences (rival hypotheses), we must examine potential alternative or modifying explanations for the reduction in alcohol related accidents. It is also possible that the apparent relationship between DWI deterrence efforts and reduction in alcohol-related accidents is nonexistent or spurious. Areas to be considered are:

1. Relationship of the changes in alcohol-related accidents to other traffic accidents.
2. Relationship of the changes in DWI arrests to non-DWI arrests.
3. Comparison of resource allocation in DWI enforcement.

### Relationship of the changes in alcohol-related accidents to non-alcohol traffic accidents.

The possibility, here, is that alcohol-related traffic accidents have decreased along with the general decline in non-alcoholic traffic accidents rather than as a result of increased enforcement. If alcohol-related accidents vary in consonance with non-alcohol related accidents, then alcohol-related accidents could be seen as being determined by general highway safety efforts such as safer automobiles and highways, the number of miles driven, and reduced speed limits.

As Table 4 shows, the annual number of non-alcohol related accidents has declined since 1980 in the 41 sample cities and since 1977 in the 15 sample counties. It can be argued that the factors that influenced the decline in non-alcohol-related accidents also influenced the decline in alcohol-related accidents. This may be the case, at least, in part.

		Table 4					
<u>Year</u>		<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
<u>41 City sample</u>							
Total drivers in non-alcohol-related accidents	Number:	22772	21929	22727	20995	20846	18495
	% CHG:		-3.7	+3.6	-7.6	-0.7	-11.3
Drivers in alcohol-related accidents	Number:	4788	4658	5045	4997	5056	4378
	% CHG:		-2.7	+8.3	-0.9	+1.2	-13.4
<u>15 County sample</u>							
Total drivers in non-alcohol related accidents	Number	23642	23314	22612	20745	20280	18520
	% CHG		-1.4	-3.0	-8.3	-2.2	-8.6
Drivers in alcohol-related accidents	Number	4430	4474	4713	4553	4765	3853
	% CHG		+1	+5.3	-3.4	+4.6	-19.1

However, the extent to which the two types of accidents are similar or dissimilar is best explained by further examination of the annual data in Table 4 above and the Ertel-Fowlkes time-series graphics that follow.

Note in Table 4, although alcohol-related accidents did decline over the 1977/1982 period they were much more resistant to the downward trend when compared to non-alcohol related accidents. The Ertel-Fowlkes examination

of the monthly accident data supports the independence of "normal" accidents and alcohol-related accidents. Charts 6, 7, 8, 9, and 10 show the relationship between alcohol and non-alcohol related accidents for the sample cities and counties. Non-alcohol related accidents have been on a gradual decline since 1977 in both cities and counties. Contrary to the non-alcohol related accident trend is the continual increase from 1977 of alcohol-related accidents until December 1980 in the cities and July 1981 in the counties, when for the first time in recent history they started on a downward trend. Overall, it appears from the time-series graphs and the annual data that alcohol-related accidents do not necessarily change in consonance with non-alcohol related accidents.

Relationships in changes in DWI arrests to non-DWI arrests

In order to evaluate DWI arrest activities it was deemed advisable to examine enforcement activities in other major areas as well as DWI. The purpose of this examination is to determine if DWI arrests change independently or if they change in concert with broader police criminal apprehension efforts. If DWI arrests move only in concert with other significant law enforcement activity, doubt could be raised regarding the relationship between new DWI laws and any subsequent increases in DWI arrests.

Changes in burglary and aggravated assault were selected to compare to changes in DWI arrests. Burglary represents property crime activity and aggravated assault represents violent crime activity. The tables below delineate these comparisons for the sample cities and counties.

Chart 9

15 COUNTIES: NON-DWI TRAFFIC ACCIDENTS, 1977-1982

RAW DATA SERIES = □  
 MULTI-SEGMENT LINE = ⊙  
 SOURCE: WASHINGTON DEPT OF TRANSPORTATION

FIRST SLOPE = -15.49	FIRST TURNING POINT	X: 17.50
Y ZERO INTERCEPT = 2019.28		Y: 1748.15
SECOND SLOPE = 115.52	SECOND TURNING POINT	X: 23.50
Y ZERO INTERCEPT = -273.40		Y: 2441.26
THIRD SLOPE = -114.78	THIRD TURNING POINT	X: 29.50
Y ZERO INTERCEPT = 5136.70		Y: 1752.55
FOURTH SLOPE = -3.63	TOTAL SSR =	
Y ZERO INTERCEPT = 1859.63		

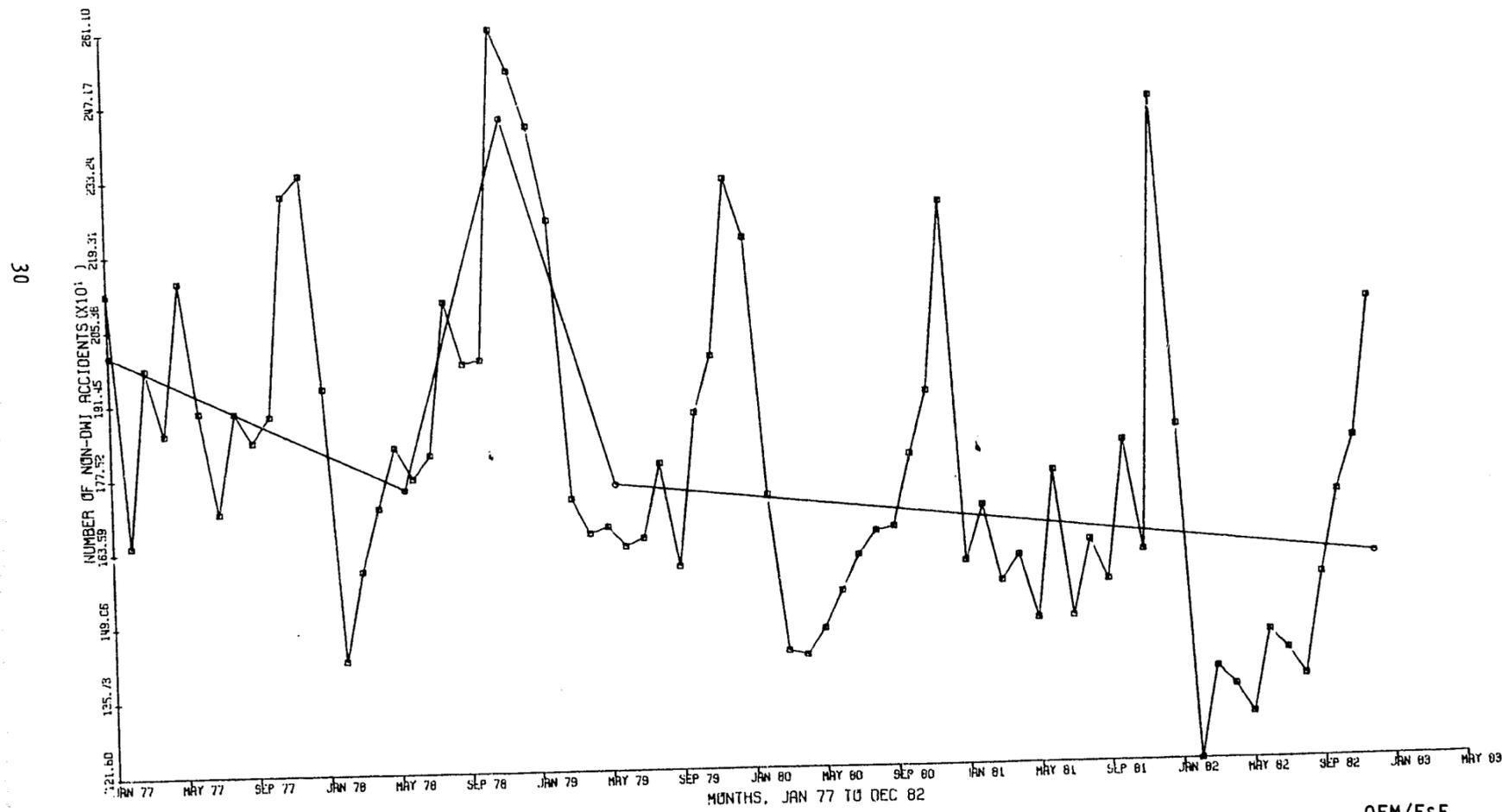
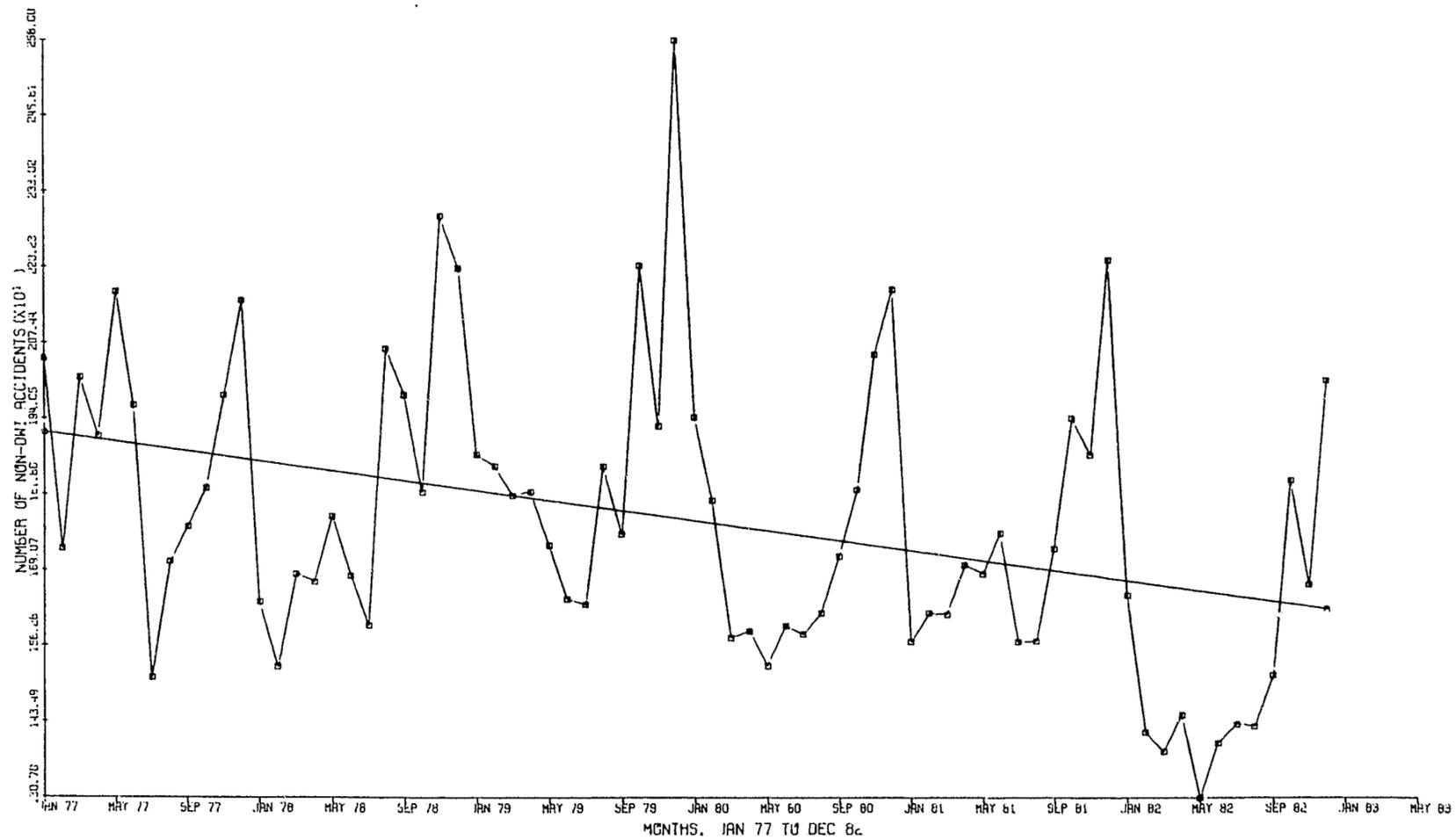


