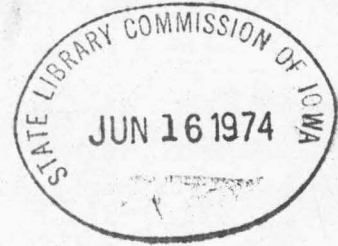
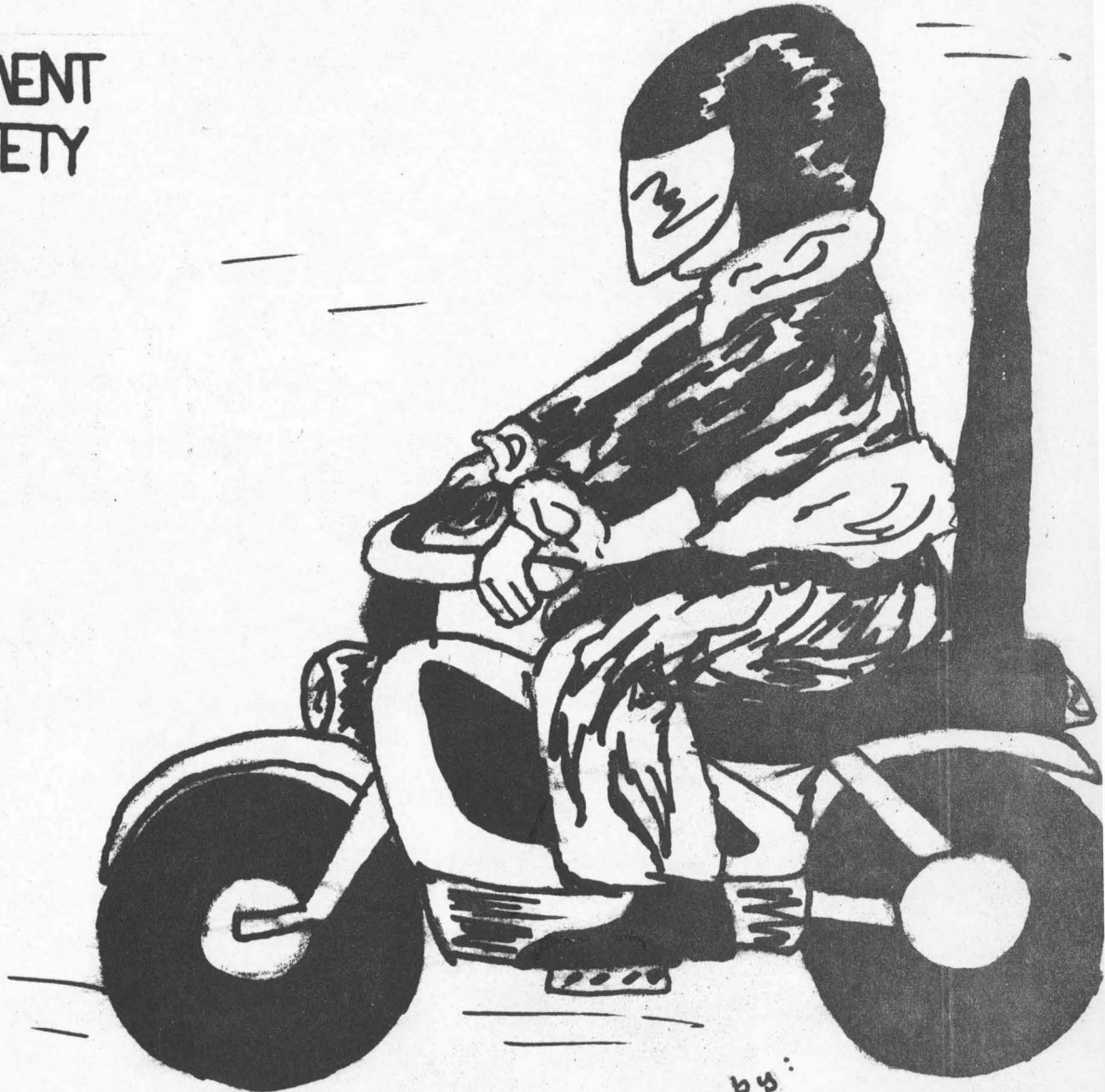


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MOTORCYCLE ACCIDENTS: 1971-1973



IOWA DEPARTMENT
OF PUBLIC SAFETY



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1974

IOWA MOTORCYCLE ACCIDENT STUDY

1971 - 1973

DEPARTMENT OF PUBLIC SAFETY

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March 6, 1974

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SUMMARY

A. Trends in Motorcycle Registrations, Accidents, and Fatalities.

1. Iowa motorcycle registrations in 1973 increased 971% compared with 1960 (11,068 in 1960 and 118,545 in 1973) or a geometric rate of increase of 21% annually. During the same period, car registrations increased by 37.2% (1,074,094 in 1960 and 1,473,312 in 1973) or an average increase of 30,000 cars per year.

2. The increase in motorcycle registrations was associated with an increase in motorcycle accidents. Motorcycle accidents in 1960 (269 accidents) compared with 1973 (2925 accidents) represented an increase of 987%.

3. Similarly, motorcycle fatalities in 1973 increased 928% (7 in 1960 and 72 in 1973) or a geometric rate of increase of 20.9% per year.

B. Motorcycle Accident Facts: 1971-1973.

1. The chances of injury or death in a motorcycle accident when related to registrations is at least twice that than when involved in other motor vehicle accidents. About 80% of motorcycle accidents were injury accidents compared with 24% in other motor vehicle accidents.

2. Collision of a motorcycle with another vehicle accounted for 70% of fatal accidents, while "ran off road, overturned and other non-collision" type of accidents accounted for 24.1%.

3. Slightly more than one half of fatal motorcycle accidents (56%) happened in rural areas which is true with single or multiple motorcycle accidents.

4. In 1971 through 1973, 2 out of 3 fatalities died of head injuries (head fracture, massive brain damage, contussions).

5. Age and Sex:

Motorcycling is predominantly a young male persons' activity.

3 out of 4 drivers in fatal accidents were 24 years of age and under. Median age of motorcycle drivers in fatal accidents was 20 years compared with median age of 31 for all motor vehicle drivers in fatal accidents.

6. Season for motorcycling in Iowa starts during the month of April and peaks during the summer months of July and August.

7. Half of fatal accidents during the three year period occurred on Fridays, Saturdays, and Sundays. Fatal accidents did not vary greatly during the weekdays.

8. Fatal motorcycle accidents appear to be at their highest level from 3:00 P.M. to midnight and another marked peak occurrence between 8:00 A.M. and 9:00 A.M. This corresponds generally to periods of peak use of cycles to and from school, work, etc.

9. An analysis of contributing factors which led to fatal motorcycle accidents revealed that drinking was prevalent (27.1%) as with the incidence of drinking in all fatal traffic accidents in the state (31.7%) during the period under review.

10. Analysis by type of accident showed drinking in 39.1% of single fatal motorcycle accidents and 25% (11.3% motorcycle driver and 13.7% other motor vehicle driver) in multiple motorcycle fatal accidents.

11. The frequency of fatal motorcycle accidents by character of roadway reflected 42.4% occurred at intersections.

Details show that slightly more than one half of the multiple type accidents occurred on intersections.

On the other hand, approximately half of accidents of single fatal motorcycle accidents occurred on curves.

12. Most of fatal accidents occurred on dry level roads under no unusual conditions. The number of fatal accidents were evenly distributed during daylight and darkness.

13. Relationship between motorcycle occupant deaths and model year of cycle showed that deaths increase sharply with newer and current models, strongly suggesting inexperience, unfamiliarity with cycle or a combination of both on the part of the cycle driver.

14. Populous counties like Polk, Scott, Black Hawk, and Lee had increases of 51.1%, 122.4%, 37.5% and 27.5% respectively in deaths per 10,000 registrations during 1971 through 1973. These counties account for 30% of total fatalities during the period under review.

15. Driving records (three years prior) of motorcycle drivers involved in fatal accidents in 1973 showed that 55.7% had at least 1 conviction and 39.3% had at least 1 accident.

16. Driving records (three years prior) of the other motor vehicle driver involved in fatal motorcycle accidents in 1973 showed that 34% had at least 1 conviction and 34% had at least 1 accident.

17. Accident and conviction rates per driver for the two groups of drivers showed that motorcycle drivers involved in fatal accidents in 1973 had approximately 3 times as many convictions and one and one fifth times as many accidents as the other motor vehicle driver based on three years prior record.

18. There was a slight decrease in death rates in the last few years (motorcycle deaths per 10,000 registrations). This might be the effect of special licensing requirements since March, 1968, implemented by the department.

IOWA MOTORCYCLE ACCIDENT STUDY: 1971-1973

1.0 Introduction:

This report was prepared to update motorcycle accident statistics in the state of Iowa. It is also aimed at providing basic data for planning and promoting countermeasure programs in motorcycle safety.

Motorcycling in the state of Iowa is growing at a geometric rate annually and this increase is associated with an increase in motorcycle deaths. Motorcycles are providing a rapid and inexpensive means of transportation. This, coupled with its ease in operation and maintainance make it most appealing to the younger group. However, the magnitude of the accident problem has reached the point of needing the attention of the legislature, the problem of safety legislation. Special consideration is needed for motorcycle safety as the rider is completely exposed and compares differently in running techniques of other types of vehicles.

1.1 Data used in this study were collected from fatal motorcycle and non-fatal motorcycle accident reports. As in the previous study of 1967-1970, (Motorcycle Accident Study in Iowa), causes of death in fatal accidents and types of injuries for those injured and not killed in fatal accidents are presented. An interesting feature of this study is a presentation of occupant deaths by model year of motorcycle. A more detailed study of violations of motorcycle as well as the other motor vehicle driver is also presented. A search into driver actions in intersection accidents was also made. Drivers three year prior record were also searched for convictions and accidents.

2.0 Trends in Motorcycle Registrations, Accidents and Fatalities:

Motorcycle registrations in Iowa in a space of 14 years increased tremendously

from a mere 11,068 in 1960 to a high of 118,545 registrations in 1973, a geometric rate of increase of 21% per year. Chart 1 enclosed with this study shows the growth of motorcycle registrations during 1960 through 1973. In 1973, motorcycle registrations chalked up 5.0% of total registrations while motorcycle accident fatalities account for 9.0% of total traffic fatalities.

A comparison of growth between motorcycle registrations and car registrations show that the latter increases linearly per year by 30,000 cars while motorcycles increased at a geometric rate of 21% per year. The two types of registrations are shown in Chart 2.

3.0 Relationship Between Motorcycle Registrations and Motorcycle Accidents:

The growth of motorcycle registrations is associated with an increase in motorcycle accidents, 269 accidents in 1960 compared with a record high of 2,925 in 1973. In Chart 3, motorcycle accidents increase annually at an average rate of 23% from 1969 through 1973.

In like manner, the sharp increase in motorcycle registrations was accompanied by an equally sharp increase in the number of motorcycle deaths, 7 in 1960 to a record high of 72 in 1973, an average exponential rate of increase of 20.9% per year. Please see Chart 4.

To find the relationship between motorcycle fatalities and registrations, a scatter diagram was drawn and this is presented in Chart 5. Degree of relationship between registrations and fatalities is almost perfect ($r = 0.96$) hence, the regression of motorcycle registrations on fatalities will be an excellent predictor of fatalities.^{1/}

4.0 Comparison Between Motorcycle Risk and All Motor Vehicle Risk: 1971-1973, Iowa

^{1/} It will be noticed that actual number of fatalities in 1973 which was 72 is within the 95% confidence limits of the expected value, (expected value = 75), this is off by 4%.

Motorcycle accidents may seem to be a small proportion of the total accident picture in Iowa, in 1973 there were 72 fatalities and 2,327 injury accidents compared with 813 fatalities and 24,693 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 VEHICLE 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
1971	3.9	5.3	9.5	22.9	362.8	916.6
1972	3.9	6.8	9.5	28.9	386.0	944.5
1973	3.4	6.1	8.2	25.2	363.6	966.4

The preceding table strongly suggests that motorcycle risk is consistently higher than all motor vehicle risk by about twice when related to registrations and thrice when related to accidents and injuries. Hence, the chances of getting killed or injured in a motorcycle accident is at least twice than when involved in other motor vehicle accidents.

5.0 Severity of Injuries:

We have established that when a motorcycle accident occurs, the riders chances of being killed or injured are greater than if they were riding in another type of motor vehicle. Injuries sustained by motorcyclists in accidents tend to be more severe than injuries sustained by people in accidents involving other types of vehicles because the motorcycle driver has very little protection. Our data show that in 1973, 80% of motorcycle accidents were injury accidents compared to 24% in other motor vehicle accidents. 35.7% of injuries in motorcycle accidents were of Class A or serious injuries, (bleeding wound, distorted member, or any

condition that required the victim to be carried away from scene). This is in contrast to 19.4% of Class A injuries sustained in other types of motor vehicles.

5.1 Causes of death in fatal motorcycle accidents: 1971-1973

A search of the causes of death in fatal motorcycle accidents showed that in 1972, 72.7% of motorcyclists killed died of head injuries of all types. Similarly this proportion in 1973 was established to be 66.7%, these figures still compare favorably or are not significantly different from the 1967-1970 study.

On the other hand, an analysis of those motorcyclists who survived in fatal motorcycle accidents showed that in 1971-1973, 45.9% had broken leg and other parts, 21.6% had abrasions and bruises, 18.9% had head injuries and other, etc. This compares favorably with the 1967-1970 study which showed 15% head injuries, 50% bruises and 25% lacerations. This strongly suggests that the likelihood of serious injury or death is much greater when the head is injured.

6.0 Relationship Between Motorcycle Occupant Deaths and Model Year of Motorcycle: 1972 and 1973

One interesting analysis in this study was establishing the relationship between motorcycle occupant deaths and model year of motorcycle. Number of occupant deaths was plotted against model year of motorcycle in 1972 and 1973. This is shown in Charts 9 and 10. The charts strongly indicate that occupant deaths increase with model year of motorcycle. Deaths increase sharply with newer and current models of motorcycles. The degree of this relationship is almost perfect ($r = 0.95$ and 0.93) in 1972 and 1973 respectively. It was observed that in 1972, 59.1% of fatalities were occupants of 1971 and 1972 model motorcycles. This compares with 61.1% in 1973 using 1972 and 1973 models. This is a strong indication that many new motorcycle riders are not familiar with the cycle, it also may suggest a lack of adequate training and experience in controlling their vehicles. They might have not been informed to the inherent dangers of riding motorcycles and are unprepared to overcome hazardous traffic situations that lead

to accidents.

7.0 Types of Fatal Motorcycle Accidents:

Collision of a motorcycle with other motor vehicle accounted for 64% of fatal motorcycle accidents and 67% for all motorcycle accidents in 1971-1973. It is interesting to note that 6% of fatal collisions are collisions of a motorcycle with another motorcycle. Single motorcycle fatal accidents of "Ran off Road, overturned, collision with fixed object, etc." type accounted for the remaining 30% of fatal accidents.

The following table shows the distribution of accidents by accident type and severity of accidents.

DISTRIBUTION OF FATAL AND ALL MOTORCYCLE ACCIDENTS BY

TYPE OF ACCIDENT: 1971-1973, IOWA

Type of Accident	Percent Distribution	
	Fatal Motorcycle Accidents	All Motorcycle Accidents
1. Collision with other motor vehicle in traffic	64.1	67.2
2. Collision with another motorcycle in traffic	5.9	N.A. ^{1/}
3. Ran off Road, overturned and other non-collision	24.1	21.1
4. Collision with railroad train, fixed object, bicyclist, animal, etc.	<u>5.9</u>	<u>11.7</u>
	100.0%	100.0%

^{1/} Included with number one.

The above tabulation suggests that it is comparable to the percentages obtained in the previous study of 1967-1970.

8.0 Age and Sex: 1971-1973:

As indicated in the beginning of this report persons between 15 and 24 years

of age are at a high risk of motorcycle accidents. Chart 12 shows the distribution of motorcycle and all motor vehicle drivers in fatal accidents by age group. From the chart, 73% of total motorcycle drivers involved in fatal motorcycle accidents during 1971-1973 were 24 years of age and under and 42% were 19 years and under. This is a disproportion when compared to the already high incidence of young drivers involved in all fatal motor vehicle accidents which is 37% and 18% respectively for the two age groups in question. The chart also reflects a sharp decline of motorcyclists compared with all motor vehicle drivers in the age group 35 and more.

Median age of motorcycle drivers in fatal accidents was 20 years while median age for all motor vehicle drivers involved in fatal accidents was 31. Median age of licensed drivers qualified to operate a motorcycle in 1973 was 24 while median age of licensed drivers in Iowa was 38.4.

Motorcycling is predominantly a male persons' activity, 97.8% of motorcycle drivers involved in fatal accidents were males. On the other hand, an analysis of passengers showed that 39.5% were females and all were 24 years of age and under with the exception of one.

9.0 The Motorcycle Season in Iowa: 1971-1973:

Fatal motorcycle accidents as well as all motorcycle accidents were charted and are shown in Chart 13. It could be noticed from this chart the sharp increase in the number of fatal accidents during the month of April. Peak months are July and August and a sharp decrease is noted during the fall months. This seasonal behavior is comparable to the previous study of 1967-1970.

10.0 Distribution of Fatal Motorcycle Accidents By Day of Week: 1971-1973:

Chart 14 reflecting distribution of fatal accidents by day of week shows that 52% of fatal accidents occurred during Fridays, Saturdays and Sundays. Fatal accidents did not vary greatly during the week.

11.0 Distribution of Fatal Motorcycle Accidents by Time of Day: 1971-1973:

The frequency of fatal motorcycle accidents appears to be at its highest level from 3:00 P.M. to midnight. From Charts 15 and 15A, it is observed that the distribution of fatal motorcycle accidents is skewed with peak occurrence between 3:00 P.M. and 11:00 P.M. Another time period which was noted was peak incidence between 8:00 A.M. and 9:00 A.M. and a subsequent increase towards noon-time and early afternoon. This would correspond generally to periods of peak use of motorcycles to and from school, work, etc.

A comparison of time distribution of fatal motorcycle accidents and other motor vehicle accidents is showed in Chart 16. The two graphs suggest that motorcycles follow time period distribution of other motor vehicles from midnight to early afternoon, however other motor vehicle fatal accidents peak between 3:00 P.M. and 6:00 P.M. and declines sharply after 6:00 P.M. This difference may suggest that motorcycles are dangerous for use during nighttime.

12.0 Motorcycle Driver Violations and Other Motor Vehicle Driver Violations:

An analysis of driver violations or contributing factors that led to the accident by accident type is as follows:

A. Fatal Single Motorcycle Accidents:

1. Drinking	39.1%
2. Not Under Control	30.4
3. Speed Too Fast	19.6
4. Ran Stop Sign	2.2
5. No Driver Violation	4.3
6. Not Stated	<u>4.3</u>
Total	100.0%

It should be noted that drinking is a factor in 39.1% of all fatal single motorcycle accidents.

B. Collision of Motorcycles With Other Motor Vehicles in Traffic:

This type of motorcycle accident as stated earlier makes up 70% of all fatal accidents. An analysis of motorcycle drivers as well as the other motor vehicle drivers was made and results showed that 39.5% of all motorcycle drivers involved in fatal accidents are not at fault. A glance at the faults of the other motor vehicle driver showed the driver failed to yield in 40.8% of the cases and had been drinking in 24.5% of the cases.

