THE EFFECT OF SELECTIVE ENFORCEMENT ON RURAL TRAFFIC FATALITIES IN SEVERAL MICHIGAN COUNTIES

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

College of Education

1974

ACKNOWLEDGMENTS

This dissertation could not have been made possible without the cooperation and assistance of many individuals.

I first would like to thank my doctoral committee for their able guidance throughout my participation in the program. A special thanks is in order for Dr. Robert Gustafson, chairman of the committee and Associate Professor, Michigan State University, Highway Traffic Safety Center, for his special attention to the details required in the writing of this manuscript. I'm also very mindful of the consideration and, especially, the encouragement that I received from Professors William Mann, College of Education, Michigan State University, and Robert Nolan, Michigan State University, Highway Traffic Safety Center, throughout my years as a student. I'm indebted to Dr. Victor Strecher, Professor, School of Criminal Justice, Michigan State University, for his counsel and encouragement to begin graduate study and for his repeated expressions of interest in my progress.

I also want to express my gratitude to Dr. William Pollock, Research Psychologist, Highway Safety Research Institute, the University of Michigan, for his invaluable guidance and counsel throughout my program. He has been most helpful as a constant influence to apply my academic training to my career work.

I am of course grateful for the cooperation of the Director of the Michigan State Police, Col. John R. Plants, who has been

particularly helpful to insure that this dissertation got completed. Also Lt. Zane Gray of the Michigan State Police, who so willingly cooperated in the production of data information concerning the individual counties contained in the discussion section of Chapter V, and for his able leadership in overseeing the executing of this demonstration project.

Thanks are in order for a group of four clerical staff who worked so hard to assist me in the production of this dissertation. To Mrs. Raymond Bennett, Sandy Bennett, Mrs. Frances Miller, and Dolores Nouhan, I will always be indebted for their assistance.

Last, but not least, to my family for tolerating a student who works full time and has considerable travel commitments. It would not have been possible to complete this important enrichment program without the constant encouragement of my wife Nancy and the interest and support of my children, Kevin, Lynn, Bruce, and Carol.

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CHAPTER I

THE PROBLEM

The police traffic services function is an important sub-system of any police operation. Although its prominence might vary from one agency to another, some degree of service to the motoring public is being rendered by all police agencies.

One of the principal reasons that police traffic services, as an integral portion of a police mission, vary so drastically from community to community is because there is little known about the relationship of the service and the results it produces in terms of crash reduction.

It seems appropriate that before investigating a very specific aspect of the police traffic services, namely, selective enforcement, that a brief examination be made of the extent of the traffic accident situation and the traffic safety system which is designed to provide safety for the motoring public. This review will sort out societal roles and responsibilities and help structure the evaluation process that is developed in this presentation.

Traffic Accident Situation

It seems that too few really understand what the traffic accident situation is all about. Not too many Americans understand that on an average day, the highway casualities in the United States

total over 10,000 injured.[1] Too few realize that these traffic accidents account for more than 1,000 deaths weekly across this nation and result in approximately $2 billion loss each month. Americans are still killing and maiming themselves on highways in large numbers as has been experienced in past years. This is particularly distressing as one observes the increasing trends in vehicle miles traveled, total vehicles registered, and numbers of licensed drivers; increases that will result in an increase in the numbers of traffic crash deaths if history continues to repeat itself in the future. Yet, somehow, this pressing problem, which afflicts great numbers of people in this country, still does not seem to get through to the thinking and emotions of most Americans or to generate social concern which this unpleasantness clearly deserves.

Specifically, motor vehicle deaths continued their rise in 1972 and reached an estimated total of 56,600 which surpassed the death figure of American lives lost in the whole of the Viet Nam war. This was the highest annual toll on record, surpassing the previous high of 55,791 in 1969.[2]

The grim statistics unmistakable highlight that in motor vehicle deaths the nation faces a destructive problem equal in size and complexity to other social ills such as crime, disease, and poverty:

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[1]William Haddon, Jr., "Address Before Association of Minnesota Counties," U.S. Department of Transportation, National Highway Safety Bureau, November 28, 1967, p. 1.

[2]"Accident Facts 1973 Edition," National Safety Council, 425 N. Michigan Avenue, Chicago, Illinois, 1973, p. 12.

> Highway injuries exceed by 10 times all violent criminal acts combined, including homicides, armed robbery, rape, riot, and assault.
>
> Motor vehicle crashes rob society of nearly as many productive working years as heart disease and of more than are lost to cancer and strokes. Only about 1 of 5 expected man years of life lost to heart disease is in the age interval between 20 and 65; in contrast, 7 out of 10 man years lost to motor vehicle deaths are in the productive years between 20 and 65.[3]

The dimensions of the problem extend beyond the death and injury totals, for each American family also suffered an average financial loss estimated at $291 as a result of highway crashes in 1968--a total loss of almost $15 billion.[4]

What further complicates the traffic safety problem is that one is not dealing with a situation so divorced from other things that it can be solved with parochial efforts and understanding which has, for over 60 years, constituted the total response and which has accounted for almost 2,000,000 highway dead.[5] The problem needs to be viewed, not as a matter in isolation from the rest of human affairs, but as having such a close relationship with other contemporary issues that it can be dealt with properly only in a much broader context than has traditionally been the case.

Consider a few illustrations:

1. The continuing tragic and large contribution of alcoholics and other heavy drinkers to highway crashes, especially to the most severe ones, must be approached in terms of the location and treatment of the alcoholic and other problem drinkers in society in general, and not exclusively in terms of their behavior on the highway, either as drivers or as pedestrians.

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[3] "Administration of the National Traffic and Motor Vehicle Act," Message from the President of the United States, U.S. Government Printing Office, Washington, D.C., 1969.

[4] Ibid., p. 3.

[5] Haddon, op. cit., p. 3.

2. The problem of the teenagers, of young men of high school and college age who are crashing as the result of drinking and other teenage behavior must be considered in the context of the overall behavior of the young, and not only as a problem in relation to the highway.
3. The deaths of children playing under the wheels of cars reflect our failure to plan our communities with suitable, neighborhood play areas, not to mention our failure to provide care for the children of working and otherwise occupied mothers who cannot properly supervise their children.
4. The deaths of so many of our elderly pedestrians reflect our failure to provide environments for them which are sheltered in much the same way as those we need for our children. Yet here, too, we seldom think in urban planning of the inevitable results over many decades of interlacing the paths of everyday pedestrian activity and those of moving traffic.[6]

This broad understanding of the highway safety problem is an important consideration in attempting to cope with it and one that should be taken into account in the decision making process to more fully optimize the utilization of available resources.

The Traffic Safety System

The traffic system is organized to permit the movement of people and goods for the satisfaction of a variety of individual needs, both commercial and private. Traffic safety is one very general measure of the effectiveness of the traffic system.[7] If one understands how individual cars and people perform in this system, then what happens when there is a breakdown can be considered next.

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[6]William Haddon, Jr., "The National Highway Safety Program--18 Months Later," Driver Behavior, Cause and Effect (Washington, D.C.: Insurance Institute for Highway Safety, March, 1968), p. 14.

[7]James O'Day, Systems Analysis and the Driver," Driver Behavior, Cause and Effect (Washington, D.C.: Insurance Institute for Highway Safety, March, 1968), p. 88.

The problems of highway safety improvement are far more complex than many early investigators recognized. This complexity is due to at least three major factors:

1. A large number of variables influencing highway safety.
2. A complex and, in most cases, unknown relationship among these variables and between these variables in safe performance.
3. The fact that both these variables and functions vary probabilistically over time.

Because of the complexity of the traffic safety problem, it has become important to structure it in the context of a system. This system approach allows for breaking down the complex problem of traffic safety into component parts which are more amenable to scientific inquiry. In addition, it also provides the basis for investigating the interrelationships that exist betwen component parts of the traffic system and for then allocating resources to meet the specific problems identified in the system.[8]

The problem of highway safety divides logically into three parts. These parts are commonly referred to as the pre-crash, crash, and the post-crash phases.[9] In the pre-crash phase, the issues are those which determine whether or not a crash takes place. In this phase, concern is with those elements of the system which are designed to prevent accidents; i.e., design of programs for the drunken driver; designing into the highways adequate signaling, markings, and signing

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[8]William Hall and William Carlson, Highway Safety Project Evaluation Methodologies, Highway Safety Research Institute, December 31, 1968, pp. 29-30.

[9]Haddon, "National Highway Safety Program," op. cit., p. 3.

systems; and inclusion of those measures which can be taken to influence driver behavior to circumvent the tragedy of the next phase which is the crash phase.

In the crash phase, the concern is with the circumstances in the crash itself which determine whether or not any injuries occur and, if so, their severity. Here the success of the vehicle package in protecting its occupants is of paramount importance. Also important is the success of the highway designer in providing the safest possible highway crash design of the road, for example, by insuring that vehicles that do leave the roadway will not hit solid objects that decelerate them too abruptly to allow the survival of those involved.

In the post-crash phase, concern becomes whether or not many will live or die. Here the principal issues involved are the rapidity and quality of the post-accident response, the accident detection and communication systems efficiency, emergency transportation, the provisions of the best in first aid and medical care, and the protection of the crash site to preclude it from causing further crashes.

To complete the matrix of arranging highway safety in some systematic fashion, one must also look at other dimensions of the problem. It is necessary to look at the elements that make up the basic traffic safety system. The first of these is the VEHICLE which is the projectile which flows through the highway and street system. The concern with the vehicle is to insure that measures be instituted to make the vehicle safe from mechanical breakdown and also crashworthy in the event that it becomes involved in a collision.

The second basic element involved in the highway safety system is the ENVIRONMENT on and through which the vehicle travels. In addition to the highway and street network system itself, this element includes such other things as the signs, markings, and signals which direct the vehicle in a safe manner through the system and the maintenance for upkeeping the condition of the highways. It is also important in examining the environmental system that crash locations be analyzed and defects that might be contributing to accidents be corrected.

The third basic element in the highway safety system and, perhaps, the most important, is the DRIVER himself. Here one becomes involved directly with the matter of human behavior and those things which are instituted as traffic accident counter measures to more properly identify the behavior traits which are most desirable to be operating in the highway safety system and suppress those that are not. Such activities as driver education, driver licensing and testing, pedestrian and passenger and safety education, and traffic law enforcement all constitute activities which attempt to deal with developing and molding human behavior. These activities are designed to better prepare drivers to deal with situations that they will encounter while traveling on the highway system. A more detailed development of the highway safety system matrix is presented in "A Relevant Methodology for Aiding Highway Safety Decision Makers in Resolving Highway Safety Problems."[10]

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[10]Noel C. Bufe, "A Relevant Methodology for Aiding Highway Safety Decision Makers in Resolving Highway Safety Problems," M.S. thesis, Michigan State University, 1971.

Analytical tools presently at hand for resolving highway safety problems in the area of the vehicle and environment are adequate to protect highway traffic safety administrators from any generally bad and expensive ventures because they are dealing with relatively stable physical factors in these highway safety sub-systems. When human beings, the drivers and pedestrians, are involved, the situation is not nearly so clear.[11] The interface with humans in the highway traffic system is complex and requires more than physical engineering solutions alone can offer.

The traffic safety system is complex and the technology scarce that delineates how all the component parts interrelate. Even within the police traffic services functional sub-system, available information indicates a lack of conclusive evidence that supports the relationship betwen police traffic services and, more specifically, the effects of selective enforcement on the traffic crash problem. The literature points to only one quantitative research study, "Operation 101, An Accident and Enforcement Study," that shows a statistically significant reduction of accidents where sufficient control of those factors that potentially influence the occurrence of an accident was present.[12] Figure 1 illustrates well the complexities of the police traffic services function which includes selective enforcement (selective location patrol) as just one component part. The unequivocal demonstration of causal connections between selective enforcement

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[11] O'Day, op. cit., p. 92.

[12] Edward F. Fennessy, Jr., et al., The Technical Content of State and Community Police Traffic Services Programs (Hartford, Conn.: Travelers Research Center, Inc., September, 1968), p. xviii.

1. Traffic Control and Direction

   a. Intersection control
   b. Parking control
   c. Pedestrian control
   d. Traffic management
   e. Public contact
   f. Escort
   g. Event control
   h. Hazard control
   i. Temporary device control

2. Accident Management

   a. Initial investigation
   b. Follow-up
   c. Traffic control
   d. Injury control
   e. Enforcement
   f. Records/reports
   g. Notification

3. Law Enforcement

   a. Line patrol
   b. Area patrol
   c. Selective location patrol
   d. Records/logistics
   e. Maintenance

4. Ancillary Services

   a. Giving information
   b. Aiding disabled motorists
   c. Emergency services
   d. Hazard removal
   e. Inspection
   f. Auto theft control
   g. Abandoned car control
   h. Missing property control

5. Support

   a. Administration
   b. Planning/budgeting
   c. Office management
   d. Personnel management
   e. Research/analysis
   f. Public information
   g. Training
   h. Communication
   i. Transportation
   j. Records/identification
   k. Facilities
   l. Property control
   m. Supply equipment
   n. Laboratory
   o. Other technical

6. Interaction

   a. Court duties
   b. Serving notices
   c. Criminal control
   d. Detention activities
   e. Transportation

7. Regulatory Activities

   a. Driver licensing
   b. Vehicle registration
   c. Vehicle inspection
   d. Weight control
   e. Carrier regulation
   f. Commercial regulation

Figure 1.--Police Traffic Functions and Subfunctions.

practices and a measured change in the accident experience continues to be of critical importance to the police administrator.

The basic difficulty is that any specially designed police operational tactic cannot be applied in isolation. Rather, the practice is usually operated coincident with other events and activities known, or believed, to be correlated with accident experience such as traffic volume, weather conditions, roadway characteristics, and a host of other conditions.

The Problem

Specific Statement of the Problem

The purpose of this investigation is to demonstrate and evaluate, in an operational environment and under controlled conditions, the efficiency and effectiveness of a sustained project applying the principles of selective traffic law enforcement to the reduction of fatal traffic crashes. The basic question to be resolved is whether or not selectively applied police resources have a significant impact on the reduction of the traffic fatality crash problem.

Theory of Study

Although there is no conclusive evidence, there is fairly general agreement that a reduction in aberrant or unsafe driving behavior will result in a reduction in traffic accidents and that enforcement of traffic laws and codes does result in some decline in unsafe driving.[13] Many police administrators, for example, contend

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[13]James E. Wilson, "Selective Traffic Enforcement Program (STEP)," U.S. Department of Transportation, National Highway Traffic Safety Administration, Washington, D.C., February 18, 1971, p. 2.

that increased or improved enforcement measures will mean fewer accidents, based on the premise that many accidents are caused by drivers who do not obey traffic laws and codes. The presence of police or other methods of surveillance should therefore detect those who through choice or low capability do not obey traffic laws so that remedial action can be taken. However, such generalizations are based more on expert judgment than on empirical evidence.

Additional empirical information is required to aid in solving decision problems such as the proper amount and allocation of resources which should be devoted to enforcement activity.[14] For example, although data obtained from police records indicate that violations were inferred in 92% of the accident investigations reported by them, it is not known with any certainty the extent to which environmental conditions and controls imposed by man contribute to aberrant driver behavior, nor the degree of interplay among these factors in generating specific types of accidents. Concomitantly, there is not sufficient information on what effects specific amounts and types of enforcement activity have on specific types of good and bad driving behavior.

Despite this uncertainty, state and local governments are investing huge amounts of money in traffic law enforcement. Substantial federal funds are being spent through the National Highway Traffic Safety Administration's State and Community Highway Safety Programs. This vast sum of resources is allocated among competing

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[14] Ibid.

enforcement activities without the benefit of sound information on anticipated effectiveness of these expenditures.[15]

Fully controlled demonstrations based on a sound analytical framework with reliable and meaningful data are required before progress can be made on methods and strategies for allocating traffic enforcement resources in an optimal manner.

Importance of the Study

The purpose in focusing on the police traffic services responsibilities of the police administrator's duties is to bring emphasis to this much neglected matter. A review of the facts quickly reveals the great losses suffered by society as a result of traffic accidents, yet in discussions with many police administrators, and with police administration academicians as well, there seems to be a tendency to consider this problem with very little regard. It is the writer's position that a police official is charged with protection of life, regardless of the means by which hurt is inflicted, be it an automobile or a weapon of some other variety. This apathy toward traffic prompted the writer's interest in pursuit of this investigation. It is intended that the arguments will be stronger upon the conclusion of this effort to influence these important officials to modify their attitudes about their responses to the traffic accident problem.

The police administrator should also appreciate, from an examination of the traffic safety problem, that it does encompass the

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[15] *Ibid.*

involvement of many other resources of the community and, additionally, that accidents are very often caused by matters over which the administrator has no direct control. The Traffic Safety System section presented earlier in this chapter illustrates this point clearly. This fact is important, and again this is the primary purpose of this investigation: to analyze an important police operational tactic believed to have high potential for accident reduction. Too frequently police administrators assume responsibility for control over matters for which the administrators should not be held accountable in total. When this occurs other more police-oriented missions will not be addressed. Oftentimes this turns out to be the police traffic mission and, in particular, the application of selective enforcement practices.

The police administrator has traditionally been charged with a very wide range of responsibilities dealing primarily with problems of human behavior and most often with those who deviate from norms established by the society in which the administrator serves. In the past, police administrators have given priority to those responsibilities related to crime. His role in controlling the community's traffic accident situation has been given considerable less attention or emphasis. Until the police administrators are shown scientifically the benefit of applying police resources to the traffic problem, it can be expected that public pressure will continue to influence them to give priority attention to problems drawing greater limelight. In spite of the historical lack of evidence to support scientifically the effects of selective enforcement in the reduction of traffic fatalities, the writer is of the belief that a properly executed

selective enforcement program can have an immediate and significant impact on the traffic fatality problem. Further, it is believed that traffic safety requires the combined services of many community agencies to sustain a successful traffic safety program over the long duration. It is important to be in a position to identify the effects of the several traffic accident countermeasures and analyze their various contributions toward the resolution of the traffic crash problem in both the immediate and long range future and then arrange to apply them accordingly. Hopefully, this investigation of the selective enforcement countermeasures will add some limited technology to promote this general objective.

Scope of Study

The independent variable of selective enforcement was applied experimentally in rural areas of six counties in the state of Michigan. The duration of the experiment was five months--August, 1972, through December, 1972. Experimental counties for the study were Berrien, Tuscola, St. Clair, Hillsdale, Cass, and Eaton. Other commonly known traffic accident countermeasures, i.e., driver education, traffic engineering service, pedestrian safety, etc., while present in various degrees, were not introduced as component features of this study.

Study Design

Experimental counties were carefully selected to represent areas of the state where the rural traffic fatality problem was acute and where necessary supporting services could be secured. Control counties were selected that closely resembled characteristics of the

experimental counties. Accident experience was analyzed during the period of the experiment in both the control and experimental counties to observe if the independent variable caused a significant change in accident experience in the experimental counties. Pre- and post-experimental analysis was also completed for both groups of counties as an additional control measure. The independent variable was applied on weekends only. This offered an additional control of observing accident experience in the experimental counties while under treatment and while not.

Definition of Terms

Selective enforcement: Enforcement measures proportional to the traffic accident experience, with respect to time, place, and type of violation.

Enforcement index: Convictions with penalty paid for hazardous traffic law violations per motor vehicle traffic accident resulting in injury or death.

Casualty accident: Any accident which results in a death or injury to a person.

Personal injury: Any bodily harm received by any person in a motor vehicle traffic accident.

Police traffic services: (Synonymous with police traffic supervision.)

Police traffic supervision: Keeping order on streets and highways within existing regulations, to make their use safe and expeditious. Traffic supervision is essentially the traffic work of

police agencies. It has three main direct functions which require police powers:

1. Police traffic accident investigation.
2. Police traffic direction.
3. Police traffic law enforcement.

Citation or arrest rate: Drivers cited or arrested for a traffic offense per 100 cases known.

Fatal accident: Any motor vehicle or other road vehicle accident that results in fatal injuries to one or more persons.

Fatality: (Synonymous with fatal injury.)

Fatal injury: Any injury that results in death within twelve months of the motor vehicle traffic accident.

Hazardous traffic law violations: Violations of any law, ordinance, or regulation affecting the use or protection of streets or highways enacted primarily to regulate safe movement of vehicles and pedestrians. There are two general kinds of these:

1. Unsafe behavior--An action or omission in traffic which is hazardous even when vehicles, streets or highways, and people involved are in legal condition.

2. Unsafe condition--Causing or permitting an illegal and possibly hazardous condition of:

   a. A driver or pedestrian in traffic.
   b. Streets or highways used by traffic.
   c. Vehicle used in traffic.

Other traffic law violations: Violation of any law, ordinance, or regulation affecting the use of protection of streets or highways but not enacted primarily to regulate safe movement of vehicles and pedestrians.

Injury severity of accident: The most severe injury to any person in the accident according to the classification of severity of

motor vehicle traffic accident injuries. Application of this classification gives the following categories of accident severity:

a. Incapacitating injury accident.
b. Nonincapacitating evident injury accident.
c. Possible injury accident.

Traffic accident countermeasure: Any effort to remedy the traffic crash problem.

Traffic safety sytem: The supporting services which provide for the safe movement of goods and people on our highways.

Motor vehicle traffic accident: Any motor vehicle accident that occurs on a trafficway or that occurs after the motor vehicle runs off roadway but before events are established.

Traffic crash: (Synonymous with motor vehicle traffic accident.)

Dissertation Overview

Isolating the problem to be investigated in a system as complex as traffic safety is vitally important prior to design of a methodology to observe the effect of change introduced to the existing system. In Chapter I, the structure of the problem to be investigated has been identified, as has its relationship to the traffic safety system as a whole. In Chapter II, pertinent literature is reviewed dealing specifically with that aspect of the police activity which bears on the cause/effect relationship between police enforcement and accident reduction. This review will be supported with empirical experience that has not been formally documented, yet offers considerable incentive to pursue the investigation of the study hypothesis.

Chapter III deals with the methodology used in conducting the experiment. Design considerations are explained along with the strategies that describe exactly what was done during the course of the experiment.

In Chapter IV, the data that were collected are presented, along with the findings produced by the analysis of the information. The experimental hypothesis is considered in terms of acceptance or rejection. The significance of the findings is also addressed.

The concluding chapter is designed to collate the summaries of the investigation, discuss the implications of the results from the theory proposed, and to suggest an appropriate course of future research endeavors on this important subject matter.

CHAPTER II

LITERATURE REVIEW

Police Traffic Services Literature

It cannot be said with any truth that police traffic functions are ill-understood because they have not been written about. Quite the contrary--even a cursory look at the holdings of any moderate-sized library will turn up hundreds of books, reports, and articles treating some aspect of police traffic services. The real problem, however, is in trying to make some composite sense out of the myriad of forms and locations in which these individual bits of literature or information exist and, more particularly, to identify those aspects of the police traffic services function that have a direct immediate influence on the traffic crash problem.

