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IOWA DEPARTMENT
OF PUBLIC SAFETY

MOTORCYCLE ACCIDENTS

A M O T O R C Y C L E
A C C I D E N T S T U D Y

IOWA DEPARTMENT OF PUBLIC SAFETY
MICHAEL M. SELLERS, COMMISSIONER

Prepared By:
Aurora P. Berenguel,
Statistical Research Analyst
Department of Public Safety

FOREWARD

The data analysis and report writing for this study has been and will be the responsibility of Aurora P. Berenguel, Statistical Research Analyst of the Iowa Department of Public Safety.

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Mike O'Donnell
Highway Safety Administrator

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SUMMARY

1. Data used in this study were collected from accident reports involving motorcycles in the State of Iowa for the years 1967 to 1970. A special search of the Fatal Accidents Investigated Reports shed substantial information regarding the causes of death and types of injuries incurred in fatal and non-fatal accidents as well as demographic characteristics and facts to describe the surroundings of the accident scene.
2. In 1970, Iowa motorcycle registrations increased 450% (11,068 in 1960 to 60,835 in 1970) followed a geometric progression rate of 20.2% per year. During the same period, the number of registrations of other motor vehicles increased by 39 percent.
3. Similarly, motorcycle accidents increased from 269 in 1960 to 1512 in 1970 representing an increase of 462% for the period under review. Fatal accidents showed an increase of 514% for the same period.
4. Comparison between motorcycle risk and all vehicles risk showed that motorcycle accidents accounted for a high proportion of deaths and injuries compared to the total accident picture and registrations. Chances of injury or death in a motorcycle was more than twice that of all other vehicles.
5. Collision of a motorcycle with other motor vehicle accounted for almost 70% of fatal accidents while 17% of the remaining 30% were of the "ran off road" type of accident.
6. "Causes of Death" in a fatal motorcycle accident.

It was revealed that 3 out of 4 fatalities (motorcycle drivers and passengers) died of head injuries (fractures, massive brain damage, con-

tussions and "head injury"). A search of the non-fatal accidents however, revealed that "head injuries" was the last on the list of classified injuries (5.3%) while "leg injuries" and "other parts of the body injuries" accounted for 73.5%. A similar search of the injured persons in the fatal accidents showed a lower percentage for "head injuries".

7. Age and Sex.

Motorcycling is predominantly a young male person's activity. In 1967 to 1970, 2 out of 3 involved in a fatal motorcycle accident were 15 to 24 years old compared to 2 out of 5 in all motor vehicles.

8. A search made of the occupations of the motorcyclists who died were composed of mostly students (34.6%) and laborers (26.8%).

9. The study indicated that 70% of the drivers owned their motorcycles while 30% had borrowed or rented their motorcycles.

10. Season for motorcycling in the State of Iowa was established to be during the months of April to September. This six-month period accounted for 88% of the total number of fatalities during the "year". Peak months are July and August representing an increase of 165% compared to the average during the year.

11. High point for fatal motorcycle accidents was Saturday and Sunday. Accidents remained quite stable and lower during week days.

12. The most dangerous time to be riding a motorcycle is from noon to midnight. This time period accounted for 75% of fatal accidents.

13. Motorcycle drivers, when involved in a fatal accident with another type of vehicle, were considered by investigating officers not to be at fault at about 1/3 of total violations. This may be partly due to

a visibility problem, the drivers of other vehicles do not see the motorcycle.

14. For single motorcycle accident violations, it was indicated that 8 out of 10 were not under control and speeding, and 1 out of 10 were drinking.

15. Speed before accident showed that about 1/3 of motorcycles involved in fatal accidents were traveling at a speed of more than 40 miles per hour. However, 47% did not state "speed before accident".

16. Most of the accidents occurred during clear weather, on dry level roads under no unusual conditions. The number of fatal accidents were evenly distributed during daylight and darkness.

17. Fourteen counties which had 3 or more fatalities in 1967-1970, accounted 60% of total fatalities were Linn (10), Polk (9), Dubuque (7), Black Hawk (7), Cerro Gordo (6), Scott (4), Wapello (3), Lee (3), Woodbury (3), Winneshiek (3), Jackson (3), Webster (3), and Johnson (3). There were 46 counties which did not have a single fatality during the period under review.

18. All counties in the state had injury motorcycle accidents for the period 1967-1970. Counties which had 50 or more injury accidents, according to rank, were Polk (509), Linn (333), Black Hawk (278), Pottawattamie (273), Scott (206), Woodbury (172), Johnson (163), Dubuque (126), Des Moines (115), Story (89), Muscatine (78), Cerro Gordo (76), Lee (71), Webster (64), Wapello (65) and Clinton (58).

19. No information is available whether the drivers wore helmets or not, hence no inferences could be made on this matter. However, data gathered

from a California study on motorcycle accidents, showed highly significant results in reducing the incidence of head injuries in motorcycle accidents.

A STUDY ON MOTORCYCLE ACCIDENTS IN THE STATE OF IOWA

1.0 Introduction:

Motorcycle use is increasing at a great speed, the motorcycle phenomenon does not appear to be a fad but rather an increasingly popular means of personal transportation. People, especially the young, are more likely to drive motorcycles which are hazardous in terms of likelihood of injury or death in a collision or non-collision accident. It seems to show that the loss of life and injury incurred due to accidents involving motorcycles, is relatively small when compared with the overall state accident picture. Nevertheless, the proportions are high when these are related to the number of registrations and total accidents.

1.1. This study attempts to show a picture of the state of motorcycle accidents in Iowa. A special search of the Fatal Accident Reports (investigated and confidential) was made which more or less shed information on the causes of death in fatal accidents and types of injuries incurred in non-fatal accidents. A detailed description of the surroundings around the accident scene is presented. Included in this report are the types of violations committed by the motorcycle driver and the other motor vehicle driver by type of accident. This study on motorcycles includes not only the driver but also the passenger as well.

2.0 Trends in Motorcycle Registrations, Accidents and Fatalities:

Motorcycle registrations in the State of Iowa in a span of 11 years increased tremendously from a mere 11,068 in 1960 to 60,835 in 1970, which is about $5\frac{1}{2}$ times that of 1960. Chart 1 of the Appendix show that the growth of motorcycle registrations followed a geometric progression at an annual increase of 20.2%. Estimates show that by 1973, there will be more than 100,000 motorcycles in use in the State of Iowa.

Similarly, motorcycle accidents grew from 269 in 1960 to 1512 in 1970 representing an increase of 462% in a span of 11 years. Every year it is estimated that there is an average increase of 134 accidents that by 1973, there will be more than 1,800 motorcycle accidents, if this trend continues.

In like manner, there was a sharp increase in the number of deaths from a low 7 in 1960 to 43 in 1970, an increase of 514%. From chart 3, it is readily evident that the number of motorcycle registrations and the number of fatalities are rising at about the same rate.

3.0 Comparison between motorcycle risk and all motor vehicle risk:

Motorcycle accidents may seem to be a small proportion of the total accident picture in the State of Iowa (in 1970, there were 43 fatalities and 1476 injury accidents compared to 912 fatalities and 33,111 injury accidents for all motor vehicles). However, motorcycle accidents accounted for a higher proportion of deaths and injuries compared to the total accident picture and registrations.

The following table provides further details:

COMPARISON BETWEEN MOTORCYCLE RISK AND ALL MOTOR VEHICLES RISK

Year	Deaths/10,000 Registrations		Deaths/1,000 Accidents		Injuries/1,000 Accidents	
	All M.V.	Motor cycles	All M.V.	Motor cycles	All M.V.	Motor cycles
1967	4.35	6.90	11.36	22.01	458	831
1968	4.45	7.86	11.04	27.64	430	796
1969	3.87	5.79	8.91	24.03	381	778
1970	4.39	7.06	10.38	29.3	378	765

The above table obviously indicated that motorcycle risk is consistently higher than all motor vehicle risk by about more than twice when related to accidents and about twice when related to registrations. Similarly, the injury rate in a motorcycle accident per 1,000 accidents is twice that of the injury rate in all

motor vehicle accidents. A graphical comparison between motorcycle risk and all motor vehicle risk is presented in Chart 4.

4.0 Analysis of Fatal Motorcycle Accidents:

A search made of the investigated and confidential reports in 1967 - 1970 afforded us to compile and analyze fatal motorcycle accidents.

4.1 Types of Fatal Motorcycle Accidents:

Collision of a motorcycle with other motor vehicle accounted for almost 70% of fatal accidents in 1967 to 1970 while 17% of the remaining 30% were of the "Ran off Road" type.

The following table shows the distribution of types of fatal motorcycle accidents in 1967 to 1970:

DISTRIBUTION OF FATAL MOTORCYCLE ACCIDENTS: 1967 - 1970

<u>Type of Fatal Accident</u>	<u>Percent Distribution</u>
1. Collision with other motor vehicle*	69.5%
2. Ran off Road	17.0
3. Overturned	5.9
4. Collision with a fixed object	3.4
5. Collision with a pedestrian	2.5
6. Other non-collision	1.7
	<u>100.0%</u>

* Includes collision with train (1 case)

4.2 Causes of death in a fatal motorcycle accident:

A special search of the causes of fatal motorcycle accidents for four years, 1967 to 1970 reveal that 90 out of 121 or 74.4% of motorcycle drivers and passengers died of head injuries of all sorts (fractures, massive brain damage, contusions and "head injury").

4.3 Injuries incurred in a non-fatal accident:

A search was made to find out types of injuries incurred in non-fatal acci-

dents. A 10% systematic sample of motorcycle injury accidents in 1970 was made to facilitate collection of data. The results of the sample showed that only 5.8% of the total injured suffered from head injuries, 31.4% were leg injuries, 42.1% were injuries involving other parts of the body while 20.7% were minor cuts, bruises and others.

Chart 5 reflects comparison between the causes of death in a fatal accident and the types of injuries incurred in non-fatal accidents in 1970. It is interesting to note that although head injuries was the smallest percentage in non-fatal accidents (5.3%), they are the leading immediate or contributory cause of death in fatal motorcycle accidents (75%). On the other hand, leg injuries and other parts of the body particularly the extremities accounted for 73.5% of total injuries in non-fatal injuries.

Similarly, a search of the injured persons in the fatal accidents showed a lower percentage for head and body injuries (15%), other parts of the body (50%), minor bruises, cuts and lacerations (25%) and not stated (18%).

4.4 Age and Sex:

Involvement in a fatal motorcycle accident is a young, male person's activity. In 1967 to 1970, 92.5% of the drivers involved were under age 34 with those 15 to 24 years old accounting for 66.7%. Almost all passengers (92.3%) involved in the fatal accidents were 15 to 24 years old.

A comparison between age groups of all motorcycle accidents and all motor vehicle accidents is presented in Chart 6. Chart indicated a sharp decline for motorcyclists compared to all motor vehicle drivers in the age group 35 and more. It is also apparent that the most common age for all motorcyclists is the age group 20 - 24 years.

4.5 Season for Motorcycling:

Four years monthly data was used and this was lumped into a single "year" to detect the season for motorcycling. A brief examination of Chart 7 shows that there is a sharp increase in the number of accidents during the month of April and

a corresponding sharp decrease is evident during the month of September. Further analysis show that 110 of the fatal accidents or 88% occurred during the six months period. Peak months for motorcycling are July and August, representing an increase of 165% compared to the average for the "year".

4.6 Distribution of Fatal Motorcycle Accidents by Day of Week:

Chart 8 shows the distribution of fatal accidents during the days of the week. The highest point for motorcycle accidents was Saturday and Sunday. All accidents for the state remained quite stable and lower from Monday to Friday.

4.7 Distribution of Fatal Motorcycle Accidents by Time of Day:

The following table shows the distribution of the accidents by time of day:

FATAL MOTORCYCLE

<u>Distribution of Accidents Time Period</u>	<u>Accidents by time of Day Percent Distribution</u>
Midnight - 3:00 A.M.	6.2%
3:00 A.M. - 7:00 A.M.	4.4
7:00 A.M. - 9:00 A.M.	6.2
9:00 A.M. - Noon	8.0
Noon - 4:00 P.M.	15.9
4:00 P.M. - 6:00 P.M.	18.6
6:00 P.M. - 9:00 P.M.	23.9
9:00 P.M. - Midnight	16.8
Total:	<u>100.00%</u>

The preceding table suggests that the most dangerous time to be riding a motorcycle is from noon to midnight. This time period accounted for 75% of fatal accidents.

