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**ANALYSIS OF WASHTENAW COUNTY ALCOHOL SAFETY
ACTION PROGRAM CRASH CRITERIA MEASURES**

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Final Report

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By

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16. Abstract <p>The primary objective of the Washtenaw County Alcohol Safety Action Program has been to reduce the number of alcohol-related crashes and the consequences of such crashes. The program, operational since 1971, includes several countermeasure activities directed toward those elements thought to contribute to the occurrence of alcohol-related crashes.</p> <p>Analyses of both fatal and non-fatal crashes do not indicate favorable changes with regard to the program objective. Crashes have continued to increase yearly. Crashes per registered vehicle in Washtenaw County have shown similar trends to those for the state of Michigan. No decreases in the proportion of alcohol-related crashes were identified. Reported alcohol-involvement increased among fatal crashes, although this was possibly due to improvement in the blood alcohol testing rates for fatalities. During three pre-program years and the subsequent two years of the ASAP, the proportion of alcohol-related non-fatal crashes remained constant. The only result consistent with program objectives was a slight decrease in the proportion of Washtenaw drivers involved in non-fatal crashes who had been drinking; comparable statewide data for 1971 through June 1973 indicate a slight increase in alcohol-involvement.</p>			
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The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of Washtenaw County.

PREFACE

The Highway Safety Research Institute has undertaken a number of activities pertaining to its evaluation of the Washtenaw County Alcohol Safety Action Program, including roadside surveys, surveys of the general public and selected target groups, and collection and analysis of crash, arrest, and recidivism data.

These activities and their findings are described in separately bound reports consistent with the reporting structure of the sponsoring agencies. This structure enables the reader interested in a single topic to access the relevant report conveniently. However, the individual reports in this series largely do not contain comparative data derived from separate evaluative activities. Such comparisons, when appropriate, will be found in the summary report cited below.

Reports in this series which are completed, in process, or planned for the Fall 1973 are listed below:

1. Washtenaw County 1971, 1972 and 1973 BAC Roadside Survey, UM-HSRI-AL-73-6.
2. 1971 and 1973 ASAP Surveys: Washtenaw and Jackson County Voluntary Organizations, UM-HSRI-AL-73-7.
3. 1971 and 1973 ASAP Surveys: Washtenaw County Physicians, UM-HSRI-AL-73-8.
4. 1971 and 1973 ASAP Surveys: Washtenaw County General Public, UM-HSRI-AL-73-9.
5. 1971 and 1973 ASAP Surveys: Washtenaw County Attorneys, UM-HSRI-AL-73-10.
6. 1971 and 1973 ASAP Surveys: Washtenaw County Law Enforcement Agencies, UM-HSRI-AL-73-11.
7. 1971 and 1973 ASAP Surveys: Washtenaw County High School Students, UM-HSRI-AL-73-12.
8. Analysis of Washtenaw County Alcohol Safety Action Program Police Countermeasure Activity, UM-HSRI-AL-73-13.
9. Analysis of Washtenaw County Alcohol Safety Action Program Judicial, Referral and Diagnostic Activity, UM-HSRI-AL-73-14.

10. Analysis of Washtenaw County Alcohol Safety Action Program Treatment Countermeasures, UM-HSRI-AL-73-15.
11. Analysis of Washtenaw County Alcohol Safety Action Program Crash Criteria Measures, UM-HSRI-AL-73-16.
12. Washtenaw County Alcohol Safety Action Program Evaluation Summary, UM-HSRI-AL-73-17.

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1. SUMMARY

An analysis of the Washtenaw County crash experience covering the years of 1968 through mid-1973 produces very little evidence to support achievement of the ASAP goal of reducing alcohol-related crashes. Such analyses may not be conclusive, being done under the handicap of incomplete alcohol determinations in fatal crashes, a rather limited time period after the initiation of the ASAP, and the absence of an adequate comparison area. However, available crash data are largely consistent and reveal the following.

1.1 FATAL CRASH FINDINGS

The number of fatal crashes has not decreased since the ASAP was initiated, as might be expected if alcohol-related fatal crashes were to decrease. Although the fatal crash rate per registered vehicle has shown a general decrease over time, that decrease in Washtenaw County is no greater than evidenced for the State of Michigan.

When fatal crashes are analyzed for alcohol involvement (using blood alcohol concentrations (BAC) or in their absence, a police officer's judgment of drinking by a driver) the data reveal an increase in the proportion of such crashes during the ASAP program period. This change in the proportion of AR fatal crashes is, however, no larger than would be expected by chance. Further, the change was a result of an increase in AR single-vehicle crashes, from 40% during the baseline to 54% during the program period. In the same time period, AR multi-vehicle crashes decreased but to a lesser extent.

No evidence was found suggesting that Washtenaw County driver fatalities were drinking prior to their crashes any less frequently than were fatalities who were non-county residents and therefore not expected to be influenced by ASAP activities.

During the program period, 32% of the drivers involved in fatal crashes (both surviving and dead) were drinking, up from the

28% of the previous three years. The only age group showing a large decrease in drinking was that of 21 to 25 year olds, while drinking among 18 to 20 year old crash-involved drivers increased. If this age group is excluded from the baseline-to-program period comparison, the proportion of drinking drivers (31%) remains the same.

1.2 NON-FATAL CRASH FINDINGS

For both Michigan and Washtenaw County, there was a slight yearly increase in the number of non-fatal crashes from 1968 to 1972. These trends are similar with no change in trend occurring in Washtenaw County following the initiation of ASAP.

For both the state and the county, there was a slight decline in non-fatal crash rates (crashes per registered vehicles) from 1968 to 1972. The decline was no greater in Washtenaw County than in Michigan and no acceleration of the rate of decline occurred in the county following initiation of ASAP activities.

The annual number of non-fatal alcohol-involved crashes in Washtenaw County increased slightly from 1968 to 1972. The rate of increase did not slow after the ASAP program began operation.

The proportion of Washtenaw County non-fatal crashes which were alcohol-involved remained fairly stable from 1968 to 1972.

The proportion of crash-involved drivers in Washtenaw County who "had been drinking" prior to the crash decreased slightly. The rate of decline was no greater after ASAP began.

In brief, examination of the number of non-fatal crashes during the baseline and program years, the number per registered vehicle, and the proportion of both crashes and drivers which were alcohol-involved gave no evidence to indicate that ASAP activities produced clearly identifiable, highly favorable changes.

Two areas of positive results were identified. From 1971 to 1973, Washtenaw County had a slightly, though consistently, better record than Michigan in the proportion of crash-involved drivers who "had been drinking". Washtenaw County experienced lesser rates of increase, greater rates of decrease, and in a few cases, decreases, while Michigan experienced increases. ASAP activities may have contributed to the more favorable Washtenaw County record.

Finally, a surrogate measure of alcohol-involvement in crashes was developed. This measure confirms the results stated above for Washtenaw County, namely that there is no evidence that ASAP activities produced the desired changes. Further, the surrogate is non-judgmental and thus not likely to be subject to bias or problems of missing data. In areas where bias or missing data confound the process of measuring alcohol-involvement, this surrogate may be a valuable measure of alcohol-involvement in crashes.

2. INTRODUCTION

The primary objective of the Washtenaw County Alcohol Safety Action Program (WCASAP) has been to reduce the number of alcohol-related crashes and the consequences of such crashes. The program became operational in March 1971, and has several components, termed countermeasure activities, which are directed toward those elements thought to contribute to the occurrence of alcohol-related crashes.

This report presents an evaluation of the ASAP program directly in terms of its central objective, the reduction of alcohol-related crashes. A discussion of fatal crashes appears in Section 3 while patterns in non-fatal crashes are addressed in Section 4. The measures used to assess program achievement in both cases include changes in the number of crashes and changes in the number or proportion of alcohol-related crashes or crash-involved drinking drivers.

3. FATAL CRASHES

3.1 NUMBER OF FATAL CRASHES

The goal of the ASAP has been to achieve a reduction in the number or proportion of alcohol-related crashes. However, without complete blood testing measurements on both fatally injured and surviving drivers, the number of alcohol-related fatal crashes cannot be accurately and completely determined. When such measurements have been available on fatally injured drivers, the proportion of alcohol-related crashes is indicated to be as high as 50%. Washtenaw County, like many other areas, has not had, over the past years, a blood testing program which includes all fatalities or all driver fatalities. It is reasonable to believe, however, that if the number of alcohol-related crashes were to decrease, this might be reflected in a decrease in total fatal crashes.

Presented in Table 3.1 are the number of fatal crashes, by year, for Washtenaw County and the comparison area of Michigan. The fatal crash rate per registered vehicle is also included.

TABLE 3.1. YEARLY DISTRIBUTION OF FATAL CRASHES,
WASHTENAW COUNTY AND MICHIGAN

Year	Washtenaw County		Michigan	
	Fatal Crashes	Rate/10,000 Vehicles	Fatal Crashes	Rate/10,000 Vehicles
1968	58	5.1	2015	4.2
1969	51	4.2	2154	4.2
1970	64	5.1	1863	3.5
1971	58	4.4	1890	3.5
1972	60	4.2	1997	3.4

These data do not suggest favorable changes since the ASAP program was instituted in Washtenaw County. The mean number of 59 crashes during 1971-72 is higher than the mean of 57.6 during the baseline years of 1968-70. While the fatal crash rate has

generally decreased in Washtenaw County (a 0.89 decrease from the baseline to the program period), the Michigan fatal crash rate shows a similar decline (0.87). Partial year data for 1973 are no more encouraging. Between January and August 1973 there were 39 fatal crashes in Washtenaw County. This is a slight increase over the 35 fatal crashes during the comparable time periods in both 1971 and 1972.

3.2 ALCOHOL-RELATED FATAL CRASHES

Available data on alcohol-related (AR) fatal crashes support the finding of no change noted in the section on total fatal crashes. An AR crash is defined to be one in which one or more driver fatalities, pedestrian fatalities, or surviving drivers had a positive BAC, or in the absence of a BAC test, was judged as "had been drinking" by the investigating police officer. Crashes in which alcohol-involvement was either questionable or determined to be negative were classified as non-alcohol-related for comparative purposes. Alcohol-involvement of passenger fatalities was excluded from the crash classification.

The distribution of AR and non-AR crashes by year is shown in Table 3.2. The yearly proportion of AR crashes as well as averages for the baseline and program periods are indicated. In general, the proportion of crashes reported to be alcohol-related was higher during the ASAP period (47%) than during the baseline years of 1968-70 (41%). The slight decline in AR multi-vehicle crashes and total crashes noted in earlier reports for 1972 did not continue into the first eight months of 1973. Thus there is little support for the hypothesis that the 1972 data may have indicated a delayed but program-related change in alcohol-involved crash patterns.

Earlier in the project, an attempt was made to control for the AR fatal crash experience of Washtenaw County. Since alcohol-related data on all Michigan fatal crashes were not available except for the years 1971 and 1972, a decision was made to select one county and collect the crash information for the period 1968-72. Those Michigan counties which are most similar demographically to Washtenaw County were independently funded to begin ASAP-like

TABLE 3.2. DISTRIBUTION OF SINGLE AND MULTI-VEHICLE FATAL CRASHES BY YEAR AND ALCOHOL INVOLVEMENT*

Year	Number Fatal Crashes	Number non-alcohol related crashes		Number alcohol-related crashes		Percent alcohol-related crashes**		
		Single Vehicle	Multi-Vehicle	Single Vehicle	Multi-Vehicle	Single Vehicle	Multi-Vehicle	All Crashes
1968	58	16	17	12	13	43%	43%	43%
1969	51	20	14	11	6	35	30	33
1970	64	22	13	16	13	42	50	45
1971	58	13	15	21	9	62	38	52
1972	60	18	18	18	6	50	25	40
1973 (Jan-Aug)	39	10	9	10	10	50%	53%	51%
Base-line period	173	58	44	39	32	40%	42%	41%
Pro-gram period	157	41	42	49	25	54%	37%	47%

*An alcohol-related crash is defined to be one in which a driver fatality, pedestrian fatality, or surviving driver had a positive BAC, or in the absence of a BAC test, was noted as 'had been drinking' on the accident report form.