Over 300 individual literature citations were reviewed during the course of this investigation. After eliminating duplicates, earlier editions of the same book, speeches, periodicals of less than five pages, and citations which contained traffic operations information as a very subordinate topic, 136 references were identified as potential resources that might have relevance to this investigation. This global literature approach was undertaken to lessen the likelihood of overlooking any possible support for the study hypothesis. Presented in Table 1 is a tabulation that shows how many of those citations were concerned with each of an abbreviated list of police traffic functions.

TABLE 1.--General Characterization of Police Traffic Services Literature.

Function	Publications
General traffic functions	22
Traffic direction and control	6
Traffic Law Enforcement	
Policy considerations	10
Alcohol-related operations	28
Violation detection	14
Enforcement effectiveness	6
Selective enforcement (STEP)	6
Accident scene management	
Accident causation	17
Investigation	12
Support functions	
Records	3
Training	0
Administration	0
Service functions	
Public information	0
Motorist aid	0
Cooperative functions	
Safety education	0
Traffic engineering	6
Driver examination and improvement	0
Vehicle inspection	2
Adjudication	4
Total	136

It can be concluded from Table 1 that the literature coverage of the police traffic services function is spotty. Some functions, for example, alcohol related enforcement, are covered in many primary publications. Selective enforcement related subjects are treated in considerable detail, however, in a conceptual context. Conversely,

many other important traffic functions are not covered as primary literature subjects. Thus, users have to glean bits and pieces from various sources relative to their roles in traffic safety. Further, because it is not clearly understood, all functional aspects of police traffic services have to be studied in order to identify, if possible, those activities which relate directly or not to the subject of this investigation.

During the course of the review, it was interesting to note that much of the literature is written by researchers, apparently for other researchers. Two such reports came from the Indiana Institute for Research in Public Safety. Both of these report series dealt in a scholarly, complete way with police functions. One, by Joscelyn, was a magnificent treatise on the drinking driver problem, but translating the concepts and approaches proposed to operations is difficult for a layman to understand.[16] Similarly, the Indiana report on automated deployment of traffic police by Jones is fascinating, but only partially useful to some operations and then only after much deliberate translation to operational language.[17]

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[16] K. B. Joscelyn and R. K. Jones, "A Systems Approach to the Analysis of the Drinking Driver Control System," Indiana University Institute for Research in Public Safety, Bloomington, Indiana, consisting of vol. I, 117 pp.; vol. II, 92 pp.; and vol. III, 98 pp.

[17] R. K. Jones and K. B. Joscelyn, "Computerized Allocation of Police Traffic Services: A Demonstration Study," Indiana University Institute for Research in Public Safety, Bloomington, Indiana, 1972, 146 pp. Also, ref. vol. I, computer-sensor system description, 212 pp.; and ref. vol. II, accident data handbook, 240 pp.

Another persistent deficiency noted in the general literature review was the very deliberate limitations in individual reports. Most of the reports treated only one or a few of the many interacting functions that police operations must perform, leaving to the reader the job of building continuity between the separately described functions. For example, several reports detailed accident investigation functions, others discussed record functions, and several described violation detection functions, but few reports talked to the art of stringing together those functions for smooth sequences of mutually supporting operations. Much of that problem would be eliminated if some taxonomy of police functions, with function interactions described, were provided and appropriate documentation to support how such interaction can be predicted scientifically. Some reports provided beginnings for such a functional taxonomy, but are currently rather bare skeletons (IACP/1969;[18] Fennessey/1968[19]). Much additional work is needed to build that operational taxonomy, one use of which could be to provide a framework on which to hang the current and future literature fragments.

The literature research on the subject of police traffic services in this broad context produced no substantive documentation for support of the study hypothesis, but did provide extensive conceptual guidance and support for the proposition of the potential

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[18] Police Traffic Responsibilities, Manpower Requirements and Allocations--Distribution (Washington, D.C.: International Association of Chiefs of Police, 1969).

[19] Fennessey, op. cit.

benefit that could be expected from the proper allocation and deployment of police traffic resources.

Information Secured From Operational Records

Conclusions relative to the fragmentary, incomplete nature of the literature relevant to the study hypothesis refer to the published literature. A compounding frustration is that the actual state of the art of police traffic services is just not covered by that literature. An enormous volume of detailed information on innovative techniques and application of results resides in the files of state and local government agencies throughout the nation which have operated police programs under grant-in-aid provisions of Section 402 of the Highway Safety Act of 1966. That "buried" literature, while extremely pertinent and current, is not available to libraries and will not be digested and made available for general distribution for some time. This is an important factor to recognize, for it is theorized that this "buried" literature probably has significant relevant information on the specific subject being investigated. For example, in Michigan, seventeen selective enforcement projects have been implemented through the Office of Highway Safety Planning, Department of State Police, in various local communities resembling closely the design of the project described in this dissertation.[20] These projects were all associated with the expansion of existing manpower resources to form selective enforcement units to be deployed for traffic purposes only.

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[20]"Selective Enforcement Project Summary Report," Office of Highway Safety Planning, Michigan Department of State Police, Lansing, Michigan, no date, p. 1.

The governmental units that conducted these projects are as follows:

1. Clinton Township Police Department
2. Dearborn Heights Police Department
3. East Detroit Police Department
4. Farmington Police Department
5. Farmington Township Police Department
6. Flint Police Department
7. Fraser Police Department
8. Genesee Township Police Department
9. Holland Police Department
10. Kalamazoo Police Department
11. Kalamazoo Township Police Department
12. Royal Oak Police Department
13. Southfield Police Department
14. Sterling Heights Police Department
15. Taylor Police Department
16. Waterford Township Police Department
17. Westland Police Department

The primary purpose of these efforts was to develop and implement a selective enforcement program in each community which would produce a reduction of traffic crashes in each of the jurisdictions. For the most part, as the following data indicates, this goal was accomplished. In several areas, the results achieved were immediate and dramatic.

The overall impact of effect of these selective enforcement activities during the period 1969-1971, looking at 13 projects where comparable pre-treatment data were available and where an appropriate time frame existed, suggested a total of 71 fewer deaths during the period 1969-1971 based on projections from earlier years. Additionally, in these same 13 projects, there was an overall reduction in injury type crashes and property damage collisions.[21] A few examples are presented to illustrate these successful projects.

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[21] Ibid., p. 2.

In Dearborn Heights, the selective enforcement unit, even though in operation for only six months of 1971, was associated with a dramatic decrease in personal injury accidents. Personal injury accidents dropped from 1,023 to 759 even though the selective enforcement program had been in effect for only six months.[22] (See Table 2.)

In East Detroit the experience showed the project correlated with a continuing decrease in the total number of traffic accidents and in the number of injury accidents since the implementation of the selective enforcement project.[23] Total accidents dropped from 1,485 to 1,189 and personal injury accidents dropped from 501 to 381. The data are presented in Table 3.

In comparing the first twelve months of operation of the city of Farmington project (September 1, 1969, through August 1, 1970) with the twelve months prior, the enforcement index was raised from 16 to 28. The arrest rate at accidents was raised from 34% to 48%. A reduction of 53% in personal injury accidents and an 11% reduction in total accidents were experienced. The severity rate for type "A" injuries was reduced 21%. Drunk driving enforcement was raised 57.5% during the first twelve months of operation.[24]

The Selective Enforcement Unit of the Flint Police Department began field operations on November 23, 1969. Fatalities were reduced by 57% just one year after the initiation of the selective enforcement program, and total accident experience in the city was reduced by

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[22] Ibid., p. 4.

[23] Ibid., p. 5.

[24] Ibid.

TABLE 2.--Dearborn Heights Traffic Crash Data.

Year	Fatalities	PI	PD	Total	H.M.V.
1968	14	930	1,331	2,275	6,404
1969	2	950	1,449	2,401	6,476
1970	8	1,023	1,514	2,545	6,621
1971*	11	759	1,669	2,439	9,899

*Selective enforcement unit had been in operation for less than six months in the latter part of 1971.

KEY: PI--Personal injury accidents.
PD--Property damage accidents.
H.M.V.--Hazardous moving violations (citations)

TABLE 3.--East Detroit Traffic Crash Data.

Year	Fatalities	PI	PD	Injured	Total	H.M.V.
1969	4	501	980	817	1,485	6,378
1970	1	467	976	699	1,444	7,561
1971	4	381	804	570	1,189	7,774

KEY: PI--Personal injury accidents.
PD--Property damage accidents.
H.M.V.--Hazardous moving violations (citations).

approximately 22%. It was also noted that a reduction of crime occurred in the areas patrolled for detecting traffic violators. In Flint, this impact occurred within only one year after implementation and speaks to the immediate payoff potential of properly executed selective enforcement programs.[25] This project has been cited for its success by the National Safety Countil, Michigan Association of Chiefs of Police, and the U.S. Department of Transportation.

A similar story can be told for each of the 13 communities. Even though these experiences are considered success stores in the eyes of the practitioner, it must be realized that they represent operational efforts, not designed, controlled experiments. Nonetheless, the efforts did offer Michigan's law enforcement community and highway safety program planners some suggestive strategies for study and analysis and also encouragement for applying the selective enforcement technique in a rural environment, a primary focus of this investigation.

The experience in these communities, in fact, led to the development of the project which is the subject of this investigation. The design efforts in this study were constructed to eliminate, to the maximum extent possible, the shortcoming that the earlier 17 products had in terms of providing more information for measurement purposes. This demonstration program eventually led to a national program implementation by the National Highway Traffic Safety Administration in which each state was offered the opportunity to implement

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[25] Ibid., p. 7.

a similar selective enforcement program, commonly referred to as FARE (Fatal Accident Reduction Enforcement).

It is understood that many of these projects have been successful but, of course, are not available at this time in the literature. There are available, however, a number of research items related to the subject of this investigation which must not go unnoticed.

Research Literature on Selective Enforcement

In a significant study done on various highway safety countermeasures in 1966, it was concluded: "At present, there is no firm evidence to indicate the degree to which enforcement contributes to traffic accident prevention."[26]

In 1968, another very important study concluded:

> . . . that there are some, sometimes very strong, indications in the studies examined that police traffic law enforcement activities can reduce traffic accidents. However, there is no adequate quantitative and objective evidence currently available that would enable us to recommend any "optimal" or "desirable" levels of traffic law enforcement. . . .[27]

A more recent study conducted by researchers involved in the 1968 study cited above concluded:

> . . . that to evalutate the full effect of traffic law enforcement requires very sophisticated design and analysis. None of the studies reviewed did attempt to measure more

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[26]Arthur D. Little, Inc., The State of the Art of Traffic Safety (New York: Praeger Publishers, 1966), p. 251.

[27]Fennessy, op. cit., xviii.

> than a gross relationship between increased police activities and accidents, and their designs were inadequate to convincingly demonstrate any effect. The consistency of the apparent effects, however, suggested the existence of real effects.[28]

One of the better known studies on the subject of selective enforcement is based on a project entitled "Operation 101, An Accident and Enforcement Study." This study was conducted in California in 1964 to determine whether selective and concentrated enforcement would result in accident reduction. Although some of the findings have been disputed, the study did show a statistically significant decrease in injury accidents (20%) and a decrease in fatal and total accidents.[29] In another phase report of "Operation 101," it was learned that ". . . the three enforcement actions--arrests, verbal warnings, and mechanical warnings--and the officer's presence, as measured by in-view hours and total stops, were significantly related to accidents."[30]

"Operation 101" also produced the fact that a major contributor to accident frequency is rainfall. It was implied from this observation that motorists were driving legally and getting into accidents because legality was no longer synonymous with safety; or that the level of enforcement was reduced and, therefore, drivers violated

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[28]H. C. Joksch, A Comprehensive Search for Cost Effectiveness Data for Highway Safety Countermeasures (Center for the Environment and Man, December, 1972, NTIS-DOT-HS-800-803).

[29]James E. Wilson, "Selective Enforcement Program," National Highway Traffic Safety Administration, February, 1971, p. 3.

[30]"Operation 101, Final Report, Phase IV, Part, 2, Relationships," State of California, Department of California Highway Patrol, April, 1972, p. 4.

more and became involved in accidents.[31] Further, it was learned that ". . . speeding, as an accident cause, was reduced by nearly half and, at the same time, 40% of the total arrests were for speeding."[32] Also, the midnight shift was the most successful with a statistically significant decrease over the entire roadway.[33] Paramount to the Michigan experimental study described in this dissertation, was the finding in the "101 study" that during the weekday, there was no significant decrease in accidents, while for the weekend, there was a statistically significant reduction in accidents. Further, relating weekday-weekend to shift, it can be concluded that the most significant results were gained on the nighttime shifts on the weekends, and the poorest results were obtained during the weekdays on the day shift.[34]

"Operation 500" is an expanded follow-up in California to the "Operation 101" project. In one investigation reported in "Operation 500," the Placerville study, manpower was increased from 13 to 34 traffic officers on a section of U.S. 50. Total accidents during the study period declined 14% from the previous two-year average. Injury and property damage accidents also decreased but fatalities did not. Although the change in accidents was not dramatic, it is significant that the decreases took place during a time when there was a rapid and general upward trend in accidents along this section

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[31] "Operation 101, An Accident and Enforcement Study" (Condensation), State of California, Department of California Highway Patrol, April, 1972, p. 4.

[32] Ibid., p. 5.

[33] Ibid., p. 10.

[34] Ibid., p. 11.

of highway.[35] The final report of "Operation 500" concluded that "a significant increase in manpower will result in a significant reduction in reportable accidents." Further, "more than 2.0 men per mile per 100,000 vehicle miles of travel is required for nonmetropolitan roadways to effect accident reduction," and that "beyond 4.2 men per mile per 100,00 vehicle miles of travel on a nonmetropolitan roadway, the benefit of manpower on accidents decreases."[36] This would tend to suggest that there is a saturation point that is reached in rural law enforcement efforts.

In a demonstration project entitled "Project 41," state police officers were concentrated along 250 miles of Route 41 in Indiana. Each vehicle was equipped with a speed measuring device. Prior to inauguration of the project, a public information campaign was undertaken. A comparison of a five-month period after implementation of "Project 41" with the same five months in the previous years indicated (1) a 5% decrease in accidents, (2) a 26% decrease in injuries, and (3) a 45% decrease in fatalities.[37]

Perhaps one of the best illustrations of what can be accomplished in just one type of enforcement activity is demonstrated by a Swedish experience. A concentrated effort directed at the drinking driver appears to have had major beneficial effects. For example, in the U.S., there are indications that alcohol is associated with

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[35]Wilson, "Selective Enforcement Program," op. cit., p. 3.

[36]"Operation 500, A Study of the Effect of Increased Road Patrol, Final Report," State of California, Department of California Highway Patrol, April, 1972, pp. 3-4.

[37]Wilson, "Selective Enforcement Program," op. cit., p. 3.

approximately 50% of all fatal accidents. In Sweden where the enforcement is much more stringent, the comparable estimate is in the neighborhood of 10 to 12%.[38]

Similar results were obtained in Great Britain. In the first 12 months of a stringently enforced alcohol safety program, a 15% reduction in auto fatalities and an 11% reduction in serious injuries was experienced.[39]

The state of Connecticut, in 1955, initiated a strong enforcement program on speeding. Although the results have been disputed, there is some indication that, as a result of the "speed crackdown," traffic deaths have decreased. During the first year of the "crackdown," highway fatalities declined by approximately 12%.[40]

Another related study bearing on the subject of this investigation was done in Wyoming.[41] This effort dealt with the matter of traffic accident costs and the effectiveness of highway safety expenditures. It was concluded that "additional dollars" allocated to the Wyoming Highway Patrol were the most effective in reducing the number of accidents and accident costs. An additional dollar spent on the patrol resulted in an average reduction in accident costs of over ten dollars. The study is being held in question, however, because of the low rigor of the analysis process that was used.

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[38] Ibid. [39] Ibid. [40] Ibid.

[41] R. W. Hooker, "Traffic Accident Costs and Effectiveness of Highway Safety Expenditures in Wyoming," University of Wyoming, Laramie, Wyoming, November, 1966.

Another relevant work is represented in the literature entitled "Saturated Patrol Works in Minnesota." Concentrated enforcement resources were applied to selected areas of the state. Results were impressive but produced scanty information in a quantitative sense. However, the few data on results were so spectacular that they show convincingly the possibility of a beneficial effect of police traffic services.[42]

One study of particular relevance to this investigation was performed by the International Association of Chiefs of Police in 1969 entitled "Police Traffic Supervision."[43] This work is prominent for its description of the police traffic services function in considerable detail, but more particularly, for its efforts in producing the first documented attempt to provide a manpower allocation formula for the delivery of total police traffic services. Although the data base from which it was structured is sketchy, it nonetheless has a bearing on this investigation in that it might be useful in corroborating findings in the investigation presently under study in terms of evaluating the extent of enforcement required to produce a desired effect. It was also defective in that it measured the effects of police agencies which had overlapping jurisdictions. The important development of the study was its production of a "percent of time allocation" system for calculating manpower requirements based upon

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[42] Fennessy, op. cit., p. 82.

[43] R. Dean Smith, et al., Police Traffic Supervision (Washington, D.C.: Management and Research Division, International Association of Chiefs of Police, July, 1969).

the services to be performed using billions of miles traveled as the principal criteria. This allocation scheme differed from those produced in "Operations 101 and 500" in that allocation was based on rendering total police traffic services and not just those which are thought to be directly related to accident reduction.

In addition, the report presented considerable detail on administrative indexes which have been used in the police traffic services function for management purposes, but it was appropriately pointed out that these have not been scientifically proven.

Several other studies of related importance were examined but found to be sufficiently deficient to be of little corroborative value. Shumate's work on the effects of enforcement on accidents had the deficiency of insufficient rigor in the deployment system used for patrol vehicles in the experiment.[44] Michael's work on the effects of enforcement on traffic behavior used some of the Shumate data and had a similar deficiency as a result.[45] The Calica et al. work on enforcement effects on traffic accidents' generation produced some interesting information on the effects of stationing patrol vehicles at recorded points and measuring the driver behavior as a result. Although statistically significant findings were noted, the magnitude of the findings was of no practical importance.[46]

In another research product from a foreign country, it was interesting to note that one of their findings was that ". . . European experience does demonstrate that the essential effect of

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[44]Fennessy, op. cit., p. 92.

[45]Ibid., p. 88.

[46]Ibid., p. 100.

conventional speed enforcement on an inexperienced automobile population is that of injury prevention rather than accident prevention."[47]

A literature review was conducted in 1967 by the Ontario Department of Transportation on the relationship between enforcement and accident frequency, and it was found that a tentative generalization from the studies they reviewed could be made that ". . . there was no clear demonstration that existing or additional enforcement activity led to accident reduction."[48]

Summary

The literature review of the police traffic services functional area did not produce substantive documentation for the study hypothesis. With the exception of a few research efforts, the bulk of the available material addressed only topical items in an administrative or conceptual context. It was also interesting to note that the principal citations usually addressed a singular portion of the police traffic services functional area. Very few develop a taxonomy for the reader to lessen the burden of making optimal use of available resource information.

The other interesting finding in the literature search was the potential gold mine of information possessed by the states as a

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[47]J. Wadsworth, "The Effects of Conventionally Enforced Maximum Speed Limits on Motor Vehicle Accidents," Technical Note #9, National Research Council of Canada, Ottawa, November, 1966, p. 21.

[48]G. D. Faxer, "Review of the Literature on Effectiveness of Journal Enforcement Activities in Reducing Accident Frequency," Research Branch, Ontario Department of Transport, 1967, p. 1.

result of programs operated in conjunction with the Highway Safety Act of 1966. These unpublished project results could hold significant information on the subject of the study hypothesis. Several references to Michigan selective enforcement projects operated with the support of Highway Safety Act money suggest that perhaps the most relevant technology on the study question might be in this unpublished status.

Most of the relevant research efforts indicate influence of police activities on accidents. However, in most cases, the experimental design, the data base, or statistical methods were inadequate to allow convincing conclusions. This appears to hold true for both reported and unreported research products. The one study were experimental control has been instituted and significant results obtained was "Operation 101."

In spite of the recognized deficiencies in the literature, much suggestive inference can be drawn from the present state of affairs to help decision makers in projecting rational judgments on police resource allocations to the traffic portion of their mission. Further, it indicates clearly the need for proper application of sound research methodology to subsequent study of the causal relationship between accidents and enforcement. The design of this investigation is modeled in part on the "101 study" which has to be identified as the best available documentation for properly designing a replication study on the effect of selective enforcement on traffic accidents.

CHAPTER III

STUDY DESIGN

Conclusive evidence that supports the relationship between police traffic services and traffic safety is not available. The literature points to only one quantitative research study, "Operation 101, An Accident and Enforcement Study," that shows a statistically significant reduction of accidents while, at the same time, offering sufficient control of factors other than police operations that could potentially influence the occurrence of an accident.[49]

The experimental project on which this dissertation is based was made possible through the assistance of federal highway safety funds awarded to the state of Michigan in June, 1972. As reviewed in Chapter II, Michigan had just completed an analysis of 17 local selective law enforcement programs supported with section 402 highway safety funds monitored by the Office of Highway Safety Planning, Department of State Police, which were very suggestive in terms of producing immediate impact on the traffic crash program in the communities in which they were operating. In addition to the interest shown by the Michigan law enforcement community concerning the results of these projects, the National Highway Traffic Safety Administration, Department of Transportation, also took notice and

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[49]Fennessy, op. cit., p. xviii.

suggested that more extensive investigation be made into the application of this police practice under more controlled experimental conditions. Further, the federal government was interested in applying selective enforcement practices in rural areas where a considerable portion of the fatal crash problem occurs. In Michigan, for example, in 1972, 66% of all traffic crashes occurred within the urban areas; however, 67% of all traffic deaths occurred in rural areas.[50]

Congress had also taken notice of the potential that police selective enforcement had in addressing the fatal crash problem and had suggested that the National Highway Traffic Safety Administration demonstrate this fact so that supplemental funds could be awarded to the states should the carefully controlled demonstration projects prove successful. In June of 1972, the federal government awarded two $300,000 projects, one each to the states of Michigan and Texas, for purposes of experimenting with selective enforcement techniques.

Michigan's traffic fatality experience in 1972 made it a good candidate for this demonstration program. Fatalities in the calendar years 1970 and 1971 were reduced; beginning with February, 1970, there were 14 consecutive months in which there were fewer traffic fatalities than during the corresponding months of the previous years. This trend, however, had reversed itself beginning in April of 1971, as traffic fatalities increased in 11 of the 14 months that followed. In the 12-month period from May of 1971 through May of 1972, Michigan had an increase of 118 deaths, or 5.6%, as compared to the previous

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[50]"1972 Michigan Traffic Accident Facts," Department of State Police, East Lansing, Michigan, p. 5.

