THE EFFECT OF VARIOUS TRAFFIC ACCIDENT COST CATEGORIES UPON RECORDS ANALYSIS

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Bruce B. Madsen

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THE EFFECT OF VARIOUS TRAFFIC ACCIDENT COST CATEGORIES UPON RECORDS ANALYSIS

By

Bruce B. Madsen

AN ABSTRACT OF A THESIS

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ABSTRACT

THE EFFECT OF VARIOUS TRAFFIC ACCIDENT COST CATEGORIES UPON RECORDS ANALYSIS

by Bruce B. Madsen

This study examines the extent to which the representativeness of summarized traffic accident information is influenced by varying the levels of property damage costs. It was hypothesized that it is possible to establish a traffic accident severity cut-off point, expressed in terms of dollar cost of property damage; with the summarized information obtained on accidents above this point remaining consistent with summarized information on all accidents.

To validate this hypothesis, data obtained on 7,756 property damage accidents reported by the Grand Rapids Police Department was used. Various computations were made of the data contained in the 200 schedules provided by this department. This resulted in a series of 20 tables which show the comparative distributions of traffic accidents by cost category and by several specific

accident factors; such as, time, location violations involved, road conditions, vehicle speed, and the like.

Examination of the tables reveals that there is a fairly high degree of representativeness in most accident factors at a property damage cost level of $250.00.

The primary purpose in establishing a severity cut-off point is to determine a level above which all accidents would be thoroughly investigated and below which information contained in the basic accident report would be obtained.

Even though a slight improvement in the degree of representativeness could be obtained by establishing the severity cut-off point at the next lowest cost category--which is $100.00--this would mean that over 40 per cent of reported accidents in the Grand Rapids Police Department would have to be thoroughly investigated, as contrasted with about 15 per cent at the $250.00 cost level.

The hypothesis was validated using the data provided by the Grand Rapids Police Department. Further research is needed to determine if this hypothesis would be similarly substantiated using data on other than urban traffic accidents.

THE EFFECT OF VARIOUS TRAFFIC ACCIDENT COST CATEGORIES UPON RECORDS ANALYSIS

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A THESIS

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

There is a growing problem represented in the conflict between the increasing demands upon police agencies to provide more and better accident information, and the shortages of manpower available in these agencies to collect and process such information.

Policies and guidelines are needed to help resolve this conflict if improvements are to be made in the quality and quantity of traffic accident investigation and reporting--or to even prevent it from deteriorating to a point below present levels.

Traffic accident records authorities have agreed that additional studies are needed to assist in the development of these policies and guidelines. One of these further suggests that the establishment of a severity cut-off point in traffic accidents is one of the most important needs to improve data collection, and recommends that damage to a vehicle, to the extent that it cannot be driven, be used as a criterion. This authority indicates, however, that

additional studies should be made in order to determine the most workable cut-off point for data collection.

I. THE PROBLEM

Key Hypothesis

It is hypothesized that it is possible to establish a traffic accident severity cut-off point, expressed in terms of dollar cost of property damage; with the summarized information obtained on accidents above this point remaining consistent with summarized information on all accidents.

Procedures

A proposal for establishing a traffic accident severity cut-off point, contained in a report of the Traffic Institute of Northwestern University, provided the initial motivation for this study.[1] Broadly stated, the proposal recommends that accident data collection (for purposes of establishing rates and trends) could be improved upon considerably if a severity cut-off point could be established. The report further suggests that a vehicle

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[1] Traffic Institute, Northwestern University, Improvement of the Present System of Traffic Accident Records (Washington: Office of Highway Safety, U. S. Bureau of Public Roads, 1963), page 92. (Mimeographed)

which cannot be driven away from the scene be used as the criterion for this cut-off point.

Though this authority seeks to establish a cut-off point primarily for the purpose of providing a basis upon which more reliable rates can be developed, he further suggests that the information collected on all accidents above this point would produce a sizeable amount of information which could be used for many kinds of special studies, and for routine summaries as well. It is inferred that information collected and summarized on accidents above the cut-off point would be representative of information summarized on all accidents.

On reading this, the writer wondered if a severity cut-off point, in terms of property damage costs in dollars, could not serve as a basis for determining a level above which all accidents would be thoroughly investigated and processed, and below which they would be reported and routinely summarized.

Subsequent discussions with prominent traffic records authorities and a search through the somewhat refractory publications and articles relating to this specific field of traffic safety revealed that no known attempts have been made to determine whether an optimum level of accident cost, in dollars, could be established which would be representative

of all accidents.

In an effort to determine whether such a cost cut-off point could be established, traffic accident data provided by the Grand Rapids Police Department was used. Over 200 separate schedules containing information on 7,756 property damage accidents investigated and reported at the scene and at the Traffic Bureau for the year 1959, served as the basic data for this study. The schedules were subdivided into accidents reported at the Bureau and at the scene, by seven categories of cost, by month of the year, and by specific "accident factor." The accident factors include day of week, hour of the day, police district, type of vehicle, residence of drivers, type of driver's license, age of drivers, sex of drivers, weather, light condition, locality, road surface, road character, directional analysis, violations indicated, drinking by drivers, condition of drinking drivers, vehicle condition, traffic controls, speed of vehicles, and accident arrest.

The data from each of the schedules was totaled, first by cost and then by the specific accident factor. The numbers of specific accident factors appearing under each of the seven cost categories were then converted into percentages for comparison purposes. This work produced 20 separate tables showing the comparative distributions

of traffic accidents by cost category and the specific accident factors enumerated above.

Limitations

The traffic accident information which a traffic records system ultimately produces can be no more reliable than the data which is originally put into the system. The quality of accident investigation and reporting is an essential part of the entire process of accident data collection, analysis, and use. The relative quantity of accident reporting is equally essential to the reliability of the final summaries. There is, therefore, a definite relationship between (1) the quality and quantity of accident investigation and reporting, (2) processing, and (3) use.

Though the results of the study are expected to have some implications for accident investigating and reporting, the emphasis here is more on results of data collection and processing than it is on procedures. For this reason, discussion is limited on the subject of: sources of information, methods of records analysis, and records forms--essential though each of these are to the entire traffic records system.

Of particular importance in noting the limitations of this study is the fact that the analysis of data in

Chapter V is intended to be applied only to the collection and processing of accident data for purposes of identifying traffic accident trends. It is not applicable to other uses which, broadly defined, would include: motor vehicle mortality records, reports for traffic engineering, driver licensing and financial responsibility, special records for legal purposes, and specialized information for technical purposes.

The Importance of the Study

The need for soundly conceived policies and guidelines to assist the police administrator in his efforts to respond to increasing demands for traffic accident information was mentioned earlier in this section.

The absence of precise definitions has created serious problems for police agencies at all levels of government. There is no doubt that much of the accident data that is presently collected and processed is superflous. Police administrators charge that time spent on accident reporting, investigation, and records processing continues to grow at the expense of time which could, perhaps, be more productively directed to traffic law enforcement efforts "on the street."

A well-defined, workable traffic accident severity

cut-off point, if high enough, could serve to meet this problem. Information obtained on accidents below this point could be minimized, thus saving many man-hours which would otherwise be spent in collecting and processing superflous information. More time could be spent in thorough investigations of fatal and personal injury accidents and accidents involving property damage costs above this point, and for conducting special studies and summaries of accidents in this category. This would help answer the demands for more "in-depth" information about traffic accidents.