4.8 Contributory circumstances leading to the accidents.

4.8.1 Driver Violations:

An analysis of driver violations on the part of the motorcycle driver and other motor vehicle drivers was made and is presented by accident type.

Type 1. Collision of a motorcycle with other motor vehicles.

This type of motorcycle accident make up almost 70% of all types that it may be worth while to look into the violations of either driver. The following tabulation shows the % distribution of motorcycle and other motor vehicle violations:

Table A

Motorcycle Driver			OTHER Motor Vehicle Driver Violations												Total Number
Violations	No.	%	Failed to yield right-way		Made improper turn		Drove left of center		Had been drinking		No Violations		Others		
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1. No Violation	29	30.2	9	22.0	6	14.6	6	14.6	4	9.8	5	12.2	11	26.8	41
2. Speed too fast	17	17.7	3	17.6	1	5.6	-	-	2	11.2	9	52.9	2	11.2	17
3. Made improper turn	8	8.3	-	-	-	-	-	-	-	-	7	87.5	1	12.5	8
4. Failed to yield	8	8.3	-	-	-	-	-	-	-	-	8	100	-	-	8
5. Not under control	8	8.3	-	-	-	-	-	-	-	-	8	100	-	-	8
5. Drove left of center	6	6.3	-	-	-	-	-	-	-	-	6	100	-	-	6
7. Ran stop sign	3	3.2	-	-	-	-	-	-	-	-	3	100	-	-	3
8. Others	17	17.7	-	-	-	-	-	-	-	-	12	70.6	5	29.4	17
Total	96	100.0	12	11.1	7	6.5	6	5.6	6	5.6	58	53.7	19	17.6	108*

*Number of violations exceeds more than number of drivers because a driver may have more than 1 violation.

The above table shows that 30.2% of violations of motorcycle drivers are not his fault. A glance at the corresponding violations of the other motor vehicle drivers show that 60% of his violations are:

Failed to yield right of way	22.0%
Made improper turn	14.6%
Drove left of center	14.6%
Had been drinking	9.8%

In general, the other motor vehicle driver is at fault in approximately 50% of the cases compared to 70% on the part of the motorcycle driver.

Analysis of the motorcycle speed before the accident showed that in 36.7%

of all cases, the speed was 40mph and more.

Type 2. Non-collision with a motor vehicle (Ran off road, overturned, collision with a fixed object, collision with a pedestrian and others).

Under this type, it was highly indicated that 95.6% of violations of motorcycle drivers were due to:

Not under control	57.8%
Speed too fast	26.7%
Drinking	11.1%

It was also revealed that average speed of motorcycle before accident occurred was 40 - 49 miles per hour.

4.8.2 Facts surrounding the accident scene:

Facts that were looked into describing the surrounding scene of the fatal accidents were:

Weather:

- 72.0% occurred during clear weather
- 20.3% occurred during cloudy weather

Surface Condition:

- 90.7% occurred on dry roads
- 4.2% occurred on wet roads

Gradient:

- 66.1% level
- 12.7% upgrade
- 11.9% downgrade

Road Conditions:

- 93.0% occurred on no unusual conditions
- 7.0% occurred on loose material on surface, holes, deep ruts, bumps and others.

Vision Obscured:

- 91.5% vision not obscured

3.4% hillcrest

1.7% blinded by sunlight

Traffic Control:

67.8% had no traffic control

11.9% stop sign

9.3% warning sign

Surface Type:

41.8% open country

28.8% residential

13.6% business

3.4 industrial mfg. district

Light:

48.3% daylight

28.0% darkness (streets not lighted)

18.6% darkness (streets lighted)

The aforementioned facts describing the surroundings of the accident scene strongly suggests that most of the accidents happened during clear weather, on dry level roads, under no unusual road conditions with concrete surface type and where there were no traffic control. Similarly, most of the accidents occurred in open country or residential areas. The number of fatal accidents was evenly distributed during daylight and darkness.

4.9 Fatalities by county:

In an effort to become more familiar with the geographic location of these fatal motorcycle cases, a distribution of fatalities by county was prepared for the years 1967 to 1970 as reflected in Chart 13. The chart shows the frequency of occurrence (number of fatalities) by county for the period under review. To a person familiar with Iowa geography, it is readily apparent that the distribution follows closely the pattern of the major population centers of the state. There, the heaviest shadings on the map occurs in counties with the largest populations.

Out of 99 counties, 46 counties didn't have a single fatality during the four year period.

Counties which had 3 or more fatalities and accounted for almost 60% of total in order of magnitude are:

<u>Rank:</u>	<u>County:</u>	<u>No. of Fatalities:</u>
1	Linn	10
2	Polk	9
3	Pottawatomie	9
4	Dubuque	7
5	Black Hawk	7
6	Cerro Gordo	6
7	Scott	4
8	Wapello	3
9	Lee	3
10	Woodbury	3
11	Winneshiek	3
12	Jackson	3
13	Webster	3
14	Johnson	3

4.91 Motorcycle death rates by county:

To get a realistic measure of death rates in the preceding listed counties, fatalities were related to registrations as shown in the following table according to rank.

Motorcycle Death Rates by County 1967 - 1970

<u>Rank:</u>	<u>County:</u>	<u>Total Registered Motorcycles:</u>	<u>Fatalities:</u>	<u>Death rate per 10,000 registrations:</u>
1	Winneshiek	1016	3	29.5
2	Jackson	1133	3	26.5
3	Cerro Gordo	2487	6	24.1
4	Dubuque	4752	7	14.7

5	Pottawattamie	7387	9	12.0
6	Linn	9460	10	10.6
7	Wapello	3160	3	9.5
8	Lee	3285	3	9.1
9	Webster	3987	3	7.5
10	Black Hawk	9796	3	7.2
11	Johnson	4949	3	6.1
12	Woodbury	5820	3	5.2
13	Scott	8249	4	4.9
14	Polk	19029	9	4.7

It's interesting to note that Polk County which is the most populous and with the most number of motorcycle registrations is the last in the list with a death rate of 4.7% per 10,000 registrations. Average death rate for the State of Iowa was 6.4% in 1967 to 1970, hence Polk County's rate is below state average.

5.0 Motorcycle Injury Accidents by County:

All 99 counties in the state had injury motorcycle accidents in the period under review. Counties which had more than 50 or more injury accidents and accounted for 69% of total according to rank were:

<u>Rank:</u>	<u>County:</u>	<u>No. of Injury Accidents:</u>
1	Polk	509
2	Linn	333
3	Black Hawk	278
4	Pottawattamie	273
5	Scott	206
6	Woodbury	172
7	Johnson	163

8	Dubuque	126
9	Des Moines	115
10	Story	89
11	Muscatine	78
12	Cerro Gordo	76
13	Lee	71
14	Webster	69
15	Wapello	61
16	Clinton	58

5.1 Motorcycle Injury Rate by County:

Injury accidents were related to registrations to get the injury rate per 10,000 motorcycle registrations for the preceding counties.

<u>Rank:</u>	<u>County:</u>	<u>Injury Rate:</u> (Injury accidents/10,000 Registrations)
1	Pottawattamie	364.6
2	Linn	352.0
3	Johnson	329.4
4	Cerro Gordo	305.6
5	Woodbury	295.5
6	Black Hawk	283.5
7	Polk	267.5
8	Dubuque	265.1
9	Scott	250.9
10	Story	245.2
11	Muscatine	229.1
12	Lee	216.1
13	Des Moines	208.4
14	Clinton	198.2

15	Wapello	193.0
16	Webster	173.3

6.0 Occupation of Fatalities:

A search made of the occupations of the motorcyclists who died were composed of:

Students.....	34.6%
Laborers.....	26.8%
Skilled or Semi-skilled.....	13.4%
Retired.....	3.2%
Military or Navy.....	3.9%
All Others.....	<u>18.1%</u>
TOTAL.....	100.0%

7.0 Acquisition:

Slightly more than 70% of the motorcycles involved in fatal accidents were owned by the person driving the vehicle and a little less than 30% were borrowed or rented.

8.0 Motorcycle Passengers by Sex:

There was an increasing trend in motorcycle female passengers in fatal motorcycle accidents. In 1970, 2 out of 3 passengers were females compared to one out of 3 in 1969. The passengers were also a younger group than the drivers, 4 out of 5 were below 20 years old.

9.0 Wearing of Helmets:

No information is available on whether the drivers wore helmets or not, hence no inferences could be made on this subject. However, data gathered from a California study showed that wearing of helmets was effective in reducing the incidence of head injuries in motorcycle accidents. The follow-

ing table shows the relationship between wearing a helmet and potential for head injury:

Driver:	* * Head Injury:			Head Injury:		
	No	Yes	Total	No	Yes	Total
Not Wearing a helmet	504	224	728	69.2%	30.8%	100.0%
Wearing a helmet	209	33	242	86.4%	13.6%	100.0%
TOTAL:	713	257	970	73.5%	26.5%	100.0%

Source: California Highway Patrol Study on Motorcycle Accidents.

The California study also showed an estimate of benefits derived from wearing helmets. The study included 14,570 motorcycle drivers involved in reportable accidents. It was estimated that the use of protective head-wear could reduce the incidence of head injuries by 49%. This is shown in the following calculation:

- (1) Total number of drivers expected to have head injuries-26.5% x 14,570=3,861.
- (2) Number expected to have head injuries if all were wearing -13.6% x 14,570=1982.
- (3) Benefit would be: 3,861-1982=1879 or 49% of head injuries prevented.

* *
 $\chi^2=27.3751$ (highly significant)

Table 1 Number of Motorcycle Registrations and Trend Computation

<u>Year</u>	<u>(Y) Number</u>	<u>X</u>	<u>X²</u>	<u>Log Y</u>	<u>X Log Y</u>	<u>Yc Trend</u>	<u>(Y-Yc)</u>
1960	11068	-5	25	4.044148	-20.220740	9,530	1538
1961	11959	-4	16	4.077731	-16.310924	11,470	489
1962	12552	-3	9	4.098644	-12.295932	13,800	1248
1963	13962	-2	4	4.144885	-8.288177	16,610	2648
1964	17141	-1	1	4.234011	-4.234011	20,000	2859
1965	25778	0	0	4.411620	0	24,000	1778
1966	32643	1	1	4.513220	4.51322	28,900	3743
1967	37645	2	4	4.575190	9.150380	34,800	2845
1968	41982	3	9	4.623250	13.86975	41,900	82
1969	48293	4	16	4.683950	18.73580	50,400	2109
1970	60835	5	25	4.783900	23.91950	60,600	235
			<u>110</u>	<u>48.190549</u>	<u>8.838866</u>		

$$\text{Log } a = \frac{48.190549}{11} = 4.380959$$

$$\text{Log } b = \frac{8.838866}{110} = 0.080353$$

Trend Equation:

$$\text{Log } Y_c = 4.380959 + .08035X$$

Table 2 Number of Motorcycle Accidents and Fatalities: 1960-1970

Year:	Number of Motor- cycle Accidents:	Number of Fatal Accidents:	Number of Fatalities:
1960	269	7	7
1961	257	7	7
1962	302	7	7
1963	418	11	11
1964	579	12	12
1965	1041	19	19
1966	1227	33	33
1967	1181	26	26
1968	1194	33	35
1969	1176	26	28
1970	1512	40	43

Table 3 All Motorcycle Accidents and All Motor Vehicle Accidents by Age Group: 1969 and 1970.