12-month period.[51] Even if the federal grant had not been made available, the increase of fatalities was beginning to dictate a need for an enlarged or more substantial effort to impact the driving habits of the motoring public.

Study Hypothesis

Given these fatality statistics the primary focus of this investigation was on the relationship between selective traffic law enforcement and fatalities; however, a review was made of the effect of the enforcement activity on fatal traffic accidents as well. In addition, a review was made to determine the effect of the saturated weekend enforcement on the crash experience during the weekdays when they were not deployed, both as an experimental control and as an indicator of enforcement diffusion. With these study aims, the following experimental hypothesis resulted.

> Hypothesis: The selective deployment of traffic law enforcement resources, concentrating on the detection and citation of traffic law violation, does not significantly impact the fatality traffic accident experience of a treated area.

Studies have been conducted which showed statistically significant reductions of accidents correlated with enforcement; however, it is difficult to attribute the reduction solely to a specific police activity. Other studies have tended to show that the immediate presence of a law enforcement symbol can reduce the occurrence of certain types of violations of traffic law; however,

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[51] "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan, p. 4.

very little is known of either (1) the relationship of violations to accidents or (2) the effect of enforcement on the commission of violations.[52] These two issues represent major subordinate problems in review of the study hypothesis and did influence the design constraints structured for the investigation.

It is anticipated that the results of the experiment will be applicable to rural county communities of this state and perhaps other states as well.

Study Design Specifications

The specific operational purpose of the experimental project was to combat the upward trend of traffic accidents, with particular emphasis on fatal crashes and resulting fatalities, through the use of selective enforcement practices. It was planned to accomplish this goal by identifying several rural geographical areas or segments of highway where fatal accident experience was unusually high. The accident data were then analyzed to determine in which of these areas the most good could be accomplished by initiating a selective enforcement program.

Sample Selection Process

The state of Michigan is made up of 83 counties. Obviously, the resources available to conduct the experimental study were not sufficient enough, nor would it otherwise be feasible to consider implementing a program in all 83 counties. Therefore, some form of

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[52]Fennessy, op. cit., p. 134.

choice had to be introduced to select those sites where best return on the project investment could be secured.

The experimental county choices made were based upon the analysis of accident data from the universe of counties. The first step was to stratify the counties into population groupings: less than 30,000; 30,000 to 50,000; 50,000 to 100,000; 100,000 to 200,000; and the balance, over 200,000. So that counties would be compared which had similar characteristics, all counties with a density of less than 30,000 were eliminated (39) as it was felt that traffic volumes in these counties would not be sufficient to measure change anticipated by the introduction of the selective enforcement independent variable. Even if change could be observed as a result of this study in these sparsely populated counties, there was considerable question that the numbers change would be sufficient to prove statistical significance. By removal of the lightly populated counties, chances were decreased of failing to include in the experimental group members from the universe which would be the most susceptible to the experimental independent variable. One other county was eliminated and that was to remove Wayne, which is Michigan's most populous county. This was done because of the very high-density population factor which obviously makes it urban, rather than rural.

Candidate experimental counties were then chosen from the remaining four groups of counties: 30,000-50,000 (eighteen counties, see Appendix A-1); 50,000-100,000 (nine counties, see Appendix A-2); 100,000-200,000 (eight counties, see Appendix A-3); and above 200,000 (eight counties, see Appendix A-4). The

principal criterion used for selection of candidate counties was rural fatal accidents. Accident experience was compared by county on the basis of an average of five years of fatal accident experience and on rural fatalities for the years 1970, 1971, and January through July of 1972. The counties which consistently deviated above the mean average fatal accident experience in all three of these comparison periods were given consideration for treatment, but a primary consideration was given for the accident experience in January through July, 1972.

In addition to fatal accident experience, such factors as cooperation from the courts, prosecutors, news media, and also the extent of county residency of those involved in fatal crashes were given consideration in the selection process. Candidate counties became those which had a high positive deviation from the mean and were considered appropriate areas to work in light of the preliminary indication of support shown by the courts, prosecutors, and press.

The relative positioning of counties in ranking order with the worst accident experience listed first is shown in Table 4 for the evaluation of the 1972 deviation from the mean accident experience.

The relative ranking of counties when weighing their average mean deviation experience for the three accident periods--1968-1972 county fatal accidents; 1970 and 1971 rural fatal accidents; and 1972, January through July, rural fatal accidents--is shown in Table 5.

It should be noted that all counties listed in Table 4 are included in Table 5, except Sanilac.

TABLE 4.--Traffic Crash Experience--Standard Mean Deviation, 1972 (January through July) Rural Fatal Crashes, Ten Most Serious Counties.

County	St. Mean Dev.	Control vs. Experimental County
1. Saginaw	+2.7	No. 2 control county
2. Cass	+2.3	Experimental county
3. Hillsdale	+1.9	Experimental county
4. Eaton	+1.7	Experimental county
5. St. Clair	+1.7	Experimental county
6. Livingston	+ .9	No. 2 control county
7. Washtenaw	+ .8	--
8. Sanilac	+ .8	No. 2 control county
9. Berrien	+ .6	Experimental county
10. Tuscola	+ .6	Experimental county

KEY: County--Michigan county.
St. Mean Dev.--Standard mean deviation values.
Control vs. Experimental County--Status of county during experiment.

TABLE 5.--Traffic Crash Experience--Standard Mean Deviation, Aggregate Fatal Crash Experience 1968-1972; Rural Fatal Crash 1970-1971; and January-July 1972 Rural Fatal Crashes; Twelve Most Serious Counties.

County	St. Mean Dev.	Control vs. Experimental County
1. Saginaw	+1.7	No. 2 control county
2. Tuscola	+1.7	Experimental county
3. Cass	+1.6	Experimental county
4. Monroe	+1.1	--
5. Huron	+1.1	No. 2 control county
6. Lapeer	+1.0	No. 2 control county
7. Washtenaw	+ .9	--
8. Hillsdale	+ .9	Experimental county
9. Eaton	+ .8	Experimental county
10. St. Clair	+ .7	Experimental county
11. Livingston	+ .7	No. 2 control county
12. Berrien	+ .7	Experimental county

KEY: County--Michigan county.
St. Mean Dev.--Standard mean deviation values.
Control vs. Experimental County--Status of county during experiment.

It is important to note that the experimental choices when examining the 1972 fatal accident experience are ranked 2, 3, 4, 5, 9, 10, in order of problem severity. More importantly, when reviewing the rankings in the overall three period evaluation, it is apparent that the experimental and No. 2 counties are equally well represented in the top 12 problem counties. This reflects likeness of the two groups in terms of problem severity and makes the No. 2 choices logical selections for control purposes.

Counties under consideration were also plotted, based upon a characterization study done for each of the counties, on the types of accidents they had experienced in the past five years. In this characterization, consideration was given to the accident rates based upon the number of vehicles registered in the county, the number of miles driven, and road mileage in each county. Appendix B contains the six experimental county graphs used for this analysis. The data from these studies corroborates the findings of the county accident severity study just described for selection of the experimental counties.

In addition to the comparisons of fatal accident experience, other parameters considered in experimental county selection included a review of the percentage of drivers who had been drinking in fatal and personal injury accidents, percentage of drivers who resided in the county where the accident occurred, and the rate of conviction for driving under the influence of liquor arrests by police in 1971 (see Appendix C). In addition, a study was made of the relationship of fatal accidents by time of day and day of week to

the accidents involving drinking drivers (see Appendices D and E). These data were reviewed as corroborative support for the choices that became apparent from the accident and characterization studies. The accident analysis was done to lead to the problem counties and the subsequent analysis was completed to more specifically identify the problem within the experimental county choices and further to insure that no particular problems were apparent which would suggest that a selective enforcement program would not work. On the basis of all the above considerations, the following counties were selected as experimental counties for the selective enforcement project: Cass, Tuscola, Hillsdale, Eaton, St. Clair, and Berrien. These six choices were among the top ten of 43 counties placed under consideration in terms of severity of problem.

A schedule for patrol assignments was provided for each county (experimental) based upon historical data, which indicated the percentage of accidents involving drinking drivers and the percentage of fatal accidents that had occurred during the hours of the scheduled patrol assignment (see Appendix F).

Experimental County Study Design

The normal accident experience in Michigan indicated a high incidence of casualty accidents during the night and early morning hours on weekends and holidays. The rate of involvement of drinking drivers and accidents during these hours was also very high.[53] As a consequence, special attention was designed at the outset to direct

[53]Fennessy, op. cit., p. 2.

resources toward this relatively small percentage of the driving population who were involved in a disproportionately high percentage of the casualty accidents. Another advantage of deploying police resources during this nighttime period was that traffic density was lower and driving behavior would be more obvious to the police observer.

Personnel deployed to the areas of high accident experience were Michigan State Troopers assigned on an overtime basis. They were all volunteers who had expressed interest in the study project. Officers at or near the counties selected for the experiment were given the option of working on Friday, Saturday, or Sunday when these days were their normally scheduled pass days. They were not permitted to work overtime on a day they had already worked. Officers were expected to travel to and from their temporary work station on their own time.

Selection of the personnel to be deployed was the responsibility of the district commander in whose district the selected high accident county or counties were located.

The work station where the officer was permanently assigned carried the hours of their men on the Post Daily Report (see Appendix G) even though the officer worked outside his post area on this project. These overtime hours were to be charged as overtime for purposes of the special selective enforcement project and were to be paid from the Federal Highway Safety Demonstration Project awarded to Michigan.

The Post (duty station) where the officer was normally assigned also had the responsibility of providing a copy of each officer's daily report (see Appendix H) to the Selective Enforcement Section of the Safety and Traffic Division which had responsibility for the staff supervision of the experimental project effort. The Post of the officers working on this project also provided the patrol vehicle and, whenever possible, the vehicle was equipped with an electronic speed timing device. Whenever the shift to be worked included two or more hours of daylight, each officer would work alone during the daylight hours and then pair up during hours of darkness in compliance with departmental policy.

Officers assigned to the project were not given duties other than traffic patrol. Complaints received or originated by project officers were turned over to regular post patrols as expeditiously as possible.

Post and District Commanders maintained their regular schedule of patrols in the experimental counties with the understanding that this special selective enforcement program was designed to complement their normal schedule of activity and not intended to be a substitute for normal patrol activity. Sheriff departments operating in the experimental counties were also encouraged to do the same. This routine patrol activity was monitored by the Safety and Traffic Division to insure this important control measure, i.e., that project activities were indeed in addition to normal patrol activities.

District Commanders who had experimental counties in their jurisdiction had the responsibility for coordinating with and seeking

the cooperation of other police agencies, prosecutors, and district judges in the experimental areas. Arrangements for local news coverage were also the responsibility of the District Commander who secured assistance from the Safety and Traffic Division when required.

Time accounting for the officers working on the project was administered by the Business Administration Division, Budget, and Financial Control Section of the Michigan State Police. The officers' time was carried on the bi-weekly attendance report (see Appendix I) of the officer's home post and was designated as overtime. Additionally, a copy of each officer's daily report was forwarded to the Selective Enforcement Section where the entries of activity were retained for analysis. The hours of each officer were provided on a bi-weekly basis to Business Administration along with the name, social security number, and civil service classification code by the Selective Enforcement Section. This was done to provide a means for retrieving work activity for analysis purposes.

The Safety and Traffic Division had responsibility for the selection of the critical areas to be worked and to provide the necessary information for selective enforcement patrolling. Information regarding accident locations by highway, violations involved in the accidents, time of day, and day of week was provided by the Data Processing Division and analyzed by the Safety and Traffic Division and disseminated to the District Commanders. Arrest information was also tabulated and correlated with this accident experience. Arrests made by officers assigned to this project had special designation so they could be retrieved from the computer for

analysis. Safety and Traffic also provided the Business Administration with the necessary information to dispense and account for the payment of the related funds on this project.

The Safety and Traffic Division prepared spot maps of each selected county with the fatal accidents for the years 1970, 1971, and partial 1972. The spot maps were delivered to the District Commander along with an analysis of the fatal accident and arrest experience.

Control County Study Design

In addition to these prime choices, five other counties (Huron, Sanilac, Saginaw, Livingston, and Lapeer) were selected representing a problem nearly as severe as in the first six. These counties were going to be used in the event that the resources were made available to extend the project beyond the six counties, but more importantly, to be used as control counties in establishing a means for offsetting the bias, i.e., extreme accident experience, used in the choice of the six experimental counties. Further control was introduced by identification of other control counties. In one group, five other counties (Arenac, Isabella, Montcalm, Allegan, and Ottawa) were selected which had no boundary in common with either the experimental or the five that closely resembled the experimental counties. Consequently, it was unlikely that the saturated patrol activities in the experimental counties would affect these counties. There was also a fourth group of control counties (Midland, Bay, Shiawassee, Clinton, Barry, Van Buren, Calhoun, St. Joseph, and Branch) of which six had some boundary touching an experimental county. Three of these

counties were adjacent to a county in the second group identified as closely resembling the prime six chosen for the experiment. Before-during-and-after analysis of the accident experience in the control counties was designed to help offset sampling error.

Experimental Variables

Given those locations for treatment or control, the general independent variable consisted of the special enforcement effort, as measured by traffic citations issued and other contacts for moving violations. Concomitantly, the general dependent variable was traffic crashes. Analysis was planned for identifying functional relationships between enforcement and accident measures in a before-during-and-after treatment paradigm. Figure 2 lists the experimental measures and shows the data source of each.

Statistical Analysis of Data

Relationships between the independent and dependent variables were explored using time-series and cross-sectional analysis techniques.

The time-series analysis, concentrating on variations in treated county accident experience before-during-and-after selective enforcement treatment, is intended to identify interruptions in the aggregate and individual treatment counties' accident experience attributable to the selective enforcement efforts. Graphical presentation and identification of those time-series interruptions were followed by evaluation of accident experience changes using probability bands established around the four-year experience of the treated counties prior to the experimental period. These bands were

Variable and Measure	Data Source
Independent Variable (Enforcement):	
Number of arrests for hazardous moving violations	
1. Weekend	Citation records
2. Weekday	Citation records
3. Alcohol involvement	Citation records
Number of enforcement man-hours	
1. Weekend	Officer daily reports
2. Weekday	Officer daily reports
Car hours on patrol	Officer daily reports
Car hours per D.U.I.L. arrest	Officer daily reports
Number of liquor inspections	Officer daily reports
Other patrol and complaint arrests	Officer daily reports
Number of verbal warnings	Officer daily reports
Number of vehicles inspected	Officer daily reports
Dependent Variable (Accidents):	
Number of fatal accidents and fatalities	
1. Weekend	Accident reports
2. Weekday	Accident reports
Number of accidents involving drinking	
1. Weekend	Accident reports
2. Weekday	Accident reports

Figure 2.--Experimental Variables List.

set to identify excursions from mean values expectable only 5% of the time in a predicated direction, i.e., ± 1.64 standard deviations with a one tailed test. While a more conservative level might be palatable to statisticians, this one tailed .05 confidence level was deliberately selected to minimize chances of a Type II experimental error, i.e., concluding that selective enforcement as a life saving response is ineffective when in fact it is effective.

Cross-sectional analysis involved Chi-square evaluation of accident experience of treated versus non-treated control counties in the immedaitely before and during periods of the experiment, i.e., calendar year 1972. This traditional experimental procedure was used to assure that some unidentified factor was not acting in common across all similar counties, treated and untreated. This control analysis was instituted, of course, to identify the presence of such general, uncontrolled factors that would tend to obscure or exaggerate the effect of experimental selective enforcement in the treated counties.

As used in the analysis described in Chapter IV, this time-series and cross-sectional analysis paradigm was implemented in an attempt to use acceptable probability expressions in evaluating measured accident experience as a function of normal versus experimentally-induced variations in the experimental counties.

Confounding Variables

Traffic safety is influenced by many directly and indirectly related community services. The extent to which each of the services, e.g., driver education, traffic courts, traffic engineering driver

licensing, emergency medical services, etc., affect traffic crash accident countermeasures could obviously influence the hypothesis being investigated.

These contaminating variables were controlled by attempting to minimize change of the traffic safety systems in the experimental counties to only those associated with the selective enforcement element. Further, nineteen control counties were selected which had similar characteristics to minimize inference drawn from the experimental counties that might have occurred by chance.

To further minimize the effects of the uncontrolled variables, post analysis of the accident experience during the year of 1973 was relied on to add a dimension of control in accounting for the effects caused by the additional enforcement activity during the period of the experiment in 1972.

Although it is most desirable in any controlled experimental study to limit the extent of the variables that would be introduced to change the existing system, it should be pointed out that, in addition to the element of selectively applying the enforcement tactic, other supportive kinds of actions were initiated which might have had a bearing on the outcome of the experiment. For example, patrol officers were instructed to make contact with drinking establishments were alcoholic beverages were being served in an effort to discourage excessive drinking by patrons who intended to drive their cars and, further, to discourage bartenders from serving patrons to the extent that they might have had the police not made the visit. Another very important support component that was developed during the design of

the experimental efforts was to make contact with the news media, prosecutors and court officials, civic organizations, and generally the citizens of the communities involved, to apprise them as to the nature of the program. This was done to insure that these necessary support components would be operative during the study and in support of the police mission associated with the selective enforcement effort.

Although these supportive elements are considered to be very important to the principal selective enforcement effort, they could be considered contaminants to the principal independent variable being introduced, namely, selective enforcement.

Data Collection

Data for study analysis were collected by the Safety and Traffic Division of the Michigan State Police. District Commanders collected manpower data of the specially assigned patrolmen through the use of the existing daily activity reporting system of the department. Accident data were collected through existing reporting procedures established by law. Enforcement data were computed from daily activity sheets, and then all data were encoded for computer storage and subsequent retrieval and analysis.

Delimiting Factors

In a system as complex as traffic safety, it is very difficult to sufficiently control or account for all the interrelationships that occurred during the course of an experiment. This is not to apologize for lack of rigor in structuring the experiment, but to more

appropriately acknowledge that the findings must be considered in light of the controls that were introduced and to realize that conditions were operating concomitantly which were not properly controlled.

In Michigan, police jurisdictions (state, county, city, township) are not clearly delineated to the extent that duplication of coverage of police resources to the same jurisdictional areas is avoided. This has both advantages and disadvantages from an operational standpoint. Unfortunately, this situation does complicate structuring experimental conditions that would be most desirable for research purposes. Michigan sheriff agencies operated in both the experimental and control counties during the investigation. Attempts to introduce control for this variable were difficult as enforcement data for comparable periods from one county to another were inconsistent or lacking. It was observed, but not documented, that sheriff enforcement increased in the experimental counties during the investigation. This effect was not measurable, but might have been a contaminating factor in the outcome of the study.

The design did not structure for measuring the saturation coverage required to cause a change in the fatal accident experience. As a result, the findings cannot speak to the degree of manpower adjustment that is necessary to create change or at what level of enforcement a point of diminishing returns is reached.

The deployment schedules were designed to place police resources in the rural areas of the experimental counties. Design consideration was not given to the type of road systems in the counties or what types would be given priority attention. This was

precluded because of the lack of sophistication in our state-wide accident location system. Spot maps were used to dictate deployment schedules rather than road types or volume of traffic on these various road systems.

It is theorized that police traffic enforcement efforts affect the driving behavior of the motoring public. This investigation did not measure before and after behavior characteristics of the motoring public, so it cannot be determined if the saturated patrol coverage affected the driving population as a whole, or just deviant behavior which causes fatal traffic crashes.

Michigan is a state affected by an assortment of demographic conditions. These were not controlled because it was felt that both the experimental and control counties would be affected equally because of their proximity to each other and, further, because of limitation of funds to properly control these factors.

Many variables were identified during the course of this investigation as having an influence on the traffic safety system. Change in the traffic fatal accident experience could have been caused by an adjustment to one, or a combination, of these components of the safety system. To properly control these would have been impossible within the constraints imposed by the resources available for this study. What was attempted was to make note of any significant change in these component sub-system and insure that they could be weighed in the final analysis of the investigation. Because of the short duration of the experiment, the chances of these changes

occurring were limited. Further, it was observed that no major changes were introduced during the experimental period.

Efforts to measure the proportion of police officer time devoted to preventative patrol activity and time spent during a traffic contact were not made. This was avoided because the actity reporting system used during the experiment was not sufficiently detailed to permit study of these two activities. Further, analysis of the types of traffic contacts, i.e., arrest, warning, and for what types of violations, was not made, which could support a formula of traffic contact action that will produce a specific result. The investigation does, however, report the rates of traffic contacts by type.

The investigation also had the limitation of applying appropriate sample selection techniques. Choices were based upon counties which had the most serious traffic fatal accident problem and were in a position to support an active enforcement program. Random selection would have strengthened the rigor of the design of this study; however, the purpose of the demonstration dimension of this effort was to place resources where they could conceivably do the most good. The county with the most serious crash problem was not selected as an experimental site in every case. This is important to understand, for it lessens the bias somewhat of the choices that were finally made. With such biased sampling, "regression to the mean" suspicions could cloud interpretation of results. However, use of counties with accident experience similar to treated counties as non-treatment controls was intended to minimize this "mean regression" effect.

Officers who were assigned in the experimental counties were not necessarily average or high traffic contact producers as originally designed in this study. Adjustment to this criteria had to be modified for reasons of fairness to all department members. Any state police officer was eligible to participate.

Supervision in the experimental counties was not completely uniform. It was learned half way through the study that one experimental county was not receiving sufficient enforcement activity comparable to the other treated counties. A critique of this matter resulted in closer attention to the matter of supervision. The experience also provided a suggestion for a minimal level of enforcement activity but, because it was just a single county experience, substantive conclusions could not be defended.

The term "hazardous moving violation" has a common meaning among the police discipline, but it should be indicated that any driver behavior coupled with the proper circumstance could be disastrous whether it be hazardous or non-hazardous. For purposes of this investigation, this variable was not accounted for other than to suggest that the interpretation of the type of moving violation would likely hold in both the experimental and control counties.

Summary

This chapter has dealt with the methodology used for conducting this investigation. Design considerations were explained along with strategies that were executed during the course of the study to adhere to these constraints. Chapter IV will present the

data collected during the study and describe the analysis treatment that was given to these data. Statistical comparisons will be made of the experimental counties with control counties in terms of the effect the independent variable, selective enforcement, had on traffic fatalities.

CHAPTER IV

ANALYSIS OF RESULTS

This chapter presents the data associated with this study and its analysis. Findings are reported for the enforcement activity (independent variable) and traffic crashes (dependent variable). Time-series and cross-sectional analyses are presented for interpretation of these data. Other miscellaneous variable analyses are also presented along with a summary of the analysis chapter.