**No statistically significant differences at the 0.05% level were indicated when the distribution of AR and non-AR single and multi-vehicle crashes were compared for the baseline vs. the program period.

programs beginning in 1971, making them unsuited for comparative purposes. Jackson County, which is contiguous to Washtenaw County, appeared as if it would present the best control to the local experience. Thus alcohol-related data, including blood alcohol concentrations (BACs) were collected for Jackson County fatal crashes.

Jackson and Washtenaw Counties are quite similar in rural/urban land use, land area (Jackson, 750 square miles; Washtenaw, 716 square miles) and road miles (Jackson, 1896 road miles; Washtenaw, 1923 road miles). Jackson differs from Washtenaw County in that it does not have two major universities and its population growth has not been as rapid as Washtenaw County. The 1970 census listed the population of Jackson County as 143,274, an 8.5% increase since 1960. The population of Washtenaw County is 234,103, a 35.8% increase in ten years, which is higher than the state growth rate of 13.4%.

The AR crash data from Jackson County do not add to an understanding of the Washtenaw County AR crash experience. Presented in Figure 3.1 is a plot of the proportion of fatal crashes which were alcohol-related for both counties by year and type (single versus multi-vehicle). For the years 1968-70 (the baseline period) the Jackson and Washtenaw AR crash patterns tend to be dissimilar, leaving the Washtenaw pattern without a control from which meaningful comparisons can be drawn. This dissimilarity continued into the program period.

3.3 ALCOHOL INVOLVEMENT OF FATALITIES

Washtenaw County has a medical examiner system which involves approximately 20 deputy medical examiners under the direction of the chief county health officer. At the time the ASAP program began, the BAC collection rate was known to be poor. To improve this rate, the medical examiners agreed to collect BACs on fatalities 16 years of age or older who lived 24 hours or less after their crash. Even with this agreement, as well as with other efforts to improve collection rates, the collection rate is not ideal. It has, however, improved over previous years and is in fact fourth best among the larger Michigan counties.

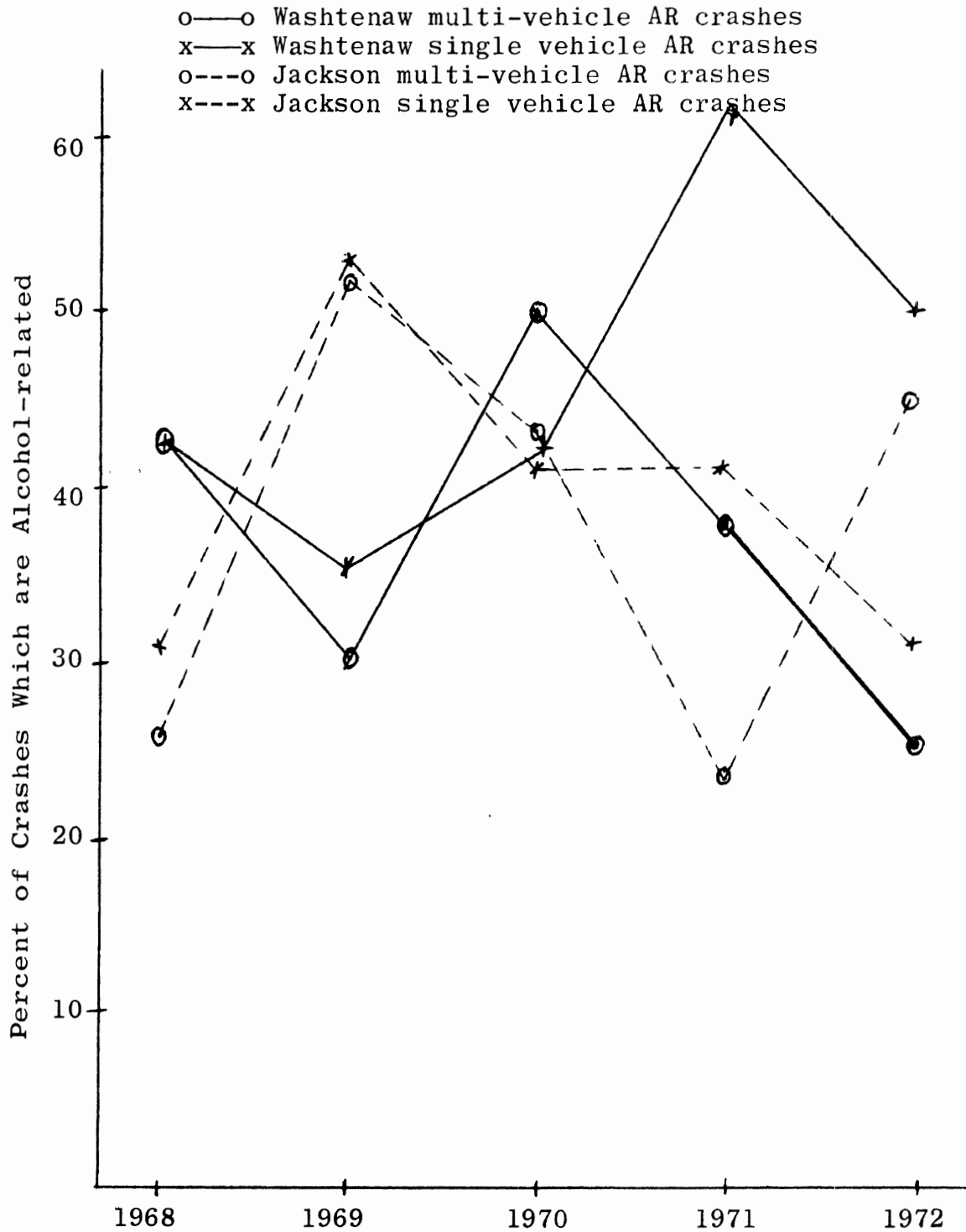


FIGURE 3.1. PERCENTAGE OF ALCOHOL-RELATED SINGLE VEHICLE AND MULTIPLE VEHICLE FATAL CRASHES; WASHTENAW AND JACKSON COUNTIES

The data in Table 3.3 indicate the proportion of driver fatalities who were tested and of those tested, the percentage with BAC \geq .10%. (Testing rates for all fatalities--drivers, passengers and pedestrians--as well as BAC distributions, appear in Appendix Tables A1-A3.) During the program years, the proportion of drivers with positive BAC and with BAC \geq .10 was generally higher than during the baseline period. This is possibly related to the improvement in the testing rate. However, because there are so few driver fatalities and rarely are more than one-half tested, it is very difficult to draw meaningful inferences about baseline-to-program period alcohol involvement. Clearly alcohol remains a serious problem in fatal crashes, with up to 53% of those driver fatalities tested having BAC of .10 or higher.

TABLE 3.3. BAC COLLECTION RATES AND SUMMARY RESULTS FOR DRIVER FATALITIES BY YEAR

Year	N	% Tested	% of Tested With Positive BAC	% of Tested With BAC \geq .10
1968	38	45%	53%	47%
1969	37	30	45	45
1970	47	32	67	47
1971	49	51	72	52
1972	42	45	68	53
1973	28	54	67	53

When BAC data, or in its absence, police estimate of drinking, are combined, the pattern over the years indicates a similar and general increase in reported drinking among persons involved in fatal crashes (Table 3.4). The proportion of driver fatalities who were judged as drinking increased from a baseline of 39%, to 45%-50% during the program period. A similar increase was reported for drivers surviving a fatal crash.

3.4 RESIDENCY AND ALCOHOL INVOLVEMENT

Because the ASAP program was expected to primarily affect the drinking/driving habits of county residents, the possibility

TABLE 3.4. ALCOHOL INVOLVEMENT OF FATALITIES AND SURVIVING DRIVERS BY YEAR

	1968-70	1971	1972	Jan-Aug 1973
<u>Driver Fatalities</u>				
Drinking	48 39%	24 49%	19 45%	14 50%
Total	122	49	42	28
<u>Passenger Fatalities</u>				
Drinking*	8 16%	1 8%	1 6%	0 0
Total	50	13	16	16
<u>Pedestrian Fatalities</u>				
Drinking	7 26%	1 20%	0 0	1 50%
Total	27	5	8	2
<u>Surviving Drivers</u>				
Drinking**	24 17%	4 11%	5 12%	6 21%
Total	139	37	43	29

*Measured only by BAC.

**In most cases, only police estimate is available.

was considered that driver fatalities who were county residents would show differences in the proportion drinking when compared to non-resident driver fatalities. The proportion drinking by residency and year (Table 3.5) indicates that although resident driver fatalities were only half as frequently drinking as non-residents in 1971, the difference narrowed in 1972, and reversed in 1973, with a higher proportion of drinking residents than drinking non-residents.

TABLE 3.5. ALCOHOL INVOLVEMENT OF RESIDENT AND NON-RESIDENT DRIVER FATALITIES

Year	Resident		Non-resident	
	% Drinking	Total	% Drinking	Total
1968-70	35%	72	46%	50
1971	30	20	62	29
1972	42	24	50	18
1973	53	17	45	11

3.5 AGE AND ALCOHOL INVOLVEMENT

Only minor shifts in the percentage distribution of all drivers by age occurred between the baseline and program period of ASAP, including a 3% decrease in the proportion of 18 to 20 year olds (see Table 3.6). Shifts in the age distribution of drinking drivers were more apparent. During the baseline period, 18 to 20 year olds accounted for 15% of the crash-involved drivers but were underrepresented among crash-involved drinking drivers (6%). In the subsequent two and one-half years, this age group comprised 12% of the drivers and 14% of the drinking drivers. Twenty-one to 25 year olds were considerably over-represented among drinkers during the baseline period (20% of the drivers and 33% of the drinkers) although this over-representation, for the most part, disappeared during the program period (22% of the drivers and 25% of the drinking drivers). The most likely explanation for the change in 18-20 year old alcohol-related crash involvement, and perhaps that of 21-25 year olds, is the January 1972 lowering of the Michigan legal drinking age*.

TABLE 3.6. PERCENTAGE DISTRIBUTION OF DRIVERS AND DRINKING DRIVERS BY AGE GROUP (INCLUDES SURVIVING AND DECEASED DRIVERS INVOLVED IN FATAL CRASHES)

Age	1968-70		1971-August 1973	
	% of Drivers By Age	% of Drinking Drivers by Age	% of Drivers By Age	% of Drinking Drivers by Age
16-17	6%	6%	5%	4%
18-20	15	6	12	14
21-25	20	33	22	25
26-35	21	24	22	24
36-45	12	11	14	14
46-55	13	12	13	11
56-65	9	8	9	7
66+	4	0	3	1
Total	100%	100%	100%	100%
N	(257)	(72)	(227)	(72)
Missing Age	(4)	(0)	(1)	(0)

*The potential effects of lower legal drinking age on youth involvement in alcohol-related crashes are presently being studied by HSRI under NHTSA sponsorship. Michigan is one of the states being studied.

Presented in Table 3.7 are the same data as Table 3.6, however, the proportion drinking within each age group is indicated. The only age group showing a large decrease in drinking was that of 21 to 25 year olds, while 18 to 20 year olds evidenced the largest increase, from 10% to 35% drinking. For all ages, the proportion drinking increased from 28% to 32%. However, if the 18 to 20 year old drinking experience is deleted from the baseline-to-program comparison, the data indicate that 31% of the remaining drivers were drinking in both time periods (68 of 222 in the baseline and 62 of 200 in the program period). Thus, although the data do not indicate the desired decline in drinking, the data at least suggest an explanation for the reported increase.