II. DEFINITIONS

Definitions

Accident reporting and accident investigation. Both of these terms, as used in this report, will refer to information obtained by police, even though "accident reporting" as defined by authorities in this field may also include reports of accident information submitted by other than police. Accident investigation and accident reporting are distinguished, one from the other, in this manner:

> Accident reporting is getting and recording required information to establish exactly where and when the event took place, to identify who and what was involved, to describe how much injury or damage resulted, to indicate the intended courses of traffic units, and to specify certain additional circumstances of the occurrence. Its objective is usually to record facts, but not the opinions, called for by an official, motor-vehicle, traffic-accident report form.
>
> An investigated accident is one in which there is, in addition to the accident report, some other, formal, official report either of information gathered for further study, or of conclusions reached.[2]

As noted, the basic difference between accident reporting and accident investigation is that, in the latter, much more time is spent in obtaining and formulating opinions as to why an accident happened. The distinction between the two is important to this study for, if the mentioned severity cut-off point can be established, accidents having a severity above this point would be thoroughly processed and cross correlated in many ways. Accident reports would be taken on those falling below the severity cut-off point (except as special needs would dictate otherwise) and summarized only routinely.

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[2]J. Stannard Baker, Traffic Accident Investigator's Manual for Police (Evanston, Illinois: The Traffic Institute, Northwestern University, 1963), pp. 58-59.

Accident records system. The entire process of collecting and summarizing accident information and the agency responsible for this function.

Highway engineering and traffic engineering. In the discussion of uses of accident information in Chapter III, a distinction is made between these two functions, though they are not defined. The highway engineer is primarily concerned with certain construction, geometrics and design features of a roadway. The traffic engineer is concerned with the safe and efficient movement of traffic upon the roadway and employs signs, signals, pavement markings, and other traffic control devices to make it so.

Police traffic accident report. This will also be referred to occasionally as the "basic accident report." It should provide for at least the following:

1. Location
2. Time
3. Vehicles involved
4. Drivers involved for each vehicle
5. Pedestrians involved
6. Other persons involved
7. Property damage other than vehicles
8. Witnesses
9. General conditions (light and weather)
10. Attention to injured
11. Diagram of accident
12. Remarks (including brief description of accident)

13. Police activity
14. Contributing circumstances for each vehicle
15. Degree of injury.[3]

There are, of course, many subordinate items included under each of the 15 major items of information listed.

Standard summary. The form approved by and obtained through the National Safety Council for use in preparing periodic (monthly, quarterly, or annually) summaries of the information contained in the Police Traffic Accident Report described above.

Public support. The meaning of this term, as it applies to traffic accident prevention, has been, in the writer's experience, a most difficult one to convey. A number of attempts have been made to succinctly define it. The following is the definition with which the writer most agrees:

> Public Support is the cooperation and active assistance extended to public officials and official programs by well-informed citizens and citizen groups to develop and sustain effective accident prevention activities; it is the

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[3]Traffic Institute, Northwestern University, Developing a Police Traffic Records System (Evanston, Illinois: Northwestern University, 1959), pp. 4-8.

necessary working relationship which bridges the gap between official action and public understanding.[4]

III. ORGANIZATION OF THE REMAINDER OF THE THESIS

The impact which the automobile has had upon our society, some of the problems that it has created, and the forces available to impinge upon these problems, constitute the main subject areas of Chapter II. This discussion is included to help develop an appreciation for and perspective of the role which traffic records have as a fundamental part of all traffic accident prevention activities.

A description of accident information uses is included in Chapter III. Emphasis is placed on the use of traffic records by traffic officials for accident prevention purposes.

The problems which police agencies are experiencing in meeting the demands of accident information users are outlined in Chapter IV. The establishment of a traffic accident severity cut-off point, as one means of meeting this problem while serving additional purposes, is also discussed in this Chapter.

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[4]James K. Williams, Director, Office of Highway Safety, U. S. Bureau of Public Roads (Mimeographed, not a part of any known publication).

Chapter V seeks to determine whether accident severity, in terms of dollar cost, might be used to establish the cut-off point discussed in the previous Chapter. A series of tables, developed for this study, is presented and analyzed in order to make such a determination.

The findings, conclusions, and a statement of additional studies needed are included in Chapter VI.

CHAPTER II

THE AUTOMOBILE IN TODAY'S SOCIETY

AND

THE NEEDS OF TRAFFIC ACCIDENT PREVENTION

Traffic accidents will always be with us. This is the penalty which we pay for motion--for the convenience of travel. However, the cost of traffic accidents--in terms of human suffering, inconvenience, and wasted dollars--is needlessly excessive.

Of the many social problems confronting this nation today, few are as devastating as that created by the motor vehicle. The 'traffic accident tragedy' is all the more tragic when one considers that "traffic accidents could be reduced by one half if we applied what is now known to be needed on the streets and highways of our nation."[1]

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[1]The President's Committee for Traffic Safety, Regional Traffic Safety Conferences of the President's Committee for Traffic Safety (Washington: Government Printing Office, 1956), p. 1.

I. THE IMPACT OF THE AUTOMOBILE UPON AMERICA'S SOCIETY

Historians of centuries to come will doubtlessly have much to say about the influence of the motor vehicle upon our present society. "The Automobile Age," as our present era may be appropriately labeled by tomorrow's historian, may well be viewed as that period in which the motor vehicle played a significant role--for better or for worse--in modifying this nation's total economy, pattern of family living, recreational activities, business and residential development, education, employment, architecture, communications, national defense, and use of our natural resources.

Whether we are or will become the master or the servant of the motor vehicle will be for the historian to record, and the answer will depend upon whether we can accelerate social controls in a degree sufficient to compensate for the carnage caused by this relatively new physical invention. At the moment, it would appear that we are the servant, for few would agree that the billions of dollars annually wasted in traffic accidents, the thousands of lives lost, and the millions injured each year is a fair and just price to pay for the benefits of mobility which

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New York's Governor Nelson A. Rockefeller, in an extemporaneous talk to a group of some of the nation's most influential businessmen in the Fall of 1963, placed the problem of highway traffic "profit and loss" in an interesting perspective. Each person, in this audience of a hundred or so, was asked to consider himself a member of this nation's legislature at the turn of the century. A session was called to approve or reject the admission of "a new invention upon the American scene." The Governor discussed, at some length, the many cultural and economic advantages which could be expected from the introduction of the automobile. The costs in terms of lives lost, persons injured, dollars wasted, facilities to accommodate the invention and additional manpower to control its use "for the first 50 years" were then outlined. The "bill to admit the use of the automobile," when put to a vote, was unanimously rejected.

The importance of the automobile in America, the benefits which it has produced, and the problems which it has created are reflected in the following observations and statistics.

The Magnitude and Influence of Motor Vehicle Transportation in the United States.

Power, when properly channeled and controlled, can be a cogent force in the development of a society. The motor vehicle represents power. The extent to which it has influenced our lives, both as a nation and as individuals, is partially told in this series of quotes from various sources:

> Traffic deaths in 1964 roared to an all-time record high of 47,800. This was 10 per cent above the 1963 total of 43,564, and was the biggest yearly increase since travel restrictions were lifted after the end of World War II.
>
> Travel, vehicles and drivers also were at record levels in 1964. Travel exploded to 840 billion miles, an increase of 40 billion miles (5 per cent) over the 1963 total, and the biggest yearly increase since 1955.
>
> Vehicle registrations jumped to 87 million, an increase of 3.5 million (4 per cent) over the 1963 total. This also was the biggest year-to-year gain since 1955 and compares with an average increase of 2.5 million per year between 1955 and 1963. Drivers totaled about 96 million.
>
> All costs--including wage loss, medical expenses, overhead cost of insurance and property damage--totaled about 8.3 billion dollars.[2]
>
> The estimated total cost of providing motor vehicle transportation in the U. S. during 1962

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[2]H. Gene Miller, "Traffic's Blackest Year," Traffic Safety, LXV (March, 1965), pp. 8-9.

was about $95 billion, or one-sixth of the U. S. Gross National Product. This figure includes motor vehicle purchases, operation and maintenance, highway construction costs, administration and research, and safety activities.[3]

About one in every seven persons employed in the United States works at a job resulting directly from the production or use of motor vehicles. In addition, untold numbers of enterprises depend indirectly upon the use of the automobile for income: hotels, motor courts, tourist homes, restaurants, roadside stands, golf courses, vacation resorts, drive-in theatres, and hundreds of others. The automobile has provided more jobs for more people than any other single element in American life [italics in the original].[4]

Eleven million pupils now ride daily to and from their daily class in more than 165,000 school buses, at an annual public expenditure approaching $400 million. Consolidation of schools made possible by this form of transport has eliminated 160,000 "one-teacher" schools during the past four decades.[5]

By themselves, or in combination with air, rail, water and pipeline facilities, trucks haul virtually everything we eat, wear or use.[6]

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[3]National Safety Council, "Billions for Transportation, How Much for Safety," Traffic Safety, LXIII (October, 1963), p. 22.