Chart 10

41 CITIES: NON-DWI TRAFFIC ACCIDENTS, 1977-1982

RAW DATA SERIES = □  
MULTI-SEGMENT LINE = ⊙  
SOURCE: WASHINGTON DEPT OF TRANSPORTATION

FIRST SLOPE = -4.19      TOTAL SSR =  
Y ZERO INTERCEPT = 1927.41



31

Table 5  
41 Cities Arrests Comparison

Year	DWI Arrest	Annual Change	Assault Arrest	Annual Change	Burglary Arrest	Annual Change
1976	6306		704		2279	
1977	6918	+9.7%	690	-2.0%	2273	-.3%
1978	5985	-13.5	673	-2.5	2700	+18.8%
1979	5781	-3.4	776	+15.3	2788	+3.3%
1980	6376	+10.3	782	+.7	2910	+4.4%
1981	7936	+24.5	820	+4.9	2752	-5.4%
1982	8157	+2.8	796	-2.9	2838	+3.1%

Table 6  
15 Counties Arrests Comparison

Year	DWI Arrests	Annual Change	Assault Arrests	Annual Change	Burglary Arrests	Annual Change
1976	2147		375		1794	
1977	1998	-6.9%	325	-13.3%	1851	+3.2%
1978	2020	+1.1	355	+9.2	1996	+7.8
1979	1778	-11.9	472	+32.9	1864	-6.6
1980	2396	+34.8	402	-14.8	1860	-.2
1981	2463	+2.8	452	+12.4	2206	+18.6
1982	2619	+6.3	480	+6.2	2119	-3.9

Tables 5 and 6 show that DWI arrests in the sample cities and counties were either unstable or on a downward trend prior to 1980. After 1980, DWI arrests in both cities and counties show a reasonably strong upward trend. The assault and burglary arrest patterns for sample cities and counties

indicate a general upward trend, albeit uneven, for 1976-1982. The dissimilarity between DWI arrest trends and the broader criminal justice trends supports the argument for the independence of DWI activities. This information strengthens the claim that the change in the DWI laws instigated increased DWI enforcement activity.

Comparison of Resource Allocation and DWI Enforcement

It has been surmised that the increase in DWI arrests is simply due to manpower increases. The table below shows the relationship between manpower, DWI arrests, and DWI arrests per officer month. An examination of this table suggests a strong relationship between available manpower and DWI arrests. However, the DWI arrests per officer month shows that there has been a constant increase in the DWI arrest rate since 1980. Even in 1982 when the sample cities and the Washington State Patrol experienced a decrease in manpower, law enforcement efficiency increased.

Table 7  
Law Enforcement Manpower and Efficiency

Year	41 Cities			15 Counties			State Patrol		
	Man Months	Arrest Per		Man Months	Arrest Per		Man Months	Arrest Per	
		DWI Arrests	Officer Per Mo.		DWI Arrests	Deputy Per Mo.		DWI Arrest	Officer Per Mo.
1976	17,244	6,306	.365	9,492	2,147	.226	-	-	-
1977	16,908	6,918	.409	9,072	1,998	.110	9,432	17,879	1.896
1978	17,256	5,985	.346	9,516	2,020	.210	9,360	17,768	1.898
1979	17,208	5,781	.335	9,852	1,778	.180	9,432	16,369	1.735
1980	17,796	6,376	.358	10,764	2,396	.222	9,708	15,779	1.625
1981	17,900	7,936	.448	11,040	2,463	.223	9,732	17,556	1.804
1982	17,556	8,157	.465	11,088	2,619	.236	9,132	17,148	1.878

VI. Summary

- o The stringent 1980 DWI law was implemented efficiently by law enforcement organizations, prosecutors, courts, and jails.
  - oo Arrests for DWI started to rise dramatically in late 1979 after passage of the new DWI law (SHB665).
  - oo In the 41 sample cities there has been a steady increase of 6.5 additional arrests per month. At the end of 1979, there were 474 DWI arrests made per month in the 41 sample cities. At the end of 1982, there were 706 DWI arrests made per month in the same cities.
  - oo DWI court convictions kept pace with arrests on a statewide basis.
  - oo Jailers continue to report a steady influx of more DWI offenders each year since 1980. Data from the Correction Standard Board shows that the number of DWI offenders in jail has doubled since 1981.
- o In spite of a long term decreasing trend in non-DWI traffic accidents, alcohol related accidents continued to climb in the 1977 to 1981 period.
- o After one year of increased enforcement, prosecution, and incarceration, alcohol-related accidents showed a significant decrease for the first time in recent history.
  - oo In the 41 sample cities there has been a 20 percent decrease in the number of alcohol related accidents per month.

- oo In the 15 sample counties there has been a 28 percent decrease in the number of alcohol related accidents per month.
- o The one year lag in realized effects may be attributed to the time it has taken for DWI offenders to understand the full impact of the tougher DWI laws and start to change their behavior.
- o Based on other DWI research, it appears that increasing the severity of punishment without ensuring the certainty of apprehension is futile.
  - oo DWI law enforcement by cities, counties and the State Patrol has grown more efficient since 1980. That is, more DWI arrests are being made per officer or deputy.

NUMBER OF DWI ARRESTS PER OFFICER PER MONTH

<u>Year</u>	<u>41 Sample Cities</u>	<u>15 Sample Counties</u>	<u>State Patrol</u>
1979	.34	.18	1.73
1982	.47	.24	1.87

A. Measurement

1. DWI arrests, 1976-1982  
Cities - Increase in arrests began in mid 1979 and continues.  
Counties - Increase began in 1979 but leveled off in Jan. 1980.  
Arrests remain at this higher level.  
Statewide - No data available.
2. DWI and reduced charge Convictions, 1978-1982  
Cities - (50% sample) Increased from 1980-1982.  
Counties - Increase from 1980-1982 faster than in the cities.  
Statewide - Decrease in 1979, since 1980 has increased.
3. Jails  
Selected sample 1979 vs. 1980 - increase in 1980.  
Statewide - steady increase since 1981.
4. Number of drivers in alcohol-related traffic accidents, 1977-1982  
Cities - Decrease began in Jan. 1981.  
Counties - Decrease began in July 1981.  
Statewide - Decrease in 1978 then increasing until downturn in 1982.
5. Number of drivers in non-alcohol related traffic accidents, 1977-1982  
Cities - steady decline throughout the period.  
Counties - slow decline since mid 1979.  
Statewide - slow decline since 1979.

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APPENDIX 1

WASHINGTON STATE TRAFFIC STATISTICS

Source: Washington Traffic Safety Commission

Traffic Safety Statistics  
1976-1982

<u>Year</u>	<u>Licensed Drivers</u>	<u>Population</u>	<u>Vehicle Registration</u>	<u>Veh. Mil. (Millions)</u>	<u>Traffic Collisions</u>	<u>Traffic Injuries</u>	<u>Traffic Deaths</u>	<u>Traffic Fatality Rate*</u>
1976	2,324,697	3,571,591	2,785,500	25,932.0	120,864	66,309	825	3.18
1977	2,339,215	3,661,975	2,952,383	27,449.0	119,058**	71,356	927	3.38
1978	2,485,248	3,774,300	3,042,265	29,378.0	116,923	64,669	1,006	3.42
1979	2,579,368	3,911,200	3,186,898	29,122.0	118,686	65,399	1,034	3.55
1980	2,662,659	4,109,853	3,293,065	28,696.0	113,751	61,532	985	3.43
1981	2,732,722	4,248,100	3,408,871	30,346.0	111,993	61,083	872	2.87
1982	2,774,212	4,264,000	3,313,348	30,353.0	100,644	54,789	757	2.49

\*Traffic deaths per 100 million vehicle miles of travel.

\*\*Minimum damage for a reportable collision was increased from \$100 to \$300 to the property of one person on 7/1/77.