Summarizing, the other motor vehicle driver is not at fault in 44% of the cases compared with about 40% on the part of the motorcycle driver. These facts are shown in Table 7.

12.1 Number of alcohol related fatal motorcycle accidents: 1971-1973:

Drinking was found to be prevalent in fatal motorcycle accidents as with the incidence of drinking in all fatal traffic accidents. The number of alcohol related fatal motorcycle accidents was 27.1% which is not significantly different from the overall proportion of alcohol related fatal accidents which is 31.7% during the years under review.

The following table supports these facts:

ALCOHOL RELATED FATAL MOTORCYCLE ACCIDENTS: IOWA, 1971-1973

Year	Motorcycle vs. Other Motor Vehicle			Single Fatal MC Acci- dents	Total Alcohol Related Fatal Accidents	All MC Fatal Acci- dents		Total Fatal Accidents		
	MC and M.V. Both Drinking	Other M.V. Drinking	Motor- cyclist Drinking			No.	%	Alcohol Related	Fatal Acci- dents	%
1971	1	3	2	3	9	41	22.0	233	680	34.3
1972	3	4	3	9	19	61	31.1	210	721	29.1
1973	2	5	5	6	18	68	26.5	217	682	31.8
Total	6	12	10	18	46	170	27.1	660	2083	31.7

13.0 Fatal Motorcycle Accidents by Character of Roadway: 1971-1973:

An attempt was made to identify character of roadway where fatal accidents

occurred during the period in question. Of the four types of roadway character intersections had the highest frequency of accidents. Table 8 shows the frequency of occurrence by character of roadway. From the table, the frequency of fatal accidents could be summarized as follows:

- 42.4% Intersections
- 21.8% Straight roads
- 19.4% Curves
- 16.5% Driveways and others

13.1 Intersection accidents:

A study of driver actions in fatal motorcycle accidents that occurred on intersections showed that the most dangerous driver action was a car driver attempting to make a left turn and pulling into the path of a motorcycle. This action accounted for approximately 40% of total.

The following summarizes 78.2% of driver actions:

Car attempted to make a left turn and pulled into path of motorcycle	39.7%
Car pulled away from stop sign in front of motorcycle	17.9%
Motorcycle went through stop sign	10.3%
Motorcycle not under control	<u>10.3%</u>
Total	78.2%

A search into the character of the roadway in single motorcycle fatal accidents showed that approximately half of the accidents happened on curves and 3 out of 10 happened on straight roads.

On the other hand, 54.0% of fatal accidents involving a collision between a motorcycle and another vehicle occurred at intersections, 19.4% on straight roads, on 19.4% on driveways.

14.0 Facts Describing the Fatal Accident Scene:

Facts that were looked into describing the accident scene were:

Weather:

72.9% Clear weather

23.5% Cloudy

3.5% Raining

Surface:

94.7% Dry

5.3% Wet and not stated

Gradient:

66.5% Level

15.3% Downgrade

9.4% Upgrade

5.3% Hillcrest

Surface Types:

37.6% Portland cement

37.1% Asphalt

14.1% Bituminous

Road Conditions:

92.4% No unusual conditions

Vision:

85.0% Not obscured

15.0% Obscured by trees, crops, hillcrest, embankments

Traffic Control:

65.3% None

19.4% Stop sign

5.3% Stoplight

4.7% Warning

Kind of Locality:

50.0% Open country
 25.3% Residential
 14.7% Business

Light Conditions:

52.9% Daylight
 22.9% Darkness, streets lighted
 17.1% Darkness, streets not lighted
 5.3% Dusk

The aforementioned facts describing the surroundings of the accident scenes strongly suggest that most of the accidents happened during clear weather, on dry level roads, under no unusual conditions, on concrete and asphalt roads and where there was no traffic control. Half of the accidents occurred in open country. Fatal accidents were evenly distributed during daylight and darkness.

15.0 Occupation of Motorcyclists:

Occupation of motorcyclists were looked into and were as follows:

Students	35.7%
Laborer	20.3%
Skilled & Semi-skilled	14.3%
Unknown	17.6%
All others	7.2%
Unemployed	4.4%

16.0 Motorcycle Deaths by County:

A map showing the number of fatalities in 1971-1973 by county show that counties that had 6 or more fatalities and are heavily shaded on the map generally occur in populous counties. These counties are Polk, Pottawattamie, Linn, Scott, and Black Hawk.

Out of 99 counties, 39 did not have a single fatality during the 3 year period.

Counties which had 3 fatalities and more accounted for 64.2% of total during 1971-1973. In order of magnitude these were:

Polk	22
Scott	14
Black Hawk	13
Linn	8
Pottawattamie	6
Cerro Gordo	5
Lee	5
Marion	5
Webster	5
Carroll	5
Dallas	4
Keokuk	4
Mills	4
Warren	3
Lucas	3
Fayette	3
Clinton	3
Calhoun	3

16.1 Motorcycle death rates of populous counties: 1/

Statewide motorcycle death rates in 1971 through 1973 were calculated to be:

1971	5.22
1972	6.78
1973	6.07
1971-1973	6.07

1/ Motorcycle Deaths per 10,000 Registrations

Let us now look at death rates of the aforementioned counties and compare it with statewide death rates and with previous 1967-1970 death rates.

County	Number of Fatalities			Death Rate			Death Rate		- decrease + increase
	1971	1972	1973	1971	1972	1973	(1971-1973)	(1967-1970)	
Polk	6	6	10	6.7	5.8	8.4	7.1	4.7	+ 51.1%
Scott	-	7	7	-	15.8	14.0	10.9	4.9	+122.4%
Black Hawk	4	3	6	11.2	7.1	11.2	9.9	7.2	+ 37.5%
Linn	-	2	6	-	4.5	11.2	5.9	10.6	- 44.3%
Pottawattamie	3	2	1	10.0	6.4	3.0	6.3	12.0	- 47.5%
Cerro Gordo	2	1	2	17.9	7.1	12.3	12.1	24.1	- 49.0%
Lee	-	3	2	-	21.8	11.4	11.6	9.1	+ 27.5%
Marion	-	2	3	2	14.1	16.9	12.2	6.4	+ 90.6%
Dallas	-	2	2	-	15.8	13.7	10.7	-	Infinite increase
Webster	-	1	4	-	4.8	16.9	8.2	7.5	+ 9.3%
Keokuk	1	-	3	20.2	-	48.5	24.1	-	Infinite increase
Mills	1	3	-	30.7	64.0	-	30.9	18.2	+ 69.8%
Warren	-	1	2	-	6.7	10.6	10.9	4.5	+142.2%
Lucas	-	1	2	-	25.4	38.1	26.1	-	Infinite increase
Fayette	-	3	-	-	39.3	-	12.6	-	Infinite increase
Clinton	-	3	-	-	2.2	-	7.4	6.8	+ 8.8%
Calhoun	1	-	2	22.7	-	31.6	18.7	9.0	+107.8%

The above tabulation reflects that of populous counties Polk, Scott, Black Hawk, and Lee had increases of 51.1, 122.4, 37.5 and 27.5% respectively. Warren, which is adjacent to Polk county, had an increase of 142.2%. Linn, Pottawattamie and Cerro Gordo had decreases of 44.3, 47.5 and 49.0% respectively. Polk county and Scott county which were below the state average of 6.4 in 1967-1970 are above the state average of 6.1 in 1971-1973.

Dallas, Keokuk, Lucas and Fayette counties which had zero fatalities or 0 death rate in 1967-1970 had 4, 4, 3 and 3 deaths in each county respectively in 1971-1973.

It is interesting to note that 22 counties did not have a single motorcycle fatality in 1967-1973. It could be wise to look into these counties and find why they did not have a single motorcycle accident fatality in 7 years. These counties with their motorcycle registrations are:

County	Motorcycle Registrations		
	1971	1972	1973
Pocahontas	419	595	727
Sac	419	554	721
Greene	495	536	596
Harrison	433	505	601
Shelby	293	370	473
Audubon	218	266	292
Case	428	580	762
Adams	142	183	257
Union	289	363	525
Clark	235	250	297
Taylor	200	279	339
Ringgold	200	233	317
Wayne	172	243	310
Washington	567	675	823
Jones	510	715	901
Delaware	398	561	809
Butler	394	557	827
Grundy	372	537	715
Hardin	532	700	921

Franklin	494	650	737
Wright	522	681	832
Worth	545	332	430

17.0 Distribution of Fatal Motorcycle Accidents by Rural Urban Classification:

The distribution of fatal motorcycle accidents by geographical location shows that 55.9% of total fatal motorcycle accidents occurred in the rural area and 44.1% in the urban area. This distribution is the same in single or multiple fatal motorcycle accidents.

This is shown in the following table:

Year	Total Fatal MC Accidents			Multiple Fatal MC Accidents			Single Fatal MC Accidents		
	R	U	Total	R	U	Total	R	U	Total
1971	23	18	41	17	13	30	6	5	11
1972	34	27	61	22	19	41	12	8	20
1973	<u>38</u>	<u>30</u>	<u>68</u>	<u>30</u>	<u>23</u>	<u>53</u>	<u>8</u>	<u>7</u>	<u>15</u>
Total	95	75	170	69	55	124	26	20	46
% Dist.	55.9	44.1	100.0	55.6	44.4	100.0	56.5	43.5	100.0

18.0 Distribution of Injury Motorcycle Accidents by Rural-Urban Classification:

Injury motorcycle accidents do not follow the distribution of fatal accidents. About two thirds of injury motorcycle accidents occurred in urban areas during the period under review.

19.0 Drivers History of Motorcycle Drivers: 1973

To get relationship between accidents and convictions of motorcycle drivers involved in fatal accidents, their 1973 drivers records were searched for convictions and accidents 3 years prior to the fatal accident.

A total of 61 motorcycle drivers had records, 7 had no drivers license and

3 were out of state drivers hence their records were not readily available.

The table below gives the number of motorcycle drivers with 0,1,2,3,4, or more accidents 3 years prior to the fatal accidents.

Number of Accidents (3 years prior records)	Number of MC Drivers	% Distribution
0	37	60.7
1	16	26.2
2	3	4.9
3	4	6.6
4 or more	<u>1</u>	<u>1.6</u>
Total Drivers	61	100.0%

On the other hand, the number of motorcycle drivers by conviction count, 3 years prior record is as follows:

Number of Convictions	Number of Drivers	% Distribution
0	27	44.3
1	19	27.9
2	6	9.8
3	5	8.2
4 or more	<u>6</u>	<u>9.8</u>
Total	61	100.0%

The preceding tabulations reflect that of the 61 motorcycle drivers with available records and involved in fatal accidents in 1973, 39.3% had 1 accident or more and 60.7% had no accidents 3 years prior in their record.

On the other hand, 55.7% of the total motorcycle drivers had at least 1 conviction and 44.3% had their records clear.

From the data on accidents and convictions of motorcycle drivers involved in fatal accidents in 1973, differential accident rates were calculated.

This is shown below:

DIFFERENTIAL ACCIDENT RATES BY CONVICTION COUNT: 1973

Convictions	Number of Accidents	Number of Drivers	Accidents/ Driver	"Times as Many"
0	11	27	0.407	1.00
1	8	17	0.407	1.16
2	5	6	0.833	2.05
3	6	5	1.200	2.95
4 or more	<u>8</u>	<u>6</u>	<u>1.200</u>	<u>2.95</u>
Total	38	61	0.623/Driver	

The calculated differential accident rates by conviction count shows that the motorcycle driver who had 0 convictions three years prior had 0.407 accidents per driver or 40.7 accidents per 100 drivers while those in the 3 or more category had 1.2 accidents per driver or 120 accidents per 100 drivers. Thus, the accidents for the later group is three times that of the 0 conviction rate.

20.0 Drivers Record of Other Motor Vehicle Driver:

Driving records of the other motor vehicle driver involved in fatal motorcycle accidents were also analyzed and results revealed that 34% had at least 1 accident 3 years prior record. Analysis of conviction record also showed that 34% had at least 1 conviction during the same time period. This is shown in the following tabulation:

NUMBER OF OTHER DRIVERS INVOLVED IN FATAL
ACCIDENTS WITH 0,1,2,3 OR MORE ACCIDENTS BY CONVICTION COUNT (3 YEARS
PRIOR): IOWA, 1973

Convictions \ Accidents	0	1	2	3	4	Total Drivers	%
0	23	6	2	-	-	31	66.0
1	7	3	1	1	-	12	25.5
2	1	1	1	1	-	4	8.5
3	-	-	-	-	-	-	-
Total Drivers	31	10	4	2	-	47	
% Distribution	66.0	21.2	8.5	4.2	-	100.0	

Differential accident rate by conviction count for the other motor vehicle driver were:

Convictions	Number of Accidents	Number of Drivers	Accidents/Driver	"Times as Many"
0	10	31	0.32	1.00
1	8	12	0.67	2.09
2	6	4	1.50	4.69
3	-	-	-	No Data
4 or more	-	-	-	No Data
Total	24	47	0.51	

21.0 Comparison of Driving History of Motorcycle Drivers and Other Motor Vehicle Drivers Involved in Fatal Accidents in 1973: (3 years prior record)

Analysis of conviction rates and accidents rates for the two groups of drivers showed that although the motorcycle drivers were of younger age (median age = 20), records show that their rates per driver were 1.3 and 0.62 respectively. This is in contrast with the conviction and accident rate of the other motor vehicle driver which were of older age (median = 32 years) calculated to be 0.43 and 0.51 respectively.^{1/}

^{1/} Median age of Iowa drivers in 1972 was 38.4 years.

Hence, motorcycle drivers involved in fatal accidents in 1973 had approximately three times as many convictions and one and one fifth times as many accidents as the other motor vehicle driver.

It should be noted that in both cases, as the number of convictions increase the frequency of accidents increased but the manner of increase is different for the two groups.^{1/} This is shown in Chart 22.

22.0 Motorcycle Death Rates (Deaths per 10,000 Registrations): Iowa, 1960-1973

Shown below are death rates per 10,000 motorcycle registrations for the past 14 years.

<u>Year</u>	<u>Deaths</u>	<u>Registrations</u>	<u>Death Rate</u>
1960	7	11,668	6.32
1961	7	11,959	5.85
1962	7	12,552	7.97
1963	11	13,962	7.88
1964	12	17,141	7.00
1965	19	25,778	7.37
1966	33	32,643	10.10
1967	26	37,645	6.90
1968	35	41,982	8.34
1969	28	48,293	5.79
1970	43	60,835	7.06
1971	41	78,902	5.20
1972	66	97,354	6.78
1973	72	118,545	6.07

^{1/} These include convictions which were accident related, more or less inflates the data.

By applying a 5 year moving average on the data, the amount of variation tends to reduce, thus smoothing out extreme fluctuations, thereby leaving the trend movement.

The graph of the 5 year moving average for the years 1960 through 1973 is shown in Chart 23. The graph indicates a slight decline in death rate which does not mean that motorcycle accidents are not a serious problem. However, this may indicate the effects of special licensing requirements to operate a motorcycle since this law was implemented on March 15, 1968.

23.0 Conclusion:

It was shown in this study that motorcycle registrations in Iowa increased at a geometric rate and this is associated with an increase in fatal accidents and injury accidents.

There is no doubt that when a motorcycle is involved in an accident, the likelihood that injury or death will result is greater than for other motor vehicles.

Causes of death in fatal motorcycle accidents listed head injury as the most serious single cause of death. One of the most publicized control measures recommended to prevent or reduce head injury in motorcycle accidents is the use of the helmet. It is not possible to evaluate the effectiveness of helmet use with reference to head injury for those wearing or not wearing helmets but this will be available when the new Iowa accident form is implemented.

The results showed significant findings in the role of age, skill in operating a cycle, experience and vehicle familiarity as important factors correlated with motorcycle accidents.

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2. Motorcycle Accidents in New York in 1972", Department of Motor Vehicles, State of New York.
3. An Abstract of the California Motorcycle Study Sacramento , Department of Motor Vehicles, California.
4. A Motorcycle Accident Study, 1970 , California Highway Patrol
5. Some Epidimiologic Features of Motorcycle Injury in a California Community , Drs. Jess F. Kraus, Richard S. Riggins, Walter Drysdale and Charles E. Fraute.
6. The Extent of Bodily Injury to Motorcycle Riders , Insurance Studies Center, Drake University.
7. Motorcycles: Random Particles in the Traffic Stream , Thomas L. McDole, The University of Michigan, Highway Safety Research Institute.

TABLE 1: NUMBER OF MOTORCYCLE REGISTRATIONS, FATAL ACCIDENTS,
FATALITIES AND TOTAL ACCIDENTS: IOWA, 1960-1973

Year	Motorcycle Registrations	Fatal Accidents		Total Accidents
		Number	Fatalities	
1960	11,668	7	7	269
1961	11,959	7	7	257
1962	12,552	7	7	302
1963	13,962	11	11	418
1964	17,141	12	12	579
1965	25,778	19	19	1,041
1966	32,643	33	33	1,227
1967	37,645	26	26	1,181
1968	41,982	33	35	1,194
1969	48,293	26	28	1,176
1970	60,835	40	43	1,512
1971	78,902	41	41	1,835
1972	97,354	61	66	2,287
1973	118,545	68	72	2,925

TABLE 2: DISTRIBUTION OF MOTORCYCLE DRIVERS AND OTHER MOTOR
 VEHICLE DRIVERS INVOLVED IN FATAL ACCIDENTS BY AGE GROUP:
 IOWA, 1971-1973

Age	Motorcycle Drivers		Other M.V. Drivers	
	Number	%	Number	%
16 & under	26	14.3	124	4.0
17-19	51	28.0	442	14.2
20-24	56	30.8	580	18.6
25-34	28	15.4	568	18.2
35-44	12	6.6	405	13.0
45-54	5	2.7	390	12.5
55-64	1	0.5	267	8.6
65 & up	1	0.5	319	10.2
Unknown	2	1.1	21	0.7
Total	182	100.0%	3116	100.0%

TABLE 3: DISTRIBUTION OF LICENSED DRIVERS

QUALIFIED TO OPERATE A MOTORCYCLE: 1973

Age Group	Number	% Distribution
13 & 14	2	<u>1/</u>
15	26	0.02
16	4,236	2.71
17	7,983	5.10
18	9,730	6.22
19	10,648	6.81
20	10,176	6.50
21	9,978	6.38
22	9,603	6.14
23	8,600	5.50
24	7,729	4.94
25-29	27,490	17.57
30-34	16,280	10.41
35-39	10,921	6.98
40-44	8,636	5.52
45-49	6,716	4.29
50-54	4,028	2.58
55-59	2,127	1.36
60-64	978	0.63
65-69	381	0.24
70-74	122	0.08
75 & up	<u>47</u>	<u>0.03</u>
Total	156,437	100.00

1/ Less than 0.01%.