[4]The Center for Safety Education, New York University, Man and the Motor Car (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1959), p. 18.

[5]Automotive Safety Foundation, Federal Extension Service, U. S. Department of Agriculture, Vehicles, Roads, People (Washington, undated), p. 3.

[6]Ibid.

To simply sum up these quotes, it can be said that motor vehicle transportation in the United States is very big business; many of us are directly involved in it, all benefit from it, and our lives have been greatly changed by it. However, there is a dark side to the story.

Problems Created by the Motor Vehicle

Although the automobile has benefited this nation greatly, it has also created some very serious problems, the most notable of which is the traffic accident toll. The series of quotes which follow will serve to show just how great is the price which we pay for the benefits reaped from this invention.

> Casualties and costs. Nearly 1.3 million persons have lost their lives in traffic in the United States since the advent of the motor vehicle at the turn of the century. Tens of millions more have been injured, many of them permanently maimed.
>
> In fact, since 1900 more than twice as many people have been killed in traffic accidents as were killed in all wars in which we have been involved since the Revolution [italics in the original].[7]
>
> The trend of the past few years points inescapably to the expectation that during 1965 traffic accidents will take well over 50,000 lives.

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[7] Ibid., p. 6.

An equivalent death toll at sea would require the sinking of 15 to 20 giant ocean liners with all hands aboard. In the air it would require around 500 jet airplane crashes--about 40 every month or 10 every week.[8]

Traffic accidents represent the leading cause of all deaths from age one to age 40.[9]

Social impact. Along with the other losses from traffic accidents, we must also count the social costs, though these cannot always be measured quantitatively.

Any family is disrupted by the death or permanent injury to the breadwinner. Since 75 per cent of all traffic fatality victims are male, many families suffer this tragic upheaval. Frequently, the family loses income essential to maintain its living standards....All these factors mean less productivity and stability in the basic fabric of our American society as a whole.[10]

Perhaps not so apparent, but equally serious, is the contribution which the automobile has made to the crime rate. Statistics bear out the fact that the automobile is directly involved in a substantial amount of crime....The stealing of automobiles and their use in crime is an important factor in the rise of juvenile delinquency. As a matter of fact, automobiles are involved in over 80 per cent of the major crimes for which young people are convicted.[11]

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[8]The Travelers Insurance Companies, A Tragedy of Errors (Hartford: The Travelers Insurance Companies, 1965), p. 1.

[9]The National Safety Council, Accident Facts, 1964 Edition (Chicago: The National Safety Council, 1965), p. 8.

[10]Automotive Safety Foundation, op. cit., p. 7.

[11]Marland K. Strasser et al., When You Take the Wheel (River Forest, Ill.: Laidlaw Brothers, 1961), p. 292.

A few comments should be made about some of the facts included in the above quotations.

First, though the numbers of people killed in traffic accidents continues to climb over the years, the death rates (i.e., the number killed per 10,000 motor vehicles or, more equitably, the number killed per 100,000,000 vehicle miles traveled) has declined. There were 18.2 persons killed per 100,000,000 miles of travel in 1923-27, and 5.5 killed per 100,000,000 miles of travel in 1963.[12] This suggests that some progress has been made in combating this problem and that the social inventions designed to cope with this physical invention, though lagging, are not entirely absent.

Second, the estimates of traffic accident costs shown above are provided by the National Safety Council and are the most widely used and accepted cost figures. However, they are reportedly very conservative. Recent studies by the Bureau of Public Roads and independent studies by some states indicate that the National Safety Council figures could be doubled and still represent a conservative evaluation.[13]

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[12]The National Safety Council, op. cit., p. 59.

[13]Wallace I. Little and Harrison Grathwohl, The Cost of Motor Vehicle Accidents (Olympia, Washington: University of Washington, 1960), pp. 32-34.

Third, though some progress has been made in stemming the traffic toll, much more must be done before we can lay claim to any vindication for allowing this waste to exist. To iterate an earlier observation, the lives and dollars lost in traffic accidents is particularly tragic when one realizes that the resources for reducing the toll, by as much as one-half, are at hand and but need to be brought more fully into play.

II. RECOGNIZED NEEDS FOR TRAFFIC ACCIDENT PREVENTION

Traffic accidents will not be easily diminished. Contrary to the notions held by so many uninformed, there is no panacea nor a simple solution. The forces which are available to impinge upon this problem are as many and varied as are the causes which contribute to it. Yet, the solution seems less imponderable and complex when one understands that, in almost every traffic accident, there is more than one contributing cause; and that the removal of any one of the causes is usually sufficient to prevent the accident. This is known as the "chain of causes" principle.

The writer had an occasion to be involved in the post-accident investigation of a fatal accident some years

ago which demonstrated this principle most pointedly. The accident report of the initial investigation showed the cause only as "speed too fast for conditions." The accident had occurred after dark and involved a vehicle which struck a tree after it failed to negotiate a curve on a blacktop country road. Interviews with the family of the deceased, observations at the scene and an examination of the wrecked vehicle revealed the following factors which were thought to have contributed to this accident.

1. Speed--occasioned by being behind schedule and there being virtually no enforcement to deter this violation.

2. A "curve ahead" sign which was almost totally obscured by a growth of underbrush.

3. No center line markings, guard rails, or reflectorized delineators which could have shown the curve ahead.

4. The tree that was hit was located only five feet off the paved edge of the roadway and had apparently been struck a number of times.

5. The headlights of the vehicle were covered with a thin film of mud which reduced the candle power output by an estimated 30 to 50 per cent.

6. Ineffective windshield wipers which had smeared rather than cleaned.

These were some of the known events which contributed to this accident. The removal of any of these 'links' in this chain of causes could have prevented this accident.

There are several implications in the chain of causes principle. One which is most pertinent to this writing is that it demonstrates present weaknesses in accident investigation and, hence, the information which traffic records provide for traffic accident prevention planning. It is conceivable that many important 'key' accident causes--causes which are not always the most obvious, but which are present in a good number of accidents--exist but have escaped attention as a result of superficial accident investigations.

When one considers each of the many possible contributing causes which are present in every one of the millions of traffic accidents occurring annually, it is easy to understand why where is no panacea for this problem and why it is that a reduction in the traffic accident toll can only be realized where there is "balance" in the application of all the forces that we have at hand to meet this problem.

Improved Performance of Official Activities

It may be safely assumed that in a substantial majority of traffic accidents which have occurred, there were contributing causes which would not have been present had official activity been operating at a higher level of performance. For example, effective traffic law enforcement could have served to deter violations which were major contributing causes in many. Proper application of traffic engineering techniques could have eliminated wrong decisions and actions. A well-conceived and managed motor vehicle inspection program could have ferreted out the type of vehicle failures which recent research indicates may be contributing more to traffic accidents than was heretofore imagined. An adequate driver licensing and driver improvement program could have removed unfit drivers from the road or resulted in correcting the hazardous driving behavior of others.

A blueprint for improvement in official activity is provided for in the Action Program of the President's Committee for Traffic Safety. In total, the Action Program consists of ten separate sections. What the Committee indicates is needed to upgrade levels of official performance in order to reduce potential contributing "links" is discussed below.

