AN ANALYSIS OF TRAFFIC ACCIDENTS
ON COUNTY ROADS

JUNE 1961

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Joint
Highway
Research
Project

by

D.F. PETTY

PURDUE UNIVERSITY
LAFAYETTE INDIANA

Informational Report

AN ANALYSIS OF TRAFFIC ACCIDENTS ON COUNTY ROADS

TO: K. B. Woods, Director
Joint Highway Research Project

June 21, 1961

FROM: H. L. Michael, Assistant Director
Joint Highway Research Project

File: 8-5

Attached is a report titled "An Analysis of Traffic Accidents on County Roads" which is presented to the Board as information. This report resulted from a research project of the Highway Extension and Research Project for Indiana Counties and has been authored by Donald F. Petty, Research Assistant, under the direction of Professor H. L. Michael.

The study found that narrow roads and/or lack of centerlining as well as insufficient use of warranted traffic control devices were major factors in county road accidents. The magnitude of the county road accident problem and many other useful items of information were obtained from the study and are reported in the attached report.

The report is presented to the Board as information.

Respectfully submitted,

Harold L. Michael

Harold L. Michael, Secretary

HLM:kmc

Attachment

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by

Donald F. Petty

Research Assistant

Highway Extension and Research Project for Indiana Counties

File No: 8-5

Purdue University
Lafayette, Indiana

June 21, 1961

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TABLE OF CONTENTS

	Page
LIST OF TABLES	v
LIST OF FIGURES.	vii
ABSTRACT	viii
INTRODUCTION	1
PURPOSE AND SCOPE.	5
PILOT STUDY.	12
Procedure.	12
Selected Accident Factors.	13
ACCIDENT PREDICTION.	16
Accidents vs. County Population.	16
Accidents vs. County Vehicle Registrations	28
Accidents vs. County Road Mileage.	31
Summary.	32
ACCIDENTS AND ROADWAY FACTORS.	37
Roadway Defects.	37
Surface Characteristics Affecting Skidding	39
Roadway Curvature and Speed.	40
Vision Obscurements.	44
Type of Intersection	46
ACCIDENTS AND TRAFFIC CONTROL.	50

	Page
Type of Accident	50
Driver Violations.	57
Speed.	61
ACCIDENTS AND MISCELLANEOUS FACTORS.	63
Weather.	63
Time.	66
Accident Severity.	71
CONCLUSIONS AND RECOMMENDATIONS.	77
BIBLIOGRAPHY	81
APPENDIX	84

LIST OF TABLES

Table	Page
1. Summary of Rural Highway Accidents in Indiana	3
2. Data for Indiana Counties	17
3. County Accident Prediction 1961-1962.	34
4. Accident Frequencies - Road Defects and Types of Road Surface	38
5. Accident Frequencies - Skidding and Types of Road Surface	39
6. Accident Frequencies - Type of Surface and Speed and Roadway Curvature	40
7. Accident Frequencies - Vision Obscurements.	45
8. Accident Frequencies - 3-Way and 4-Way Intersections. . .	46
9. Accident Frequencies - Type of Accident vs. Traffic Control	51
10. County and All Indiana Accidents By Type.	53
11. Accident Frequencies - Driver Violation vs. Traffic Control	58
12. Driver Violation Comparison for County and "All Reported" Accidents	60
13. Effect of Weather on Accidents.	64
14. Accident Frequencies - Time of Day - November Through March - 1958-1959	67
15. Fatal and Total Accidents on Rural State and County Roads	72

Table	Page
16. County Road Accident Costs in Indiana.	74
17. Speed and Property Damage - County Road Accidents 1958-1959.	75

LIST OF FIGURES

Figure	Page
1. State and County Road Accidents in Indiana 1952-1959	4
2. Accident Report Form	6
3. 1958-1959 Accident Punch Cards	9
4. Location of Counties Studied	11
5. Pilot Study - Two-Way Frequencies.	14
6. Regression Line - Accidents vs. Population 1958-1959	23
7. Control Chart - Population per Accident Ratio by County. . .	26
8. Regression Line - Accidents vs. Registrations 1958-1959. . .	29
9. Control Chart Vehicle Registration per Accident Ratio by County.	30
10. Comparison of Conflict Points in 3-Legged and 4-Legged Intersections.	48
11. Examples of Narrow Pavement and Shoulders on County Granular Roads in Indiana.	55
12. Examples of Hard Surfaced County Roads Showing Narrow Shoulders and the Absence of Centerlines	56
13. Cumulative Speed Curve - All Vehicles.	62
14. Time of Day Distribution of Accidents.	69
15. Regression Line - Property Damage vs. Speed Before Accident.	76

ABSTRACT

Petty, Donald F., MSE, Purdue University, June 1961. An Analysis of Traffic Accidents on County Roads. Major Professor: Harold L. Michael.

Several procedures have been found to be useful in determining causes of accidents at high frequency locations. However, very little work has been done to determine accident causes or to develop analysis procedures for low frequency locations, such as most county roads.

This thesis reports the results of a study concerned with the use of accident reports to determine major causes of accidents at low frequency locations. All county road accidents, for a two year period, in ten Indiana counties were analyzed. Statistical methods were used in the analysis when it was feasible.

A very significant correlation between the number of vehicle registrations per county and the number of accidents was found in an investigation of accident predictability on county roads.

The study revealed that three-way intersections are safer than four-way intersections for county roads. At many intersections of both types, however, it was found that there is an insufficient use of traffic controls, i.e. stop signs, yield signs, warning signs, etc.

Another major cause of accidents, it was found, is narrow

roadways and/or shoulders with the absence of centerlines on hard surface roads a possible contributing factor. The 85th percentile reported speeds of vehicles involved in all accidents in the study was 42 miles per hour.

The average property damage cost per accident was 400 dollars and the total estimated cost for all county road accidents in the state in 1959 was 18 million dollars. The drivers were found to be the primary factor in county road accidents and this tremendous cost to the economy.

AN ANALYSIS OF TRAFFIC ACCIDENTS ON COUNTY ROADS

INTRODUCTION

Motor vehicles have become one of the major factors in the American way of life. Almost everyone plans their living habits in such a manner that they could not function or even exist without an automobile or public transportation. A few steps removed from most people is another large segment of our motor vehicle transportation — the truck.

In 1960, there were over 73 million motor vehicles in the United States. Approximately 12 million (17 percent) of these were trucks and busses. The remaining 61 million (83 percent) were passenger cars. Trucks travelled approximately 130 billion miles for that year and transported 38 percent of the total tonnage of goods (1600 million tons), and passenger cars travelled approximately 590 billion miles (1,2)*. This is a phenomenal growth in an industry and method of travel that did not exist sixty years ago.

With this great and increasing number of vehicles on the roads and streets today, the probability that they will hit each other or

*Numbers in parenthesis refer to references listed in the bibliography at the end of the report.

some other object or person becomes greater and greater. Sixty years ago, the accident problem was very small. Today, there are slightly less than 40,000 deaths per year attributable to motor vehicles. In addition, there are many major and minor injuries plus an estimated cost to the United States economy of 6.4 billion dollars (1960) for deaths, medical charges, time lost from work, property damage and other related items (3).

In Indiana alone in recent years, there have been approximately 100,000 accidents per year of greater than fifty dollars damage. This figure has been about the same for the period 1952 to 1959 (4). During this same period, accidents on state highways have been decreasing while accidents on county roads have been increasing. Table 1 and Figure 1 present a summary of rural traffic accidents in Indiana for the period 1952-1959. Also shown in Table 1 is the percentage that county road accidents are of total rural accidents.

TABLE 1

SUMMARY OF RURAL HIGHWAY ACCIDENTS IN INDIANA

Year	County Roads No. of Accidents	Rural State Highways No. of Accidents	Total Rural Road Accidents	% County of Total Rural Accidents
1952	7857	23889	31746	24.2
1953	9794	22751	32545	30.1
1954	10436	20326	32177	32.5
1955	11851	23038	34889	34.0
1956	12322	22792	35114	35.2
1957	12339	21827	34166	36.2
1958	12634	20084	32718	38.7
1959	13330	22422	35752	37.3

STATE AND COUNTY ROAD ACCIDENTS IN INDIANA

1952-1959

Figure 1

PURPOSE AND SCOPE

The purpose of this research was to investigate the causes of and determine possible remedies for county road accidents in Indiana. County road accidents are defined for the purpose of this study as all traffic accidents occurring on roads which are administered by the County Commissioners in Indiana except accidents occurring at intersections of county roads with state highways. These latter accidents are normally credited to state highways.

The information used in this research was obtained from accident records. The best available source of this type of information ^{is} in the accident reports which are filed at the Indiana State Police Headquarters in Indianapolis. A facsimile of the accident form is shown in Figure 2.

State law requires that the driver of each vehicle involved in an accident file an accident report with the Indiana State Police for an accident which involves property damage of more than \$50 or which involves an injury or death. The investigating officer, if there is one, also files an accident report. Therefore, most accidents of significance are recorded. Generally, the reports are fairly complete, particularly the ones that are completed by police officers. The reports filed by persons involved in an accident, however, are often of questionable accuracy. The investigating officer, on the other hand, has an opportunity

Figure 2 a

INDICATE ON THIS DIAGRAM WHAT HAPPENED

INSTRUCTIONS.

- Follow dotted lines to draw outline of roadway at place of accident.
- Number each vehicle and show direction of travel by arrow.
- Use solid line to show path before accident. Dotted line after accident.
- Show pedestrian by
- Show railroad by
- Show distance and direction to landmarks; identify landmarks by name or number.

WHAT DRIVERS WERE DOING
(Check one for each driver)

Driver 1 2

☐ Going straight ahead
☐ Making right turn
☐ Making left turn
☐ Making U turn
☐ Stopping or stopping
☐ Starting in traffic lane
☐ Starting from parked position
☐ Stopped in traffic lane
☐ Parked
☐ Backing

(Check applicable items)

☐ Passing
☐ Avoiding vehicle, object, or pedestrian
☐ Skidded before applying brakes
☐ Skidded after applying brakes
☐ Hit and run
☐ Driverless moving vehicle

DRIVERS' VIOLATIONS INDICATED (Check one or more for each driver)

Driver 1 2

☐ Exceeded lawful speed
☐ Did not grant right of way to vehicle
☐ Did not grant right of way to pedestrian
☐ Followed too closely
☐ Drove through safety zone
☐ Passed on hill
☐ Passed on curve
☐ Cut in after passing
☐ Other improper passing
☐ On wrong side of road not in passing
☐ Failed to signal or gave improper signal
☐ Improper turn—wide right turn
☐ Improper turn—cut corner on left turn
☐ Improper turn—from wrong lane
☐ Other improper turning

Driver 1 2

☐ Disregarded police officer
☐ Disregarded stop and go light
☐ Disregarded flashing light
☐ Disregarded stop sign
☐ Disregarded warning sign
☐ Improper starting from parked position
☐ Improper parking location
☐ Other improper actions

☐ No improper driving

WHAT PEDESTRIAN WAS DOING
(Check one)

☐ Crossing at intersection—with signal
☐ Crossing at intersection—against signal
☐ Crossing at intersection—no signal
☐ Crossing at intersection—diagonally
☐ Crossing not at intersection
☐ Coming from behind parked cars
☐ Walking in roadway—(Check two below)
☐ With traffic
☐ Against traffic
☐ Sidewalks available
☐ Sidewalks not available
☐ Pushing or working on vehicle
☐ Other working on roadway
☐ Playing on roadway
☐ Hitching on vehicle
☐ Not on roadway (Explain)

☐ Specify other action

Occupation _____

CONDITION OF DRIVERS AND PEDESTRIAN.

Driver 1 2 Ped

(Check one or more)

☐ Had been drinking
☐ Apparently asleep
☐ Body defect (arms, eyesight, paralysis, etc)
☐ No apparent defects
☐ Defects not known

Explain condition _____

VEHICLE CONDITION
(Check one or more)

Vehicle 1 2

☐ Defective brakes
☐ Improper lights
☐ Defective steering mechanism
☐ Defective tires
☐ Other defects
☐ No defects
☐ Defects not known

☐ Chains in use

DRIVER VISION OBSCURED
(Check one or more in each section)

Driver 1 2

☐ Rain, snow, etc. on windshield
☐ Windshield otherwise obscured
☐ Vision obscured by load on vehicle

☐ Specify other _____

☐ Vision not obscured

DRIVER VISION OBSCURED
(Check one or more in each section)

Driver 1 2

☐ Trees, crops, etc
☐ Building
☐ Embankment
☐ Signboard
☐ Millcrest
☐ Parked vehicles
☐ Moving vehicles

☐ Specify other _____

☐ Not obscured

DESCRIBE WHAT HAPPENED

(Refer to vehicles by number)

Use this space for listing additional witnesses and injured persons. Also explain questions not fully answered by checking in the boxes provided.

If more space is needed use another form or a sheet of paper the same size.

ARRESTS: Name _____ Charge _____

Name _____ Charge _____

INVESTIGATION.