Age Group	Motorcycle Accidents				All Motor Vehicle Accidents			
	1969	%	1970	%	1969	%	1970	%
15 or under	39	3.34	61	4.06	15,197	10.2	13,533	9.2
16	84	7.19	126	8.38	5,568	3.8	6,243	4.2
17	146	12.50	155	10.31	7,750	5.2	7,771	5.3
18-19	299	25.60	351	23.35	15,399	10.4	16,024	10.9
20-24	299	25.60	426	28.34	23,641	15.9	24,397	16.5
25-34	168	14.38	222	14.77	24,272	16.3	24,004	16.3
35-44	52	4.45	50	3.33	18,232	12.3	17,707	12.1
45-54	14	1.20	28	1.86	15,804	10.6	15,727	10.7
55-64	10	0.86	9	0.60	11,161	7.5	11,523	7.8
65-74	4	0.34	7	0.47	6,608	4.4	6,784	4.6
75 & over	1	0.08	2	0.13	2,649	1.8	2,832	1.9
NS	52	4.45	66	4.39	2,194	1.5	920	0.6
TOTAL	1168	100.0%	1503	100.0%	148,475	100.0%	147,465	100.0%

Source: Standard Summary of Motor Vehicle Accident Report: 1969 - 1970

References:

1. Motorcycles: Random Particles in the Traffic Stream

By: Thomas L. McDole
The University of Michigan
Highway Safety Research Institute

2. Motorcycle Accidents in New York State in 1962

Department of Motor Vehicles
Statistical Bulletin No. 2 (63)

3. The State of the Art of Traffic Safety

By: Arthur D. Little, Inc.

4. Motorcycle Accident Study, Department of the California Highway

Patrol/ H. W. Sullivan, Commissioner - January 1968

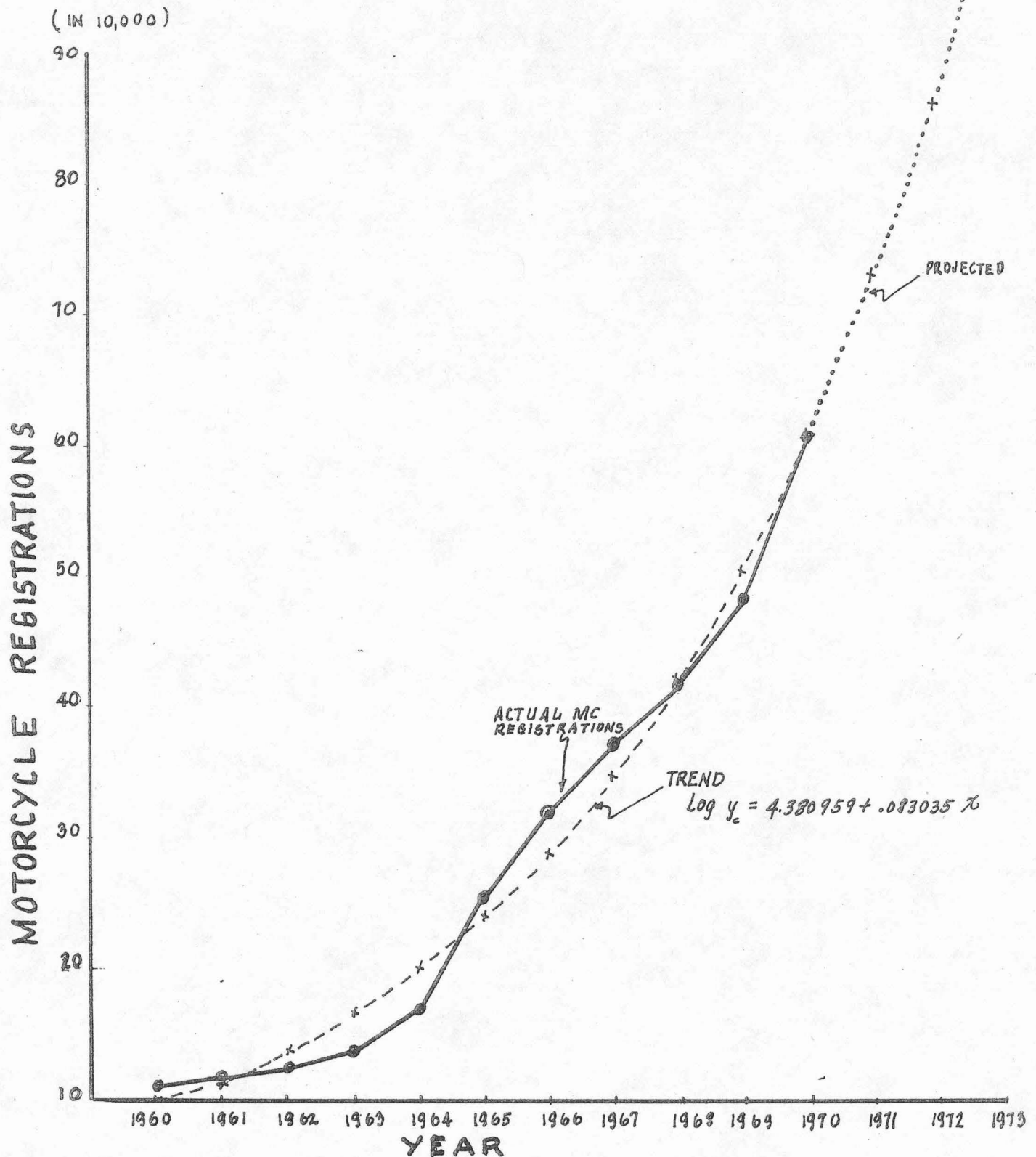


CHART 1: MOTORCYCLE REGISTRATIONS AND TREND

STATE OF IOWA: 1960-1970

9/20/71
 RESEARCH. PUBLIC SAFETY DEPT.