Comparison of DWI/HBD Drivers Involved In Traffic Collisions

Year	<u>DWI Drivers Involved in:</u>			<u>HBD (Had Been Drinking) Drivers (Includes DWI Drivers) Involved in</u>		
	<u>Total Accidents</u>	<u>Fatal Accidents</u>	<u>Injury Accidents</u>	<u>Total Accidents</u>	<u>Fatal Accidents</u>	<u>Injury Accidents</u>
1976	9,385	299	4,750	20,228	404	10,144
1977	9,874	379	5,108	21,237	486	10,992
1978	9,594	387	4,985	20,959	500	10,725
1979	10,590	426	5,465	22,594	559	11,595
1980	11,243	437	5,790	23,047	568	11,664
1981	11,609	364	5,996	23,228	506	11,666
1982	10,379	333	5,301	19,577	423	9,872

Motor Vehicle Collisions

Year	DWI Collisions					HBD Collisions (Includes DWI Collisions)				
	Total Accidents	Fatal Accidents	Injury Accidents	Persons Killed	Persons Injured	Total Accidents	Fatal Accidents	Injury Accidents	Persons Killed	Persons Injured
1976	9,308	287	4,713	337	7,689	19,376	393	9,681	461	15,667
1977	9,786	363	5,057	425	8,370	20,394	445	10,518	518	16,973
1978	9,510	373	4,939	440	7,934	20,028	458	10,214	534	16,028
1979	10,490	410	5,407	472	8,562	21,614	522	11,027	594	17,301
1980	11,131	423	5,725	495	9,062	21,916	534	11,048	619	17,272
1981	11,499	349	5,926	389	9,266	22,173	461	11,115	516	17,268
1982	10,292	323	5,256	366	8,202	18,669	393	9,371	442	14,491

41

APPENDIX 2

STEPS IN THE PROCESS OF CHANGING  
DWI LEGISLATION IN WASHINGTON STATE

Source: Department of Licensing  
Research & Technology Division

(1)  
1968

RCW 46.20.308 Implied Consent statute provided that a driver of a motor vehicle is deemed to have given his consent to a chemical test of his breath or blood to determine alcoholic content if the arresting officer has reasonable grounds to believe that he was driving or in physical control of a motor vehicle while under the influence of intoxicating liquor and that his driver's license shall be revoked for six months if he refuses to permit such chemical test.

(2)  
1970

To implement RCW 46.20, Department of Licensing initiated alcohol control interview program. Drivers with alcohol related citations were placed on 24 month probation. If another alcohol related entry added to record during probation, an order suspending the driving privilege was issued.

(3)  
1971

RCW 46.65 Washington Habitual Traffic Offenders Act, amended 1979 and 1981, provided for revocation of driver's license of any person defined as a habitual traffic offender, such revocation to be for five years but with opportunity to petition for reinstatement after two years, either wholly or conditionally. Definition included any person who has three or more convictions within five years of driving or operating a motor vehicle while under the influence of intoxicants or drugs. Hearings initially were conducted by superior courts, then transferred to the Department of Licensing in 1979.

(4)  
1971

RCW 09.54 The Drug and Alcohol Rehabilitation Education Program provided that the Secretary, Department of Social and Health Services, shall establish a program to aid and rehabilitate persons suffering with drug or alcohol problems; and shall establish community education programs, in coordination with programs established by the state Superintendent of Public Instruction, in the schools relating to alcohol and drug use and abuse.

(5)  
1971

RCW 70.96 Established community alcoholism treatment centers, funded by DSHS, provided that at least 10 percent of the cost was funded by local, public or private sources.

(6)

1971-2 Alcohol Safety Action Project (ASAP) conducted in King County is a federally funded program aimed at determining the extent of alcohol abuse among drivers. It sought to evaluate the success of a coordinated effort by enforcement, the courts, alcohol treatment facilities and the department, in detecting and treating alcohol abusive drivers.

(7)

1972 RCW 70.96 Provided that in order for a city or county to be eligible to receive its share of liquor taxes and profits it must devote no less than 2 percent of such share to support of an alcoholism program.

(8)

1972 RCW 70.96A The uniform Alcoholism and Intoxication Treatment Act, subsequently amended, initially declared the policy that alcoholics and intoxicated persons may not be subjected to criminal prosecution solely because of their consumption of alcoholic beverages but rather should be afforded treatment in order that they might lead normal, productive lives. It authorized DSHS to plan, establish and maintain alcoholism treatment programs. It established an interdepartmental coordinating committee for prevention of alcoholism and for treatment of alcoholics, persons incapacitated by alcohol, and intoxicated persons. It mandated that DSHS establish a comprehensive and coordinated program for treatment of alcoholics, persons incapacitated by alcohol, and intoxicated persons. It established standards for public and private treatment facilities. It provided for voluntary treatment of alcoholics at approved facilities, and for involuntary commitment of alcoholics who are incapacitated by alcohol.

(9)

1973 RCW 46.20.391 Amended 1979, defined eligibility for Occupational Driver's License after conviction of an offense for which license revocation is mandatory, upon approval by court and subject to statutory conditions and limitations.

(10)

1973 Department of Licensing revised Alcohol Control Program and initiated requirement that drivers who violate Alcohol Control probation must show proof of alcohol treatment before gaining reinstatement of driving privilege.

(11)

1974 Department of Licensing conducted first early reinstatement hearings for Habitual Traffic Offenders. Alcohol treatment requirement established as partial basis for showing "good

cause" for license reinstatement in those cases where alcoholism was present.

(12)  
1974

RCW 46.61.515 Amended to impose a special penalty assessment in the minimum amount of 25 percent of any fine or bail forfeiture on all offenses involving a violation of any state law or city or county ordinance relating to driving or being in physical control while under the influence of intoxicants. All assessments are paid into the highway safety fund for the exclusive use of the Department of Licensing for alcohol safety programs and driver services programs.

(13)  
1975

RCW 46.01.520 Rules of the Road provided that any person driving a motor vehicle while under the influence of or affected by intoxicating liquor or drugs, and which driving is the cause of injury to a person who dies within three years as the proximate cause of such injury, shall be guilty of negligent homicide by motor vehicle, and provided both fines up to \$1,000 and imprisonment up to ten years.

(14)  
1975

RCW 10.05 Deferred prosecution statute provided that a person charged with a misdemeanor or a gross misdemeanor may petition the court for a deferred prosecution program if the wrongful conduct was the result of or caused by an alcohol, drug or mental problem for which the person is in need of treatment and unless treated such wrongful conduct will reoccur.

(15)  
1977

RCW 46.20.031 Amended to provide that a person who is an habitual user of any drug to a degree which renders him incapable of safely driving a motor vehicle or who habitually lacks self-control as to the use of alcoholic beverages, or uses alcoholic beverages to the extent that his health is substantially impaired or endangered or his social or economic function is disrupted so as to constitute a danger to other persons or property, is ineligible for a driver's license.

(16)  
1977

Department of Licensing initiated an automated certification program. This enabled continuous monitoring of success for drivers who were required to undergo alcohol treatment in order to secure license reinstatement from either an Alcohol Control Program suspension or an Habitual Traffic Offender revocation. Certification system provided for quarterly reports of progress.

(17)  
1977

RCW 46.61.515 Amended to permit the court to recommend no suspension action be taken by the Department of Licensing on the first conviction (30 day suspension).

(18)  
1978

DOL revised its criteria for selection of drivers for its Alcohol Interview Program from two convictions of DWI to one conviction, or two convictions of alcohol-related charges.

(19)  
1979

RCW 46.65.020 Habitual Traffic Offenders Act amended to provide that DOL shall administer the license revocation hearing of the person whose record shows three or more convictions within five years of driving while under the influence of intoxicants or drugs. DOL revocation subject to person's right to appeal to superior court.

(20)  
1979

RCW 70.96A Amended to mandate specific duties to DSHS in carrying out its functions as a planning and coordinating agency, including cooperating with public and private agencies in establishing and conducting programs designed to deal with the problem of persons operating motor vehicles while intoxicated.

(21)  
1979

RCW 46.61 Amended to make driving while having 0.10 percent or more by weight of alcohol in the blood as shown by chemical analysis of breath, blood or other bodily substance as per se case of driving while intoxicated. The amendment eliminated earlier "presumptions" of DWI which left room for case by case adjudication.

(22)  
1979

RCW 46.61.515 Rules of the Road amended to provide equal penalties for driving while under the influence of intoxicating liquor or drug and for being in actual physical control of a motor vehicle while under the influence of intoxicating liquor or drug, and amended RCW 46.61.502 and 504 to define the constitution of both offenses equally.

(23)  
1979

RCW 46.61.515 Amended to require one day in jail upon first conviction for DWI or physical control. The mandatory one day in jail shall not be suspended or deferred unless the judge finds that imposition of the jail sentence will pose a risk to the defendant's physical or mental well-being. Reasons for granting suspension or deferral must be stated in writing.

(24)  
1982 RCW 4b.61.515 Amended to clarify that the minimum mandatory day  
in jail for DWI first offenses means 24 consecutive hours. (HB  
600)

(25)  
1982 RCW 4b.61.515 Amended. If the court or alcohol information  
school finds that a convicted person has serious alcoholism  
problems, he or she may be required to participate in a more  
intensive alcoholism treatment program approved by DSHS. Upon a  
second conviction, a complete diagnostic evaluation is required.  
Those found to have serious alcohol or drug problems must  
complete an approved treatment program. DOL may not reinstate a  
convicted person's license until it has received a copy of the  
diagnostic evaluation and treatment report from the treatment  
agency. DOL must condition reinstatement of driving privileges  
on enrollment and participation in any treatment program which  
may be required. (HB 600)

RB:gs5/3

APPENDIX 3

TIME SERIES PATTERN DESCRIPTION  
DISCUSSION AND EXAMPLES

### Time Series Pattern Description Method

The time series pattern description method was made available through the good offices of the Statistical Analysis Center, Criminal Justice Information Systems Division, Illinois Law Enforcement Commission in Chicago, Illinois. Dr. Carolyn R. Block of the Illinois Statistical Analysis Center is one of the primary authors of the package and was most helpful in the transfer process. The original computer programs were written in Fortran for use on a Hewlett-Packard 3000. Doris Steingraber of the Washington State University, Computer Service Center translated the existing programs into VS Fortran for use in an Amdahl/IBM environment. The computerized method is now available at several other universities, thanks to Doris Steingraber and the ILEC.