Laws and ordinances. Improved standards for driver licensing, better traffic law enforcement, and a more orderly and efficient flow of traffic, with a resultant reduction in the danger of accidents, are among the primary goals in the Committee's efforts to obtain uniform legislation. Specifically, the Committee indicates that, "a well-ordered pattern of uniform legislation based on the Uniform Vehicle Code and Model Traffic Ordinance" will provide the following types of benefits:

1. Removal of motorist's uncertainties in such matters as right-of-way, overtaking and passing, execution of lefthand turn, speed limits, privileges accorded school buses and emergency vehicles, pedestrians' rights and duties, and operation of bicycles and motor vehicle equipment.

2. Uniformly high standards for driver licenses, to assure competence and responsibility on the part of motorists in all jurisdictions.

3. Improved standards for vehicular equipment (lights, brakes, warning devices, etc.) and for maximum-size-and-weight limits of individual vehicles and vehicle combinations.

4. Uniform arrest procedure clarifying the rights of all motorists in any jurisdiction.

5. Financial protection for those involved in accidents, through financial responsibility laws based upon the model provided in the Uniform Vehicle Code and through uniform provisions for service of process upon nonresident motorists.

6. Protection of the proprietary interest in a motor vehicle through uniform certificate-of-title and anti-theft laws.[14]

Traffic accident records. Without a good traffic records system, the solution of traffic accident problems becomes a matter of opinion and guesswork. Traffic accident investigation and reporting, followed up by analysis and interpretation of accident facts represents the foundation stone for accident prevention planning. An effective traffic records system will yield the type of information necessary to solve problems through:

selective enforcement

detection of engineering deficiencies

direction of public information and safety efforts to known trouble spots

identification of problem drivers

guidance development of laws, ordinances, and regulations

identifying areas requiring further research.

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[14]The President's Committee for Traffic Safety, Laws and Ordinances, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961), p. 5.

The President's Committee includes 20 recommendations for improving traffic records systems at the state and local levels. Summarized, these recommendations call for uniformity of reported information; better accident reporting; decreases in routine summaries and increases in special studies; use of electronic data processing; increases in manpower and training; and most importantly, greater use of accident records information once obtained.[15]

Education. The goal of safety education, according to the President's Committee is that of "helping young people develop lifelong patterns of intelligent thought, action, and attitudes that will manifest themselves in safe driving and walking--including the ability to deal with new situations as traffic conditions constantly change.[16] The Committee, in the Section on Education, includes 55 recommendations for meeting this broadly stated objective. These appear under five sub-divisions, including: Elementary Education, Secondary Education,

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[15]The President's Committee for Traffic Safety, Traffic Accident Records, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961), pp. 17-19.

[16]The President's Committee for Traffic Safety, Education, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961), p. 14.

Pupil Transportation, Teacher Education, and Specialized College and University Education and Research. The primary need, as indicated in the Committee Report, "is not a matter of finding new ways...but of wider application of what is already known."[17] The reluctance which many states have shown toward the establishment of requirements for driver education for the young driver, despite its proven value, is an example of what is included in the term "wider application."

Engineering. This section is one of the most comprehensive of the 11 sections of the Action Program. It includes detailed examination of the efforts and needs of traffic engineering per se, and explores the functional areas of highway and automotive engineering as well. This section contains 28 recommendations designed to assist engineers in meeting their responsibilities to "provide motorists and pedestrians with protection against hazards over which they have no control, such as the acts of other drivers and pedestrians, physical features of the highway and vehicle, and uncontrolled or unrelieved congestion."[18]

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[17] Ibid.

[18] The President's Committee for Traffic Safety, Engineering, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961), p. 9.

Motor vehicle administration. Perhaps one of the brightest hopes for traffic accident reduction, looking at this problem at long range, lies in the administrative and operational guidelines and standards posed in this section of the Action Program. The manner in which the elements of motor vehicle administration can contribute to accident prevention are described as follows:

> Driver examination and licensing requires motorists to develop the driving skill and knowledge of traffic laws essential to safe use of the public highways. Properly administered, this element of the total program will encourage license applicants to take advantage of opportunities for driver and safety education, and also will provide invaluable driver records.
>
> Suspension or revocation of licenses--when driving records warrant this action--removes from the highways those who cannot or will not assume individual responsibility for highway safety.
>
> Registration procedures provide effective control of improper and unsafe use of motor vehicles by regulation of the vehicle itself.
>
> Periodic motor vehicle inspection helps to assure safe operating condition of motor vehicles. Accompanied by a proper program of education, it also helps make motorists more keenly aware of the relationship of car condition to traffic safety and of their individual responsibilities for proper vehicle maintenance.
>
> Sound financial responsibility laws keep many irresponsible drivers off the roads and provide further incentives for safe driving.[19]

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[19]The President's Committee for Traffic Safety, Motor Vehicle Administration, A Section of the Action Program for

Police traffic supervision. It has been said that the most immediate impact upon traffic accidents can be accomplished through increases in the quantity and quality of police traffic law enforcement. Comparisons of traffic enforcement and traffic accident records information have clearly demonstrated, many times in many cities, the fact that when enforcement increases, accidents go down.[20] The reason for this common phenomenon is apparent when one understands that traffic law violations are contributing causes in as many as 85 per cent of all accidents and that sound enforcement operations can, in fact, deter traffic violations.

To achieve constructive progress in this particularly important accident prevention activity, the President's Committee recommends full, continuous and systematic use of known techniques and procedures and further suggests that additional study be conducted to learn more about driving behavior and the role of the police in constructively influencing this behavior.

Highway Safety (Washington: Government Printing Office, 1961), p. 5.

[20]Franklin M. Kreml, "Traffic Law Enforcement" (1952 Beecroft Memorial Lecture delivered by Franklin M. Kreml at the National Safety Congress in Chicago, Ill., Oct. 21, 1952).

The 13 recommendations of the Committee, summarized, suggest improvements in accident investigation and reporting enforcement activity which would be applied more effectively to accident experience, improved communications and relationships with the public and other official agencies--particularly the courts--improvements in selection and training activities, and more adequate facilities.[21]

Traffic courts. Contact with America's judicial system, by the great majority of those who will have any contact at all, will come about as a result of a traffic violation. The impressions which are created in these contacts are important, not only in developing desirable attitudes toward traffic law, but to government in general. This is but one reason why the manner in which traffic violations are handled should be of considerable concern. Another reason lies in the influence which courts have over police traffic enforcement. The writer has personally observed situations in a number of cities in which the traffic enforcement efforts of well-trained and dedicated officers were reduced to a bare minimum because of high dismissal rates and reduced charges and, in some cases,

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[21]The President's Committee for Traffic Safety, Police Traffic Supervision, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, (1961), p. 22.

because the officer rather than the violator was regularly placed on trial.

In the words of the President's Committee for Traffic Safety, "It is axiomatic that the judiciary has the final opportunity to inculcate respect for the entire enforcement process."[22] The means by which the judiciary can upgrade its level of performance in traffic cases, and thus enhance respect for the enforcement process, is outlined in some 15 recommendations. Broadly summarized, the recommendations provide for: Widespread adoption of the National Standards for Improving the Administration of Traffic Courts, more full-time judges, removing judges from the political arena, adequate salaries, a 'court of record' status for all courts hearing traffic cases, greater use of violator records, better prosecution, and elimination of the use of traffic courts as a source of revenue for general purposes.[23]

Other sections of the Action Program for Highway Safety include Public Information, Organized Citizen Support,

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[22]The President's Committee for Traffic Safety, Traffic Courts, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961), p.5.

[23]Ibid., pp. 22-23.

Research, and Health and Medical Care. Discussion of these are not included at this point because, for the most part, they do not so directly involve the operations of traffic officials.

The many guidelines and recommendations contained in all sections of the Action Program are probably what the author of a previously used quotation was referring to when he indicated that we could reduce traffic accidents by one-half "if we applied what is now known to be needed,"--though he did not say so specifically. There is little in the Action Program that is new. But, even a little exposure to the several functional areas of traffic accident prevention is sufficient to convince one of the need for vast improvements in what has already begun.