Time notified at accident _____

Where else was investigation made? _____

Time of arrival at the scene _____

is investigation complete? ☐ Yes ☐ No

Were photographs taken? ☐ Yes ☐ No

Driver report form furnished to: ☐ Driver 1 ☐ Driver 2

★ SIGNATURE _____

Investigator's rank and name _____

Department _____

Date of report _____

IMPORTANT! The driver of every motor vehicle involved in an accident is required to submit a separate accident report even though such accident was investigated by a police officer. Drivers' accident report forms are available at all city, county, and state police offices.

ACCIDENT REPORT FORM REVERSE SIDE

Figure 2b

to interrogate persons involved and to investigate the physical factors present, and does his best to prepare an accurate report.

This philosophy is followed by the Indiana State Police when preparing punch cards of each accident. As a consequence, the punch cards contain the best information available about each accident.

A photographic copy of a punch card form is shown in Figure 3.

The accident report punch cards, therefore suited the purposes of this project very well and were the primary source of information for this study. The punch cards when processed on tabulating equipment, provided more information in less time and at less cost than manual tabulation of the data from the original accident reports would have given.

To determine which items of information on the punch cards would be most valuable, a thorough pilot study for one county was performed. For convenience, Tippecanoe county was used. A complete discussion of this pilot study is reported in the following section of this report. In general it was found that much of the recorded accident data did not supply information of value to this study. There were several items, however, which appeared significant and these were investigated in a general study for ten counties.

Ten counties were used for the general study, because a hundred percent sample of all 92 counties would have been too time consuming and too costly to analyze. The information for the ten counties was analyzed quite thoroughly and provided sufficient evidence for general recommendations applicable to the whole state. The ten county sample, except for Tippecanoe County, was chosen randomly by use of a table of

random numbers, and should be representative of all counties. The ten counties selected were:

Adams	Madison
Brown	Steuben
Hendricks	Sullivan
Jefferson	Tippecanoe
Lawrence	Wayne

These counties are geographically shown in Figure 4. During 1958 and 1959 there were 2650 accidents involving 3953 vehicles in these counties. This is approximately ten percent of the total number of accidents on county roads in the entire state.

LOCATION OF COUNTIES STUDIED

Figure 4

PILOT STUDY

Very little work has been done in the specific area of county road accidents, and little information was available as to procedures which would yield significant findings. It was therefore decided to conduct a pilot study of all accident factors which were recorded on the accident record punch cards for one county. The purpose of the pilot study was to determine procedures for this research and to determine which factors appeared to have significant effects on county road accidents.

Procedure

The pilot study was limited to Tippecanoe County with the proximity of this county to Purdue University where this research was performed being the main reason for this choice.

The information available on the punch cards and the punch card codes are listed in the Appendix. Accident information for the calendar years 1957, 1958, and 1959 was utilized for the pilot study.

The first analysis completed was to obtain a one-way frequency tabulation of most of the information on the punch cards. Only that punched information which obviously could not be of value to this study was eliminated.

After completing the summarization or the one-way frequency, the decision was made as to which factors appeared important enough to

investigate further. This was done on a quantity basis, i.e. those factors, for which there was a significant number of accidents, were selected.

Selected two-way frequency tabulations were then prepared for the selected factors. The two-way frequencies, which were partially obtained by punch-card data processing equipment, indicates an effect which one factor might have on another. Figure 5 shows the factors by code number which were analyzed in this manner. Many such comparisons were made; most factors which could have any possible relationship with each other were analyzed. A total of fifty relationships were thoroughly investigated.

From these relationships and from the one-way frequency tabulations, conclusions were made as to which factors appeared to be important enough to use in some way in the ten-county study. Criteria used in making these decisions were concerned with numbers of accidents for the various factors, the strength of the relationships between factors and the possibility of determining remedies which could be applied by county highway authorities.

Selected Accident Factors

The accident information which was determined from the pilot study to be worthy of further investigation was as follows:

1. Accident Prediction - three factors were found which offered possibilities of predicting numbers of accidents for future years.
 - a. County population

CODE NUMBER	CODE NUMBER																					
	2	11	12	16	17	19	20	21	23	24	25	26	32	33	36	37	41	42				
2	X																		X	X	X	X
11		X							X											X		
12			X						X											X	X	
16				X					X											X		X
17									X											X		
19									X											X		X
20								X												X		X
21																						X
23																						X
24												X								X	X	X
25																				X	X	X
26																				X		X
32																						X
33																				X	X	X
36																				X		X
37																						X
41																						X
42																						

"X" INDICATES TWO-WAY FREQUENCIES WHICH WERE ANALYZED

SEE APPENDIX FOR CODE NUMBER DEFINITION

PILOT STUDY—TWO-WAY FREQUENCIES

Figure 5

- b. County vehicle registrations
 - c. County road mileage
2. Roadway factors - five factors were found which indicated that recommendations for corrective action might be possible after additional study. These five were:
- a. Roadway defects
 - b. Surface characteristics affecting skidding
 - c. Roadway curvature and speed
 - d. Vision obstructions
 - e. Type of intersection
3. Traffic Control - four factors were found which suggested that additional analysis was desirable:
- a. Traffic controls utilized
 - b. Directional analysis
 - c. Driver violations
 - d. Speed
4. Miscellaneous Factors - three factors were found which indicated some possibility of providing interesting and valuable information related to accidents:
- a. Weather conditions
 - b. Type of time
 - c. Accident severity and property damage

ACCIDENT PREDICTION

Many people believe that, at least to some degree, accidents can be predicted. An investigation, therefore, was made of three variables and their relationship to the number of county road accidents. There are undoubtedly many variables which are correlated with the number of accidents, but the three used - population, vehicle registrations, and county road mileage - were chosen because data are readily available for them.

The data were obtained on a county basis for the most current figures available, and are shown in Table 2. The population data were obtained from advance 1960 Census Reports which were made available by the Indiana State Police. County road mileage and vehicle registration data were taken from the Handbook of Facts and Figures on Indiana County Roads, Purdue University - Engineering Experiment Station and the County Commissioners of Indiana, November, 1960 (5).

The accident data for county roads were obtained from the annual official Indiana State Police Accident Summary for the years 1958 and 1959.

Accidents vs. County Population

Two methods of analysis were used, correlation-regression and control chart.

A regression line equation was calculated by use of the following formula:

$$\hat{Y} = \bar{Y} + b (\bar{X} - X)$$

TABLE 2
DATA FOR INDIANA COUNTIES

County	Total County Road Accidents 1958-1959	County Population 1960 (Est)	Vehicle Registrations 1959	Mileage of County Road 1959
Adams	125	24643	13573	728
Allen	1132	232196	107387	1544
Bartholomew	456	48198	22948	784
Benton	70	11912	6871	729
Blackford	121	14792	7671	334
Boone	172	27543	15028	794
Brown	112	7024	3391	604
Carroll	163	16934	10443	895
Cass	281	40931	21515	1134
Clark	384	62795	25588	695
Clay	100	24207	12208	812
Clinton	181	30765	15912	860
Crawford	75	8379	3832	657
Daviess	175	26636	12240	895
Dearborn	148	28674	14227	587
Decatur	221	20019	9878	669
Dekalb	227	28271	15173	752
Delaware	716	110938	51539	1229
Dubois	152	27463	12163	1009

TABLE 2 (Continued)

County	Total County Road Accidents 1958-1959	County Population 1960 (Est)	Vehicle Registrations 1959	Mileage of County Road 1959
Elkhart	749	106790	57487	1289
Fayette	112	24454	11235	417
Floyd	169	51397	20806	304
Fountain	107	18706	10272	717
Franklin	180	17015	7582	770
Fulton	139	16957	10532	825
Gibson	158	29949	14876	1075
Grant	333	75741	34927	937
Greene	156	26327	13436	1175
Hamilton	262	40132	19296	916
Hancock	193	26665	13360	665
Harrison	163	19207	8941	928
Hendricks	255	40896	19046	759
Henry	314	48899	23266	896
Howard	322	69509	30778	683
Huntington	214	33814	17419	720
Jackson	231	30556	14817	907
Jasper	122	18842	9824	967
Jay	193	22572	12851	736
Jefferson	161	24061	9849	677
Jennings	141	17267	6976	762
Johnson	364	43704	19694	610
Knox	176	41561	14876	1235

TABLE 2 (Continued)

County	Total County Road Accidents 1958-1959	County Population 1960 (Est.)	Vehicle Registrations 1959	Mileage of County Road 1959
Kosciusco	552	40373	23253	1333
LaGrange	222	17380	7938	780
Lake	1425	513269	198819	1098
LaPorte	530	95111	40790	1246
Lawrence	277	36564	17067	846
Madison	664	125819	56324	1308
Marion	2734	697567	322431	1545
Marshall	271	32443	17667	929
Martin	75	10608	4383	650
Miami	268	38000	17858	795
Monroe	365	59225	23848	947
Montgomery	175	32809	17026	898
Morgan	282	33875	15435	725
Newton	92	11502	6801	640
Noble	293	28163	16277	890
Ohio	45	4165	2046	180
Orange	112	16877	7984	781
Owen	120	11400	6107	710
Parke	158	14804	8130	816
Perry	79	17232	7392	876
Pike	101	12797	6836	953
Porter	329	60279	24923	819
Posey	173	19214	10007	839

TABLE 2 (Continued)

County	Total County Road Accidents 1958-1959	County Population 1960 (Est)	Vehicle Registration 1959	Mileage of County Road 1959
Pulaski	142	12837	7423	905
Putnam	228	24927	11198	137
Randolph	260	28434	15590	893
Ripley	161	20641	10046	907
Rush	188	20393	10516	778
St. Joseph	993	238614	105365	1550
Scott	143	14643	6547	368
Shelby	440	34093	16512	826
Spencer	88	16074	7717	1359
Starke	146	17911	9131	840
Steuben	256	17184	10509	646
Sullivan	112	21721	11437	877
Switzerland	62	7092	3334	620
Tippecanoe	439	89112	37868	881
Tipton	113	15856	8973	573
Union	50	6457	3399	327
Vanderburgh	529	165749	71823	692
Vermillion	80	17683	9396	465
Vigo	332	108458	50333	1006
Wabash	239	32605	17497	806
Warren	118	8545	4864	575
Warrick	120	23577	11405	950
Washington	176	17819	9025	963

TABLE 2 (Continued)

County	Total County Road Accidents 1958-1959	County Population 1960 (Est)	Vehicle Registration 1959	Mileage of County Road 1959
Wayne	274	74039	34228	746
Wells	135	21220	12296	742
White	214	19709	11604	988
Whitley	187	20954	12763	682

Sources: 1. Indiana State Police
 2. Handbook of Facts and Figures on
 Indiana County Roads

where:

$\bar{Y}$ = average number of accidents per county
(the total number of county road accidents
in Indiana divided by 92, the number of
counties)

X = population of a county

$\bar{X}$ = average population per county (state popula-
tion divided by 92)

$\hat{Y}$ = predicted number of accidents for a county

b = slope of regression line

as further defined by following formula:

$$b = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sum X^2 - \frac{(\sum X)^2}{n}}$$

where:

n = number of counties

Y = number of accidents in a county

This regression line equation for all 1958 and 1959 county road accidents is:

$$\hat{Y} = 103.81 + .0035X$$

After plotting this line and the 92 points, it was obvious that three counties (Marion, Lake and Allen) had considerable affect on the regression line. These three counties, however, are not typical of the other 89 counties because of their urban character. The regression line equation was therefore calculated using only data from the other 89 counties and it is:

$$Y = 85.00 + .0040X$$

Figure 6 shows this line and the points from which it was calculated.

Also shown is the 95 percent confidence limits for the slope of the line.

REGRESSION LINE - ACCIDENTS VS. POPULATION

1958 - 1959

Figure 6

These limits were calculated by the following equation (6):

$$Y = \bar{Y} \pm b (X - \bar{X}) \pm t_{.025} S_{xy} \sqrt{\frac{1}{n} \pm \frac{1}{\sum X^2 - n\bar{X}^2} (X - \bar{X})^2}$$

where:

$$S_{xy} = \sqrt{\frac{(\sum Y^2 - n\bar{Y}^2) - (b) (\sum XY - n\bar{X}\bar{Y})}{n-2}}$$

The resulting confidence limits for the slope of the regression line are:

$$Y = 85.00 \pm .0040 \pm 16.7 \sqrt{1 \pm \frac{(X - 36180)^2}{12.82 \times 10^8}}$$

The correlation coefficient was then calculated. The purpose of this measure is to determine the amount of variation due to linear regression. The following formula was used:

$$r = \frac{n \sum XY - \sum X \sum Y}{\sqrt{[n \sum X^2 - (\sum X)^2] [n \sum Y^2 - (\sum Y)^2]}}$$

where:

r = correlation coefficient.

The correlation coefficient was found to be .8804 and $r^2 = .7751$.