Independent Variable Analysis (Enforcement)

The independent variable in this study was enforcement. It was measured by recording the number of citations issued by the specially deployed police resources in six experimental Michigan counties (Cass, Eaton, Berrien, Hillsdale, St. Clair, and Tuscola).

Deployment schedules were carefully designed to create the impression of omnipresence of the police during the periods of the week when there were high incidents of fatal traffic crashes. Additionally, concern was focused on those offenses known to be over represented as contributing factors in traffic crashes. In this study, alcohol was identified as the predominant contributing factor and deployment was concentrated on those periods of the week when these incidents were most likely to occur.

Review of the crash problem by day of week revealed a heavy concentration of fatal crashes on weekends. Alcohol was also determined to be a factor in a large number of these weekend accidents. For these reasons, and to insure sufficient saturation, the specially deployed police resources were used only on weekends. Also, deployment was limited to the rural areas of the experimental counties. Michigan's fatal crash experience has consistently reflected that a predominant share of our fatalities occur in rural areas of the state. However, a great majority of total accidents occur in the urban area. It was also tactically convenient to hold to the rural deployment practive, as that is the primary work jurisdiction of the Michigan State Police.

A review of the data in Table 6 reveals that there was a substantial increase or surge in the traffic arrest activity of the Michigan State Police in the experimental counties during the period August through December, 1972, when compared with the like period in 1971.

Table 6 indicates that traffic arrests rose from a total of 12,994 in 1971 for the months of August-December to a total of 24,461 for the same period in 1972, representing an increase of 88%. The 1972 traffic arrest total for the treatment period consisted of 13,767 arrests being produced by the existing patrol personnel normally assigned to the experimental counties, which represents an increase of 5.9% over the arrest productivity of the existing police resources deployed in these counties in 1971. The 10,694 traffic arrests produced by the specially deployed experimental police

TABLE 6.--Michigan State Police Traffic Arrest Activity, 1971-1972 (August-December). Experimental Counties: Berrien, Cass Eaton, Hillsdale, St. Clair, and Tuscola.

County	1971	1972 Exist. Patrol	1972 S.E. Project	1972 Total S.E. & Exist.	% Increase
Berrien	5,590	5,256	2,873	8,129	45.4
Cass	884	1,002	1,042	2,044	131.2
Eaton	939	1,928	2,187	4,115	338.2
Hillsdale	1,275	1,290	636	1,926	51.0
St. Clair	3,764	3,445	2,169	5,614	49.0
Tuscola	542	846	1,787	2,633	385.7
Total	12,994	13,767	10,694	24,461	88.2

KEY: S.E. Project--Traffic arrest activity for selective enforcement personnel assigned to experiment.
Exist. Patrol--Traffic arrest activity for Michigan State Police personnel regularly assigned to the experimental counties.
1972 Total S.E. & Exist.--The combined traffic arrest enforcement activity produced by the selective enforcement and existing deployed Michigan State Police resouces.
% Increase--Determined by adding the 1972 existing enforcement and the selective enforcement project activity and comparing with 1971.

resources accounted for nearly the whole change or increase of enforcement activity during the treatment period.

It also is interesting to note in Table 6 the great variance in the percentage increase changes when analyzing enforcement activity for the six counties. The range of percentage change from 45% to 385.7% is dramatic. The two counties that had the biggest percentage increases in enforcement activity totals--Eaton, 338.2%, and Tuscola, 385.7%--received a substantial boost from the existing deployed forces.

In Eaton County the existing patrol force activity rose from 939 traffic arrests in 1971 to 1,928 in 1972, more than doubling, and in Tuscola County the change was from 542 to 846 arrests, an increase of 56%.

The balance of the four counties remained fairly constant. Analysis of the traffic arrests of the special police resources indicated that there was an important change in arrest activity during the experimental period. Arrests shifted from 37% of those citations being issued on weekends before the experiment (January to July, 1972) to 62% during the treatment period (August-December, 1972). These data are presented in Table 7.

TABLE 7.--Michigan State Police Traffic Arrests Actvities: Weekend vs. Weekday, January-July 1972, August-December 1972, Experimental Counties (Berrien, Cass, Eaton, Hillsdale, St. Clair, Tuscola).

County	Jan.-July 1972		Aug.-Dec. 1972	
	Weekend	Weekday	Weekend	Weekday
Berrien	41.0%	59.0%	56.5%	43.5%
Cass	44.7%	55.3%	63.5%	36.5%
Eaton	44.1%	55.9%	67.7%	32.3%
Hillsdale	30.9%	69.1%	51.8%	48.2%
St. Clair	34.0%	66.0%	56.0%	44.0%
Tuscola	22.7%	72.3%	76.7%	23.3%
Average Percentage	37.06%	62.94%	62.03%	37.91%

KEY: Weekend--From 6:00 P.M. Friday to 12 Midnight Sunday.
Weekday--Balance of week.

This is evidence that the increased enforcement saturation coverage changed the existing weekend-weekday enforcement pattern as was scheduled in the design strategy.

Table 8, Michigan State Police Fatal Crash Reduction Program Patrol Activity Comparisons, August-December 1972, reflects the work activity accomplishments of the selective enforcement personnel in each of the six experimental counties during the treatment period. Several aspects of the police activity are detailed in addition to just traffic offense arrests because it was felt at the design stage of this study that these related activities might possibly help explain variations in the success of the selective enforcement tactic in the respective experimental counties. In all cases, in Table 8, these activities were related to "car hours" per contact.

Driving Under the Influence of Liquor (D.U.I.L.) arrest activity was singled out because this was a specific target activity of the project. It is interesting to note car hours per D.U.I.L. contact varied from 18 to 45.4 even though this was a target activity.

Other patrol and complaint arrests were observed during the study to account for any over-emphasis of activity that was not traffic related. The range of difference was 8.7 to 48.1 car hours per contact.

Liquor inspection of drinking establishments were recorded during the study because of the emphasis given to the drinking driver problem. The "car hour" contact rate varied from 3.4 to 14.1.

TABLE 8.--Michigan State Police Fatal Crash Reduction Program Patrol Activity Comparisons, August-December 1972, Experimental Counties (Berrien, Cass, Eaton, Hillsdale, St. Clair, Tuscola).

County	Car Hours on Patrol[1]	D.U.I.L. Arrests[2]	Car Hours per D.U.I.L. Arrest[3]	Other Patrol and Comp. Arrests[4]	Car Hours per O.P. and C.A.[5]	Liquor Inspection[6]	Car Hours per Liquor Inspection[7]	Traffic Offense Arrests[8]	Car Hours per Offense Arrest[9]	Verbal Warning[10]	Car Hours per Verbal Warning[11]
Berrien	3,349.5	80	41.9	91	36.8	310	10.8	2,873	1.2	3,175	1.1
Cass	1,635.5	36	45.4	34	48.1	116	14.1	1,042	1.6	1,647	.99
Eaton	2,471.5	67	36.9	104	23.8	232	10.7	2,187	1.1	2,224	1.1
Hillsdale	1,109	38	29.2	61	18.2	329	3.4	636	1.7	1,086	1.0
St. Clair	1,923	107	18.0	220	8.7	279	6.9	2,169	.89	2,326	.83
Tuscola	2,198	87	25.3	76	29.0	422	5.2	1,787	1.2	1,786	1.2
Totals	12,686.5	415		586		1,688		10,694		12,244	
Averages			30.6		21.6		7.5		1.2		

[1]Total hours of traffic patrol by county by project selective enforcement personnel for each of the experimental counties.

[2]Arrests made by experimental county selective enforcement personnel for driving while under the influence of intoxicating liquor (D.U.I.L.).

[3]Car hours on patrol by project selective enforcement personnel for each D.U.I.L. arrest.

[4]All other patrol and complaint arrests, other than traffic offense arrests, made by the project selective enforcement personnel.

[5]Car hours on patrol by project selective enforcement personnel for other patrol and complaint arrests.

[6]Inspections made by project selective enforcement personnel of bars and cocktail lounges.

[7]Car hours on patrol by project selective enforcement personnel for each liquor inspection.

[8]Number of traffic offense arrests or citations issued by project selective enforcement personnel.

[9]Car hours on patrol by project selective enforcement personnel for each traffic offense arrest.

[10]Number of verbal warnings issued by project selective enforcement personnel.

[11]Car hours on patrol by project selective enforcement personnel for each verbal warning.

Traffic offense arrests were the principal police activity emphasized during the study. The "car hour" contact rate ranged from .89 to 1.7 for each of these arrests.

Verbal warnings represented a substantial enforcement commitment during the study period. It is important to single out this activity because it constitutes such a considerable portion of the police effort in most police agencies. The "car hour" contact rate for verbal warnings ranged from .83 to 1.2.

Technology to single out which of these traffic related enforcement activities is most productive in controlling errant driving behavior is not available as has been developed in Chapter II. It is interesting, however, to make note of the total average contact per car hour of patrol for all of the categories of patrol activity detailed in Table 8. This contact rate is obtained by accumulating the enforcement contact totals as detailed in Table 8 for each county by type and dividing by the total car hours on patrol for each of the counties. This calculation results in the following county "car hour"-per traffic contact rate (see Table 9).

The counties were nearly equal with the exception of St. Clair which had a more frequent traffic contact rate than the balance of the experimental counties.

These data are provided to characterize the enforcement activity that took place during the experiment. Unfortunately, data for these specific enforcement activities for previous years were not available for making comparative studies. They were recorded, however, to profile the traffic enforcement experience with detail not

TABLE 9.--Michigan State Police Car Hour Per Traffic Contact, August 1972-December 1972, Experimental Counties (Berrien, Cass, Eaton, Hillsdale, St. Clair, Tuscola).

County	Car Hour Per Traffic Contact
Berrien	.51
Cass	.56
Eaton	.51
Hillsdale	.51
St. Clair	.37
Tuscola	.52

normally associated with selective enforcement projects. Most commonly "traffic arrests" are the only data available for study purposes.

To further attempt to sort out the traffic related work of the specially assigned selective enforcement personnel, an examination was made of their criminal arrest activity which is presented in Appendix J. These criminal arrest activities are listed alphabetically and four of the list were considered to be related to this project: "consuming; drunk and disorderly; minors in possession; and violation of controlled substances act. The experimental counties' productivity during the project period in these activities is shown in Table 10.

The range of arrests by county for these four criminal offenses is from 21-132. In analyzing the effect of the independent variable of enforcement these data might have been an influencing factor, but this cannot be documented.

TABLE 10.--Michigan State Police Criminal Arrests for Traffic Related Offenses, Project Selective Enforcement Personnel, August-December 1972, Experimental Counties (Berrien, Cass, Eaton, Hillsdale, St. Clair, Tuscola).

County	Consuming	Drunk and Disorderly	Minor in Possession	Viol. Cont. Subst. Act	Total
Berrien	8	21	10	7	46
Cass	0	3	7	11	21
Eaton	1	14	9	36	60
Hillsdale	2	8	5	23	38
St. Clair	40	25	41	26	132
Tuscola	1	21	4	6	32
Total	52	92	76	109	329

The data in this section show that while highly variable between the treated counties, the enforcement effort as characterized by traffic arrest for moving violations principally, increased substantially over the normal existing effort. The section that follows relates that extra (enforcement) effect to measured variations in the dependent variable, accident experience.

Dependent Variable Analysis (Accidents)

The dependent variable, traffic fatalities, was examined during the analysis phase of this study using two basic statistical processes, time-series and cross-sectional analysis. These techniques allowed for the study of the relationship between the dependent and independent variables from two different perspectives.

Time-Series Analysis

The time-series analysis provided an analysis of the variations in accident experience before, during, and after selective enforcement treatment. The purpose of this analysis is to search out interruptions in the aggregate and invididual treatment counties' accident experience attributable to the selective enforcement efforts when comparing the project year experience with the previous four-year average experience for the same time frames: before, during, and after the treatment period.

These interruptions or accident experience changes were evaluated using probability bands established around the four-year average accident experience of the treated counties prior to the experimental project period year. These bands were established to identify variations from the mean values expectable only 5% of the time, i.e., ± 1.64 standard deviations. Table 11 presents the fatality counts on which these comparisons of monthly experience during the experiment year and average experience (and variation) during the four prior years (1968-1971) in the six experimental counties were based.

Figure 3 (on page 71) reflects graphically that rudimentary time-series analysis. Fatalities are presented on the ordinate and the months of the year are reflected on the abscissa. The dotted line reveals the traffic fatality experience during the project year, April 1972-March 1973, and the solid line represents the four-year average fatality experience summed by month for the like period of months. The variation in prior years' experience is shown by the vertical lines through the four-year average data points, with the

TABLE 11.--Monthly Fatality Counts, Means, and Standard Deviations for the Four-Year Period Preceding the Experimental Treatment Year, Experimental Counties (Berrien, Cass, Eaton, Hillsdale, St. Clair, Tuscola).

Prior Year	Month											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1968-69	23	18	28	16	18	13	22	39	10	12	11	17
1969-70	10	23	18	26	20	28	9	21	14	10	14	12
1970-71	5	13	25	20	12	27	23	14	11	11	7	13
1971-72	9	14	12	17	21	15	17	15	11	26	15	16
Mean	11.8	17.0	20.8	19.8	17.8	20.8	17.8	22.2	11.5	14.8	11.8	14.5
Standard deviation	6.8	3.9	6.2	3.9	3.5	6.8	5.5	10.0	1.5	6.5	3.1	2.1

Note: The sequence of months has been rotated for convenient placing of the treatment period (August-December) between the "before" and "after" periods discussed in the text.

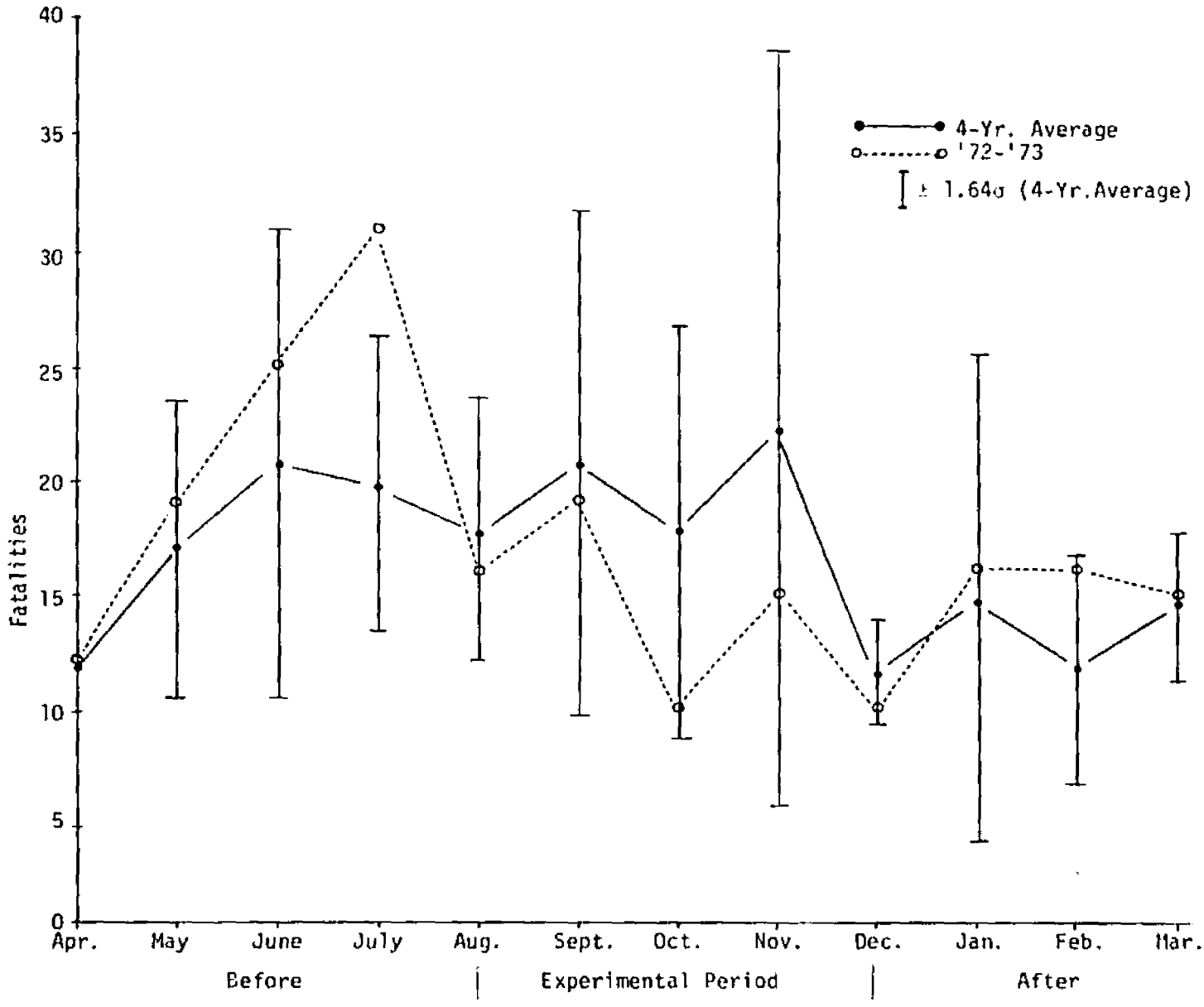

Figure 3.--Comparison of Treatment Year Fatalities with Average Fatalities in the Four Years Preceding the Treatment Year.

excursion of each line showing the limits defining 90% of the expected values for each of the averages, i.e., the ± 1.64 standard deviation values from Table 11. Note also the notations defining the three periods of the treatment year--"before" treatment, "during" treatment, and "after" treatment.

Inspection of this figure reveals that the "before" traffic fatality experience during the project year exceeds the four-year average experience for all of the "before" designated months. Note that the July treatment year experience exceeds the standard deviation band established at the .05 confidence level (± .164 standard deviation).

The "during" period (August-December) for the project year reflects a drop in fatalities for each of the months below the four-year average trend line. This drop to below-average experience is dramatically demonstrated in the figure between July and August, the first month of the "during" treatment period.

The "after" period (January-March) shows a return of the fatality experience during the project year to slightly above the average four-year fatality experience.

This figure suggests that the "during" period of the project year was associated with a dramatic decrease in traffic fatalities from the immediately "before" period and also when comparing the "during" period of the project year with the four-year average period for the same months. The July 1972 project year traffic fatality deviation from the four-year average beyond the standard deviation band established for this analysis points to a trend significantly

beyond what could be expected by chance alone and makes dramatic the severe drop in traffic fatalities associated with the treatment period.

In order to evaluate these fatality experience differences between the three time periods in this time series, the project year (before, during, and after) and the same time periods of the previous four years, a Chi-square analysis was done on the fatalities sums. Table 12 shows the grouped fatality data and the Chi-Square analysis results.

Table 12 also shows that there is a significant difference between the project year experience and the four-year experience at probability level slightly greater than $p = .02$ when examining these comparisons for the before, during, and after periods.

Inspection of Table 12 reveals that the greatest contribution to that χ^2 came from the greater-than-expected fatalities in the "before" period and the less-than-expected fatalities in the "during" period for the project year.

There can be no question that the project year broken into the three groups, "before," "during," and "after," was associated with a fatality crash experience that deviated significantly from this four-year average experience; however, the effects of the "before" and "during" project year periods are confounded. Thus, either of two interpretations is equally likely from this time-series analysis:

1. The "before" traffic fatality crash experience during the project year as shown in Figure 3 was a significant departure from the average and the drop in fatality experience in the "during"

TABLE 12.--Chi-Square Analysis of Project Year Fatalities Versus Fatalities in the Four Preceding Years.

	"Before" (Apr-Jul)			"During" (Aug-Dec)			"After" (Jan-Mar)			
	Observed	Expected	χ^2 Contrib.	Observed	Expected	χ^2 Contrib.	Observed	Expected	χ^2 Contrib.	Total Observed
Four prior years	277	290.1	.60	360	342.8	.87	164	168.2	.10	801
Project year	87	73.9	2.33	70	87.3	3.42	47	42.8	.41	204
Total observed	364			430			211			1,005

$\chi^2 = 7.73$, df = 2, p = .02

KEY: Observed--Number of fatalities.
Expected--Frequency you would predict given the row and column totals.
χ^2 Contrib.--Cell contribution to total χ^2 sum.
Total Observed--Total fatalities.

period can be attributed simply to the regression-to-the-mean phenomenon, or

2. The selective enforcement exercise did have an impact that reversed the trend that was being experienced in the "before" period.

Cross-Sectional Analysis

This analysis was designed to evaluate the accident experience of treated versus non-treated control counties in the immediate "before," "during," and "after" periods of the experiment. The six experimental counties were compared with the three other groups of counties previously identified on pages 49 and 50.

Inspection of Figure 4 provides graphic illustration of the number of fatalities for each of the four groups of counties for the "before," "during," and "after" periods.

This figure shows that each of the control county groups had a general function of increasing fatality experience in the "during" period over the "before" period, followed by a decrease to a lower level during the "after" period. Note, however, in the case of the experimental counties that a monotonic function is in evidence starting with a high "before" experience and progressively decreasing traffic fatality experience for the "during" and "after" periods.