The method is based upon a segment spline regression algorithm written by James B. Ertel and Edward E. Fowlkes of Bell Laboratories. For further information as to the source, see "Some Algorithms for Linear Spline and Piece-Wise Multiple Linear Regression", Journal of The American Statistical Association, #71, (September, 1976):640-648.

Basically, the computerized method determines the best fit for a linear spline regression line in a series of continuous segments to a time series data set. Through a series of iterative steps, the program calculates and plots a series of graphics which depict the slope turning point and length of each segment. The analyst may choose the appropriate graphic from the series which best represents the situation as interpreted by subjective or other measures. Thus, the graphics presented in this publication are each one of a series which were selected on the basis of verisimilitude.

The time series pattern description method is meant to be used as a statistically significant description of the data rather than as an explanation. Consequently, additional measures should be utilized for analysis. Extreme values will affect the position and/or turning point of a line segment. And the method ignores autocorrelation and seasonality which may also affect the turning point. The data series for the sample

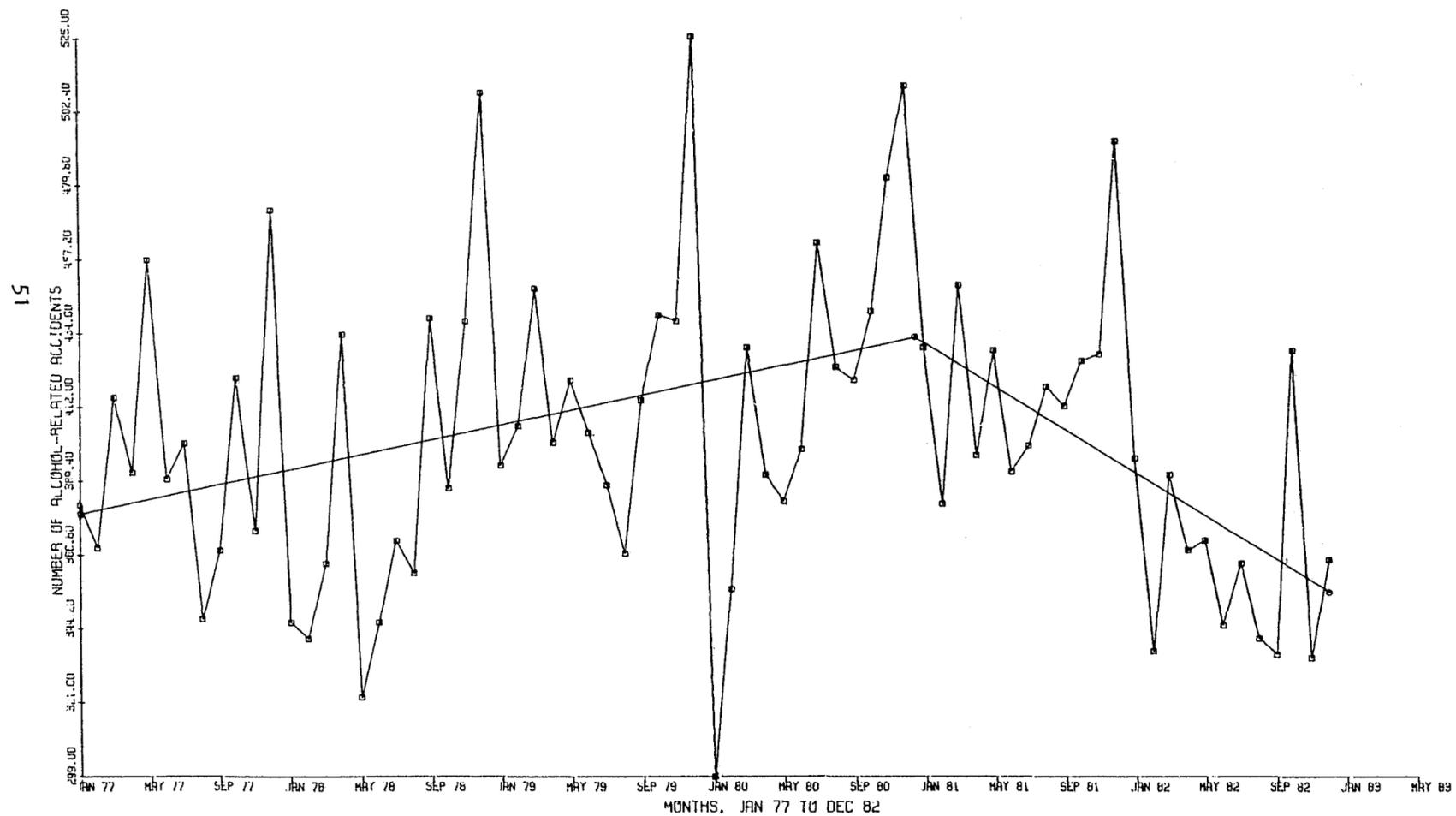
sites were examined for autocorrelation and the results indicated strong seasonality in three of the six series, viz., alcohol-related convictions and alcohol-related city accidents. The convictions data series have an inherent redundancy problem due to double reporting, hence, require further refinement and additional analysis. The city accident series should provide additional beneficial insights after similar work. Smoothed data was applied to the pattern description for analysis but was not utilized in this publication since the results are basically similar.

There is an alternate pattern description technique in the ILEC package known as the Hudson/Fox method, named for Derek J. Hudson and James Alan Fox. The Hudson/Fox program will find the best straight and the best two segment least square lines. The two are then superimposed on a plot. In this appendix, there are two examples of the Hudson/Fox technique, viz., the plots depicting alcohol-related traffic convictions for the cities and the counties.

41 WASHINGTON CITIES: ALCOHOL-RELATED ACCIDENTS, 1977/1982

RAW DATA SERIES = □  
 MULTI-SEGMENT LINE = ⊙  
 SOURCE: WASHINGTON DEPT. OF TRANSPORTATION

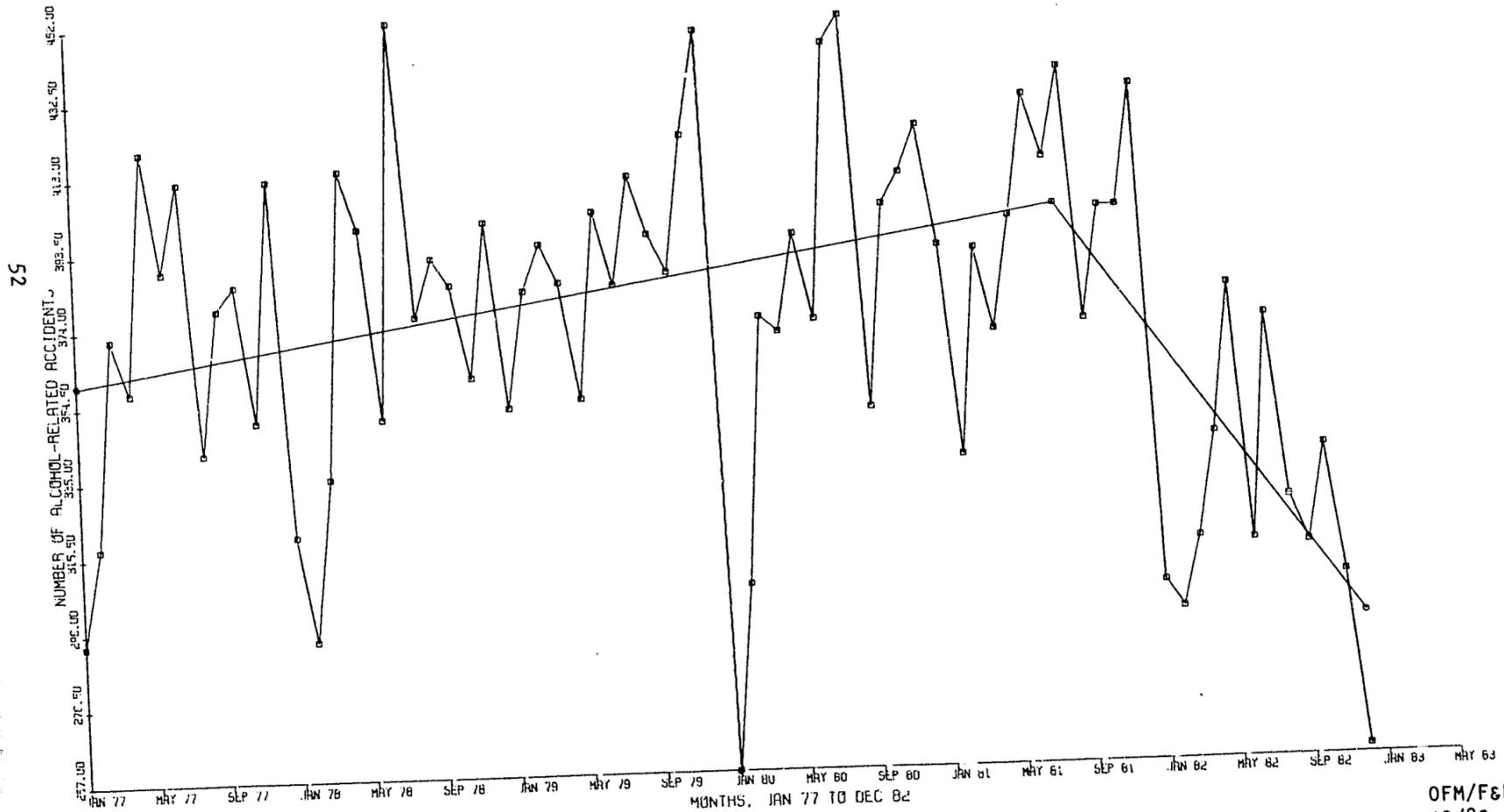
FIRST SLOPE = 1.13      FIRST TURNING POINT      X:48.50  
 Y ZERO INTERCEPT = 378.07      Y:433.10  
 SECOND SLOPE = -3.31      TOTAL SSR =  
 Y ZERO INTERCEPT = 593.74



