

Report HSRI-320139-1

EVALUATION OF TRAFFIC ACCIDENT EXPERIENCE FOR COUNTERMEASURE PROGRAM PLANNING

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FINAL REPORT

Prepared for

*MICHIGAN OFFICE OF HIGHWAY SAFETY PLANNING
and
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
U. S. Department of Transportation*

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the State or the U. S. Department of Transportation, National Highway Traffic Safety Administration.

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PREFACE

This report was prepared by the Highway Safety Research Institute (HSRI) of The University of Michigan for the Michigan Office of Highway Safety Planning (OHSP). It is the final report from the resultant contract work of HSRI proposal ORA-72-603-B1. This work, as reported herein, was undertaken to develop areal indices of Michigan's accident experience based on data available within the various State agencies. In addition, it reflects ad hoc support to the OHSP for specific project planning and evaluation.

While responsibility for this report rests with its authors, appreciation is expressed to Mr. Noel C. Bufe, executive director of the OHSP, and his staff for their support and assistance, without which the research reported here could not have proceeded.

TABLE OF CONTENTS

Preface	i
1.0 Introduction	1
2.0 Support for Project Planning and Evaluation.....	4
3.0 Model Refinement	8
3.1 Exposure Information	9
3.2 Data Aggregation and Presentation	12
3.3 Normalizing for Exposure	13
3.4 Areal Perspective.....	14
3.5 Alternative Criteria.....	19
4.0 Model Use	36
5.0 Summary and Recommendations	41
Appendix A: Sample Evaluation Form and Summaries of Quarterly Data	43
Appendix B: County Profiles, Accident Experience 1966-1971	54

LIST OF TABLES

Table 1:	County Ranks for Registered Vehicles and Density Normalized Accident Data, Summed for 1966-1971.....	20
Table 2:	Slopes and Ranks for Density Normalized Accident Data, Summed for 1966-1971	24

LIST OF FIGURES

Figure 1: Injury Accidents/Registered Vehicle/Road Mile,
Genesee and Saginaw Counties, Data and
Trendlines for 1966-1971 21

LIST OF MAPS

Map 1.	Relative County Status Normalized by Registered Vehicle Density (RV/RM), 1966-71.....	16
Map 2.	Relative County Status Normalized by Registered Vehicle Count (RV), 1966-71.....	17
Map 3.	County Trend with Accident Data Normalized by Registered Vehicle Density (RV/RM), 1966-71.....	27
Map 4.	County Trend with Accident Data Normalized by Registered Vehicle Count (RV), 1966-71.....	28
Map 5.	County Status and Trend with All Accidents Normalized by Registered Vehicle Density (RV/RM), 1966-71.....	30
Map 6.	County Status and Trend with Injury Accidents Normalized by Registered Vehicle Density (RV/RM), 1966-71.....	31
Map 7.	County Status and Trend with Fatal Accidents Normalized by Registered Vehicle Density (RV/RM), 1966-71.....	32
Map 8.	County Status and Trend with All Accidents Normalized by Registered Vehicle Count (RV), 1966-71.....	33
Map 9.	County Status and Trend with Injury Accidents Normalized by Registered Vehicle Count (RV), 1966-71.....	34
Map 10.	County Status and Trend with Fatal Accidents Normalized by Registered Vehicle Count (RV), 1966-71.....	35

1.0 INTRODUCTION

Program planning, project design, and evaluation are critical aspects of an iterative process necessary to the continued development of improved highway accident countermeasures. The Michigan Office of Highway Safety Planning (OHSP) recognizes this need and has long been in the forefront of developing operationally useful planning procedures. While allocation of resources includes such subjective considerations as local interest, available personnel and their capabilities, and availability of funding from other sources, and while these inputs will continue, these decisions must become increasingly based on objective data analyses and project evaluations. The work reported herein is part of this effort to objectify inputs to operational decision-making.

An important aspect of this task is the development of project evaluation criteria. Previous work for the OHSP produced individual project evaluation forms which were adaptable to general Standard area application. Parts of these forms proved operationally useful while others were infeasible. Discussion on the review of this effort following pilot use and further ad hoc support for the design of project evaluation plans will be found in Section 2.0.

A second need to which we have been attentive is the location of data which are reliable, collected on a regular basis, available for reasonably finite geographical areas, and meaningfully reflect approach to overall goals and objectives. These programming inputs were previously sought out in files of Michigan's various departments.

Discussion of that search was presented in a previous report.* As a result of that effort some useful data were located and some data needs were identified. Additional searching for relevant data was undertaken for the present report and is discussed in Section 3.1.

Recognizing the fact that not all desirable data are available, the question becomes one of how best to utilize those data we have. How can the data be dissected and aggregated to most realistically portray the highway accident scene? We have taken the stance that the most reasonable approach to problem recognition is to establish a step-down system which narrows in on increasingly specific elements defining the accident problem. This process requires continual refinement and it should be recognized that the work reported here reflects initial steps toward this end. Discussion of our efforts to begin development of a characterization model is found in Section 3.0.

Section 4.0 is a summary demonstration of how the maps and county profiles may be used to narrow in on problem definition. Some suggestions are also made concerning the next steps to be taken to further analyze countermeasure project needs.

Probably the keyword for the type of work which underlies this report is "adjustment." There is a vast difference between having all relevant data that one might wish before making some decisions and the data that are at hand when that decision must

*Damkot, D. K., "Summary of Effort to Collect Data for the AHSWP Effectiveness and Output Criteria," Interim Report (HSRI-335040-1) to OHSP, February, 1971.

be made. There is a wide gulf between what a researcher wants in the way of rigorous experimental design and control of variables and what the director of an operational field project sees as primarily important to getting the job done. There is often little relationship between what an evaluator wants in the way of information and what a project director may be able to collect and summarize in a reasonable time period. There may often be meager practical application value of a high powered research report and there may be little one can conclude from an action project that was operated without regard for eventual evaluation.

It is difficult to find that middle ground which does not over-compromise professional rigor and does not over-scientificate what are essentially action projects and "yesterday's" decisions. We have attempted to walk that path of compromise.

2.0 SUPPORT FOR PROJECT PLANNING AND EVALUATION

An important concern of any good planning office involved in resource allocation is the evaluation of the activities which it funds. Evaluation serves as an essential feedback mechanism not only for assessing the strengths and weaknesses of those activities in order that appropriate modifications may be made, but also for the planning of future projects based on past experience.

One of the early tasks we undertook at the request of OHSP was an assessment of a number of projects which had been underway for some time. Evaluation forms had been prepared for the projects earlier and were used for slightly more than one year.* These forms called for data on accident experience, which were referred to as ultimate performance measures, and information on equipment purchases, man-hours of work, etc., which may be termed proxy measures. Project directors were instructed to complete the forms on a quarterly basis in order that a continuing technical audit might be possible both for the OHSP and the project directors. An example of such an evaluation form is found in Appendix A along with summary data extracted from these forms when project reviews were made. (One can insert most any jurisdictional name into the blanks.)

*Damkot, D. K. and Pollock, W. T. "Highway Safety Project Evaluation System" Final Report to the Michigan OHSP, October, 1970.

It can be seen that the information obtained with the evaluation forms was somewhat spotty, especially in the first few months of their initiation. This can be expected of any new record-keeping procedure and generally improves as the reportees become adapted to the necessary data gathering and form filling. This systematic reporting is desirable from a number of viewpoints. In the first place, it affords the funding agency a method of detecting problems such as faulty equipment, insufficient patrol work, etc., before they become major. Secondly, they help project directors keep a handle on the operations as they occur. Third, they allow regular review of project modifications.

The utility of evaluation forms is dependent upon project directors taking an active interest and keeping fudge figures out of the reports. It is desirable then to discuss such reporting with the project heads as a project is being initiated. Data of use both to the program and to the funding agency can then be worked into specific evaluation forms modelled roughly after the example shown here.

Originally it was hoped that the forms could be generalized such that a single form might be devised for each standard area. This would allow, we felt, reasonable inter-project comparisons. However, review of twelve police projects indicated to us that there are just too many project dissimilarities for this to be a strong possibility. Evaluation

forms should serve as project audits of a technical nature. They may also assist in getting a feel for the "goodness" or "badness" of a project, but are not likely vehicles for objective cross-comparisons.

Review of these data also indicated that one cannot expect the efforts of a small project to be reflected in gross changes of the accident data. With the exception of very specific direct contact projects such as adding a left turn lane at an intersection, projects somewhat removed from direct accident impact require a closer look at project "goodness" as opposed to accident change. With the exclusion of rigorous experimental design and adequate variable controls, it is ridiculous to ask a police or driver education project "How many lives did you save?"

Evaluation based primarily on accident characteristics is useful at two ends of a continuum really. Specific engineering countermeasures for particular locations may be capable of controlling extraneous variables so that before-after measures of accidents accompanied by exposure measures (e.g., daily traffic counts) may be an adequate reflection of countermeasure effect. At the other extreme, programming for countermeasure locations can make use of gross accident characteristics. For instance, accident rates by county or township reflect where the problems are and hence where countermeasures should be instituted. Evaluation on the countermeasure project which is instituted must then include

efficiency and "work-load" measures.

We are suggesting, then, not that relevant accident statistics should not be reported at the project level, but that evaluation of individual projects should not be solely or even primarily based on accident changes. Instead it hinges on operational effort and efficiency with the hope that good projects will be reflected in desirable accident changes.

We have carried this stand through while consulting on two new projects as evaluation plans were being formed. At OHSP request, discussions were held with key personnel of both the State Police Selective Traffic Enforcement Program (STEP) and the Department of Administration new driver education project. We have stressed operational objectives and measures as well as discussing appropriate accident change and exposure data.

3.0 MODEL REFINEMENT

The major task of the present contract, and the principal subject of this report, was the refinement of a model to characterize the State of Michigan in terms of its accident experience and highway safety needs. Programming for counter-measure application must first of all recognize where the problems exist and consequently where and when action should be taken.

This involves a number of considerations such as area size to be used, choice of appropriate criteria measures, adequate normalizing measures, and relative importance of absolute accident experience to accident experience changes over some time period. As a result of these considerations individual county profiles were prepared which included 1966-1970 gross accident figures, data normalized by number of registered vehicles per county, and data normalized by a density figure--registered vehicles/road mile--for each county.* An update of those profiles to include 1971 data are presented in Appendix B.

The sections that follow describe thoughts, considerations and exploratory techniques generated since the county profile development illustrated in Appendix B. The goals of the more recent effort were to extend and consolidate the demonstrable or assumed relationships between available

*Damkot, D.K., and Pollock, W.T. "Development of Highway Safety Program and Project Evaluation Criteria: Accident Experience Characterization," Final Report to the OHSP, November, 1971.

state-wide data collections, i.e., accident, vehicle and roadway distributions, and to develop useful, understandable techniques for displaying these data relationships.

3.1 Exposure Information

The goal of highway safety planning is the judicious distribution of limited resources to those times, places and events with high accident potential. However, since we have no direct, a priori measures of accident potential, estimates of that characteristic are made after the fact, i.e., based on accident experience, with countermeasures then applied based on the assumption that the measured experience is a predictor of future accident potential. However, accident experience in terms of raw number of accidents per units of time and space just does not express accident potential. As long recognized, accident data are meaningful only when expressed relative to some measure of risk, or exposure, of vehicles in the traffic stream.

Vehicle motion is certainly related to risk, so that the recognized, ideal measure of past accident potential would be experienced accidents per unit of vehicle motion in some space/time sample. That is indeed the procedure used in establishing national and state-wide annual accident rates. In those instances, gasoline consumption, estimated from gasoline sales, is used to estimate total vehicle motion which in turn is used to establish accident rate per unit of vehicle motion. However, we have argued in a previous report that the accuracy of vehicle motion estimates based on gasoline sales

deteriorates as the size of the area of concern decreases. Paraphrased, most of the gasoline sold in the United States is probably consumed in the United States, and that areal relationship probably holds, but to a lesser extent, in the State of Michigan. We argue, however, that the relationship of sales to use breaks down for area units the size of counties or smaller.

Highway departments measure vehicle motion, but by and large in the form of motion past or between selected points. While some preliminary work has been reported on efforts to extend such measures to estimates of vehicle motion in an area, nothing definitive and acceptable has been published.

With that judged inadequacy of available data on county gasoline sales and traffic counts as exposure indices, we were caused to look for surrogate measures of vehicle motion. While much of that search was discussed in earlier reports, the fundamental position of exposure measures in the model development presented in later sections of this report requires review of the considerations leading to our selection of surrogate exposure measures.

Review of state-wide data files showed the availability of several classes of data, each of which has some empirical or rational relation to vehicle motion. Census population is one, with studies showing high correlation between volume of vehicle motion and population. While available on a county-by-county basis, census population is up-dated on a ten-year cycle. Given

our criterion of data update at least annually, that data set was rejected as an exposure surrogate.

The annual counts of vehicles registered in a county and of the miles of roadway within each county are available data sets. Certainly each of those data elements is required for vehicle motion. Thus, county registered vehicles and a composite measure of vehicles and roadway--number of vehicles per road mile--were accepted as best available exposure indices, and are the basis for the development of the relative accident rate comparison model developed.

However, the deficiencies of those measures must be recognized. While we can argue that the vehicles registered in a county contribute heavily to the vehicle mileage of that county, the registration index takes no account of mileage contributed by out-of-county vehicles. Thus, counties that differ in through-county traffic characteristics or in recreation traffic characteristics are not properly represented by the static registered vehicles index.

The density measure, i.e., registered vehicles per road mile, is a somewhat more refined exposure measure to reflect the space over which the vehicles may be dispersed. Obviously 100 vehicles on 10 miles of roadway have greater accident potential than the same number of vehicles spread over 100 road miles. Again, this measure also contains the deficiencies noted for registered vehicles. In addition, we must assume uniform distribution over the county's road net until more

specific space/time exposure measures can be obtained, even though we know the relative inaccuracy of the assumption.

Despite those clearly identifiable deficiencies, those are the data sets available for use as surrogates to pure measures of vehicle movement within a county. And as subsequent sections show, these data have been used with clear recognition of their deficiencies. This use is deliberate, with the conviction that some cautious conclusions on relative accident potential can be made by their use now, and that such use will add impetus to the development of data sets more adequate as measures of exposure.

3.2 Data Aggregation and Presentation

Given the limited data available, then, how shall these be best analyzed and presented to reflect activity in our highway system? The county profiles are a method to show a county's experience relative to a hypothetical "average" county in Michigan and reflect change-over time. They are useful tools to look at one county or to compare a small number of counties. However, it is difficult to grasp a relationship in terms of areal perspective from looking at these county profiles.

Thus, exploratory work was required to combine some of the data available and to summarize presentation into a more compact and usable form.

Recognizing that exploratory need, the question then

became one of how best to get on with that endeavor. Since the Michigan State Police computer and personnel must necessarily be operations-oriented, it was apparent that we could not efficiently utilize those facilities to continue exploration. Instead it was decided that a data file should be built to make use of the University of Michigan computing facilities. This served to give us direct access to the data and to canned data manipulation packages available at HSRI. In particular, the Michigan Interactive Data Analysis System (MIDAS) is a powerful package of console-oriented integrated programs which contain analytical and manipulative functions of major exploratory utility. It is possible to do considerable exploratory work with MIDAS at relatively low cost since the programs are already developed and debugged.

Appropriate reorganization of the data was accomplished to make it compatible with the read characteristics of the MIDAS package. A number of manipulations and analyses were then performed to best represent the data in an operationally useful framework.

3.3 Normalizing for Exposure

An initial consideration is just what defines an operationally useful framework. Should funds be allocated according to gross accident statistics? This criterion indicates that moneys should be spent in the most populous areas as that is where most of the accidents occur. As a consequence of this

approach efforts would have to be concentrated in the large Detroit Standard Metropolitan Statistical Area, namely, Oakland, Macomb, and Wayne counties, with perhaps a small expenditure of funds in Genesee and Kent counties. This is not a very realistic approach.

Obviously, then, accident statistics must be normalized for exposure since there is great variance in traffic quantities throughout Michigan. As explained in a previous report, the two most reliable and useful exposure measures we have available on a county basis are number of registered vehicles and density (i.e., number of registered vehicles per road mile). These measures lack dynamicity of travel patterns, but do afford a logical relationship to population centers and are the only clean exposure measures readily available. Thus, we have developed a characterization model of Michigan's accident occurrence based on data normalized by these exposure measures on a county basis.

3.4 Areal Perspective

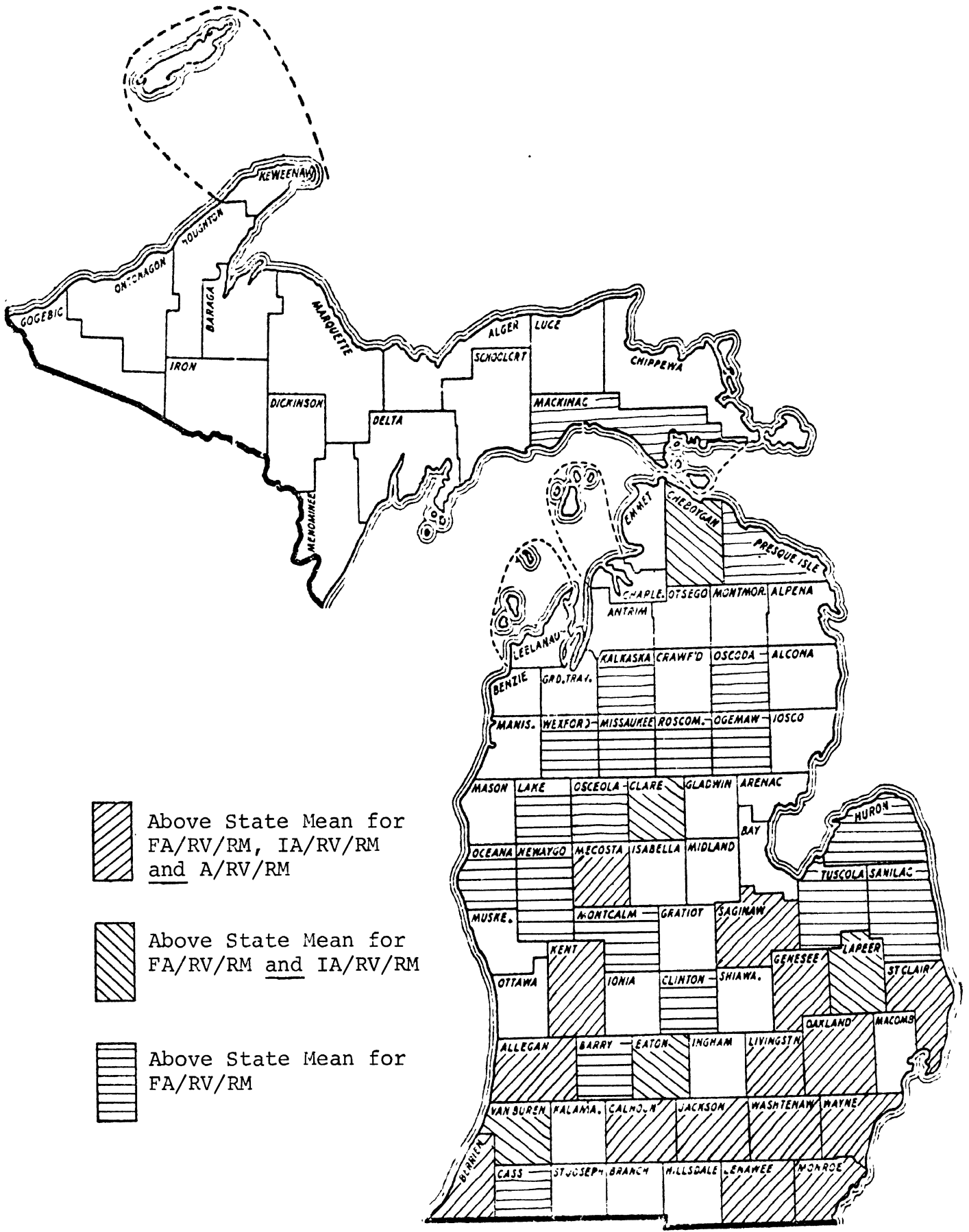
What, then, is the best way to organize these data in order to form a conceptual overview of Michigan's traffic accident problem areas? The county profiles proved valuable in tracing a given county's change from 1966 to 1971 and in determining that county's relationship to a hypothetical "average" county, but it is difficult to conceptualize how each county compares to all others on any criteria. One problem with the county profiles is that a separate page must be studied

for each county while integrating the information from a number of different counties. This is extremely difficult. A second problem is that the profiles contain too much information to be assimilated except on a piecemeal county-by-county basis.

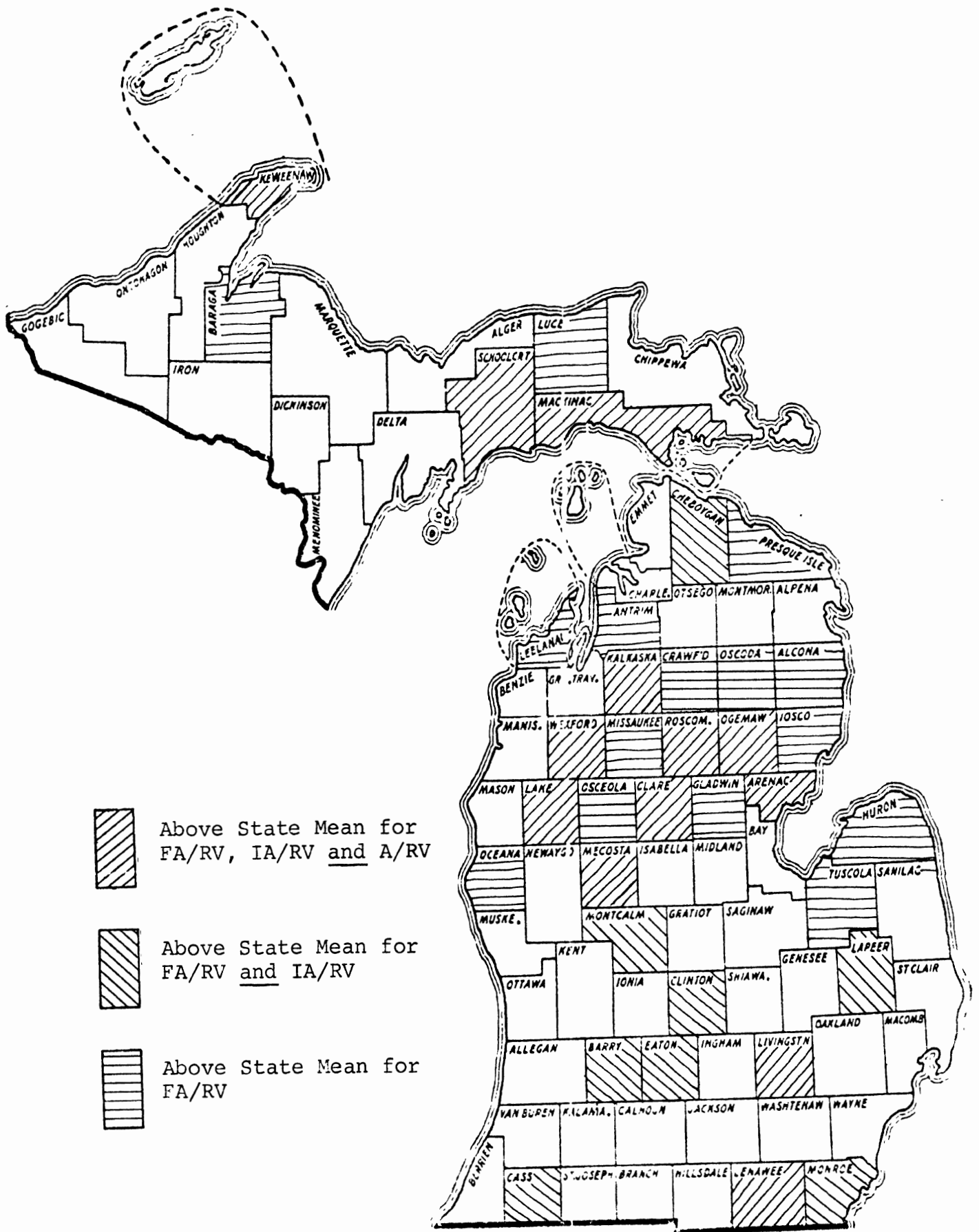
Preparation of maps exhibiting each area's categorical position on some accident experience basis may be a much better approach to developing an overall picture of the State. Thus, one might indicate counties with fewer than ten fatal accidents per year, those with ten to fifty fatal accidents, those with fifty to one hundred, and those with more than one hundred fatal accidents by shading each category of counties differentially. This mapping strategy would essentially show population differences between counties since there is a very high correlation between gross accident statistics and population.

The same process can be used, of course, with normalized data and this results in a picture less linked to differences in exposure. For example, consider Maps 1 and 2. The first map, using density normalized data, somewhat represents the larger counties but it can be seen that normalizing the data by this exposure measure controls some of the overriding effects of the giant counties and does allow better representation of the smaller counties.

Map 2 uses registered vehicle normalized data and creates a much different picture. Because there are so few vehicles



Map 1. Relative County Status Normalized by Registered Vehicle Density (RV/RM), 1966-71.



Map 2. Relative County Status Normalized by Registered Vehicle Count (RV), 1966-71.

in the small counties these data appear inflated with relatively few accidents. Can there really be five problem counties in the upper peninsula? Since it is unlikely that resources can best be allocated to the small counties, as Map 2 may suggest, density normalized data appear more realistically indicative of an acceptable modelling system. Considering Map 1, then, fifteen counties are above the State average on three different accident measures: fatal accidents/vehicle/road mile, injury accidents/vehicle/road mile and total accidents/vehicle/road mile. An additional five counties are above the mean for fatal accidents/vehicle/road mile, and injury accidents/vehicle/road mile. Sixteen more counties are above average for fatal accidents/vehicle/road mile. If funds were to be distributed on this basis, location choices for projects have been limited to 15, 20, or 36 counties, depending on how many of these criteria a county must meet to require further analysis as a potential project county.

Mapping in this manner also gives some indication of the severity of accident involvement for each county. For instance, those counties that are above the mean for fatal accidents but not for injury accidents or total accidents seem to have a relative preponderance of more severe accidents. As Map 1 indicates, these are basically medium to small counties which have lower traffic densities and probably more high speed accidents.

This is even more apparent when the six year sums of accidents/vehicle/road mile, injury accidents/vehicle/road mile and fatal accidents/vehicle/road mile for each county are ranked in ascending order. Table 1 presents the rank orderings such that a rank of 83 indicates the "worst" county and 1 represents the "best" county. It is apparent that the hypothesis that any given county should rank at about the same level for each of the three accident types is not valid. Indeed, there are some rather striking disparities between these rankings for some counties.

It can be seen, for example, that Mackinac County ranked 49th and 46th in terms of accidents and injury accidents, respectively, but 70th for fatal accidents. This discrepancy may call for further investigation as to locations, times, and contributing factors for accidents in this county. Additionally, considering each county's rank in terms of registered vehicles, it is apparent that Mackinac is well above its vehicle rank in all measures. Thus, one might seek more data on vacation travel in this county and derive appropriate countermeasure projects.

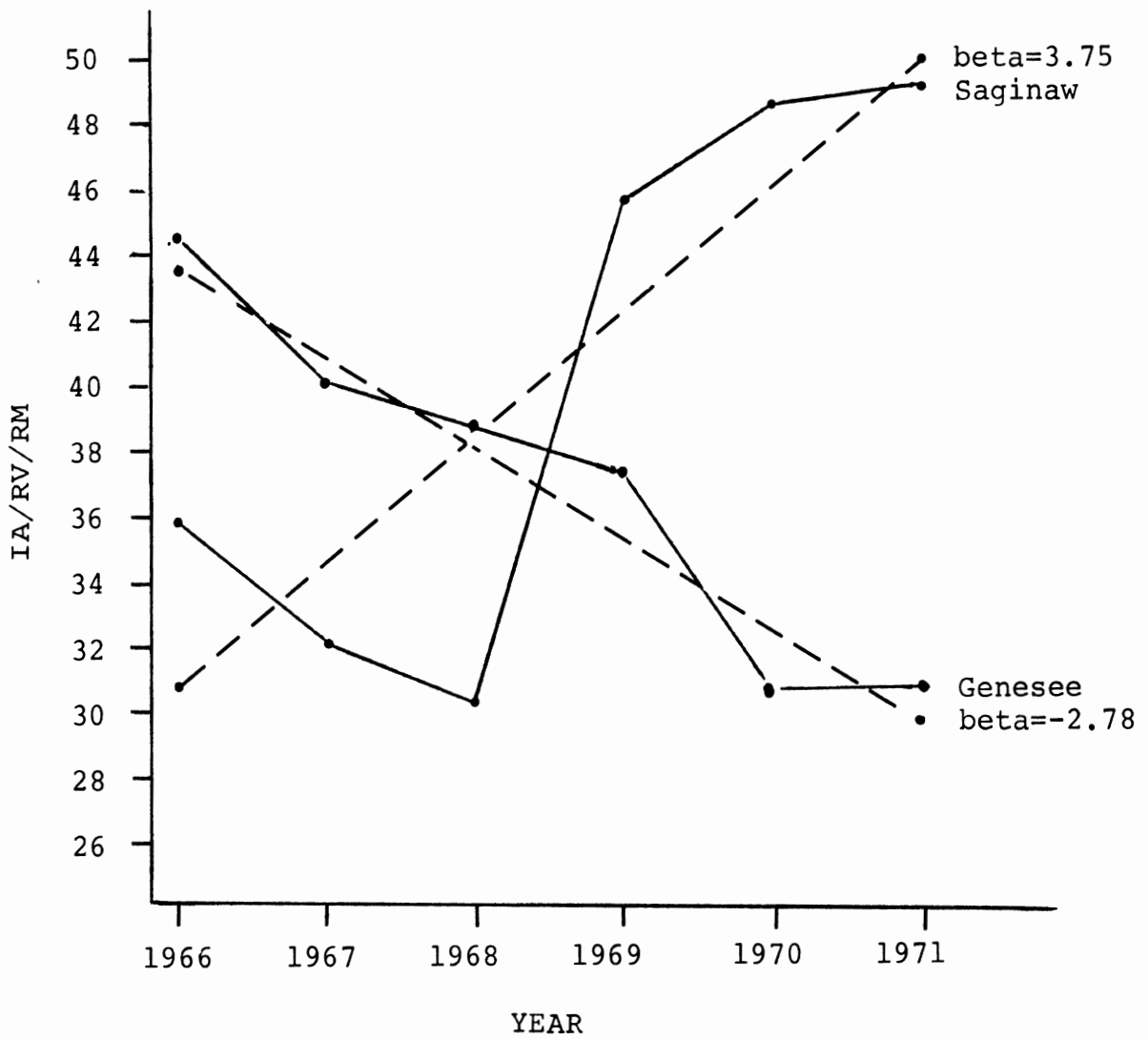
3.5 Alternative Criteria

An alternative way to allocate resources might be based on intra-county trends for the accident measures. This emphasizes relative change within each county rather than relative position on some scale between counties. The

TABLE 1
 County Ranks for Registered Vehicles and Density
 Normalized Accident Data, Summed for 1966-1971

County	R.V.	A/V/M	IA/V/M	FA/V/M	County	R.V.	A/V/M	IA/V/M	FA/V/M
Alcona	11	19	20	34	Lake	3	64	44	62
Alger	10	20	10	8	Lapeer	56	57	64	80
Allegan	64	65	68	79	Leelanau	16	8	18	18
Alpena	42	21	23	5	Lenawee	66	70	69	77
Antrim	20	18	22	26	Livingston	57	59	65	74
Arenac	18	22	25	46	Luce	6	2	2	3
Baraga	9	5	3	23	Mackinac	12	49	46	70
Barry	45	37	49	49	Macomb	81	77	80	37
Bay	68	62	66	35	Manistee	32	45	41	31
Benzie	14	16	14	4	Marquette	60	67	62	38
Berrien	74	75	71	67	Mason	35	44	35	20
Branch	47	31	26	21	Mecosta	36	69	61	51
Calhoun	72	76	72	57	Menominee	37	51	34	29
Cass	52	39	48	55	Midland	65	28	30	15
Charlevoix	29	13	11	11	Missaukee	8	7	8	44
Cheboygan	27	47	56	64	Monroe	67	63	70	73
Chippewa	40	29	19	9	Montcalm	54	60	51	71
Clare	26	56	59	52	Montmorency	5	17	15	10
Clinton	50	40	52	60	Muskegon	73	74	75	33
Crawford	7	4	7	45	Newaygo	41	43	53	58
Delta	44	61	40	22	Oakland	82	82	82	81
Dickinson	38	3	5	1	Oceana	28	27	38	63
Eaton	62	55	57	53	Ogemaw	22	26	24	50
Emmet	30	33	32	19	Ontonagon	15	6	6	13
Genesee	80	66	77	69	Osceola	25	38	28	59
Gladwin	23	10	17	30	Oscoda	2	12	12	68
Gogebic	31	14	9	7	Otsego	17	24	29	16
Gr. Traverse	55	36	33	17	Ottawa	70	68	63	41
Gratiot	51	35	45	42	Presque Isle	19	25	16	47
Hillsdale	49	48	37	39	Roscommon	21	32	42	48
Houghton	39	54	27	24	Saginaw	77	80	78	72
Huron	48	30	43	78	St. Clair	69	78	74	75
Ingham	78	79	76	14	St. Joseph	59	42	39	40
Ionia	53	52	50	43	Sanilac	46	46	55	76
Iosco	34	23	21	25	Schoolcraft	13	15	13	12
Iron	24	9	4	6	Shiawassee	63	11	31	36
Isabella	43	50	60	32	Tuscola	58	34	47	82
Jackson	71	71	73	56	Van Buren	61	53	58	61
Kalamazoo	75	72	67	27	Washtenaw	76	73	79	65
Kalkaska	4	41	36	28	Wayne	83	83	83	83
Kent	79	81	81	66	Wexford	33	58	54	54
Keweenaw	1	1	1	2					

FIGURE 1
 Injury Accidents/Registered Vehicle/Road Mile
 Genesee and Saginaw Counties,
 Data and Trendlines for 1966-1971



primary advantage of this approach is that counties that may be below the average on some measure but are increasing rapidly would not be overshadowed by the above average counties. Thus, we would be trying to recognize a potential problem as it develops rather than searching for the already big problem.

The purpose of this procedure is to find a straight line for accident data of 1966-1971 such that, across all six years, the amount of error or "miss" between the line and the actual data is minimized. The resultant trendline is the best linear descriptor of the data. For example, we have calculated the measure injury accidents/registered vehicle/road mile for each of six years for each county in Michigan and note that there is some variability in those scores from year to year. Now we wish to fit a straight line to those six years of IA/RV/RM scores which best represent the data. To do this we calculate statistics which indicate where the line starts (alpha) and the rate it is increasing or decreasing (beta). Figure 1 shows trendlines fitted to six years of IA/RV/RM for Saginaw and Genesee counties. It can be seen that Saginaw has had an increase while Genesee experienced a decrease in this measure from 1966-1971. Beta, or the slope of the line, indicates the rate of change for the data. It is this descriptive measure of change rate which we are interested in.

The beta weights, or slopes, were computed for various

accident statistics of each county with the formula:

$$b_{xy} = \frac{\sum X_1 Y_1 - NM_x M_y}{\sum X_1^2 - NM_x^2}$$

where X = years 1966-1971 (i.e., 1-6)
 Y = data points for each year (e.g., accidents, fatal accidents, etc.)
 N = number of data points
 M = mean

For example, injury accidents/vehicle/road mile for Saginaw County were:

1966 - 36.0
1967 - 31.8
1968 - 30.0
1969 - 45.6
1970 - 48.4
1971 - 49.2

to give a trend of 3.75.

Trendline calculations yield both positive and negative beta weights as can be seen in the following Table 2. Positive betas indicate a rising trend and negative betas mean decreasing trend with larger numbers being steeper slopes. Thus, Wayne County has been experiencing rather sharply decreasing accident statistics for the six-year period for accidents, injury accidents, and fatal accidents normalized by density.

Table 2 also shows county ranks in terms of the calculated trends. Thus, Saginaw County is near the norm for accident and fatal accident trends (increasing and decreasing respectively) while it has experienced more sharply rising injury

TABLE 2

Slopes and Ranks for Density Normalized
Accident Data, Summed for 1966-1971

County	A/RV/RM		IA/RV/RM		FA/RV/RM		County	A/RV/RM		IA/RV/RM		FA/RV/RM	
	Slope	Rank	Slope	Rank	Slope	Rank		Slope	Rank	Slope	Rank	Slope	Rank
Alcona	-.99979	19	-.20183	32	-.01357	52	Lake	-3.02850	12	4.16360	83	.03735	76
Alger	-.55381	22	.24797	54	.03483	75	Lapeer	.04269	30	-.73143	19	-.09940	5
Allegan	6.90340	81	2.34810	81	-.16271	3	Leelanau	1.76600	49	.43065	60	-.07667	11
Alpena	-3.60710	8	-1.44130	9	.01358	69	Lenawee	-.52026	23	-.64253	24	.01836	72
Antrim	2.35380	59	.69360	69	.01433	70	Livingston	.34473	33	-.69108	20	-.61538	18
Arenac	.66349	35	.06229	44	-.01324	53	Luce	1.88940	51	.48203	61	.01976	73
Baraga	2.09480	55	-.03655	40	-.02183	48	Mackinac	2.08730	54	.16576	49	-.03162	37
Barry	3.46640	74	.17569	51	-.05803	21	Macomb	-7.08630	4	-2.87360	4	-.08937	8
Bay	-4.60590	6	-1.78430	8	-.03785	33	Manistee	-.26043	26	-.07740	37	-.01000	65
Benzie	-.03839	29	-.51812	26	-.03364	35	Marquette	2.62600	64	-.27035	29	-.02578	44
Berrien	-.27400	24	-1.07100	13	-.04208	31	Mason	1.60730	47	-.54035	25	.05605	22
Branch	3.17700	72	.08371	47	.00228	62	Mecosta	2.16520	56	-1.13080	11	.01570	71
Calhoun	-2.87840	14	-1.84430	7	-.05889	19	Menominee	2.05560	52	-.17570	35	-.04666	28
Cass	2.56530	63	-.36501	28	.02398	74	Midland	-3.52410	11	-.77512	17	-.00224	57
Charlevoix	1.58500	46	.37166	59	.05497	80	Missaukee	.78265	38	-.00373	41	-.09269	7
Cheboygan	2.90970	66	.20584	52	-.06312	17	Monroe	-1.38890	18	.08165	46	-.02870	39
Chippewa	8.25200	83	1.41370	79	.05478	79	Montcalm	3.16650	70	.28231	56	-.07785	10
Clare	4.40680	77	.35513	57	.04890	77	Montmorency	7.15320	82	1.32610	77	.05015	78
Clinton	-.26612	25	-.78256	16	.01141	68	Muskegon	-8.37400	3	-2.36870	6	-.06843	14
Crawford	5.54950	78	.83292	72	.08380	83	Newago	1.25770	41	-.68022	23	.08304	82
Delta	.88698	40	.05030	43	.01086	67	Oakland	-3.55570	9	-3.29480	2	-.05108	24
Dickinson	.70319	36	.35976	58	.00655	64	Oceana	6.32670	79	1.38850	78	-.03209	36
Eaton	.73937	37	.00845	42	-.01494	50	Ogemaw	3.35190	73	.74339	71	-.09273	6
Emmet	.31561	32	.90402	74	-.00297	56	Ontonagon	3.01370	67	.84952	73	-.01637	49
Genesee	2.80790	65	-2.77820	5	-.03113	38	Osceola	.84276	39	.51105	62	.00100	61
Gladwin	1.84450	50	-.19008	34	-.03528	34	Oscoda	-2.52220	15	-1.07680	12	-.17221	2
Gogebic	2.46630	62	.23453	53	-.05849	20	Otsego	3.84290	75	.61054	65	-.04914	26
Gr. Traverse	2.17210	57	.17396	50	-.03817	32	Ottawa	-.17589	27	-.74222	18	-.00833	54
Gratiot	-.91528	21	-.24935	30	-.02614	43	Pr. Isle	1.35670	43	-.07170	38	-.04841	27
Hillsdale	1.67210	48	-.19855	33	-.02248	47	Roscommon	2.44060	61	.60150	64	-.04603	29
Houghton	2.29010	58	-.06673	39	-.05157	23	Saginaw	1.33090	42	3.75000	82	-.00169	59
Huron	-.08866	28	-.45267	27	.07395	81	St. Clair	-3.82470	7	-.93056	14	-.07174	12
Ingham	-3.54230	10	-.84381	15	.00552	63	St. Joseph	2.08650	53	.62930	67	-.02625	42
Ionia	2.37470	60	.26385	55	-.02261	46	Sanilac	3.16980	71	.67089	68	-.11013	4
Iosco	3.04270	69	1.01690	76	-.06743	15	Schoolcraft	1.50210	45	-.09543	36	-.06945	13
Iron	.16831	31	.06263	45	.01061	66	Shiawassee	.38615	34	.10517	48	.00037	60
Isabella	4.02290	76	.56616	63	-.01492	51	Tuscola	6.50900	80	1.83120	80	-.08284	9
Jackson	-2.88930	13	-.68683	22	-.04317	30	Van Buren	3.03750	68	.61909	66	-.02677	41
Kalamazoo	-.95418	20	-.68826	21	-.00199	58	Wastenaw	-2.17100	16	-1.26070	10	-.02841	40
Kalkaska	-4.62740	5	-.22915	31	-.39338	1	Wayne	-21.22400	1	-3.09290	3	-.06714	16
Kent	-8.96660	2	-3.36800	1	-.04998	25	Wexford	1.43380	44	.92890	75	-.02349	45
Keweenaw	-1.42620	17	.70806	70	-.00588	55							

accidents than most Michigan counties.

It should be noted that one must be careful when utilizing trendline information because the trends calculated are based on only six data points. As a result one really bad year for a county could pull the trend up quite sharply and can be somewhat misleading. Therefore potential project county determination based on the slope of the trendline must include study of the profiles in Appendix B to ensure the trend is not spuriously inflated.

Saginaw County, for example, has a sharply increasing trend for IA/RV/RM and the county profile indicates that this is primarily due to years 1969 to 1971. Indeed, there was a major increase noted on this criterion from 1968 to 1969. However, this remained high in 1970 and 1971 also, so it is probably not a spurious increase.

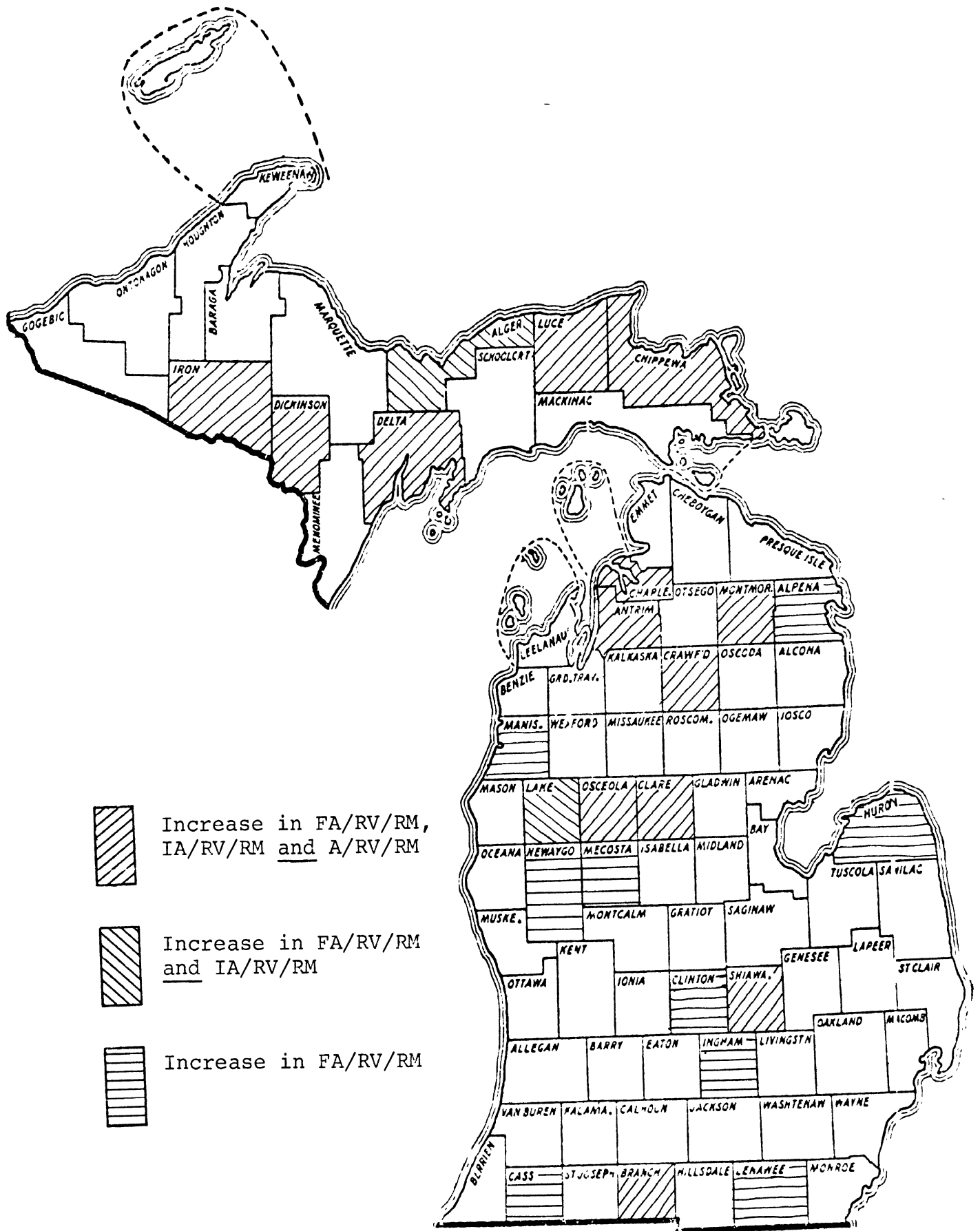
Chippewa County, on the other hand, has a beta coefficient for IA/RV/RM of 1.4137 and a rank of 79, which is also very high. The county profile however shows that Chippewa had a slight decrement in IA/RV/RM from 1966-1970 with a sharp increase in 1971. Since it is too early to determine if 1971 was an atypical year or if there has been a sudden change in this county's experience, little emphasis should be placed on this measure until the stability of change can be determined.