As was done with the previous time-series data, a Chi-square analysis was conducted with these "before," "during," and "after" data. This analysis, shown in Table 13 (on page 77), resulted in a $\chi^2 = 8.50$ proving not significant. It should be noted that the

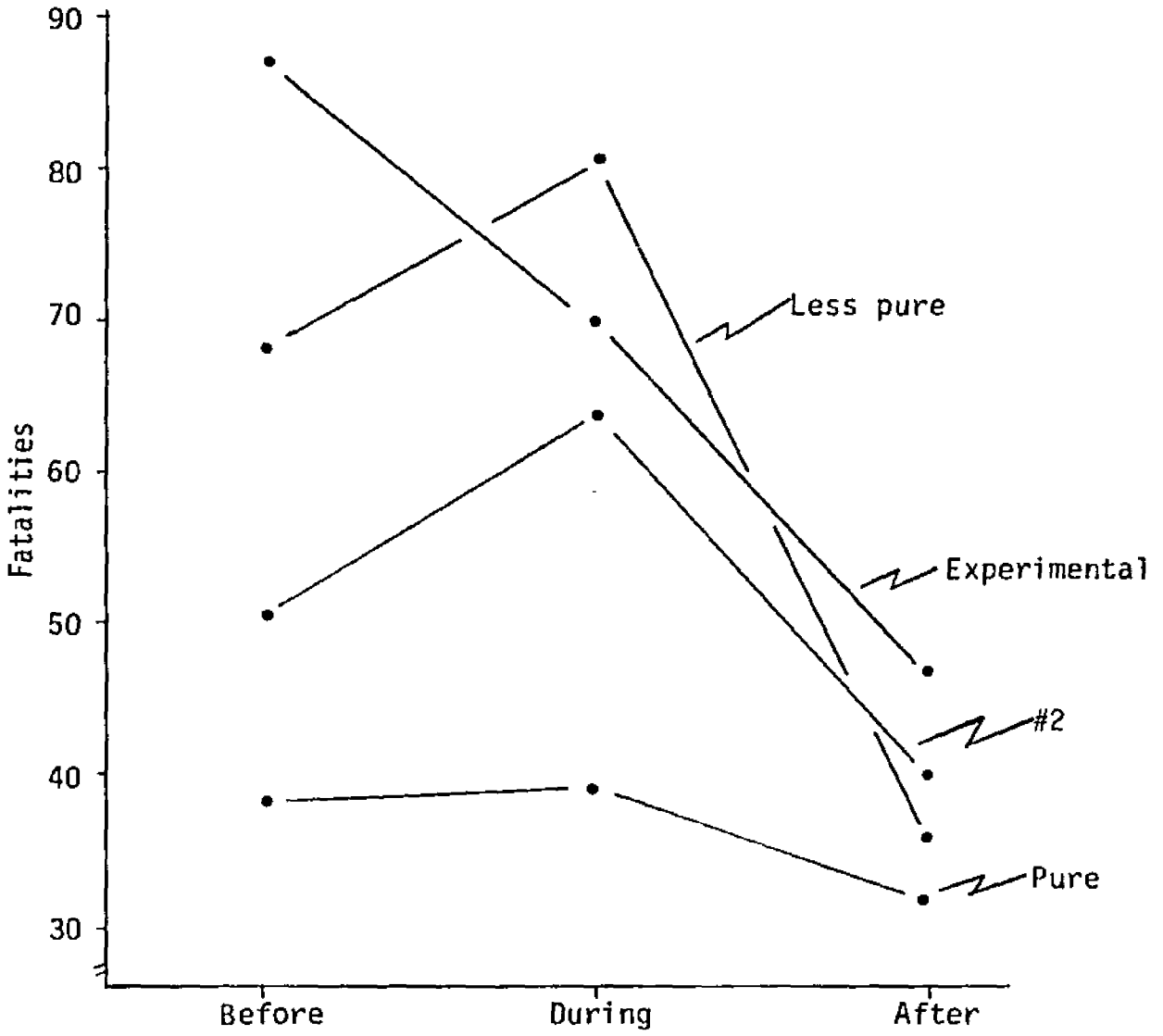

Figure 4.--Combined Fatality Experience of the Experimental Counties and the Three Control County Groups During the Three Periods of the Project.

TABLE 13.--Chi-Square Analysis of Experimental Counties' Fatalities Versus Fatalities in the Control County Groups During the Project Year.

	"Before" (Apr-Jul)			"During" (Aug-Dec)			"After" (Jan-Mar)			
	Observed	Expected	χ^2 Contrib.	Observed	Expected	χ^2 Contrib.	Observed	Expected	χ^2 Contrib.	Total Observed
Experimental	87	76.2	1.52	70	79.4	1.10	47	48.4	.04	204
Alternate	51	57.9	.83	64	60.3	.23	40	36.8	.28	155
Nearby	38	40.8	.19	39	42.4	.28	32	25.9	1.45	109
Distant	68	69.1	.02	81	72.0	1.14	36	43.9	1.42	185
Total observed	244			254			155			653

$\chi^2 = 8.50$, df = 6, p = NS

KEY: Observed--Number of fatalities.
Expected--Frequency you would predict given the row and column totals.
χ^2 Contrib.--Cell contribution to total χ^2 sum.
Total observed--Total fatalities.

greatest contribution to the χ^2 sum was the data associated with the "before" period of the experimental counties.

Several further analyses of the data were attempted to search out other findings. One of these attempts involved collapsing the data from Table 13 into a six cell table consisting of the three time periods times the sums of fatalities across all three of the control county groups and the experimental county fatalities. These data combinations and the resulting χ^2 are shown in Table 14.

As indicated in Table 14, the χ^2 did not reach a significant level. Note, however, the major contributions to that Chi-square were from the "before" and "during" periods in the experimental counties.

Still another analysis in this search process matched the experimental with the alternate or "number two" counties. As developed in the study design section of this report in Chapter III, the alternate counties were very similar as a group to the experimental group, especially with regard to their ranking in traffic fatality severity. A Chi-square analysis associated with the three time periods and fatality experience of the experimental group versus the number two county group produced a $\chi^2 = 3.61$ with two degrees of freedom. This value is associated with a probability slightly in excess of $p = .10$, suggesting, but not proving, significance.

A further analysis of these two groups using the same statistical testing technique but with Berrien county removed from the experimental group resulted in $\chi^2 = 8.55$. This value with $df = 2$, is associated with a probability of $p = .01$, which provides conclusive

TABLE 14.--Chi-Square Analysis of Experimental Counties' Fatalities Versus Fatalities in All Control Groups During the Project Year.

Counties	"Before" (Apr-Jul)			"During" (Aug-Dec)			"After" (Jan-Mar)			Total Observed
	Observed	Expected	χ^2 Contrib.	Observed	Expected	χ^2 Contrib.	Observed	Expected	χ^2 Contrib.	
Experimental	87	76.2	1.52	70	79.4	1.10	47	48.4	.04	204
Control	157	167.7	.68	184	174.6	.51	108	106.5	.02	449
Total observed	244			254			155			653

$\chi^2 = 3.87$, df = 2, p = NS

KEY: Observed--Number of fatalities.
Expected--Frequency you would predict given the row and column totals.
χ^2 Contrib.--Cell contribution to total χ^2 sum.
Total Observed--Total fatalities.

evidence that these two comparable county groupings did have significantly different fatality experiences during the three time periods. In that analysis, the χ^2 value came mainly from the "before" and "during" experience of both county groupings, with the experimental counties showing a fatality decrease and the control counties an increase when going from "before" to "during." It should be reiterated why Berrien county was removed from this exploration analysis. Half way through the experiment this county was identified as one where the independent variable was not being implemented with any sufficiency. This was corrected through supervisory emphasis, but the fatality experience did not improve as was predicted which led to this deficiency discovery.

As a further attempt to identify what this difference is attributed to, another more precise method was used (student "t" distribution test) to compare fatalities of the experimental counties with the number two alternative group. These data and their analysis are presented in Table 15.

This analysis shows that the primary factor in the graphical and analytic differences between the experimental and most similar group of control counties is largely due to the extremely high fatality experience in the experimental counties in the "before" period.

Miscellaneous Variable Analysis

In addition to the primary findings discussed above, some limited analysis was possible with weekend versus weekday accident experience and with alcohol-related accidents.

TABLE 15.--"t"-Test Evaluation of Fatality Experience of Experimental Counties Versus Alternate Control Counties During the Project Year.

	Before	During	After
Experimental counties			
Berrien	14	28	10
Cass	21	11	6
Eaton	14	7	5
Hillsdale	15	3	6
St. Clair	11	6	15
Tuscola	12	15	5
Mean	14.5	11.7	7.8
Standard deviation	3.2	8.2	3.6
Standard error	1.4	3.7	1.6
Alternate counties			
Huron	7	8	8
Lapeer	10	9	7
Livingston	12	13	6
Saginaw	13	27	14
Sanilac	9	7	5
Mean	10.2	12.8	8.0
Standard deviation	2.1	7.4	3.2
Standard error	1.1	3.7	1.6
Standard error of mean diff.	1.79	5.22	2.27
t	2.40	--	--
df	10	10	10
p	< .05	NS	NS

Recalling that the special enforcement effort was concentrated on weekends, the expectation was that maximal impact, i.e., fatal accident and fatality reductions, would be experienced on weekends during the treatment period with some lesser impact during associated weekday periods attributable to some diffusion effect.

The data shows, however, that greater proportionate impact was experienced on weekdays. In the experimental counties, weekend fatal crashes decreased from an average of 8.5 per month "before" enforcement to an average of 7.2 "during" treatment--a 15% decrease. In contrast, weekday fatal crashes for the same time periods fell from 9.2 per month to 6.6--a decrease of 28%. Similarly, fatalities decreased 24% for weekends, but 38% for weekday periods. These findings suggest a delayed, diffuse effect of special enforcement that may exceed the immediate, real-time effect.

As discussed earlier, drinking drivers were a special target of the enforcement effort. While the enforcement data presented earlier show arrests concentrated on drinking offenses, review of the alcohol-related accident data shows uncertain results. Generally, "had-been-drinking" accident report notations increased "during" the experimental period. However, that increase was less during the weekend enforcement periods than during the associated weekday periods. Weekday drinking-related accidents increased from an average of 52.5 per month "before" the experiment to 64.8 "during" treatment, for an increase of 23%. On the other hand, weekend drinking-related crashes rose from 46.8 to 54.0, an increase of only 15%. While hardly conclusive, this difference in weekday versus weekend experience

suggests that the weekend enforcement effort served to suppress the drinking-involved accident rate.

But even that tentative conclusion falters when the mixed experience of the individual experimental counties is reviewed. For weekends, four counties (Berrien, Cass, St. Clair, and Tuscola) showed reductions in drinking crashes during the experiment, while the other two counties (Eaton and Hillsdale) showed increases. For weekdays, the same four-county group showed increases in "had-been-drinking" accidents, while Eaton had no change and Hillsdale showed a dramatic decrease. Thus, the rate reduction associated with the weekend enforcement effort appears mainly attributable to the extreme "before-during" experiences in Hillsdale county. No clear conclusion, therefore, is possible on the impact of selective enforcement on alcohol-related creashes in the experimental counties.

Summary

The independent variable (enforcement) and dependent variable (accidents) were analyzed in the experimental counties during the treatment period to measure the interrelationships between these two variables.

Analysis showed that the independent variable (enforcement) increased substantially over the existing productivity of the enforcement personnel assigned permanently to the experimental counties. These increases varied drastically, however, in the six experimental counties.

The fatality accident experience was significantly impacted during the experimental period; however, interpretation of this change is confounded by the fact that the immediate "before" accident experience in the experimental counties was extremely high. As a result, even though the improvement was statistically significant, one of two conclusions is likely:

1. That the reduction was the result of the extremely high "before" fatality experience returning to normal, or

2. The selective enforcement effort impacted the fatality experience in the experimental counties.

Chapter V presents an overview of the study and its findings with items of discussion which resulted from the research process associated with this investigation.

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSION, AND IMPLICATIONS FOR FURTHER RESEARCH

Summary

This study investigated the relationship between the police traffic services tactic of selective enforcement and its impact on traffic fatalities. The relationship was investigated with focus on the independent variable of enforcement activity as delineated by where, when, and to what extent it was applied, particularly to the traffic violation of driving while under the influence of alcohol.

The selective enforcement treatment was scheduled in six experimental counties in Michigan during the weekend only, over a five-month period, August through December, 1972. Nineteen other counties were identified as control counties and separated into three groups.

The Michigan State Police were selected to provide the saturated enforcement activity in the six experimental counties which were carefully selected on the basis of the severity of their rural traffic fatal crash experience. Officers were assigned to these counties on an overtime basis to supplement the existing or ongoing enforcement effort. The troopers worked on their days off to provide the added police coverage.

The added patrol coverage increased enforcement saturation by 88% in the experimental counties. This saturation produced a shift in the existing enforcement pattern from 37% of traffic arrests occurring on the weekend to 62%.

In addition to the selective enforcement variable, attention was given to the matter of involving the courts, prosecutors, and news media to insure that the program had the backing of the communities within the experimental counties.

The dependent variable, traffic fatalities, was significantly impacted in the experimental counties during the treatment period when compared with the BEFORE period during the project year and four-year average experience prior to the project year. Accident experience in the control counties also changed, but not as dramatically.

Time-series and cross-sectional analyses were completed on the accident data for the experimental and control counties. The time-series analysis showed that there was a significant difference between the project year experience and the four-year average experience at the $p = .02$ confidence level. However, that finding is confounded. Thus, either of two interpretations is equally likely.

Findings

1. The "before" period of the project year deviated so drastically from the average that the improvement could be attributed to the phenomenon of regression to the mean.

2. The enforcement effort "during" the treatment period did impact the fatality experience in the experimental counties.

In the cross-sectional analysis where the experimental county group was compared with three other control groups, the statistical analysis produced an assortment of mixed findings.

1. A Chi-square analysis of the four groups produced a significance at the p = .10 level when compared with each other which is not within the confidence limits of acceptability developed for this study.

2. When comparing the experimental group with the group most like itself, less one of the experimental counties where adequate enforcement was not implemented, significance was determined at the p = .01 level.

3. Using the "t"-test statistic comparing the same two county groups, as identified above, it was determined when comparing the "before" accident experience for the project year that a significant difference was noted at the .05 confidence level.

The major finding of the study was that the analysis was unable to reject the null hypothesis that the additional enforcement effort did not materially affect the fatality crash experience in the experimental counties.

However, exclusive of these statistical findings in measuring the fatality reversal experience, caution should be exercised in this interpretation to avoid making a Type II error, i.e., concluding that selective enforcement as a life saving response is ineffective when in fact it is effective. In effect, the study produced further suggestive evidence to encourage more controlled investigation of this very important police tactic.

Conclusions

The emphasis given to operational considerations in the design of this investigation resulted in confounding the results produced by the experiment. Choosing the experimental counties on the basis of

the severity of their rural fatality crash experience served to address a serious problem and not an average or representative problem which would have been more appropriate for scientific analysis.

During the study, a measurable reduction in the rural fatality experience in the experimental counties was observed. It cannot be said with conclusiveness that it was the independent variable of selective enforcement that produced it or whether it was the result of an extremely bad accident experience returning to its normal or more average experience. One group of control counties which had an accident experience similar to the experimental group did not show as good an improvement which provides further suggestive implications that the positive fatality reduction experience in the experimental counties was produced by the selective enforcement treatment.

Interpretation of the impact of the special selective enforcement effort is confounded by the reasonable operational considerations used in the selection of the experimental counties. Therefore, the analysis is unable to reject the null hypothesis:

> The selective deployment of traffic law enforcement resources, concentrating on the detection and citation of traffic law violation, does not significantly impact the fatality traffic accident experience of a treated area.

It should be emphasized that exclusive of these statistical findings, police administrators should consider the demonstrated fatality reversal associated with this study as potentially significant and desirable. While results could be explained by a regression to the mean phenomenon, it should be mentioned that that conclusion

is probablistic; therefore, caution has to be exercised to avoid committing a possible Type II statistical error, which is to reject a finding that might have substantive merit.

Discussion

The thesis advanced in the beginning of this study suggested that conclusive evidence is lacking to support the contention that a reduction in unsafe driving behavior will result in a reduction of traffic accidents and that the enforcement of traffic laws does result in some decline in unsafe driving. In spite of this lack of conclusive evidence, police administrators contend that improved enforcement efforts will mean fewer accidents based on the premise that many accidents are caused by drivers who do not obey traffic laws and codes.

Such generalizations are based more upon expert judgment than on empirical evidence. The results of this investigation do not give much added empirical evidence to support conclusively the theory advanced by this investigation. What it does is afford those in administrative positions further encouragement for implementing soundly conceived selective enforcement programs. In spite of the failure of this project to be statistically convincing, the trends and associations developed in Chapter IV lend further evidence that the selective enforcement countermeasures choice can, and in this case probably did, produce a favorable change in accident experience.

The investigation also pointed to the need for continuing the matter of producing statistically adequate evidence that will more clearly delineate the merits of selective enforcement

countermeasure programs. The police traffic services function of the traffic safety system constitutes a significant share of the expenditures allocated for protecting the motoring public. To continue to invest huge sums of human and financial resources without the benefit of such necessary technology as selective enforcement borders on the realm of irresponsibility.

Officials responsible for the management of the highway safety system need to be convinced that certain aspects of the problem can be attributed to a certain deficiency in remedy design. Until this can be achieved from research data, difficulty can be expected in materially altering the existing system for introduction of new and perhaps more effective countermeasure activity.

More scientific evidence is also needed to account for changes when they occur in the traffic crash experience. The technology sought to establish the benefits of the selective enforcement countermeasures will assist responsible decision makers in adjusting police resources to meet the changing needs.

This project should not be measured completely on the basis of the rejection of the basic hypothesis. Too little is known, as documented by the state-of-the-art review of police traffic services contained in Chapter II, to be sure that the criteria for evaluating this study was properly identified in the hypothesis that was developed. The hypothesis represented the ultimate effect the study was attempting to demonstrate; however, to be satisfied that the selective enforcement countermeasure could produce this ultimate cause/effect relationship was purely speculative. We know only

that suggestive evidence points to that potential benefit, and this study produces further suggestive thoughts along these lines.

It is also important to mention that the National Highway Traffic Safety Adminstration did an analysis of this study and determined that the results were indeed significant. It should be importantly noted, however, that their analysis left out Berrien county because of the problem identified about half way through the experiment with the delivery of the enforcement independent variable in that county. Reductions in both fatal crashes and fatalities were found to be significant in their review.[54]

Another prominent review of this project, completed by the Insurance Institute for Highway Safety, resulted in opposite conclusions.[55] Their principal objections to the study had to do with the methodology designed for selection of the experimental counties. They attack the strategy of choosing those counties with a severe problem as not allowing for a scientific basis from which objective conclusions could be drawn. Further, they argued that reductions experienced could be accounted for by "regression-to-the-mean phenomenon" or a return of an unusual experience to the average just by chance alone. Control counties were chosen in this study to compensate for this lack of proper rigor in design so that at the same time a most serious problem was being evaluated, the delivery

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[54]"Fatal Crash Reduction Program," A Demonstration Project, Department of Transportation, National Highway Safety Administration, February, 1973, p. 2.

[55]"FARE Built on Faulty Foundation," Status Report, Insurance Institute for Highway Safety, May 5, 1974, Vol. 9, No. 10, p. 3.

of an appropriate remedy might be instituted. It is interesting to note that traffic fatalities were reduced below the mean in the experimental counties and the same did not occur as consistently in the control counties. It is also questionable whether the "regression-to-the-mean" argument applies in this study case, as the technique is most applicable when there is erratic fluctuation in the data being analyzed. It is questionable whether or not traffic crash experience falls in the erratic category, but it does not seem to.

One factor that added an interesting dimension to this study was that three of the experimental counties were again the subjects of further enforcement treatment during periods of 1973 and three were not. A review of the experience during the period of August through December, 1973, revealed that two of the counties that had received the enforcement coverage during the 1973 period had a better fatal and fatality crash experience. In those counties not treated in 1973, two became worse and one better.

In another analysis of this study, it was determined that

> . . . the experimental counties differ markedly from each of the other three control groups of counties, both in the contrast between deviations from averages during the experimental period, August through December, 1972, compared to January through July, 1972, and in the consistency of the deviations.[56]

The report further concluded that the direction of deviation from averages for the No. 2 control counties are quite similar to those of the experimental group. The principal difference was that

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[56]William H. Peckham, "Experimental Rural Traffic Patrol," Crminal Justice Data Center, Analysis Section, Michigan State Police, February 15, 1973, pp. 3-8.

the probabilities of not being due to chance were generally much lower than for the experimental counties.

The pure counties showed a probability pattern far more irregular than the experimental counties for both fatal crashes/fatalities. The same basic finding was noted for the less pure counties.

Since the conclusion of this study, two subsequent selective enforcement programs have been initiated by the Michigan State Police. In both these efforts, similar positive results occurred in reducing the trend in the fatality accident experience.

Project success for this study was measured in an aggregate way and, although this is the test appropriate for the circumstances, there is much to be said for project results by examination of each of the counties individually and then attempting to suggest why these differences might have occurred.

Reductions in fatal accidents and fatalities were experienced in the counties of Eaton, Hillsdale, and St. Clair. The results in Cass and Tuscola counties were favorable but did not reflect as much improvement. The results in Berrien county were less than satisfactory.

Eaton, Hillsdale, and St. Clair Counties

The combined four-year averages for the first seven months in the counties of Eaton, Hillsdale, and St. Clair were 36 rural fatal accidents and 43.25 rural fatalities, combined across these three counties. During the first seven months of 1972, these same counties had recorded a total of 68 rural fatal accidents and 75 rural

fatalities. The four-year averages for the months of August through December in these same counties were 29.75 rural fatal accidents and 37.75 rural fatalities. During these same months of 1972, there were 16 fatal accidents and 16 fatalities in these three counties. These statistics reveal that during the first seven months of 1972 there was an increase of 32 rural fatal accidents and 32 rural fatalities as compared to the four-year average which represents percentage increases of 88.9 and 74.0, respectively. By contrast, there were reductions in rural fatal accidents during the August-through-December period from the four-year average of 29.75 to 16 in 1972 and in rural fatalities from the four-year average of 37.75 to 26 in 1972. The percentage reductions were 46.2 and 57.4, respectively.

Reviewing the programs in the counties of Eaton, Hillsdale, and St. Clair, there appeared to be factors in common that seemed to contribute greatly to their success. In each of these counties, excellent news coverage was received, both before the programs were initiated and during the period the programs were in operation. The news media were present at each meeting held in these counties prior to the inception of the program. These meetings included a gathering of law enforcement officers, prosecutors, and district judges in the county affected, as well as meetings arranged by the Michigan Women for Highway Safety which also involved the above public officials. During the period the program was in operation, the news media released regular progress reports relating to the accident experience and the presence of the additional patrol units.

Another factor that unquestionably influenced the program in these three counties was the enthusiasm of the Michigan State Police commanding officers of the posts and districts involved. In each case the patrol activity was very good and the quality of the reporting of the activity and the time accounting was unusually good. In addition to the excellent enforcement activity of the State Police, the Eaton County Sheriff attended the meetings prior to the start of the program and assigned as many of his officers as possible to patrol during the hours when and where most fatal accidents were occurring. Their drunk driving arrests increased substantially during this period and probably contributed to the improved accident experience in Eaton county.

Tuscola County

Tuscola county has traditionally had the highest or one of the highest rural death rates in the state during recent years. This special enforcement program was very well recieved by the public officials in the county and also had very good news coverage. The District Commander was enthusiastic about the program and the activity of the patrol units was very good. This program had a very bad start, as there were six rural fatal accidents with six fatalities during August. One of the fatal accidents occurred on August 2, 1972, which was actually prior to the beginning of the program which started August 4, 1972. Although Tuscola county had an increase of three fatal accidents during the five-month period as compared with the four-year average, there was a reduction of 1.5 fatalities as compared with the four-year average. There was actually a reduction

in both fatal accidents and fatalities after the first month of the program.