# 15 WASHINGTON COUNTIES: ALCOHOL-RELATED ACCIDENTS, 1977/1982

RAW DATA SERIES - □  
 MULTI-SEGMENT LINE - ⊙  
 SOURCE: WASHINGTON DEPT. OF TRANSPORTATION

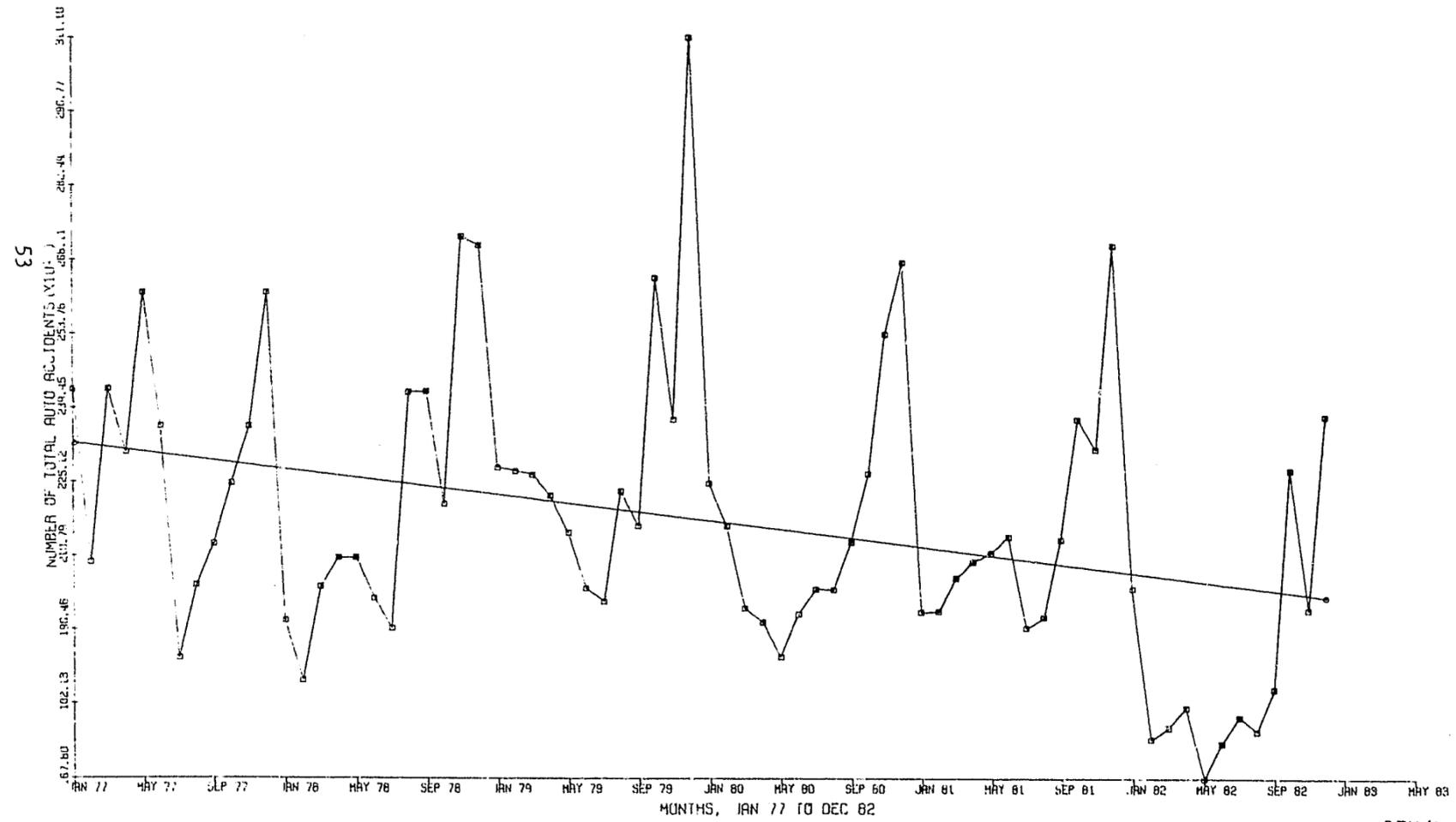
FIRST SLOPE = 0.74      FIRST TURNING POINT      X: 55.50  
 Y ZERO INTERCEPT = 359.50      Y: 400.74  
 SECOND SLOPE = -6.52      TOTAL SSR =  
 Y ZERO INTERCEPT = 762.39



# 41 WASHINGTON CITIES : TOTAL AUTO ACCIDENTS, 1977 - 1982

RAW DATA SERIES - □  
 MULTI-SEGMENT LINE - ○  
 SOURCE: WASHINGTON DEPT. OF TRANSPORTATION

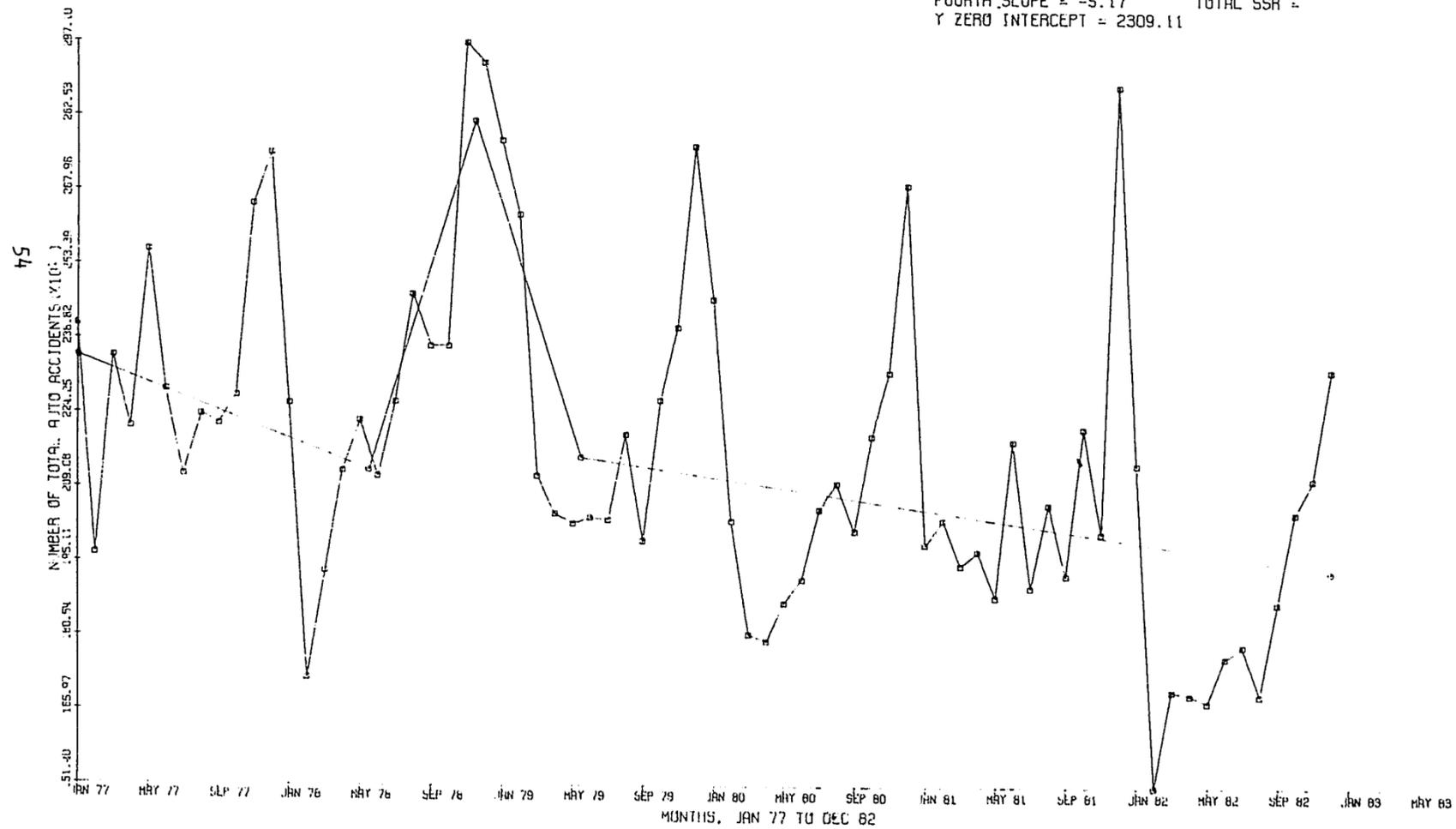
FIRST SLOPE = -4.21      TOTAL SSR =  
 Y ZERO INTERCEPT = 2329.76



# 15 WASHINGTON COUNTIES : TOTAL AUTO ACCIDENTS, 1977 - 1982

RAW DATA SERIES = □  
 MULTI-SEGMENT LINE = ⊙  
 SOURCE: WASHINGTON DEPT. OF TRANSPORTATION

FIRST SLOPE = -13.53	FIRST TURNING POINT	X: 17.50
Y ZERO INTERCEPT = 2367.48		Y: 2130.63
SECOND SLOPE = 114.31	SECOND TURNING POINT	X: 23.50
Y ZERO INTERCEPT = 130.25		Y: 2816.48
THIRD SLOPE = -109.96	THIRD TURNING POINT	X: 29.50
Y ZERO INTERCEPT = 5400.63		Y: 2156.70
FOURTH SLOPE = -5.17	TOTAL SSA =	
Y ZERO INTERCEPT = 2309.11		