The .001 level of significance for a sample size of 89 is $r = .3375$ (7): therefore, the county population (the independent variable) is a very significant factor in accounting for the variation in the number of accidents (the dependent variable) in a county. In this

case 77.51 percent of the variation in the number of accidents between counties is linearly related to the population of the counties.

A control chart was also developed for the accidents versus population analysis. It was decided to obtain the values for the control chart by dividing the population of each county by its number of accidents. The purpose of this was to derive a straight horizontal line relationship involving both factors. All 92 counties were used in the control chart analysis. Of the three counties that were omitted from the correlation-regression analysis, only one - Lake - was an extreme point in the control chart.

Figure 7 shows the control chart with upper and lower control limits (UCL and LCL) to two standard deviations (σ). Four counties were found to be extremely "safe", or above the UCL - Floyd, Lake, Vanderburgh and Vigo. It is significant to note that there were no counties in the "unsafe" area or below the LCL. The following procedure was used to determine the UCL and LCL:

$$\sigma = \sqrt{\frac{n \sum X^2 - (\sum X)^2}{n(n-1)}}$$

$$\sigma = 58.85$$

therefore:

$$\begin{aligned} \text{UCL} &= \bar{X} + 2\sigma \\ &= 153.65 + 2(58.85) \\ &= 271.35 \end{aligned}$$

CONTROL CHART - POPULATION
PER ACCIDENT RATIO BY COUNTY

Figure 7

$$\begin{aligned}
 \text{and LCL} &= \bar{X} - 2\sigma \\
 &= 153.65 - 2(58.85) \\
 &= 35.95
 \end{aligned}$$

For the four "safe" counties, a test was used to determine the confidence that they were safe. This was done by calculating a "t" value for each point relative to the remaining 91 points. The significance level is 92 times the alpha obtained from appropriate tables as there are 92 possibilities of having an extreme point (8). The following equation was used to calculate a "t" for each of the four counties:

$$t = \frac{\bar{X}_n - \bar{X}_{n-1}}{\sqrt{\frac{\sum_{i=1}^{n-1} (X_i - \bar{X})^2}{n-2} \left(\frac{1}{n-1}\right)}} \quad (8)$$

The significance levels and "t" values obtained for each of the four counties were as follows:

EXTREME POINT "t" AND SIGNIFICANCE LEVELS
ACCIDENTS VS. POPULATION

County	t	Significance Level
Floyd	2.670	.92
Lake	2.784	.05
Vanderburgh	2.847	.46
Vigo	3.110	.18

Only Lake and possibly Vigo Counties are confidently "safe", as indicated by the low significance levels obtained for these counties.

Accidents vs County Vehicle Registrations

The procedure of this analysis was the same as previously described for accidents vs county population, except that county vehicle registration figures for 1959 were substituted for the population figures. The same eighty-nine counties were again used.

It was found that the straight line of best fit for these data is:

$$\hat{Y} = 66.38 + .0095 X$$

and that the 95 percent confidence limits for the slope of the regression line is:

$$\hat{Y} = 66.38 + .0095 X \pm 13.13 \sqrt{1 \pm \frac{(X - 17319)^2}{256 \times 10^6}}$$

These lines, the regression line and slope confidence limits, are shown in Figure 8. The correlation coefficient for this regression line is .9270 and $r^2 = .8593$. This is very significant as the .001 significance level for this sample size is $r = .3375$. In other words 85.93 percent of the variation in the number of accidents between counties can be accounted for by the vehicle registrations of the counties.

A control chart was also obtained and is shown in Figure 9. The UCL is 124.4 and LCL is 24.8. Again, four counties are in the "safe" area, which is above the UCL. These four counties are Lake, Vanderburgh, Vigo and Wayne. Floyd County is not in this group as

REGRESSION LINE - ACCIDENTS VS. REGISTRATIONS
1958 - 1959

Figure 8

CONTROL CHART - VEHICLE REGISTRATION
PER ACCIDENT RATIO BY COUNTY

Figure 9

it was previously, but Wayne County is added. Again, it is significant to note that there are no counties in the "unsafe" area below the LCL.

The four counties which were out of control, on the "safe" side, were then tested to determine what the significance level is that they are "safe". The "t" and significance level values obtained for each of the four counties are as follows:

EXTREME POINT "t" AND SIGNIFICANCE LEVELS
ACCIDENTS VS VEHICLE REGISTRATIONS

County	t	Significance Level
Lake	2.729	.82
Vanderburgh	3.112	.18
Vigo	2.563	.95
Wayne	2.083	> 1.00

As shown by the high values in the table, the significance level is very low or questionable for each of these counties.

Accident vs County Road Mileage

A third analysis completed was to correlate the number of accidents with the mileage of county roads in each county. The procedure was the same as in the two previous correlations except that county road mileage in 1959 was the independent variable.

The same 89 counties were used again to prevent the three counties of high urban character from having an undue influence on the regression line.

The calculated regression equation is:

$$\hat{Y} = -81.49 + .3814 X$$

and the correlation coefficient is $r = .5559$ with $r^2 = .3090$. Because the .001 significance level for this sample size is $r = .3375$, it was concluded that this correlation is much less significant than for the previous prediction factors and was not investigated further.

Summary

The conclusion from these three analyses was that there is a strong relationship between the number of accidents in a county and its population and number of registered vehicles. As these two independent variables are obviously related to each other and the latter has a higher correlation with the number of accidents, it was concluded that the best predictor of the number of county road accidents in a county for a two-year period is the number of registered vehicles in that county. A two year period was used in this analysis, because of the relatively small number of accidents which occur in each county in one year.

There is also a relationship between the number of miles of county road in a county and the number of county road accidents, but the correlation is not as significant as it is for population and vehicle registration.

The control charts did not prove to be of much value in this analysis, but if they were used every year some "safe" or "unsafe" counties could possibly be found. These counties could then be analyzed in more detail to determine the cause of being "out of

control". The specific counties (Floyd, Lake, Vanderburgh, Vigo and Wayne) which were found to be in the "safe" category in these analyses have large urban areas which may in some way account for their rating of "safe". It should also be emphasized that the "safe" level of accidents for each county was determined from current accident experience and is not necessarily a level which is really safe.

A prediction of the number of accidents for each county for 1961-1962 was made and is shown in Table 3. The predicted frequencies of accidents were obtained by estimating the number of vehicle registrations per county (by extrapolating previous years data) and substituting it in the regression equation for the independent variable.

TABLE 3
COUNTY ACCIDENT PREDICTION - 1961-1962

County	Predicted Accidents 1961-1962	County	Predicted Accidents 1961-1962
Adams	200	Floyd	280
Allen	*	Fountain	169
Bartholomew	310	Franklin	144
Benton	134	Fulton	167
Blackford	141	Gibson	215
Boone	220	Grant	428
Brown	102	Greene	200
Carroll	170	Hamilton	268
Cass	284	Hancock	205
Clark	344	Harrison	158
Clay	189	Hendricks	275
Clinton	225	Henry	300
Crawford	105	Howard	385
Daviess	189	Huntington	239
Dearborn	213	Jackson	219
Decatur	171	Jasper	165
DeKalb	216	Jay	193
Delaware	602	Jefferson	154
Dubois	192	Jennings	139
Elkhart	670	Johnson	279
Fayette	180	Knox	278

TABLE 3 (Continued)

County	Predicted Accidents 1961-1962	County	Predicted Accidents 1961-1962
Kosciusco	306	Putnam	180
La Grange	145	Randolph	212
Lake	*	Ripley	168
La Porte	491	Rush	177
Lawrence	243	St. Joseph	1143
Madison	646	Scott	134
Marion	*	Shelby	235
Marshall	244	Spencer	145
Martin	111	Stark	159
Miami	248	Steuben	171
Monroe	316	Sullivan	185
Montgomery	236	Switzerland	99
Morgan	228	Tippecanoe	455
Newton	134	Tipton	156
Noble	233	Union	100
Ohio	87	Vanderburgh	801
Orange	148	Vermillion	161
Owen	128	Vigo	585
Park	148	Wabash	244
Perry	142	Warren	115
Pike	135	Warrick	185
Porter	332	Washington	156
Posey	167	Wayne	410
Pulaski	140	Wells	188

TABLE 3 (Continued)

County	Predicted Accidents 1961-1962
White	183
Whitley	196

* Not predicted because data from these three counties with high urban characteristics were not used in developing the prediction equation.

ACCIDENTS AND ROADWAY FACTORS

The pilot study indicated that significant information relative to the causes of or remedies for county road accidents might be obtained from an analysis of the effect on such accidents of the following factors:

1. Roadway Defects
2. Surface Characteristics Affecting Skidding
3. Roadway Curvature and Speed
4. Vision Obscurements
5. Type of Intersection

Roadway Defects

For practical reasons, roadway surfaces were classified into two types - hard and granular. Included in the hard surface group were all surfaces which did not contain loose material, i.e., gravel, sand or dirt.

Information as to roadway defects which were present at the accident locations was contained on the punch cards and was tabulated for the 1958-1959 accidents. Only four items were found in any significant number; they were 1) loose surface material - gravel etc., 2) holes, ruts and bumps, 3) defective shoulders, and 4) no defects. The tabulation for the various combinations of surfaces and these items are shown in Table 4.

TABLE 4

ACCIDENT FREQUENCIES - ROAD DEFECTS AND TYPES OF ROAD SURFACE

Road Defects	Hard Surface		Granular Surface		Total	
	N	%	N	%	N	%
Loose Surface Material - Gravel	75	4.3	221	25.2	296	11.3
Holes, Ruts, Bumps, etc.	35	2.0	69	7.9	104	4.0
Defective Shoulders	54	3.1	40	4.6	94	3.6
No Defects	1582	90.6	546	62.3	2128	81.1
Total	1746	100.0	876	100.0	2622	100.0
Percent of Grand Total	66.6		33.4		---	

Slightly over twenty-five percent of those involved in accidents on granular surfaced roads claimed that loose surface material was a defect of the road surfaces involved. On the other hand, 4.3 percent of the hard surface road accidents occurred where loose surface material was present, perhaps gravel or dirt thrown unintentionally by vehicles from side roads and shoulders.

Holes, ruts, and bumps were found to be slightly more troublesome on granular surfaces in this sample. Defective shoulders caused about the same amount of trouble on both types of surfaces and occurred for 3.6 percent of the total accidents.

No road defects, on the other hand, occurred for a large portion (81.1 percent) of total accidents. This is an indication that there are very few defects on county roads that are blamed for traffic accidents or that drivers compensate (by driving slower, with more care, etc.) for poor conditions.

It is possible, however, that part of the 18.9 percent which claimed a road defect could have been prevented by improved maintenance. Loose surface material on hard surfaces, holes, ruts, bumps, and defective shoulders do contribute to accidents on county roads and their effect could be minimized by rapid elimination of these defects. Loose surface material, however, is inherent with granular surfaces, and very little could be done about this major claimed defect except the construction of a hard surface. This may not be economical for much of the county road system. County road classification, based on traffic volumes and the development of a systems approach to county transportation must be completed before it could be decided which specific roads should be surfaced with other than loose surface material. It is therefore recommended that all counties classify their county roads and plan for the development of hard surfaces on the major systems of this classification.

Surface Characteristics Affecting Skidding

Skidding information was obtained from the punch cards for hard and granular surfaces. Table 5 shows the results of this tabulation for 1958 and 1959 data.

TABLE 5

ACCIDENT FREQUENCIES - SKIDDING AND TYPES OF ROAD SURFACE

Type of Surface	Total	Skidded	Skidded
	N	N	%
Hard Surfaces	1753	350	20.0
Granular Surfaces	880	221	25.1

The information in the table is for wet and dry conditions as the pilot study indicated no value to a separate analysis of these data. The tabulation indicates that skidding is an important factor in accidents on both types of surfaces and that the frequency of accidents involving skidding on hard or granular surfaces is similar. The information indicates that converting a granular surface may not result in a great reduction in the number of accidents involving skidding.

Roadway Curvature and Speed

The basic information in Table 6 was prepared from the punch cards.

TABLE 6

ACCIDENT FREQUENCIES - TYPE OF SURFACE AND SPEED AND ROADWAY CURVATURE

Roadway Curvature	Straight		Curved		All
Surface type	Hard	Granular	Hard	Granular	Conditions
Number in Sample	1049	512	407	248	2216
85th percentile speed	43	39	46	36	42
Average speed ($\bar{X}$)	25.84	25.21	30.39	24.08	26.33
Std. Deviation (σ)	16.46	14.48	15.25	11.85	---
$\sigma_{\text{hard}} =$	16.26		$\bar{X}_{\text{hard}} =$		27.11 MPH
$\sigma_{\text{granular}} =$	13.69		$\bar{X}_{\text{granular}} =$		24.84 MPH

The 85th percentile speeds reported in the above Table were obtained from a cumulative frequency curve plotted for each group of data given in the Table from the speeds reported on the accident punch cards. These reported speeds were those stated by the motorists or police officers on the accident reports as the speeds at which the vehicles were travelling just prior to the accidents. The 85th percentile speed indicated in Table 6 means that just prior to the accidents of each group, 85 percent of the vehicles involved were travelling at a reported speed of at least the speed indicated.