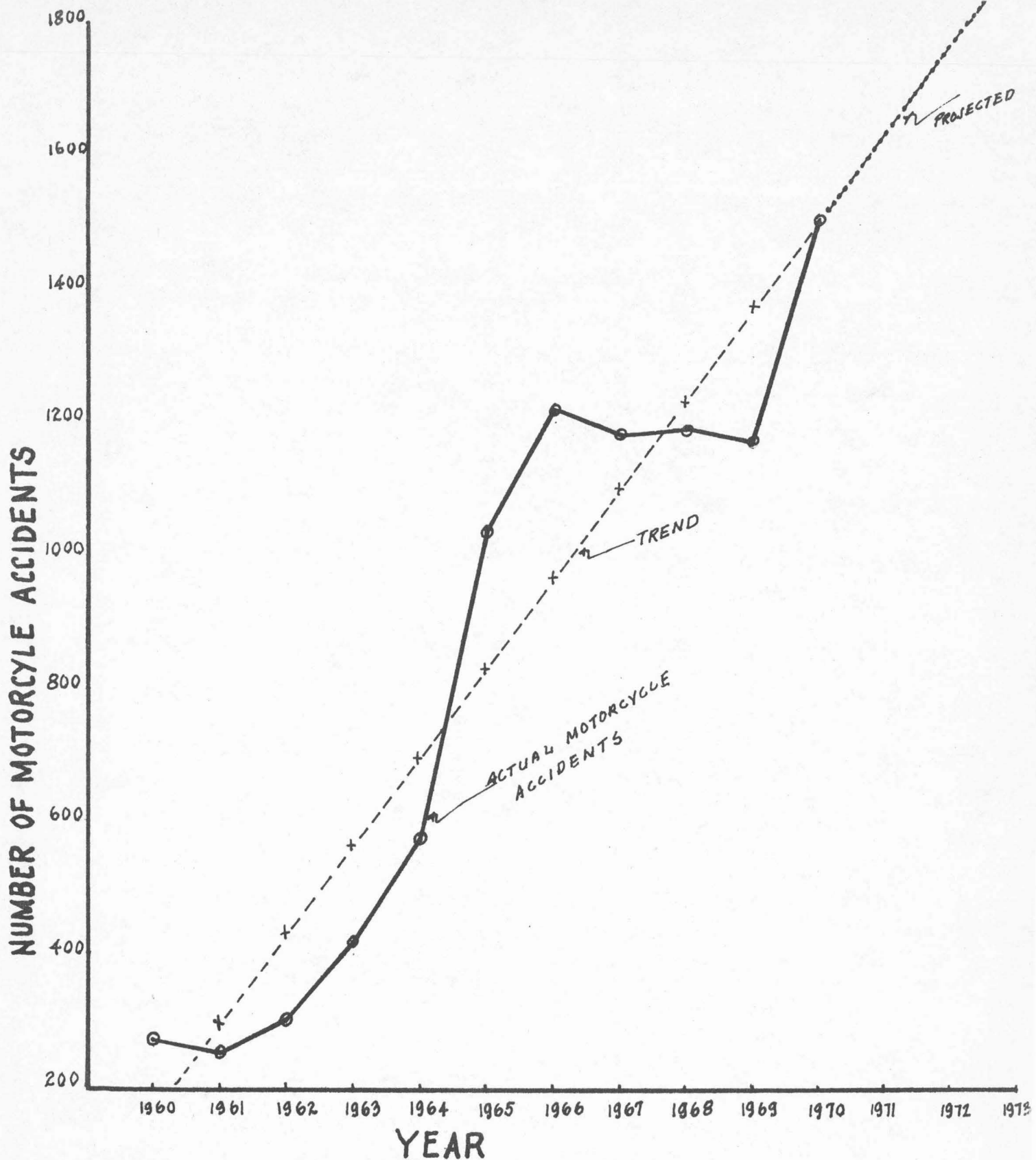


CHART 2: MOTORCYCLE ACCIDENTS AND TREND
STATE OF IOWA: 1960-1970

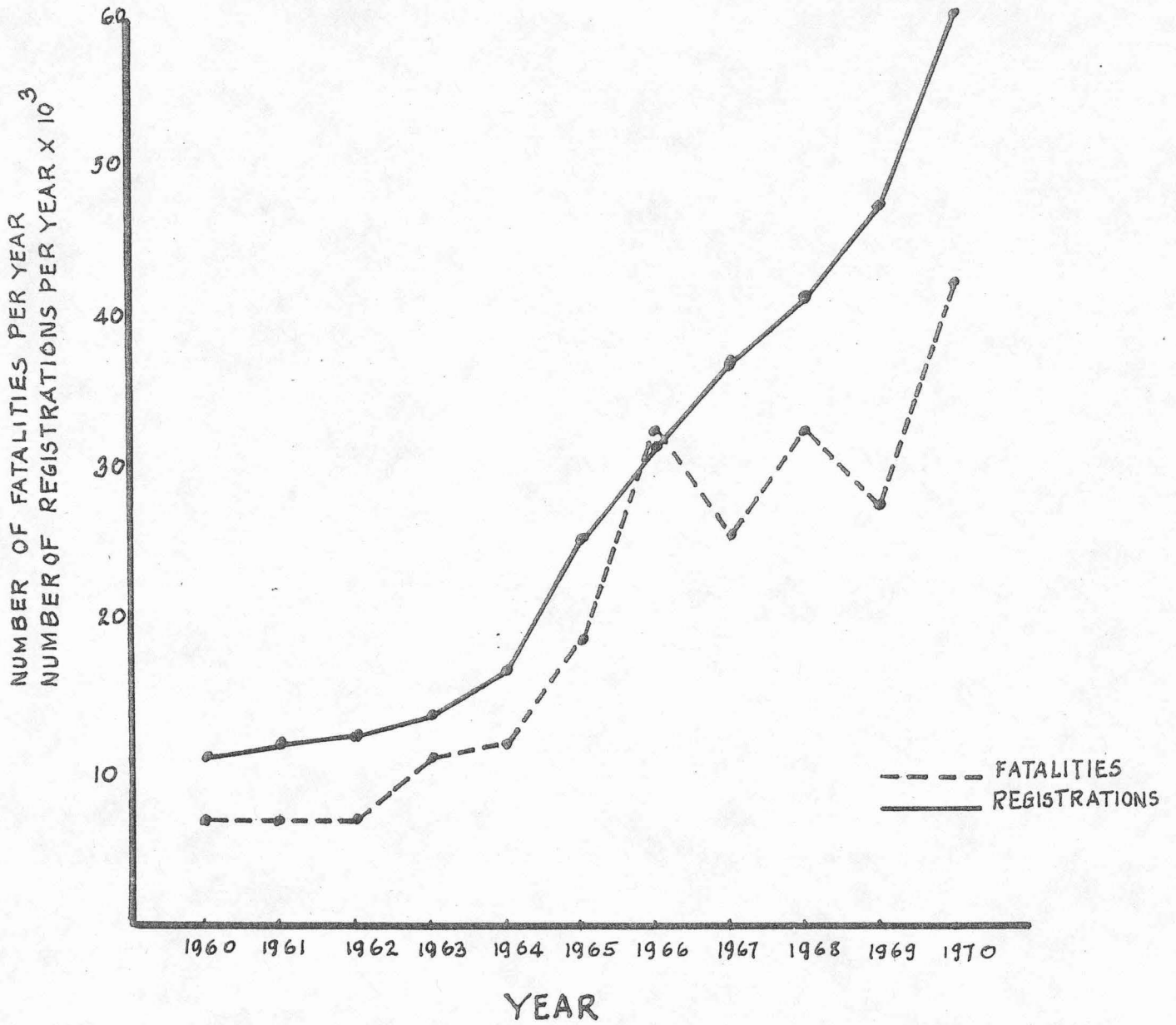
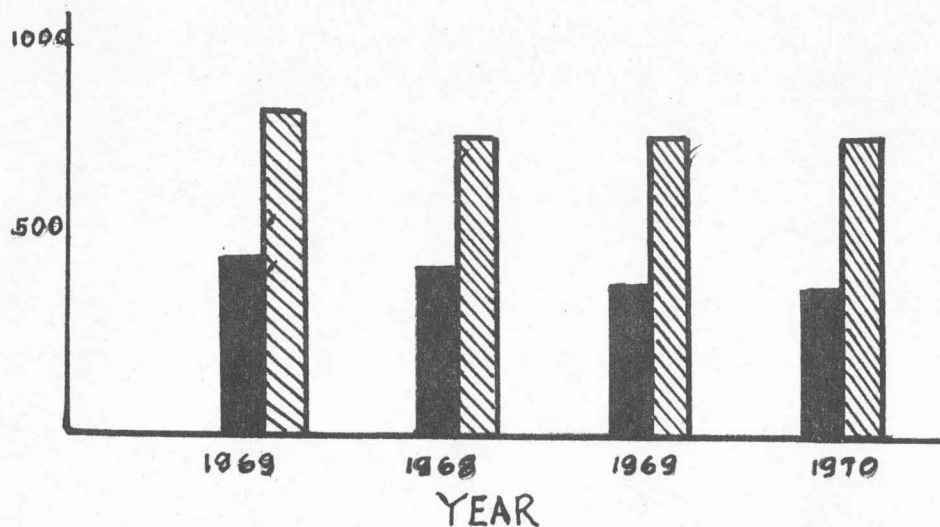


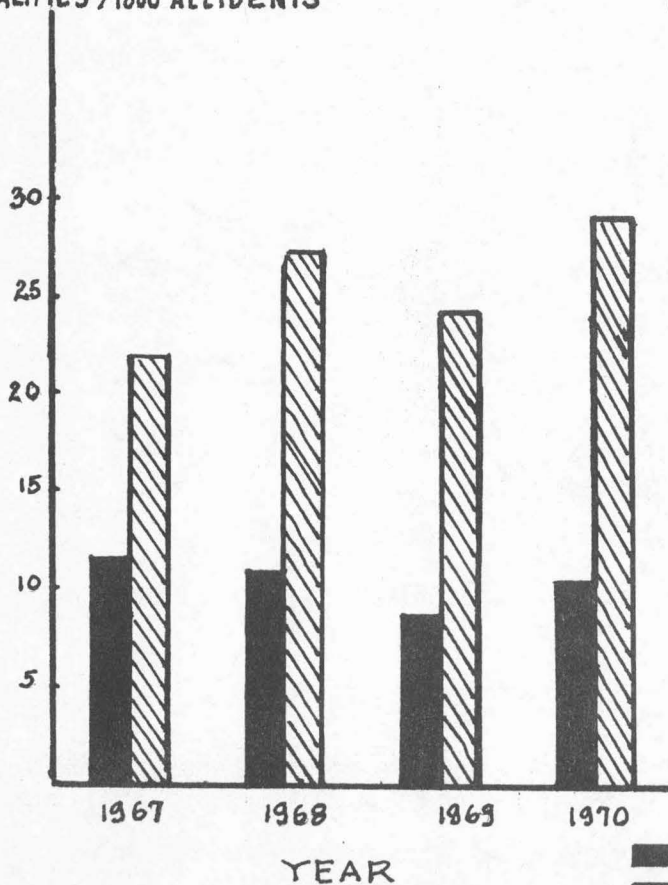
CHART 3: MOTORCYCLE FATALITIES AND REGISTRATIONS PER YEAR: 1960-1970 IOWA STATE

CHART 4: MOTORCYCLE RISK COMPARED WITH ALL MOTOR VEHICLES RISK

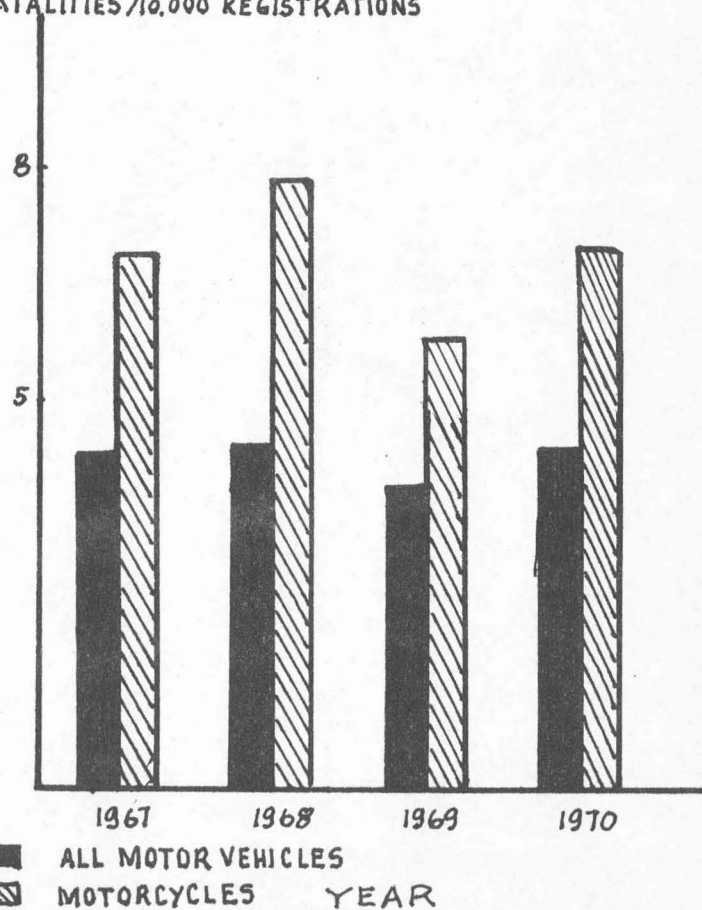
INJURIES PER 1000 ACCIDENTS



FATALITIES /1000 ACCIDENTS



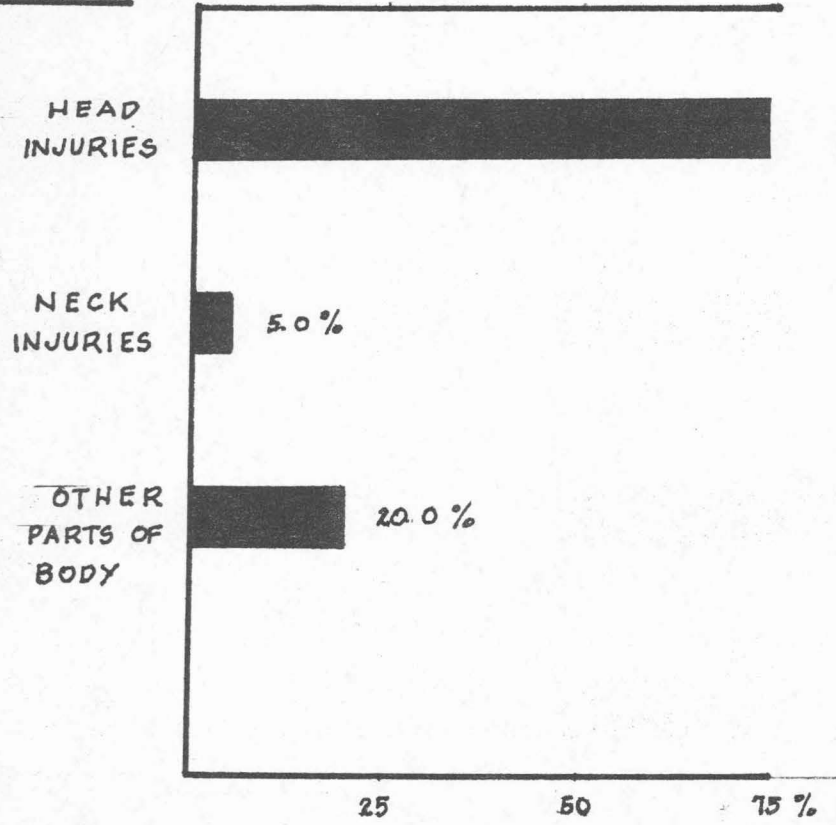
FATALITIES /10,000 REGISTRATIONS



ALL MOTOR VEHICLES
 MOTORCYCLES

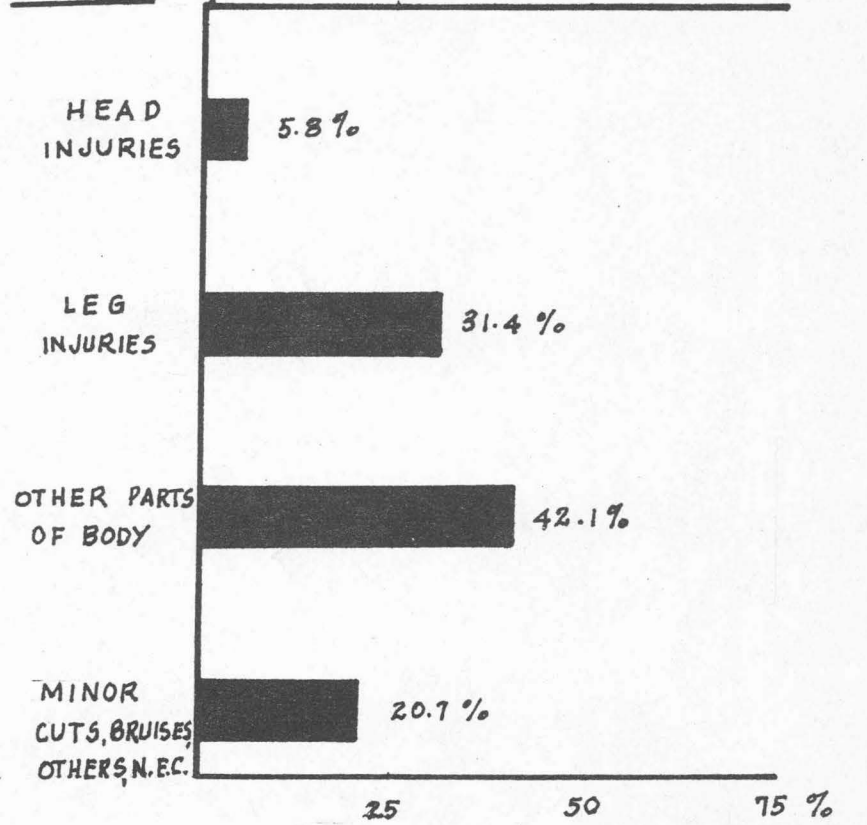
SOURCE : STANDARD SUMMARY OF MOTOR VEHICLE TRAFFIC ACCIDENTS ,1967-1970
 MOTORCYCLE ACCIDENT REPORT AND MOTOR VEHICLE REGISTRATION REPORT, 1967-1970