And, in addition, one needs but have limited association with traffic officials to understand that many of the deficiencies and shortcomings in their operations exist through no fault of their own. Traffic officials are charged, by law, with the responsibility for traffic safety. Yet, in a good example of one of the paradoxes of democracy, they can do only as much for the public as the public is willing to accept and support. Organized support of informed citizens is perhaps the most essential ingredient

to the future of traffic accident prevention. Indications are that this essential ingredient is regrettably lacking.

Public Understanding and Support

A few of the more obvious needs for traffic accident prevention, as outlined by the President's Committee for Traffic Safety, have been summarily discussed. And, it has been suggested that a greater level of public understanding and support for official needs and programs will be necessary if traffic safety is to become other than an illusive ideal. The development of organized support of the order necessary to meet this problem is more easily talked about than achieved. This is due, in large measure, to the fact that there are few fields in which one can find so much general apathy. To quote one prominent businessman, Clifton W. Phalen, President, New York Telephone Company, "There is no national problem of such magnitude which receives so little citizen attention at the local level."[24] In support of his observation, Mr. Phalen cites the following:

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[24]The New York State Citizens Council on Traffic Safety, Organizing a Citizen's Traffic Safety Council (New York: The New York State Citizens Council on Traffic Safety, 1962), p. 1.

> According to the U. S. Public Health Service, $87.00 is spent annually on research for each death caused by heart disease; $360.00 for research for each death caused by cancer; and $40,000.00 for research for each death caused by polio. These expenditures have been productive. But less than $5.00 is spent on research for every death caused by traffic accidents.[25]

A study conducted in 1960 revealed that apathy was one of the primary reasons why so few penalties were meted out to drivers who were involved in fatal accident causes and against whom charges were made. This report reveals that:

> Even if prosecuted and convicted--which few are--many of those blamed for fatal crashes receive only small penalties. Most of them never appear in court....
>
> In their [prosecutors, police officers and sheriff's deputies] statements, the words "apathy," "sympathy," and similar references frequently appeared, pointing to a lack of public recognition of the necessity for traffic prosecutions. Without rancor, this idea was often expressed:
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> "A traffic violation is not considered by the public to be a crime and people are reluctant to convict a driver of a serious charge for this violation."[26]

There are probably a good many reasons for this apathy, a number of which can be readily identified. For

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[25] Ibid.

[26] Harry E. Taylor, Prosecution in Fatal Traffic Accidents in Michigan, 1957-58 (A summary report of a

example, psychologists tell us that we all have an urge to risk, to live somewhat dangerously. There is, therefore, a natural reluctance to support a system which will restrict this urge or limit our freedoms in any manner.

Also, there are many communications experts who feel that this field is over-sloganized; that too many who have too little knowledge about communications and human motivation have been meddling too long in this field--that there has been too much stress on the negative approach and too much use of the scare technique. It is difficult to argue with these charges.

The fact that most people commonly view an accident as a chance occurrence, rarely with an assignable human cause, undoubtedly contributes considerably to the widespread indifference toward traffic accident prevention. A brief but pointed refutation of this popularly conceived notion of an accident can be found in a recent text on accident research by Clara Stratemeyer, who maintains that:

> Such a concept, by implication, characterizes an accident as being something outside the possibility of control. Since one cannot prevent what he cannot control, this uncontrollable phenomenon,

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thesis by James Edwin Carnahan, Highway Traffic Safety Center, Michigan State University, East Lansing, Michigan, 1960), p. 1.

> obviously, cannot be prevented. In this framework, it would be impossible to arrive at an answer to the vital question: How might other accidents of this kind be prevented? Accidents, if they are truly matters of chance, cannot really be prevented.
>
> The acceptance of this point of view may be seen in the common response: "It couldn't be helped; it was an accident."...But a realistic appraisal of accident data clearly shows that such a fatalistic attitude toward accidents and the inevitability of their occurrence is simply not in accord with the evidence. Accidents, like other events, are caused; and, like other events, they can be controlled when their causes are identified and their nature understood [italics not in the original].[27]

Whatever the reasons may be for its existence, public apathy and indifference toward the traffic problem must be recognized as a major obstacle to traffic improvement and every effort must be made to break through it if public support on a large scale is ever to be achieved.

The public is not likely to actively support what it does not understand. Accordingly, the facts about accidents and what is needed for their prevention must be made known. This is another of the reasons why traffic

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[27]Clara G. Stratemeyer, Accident Research (Washington: National Commission on Safety Education, National Education Association, 1964), p. 6.

accident records have long been considered a fundamental first step in any program of traffic accident prevention.

III. SUMMARY

The automobile has brought many benefits to the American people. It has modified our way of living in many ways. It has also created numerous problems, the most serious of which is the human suffering and economic losses which result from traffic accidents.

Programs have been developed which, if followed, could bring about a substantial reduction in traffic accidents. Most of these require a general upgrading in the level of performance of various traffic officials. However, in order to discharge their responsibilities more effectively, these officials need the acceptance and support of the public. Such support can come only when the public understands the nature of the traffic problem and what is required to meet it. Traffic accident information is basic to the development of this needed public awareness and understanding as well as to the equally important areas of planning and research.

CHAPTER III

TRAFFIC ACCIDENT INFORMATION USES AND NEEDS

The facts about traffic accidents are essential to the prevention of them. The many purposes for which traffic accident information is used, if detailed, would result in a substantial listing. They have, however, been synthesized into five distinct categories by the Traffic Institute of Northwestern University. They are:

1. To have knowledge of traffic accidents as a cause of mortality, morbidity and economic loss.

2. To point out where, when, and to whom traffic accidents are a critical problem.

3. To suggest lines of preventative action to be taken...including two different approaches; the case study method, and the statistical method.

4. To measure the effect of accident prevention efforts.

5. To determine negligence or fault.[1]

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[1]Traffic Institute, Northwestern University, Improvement of the Present System of Traffic Accident Records (Washington: Office of Highway Safety, U. S. Bureau of Public Roads, 1963), pp. 9-10 (Mimeographed).

One specific kind of traffic accident information may serve any number of purposes for many different users. And further, the purposes served will dictate the specific kind of accident information that is required.

An understanding of the purposes and requirements of traffic accident information by primary users is basic to this thesis for, as indicated in Chapter I, this study seeks to determine if it is possible to reduce the input of information on certain classes of accidents without sacrificing the validity--and hence, the value--of the output to the users for accident prevention purposes.

I. USES OF ACCIDENT INFORMATION

Except where otherwise noted, the purposes and requirements of traffic accident data included in the following sections represents a compilation of information drawn from charts, tables, and discussion found in three publications: Improvement of the Present System of Traffic Accident Records, Traffic Institute, Northwestern University;[2] Uses of Traffic Accident Records, Eno Foundation

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[2]Ibid., pp. 4-14.

for Highway Traffic Control, Inc.;[3] and Traffic Accident Records, A Report of the President's Committee for Traffic Safety.[4]

Police Uses of Accident Information

Police agencies, as a group, are one of the largest users of traffic accident information. This may be due more to the fact that they are usually the collectors and custodians of accident information than to the fact that their need for this information is any greater than that of other users. The information is simply more accessible to them.

Perhaps the greatest potential of accident records information for police lies in its use for selective enforcement. Selective enforcement is the assignment of available manpower to the locations where accidents are occurring most frequently, at the times of the day when their frequency is greatest, with enforcement attention

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[3]National Conference on Uniform Traffic Accident Statistics, Uses of Traffic Accident Records (Saugatuck, Conn.: Eno Foundation for Highway Traffic Control, Inc., 1947).

[4]The President's Committee for Traffic Safety, Traffic Accident Records, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961).

given particularly to the types of violations which records indicate are contributing most to accidents. It is a planning tool which the police supervisor can use to assure maximum results in the accident-deterring effect of enforcement. It is accomplished by comparing accident information with enforcement experience by time of day, by location, and by type of violation. It has been useful, in some instances, to extend the comparisons to include the day of the week, the month of the year, and police districts or divisions.