The standard deviation (σ) of the speeds for each particular group was obtained by solving the following equation:

$$\sigma = \sqrt{\frac{\sum f(x)^2}{n} - \bar{x}^2}$$

where: f = frequency of speeds in a 10 MPH class
 x = average speed of class
 n = number of accidents

The first analysis completed was to compare the speeds of hard surface roads with granular surface roads. The following equation was utilized (9):

$$\sigma_{\text{diff}}^2 = \frac{\sigma_H^2}{N_H} + \frac{\sigma_G^2}{N_G}, \text{ and;}$$

$$\sigma_{\text{diff}}^2 = .4281, \text{ and}$$

$$\sigma_{\text{diff}} = .6543$$

Therefore, a speed difference between these two groups of data (hard and granular) of more than $t_{\alpha} \times .6543$ is a significant difference. The significance level (α) was arbitrarily chosen at .05 ($t_{.05} = 1.96$), which means that the difference between average speeds must be greater than 1.282 to be significant. Since $\bar{X}_{\text{hard}}$ (27.11 miles per hour) is 2.27 (miles per hour) greater than $\bar{X}_{\text{granular}}$ (24.84 miles per hour) the difference is significant.

This indicates that people have accidents at higher speeds on hard surface roads than on granular surface roads. This is as might be expected.

The next analysis was to test whether there was a significant difference between the speeds at curves and the speeds on tangent sections of road.

The calculation procedure was the same as previously described except that the data were appropriately regrouped. The following values were obtained when comparing the two variables (curved and tangent road) for hard surface roads:

$$\sigma_{\text{diff}}^2 = .8295 \quad \text{and}$$

$$\sigma_{\text{diff}} = .9108 \quad \text{and}$$

$$1.96 \sigma_{\text{diff}} = 1.785$$

Since the difference in the two mean speeds on hard surface roads was 4.55 MPH, it was concluded that accidents happened at significantly higher speeds on curves than on tangent hard surface sections.

The following similar values were obtained for granular surface roads:

$$\sigma_{\text{diff}}^2 = .9755 \quad \text{and}$$

$$\sigma_{\text{diff}} = .9877 \quad \text{and}$$

$$1.96 \sigma_{\text{diff}} = 1.936$$

The mean speed difference for the two conditions on granular surface roads was 1.13 (MPH). Therefore, there is no significant difference in the speeds just prior to accidents, on curves and tangent sections for granular surfaces.

The same calculations were completed for 85th percentile speeds (10), instead of mean speeds, and the results were the same.

Historically, county road geometric design of curves, as well as other features, is usually not changed when the road surface is improved (11). Essentially, the surface improvement is the only improvement made. It is to be expected that people will drive faster on county roads after a surface improvement, even if this is the only change.

This investigation indicates that the higher speeds on hard surface roads are a factor in causing accidents on curves.

The reported accidents on curves of hard surface roads occurred at higher speeds than on tangent sections of these same roads. This indicates that in many cases motorists were travelling at speeds too high to safely traverse the curves, possibly because they had too little warning of the curve or that they were travelling

as most drivers on a "40 MPH surface with 20 MPH geometry". There are two possible solutions to this problem: 1) the speeds might be reduced, or 2) the geometric design of the road can be improved. Speeds, as others have shown (10), are difficult to reduce if not impossible, especially for all but the most careful driver. The only alternatives which exist, therefore, are to either improve the surface and the road geometry or leave the road surface as a granular one. It is, therefore, recommended that whenever a surface improvement is warranted, the geometric design of curves and other features must be changed so as to permit the higher speeds that will occur.

On granular surface roads, as there was no significant difference in accident speeds for curves and tangent sections, drivers apparently expect sharper curves and more defects and therefore make appropriate corrections in their driving speed.

Vision Obscurements

It has long been a belief of many people that county roads suffer from poor sight distance because of vision obscurements. This part of the study, therefore, was undertaken to determine the effects of vision obscurements on traffic accidents.

Some drivers may compensate for poor driving conditions, such as poor vision, but adjusting to those conditions is still an irritant factor. Others do not adjust their driving to poor sight conditions but blindly and rapidly move ahead. The seriousness of vision obscurement as an accident problem should be indicated by the percentage of

drivers claiming a vision obscurement as one of the causes of their accidents.

Table 7 lists the vision obscurments by quantity and percentage of the total as determined in this study.

TABLE 7
ACCIDENT FREQUENCIES - VISION OBSCUREMENTS

	Number of Accidents	Percent of Total
Vision Obscured	256	9.8
Trees, crops, etc.	9	.3
Sign boards	2	.1
Hillcrest	3	.1
Vehicle obscurments	242	9.3
Vision Not Obscured	2344	90.2
Sub Total	2600	100.0
Vision Obscurement Not Stated	50	---
Total	2650	---

Of the 2650 accidents, there were only 256 accidents in which the driver or investigating officer claimed a vision obscurement. Only 14 (.5 percent) of these involved the highway or adjacent property. The remainder were vehicle related obscurments, such as fogged windshields, snow, etc.

It was concluded from these findings that there is no highway related vision obscurement problem which is not adequately compensated for by the drivers, but that any problem of vision obscurement

is related to the vehicle.

Type of Intersection

It was found in the pilot study that three-way intersections were approximately twice as safe as four-way intersections. This study was then undertaken to discover whether this was true for the whole state. Data were obtained from the accident punch cards, and Table 8 was prepared from these data. The numbers of the various intersections were obtained by counting them on official county road maps. Both study years, 1958 and 1959, were combined for this analysis of the accident data from the ten counties.

TABLE 8
ACCIDENT FREQUENCIES - 3-WAY AND 4-WAY INTERSECTIONS

Type of Intersection	Number of Accidents		Number of Intersections		Safety Ratio
	N	%	N	%	Acc./Inter.
"T" Intersections	177	35.7	3108	64.4	.057
"Y" Intersections	10	2.0	3.9	6.6	.031
Total - "T" and "Y"	187	37.7	3427	71.0	.055
4-Way Intersections	308	62.3	1400	29.0	.220
Total - 3 and 4-Way	495	100.0	4827	100.0	--

As shown in the Table, three-way intersections are approximately four times safer than four-way intersections, assuming that similar volumes of traffic used the three and four-way intersections which were analyzed. Even though this may not be exactly true, it

was evident that any volume difference did not account for the total difference in accidents.

One of the reasons for less accidents at three-way intersections is the well-known fact that there are only three conflict points at three-way intersections, and sixteen conflict points at four-way intersections (12). This is graphically shown in Figure 10. A second reason could be that drivers are better informed of the situation at three-way than at four-way intersections. In most cases the driver approaching a three-way intersection on the non-through leg is warned of the intersection by directional arrows or other signing or by advertising signs. This information permits these drivers to take the necessary care when passing through the intersection. Drivers approaching four-way county road intersections, on the other hand, are seldom provided information relative to the location of the intersection, as few such intersections are signed with any traffic controls.

This information indicates that better traffic control at four-way intersections might improve the relatively poor accident experience at these intersections. Better control of traffic on one of the opposing crossroads by stop or yield signs, if the traffic volume is sufficient to warrant such signs, or the standard cross-road warning sign, if the traffic volume is low, is recommended. All traffic control signs and signing practice should be in accord with the provisions of the current Indiana Manual on Uniform Traffic Control Devices for Streets and Highways and state and local laws (13).

COMPARISON OF CONFLICT POINTS IN 3-LEGGED
AND 4-LEGGED INTERSECTIONS.

Figure 10

The fact that three-way intersections are safer than four-way intersections should also be considered when road layouts in new county subdivisions are made and in redesigning local, low-volume county roads.

ACCIDENTS AND TRAFFIC CONTROL

The claim has been made that traffic controls are grossly underused on county roads in Indiana (11). Factual evidence to support this claim, however, is not easy to obtain and little research in this area has occurred.

It was concluded from the pilot study that four factors which were recorded on the punch cards - traffic control (Code 21), directional analysis (Code 11), driver violations (Code 37) and speed (Code 42) - would provide information of value.

Type of Accident

A detailed description of the data available from the directional analysis code (type of accident) is shown in the Appendix. A tremendous amount of detail is presented. Many of the items were combined for this analysis to make it less complex and to make the results comparable with similar data available for all other highways in Indiana.

Table 9 shows a summary version of the directional analysis data in a two-way frequency with significant traffic controls.

The tabulation clearly shows that traffic controls were not appreciably utilized at locations where county road accidents occurred in 1958 and 1959. The 85.4 percent of "no control" for all county road accidents and the 60.2 percent for the intersection

TABLE 9

ACCIDENT FREQUENCIES - TYPE OF ACCIDENT VS TRAFFIC CONTROL

Type of Accident	Traffic Signal	Stop Sign	Warning Sign	Center Line Marked	No Control	Total
Two Vehicle	19	122	61	30	1071	1303
Intersection	16	118	15	5	245	399
Non Intersection	3	4	46	25	826	904
One Vehicle	0	35	89	25	1095	1244
Hit Fixed Object	0	0	9	1	70	81
Ran Off Road	0	35	80	24	1025	1164
All Other	0	1	8	0	67	76
TOTAL	19	158	158	55	2233	2623
TOTAL PERCENT	.7	5.9	5.9	2.1	85.4	100.0

accidents are extremely high percentages. As a comparison, no traffic control existed at only 41.9 percent of all traffic accidents in Indiana, including those on county roads, and at only 25.7 percent of the total intersection accidents in Indiana in 1958. These data indicate that traffic control is not utilized on county roads as much as is desirable from the safety standpoint.

Table 10 was prepared to compare the county road accident data for ten counties for 1958-1959 with similar data for all reported accidents for the state. The comparison would have been more informative by making the comparison with all other than county road accidents, because a more serious effort has been made on state highways and city streets to use traffic controls where they are warranted. These data, however, were not available so the comparison was made with all accidents in Indiana.

The data of Table 10 indicate a similarity of accident type on county roads and on all roads and streets in Indiana except for rear end collisions, sideswipe accidents, collisions with a parked car, and driveway accidents for two vehicles and left road at a curve and pedestrian accidents for single vehicles. For three of these accident types - rear end collision, collision with a parked car and pedestrian accidents - experience, as indicated by the Table, indicates the higher rate on other than county roads. This is not unexpected because of the low volume of traffic, the small number of parked cars, and the few pedestrians on county roads. Rear-end collisions are also increased with the increased use of traffic controls, especially signals, of which very few are located

TABLE 10
COUNTY AND ALL INDIANA ACCIDENTS BY TYPE

Two Vehicle Accident				One Vehicle Accident			
Type of Accident	10 Counties N _{acc}	%	Ind. %	Type of Accident	10 Counties N _{acc}	%	Ind. %
Angle Collision	300	22.9	23.3	Left Road (Straight Road)	600	48.9	42.6
Rear End Collision	61	4.6	19.8	Left Road (at curve)	404	30.0	18.8
Sideswipe	448	34.1	18.7	Other Collision types	136	10.1	12.5
Hit Parked Car	80	6.1	13.3	Struck Pedestrian	17	1.3	12.4
Turning	96	7.4	9.8	Left Road at Intersection	102	7.6	7.9
Driveway	190	14.4	6.8	Non Collision	28	2.1	5.8
In-Out Parking	16	1.2	3.7				
Others	112	9.3	4.6				
TOTAL	1303	100.0	100.0	TOTAL	1347	100.0	100.0

on county roads.

Three accident types, however, occurred at a higher rate on county roads than on all highways and streets in Indiana. These constituted 48.5 percent of all two-vehicle accidents and 30.0 percent of all one-vehicle accidents on county roads - percentages which if reduced to those for all accidents would be a reduction for two-vehicle accidents of 21.9 percent and for one-vehicle accidents of 11.2 percent.

Sideswipe collisions, with the involved vehicles meeting head on or going the same direction, is the most frequent type of two-vehicle accident on county roads. This type of accident constitutes 34.1 percent of all county road two-vehicle accidents but only 18.7 percent of all Indiana two-vehicle accidents. There are many possible conditions that could cause this, but narrow pavement and shoulders and the almost complete absence of centerlines on even hard surfaced roads are the most probable causes. Typical examples of these conditions are shown in Figures 11 and 12.

Accidents occurring at driveways were also much worse for county roads. There are two possible major causes for driveway accidents; driver inattentiveness and poor visibility conditions. However, it was found, as previously noted in this report, that there is virtually no visibility problem except for vehicle obscurements. This is an indication that the driver exiting or entering a driveway is often a cause for these accidents, as the other vehicle on the road has the right-of-way and/or good visibility.