CAUSES OF DEATH PERCENT DISTRIBUTION
 0 25 50 75 %



FATAL ACCIDENTS

TYPE OF INJURY PERCENT DISTRIBUTION
 0 25 50 75 %



INJURY ACCIDENTS

CHART 5 : COMPARISON BETWEEN TYPE OF INJURIES
 IN FATAL AND INJURY MOTORCYCLE ACCIDENTS: 1970

SOURCES : (1) FATAL ACCIDENT REPORTS
 (2) 10% SYSTEMATIC SAMPLE OF MC INJURY ACCIDENTS

PERCENT

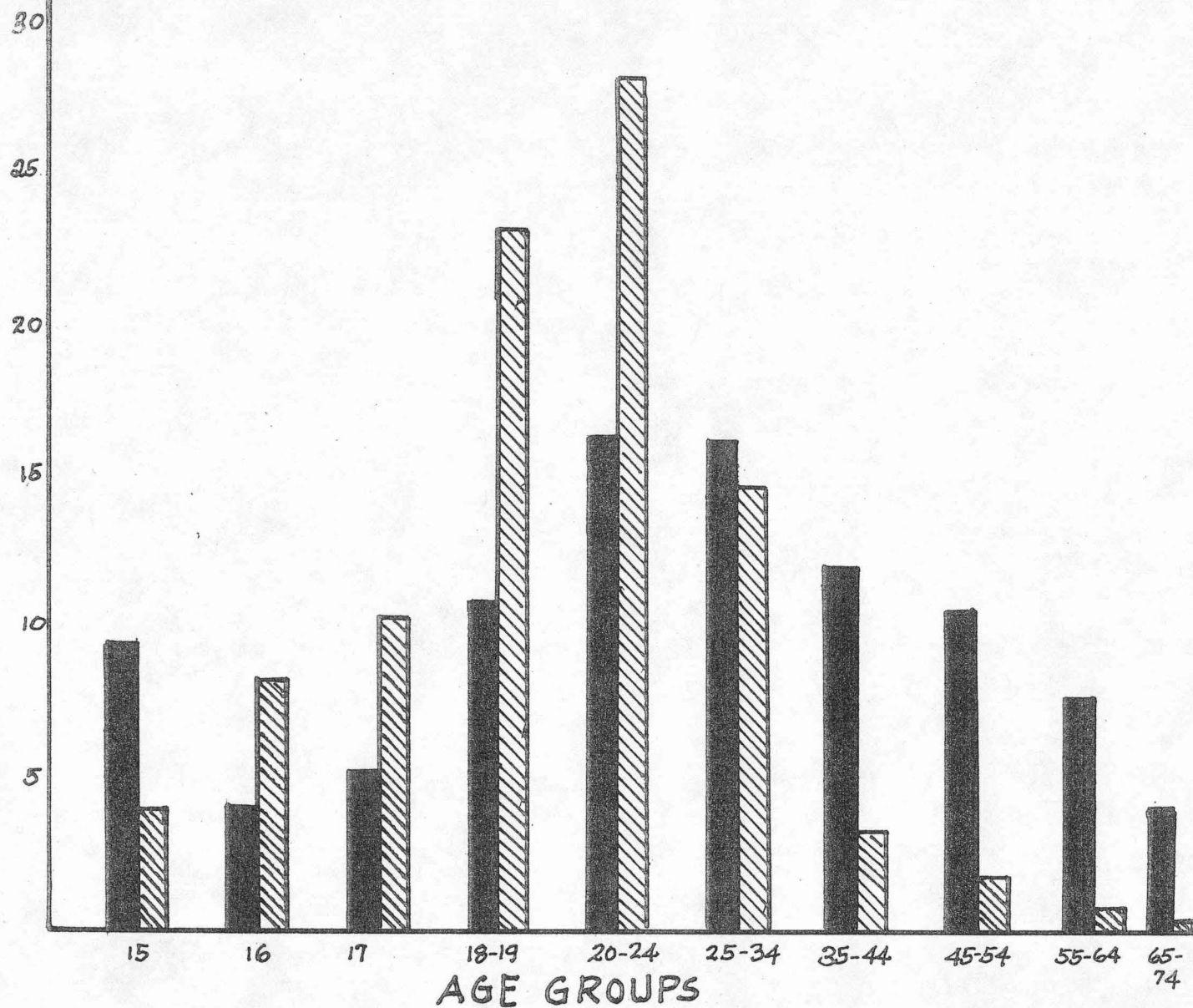




CHART 6 : PERCENT DISTRIBUTION OF
DRIVERS INVOLVED IN MOTORCYCLE
AND ALL MOTOR VEHICLE ACCIDENTS:
1970, IOWA STATE

 ALL MOTOR VEHICLES
 MOTORCYCLES

RESEARCH-PUBLIC SAFETY
DEPT.

PERCENT DISTRIBUTION OF FATAL ACCIDENTS

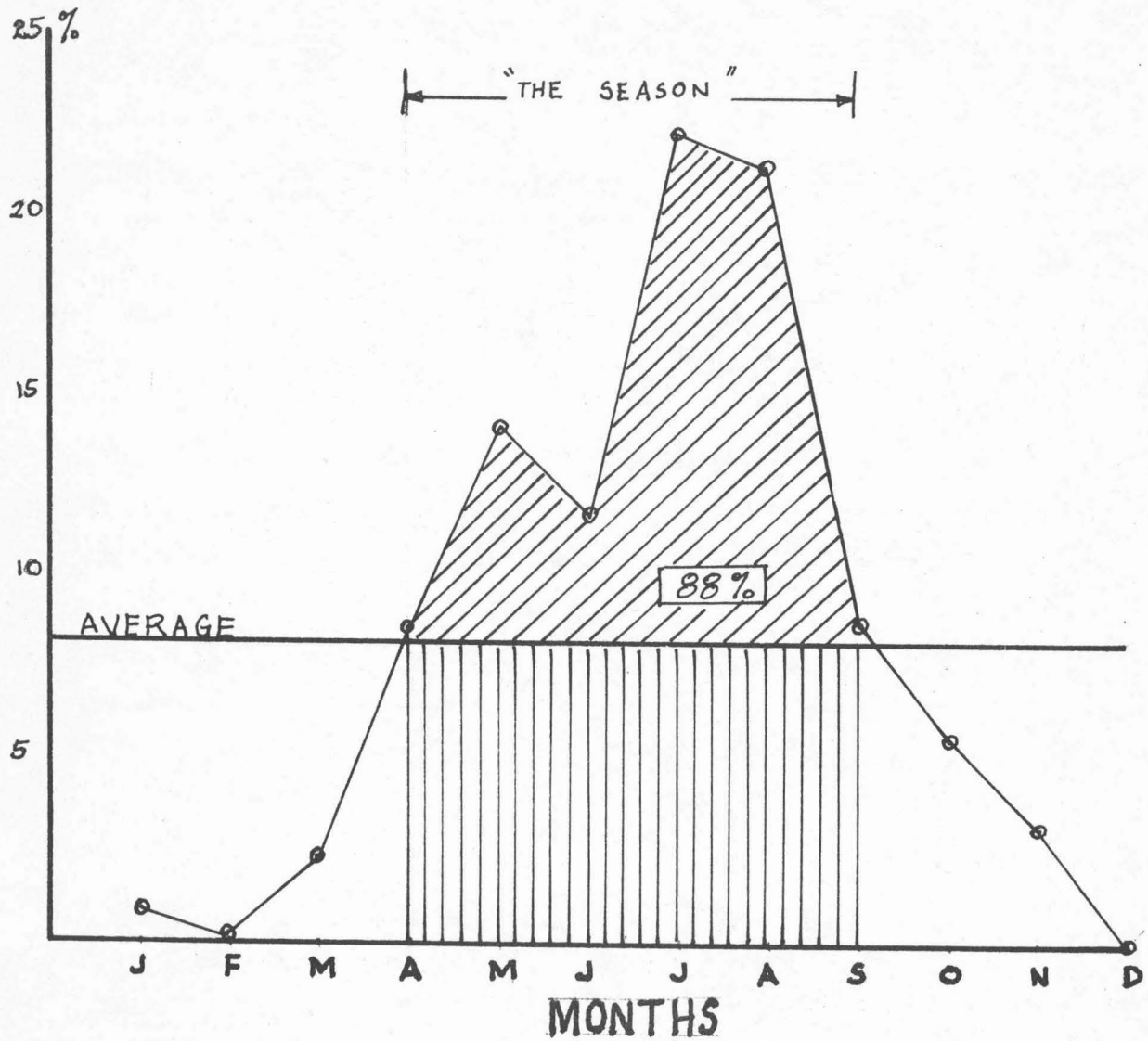


CHART 7: SEASON FOR MOTORCYCLING
IOWA STATE

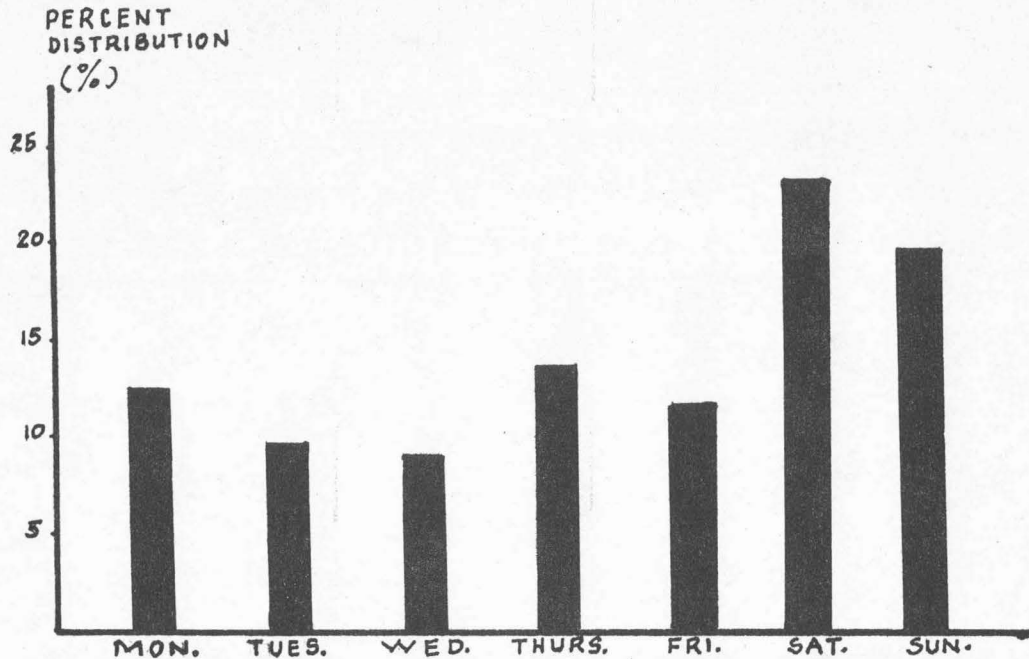


CHART 8: IOWA FATAL MOTORCYCLE ACCIDENTS BY DAY OF WEEK OF THE YEAR FOR 1967-1970: (Seven day moving mean applied).