TABLE 4: MOTORCYCLE OCCUPANT DEATHS

BY MODEL YEAR AND BY MONTH: 1972

Model Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1973	-	-	-	-	-	-	-	-	-	-	1	-	1
1972	-	1	1	-	4	3	7	8	1	2	1	-	28
1971	-	-	-	-	2	1	3	-	3	2	-	-	11
1970	-	-	2	1	1	1	-	-	1	1	-	-	7
1969	-	-	-	-	1	1	1	-	1	-	-	-	4
1968	-	-	-	-	-	1	-	-	-	2	-	-	3
1967	-	-	-	-	-	1	2	-	-	-	-	-	3
Before 1967	<u>-</u>	<u>-</u>	<u>-</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>9</u>
Total	-	1	3	3	10	10	14	10	6	7	2	-	66

TABLE 5: MOTORCYCLE OCCUPANT DEATHS
 BY MODEL YEAR AND BY MONTH: 1973

Model Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1973	-	-	-	5	1	4	3	6	1	2	-	-	22
1972	-	-	2	4	1	4	2	6	2	-	1	-	22
1971	-	-	-	-	2	2	2	4	-	1	-	-	11
1970	-	-	-	1	2	-	1	2	-	-	-	-	6
1969	-	-	-	-	-	-	-	1	-	-	-	-	1
1968	-	-	-	1	-	-	-	-	-	1	-	-	2
1967	-	-	-	-	-	-	-	-	-	-	-	-	-
Before 1967	<u>1</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>1</u>	<u>4</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>8</u>
Total	1	-	2	12	6	11	12	19	3	4	2	-	72

TABLE 6: VIOLATIONS OF MOTORCYCLE DRIVERS INVOLVED IN SINGLE MOTORCYCLE
 FATAL ACCIDENTS: IOWA, 1971-1973^{1/}

Violations	1971		1972		1973		1971-1973	
	No.	%	No.	%	No.	%	No.	%
Drinking	3	30.0	9	42.9	6	40.0	18	39.1
Not Under Control	3	30.0	6	28.6	5	33.3	14	30.4
Speed Too Fast	2	20.0	4	19.0	3	20.0	9	19.6
None	1	10.0	1	4.8	-	-	2	4.3
Ran Stop Sign	-	-	1	4.8	-	-	1	2.2
Not Stated	1	10.0	-	-	1	6.7	2	4.3
Total	10	100.0	21	100.0	15	100.0	46	100.0

^{1/} Details do not always add up to 100.0% due to rounding.

TABLE 7: VIOLATIONS OF MOTORCYCLE DRIVER AND OTHER MOTOR VEHICLE DRIVER INVOLVED
IN FATAL ACCIDENTS: IOWA, 1971-1973^{1/}

Motorcycle Driver			Other Motor Vehicle Driver													
Violations	No.	%	No Violations		Had Been Drinking		Speed Too Fast		Failed To Yield		Improper Turn		Improper Passing		Others	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No Violations	49	39.5	5	10.2	12	24.5	1	2.0	20	40.8	4	8.2	1	2.0	6	12.2
Speed Too Fast	14	39.5	9	64.3	-	-	1	7.1	1	7.1	2	14.3	-	-	1	7.1
Failed To Yield	12	9.7	12	100.0	-	-	-	-	-	-	-	-	-	-	-	-
Drove Left of Center	6	4.8	4	66.7	-	-	-	-	-	-	-	-	-	-	2	33.3
Improper Passing	1	.8	1	100.0	-	-	-	-	-	-	-	-	-	-	-	-
Had Been Drinking	14	11.3	8	57.1	3	21.4	-	-	2	14.3	-	-	-	-	1	7.1
Not Under Control	5	4.0	3	60.0	1	20.0	-	-	-	-	-	-	-	-	1	20.0
Ran Stop Sign	8	6.4	7	87.5	-	-	-	-	-	-	-	-	-	-	1	12.5
Others Not Stated	15	12.1	5	33.3	1	6.7	-	-	2	13.3	2	13.3	-	-	5	33.3
Total	124	100.0	54	-	17	-	2	-	25	-	8	-	1	-	17	-
% Distribution		100.0%		43.5%		13.7%		1.6%		20.2%		6.4%		.8%		13.7%

^{1/} Details do not always add up to 100.0% due to rounding.

TABLE 8: NUMBER OF FATAL MOTORCYCLE ACCIDENTS BY CHARACTER OF ROADWAY: IOWA, 1971-1973

Character of Roadway	Total		Type of Accident			
			Motorcycle and Other Motor Vehicle		Single Motorcycle	
	Number	%	Number	%	Number	%
Intersection	72	42.4	67	54.0	5	10.9
Straight	37	21.8	24	19.4	13	28.3
Curve	33	19.4	9	7.3	24	52.2
Driveway & Other	28	16.5	24	19.4	4	8.7
Total	170	100.0% ^{1/}	124	100.0% ^{1/}	46	100.0% ^{1/}

^{1/}Details do not always add up to 100.0% due to rounding

TABLE 9: FREQUENCY OF INTERSECTION FATAL MOTORCYCLE ACCIDENTS BY DRIVER ACTIONS: IOWA, 1971-1973

Driver Actions	Year				
	1971	1972	1973	1971-1973	%
1. Car attempted to make a left turn and pulled into path of motorcycle	4	15	12	31	39.7
2. Car backing or pulled out of driveway	-	2	1	4	5.1
3. Motorcycle not under control	-	6	1	8	10.3
4. Motorcycle failed to stop, struck car who stopped before making a left turn	-	2	-	2	2.6
5. Car pulled away from stop sign in front of motorcycle	2	3	9	14	17.9
6. Car failed to see motorcycle	1	-	1	2	2.6
7. Motorcycle went thru stop sign	3	1	4	8	10.3
8. Other motorcycle or other driver actions	-	3	1	4	5.1
9. Car failed to stop, hit motorcycle at rear	1	3	1	5	6.4
10. Motorcycle side swiped by car	-	1	-	-	-
Total	11	36	31	78	100.0%

MC
Registrations
(1,000)

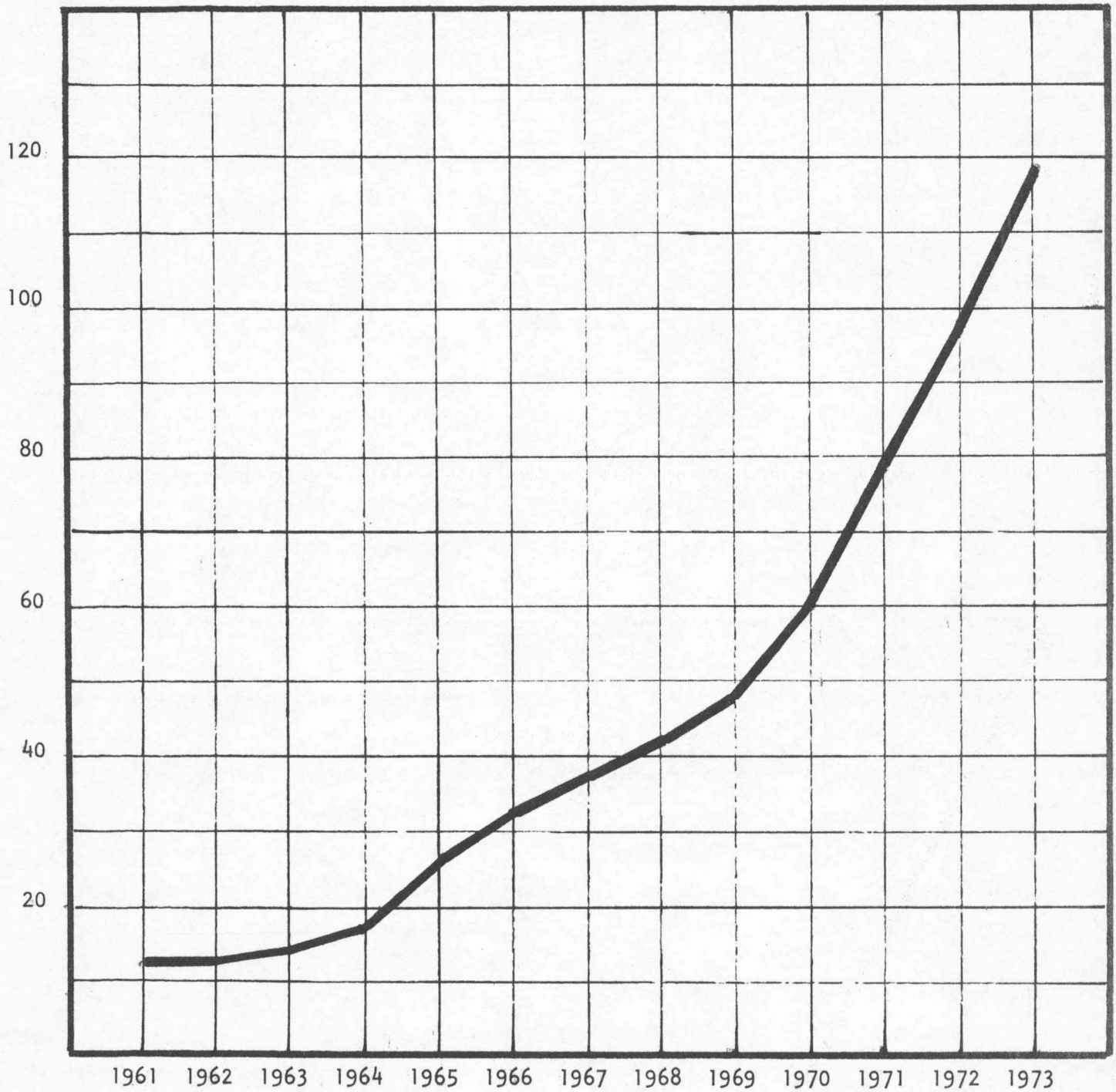


CHART 1: MOTORCYCLE REGISTRATIONS IN IOWA: 1961 - 1973

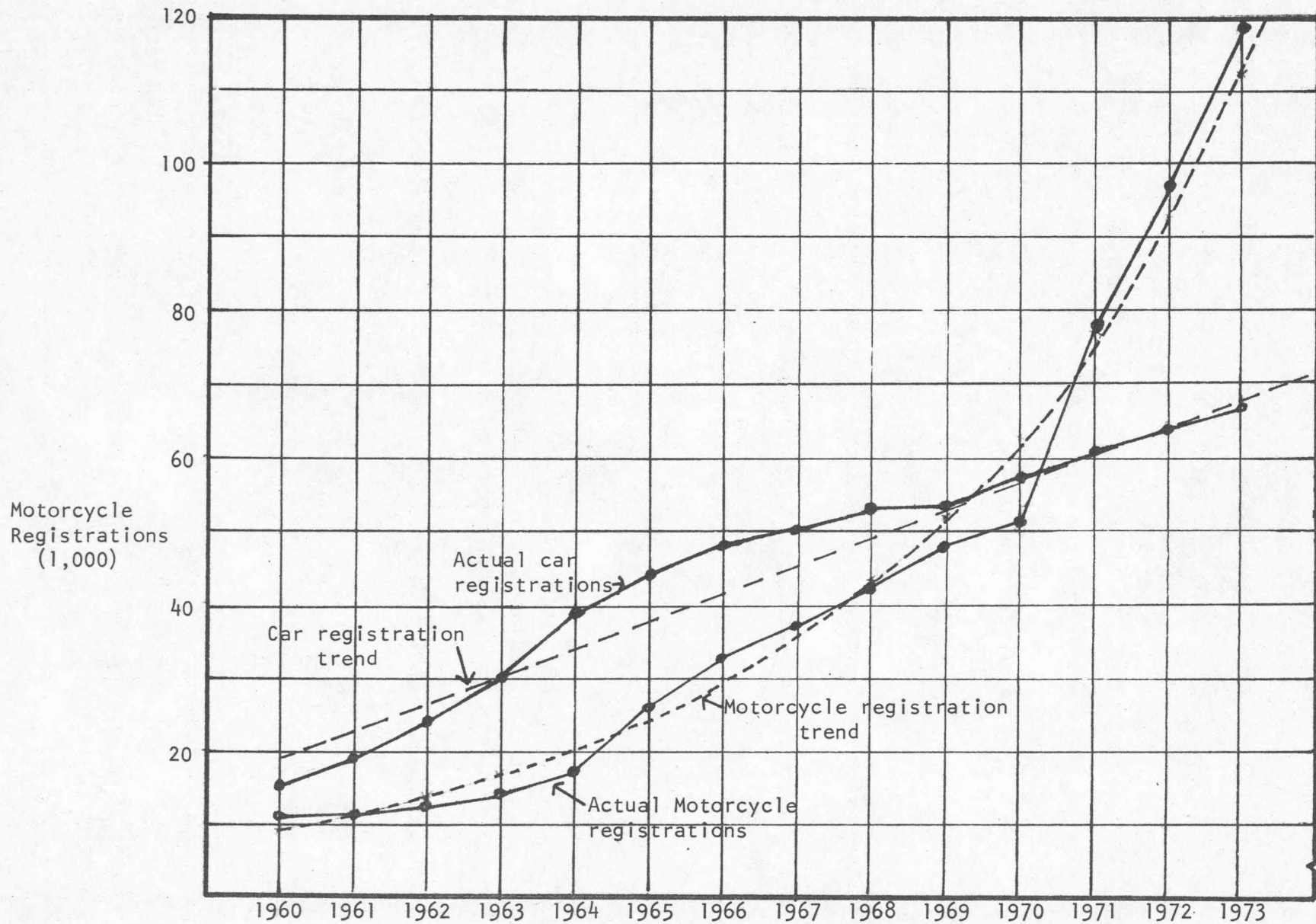


CHART 2: MOTORCYCLE AND CAR REGISTRATIONS, ACTUAL AND TREND:

IOWA, 1960-1973

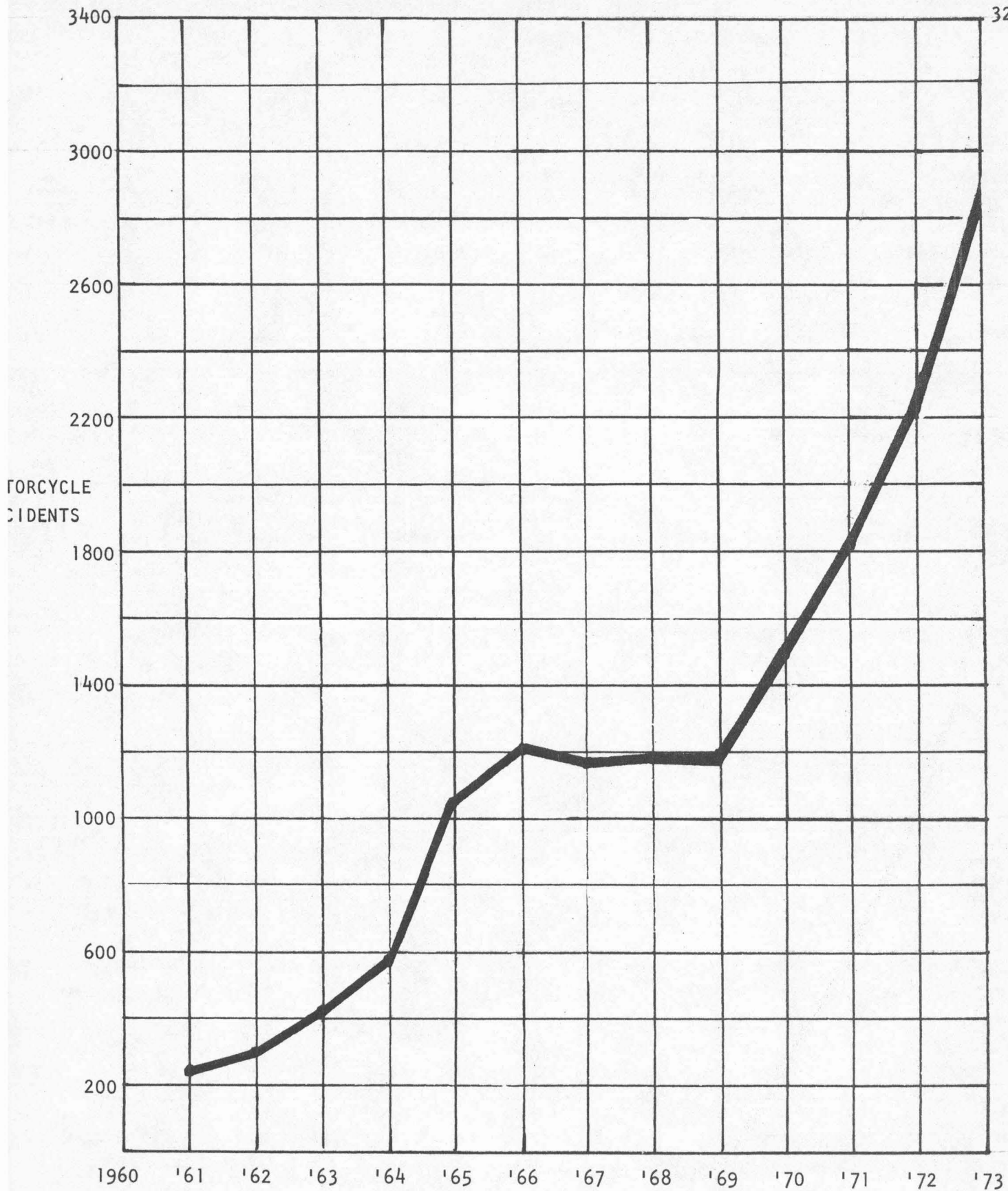


CHART 3: TOTAL NUMBER OF MOTORCYCLE ACCIDENTS: IOWA, 1960-1973(Jan.-Oct.)