The third type of accident which occurs more often on county

EXAMPLES OF NARROW PAVEMENT AND SHOULDERS
ON COUNTY GRANULAR ROADS IN INDIANA

Figure 11

EXAMPLES OF HARD SURFACED COUNTY ROADS
SHOWING NARROW SHOULDERS AND THE ABSENCE
OF CENTER-LINES

Figure 12

roads than data for the state indicates that it should be where one vehicle leaves the road on a curve. A previous section of this report shows that too many single vehicle accidents occur on hard surfaced county roads at curves because of speed at these locations. Experience indicates that centerlines and edge lines on roads at curves are very helpful in reducing accidents at these locations, as they give the driver a forewarning of the curve and guidance around the curve.

Driver Violations

The data available under the driver violation code (Code 37) is shown in the Appendix. Several violations occurred in sufficient volume to warrant an analysis. Table 11 shows these data tabulated in a two-way frequency with Traffic Control Present.

Again, there is a preponderance of "No Control Present" for most classes of violation. For each of these, there is no proof that controls would reduce the number of accidents. However, it is a recognized fact that traffic controls do reduce accidents when used appropriately (12).

It is probable, moreover, that the presence of center lines on the hard surfaced roads where some of the driving left of center violations occurred would have reduced the violations and the accidents. It is also probable that yield or stop signs at the locations where a right-of-way violation occurred would have reduced the violations and the accidents if the volume on the major road warranted such signing. It is also possible that signed speed control on county roads would have reduced the accidents on these roads.

TABLE 11
 ACCIDENT FREQUENCIES - DRIVER VIOLATIONS
 VS TRAFFIC CONTROL

Traffic Violation	Traffic Signal	Stop Sign	Warning Sign	Center Line Marked	No Control Present	Total
Did not give right-of-way	1	59	12	3	242	317
Followed to closely	9	20	5	5	125	164
Other improper driving	1	2	63	8	246	320
Driving to left of center	1	7	40	15	614	677
Improper passing	-	5	8	4	111	128
Exceeded legal or safe speed	-	6	31	7	179	223
Made improper turn	3	14	3	2	84	106
Disregarded traffic signal	7	3	--	-	---	10
Disregarded stop sign	1	35	--	-	---	36
Inadequate brakes	-	--	--	-	---	0
Improper lights	-	--	--	-	---	0
TOTAL	23	151	162	44	1601	1981

One type of violation, disregarded traffic signal or sign, shows that considerable violation of the little traffic control signing on county roads already occurs. This, however, may not be a condemnation of good traffic control practices but a condemnation of the many non-standard, poorly planned, inadequately maintained, and inadequate controls which now exist.

Table 12, a one-way frequency table, shows the percentage data on driver violations for accidents on county roads in the ten counties and "all reported accidents" in the state for comparison.

Three driver violations are shown by the Table to not occur in similar percentages in the two cases. These violations are "did not give right-of-way," "followed too closely," and "driving to left of center."

The first of these, "did not yield right-of-way," occurs less frequently on county roads than for the state as a whole. As mentioned previously, traffic volumes on county roads are usually low while high volumes occur on most city streets and other rural roads (11). It is therefore logical that there are fewer violations of this type since there is less opportunity for it to occur.

The second factor, "followed too closely," also shows that, because there are lower volumes of traffic on county roads than other roads and streets, there is less opportunity for this driver error to happen.

The third factor, "driving to left of center," is much higher for county roads than for "all reported accidents" in the state. This violation further supports the conclusion obtained in a previous section

TABLE 12

DRIVER VIOLATION COMPARISON FOR COUNTY AND
"ALL REPORTED" ACCIDENTS

Traffic Violations	Percent	
	County Roads	All Indiana
Did Not Give Right-of-Way	16.0	23.3
Followed Too Closely	8.3	18.0
Other Improper Driving	16.1	12.5
Driving to Left of Center	34.1	10.8
Improper Passing	6.5	9.7
Exceeded Legal or Safe Speed	11.3	7.5
Made Improper Turn	5.4	6.6
Disregarded Traffic Signal	.5	4.6
Disregarded Stop Sign	1.8	3.5
Inadequate Brakes	0.0	3.4
Improper Lights	0.0	.1
TOTAL	100.0	100.0

of this report that lack of centerlines definitely cause drivers to "crowd" the center of the road and/or that narrow roads and shoulders cause drivers to drive nearer the center of the road than when the roadway is wider.

Speed

Speed is often associated with accidents and is recognized as a contributing factor to accident severity. The accident reports included information relative to the speeds at which the drivers of vehicles involved in accidents were travelling just prior to involvement. Figure 13 is a cumulative frequency curve of the reported speeds for all the county road accidents of 1958 and 1959 in the ten counties.

One half of the accidents occurred at reported speeds below 22.5 MPH and 90 percent of the accidents at speeds less than 45 MPH. Approximately 10 percent of the accidents occurred above a reported speed of 45 MPH and only one percent above sixty MPH.

A 45 MPH speed limit has been urged for all county roads except specific road sections otherwise speed zoned by county authorities. The speeds reported on the accidents analyzed in this study indicate that such a speed limit is realistic to drivers as 85 percent of them reported a speed of 42 MPH or less. The 85th percentile speed at which drivers travel on a road is recognized as the proper speed limit for that location unless reasons which the driver cannot see warrant a lower speed limit.

CUMULATIVE SPEED CURVE - ALL VEHICLES

Figure 13

ACCIDENTS AND MISCELLANEOUS FACTORS

The pilot study indicated that an analysis of several additional factors might possibly reveal some valuable accident information. Included were the effects on accidents of weather, daylight savings time, and accident severity.

Weather

Weather data were obtained from the U. S. Weather Bureau Monthly Reports for all weather station in the Indiana area. With the aid of the State Climatologist, these data were interpolated station by station to give the approximate number of hours of each type of weather for 1958 and 1959 for each of the ten counties studied. For each county, the percentage of the total number of accidents that happened in a given type of weather was divided by the percentage of the total number of hours of that type of weather. This factor is called Percent A/H Ratio in Table 13. The results of this calculation are shown in that Table.

A method previously used in this report (see page 41) was used to determine the significance limits of these ratios. The calculations revealed the following results when comparing rain, snow and sleet, and fog with clear and cloudy conditions.

TABLE 13

EFFECT OF WEATHER ON ACCIDENTS
Percent A/H Ratio by Weather Type
For Ten Counties

	Clear and Cloudy	Rain	Snow and Sleet	Fog
Adams	1.18	.63	.33	.30
Brown	1.17	1.00	.25	.09
Hendricks	1.08	1.44	.80	.18
Jefferson	1.17	.40	1.25	.20
Lawrence	1.13	1.11	.75	.09
Madison	1.08	1.56	.80	.09
Steuben	1.06	1.88	.62	.27
Sullivan	1.15	.56	.67	.30
Tippecanoe	1.07	1.36	1.00	.10
Wayne	1.08	1.11	.80	.40
$\bar{X}$	1.12	1.11	.73	.20
σ	.0473	.4627	.2920	.1113

Summary

	Accidents		Hours of Weather		Percent A/H Ratio
	N	%	N _{avg}	%	
Clear and Cloudy	2187	82.6	13230	75.5	1.12
Rain	303	11.4	1628	9.3	1.11
Snow and Sleet	105	3.9	846	4.8	.73
Fog	55	2.1	1816	10.4	.20
Total	2650	100.0	17520	100.0	1.00

	$\sigma_{\text{diff.}}$	$\frac{1.96 \times \sigma_{\text{diff.}}}{\text{diff.}}$	<u>Actual Diff.</u>
Rain	.1471	.2883	- .01
Snow and Sleet	.0935	.1833	-.39*
Fog	.0382	.0749	- .92*

* indicates a significant difference

It was concluded therefore, from this study that on county roads inclement weather has no detrimental effects on the frequency of accidents. More specifically, fog and snow and sleet conditions encourage fewer accidents, while rain has no significant effect on accident frequency.

This is contradictory to the beliefs held by many persons. However, one explanation could be that people drive fewer miles during one hour of fog or snow and sleet than they do in one hour of good weather. In the case of fog, it usually occurs in the early hours of morning when the traffic volumes are low. For snow and sleet, people may also voluntarily reduce their driving when these conditions exist. Drivers may also compensate for the hazardous conditions and thereby travel with greater care during bad weather conditions.

The information obtained from this analysis indicates that county road safety programs to be of the greatest value should be directed toward reducing accidents during good weather conditions rather than toward bad weather.

Time

Daylight savings time, or eastern standard time, has been a controversial subject in Indiana for several years. Reduction of accidents is one of the many factors which might occur because of a time change and which has been utilized by the proponents of daylight savings time.

Some of the counties which were used in this study operated on central standard time for at least a portion of the year while others operated on daylight savings time for the full year. It is also generally recognized that any advantage for daylight savings time relative to accidents would occur in the winter months when dusk and darkness occur during the evening peak period of travel. These two conditions, therefore, indicated that an analysis of accidents by hour during the five month period, November through March, for the counties in each of the two time groups might show some improved accident condition for one of the two time types.

The accidents for these five months were tabulated with the two time zones and the 24 hours of the day as the two variables of classifications. The results are illustrated in Figure 14 and shown in Table 14. A Chi square (χ^2) test was made to determine whether there was a significant difference between the two time frequency distributions. The χ^2 value for these data was obtained by using the following equation:

$$\chi^2 = \frac{1}{\bar{p}(1-\bar{p})} \left[\sum_{i=1}^{24} f_{fi}P_i - N_f\bar{P} \right] \quad (8)$$

TABLE 14
 ACCIDENT FREQUENCIES - TIME OF DAY
 NOVEMBER THROUGH MARCH 1958-1959

Time-CST	Counties with DST Winter Months		Counties with CST Winter Months	
	No. Accidents	% Total	No. Accidents	% Total
12:00-12:59 AM	7	1.11	16	3.60
1:00-1:59	8	1.27	14	3.15
2:00-2:59	6	.95	4	.90
3:00-3:59	4	.64	5	1.13
4:00-4:59	6	.95	4	.90
5:00-5:59*	15	2.38	0	--
6:00-6:59*	28	4.45	12	2.70
7:00-7:59*	28	4.45	30	6.76
8:00-8:59*	41	6.52	25	5.63
9:00-9:59	34	5.41	25	5.63
10:00-10:59	19	3.02	26	5.86
11:00-11:59	37	5.88	16	3.60

TABLE 14 (Continued)

Time-CST	Counties with DST Winter Months		Counties with CST Winter Months	
	No. Accidents	% Total	No. Accidents	% Total
12:00-12:59 PM	39	6.20	16	3.60
1:00- 1:59	41	6.52	14	3.15
2:00- 2:59	39	6.20	27	6.08
3:00- 3:59*	60	9.54	43	9.68
4:00- 4:59*	44	7.00	36	8.11
5:00- 5:59*	33	5.25	26	5.86
6:00- 6:59*	20	3.18	19	4.28
7:00- 7:59	22	3.50	21	4.73
8:00- 8:59	30	4.77	17	3.83
9:00- 9:59	28	4.45	15	3.38
10:00-10:59	20	3.18	18	4.05
11:00-11:59	20	3.18	15	3.38
* Subtotal 8 hours	269	42.77	191	43.02
TOTAL	629	100.00	444	100.00

TIME OF DAY DISTRIBUTION OF ACCIDENTS

Figure 14

where:

f_f = Frequency - DST Accidents

f_s = Frequency - CST Accidents

$$P_i = \frac{f_f}{f_f + f_s} \quad (\text{for each hour})$$

$$\bar{p} = \frac{N_f}{N_f + N_s}$$

N_f = total accidents - fast time

N_s = total accidents - slow time

A χ^2 value was calculated and found to be 51.30. Since χ^2 with 23 degrees of freedom and a significance level of .05 is 35.20 (10) this value is significant.

The periods during which both light and traffic conditions are variable for the two types of time are, using central standard time as the unit of measure, 5 AM to 9 AM and 3 PM to 7 PM for these five months. For these eight hours χ^2 was 17.08 which is also significant at the .05 level.

Additional analysis relative to the presence of any indication of accident reduction associated with one of the time types did not provide conclusive results because of insufficient data, other variable conditions, and the quantitative similarity of the data. It was, however, apparent (see Table 14) from the data that any reduction or increase of accidents associated with a time type, if present, would be quite small.

The analyses indicates that, for this particular study, type

of time had a significant effect on the distribution of accidents over the entire day, and that it also had an effect on distribution during the periods of the day when both light and traffic conditions are most variable. The effect on accident distribution over the entire day may be due to different traffic volume patterns throughout the day because of the type of time and/or other factors. The significant effect on accident distribution during the variable light hours of the day may also be due to different traffic volume patterns during these hours.

Accident Severity

As shown in the Traffic Accident Punch Card Code section of the Appendix, there are three classifications of accidents according to severity. They are fatal, non-fatal injury, and property damage only. Property damage of course, occurs in almost every accident but an accident is not classed as a property damage accident if a fatality or injury occurs.

Table 15 was prepared from the Annual Indiana State Police Accident Summary Sheets, and shows the number of fatal accidents and the total number of accidents for county roads and for all State rural roads. The number of fatal accidents per each one hundred accidents is also shown for these two road types.