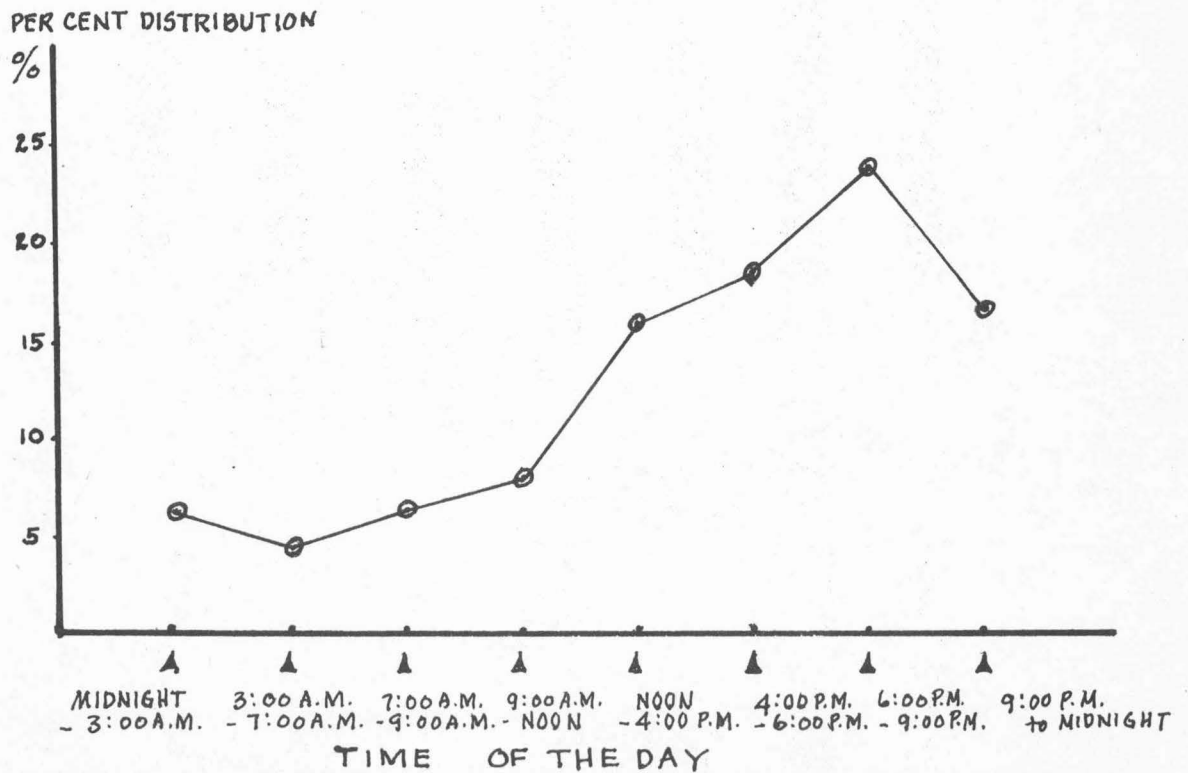
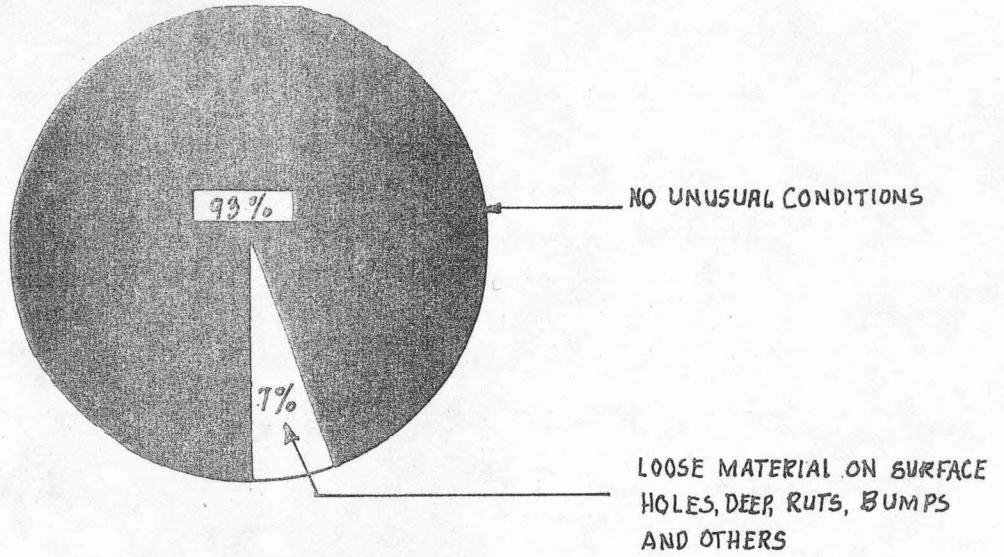


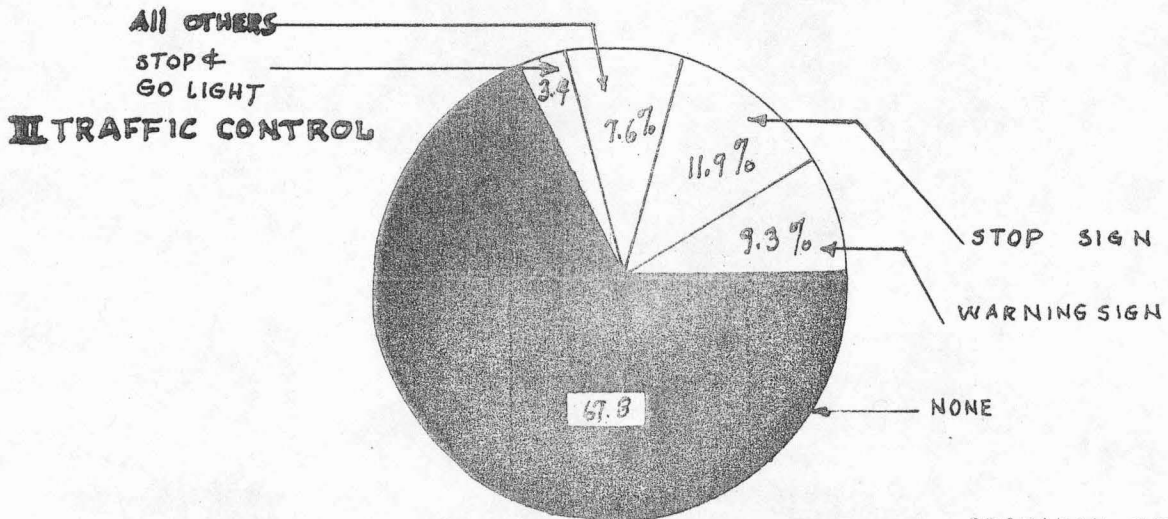
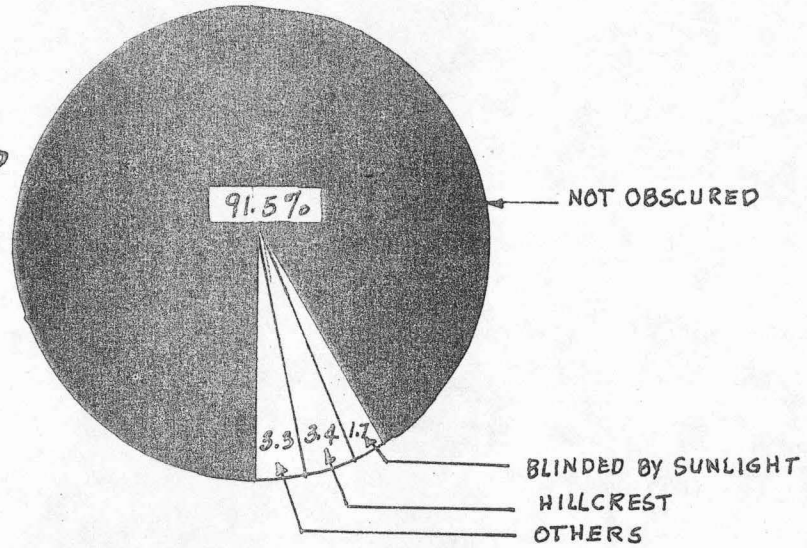
CHART 9: IOWA FATAL MOTORCYCLE ACCIDENTS BY TIME OF DAY: (1967-1970)