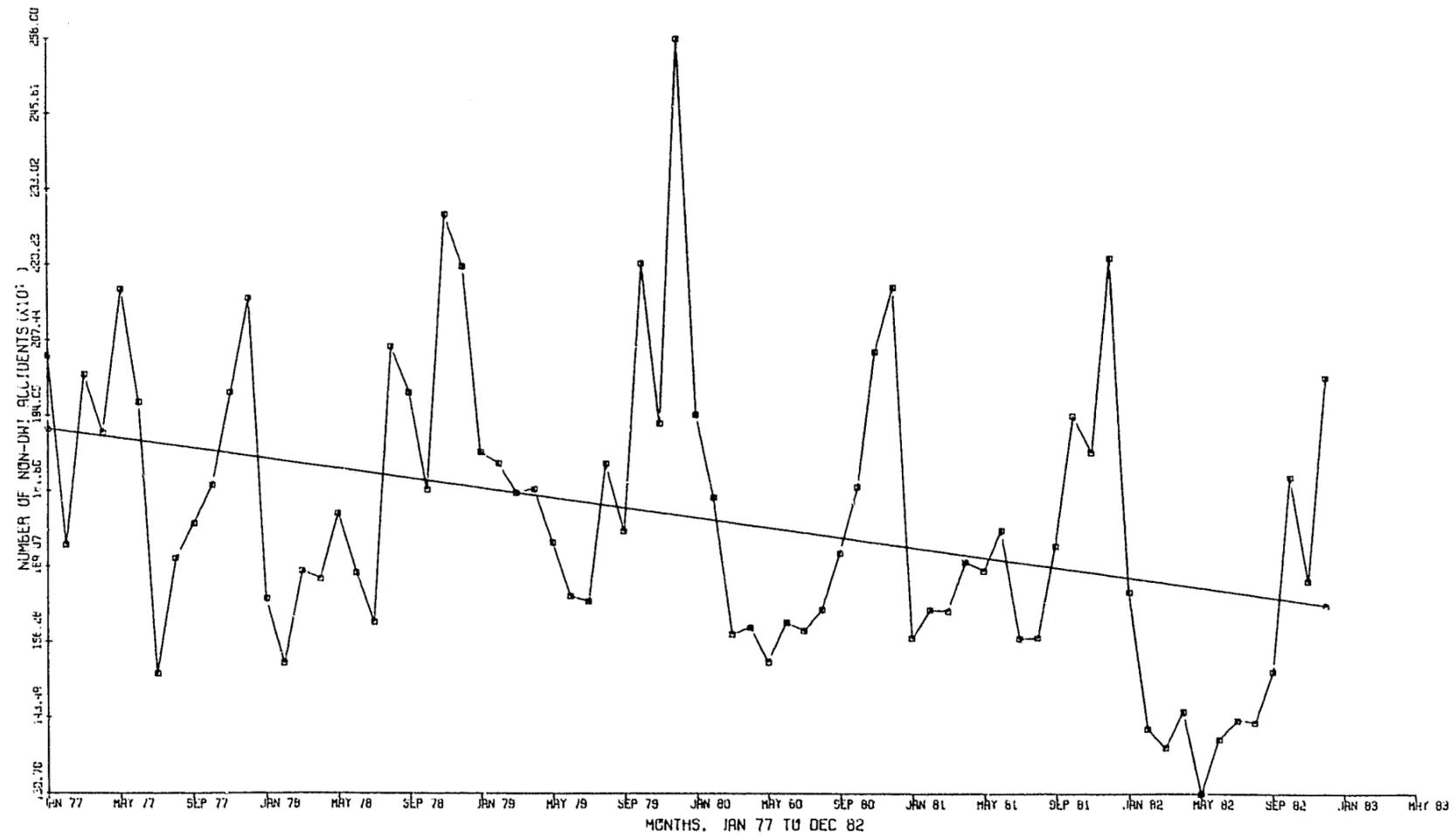


41 CITIES: NON-DWI TRAFFIC ACCIDENTS, 1977-1982

RAW DATA SERIES - □  
 MULTI-SEGMENT LINE - ⊙  
 SOURCE: WASHINGTON DEPT OF TRANSPORTATION

FIRST SLOPE = -4.19      TOTAL SSR =  
 Y ZERO INTERCEPT = 1927.41

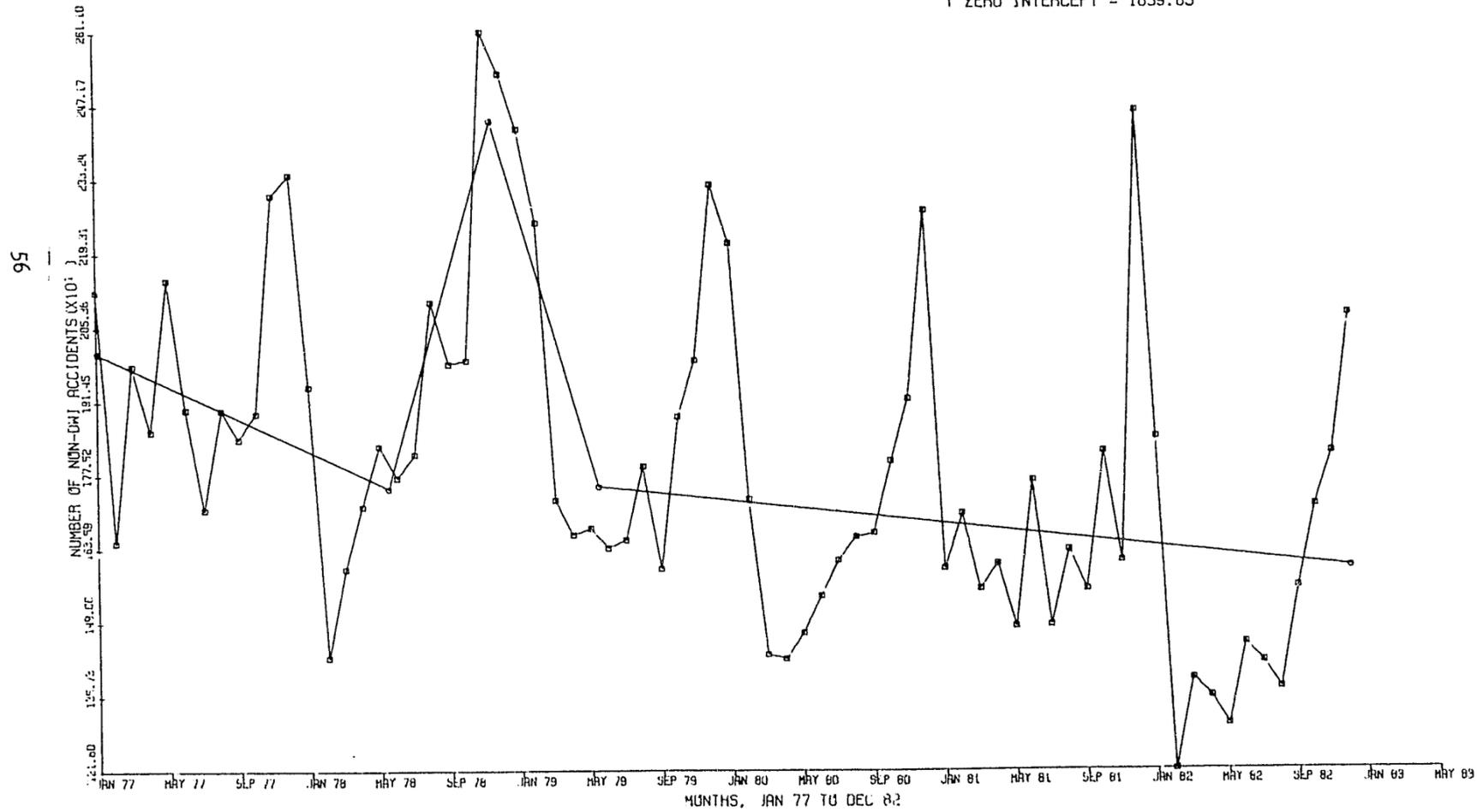
55



# 15 COUNTIES: NON-DWI TRAFFIC ACCIDENTS, 1977-1982

RAW DATA SERIES = □  
 MULTI-SEGMENT LINE = ⊙  
 SOURCE: WASHINGTON DEPT OF TRANSPORTATION

FIRST SLOPE = -15.49	FIRST TURNING POINT	X: 17.50
Y ZERO INTERCEPT = 2019.28		Y: 1748.15
SECOND SLOPE = 115.52	SECOND TURNING POINT	X: 23.50
Y ZERO INTERCEPT = -273.40		Y: 2441.26
THIRD SLOPE = -114.78	THIRD TURNING POINT	X: 29.50
Y ZERO INTERCEPT = 5136.70		Y: 1752.55
FOURTH SLOPE = -3.63	TOTAL SSA =	
Y ZERO INTERCEPT = 1859.63		