Again, tabular data presentation is difficult to interpret in terms of the relationship between counties. Mapping of trend information gives a clearer representation of these

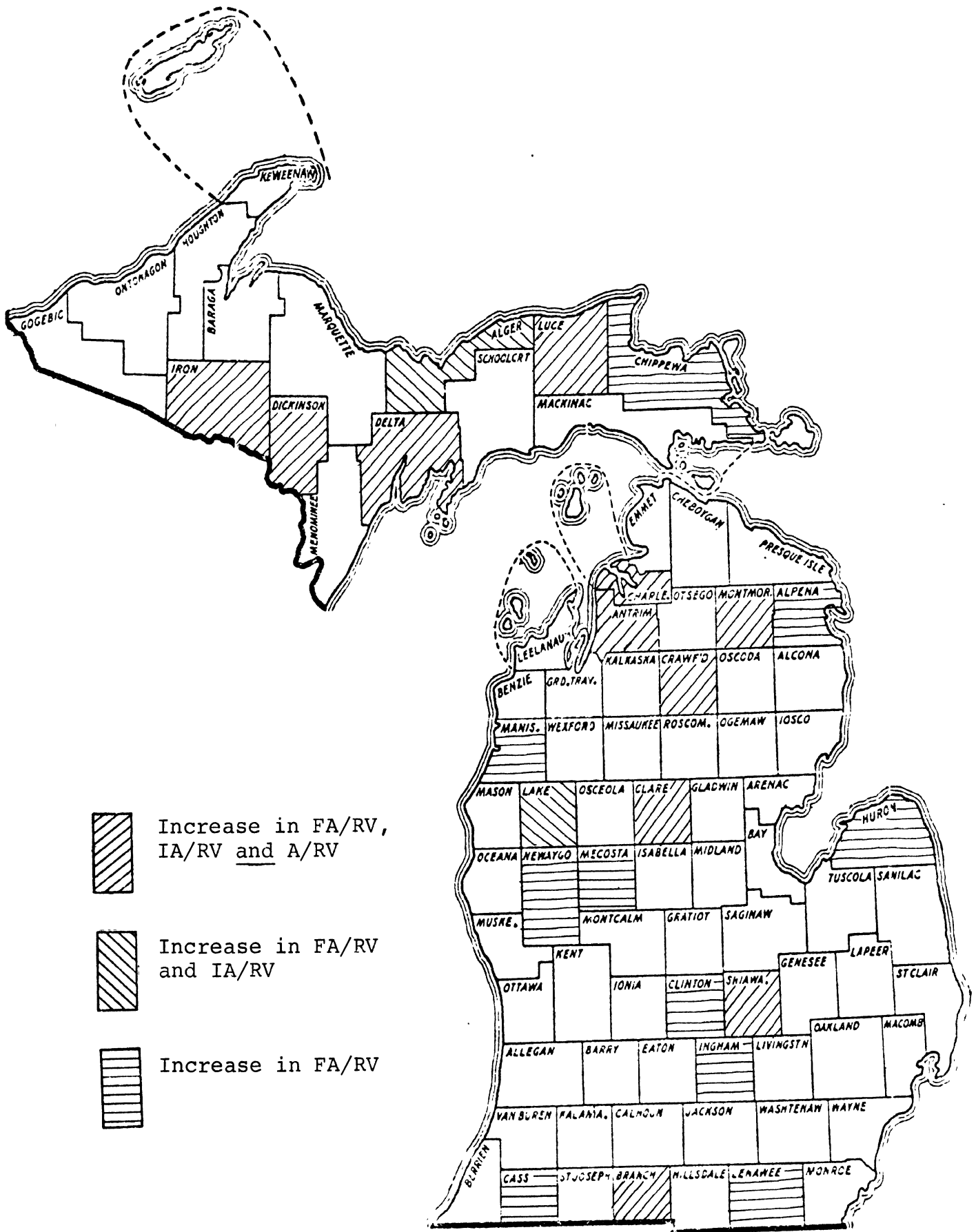
data. Maps 3 and 4 were prepared for trendline increases of accident data normalized by density and by number of registered vehicles, respectively. It is apparent from these maps that there is a high degree of relationship between density and registered vehicle normalized data in terms of trend information. Again, particular attention may be given to the density normalized data.

Comparing Maps 1 and 3, we can see some disparity between the "bad" counties indicated depending on whether we use an intra-county trend change (Map 3) or an inter-county relation to the mean criterion (Map 1). Thus, resources might be allocated quite differently depending on our criteria for county selection. Map 1 indicates the medium and larger counties are frequently above the State average while Map 3 tends to indicate that the less populous counties have been experiencing increases in accident statistics.

There are some interesting overlaps indicated for these, however. Clare County is not only above the average on two of the measures, IA/RV/RM and FA/RV/RM, but also has increasing trends on all three of the density normalized statistics. Osceola likewise has increasing trendlines for all three measures and is above the State mean for the most severe accident indicator, FA/RV/RM. Huron County also exhibits a problem for fatal accidents. It is both above average and increasing for FA/RV/RM. Finally, Lenawee County is not only above the State mean on all three measures but additionally shows an



Map 3. County Trend with Accident Data Normalized by Registered Vehicle Density (RV/RM), 1966-71.

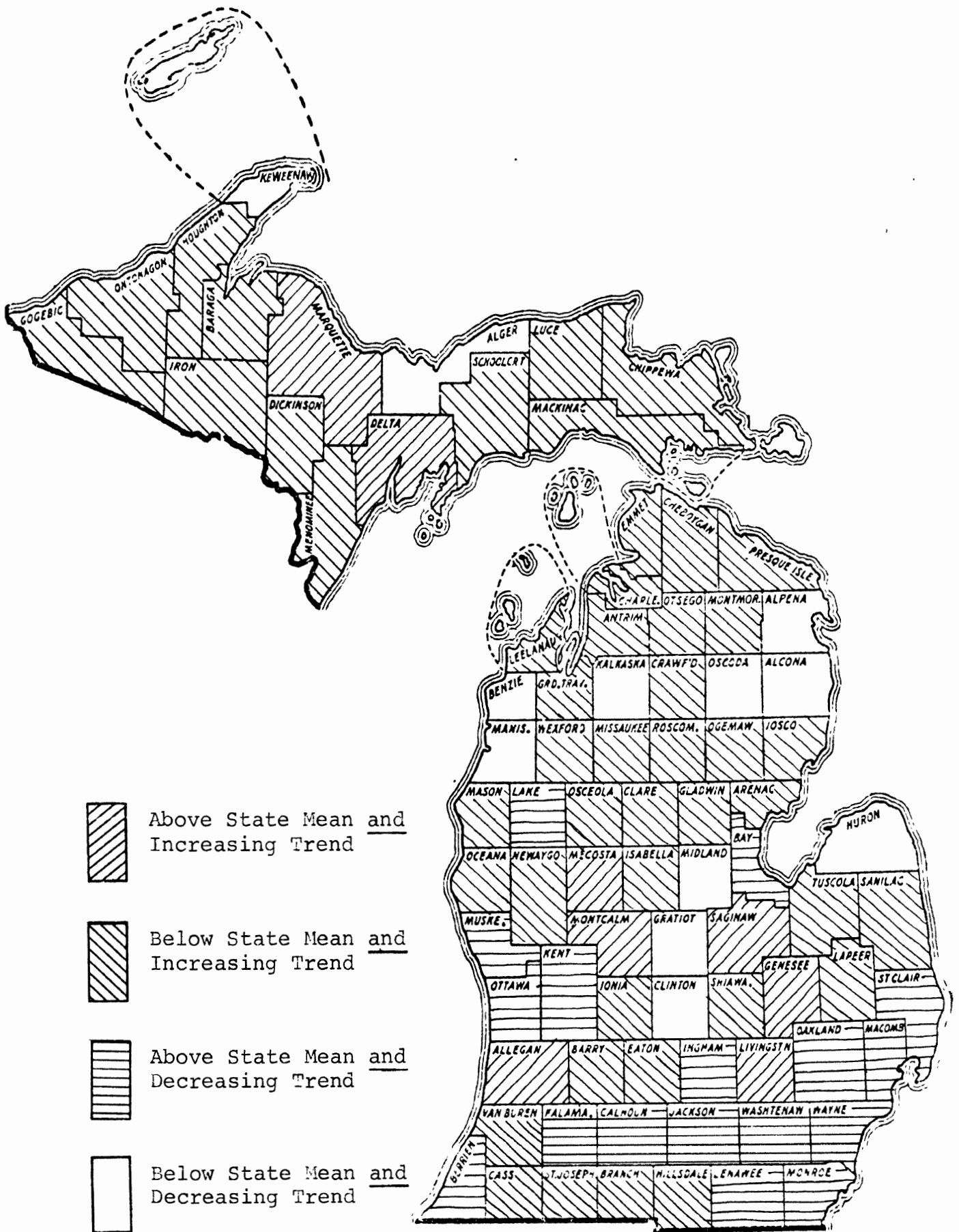


Map 4. County Trend with Accident Data Normalized by Registered Vehicle Count (RV), 1966-71.

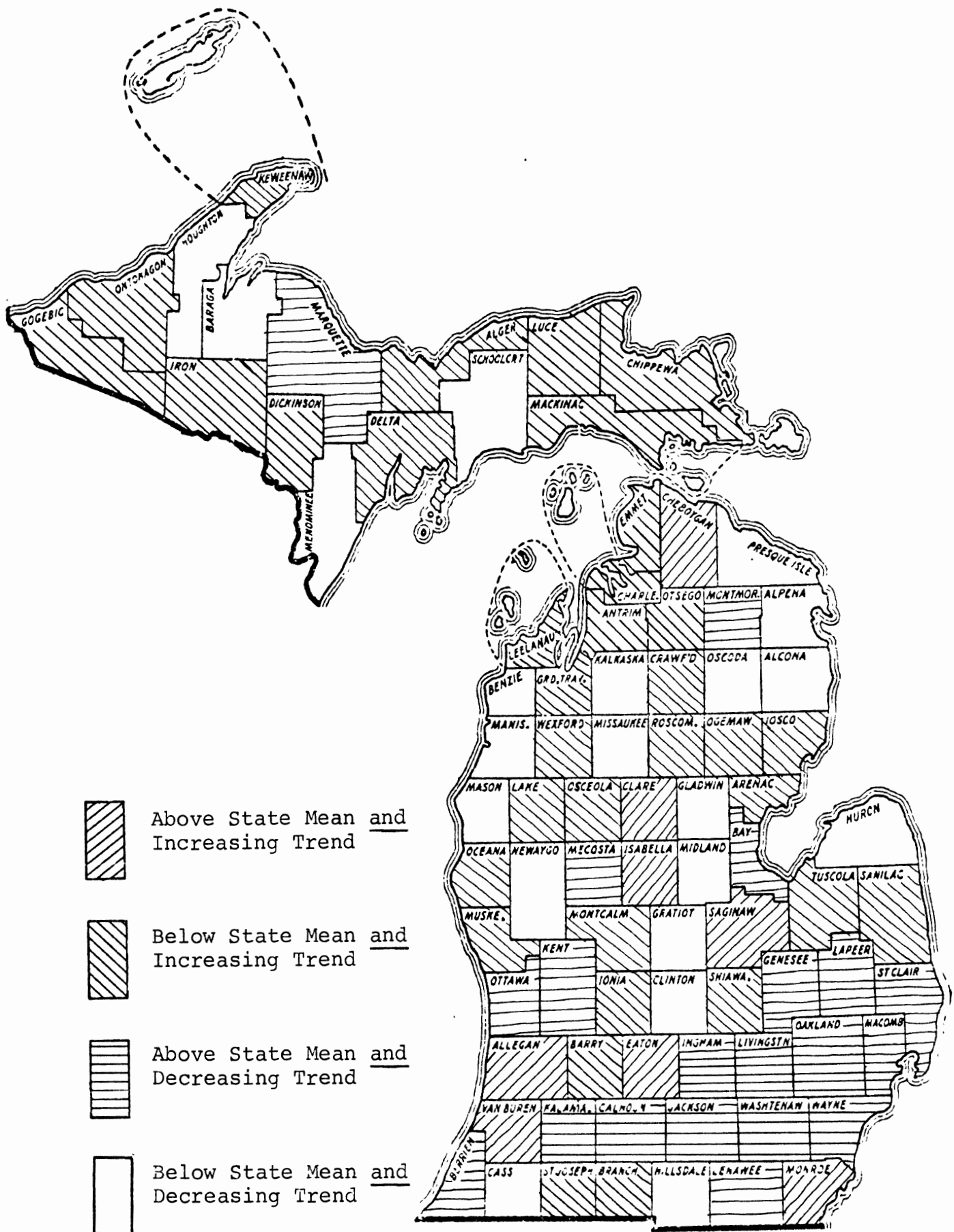
increase in fatal accidents/registered vehicle/road mile.

This suggests another potentially useful approach to integrating the accident data. It can be argued that allocation of resources should be based both on inter-county accident experience and intra-county changes in the statistics. Consequently, representation of counties that are, say, above the average for fatal accidents/registered vehicle/road mile and also are experiencing an increase for that measure may be indicative of a sub-set that should be considered as prime candidates for countermeasure projects. Similarly, mapping in this manner may indicate "good" counties as those which are below average for some statistic and are also showing decreasing trendlines.

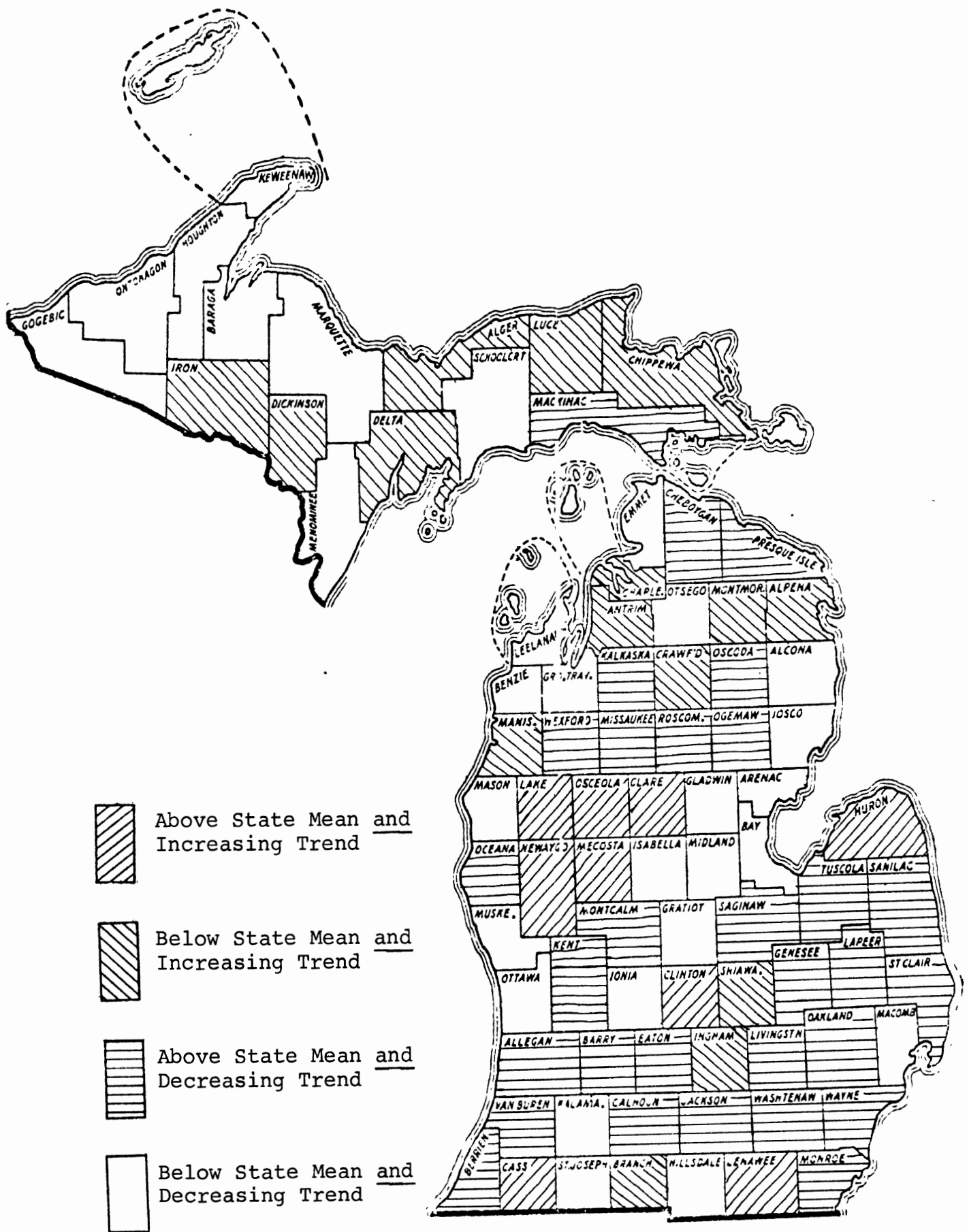
Using this approach, Maps 5-10 were prepared to show above and below average counties which also have increasing and decreasing trends. These maps can be selectively used or cross-compared depending on which of the accident measures are deemed most important for countermeasure initiation. Thus, if the incidence of injury accidents is of major concern, Map 6 can be used to determine problem counties. Similarly, if all three of the density normalized accident statistics are judged equally relevant, Maps 5, 6, and 7 may be compared to locate those counties that are above average on all three measures and also have increasing trends for one or more of the measures.



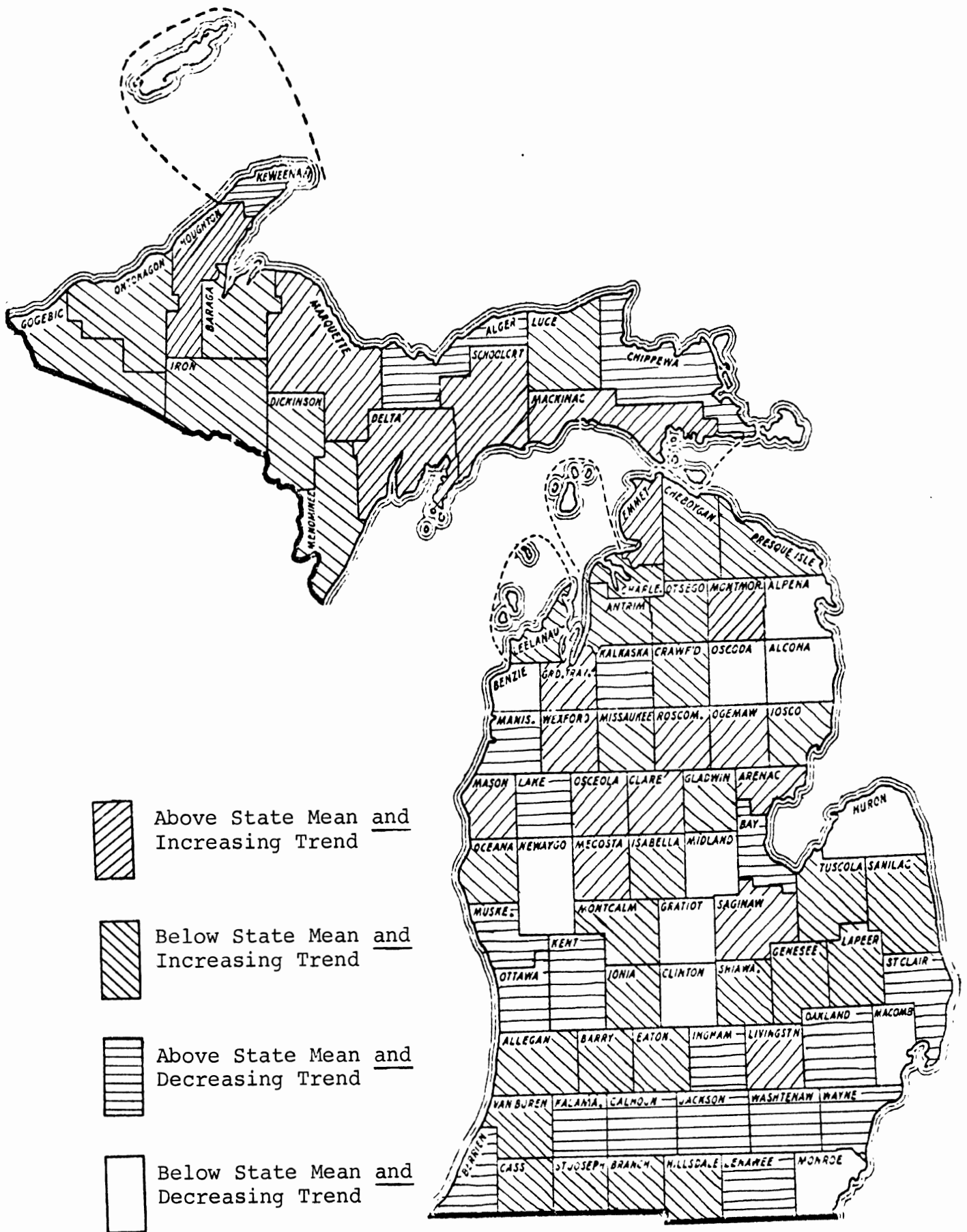
Map 5. County Status and Trend with All Accidents Normalized by Registered Vehicle Density (RV/RM), 1966-71.



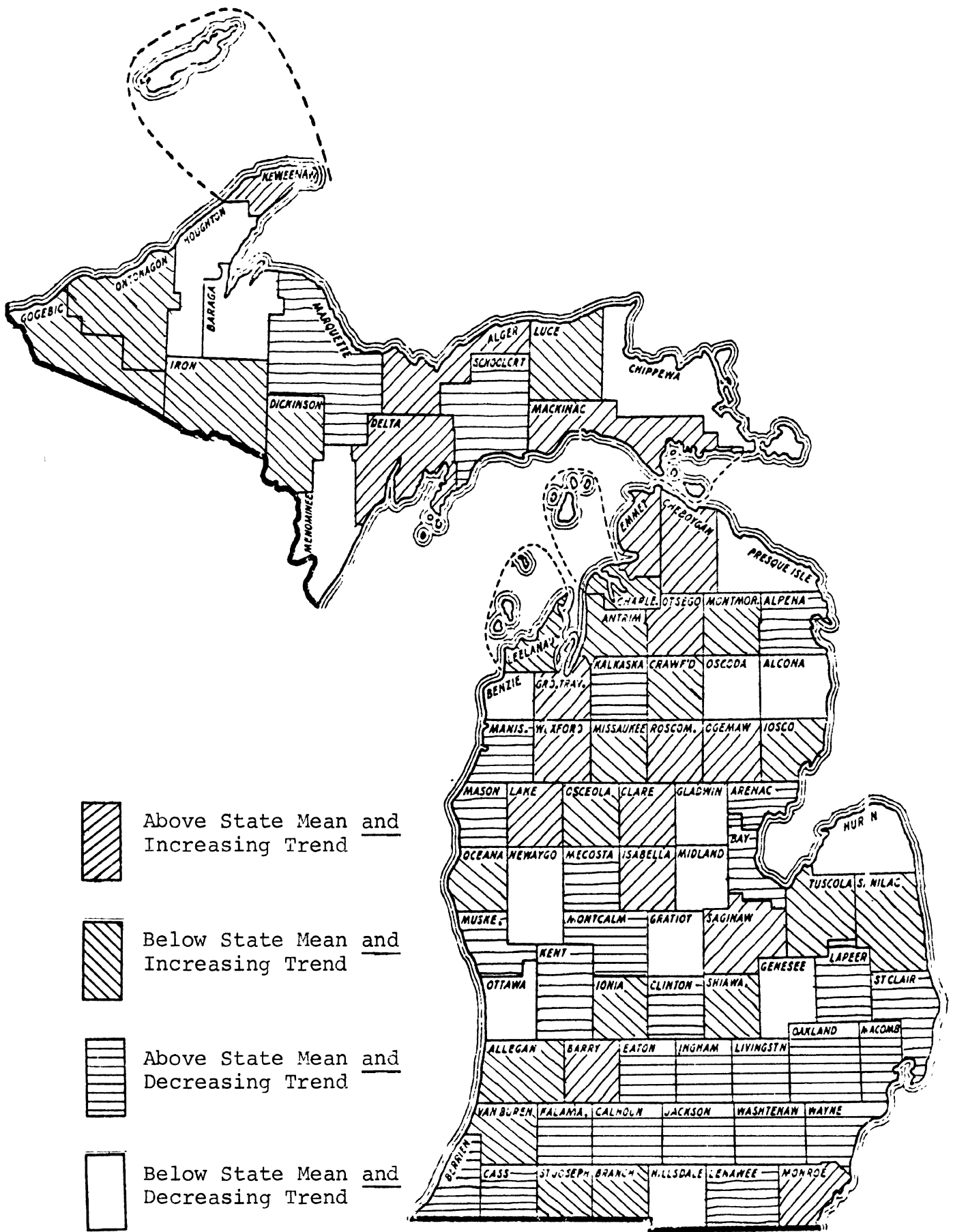
Map 6. County Status and Trend with Injury Accidents Normalized by Registered Vehicle Density (RV/RM), 1966-71.



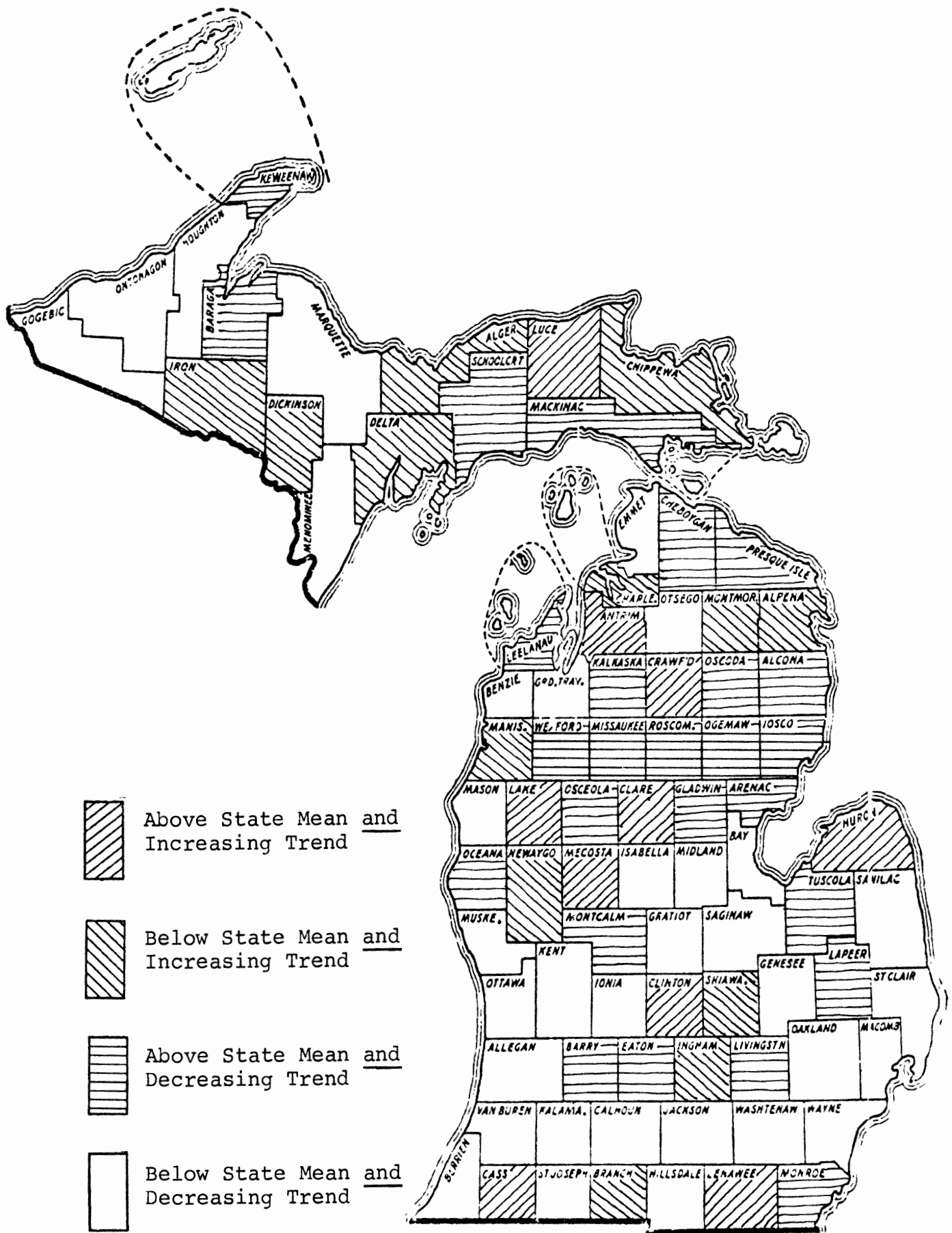
Map 7. County Status and Trend with Fatal Accidents Normalized by Registered Vehicle Density (RV/RM), 1966-71.



Map 8. County Status and Trend with All Accidents Normalized by Registered Vehicle Count (RV), 1966-71.



Map 9. County Status and Trend with Injury Accidents Normalized by Registered Vehicle Count (RV), 1966-71.



Map 10. County Status and Trend with Fatal Accidents Normalized by Registered Vehicle Count (RV), 1966-71.

4.0 MODEL USE

In order to demonstrate use of the system, let us assume that it is desirable to impact first those counties that are experiencing problems with injury and fatal accidents. Thus, we will consider those counties that are above the State average and show increasing rates for density normalized injury and fatal accidents.

Maps 6 and 7 are relevant for selecting a sub-set of problem counties on this criterion. Counties that fit the model as being above average and increasing for either IA/RV/RM or FA/RV/RM include: Cheboygan, Clare, Osceola, Lake, Newaygo, Mecosta, Isabella, Huron, Saginaw, Clinton, Allegan, Eaton, Van Buren, Cass, Lenawee, and Monroe. This sub-set of sixteen counties may be too large so additional criteria may be employed to reduce the candidate population.

To accomplish this, counties that are below the mean and decreasing for either IA/RV/RM or FA/RV/RM may be excluded from the sample. This effectively removes those counties that may be defined as "very good" on one of the criteria previously chosen even though they are above average and increasing for the other measure. This strategy removes Newaygo, Isabella, Huron, Clinton, and Cass from our problem set.

Reamining, then, are those counties which are above average and increasing for either IA/RV/RM or FA/RV/RM and additionally are above the mean or increasing on the other measure. Thus, a problem sub-set consisting of Cheboygan,

Clare, Osceola, Lake, Mecosta, Saginaw, Allegan, Eaton, Van Buren, Lenawee, and Monroe counties remains. This narrows the search to eleven candidates.

If it is further assumed that this sub-set is too large, it may be valuable to determine from Table 2 how these counties rank in terms of trendline increases. Since injury accidents are more frequent than fatal accidents, trends for this measure will be somewhat more stable over time and less subject to large changes from one bad year's experience. Looking, then, at trends and ranks of IA/RV/RM for these counties, it can be seen that Lake, Saginaw, and Allegan rank 83, 82, and 81 respectively. This is not only worst for this group, but these three counties have the most rapidly increasing IA/RV/RM over the six year period for the entire State.

Now, as noted previously, the county profiles should be examined to determine if these trends are relatively stable or may have been inflated by one or two particularly bad years. Lake County shows a rather unstable year to year experience primarily because it is so small, although the trends are generally upward. Allegan County is larger and has been fairly stable in terms of IA/RV/RM for the past five years. The relatively low experience in 1966 tends to inflate the trend. Also, it may be noted that although FA/RV/RM has been well above average in Allegan this measure has been showing a fairly sharp downtrend. Saginaw County is much larger than either Allegan or Lake and its trend is generally upward

on all measures, at least for the past three years.

Thus, funding might be considered on a priority basis with Saginaw being the leading candidate followed by Allegan and Lake counties in that order.

Determining what kind of countermeasure project to employ is obviously the next question and one that cannot be answered by the data presented here. A desirable next step is to investigate selected counties on a case study basis. This would entail, at the least, deeper digging into the M.S.P. accident files, specific data searches with D.S.H. personnel for exposure data or perhaps selective sampling of A.D.T. by the D.S.H. traffic counters, and possibly employment of portions of the QMT developed by Michigan State University to sample public officials' opinions on their traffic problems.

An example of more careful study of M.S.P. data is their county and city audit trails. For 1971 these reveal a rather even dispersion of accidents, fatal accidents, and injury accidents in each month for Saginaw County. This seems to indicate that Saginaw is not particularly inundated with vacation traffic during any particular season. Other counties may show such an effect, however.

Lake County had the following monthly accident statistics:

	<u>Accidents</u>	<u>Fatal Acc.</u>	<u>Injury Acc.</u>
January	28		6
February	16		5
March	23		9
April	22		7
May	26		9
June	26		8
July	31	1	13
August	34		15
September	26		6
October	31		6
November	36	1	13
December	14		3
Total	<u>334</u>	<u>2</u>	<u>106</u>

These data tend to show interesting increases of accident statistics for July, August, October, and November. This may reflect Summer recreation and Fall hunting activities. Further check on other years may be done to confirm or deny this apparent trend. If the phenomena occurs in other years as well, increased enforcement during the high months might be considered.

The audit trails also contain data on cities in Michigan. For 1971 the City of Saginaw had 5,090 accidents, 1,501 of which were injury accidents. Relating this to Saginaw's county profile reveals this city accounted for over half of

the total accidents and about one-third of the injury accidents in 1971.

One might then seek more specific information about accident types, locations, times, etc., from the M.S.P. accident file or their semi-annual county and city reports for selected areas. Utilization of this model and selective inquiry will form a more objective base for the planning of countermeasure projects and programming resource allocations.

5.0 SUMMARY AND RECOMMENDATIONS

The model presented in this report is a procedure to identify accident problem areas on the basis of past accident experience. Utilizing exposure normalized accident statistics, key problem counties in Michigan can be identified both by relative differences in county's accident experience and by relative change of accident involvement within each county from 1966 to 1971.

The technique proposed is a categorization of counties on some basis, such as those above the State average versus those below the average (inter-county comparison) or increasing trend over the six year period versus decreasing trend (intra-county change), and then plotting the respective categories by appropriate map designations. Thus, it is reasonably simple to identify problem areas that experience more accidents than a hypothetical average county or counties that are experiencing rapid increases in their accident experience.

Either of these criteria for determining the "bad" counties is defensible and useful depending on the position taken as to which is of primary importance. It may well be the case, however, that both criteria are relevant and a specific sub-set of counties which have both above average accident experience and an increasing rate of accidents should be identified as potential countermeasure project locations. Categorizations of above average and increasing, above average and decreasing, below average and increasing, and below average and decreasing were

made and plotted. Thus, these maps show the overlap of both the intra- and inter-county problem identification approaches.

Various decision-making stances may be taken, of course, and it is recommended that the reader use the technique proposed to develop his own sub-sets of problem counties. From that point then, as suggested in Section 4.0, further problem definition may be accomplished by more specific accident file inquiries. Indeed, case studies of selected counties can be undertaken to identify candidate countermeasure applications.

Trial use by OHSP of the materials in Section 3.0 is recommended to determine which of the several categorization procedures, means for rank-ordering of county data, and mapping techniques are most useful for planning purposes. While an operational procedure may evolve in which all of the illustrated ways of processing and displaying the data are useful, a more probable result will be that some sub-set of illustrated techniques will be adequate for OHSP planning purposes. For that reason, we recommend delay of computer implementation of the model pending operational utility review. Such implementation, including computer-generated maps, is well within the capabilities of HSRI computer facilities and is adaptable to MSP operations.

APPENDIX A

SAMPLE EVALUATION FORM AND
SUMMARIES OF QUARTERLY DATA

PT 69-10

Selective Traffic Law Enforcement and Accident Investigation
Unit -

Evaluation Suggestions

This program, along with Accident Victim Unit, provides a major input to the traffic safety activities of this community. This particular project includes the hiring of personnel for a traffic unit in the police department and the purchase of equipment for crash investigation and for rescuing crash victims. The goals of the project were carefully spelled out in the original application in a form that is amenable to objective measurements. Thus, while the implicit goals are safer, more efficient transportation and the reduction of deaths and injuries from highway accidents, it was apparently recognized that more immediate goals were necessary for project guidance.

It is somewhat more difficult to determine from the quarterly narrative reports if the appropriate measures have been taken to evaluate progress toward the stated goals. Meaningful and worthwhile information is presented to indicate project progress, but objective data gathering has not been evidenced except in the indication of percentage of injury accident changes.

Some relatively straightforward measures of performance are readily obtainable to gauge progress toward the goals as stated in the original proposal. Many of these measures are

included in the following evaluation plan. It is important that these measurements be taken in order that effective internal program evaluation be possible and to afford helpful information to OHSP for planning future projects of a similar nature.

It might be noted here that evaluation is usually a relative thing. That is, it is concerned with progress toward a goal, improved performance over prior levels, effective change in, say, traffic flow with the introduction of a new stop light, or simply contact with more citizens in a positive manner. It will be seen that many of these considerations are included in this plan. However, this evaluation outline should also be viewed as a model to serve as a guideline for additional measures pertinent to evaluating specific job requirements in . Certainly traffic services must be adaptable to local needs and consequently additional evaluation measures may also be required.

Evaluation Plan

I. Ultimate Performance Factors

A. Safe Transportation

1. Vehicle crashes	this quarter	total this year
total	_____	_____
fatal	_____	_____
injury	_____	_____
non-injury	_____	_____

2. Cycle crashes	this quarter	total	this year
fatal	_____		_____
non-fatal	_____		_____
3. Pedestrian and Bicycle			
fatal	_____		_____
non-fatal	_____		_____

B. Efficient Traffic Flow

1. Estimated accumulated vehicle-miles travelled in the jurisdiction during year _____
2. Vehicle miles per crash
 - total _____
 - fatal _____
 - injury _____
 - non-injury _____
3. Indicate location of greatest traffic congestion.

II. Measures of operational effectiveness

A. Frequency measures

1. Action operations
 - Number crashes investigated _____
 - Number citations issued _____ (enumerate by violation)
 - Number convictions obtained _____ (enumerate by violation)
 - Number hours of patrol _____
 - Number of selective enforcement operations conducted _____
 - Number citizen complaints _____
 - Number citizen praises _____

2. Public education (schools, civic groups, etc.)

Number talks given _____

Number students instructed _____

Accumulated student-hours _____

3. Indicate formal training received by the men in unit thus far.

4. Planning and Administration

Man-hours devoted to selective enforcement planning _____

Man-hours devoted to public contact (e.g., lecture preparations, press releases, etc.) _____

Man-hours devoted to routine administration _____

5. Equipment Utilization

List equipment used in this project and the hours of use for major items _____

For equipment used in routine patrol or selective enforcement note hours use per citation _____

B. Efficiency measures

1. Action operations

_____ man-hours of patrol per citation

_____ man-hours expended by unit per man-hour of traffic patrol

_____ man-hours expended by unit per man-hour devoted to selective enforcement

_____ average man-hours per crash investigation

_____ number citations issued for each conviction obtained

_____ average response time to an accident

2. Public education

_____ man-hours (preparation and presentation)
per talk presented

_____ man-hours per student instructed

_____ students contact per student enrollment
(e.g., school, class, or other base measure)

3. Equipment utilization

For each major piece of equipment note hours
of use per hours of availability.

For malfunctioning equipment note down-time this
quarter.

For equipment used in enforcement note average
hours of use per citation issued.

For crash victim extrication equipment note items
of particular usefulness and other equipment
which would have been beneficial in any such
situation encountered.

OSCODA COUNTY

	Quarters Ending			
	3/71	6/71	9/71	12/71
No. of crashes				
Fatal	0	1	0	0
Injury	8	11	14	15
A				
B				
C				
Property damage	23	25	33	56
Total	31	37	47	71
No. of crashes investigated by				
Selective Enforcement Unit	31	37	47	71
No. of crashes yielding arrests or citations	22		32	35
No. of crashes closed by convictions			22	27
Pedestrian and bicycle				
Injuries	0	1	0	0
Fatais	0	0	0	0
No. of hazardous citations issued by				
Selective Enforcement Unit		0	0	0
by entire bureau		92	102	121
No. of non-hazardous citations issued				
by Selective Enforcement Unit				
by entire bureau				
Estimated vehicle miles	29K	33K	57K	63K
per crash	908	886	1213	887
per fatal crash		33K		
per injury crash	2891	2916	4K	4K
per non-injury crash	893	1312	1.7K	1.6K
Miles of streets and roads	788		910	910
Number of warnings given			81	76
Number of hours of patrol	2260	2421	987	1131
Number of selective enforcement plans			0	0
Number of selective enforcement operations			0	0
Number of convictions obtained	148	107	87	101
Number of talks given			12	17
Number of persons instructed			360	188
Total student hours			180	240
Total instructor hours			30	45
Man hours of training			368	420
Man hours of planning and admin.	70	84	130	130
Hours of equipment use/hours available	2210	2412	2232	2016
	?	?	?	?
Down time of malfunctioning equipment		49 hrs.	16 hrs.	32 hrs.
No. citations issued w. equipment			52	86
<u>Ambulance</u>				
Number of calls	44	29		
Number of calls answered	44	29		
Number of calls resulting in transportation	34	26		
Number of victims transported	37	34		
Average cost per service call	\$5.42	\$4.89		

Oscoda cont'd

	Quarters Ending			
	3/71	6/71	9/71	12/71
<u>Dodge Station Wagon</u>				
Number of calls	17	12		
Number of calls answered	17	12		
Number of calls resulting in transportation	8	8		
Number of victims transported	9	8		
Average cost per call	\$6.80	\$5.20		
Average time from call to delivery	1-1/4 hrs	1-1/3 hrs		
Average trip distance	45 mi.	47 mi.		

CLINTON TOWNSHIP

	Quarters Ending				
	12/70	3/71	6/71	9/71	12/71
No. of crashes					
Fatal	0	1	1	3	1
Injury	124	105	101	92	137
A				24	57
B				39	41
C				66	116
Property damage	385	316	239	156	241
Total	509	422	341	336	475
No. of crashes investigated by Selective Enforcement Unit	509	422	341	286	365
No. of crashes yielding arrests or citations			77	161	230
No. of crashes closed by convictions Pedestrian and bicycle			59	79	146
Injuries	4	6	9	4	11
Fatals	0	0	0	1	1
No. of hazardous citations issued by Selective Enforcement Unit by entire bureau	1021	1081	1173	892	810
No. of non-hazardous citations issued by Selective Enforcement Unit by entire bureau	549	632	460	503	260
Estimated vehicle miles	90M			90M	90M
per crash	500K			268K	238K
per fatal crash				30M	90M
per injury crash	220K			978K	635K
per non-injury crash	73K			369K	373K
Miles of streets and roads				205	205
Number of warnings given	600	500	450	?	?
Number of hours of patrol				6336	5876
Number of selective enforcement plans		1		1	1
Number of selective enforcement operations		1		1	1
Number of convictions obtained					
Number of talks given	6	0	0	10	10
Number of persons instructed	4845	0	0	450	550
Total student hours					
Total instructor hours	20	0	0	12	12
Man hours of training	80				
Man hours of planning and admin.				200	210
Hours of equipment use/hours available				5000/5000	5000/5000
Down time of malfunctioning equipment				radar	radar
				1300hrs	1200 hrs

FARMINGTON

	Quarters Ending				
	12/70	3/71	6/71	9/71	12/71
Crashes					
fatal	0	0	0	0	1
No. of deaths		2		0	1
injury	31	21	25	20	23
No. A injuries		3		2	10
No. B injuries		5		11	9
No. C injuries		12		13	23
Property Damage	108	67	52	63	73
Total	139	135	77	129	157
No. crashes investigated					
by Selective Enforcement Unit	184	88		99%	99%
No. of crashes investigated and arrests made	265			42	54
No. of crashes closed by arrest and conviction	255			98%	16
Pedestrians and bicycle injuries	0	4	2	3	1
fatalities	0	0	0	0	0
No. of hazardous citations					
by Selective Enforcement Unit				275	306
by entire bureau		551	619	617	637
No. of non-hazardous citations					
by Selective Enforcement Unit				140	107
by entire bureau		200	168	209	200
Estimated vehicle miles					
per crash					
per fatal crash					
per injury crash					
per non injury crash					
No. of miles of streets and roads			41		
No. of citations issued by Selective Enforcement Unit		338	340		413
No. of warnings given				167	130
No. of hours of patrol	1291	1211	1137	1296	1203
No. of selective enforcement plans				84	21
No. of selective enforcement operations	242	6	39	84	21
No. of convictions obtained	255	652	744	869	629
No. of talks given	6	0	14	0	0
No. of persons instructed	1835		1900		
Total student hours	1375		2200		
Total instructor hours			1-1/2		
Man hours of training					40
Man hours devoted to planning and administration	435	537	537	495	495
Equipment					
hours use/hours available	2182/3181		1614/?	1671/?	
hours down time	0		vascar 2 mo.	radar 10 hrs	0
citations issued w. equipment					144
Man hours/citation	4.1	2.3	2.3		

Farmington Cont'd

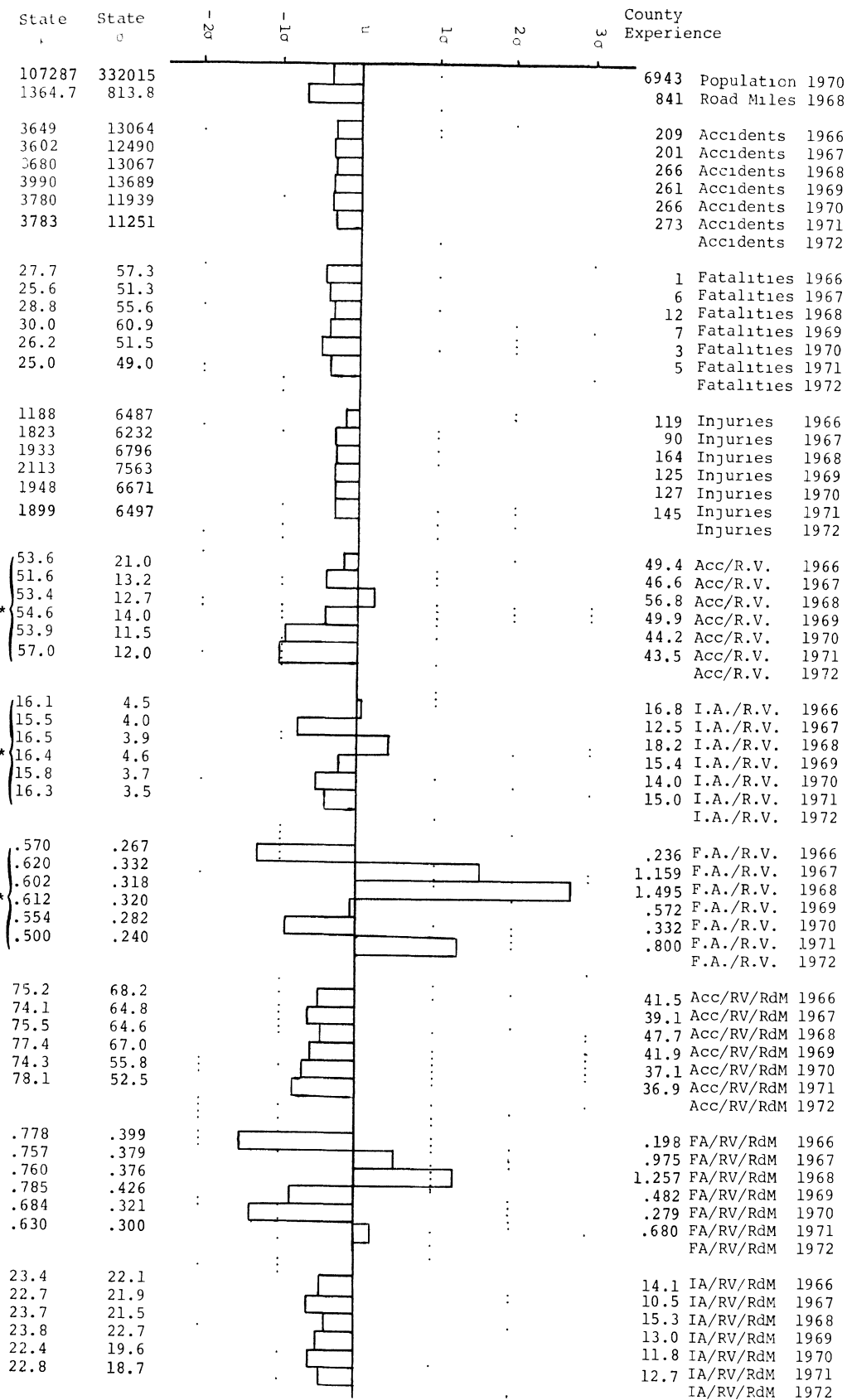
	12/70	3/71	6/71	9/71	12/71
Man hours/citation	4.1		2.3	2.3	
Sel. Enf. Unit hours/total hours	11.2		4.5	1.7	
Man hours/crash investigation	34 min.		26 min.	33 min.	
Citations issued/conviction obtained	1.02		1.02		
Average response time to an accident call	1.47 sec.		2 min. 1 sec.	2 min. 5 sec.	
No. of Emergency Medical Service calls	139				
No. of Emergency Medical Service calls answered	139				
No. calls resulting in transporting victims	4				
No. of victims transported	7				
No. of trained personnel available	6				
No. of man hours logged	1818				
Average trip distance	3 miles				
Av. time from call to victim delivery	10 min.				
Av. time spent at crash site	5 min.				
% of citations issued by Traffic Division	40%				42%