Cass County

Cass county recorded a slight reduction in fatalities, but an increase in fatal accidents. Cass and Berrien counties are located side by side and are both in the same State Police district. Both of these counties were low in enforcement activity as compared with the other four counties in the program. Comparison studies prior to the beginning of the program indicate that drinking drivers were involved in 60% of the fatal accidents in Cass county and that most of the accidents were one-car accidents which normally involve a high percentage of drinking drivers. In spite of the apparent drinking driver problem in Cass county, the special enforcement officers only arrested a drunk driver for every 45.4 car hours on patrol. This was the poorest rate of any of the counties. Berrien county had the second worst rate with an average of one drunk driver for each 41.9 car hours on patrol. The average rate for the other four counties was a drunk driver arrest for each 25.8 car hours. Berrien and Cass county patrols also had the poorest rate of "other patrol and complaint arrests" per car hour on patrol and the lowest rate of liquor establishment inspections per car hour when compared with the other four counties. With this program predicated on the drinking driver and fatal accident problem, shortocmings in D.U.I.L. enforcement, liquor inspections, and the "other patrol and complaint arrest" categories should, and apparently did, reflect in the ultimate success of the program in these counties. The "other patrol and complaint arrests"

include those arrests that are not a part of the vehicle code except those arrested on open traffic warrants. These arrests are considered to be very important as approximately 60% involve either alcohol or narcotics and could well have resulted in the subject driving a vehicle while his ability was impaired or influenced had he not been apprehended.

Berrien County

Berrien county was the only experimental county where there was an increase in fatalities. The law enforcement consideration described previously was probably a factor in the increase in fatal accidents and fatalities in Berrien county. However, there was also another element that certainly deserves an explanation. Berrien county recorded an exceptionally high number of what would normally be considered unusual fatal accidents for a rural area. Berrien county recorded 28 rural fatal accidents and fatalities during the August-through-December program. This total included seven pedestrian fatalities, one farm tractor fatality on a roadway that did not involve a road vehicle, and one fatality involving a snowmobile and a car.

Multiple Fatalities

There was a very low ratio of multiple fatalities during the five-month period in the six counties involved in the special enforcement program. There were 68 single fatality accidents and one double fatality during the five-month program. This amounts to a rate of 1.01 fatalities per fatal accident during the program as compared to

a rate of 1.15 during the first seven months of 1972. The rural state-wide rate for 1972 was 1.16 fatalities per fatal accident.

There is no way of determining what effect, if any, the special enforcement program had on this extremely low rate of multiple fatalities. However, it would appear there was a sufficient number of fatal accidents during this period to determine that the probability of this reduction being a matter of chance alone is very small. The publicity given the program both before and during the project period plus the extra enforcement could well have created an awareness in the general driving population of the problem of the drinking driver to the extent that most motorists were driving defensively to avoid involvement in an accident with a drunken driver.

Traditionally a high percentage of multiople fatality accidents occur on weekends and involve drinking drivers. The special enforcement program was assigned to combat these factors and could well have been partially responsible for the very low fatality rate per fatal accident.

Miscellaneous

In addition to reversing the spiraling upward trend in fatal accidents and fatalities in the six county area prior to this program to a reduction during the program, there was a side benefit that may well result in a future saving of lives.

Many times officers on patrol become discouraged and wonder if they are accomplishing anything by enforcing traffic laws. It was brought to the attention of project personnel by the commanding officers in at least two of the counties that they could detect an

enthusiasm in the troopers toward traffic law enforcement by their having participated in this program and having observed the reduction in fatal accidents and fatalities that resulted. It was felt that being able to measure the reductions that were apparently a direct result of their selective enforcement efforts will provide motivation for the future.

It is important to make note of the fact that the county that had the best crash reduction experience also did so well when measured on alcohol-related criminal arrests. The present state-of-the-art in alcohol, in relation to highway safety, suggests that the social problem of alcohol beyond its involvement with traffic is probably the more basic causal factor and perhaps its involvement with traffic is only symptomatic of this broader social ill. Further, although other forms of drugs have not been isolated as a major contributing factor in fatal crashes, it seems important to make mention of the fact that the county whose enforcement performance was the best made a considerable number of these contacts when compared to their partner experimental counties.

Surprisingly, drinking accidents were not materially impacted during the weekend deployment schedule. However, the rate of increase was less during the weekend when compared to the weekday. In either case, the change was not significant, but it was of concern to note that that particular aspect of the problem did not seem to be affected too dramatically and suggests perhaps that the alcohol component portion of the problem is much broader than just being associated with highway safety.

The variance of enforcement coverage points to one of the most perplexing issues facing police administrators. Not only is the matter of selective enforcement and its effects of concern, but, importantly, to what level of saturation must this countermeasure be introduced to create that desired effect, or, just as importantly, at what level will it lose its efficiency in producing this important effect. It would appear that the enforcement level has to be increased dramatically before an effect can be expected. But it is not clear from this study the level at which the returns begin to diminish.

This study was greatly encouraged by a history of Michigan State Police traffic enforcement experience which has tremendous suggestive implications. Examining the enforcement and accident experience correlation for the period 1954 through 1972 offers corroborative help to decision makers who are considering pursuit of the selective enforcement highway safety countermeasure. For these many years, it shows that when traffic enforcement activity is high, accident experience is generally low. See Figure 5.

In Chapter I, reference was made to the problem of highway safety and that perhaps remedies will have to go beyond the highway safety system, as the basic problems do not necessarily lend themselves to solution within the framework of the highway safety system. In Michigan, one of the consistent variables in society that correlates with the traffic crash problem is associated with employment trends. Figure 6 vividly demonstrates this interesting correlation.

Another important question that was being observed during the study was to note the diffusion effect that the enforcement activity

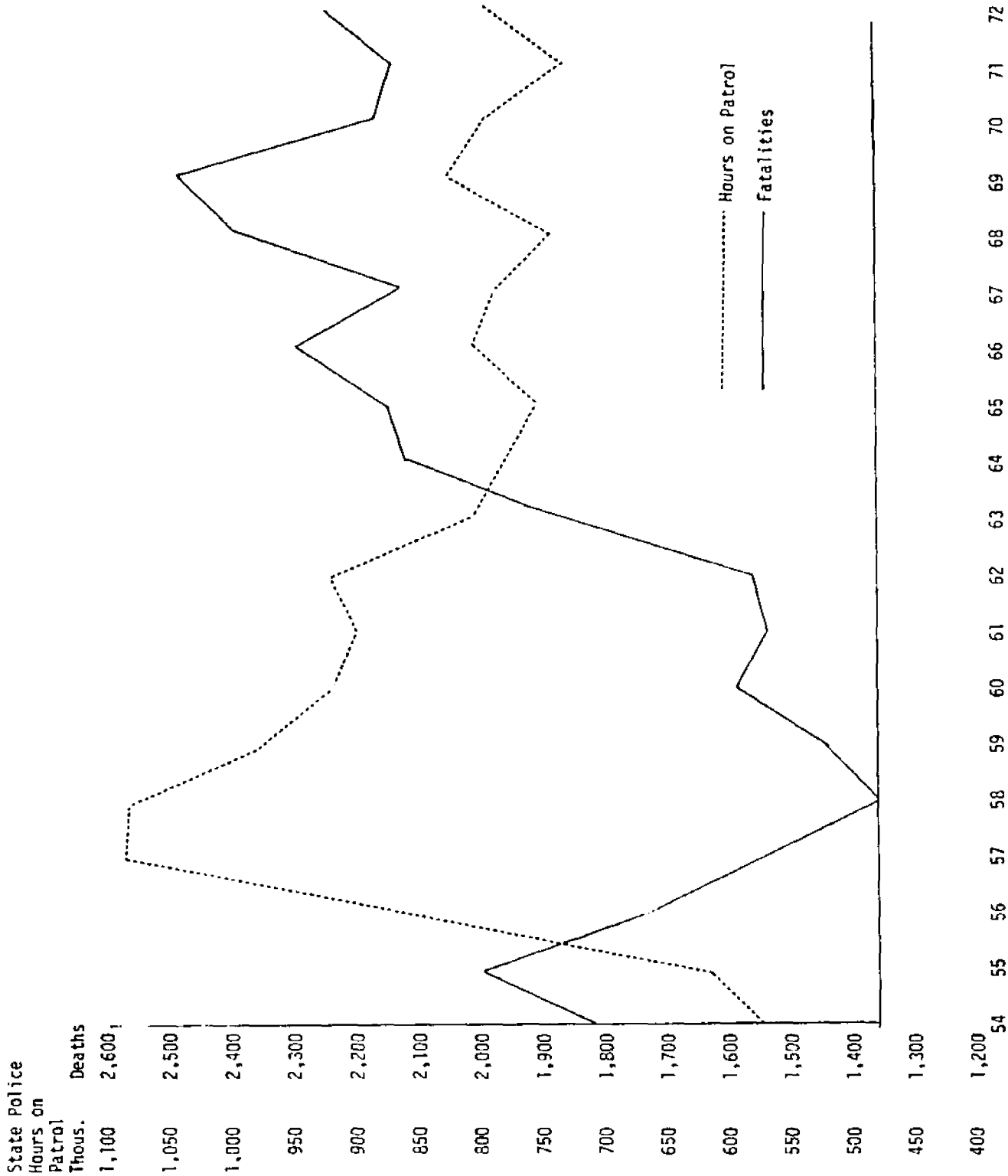

Figure 5.--State Police Patrol Hours--Traffic Fatality Comparison, 1954 Through 1972.

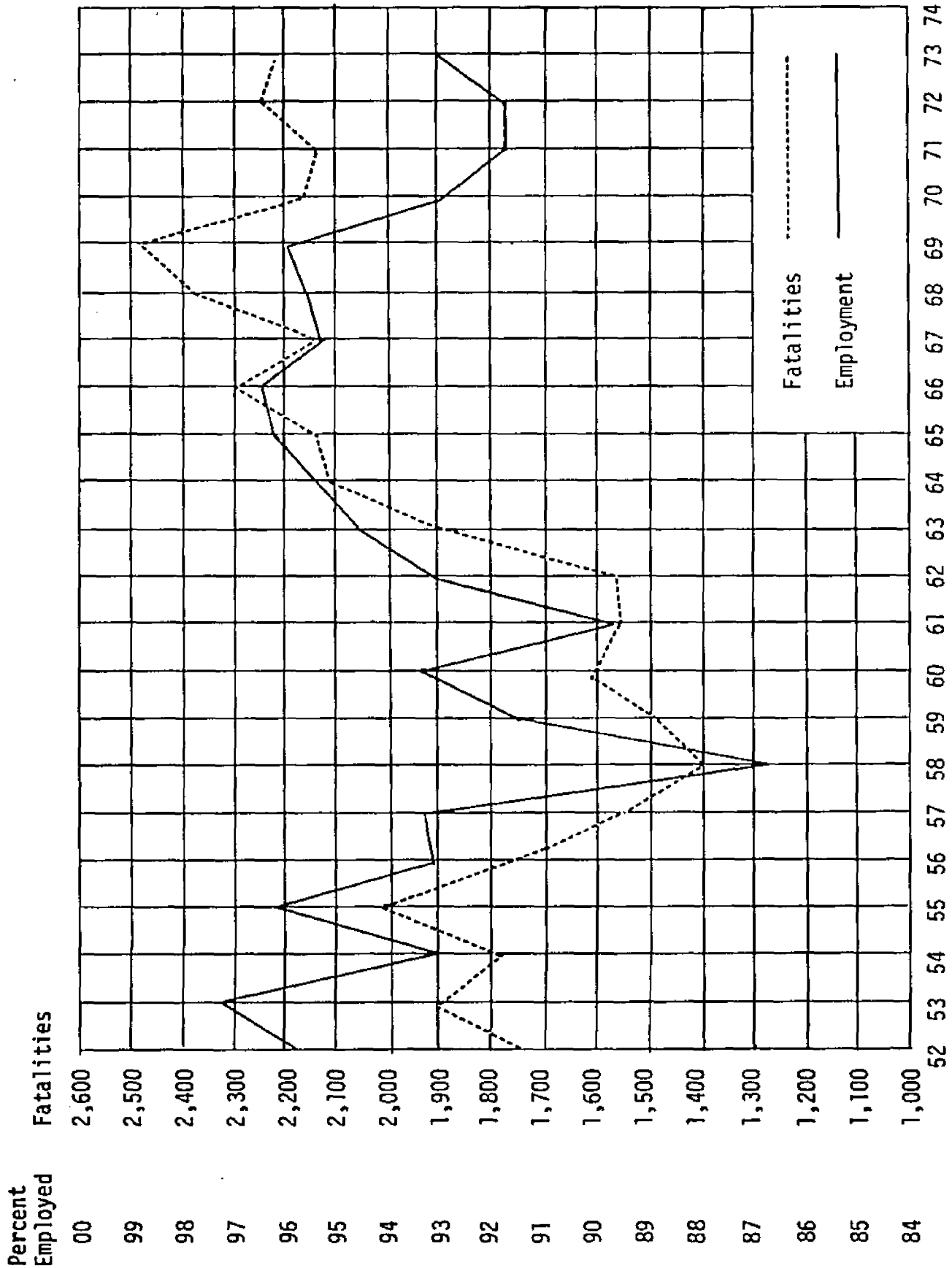

Figure 6.--Traffic Fatality Vs. Employment Trends, 1952-74.

executed during the weekend might have had on the crash experience during the week.

As noted earlier, the crash experience was better during the week when the enforcement effort was less concentrated. The issue that becomes apparent is whether or not the weekend enforcement effort had the effect of impacting the fatal crash experience during the week. Literature support for this carry-over effect is not substantial. The most recent work on this matter was completed on three enforcement projects sponsored by the National Highway Traffic Safety Administration in three large urban communities. The suggestive finding in these projects was that there was no diffusion effect of the enforcement activity beyond the treatment period.[57] The observation of the personnel managing this Michigan study, however, was that the effect did in fact carry over. They had no way of explaining the otherwise good success of the enforcement activity.

Implications for Further Research

The police traffic services sub-system component constitutes a major portion of the whole traffic safety system. A projection study of highway safety needs for a ten-yer period, 1967-1977, in fact, indicated that 51% of all future highway safety resources would be needed to properly implement the provisions of the police traffic services standard.[58]

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[57]Anonymous, "Evaluation of Selective Traffic Enforcement Programs," PRC Public Management Services, Inc., Final Report, Contract No. DOT-HS-268-2-517, May, 1974.

[58]"Estimate of the Cost of Carrying Out the Provisions of the Highway Safety Act of 1966," a report to the Congress from the Secretary of Transportation, October, 1968, U.S. Dept. of Transportation, p. 12.

The magnitude of the work to be done in the police traffic functional area points to the need for insuring that adequate mechanisms be employed for monitoring the effects of this significant commitment. To continue traditional inattention to the matter of evaluating the effects of the police in control of the motoring public would be a disservice to the public, for it does constitute such a large expense to the American taxpayer.

The implications of the investigation reported in this study offer more suggestive support for the proposition that the practice of selective enforcement produces a direct contribution in the reduction of the traffic crash problem. As has been pointed out, the rigor of this study does not allow for conclusiveness in supporting scientifically this suggestive proposition. At the least, it suggests that extensive work is needed to close the loops that have been identified in the section of the study that speaks to its limitations. The findings are suggestive enough to encourage that further work be initiated to pursue the basic concept structured in this study.

It is obvious that properly designing a study to adequately account for the variables that operate in the traffic safety system will be expensive. Those who choose to further examine the basic proposition of this study must be prepared to accept the fact that designing for control of appropriate variables will be costly, but necessary to produce much needed technology in police traffic services.

A logical first step in designing large scale traffic accident countermeasure programs is to implement pilot projects that have

appropriate evaluation provisions designed into them. Only after such a deliberate process where countermeasure programs have been proved to be effective is it appropriate to give high emphasis priority to the widespread implementation of such known successes.[59]

Implications are made throughout this study that offer suggestions for strengthening methodological design for future efforts in measuring the effects of selective enforcement programs. Many of the limitations of this study were acknowledged and identified in advance of the study analysis process contained in Chapter IV. However, several further contaminating elements were identified as a result of the analysis process. These are offered to assist those who replicate this effort with similar research projects.

Project Management

More attention should be placed upon the management aspects of the delivery of a successful selective enforcement effort: controls to measure leadership attitude and effectiveness, manpower allocation techniques, and, particularly, first line supervisory attention to the qualitative productivity of the selective enforcement patrol units.

Personnel Training

Training of selective enforcement personnel should be carefully accounted for in subsequent research attention to this police

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[59]Allan F. Williams and Leon S. Robertson, "The Fatal Crash Reduction Program: A Re-evaluation," The Insurance Institute for Highway Safety, Washington, D.C., 1974, p. 12.

tactic. Pre- and post-evaluation of the level of competency prior to the officers being assigned to this enforcement activity would assist in appropriately designing in the future to provide police officers who can effectively render this police service.

Equipment

It is important to be able to isolate the effects of equipment that is used in a selective enforcement effort. Does the use of vascar, radar, and other speed measuring devices greatly contribute to the effectiveness of the traffic patrol officer? Does the scientific alcohol breath testing equipment materially affect the productivity of the patrol officer? Can video tape assist in corroborating on-view observations of the officer which might encourage more attention to marginal driving behavior?

Data Base

Extreme caution is offered to those who propose to conduct scientific research in the selective enforcement element of police traffic services to insure that study areas are chosen appropriately for statistical and operational analysis. Potential study sites should be considered to insure adequacy of numbers. They can be secured by working in areas of sufficiency in accident density or by scheduling the experiment over a period of sufficient duration to allow for the accumulation of sufficient numbers to insure a basis for proper analysis. The literature is loaded with intances of inappropriate design attention to this important matter.

Selective Enforcement Activity

It can be observed by review of the data analysis in Chapter IV that enforcement activity consists of an assortment of public contacts, i.e., arrests, warnings, inspections, other complaint arrests, criminal related arrests, and D.U.I.L. arrests. It was theorized that D.U.I.L. arrests were a very important enforcement activity to emphasize because of the particular nature of the fatality problem in the experimental counties.

This study did not measure the effect that each of the various activities might have had on the traffic fatality problem.

Problem Definition

This study focused on traffic fatalities. There are other commonly identified categories of traffic crashes, i.e., personal injury and property damage. The effect of selective enforcement on these other types of crashes should be a subject of further investigation.

Police Jurisdiction

In this study the matter of overlapping police jurisdiction was identified as a confounding variable at the design stages of development. Further experimentation should be designed to avoid this contaminate for the response from other police agencies patroling the same area could be a very influential factor in enforcement productivity. In Michigan there was no way to avoid this situation.

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APPENDICES

APPENDIX A

FATAL ACCIDENT COMPARISONS

BY COUNTY

Appendix A-1. Fatal Accident Comparisons by County, 30.000-50,000 Population.

County	Pop.	Total Fat. 5 Yrs.	Avg. Fat. 5 Yrs.	Avg. Rate Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1970	Rural F.A./ Fat. 1971	Avg. Rural Fat. 70/71	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1972	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean
Alpena	30.7	43	6.6	.280	-1.1	8/11	6/6	8.5	.277	- .8	6/6	.195	- .1
Chippewa	32.4	45	9.0	.278	-1.1	10/13	4/4	8.5	.262	- .9	4/4	.123	- .7
Huron	34.1	86	17.2	.504	+ .8	19/22	16/21	21.5	.630	+1.9	8/10	.293	+ .6
Houghton	34.7	43	8.6	.248	-1.3	5/6	10/10	8.0	.231	-1.2	2/3	.086	-1.0
Sanilac	34.9	71	14.2	.407	+ .0	15/21	9/10	15.5	.444	+ .5	11/11	.315	+ .8
Delta	35.9	56	11.2	.312	- .8	6/6	8/9	7.5	.209	-1.3	6/7	.195	- .1
Hillsdale	37.2	84	16.8	.452	+ .4	12/13	12/12	12.5	.336	- .4	13/17	.457	+1.9
Branch	37.9	66	13.2	.348	- .5	7/8	15.20	14.0	.369	- .1	6/6	.158	- .4
Barry	38.2	84	16.8	.440	+ .3	11/18	11/16	17.0	.445	+ .5	6/8	2.09	- .0
Grd. Traverse	39.2	62	12.4	.316	- .8	8/9	8/10	9.5	.242	-1.1	3/3	.077	-1.1
Gratiot	39.2	83	16.6	.423	+ .2	15/20	12/12	16.0	.408	+ .2	10/11	.281	+ .5
Montcalm	39.7	86	17.2	.433	+ .2	15/15	10/11	13.0	.327	- .4	4/5	.125	- .7
Cass	43.3	117	23.4	.540	+1.1	17/21	21/28	24.5	.566	+1.4	16/22	.508	+2.3
Isabella	44.6	67	13.4	.300	- .9	6/7	12/18	12.5	.280	- .8	6/6	.135	- .6
Ionia	45.9	83	16.6	.362	- .4	14/16	14/18	17.0	.370	- .1	7/7	.153	- .5
St. Joseph	47.4	120	24.0	.506	+ .9	18/23	16/25	24.0	.506	+ .9	9/9	.190	- .2
Clinton	48.5	100	20.0	.412	+ .1	18/19	18/18	18.5	.381	- .0	2/2	.041	-1.4
Tuscola	48.6	175	35.0	.720	+2.7	19/34	24/27	30.5	.628	+1.9	12/14	.288	+ .6
					.405 Mean .118 St. Dev. .028 St. Err.					.384 Mean .130 St. Dev. .031 St. Err.			.213 Mean .126 St.Dev. .030 St.Err.

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan.

Appendix A-2. Fatal Accident Comparisons by County, 50,000-100,000 Population.

County	Pop.	Total Fat. 5 Yrs.	Avg. Fat. 5 Yrs.	Avg. Rate Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1970	Rural F.A./ Fat. 1971	Avg. Rural Fat. 70/71	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1972	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean
Lapeer	52.3	137	27.4	.524	+1.4	16/19	23/29	24.0	.459	+1.1	9/11	.210	+ .5
Van Buren	56.2	132	26.4	.470	+ .8	24/28	14/17	22.5	.400	+ .5	8/8	.142	- .6
Livingston	59.0	135	27.0	.458	+ .6	18/23	25/28	25.5	.432	+ .8	13/14	.237	+ .9
Shiawassee	63.1	111	22.2	.352	- .6	15/22	19/20	21.0	.333	- .2	7/8	.127	- .8
Midland	63.8	95	19.0	.298	-1.3	7/7	13/17	12.0	.188	-1.6	5/10	.157	- .4
Marquette	64.7	91	18.2	.281	-1.5	12/15	11/12	13.5	.209	-1.4	3/5	.077	-1.6
Allegan	66.6	123	24.6	.369	- .4	15/17	15/21	19.0	.285	- .6	8/12	.180	0
Eaton	68.9	148	29.6	.430	+ .3	19/26	21/26	26.0	.377	+ .3	19/20	.290	+1.7
Lenawee	81.6	190	38.9	.466	+ .7	31/41	30/33	37.0	.453	+1.1	14/16	.196	+ .3
					.405 Mean .084 St.Dev. .028 St.Err.					.348 Mean .100 St.Dev. .033 St.Err.			.180 Mean .063 St.Dev. .021 St.Err.