The fact that accidents are reduced as enforcement is increased was pointed out in the preceding Chapter. This might suggest that increases in enforcement quantity alone would have an impact on the accident experience. This, obviously, cannot be so where enforcement efforts, through lack of direction, "miss the mark," with no reference to accident factors.

The measurement used to determine <u>how much</u> enforcement a community should have is referred to as the "enforcement index." The enforcement index is determined by dividing the number of convictions, with penalty, by the number of accidents involving personal injury or death.

> The International Association of Chiefs of Police and the National Safety Council have learned that an enforcement index of about 20 is both attainable and effective for most cities. But the best rate for any given city must be determined individually. Some cities have found that an index of 10 is adequate, although this is generally felt to be on the low fringe of effectiveness. Other cities have needed to increase the index to 40 or 50 before real results have been obtained.[5]

The development of a selective enforcement program and the measurement of the quantity of enforcement are the two primary uses of accident information by police in their direct accident prevention functions. Extensive use of accident information is also made for training, answering complaints, safety contests, budget planning and justification and other activities not so directly related to the prevention of accidents. The police in many communities have also assumed the responsibility for traffic engineering and public education. However, the information requirements for these purposes will be treated separately.

Requirements of police. To effectively carry out the two primary accident prevention functions outlined

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[5]The International City Managers' Association, Municipal Police Administration (Chicago: The International City Managers' Association, 1954), p. 356.

above, the police would require the following accident information:

1. Year, month, day
2. Time of day
3. State and jurisdiction
4. Road or street
5. Type of accident
6. Highway type
7. Directional analysis
8. Violation involved

This is far short of the types of accident information which is usually collected and summarized by police agencies. However, it is basically all that is needed for their primary enforcement functions.

Traffic Courts Use of Accident Information

As mentioned previously, the courts have the last opportunity to inculcate respect for the judicial process. This respect can be greatly enhanced if, in adjudicating a traffic case, the judge seeks to "educate" the violator by explaining the seriousness of the offense committed. A violator is likely to be more repentant if he is convinced that the reason for his appearance is due more to his having created a hazzard than he will be if he feels

that he merely "broke a law." For this type of education, the judge will require only summarized data which, where possible, relate the consequences of traffic accidents to the violations involved.

The prosecution of violations in accident cases could conceivably make use of almost every fact included on the standard accident report form. Such information requirements generally apply only to individual cases and do not involve large-scale processing and analysis of mass data, and are, therefore, somewhat outside the direct purview of this study.

Requirements of courts. The accident information produced by the records system (as distinguished from information included on individual accident reports), which is most appropriate for court use, would include:

1. Summaries of the results of accidents such as severity and costs.
2. General identifying summary information such as time and place.
3. Where possible, the relationship of each of the above to violations involved in accidents.

Public Information and Safety Education Uses of Accident Information

Though there are certain identifiable differences in the processes and intended effects of public information as compared to safety education, the accident information requirements of each are so similar in many respects that they are combined here for discussion purposes.

Some emphasis was previously placed upon the importance of public understanding as a requisite to support which, in turn, is a requisite to improvements in accident prevention activities. Development of this necessary understanding is the primary objective of public information. According to the President's Committee for Traffic Safety, a well-executed public information program will:

1. Tell the public the facts about accidents.

2. Define and explain to the public the various traffic safety measures which make up the Action Program, and develop support for them.

3. Provide individual drivers and pedestrians with the information they need to protect themselves and others against accidents.

4. Continually emphasize the need for each individual to meet his personal responsibility for safe driving and safe walking.

5. Utilize special-emphasis programs when circumstances call for accenting specific seasonal or other problems.[6]

A substantial number of categories of accident information could be included in the word "facts" in the first function listed.

The facts about accidents are not only useful for "getting the message across" but for determining, in the first instance, what information needs to be directed to what particular segments of the population, and even where and when.

An outstanding example of the usefulness of accident information to the planning of a public information program was reported in a conversation with a representative of the Traffic Safety Association of Detroit. While conducting a detailed analysis of pedestrian accidents, the staff of this organization noticed that a disproportionately high number of fatal and injury pedestrian accidents in a certain area involved elderly persons. Additional inquiry revealed that a great majority of those killed and

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[6]The President's Committee for Traffic Safety, Public Information, A Section of the Action Program for Highway Safety (Washington: Government Printing Office, 1961), p. 3.

injured in this neighborhood neither read nor spoke English. The proven, hard-hitting pedestrian safety programs which this organization conducted had completely missed this group. All pedestrian protection program materials, subsequently produced, were translated into the mother tongue of those in this ethnic group with measurable results.

The accident information requirements of safety education, as mentioned, are quite similar to those of public information. The manner in which this will be used would differ, however. In the former, the information would primarily serve to develop a public awareness of the fact that there is a traffic problem and a general understanding of what can be done about it. In safety education, the information is used in a more specific, person-to-person manner to supply discipline, training, and to either change or develop attitudes. The distinction between the two is a fine one, however.

Requirements for public information and safety education. Outside the specific items on the standard accident report which identifies individuals involved, there appears to be little which could not be used

effectively, at one time or another, for public information and safety education purposes. It may safely be concluded that all information which is contained in each of the schedules in the traffic accident summaries recommended by the National Safety Council, and the Northwestern University Traffic Institute, is important for public information and safety education purposes.

Driver Licensing and Driver Improvement Uses of Accident Information

Many of the shortcomings in a driver's skill, knowledge, attitudes, and physical state, which lead to accidents, are detected in accident investigations and ultimately find their way into records systems. Analysis of summarized accident information can be used by motor vehicle administrators to determine which areas in their license examination procedures are in need of strengthening or modification. Such analysis may show, for example, that emphasis in the written examination needs to be placed upon certain rules of the road which are being ignored; or that closer attention should be given the portion of the test relating to the licensee's physical condition; or that a more comprehensive road test should be

conducted. If the licensing process is to accomplish what it is designed to accomplish--that is, to cause people to prepare themselves better for the complex job of driving and to weed out the unfit driver--it must be geared to practical driving situations and to the problems encountered in this task, many of which manifest themselves in traffic accidents.

Those who cannot or who will not obey the laws, or whose record of accident experience suggests the presence of a problem, may become the object of what is commonly called "driver improvement." This may involve "education" in personal hearings or group sessions, or, if the driver's actions warrant, the removal or restriction of his driving privilege for a period of time.

Driver improvement activities are highly organized in most states. Accident information is, in part, the basis for driver improvement action. Though the information used is generally confined to specific instances or violations and accidents, the general work of driver improvement administrators is guided to a considerable extent by accident trends and rates derived from records systems.

Requirements for driver licensing and driver improvement. Excluding the accident information which would

be required on individual accident cases for driver improvement purposes, the informational needs for driver licensing--and to a lesser extent for driver improvement--would include almost all that contained in the standard summaries. A possible exception might be the location of accidents by areas within a community.

Engineering Uses of Accident Information

Accident information serves both the highway engineer and the traffic engineer in a similar way. First, it makes possible the identification of high accident locations and may even suggest what possible corrections may be needed (though a field study should precede a final determination). Secondly, "before and after" studies can show the results of corrective action taken. And, third, accident information can lead to the development of improved standards and techniques for the highway engineer and the traffic engineer alike.

Requirements for engineering. Accident location is a factor in which the engineer has primary interest. He is also interested in all other factors which tell him what happened, when, how, and to the extent possible, why. The only accident facts which may be of little value to

him are those relating to the age, sex, and residence of the driver or pedestrian.

Legislative Uses of Accident Information

Constant changes in highways and in traffic speed and volume result in changes in traffic accident problems. Legislation necessary to control the problems, obviously, cannot remain static and inflexible. The repeal or modification of existing laws and the need for new laws should be guided by careful analysis of traffic accident trends. Legal requirements for safety equipment for vehicles, age limits for licensing, driving regulations for modern expressways, the penalties for certain types of driving violations (notably driving while under the influence) can and should be modified as the need is shown in accident analysis.