TABLE 3.7. PROPORTION OF FATAL CRASH-INVOLVED DRINKING DRIVERS WITHIN AGE GROUPS

Age	1968-70			1971-Aug 1973		
	N	Drinking		N	Drinking	
16-17	16	4	25%	11	3	27%
18-20	39	4	10	28	10	35
21-25	51	24	47	51	18	38
26-35	55	17	31	49	17	35
36-45	31	8	26	33	10	30
46-55	33	9	27	29	8	28
56-65	22	6	27	20	5	25
66+	10	0	0	6	1	17
Missing	4	0	0	1	0	0
Total	261	72	28%	228	72	32%

4. NON-FATAL CRASHES

Criterion measures assessing changes in the number or rate of non-fatal crashes occurring in Washtenaw County are presented in this section. The measures are similar to those applied to fatal crashes and can be stated as follows:

- (1) A change in the number of non-fatal crashes,
- (2) A change in the number or proportion of alcohol-related non-fatal crashes or alcohol-involved drivers.

Two data banks have been used in analyses of non-fatal crashes. The first is the HIT LAB file, maintained by HSRI, and including all 1968-72 crashes occurring in Washtenaw County. Data on statewide crash experience have been supplied by the Michigan State Police. Both data banks contain information recorded on the traffic accident report form prepared by investigating police officers. Information regarding alcohol involvement is the police officer's judgment that one or more drivers in a crash had been drinking. Blood alcohol concentrations are rarely available in non-fatal crashes.

Data for the first half of 1973 have been added where pertinent to provide additional insights into the non-fatal crash experience for both Washtenaw County and the State of Michigan.

4.1 NUMBER OF NON-FATAL CRASHES

Figures 4.1 and 4.2 present data on the number of non-fatal crashes occurring in both Washtenaw County and the State of Michigan for the period 1968 to 1972. The graphs indicate the portion of non-fatal crashes which involved personal injury and the portion which involved only property damage.

Washtenaw County has experienced a slight yearly increase in non-fatal crashes. Personal injury crashes were fairly stable throughout the period, especially for the last four years. Property damage crashes increased steadily during the five year period.

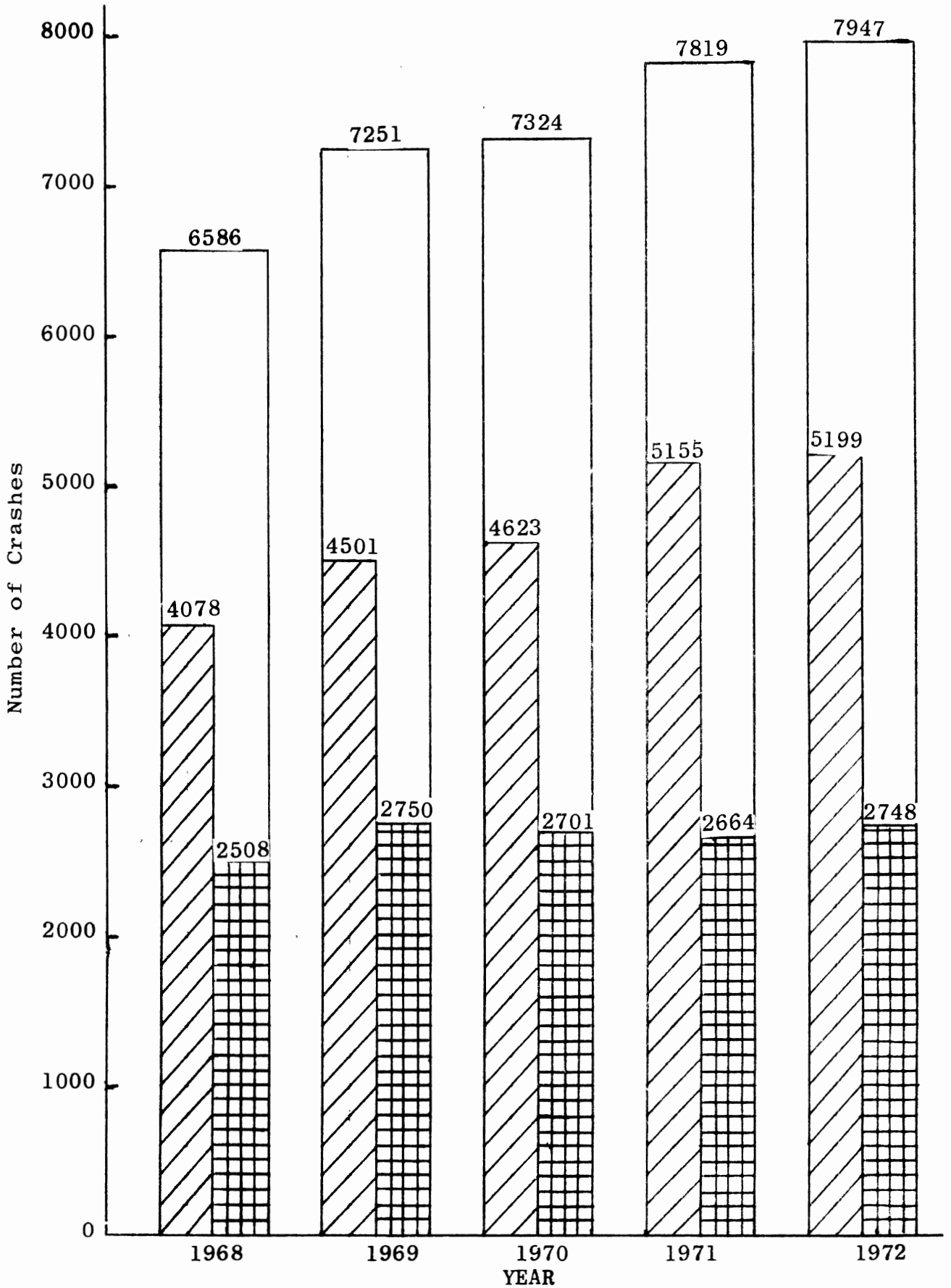
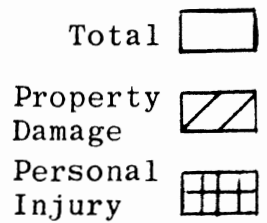


FIGURE 4.2. THE NUMBER OF NON-FATAL CRASHES IN MICHIGAN BY SEVERITY AND YEAR



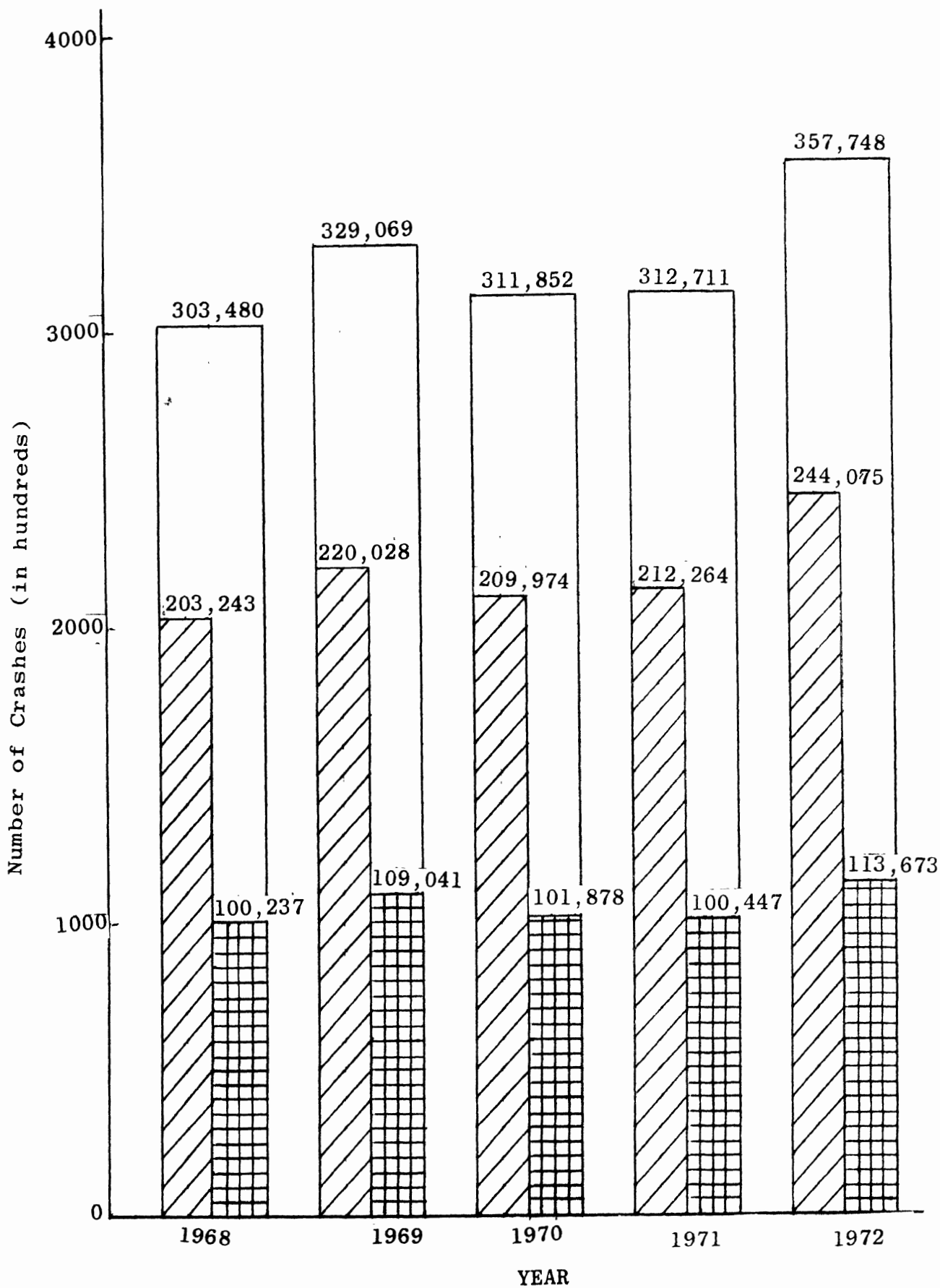





FIGURE 4.2. THE NUMBER OF NON-FATAL CRASHES IN MICHIGAN BY SEVERITY AND YEAR

Total 
Property Damage 
Personal Injury 

Michigan has experienced very little change in the number of non-fatal crashes over the five year period with the exception of the spurt in 1972. Thus, due to the effect of the 1972 spurt, the overall trends show a very slight increase in the number of both personal injury and property damage crashes over time.

If alcohol-related crashes were to decrease with the initiation of ASAP, one would expect that this would be reflected in the total number of crashes and would be unlike statewide patterns. Since there is very little difference in trends in the number of non-fatal crashes between Washtenaw County and Michigan over the five year period, it can be concluded that Washtenaw County ASAP activities had no discernible effect on the number of non-fatal crashes occurring within the county.

It is also known that personal injury crashes are more likely to be alcohol involved than are property damage crashes. The number of personal injury crashes would thus be more sensitive to changes in drinking and driving behavior than would total non-fatal crashes. Since there was very little change in the number of personal injury crashes over the five year period, either in Washtenaw County or in the State as a whole, it appears even less likely that WCASAP affected the occurrence of non-fatal crashes, or of alcohol involvement in those crashes. (Crash data for 1968-72 appears in Appendix B1.)

To further examine non-fatal crash experience, rates reflecting the number of crashes per thousand registered vehicles were calculated. In Figure 4.3, rates for Washtenaw County and the State of Michigan are compared. If ASAP had had a favorable effect on Washtenaw County crash rates, there might have been changes in Washtenaw County rates which were more favorable than changes in Michigan rates. Even though there was a slight decline in Washtenaw County non-fatal crash rates over time, it was neither sharper after the program was initiated nor sharper than the general decline in rates for the State of Michigan. Here again, it can be concluded that Washtenaw County ASAP had no discernible effect on non-fatal crash rates, or by inference, on alcohol-involved crash rates.