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan.

Appendix A-3. Fatal Accident Comparisons by County, 100,000-200,000 Population.

County	Pop.	Total Fat. 5 Yrs.	Avg. Fat. 5 Yrs.	Avg. Rate Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1970	Rural F.A./ Fat. 1971	Avg. Rural Fat. 70/71	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1972	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean
Bay	117.3	179	35.8	.305	- .2	19/21	29/34	27.5	.234	- .2	6/8	.068	-1.2
Monroe	118.5	277	55.4	.468	+2.1	40/49	40/45	47.0	.397	+1.8	17/19	.160	+ .5
St. Clair	120.2	207	41.4	.344	+ .2	26/31	22/22	26.5	.220	- .3	25/27	.225	+1.7
Ottawa	128.2	167	33.4	.261	- .8	23/25	31/35	30.0	.234	- .2	14/16	.125	- .1
Calhoun	142.0	217	43.4	.307	- .2	31/32	22/24	28.0	.197	- .6	13/19	.134	+ .0
Jackson	143.3	199	39.8	.278	- .6	22/27	37/40	33.5	.238	- .1	15/18	.126	- .1
Muskegon	157.4	188	37.6	.239	-1.2	19/22	16/19	20.5	.130	-1.4	7/9	.057	-1.4
Berrien	163.9	300	60.0	.366	+ .6	53/61	45/47	54.0	.329	+1.0	25/27	.165	+ .6
					.321 Mean .071 St.Dev. .025 St.Err.					.247 Mean .084 St.Dev. .030 St.Err.			.133 Mean .055 St.Dev. .019 St.Err.

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of HIghway Safety Planning, Lansing, Michigan.

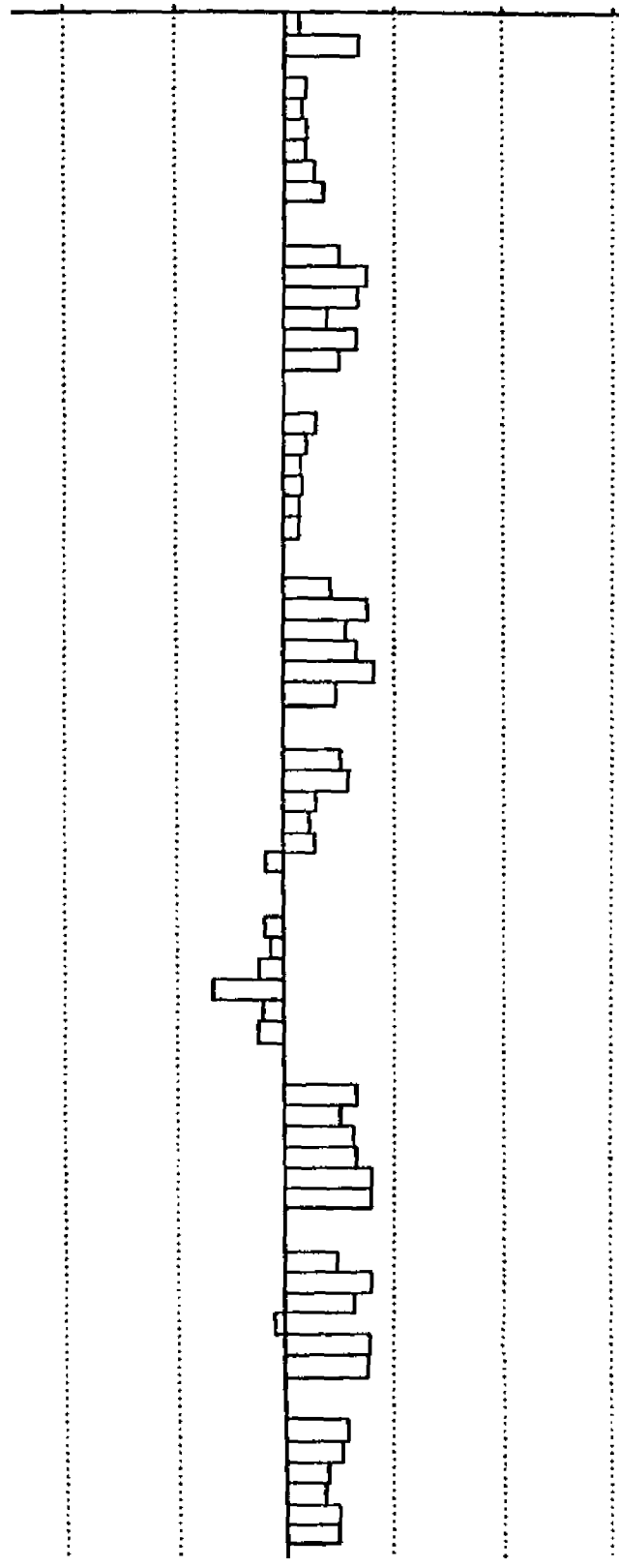
Appendix A-4. Fatal Accident Comparisons by County, Over 200,000 Population.

County	Pop.	Total Fat. 5 Yrs.	Avg. Fat. 5 Yrs.	Avg. Rate Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1970	Rural F.A./ Fat. 1971	Avg. Rural Fat. 70/71	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean	Rural F.A./ Fat. 1972	Rural Fat. Rate Per Thou. Pop.	+ or - St.Dev. From Mean
Kalamazoo	201.6	231	46.2	.229	+ .1	22/29	34/39	34.0	.169	+ .1	13/14	.069	+ .1
Saginaw	219.7	336	67.2	.306	+1.3	41/46	55/71	58.5	.266	+1.3	21/28	.127	+2.7
Washtenaw	234.1	321	64.2	.274	+ .8	57/71	49/57	64.0	.273	+1.4	20/21	.090	+ .8
Ingham	261.0	180	36.0	.138	-1.4	27/30	19/20	25.0	.096	- .9	5/6	.023	-1.9
Kent	411.0	435	87.0	.217	- .1	34/42	44/51	46.5	.113	- .6	14/17	.041	- .8
Genesee	444.3	621	124.2	.280	+ .9	68/77	78/99	88.0	.198	+ .5	28/34	.077	+ .5
Macomb	625.3	470	94.0	.150	-1.2	40/45	41/46	45.5	.073	-1.2	22/25	.040	-1.1
Oakland	907.9	890	178.0	.196	- .4	99/109	92/103	106.0	.117	- .6	48/53	.058	- .3
				.224 Mean .063 St.Dev. .022 St.Err.					.163 Mean .077 St.Dev. .027 St.Err.			.066 Mean .032 St.Dev. .011 St.Err.	

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of H"ghway Safety Planning, Lansing, Michigan.

APPENDIX B

EXPERIMENTAL COUNTY TRAFFIC CRASH CHARACTERIZATION



State μ	State σ		County Experience
107287	332015		161400 Population 1970
1364.7	813.8		1912 Road Miles 1968
3649	13064		6159 Accidents 1966
3602	12490		5981 Accidents 1967
3680	13067		6224 Accidents 1968
3990	13689		6791 Accidents 1969
3780	11939		6918 Accidents 1970
3783	11251		6987 Accidents 1971
			Accidents 1972
27.7	57.3		58 Fatalities 1966
25.6	51.3		65 Fatalities 1967
28.8	55.6		67 Fatalities 1968
30.0	60.9		54 Fatalities 1969
26.2	51.5		62 Fatalities 1970
25.0	49.0		51 Fatalities 1971
			Fatalities 1972
1188	6487		2972 Injuries 1966
1823	6232		2916 Injuries 1967
1933	6796		2849 Injuries 1968
2113	7563		2961 Injuries 1969
1948	6671		3019 Injuries 1970
1899	6497		2799 Injuries 1971
			Injuries 1972
53.6	21.0		64.4 Acc/R.V. 1966
51.6	13.2		61.8 Acc/R.V. 1967
53.4	12.7		61.8 Acc/R.V. 1968
* 54.6	14.0		64.6 Acc/R.V. 1969
53.9	11.5		63.3 Acc/R.V. 1970
57.0	12.0		61.8 Acc/R.V. 1971
			Acc/R.V. 1972
16.1	4.5		18.9 I.A./R.V. 1966
15.5	4.0		18.1 I.A./R.V. 1967
16.5	3.9		17.6 I.A./R.V. 1968
* 16.4	4.6		17.3 I.A./R.V. 1969
15.8	3.7		16.9 I.A./R.V. 1970
16.3	3.5		15.7 I.A./R.V. 1971
			I.A./R.V. 1972
.570	.267		.512 F.A./R.V. 1966
.620	.332		.568 F.A./R.V. 1967
.602	.318		.526 F.A./R.V. 1968
* .612	.320		.399 F.A./R.V. 1969
.554	.282		.493 F.A./R.V. 1970
.500	.240		.430 F.A./R.V. 1971
			F.A./R.V. 1972
75.2	68.2		123.1 Acc/RV/RdM 1966
74.1	64.8		119.5 Acc/RV/RdM 1967
75.5	64.6		118.1 Acc/RV/RdM 1968
77.4	67.0		121.4 Acc/RV/RdM 1969
74.3	55.8		120.9 Acc/RV/RdM 1970
78.1	52.5		118.5 Acc/RV/RdM 1971
			Acc/RV/RdM 1972
.778	.399		.979 FA/RV/RdM 1966
.757	.379		1.086 FA/RV/RdM 1967
.760	.376		1.006 FA/RV/RdM 1968
.785	.426		.764 FA/RV/RdM 1969
.684	.321		.943 FA/RV/RdM 1970
.630	.300		.830 FA/RV/RdM 1971
			FA/RV/RdM 1972
23.4	22.1		36.1 IA/RV/RdM 1966
22.7	21.9		34.6 IA/RV/RdM 1967
23.7	21.5		33.7 IA/RV/RdM 1968
23.8	22.7		33.1 IA/RV/RdM 1969
22.4	19.6		32.3 IA/RV/RdM 1970
22.8	18.7		30.2 IA/RV/RdM 1971
			IA/RV/RdM 1972

*figures represent actual value times 10^1

BERRIEN COUNTY

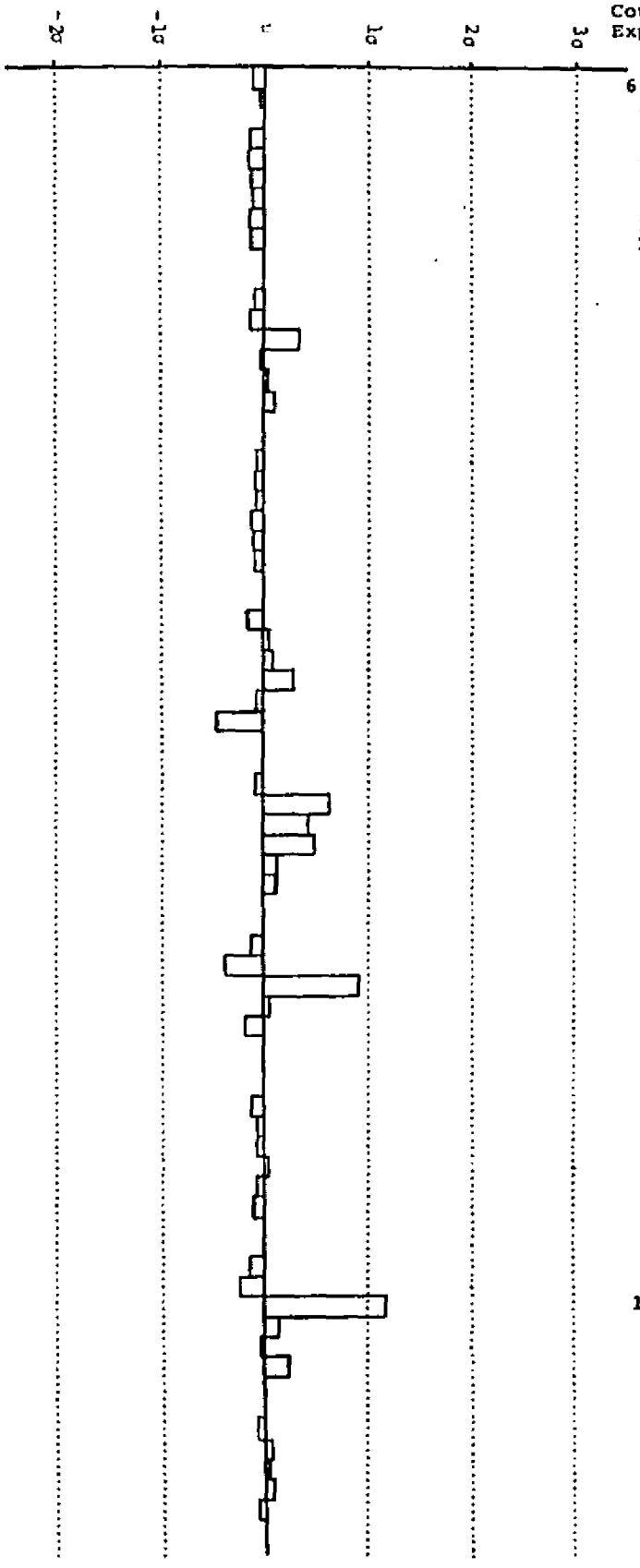
Source: David K. Damkot and William T. Pollock, Development of Highway Safety Program and Project Evaluation Criteria Accident Experience Characterization, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, November, 1971.

State μ	State σ	-2σ	-1σ	μ	1σ	2σ	3σ	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 10^3

CASS COUNTY

Source: David K. Damkot and William T. Pollock, Development of Highway Safety Program and Project Evaluation Criteria Accident Experience Characterization, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, November, 1971.

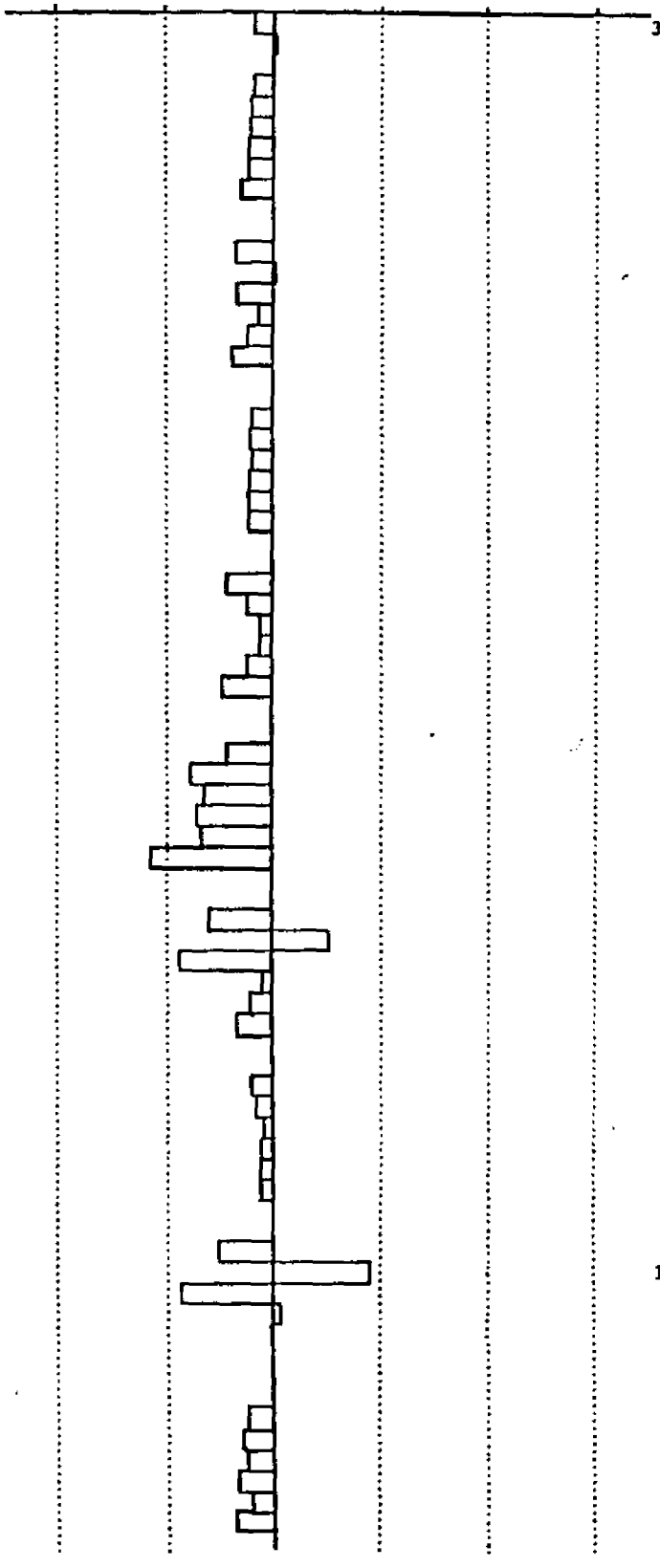


State μ	State σ		County Experience
107287	332015		68352 Population 1970
1364.7	813.8		1348 Road Miles 1968
3649	13064		1694 Accidents 1966
3602	12490		1793 Accidents 1967
3680	13067		1988 Accidents 1968
3990	13689		2318 Accidents 1969
3780	11939		2198 Accidents 1970
3783	11251		2382 Accidents 1971
			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		.624 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 10^3

EATON COUNTY

Source: David K. Damkot and William T. Pollock, Development of Highway Safety Program and Project Evaluation Criteria Accident Experience Characterization, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, November, 1971.

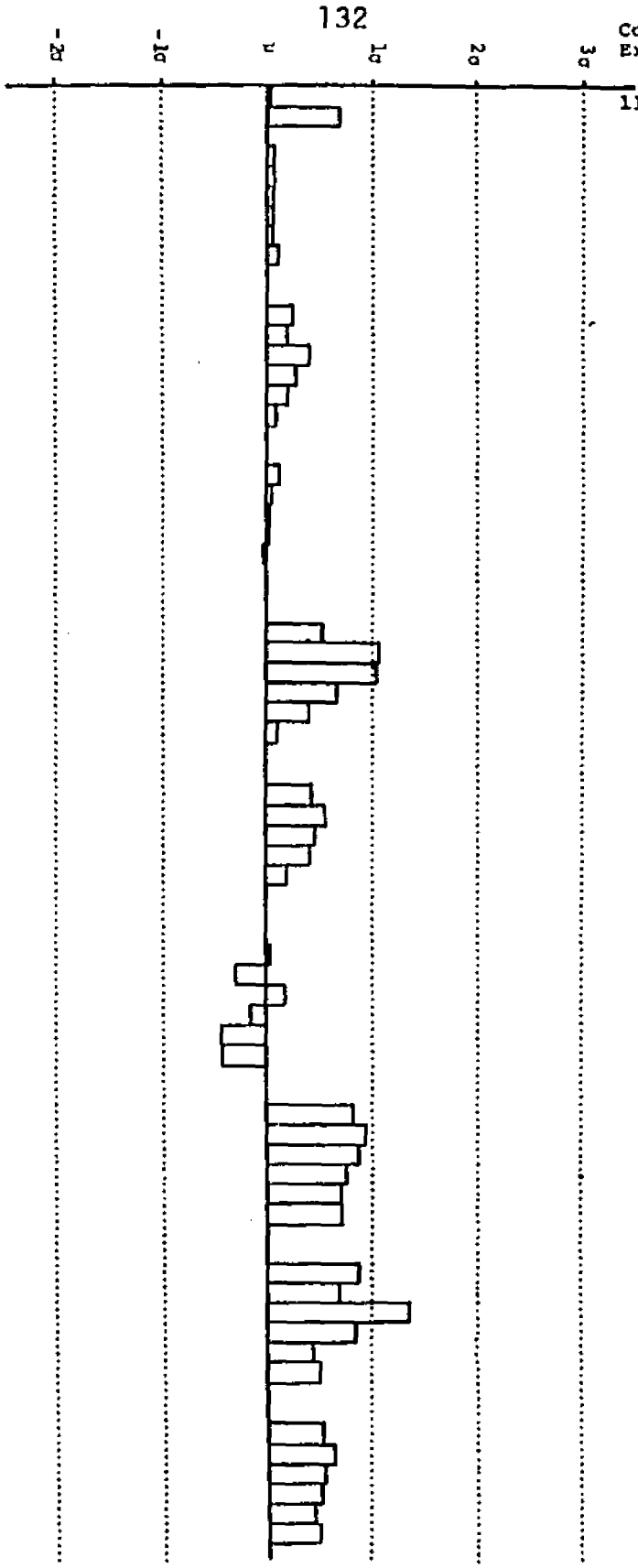


State n	State o		County Experience
107287	332015		36599 Population 1970
1364.7	813.8		1372 Road Miles 1968
3649	13064		1068 Accidents 1966
3602	12490		1179 Accidents 1967
3680	13067		1315 Accidents 1968
3990	13689		1369 Accidents 1969
3780	11939		1352 Accidents 1970
3783	11251		1376 Accidents 1971
			Accidents 1972
27.7	57.3		10 Fatalities 1966
25.6	51.3		26 Fatalities 1967
28.8	55.6		11 Fatalities 1968
30.0	60.9		21 Fatalities 1969
26.2	51.5		14 Fatalities 1970
25.0	49.0		12 Fatalities 1971
			Fatalities 1972
1188	6487		531 Injuries 1966
1823	6232		475 Injuries 1967
1933	6796		604 Injuries 1968
2113	7563		560 Injuries 1969
1948	6671		572 Injuries 1970
1899	6497		516 Injuries 1971
			Injuries 1972
53.6	21.0		45.1 Acc/R.V. 1966
51.6	13.2		48.5 Acc/R.V. 1967
53.4	12.7		52.5 Acc/R.V. 1968
*54.6	14.0		53.6 Acc/R.V. 1969
53.9	11.5		51.8 Acc/R.V. 1970
57.0	12.0		50.7 Acc/R.V. 1971
			Acc/R.V. 1972
16.1	4.5		14.2 I.A./R.V. 1966
15.5	4.0		12.5 I.A./R.V. 1967
16.5	3.9		14.0 I.A./R.V. 1968
*16.4	4.6		13.0 I.A./R.V. 1969
15.8	3.7		13.6 I.A./R.V. 1970
16.3	3.5		12.5 I.A./R.V. 1971
			I.A./R.V. 1972
.570	.267		.422 F.A./R.V. 1966
.620	.332		.821 F.A./R.V. 1967
.602	.318		.319 F.A./R.V. 1968
*.612	.320		.587 F.A./R.V. 1969
.554	.282		.498 F.A./R.V. 1970
.500	.240		.440 F.A./R.V. 1971
			F.A./R.V. 1972
75.2	68.2		61.9 Acc/RV/RdM 1966
74.1	64.8		66.4 Acc/RV/RdM 1967
75.5	64.6		72.0 Acc/RV/RdM 1968
77.4	67.0		73.6 Acc/RV/RdM 1969
74.3	55.8		71.1 Acc/RV/RdM 1970
78.1	52.5		70.5 Acc/RV/RdM 1971
			Acc/RV/RdM 1972
.778	.399		.579 FA/RV/RdM 1966
.757	.379		1.126 FA/RV/RdM 1967
.760	.376		.438 FA/RV/RdM 1968
.785	.426		.806 FA/RV/RdM 1969
.684	.321		.683 FA/RV/RdM 1970
.630	.300		.620 FA/RV/RdM 1971
			FA/RV/RdM 1972
23.4	22.1		19.5 IA/RV/RdM 1966
22.7	21.9		17.2 IA/RV/RdM 1967
23.7	21.5		19.2 IA/RV/RdM 1968
23.8	22.7		17.8 IA/RV/RdM 1969
22.4	19.6		18.7 IA/RV/RdM 1970
22.8	18.7		17.4 IA/RV/RdM 1971
			IA/RV/RdM 1972

*figures represent actual value times 10^3

HILLSDALE COUNTY

Source: David K. Damkot and William T. Pollock, Development of Highway Safety Program and Project Evaluation Criteria Accident Experience Characterization, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, November, 1971.