CHART : FACTS DESCRIBING THE ACCIDENT (FATAL) SCENE 1967-1970

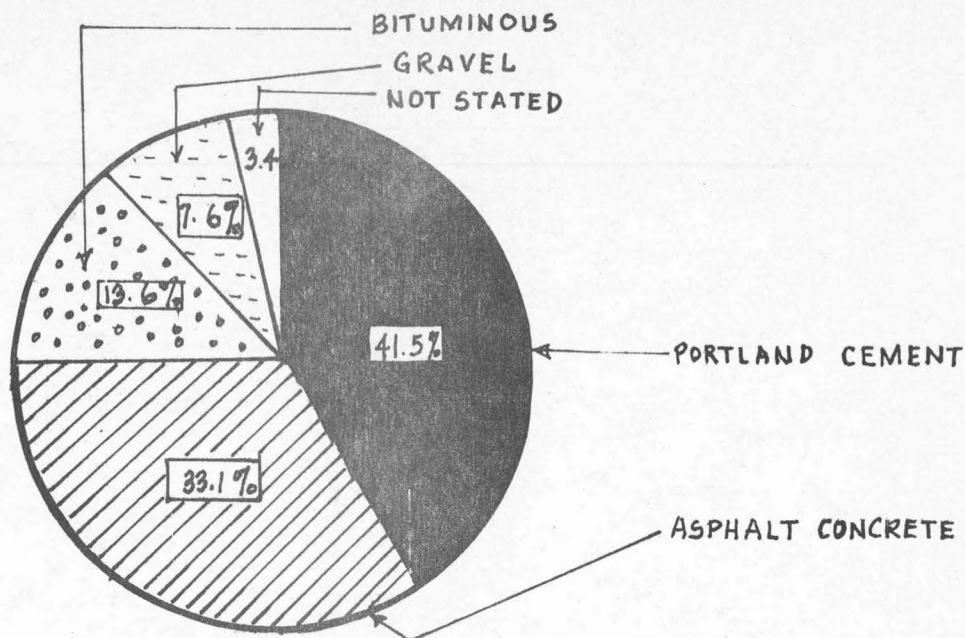
I ROAD CONDITIONS



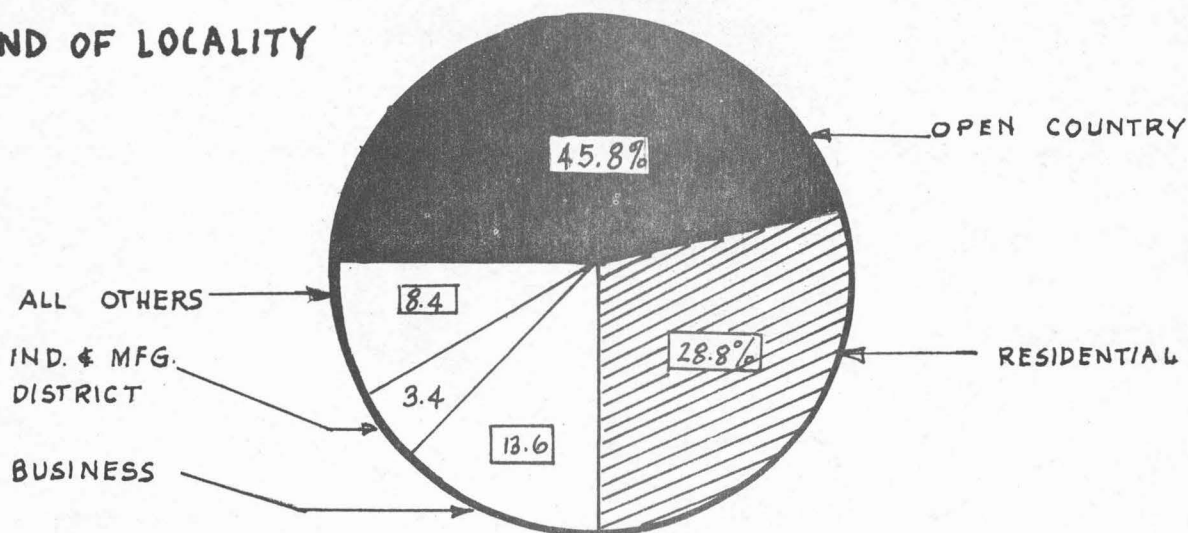
II VISION OBSCURED



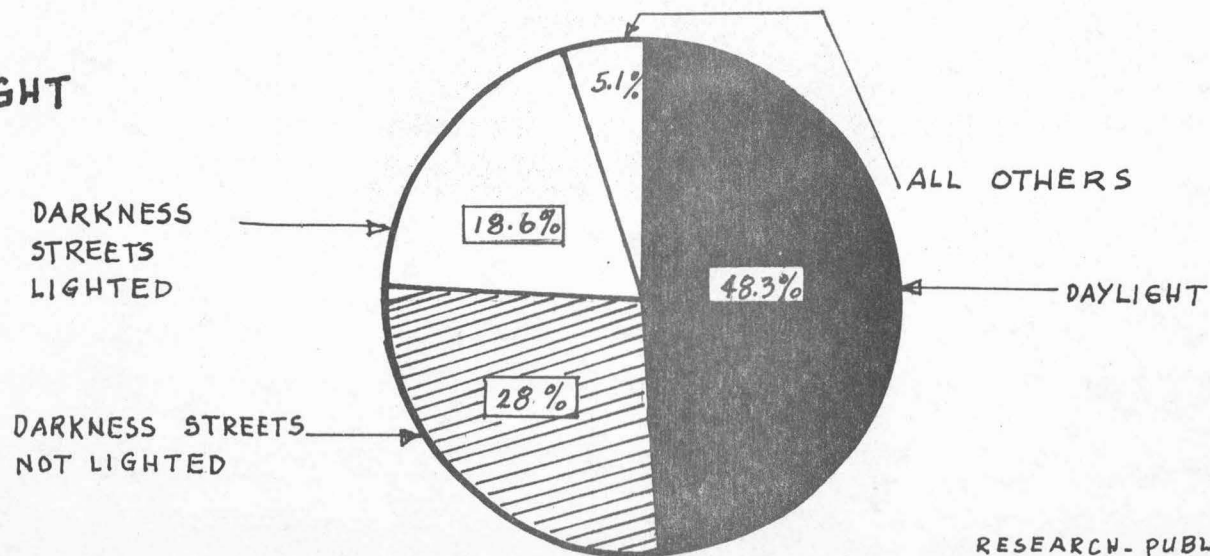
IV SURFACE TYPE



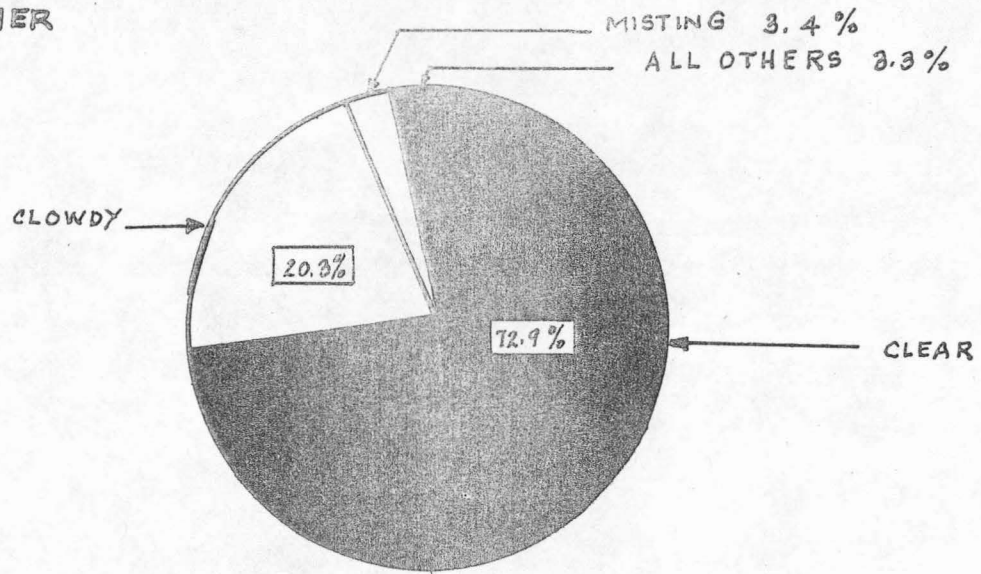
V KIND OF LOCALITY



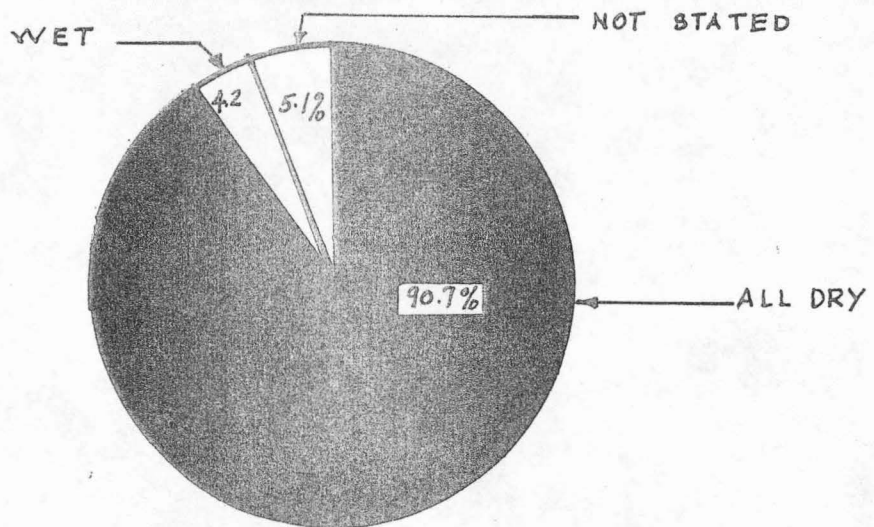
VI LIGHT



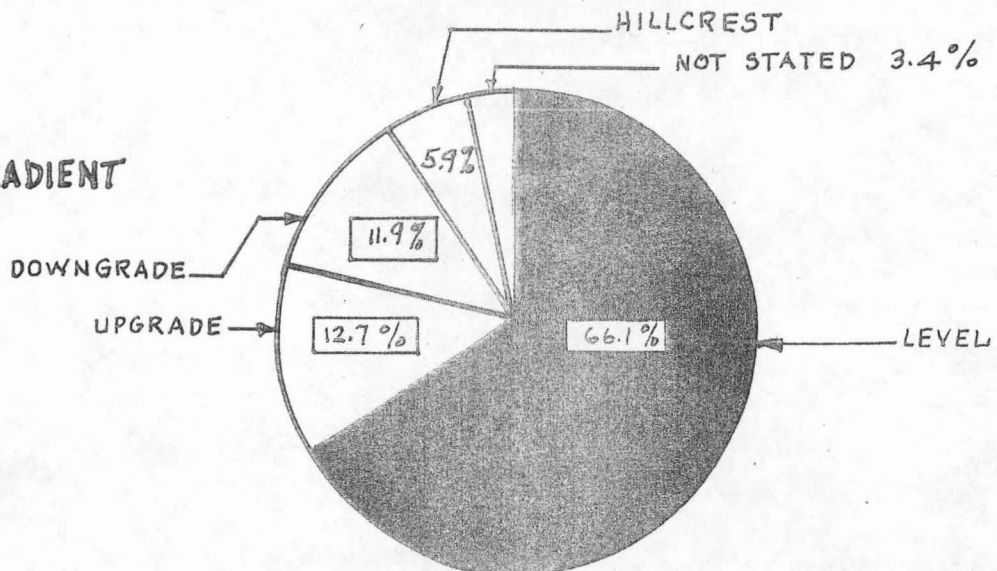
VII WEATHER



VIII SURFACE CONDITIONS



IX GRADIENT



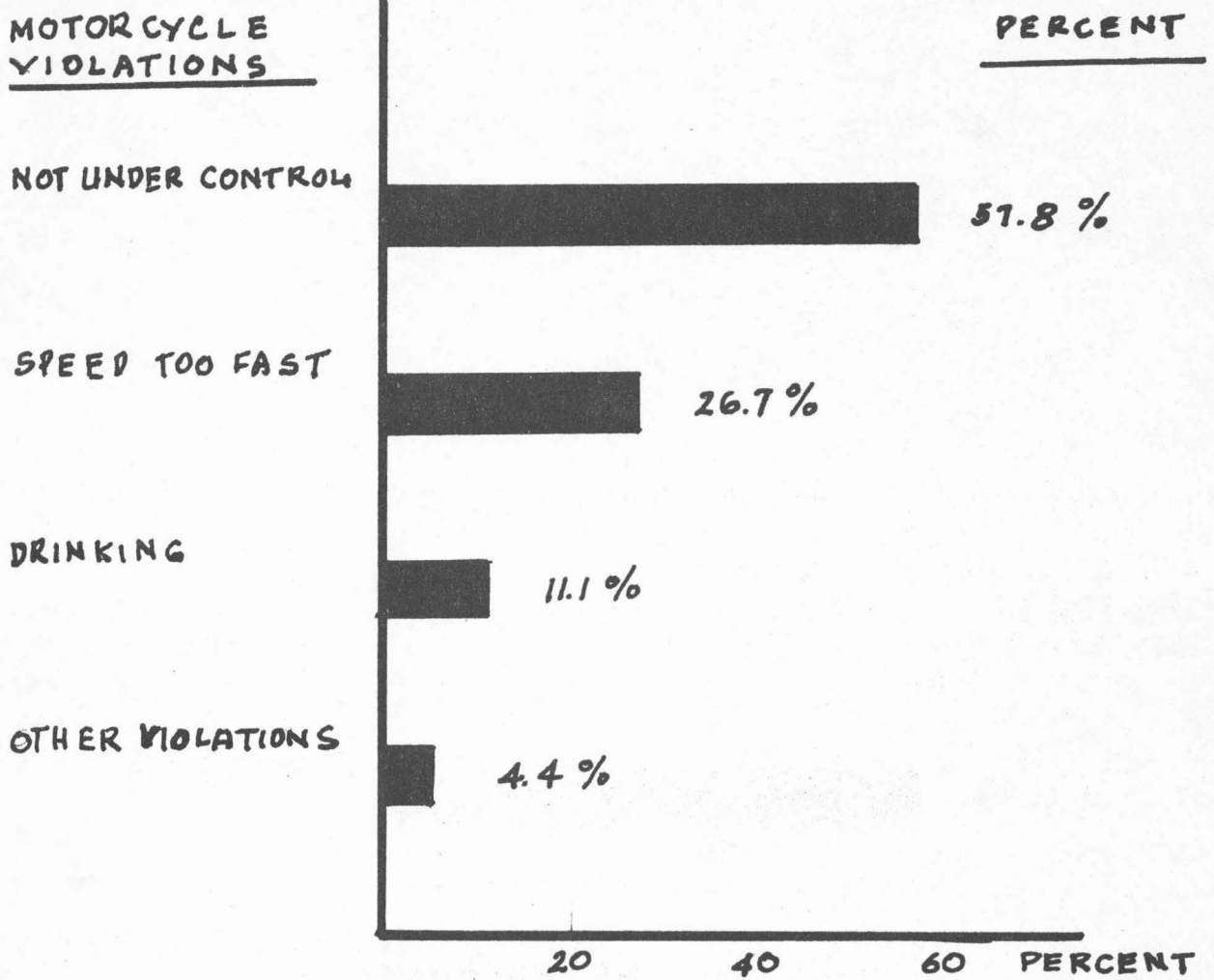
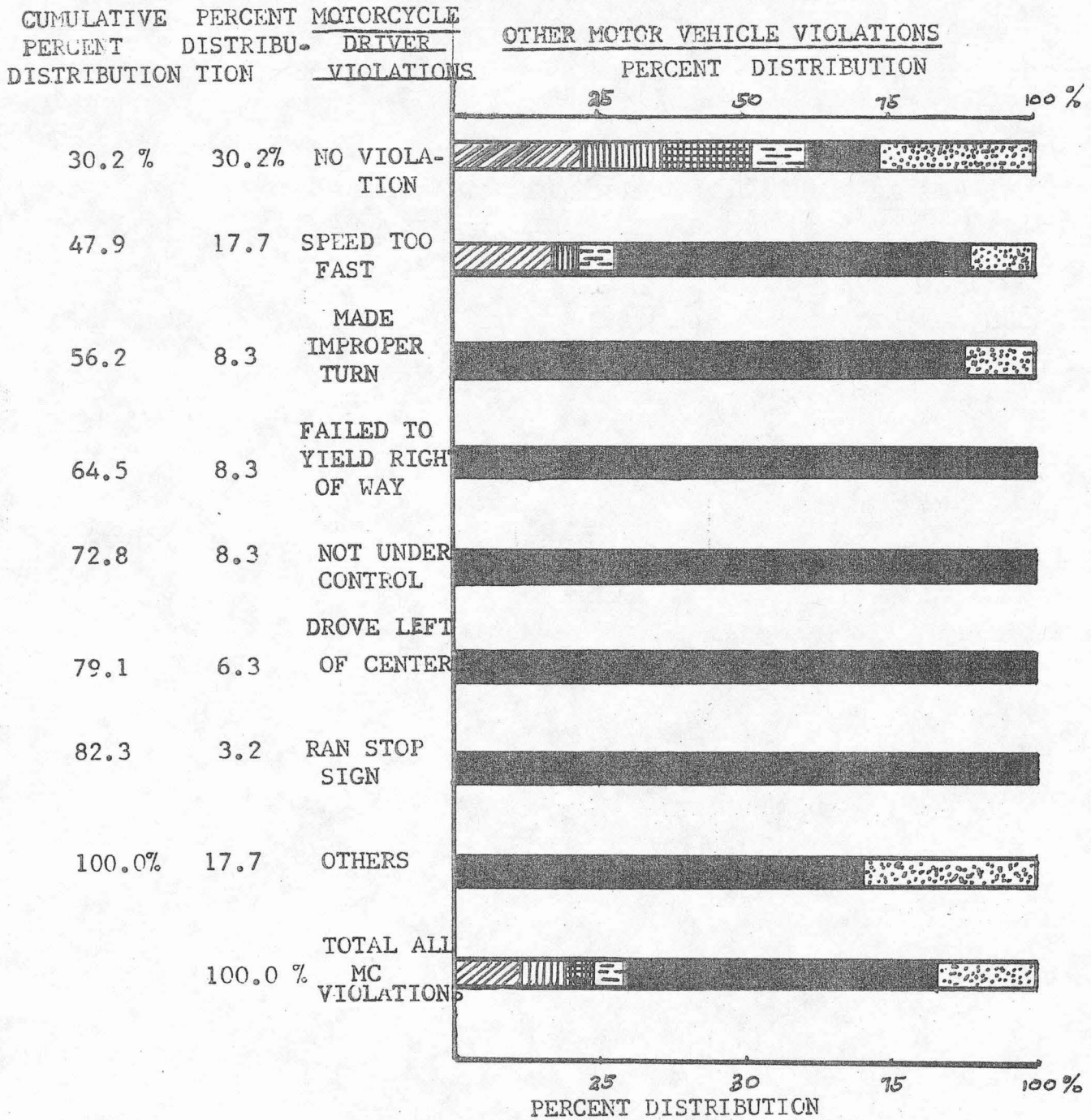