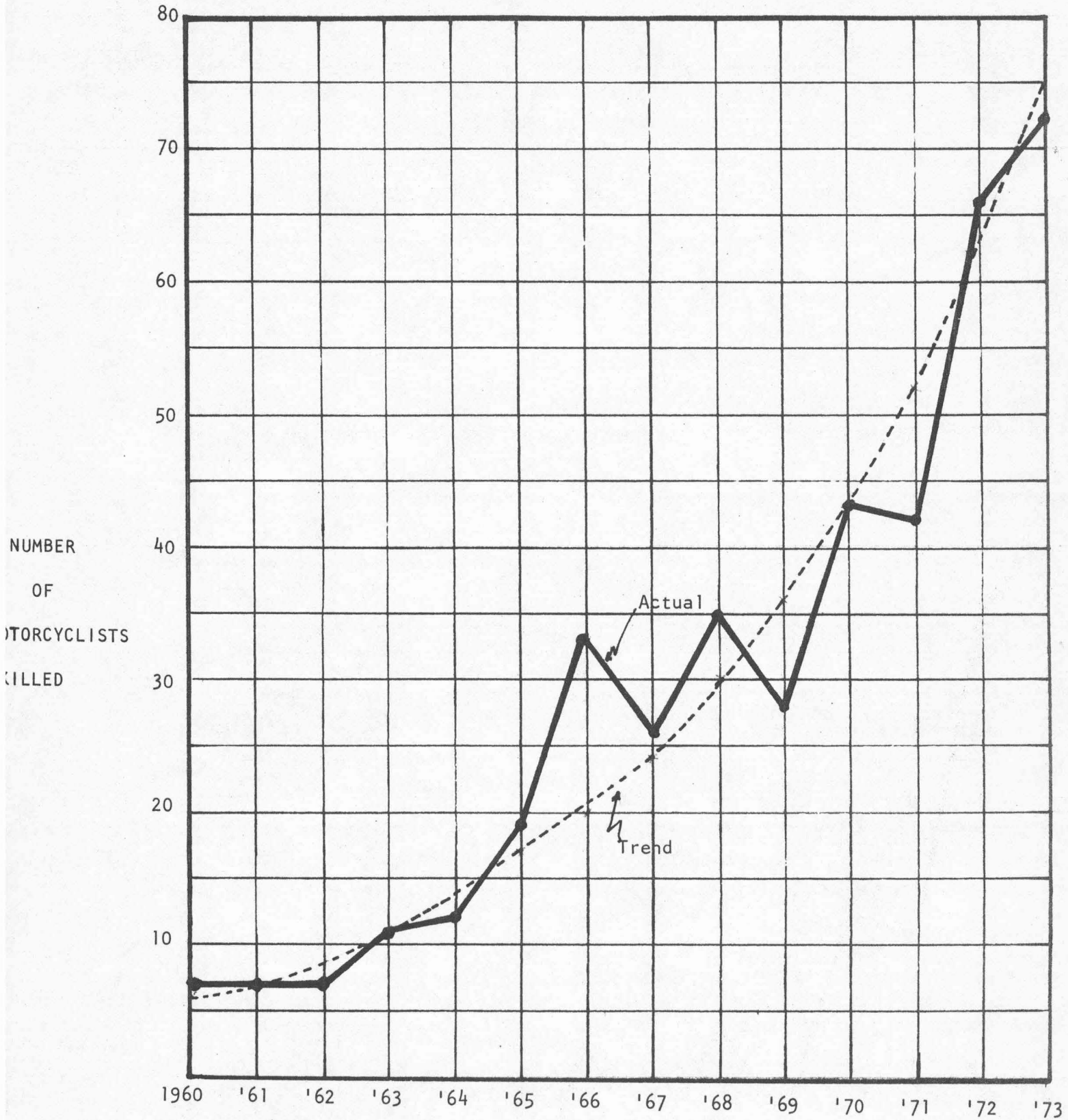


CHART 4: NUMBER OF MOTORCYCLE ACCIDENT FATALITIES: IOWA, 1960-1973

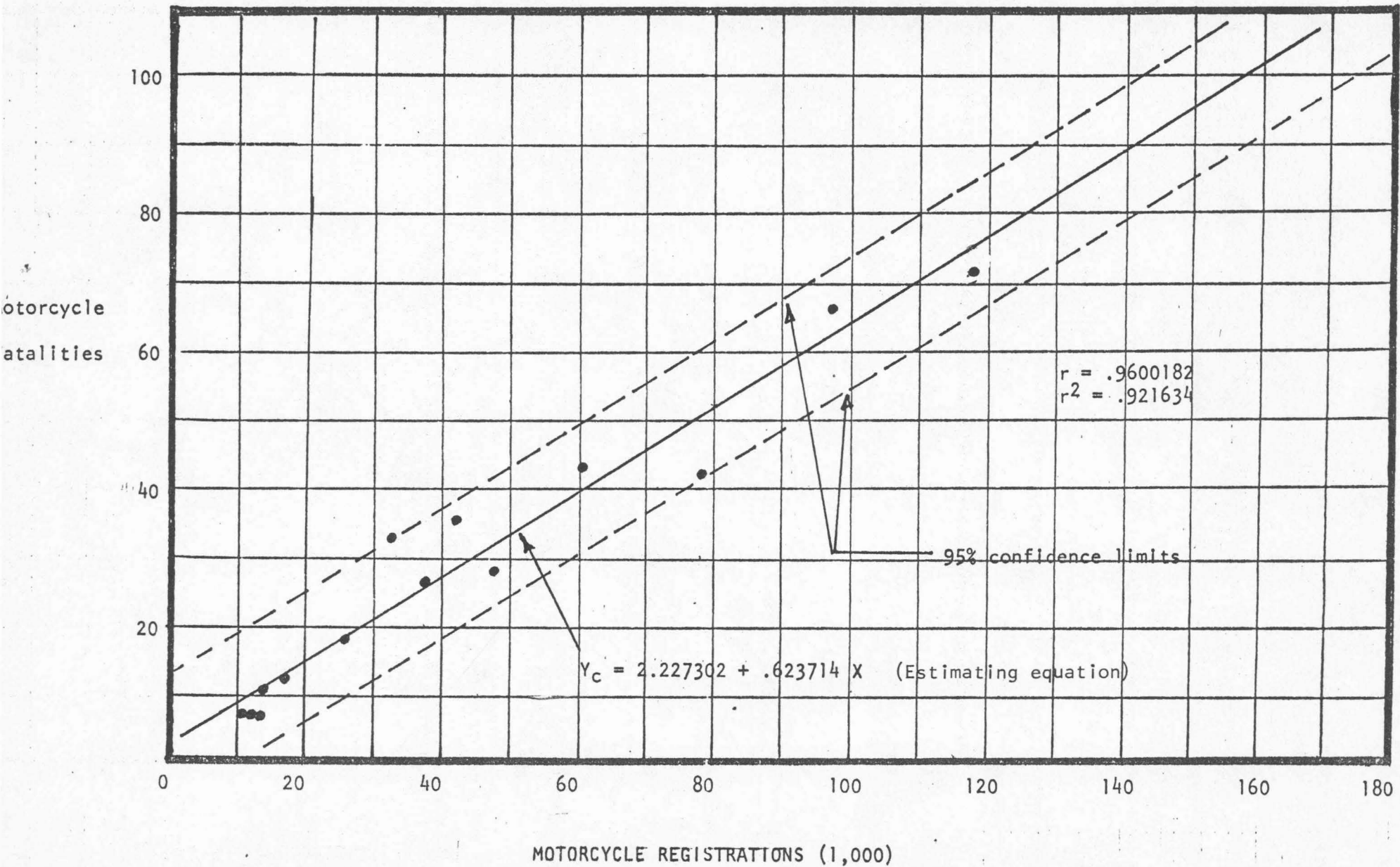
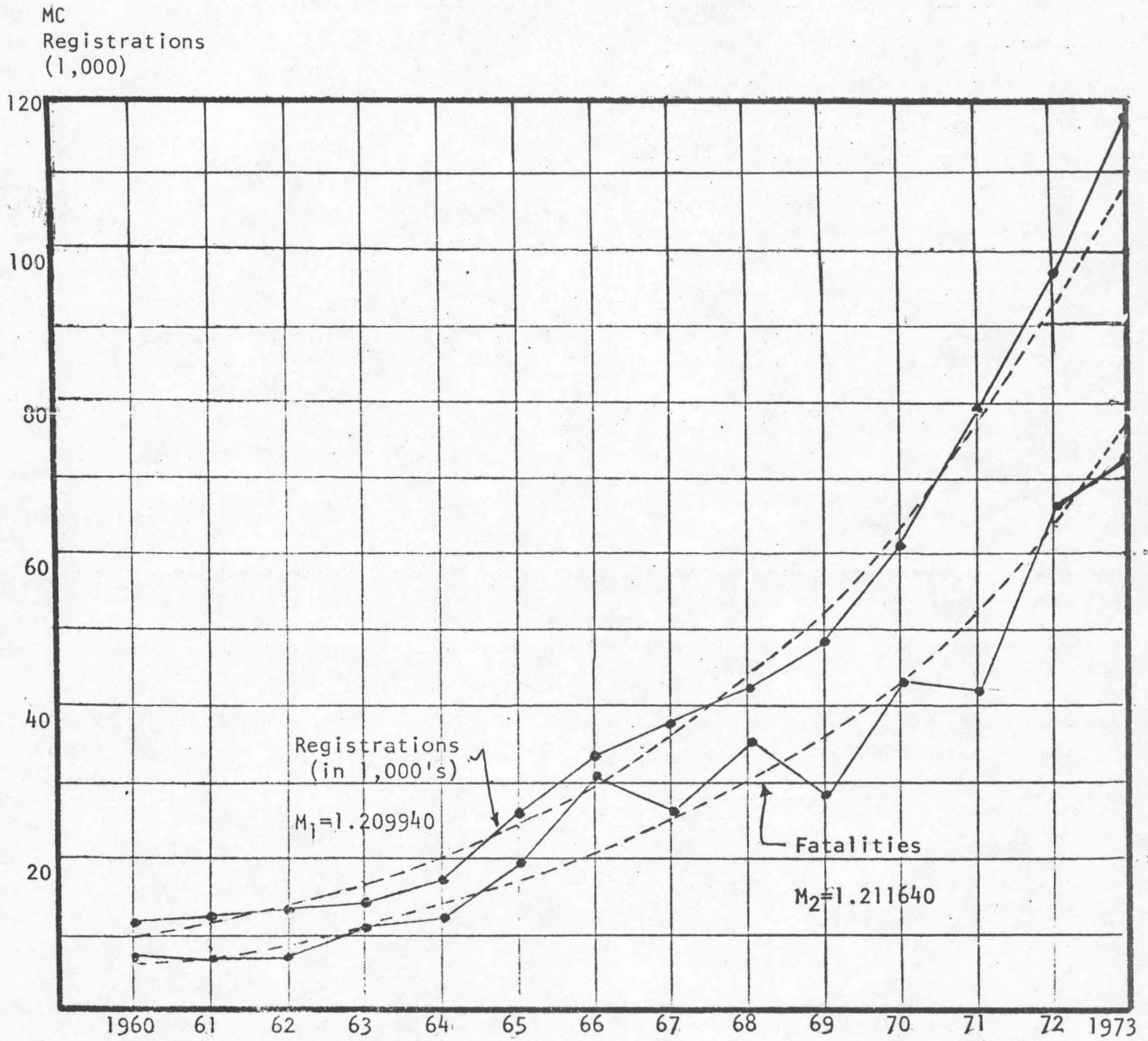


CHART 5: RELATIONSHIP BETWEEN MOTORCYCLE REGISTRATIONS AND MOTORCYCLE FATALITIES
IOWA: 1960-1972



HART 6: COMPARISON BETWEEN MOTORCYCLE REGISTRATION AND FATALITIES: IOWA, 1960-1973

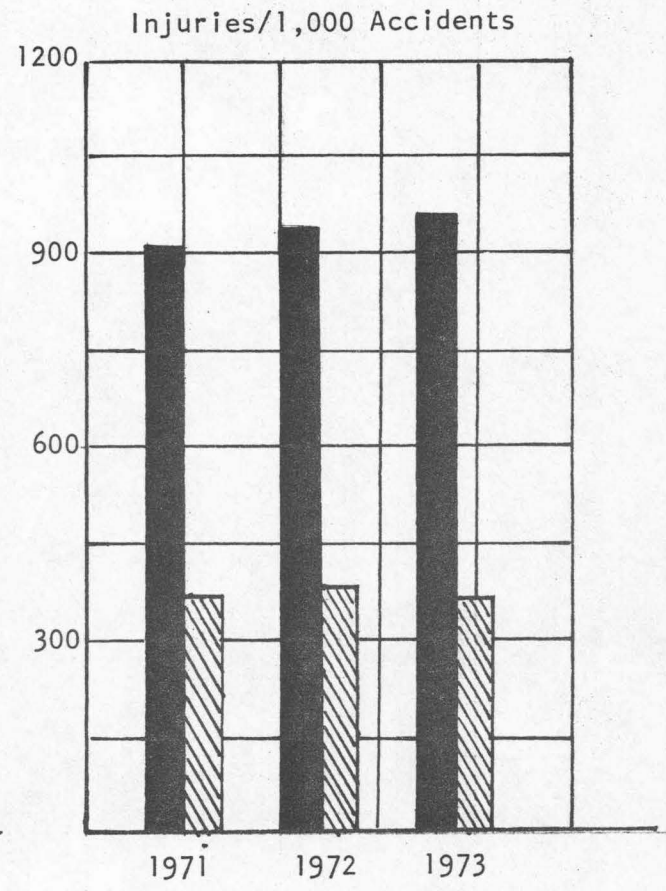
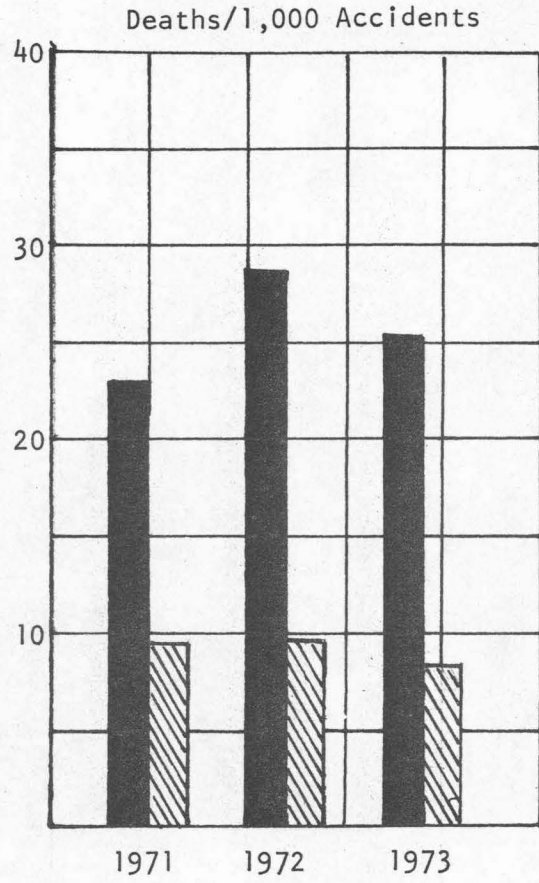
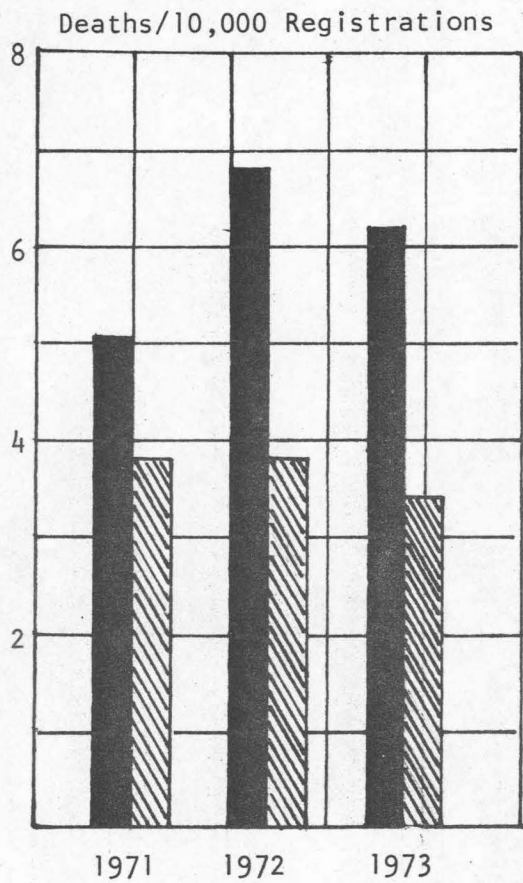
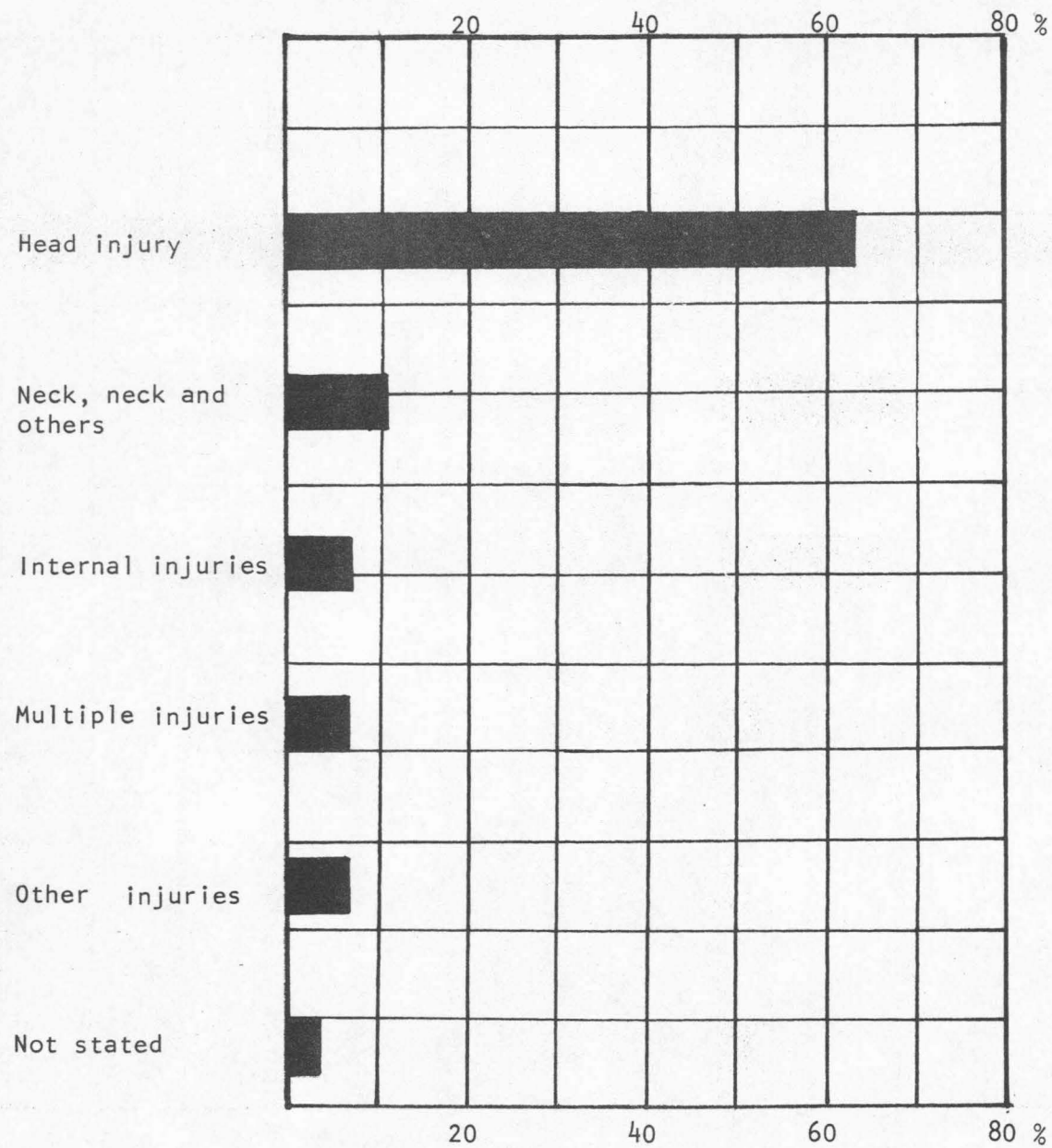