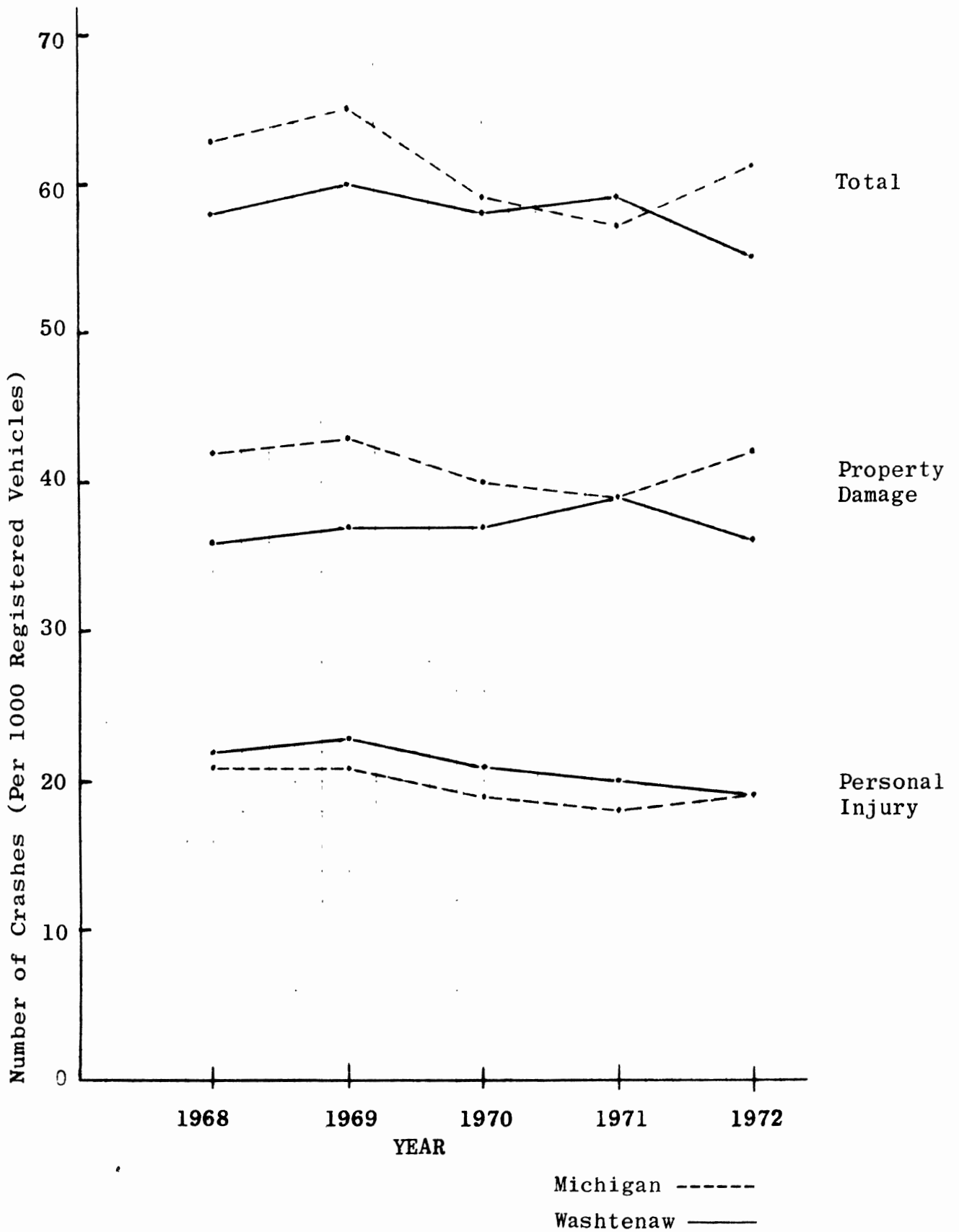


FIGURE 4.3. THE NUMBER OF WASHTENAW COUNTY AND MICHIGAN NON-FATAL CRASHES PER 1000 REGISTERED VEHICLES BY SEVERITY AND YEAR

Figure 4.3 also displays the relationship between Washtenaw County and Michigan for personal injury and property damage crash rates. The personal injury crash rate is declining slightly for both Washtenaw County and Michigan. While this is favorable since personal injury crashes are more likely to be alcohol-related, the experiences of the two jurisdictions are very similar. There was very little change in property damage crash rates for either Washtenaw County or the State.

In sum, it was believed that if Washtenaw County ASAP had achieved its goals, evidence of this might appear as a change in the number of non-fatal crashes or in crash rates. Further, it was felt that differences between Washtenaw County and a comparison area, in this case the State of Michigan, might appear if ASAP were achieving its goals. Finally, since personal injury crashes are more likely to be alcohol involved, it was expected that this type of crash would be a more sensitive measure of effectiveness; ASAP effects that did not appear in total non-fatal crash trends might appear in personal injury crash trends. As the data presented above indicate, none of these hoped for results materialized. Due to these factors, it can only be concluded that, using non-fatal crashes as a measure, Washtenaw County ASAP produced no discernible changes in the number or rate of non-fatal crashes, and thus did not produce changes in the number or rate of occurrence of alcohol involved crashes.

4.2 ALCOHOL-RELATED NON-FATAL CRASHES

Data presented in this section reflect only Washtenaw County experience as statewide data are not available. The time period examined is 1968-72.* (Tabular presentation of these data appears in Appendix B2.)

As was the case with total non-fatal crash experience, the number of alcohol-involved non-fatal crashes increased gradually during the time period. Figure 4.4 shows these data. Here, however, the key measure is in the yearly trend in proportion of all

*Data reflecting crash experience for the first half of 1973 are also available, but are not being presented here. A preliminary examination of a limited set of the data indicated no new trends that would change the conclusions drawn from data through 1972.

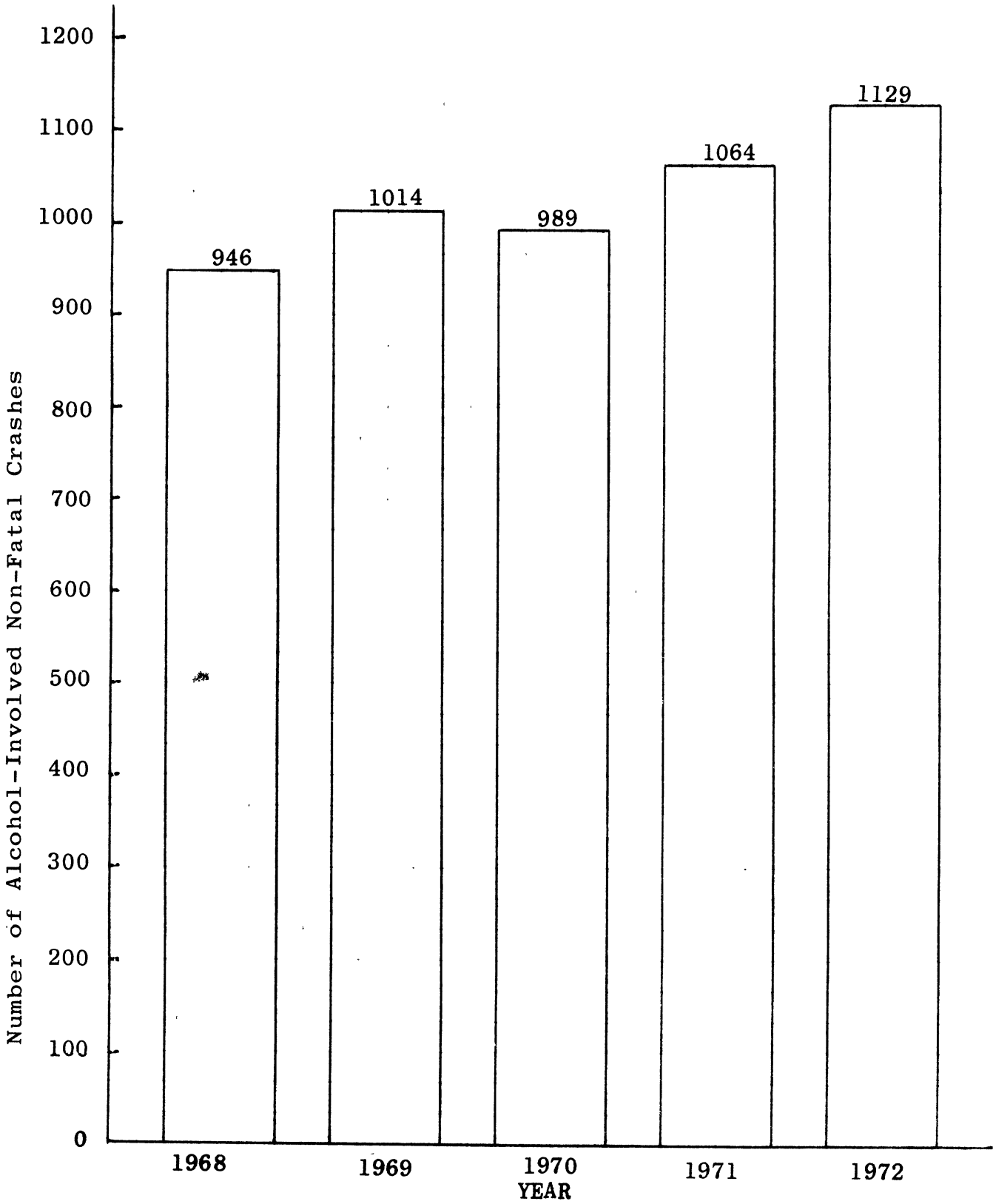


FIGURE 4.4. THE NUMBER OF ALCOHOL-INVOLVED NON-FATAL CRASHES IN WASHTENAW COUNTY BY YEAR

crashes which were alcohol-involved. If Washtenaw County ASAP had an effect on alcohol-involved crash experience, then a change in the proportion of crashes which were alcohol-involved should occur. Table 4.1 shows that the proportion of non-fatal crashes that were alcohol-involved was in fact fairly stable. For both the baseline and the program periods, 13.9% of all non-fatal crashes were alcohol-involved.

Figure 4.5 compares trends in the proportion of personal injury and property damage crashes which were alcohol-involved with the total non-fatal crash trend. Two things seem apparent from this graph. First, the slight increase in the proportion of personal injury crashes which were alcohol-involved was balanced by the slight decrease found among the property damage crashes producing no overall change in the proportion of non-fatal crashes which were alcohol-involved. Second, since personal injury crashes are more likely to be alcohol-involved, thus more sensitive to changes in drinking and driving behavior, the slight increase in personal injury crash alcohol-involvement in Washtenaw County indicates that ASAP activities produced no visible changes in alcohol involvement among non-fatal crashes.