The number of fatal accidents per 100 accidents on county roads was tested statistically to determine if there was any significant difference between it and the number found for State rural roads. The procedure used is described in a previous section of the report (see page 41). It was found that a difference greater than

TABLE 15
FATAL AND TOTAL ACCIDENTS ON RURAL
STATE AND COUNTY ROADS

Year	County Roads			Rural State Roads		
	Fatal Acc.	Total Acc.	Fatal Acc./ 100 Acc.	Fatal Acc.	Total Acc.	Fatal Acc./ 100 Acc.
1952	151	7857	1.92	628	23889	2.63
1953	171	9794	1.75	593	22751	2.61
1954	171	10436	1.64	496	20326	2.44
1955	159	11851	1.34	552	23038	2.40
1956	174	12322	1.41	567	22792	2.49
1957	195	12339	1.58	544	21827	2.49
1958	175	12634	1.39	480	20084	2.39
1959	165	13330	1.24	512	22422	2.28
Total	1361	90563	1.50	4372	177129	2.47

.58 fatal accidents per 100 accidents would be significant at a significance level of .05. Since the computed difference was .97, there were significantly fewer fatal accidents per 100 accidents on county roads than there were on State rural roads.

It is generally recognized that the severity of an accident is relative to the speed of the vehicles involved. As the accident information included data on the speed of the vehicles involved, as reported by those involved in the accident or investigation, an analysis was made of the relationship between the reported speed and the severity of the accident. It was found that the average reported speed before fatal accidents was 35.31 miles per hour, non-fatal injury accidents was 27.85 miles per hour, and property damage only accidents was 22.96 miles per hour. Using the same procedure as used previously it was found that all three average speeds were significantly different at a significance level of .05.

The cost to the country for vehicle accidents has been estimated at 6.4 billion dollars for 1960 as previously noted. This study also included a determination of the cost of accidents on county roads in Indiana.

In the ten counties studied, there were 2650 accidents with an estimated total reported property damage of \$1,063,446. This is an average property damage per reported accident of \$401.20 or approximately \$400. If the \$400 is multiplied by the total number of accidents per year on county roads in Indiana the total property damage per year is estimated. It has been estimated by the National Safety Council that each fatality is a cost to the national economy

of \$30,000 in wages lost and other items and that a corresponding figure for each non-fatal injury is \$1600 (14). Table 16 was prepared using these figures to estimate the total cost to the economy of all county road accidents in Indiana.

TABLE 16
COUNTY ROAD ACCIDENT COSTS IN INDIANA

Year	Fatal	Non-Fatal Injuries	Property Damage Accidents	Accident Costs Thousands of Dollars			
				Fatal	Injury	Property Damage	Total
1952	178	3820	5262	\$5340	\$6128	\$2112	\$13,580
1953	197	3950	6703	5910	6320	2690	14,920
1954	196	4796	7222	5880	7674	2898	16,452
1955	183	5550	8118	5490	8880	3258	17,628
1956	201	5767	8442	6030	9227	3388	18,645
1957	238	5840	8466	7140	9344	3397	19,881
1958	209	5613	8904	6270	8981	3573	18,824
1959	188	5536	9551	5640	8858	3833	18,331

The total costs rose steadily from 1952 to 1957 but slightly decreases in 1958 and 1959. This, however, cannot, be taken as a trend because of the short time involved. The \$18 million, however, of accident costs on county roads for 1959 is a tremendous economic burden for society to carry and is 38 percent of the total funds expended by county highway authorities on county roads in 1959.

The relationship of reported property damage to speed was also obtained in a two-way frequency from the accident punch cards. A summary of these data are shown in Table 17 and Figure 15.

TABLE 17
SPEED AND PROPERTY DAMAGE
COUNTY ROAD ACCIDENTS 1958-1959

Property Damage Range - \$	0- 250	251- 500	501- 750	751- 1000	Over 1000
Average Property Damage - \$	138	375	625	875	1250
Average Property Speed MPH	21.53	24.80	24.70	28.11	31.80

A regression line was calculated as described in the accident prediction portion of this report, and the equation is:

$$\hat{Y} = 20.44 + .0088 X$$

where:

$\hat{Y}$ = estimated speed before accident

X = property damage

The indicated relationship between property damage and speed was expected, as severity is generally recognized as related to speed. The analysis, however, does place some quantitative estimates on the property damage-speed relationship for county road accidents in Indiana.

REGRESSION LINE - PROPERTY DAMAGE VS.
SPEED BEFORE ACCIDENT

Figure 15

CONCLUSIONS AND RECOMMENDATIONS

The following are conclusions and recommendations about county road accidents in Indiana which are made from the findings discussed in the previous chapters of this report:

1. There is a very significant correlation between the number of accidents per county (in a two year period) and the number of vehicle registrations. It is suggested that the degree of success of accident-reduction and traffic safety programs be measured by comparing the number of accidents that occur in a two-year period with the number of accidents predicted from the regression equation developed in this study and which utilizes vehicle registrations as the independent variable.
2. Road defects are not a major cause of county road accidents. Slight improvement in county road accident statistics may be possible, however, with improved maintenance of shoulders and the elimination of holes, ruts, and bumps.
3. Little improvement in the county road accident problem results from converting a granular surface road to a hard surface one. Accidents, in fact, will most likely

increase if the road geometry is not improved at the same time as the conversion to a hard surface is performed. It is recommended that whenever a surface improvement is warranted, based upon road classification and a systems approach to county highway transportation, that the geometric design of curves and other features be changed so as to permit safely the higher speeds which will result.

4. There is no important highway-related, vision-obscurement problem which is not adequately compensated for by the drivers on Indiana county roads. There is a problem, however, of vision obscurement, due to fogged windows, snow, etc.
5. Three-way intersections were found to be safer than four-way intersections. It is recommended that this finding be used, whenever possible, in designing local streets in subdivisions and in redesigning local county roads.
6. Better traffic control at four-way intersections, where conditions warrant, is indicated. It is recommended that stop, yield, crossroad warning, or other traffic control devices be erected at all four-way intersections where the warrants as provided in the Indiana Manual on Uniform Traffic Control Devices for Streets and Highways are met. All such devices should be in accord with the requirements of this manual and other state and local laws.
7. A major cause of accidents on county roads in Indiana

is the narrow roadway and/or shoulders and the absence of centerlines. It is recommended that county highway programs of roadway and shoulder widening for major county roads be developed and aggressively pursued and that centerlines be placed on all arterial hard surface roads.

8. Vehicles involved in accidents have an 85th percentile reported speed of approximately 42 miles per hour. It is recommended that a speed limit of 45 miles per hour for all county roads except sections specifically speed zoned by county authorities be established.
9. The distribution of accidents occurring in counties using Daylight Savings Time is significantly different from that in counties using Central Standard Time. It is recommended that further study be performed relative to any reduction or increase in accidents which may be associated with the type of time.
10. The average property damage resulting from each county road accident was \$400 and the total cost of all county road accidents in the state was 18 million dollars in 1959. This is a tremendous burden for the state.
11. The analysis of the data for this project emphasized the well-known fact that the driver is responsible for a major share of county-road accidents. It is recommended that more attention be given in county safety programs to the driver and that he be continually informed :

and educated concerning accident causing conditions and the personal economic impact of having an accident.

12. It is recommended that the accident punch cards for 1958, 1959, and future years for the ten counties used in this study be saved, and that a similar project be performed at some future date. With more data, a more complete analysis, including trends, could be made.

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APPENDIX

TRAFFIC ACCIDENT PUNCH CARD CODES

INDIANA STATE POLICE

The following codes are for use with IBM 80 column punch cards.
Detailed descriptions have been omitted.

Code 1. Col. 1 to 5 Accident Number

Code 2. Col. 6 Year

1957 - 12 in Col. 7

1958 - 0 in Col. 7

1959 - 12 in Col. 7

1960 - 11 in Col. 6

Code 3. Col. 6 Investigation

4. Not investigated

5. Investigated - State Police

6. Investigated - Local Police

Code 4. Col. 6 Trailer Cards

7. A - Primary card

8. B - Supplementary card or cards

9. C - Supplementary card or cards

Code 5. Col. 6 and Col. 7 Date of Month

0-3 in Col. 6

0-9 in Col. 7 Numerical code, number 01-31

Code 6. Col. 8 Month

1. January

2. February

3. March

4. April

5. May

6. June

7. July

Traffic Accident Punch Card Codes

Code 6. Col. 8 Month (Cont'd.)

- 8. August
- 9. September
- 10. October
- 11. November
- 12. December

Code 7. Col. 9 Day of Week

- 1. Monday
- 2. Tuesday
- 3. Wednesday
- 4. Thursday
- 5. Friday
- 6. Saturday
- 7. Sunday
- 8. Not stated

Code 8. Col. 10 Hour

- A. Col. 10 12. 12:00 - 12:59
 - 1. 1:00 - 1:59
 - 2. 2:00 - 2:59
 - 3. 3:00 - 3:59
 - 4. 4:00 - 4:59
 - 5. 5:00 - 5:59
 - 6. 6:00 - 6:59
 - 7. 7:00 - 7:59
 - 8. 8:00 - 8:59
 - 9. 9:00 - 9:59
 - 0. 10:00 - 10:59
 - 11. 11:00 - 11:59

- B. Col. 9 12. A.M.
- 11. P.M.
- 0. Hour not stated

Code 9. Col. 11 Severity

- 12. Fatal accident
- 11. Non-fatal injury accident
- 0. Property damage only accident

Code 10. Col. 11 Total Property Damage

- 1. \$0. - \$25.
- 2. 26 - 50

Traffic Accident Punch Card Codes

Code 10. Col. 11 Total Property Damage (Cont'd.)

- 3. 51-100
- 4. 101-250
- 5. \$251.-\$500.
- 6. 501. -750.
- 7. 751.-1,000.
- 8. Over \$1,000.00
- 9. Not stated

Code 11. Col. 12 and 13 Directional Analysis

- 0-9. Numerical type code, numbers 00-99.
- 12. Signal #100-199
- 11. Signal #200-299

Collision with pedestrian - #00-39
 Collision with other motor vehicle - #40-119
 Collision with railroad train - #120-129
 Collision with street car - #130-139
 Collision with animal-drawn vehicle - #140-149
 Collision with bicycle - #150-159
 Collision with animal - #160-179
 Collision with fixed object - #180-189
 Overturned in roadway - #190-199
 Ran off roadway - #200-219
 Other non-collision - #220-229
 Miscellaneous - #230-239

A. Pedestrian - Intersection

- 00. Car going straight - car entering intersection
- 01. Car going straight - car within intersection
- 02. Car going straight - car leaving intersection
- 03. Car turning right - car entering intersection
- 04. Car turning right - car within intersection
- 05. Car turning right - car leaving intersection
- 06. Car turning left - car entering intersection
- 07. Car turning left - car within intersection
- 08. Car turning left - car leaving intersection
- 09. Car backing - car entering intersection
- 10. Car backing - car within intersection
- 11. Car backing - car leaving intersection
- 12. All others - car entering intersection
- 13. All others - car within intersection
- 14. All others - car leaving intersection
- 15. Not stated

Traffic Accident Punch Card Codes

Code 11. Col. 12 and 13 Directional Analysis (Cont'd.)

B. Pedestrian Non-Intersection

- 20. Car going straight ahead
- 21. Car turning right
- 22. Car turning left
- 23. Car backing
- 24. Car making U turn
- 25. Car slowing down or stopping
- 26. Car starting in traffic lane
- 27. Car starting from parked position
- 28. All others
- 29. Not stated

C. Two-Vehicle Collisions - Intersection

- 40. Entering at angle - both going straight
- 41. Entering at angle - one right turn other straight from right
- 42. Entering at angle - one right turn, other straight from left
- 43. Entering at angle - one left turn, other straight and from right
- 44. Entering at angle - one left turn, other straight and from left
- 45. Entering at angle - both turning right
- 46. Entering at angle - both turning left
- 47. Entering at angle - one left turn, other right turn from right
- 48. Entering at angle - one left turn, other right turn and from left
- 49. Entering at angle - one stopped, other from right
- 50. Entering at angle - one stopped, other from left
- 51. Entering at angle - one U-turn
- 52. Entering at angle - all others
- 53. Entering from same direction - both going straight
- 54. Entering from same direction - one right turn, one straight
- 55. Entering from same direction - one left turn, one straight
- 56. Entering from same direction - both turning right
- 57. Entering from same direction - both turning left
- 58. Entering from same direction - one right and other left turn
- 59. Entering from same direction - one stopped
- 60. Entering from same direction - one U-turn

Traffic Accident Punch Card Codes

Code 11. Col. 12 and 13 Directional Analysis (Cont'd.)