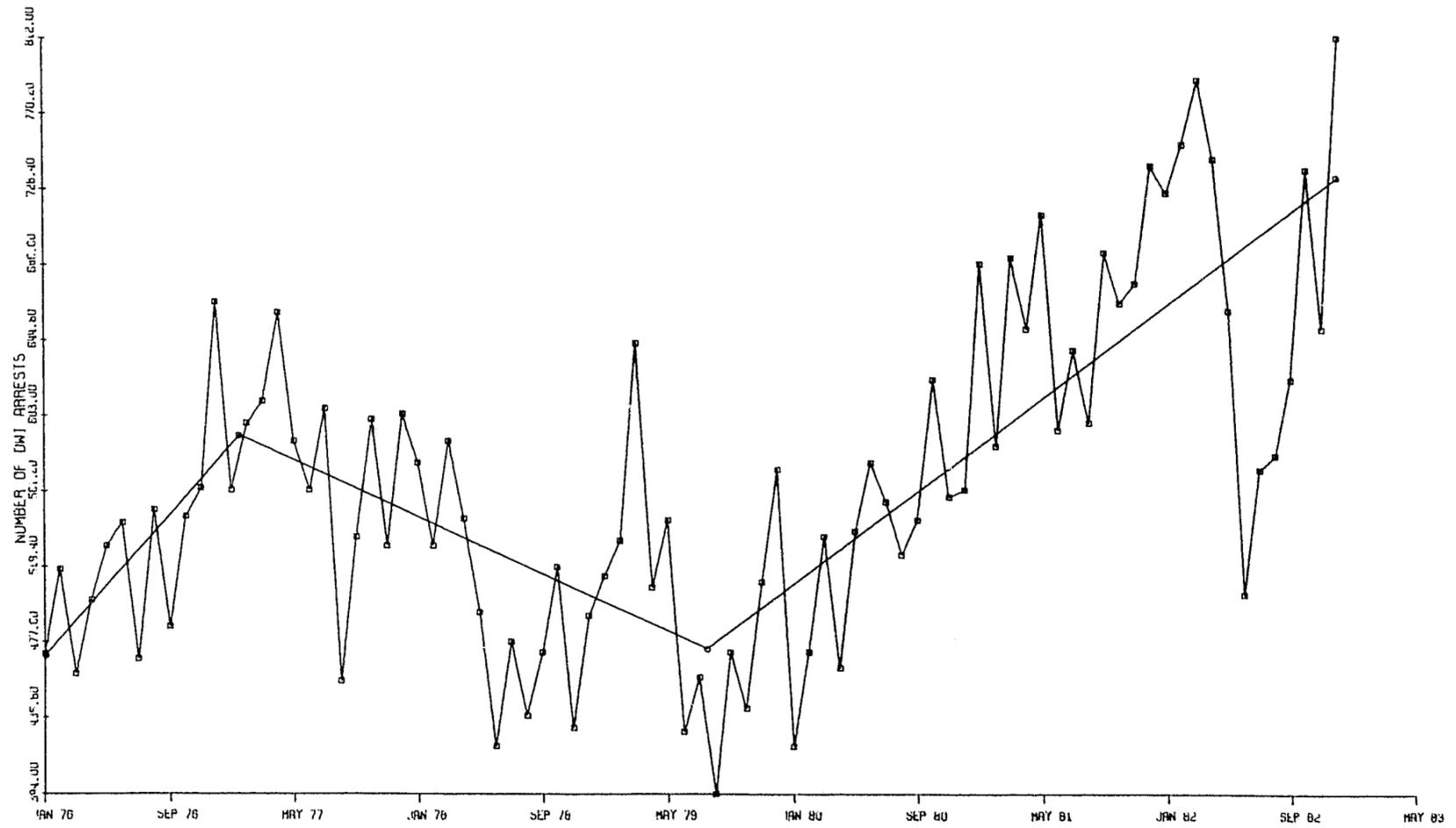
95

# 41 WASHINGTON CITIES - DWI ARRESTS, 1976 - 1982

RAW DATA SERIES = □  
 MULTI-SEGMENT LINE = ⊙  
 SOURCE: WASHINGTON UNIFORM CRIME REPORTS

FIRST SLOPE = 9.77      FIRST TURNING POINT      X:13.50  
 Y ZERO INTERCEPT = 460.20      Y:592.13  
 SECOND SLOPE = -3.95      SECOND TURNING POINT      X:43.50  
 Y ZERO INTERCEPT = 645.40      Y:473.73  
 THIRD SLOPE = 6.44      TOTAL SSR =  
 Y ZERO INTERCEPT = 193.40

57



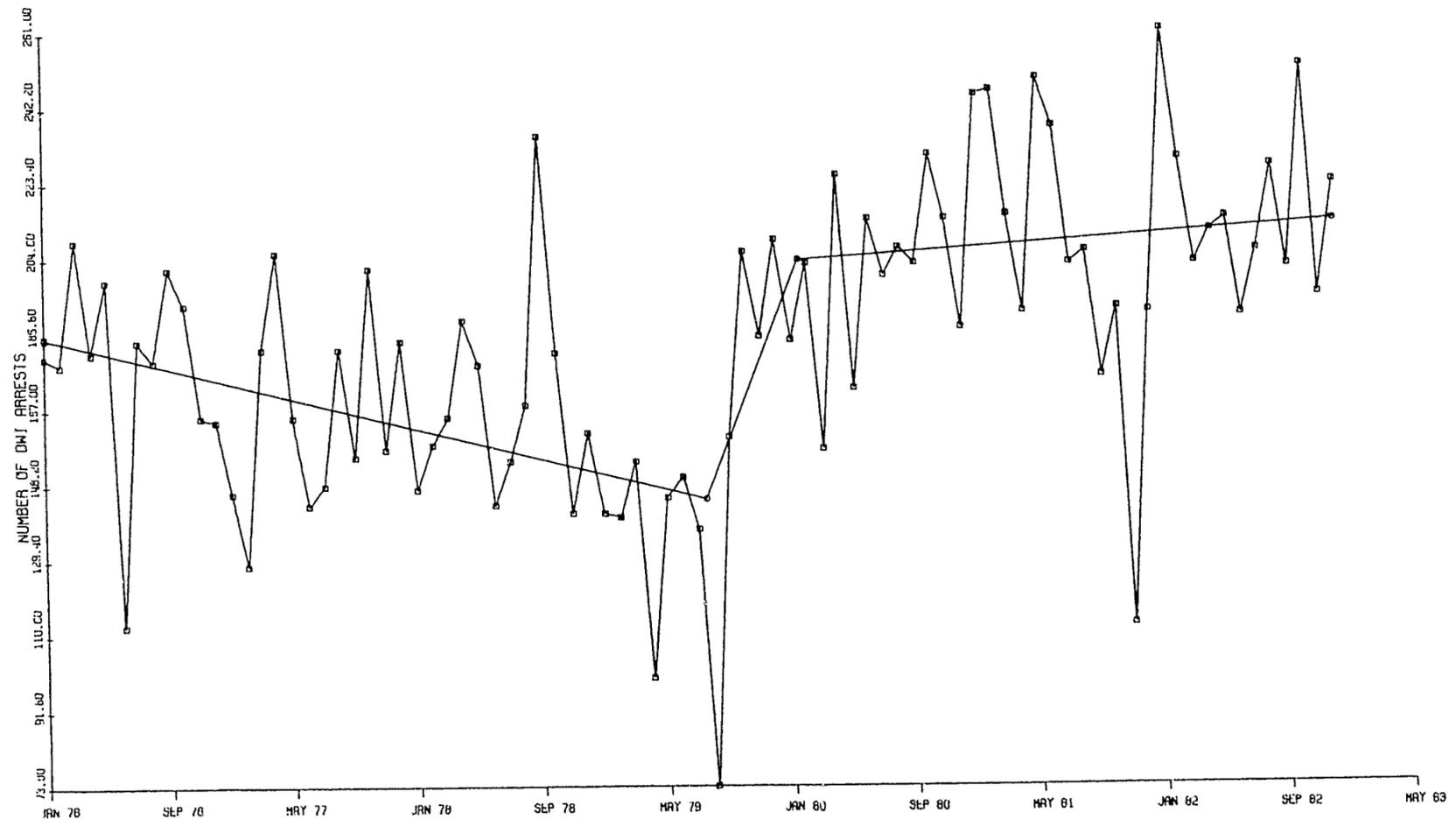
# 15 WASHINGTON COUNTIES - DWI ARRESTS, 1976 - 1982

RAW DATA SERIES = □  
 MULTI-SEGMENT LINE = ⊕  
 SOURCE: WASHINGTON UNIFORM CRIME REPORTS

FIRST SLOPE = -0.95  
 Y ZERO INTERCEPT = 185.74  
 SECOND SLOPE = 9.91  
 Y ZERO INTERCEPT = -286.42  
 THIRD SLOPE = 0.27  
 Y ZERO INTERCEPT = 190.61