TABLE 4.1. THE PROPORTION OF WASHTENAW COUNTY NON-FATAL CRASHES WHICH WERE ALCOHOL-INVOLVED BY YEAR FOR BASELINE AND PROGRAM PERIODS

<u>Baseline Period</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>Total</u>
Total Crashes	6586	7251	7324	21,161
# Alcohol-Involved	946	1014	989	2,949
% Alcohol-Involved	14.4%	14.0%	13.5%	13.9%
<u>Program Period</u>	<u>1971</u>	<u>1972</u>	<u>Total</u>	
Total Crashes	7819	7947	15,766	
# Alcohol-Involved	1064	1129	2,193	
% Alcohol-Involved	13.6%	14.2%	13.9%	

Figure 4.6 compares data on the alcohol-involvement in single and multiple vehicle non-fatal crashes with alcohol-involvement for all non-fatal crashes. A slight increase in

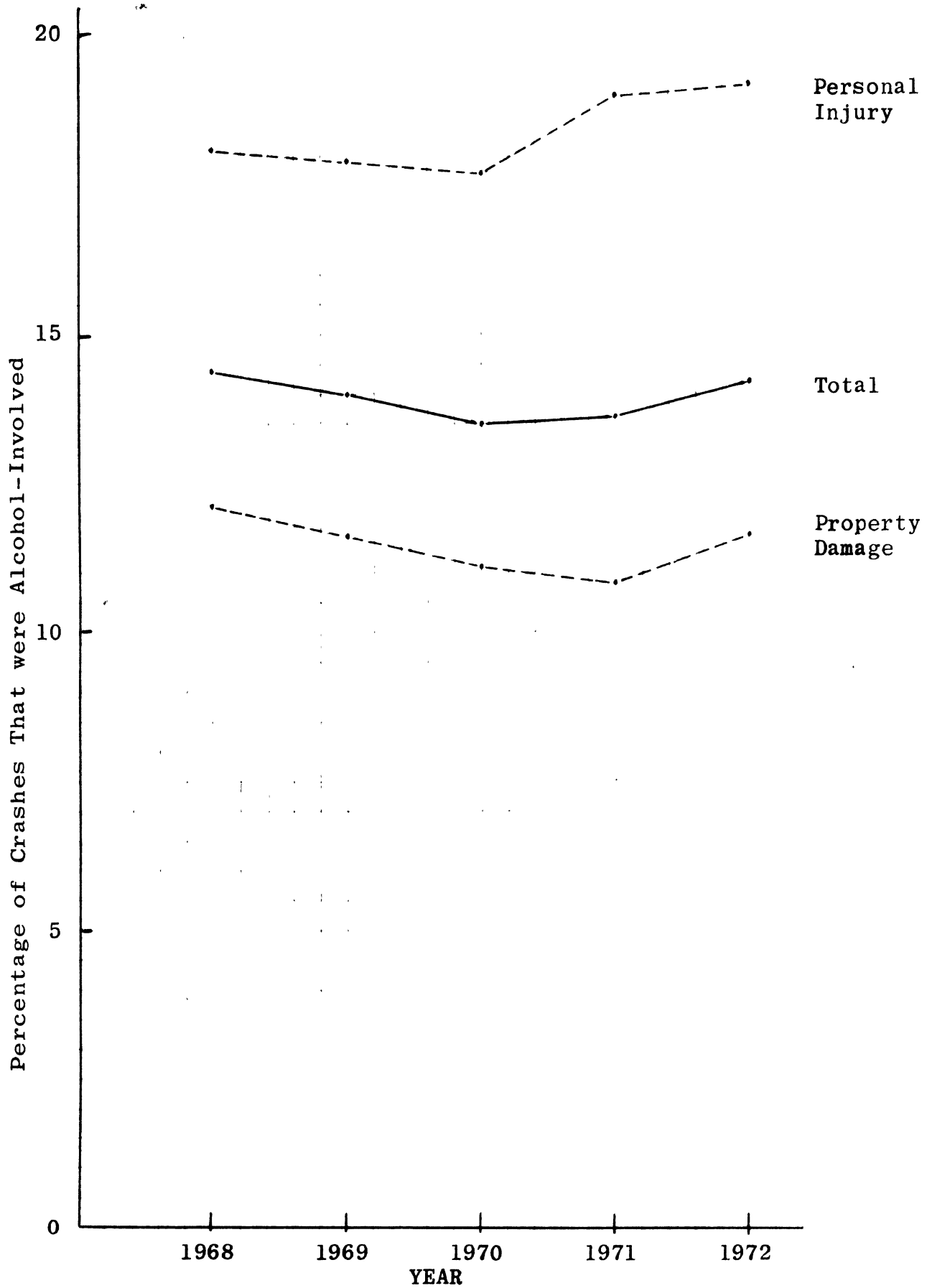


FIGURE 4.5. THE PROPORTION OF WASHTENAW COUNTY NON-FATAL CRASHES WHICH WERE ALCOHOL-INVOLVED BY SEVERITY AND YEAR

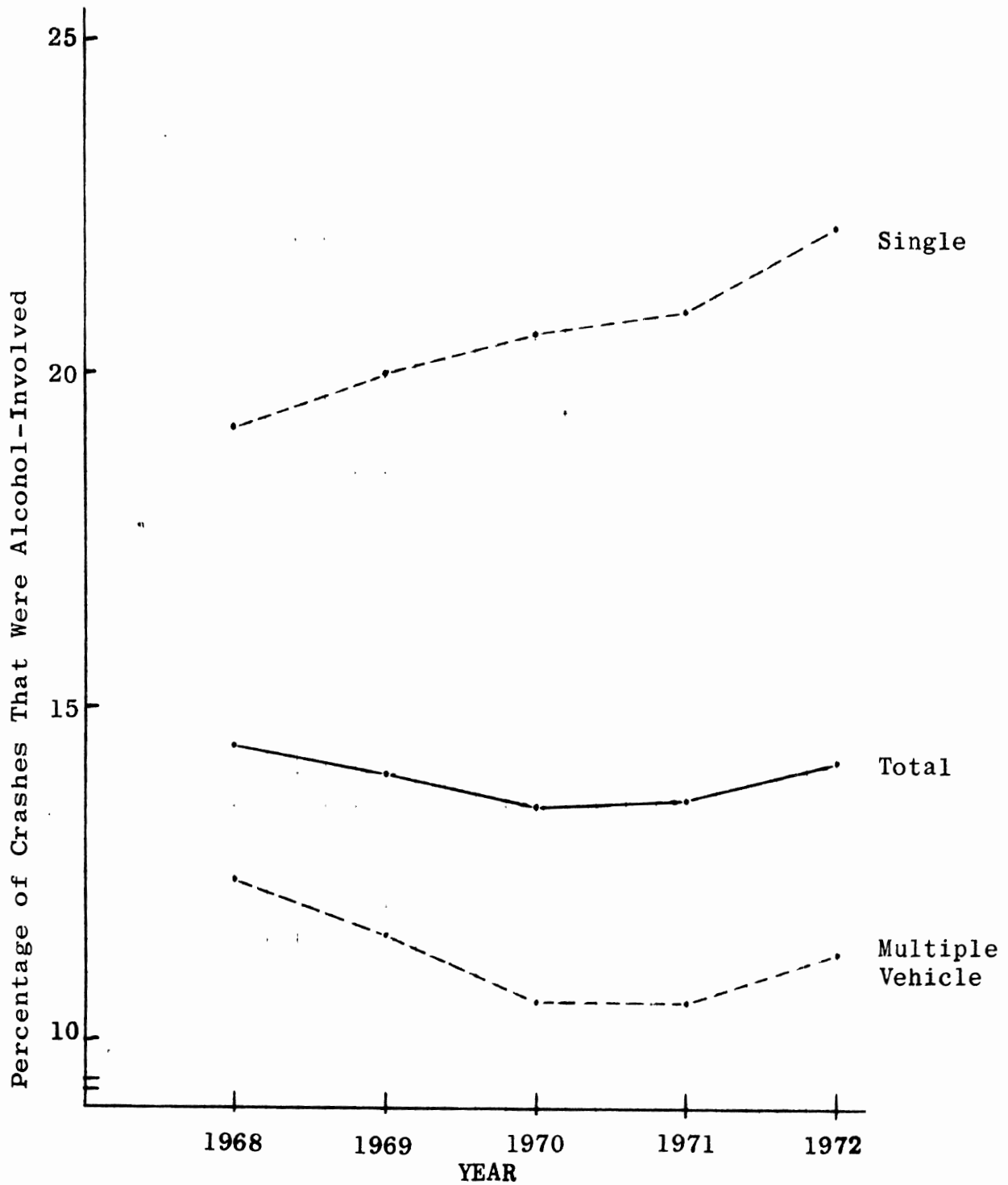


FIGURE 4.6. THE PROPORTION OF WASHTENAW COUNTY NON-FATAL CRASHES WHICH WERE ALCOHOL-INVOLVED BY NUMBER OF VEHICLES IN THE CRASH AND YEAR

alcohol-involvement among single vehicle crashes was balanced by a slight decrease among multiple vehicle crashes so that, overall, no apparent change occurred. Also, the slight increase in alcohol-involvement observed in single vehicle crashes, which are more likely to be alcohol-involved and thus more sensitive to changes in drinking and driving behavior, indicates no changes took place in alcohol-involvement that might be attributable to Washtenaw County ASAP.

In conclusion, the number of alcohol-involved crashes increased gradually from 1968 to 1972 and the proportion of non-fatal crashes which were alcohol-involved remained fairly stable. The proportion of both single vehicle and personal injury crashes which were alcohol-involved increased slightly over time. These data, along with the fact that no marked changes in trends occurred following the initiation of ASAP activities, indicate that these activities had no apparent effect on alcohol-involvement in Washtenaw County non-fatal crashes.

4.3 DRINKING DRIVERS IN NON-FATAL CRASHES

The 1968 to 1972 Washtenaw County experience regarding the proportion of non-fatal crash-involved drivers who had been drinking showed a decline. Figure 4.7 shows this overall experience along with drinking driver involvement in personal injury and property damage crashes. It is apparent that there was a slight increase in the proportion of drinking drivers in personal injury crashes, and a somewhat larger decrease in property damage crashes.

As before, however, it seems that the initiation of ASAP activities in Washtenaw County had no noticeable effect on this experience. The slight decline in proportion of crashing drivers who had been drinking in all non-fatal crashes did not become more pronounced during the program period and the increase in drinking driver involvement in personal injury crashes occurred mostly during the program period. (Data discussed here are included as Appendix B3.)

Since Michigan lowered the legal drinking age to 18 years effective January 1, 1972, an age split was used to compare 18-20 year old drivers to the remainder of the driving population. If

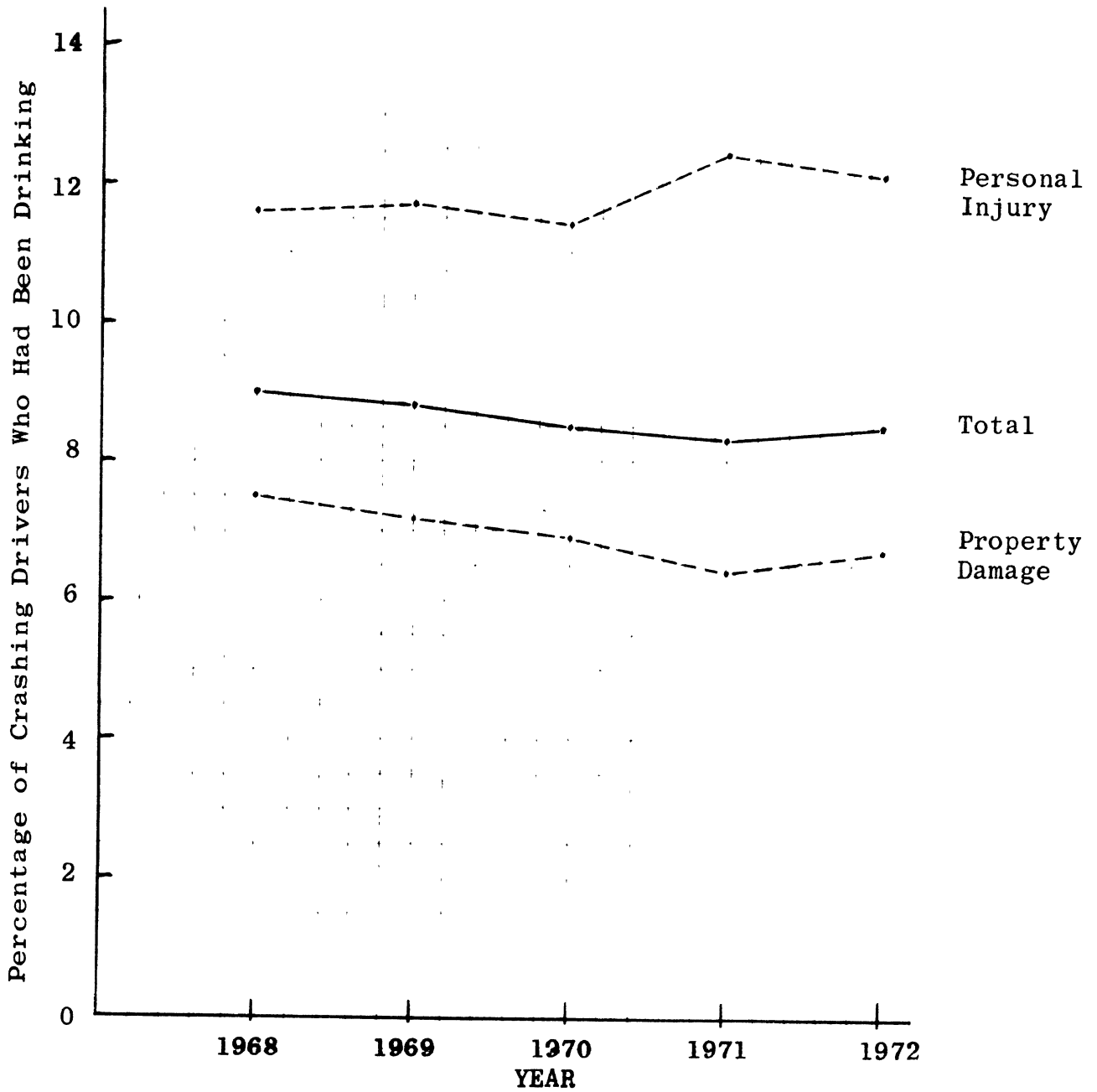


FIGURE 4.7. THE PROPORTION OF WASHTENAW COUNTY NON-FATAL CRASH-INVOLVED DRIVERS WHO HAD BEEN DRINKING BY SEVERITY AND YEAR