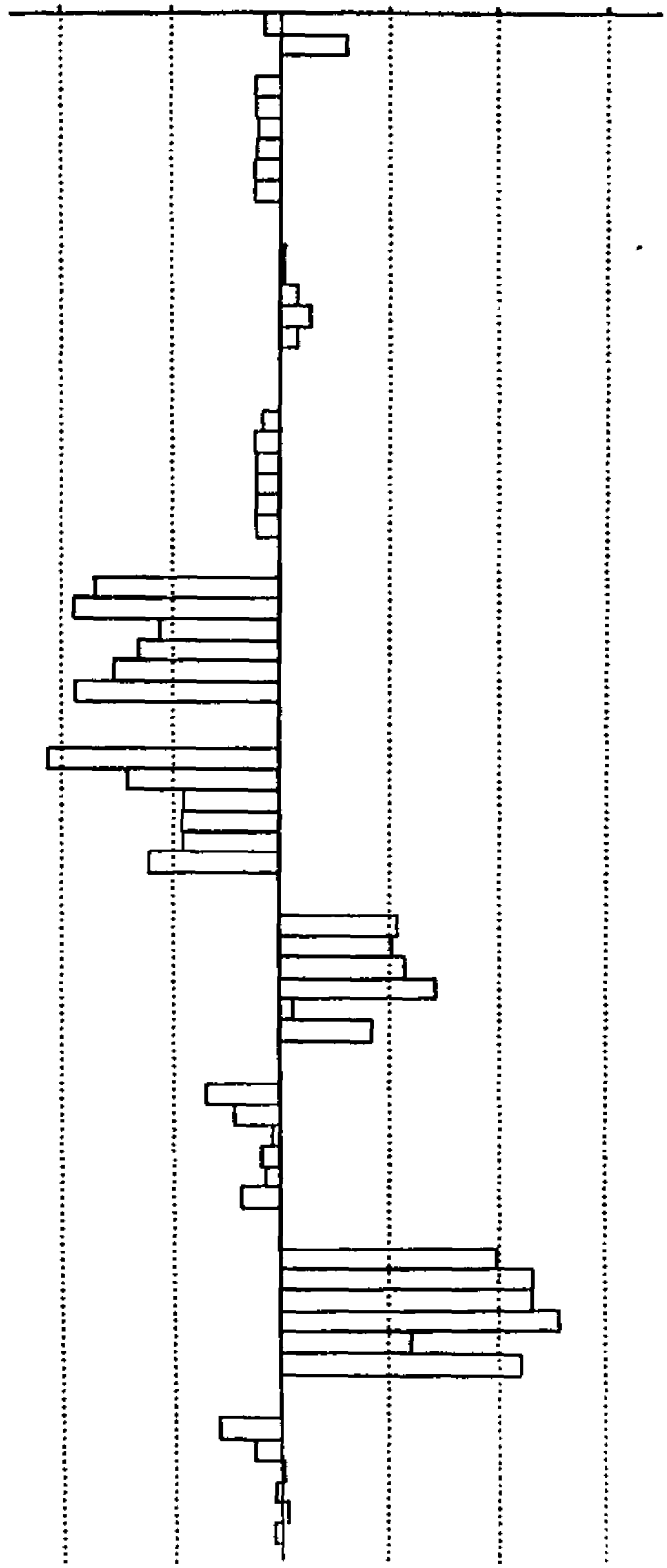


State μ	State σ		County Experience
107287	332015	118776	Population 1970
1364.7	813.8	1967	Road Miles 1968
3649	13064	4158	Accidents 1966
3602	12490	4212	Accidents 1967
3680	13067	4410	Accidents 1968
3990	13689	4554	Accidents 1969
3780	11939	4244	Accidents 1970
3783	11251	4361	Accidents 1971
			Accidents 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 10^3

ST. CLAIR COUNTY

Source: David K. Damkot and William T. Pollock, Development of Highway Safety Program and Project Evaluation Criteria Accident Experience Characterization, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, November, 1971.



State μ	State σ		County Experience
107287	332015		48285 Population 1970
1364.7	813.8		1850 Road Miles 1968
3649	13064		454 Accidents 1966
3602	12490		762 Accidents 1967
3680	13067		1155 Accidents 1968
3990	13689		1156 Accidents 1969
3780	11939		1186 Accidents 1970
3783	11251		1198 Accidents 1971
			Accidents 1972
27.7	57.3		28 Fatalities 1966
25.6	51.3		26 Fatalities 1967
28.8	55.6		37 Fatalities 1968
30.0	60.9		48 Fatalities 1969
26.2	51.5		34 Fatalities 1970
25.0	49.0		27 Fatalities 1971
			Fatalities 1972
1188	6487		356 Injuries 1966
1823	6232		448 Injuries 1967
1933	6796		661 Injuries 1968
2113	7563		650 Injuries 1969
1948	6671		645 Injuries 1970
1899	6497		621 Injuries 1971
			Injuries 1972
53.6	21.0		15.5 Acc/R.V. 1966
51.6	13.2		27.0 Acc/R.V. 1967
53.4	12.7		39.4 Acc/R.V. 1968
* 54.6	14.0		37.0 Acc/R.V. 1969
53.9	11.5		36.3 Acc/R.V. 1970
57.0	12.0		35.0 Acc/R.V. 1971
			Acc/R.V. 1972
16.1	4.5		6.2 I.A./R.V. 1966
15.5	4.0		9.9 I.A./R.V. 1967
16.5	3.9		12.9 I.A./R.V. 1968
* 16.4	4.6		12.2 I.A./R.V. 1969
15.8	3.7		12.6 I.A./R.V. 1970
16.3	3.5		11.6 I.A./R.V. 1971
			I.A./R.V. 1972
.570	.267		.850 F.A./R.V. 1966
.620	.332		.886 F.A./R.V. 1967
.602	.318		.886 F.A./R.V. 1968
* .612	.320		1.087 F.A./R.V. 1969
.554	.282		.581 F.A./R.V. 1970
.500	.240		.700 F.A./R.V. 1971
			F.A./R.V. 1972
75.2	68.2		28.6 Acc/RV/RdM 1966
74.1	64.8		49.9 Acc/RV/RdM 1967
75.5	64.6		72.8 Acc/RV/RdM 1968
77.4	67.0		65.5 Acc/RV/RdM 1969
74.3	55.8		67.2 Acc/RV/RdM 1970
78.1	52.5		64.7 Acc/RV/RdM 1971
			Acc/RV/RdM 1972
.778	.399		1.573 FA/RV/RdM 1966
.757	.379		1.639 FA/RV/RdM 1967
.760	.376		1.639 FA/RV/RdM 1968
.785	.426		2.012 FA/RV/RdM 1969
.684	.321		1.075 FA/RV/RdM 1970
.630	.300		1.300 FA/RV/RdM 1971
			FA/RV/RdM 1972
23.4	22.1		11.5 IA/RV/RdM 1966
22.7	21.9		18.3 IA/RV/RdM 1967
23.7	21.5		23.9 IA/RV/RdM 1968
23.8	22.7		22.6 IA/RV/RdM 1969
22.4	19.6		23.3 IA/RV/RdM 1970
22.8	18.7		21.5 IA/RV/RdM 1971
			IA/RV/RdM 1972

*figures represent actual value times 10^7

TUSCOLA COUNTY

Source: David K. Damkot and William T. Pollock, Development of Highway Safety Program and Project Evaluation Criteria Accident Experience Characterization, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, November, 1971.

APPENDIX C

COMPARISON OF COUNTIES WITH HIGH FATAL ACCIDENT EXPERIENCE

APPENDIX C

COMPARISON OF COUNTIES WITH HIGH FATAL ACCIDENT EXPERIENCE

Percentage of Accidents Involving Drinking Drivers, Percentage of Drivers Residing in County Where Accident Occurred, and Percentage of Conviction of State Police D.U.I.L. Arrests.

County	% of Accidents Involving Drinking Drivers		Percentage of Drivers Residing in County Where Accident Occurred		% Conviction of D.U.I.L. Arrests State Police
	Fatals 1971-72	Injury 1971-72	Fatals 1971-72	Injury 1971-72	1972
Huron	37.5	30.7	80.6	70.9	61
Sanilac	53.3	30.0	83.3	62.2	72
Hillsdale	45.5	24.4	80.0	66.3	50
Barry	62.5	21.5	56.3	57.8	100
Gratiot	23.1	22.5	54.1	61.9	60
Cass	60.0	26.6	58.5	53.9	81
Tuscola	32.4	16.3	56.5	69.3	71
Livingston	35.5	25.2	57.1	55.2	54
Eaton	57.6	24.9	48.8	65.0	74
Lenawee	55.0	24.7	74.5	74.4	78
Monroe	30.6	26.8	64.9	68.3	71
St. Clair	45.5	26.1	77.4	79.0	90
Berrien	45.0	22.4	67.5	77.8	85
Saginaw	33.8	18.7	67.0	82.4	40
Washtenaw	56.7	20.4	49.0	69.3	82
Genesee	42.0	20.7	77.7	86.8	55

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan.

APPENDIX D

DATA EXAMPLE: RURAL TOTAL ACCIDENTS BY TIME OF DAY, DAY OF WEEK (DRINKING INVOLVED)

APPENDIX D

DATA EXAMPLE: RURAL TOTAL ACCIDENTS BY TIME OF DAY, DAY OF WEEK (DRINKING INVOLVED)

Cass County, January-May, 1972.

Time of Day	Total	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
0000 to 0100	15 (13%)	2	2	1	1	2	5	2
0100 to 0200	9 (8%)				1	1	2	5
0200 to 0300	16 (14%)	2	2	2	1	1	3	5
0300 to 0400	12 (10%)	2	1	2			7	
0400 to 0500	2 (2%)				1			1
0500 to 0600	1 (1%)						1	
0900 to 0700	2 (2%)					1		1
0700 to 0800	1 (1%)						1	
0800 to 0900	1 (1%)							1
0900 to 1000								
1000 to 1100	1 (1%)				1			
1100 to 1200								
1200 to 1300	2 (2%)					1		1
1300 to 1400	4 (3%)		1			2	1	
1400 to 1500	3 (3%)		1				2	
1500 to 1600								
1600 to 1700	2 (2%)					1		1
1700 to 1800	4 (3%)		1				3	
1800 to 1900	5 (4%)					1	4	
1900 to 2000	3 (3%)	1					1	1
2000 to 2100	6 (5%)	1					1	4
2100 to 2200	7 (6%)			1		4	2	
2200 to 2300	7 (6%)	2	1	1		1	1	1
2300 to 0000	12 (10%)	2	1	1	3	2	2	1
Total	115	12 (10%)	10 (9%)	8 (7%)	8 (7%)	17 (15%)	36 (31%)	24 (21%)

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan.

APPENDIX E

DATA EXAMPLE: RURAL FATAL ACCIDENTS BY TIME OF DAY, DAY OF WEEK

APPENDIX E

DATA EXAMPLE: RURAL FATAL ACCIDENTS BY TIME OF DAY, DAY OF WEEK

St. Clair County, 1971/January-June, 1972.

Time of Day	Total	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
0000 to 0100	3 (6%)						1	2
0100 to 0200	1 (2%)							1
0200 to 0300	6 (12%)				1		4	1
0300 to 0400	1 (2%)				1			
0400 to 0500	1 (2%)						1	
0500 to 0600	1 (2%)						1	
0600 to 0700								
0700 to 0800	1 (2%)		1					
0800 to 0900	2 (4%)			1			1	
0900 to 1000	1 (2%)					1		
1000 to 1100	1 (2%)		1					
1100 to 1200	2 (4%)					1		1
1200 to 1300	4 (8%)		1		2		1	
1300 to 1400								
1400 to 1500	3 (6%)		1		1		1	
1500 to 1600	3 (6%)				1	1		1
1600 to 1700	1 (2%)			1				
1700 to 1800	3 (6%)	2					1	
1800 to 1900	1 (2%)							1
1900 to 2000	7 (15%)	1		1	2	1		2
2000 to 2100	2 (4%)			1				1
2100 to 2200	2 (4%)				1			1
2200 to 2300								
2300 to 2400	2 (4%)							2
Time not stated	1 (2%)						1	
Total	49	3 (6%)	4 (8%)	3 (6%)	10 (20%)	4 (8%)	12 (25%)	13 (27%)

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan.

APPENDIX F

MANPOWER DEPLOYMENT OF EXPERIMENTAL COUNTY STATE POLICE PERSONNEL

County	Total Men Assigned	Officers	/	Shift Hours	Total Man Hours	% of Accidents Involving Drinking Drivers Occurring During Hours of Special Patrols-1972	% of Fatal Accidents Occurring During Hours of Special Patrols 1971-1972
Cass	6	2		1 pm Fri - 9 pm Fri			
		4		8 pm Fri - 4 am Sat			
		2		6 pm Sat - 2 am Sun			
		4		8 pm Sat - 4 am Sun			
		4		2 pm Sun - 10 pm Sun	144	50%	36%
Tuscola	8	8		5 pm Fri - 3 am Sat			
		4		6 pm Sat - 3 am Sun			
		4		7 pm Sat - 4 am Sun			
		4		3 pm Sun - 7 pm Sun			
		4		6 pm Sun - 10 pm Sun	184	51%	44%
Hillsdale	6	2		5 pm Fri - 3 am Sat			
		4		7 pm Fri - 5 am Sat			
		6		5 pm Sat - 3 am Sun	120	48%	32%
Eaton	8	4		5 pm Fri - 3 am Sat			
		4		7 pm Fri - 5 am Sat			
		4		5 pm Sat - 3 am Sun			
		4		6 pm Sat - 4 am Sun			
		8		1 pm Sun - 6 pm Sun	200	50%	42%
St. Clair	10	2		2 pm Fri - 10 pm Fri			
		4		7 pm Fri - 3 am Sat			
		4		8 pm Fri - 4 am Sat			
		2		12 n Sat - 8 pm Sat			
		4		7 pm Sat - 3 am Sun			
		4		8 pm Sat - 4 am Sun			
		4		4 pm Sun - 8 pm Sun			
		6		6 pm Sun - 10 pm Sun	200	53%	41
Berrien	12	4		1 pm Fri - 9 pm Fri			
		4		7 pm Fri - 3 am Sat			
		4		9 pm Sat - 5 am Sat			
		4		1 pm Sat - 9 pm Sat			
		4		7 pm Sat - 3 am Sun			
		4		8 pm Sat - 4 am Sun			
		4		1 pm Sun - 5 pm Sun			
		4		3 pm Sun - 7 pm Sun			
		4		5 pm Sun - 9 pm Sun	240	57%	31%
Total	50				1,088	53%	37%

Source: "Fatal Crash Reduction Program," Federal Application for Highway Safety Funds, Michigan Department of State Police, Office of Highway Safety Planning, Lansing, Michigan.

APPENDIX G

MICHIGAN STATE POLICE POST

DAILY REPORT

UD 1 REV 2-93

MICHIGAN STATE POLICE POST DAILY REPORT

Location | Date

MEN

Assigned		On Duty	
From other posts		At other posts	
		On Pass	
		Sick or Accident	
Total		Total	
		Man Days this Month	

COMPLAINT RECORD

	This Date	This Month
Complaints received		
From other posts		
Other complaint arrests		

MILEAGE

	This Date	This Month
Traffic patrol		
Traffic complaint		
Other complaint		
Other		
Total		

FILE CLASS OF POST COMPLAINTS RECEIVED

File Class	This Date	This Month
1 1		
1 8		
5 1		
5 2		
5 4		
5 5		
Total		

MAN HOURS

	This Date	This Month
Traffic Patrol		
Other Traffic Work		
Complaint 3.1-3.4 incl. & 3.8-3.9		
Complaint 3.5-3.7 incl.		
Complaint 1 & 2		
Complaint 5 & 6		
Complaint 4		
Other Fire Marshal Work		
Civil Defense Work		
Comm. Relations, Juv. Work		
Report Writing		
Desk Assignment		
Admin. & Supervision		
Training		
Fatigue		
Other Duty		
Total		

PATROL RECORD

	This Date	This Month
Car Hours on Patrol		
Traffic Offense Arrests		
Other Patrol Arrests		
Cars Assisted		
Cars Investigated		
Property Inspections		
Liquor Inspections		
Verbal Warnings		
Other Performance		
Total 3.5 & 3.6 incl.		
Total		

TRAFFIC PATROL MILEAGE AND HOURS BY TYPE OF HIGHWAY

Type of Highway	Man Hours		Car Hours		Mileage	
	This Date	This Month	This Date	This Month	This date	This Month
Freeway						
Other Trunkline						
County Roads						
Total						

PERSONNEL ON TEMPORARY ASSIGNMENT AT OR FROM POST

Name and Rank	Temporary Assigned To	Temporary Assigned From

Signature of Commanding Officer

(USE REVERSE SIDE IF NECESSARY)

APPENDIX H

MICHIGAN STATE POLICE OFFICER'S DAILY REPORT

UD-2 (Rev. 8-68)

MICHIGAN STATE POLICE OFFICER'S DAILY REPORT

Name and Rank | Station | Date

Off Duty - Reason | Temporary Station

HOURS - Traffic Patrol Freeway 1	2	Other Trunkline 1	2	County Roads 1	2	1	2
Other Traffic Work (at court, prosecutors, etc., on traffic)							
Complaint (File class 3.1 - 3.4 incl. & 3.8—3.9							
Complaint (File class 3.5 - 3.7 incl.)							
Complaint (File class 1 & 2)							
Complaint (File class 5 & 6)							
Complaint (File class 4)							
Other Fire-Marshal Work							
Civil Defense Work							
Community Relations - Juvenile Work							
Report Writing							
Desk Assignment							
Administration and Supervision							
Training							
Fatigue Work							
Other Duty							
Total Hours							

ARRESTS	1	2
Traffic Offense Arrests		
Other Patrol Arrests		
Other Complaint Arrests		
Total Arrests		

PATROL PERFORMANCE	1	2
Cars Assisted		
Cars Investigated		
Property Inspections		
Liquor Inspections		
Verbal Warnings		
Other Performance		
Total 1.5 & 3.6 Accidents		

COMPLAINT RECORD	1	2
Original Comp. Investigations		
Original Post Comp. Investigations		
Supp. Comp. Investigations		

MILEAGE

Traffic Complaint 1	2	Other Complaint 1	2	Other 1	2	TRAFFIC PATROL Freeway 1	2	Other Trunklines 1	2	County Road 1	2	Total Patrol Miles 1	2

ACTIVITY Time Record	Officers	Car No.	Patrol Area	Out Mileage	In Mileage	Gun No.	Camera No.

Signature of Officer

(USE REVERSE SIDE IF NECESSARY)

APPENDIX I

DEPARTMENT OF STATE POLICE

ATTENDANCE REPORT

DEPARTMENT OF STATE POLICE ATTENDANCE REPORT

______________________ FROM ______________ TO ______________ INCLUSIVE PAGE ______________

DISTRICT, POST, DIVISION OR SECTION

NAME	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	TOTAL IN HOURS: WORK	ANNUAL LEAVE	SICK	HOLIDAY	MILITARY LEAVE	ADMIN LEAVE	PAID OVER TIME	SHIFT DIFF. REG-ULAR	SHIFT DIFF. OVER TIME
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									
	W	W	W	W	W	W	W	W	W	W	W	W	W	W									

PD 13 REV. 6-70

W–WORK
S–SICK
P–PASS
H–HOLIDAY
M–MILITARY LEAVE
A–ANNUAL LEAVE
O–OVERTIME
D–SHIFT DIFFERENTIAL
*–ADMINISTRATIVE LEAVE
DO–SHIFT DIFFERENTIAL OVERTIME
– –OTHER POST (INDICATE POST)

SIGNED ______________________________

APPENDIX J

OTHER PATROL AND COMPLAINT ARRESTS, SELECTIVE ENFORCEMENT OFFICERS

Other Patrol and Complaint Arrests, Selective Enforcement Officers, August-December, 1972.

Offense	Berrien	Cass	Eaton	Hillsdale	St. Clair	Tuscola	Total
Assault				2			2
Assaulting a police officer				1			1
Assault with a deadly weapon	1				1		2
A.W.O.L.						1	1
Bench warrant	1	3	1	1	3	1	10
Breaking and entering	1						1
Carrying concealed weapon	5	2	8	1	1		17
Consuming	8		1	2	40	1	52
Contempt and perjury			1				1
Contributing to delinquency of minor			1	3	2		6
Curfew violation			1				1
Disguising with intent to intimidate	2						2
Drunk and disorderly	21	3	14	8	25	21	92
Escaped from B.T.S.			2			1	3
Fireworks		1		1			2
Fleeing					1		1
Furnishing to minors	4	2	2	8		3	19
Gross indecency			1				1
Insanity	1						1
Interfering with police officer				1	1		2
Larceny	1		2	2	3		8
Littering	2	3			2	2	9
Malicious destruction of property					6		6
Minors in possession	10	7	9	5	41	4	76
Parole violation	1						1
Possession of a blank pistol					1		1
Possession of stolen property	1			2	4		7
Probation violation			1				1
Rape			1				1
Resisting arrest						1	1
Runaway	2		1	1	3	1	8
Shoplifting			2				2
Traffic warrant	25	6	29	4	28	3	95
Uncased gun			2			6	8
Unlawfully driving stolen auto					1		1
Violation of conservation law				2	1		3
Violation of controlled substances act	7	11	36	23	26	6	109
Violation of snowmobile laws		1		2	12	27	42

Source: Michigan State Police, East Lansing, Michigan. Project officers' daily activity reports, August-December, 1972.