APPENDIX B

i

County Profiles

Accident Experience 1966-1971

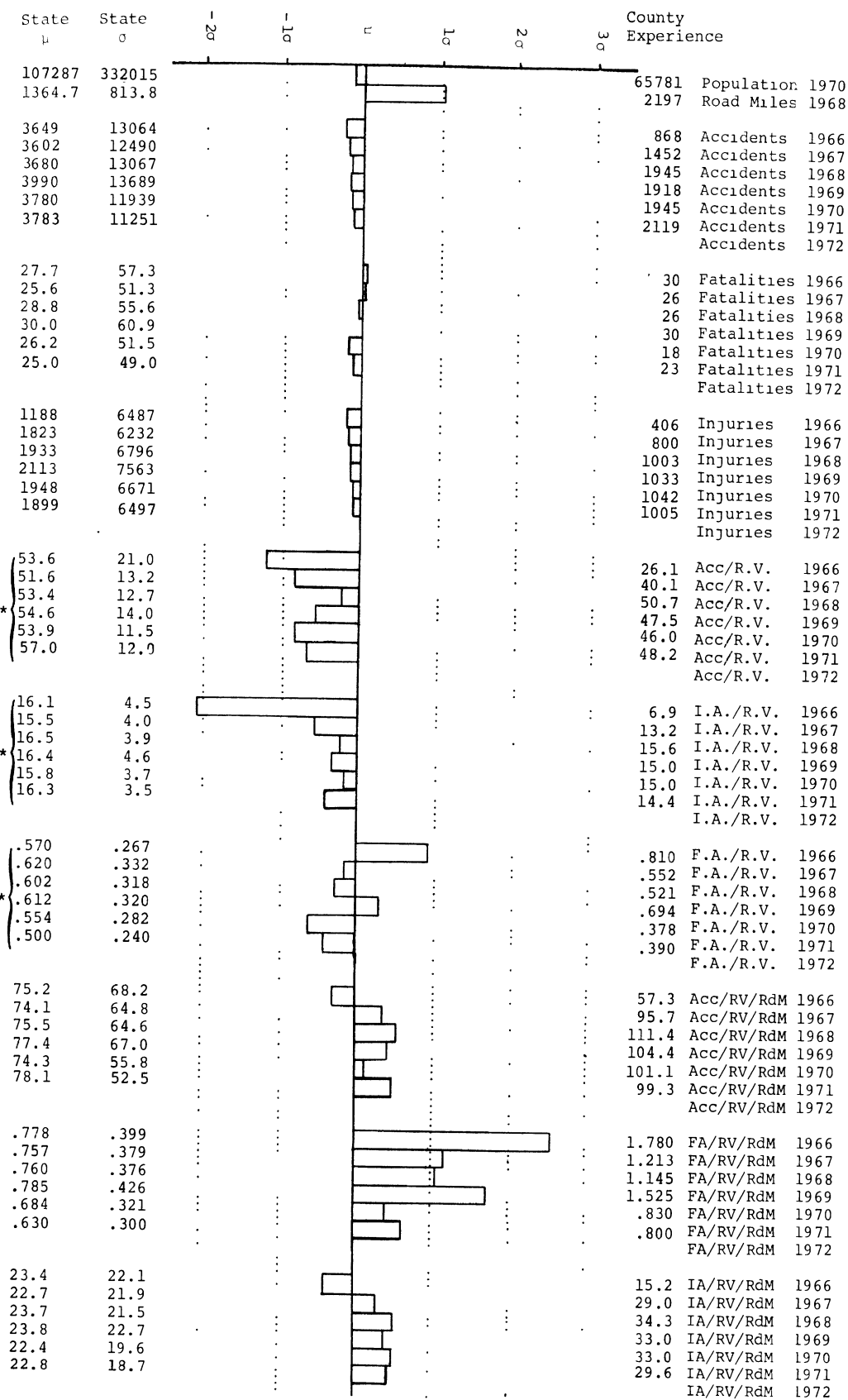


* Figures represent actual value times 10³

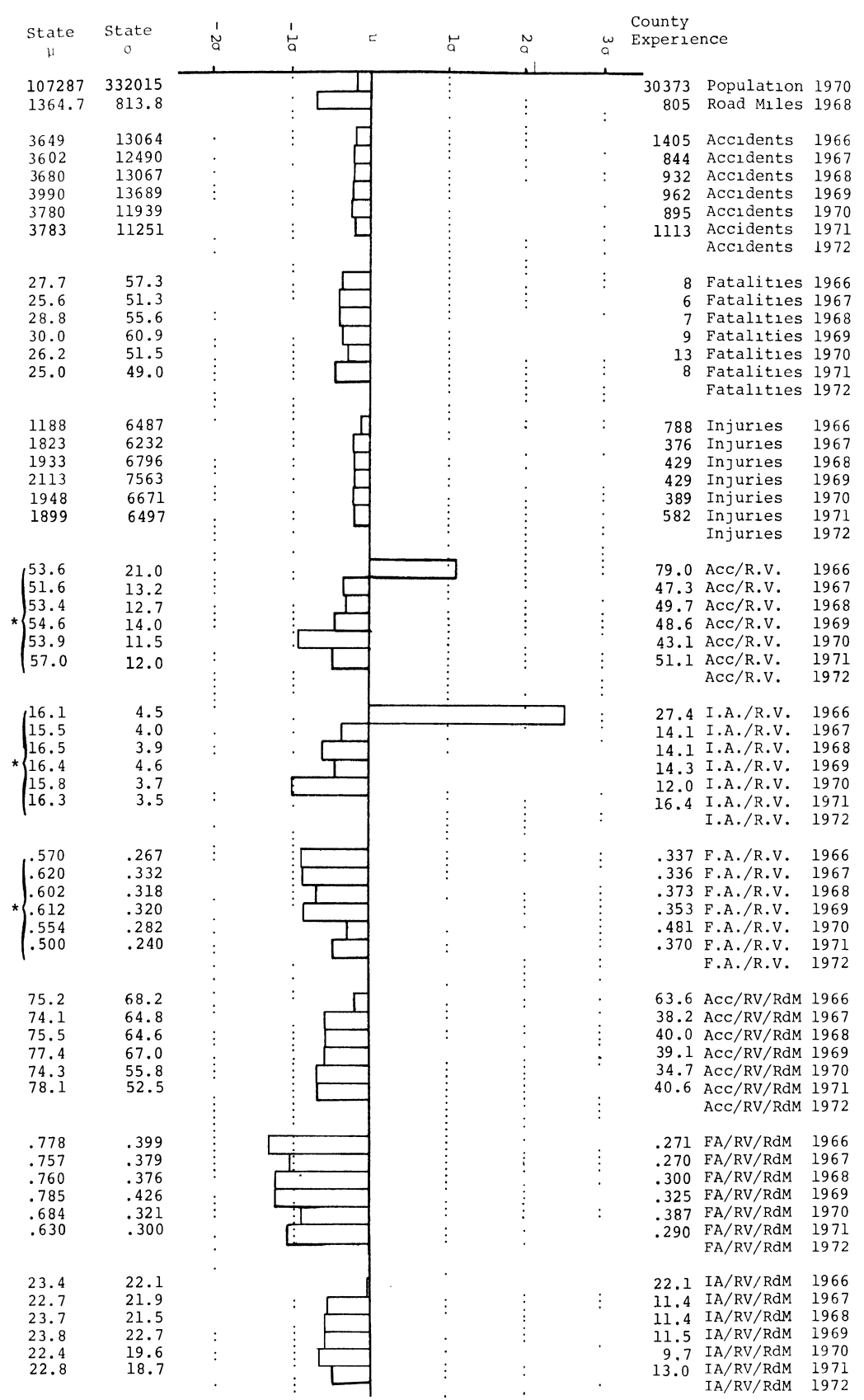
State #	State 0	-20	-10	0	10	20	30	County Experience
107287	332015							8370 Population 1970
1364.7	813.8							609 Road Miles 1968
3649	13064							346 Accidents 1966
3602	12490							356 Accidents 1967
3680	13067							334 Accidents 1968
3990	13689							305 Accidents 1969
3780	11939							357 Accidents 1970
3783	11251							336 Accidents 1971
								Accidents 1972
27.7	57.3							2 Fatalities 1966
25.6	51.3							4 Fatalities 1967
28.8	55.6							1 Fatalities 1968
30.0	60.9							3 Fatalities 1969
26.2	51.5							7 Fatalities 1970
25.0	49.0							2 Fatalities 1971
								Fatalities 1972
1188	6487							80 Injuries 1966
1823	6232							143 Injuries 1967
1933	6796							123 Injuries 1968
2113	7563							139 Injuries 1969
1948	6671							135 Injuries 1970
1899	6497							146 Injuries 1971
								Injuries 1972
53.6	21.0							73.0 Acc/R.V. 1966
51.6	13.2							76.5 Acc/R.V. 1967
53.4	12.7							67.5 Acc/R.V. 1968
*54.6	14.0							60.1 Acc/R.V. 1969
53.9	11.5							69.6 Acc/R.V. 1970
57.0	12.0							66.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							15.2 I.A./R.V. 1966
15.5	4.0							18.5 I.A./R.V. 1967
16.5	3.9							16.4 I.A./R.V. 1968
*16.4	4.6							16.0 I.A./R.V. 1969
15.8	3.7							16.4 I.A./R.V. 1970
16.3	3.5							18.0 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.422 F.A./R.V. 1966
.620	.332							.644 F.A./R.V. 1967
.602	.318							.202 F.A./R.V. 1968
*.612	.320							.591 F.A./R.V. 1969
.554	.282							1.169 F.A./R.V. 1970
.500	.240							.400 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							44.5 Acc/RV/RdM 1966
74.1	64.8							46.5 Acc/RV/RdM 1967
75.5	64.6							41.1 Acc/RV/RdM 1968
77.4	67.0							36.6 Acc/RV/RdM 1969
74.3	55.8							42.3 Acc/RV/RdM 1970
78.1	52.5							42.2 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.257 FA/RV/RdM 1966
.757	.379							.392 FA/RV/RdM 1967
.760	.376							.123 FA/RV/RdM 1968
.785	.426							.360 FA/RV/RdM 1969
.684	.321							.712 FA/RV/RdM 1970
.630	.300							.250 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							9.3 IA/RV/RdM 1966
22.7	21.9							11.3 IA/RV/RdM 1967
23.7	21.5							10.0 IA/RV/RdM 1968
23.8	22.7							9.7 IA/RV/RdM 1969
22.4	19.6							10.0 IA/RV/RdM 1970
22.8	18.7							11.4 IA/RV/RdM 1971
								IA/RV/RdM 1972

*figures represent
actual value
times 10³

ALGER



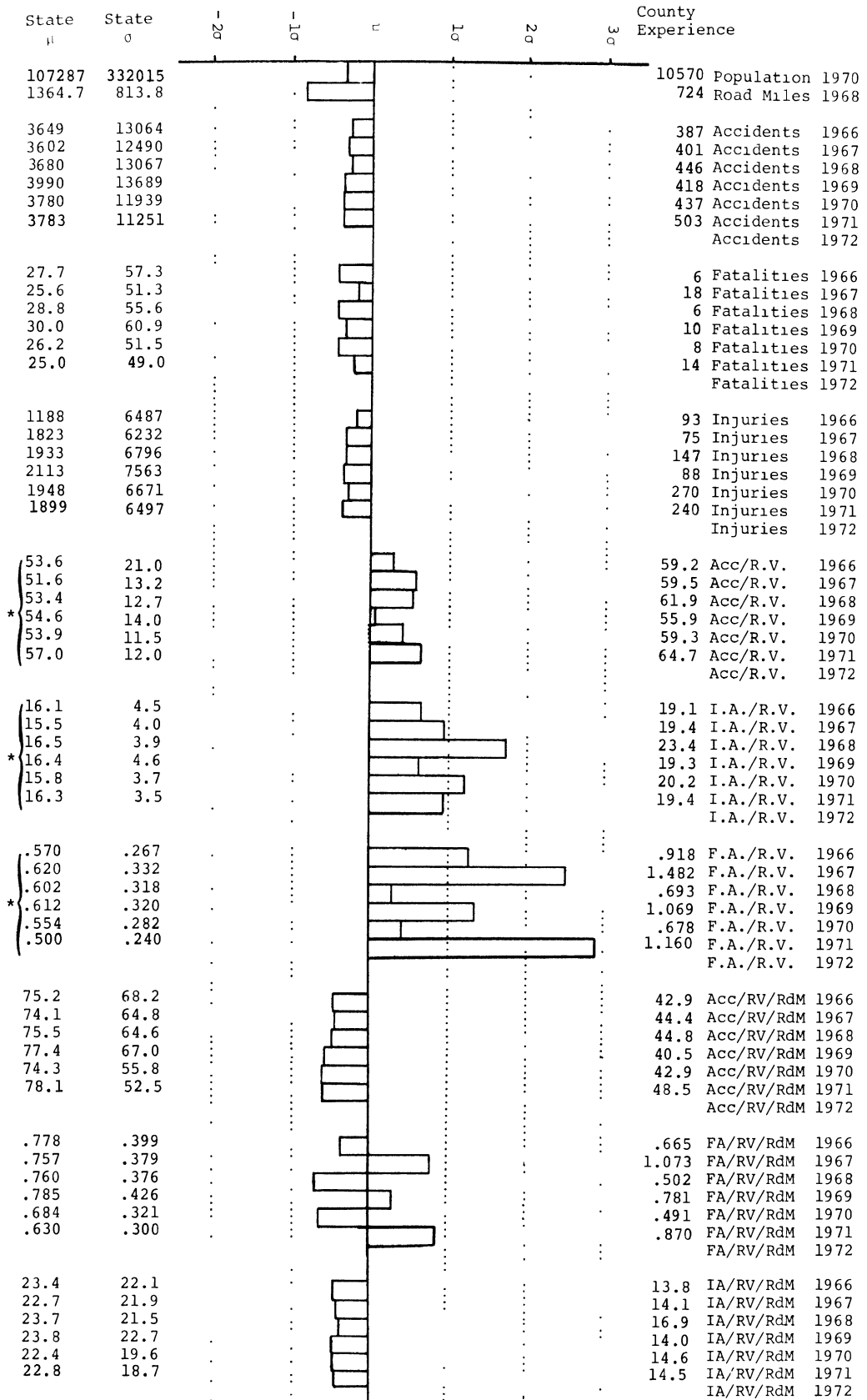
* figures represent actual value times 10³



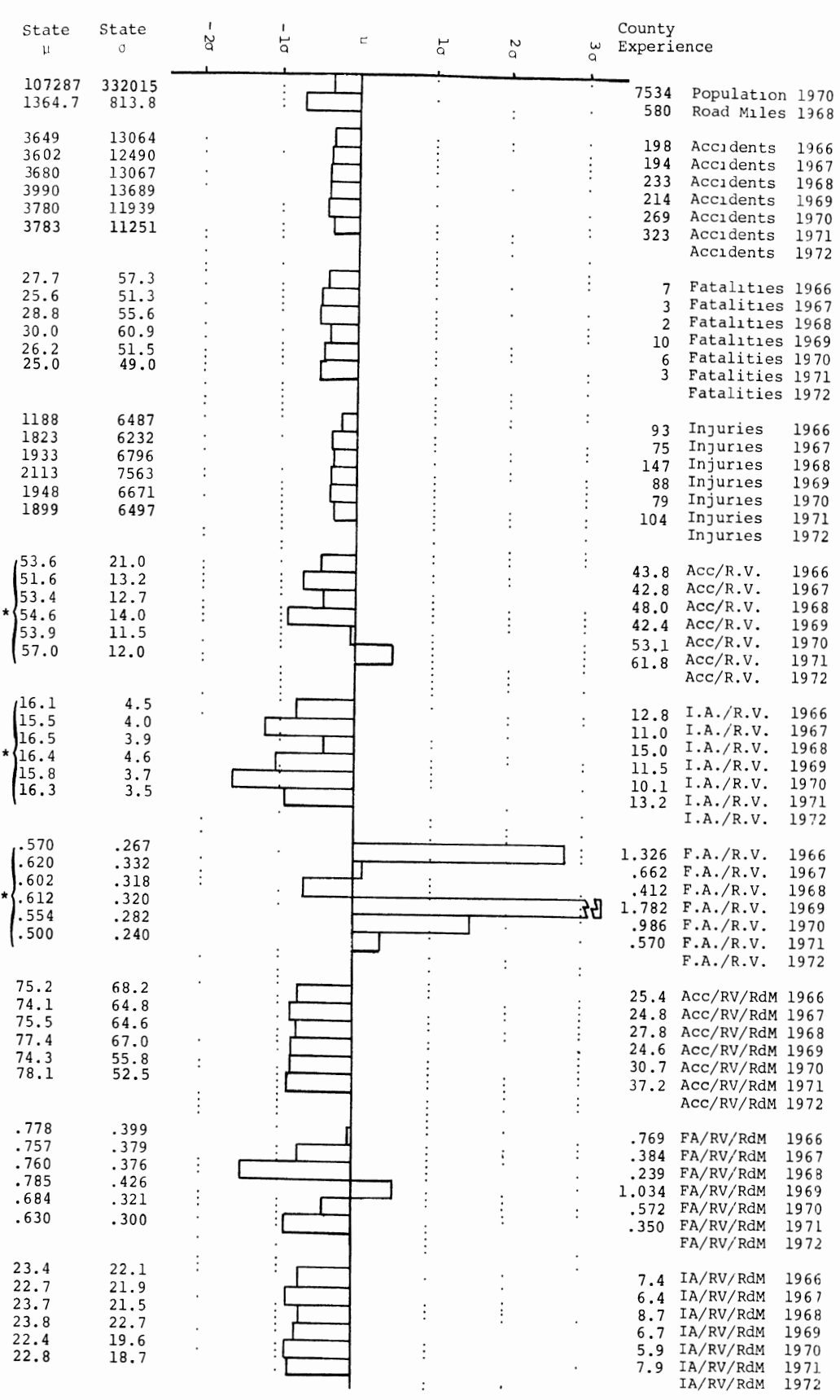
*Figures represent actual value times 10³

State u	State c	-2σ	-1σ	u	1σ	2σ	3σ	County Experience
107287	332015							12055 Population 1970
1364.7	813.8							974 Road Miles 1968
3649	13064							251 Accidents 1966
3602	12490							330 Accidents 1967
3680	13067							273 Accidents 1968
3990	13689							327 Accidents 1969
3780	11939							341 Accidents 1970
3783	11251							438 Accidents 1971
								Accidents 1972
27.7	57.3							3 Fatalities 1966
25.6	51.3							7 Fatalities 1967
28.8	55.6							5 Fatalities 1968
30.0	60.9							11 Fatalities 1969
26.2	51.5							13 Fatalities 1970
25.0	49.0							2 Fatalities 1971
								Fatalities 1972
1188	6487							129 Injuries 1966
1823	6232							180 Injuries 1967
1933	6796							149 Injuries 1968
2113	7563							132 Injuries 1969
1948	6671							162 Injuries 1970
1899	6497							238 Injuries 1971
								Injuries 1972
53.6	21.0							35.2 Acc/R.V. 1966
51.6	13.2							45.2 Acc/R.V. 1967
53.4	12.7							35.3 Acc/R.V. 1968
* 54.6	14.0							39.5 Acc/R.V. 1969
53.9	11.5							40.7 Acc/R.V. 1970
57.0	12.0							52.2 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							11.8 I.A./R.V. 1966
15.5	4.0							15.5 I.A./R.V. 1967
16.5	3.9							11.4 I.A./R.V. 1968
* 16.4	4.6							11.4 I.A./R.V. 1969
15.8	3.7							12.4 I.A./R.V. 1970
16.3	3.5							18.0 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.420 F.A./R.V. 1966
.620	.332							.685 F.A./R.V. 1967
.602	.318							.387 F.A./R.V. 1968
* .612	.320							.966 F.A./R.V. 1969
.554	.282							.954 F.A./R.V. 1970
.500	.240							.240 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							34.3 Acc/RV/RdM 1966
74.1	64.8							45.0 Acc/RV/RdM 1967
75.5	64.6							34.3 Acc/RV/RdM 1968
77.4	67.0							38.5 Acc/RV/RdM 1969
74.3	55.8							39.7 Acc/RV/RdM 1970
78.1	52.5							52.6 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.409 FA/RV/RdM 1966
.757	.379							.667 FA/RV/RdM 1967
.760	.376							.377 FA/RV/RdM 1968
.785	.426							.942 FA/RV/RdM 1969
.684	.321							.929 FA/RV/RdM 1970
.630	.300							.240 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							11.5 IA/RV/RdM 1966
22.7	21.9							15.1 IA/RV/RdM 1967
23.7	21.5							11.1 IA/RV/RdM 1968
23.8	22.7							11.1 IA/RV/RdM 1969
22.4	19.6							12.1 IA/RV/RdM 1970
22.8	18.7							18.1 IA/RV/RdM 1971
								IA/RV/RdM 1972

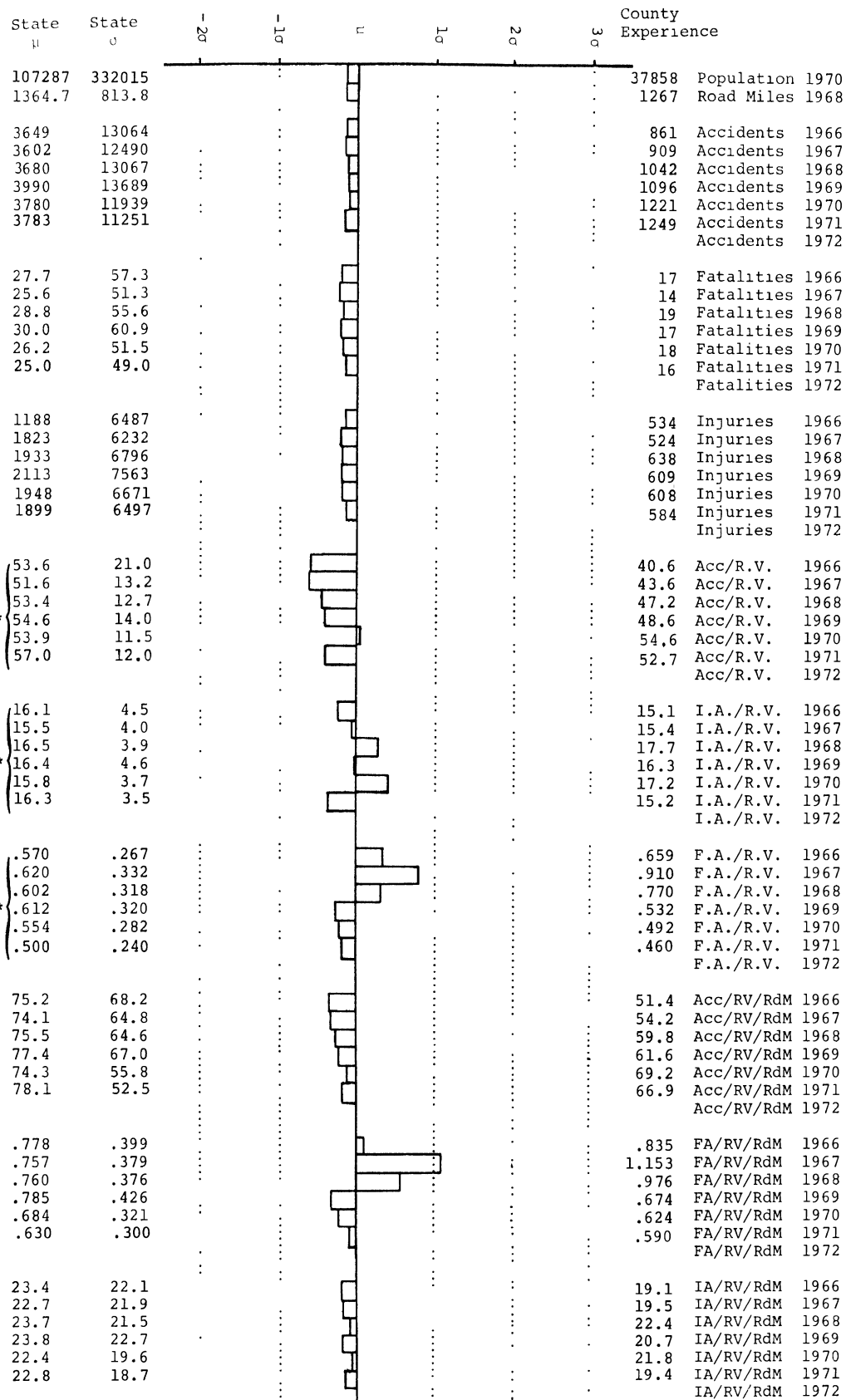
*figures represent actual value times 10³



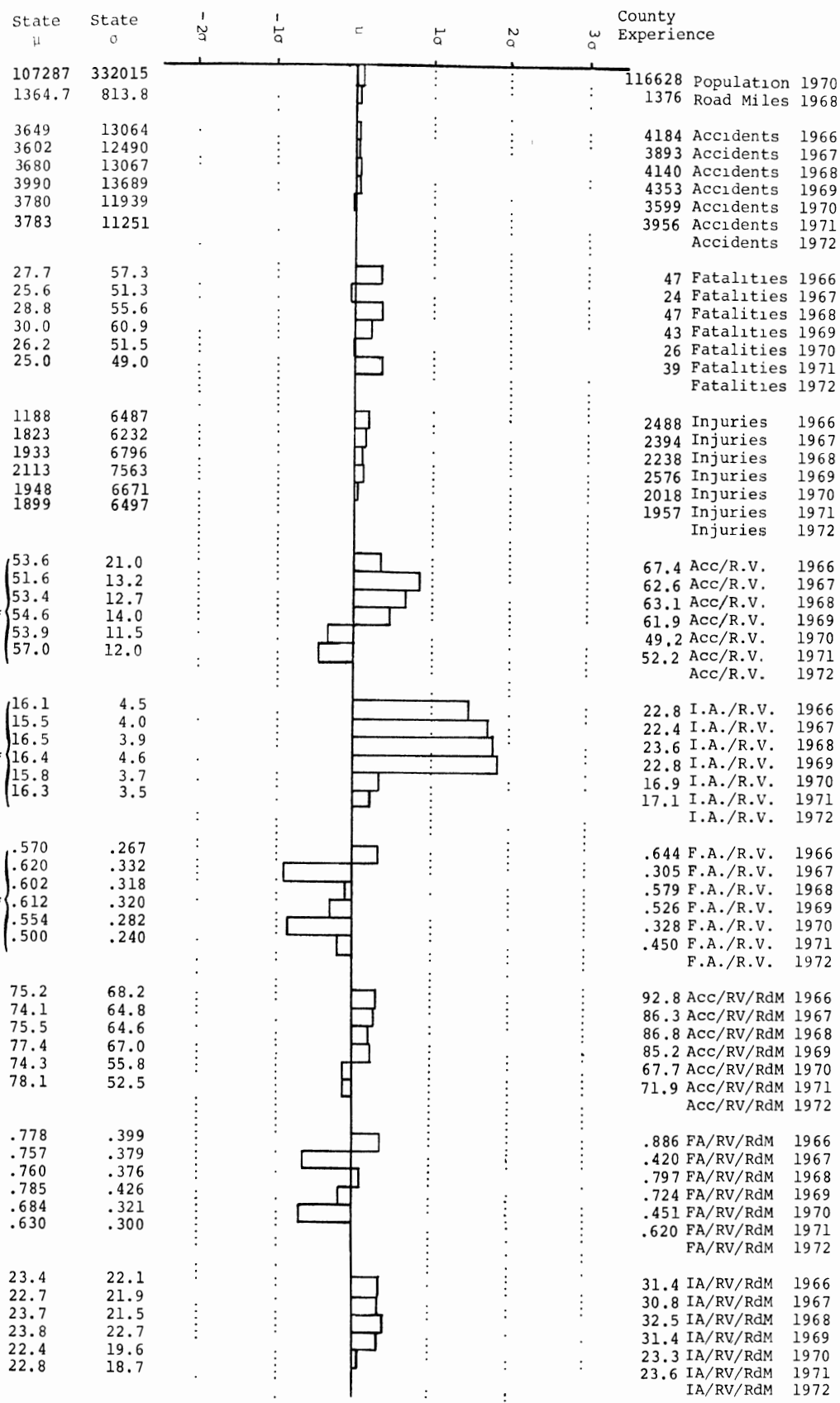
*Figures represent actual value times 10³



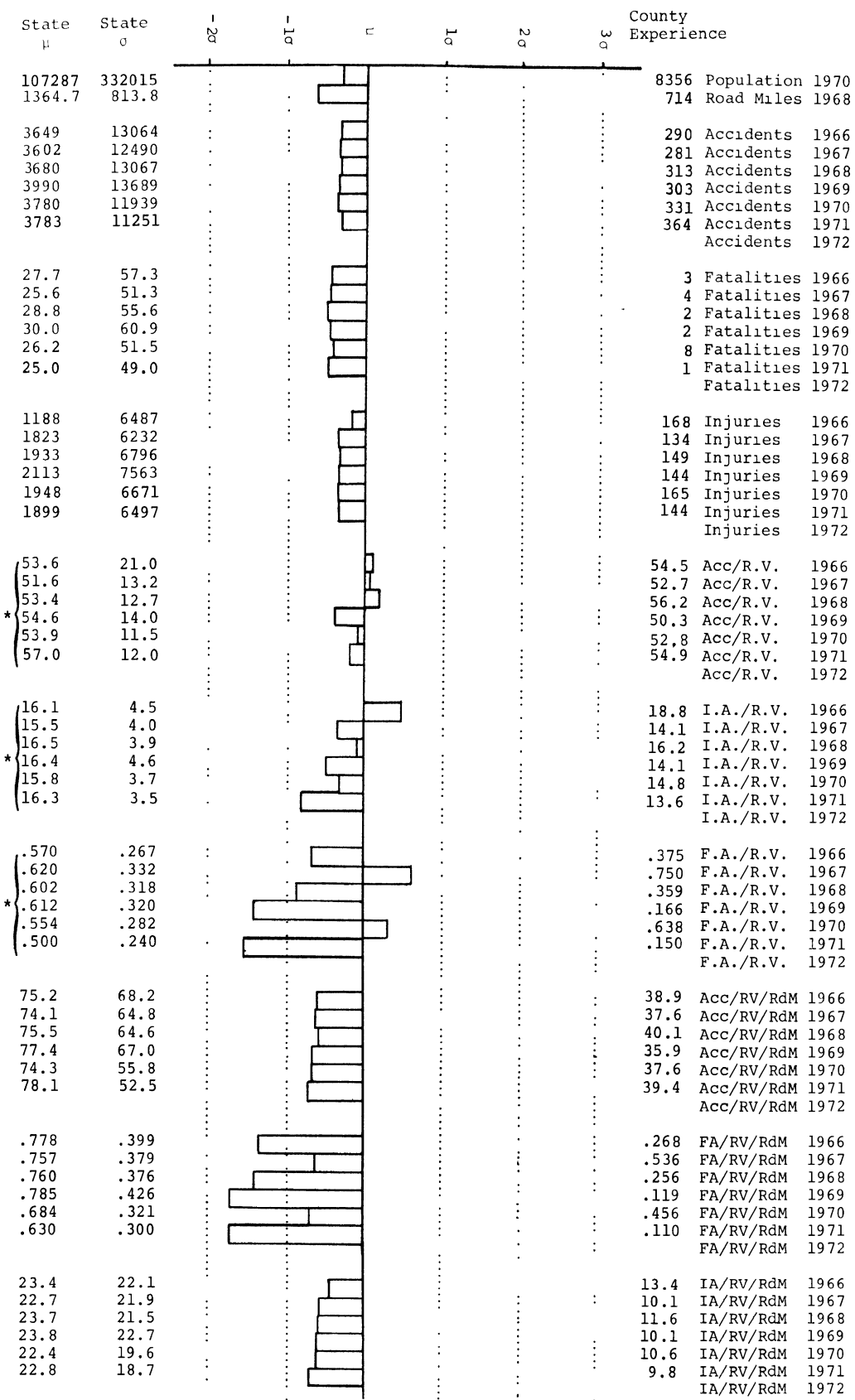
* Figures represent actual value times 10³



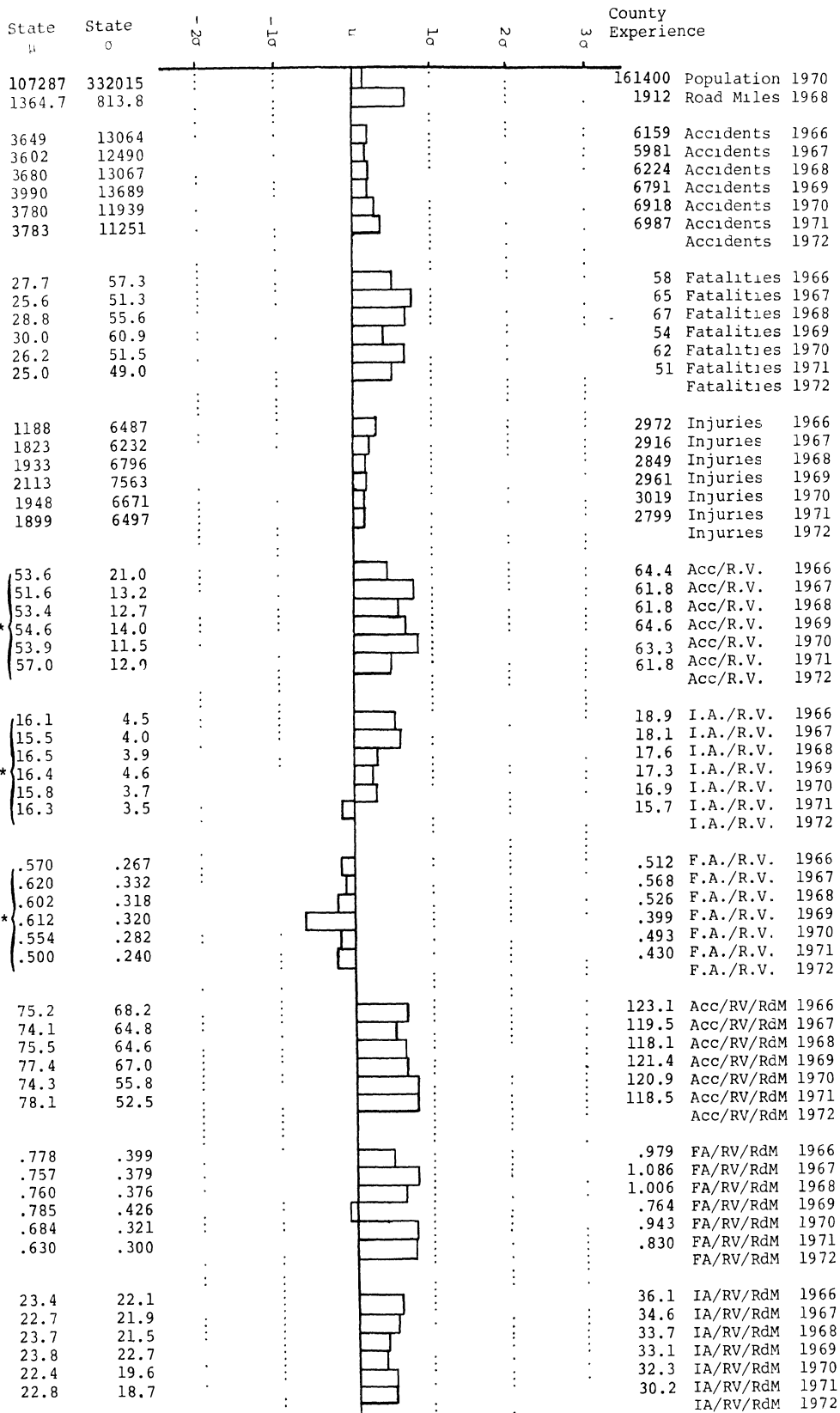
* Figures represent actual value times 10³



*Figures represent actual value times 10³



* Figures represent actual value times 10³



* Figures represent actual value times 10³

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							36396 Population 1970
1364.7	813.8							1161 Road Miles 1968
3649	13064							957 Accidents 1966
3602	12490							1019 Accidents 1967
3680	13067							1003 Accidents 1968
3990	13689							1261 Accidents 1969
3780	11939							1365 Accidents 1970
3783	11251							1481 Accidents 1971
								Accidents 1972
27.7	57.3							24 Fatalities 1966
25.6	51.3							9 Fatalities 1967
28.8	55.6							10 Fatalities 1968
30.0	60.9							19 Fatalities 1969
26.2	51.5							8 Fatalities 1970
25.0	49.0							20 Fatalities 1971
								Fatalities 1972
1188	6487							544 Injuries 1966
1823	6232							476 Injuries 1967
1933	6796							434 Injuries 1968
2113	7563							472 Injuries 1969
1948	6671							557 Injuries 1970
1899	6497							563 Injuries 1971
								Injuries 1972
53.6	21.0							42.3 Acc/R.V. 1966
51.6	13.2							45.0 Acc/R.V. 1967
53.4	12.7							42.6 Acc/R.V. 1968
* 54.6	14.0							51.7 Acc/R.V. 1969
53.9	11.5							53.5 Acc/R.V. 1970
57.0	12.0							54.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							14.0 I.A./R.V. 1966
15.5	4.0							13.0 I.A./R.V. 1967
16.5	3.9							11.9 I.A./R.V. 1968
* 16.4	4.6							12.3 I.A./R.V. 1969
15.8	3.7							13.8 I.A./R.V. 1970
16.3	3.5							14.0 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.575 F.A./R.V. 1966
.620	.332							.265 F.A./R.V. 1967
.602	.318							.339 F.A./R.V. 1968
* .612	.320							.491 F.A./R.V. 1969
.554	.282							.274 F.A./R.V. 1970
.500	.240							.550 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							49.1 Acc/RV/RdM 1966
74.1	64.8							52.3 Acc/RV/RdM 1967
75.5	64.6							49.3 Acc/RV/RdM 1968
77.4	67.0							60.0 Acc/RV/RdM 1969
74.3	55.8							62.1 Acc/RV/RdM 1970
78.1	52.5							63.4 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.668 FA/RV/RdM 1966
.757	.379							.308 FA/RV/RdM 1967
.760	.376							.394 FA/RV/RdM 1968
.785	.426							.764 FA/RV/RdM 1969
.684	.321							.318 FA/RV/RdM 1970
.630	.300							.640 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							16.3 IA/RV/RdM 1966
22.7	21.9							15.2 IA/RV/RdM 1967
23.7	21.5							13.8 IA/RV/RdM 1968
23.8	22.7							14.3 IA/RV/RdM 1969
22.4	19.6							16.0 IA/RV/RdM 1970
22.8	18.7							16.3 IA/RV/RdM 1971
								IA/RV/RdM 1972

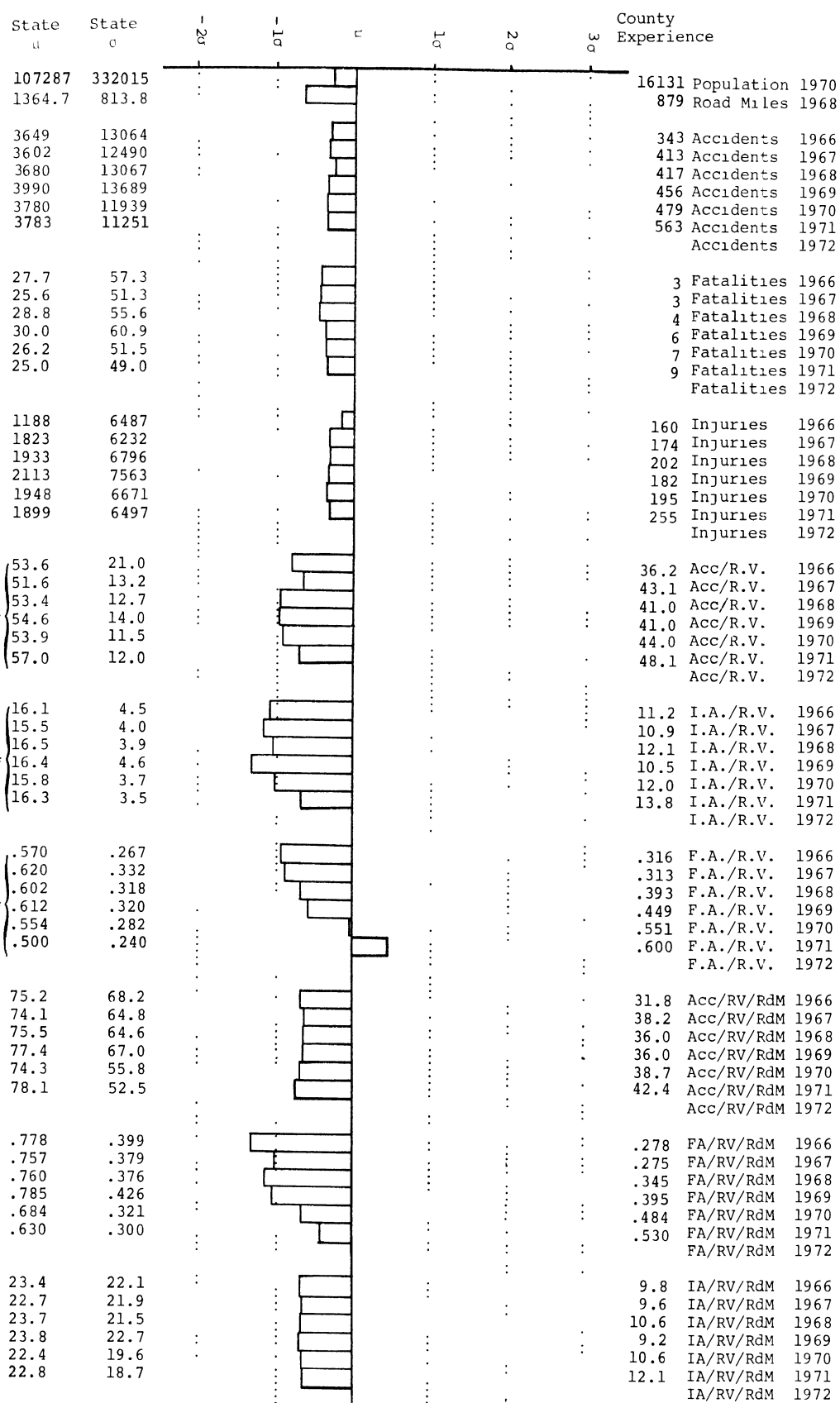
* Figures represent actual value times 10³

State	State						County	Experience
1	2	-20	-10	0	10	20	30	
107287	332015							140061 Population 1970
1364.7	813.8							1887 Road Miles 1968
3649	13064							5496 Accidents 1966
3602	12490							5735 Accidents 1967
3680	13067							5882 Accidents 1968
3990	13689							5901 Accidents 1969
3780	11939							5485 Accidents 1970
3783	11251							5955 Accidents 1971
								Accidents 1972
27.7	57.3							43 Fatalities 1966
25.6	51.3							46 Fatalities 1967
28.8	55.6							56 Fatalities 1968
30.0	60.9							46 Fatalities 1969
26.2	51.5							40 Fatalities 1970
25.0	49.0							28 Fatalities 1971
								Fatalities 1972
1188	6487							2669 Injuries 1966
1823	6232							2316 Injuries 1967
1933	6796							2423 Injuries 1968
2113	7563							2464 Injuries 1969
1948	6671							2339 Injuries 1970
1899	6497							2204 Injuries 1971
								Injuries 1972
53.6	21.0							67.2 Acc/R.V. 1966
51.6	13.2							69.6 Acc/R.V. 1967
53.4	12.7							68.8 Acc/R.V. 1968
* 54.6	14.0							65.5 Acc/R.V. 1969
53.9	11.5							59.4 Acc/R.V. 1970
57.0	12.0							62.9 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							20.7 I.A./R.V. 1966
15.5	4.0							18.4 I.A./R.V. 1967
16.5	3.9							18.7 I.A./R.V. 1968
* 16.4	4.6							17.3 I.A./R.V. 1969
15.8	3.7							15.9 I.A./R.V. 1970
16.3	3.5							15.6 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.439 F.A./R.V. 1966
.620	.332							.485 F.A./R.V. 1967
* .602	.318							.561 F.A./R.V. 1968
.612	.320							.477 F.A./R.V. 1969
.554	.282							.422 F.A./R.V. 1970
.500	.240							.270 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							126.7 Acc/RV/RdM 1966
74.1	64.8							132.2 Acc/RV/RdM 1967
75.5	64.6							129.7 Acc/RV/RdM 1968
77.4	67.0							123.7 Acc/RV/RdM 1969
74.3	55.8							112.0 Acc/RV/RdM 1970
78.1	52.5							119.4 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.828 FA/RV/RdM 1966
.757	.379							.915 FA/RV/RdM 1967
.760	.376							1.059 FA/RV/RdM 1968
.785	.426							.901 FA/RV/RdM 1969
.684	.321							.796 FA/RV/RdM 1970
.630	.300							.520 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							39.1 IA/RV/RdM 1966
22.7	21.9							34.7 IA/RV/RdM 1967
23.7	21.5							35.3 IA/RV/RdM 1968
23.8	22.7							32.7 IA/RV/RdM 1969
22.4	19.6							30.0 IA/RV/RdM 1970
22.8	18.7							29.5 IA/RV/RdM 1971
								IA/RV/RdM 1972