Requirements for legislation. The accident information requirements for legislation at local levels will differ somewhat from those at the state level. But, taking these as a combined unit, and considering the fact that legislation is the basis upon which all other functional areas of traffic operations is established, it is clear that no category of accident information is unimportant

here--all would be used at one time or another.

Observations on the Present Level of Use

It is interesting to speculate upon what difference, if any, there would be in today's accident experience if accident information was actually being used in the ways described above. As a result of field work with a number of state and local organizations and agencies having traffic responsibilities, the writer has somewhat empirically concluded that, although a good deal of time and money is spent in collecting and summarizing traffic accident information, only a fraction of the potential value of the data obtained is realized. The result is a costly compilation of little-used history.

Support for this observation, as it applies to at least one area, can be found in a report of a committee of citizens and officials who studied the traffic records activities in one sizeable Michigan county.[7] Their inquiries revealed that most of the 37 departments in the

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[7]Mott Center for Community Affairs, Oakland University, and the Highway Traffic Safety Center, Michigan State University, "Oakland County Traffic Safety Committee, Study Group I, Traffic Records" (an unpublished report of the status of records systems in local police departments in Oakland County, 1965).

county were doing a creditable job of obtaining and summarizing accident information. However, it was found, generally, that only limited use was made of the information for enforcement purposes, very little for engineering purposes, and virtually none for public information and education purposes.

The situation, as it obtains in this county, appears to be quite typical; though there are exceptions, particularly in traffic agencies at the state level.

Non-Official Uses of Accident Information

The uses and users of accident information are far more extensive than described in this Section. This represents a listing of only the officials who are the primary users of information for accident prevention purposes, and the basic requirements of each. It does not include the many agencies, organizations, and individuals who may have need for information for special studies which may demand data of a highly specialized nature--such as that which would have application for motor vehicle design--even though the object may be the prevention of traffic accidents. Neither does the foregoing discussion include the many whose needs for accident information are frequently not quite so directly related to accident prevention, such

as insurance companies.[8]

II. SUMMARY

Because there are so many different users of accident information--each seeking different kinds of data for different purposes--police administrators have become somewhat frustrated and perplexed as to how much information should be obtained and processed on what types of accidents. Very little need be collected for purposes of identifying high-accident locations or for a driver record file. A great deal of information may be necessary for special studies of causative factors contributed by either the driver, the vehicle, or the roadway. The information which would be required to establish accident rates or trends would be somewhere in between.

This latter category of information requirements--that which is necessary to establish rates or trends--is particularly crucial to this study. The validity of accident rates, as used today, has been seriously questioned

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[8]A complete listing of all users and their particular requirements, although possibly enlightening, would not serve the purpose of this study as outlined in Chapter I. The information required by most of those not included is generally outside that contained in the basic accident report.

by authorities. There is a recognized need to establish "an accident severity cut-off point which will be more clearly distinguishable and easily applicable than the traditional injury accidents and include a much larger number than fatal accidents only."[9]

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[9]Traffic Institute, Northwestern University, op. cit., p. 91.

CHAPTER IV

ESTABLISHING A SEVERITY CUT-OFF POINT-- A PRIMARY REQUIREMENT FOR IMPROVING ACCIDENT DATA COLLECTION

The purpose of traffic accident reporting and investigation, as outlined in the previous Chapter, is to provide data which, generally stated, can point out the magnitude of the problem, satisfy certain legal needs, serve as the basis for comparing rates and trends, and identify particular problem areas which can become the object of special studies of accident causation.

I. TRAFFIC RECORDS PROBLEMS OF THE POLICE

A question which has plagued police administrators, for some time, and more particularly in recent years, is that of how much traffic accident information they should obtain in what types (mainly in terms of severity) of accidents. How much information should be obtained in a minor property damage accident? How much in a fatal accident?

It is extremely difficult, if not impossible, for a

police officer arriving at the scene of an accident, to predict how much information will ultimately be needed. The information required of a minor property damage accident may, on one hand, include only that which is necessary to establish identity of drivers (for driver record files) and other information to establish location. The information needs for this same accident would be increased many times over, however, if either criminal or civil actions should subsequently ensue.

Even considering the difficulties in trying to ascertain, beforehand, how much information might ultimately be needed in a given accident, the fact remains that there have been few, if any, sound policies and guidelines established to assist the police administrator in determining what kind and how much information should generally be collected on accidents of different levels of severity. The result is that much information is collected for which there may be only occasional use, while not enough is collected for which there may be great need.

The need for resolving this problem has been recognized by the Traffic Committee for the International Association of Chiefs of Police. In 1963, this Committee

passed a resolution which stated, in part:

> "WHEREAS, the Action Program for Highway Safety contains recommendations for a program designed to establish complete reporting of all motor vehicle traffic accidents [italics not in the original]; and
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> "WHEREAS, the system of reporting advocated prescribes a police report designed to supply the critical and fundamental needs of the police, the engineer, and the driver licensing authority; and
>
> "WHEREAS, the system advocated prescribes a procedure which would significantly affect the expenditure of time in both the collection and compilation of data; and
>
> "WHEREAS, the precise definition of the volume of information gathered and a decision as to whether reports should be completed on all motor vehicle accidents are critical factors in determining the expenditure of officer time in accident investigation; now therefore be it,
>
> RESOLVED "That prior to endorsement of the recommendations contained in the accident records section of the Action Program, there be established a sub-committee within the Traffic Committee of the International Association of Chiefs of Police to establish precise definition of the extent of information to be gathered in the accident investigation process as well as the completeness of accidents to be reported and those to be investigated... [italics in the original, as reported.]"[1]

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[1]David S. Luethje, Inspector, California Highway Patrol, "Use of Traffic Records" (from remarks presented at the Mountain-Pacific Regional Conference, State, and Provincial Section, International Association of Chiefs of Police, Jackson, Wyoming, July, 1963), pp. 8-9.

Even without benefit of policies, guidelines, or the "precise definition" mentioned in this resolution, isolated attempts have been made to resolve the conflict between increases in the demand for accident information and the increasing problems which most police are experiencing in providing the manpower necessary to collect and process accident data.

II. EXAMPLES OF EFFORTS TO RESOLVE THE RECORDS CONFLICT

Attempts to resolve the problem can be seen in the trend toward reducing the number of items on the basic accident report form and making greater use of supplementary forms. The California Highway Patrol is a notable example of one agency which has taken steps in this direction.[2] Interviews with Mr. Waldorf Pletcher, Chief of the Accident Records Branch of the Office of Highway Safety, U. S. Bureau of Public Roads, revealed that Chicago has also revised its accident reporting forms and procedures considerably in an effort to simplify its basic reporting activities. He further indicated that Los Angeles has virtually abandoned reporting of property

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[2]David S. Leuthje, op. cit., pp. 11-12.

damage accidents, the justification being that the patterns of accidents do not change radically, and that the gross expenditures of man-hours spent in reporting this class of accidents was, therefore, not warranted.

Some substantiation of this position is provided in an unpublished report of a study of correlations of certain accident factors from year to year, over a five-year period, as reported by the Grand Rapids, Michigan, Police Department.[3] This study showed a high degree of correlation in over 75 per cent of the schedules studied (type of accident, age of driver, hour of day, and so forth). No attempt is made in this report to interpret the significance, if any, in the high correlations of some items and the low correlations in others. It could well be that the presence of low correlations among certain schedules could have extremely important implications to accident prevention planning activities.

The fact that there may be considerable repetition in the distribution and frequency of certain accident

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[3]Walter D. Weiss, "Investigation of Year-End Total Traffic Accident Statistics in the City of Grand Rapids, Michigan, for the Years 1955 Through 1959 - A Preliminary Study" (an unpublished research report, Michigan State University, East Lansing, Michigan, September, 1960).

facts from year to year, would not seem to justify complete abandonment of reporting of property damage accidents, as was reportedly the case in Los Angeles. For the accident prevention and planning needs of many traffic officials, there is virtually no difference between a fatal accident and a property damage accident. As indicated earlier, there are a good number of reasons why at least basic information is needed on nearly all accidents.