Washtenaw County ASAP activities had an effect on drinking and driving behavior, that effect might appear in the experience on non 18-20 year olds but might be masked overall due to a spurt in alcohol-involvement in crashes among 18-20 year old drivers. In fact, as Figure 4.8 clearly shows, there was a spurt in 18-20 year old alcohol-involvement in non-fatal crashes. Also, non 18-20 year old involvement continued to decrease into 1972. However, it is also apparent that there was no pronounced dip in the curve for non 18-20 year olds during the program years, especially 1972. Thus, it can be concluded that there was no discernible change in the proportion of drinking drivers involved in non-fatal crashes even when the apparent effects of the legal drinking age change are neutralized (see Appendix B4).

Some data are available which allow comparisons between the proportion of drivers in crashes who were drinking in Washtenaw County and in Michigan. Figure 4.9 shows this comparison for all non-fatal crashes, for personal injury crashes, and for property damage crashes. The data represent the proportion of crash involved drivers who had been drinking for the first six months of each year, 1971-73.

The experiences for the two areas were very similar for both types of non-fatal crashes examined. There were, however, differences between Washtenaw County and the State of Michigan which, though slight, indicate that Washtenaw County experience was more favorable than Michigan experience. For total non-fatal crashes, the proportion of crash-involved drivers who were drinking increased slightly for the State while it decreased slightly for Washtenaw County. For personal injury crashes, the percentage of involved drivers who were drinking remained approximately the same for Michigan, while Washtenaw County experienced a slight decrease.

It must be pointed out that the differences noted above are very slight. Also, it must be remembered that the available data reflect only three points in time and thus hardly establish a stable trend. But it is favorable from the standpoint of Washtenaw County ASAP goals to see that, during the program period, the

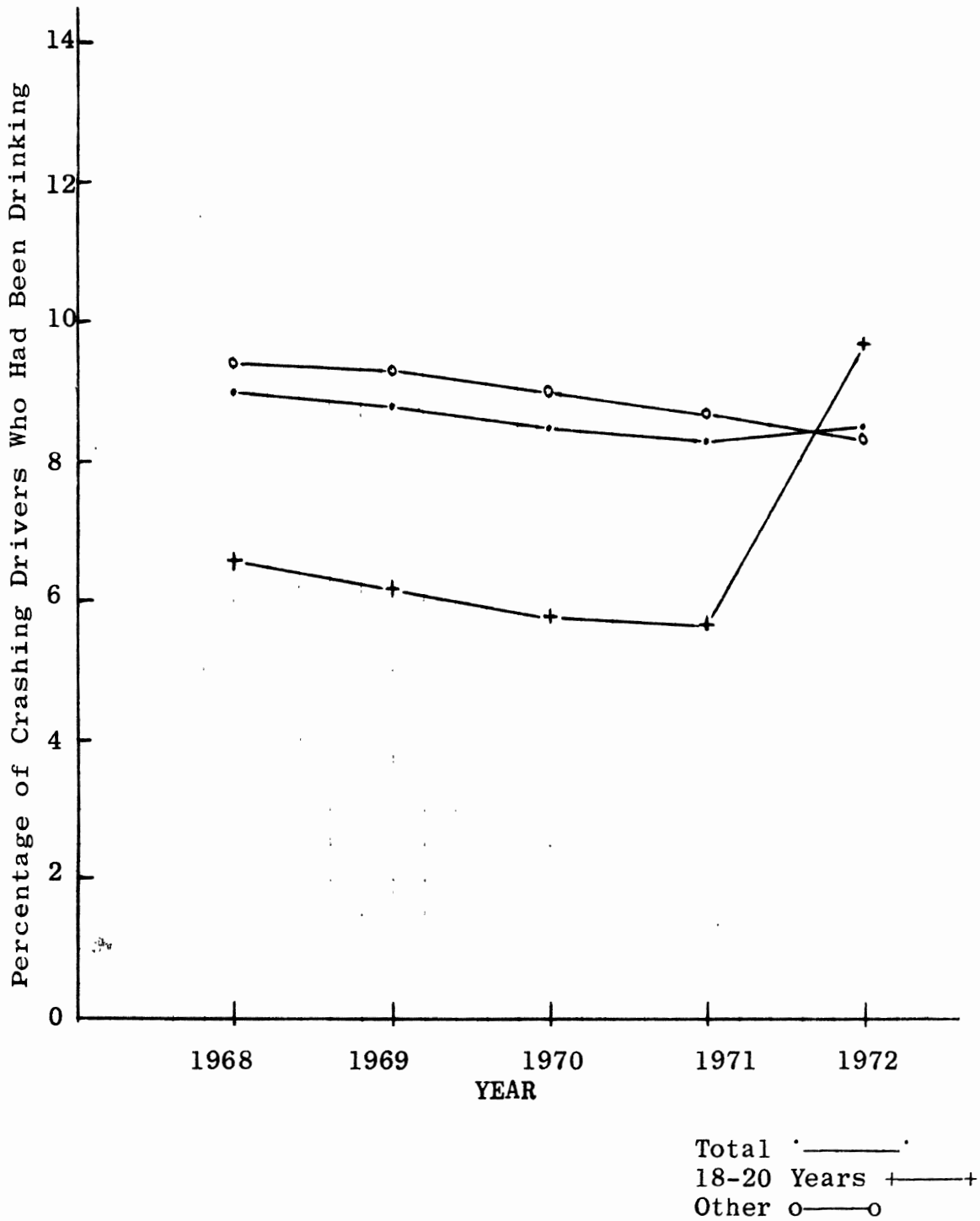


FIGURE 4.8. THE PROPORTION OF WASHTENAW COUNTY NON-FATAL CRASH-INVOLVED DRIVERS WHO HAD BEEN DRINKING BY AGE GROUP AND YEAR

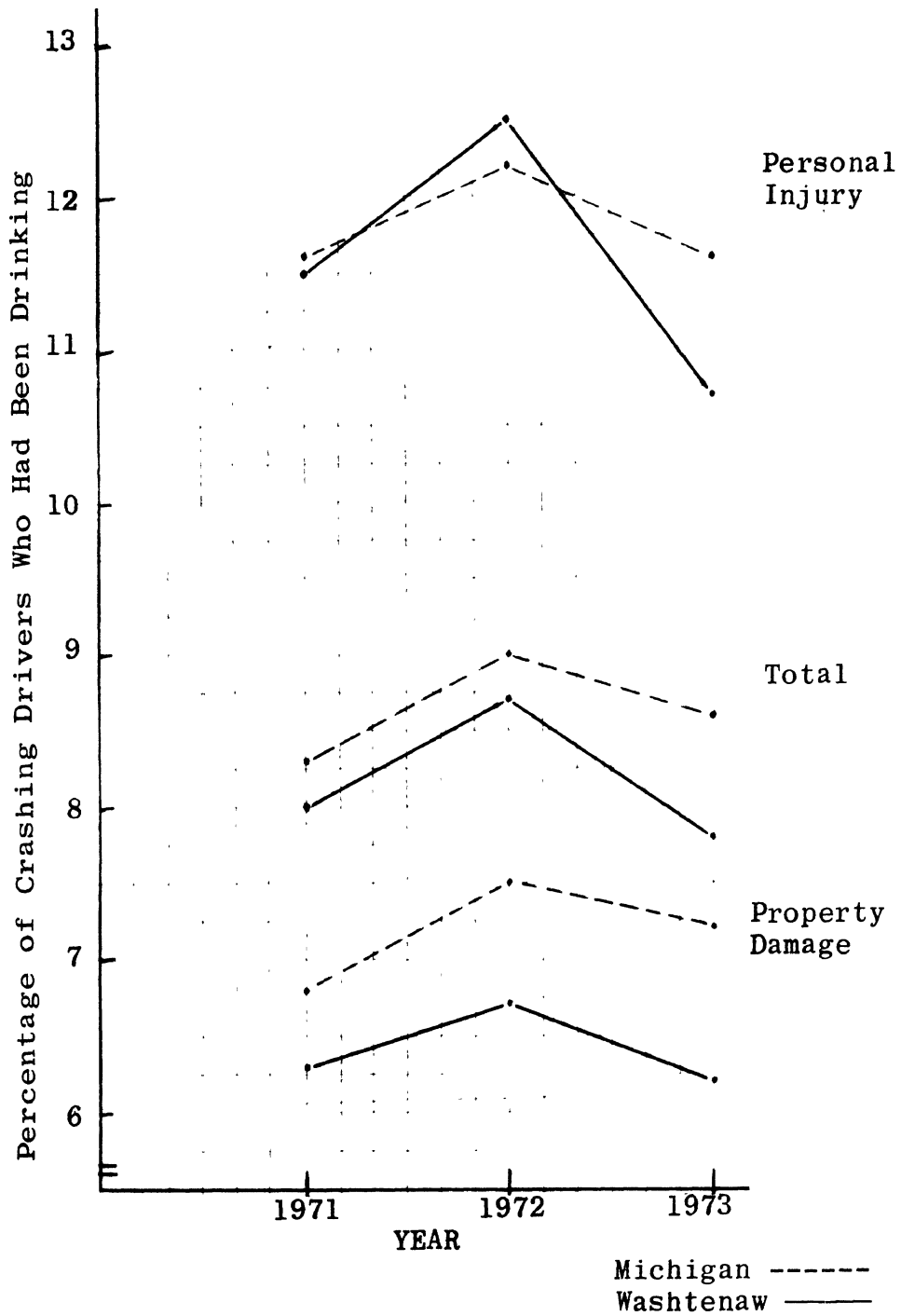


FIGURE 4.9. THE PROPORTION OF WASHTENAW COUNTY AND MICHIGAN NON-FATAL CRASH-INVOLVED DRIVERS WHO HAD BEEN DRINKING BY SEVERITY AND YEAR (FIRST SIX MONTHS ONLY)

county experienced some slight decrease in the proportion of crash involved drivers who had been drinking while the State experienced no change or a slight increase in this proportion. (Data discussed above are displayed in Appendix B5.)

When these data were split into age groups, for each age group and crash type examined, Washtenaw County decreases were greater than Michigan decreases, and Washtenaw County increases were less than Michigan increases. Figure 4.10 shows total non-fatal crash experience for 18-20 year old drivers' alcohol-involvement on the left and the other drivers' alcohol-involvement on the right. Notice that Michigan's increase among 18-20 year olds was steeper than Washtenaw's increase and that the decrease for other drivers was steeper in Washtenaw than in the State as a whole. Again, while these differences are slight, the trends in alcohol-involvement among crashing drivers in Washtenaw County were more favorable than were those in Michigan. (See Appendix B6 for age-specific data.)