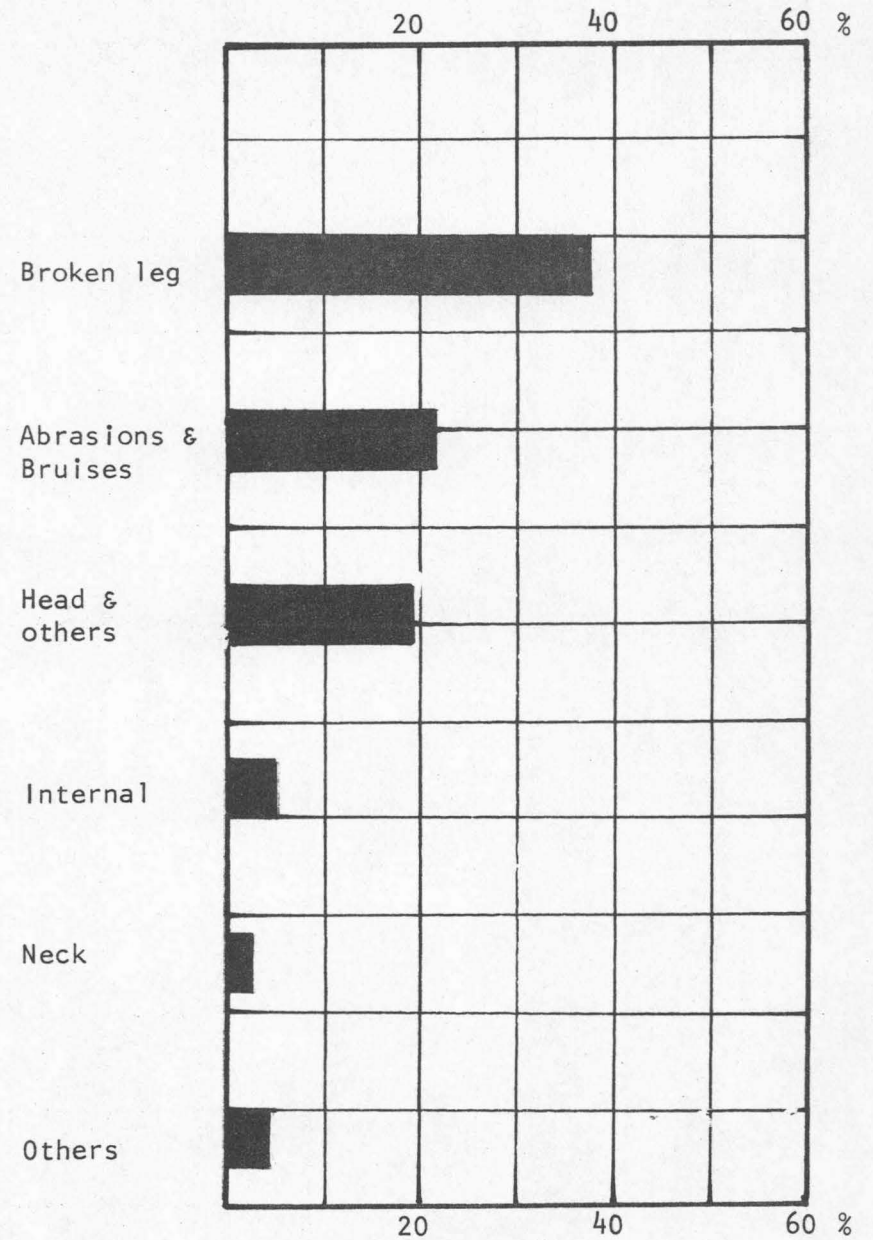
CHART 7: COMPARISON BETWEEN MOTORCYCLE AND ALL MOTOR VEHICLE ACCIDENT RATES:
IOWA; 1971-1973

Motorcycle
Motor Vehicle



CAUSES OF DEATH OF MOTORCYCLISTS
KILLED IN FATAL MOTORCYCLE ACCIDENTS

IOWA 1971-1973



INJURED MOTORCYCLISTS IN
FATAL MOTORCYCLE ACCIDENTS BY TYPE OF INJURY

IOWA 1971-1973

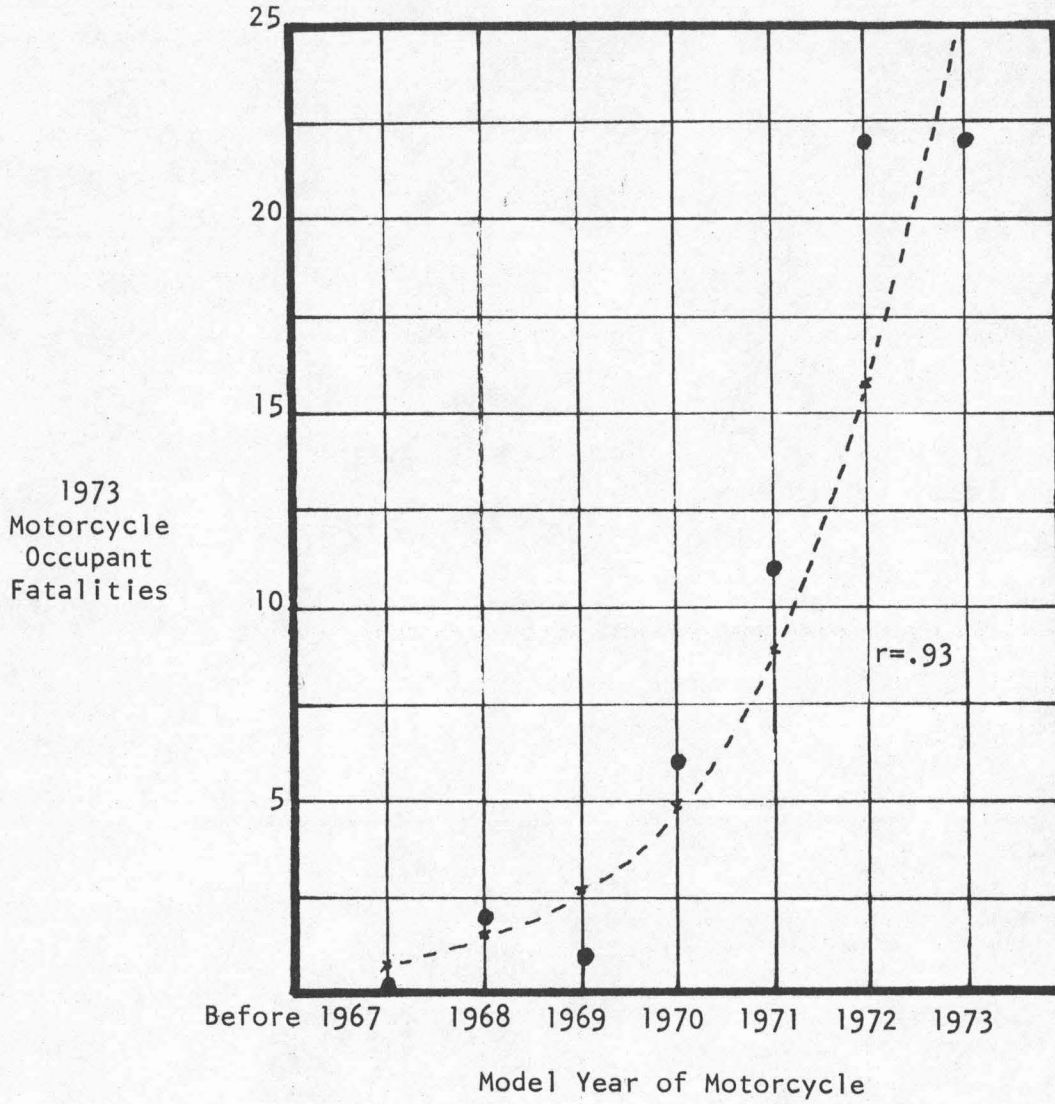
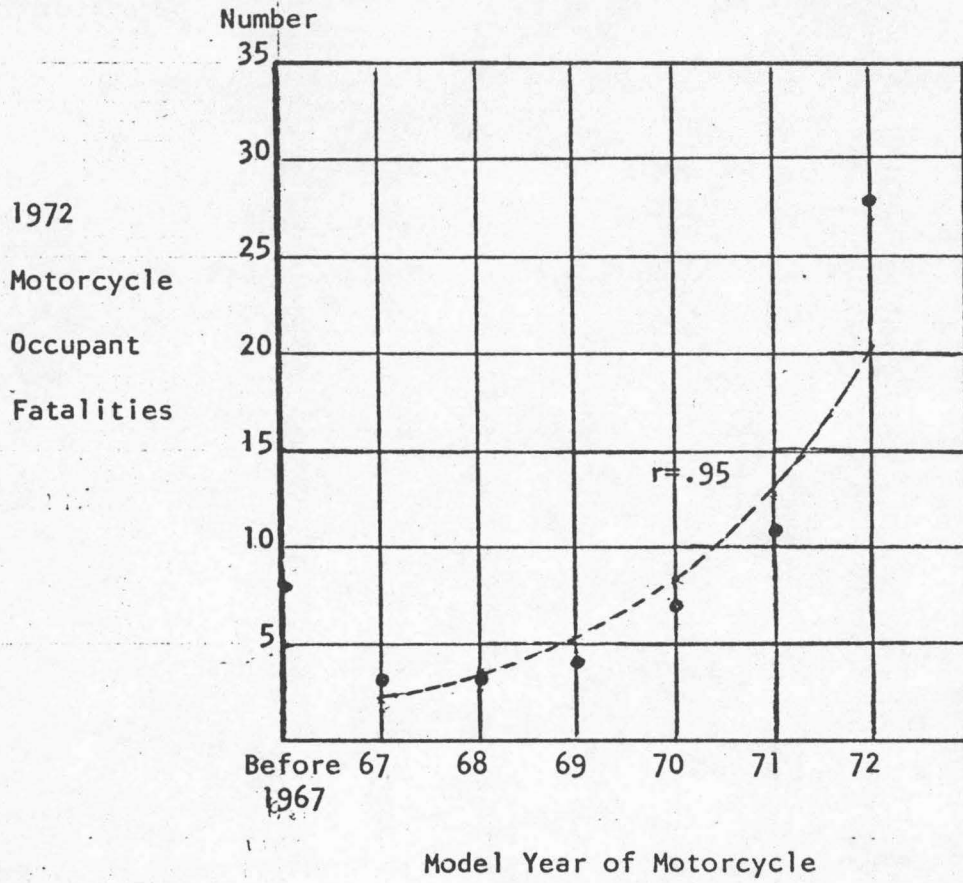


CHART 9: RELATIONSHIP BETWEEN MOTORCYCLE FATALITIES
AND MODEL YEAR OF MOTORCYCLE
IOWA, 1973



RELATIONSHIP BETWEEN MOTORCYCLE FATALITIES AND MODEL YEAR OF MOTORCYCLE: IOWA, 1972

CHART 10

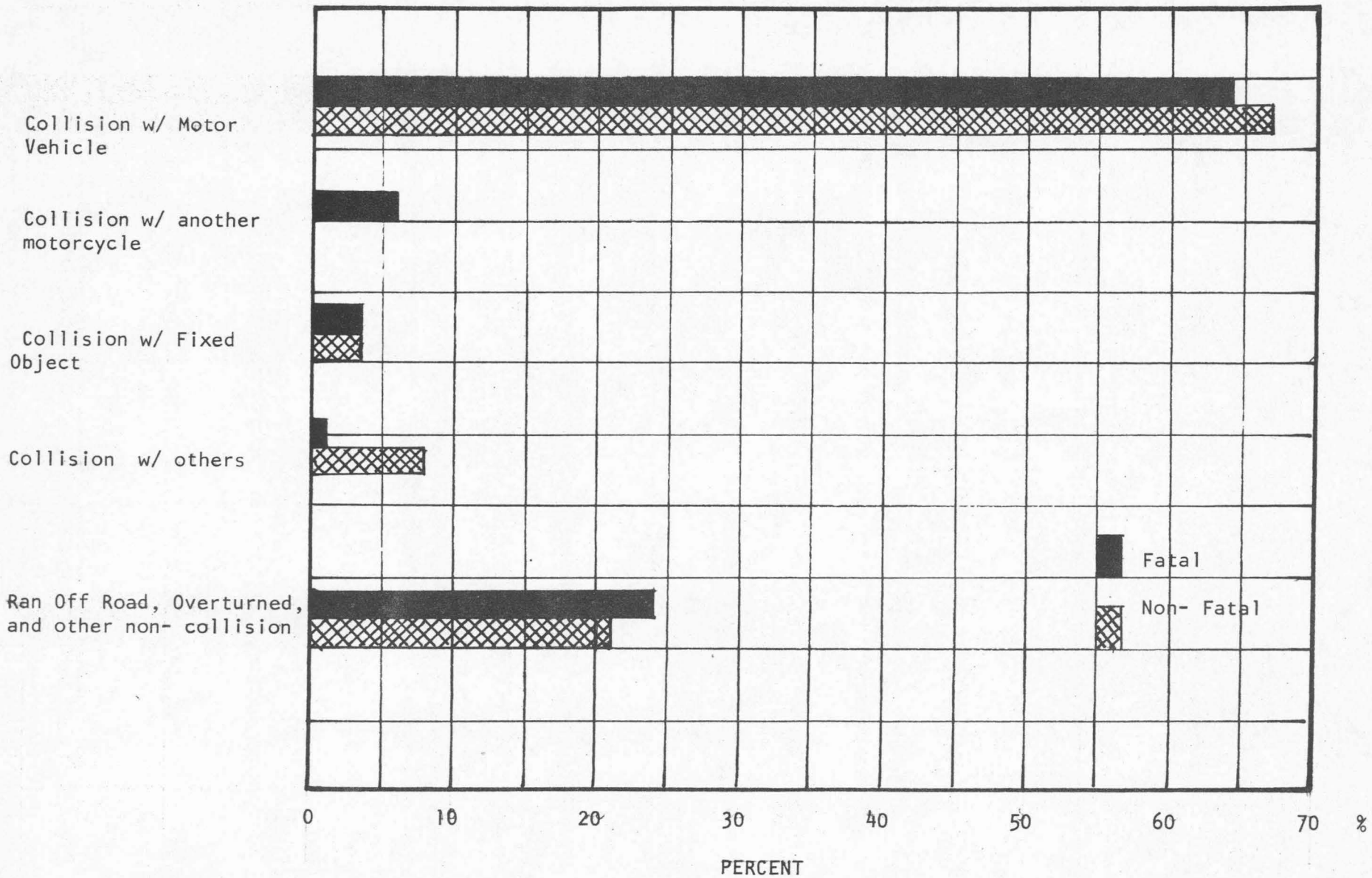
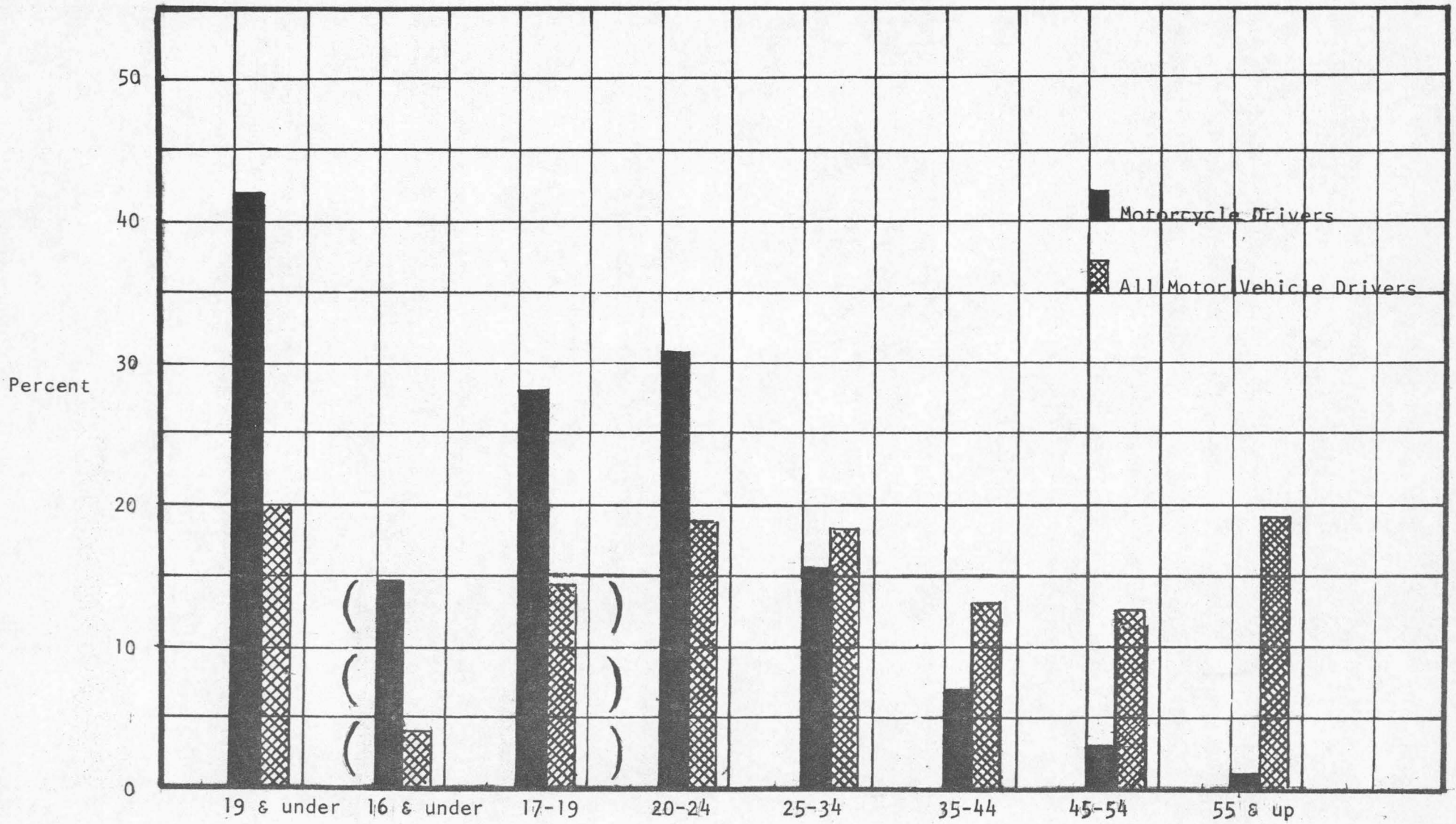


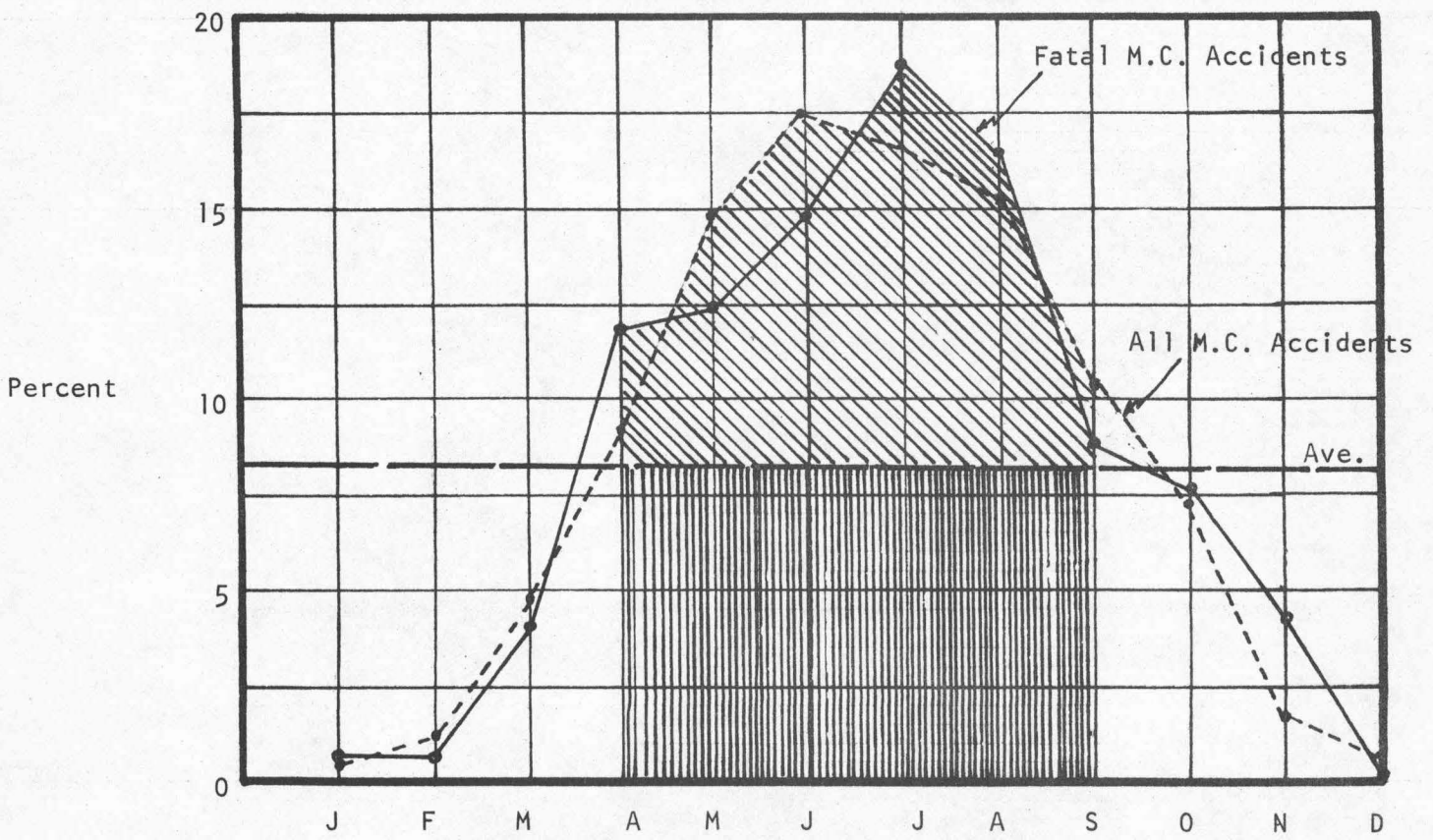
CHART 11: PERCENT DISTRIBUTION OF FATAL AND ALL MOTORCYCLE ACCIDENTS BY TYPE OF ACCIDENT
IOWA: 1971 - 1973