* figures represent actual value times 10³

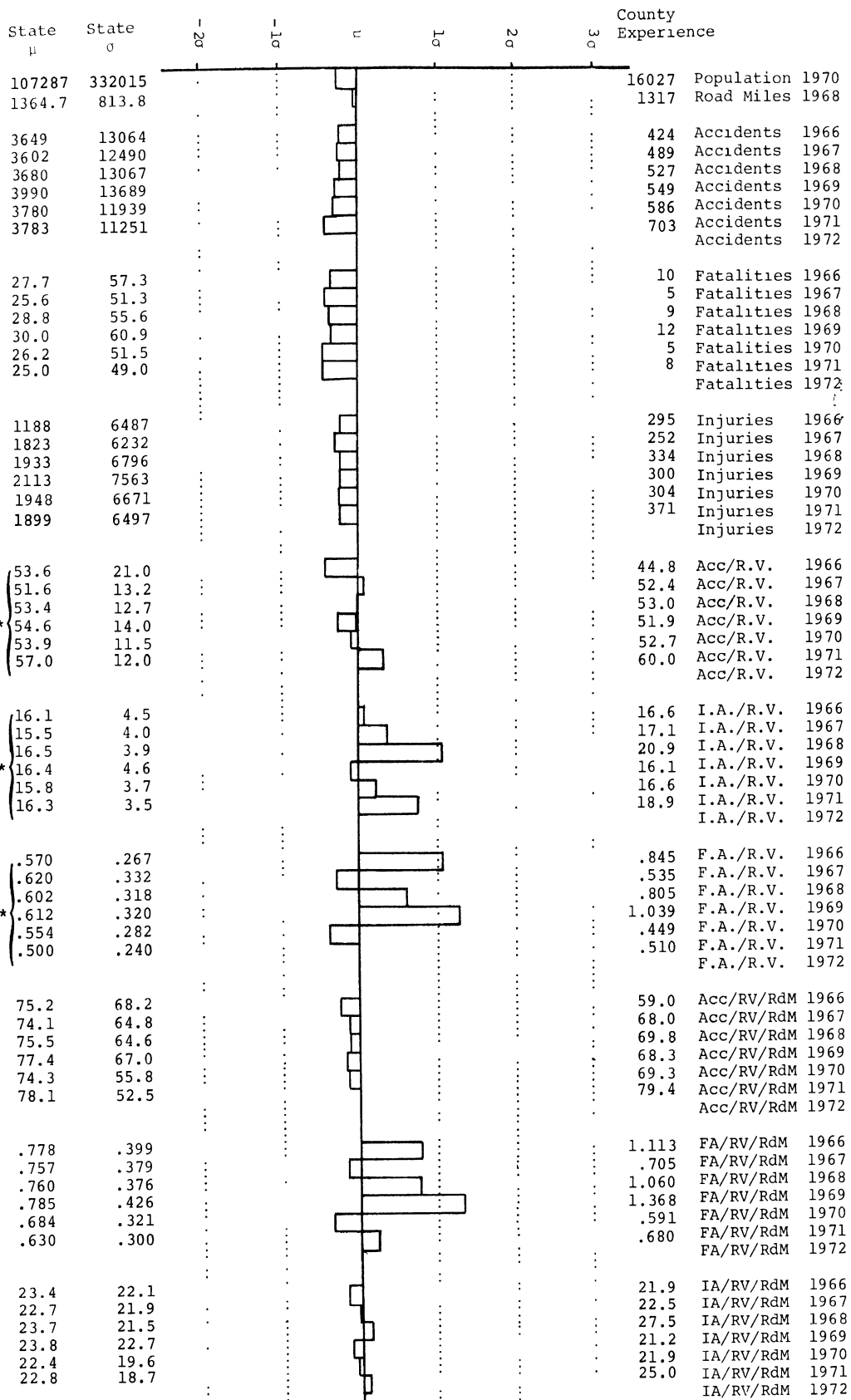
State u	State o	-20	-10	0	10	20	30	County Experience
107287	332015							42681 Population 1970
1364.7	813.8							1192 Road Miles 1968
3649	13064							1115 Accidents 1966
3602	12490							1194 Accidents 1967
3680	13067							1450 Accidents 1968
3990	13689							1545 Accidents 1969
3780	11939							1579 Accidents 1970
3783	11251							1654 Accidents 1971
								Accidents 1972
27.7	57.3							24 Fatalities 1966
25.6	51.3							14 Fatalities 1967
28.8	55.6							26 Fatalities 1968
30.0	60.9							28 Fatalities 1969
26.2	51.5							21 Fatalities 1970
25.0	49.0							28 Fatalities 1971
								Fatalities 1972
1188	6487							742 Injuries 1966
1823	6232							729 Injuries 1967
1933	6796							668 Injuries 1968
2113	7563							785 Injuries 1969
1948	6671							755 Injuries 1970
1899	6497							702 Injuries 1971
								Injuries 1972
53.6	21.0							45.5 Acc/R.V. 1966
51.6	13.2							49.0 Acc/R.V. 1967
53.4	12.7							56.0 Acc/R.V. 1968
* 54.6	14.0							56.7 Acc/R.V. 1969
53.9	11.5							55.8 Acc/R.V. 1970
57.0	12.0							56.2 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							18.1 I.A./R.V. 1966
15.5	4.0							17.9 I.A./R.V. 1967
16.5	3.9							15.9 I.A./R.V. 1968
* 16.4	4.6							17.5 I.A./R.V. 1969
15.8	3.7							17.3 I.A./R.V. 1970
16.3	3.5							15.9 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.693 F.A./R.V. 1966
.620	.332							.451 F.A./R.V. 1967
.602	.318							.733 F.A./R.V. 1968
* .612	.320							.881 F.A./R.V. 1969
.554	.282							.600 F.A./R.V. 1970
.500	.240							.710 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							54.2 Acc/RV/RdM 1966
74.1	64.8							58.0 Acc/RV/RdM 1967
75.5	64.6							66.7 Acc/RV/RdM 1968
77.4	67.0							67.6 Acc/RV/RdM 1969
74.3	55.8							66.4 Acc/RV/RdM 1970
78.1	52.5							67.2 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.826 FA/RV/RdM 1966
.757	.379							.538 FA/RV/RdM 1967
.760	.376							.874 FA/RV/RdM 1968
.785	.426							1.051 FA/RV/RdM 1969
.684	.321							.715 FA/RV/RdM 1970
.630	.300							.850 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							21.6 IA/RV/RdM 1966
22.7	21.9							21.3 IA/RV/RdM 1967
23.7	21.5							19.0 IA/RV/RdM 1968
23.8	22.7							20.9 IA/RV/RdM 1969
22.4	19.6							20.6 IA/RV/RdM 1970
22.8	18.7							19.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

* figures represent
actual value
times 10³



* Figures represent actual value times 10³

CHARLEVOIX



*figures represent actual value times 10³

CHEBOYGAN

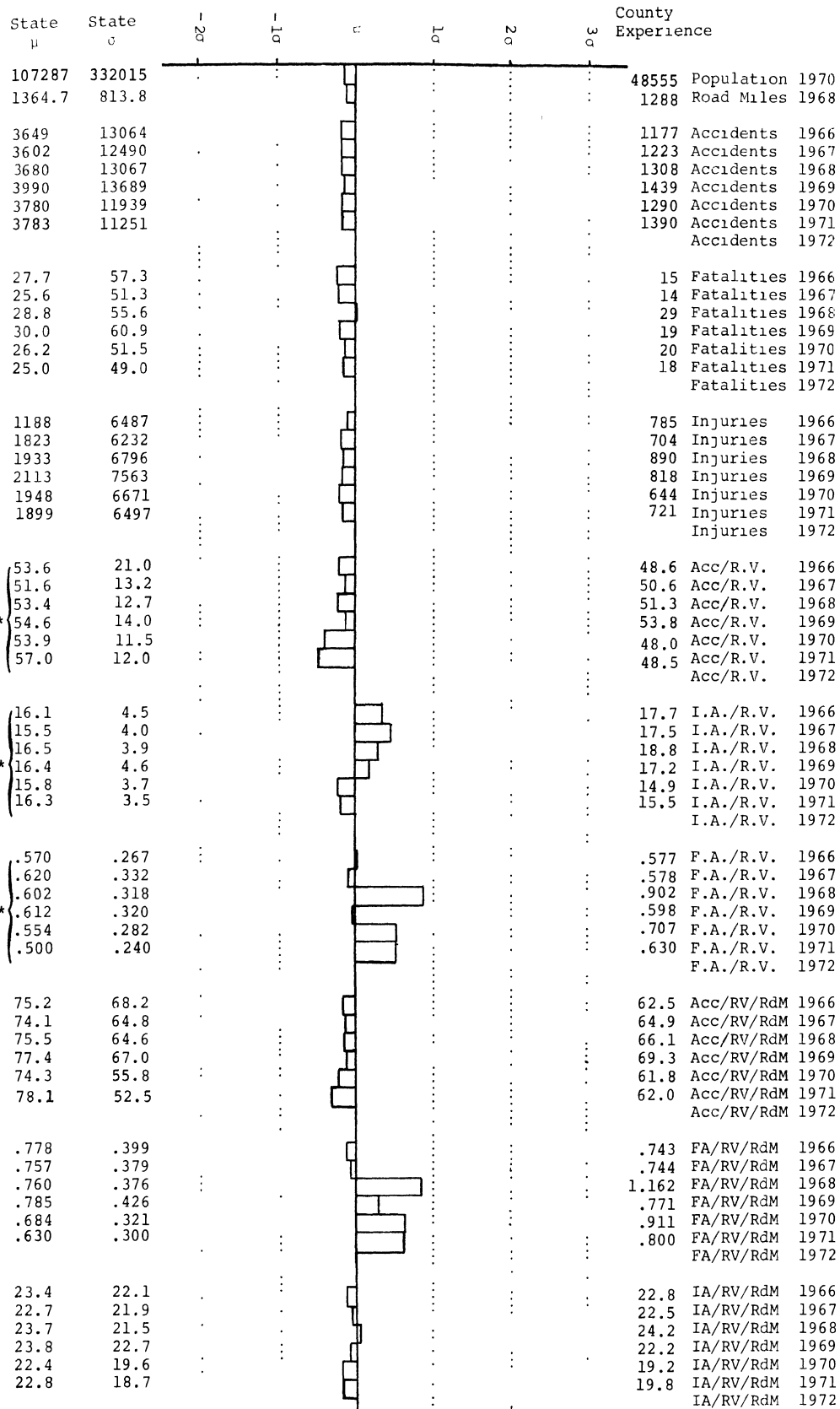
State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							31910 Population 1970
1364.7	813.8							707 Road Miles 1968
3649	13064							1130 Accidents 1966
3602	12490							1030 Accidents 1967
3680	13067							1091 Accidents 1968
3990	13689							977 Accidents 1969
3780	11939							1091 Accidents 1970
3783	11251							1274 Accidents 1971
								Accidents 1972
27.7	57.3							6 Fatalities 1966
25.6	51.3							5 Fatalities 1967
28.8	55.6							11 Fatalities 1968
30.0	60.9							8 Fatalities 1969
26.2	51.5							15 Fatalities 1970
25.0	49.0							6 Fatalities 1971
								Fatalities 1972
1188	6487							435 Injuries 1966
1823	6232							413 Injuries 1967
1933	6796							395 Injuries 1968
2113	7563							359 Injuries 1969
1948	6671							398 Injuries 1970
1899	6497							407 Injuries 1971
								Injuries 1972
53.6	21.0							67.1 Acc/R.V. 1966
51.6	13.2							60.4 Acc/R.V. 1967
53.4	12.7							61.6 Acc/R.V. 1968
* 54.6	14.0							54.7 Acc/R.V. 1969
53.9	11.5							61.2 Acc/R.V. 1970
57.0	12.0							67.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							16.5 I.A./R.V. 1966
15.5	4.0							15.9 I.A./R.V. 1967
16.5	3.9							13.7 I.A./R.V. 1968
* 16.4	4.6							12.7 I.A./R.V. 1969
15.8	3.7							13.8 I.A./R.V. 1970
16.3	3.5							14.4 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.356 F.A./R.V. 1966
.620	.332							.293 F.A./R.V. 1967
.602	.318							.564 F.A./R.V. 1968
* .612	.320							.392 F.A./R.V. 1969
.554	.282							.673 F.A./R.V. 1970
.500	.240							.320 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							47.4 Acc/RV/RdM 1966
74.1	64.8							43.2 Acc/RV/RdM 1967
75.5	64.6							43.5 Acc/RV/RdM 1968
77.4	67.0							38.7 Acc/RV/RdM 1969
74.3	55.8							43.2 Acc/RV/RdM 1970
78.1	52.5							105.8 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.252 FA/RV/RdM 1966
.757	.379							.207 FA/RV/RdM 1967
.760	.376							.399 FA/RV/RdM 1968
.785	.426							.277 FA/RV/RdM 1969
.684	.321							.476 FA/RV/RdM 1970
.630	.300							.500 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							11.7 IA/RV/RdM 1966
22.7	21.9							11.2 IA/RV/RdM 1967
23.7	21.5							9.7 IA/RV/RdM 1968
23.8	22.7							9.0 IA/RV/RdM 1969
22.4	19.6							9.8 IA/RV/RdM 1970
22.8	18.7							22.6 IA/RV/RdM 1971
								IA/RV/RdM 1972

*figures represent
actual value
times 10³

CHIPPEWA

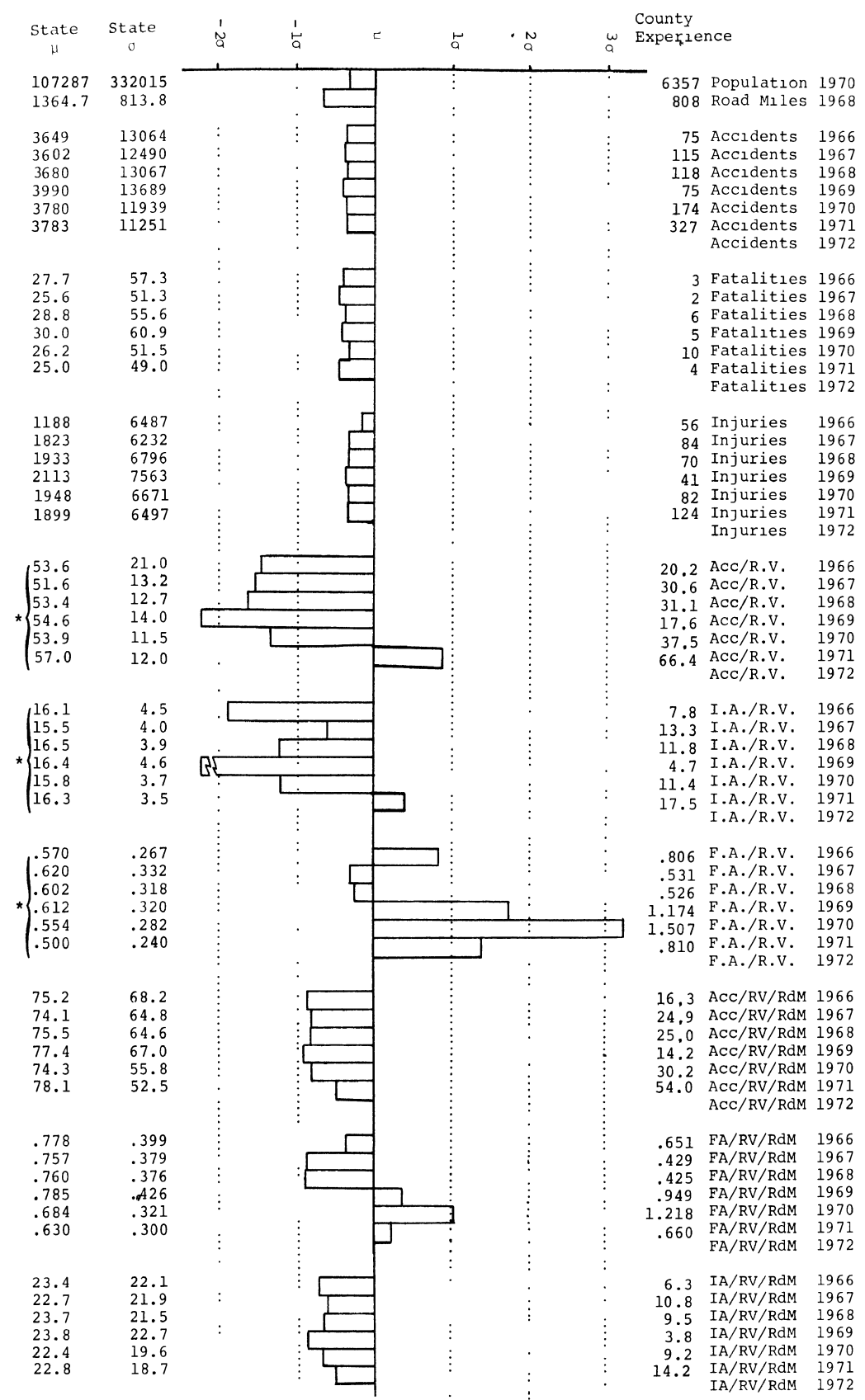
State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							15680 Population 1970
1364.7	813.8							1123 Road Miles 1968
3649	13064							489 Accidents 1966
3602	12490							539 Accidents 1967
3680	13067							575 Accidents 1968
3990	13689							682 Accidents 1969
3780	11939							823 Accidents 1970
3783	11251							913 Accidents 1971
								Accidents 1972
27.7	57.3							7 Fatalities 1966
25.6	51.3							11 Fatalities 1967
28.8	55.6							10 Fatalities 1968
30.0	60.9							5 Fatalities 1969
26.2	51.5							10 Fatalities 1970
25.0	49.0							14 Fatalities 1971
								Fatalities 1972
1188	6487							295 Injuries 1966
1823	6232							383 Injuries 1967
1933	6796							406 Injuries 1968
2113	7563							402 Injuries 1969
1948	6671							385 Injuries 1970
1899	6497							433 Injuries 1971
								Injuries 1972
53.6	21.0							56.9 Acc/R.V. 1966
51.6	13.2							60.8 Acc/R.V. 1967
53.4	12.7							57.5 Acc/R.V. 1968
* 54.6	14.0							63.9 Acc/R.V. 1969
53.9	11.5							73.6 Acc/R.V. 1970
57.0	12.0							74.8 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							18.8 I.A./R.V. 1966
15.5	4.0							22.4 I.A./R.V. 1967
16.5	3.9							21.7 I.A./R.V. 1968
* 16.4	4.6							21.9 I.A./R.V. 1969
15.8	3.7							21.8 I.A./R.V. 1970
16.3	3.5							21.2 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.697 F.A./R.V. 1966
.620	.332							.676 F.A./R.V. 1967
.602	.318							.699 F.A./R.V. 1968
* .612	.320							.374 F.A./R.V. 1969
.554	.282							.804 F.A./R.V. 1970
.500	.240							.980 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							63.9 Acc/RV/RdM 1966
74.1	64.8							70.3 Acc/RV/RdM 1967
75.5	64.6							64.5 Acc/RV/RdM 1968
77.4	67.0							71.7 Acc/RV/RdM 1969
74.3	55.8							82.6 Acc/RV/RdM 1970
78.1	52.5							84.6 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.782 FA/RV/RdM 1966
.757	.379							.759 FA/RV/RdM 1967
.760	.376							.785 FA/RV/RdM 1968
.785	.426							.421 FA/RV/RdM 1969
.684	.321							.903 FA/RV/RdM 1970
.630	.300							1.110 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							21.1 IA/RV/RdM 1966
22.7	21.9							25.2 IA/RV/RdM 1967
23.7	21.5							24.4 IA/RV/RdM 1968
23.8	22.7							24.6 IA/RV/RdM 1969
22.4	19.6							24.5 IA/RV/RdM 1970
22.8	18.7							24.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

* figures represent actual value times 10³



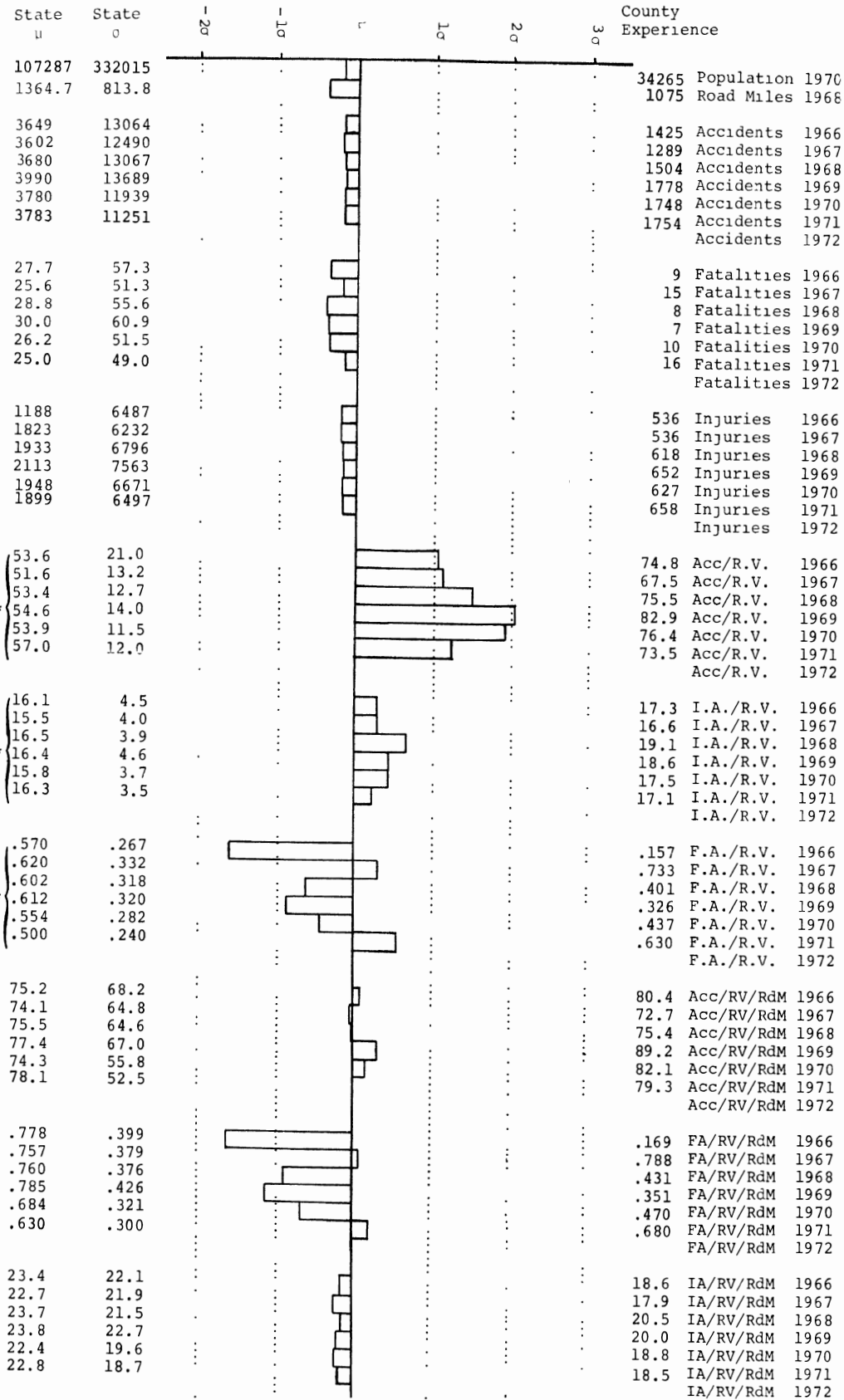
* Figures represent actual value times 10³

CLINTON

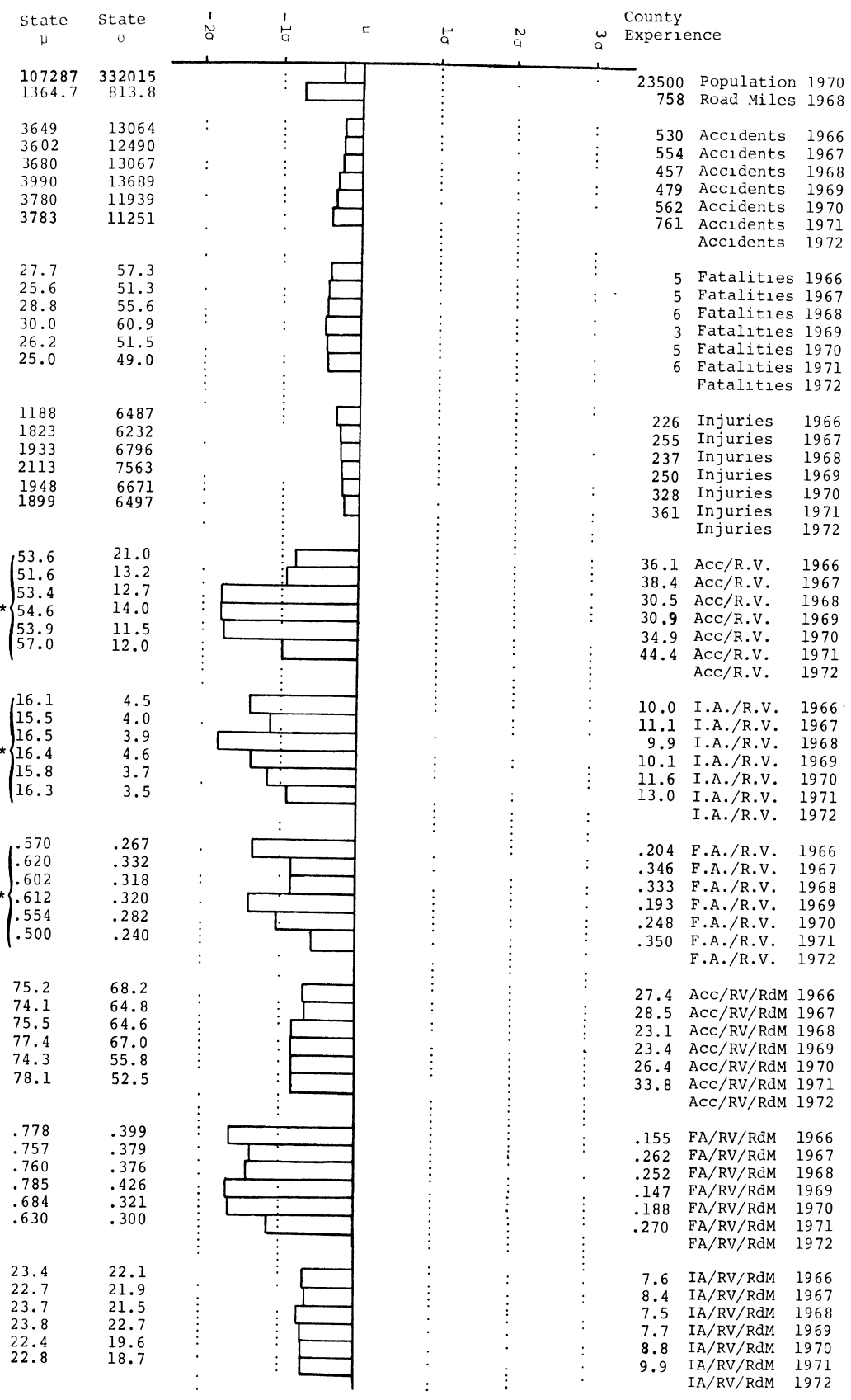


*figures represent actual value times 10³

CRAWFORD



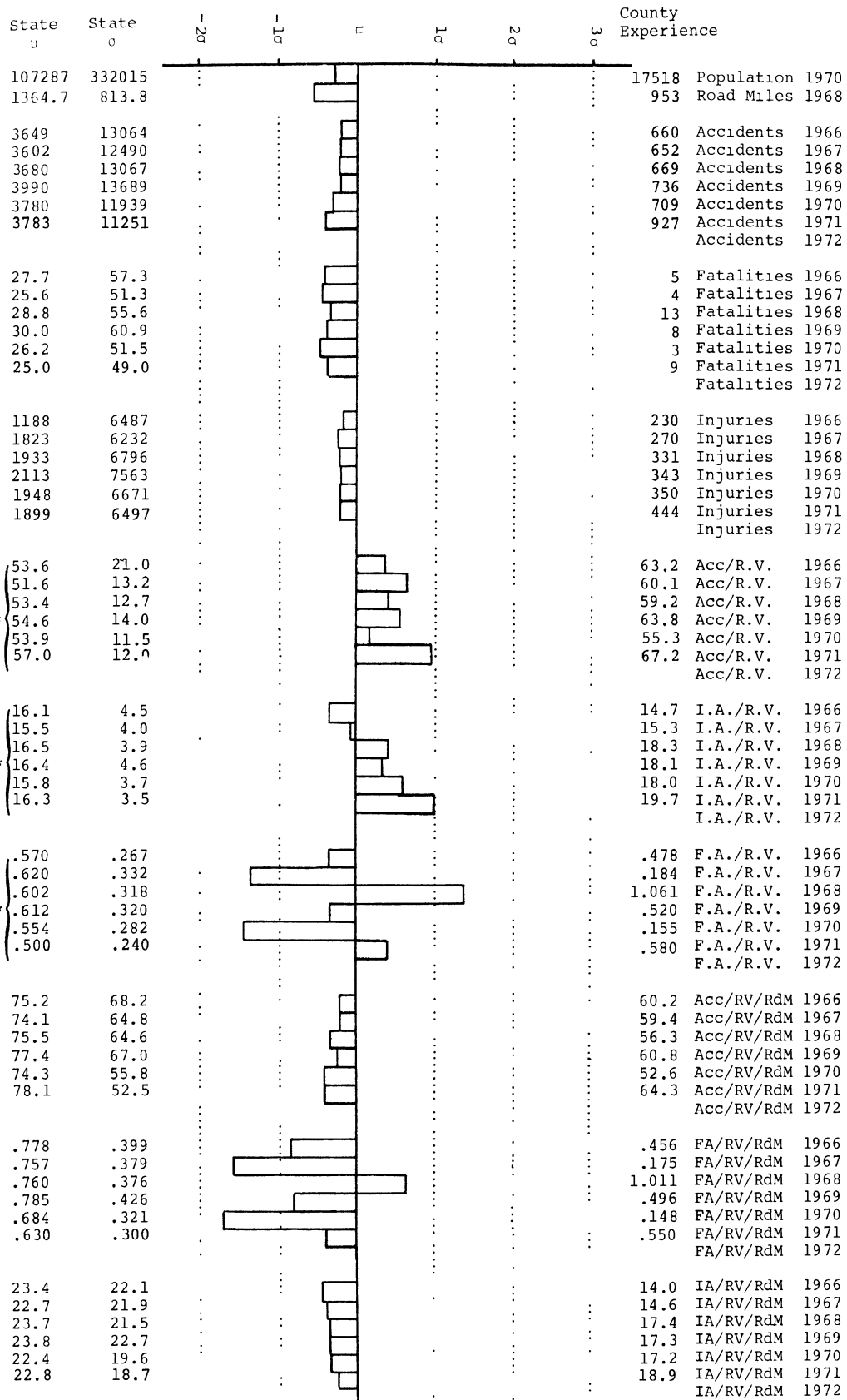
* Figures represent actual value times 10³



* figures represent actual value times 10³

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							68352 Population 1970
1364.7	813.8							1348 Road Miles 1968
3649	13064							1694 Accidents 1966
3602	12490							1793 Accidents 1967
3680	13067							1988 Accidents 1968
3990	13689							2318 Accidents 1969
3780	11939							2198 Accidents 1970
3783	11251							2382 Accidents 1971
								Accidents 1972
27.7	57.3							23 Fatalities 1966
25.6	51.3							17 Fatalities 1967
28.8	55.6							48 Fatalities 1968
30.0	60.9							27 Fatalities 1969
26.2	51.5							28 Fatalities 1970
25.0	49.0							29 Fatalities 1971
								Fatalities 1972
1188	6487							905 Injuries 1966
1823	6232							1033 Injuries 1967
1933	6796							1129 Injuries 1968
2113	7563							1270 Injuries 1969
1948	6671							1172 Injuries 1970
1899	6497							1224 Injuries 1971
								Injuries 1972
53.6	21.0							50.6 Acc/R.V. 1966
51.6	13.2							52.5 Acc/R.V. 1967
53.4	12.7							54.8 Acc/R.V. 1968
* 54.6	14.0							59.1 Acc/R.V. 1969
53.9	11.5							52.9 Acc/R.V. 1970
57.0	12.0							52.5 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							15.8 I.A./R.V. 1966
15.5	4.0							18.1 I.A./R.V. 1967
16.5	3.9							18.3 I.A./R.V. 1968
* 16.4	4.6							18.9 I.A./R.V. 1969
15.8	3.7							16.2 I.A./R.V. 1970
16.3	3.5							16.6 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.537 F.A./R.V. 1966
.620	.332							.497 F.A./R.V. 1967
* .602	.318							.909 F.A./R.V. 1968
.612	.320							.611 F.A./R.V. 1969
.554	.282							.505 F.A./R.V. 1970
.500	.240							.510 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							68.1 Acc/RV/RdM 1966
74.1	64.8							72.1 Acc/RV/RdM 1967
75.5	64.6							73.8 Acc/RV/RdM 1968
77.4	67.0							79.6 Acc/RV/RdM 1969
74.3	55.8							71.3 Acc/RV/RdM 1970
78.1	52.5							71.8 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.724 FA/RV/RdM 1966
.757	.379							.670 FA/RV/RdM 1967
* .760	.376							1.225 FA/RV/RdM 1968
.785	.426							.824 FA/RV/RdM 1969
.684	.321							.681 FA/RV/RdM 1970
.630	.300							.690 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							21.3 IA/RV/RdM 1966
22.7	21.9							24.4 IA/RV/RdM 1967
23.7	21.5							24.7 IA/RV/RdM 1968
23.8	22.7							25.5 IA/RV/RdM 1969
22.4	19.6							21.8 IA/RV/RdM 1970
22.8	18.7							22.8 IA/RV/RdM 1971
								IA/RV/RdM 1972

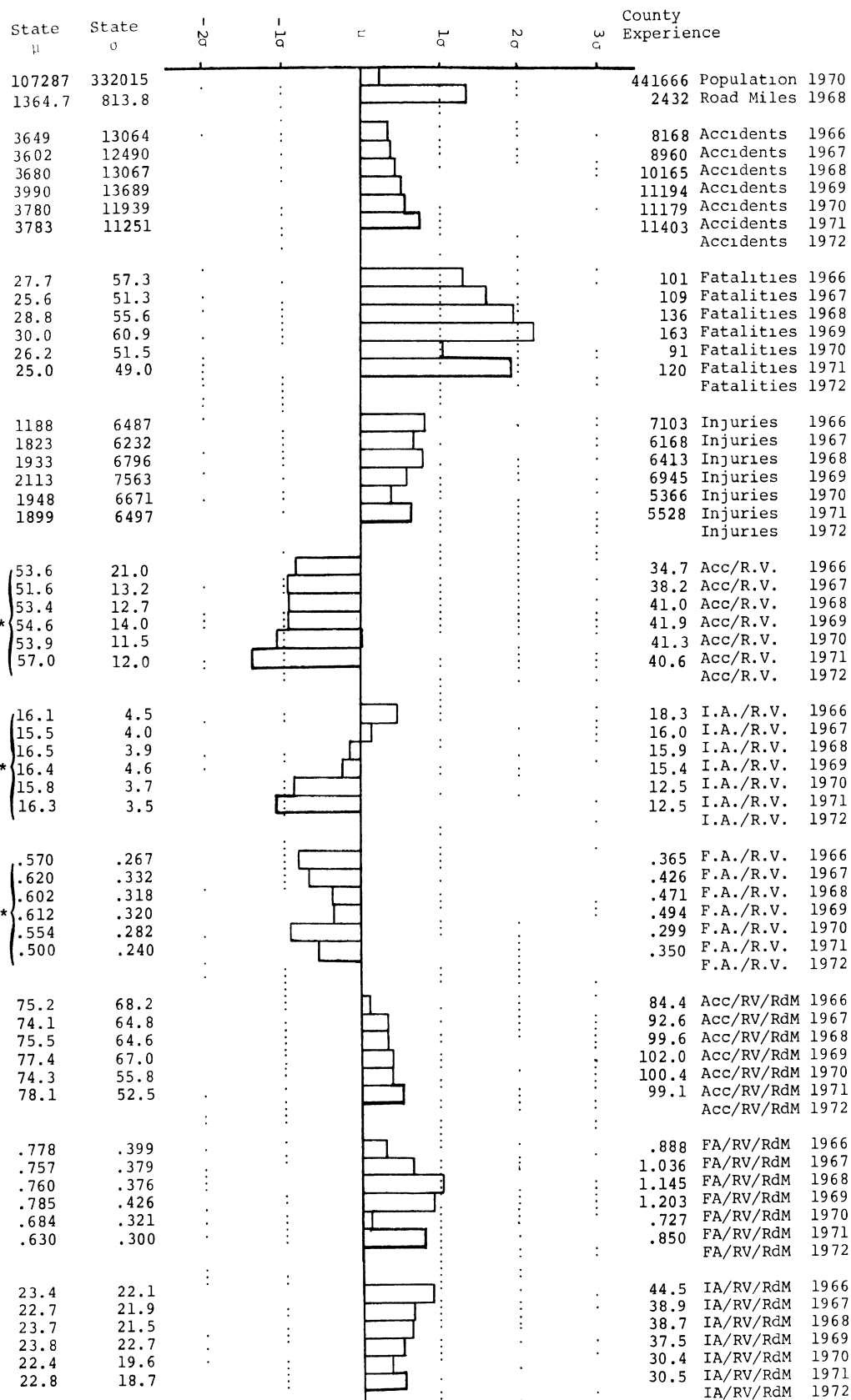
* Figures represent actual value times 10³



* Figures represent actual value times 10³

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							12747 Population 1970
1364.7	813.8							935 Road Miles 1968
3649	13064							231 Accidents 1966
3602	12490							234 Accidents 1967
3680	13067							326 Accidents 1968
3990	13689							316 Accidents 1969
3780	11939							409 Accidents 1970
3783	11251							376 Accidents 1971
								Accidents 1972
27.7	57.3							8 Fatalities 1966
25.6	51.3							4 Fatalities 1967
28.8	55.6							13 Fatalities 1968
30.0	60.9							11 Fatalities 1969
26.2	51.5							5 Fatalities 1970
25.0	49.0							5 Fatalities 1971
								Fatalities 1972
1188	6487							185 Injuries 1966
1823	6232							162 Injuries 1967
1933	6796							206 Injuries 1968
2113	7563							170 Injuries 1969
1948	6671							161 Injuries 1970
1899	6497							178 Injuries 1971
								Injuries 1972
53.6	21.0							31.7 Acc/R.V. 1966
51.6	13.2							32.6 Acc/R.V. 1967
53.4	12.7							42.8 Acc/R.V. 1968
* 54.6	14.0							38.6 Acc/R.V. 1969
53.9	11.5							45.5 Acc/R.V. 1970
57.0	12.0							38.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							11.5 I.A./R.V. 1966
15.5	4.0							12.5 I.A./R.V. 1967
16.5	3.9							14.6 I.A./R.V. 1968
* 16.4	4.6							12.6 I.A./R.V. 1969
15.8	3.7							12.2 I.A./R.V. 1970
16.3	3.5							10.6 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.823 F.A./R.V. 1966
.620	.332							.417 F.A./R.V. 1967
.602	.318							.917 F.A./R.V. 1968
* .612	.320							.731 F.A./R.V. 1969
.554	.282							.555 F.A./R.V. 1970
.500	.240							.510 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							29.6 Acc/RV/RdM 1966
74.1	64.8							30.4 Acc/RV/RdM 1967
75.5	64.6							39.9 Acc/RV/RdM 1968
77.4	67.0							36.0 Acc/RV/RdM 1969
74.3	55.8							42.5 Acc/RV/RdM 1970
78.1	52.5							36.1 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.770 FA/RV/RdM 1966
.757	.379							.390 FA/RV/RdM 1967
.760	.376							.857 FA/RV/RdM 1968
.785	.426							.684 FA/RV/RdM 1969
.684	.321							.519 FA/RV/RdM 1970
.630	.300							.480 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							10.8 IA/RV/RdM 1966
22.7	21.9							11.7 IA/RV/RdM 1967
23.7	21.5							13.7 IA/RV/RdM 1968
23.8	22.7							11.8 IA/RV/RdM 1969
22.4	19.6							11.4 IA/RV/RdM 1970
22.8	18.7							10.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

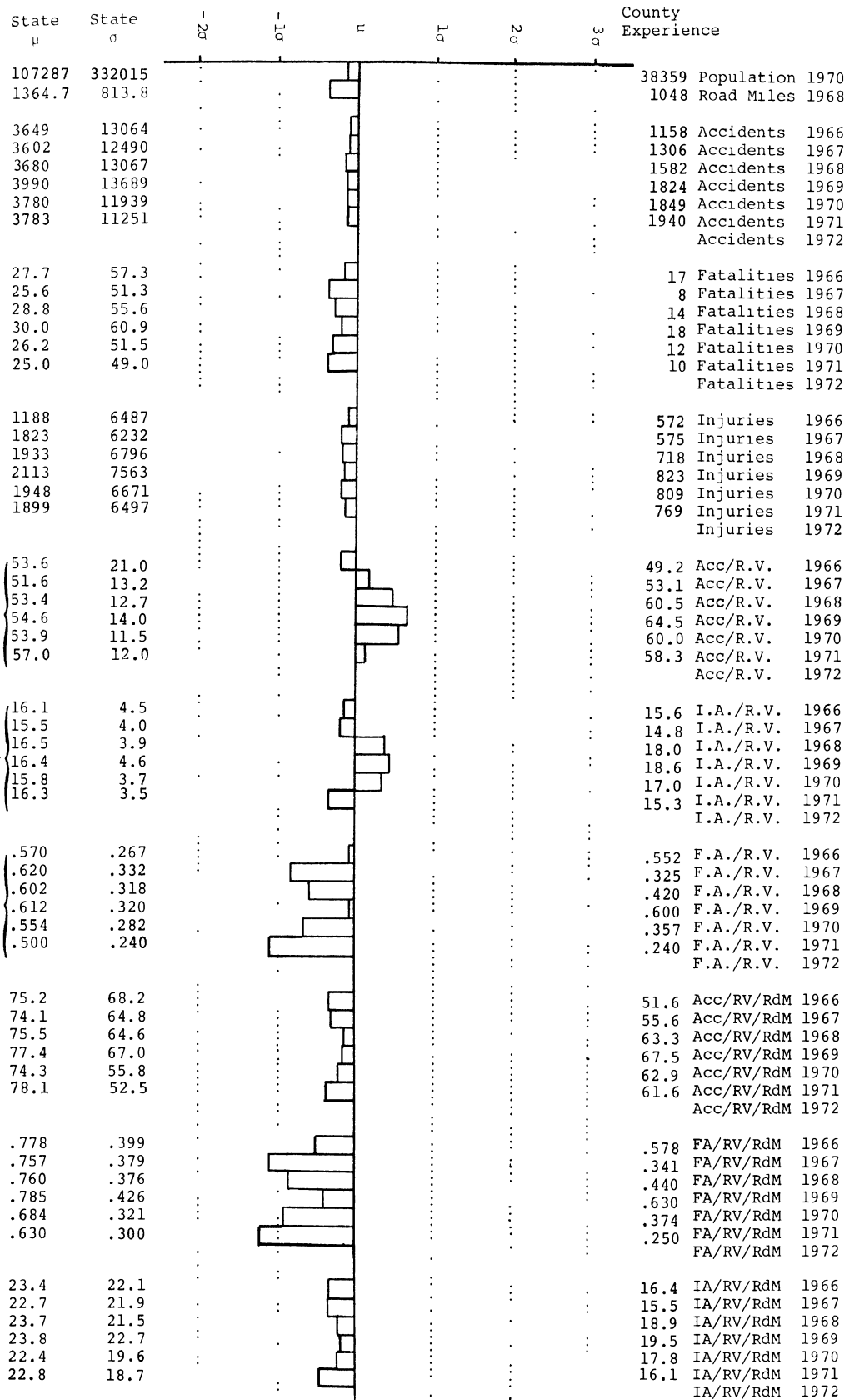
*Figures represent actual value times 10³



* Figures represent actual value times 10³

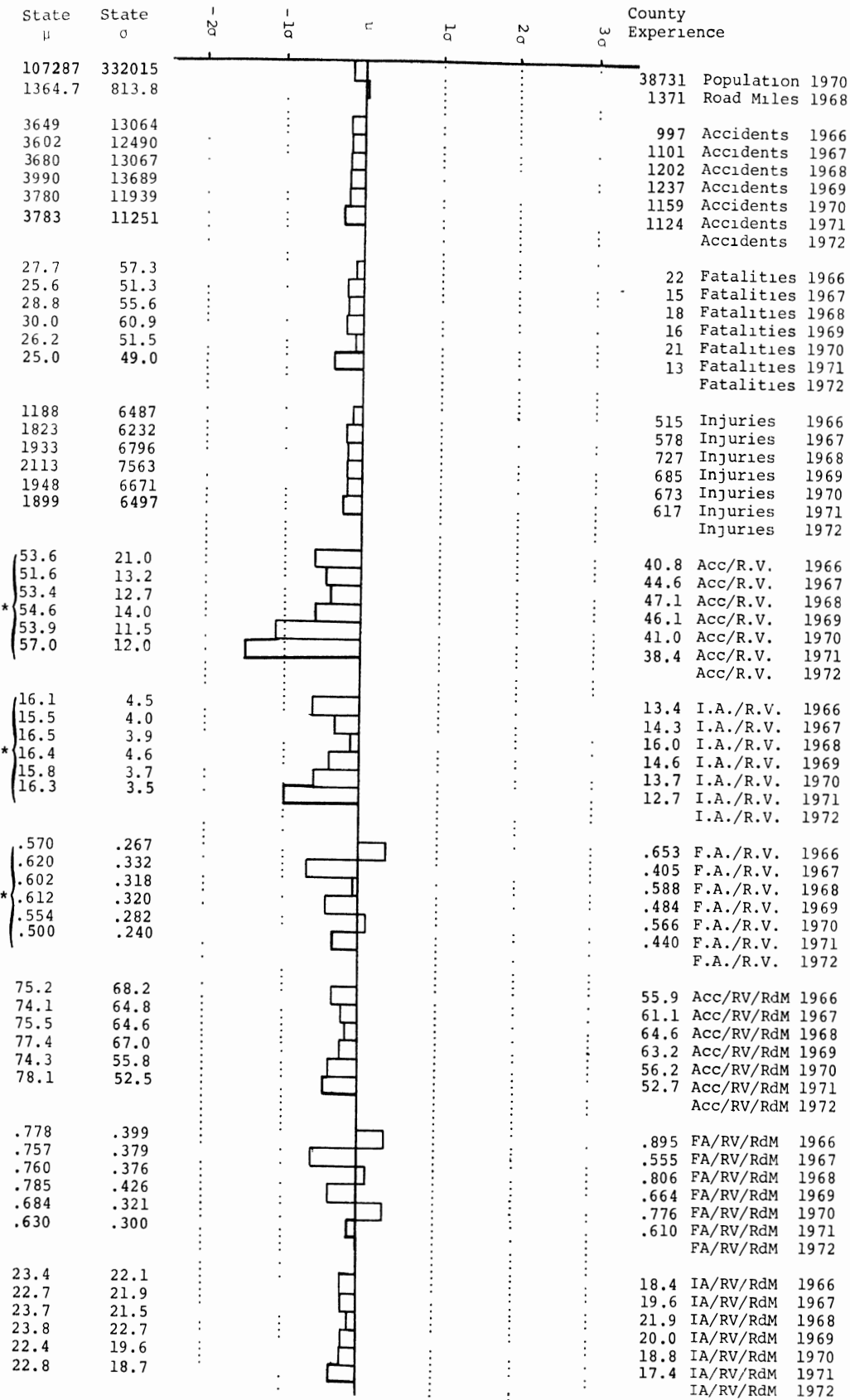
State u	State o	-2o	-1o	u	1o	2o	3o	County Experience
107287	332015							20116 Population 1970
1364.7	813.8							809 Road Miles 1968
3649	13064							379 Accidents 1966
3602	12490							492 Accidents 1967
3680	13067							602 Accidents 1968
3990	13689							608 Accidents 1969
3780	11939							607 Accidents 1970
3783	11251							642 Accidents 1971
								Accidents 1972
27.7	57.3							8 Fatalities 1966
25.6	51.3							6 Fatalities 1967
28.8	55.6							7 Fatalities 1968
30.0	60.9							7 Fatalities 1969
26.2	51.5							4 Fatalities 1970
25.0	49.0							2 Fatalities 1971
								Fatalities 1972
1188	6487							190 Injuries 1966
1823	6232							195 Injuries 1967
1933	6796							239 Injuries 1968
2113	7563							258 Injuries 1969
1948	6671							225 Injuries 1970
1899	6497							214 Injuries 1971
								Injuries 1972
53.6	21.0							33.2 Acc/R.V. 1966
51.6	13.2							43.4 Acc/R.V. 1967
53.4	12.7							51.5 Acc/R.V. 1968
*54.6	14.0							50.9 Acc/R.V. 1969
53.9	11.5							48.8 Acc/R.V. 1970
57.0	12.0							51.0 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							10.1 I.A./R.V. 1966
15.5	4.0							11.7 I.A./R.V. 1967
16.5	3.9							13.0 I.A./R.V. 1968
*16.4	4.6							13.0 I.A./R.V. 1969
15.8	3.7							11.9 I.A./R.V. 1970
16.3	3.5							12.0 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.525 F.A./R.V. 1966
.620	.332							.528 F.A./R.V. 1967
.602	.318							.427 F.A./R.V. 1968
*.612	.320							.586 F.A./R.V. 1969
.554	.282							.241 F.A./R.V. 1970
.500	.240							.160 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							26.8 Acc/RV/RdM 1966
74.1	64.8							35.0 Acc/RV/RdM 1967
75.5	64.6							41.6 Acc/RV/RdM 1968
77.4	67.0							41.2 Acc/RV/RdM 1969
74.3	55.8							39.4 Acc/RV/RdM 1970
78.1	52.5							41.6 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.425 FA/RV/RdM 1966
.757	.379							.427 FA/RV/RdM 1967
.760	.376							.345 FA/RV/RdM 1968
.785	.426							.474 FA/RV/RdM 1969
.684	.321							.195 FA/RV/RdM 1970
.630	.300							.130 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							8.2 IA/RV/RdM 1966
22.7	21.9							9.5 IA/RV/RdM 1967
23.7	21.5							10.5 IA/RV/RdM 1968
23.8	22.7							10.5 IA/RV/RdM 1969
22.4	19.6							9.6 IA/RV/RdM 1970
22.8	18.7							9.8 IA/RV/RdM 1971
								IA/RV/RdM 1972