In conclusion, the five year trend in the proportion of crash involved drivers who had been drinking indicates a slight decline in alcohol-involvement. Also, when Michigan and Washtenaw County were compared for program period years, it appears that the county did slightly, though consistently, better than the state. Thus, while no marked change in trend occurred in alcohol involvement among crashing drivers following the initiation of Washtenaw County ASAP activities, there is some favorable evidence that ASAP may have kept the proportion of crash-involved drivers who had been drinking in Washtenaw County at a more favorable level than those for the state.

4.4 TOWARD A SURROGATE MEASURE OF ALCOHOL-INVOLVEMENT

Definitive data on alcohol-involvement in non-fatal crashes are very scarce. A blood alcohol determination is not likely to be made unless an arrest for driving under the influence follows the crash. Since such an arrest occurs infrequently, the data regarding alcohol-involvement usually reflect the police officers' estimations of whether or not the involved drivers had been drinking. Often, there is a large proportion of cases where data on

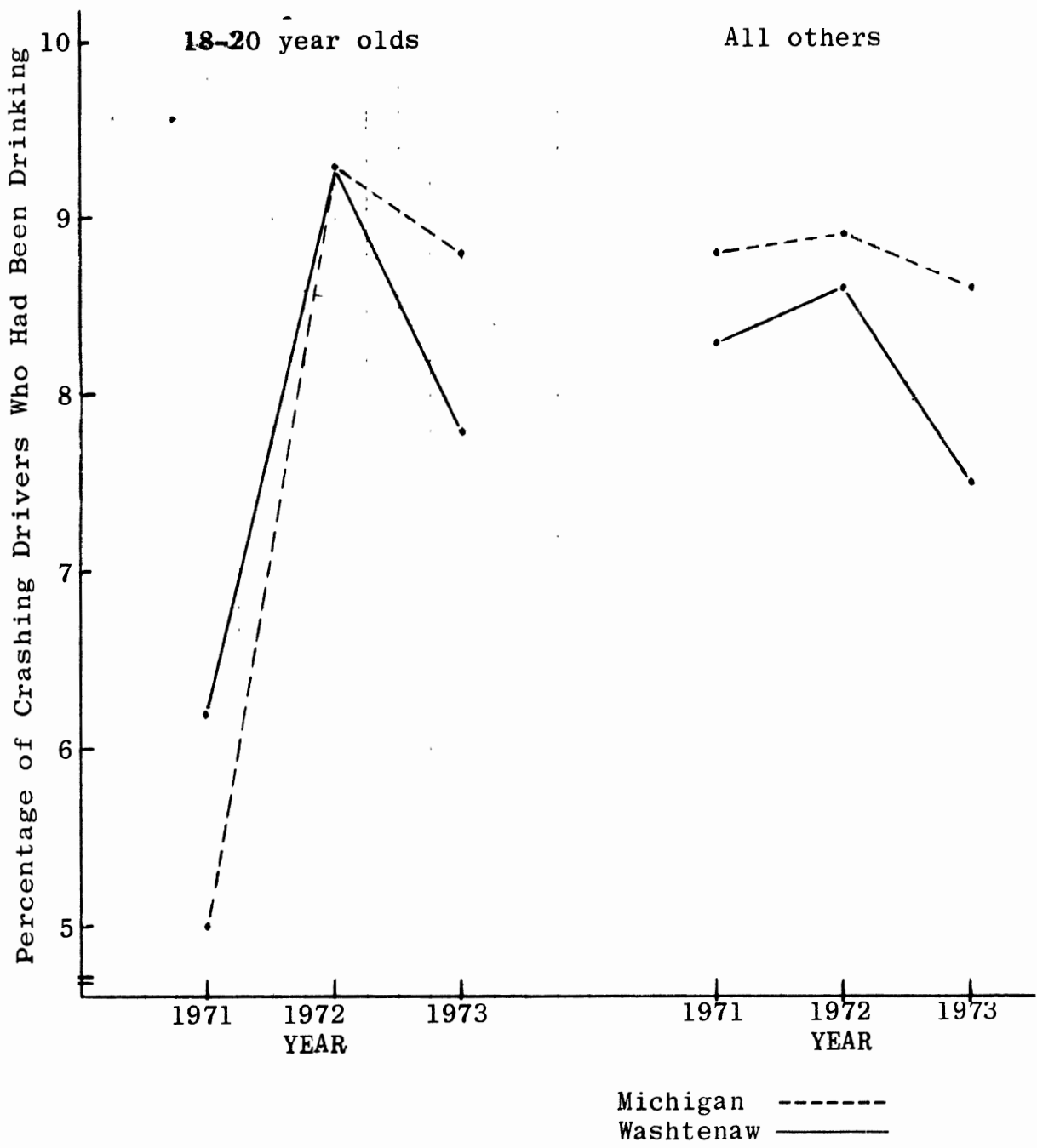


FIGURE 4.10. THE PROPORTION OF WASHTENAW COUNTY AND MICHIGAN NON-FATAL CRASH-INVOLVED DRIVERS WHO HAD BEEN DRINKING BY AGE GROUP AND YEAR (FIRST SIX MONTHS ONLY)

alcohol-involvement are missing. Also, the notation "had been drinking" is a subjective measure which is admittedly open to error or bias. The role of a surrogate, then, would be to measure alcohol-involvement in crashes on the basis of the trends observed in a non-judgmental variable. The surrogate would obviously have to correlate highly with trends in alcohol-involvement for areas where this information is known.

It would undoubtedly be best to develop a surrogate measure that correlates highly with known alcohol-involvement as determined by blood alcohol test data for all crashing drivers. Since these data are not available, it was decided to look for a high correlation between some surrogate measure and the number of crash involved drivers noted as "had been drinking". The data base used for this procedure includes information on all drivers involved in crashes in Washtenaw County for the years 1968 to 1972.

Several variables which have been historically related to alcohol-involvement were selected in an initial attempt to determine a satisfactory surrogate measure. Among these was sex of the driver involved. Three year roadside survey data for Washtenaw County indicate that 90.5% of drivers with measurable blood alcohol concentration (.02 and above) were males. Also, upon examination of the five year Washtenaw County crash data base, it was found that 87.7% of the crashing drivers noted as "had been drinking" were males.

A second variable was hour of day of the crash. Roadside surveys were operated from 7PM to 3AM based on the premise that more drinking and driving occurs during the evening and early morning hours. In fact, 21.3% of drivers stopped between 10PM and 3AM had been drinking (BAC of .02 or greater). Washtenaw County crash data indicate that 25.8% of the crashing drivers between 10PM and 3AM "had been drinking" while only 5.9% of all other crashing drivers were noted as drinking.

A third variable used was the number of vehicles involved in the crash. It has been consistently found that single vehicle crashes are much more likely to be alcohol-involved than are multiple vehicle crashes. In Washtenaw County, while 20.6% of single

vehicle crashes were alcohol-involved, only 11.2% of multiple vehicle crashes were alcohol involved.

By comparing these variables separately and in groups, it was found that the number of male drivers involved in single vehicle crashes between 10PM and 3AM correlates highly with the number of drinking drivers involved in crashes. The number of drivers in each category are displayed by quarter of the year, for all five years in Figure 4.11. It can readily be seen that the curves "fit" very well and that there appears to be a high positive correlation between the two sets of data. In fact, the Pearson product-moment correlation coefficient for the comparison was $+0.839$ for eighteen degrees of freedom which indicates significant correlation well beyond the $.01$ level of confidence. Further, a rank order correlation coefficient of $+0.577$ indicates a significant rank order correlation beyond the $.02$ level of confidence. Thus, it appears that, for Washtenaw County, trends in the number of males involved in single vehicle crashes between 10PM and 3AM are quite predictive of alcohol-involvement among crashing drivers. (Data reflecting both the surrogate measure and actual alcohol-involvement are displayed in Appendix B7.)

The results reported in previous sections of this report all tend to indicate that there were few changes in Washtenaw County alcohol-involved crash experience. Two events which may have had an effect on the reporting of alcohol-involvement occurred during the program period. First, the "had been drinking" variable on the official Michigan crash report form was altered from an item with five choices (under the influence, had been drinking but not under the influence, had been drinking but influence not known, had not been drinking, and not known if drinking) to an item with only two choices (had been drinking, had not been drinking). Reporting of alcohol-involvement might have changed due to the fact that the officer is forced to choose between had or had not been drinking rather than being allowed to record a "not known" response. Second, since the legal drinking age was lowered from 21 to 18 years of age in 1972, a change in the reporting of alcohol-involvement in crashes involving young drivers might have

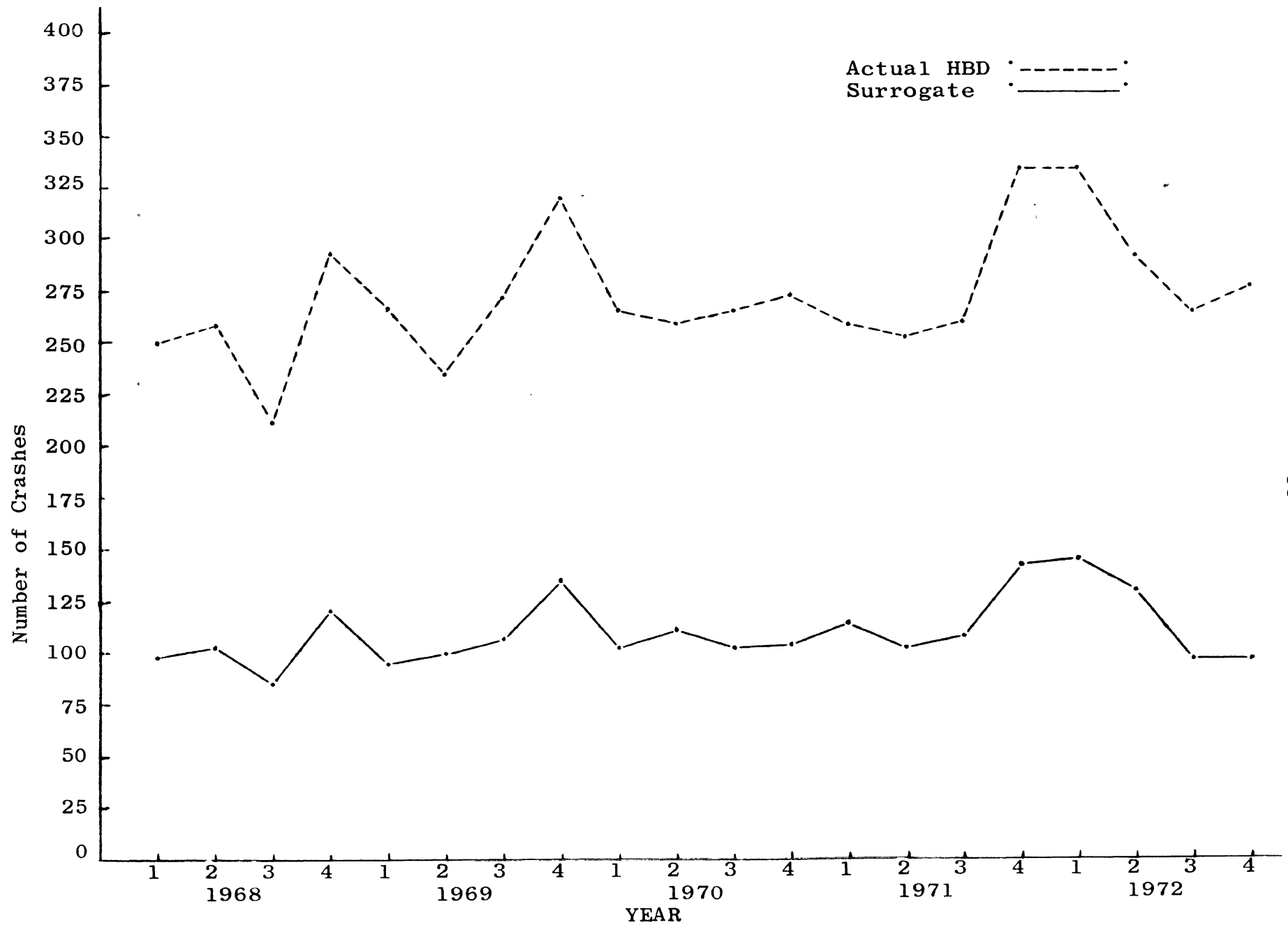


FIGURE 4.11. THE NUMBER OF DRINKING DRIVERS IN WASHTENAW COUNTY NON-FATAL CRASHES (ACTUAL HBD) AND THE NUMBER OF MALE DRIVERS INVOLVED IN LATE-NIGHT SINGLE VEHICLE CRASHES (SURROGATE) BY QUARTER OF YEAR

occurred because of changed police attitudes. Police officers might have been generally more aware of drinking among young drivers and thus more likely to record them as "had been drinking" while investigating crashes. If either of these reporting changes occurred, then there might have been biases involved which masked the actual trends in alcohol-involvement.