Percent Distribution of Motorcycle Drivers and All Motor Vehicle Drivers Involved in Fatal Accidents by Age: Iowa, 1971-1973

CHART 12

← "The season" →



Months of the Year
SEASON FOR MOTORCYCLING IN THE STATE

IOWA, 1971-1973

CHART 13

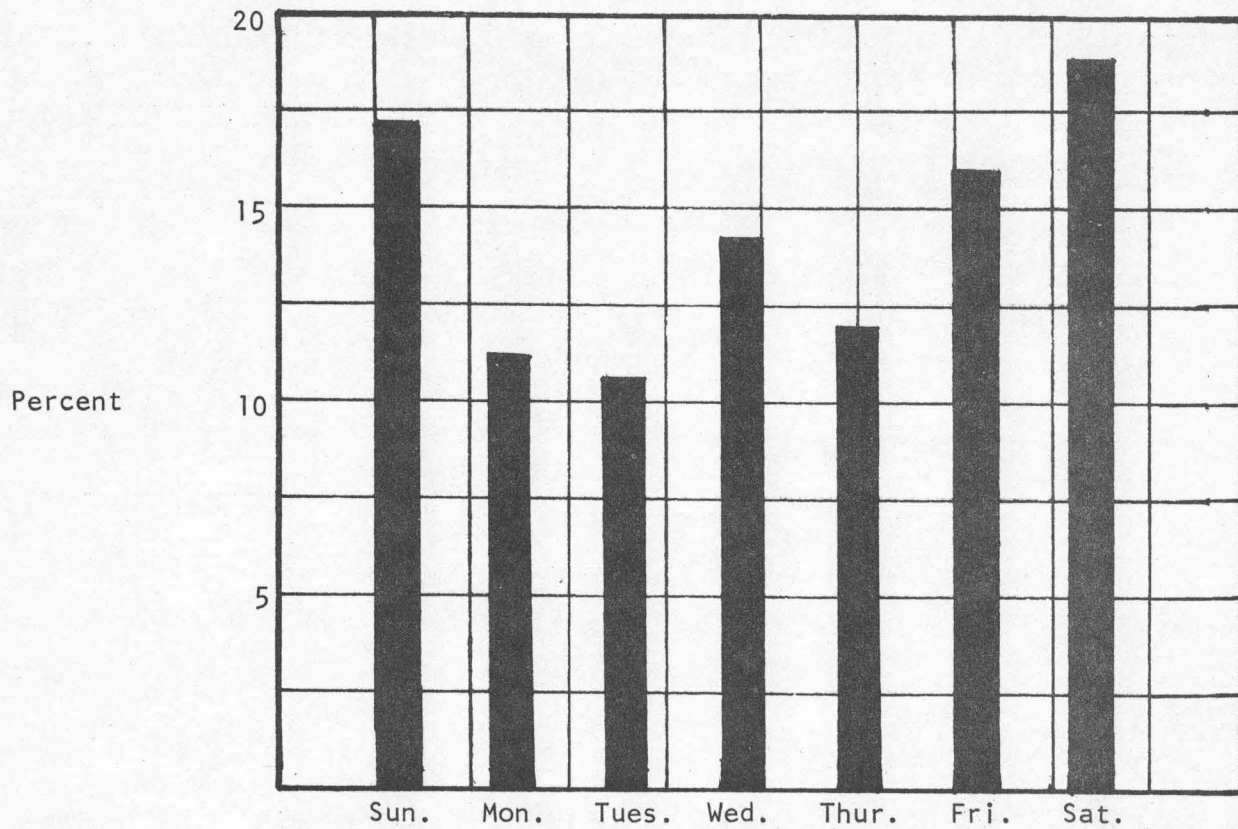


CHART 14: Percent Distribution of Fatal Motorcycle Accidents by Day of Week: Iowa, 1971-1973

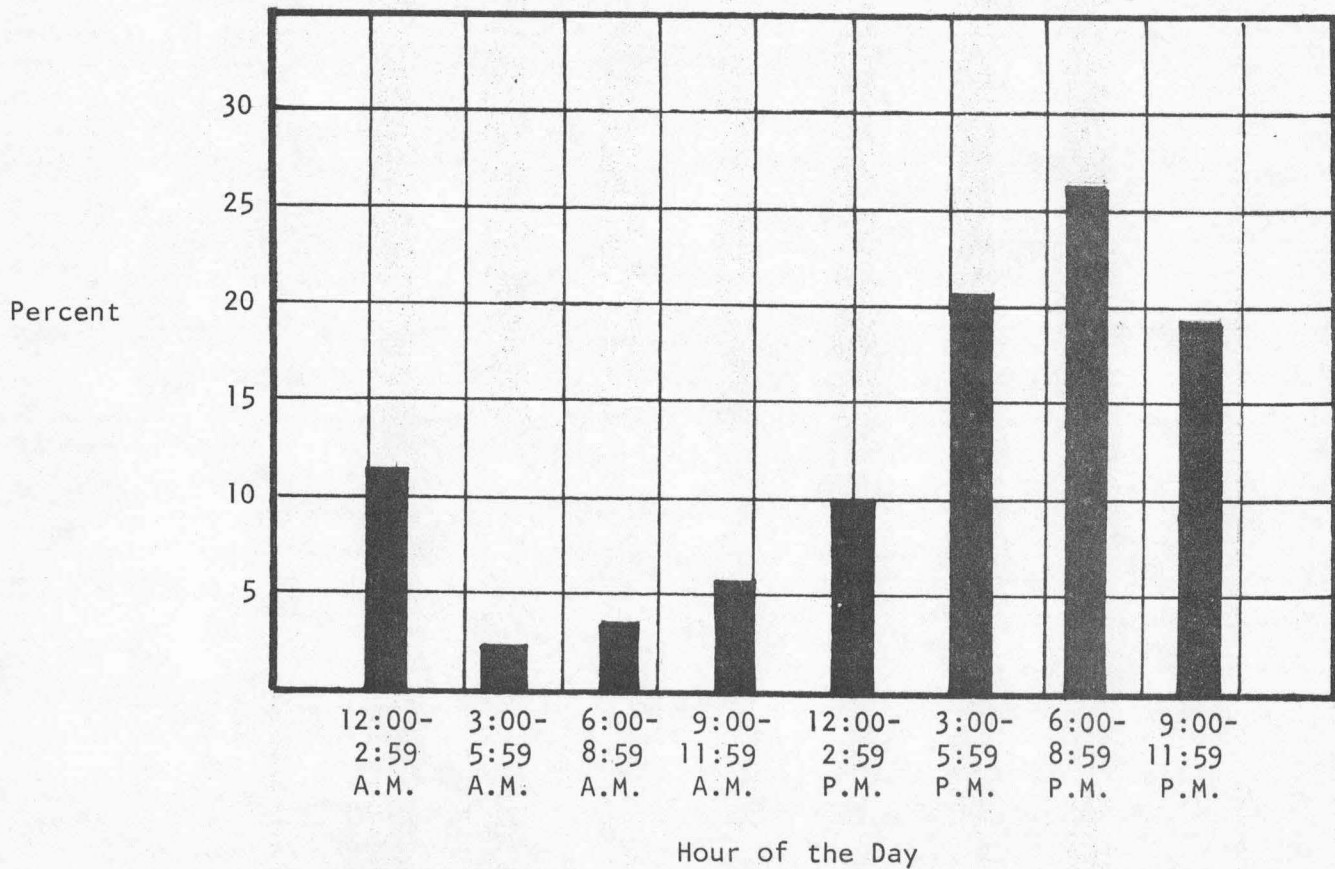


CHART 15: Percent Distribution of Fatal Motorcycle Accidents by Time of Day: Iowa, 1971-1973

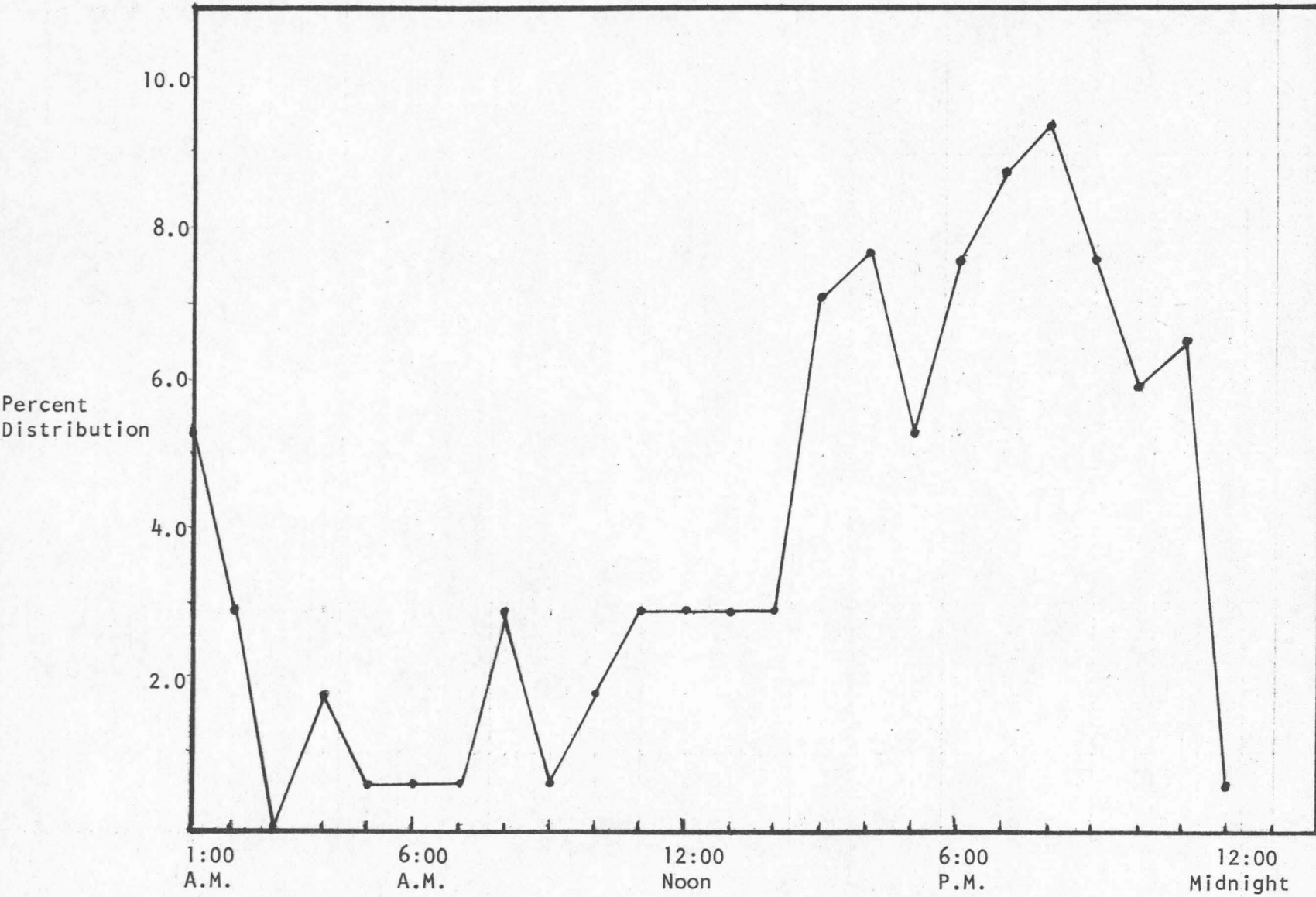
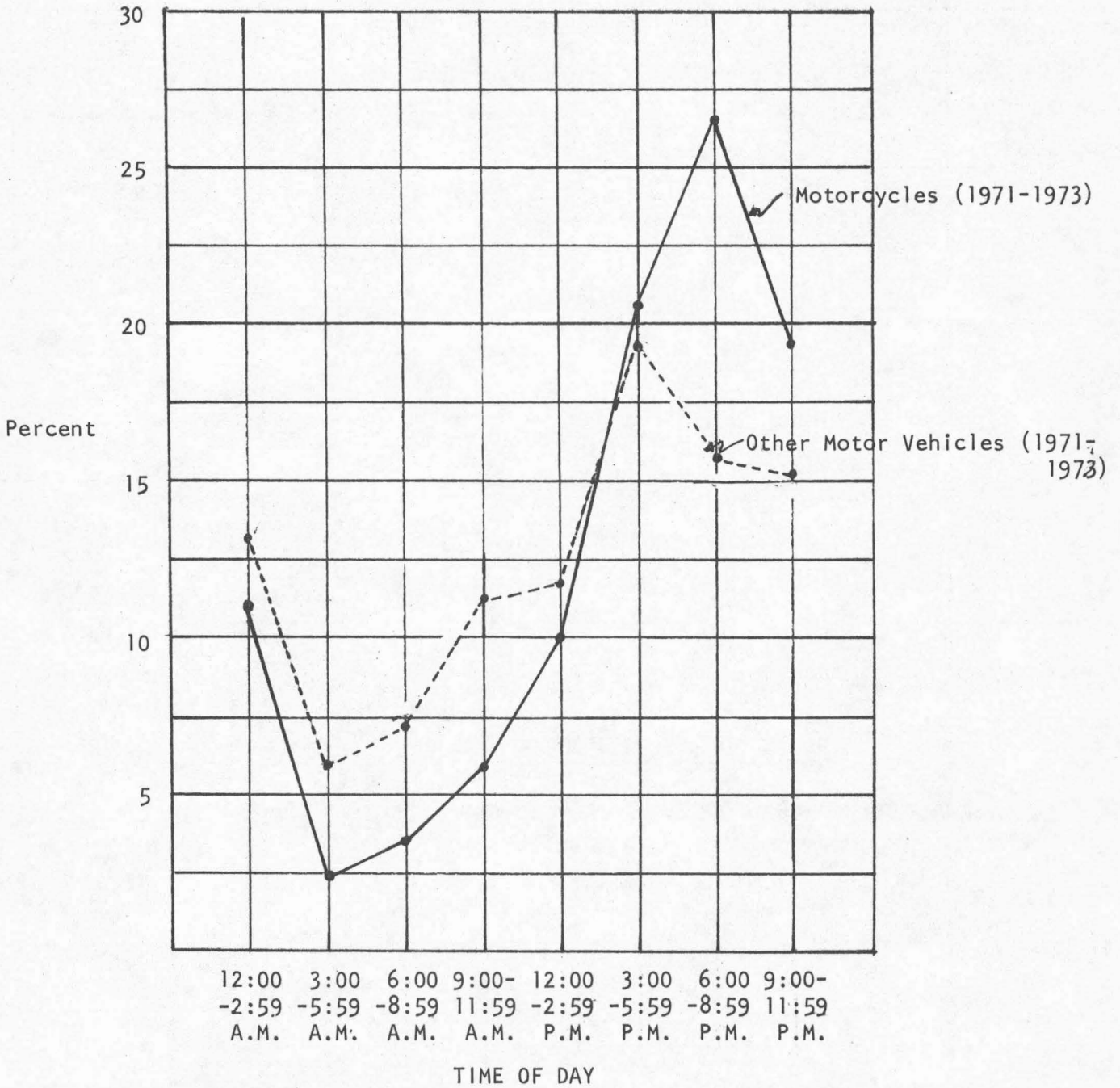


CHART 15A: FREQUENCY OF FATAL MOTORCYCLE ACCIDENTS BY HOUR OF DAY:

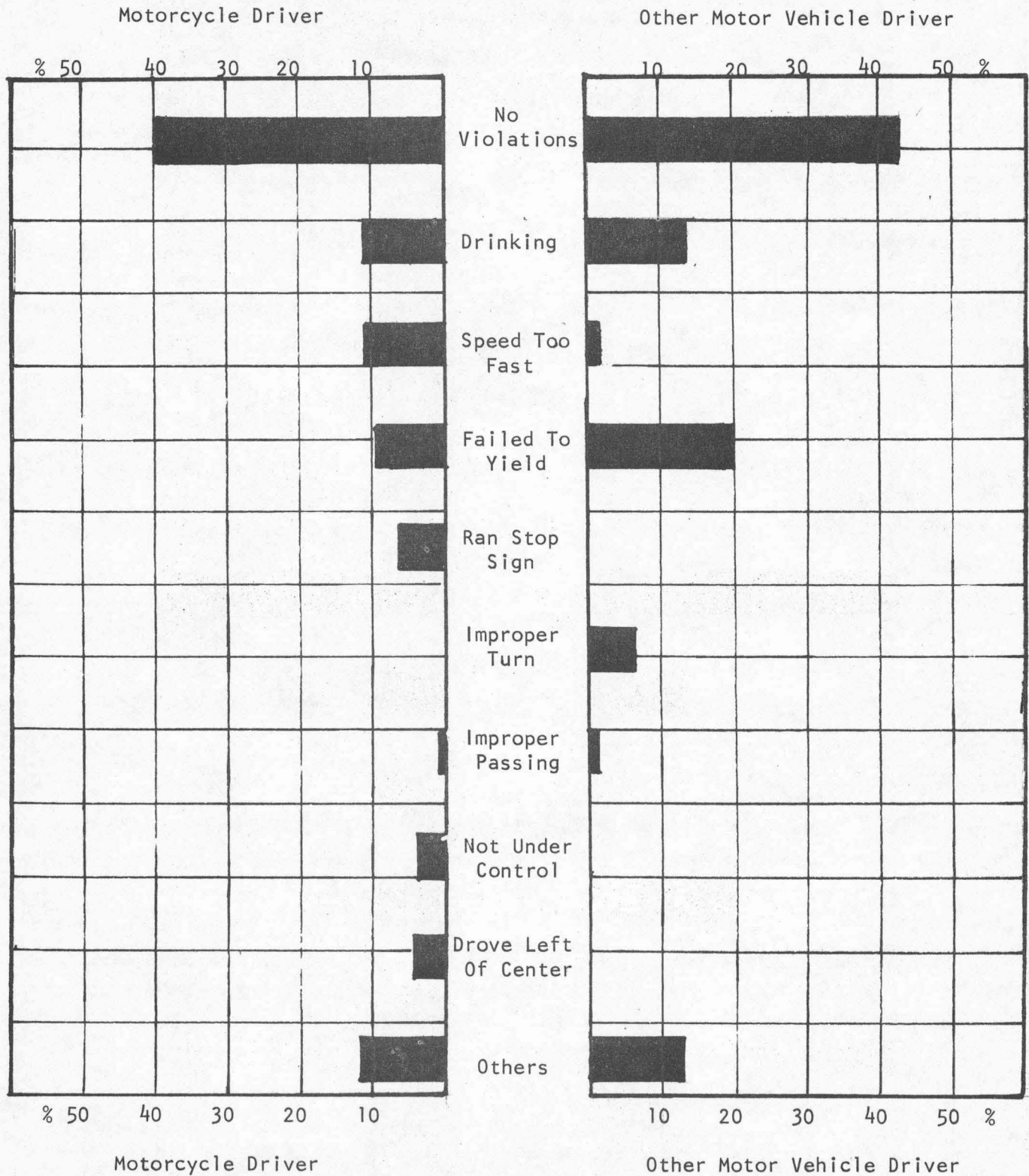
IOWA, 1971-1973

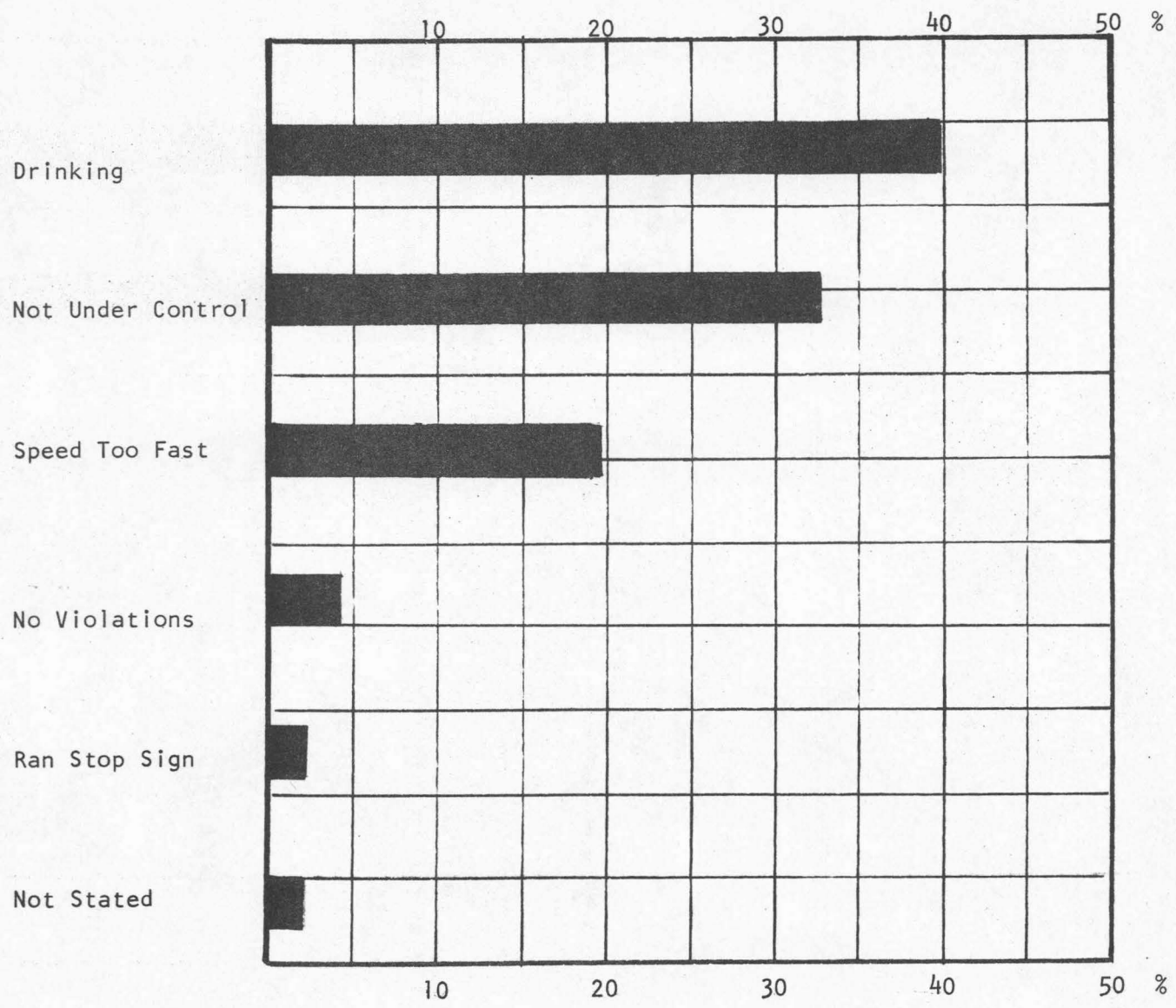


TRI-HOURLY PERCENT DISTRIBUTION OF MOTORCYCLE FATAL ACCIDENTS AND OTHER MOTOR VEHICLE ACCIDENTS: IOWA, 1971-1973 (MOTORCYCLE) AND 1971-1972 OTHER MOTOR VEHICLE ACCIDENTS

CHART 16

CHART 17: SUMMARY OF MOTORCYCLE DRIVER VIOLATIONS
AND OTHER MOTOR VEHICLE DRIVER VIOLATIONS
IN FATAL MOTORCYCLE ACCIDENTS: IOWA, 1971-1973

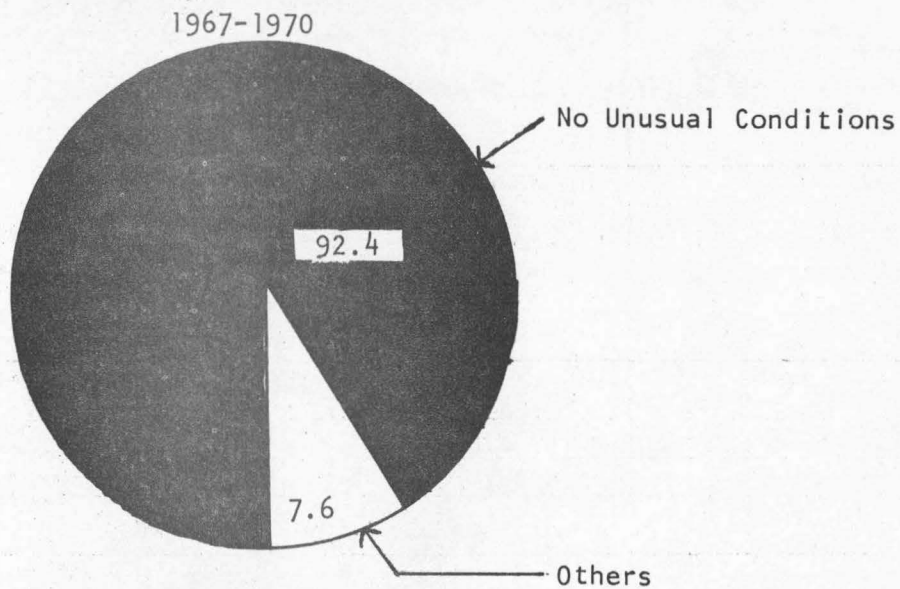




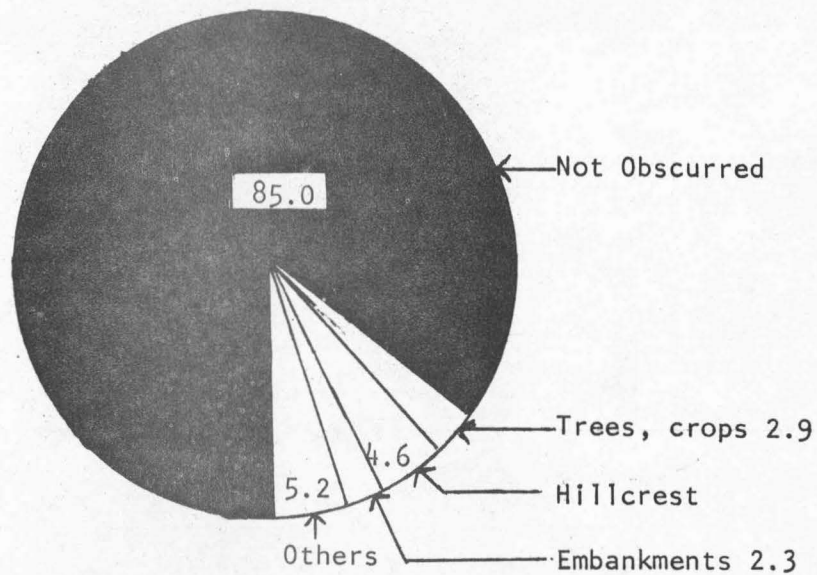
RANKED VIOLATIONS IN SINGLE MOTORCYCLE FATAL ACCIDENTS: IOWA, 1971-1973

CHART 18

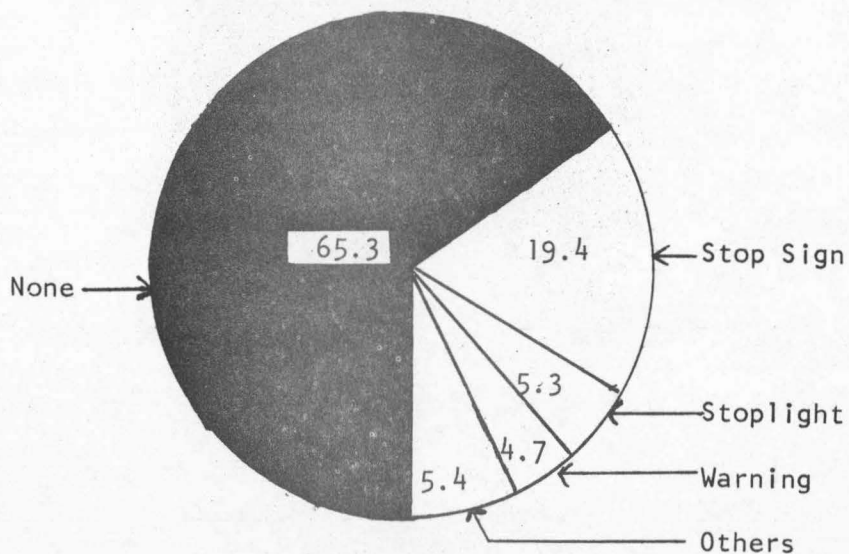
Road Conditions



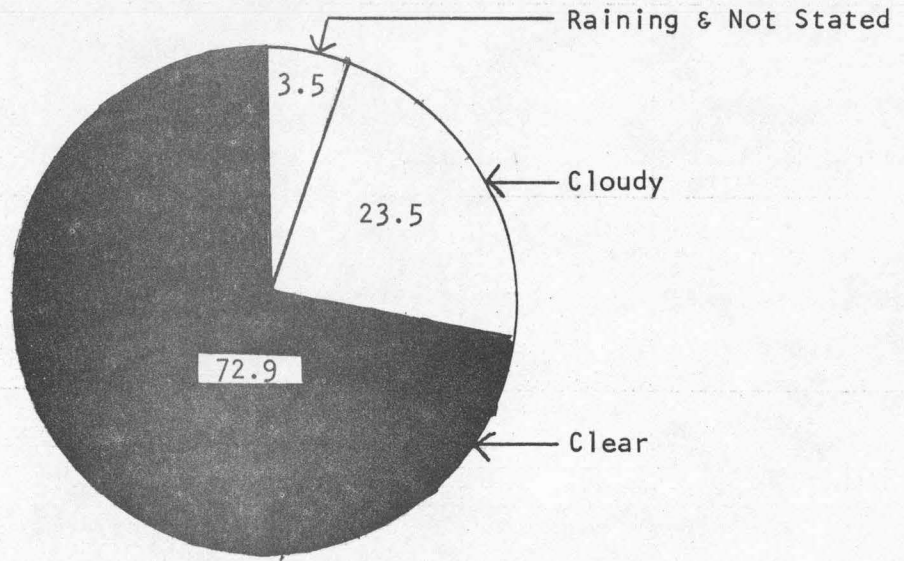
Vision Obscured



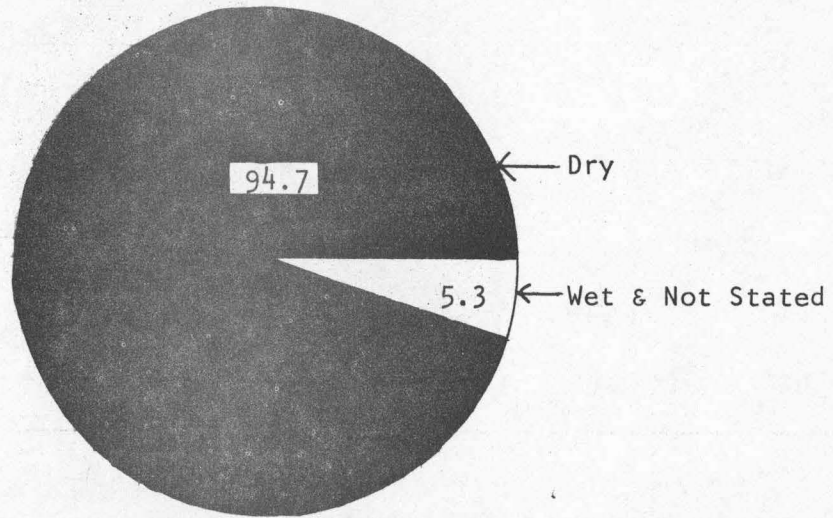
Traffic Control



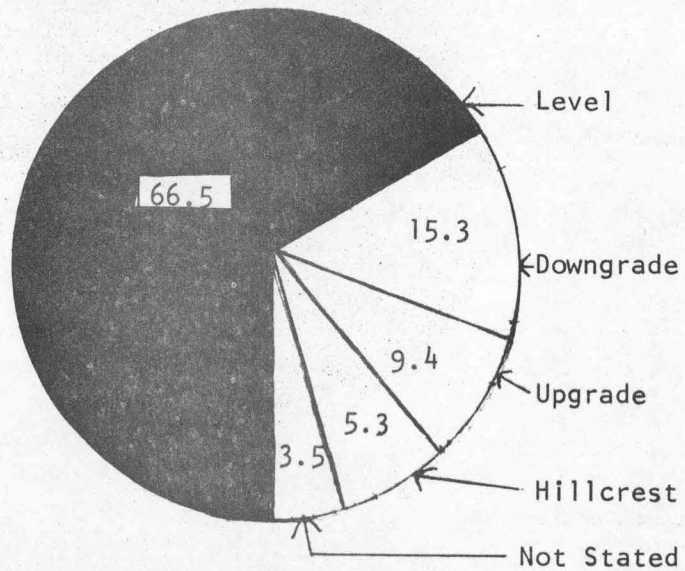
Weather

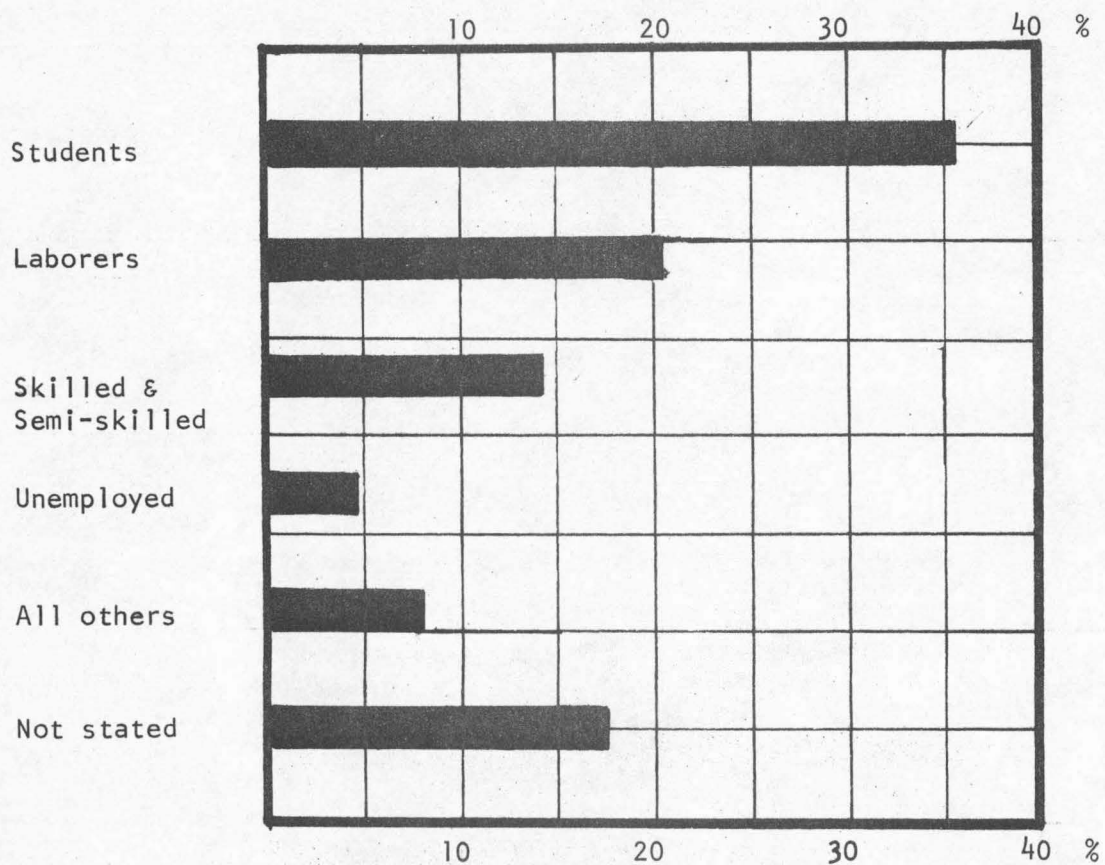


Surface Conditions



Gradient

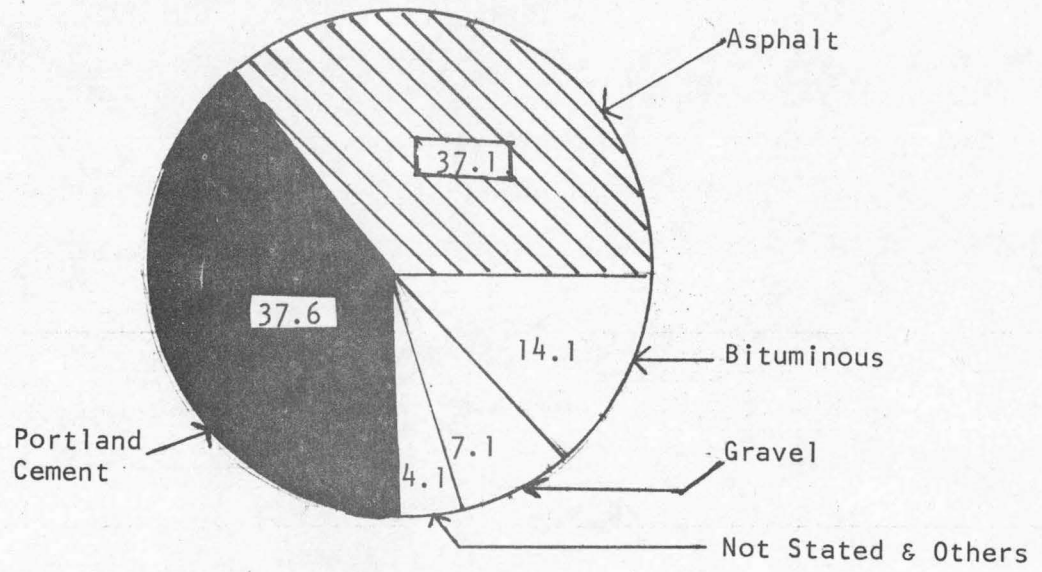




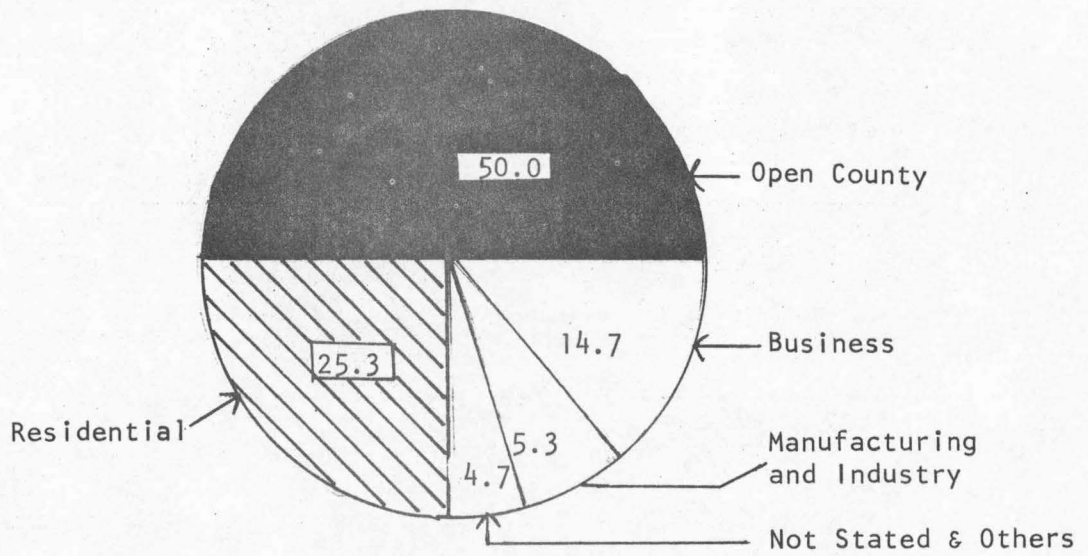
PERCENT DISTRIBUTION OF MOTORCYCLISTS
 KILLED IN FATAL MOTORCYCLE ACCIDENTS BY TYPE
 OF OCCUPATION: IOWA, 1971-1973