*Figures represent actual value times 10³

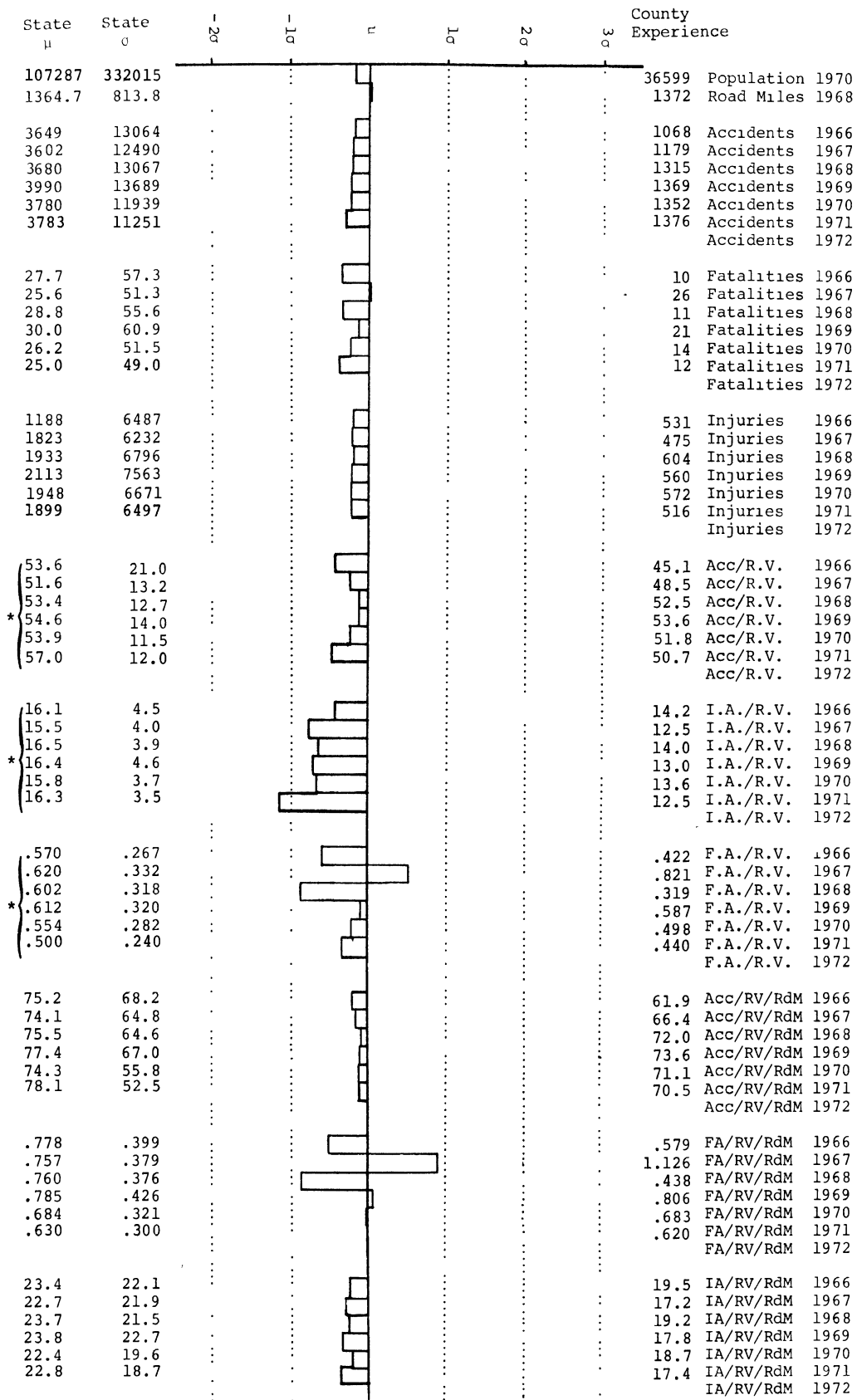


*figures represent
actual value
times 10³

GRAND TRAVERSE

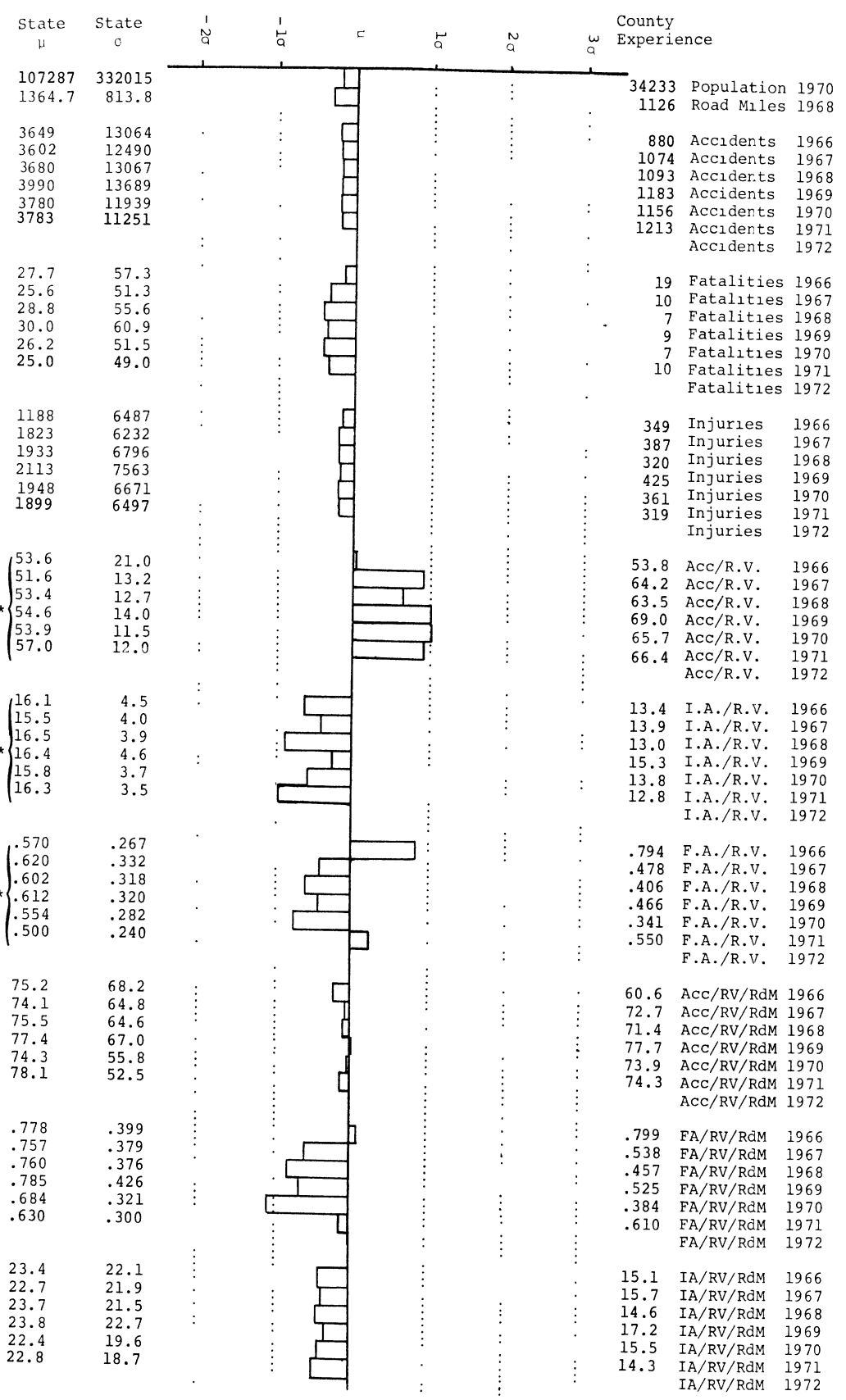


* Figures represent actual value times 10⁴

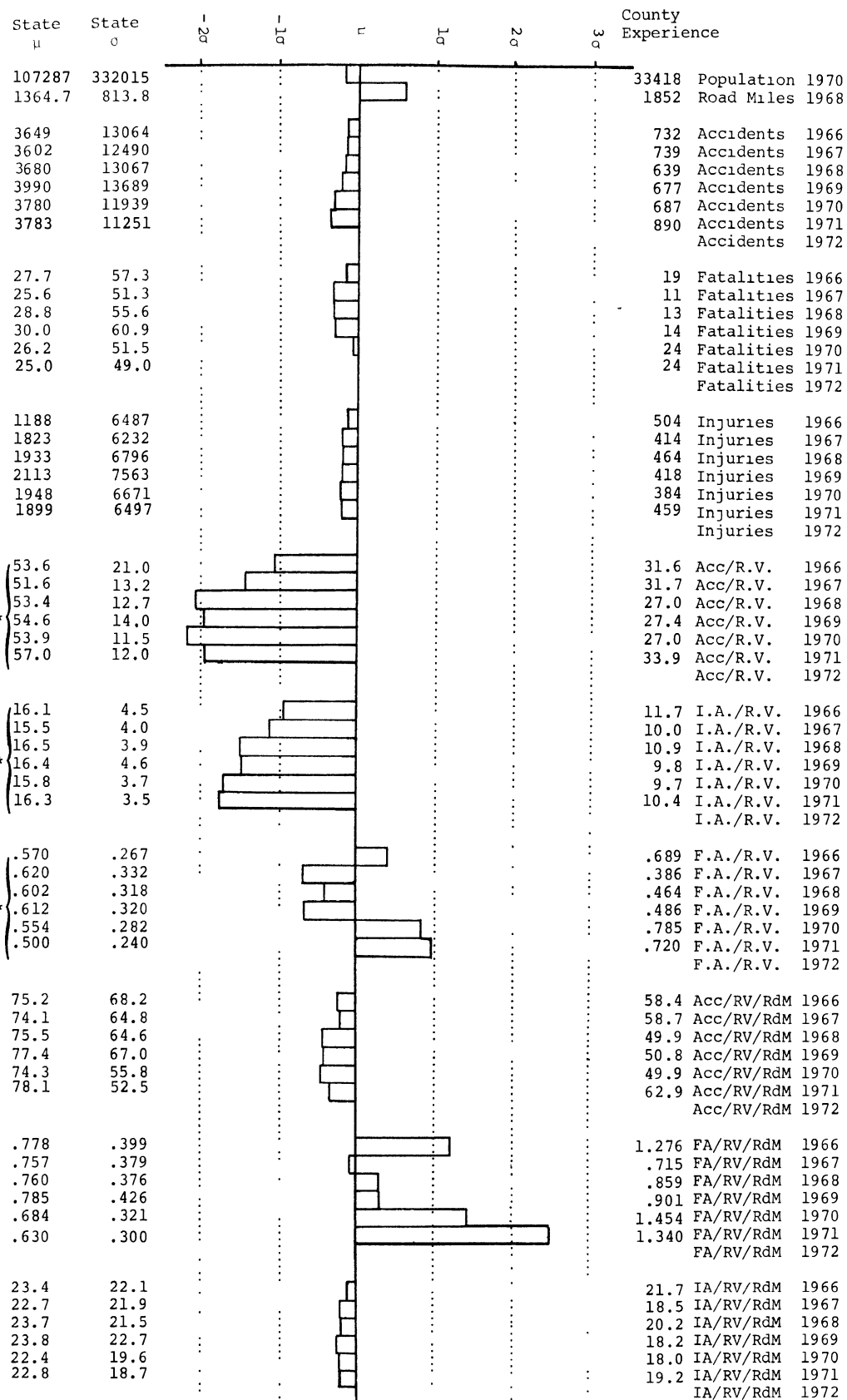


* Figures represent actual value times 10³

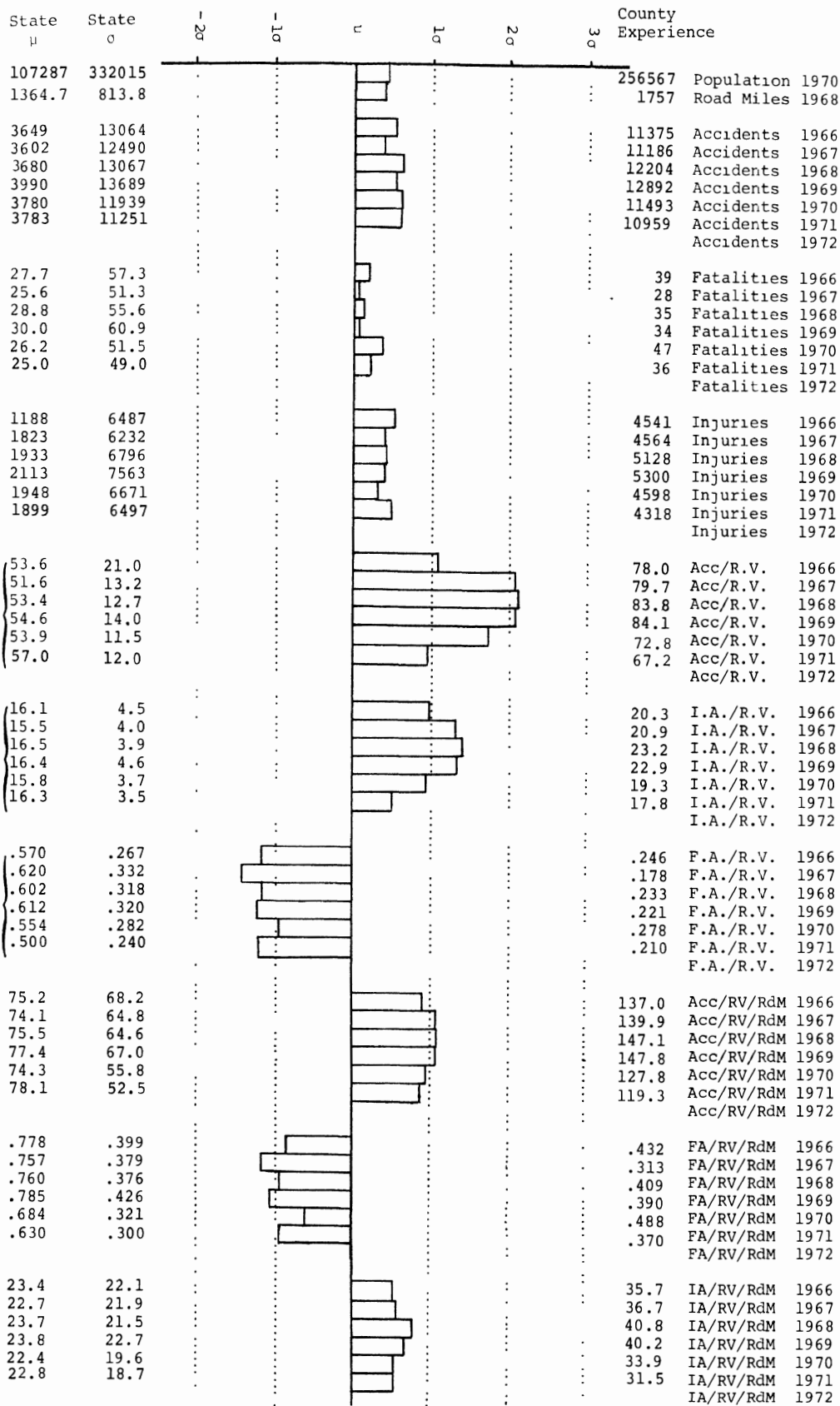
HILLSDALE



*Figures represent actual value times 10³

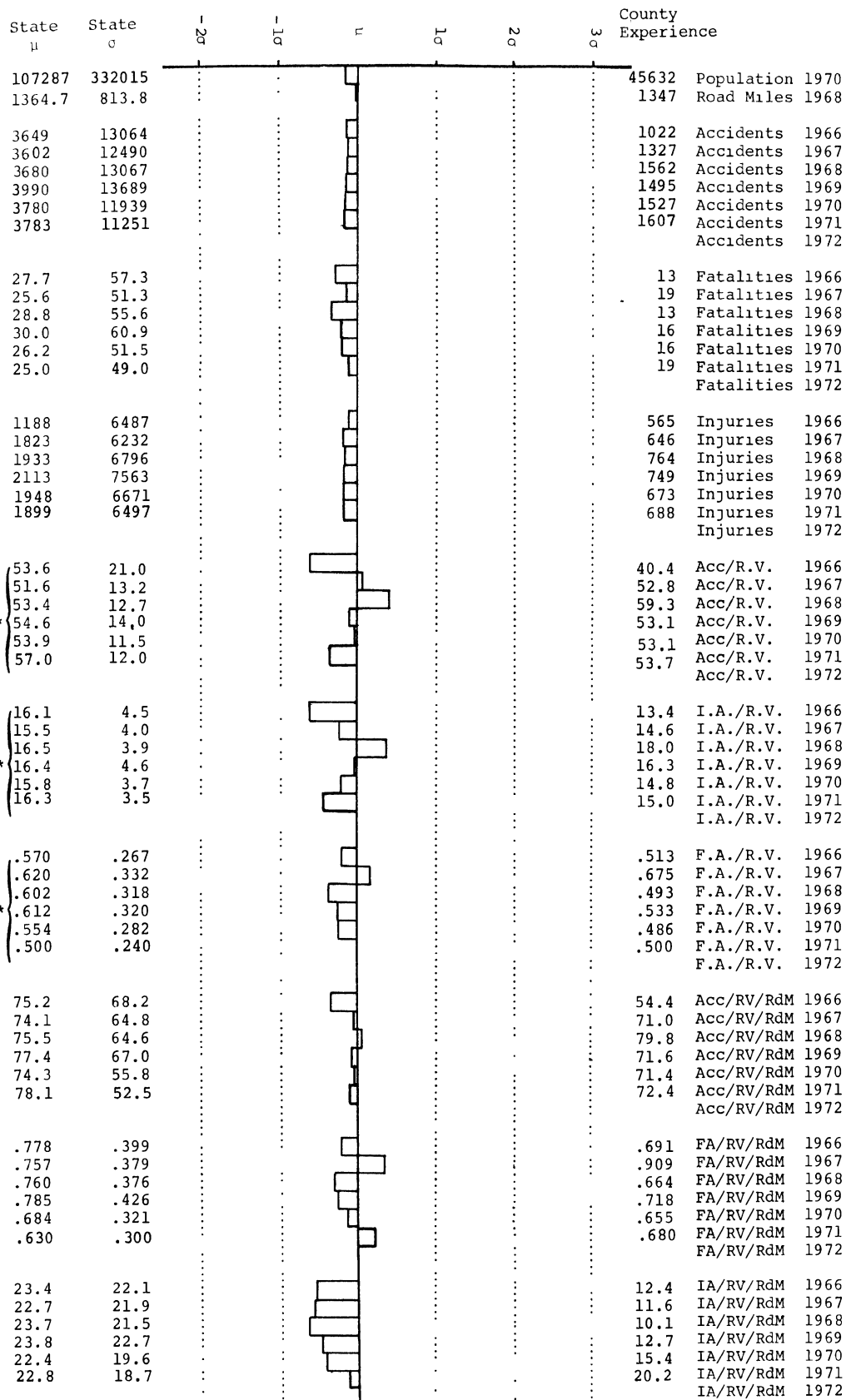


* figures represent actual value times 10³

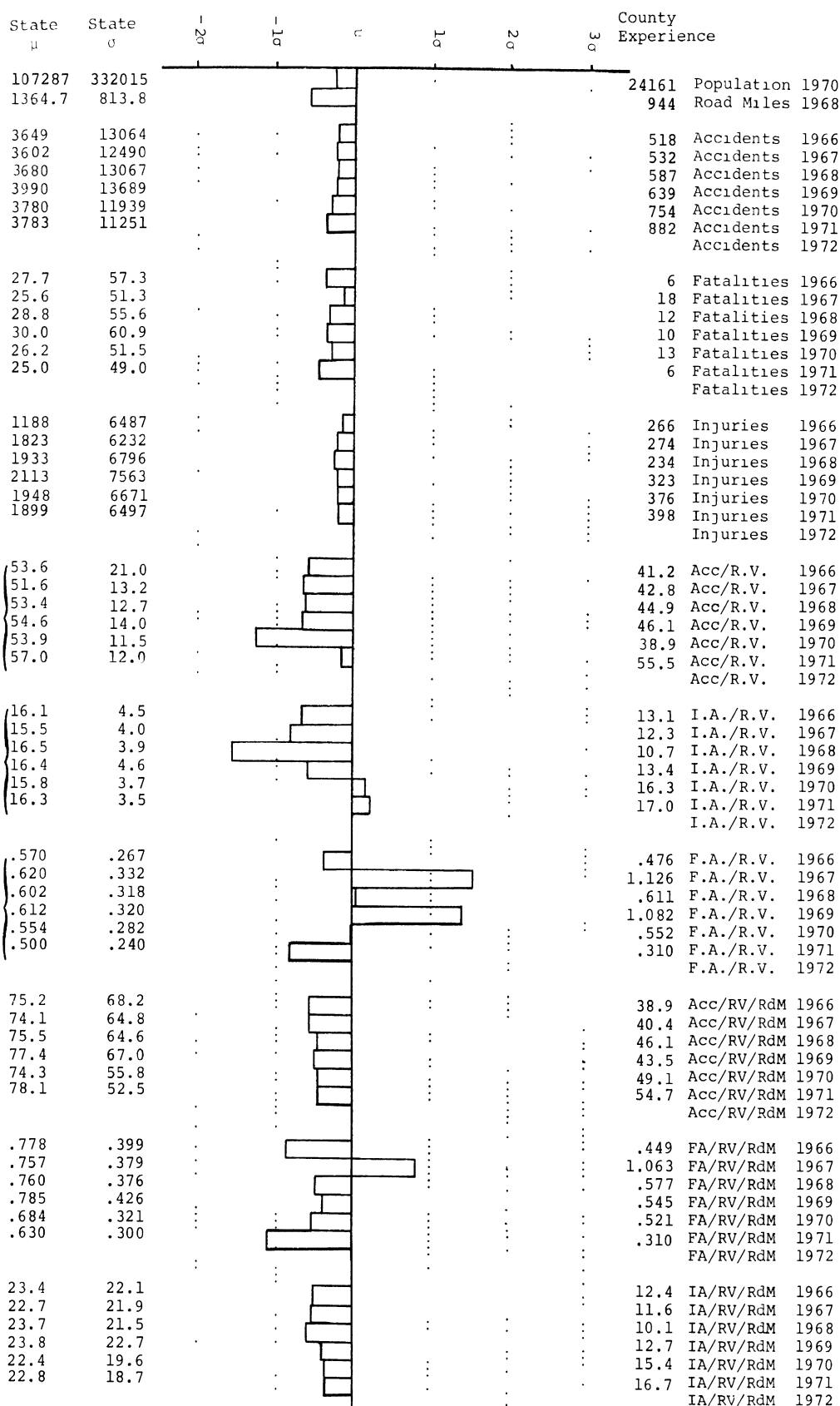


*figures represent actual value times 10³

INGHAM



* Figures represent actual value times 10³



* Figures represent actual value times 10³

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							13678 Population 1970
1364.7	813.8							806 Road Miles 1968
3649	13064							371 Accidents 1966
3602	12490							388 Accidents 1967
3680	13067							407 Accidents 1968
3990	13689							377 Accidents 1969
3780	11939							363 Accidents 1970
3783	11251							418 Accidents 1971
								Accidents 1972
27.7	57.3							2 Fatalities 1966
25.6	51.3							8 Fatalities 1967
28.8	55.6							5 Fatalities 1968
30.0	60.9							3 Fatalities 1969
26.2	51.5							4 Fatalities 1970
25.0	49.0							4 Fatalities 1971
								Fatalities 1972
1188	6487							117 Injuries 1966
1823	6232							157 Injuries 1967
1933	6796							132 Injuries 1968
2113	7563							153 Injuries 1969
1948	6671							106 Injuries 1970
1899	6497							128 Injuries 1971
								Injuries 1972
53.6	21.0							39.2 Acc/R.V. 1966
51.6	13.2							41.7 Acc/R.V. 1967
53.4	12.7							43.3 Acc/R.V. 1968
* 54.6	14.0							40.2 Acc/R.V. 1969
53.9	11.5							59.8 Acc/R.V. 1970
57.0	12.0							43.0 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							8.2 I.A./R.V. 1966
15.5	4.0							9.9 I.A./R.V. 1967
16.5	3.9							8.8 I.A./R.V. 1968
* 16.4	4.6							10.8 I.A./R.V. 1969
15.8	3.7							8.5 I.A./R.V. 1970
16.3	3.5							9.3 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.211 F.A./R.V. 1966
.620	.332							.537 F.A./R.V. 1967
.602	.318							.531 F.A./R.V. 1968
* .612	.320							.320 F.A./R.V. 1969
.554	.282							.429 F.A./R.V. 1970
.500	.240							.410 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							31.6 Acc/RV/RdM 1966
74.1	64.8							33.5 Acc/RV/RdM 1967
75.5	64.6							34.8 Acc/RV/RdM 1968
77.4	67.0							32.4 Acc/RV/RdM 1969
74.3	55.8							31.3 Acc/RV/RdM 1970
78.1	52.5							34.6 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.170 FA/RV/RdM 1966
.757	.379							.433 FA/RV/RdM 1967
.760	.376							.428 FA/RV/RdM 1968
.785	.426							.258 FA/RV/RdM 1969
.684	.321							.346 FA/RV/RdM 1970
.630	.300							.330 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							6.6 IA/RV/RdM 1966
22.7	21.9							8.0 IA/RV/RdM 1967
23.7	21.5							7.1 IA/RV/RdM 1968
23.8	22.7							8.7 IA/RV/RdM 1969
22.4	19.6							6.9 IA/RV/RdM 1970
22.8	18.7							7.5 IA/RV/RdM 1971
								IA/RV/RdM 1972

* Figures represent actual value times 10³

State #	State 0	-20	-10	0	10	20	30	County Experience
107287	332015							43769 Population 1970
1364.7	813.8							1310 Road Miles 1968
3649	13064							871 Accidents 1966
3602	12490							985 Accidents 1967
3680	13067							950 Accidents 1968
3990	13689							1100 Accidents 1969
3780	11939							1321 Accidents 1970
3783	11251							1424 Accidents 1971
								Accidents 1972
27.7	57.3							10 Fatalities 1966
25.6	51.3							17 Fatalities 1967
28.8	55.6							8 Fatalities 1968
30.0	60.9							14 Fatalities 1969
26.2	51.5							7 Fatalities 1970
25.0	49.0							21 Fatalities 1971
								Fatalities 1972
1188	6487							522 Injuries 1966
1823	6232							617 Injuries 1967
1933	6796							632 Injuries 1968
2113	7563							761 Injuries 1969
1948	6671							693 Injuries 1970
1899	6497							703 Injuries 1971
								Injuries 1972
53.6	21.0							45.6 Acc/R.V. 1966
51.6	13.2							51.4 Acc/R.V. 1967
53.4	12.7							47.5 Acc/R.V. 1968
* 54.6	14.0							52.5 Acc/R.V. 1969
53.9	11.5							56.6 Acc/R.V. 1970
57.0	12.0							60.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							16.5 I.A./R.V. 1966
15.5	4.0							18.5 I.A./R.V. 1967
16.5	3.9							18.7 I.A./R.V. 1968
* 16.4	4.6							20.4 I.A./R.V. 1969
15.8	3.7							19.3 I.A./R.V. 1970
16.3	3.5							18.5 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.522 F.A./R.V. 1966
.620	.332							.573 F.A./R.V. 1967
.602	.318							.399 F.A./R.V. 1968
* .612	.320							.524 F.A./R.V. 1969
.554	.282							.271 F.A./R.V. 1970
.500	.240							.590 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							59.7 Acc/RV/RdM 1966
74.1	64.8							67.3 Acc/RV/RdM 1967
75.5	64.6							62.1 Acc/RV/RdM 1968
77.4	67.0							68.7 Acc/RV/RdM 1969
74.3	55.8							78.3 Acc/RV/RdM 1970
78.1	52.5							79.9 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.684 FA/RV/RdM 1966
.757	.379							.751 FA/RV/RdM 1967
.760	.376							.523 FA/RV/RdM 1968
.785	.426							.687 FA/RV/RdM 1969
.684	.321							.355 FA/RV/RdM 1970
.630	.300							.790 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							21.8 IA/RV/RdM 1966
22.7	21.9							24.2 IA/RV/RdM 1967
23.7	21.5							24.5 IA/RV/RdM 1968
23.8	22.7							26.7 IA/RV/RdM 1969
22.4	19.6							25.3 IA/RV/RdM 1970
22.8	18.7							24.5 IA/RV/RdM 1971
								IA/RV/RdM 1972

* figures represent actual value times 10³

State #	State c	-20	-10	0	10	20	30	County Experience
107287	332015							142422 Population 1970
1364.7	813.8							1896 Road Miles 1968
3649	13064							5206 Accidents 1966
3602	12490							4571 Accidents 1967
3680	13067							4748 Accidents 1968
3990	13689							5099 Accidents 1969
3780	11939							4973 Accidents 1970
3783	11251							5190 Accidents 1971
								Accidents 1972
27.7	57.3							41 Fatalities 1966
25.6	51.3							41 Fatalities 1967
28.8	55.6							35 Fatalities 1968
30.0	60.9							47 Fatalities 1969
26.2	51.5							29 Fatalities 1970
25.0	49.0							45 Fatalities 1971
								Fatalities 1972
1188	6487							2309 Injuries 1966
1823	6232							2153 Injuries 1967
1933	6796							2349 Injuries 1968
2113	7563							2408 Injuries 1969
1948	6671							2323 Injuries 1970
1899	6497							2339 Injuries 1971
								Injuries 1972
53.6	21.0							66.7 Acc/R.V. 1966
51.6	13.2							58.8 Acc/R.V. 1967
53.4	12.7							58.8 Acc/R.V. 1968
* 54.6	14.0							60.3 Acc/R.V. 1969
53.9	11.5							56.6 Acc/R.V. 1970
57.0	12.0							57.6 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							19.1 I.A./R.V. 1966
15.5	4.0							17.7 I.A./R.V. 1967
16.5	3.9							17.8 I.A./R.V. 1968
* 16.4	4.6							18.2 I.A./R.V. 1969
15.8	3.7							17.2 I.A./R.V. 1970
16.3	3.5							17.0 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.488 F.A./R.V. 1966
.620	.332							.501 F.A./R.V. 1967
.602	.318							.421 F.A./R.V. 1968
* .612	.320							.472 F.A./R.V. 1969
.554	.282							.273 F.A./R.V. 1970
.500	.240							.470 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							126.9 Acc/RV/RdM 1966
74.1	64.8							111.4 Acc/RV/RdM 1967
75.5	64.6							111.4 Acc/RV/RdM 1968
77.4	67.0							114.3 Acc/RV/RdM 1969
74.3	55.8							107.3 Acc/RV/RdM 1970
78.1	52.5							108.6 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.925 FA/RV/RdM 1966
.757	.379							.950 FA/RV/RdM 1967
.760	.376							.798 FA/RV/RdM 1968
.785	.426							.897 FA/RV/RdM 1969
.684	.321							.518 FA/RV/RdM 1970
.630	.300							.880 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							36.2 IA/RV/RdM 1966
22.7	21.9							33.6 IA/RV/RdM 1967
23.7	21.5							33.8 IA/RV/RdM 1968
23.8	22.7							34.5 IA/RV/RdM 1969
22.4	19.6							32.6 IA/RV/RdM 1970
22.8	18.7							32.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

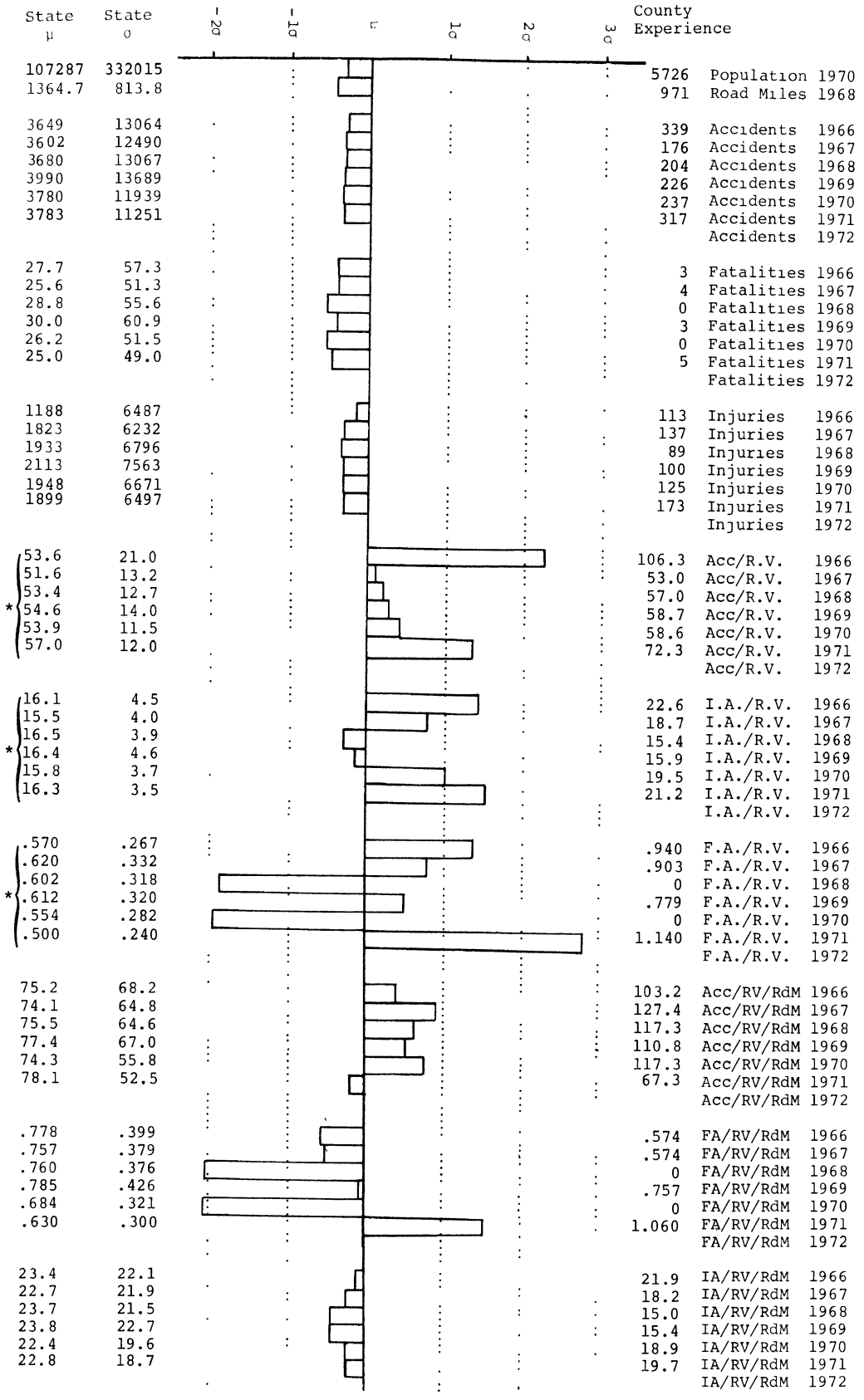
*Figures represent actual value times 10³

JACKSON

State	State	-20	-10	0	10	20	30	County Experience
107287	332015							199287 Population 1970
1364.7	813.8							1699 Road Miles 1968
3649	13064							6968 Accidents 1966
3602	12490							7789 Accidents 1967
3680	13067							7501 Accidents 1968
3990	13689							7348 Accidents 1969
3780	11939							8089 Accidents 1970
3783	11251							8261 Accidents 1971
								Accidents 1972
27.7	57.3							47 Fatalities 1966
25.6	51.3							39 Fatalities 1967
28.8	55.6							57 Fatalities 1968
30.0	60.9							45 Fatalities 1969
26.2	51.5							39 Fatalities 1970
25.0	49.0							52 Fatalities 1971
								Fatalities 1972
1188	6487							2820 Injuries 1966
1823	6232							2750 Injuries 1967
1933	6796							3079 Injuries 1968
2113	7563							2683 Injuries 1969
1948	6671							2888 Injuries 1970
1899	6497							2844 Injuries 1971
								Injuries 1972
53.6	21.0							67.2 Acc/R.V. 1966
51.6	13.2							75.0 Acc/R.V. 1967
53.4	12.7							69.1 Acc/R.V. 1968
54.6	14.0							65.2 Acc/R.V. 1969
53.9	11.5							69.1 Acc/R.V. 1970
57.0	12.0							67.3 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							17.8 I.A./R.V. 1966
15.5	4.0							17.8 I.A./R.V. 1967
16.5	3.9							17.8 I.A./R.V. 1968
16.4	4.6							16.0 I.A./R.V. 1969
15.8	3.7							16.4 I.A./R.V. 1970
16.3	3.5							16.0 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.338 F.A./R.V. 1966
.620	.332							.336 F.A./R.V. 1967
.602	.318							.423 F.A./R.V. 1968
.612	.320							.363 F.A./R.V. 1969
.554	.282							.264 F.A./R.V. 1970
.500	.240							.380 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							114.4 Acc/RV/RdM 1966
74.1	64.8							127.4 Acc/RV/RdM 1967
75.5	64.6							117.3 Acc/RV/RdM 1968
77.4	67.0							110.8 Acc/RV/RdM 1969
74.3	55.8							117.3 Acc/RV/RdM 1970
78.1	52.5							115.1 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.574 FA/RV/RdM 1966
.757	.379							.571 FA/RV/RdM 1967
.760	.376							.719 FA/RV/RdM 1968
.785	.426							.618 FA/RV/RdM 1969
.684	.321							.449 FA/RV/RdM 1970
.630	.300							.650 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							30.2 IA/RV/RdM 1966
22.7	21.9							30.2 IA/RV/RdM 1967
23.7	21.5							30.2 IA/RV/RdM 1968
23.8	22.7							27.2 IA/RV/RdM 1969
22.4	19.6							27.9 IA/RV/RdM 1970
22.8	18.7							27.5 IA/RV/RdM 1971
								IA/RV/RdM 1972

* Figures represent actual value times 10³

KALAMAZOO

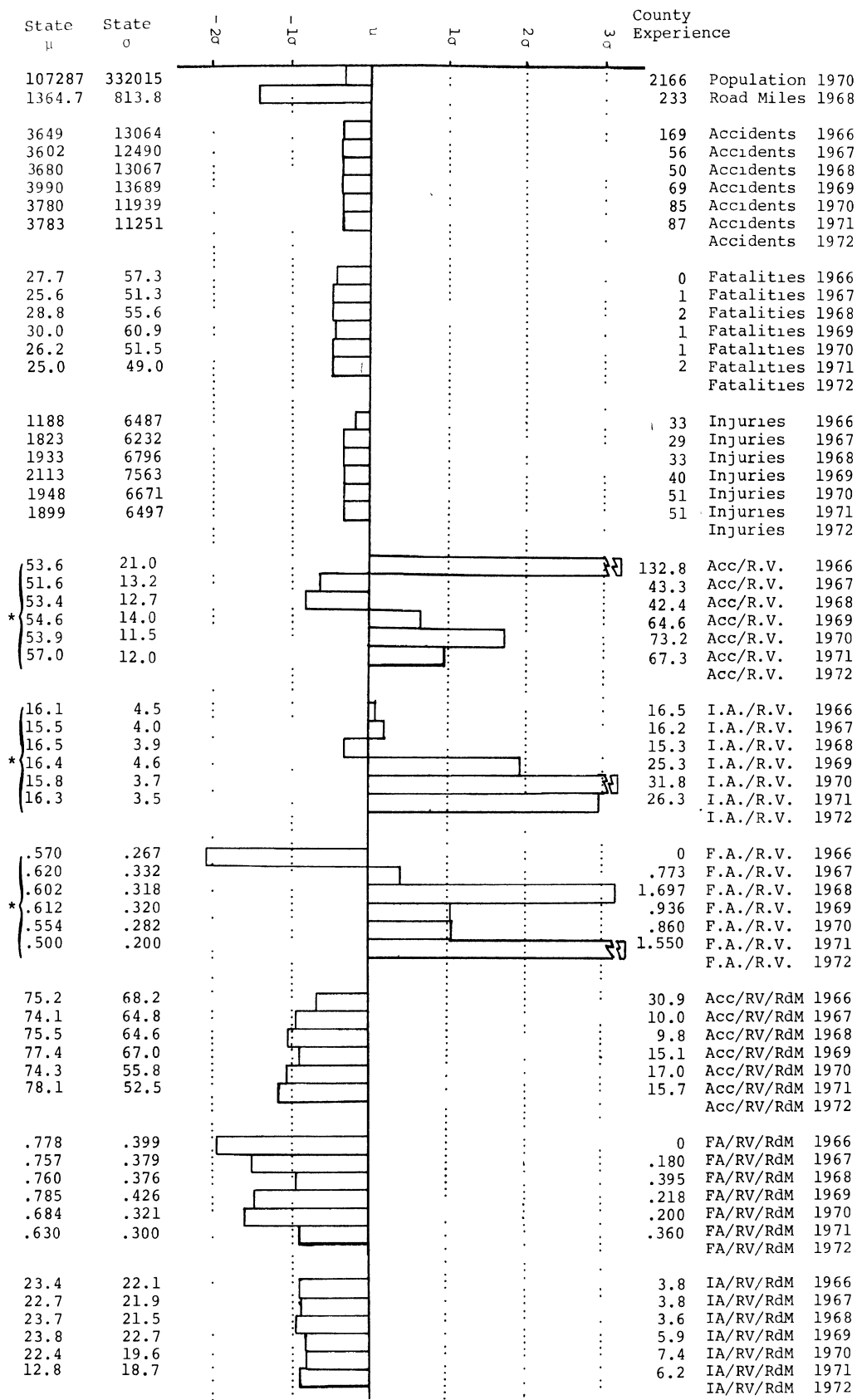


* figures represent actual value times 10³

KALKASKA

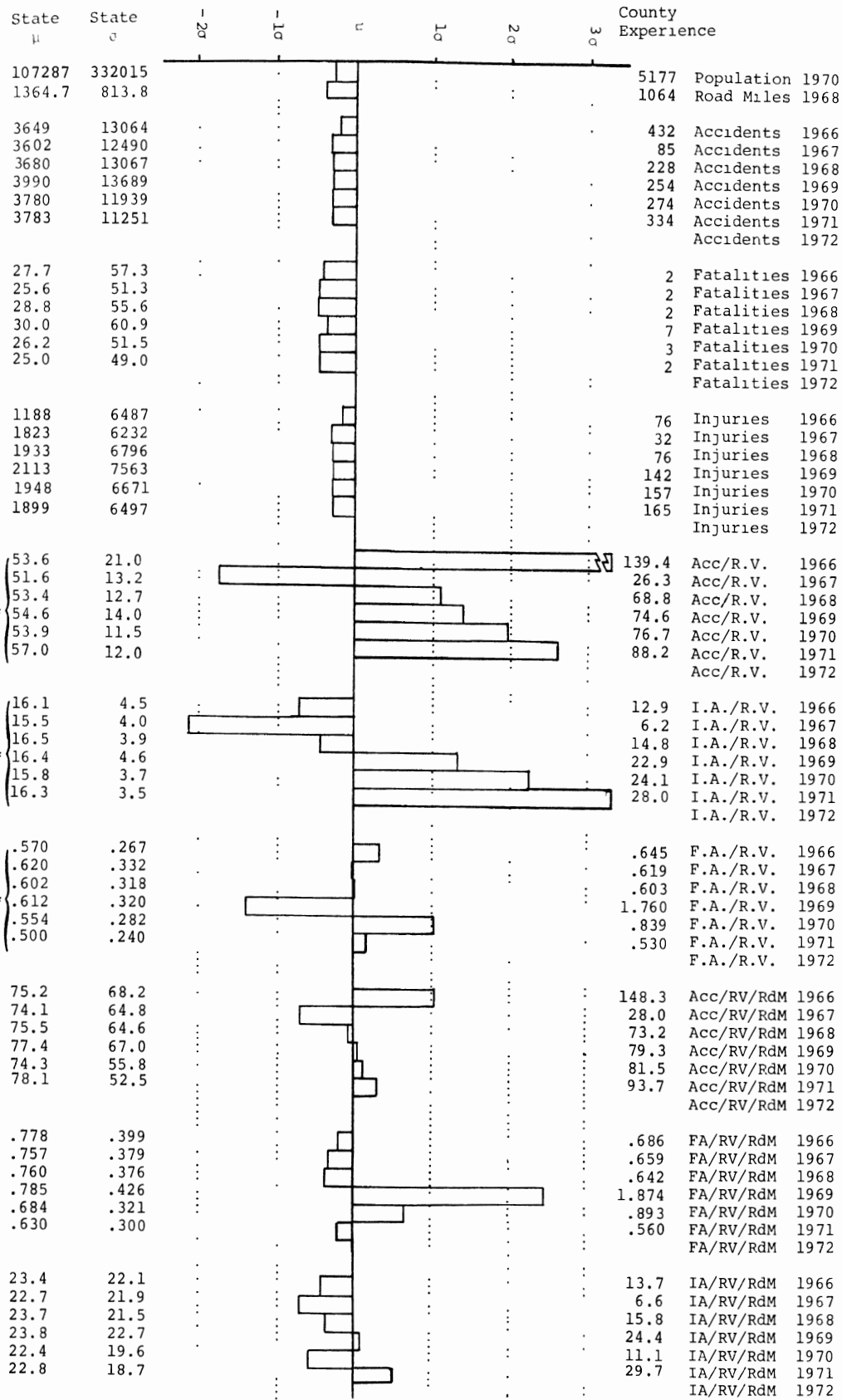
State #	State %	-20	-10	0	10	20	30	County Experience
107287	332015							408234 Population 1970
1364.7	813.8							3018 Road Miles 1968
3649	13064							15958 Accidents 1966
3602	12490							16753 Accidents 1967
3680	13067							17744 Accidents 1968
3990	13689							18229 Accidents 1969
3780	11939							16733 Accidents 1970
3783	11251							15391 Accidents 1971
								Accidents 1972
27.7	57.3							80 Fatalities 1966
25.6	51.3							92 Fatalities 1967
28.8	55.6							97 Fatalities 1968
30.0	60.9							87 Fatalities 1969
26.2	51.5							77 Fatalities 1970
25.0	49.0							81 Fatalities 1971
								Fatalities 1972
1188	6487							6636 Injuries 1966
1823	6232							6928 Injuries 1967
1933	6796							8199 Injuries 1968
2113	7563							7969 Injuries 1969
1948	6671							6058 Injuries 1970
1899	6497							5848 Injuries 1971
								Injuries 1972
53.6	21.0							72.0 Acc/R.V. 1966
51.6	13.2							73.6 Acc/R.V. 1967
53.4	12.7							74.9 Acc/R.V. 1968
* 54.6	14.0							72.6 Acc/R.V. 1969
53.9	11.5							64.4 Acc/R.V. 1970
57.0	12.0							56.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							19.5 I.A./R.V. 1966
15.5	4.0							19.5 I.A./R.V. 1967
16.5	3.9							22.2 I.A./R.V. 1968
* 16.4	4.6							20.6 I.A./R.V. 1969
15.8	3.7							15.4 I.A./R.V. 1970
16.3	3.5							14.4 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.320 F.A./R.V. 1966
.620	.332							.333 F.A./R.V. 1967
.602	.318							.367 F.A./R.V. 1968
* .612	.320							.298 F.A./R.V. 1969
.554	.282							.258 F.A./R.V. 1970
.500	.240							.260 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							217.2 Acc/RV/RdM 1966
74.1	64.8							222.0 Acc/RV/RdM 1967
75.5	64.6							226.0 Acc/RV/RdM 1968
77.4	67.0							219.1 Acc/RV/RdM 1969
74.3	55.8							194.6 Acc/RV/RdM 1970
78.1	52.5							172.3 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.966 FA/RV/RdM 1966
.757	.379							1.005 FA/RV/RdM 1967
.760	.376							1.108 FA/RV/RdM 1968
.785	.426							.901 FA/RV/RdM 1969
.684	.321							.779 FA/RV/RdM 1970
.630	.300							.790 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							58.9 IA/RV/RdM 1966
22.7	21.9							58.9 IA/RV/RdM 1967
23.7	21.5							67.0 IA/RV/RdM 1968
23.8	22.7							62.2 IA/RV/RdM 1969
22.4	19.6							46.5 IA/RV/RdM 1970
22.8	18.7							43.9 IA/RV/RdM 1971
								IA/RV/RdM 1972