C. Two-Vehicle Collisions - Intersection (Cont'd.)

- 61. Entering from same direction - all others
- 62. Entering from opposite directions - both going straight
- 63. Entering from opposite directions - one right turn, one straight
- 64. Entering from opposite directions - one left turn, one straight
- 65. Entering from opposite directions - both turning right
- 66. Entering from opposite directions - both turning left
- 67. Entering from opposite directions - one stopped
- 68. Entering from opposite directions - one U-turn
- 69. Entering from opposite directions - all others
- 70. Not stated
- 71. Entering from opposite directions - one left turn, one right turn

D. Two-Vehicle Collisions - Non-Intersection

- 80. Opposite directions - head-on collision
- 81. Opposite directions - side-swipe collision
- 82. Same direction - Rear-end collision
- 83. Same direction - Side-swipe collision
- 84. One car parked - proper location - other from same direction
- 85. One car parked - proper location - other from opposited direction
- 86. One car parked - improper location - other from same direction
- 87. One car parked - improper location - other from opposite direction
- 88. One car stopped in traffic - other from same direction
- 89. One car stopped in traffic - other from opposite direction
- 90. One car forward from parked position - other from same direction
- 91. One car forward from parked position - other from opposite direction
- 92. One car backward from parked position - other from same direction
- 93. One car backward from parked position - other from opposite direction
- 94. One car backing into parked position - other from same direction

Traffic Accident Punch Card Codes

Code 11. Col. 12 and 13 Directional Analysis (Cont'd.)

- 95. One car backing into parked position - other from opposite direction
- 96. One car turning right to enter alley - other from same direction
- 97. One car turning right to enter alley - other from opposite direction
- 98. One car turning left to enter alley - other from same direction
- 99. One car turning left to enter alley - other from opposite direction
- 100. One car turning right leaving alley - other from left
- 101. One car turning right leaving alley - other from right
- 102. One car turning left leaving alley - other from left
- 103. One car turning left leaving alley - other from right
- 104. One car turning right to enter driveway - other same direction
- 105. One car turning right to enter driveway - other from opposite direction
- 106. One car turning left to enter driveway - other from same direction
- 107. One car turning left to enter driveway - other from opposite direction
- 108. One car turning right leaving driveway - other from left
- 109. One car turning right leaving driveway - other from right
- 110. One car turning left leaving driveway - other from left
- 111. One car turning left leaving driveway - other from right
- 112. Car parked, other backing
- 113. U-turn in straight road, other same direction
- 114. U-turn in straight road, other opposite direction
- 115. Car stopped, then backed into car in rear
- 116. Backing out of driveway or alley
- 117. Car backing out of driveway or alley and hitting a parked car
- *118. All others
- 119. Not stated

*Alley intersection

Traffic Accident Punch Card Codes

Code 11. Col. 12 and 13 Directional Analysis (Cont'd.)

E. All Other Accidents

- 120. Collision with railroad train - at street intersection
- 121. Collision with railroad train - not at street intersection
- 122. Collision with railroad train
- 130. Collision with trackless trolley - at intersection
- 131. Collision with trackless trolley - not at intersection
- 140. Collision with animal-drawn vehicle - at intersection
- 141. Collision with animal-drawn vehicle - not at intersection
- 150. Collision with bicycle - at intersection
- 151. Collision with bicycle - not at intersection
- 160. Collision with animal - at intersection - ridden
- 161. Collision with animal - at intersection - herded
- 162. Collision with animal - at intersection - unattended, horse, cow, etc.
- 163. Collision with animal - at intersection - unattended, pig, sheep, etc.
- 164. Collision with animal - at intersection - unattended, dog, cat, etc.
- 165. Collision with animal - at intersection - wild deer, moose, etc.
- 166. Collision with animal - at intersection - all others
- 167. Collision with animal - not at intersection - ridden
- 168. Collision with animal - not at intersection - herded
- 169. Collision with animal - not at intersection - unattended, horse, cow, etc.
- 170. Collision with animal - not at intersection - unattended, pig, sheep, etc.
- 171. Collision with animal - not at intersection - unattended, dog, cat, etc.
- 172. Collision with animal - not at intersection - wild deer, moose, etc.
- 173. Collision with animal - not at intersection - all others
- 180. Collision with fixed object immediately adjacent to road (rual) - at intersection
- 181. Collision with fixed object immediately adjacent to road (rual) - not at intersection
- 182. Collision with fixed object in road - same direction lanes - at intersection

Traffic Accident Punch Card Codes

Code 11. Col. 12 and 13 Directional Analysis (Cont'd.)

- 183. Collision with fixed object in road - same direction lanes - not at intersection
- 184. Collision with fixed object in road - opposite direction lanes - at intersection
- 185. Collision with fixed object in road - opposite direction lanes - not at intersection
- 186. Collision with fixed object on centerline - not at intersection
- 187. Collision with fixed object on centerline - at intersection
- 188. Collision with other object
- 190. Overturned in roadway - at intersection
- 191. Overturned in roadway - at curve
- 192. Overturned in roadway - on straight road
- 200. Left roadway at intersection, then overturned
- 201. Left roadway at intersection, struck fixed object adjacent to road (urban)
- 202. Left roadway at intersection, struck fixed object - other
- 203. Left roadway at intersection, struck other vehicle
- 204. Left roadway at intersection, struck pedestrian
- 205. Left roadway at curve, then overturned
- 206. Left roadway at curve, struck fixed object adjacent to road (urban)
- 207. Left roadway at curve, struck fixed object - other
- 208. Left roadway at curve, struck other vehicle
- 209. Left roadway at curve, struck pedestrian
- 210. Left roadway - straight road - overturned
- 211. Left roadway - straight road - struck fixed object adjacent to road (urban)
- 212. Left roadway - straight road - struck fixed object - other
- 213. Left roadway - straight road - struck pedestrian
- 214. Left roadway - straight road - struck other vehicle
- 220. Driverless moving vehicle
- 221. Occupant fell from vehicle - boarding or alighting in traffic
- 222. Occupant fell from vehicle - not in boarding or alighting
- 223. Injured within vehicle (no other vehicle)
- 224. Mechanical failure (no other event)
- 225. Fire (no other event)
- 226. All other non-collision
- 230. Miscellaneous

Traffic Accident Punch Card Codes

Code 12. Col. 14 and 15 City or Township

0-9 Numerical code, numbers 01-99.

If necessary, use Col. 14 #11, to signal numbers 100-199, also punched as above. Used in Marion County where more than 19 towns under 1,000.

Population groups are as follows:

01-29 Townships (outside incorporated places)
 30-34 50,000 population and over
 35-39 25,000 to 50,000 population
 40-49 10,000 to 25,000 population
 50-59 5,000 to 10,000 population
 60-69 2,500 to 5,000 population
 70-79 1,000 to 2,500 population
 80-99 Under 1,000 population

Code 13. Col. 16 and 17 County

Code 14. Col. 18 and 19 Highway Number

Col. 18 0-9 Numerical code, numbers 001-499
 12. Signal 100-199
 11. Signal 200-299

12. Signal 300-399
 11. Signal 400-499

(For any highways numbered over 499, assign arbitrary numbers in the 400 series.)

Code 15. Col. 20 Class of Highway Card Symbols

4. Not stated	
5. Local roads and streets	LOC
6. US numbered highway	US
7. State numbered highway	SH
8. County highway	CO

9. Detour - Double punch Col. 20

Code 16. Col. 20 Light Conditions

12. Daylight
 11. Dusk
 0. Dawn
 1. Darkness - street or highway lighted

Traffic Accidents Punch Card Codes

Code 16. Col. 20 Light Conditions (Cont'd.)

- 2. Darkness - street or highway not lighted
- 3. Darkness - lighting not stated
- Rejects - not stated

Code 17. Col. 21 Character of Location

- #12 &
 - 1. T intersection
 - 2. Y intersection
 - 3. Offset intersection
 - 4. Five or more corners
 - 5. Rotary
 - 6. Grade separation, or clover - leaf
 - 0. All other intersections

- #11 &
 - 1. Culvert
 - 2. Overpass
 - 3. Alley intersection
 - 4. Driveway intersection
 - 5. Railroad crossing
 - 6. Bridge
 - 7. Underpass
 - 8. In alley
 - 9. All others
 - 0. Not stated

Code 18. Col. 22 Vision Obscured - Highway (Also see Code 40)

- A.
 - 1. Trees, crops, bushes, etc.
 - 2. Building
 - 3. Embankment
 - 4. Signboards, etc.
 - 5. Hillcrest
 - 6. Others (Permanent highway elements)
- B.
 - 7. Parked cars
 - 8. Moving cars
 - 9. Others (temporary conditions)
- C.
 - 0. Accident - vision not obscured
 - 11. Accident - vision obscured (including driver and vehicle obscurements)
 - 12. Accident - information not stated

NOTE: Punch as many as apply in parts A and B

Code 19. Col. 23 Weather

- 0. Clear

Traffic Accident Punch Card Codes

Code 19. Col. 23 Weather (Cont'd.)

1. Cloudy
2. Raining
3. Snowing
4. Fog
5. Sleet
6. Dust
7. Smoke
8. Other
9. Not stated

Code 20. Col. 24 Road Defects

- A.
 1. Foreign material on surface
 2. Loose surface material - gravel, etc.
 3. Holes, ruts, bumps, dips, etc.
 4. Defective shoulders
 5. Obstruction not lighted (darkness)
 6. Obstruction not signalled (daylight)
 7. Flood, landslide, etc.
 8. No defects
 9. Not stated
 0. Other defects
- B.
 12. Road under construction
 11. Road obstructed by previous accident

Code 21. Col. 25 and 26 Traffic Control

- 25 A.
 1. Police officer
 2. Stop and go light
 3. Stop sign - failed to yield right-of-way
 4. Warning sign
 5. RR watchman, gates, signal
 6. In N-bound lane of NS road; E-bound of EW 4-lane divided highway
 7. In S-bound lane of NS road; or W-bound lane of EW 4-lane divided highway
 8. Center line marked (two lane road only)
 9. Lane markings (four lane undivided)
 0. No passing zone
 11. Three lane undivided
 12. Four lanes divided
- 26 B.
 0. 1st control not functioning - OFF
 1. 1st control not functioning - other
 2. 2nd control not functioning - OFF
 3. 2nd control not functioning - other
 4. 3rd control not functioning - OFF

Traffic Accident Punch Card Code

Code 21. Col. 25 and 26 Traffic Control (Cont'd.)

- 5. 3rd control not functioning - other
- C. 6. One or more controls present, all functioning
- 7. One or more controls present, one or more not functioning - OFF
- 8. One or more controls present, one or more not functioning - other
- 9. No controls present
- 0. Rejects - not stated
- 11. Punch one way street
- 12. Punch all others

Code 22. Col. 27 Kind of Locality

- 12. Manufacturing or industrial district
- 11. Shopping or business district
- 0. Residential district
- 1. School or playground district
- 2. Open country
- 3. Other
- Rejects - not stated

Code 23. Col. 27 Condition of Road Surface

4. Dry	7. Snowy
5. Wet	8. Icy
6. Muddy	9. Not stated

Code 24. Col. 28 Type of Road Surface

- 1. Concrete
- 2. Brick
- 3. Blacktop, Asphalt, or bituminous
- 4. Gravel
- 5. Sand or dirt
- 7. Other
- 8. Not stated

Code 25. Col. 29 Character of Roadway - Horizontal

- 12. Straight road
- 11. Sharp curve or turn
- 0. Other curves
- 1. Not stated

Code 26. Col. 29 Character of Roadway - Vertical

- 2. Level road

Traffic Accident Punch Card Code

Code 26. Col. 29 Character of Roadway - Vertical (Cont'd.)

- 3. Up grade
- 4. Hillcrest
- 5. Down grade
- 6. Rejects - not stated

Code 27. Col. 30 and 47 Type of Vehicle

- A. 12 &
 - 1. Passenger
 - 2. Passenger car and trailer
 - 3. Passenger car and house trailer
 - 4. Truck
 - 5. Truck and trailer
 - 6. Truck tractor
- 11 &
 - 1. Truck tractor and semi-trailer
 - 2. Other combination
 - 3. Other tractor
 - 4. Taxicab
 - 5. Bus
 - 6. School bus
- 0 &
 - 1. Motorcycle
 - 2. Motor bike
 - 3. Trackless trolley
 - 4. Motor scooter
 - 6. Not stated
- B. (Double Punch)
 - 7. Emergency vehicle (incl. private-owned)
 - 8. Military vehicle
 - 9. Other publicly-owned vehicle

Code 28. Col. 31 and 48 Defects of the Vehicle

- A.
 - 1. Defective brakes
 - 2. No trailer brakes
 - 3. One headlight out
 - 4. Both headlights out
 - 5. Headlights insufficient
 - 6. Headlights glaring
 - 7. Rear light insufficient
 - 8. Rear light out
 - 9. Other lights or reflectors deficient
 - 0. Steering mechanism defective
 - 11. Puncture or blowout
 - 12. Worn, smooth tires

Col. 32 and 49 12.
 11.
 0.
 1.

Traffic Accident Punch Card Code

Code 28.

Col. 32 and 49 (Cont'd.)