CHART 20

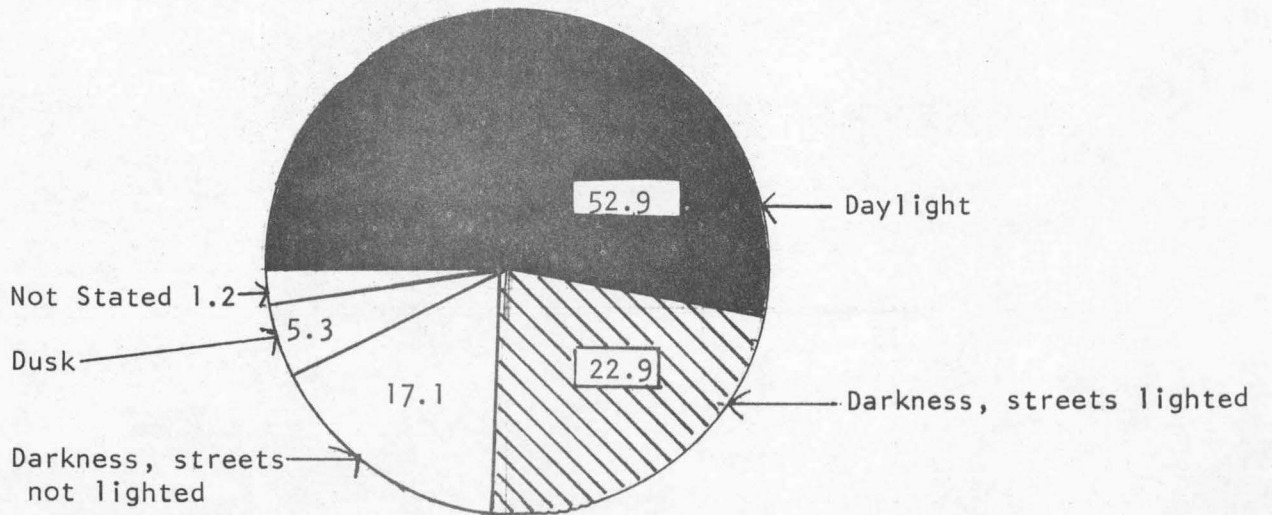
Surface Type

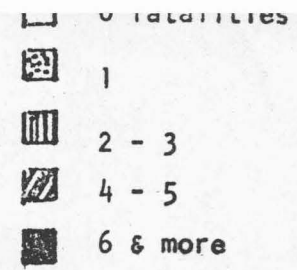


Kind of Locality

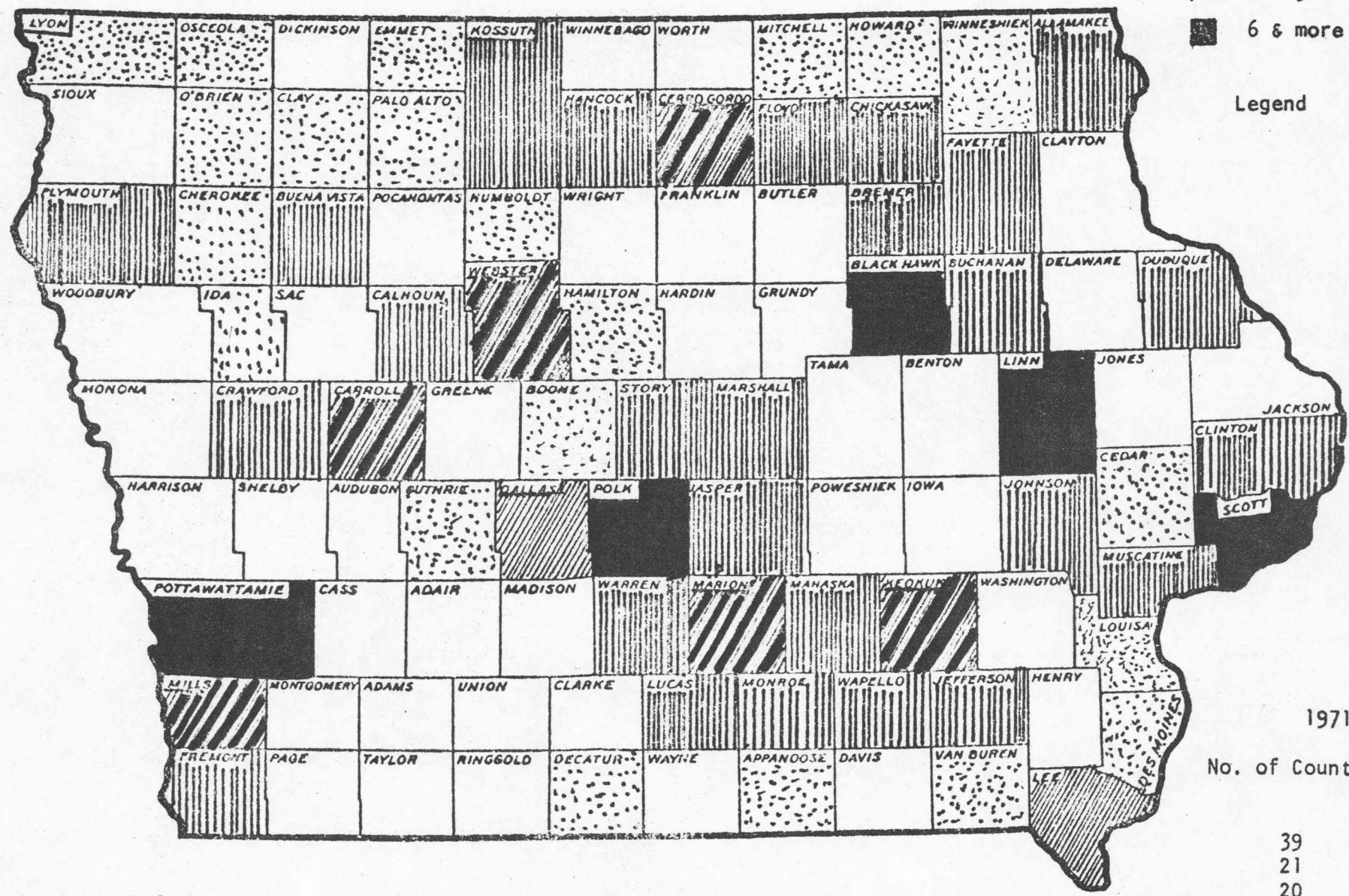


Light





Legend



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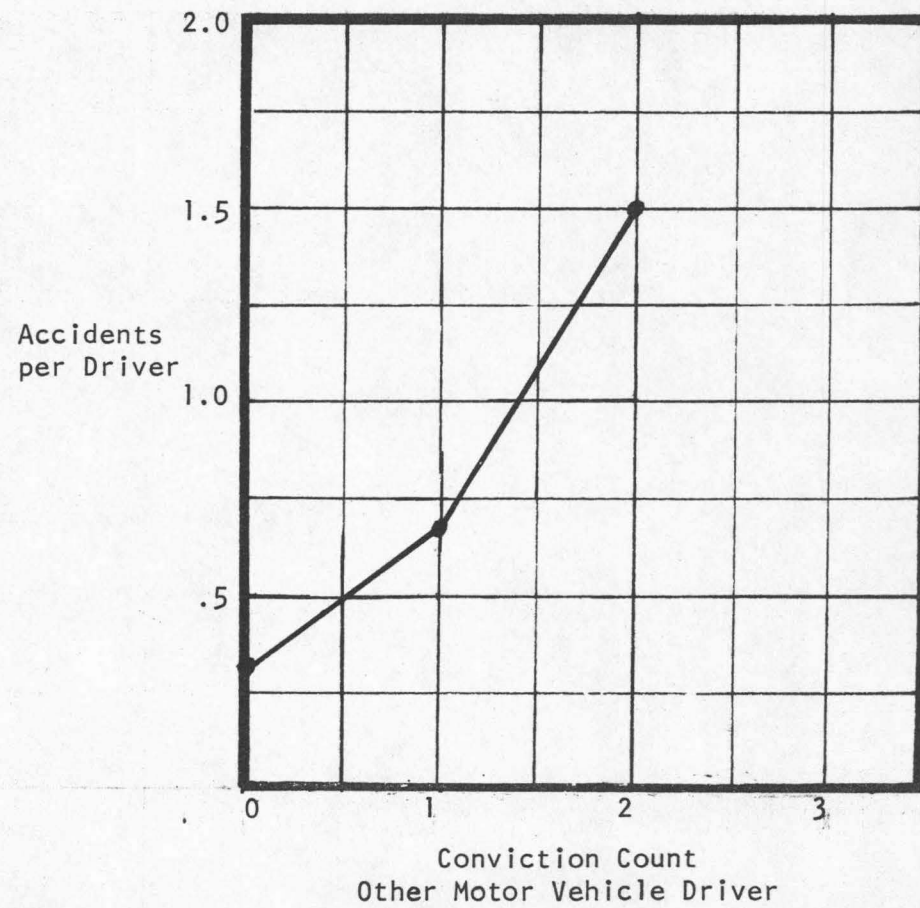
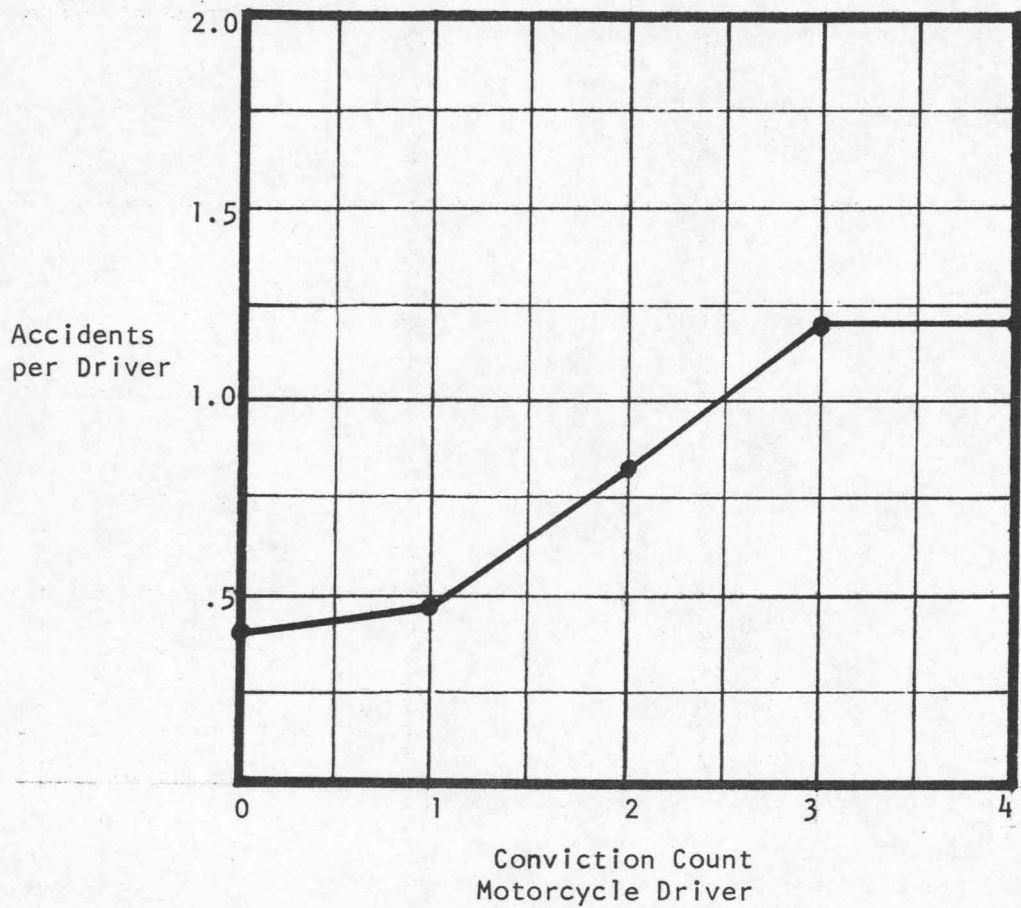
1971 - 1973

No. of Counties	No. Killed
39	0
21	1
20	2
6	3
3	4
5	5
5	6 &
<u>99</u>	more

Iowa Number of Motorcycle Accident Fatalities By County: 1971 - 1973

CHART 21

RESEARCH & STATISTICS
IOWA DEPARTMENT OF PUBLIC SAFETY
DES MOINES, IOWA 50319



COMPARISON BETWEEN RELATIONSHIP OF CONVICTION COUNT TO ACCIDENTS PER DRIVER FOR THE MOTORCYCLE DRIVER AND OTHER MOTOR VEHICLE DRIVER INVOLVED IN FATAL ACCIDENTS: THREE YEARS PRIOR RECORD, 1973

CHART 22

MC Deaths
per 10,000
Registrations

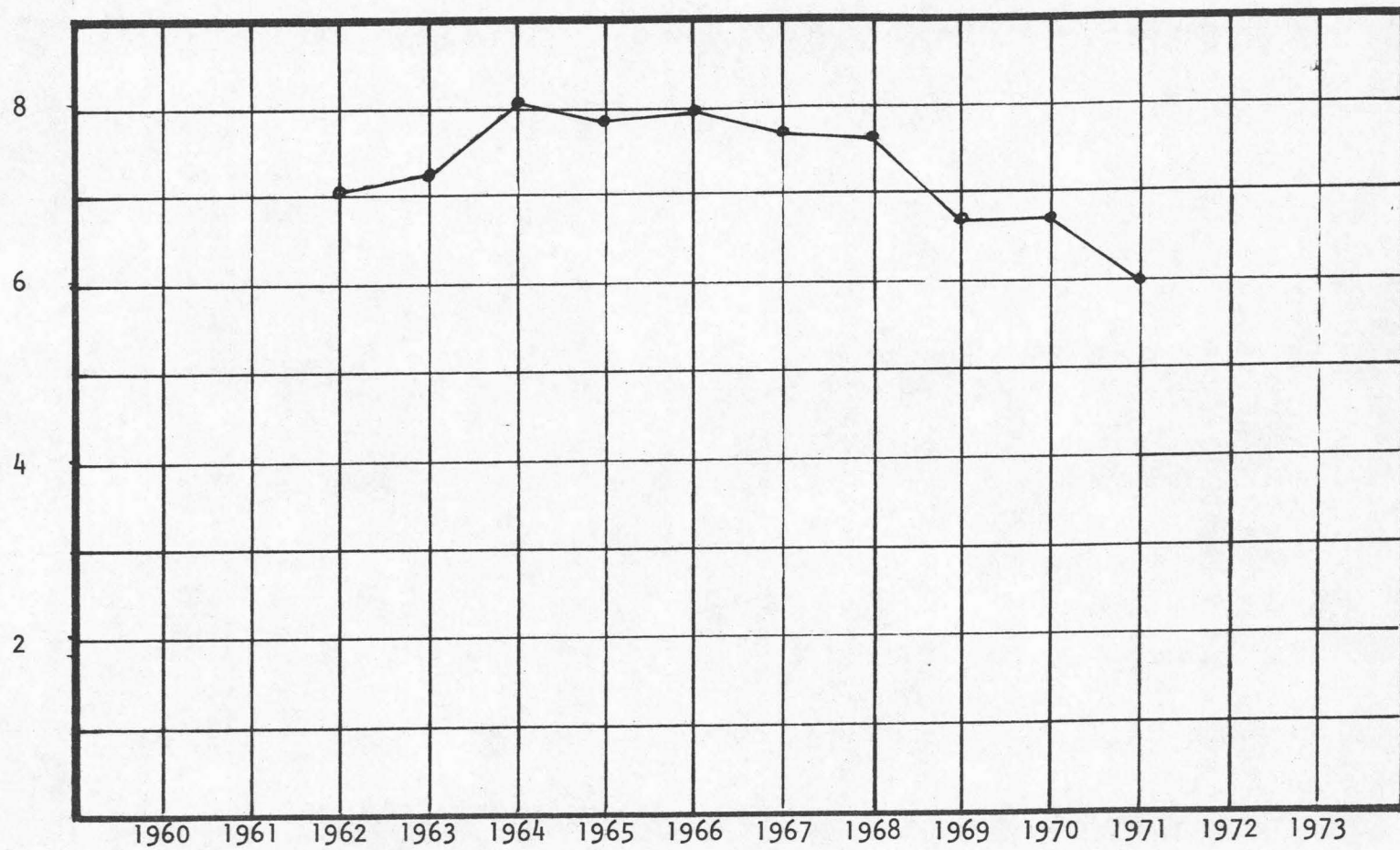


CHART 23: 5-YEAR MOVING AVERAGE MOTORCYCLE DEATH RATE: IOWA, 1960-1973

STATE LIBRARY OF IOWA



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