*Figures represent actual value times 10³



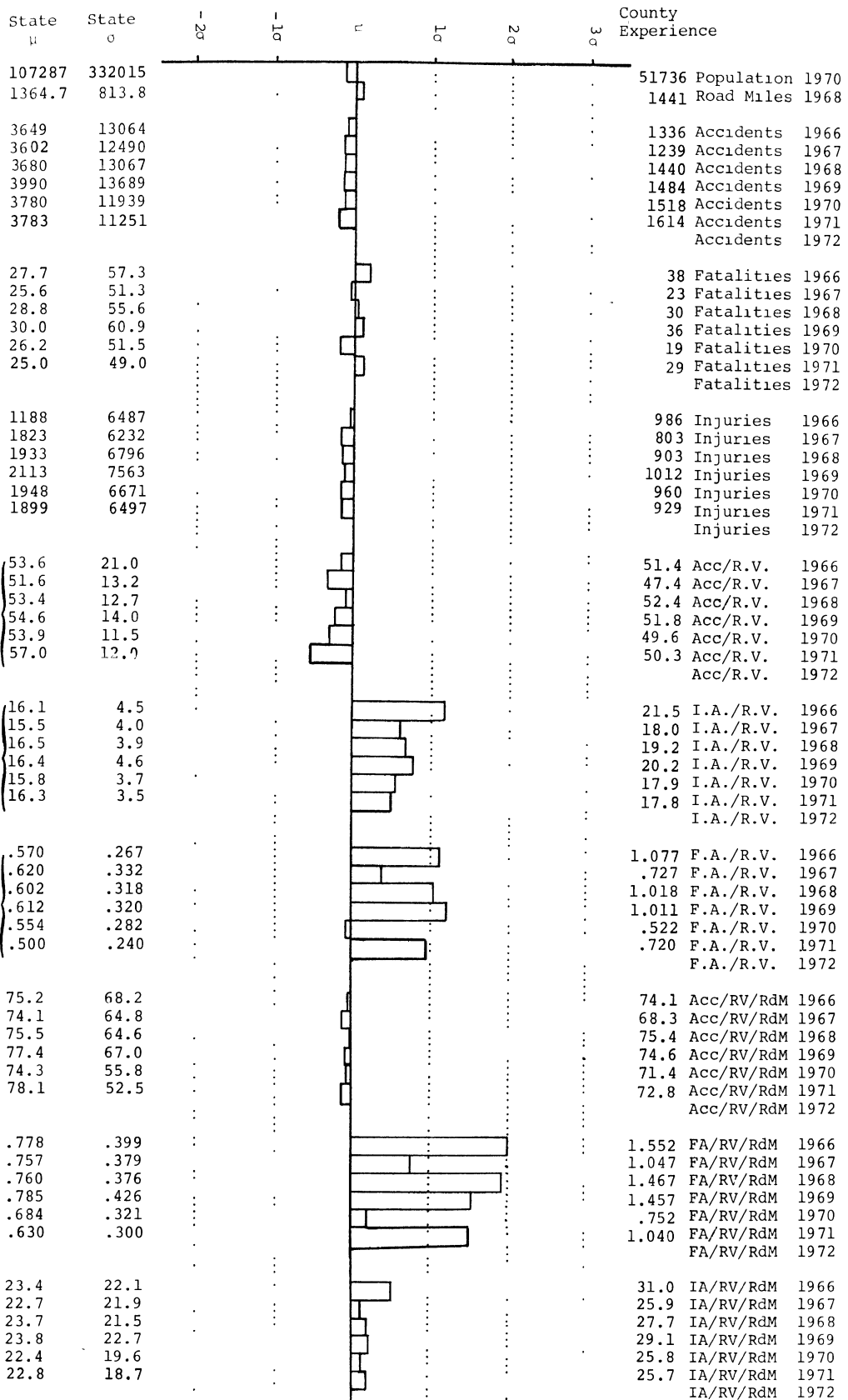
* figures represent actual value times 10³

KEWEENAW



* figures represent actual value times 10³

LAKE

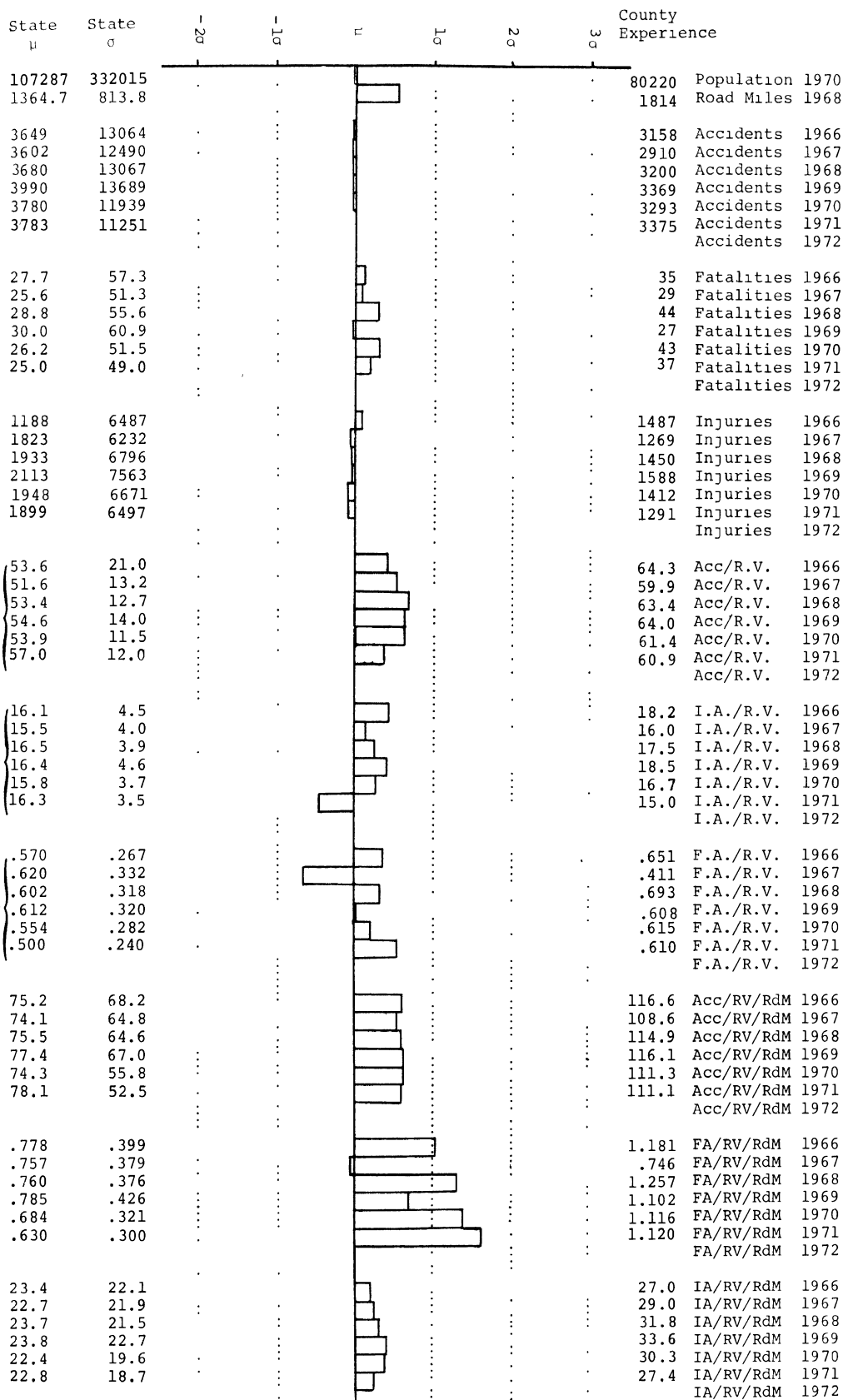


* Figures represent actual value times 10³

State	State	-20	-10	0	10	20	30	County Experience
107287	332015							10586 Population 1970
1364.7	813.8							764 Road Miles 1968
3649	13064							233 Accidents 1966
3602	12490							225 Accidents 1967
3680	13067							286 Accidents 1968
3990	13689							320 Accidents 1969
3780	11939							308 Accidents 1970
3783	11251							387 Accidents 1971
								Accidents 1972
27.7	57.3							3 Fatalities 1966
25.6	51.3							7 Fatalities 1967
28.8	55.6							7 Fatalities 1968
30.0	60.9							3 Fatalities 1969
26.2	51.5							5 Fatalities 1970
25.0	49.0							1 Fatalities 1971
								Fatalities 1972
1188	6487							162 Injuries 1966
1823	6232							129 Injuries 1967
1933	6796							134 Injuries 1968
2113	7563							189 Injuries 1969
1948	6671							160 Injuries 1970
1899	6497							217 Injuries 1971
								Injuries 1972
53.6	21.0							38.3 Acc/R.V. 1966
51.6	13.2							37.4 Acc/R.V. 1967
53.4	12.7							44.1 Acc/R.V. 1968
* 54.6	14.0							44.8 Acc/R.V. 1969
53.9	11.5							42.8 Acc/R.V. 1970
57.0	12.0							51.9 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							15.8 I.A./R.V. 1966
15.5	4.0							13.1 I.A./R.V. 1967
16.5	3.9							13.9 I.A./R.V. 1968
* 16.4	4.6							15.5 I.A./R.V. 1969
15.8	3.7							14.9 I.A./R.V. 1970
16.3	3.5							18.7 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.493 F.A./R.V. 1966
.620	.332							.997 F.A./R.V. 1967
.602	.318							1.078 F.A./R.V. 1968
* .612	.320							.279 F.A./R.V. 1969
.554	.282							.695 F.A./R.V. 1970
.500	.240							.130 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							29.3 Acc/RV/RdM 1966
74.1	64.8							28.5 Acc/RV/RdM 1967
75.5	64.6							33.6 Acc/RV/RdM 1968
77.4	67.0							34.2 Acc/RV/RdM 1969
74.3	55.8							32.7 Acc/RV/RdM 1970
78.1	52.5							39.1 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.377 FA/RV/RdM 1966
.757	.379							.762 FA/RV/RdM 1967
.760	.376							.824 FA/RV/RdM 1968
.785	.426							.214 FA/RV/RdM 1969
.684	.321							.531 FA/RV/RdM 1970
.600	.300							.100 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							12.1 IA/RV/RdM 1966
22.7	21.9							10.0 IA/RV/RdM 1967
23.7	21.5							10.6 IA/RV/RdM 1968
23.8	22.7							11.8 IA/RV/RdM 1969
22.4	19.6							11.4 IA/RV/RdM 1970
22.8	18.7							14.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

*figures represent actual value times 10³

LEELANAU



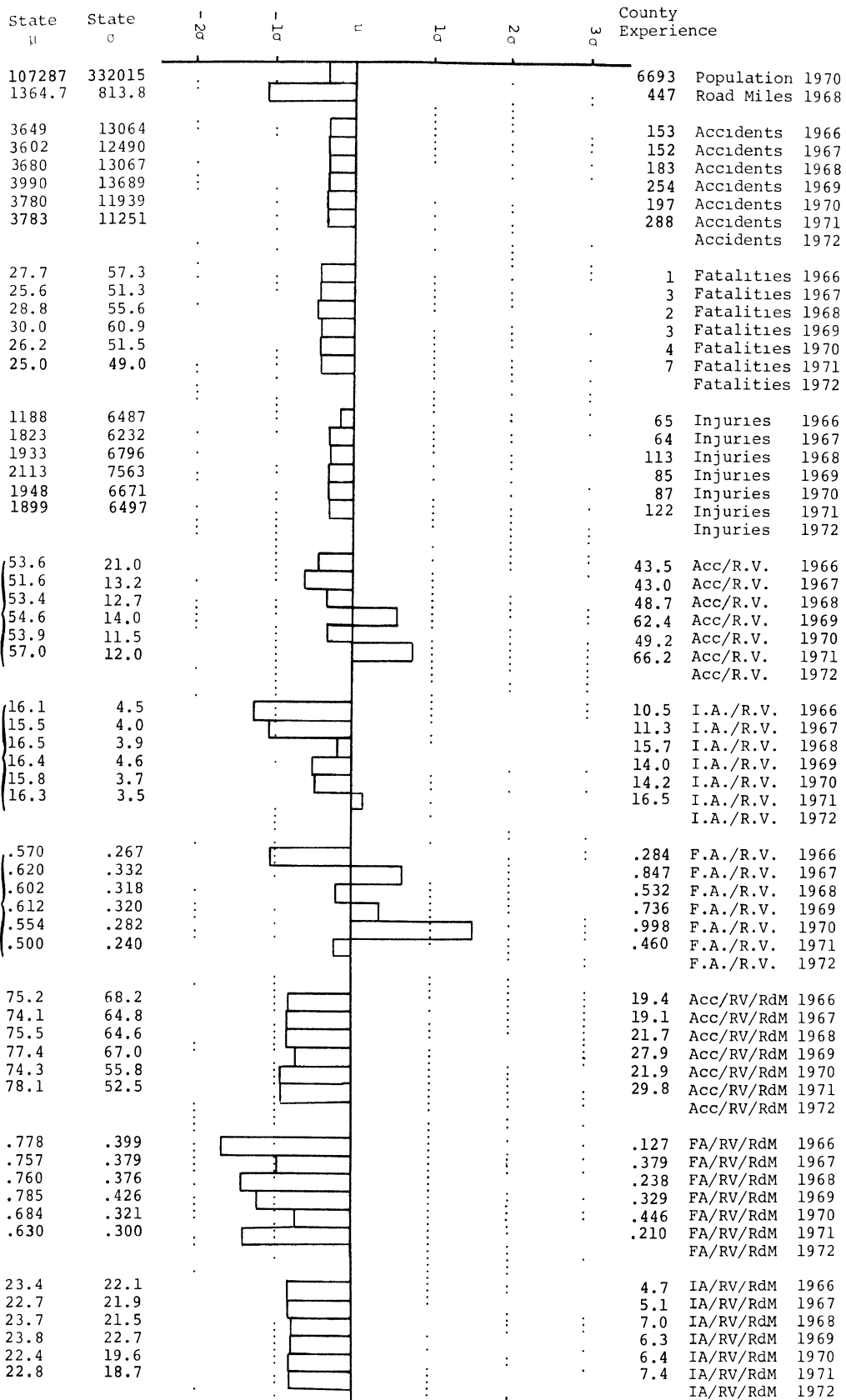
* Figures represent actual value times 10³

LENAWEE

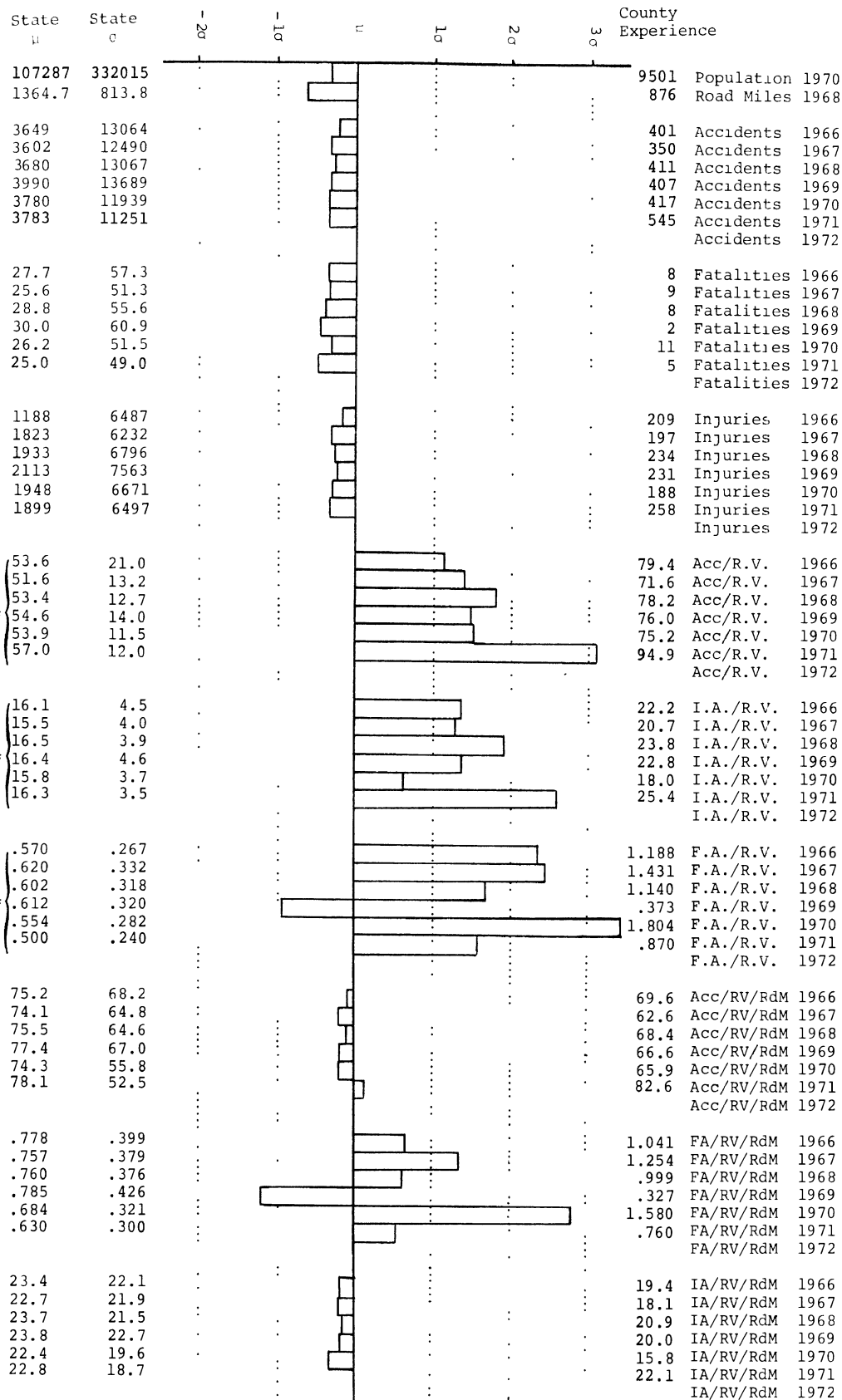
State #	State %	-20	-10	0	10	20	30	County Experience
107287	332015							58666 Population 1970
1364.7	813.8							1349 Road Miles 1968
3649	13064							1472 Accidents 1966
3602	12490							1524 Accidents 1967
3680	13067							1654 Accidents 1968
3990	13689							1929 Accidents 1969
3780	11939							1961 Accidents 1970
3783	11251							2019 Accidents 1971
								Accidents 1972
27.7	57.3							32 Fatalities 1966
25.6	51.3							22 Fatalities 1967
28.8	55.6							25 Fatalities 1968
30.0	60.9							35 Fatalities 1969
26.2	51.5							25 Fatalities 1970
25.0	49.0							28 Fatalities 1971
								Fatalities 1972
1188	6487							893 Injuries 1966
1823	6232							980 Injuries 1967
1933	6796							997 Injuries 1968
2113	7563							1217 Injuries 1969
1948	6671							1098 Injuries 1970
1899	6497							1001 Injuries 1971
								Injuries 1972
53.6	21.0							55.8 Acc/R.V. 1966
51.6	13.2							55.7 Acc/R.V. 1967
53.4	12.7							56.8 Acc/R.V. 1968
* 54.6	14.0							62.3 Acc/R.V. 1969
53.9	11.5							58.4 Acc/R.V. 1970
57.0	12.0							55.7 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							20.0 I.A./R.V. 1966
15.5	4.0							21.5 I.A./R.V. 1967
16.5	3.9							21.9 I.A./R.V. 1968
* 16.4	4.6							23.2 I.A./R.V. 1969
15.8	3.7							20.8 I.A./R.V. 1970
16.3	3.5							16.8 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							1.062 F.A./R.V. 1966
.620	.332							.584 F.A./R.V. 1967
.602	.318							.686 F.A./R.V. 1968
* .612	.320							.969 F.A./R.V. 1969
.554	.282							.595 F.A./R.V. 1970
.500	.240							.690 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							75.3 Acc/RV/RdM 1966
74.1	64.8							75.1 Acc/RV/RdM 1967
75.5	64.6							76.6 Acc/RV/RdM 1968
77.4	67.0							84.1 Acc/RV/RdM 1969
74.3	55.8							78.7 Acc/RV/RdM 1970
78.1	52.5							74.1 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							1.433 FA/RV/RdM 1966
.757	.379							.788 FA/RV/RdM 1967
.760	.376							.925 FA/RV/RdM 1968
.785	.426							1.307 FA/RV/RdM 1969
.684	.321							.803 FA/RV/RdM 1970
.630	.300							.920 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							27.0 IA/RV/RdM 1966
22.7	21.9							29.0 IA/RV/RdM 1967
23.7	21.5							29.5 IA/RV/RdM 1968
23.8	22.7							31.3 IA/RV/RdM 1969
22.4	19.6							28.1 IA/RV/RdM 1970
22.8	18.7							22.4 IA/RV/RdM 1971
								IA/RV/RdM 1972

* Figures represent actual value times 10³

LIVINGSTON

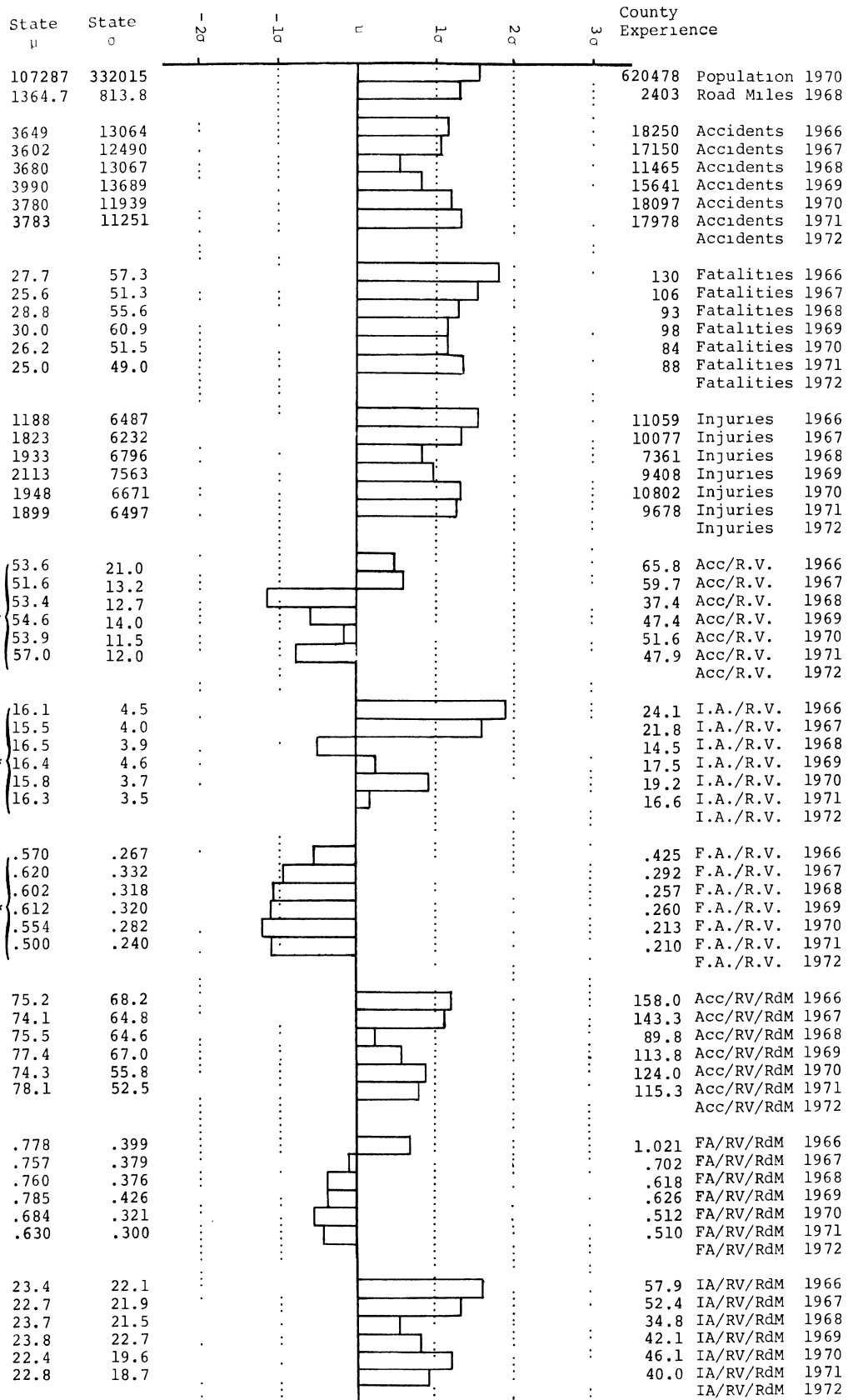


*Figures represent actual value times 10³



*Figures represent actual value times 10³

MACKINAC



* Figures represent actual value times 10³

MACOMB

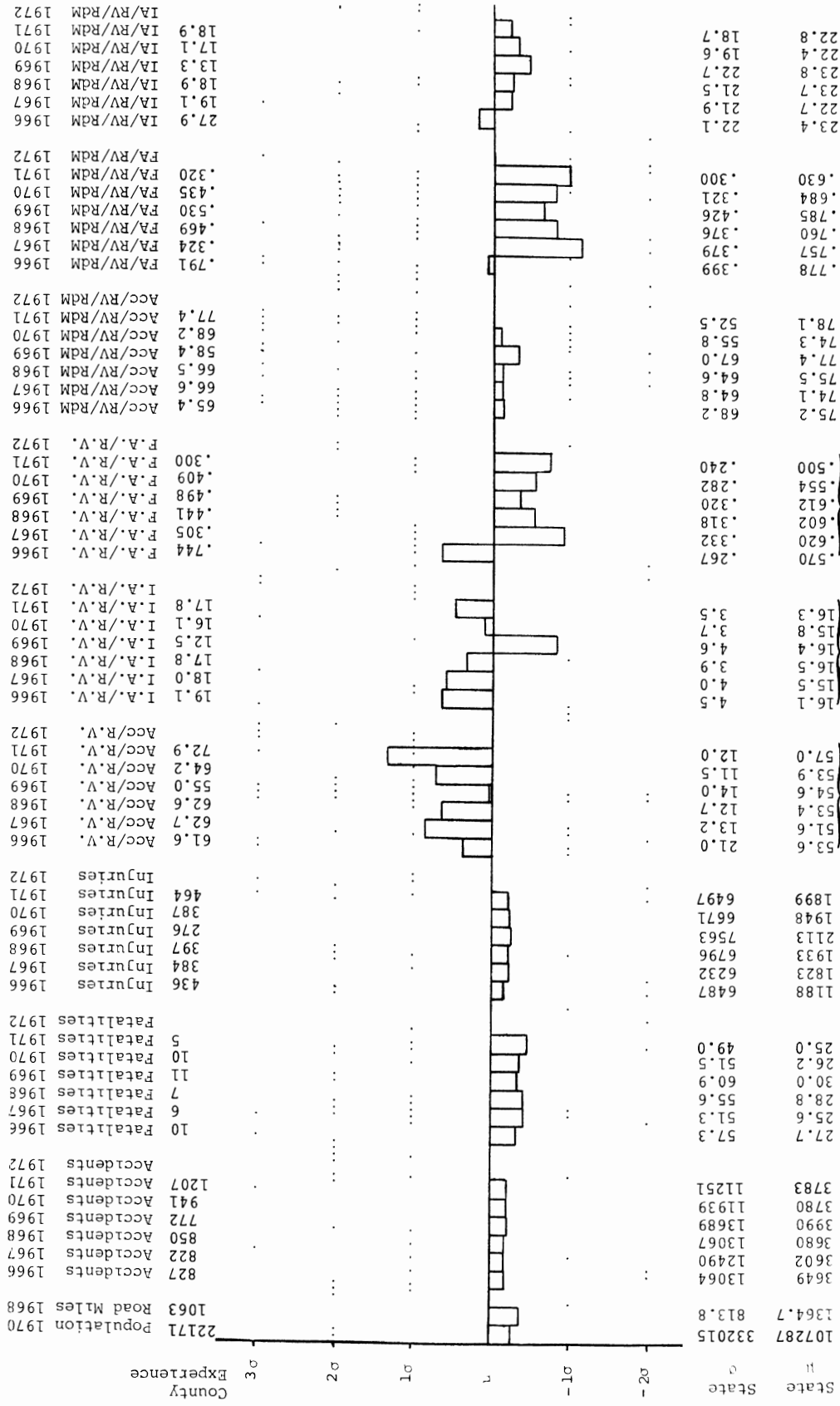
State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							19788 Population 1970
1364.7	813.8							1183 Road Miles 1968
3649	13064							670 Accidents 1966
3602	12490							677 Accidents 1967
3680	13067							755 Accidents 1968
3990	13689							765 Accidents 1969
3780	11939							687 Accidents 1970
3783	11251							816 Accidents 1971
								Accidents 1972
27.7	57.3							7 Fatalities 1966
25.6	51.3							13 Fatalities 1967
28.8	55.6							5 Fatalities 1968
30.0	60.9							9 Fatalities 1969
26.2	51.5							6 Fatalities 1970
25.0	49.0							8 Fatalities 1971
								Fatalities 1972
1188	6487							315 Injuries 1966
1823	6232							346 Injuries 1967
1933	6796							317 Injuries 1968
2113	7563							353 Injuries 1969
1948	6671							345 Injuries 1970
1899	6497							385 Injuries 1971
								Injuries 1972
53.6	21.0							55.1 Acc/R.V. 1966
51.6	13.2							57.4 Acc/R.V. 1967
53.4	12.7							61.7 Acc/R.V. 1968
* 54.6	14.0							59.4 Acc/R.V. 1969
53.9	11.5							50.7 Acc/R.V. 1970
57.0	12.0							58.0 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							16.6 I.A./R.V. 1966
15.5	4.0							15.8 I.A./R.V. 1967
16.5	3.9							16.3 I.A./R.V. 1968
* 16.4	4.6							16.3 I.A./R.V. 1969
15.8	3.7							15.6 I.A./R.V. 1970
16.3	3.5							16.3 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.411 F.A./R.V. 1966
.620	.332							.677 F.A./R.V. 1967
.602	.318							.408 F.A./R.V. 1968
* .612	.320							.621 F.A./R.V. 1969
.554	.282							.442 F.A./R.V. 1970
.500	.240							.570 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							65.2 Acc/RV/RdM 1966
74.1	64.8							67.8 Acc/RV/RdM 1967
75.5	64.6							73.0 Acc/RV/RdM 1968
77.4	67.0							70.3 Acc/RV/RdM 1969
74.3	55.8							59.9 Acc/RV/RdM 1970
78.1	52.5							68.7 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.486 FA/RV/RdM 1966
.757	.379							.801 FA/RV/RdM 1967
.760	.376							.483 FA/RV/RdM 1968
.785	.426							.735 FA/RV/RdM 1969
.684	.321							.523 FA/RV/RdM 1970
.630	.300							.670 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							25.6 IA/RV/RdM 1966
22.7	21.9							18.7 IA/RV/RdM 1967
23.7	21.5							19.3 IA/RV/RdM 1968
23.8	22.7							19.3 IA/RV/RdM 1969
22.4	19.6							18.5 IA/RV/RdM 1970
22.8	18.7							19.3 IA/RV/RdM 1971
								IA/RV/RdM 1972

* Figures represent actual value times 10³

MANISTEE

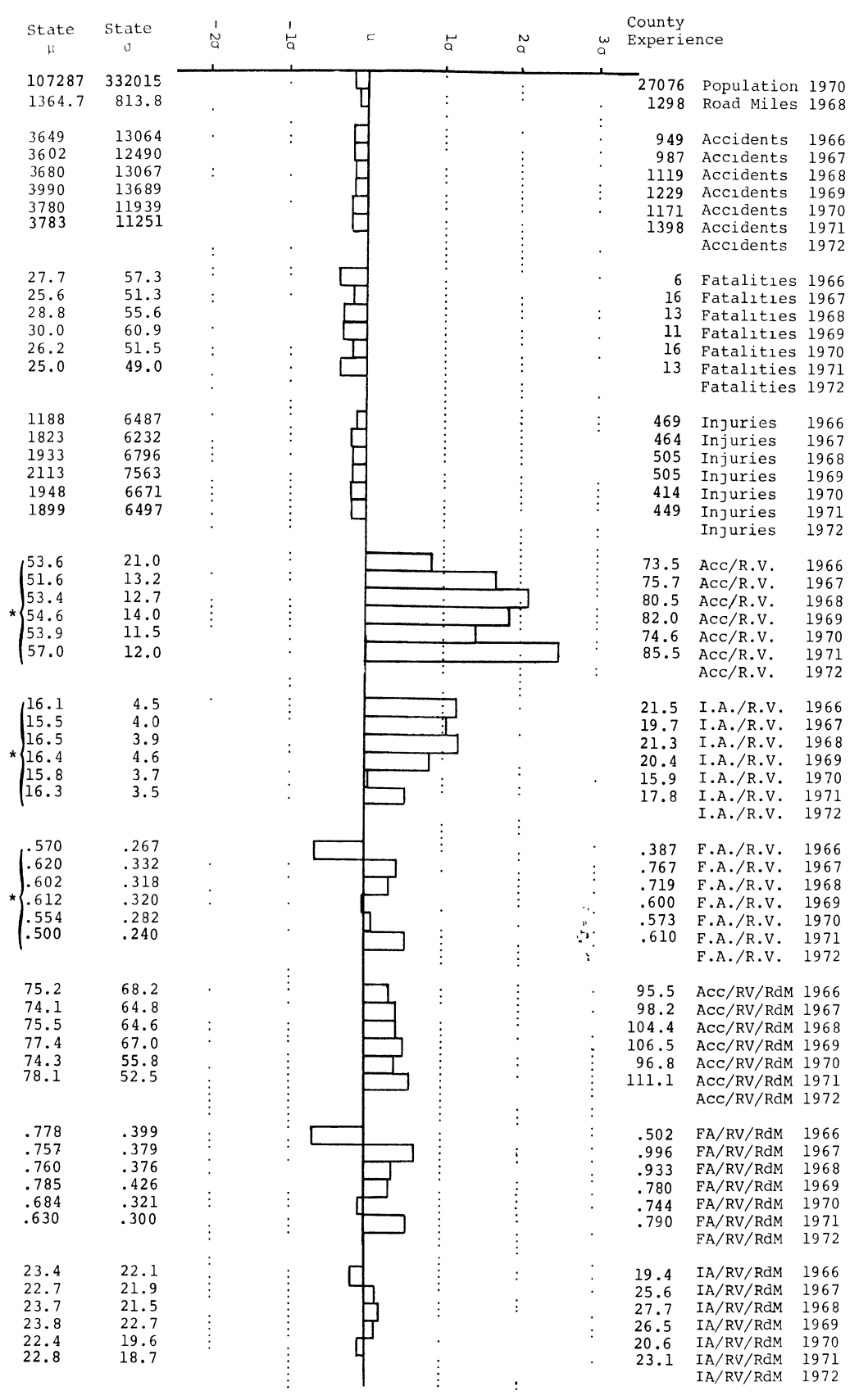
State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							63645 Population 1970
1364.7	813.8							1562 Road Miles 1968
3649	13064							1697 Accidents 1966
3602	12490							1910 Accidents 1967
3680	13067							2205 Accidents 1968
3990	13689							2049 Accidents 1969
3780	11939							2018 Accidents 1970
3783	11251							2522 Accidents 1971
								Accidents 1972
27.7	57.3							16 Fatalities 1966
25.6	51.3							17 Fatalities 1967
28.8	55.6							24 Fatalities 1968
30.0	60.9							15 Fatalities 1969
26.2	51.5							18 Fatalities 1970
25.0	49.0							17 Fatalities 1971
								Fatalities 1972
1188	6487							798 Injuries 1966
1823	6232							950 Injuries 1967
1933	6796							883 Injuries 1968
2113	7563							748 Injuries 1969
1948	6671							890 Injuries 1970
1899	6497							948 Injuries 1971
								Injuries 1972
53.6	21.0							54.2 Acc/R.V. 1966
51.6	13.2							60.6 Acc/R.V. 1967
53.4	12.7							68.1 Acc/R.V. 1968
* 54.6	14.0							61.4 Acc/R.V. 1969
53.9	11.5							58.4 Acc/R.V. 1970
57.0	12.0							69.2 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							16.4 I.A./R.V. 1966
15.5	4.0							19.3 I.A./R.V. 1967
16.5	3.9							17.7 I.A./R.V. 1968
* 16.4	4.6							14.9 I.A./R.V. 1969
15.8	3.7							16.9 I.A./R.V. 1970
16.3	3.5							17.4 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.447 F.A./R.V. 1966
.620	.332							.475 F.A./R.V. 1967
* .602	.318							.586 F.A./R.V. 1968
.612	.320							.329 F.A./R.V. 1969
.554	.282							.433 F.A./R.V. 1970
.500	.240							.410 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							84.7 Acc/RV/RdM 1966
74.1	64.8							94.6 Acc/RV/RdM 1967
75.5	64.6							106.3 Acc/RV/RdM 1968
77.4	67.0							95.9 Acc/RV/RdM 1969
74.3	55.8							91.1 Acc/RV/RdM 1970
78.1	52.5							107.2 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.698 FA/RV/RdM 1966
.757	.379							.742 FA/RV/RdM 1967
.760	.376							.915 FA/RV/RdM 1968
.785	.426							.515 FA/RV/RdM 1969
.684	.321							.676 FA/RV/RdM 1970
.630	.300							.640 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							20.3 IA/RV/RdM 1966
22.7	21.9							30.2 IA/RV/RdM 1967
23.7	21.5							26.8 IA/RV/RdM 1968
23.8	22.7							23.3 IA/RV/RdM 1969
22.4	19.6							26.4 IA/RV/RdM 1970
22.8	18.7							26.9 IA/RV/RdM 1971
								IA/RV/RdM 1972

* Figures represent actual value times 10³



WASON

*figures represent actual value times 10³

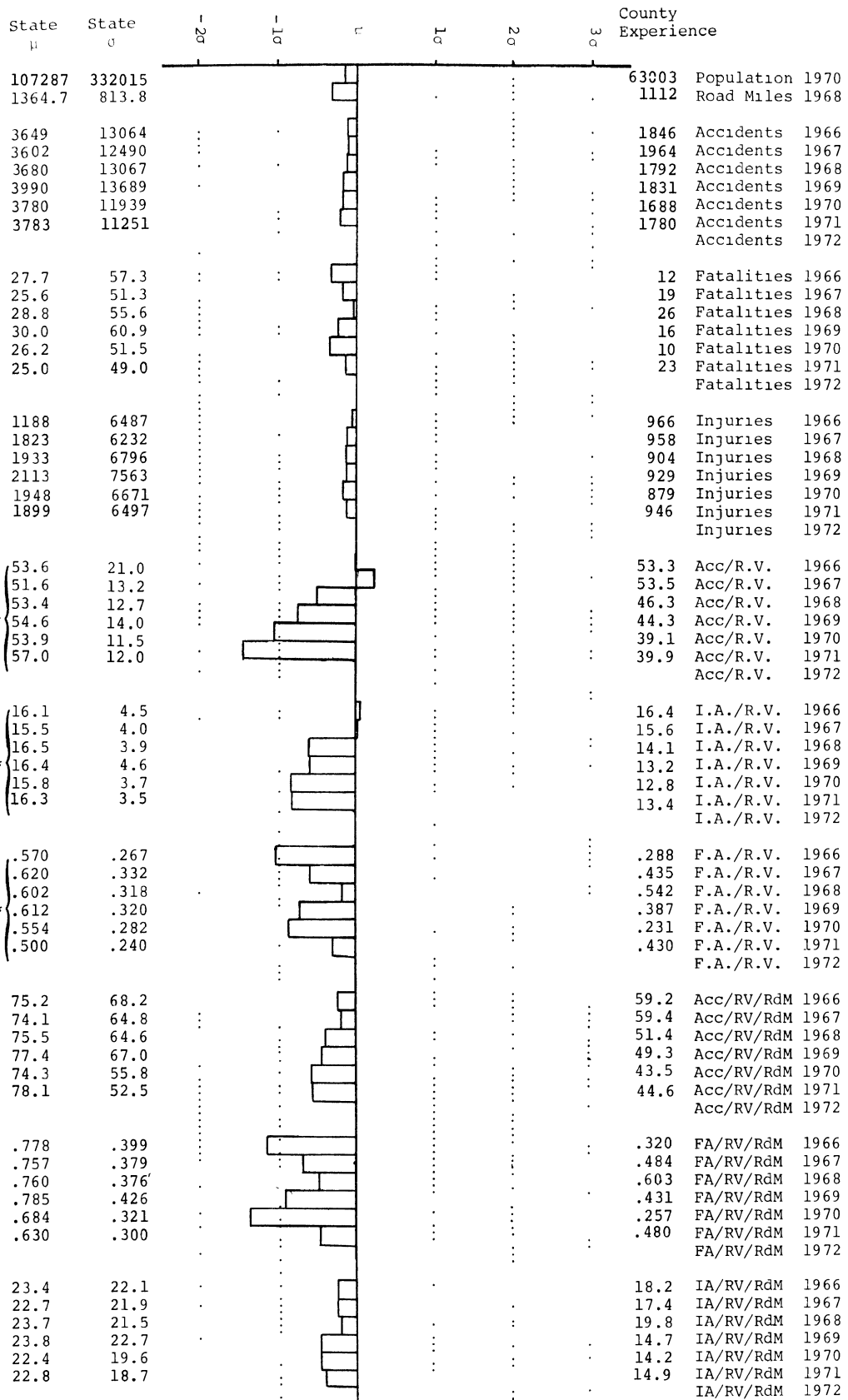


*figures represent actual value times 10³

State II	State J	-20	-10	0	10	20	30	County Experience
107287	332015							23974 Population 1970
1364.7	813.8							1401 Road Miles 1968
3649	13064							662 Accidents 1966
3602	12490							685 Accidents 1967
3680	13067							625 Accidents 1968
3990	13689							798 Accidents 1969
3780	11939							824 Accidents 1970
3783	11251							885 Accidents 1971
								Accidents 1972
27.7	57.3							9 Fatalities 1966
25.6	51.3							8 Fatalities 1967
28.8	55.6							7 Fatalities 1968
30.0	60.9							3 Fatalities 1969
26.2	51.5							14 Fatalities 1970
25.0	49.0							4 Fatalities 1971
								Fatalities 1972
1188	6487							302 Injuries 1966
1823	6232							282 Injuries 1967
1933	6796							277 Injuries 1968
2113	7563							344 Injuries 1969
1948	6671							315 Injuries 1970
1899	6497							287 Injuries 1971
								Injuries 1972
53.6	21.0							48.4 Acc/R.V. 1966
51.6	13.2							49.1 Acc/R.V. 1967
53.4	12.7							42.6 Acc/R.V. 1968
* 54.6	14.0							52.6 Acc/R.V. 1969
53.9	11.5							52.0 Acc/R.V. 1970
57.0	12.0							54.8 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							13.8 I.A./R.V. 1966
15.5	4.0							11.9 I.A./R.V. 1967
16.5	3.9							11.6 I.A./R.V. 1968
* 16.4	4.6							14.1 I.A./R.V. 1969
15.8	3.7							12.2 I.A./R.V. 1970
16.3	3.5							12.2 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.511 F.A./R.V. 1966
.620	.332							.573 F.A./R.V. 1967
.602	.318							.408 F.A./R.V. 1968
* .612	.320							.197 F.A./R.V. 1969
.554	.282							.693 F.A./R.V. 1970
.500	.240							.250 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							67.8 Acc/RV/RdM 1966
74.1	64.8							68.7 Acc/RV/RdM 1967
75.5	64.6							80.8 Acc/RV/RdM 1968
77.4	67.0							73.7 Acc/RV/RdM 1969
74.3	55.8							72.8 Acc/RV/RdM 1970
78.1	52.5							76.9 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.716 FA/RV/RdM 1966
.757	.379							.803 FA/RV/RdM 1967
.760	.376							.553 FA/RV/RdM 1968
.785	.426							.277 FA/RV/RdM 1969
.684	.321							.971 FA/RV/RdM 1970
.630	.300							.350 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							18.3 IA/RV/RdM 1966
22.7	21.9							16.7 IA/RV/RdM 1967
23.7	21.5							14.9 IA/RV/RdM 1968
23.8	22.7							19.8 IA/RV/RdM 1969
22.4	19.6							17.1 IA/RV/RdM 1970
22.8	18.7							17.1 IA/RV/RdM 1971
								IA/RV/RdM 1972