FIRST TURNING POINT X:43.50  
 Y:144.10  
 SECOND TURNING POINT X:49.50  
 Y:203.60  
 TOTAL SSR = 61564.58

85



ILEC CRIMINAL JUSTICE INFORMATION SYSTEMS - STATISTICAL ANALYSIS CENTER GRAPH

OFM/F&E  
 10/83

**CONTINUED**

**1 OF 2**

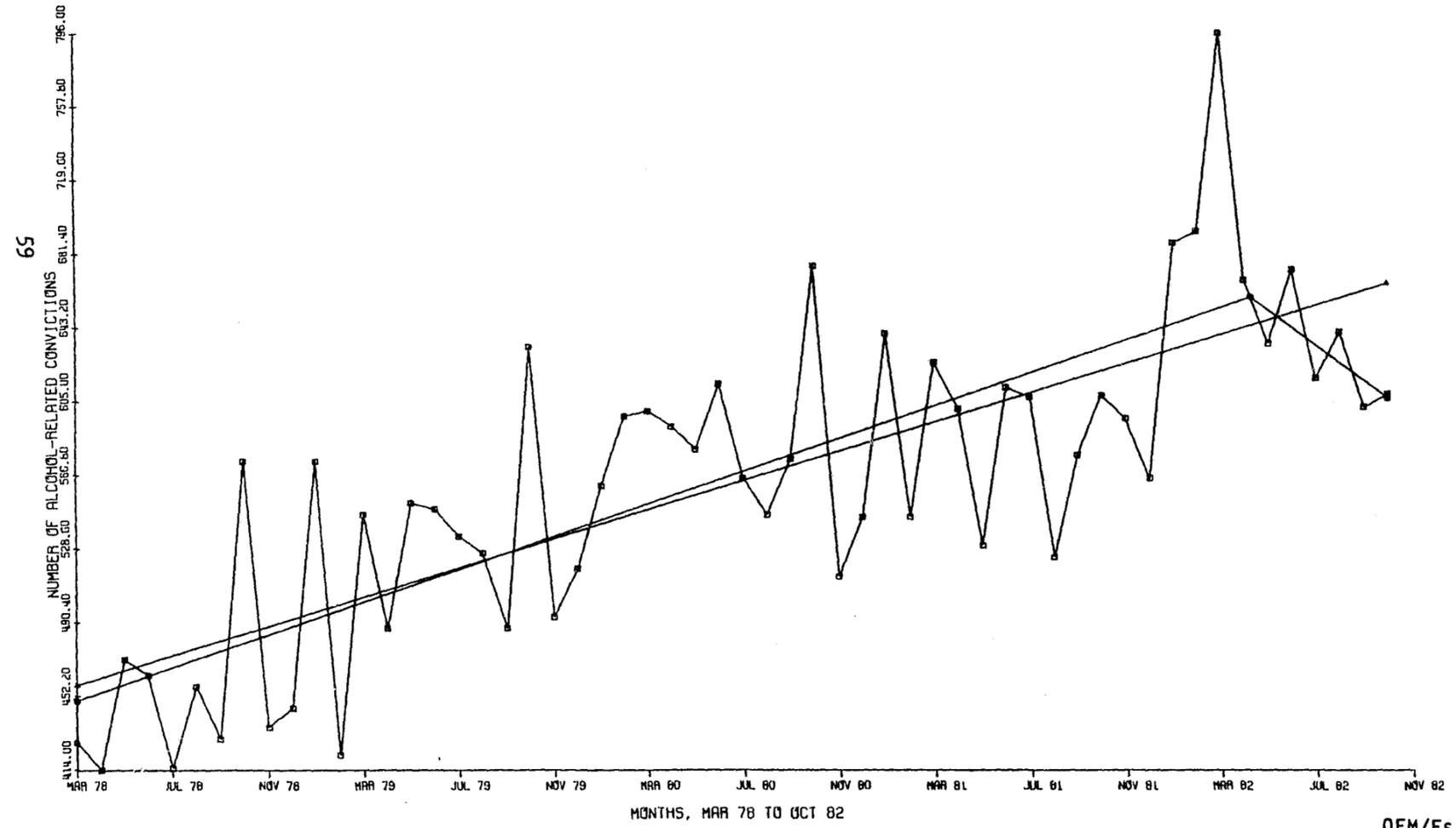
41 CITIES -50% SAMPLE: CONVICTIONS, 1978 - 1982

RAW DATA SERIES = □  
 SIMPLE REGRESSION LINE = ▲  
 TWO-SEGMENT LINE = ○

SIMPLE REGRESSION LINE:  
 SLOPE = 3.787  
 INTERCEPT = 454.043  
 SUM OF SQ. RES. =

TWO-SEGMENT LINE:

TURNING POINT = 50.259  
 SEGMENT 1 Y-INTERCEPT = 445.574  
 SEGMENT 1 SLOPE = 4.247  
 SEGMENT 2 SLOPE = -9.114  
 SUM OF SQ. RES. =  
 F VALUE = 7.643



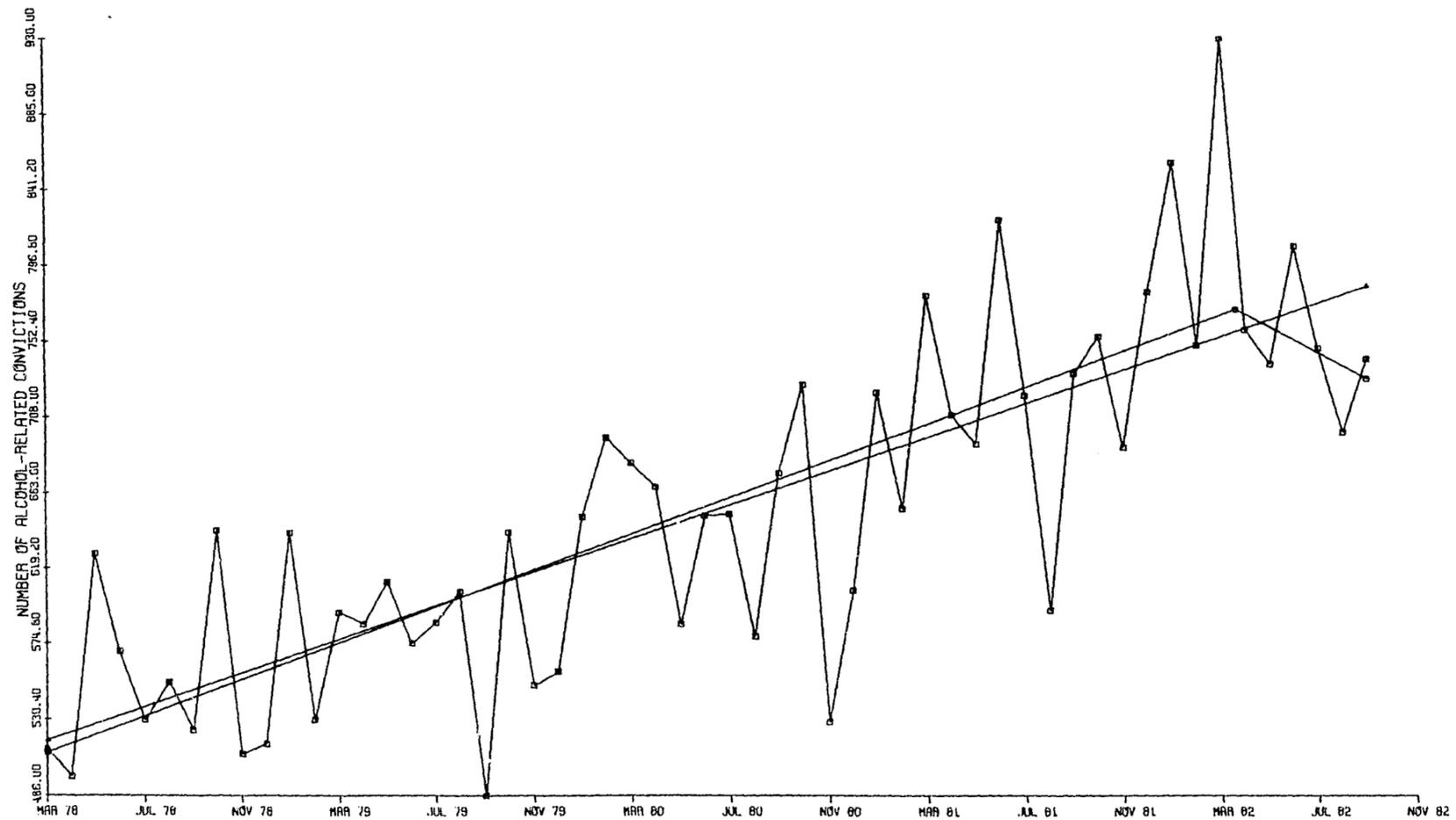
15 COUNTIES : ALCOHOL-RELATED CONVICTIONS, 1978 - 1982

RAW DATA SERIES = □  
 SIMPLE REGRESSION LINE = ▲  
 TWO-SEGMENT LINE = ⊙

SIMPLE REGRESSION LINE:  
 SLOPE = 4.940  
 INTERCEPT = 513.000  
 SUM OF SQ. RES. =

TWO-SEGMENT LINE:  
 TURNING POINT = 49.611  
 SEGMENT 1 Y-INTERCEPT = 505.528  
 SEGMENT 1 SLOPE = 5.352  
 SEGMENT 2 SLOPE = -7.571  
 SUM OF SQ. RES. =  
 F VALUE = 4.204

09



APPENDIX 4  
SAMPLE SITES  
41 WASHINGTON CITIES  
15 WASHINGTON COUNTIES

<u>City</u>	<u>County</u>	<u>1980 Pop</u>	<u>Pop Density</u>
Spokane	Spokane	171,000	3,260
Tacoma	Pierce	158,000	3,324
Yakima	Yakima	49,826	3,868
Vancouver	Clark	42,834	2,818
Bremerton	Kitsap	36,208	2,124
Kennewick	Benton	34,397	2,218
Richland	Benton	33,578	1,050
Longview	Cowlitz	31,052	2,486
Renton	King	30,612	2,001
Pullman	Whitman	23,579	2,996
Kent	King	23,152	1,251
Lynnwood	Snohomish	22,641	3,611
Aberdeen	Grays Harbor	18,739	1,331
Puyallup	Pierce	18,251	2,074
Pasco	Franklin	17,994	1,122
Port Angeles	Clallam	17,311	2,018
Wenatchee	Chelan	17,257	4,138
Lacey	Thurston	13,940	1,776
Mt. Vernon	Skagit	13,009	1,718
Oak Harbor	Island	12,271	1,656
Moses Lake	Grant	10,629	1,419
Hoquiam	Grays Harbor	9,719	1,331
Sunnyside	Yakima	9,225	3,237
Bothell	King	7,943	1,896
Shelton	Mason	7,629	1,620
Des Moines	King	7,378	4,032
Clarkston	Asotin	6,903	3,452
Port Townsend	Jefferson	6,067	1,011
Camas	Clark	5,681	1,479
Enumclaw	King	5,427	1,762
Ephrata	Grant	5,359	1,644
Sumner	Pierce	4,936	2,456
Port Orchard	Kitsap	4,787	1,780
Colville	Stevens	4,603	2,488
Othello	Adams	4,522	2,393
Tukwilla	King	3,578	932
Buckley	Pierce	3,143	838
Elma	Grays Harbor	2,720	1,604
Blaine	Whatcom	2,363	664
Westport	Grays Harbor	1,954	275
Ocean Shores	Grays Harbor	1,777	191

#Commissioned Law Enforcement Officers in 1980= 1483

<u>County</u>	<u>Unincorp Pop 1980</u>	<u>Population Density</u>
King	503,172	265
Spokane	152,164	90
Yakima	83,462	20
Cowlitz	31,654	28
Skagit	30,292	18
Island	30,117	149
Grant	22,005	8
Stevens	20,398	8
Pacific	10,713	12
Klickitat	9,876	5
Asotin	8,974	14
Adams	6,031	7
Lincoln	3,769	2
Wahkiakum	3,197	12
Columbia	1,294	2

#Commissioned Law Enforcement Officers in 1980 = 897

**END**