CHART 11 : PERCENT DISTRIBUTION OF VIOLATIONS OF MOTORCYCLE DRIVER IN A SINGLE MOTORCYCLE ACCIDENT (RAN OFF ROAD, OVERTURNED, HIT FIXED OBJECT). 1967 - 1970, IOWA STATE

CHART 12: AN ANALYSIS OF DRIVER VIOLATIONS (MOTORCYCLE AND OTHER MOTOR VEHICLE) IN A MOTORCYCLE-MOTOR VEHICLE COLLISION ACCIDENT: 1961-1970



LEGEND:





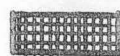

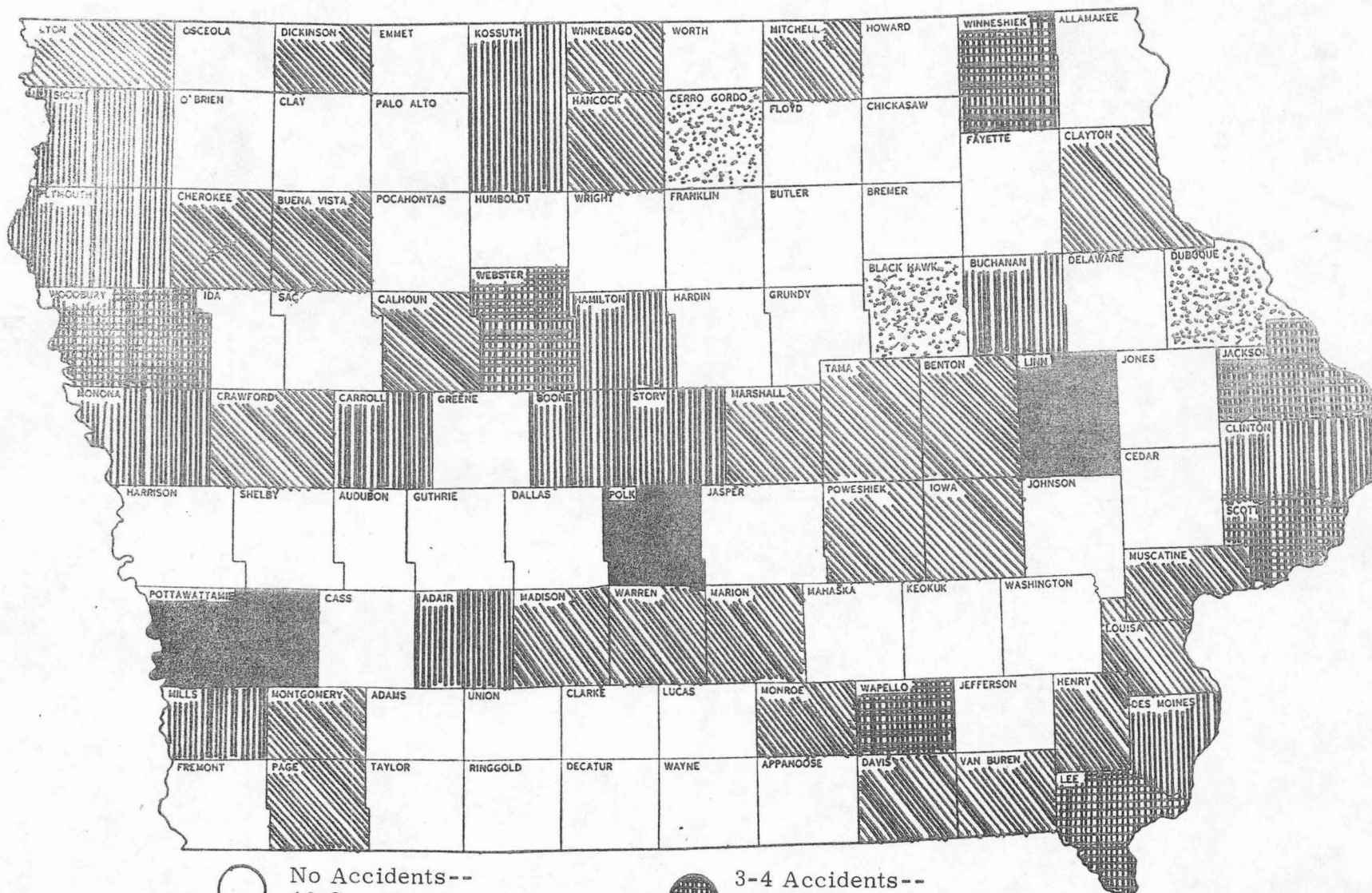
- | | | | |
|---|----------------------|---|-------------------|
|  | Failed to yield |  | Had been drinking |
|  | Improper turn |  | No Violation |
|  | Drove left of center |  | All others |

CHART 13:

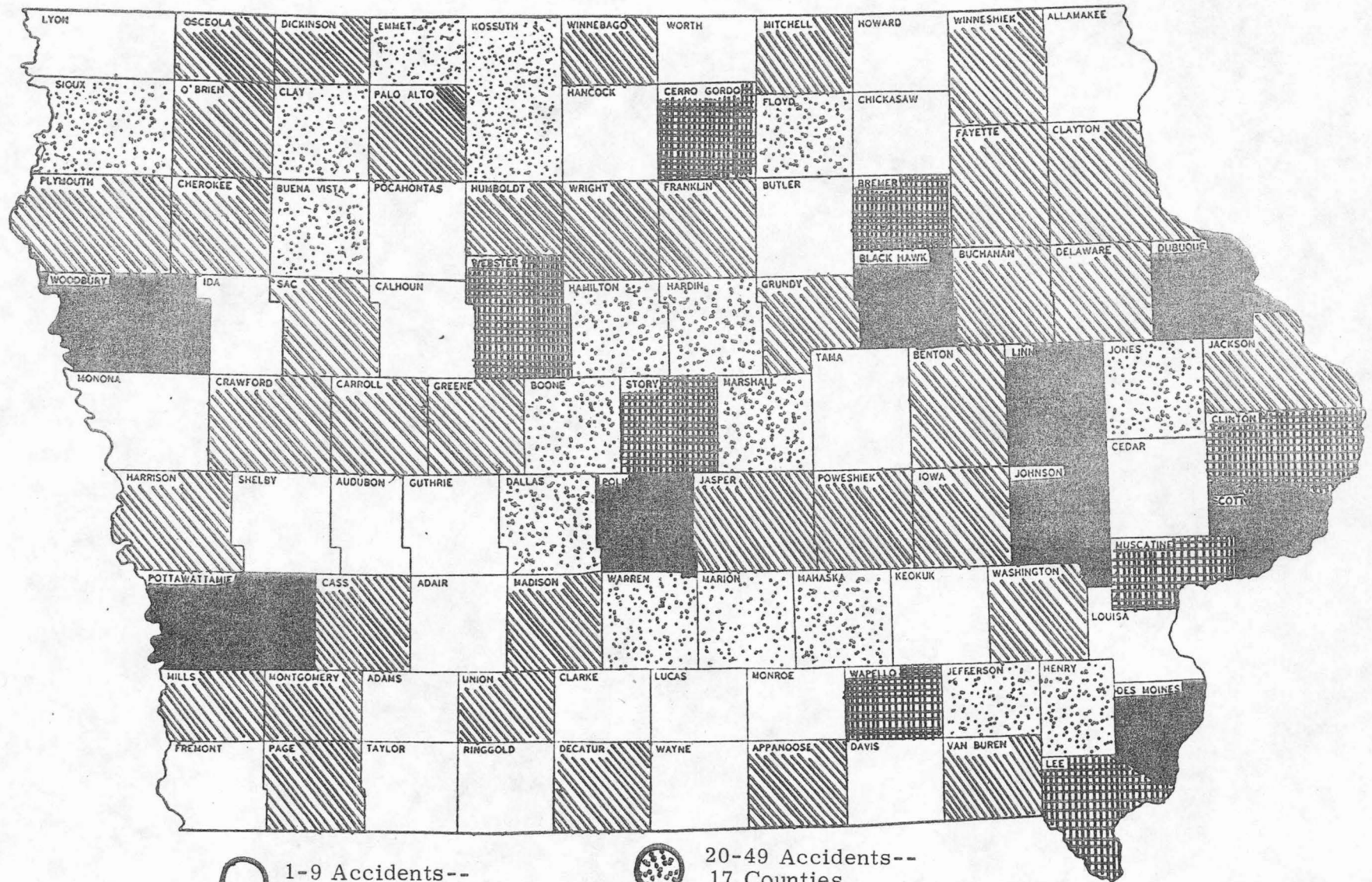
FATAL MOTORCYCLE ACCIDENTS BY COUNTY: IOWA, 1967-1970



- No Accidents--
46 Counties
- ▨ 1 Accident--
26 Counties
- ▧ 2 Accidents
13 Counties
- ▩ 3-4 Accidents--
8 Counties
- ◐ 5-7 Accidents
3 Counties
- ◑ 8-10 Accidents
3 Counties

CHART 14:

INJURY MOTORCYCLE ACCIDENTS BY COUNTY: IOWA, 1967-1970



- 1-9 Accidents--
28 Counties
- ▨ 10-19 Accidents--
37 Counties
- (stippled) 20-49 Accidents--
17 Counties
- (cross-hatched) 50-99 Accidents--
8 Counties
- (solid black) 100 or more Accidents--
9 Counties

STATE LIBRARY OF IOWA



3 1723 02057 2731