*Figures represent actual value times 10³

MENOMINEE



* Figures represent actual value times 10³

MIDLAND

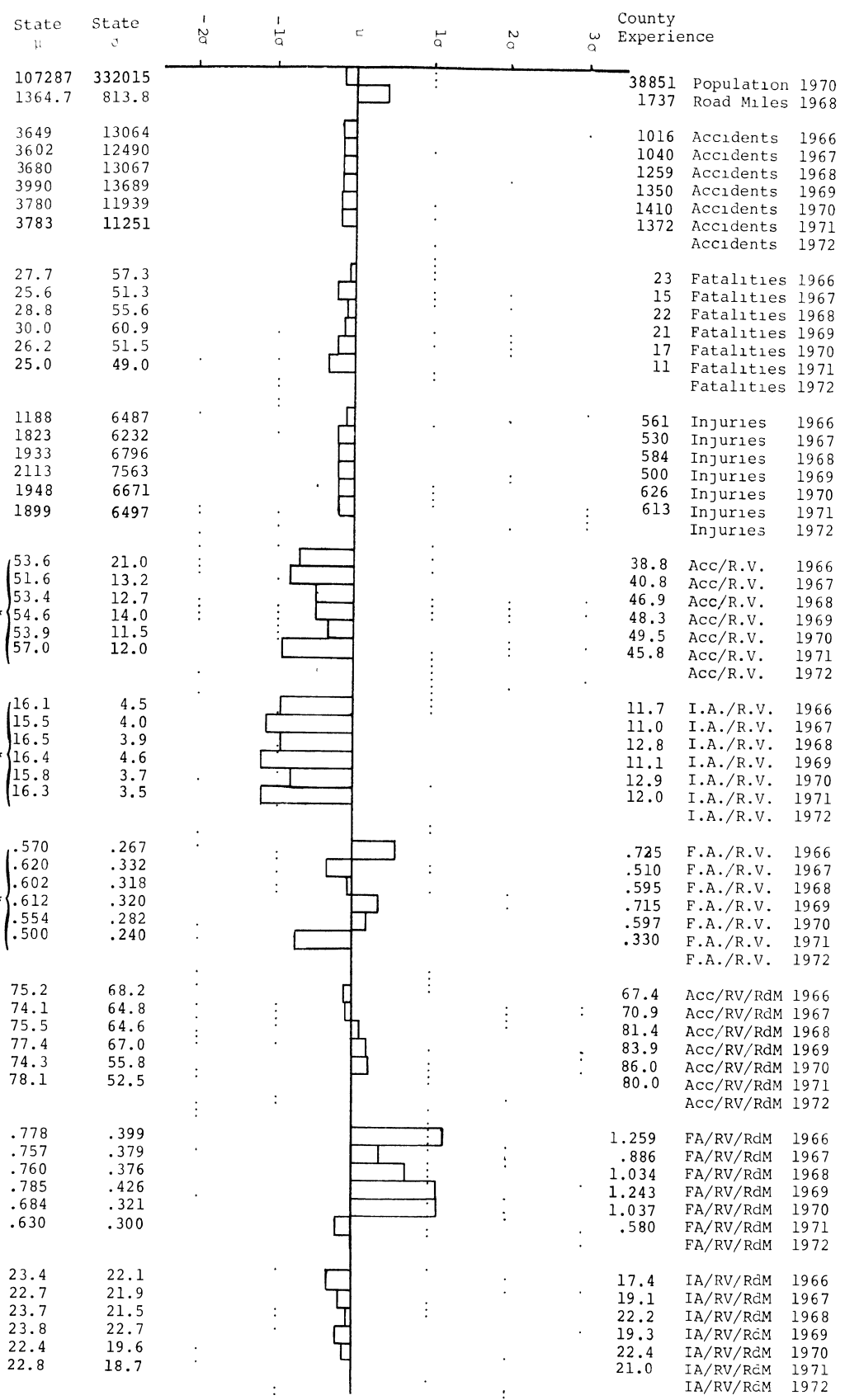
State #	State %	-20	-10	0	10	20	30	County Experience
107287	332015							7001 Population 1970
1364.7	813.8							993 Road Miles 1968
3649	13064							129 Accidents 1966
3602	12490							152 Accidents 1967
3680	13067							149 Accidents 1968
3990	13689							118 Accidents 1969
3780	11939							143 Accidents 1970
3783	11251							205 Accidents 1971
								Accidents 1972
27.7	57.3							0 Fatalities 1966
25.6	51.3							4 Fatalities 1967
28.8	55.6							4 Fatalities 1968
30.0	60.9							6 Fatalities 1969
26.2	51.5							7 Fatalities 1970
25.0	49.0							3 Fatalities 1971
								Fatalities 1972
1188	6487							57 Injuries 1966
1823	6232							64 Injuries 1967
1933	6796							80 Injuries 1968
2113	7563							59 Injuries 1969
1948	6671							75 Injuries 1970
1899	6497							92 Injuries 1971
								Injuries 1972
53.6	21.0							29.5 Acc/R.V. 1966
51.6	13.2							35.9 Acc/R.V. 1967
53.4	12.7							33.5 Acc/R.V. 1968
* 54.6	14.0							25.3 Acc/R.V. 1969
53.9	11.5							30.9 Acc/R.V. 1970
57.0	17.0							40.3 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							9.1 I.A./R.V. 1966
15.5	4.0							10.1 I.A./R.V. 1967
16.5	3.9							10.6 I.A./R.V. 1968
* 16.4	4.6							5.6 I.A./R.V. 1969
15.8	3.7							8.6 I.A./R.V. 1970
16.3	3.5							11.2 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							0 F.A./R.V. 1966
.620	.332							.943 F.A./R.V. 1967
.602	.318							.899 F.A./R.V. 1968
* .612	.320							1.071 F.A./R.V. 1969
.554	.282							.863 F.A./R.V. 1970
.500	.240							.590 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							29.3 Acc/RV/RdM 1966
74.1	64.8							35.5 Acc/RV/RdM 1967
75.5	64.6							33.2 Acc/RV/RdM 1968
77.4	67.0							25.1 Acc/RV/RdM 1969
74.3	55.8							30.6 Acc/RV/RdM 1970
78.1	52.5							39.4 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							0 FA/RV/RdM 1966
.757	.379							.936 FA/RV/RdM 1967
.760	.376							.893 FA/RV/RdM 1968
.785	.426							1.064 FA/RV/RdM 1969
.684	.321							.857 FA/RV/RdM 1970
.630	.300							.580 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							9.0 IA/RV/RdM 1966
22.7	21.9							10.0 IA/RV/RdM 1967
23.7	21.5							10.5 IA/RV/RdM 1968
23.8	22.7							5.6 IA/RV/RdM 1969
22.4	19.6							8.6 IA/RV/RdM 1970
22.8	18.7							11.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

*Figures represent actual value times 10

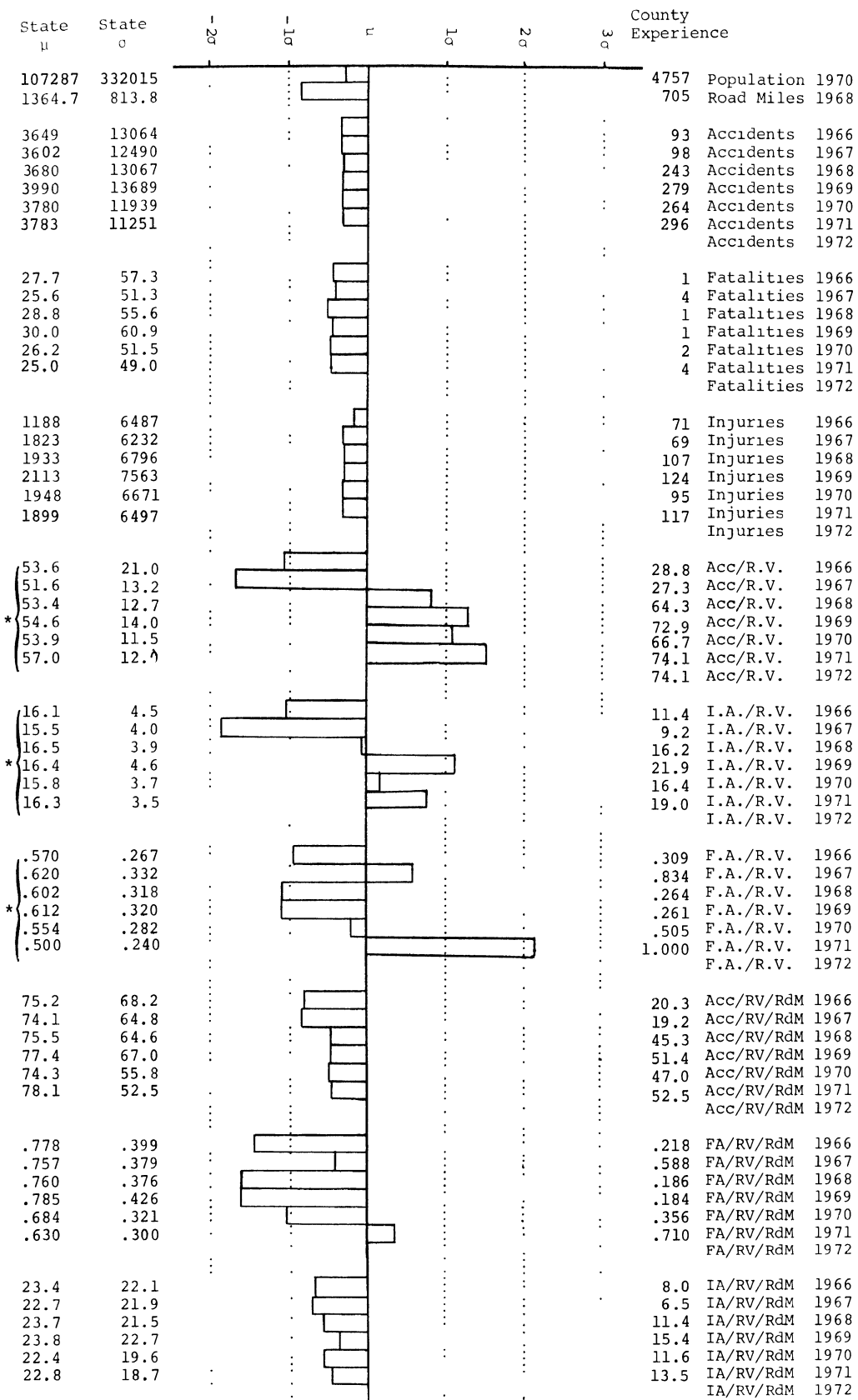
MISSAUKEE

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							117625 Population 1970
1364.7	813.8							1557 Road Miles 1968
3649	13064							3521 Accidents 1966
3602	12490							3155 Accidents 1967
3680	13067							3491 Accidents 1968
3990	13689							3957 Accidents 1969
3780	11939							3503 Accidents 1970
3783	11251							3734 Accidents 1971
								Accidents 1972
27.7	57.3							61 Fatalities 1966
25.6	51.3							54 Fatalities 1967
28.8	55.6							55 Fatalities 1968
30.0	60.9							68 Fatalities 1969
26.2	51.5							51 Fatalities 1970
25.0	49.0							50 Fatalities 1971
								Fatalities 1972
1188	6487							2141 Injuries 1966
1823	6232							1777 Injuries 1967
1933	6796							2235 Injuries 1968
2113	7563							2511 Injuries 1969
1948	6671							2397 Injuries 1970
1899	6497							2230 Injuries 1971
								Injuries 1972
53.6	21.0							56.2 Acc/R.V. 1966
51.6	13.2							50.3 Acc/R.V. 1967
53.4	12.7							52.8 Acc/R.V. 1968
* 54.6	14.0							57.2 Acc/R.V. 1969
53.9	11.5							48.6 Acc/R.V. 1970
57.0	12.0							50.0 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							20.8 I.A./R.V. 1966
15.5	4.0							17.5 I.A./R.V. 1967
16.5	3.9							20.6 I.A./R.V. 1968
* 16.4	4.6							22.1 I.A./R.V. 1969
15.8	3.7							20.3 I.A./R.V. 1970
16.3	3.5							19.3 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.669 F.A./R.V. 1966
.620	.332							.701 F.A./R.V. 1967
.602	.318							.665 F.A./R.V. 1968
* .612	.320							.751 F.A./R.V. 1969
.554	.282							.568 F.A./R.V. 1970
.500	.240							.600 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							87.4 Acc/RV/RdM 1966
74.1	64.8							78.3 Acc/RV/RdM 1967
75.5	64.6							82.2 Acc/RV/RdM 1968
77.4	67.0							89.0 Acc/RV/RdM 1969
74.3	55.8							75.6 Acc/RV/RdM 1970
78.1	52.5							78.0 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							1.042 FA/RV/RdM 1966
.757	.379							1.091 FA/RV/RdM 1967
.760	.376							1.035 FA/RV/RdM 1968
.785	.426							1.169 FA/RV/RdM 1969
.684	.321							.884 FA/RV/RdM 1970
.630	.300							.940 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							32.4 IA/RV/RdM 1966
22.7	21.9							27.3 IA/RV/RdM 1967
23.7	21.5							32.1 IA/RV/RdM 1968
23.8	22.7							34.4 IA/RV/RdM 1969
22.4	19.6							31.6 IA/RV/RdM 1970
22.8	18.7							30.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

* Figures represent actual value times 10³

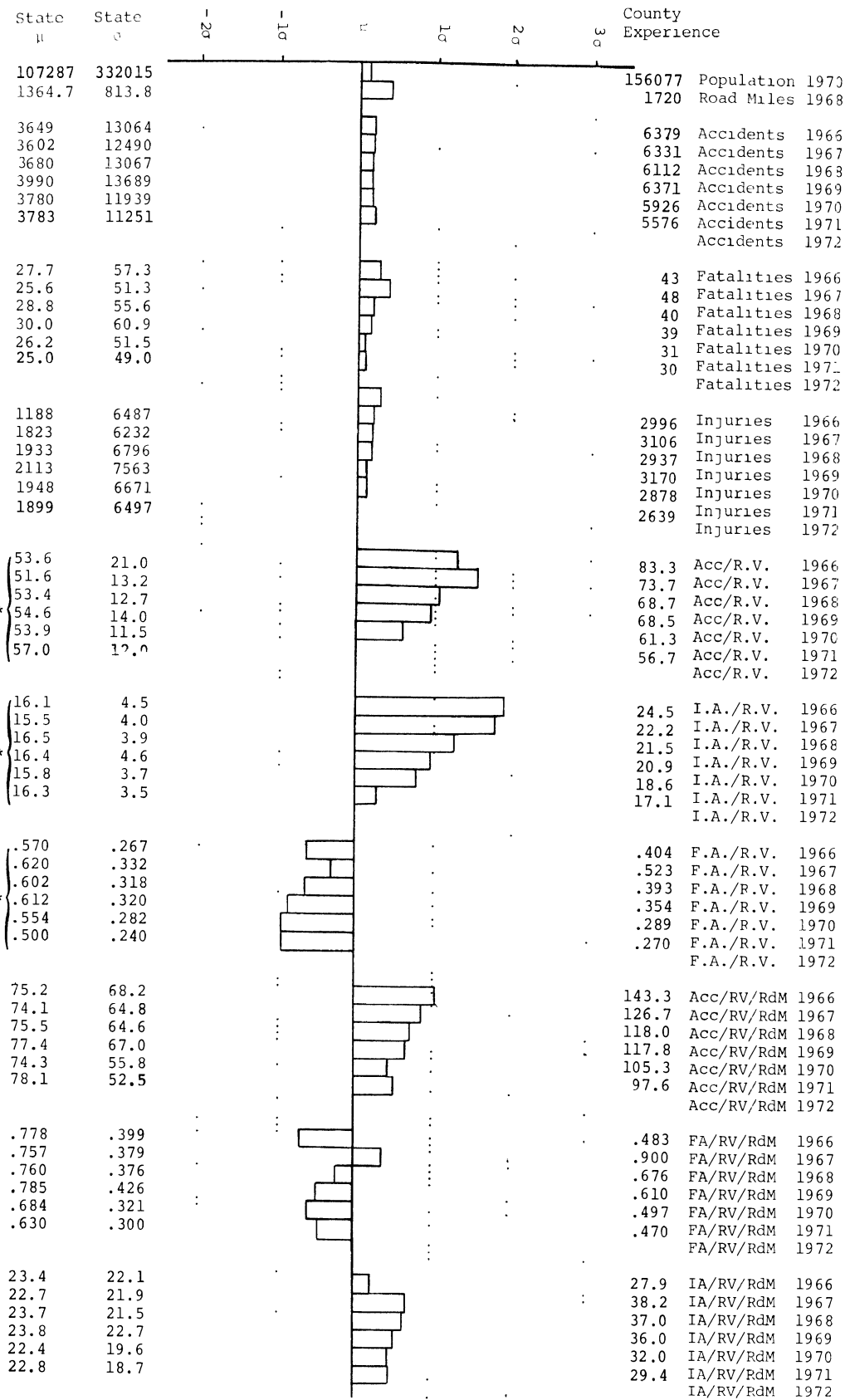


*Figures represent actual value times 10³



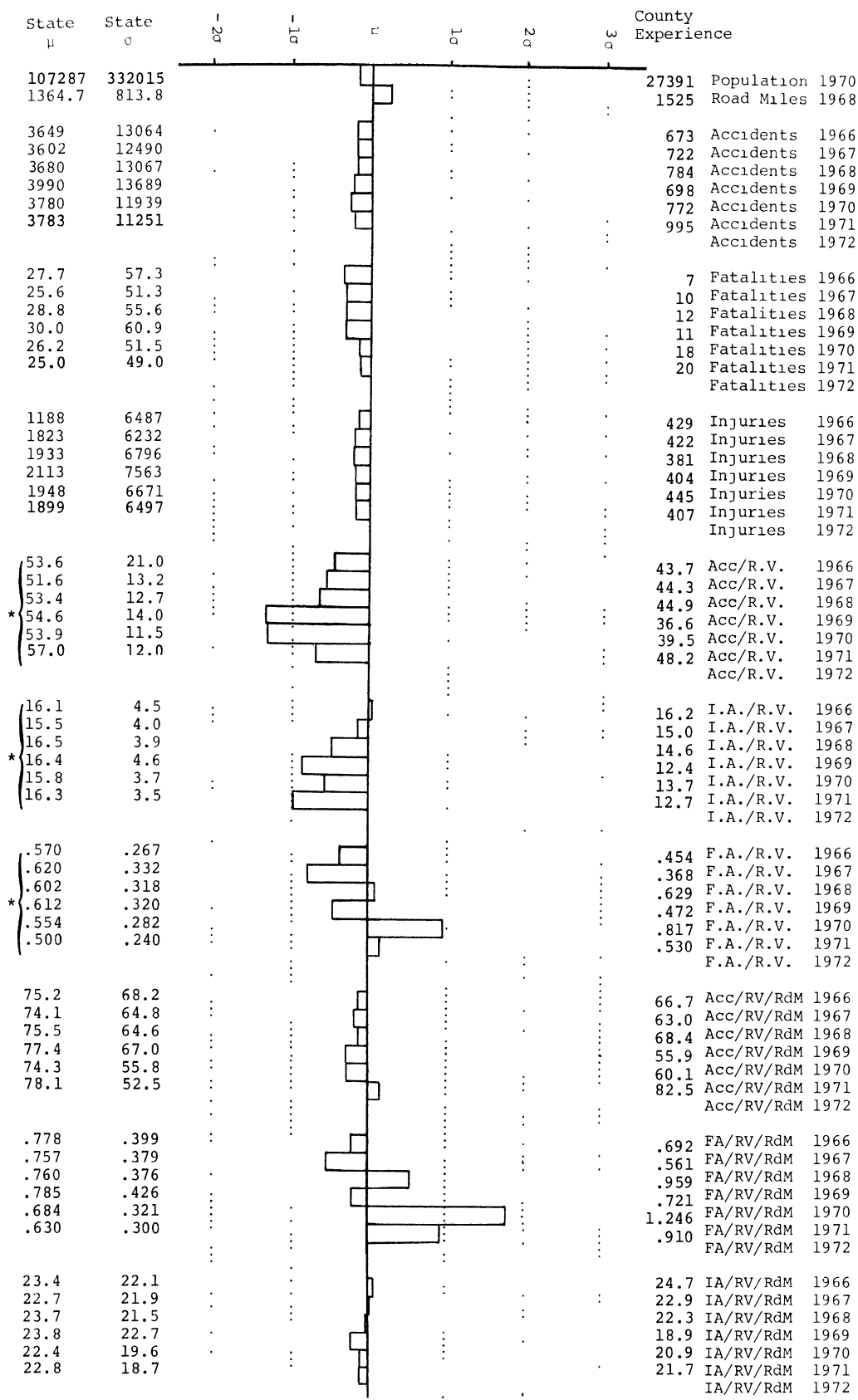
* Figures represent actual value times 10³

MONTMORENCY

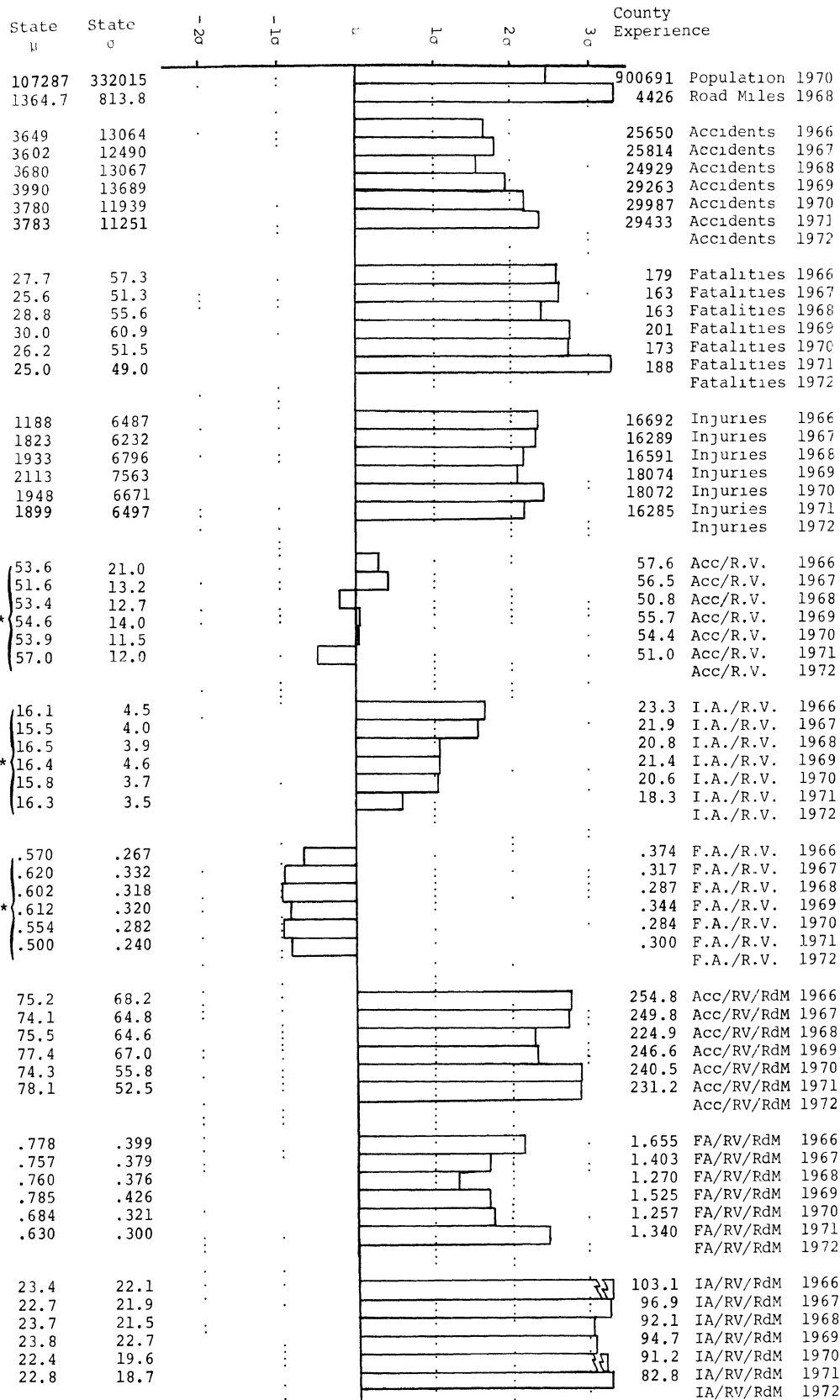


* Figures represent actual value times 10³

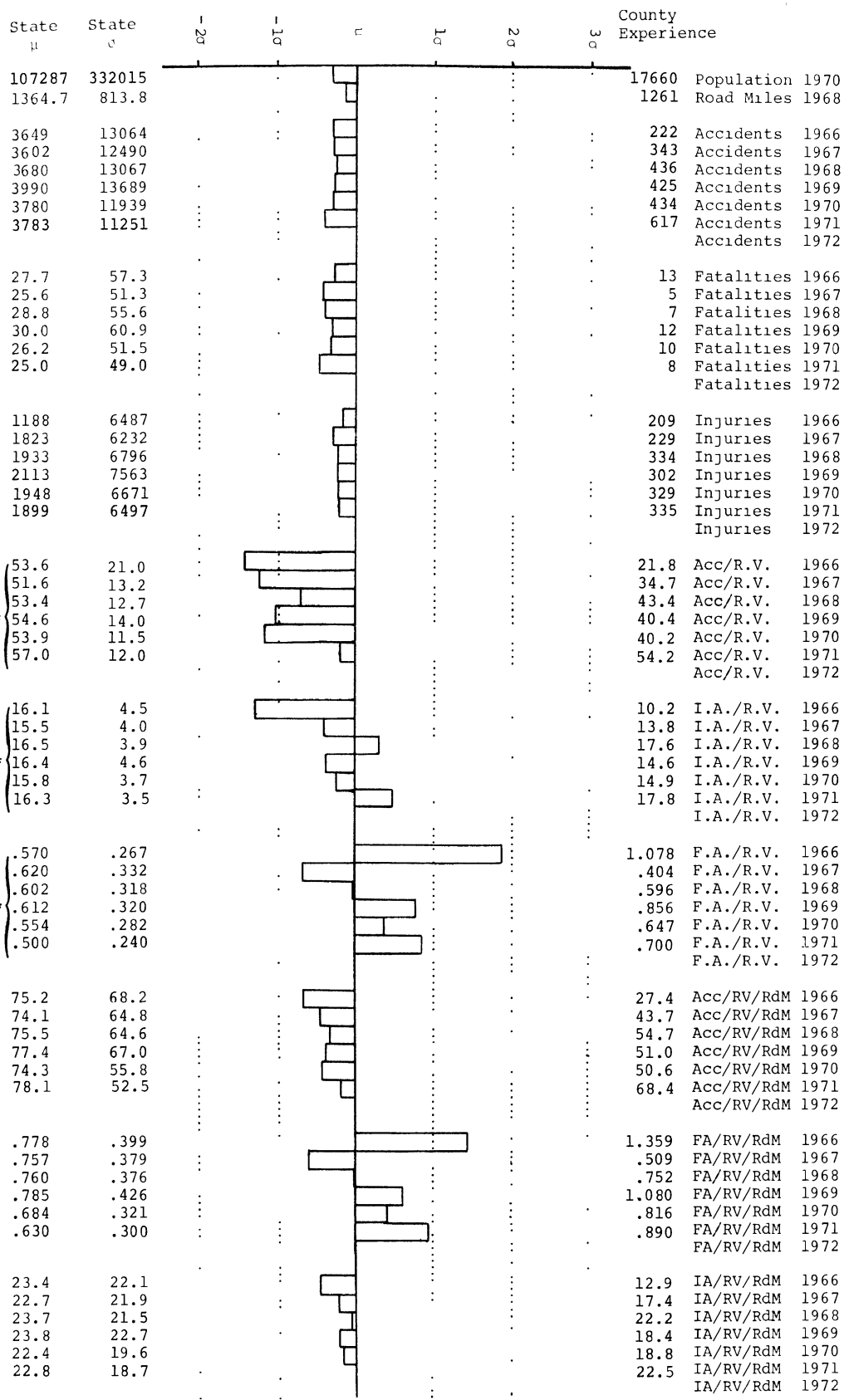
MUSKEGON



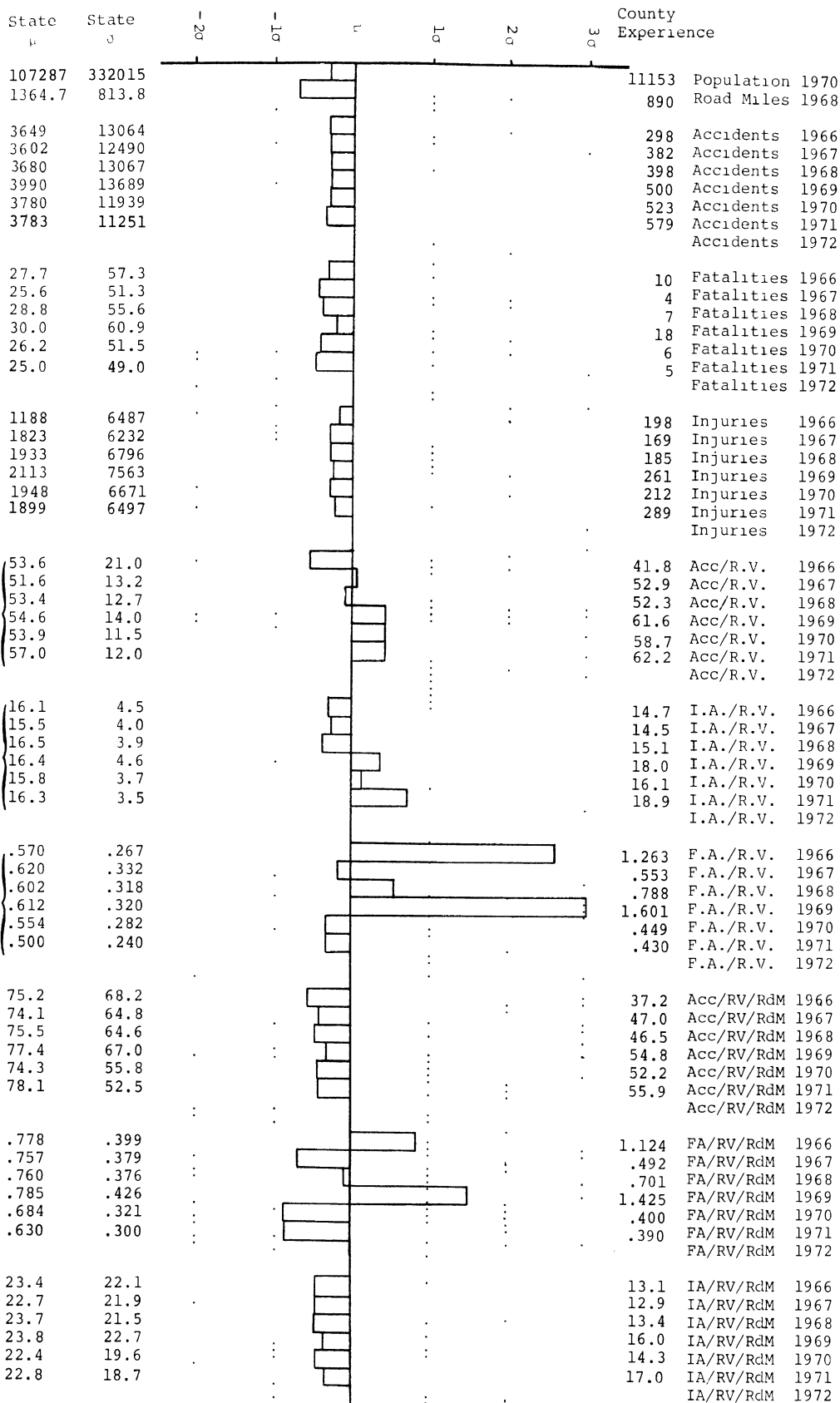
* Figures represent actual value times 10³



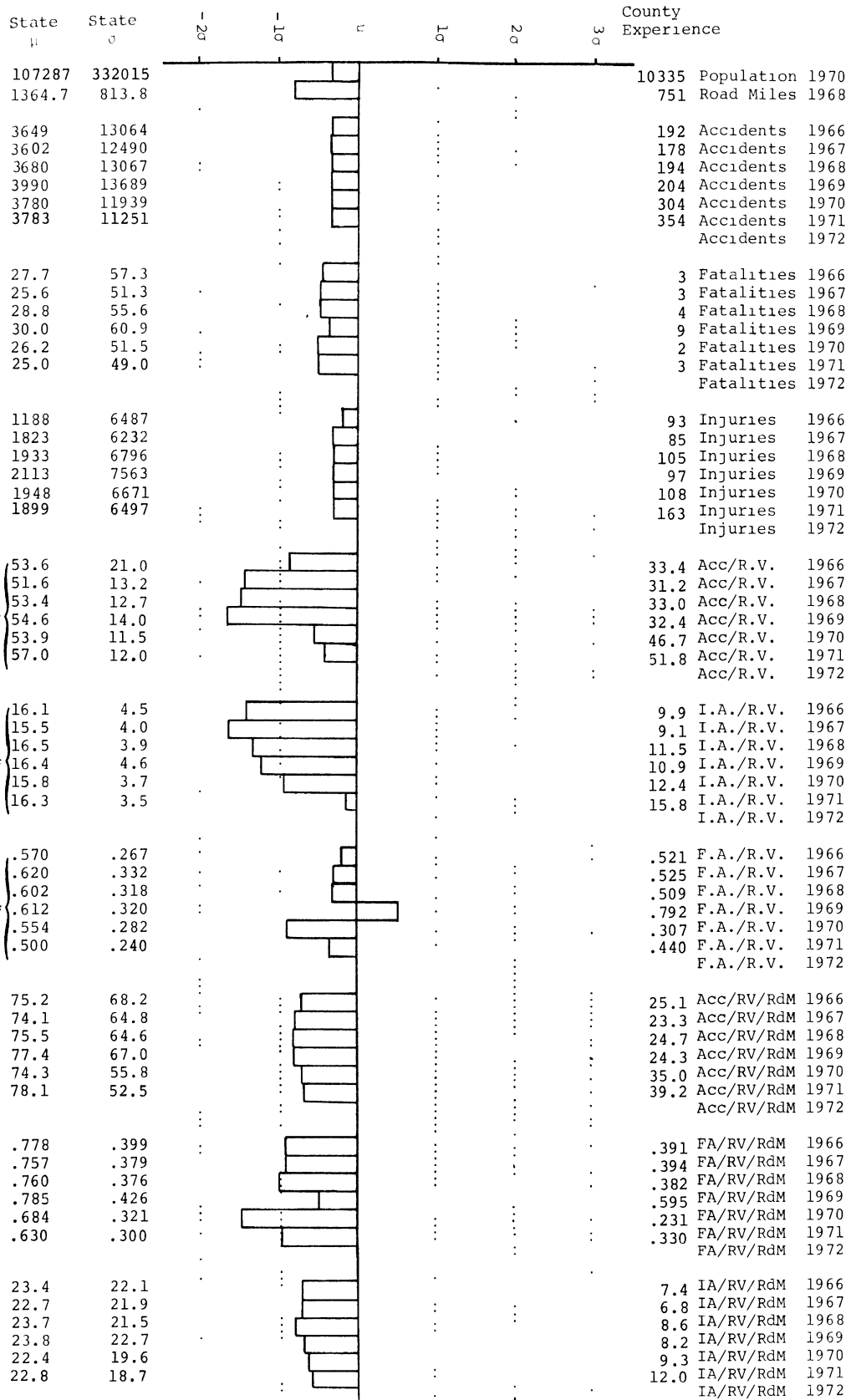
*figures represent actual value times 10³



*figures represent actual value times 10



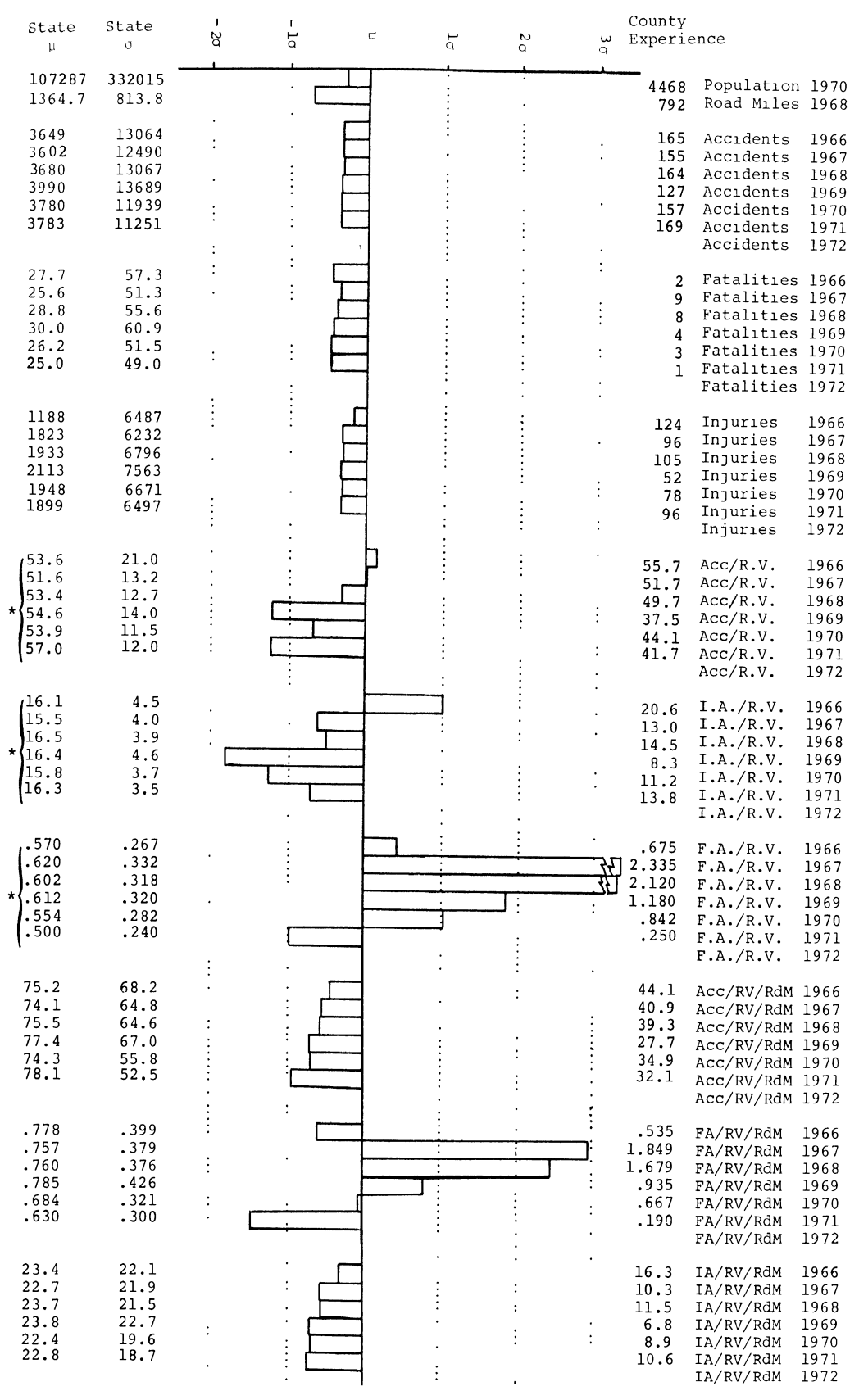
*Figures represent actual value times 10



* Figures represent actual value times 10³

State #	State e		County Experience
107287	332015		14673 Population 1970
1364.7	813.8		1079 Road Miles 1968
3649	13064		454 Accidents 1966
3602	12490		485 Accidents 1967
3680	13067		558 Accidents 1968
3990	13689		560 Accidents 1969
3780	11939		608 Accidents 1970
3783	11251		600 Accidents 1971
			Accidents 1972
27.7	57.3		4 Fatalities 1966
25.6	51.3		13 Fatalities 1967
28.8	55.6		10 Fatalities 1968
30.0	60.9		11 Fatalities 1969
26.2	51.5		11 Fatalities 1970
25.0	49.0		8 Fatalities 1971
			Fatalities 1972
1188	6487		164 Injuries 1966
1823	6232		247 Injuries 1967
1933	6796		212 Injuries 1968
2113	7563		273 Injuries 1969
1948	6671		269 Injuries 1970
1899	6497		285 Injuries 1971
			Injuries 1972
53.6	21.0		52.5 Acc/R.V. 1966
51.6	13.2		56.1 Acc/R.V. 1967
53.4	12.7		59.9 Acc/R.V. 1968
* 54.6	14.0		58.5 Acc/R.V. 1969
53.9	11.5		59.4 Acc/R.V. 1970
57.0	12.0		55.5 Acc/R.V. 1971
			Acc/R.V. 1972
16.1	4.5		12.9 I.A./R.V. 1966
15.5	4.0		14.5 I.A./R.V. 1967
16.5	3.9		13.8 I.A./R.V. 1968
* 16.4	4.6		14.3 I.A./R.V. 1969
15.8	3.7		14.9 I.A./R.V. 1970
16.3	3.5		15.8 I.A./R.V. 1971
			I.A./R.V. 1972
.570	.267		.462 F.A./R.V. 1966
.620	.332		1.156 F.A./R.V. 1967
.602	.318		.751 F.A./R.V. 1968
* .612	.320		.940 F.A./R.V. 1969
.554	.282		.782 F.A./R.V. 1970
.500	.240		.650 F.A./R.V. 1971
			F.A./R.V. 1972
75.2	68.2		56.6 Acc/RV/RdM 1966
74.1	64.8		60.5 Acc/RV/RdM 1967
75.5	64.6		64.6 Acc/RV/RdM 1968
77.4	67.0		61.0 Acc/RV/RdM 1969
74.3	55.8		64.1 Acc/RV/RdM 1970
78.1	52.5		60.6 Acc/RV/RdM 1971
			Acc/RV/RdM 1972
.778	.399		.498 FA/RV/RdM 1966
.757	.379		1.247 FA/RV/RdM 1967
.760	.376		.810 FA/RV/RdM 1968
.785	.426		1.015 FA/RV/RdM 1969
.684	.321		.844 FA/RV/RdM 1970
.630	.300		.710 FA/RV/RdM 1971
			FA/RV/RdM 1972
23.4	22.1		13.9 IA/RV/RdM 1966
22.7	21.9		15.7 IA/RV/RdM 1967
23.7	21.5		14.9 IA/RV/RdM 1968
23.8	22.7		15.4 IA/RV/RdM 1969
22.4	19.6		16.1 IA/RV/RdM 1970
22.8	18.7		17.2 IA/RV/RdM 1971
			IA/RV/RdM 1972

* Figures represent actual value times 10³



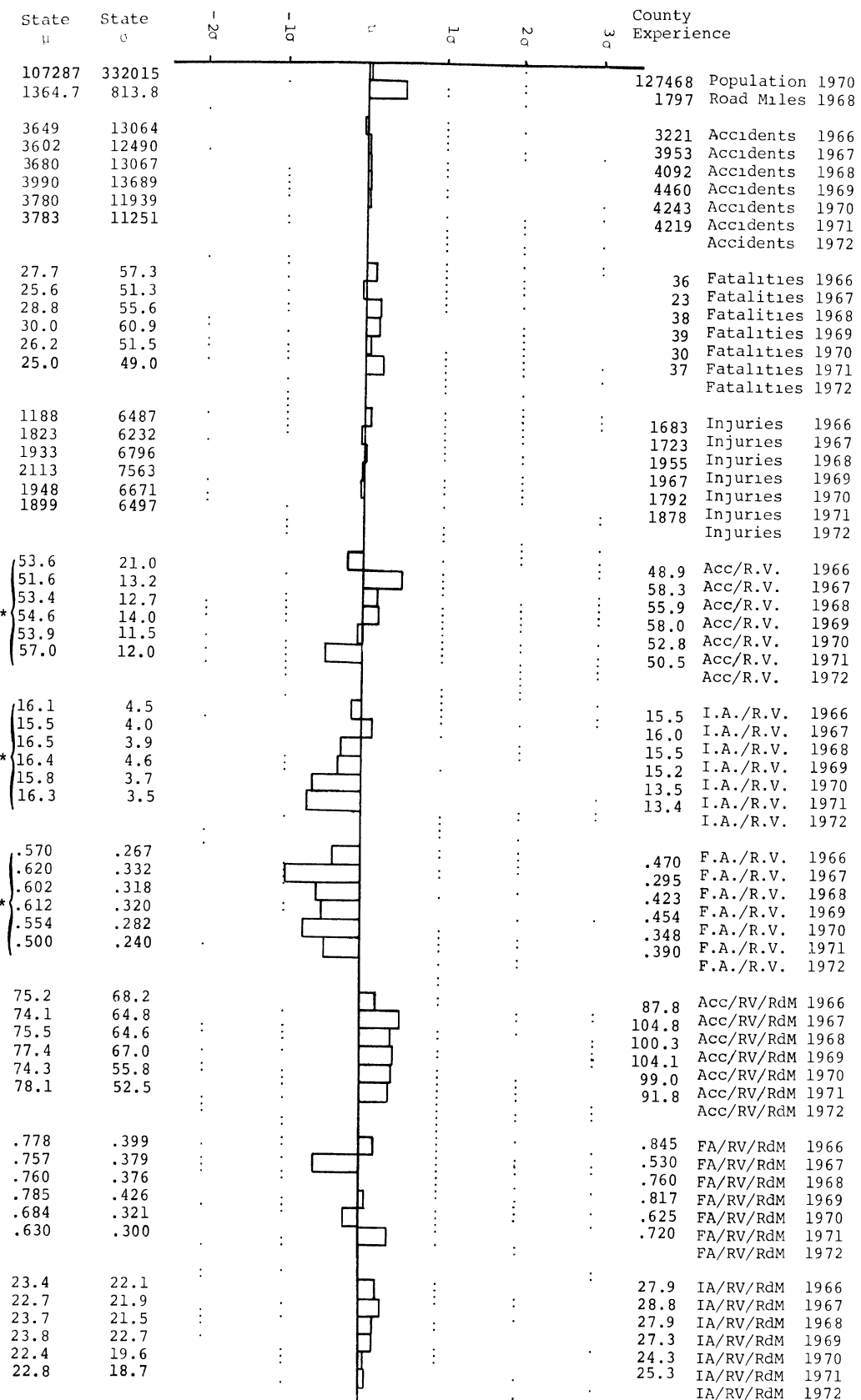
*figures represent actual value times 10³

OSCODA

State #	State e	-20	-10	0	10	20	30	County Experience
107287	332015							10013 Population 1970
1364.7	813.8							858 Road Miles 1968
3649	13064							251 Accidents 1966
3602	12490							263 Accidents 1967
3680	13067							330 Accidents 1968
3990	13689							335 Accidents 1969
3780	11939							434 Accidents 1970
3783	11251							573 Accidents 1971
								Accidents 1972
27.7	57.3							5 Fatalities 1966
25.6	51.3							3 Fatalities 1967
28.8	55.6							2 Fatalities 1968
30.0	60.9							2 Fatalities 1969
26.2	51.5							4 Fatalities 1970
25.0	49.0							4 Fatalities 1971
								Fatalities 1972
1188	6487							175 Injuries 1966
1823	6232							162 Injuries 1967
1933	6796							209 Injuries 1968
2113	7563							211 Injuries 1969
1948	6671							233 Injuries 1970
1899	6497							279 Injuries 1971
								Injuries 1972
53.6	21.0							44.3 Acc/R.V. 1966
51.6	13.2							46.1 Acc/R.V. 1967
53.4	12.7							51.8 Acc/R.V. 1968
* 54.6	14.0							48.1 Acc/R.V. 1969
53.9	11.5							56.6 Acc/R.V. 1970
57.0	12.0							69.4 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							17.1 I.A./R.V. 1966
15.5	4.0							15.8 I.A./R.V. 1967
16.5	3.9							19.1 I.A./R.V. 1968
* 16.4	4.6							18.8 I.A./R.V. 1969
15.8	3.7							19.7 I.A./R.V. 1970
16.3	3.5							19.6 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.882 F.A./R.V. 1966
.620	.332							.525 F.A./R.V. 1967
.602	.318							.313 F.A./R.V. 1968
* .612	.320							.286 F.A./R.V. 1969
.554	.282							.521 F.A./R.V. 1970
.500	.240							.480 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							37.9 Acc/RV/RdM 1966
74.1	64.8							39.5 Acc/RV/RdM 1967
75.5	64.6							44.4 Acc/RV/RdM 1968
77.4	67.0							41.2 Acc/RV/RdM 1969
74.3	55.8							48.5 Acc/RV/RdM 1970
78.1	52.5							60.1 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.757 FA/RV/RdM 1966
.757	.379							.450 FA/RV/RdM 1967
.760	.376							.269 FA/RV/RdM 1968
.785	.426							.246 FA/RV/RdM 1969
.684	.321							.447 FA/RV/RdM 1970
.630	.300							.420 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							14.7 IA/RV/RdM 1966
22.7	21.9							13.6 IA/RV/RdM 1967
23.7	21.5							16.4 IA/RV/RdM 1968
23.8	22.7							16.1 IA/RV/RdM 1969
22.4	19.6							16.9 IA/RV/RdM 1970
22.8	18.7							17.0 IA/RV/RdM 1971
								IA/RV/RdM 1972