2. Other defects
3. No defects
4. Not stated

NOTE: Code one or more

B. Col.65

12. Accident - one or more vehicle defective
11. Accident - no vehicles defective
0. Accident - defects not stated

Code 29. Col. 33 and 50 Residence of Driver - Urban or Rural

12. Resident of town under 1,000 population
11. Resident of city 1,000 - 5,000 population
0. Resident of city 9,000 - 10,000 population
1. Resident of city 10,000 - 50,000 population
2. Resident of city over 50,000
4. Resident of rural area
5. Not stated

Code 30. Col. 33 and 50 Residence of driver - Proximity

6. Residing within 25 miles of accident location
7. Residing elsewhere in state
8. Non-resident of state
9. Not stated

Code 31. Col. 34 - 51 Sex of Driver

12. Male
11. Female
0. Not stated

Code 32. Col. 34 - 51 Experience of Driver

1. Learner - under instruction
2. Less than 3 months
3. Three to six months
4. Six to twelve months
5. One year
6. Two to five years
7. Six to ten years
8. Eleven years or over
9. Not stated

Traffic Accident Punch Card Code

Code 33. Col. 35-36 and 52-53 Age of Drivers

- 0-9 Numerical type code 00-99
- 11. 100 and over
- 12. Not stated

Code 34. Col. 37 - 54 Race of Driver

- 12. White
- 11. Negro
- 0. Not stated
- 1. Other

(One other specific coding may be inserted, using Rejects for Not stated).

Code 35. Col. 37-54 Driver's License

- 2. Licensed in state - operator
- 3. Licensed in state - beginner
- 4. Licensed in state - chauffeur
- 5. Resident - no license
- 6. Non-resident - licensed in other state
- 7. Non-resident - no license
- 8. Not stated

Code 36. Col. 38-55 Occupation of Driver

- #12 &
 - 1. Professional
 - 2. Semi-Professional
 - 3. Businessmen, Proprietors, Managers and Officials
 - 4. Farmers
 - 5. Farm Laborers
 - 6. Clerical, sales, etc.
 - 7. Travelling Salesmen
 - 8. Other Commercial Drivers
 - 9. Military
 - 0. Other Protective Service Workers
- #11 &
 - 1. Other Service Workers
 - 2. Craftsmen and Foremen (Skilled)
 - 3. Operatives (semi-skilled)
 - 4. Laborers (Except farm)
 - 5. Housewives
 - 6. Domestic Servants
 - 7. Students
 - 8. Retired
 - 9. Other and Miscellaneous - (Exclude any with occupation).
 - 0. Not stated (Include "Unemployed".)

Traffic Accident Punch Card Codes

Code 37. Col. 39 and 56 Driver Violations Indicated

- A.
1. Exceeded stated speed limit
 2. Exceeded reasonable, safe speed, but not stated speed limit
 3. Exceeded reasonable, safe speed, not stated speed limit existing
 4. Failure to grant right-of-way - pedestrian
 5. Failure to grant right-of-way - vehicle
 6. Following too closely
 7. Wrong way on one-way street
 8. Passing standing street car
 9. Passing on hill
 0. Passing on curve
 11. Cutting in
 12. Passing standing school bus

B. Col. 40 and 57

1. Passing on wrong side
2. Passing at intersection
3. Other improper passing
4. On wrong side of road
5. Failure to signal or improper signal
6. Improper turn-wide right turn
7. Improper turn-cut corner on left turn
8. Improper turn-turned from wrong lane
9. Other improper turning
0. Disregarded police officer
11. Disregarded stop and go light
12. Disregarded stop and go sign

C. Col. 41 and 58

1. Disregarded warning sign or signal
2. Disregarded other traffic control device
3. Improper starting from parked position
4. Improper parking location
5. Failed to turn on lights
6. Failed to dim headlights
7. Failed to use bright headlights
8. Reckless driving
9. Too slow for traffic conditions
0. Disregarding hand signal
12. Other violations (Hit and run)

Traffic Accident Punch Card Codes

Code 37. Driver Violations Indicated (Cont'd.)

D. Col. 42 and 59

- 0. Driver in violation
- 11. Driver not in violation
- 12. Not stated

NOTE: (1) Code one or more. Be sure to code one of the last three items.

B. Col. 64

- 1. Accident - stated speed limit exceeded
- 2. Accident - reasonable, safe speed exceeded, but not stated limit
- 3. Accident - reasonable, safe speed exceeded, stated limit not existing
- 4. Accident - no speed violation
- 5. Accident - speed violations not stated
- 6. Too slow for traffic conditions

C. Col. 64

- 12. Accident involving a violation
- 11. Accident not involving a violation
- 0. Accident - violations not stated

NOTE: Code parts B and C on supplementary cards. In part C, code as "not stated" if speed data is incomplete, even though non-speed violations may be shown.

Code 38. Col. 42 and 59 Condition of Driver - Drinking

- A.
 - 1. Had not been drinking
 - 2. Had been drinking - obviously drunk
 - 3. Same - ability impaired
 - 4. Same - ability not impaired
 - 5. Same - not known whether ability impaired
 - 6. Not stated

NOTE: Items 2 and 3 constitute the first violation listed on the summary, and drivers included in these items are not to be included in the individual driving violations on the summary even though those violations will have been punched in code 37 so that they may be available for special study. Data for the violations schedule of the summary may be obtained by sorting first for the above code (at the same time record other data counted in this column) and then holding out items 2 and 3 when counting the driving violations. (Code 37)

Traffic Accident Punch Card Codes

Code 38. Condition of Driver - Drinking (Cont'd.)

Col. 64

- B.
 - 7. Accident - one or more drivers under the influence of alcohol
 - 8. Accident - No drivers under the influence of alcohol
 - 9. Accident - not stated
- C. Alcohol tests - code for investigated accidents only.
 - 7. Chemical tests
 - 8. Other tests
 - 9. No tests or not stated

Code 39. Col. 43 and 60 Condition of Driver - Except Drinking

- A.
 - 1. Eyesight defective
 - 2. Hearing defective
 - 3. Other bodily defects
 - 4. Illness
 - 5. Fatigued
 - 6. Apparently asleep
 - 8. Attention diverted
 - 9. Other handicaps (write or code above)
 - 0. Apparently normal
 - 11. Not stated

NOTE: Code one or more

- B. Col. 65
 - 1. Accident - one or more drivers defective
 - 2. Accident - no drivers physically defective
 - 3. Accident - not stated

NOTE: Also code part B on supplementary cards.

- C. 43 & 60 12. Wearing glasses

Code 40. Col. 44 and 61 Vision Obscured - Driver and Vehicle

- A.
 - 1. Rain, snow, etc. on windshield
 - 2. Stickers on windshield
 - 3. Windshield otherwise obscured
 - 4. Vision obscured by load on vehicle
 - 5. Frost
 - 6. Other (Obscurements in or on vehicle)
- B.
 - 7. Blinded by headlights
 - 8. Blinded by sunglare
 - 11. Other (external, but affected this driver only.)

Traffic Accident Punch Card Codes

Code 40. Col. 44 and 61 Vision Obscured - Driver and Vehicle (Cont'd.)

NOTES: (1) Code as many as necessary
 (2) Highway vision obscurements and accident control coding is in Code 18.

Code 41. Col. 45 and 62 Miscellaneous Actions

1. Passing or overtaking other vehicle
2. Avoiding vehicle approaching at angle
3. Avoiding vehicle travelling same direction
4. Avoiding vehicle travelling opposite direction
5. Avoiding parked vehicle
6. Avoiding fixed object immediately adjacent to roadway (rural)
7. Avoiding fixed object in roadway - same direction lanes
8. Avoiding fixed object in roadway - opposite direction lanes
9. Avoiding fixed object on line between opposing traffic
0. Avoiding pedestrian
11. Vehicle skidded - before applying brakes
12. Vehicle skidded - after applying brakes

NOTE: Code as many as apply. (There is space in Code 40 for expansion of this code.)

Code 42. Col. 46 and 63 Speed before Accident

12. Standing still (excl. proper parking location)
11. 0 - 5 mph
0. 6 - 10 mph
- 1.11 - 15 mph
- 2.16 - 20 mph
- 3.21 - 30 mph
- 4.31 - 40 mph
5. 41 - 50 mph
6. 51 - 60 mph
7. 61 - 70 mph
8. Over 70 mph
9. Not stated

Code 43. Col. 65 Other Contributing Factors

4. Railroad train - violation or defective equipment
5. Street car - violation or defective equipment
6. Animal-drawn vehicle - violation or defective equipment
7. Bicycle
8. Motor vehicle - not involved by contact - violation or defective equipment (See "c" card for details.)
9. Pedestrian - not involved by contact - violation, unsafe act, or defective (See "C" card for details.)

Traffic Accident Punch Card Codes

Code 44. Col. 66 - 67 and 70 - 73 Age of Killed or Injured

A. Injury #1

Col. 66 and 67

0-9 Numerical type code #01-99

11. 100 and over

12. Not stated

B. Injury #2 and #3

Col. 70 and 73

1. 0 - 4 years

2. 5 - 9 years

3. 10 - 14 years

4. 15 - 19 years

5. 20 - 24 years

6. 25 - 34 years

7. 35 - 44 years

8. 45 - 54 years

9. 55 - 64 years

0. 65 - 74 years

11. 75 years and over

12. Not stated

Code 45. Col. 68, 71, 74 Severity of Injury

12. Fatal

11. Major non-fatal

0. Minor non-fatal

Code 46. Col. 68, 71, 74 Sex of Injured or Killed

1. Male

2. Female

3. Not stated

Code 47. Col. 68, 71, 74 Location of Injured

4. Motor vehicle driver

5. Motor vehicle passenger

6. Pedestrian

7. Bicyclist

8. All others

9. Not stated

Code 48. Col. 69, 72 and 75 Car Occupied

12. Car #1

11. Car #2

0. Car #3

1. Car #4, 5, etc. Rejects - not stated

Traffic Accident Punch Card Codes

Code 49. Col. 69, 72, and 75 Race of Injured

2. White
3. Negro
4. Yellow or brown (Japanese, Chinese, Filipino)
5. Red (Mexican, Indian)
6. Other
7. Not stated

Code 50. Col. 69, 72 and 75 Military Personnel

8. Military
9. Other and not stated

Code 51. Col. 76 Pedestrian Actions

- 12 & 1. Crossing at intersection - with signal
2. Crossing at intersection - against signal
3. Crossing at intersection - no signal
4. Crossing at intersection - diagonally
5. Crossing - not at intersection
6. Coming from behind parked cars
7. Walking in roadway with traffic - sidewalks available
8. Walking in roadway with traffic - sidewalks not available
9. Walking in roadway against traffic - sidewalks not available
- 12 & 0. Walking in roadway against traffic - sidewalks not available
- 11 & 1. Standing in safety zone
2. Standing in roadway
3. Getting on or off other vehicle
4. Pushing or working on vehicle in roadway
5. Other working in roadway
6. Playing in roadway
7. Hitching on vehicle
8. Lying in roadway
9. Not in roadway
- 11 & 0. Not stated

Code 52. Col. 77 Other Pedestrian Actions

1. On sled
2. On coaster wagon, tricycle, etc.
3. On roller skates
4. Pushing or pulling cart, buggy, wagon, etc.
5. Vending in roadway (no cart)
6. Hitch-hiking in roadway

Traffic Accident Punch Card Codes

Code 53. Col. 77 Pedestrian Residence - Proximity

- 12. Residing within 25 miles of accident location
- 11. Residing elsewhere in state
- 0. Non-resident of state. Rejects - not stated

Code 54. Col. 77 Pedestrian Residence - Urban, Rural

- 7. Resident of town under 1,000 population
- 8. Resident of city over 1,000 population
- 9. Resident of rural area. Rejects - not stated

Code 55. Col. 78 Pedestrian's Condition

- 1. Had been drinking - obviously drunk
- 2. Had been drinking - ability impaired
- 3. Had been drinking - ability not impaired (See Note 2)
- 4. Had been drinking - not known whether impaired
- 5. Eyesight defective
- 6. Hearing defective
- 7. Other bodily defect
- 8. Illness
- 9. Fatigued or asleep
- 0. Other handicap (Write or code above)
- 11. Apparently normal
- 12. Not stated

Code 56. Col. 79 Pedestrian's Occupation

- 12 & 1. Professionals
- 2. Semi-Professionals
- 3. Businessmen, proprietors, managers, and officials
- 4. Farmers
- 5. Farm laborers
- 6. Clerical, sales, etc.
- 7. Travelling salesmen
- 8. Other commercial drivers
- 9. Military
- 12 & 0. Other protective service workers
- 11 & 1. Other service workers (except domestic servants)
- 11 & 2. Craftsmen, foremen (skilled)
- 3. Operatives (semi-skilled)
- 4. Laborers (except farm)
- 5. Housewives
- 6. Domestic servants
- 7. Students
- 8. Retired

Traffic Accident Punch Card Codes

Code 56. Col 79 Pedestrian's Occupation (Cont'd.)

9. Other and miscellaneous
11 & 0. Not stated

NOTE: See Code 36 for detailed description of items.

Code 57. Col. 80 Post Area