Based on the evidence cited above, it was decided to apply the surrogate measure to Washtenaw County crash experience to see if the results would support or contradict those previously cited. Initially, the correlations performed on the 1968-72 data were performed in the 1968-70 and 1971-72 data separately. The correlations held true for both time periods with Pearson product-moment coefficients of $+0.855$ for the 1968-70 data (significant beyond the $.01$ level of confidence) and $+0.809$ for the 1971-72 period (significant beyond the $.02$ level of confidence). If reporting bias developed during the 1971-72 period, one would expect the correlation to be weaker since there is not likely to be any bias on the surrogate variable components (sex of driver, time of crash, and number of vehicles in the crash). The correlation held at a high level during 1971-72, however, so that there do not appear to be any new significant biases added due to the change in the crash report form or the change in the legal drinking age.

Two applications of the surrogate measure further confirm the findings that little change in trends in alcohol-involvement in crashes took place. First, the ratios of cases meeting the surrogate criteria to the total number of non-fatal crashes were computed. Table 4.2 displays these data. It is apparent that there was very little change between baseline and program periods in this ratio and that the curve for the five year period is relatively flat. The results of the second set of computations, the number of surrogate cases per registered vehicle, are also shown in Table 4.2. Again, the results indicate little change in alcohol-involvement from baseline to program period and a relatively flat curve across the five years.

TABLE 4.2. THE NUMBER OF SURROGATE CRASHES PER NON-FATAL CRASH AND THE NUMBER OF SURROGATE CRASHES PER REGISTERED VEHICLE BY YEAR FOR BASELINE AND PROGRAM PERIODS

	1968	1969	1970	Baseline Total	1971	1972	Program Total
Number of Surrogate Crashes	418	437	422	1,277	467	470	937
Number of Non-Fatal Crashes	6,586	7,251	7,324	21,161	7,819	7,947	15,766
Surrogate/Non-Fatal Crashes	.063	.060	.058	.060	.060	.059	.059
Number of Registered Vehicles	113,081	120,877	125,719	359,677	132,294	144,203	276,497
Surrogate/Registered Vehicles	.0037	.0036	.0034	.0036	.0035	.0033	.0034

The two techniques using the surrogate measure of alcohol-involvement reinforce the findings reported earlier. When the effects of possible reporting bias were removed, the analyses still showed no noticeable changes in alcohol-involvement in crashes with the initiation of ASAP activities.

The surrogate measure described here may have general applicability in measuring trends in alcohol-involvement. There may be problems with assuming that the correlation found between the surrogate and alcohol-involvement among drivers in Washtenaw County crashes exists in other areas. In general, though, alcohol-involved crashes are most likely to occur late at night and to be single vehicle crashes. Further, the surrogate is non-judgmental in its measurement of alcohol-involvement and may be of particular use where large proportions of cases have missing data regarding alcohol-involvement or when reporting biases are suspected. Thus, the surrogate may be of use in gaining a non-judgmental measure of alcohol-involvement in other jurisdictions.

APPENDIX A

BAC DISTRIBUTIONS OF FATALITIES

TABLE 1. DISTRIBUTION OF DRIVER FATALITIES BY YEAR AND BAC

Year	Neg.	Blood Alcohol Concentration						Total	% Tested	
		.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	.25			
1968	8	0	1	5	1	1	1	17	38	45%
1969	6	0	0	1	2	1	1	11	37	30
1970	5	3	0	0	6	0	1	15	47	32
1971	7	2	3	3	5	3	2	25	49	51
1972	6	0	3	2	3	3	2	19	42	45
1973	5	2	0	4	2	2	0	15	28	54%

TABLE 2. DISTRIBUTION OF PASSENGER FATALITIES BY YEAR AND BAC

Year	Neg.	Blood Alcohol Concentration						Total	% Tested	
		.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	.25			
1968	1	0	1	0	0	0	0	2	16	13%
1969	2	0	0	2	0	0	0	4	14	29
1970	3	0	1	1	3	0	0	8	20	40
1971	1	1	0	0	0	0	0	2	13	15
1972	2	0	0	0	0	1	0	3	16	19
1973	4	0	0	0	0	0	0	4	16	25%

TABLE 3. DISTRIBUTION OF PEDESTRIAN FATALITIES BY YEAR AND BAC

Year	Neg.	Blood Alcohol Concentration						Total	% Tested	
		.01-.04	.05-.09	.10-.14	.15-.19	.20-.24	.25			
1968	4	1	0	0	0	0	0	5	10	50%
1969	1	0	0	0	0	1	0	2	6	33
1970	2	0	0	0	2	2	0	6	11	55
1971	0	0	0	0	0	0	2	2	5	40
1972	1	0	0	0	0	0	0	1	8	13
1973	1	0	1	0	0	0	0	2	2	100%

APPENDIX B
NON-FATAL CRASH DATA

TABLE 1. DISTRIBUTION OF WASHTENAW COUNTY AND MICHIGAN NON-FATAL CRASHES
BY CRASH SEVERITY AND YEAR

	1968	1969	1970	1971	1972
Total Washtenaw County					
Non-Fatal Crashes	6,586	7,251	7,324	7,819	7,947
Personal Injury	2,508	2,750	2,701	2,664	2,748
Property Damage	4,078	4,501	4,623	5,155	5,199
Total Michigan Non-Fatal Crashes	303,480	329,069	311,852	312,711	357,748
Personal Injury	100,237	109,041	101,878	100,447	113,673
Property Damage	203,243	220,028	209,974	212,264	244,075

TABLE 2. DISTRIBUTION OF WASHTENAW COUNTY NON-FATAL CRASHES BY CRASH SEVERITY, YEAR, AND ALCOHOL-INVOLVEMENT

	Baseline					Program Total
	1968	1969	1970	Total	1972	
Total Non-Fatal Crashes	6,586	7,251	7,234	21,161	7,819	7,947
# Alcohol-Involved	946	1,014	989	2,949	1,064	1,129
% Alcohol-Involved	14.4%	14.0%	13.5%	13.9%	13.6%	14.2%
Single Vehicle	1,924	2,051	2,133	6,108	2,279	2,115
# Alcohol-Involved	369	411	440	1,220	477	470
% Alcohol-Involved	19.2%	20.0%	20.6%	20.0%	20.9%	22.2%
Multiple Vehicle	4,662	5,200	5,191	15,053	5,540	5,832
# Alcohol-Involved	577	603	549	1,729	587	659
% Alcohol-Involved	12.4%	11.6%	10.6%	11.5%	10.6%	11.3%
Personal Injury Crashes	2,508	2,750	2,701	7,959	2,664	2,748
# Alcohol-Involved	454	491	477	1,422	506	528
% Alcohol-Involved	18.1%	17.9%	17.7%	17.9%	19.0%	19.2%
Property Damage Crashes	4,078	4,501	4,623	13,202	5,155	5,199
# Alcohol-Involved	492	523	512	1,527	558	601
% Alcohol-Involved	12.1%	11.6%	11.1%	11.6%	10.8%	11.6%

TABLE 3. DISTRIBUTION OF DRIVERS INVOLVED IN WASHTENAW COUNTY NON-FATAL
 CRASHES BY CRASH SEVERITY, YEAR, AND ALCOHOL-INVOLVEMENT

	1968	1969	1970	1971	1972
Total Non-Fatal Crashes					
# Drivers	11,248	12,451	12,515	13,359	13,779
# Drivers Drinking	1,014	1,096	1,064	1,108	1,171
% Drivers Drinking	9.0%	8.8%	8.5%	8.3%	8.5%
Personal Injury Crashes					
# Drivers	4,164	4,564	4,488	4,267	4,536
# Drivers Drinking	482	534	512	529	550
% Drivers Drinking	11.6%	11.7%	11.4%	12.4%	12.1%
Property Damage Crashes					
# Drivers	7,084	7,887	8,027	9,092	9,243
# Drivers Drinking	532	562	552	579	621
% Drivers Drinking	7.5%	7.2%	6.9%	6.4%	6.7%

TABLE 4. DISTRIBUTION OF DRIVERS INVOLVED IN WASHTENAW COUNTY NON-FATAL
 CRASHES BY AGE GROUP, YEAR, AND ALCOHOL-INVOLVEMENT

	1968	1969	1970	1971	1972
18-20 Year Olds					
# Drivers	1,702	1,863	1,803	1,899	2,171
# Drinking Drivers	112	116	105	108	211
% Drinking Drivers	6.6%	6.2%	5.8%	5.7%	9.7%
All Other Drivers					
# Drivers	9,546	10,588	10,712	11,460	11,608
# Drinking Drivers	902	980	959	1,000	960
% Drinking Drivers	9.4%	9.3%	9.0%	8.7%	8.3%

TABLE 5. DISTRIBUTION OF DRIVERS INVOLVED IN WASHTENAW COUNTY AND MICHIGAN NON-FATAL CRASHES BY CRASH SEVERITY, YEAR, AND ALCOHOL-INVOLVEMENT*

	Washtenaw County		Michigan	
	1971	1972	1971	1972
Total Non-Fatal Crashes				
# Drivers	6,471	7,593	263,302	279,142
# Drinking Drivers	515	661	21,886	25,086
% Drivers Drinking	8.0%	8.7%	8.3%	9.0%
Personal Injury Crashes				
# Drivers	2,090	2,673	81,684	88,490
# Drinking Drivers	240	333	9,502	10,806
% Drivers Drinking	11.5%	12.5%	11.6%	12.2%
Property Damage Crashes				
# Drivers	4,381	4,920	181,618	190,652
# Drinking Drivers	275	328	12,384	14,280
% Drivers Drinking	6.3%	6.7%	6.8%	7.5%

*These data reflect the crash experience for the first six months of each year only.

TABLE 6. DISTRIBUTION OF DRIVERS INVOLVED IN WASHTENAW COUNTY AND MICHIGAN NON-FATAL CRASHES BY AGE GROUP, YEAR, AND ALCOHOL-INVOLVEMENT*

	Washtenaw County			Michigan		1973
	1971	1972	1973	1971	1972	
18-20 Year Olds						
# Drivers	909	1,157	1,112	35,123	40,021	41,801
# Drivers Drinking	56	108	87	1,739	3,738	3,690
% Drivers Drinking	6.2%	9.3%	7.8%	5.0%	9.3%	8.8%
All Other Drivers						
# Drivers	5,562	6,436	6,428	228,179	239,121	244,956
# Drinking Drivers	459	553	484	20,147	21,348	21,056
% Drivers Drinking	8.3%	8.6%	7.5%	8.8%	8.9%	8.6%

*These data reflect the crash experience for the first six months of each year only.

TABLE 7. DISTRIBUTION OF MALE DRIVERS INVOLVED IN LATE-NIGHT, SINGLE VEHICLE, NON-FATAL CRASHES (S), AND DRINKING DRIVERS INVOLVED IN NON-FATAL CRASHES (A), BY YEAR AND QUARTER

	1968		1969		1970		1971		1972	
	S	A	S	A	S	A	S	A	S	A
Jan-Mar	97	250	95	268	103	265	114	259	146	336
Apr-Jun	115	258	100	235	112	260	103	253	130	292
Jul-Sep	85	212	107	273	103	265	108	260	97	265
Oct-Dec	121	294	135	320	104	274	142	336	97	278