*figures represent
actual value
times 10³

OTSEGO

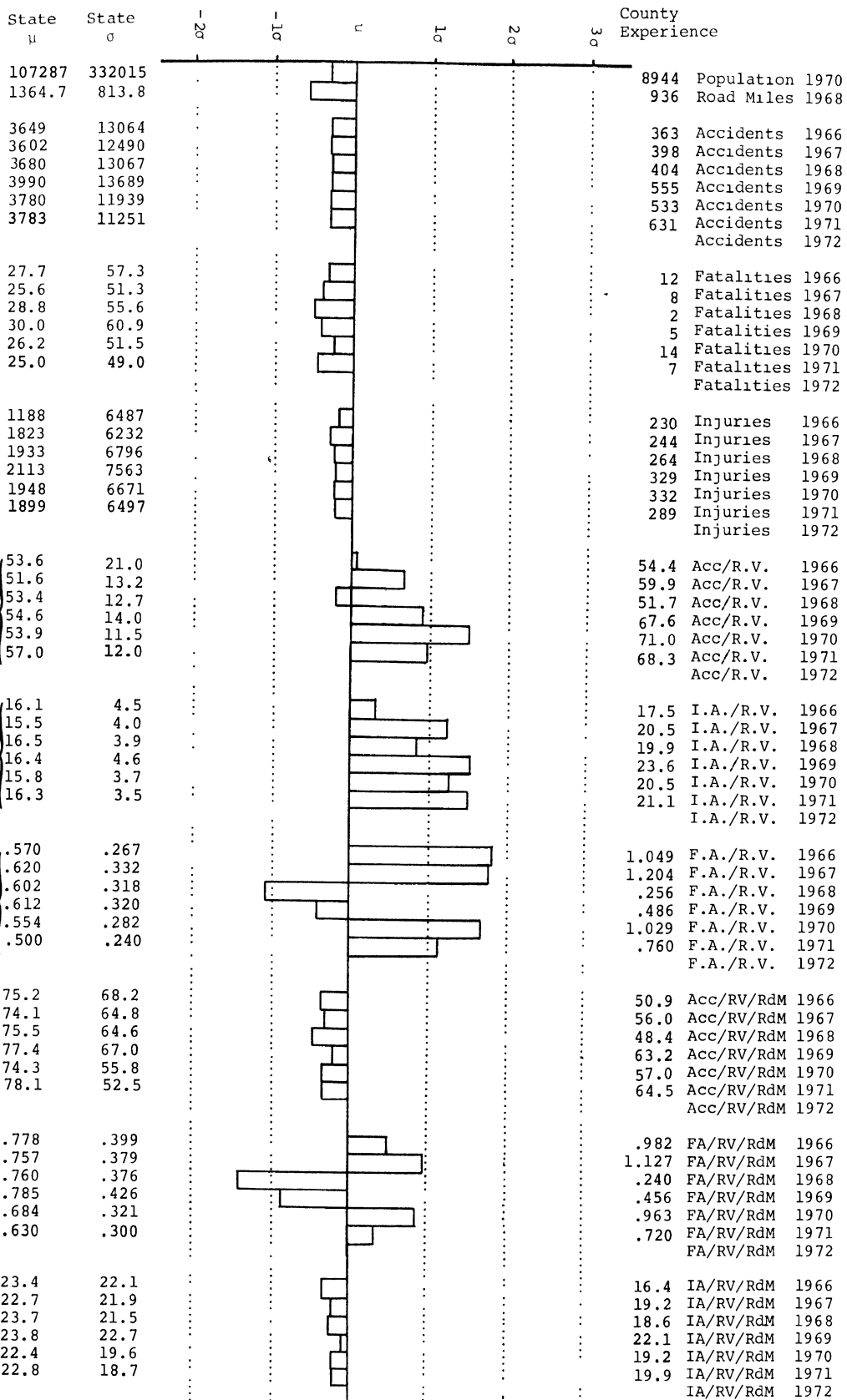


* Figures represent actual value times 10³

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							12486 Population 1970
1364.7	813.8							906 Road Miles 1968
3649	13064							348 Accidents 1966
3602	12490							338 Accidents 1967
3680	13067							330 Accidents 1968
3990	13689							431 Accidents 1969
3780	11939							426 Accidents 1970
3783	11251							489 Accidents 1971
								Accidents 1972
27.7	57.3							5 Fatalities 1966
25.6	51.3							9 Fatalities 1967
28.8	55.6							11 Fatalities 1968
30.0	60.9							7 Fatalities 1969
26.2	51.5							6 Fatalities 1970
25.0	49.0							4 Fatalities 1971
								Fatalities 1972
1188	6487							163 Injuries 1966
1823	6232							145 Injuries 1967
1933	6796							156 Injuries 1968
2113	7563							149 Injuries 1969
1948	6671							157 Injuries 1970
1899	6497							162 Injuries 1971
								Injuries 1972
53.6	21.0							50.4 Acc/R.V. 1966
51.6	13.2							49.8 Acc/R.V. 1967
53.4	12.7							45.5 Acc/R.V. 1968
* 54.6	14.0							58.3 Acc/R.V. 1969
53.9	11.5							53.6 Acc/R.V. 1970
57.0	12.0							56.0 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							14.3 I.A./R.V. 1966
15.5	4.0							11.2 I.A./R.V. 1967
16.5	3.9							11.3 I.A./R.V. 1968
* 16.4	4.6							13.4 I.A./R.V. 1969
15.8	3.7							12.1 I.A./R.V. 1970
16.3	3.5							12.8 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.723 F.A./R.V. 1966
.620	.332							.884 F.A./R.V. 1967
* .602	.318							1.102 F.A./R.V. 1968
.612	.320							.947 F.A./R.V. 1969
.554	.282							.755 F.A./R.V. 1970
.500	.240							.460 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							45.6 Acc/RV/RdM 1966
74.1	64.8							45.1 Acc/RV/RdM 1967
75.5	64.6							41.1 Acc/RV/RdM 1968
77.4	67.0							52.8 Acc/RV/RdM 1969
74.3	55.8							48.5 Acc/RV/RdM 1970
78.1	52.5							50.7 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							.655 FA/RV/RdM 1966
.757	.379							.801 FA/RV/RdM 1967
.760	.376							.998 FA/RV/RdM 1968
.785	.426							.858 FA/RV/RdM 1969
.684	.321							.684 FA/RV/RdM 1970
.630	.300							.410 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							13.0 IA/RV/RdM 1966
22.7	21.9							10.2 IA/RV/RdM 1967
23.7	21.5							10.2 IA/RV/RdM 1968
23.8	22.7							12.1 IA/RV/RdM 1969
22.4	19.6							11.0 IA/RV/RdM 1970
22.8	18.7							11.6 IA/RV/RdM 1971
								IA/RV/RdM 1972

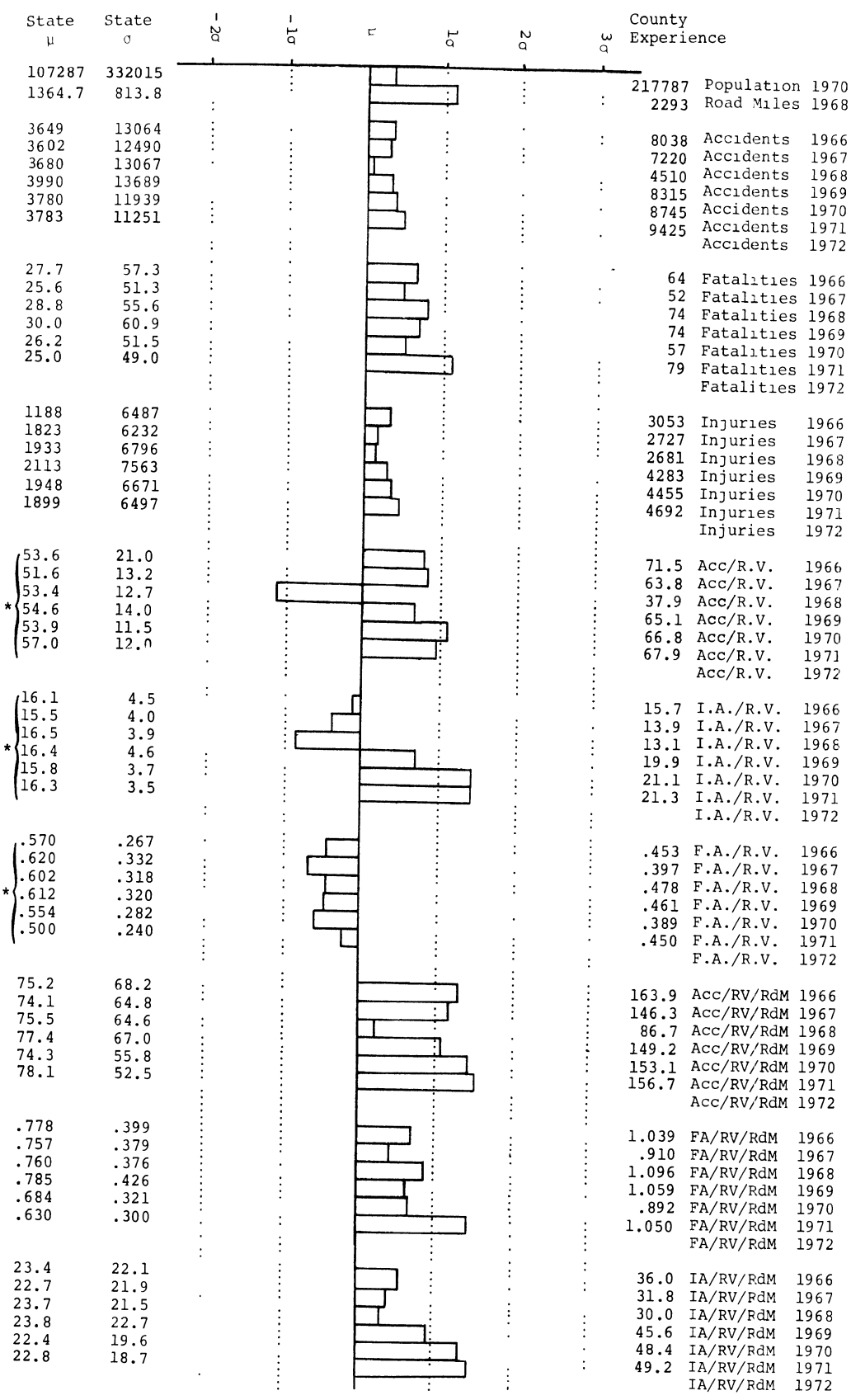
* Figures represent actual value times 10³

PRESQUE ISLE



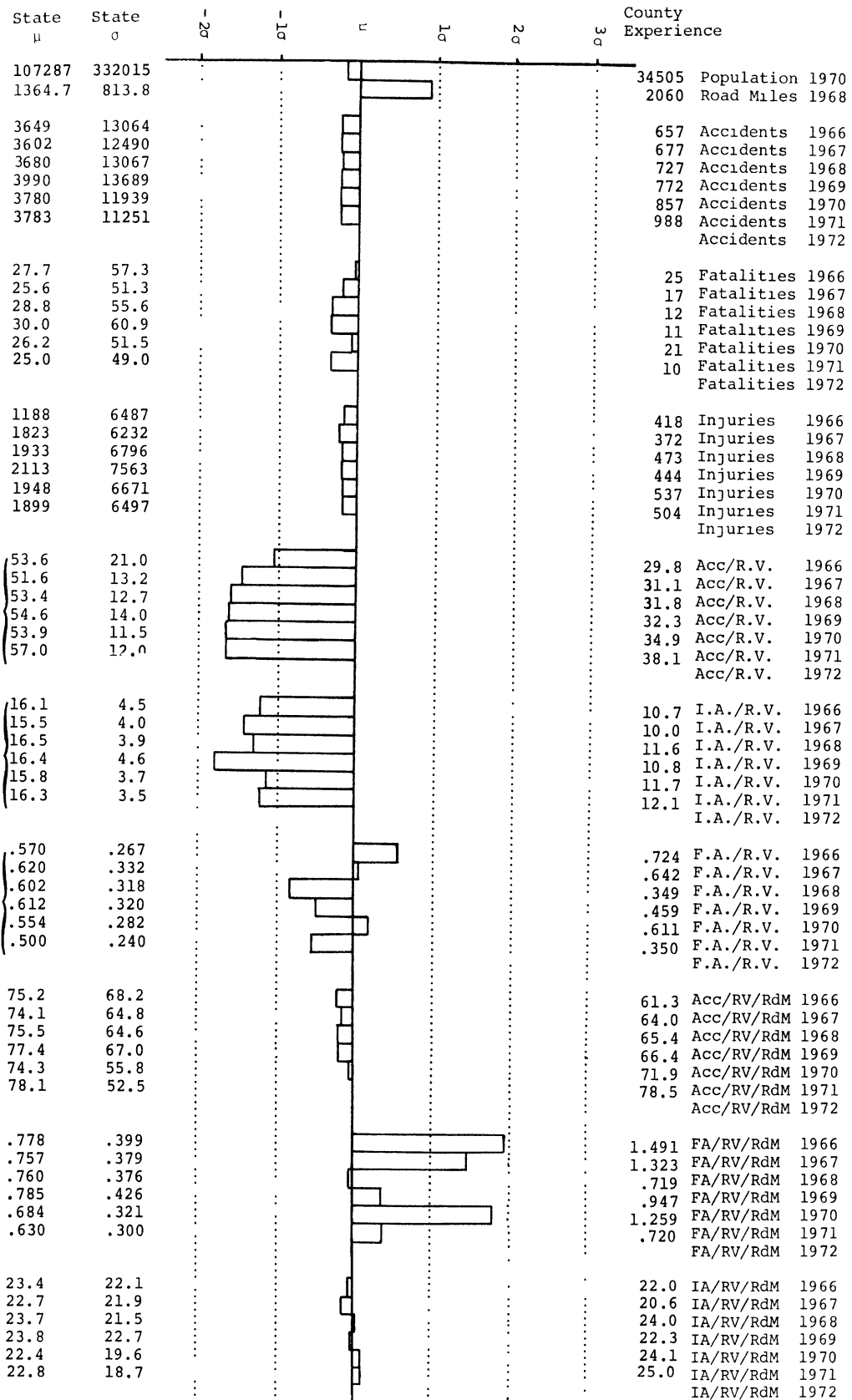
* figures represent actual value times 10³

ROSCOMMON



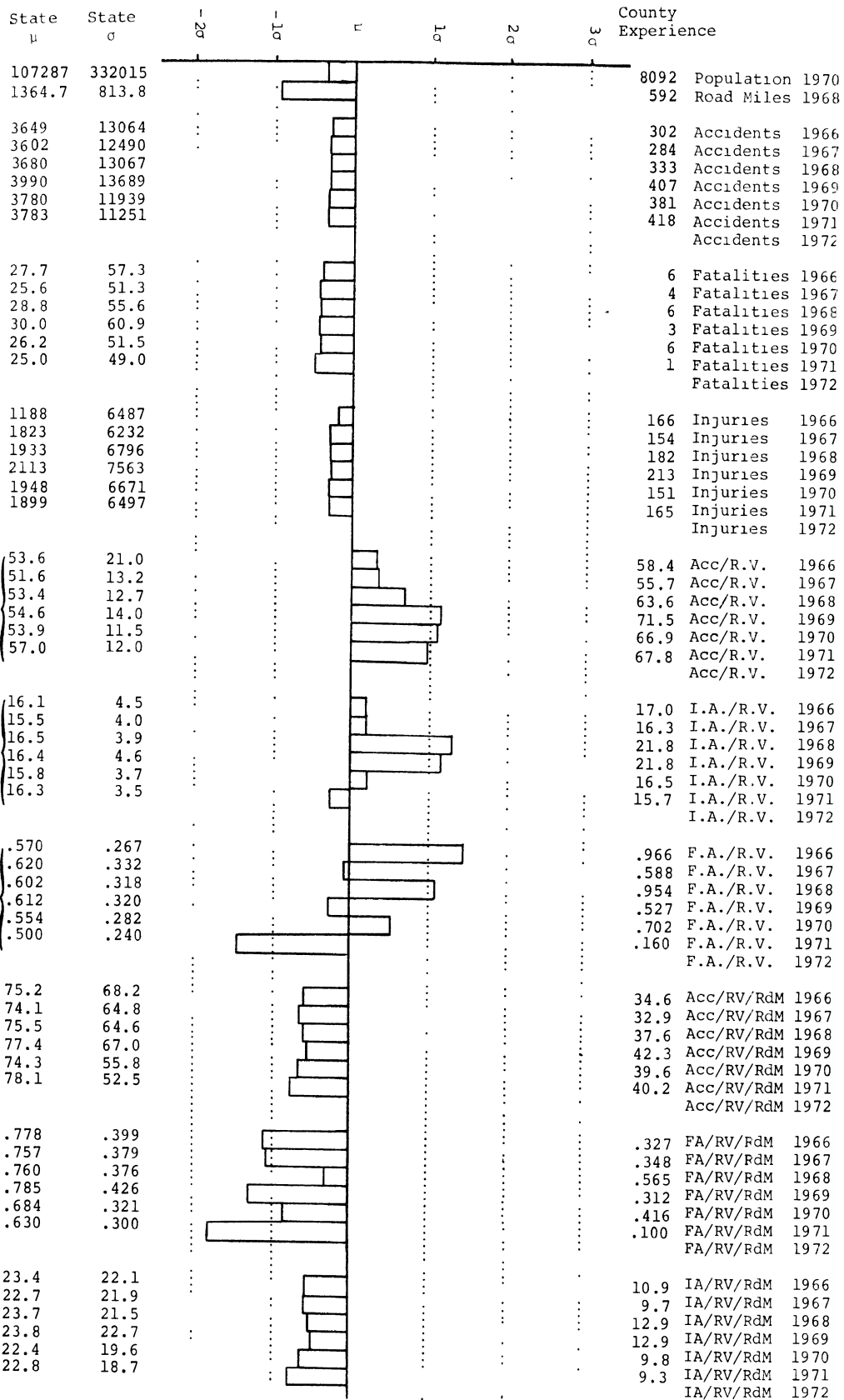
* Figures represent actual value times 10³

SAGINAW

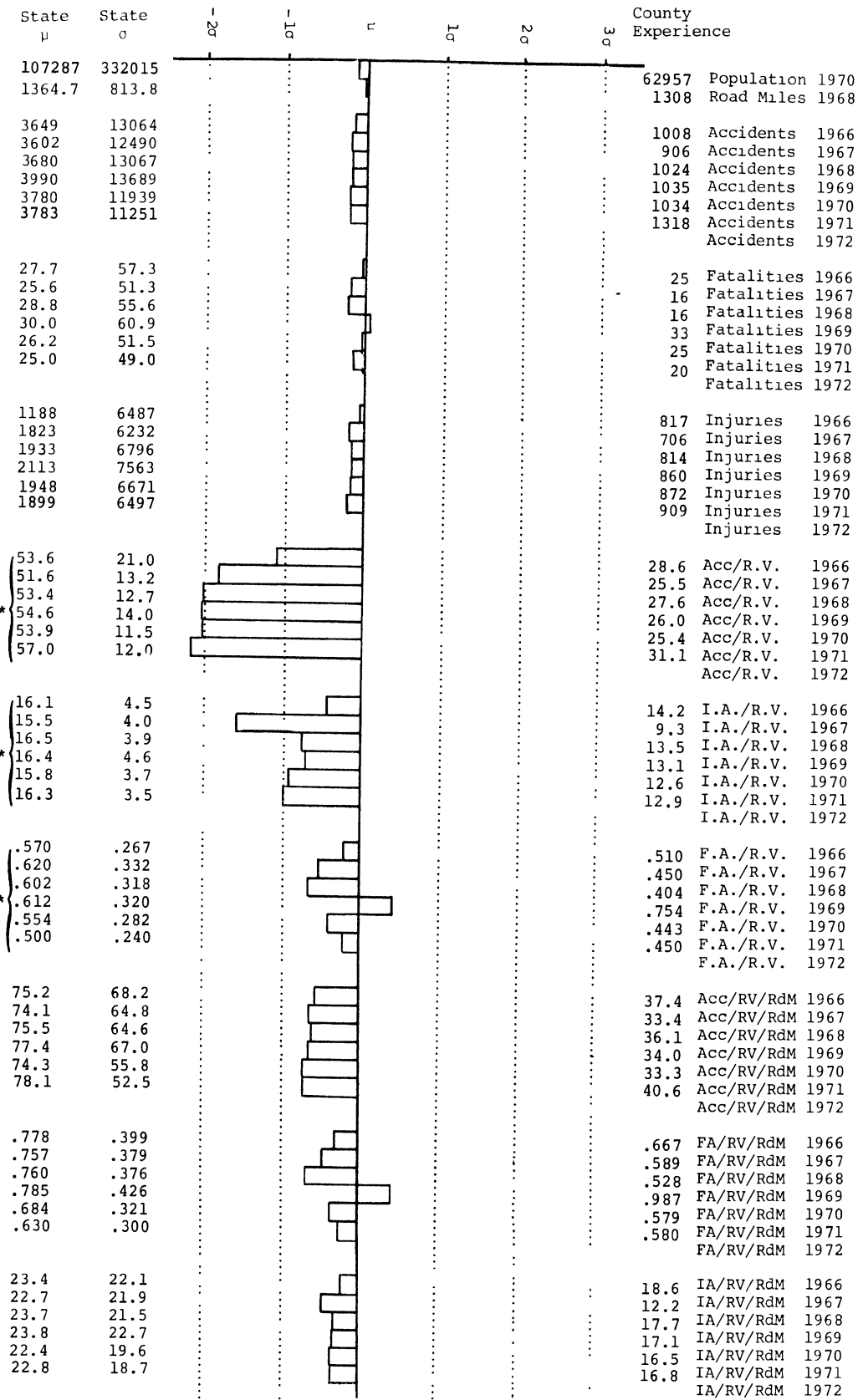


* Figures represent
actual value
times 10³

SAWILAC



* figures represent actual value times 10³



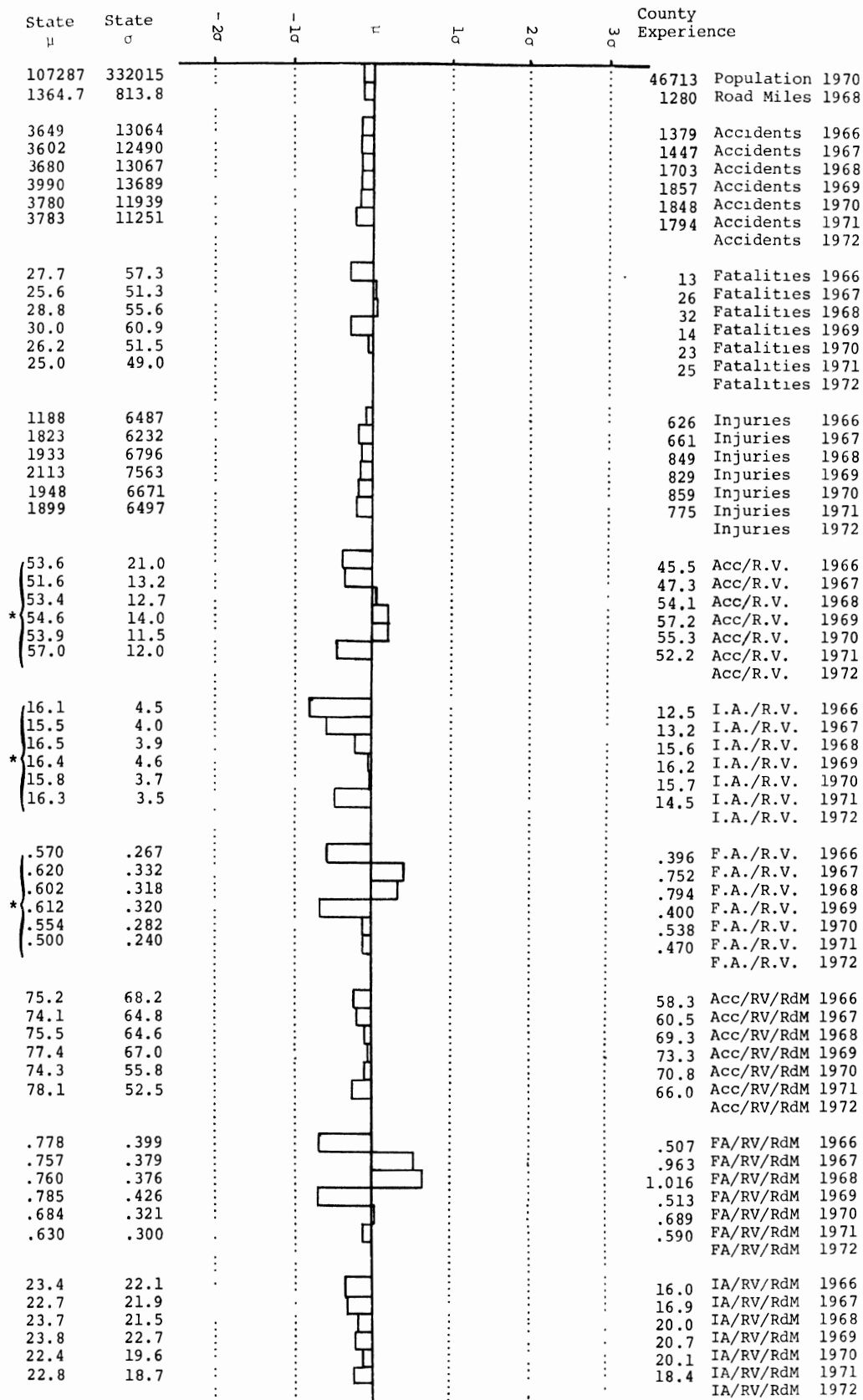
*Figures represent actual value times 10³

SHIAWASSEE

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	County Experience
107287	332015							118776 Population 1970
1364.7	813.8							1967 Road Miles 1968
3649	13064							4158 Accidents 1966
3602	12490							4212 Accidents 1967
3680	13067							4410 Accidents 1968
3990	13689							4554 Accidents 1969
3780	11939							4244 Accidents 1970
3783	11251							4361 Accidents 1971
								Accidents 1972
27.7	57.3							42 Fatalities 1966
25.6	51.3							35 Fatalities 1967
28.8	55.6							55 Fatalities 1968
30.0	60.9							46 Fatalities 1969
26.2	51.5							36 Fatalities 1970
25.0	49.0							33 Fatalities 1971
								Fatalities 1972
1188	6487							1923 Injuries 1966
1823	6232							1973 Injuries 1967
1933	6796							1963 Injuries 1968
2113	7563							2145 Injuries 1969
1948	6671							1826 Injuries 1970
1899	6497							1963 Injuries 1971
								Injuries 1972
53.6	21.0							66.3 Acc/R.V. 1966
51.6	13.2							66.7 Acc/R.V. 1967
53.4	12.7							66.7 Acc/R.V. 1968
* 54.6	14.0							64.3 Acc/R.V. 1969
53.9	11.5							58.6 Acc/R.V. 1970
57.0	12.0							57.6 Acc/R.V. 1971
								Acc/R.V. 1972
16.1	4.5							18.2 I.A./R.V. 1966
15.5	4.0							18.8 I.A./R.V. 1967
16.5	3.9							18.4 I.A./R.V. 1968
* 16.4	4.6							18.5 I.A./R.V. 1969
15.8	3.7							16.3 I.A./R.V. 1970
16.3	3.5							16.3 I.A./R.V. 1971
								I.A./R.V. 1972
.570	.267							.574 F.A./R.V. 1966
.620	.332							.522 F.A./R.V. 1967
* .602	.318							.650 F.A./R.V. 1968
.612	.320							.578 F.A./R.V. 1969
.554	.282							.427 F.A./R.V. 1970
.500	.240							.400 F.A./R.V. 1971
								F.A./R.V. 1972
75.2	68.2							130.4 Acc/RV/RdM 1966
74.1	64.8							131.2 Acc/RV/RdM 1967
75.5	64.6							131.1 Acc/RV/RdM 1968
77.4	67.0							126.4 Acc/RV/RdM 1969
74.3	55.8							115.2 Acc/RV/RdM 1970
78.1	52.5							114.2 Acc/RV/RdM 1971
								Acc/RV/RdM 1972
.778	.399							1.129 FA/RV/RdM 1966
.757	.379							1.027 FA/RV/RdM 1967
.760	.376							1.279 FA/RV/RdM 1968
.785	.426							1.138 FA/RV/RdM 1969
.684	.321							.840 FA/RV/RdM 1970
.630	.300							.790 FA/RV/RdM 1971
								FA/RV/RdM 1972
23.4	22.1							35.8 IA/RV/RdM 1966
22.7	21.9							37.0 IA/RV/RdM 1967
23.7	21.5							36.2 IA/RV/RdM 1968
23.8	22.7							36.4 IA/RV/RdM 1969
22.4	19.6							32.1 IA/RV/RdM 1970
22.8	18.7							32.3 IA/RV/RdM 1971
								IA/RV/RdM 1972

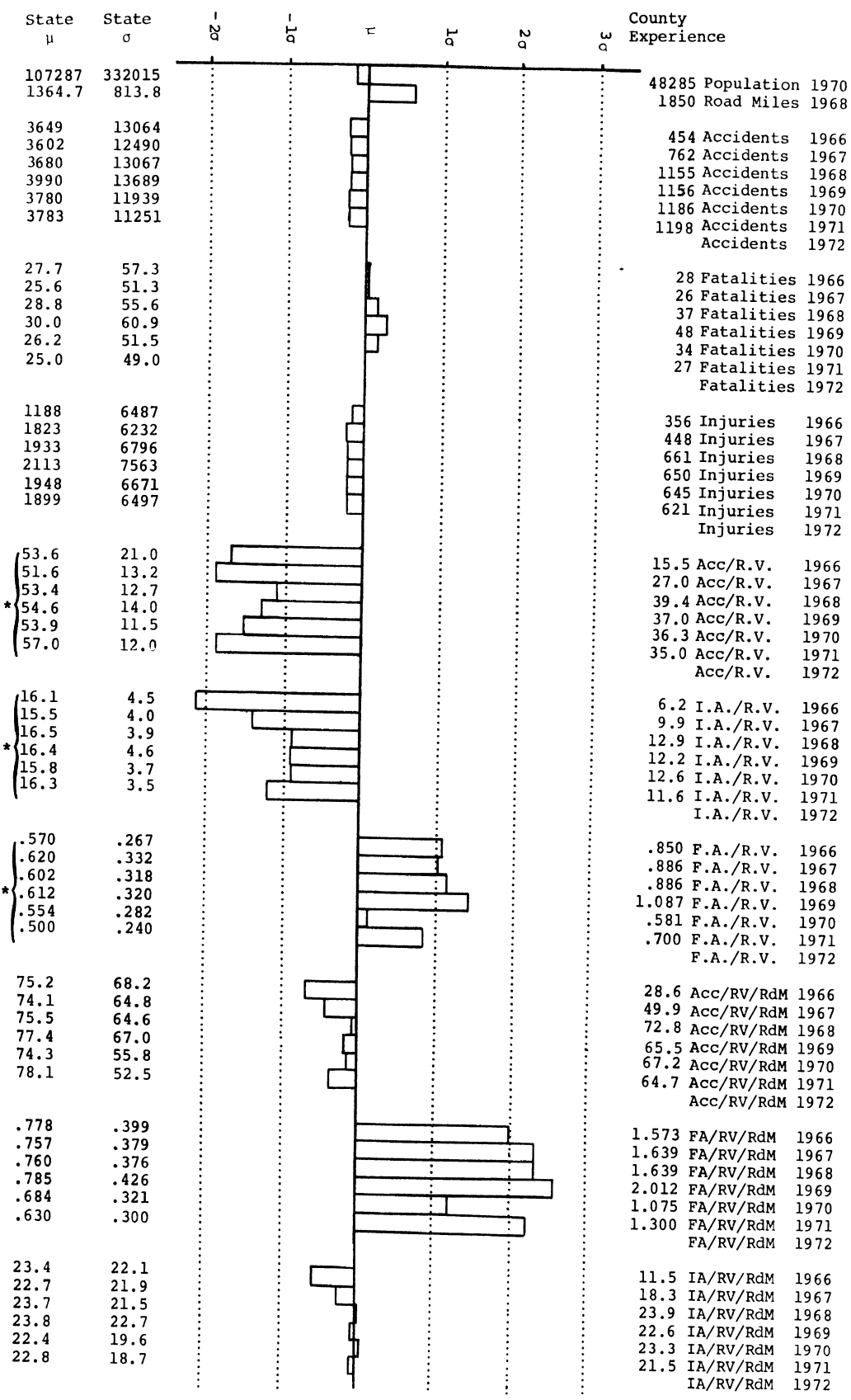
* figures represent actual value times 10³

ST. CLAIR



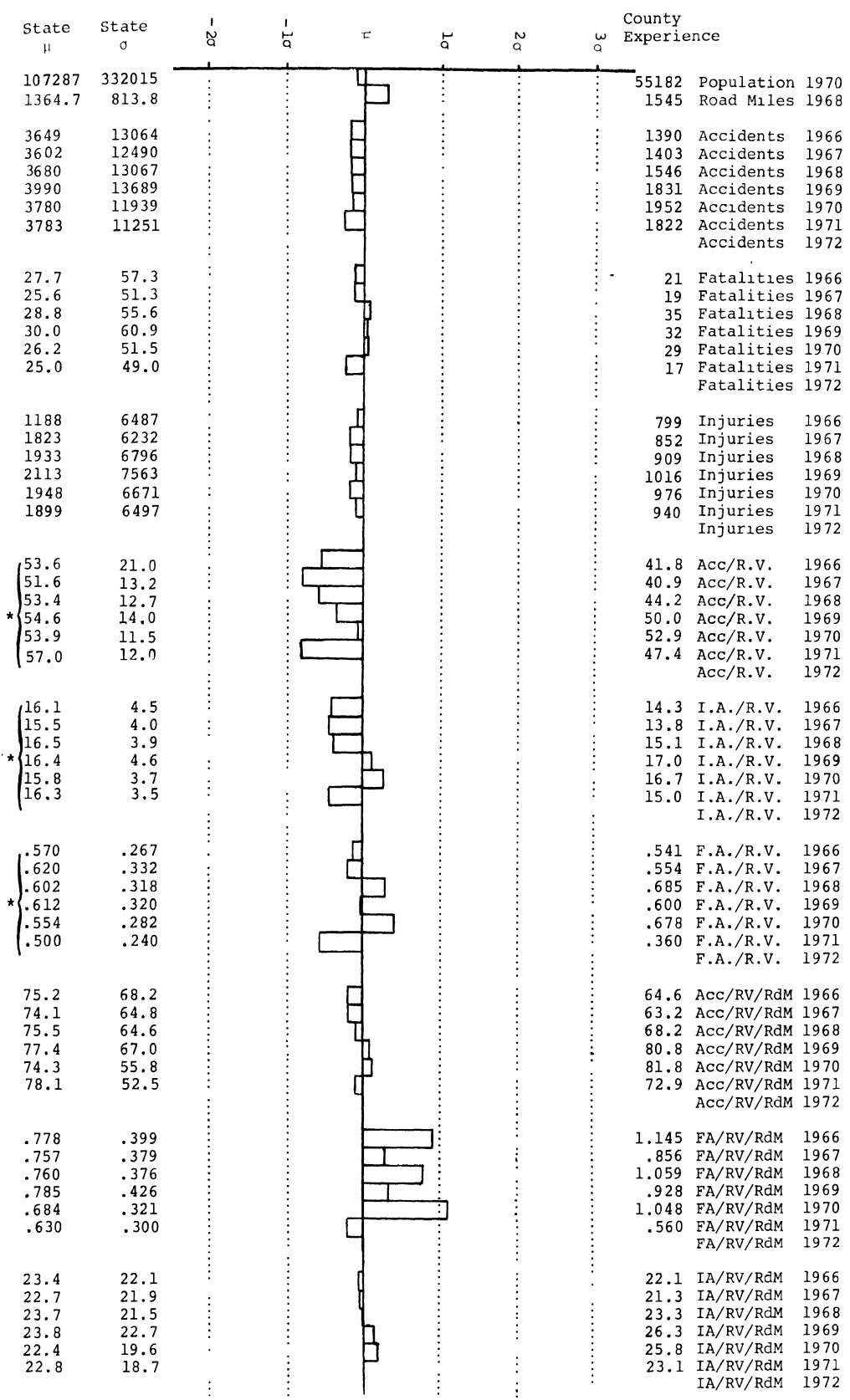
* Figures represent actual value times 10³

ST. JOSEPH

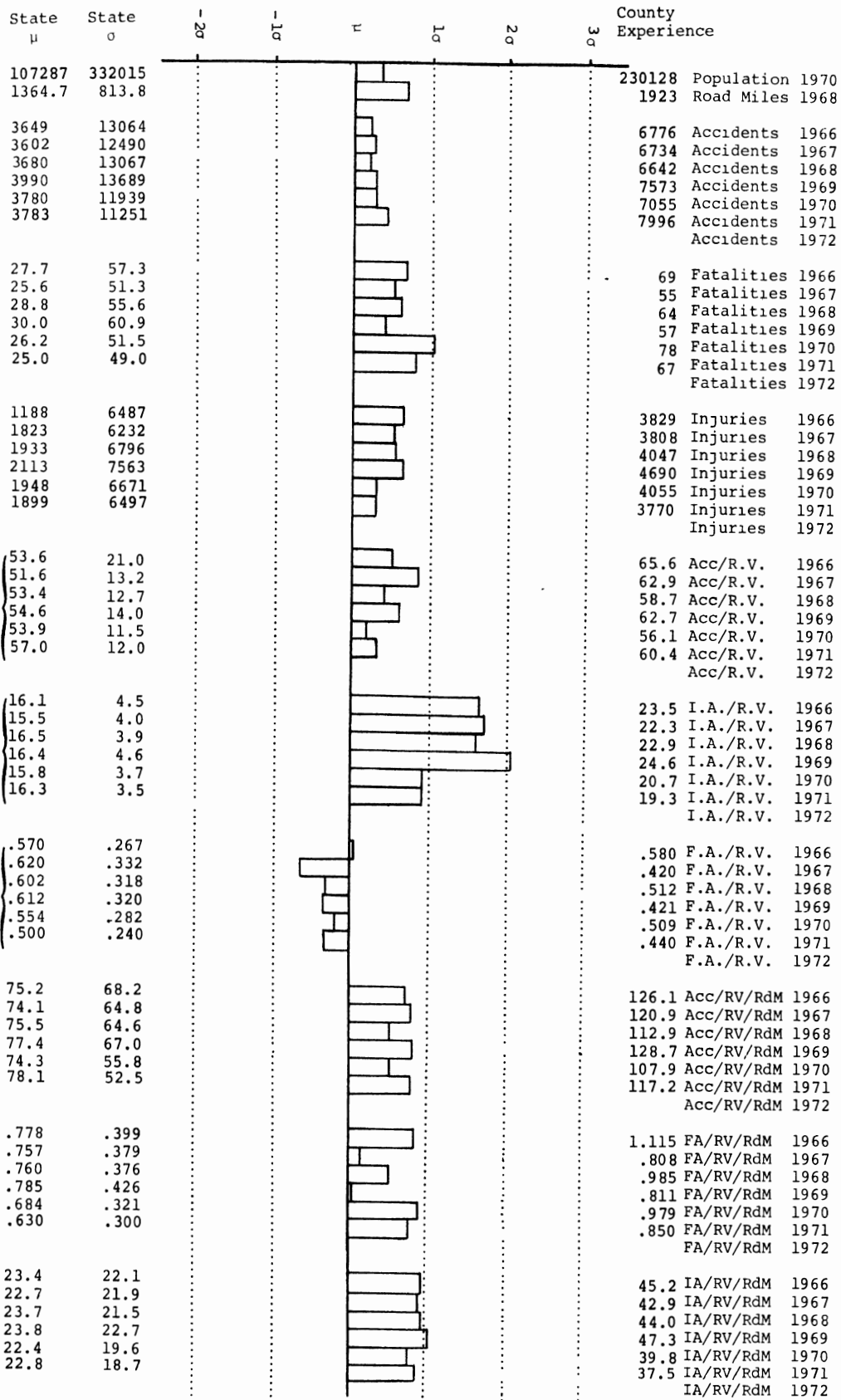


*figures represent actual value times 10³

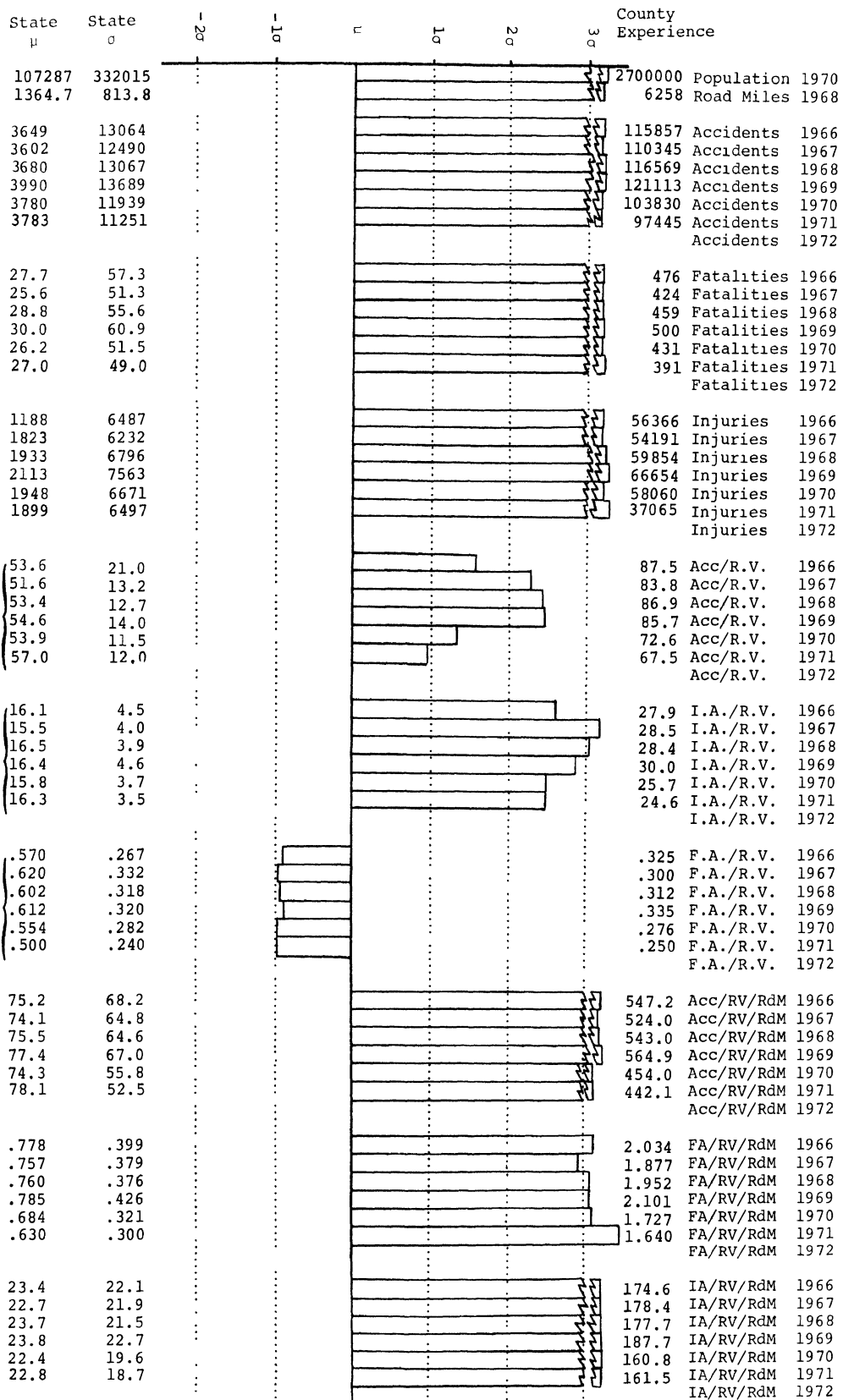
TUSCOLA



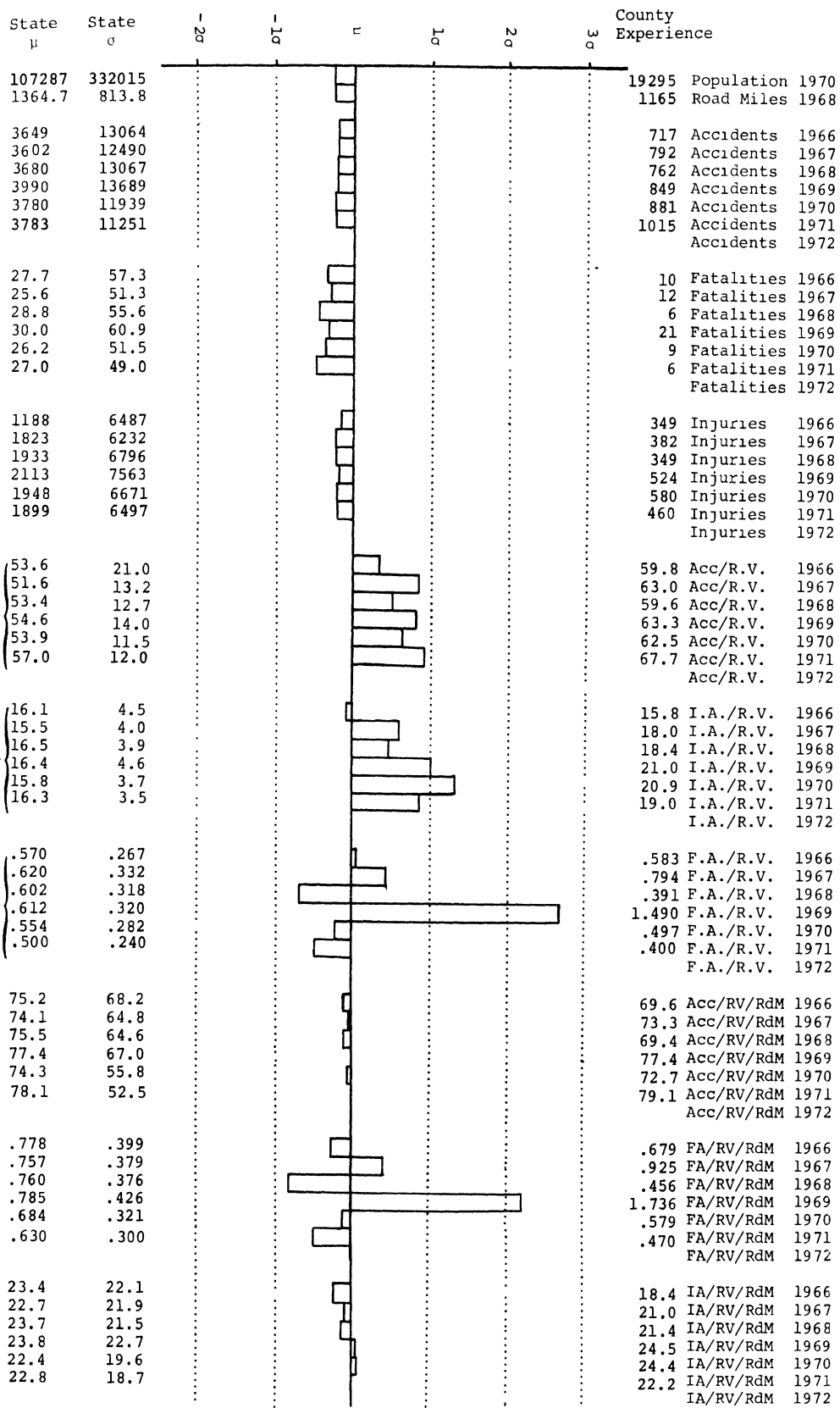
* figures represent actual value times 10³



*figures represent actual value times 10³



* figures represent actual value times 10³



*figures represent actual value times 10³