On the other hand, there is no purpose served in collecting information which is superflous. As noted earlier, any information obtained in investigating or reporting an accident might be of value at one time or another. However, as a matter of practical economics, a limit must be drawn on the extent of information which is obtained in most cases. The steadily increasing numbers of vehicles and drivers on the highways have resulted in substantial increases in numbers of traffic accidents. In most departments, there has not been a commensurate increase in the numbers of police officers available to investigate and report these accidents. The California Highway Patrol reported that, in 1962, the equivalent of 220 man years were spent in accident investigation and

reporting.[4] The monetary cost was estimated to run over $2,000,000 per year. This amount was considered excessive.

There has been considerable discussion among records authorities lately about the possibilities of sampling. For certain purposes, this may be entirely appropriate. Although, as mentioned earlier, a certain amount of information is required of a great majority of the accidents to satisfy the legal and technical needs of some users. Even so, a form of "sampling" which would result in a compromise between the recording of a very minimal amount of information on certain accidents and recording a substantial amount of information on others could conceivably result in a records system producing more reliable information over-all. As one author has indicated, in a general discussion of sampling techniques:

> Sampling is not just a stop-gap or substitute for the collection of all data relating to a particular study. It is often not realized that estimates based on relatively small samples may be more reliable than results of complete census. Since fewer personnel are needed for sample studies than for complete censuses,

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[4]David S. Leuthje, op. cit., p. 1.

> there is opportunity for more thorough training and for better supervisor control of employees than is possible in complete censuses.[5]

There is some validity in this observation for the records field. The time spent in collecting and processing superflous information might be reduced and directed more productively to obtaining additional data on more severe accidents. This represents a form of what might be termed "vertical sampling," for it presumes that a determination of a point of accident severity can be made, above which representativeness in the final tabluations can be obtained.

An interesting proposal for a form of what might be considered "horizontal sampling" is proposed by B. J. Campbell, Assistant Director of the Automotive Crash Injury Research Program of the Cornell Aeronautical Laboratory, Cornell University. His technique is based upon one which is used in conducting the U. S. Census. That is, basic information is obtained on everyone and, in addition, detailed information is obtained on a series of specific items (which might concern television viewing,

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[5]Nathan Lieder, "Sampling Techniques Applicable to the Collection of Economic Data," Public Roads, XXX (December, 1959), p. 246.

plumbing facilities, and so forth) on a smaller number, selected through a sampling technique. How this procedure might be applied to traffic accident investigation is described in the following paragraphs:

> An officer could be given a packet of report forms. On each form, the top half of the front calls for basic data--information that must be collected for every accident. The bottom half of the front and all of the back concern specialized information on a particular topic. The second sheet of the packet repeats basic data on the top half of the front, and on the bottom half and the back is a second specialized area. This continues until all specialized areas are completed and then the cycle repeats. This would mean that <u>every</u> report would require about the same officer effort, but that he would specialize on different pieces of information for different accidents.
>
> As a specific example, suppose that there are seven types of forms. The first form could be basic information plus details on vehicle path reconstruction (an attempt to reconstruct vehicle trajectories and evasive actions). Number three could be basic information plus details on driver characteristics and condition. Number four could be basic information plus crash injury facts. Five could be basic information plus origin and destination data. Six could be basic information plus road geometry data. Seven could be basic information plus visibility and weather conditions. Number eight would be a repeat of the first form. Thus, a pad of seventy forms would include ten complete sets.
>
> Over a year period, the officers would report more total information than at present, yet officer effort could actually be <u>less per accident</u>.

EXAMPLE

Form 1	Basic + vehicle defects
Form 2	Basic + path reconstruction
Form 3	Basic + driver characteristics
Form 4	Basic + crash injury details
Form 5	Basic + origin and destination data
Form 6	Basic + road geometry data
Form 7	Basic + light & weather conditions[6]

In his discussion of this sampling proposal, Mr. Campbell recognizes certain problems which are inherent in this technique. The first lies in the fact that so many subdivisions of information would require a substantial volume of accidents in a jurisdiction in order to sustain reliability in all of the subject areas sampled. Another problem would be presented those who have the responsibility of designing forms. And, what is presumably an even greater problem, is represented in the admitted substantial increase in the burden placed upon data processing and handling facilities. Even so, this proposal is one which has aroused the interest of a number of records authorities and certainly appears to be

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[6]B. J. Campbell, "Accident Investigation Report Forms" (from a five-page, photocopy of a report of a proposal, presumably unpublished, April, 1964).

deserving of a trial in a pilot study.

III. A SEVERITY CUT-OFF POINT FOR THE BASIC ACCIDENT RECORD

The previously cited publication of the Traffic Institute of Northwestern University emphasizes that the establishment of a severity cut-off point in traffic accidents is one of the important needs to improve data collection. The detailed treatment of this need in this report, combined with subsequent conversations about it with traffic records authorities and police administrators in New York and Michigan, was largely responsible for the selection of the subject of this study.

The Institute's views on the need for and purposes served by a severity cut-off point are as follows:

> Basic accident records for rates and comparisons. The only really trustworthy accident rates today are those of fatal accidents, but they are useful only for large geographical areas or long periods of time because fatalities are relatively rare events. Injury-accident rates are always suspect because we are never sure how completely the numerous less serious accidents are being reported. All reported accidents are so ill-defined that one can have little confidence in total accident rates.
>
> Perhaps the most important improvement in data collection, therefore, is to specify an accident severity cut-off point which will be more clearly distinguishable and easily applicable than the

> traditional injury accident and include a much larger number of cases than fatal accidents only [italics not in the original]. The next most important improvement would be to secure the most complete reporting possible of all accidents down to this standard specific cut-off point. The object of these improvements would be to provide a fairly large collection of reasonably complete reports and records as a basis for special studies and research as well as routine summaries.
>
> Study and agreement would be needed to specify such a cut-off point...It would be foolish to suggest improvements which would be impossible to achieve. Hence, some thought has been given to a possible cut-off point which would be sufficiently better than the rather vague ones now in use. Further study might develop other possibilities for consideration. [italics not in the original].
>
> It would seem better to tie the cut-off severity for basic reports to motor-vehicle damage (except for pedestrian accidents) than to the most serious injury to any occupant....
>
> Serious consideration should be given to using for cut-off severity any damage which prevents a vehicle from being driven away from the scene under its own power.[7]

The Institute suggests that a measurement of accident severity other than that based on a dollar amount of property damage be used to determine a cut-off point and indicates that something akin to Michigan's law for

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[7]Traffic Institute, Northwestern University, Improvement of the Present System of Traffic Accident Records (Washington: Office of Highway Safety, U. S. Bureau of Public Roads, 1963), pp. 91-92.

reporting accidents might be most equitable.

Chapter VI, Sec. 622 of the Michigan Vehicle Code, provides that:

> The driver of every motor vehicle involved in an accident resulting in a vehicle or vehicles becoming so disabled as to be incapable of being propelled in the usual manner, or resulting in personal injury or death of any person shall forthwith report such accident to the nearest or most convenient police station or police officer...

(It should be made clear here that the Institute is not suggesting that this Michigan law be adopted as a requirement for the reporting of an accident by a motorist. It is recommended that this description of level of severity be tried as a cut-off point, by the officer at the scene, in determining whether the accident is to be only reported (using the basic report form) or more fully investigated.

(According to police authorities in Michigan, this state has had poor experience with its reporting law, as a reporting requirement. Most Michigan authorities agree that a reporting requirement based upon damage, in a fixed dollar amount, as prescribed in the Uniform Vehicle Code, would be superior.)

The Institute indicates that the motor vehicle damage severity cut-off point has a number of advantages.

> It can be determined at the scene of an accident; no follow-up is necessary to determine medical treatment, days of disability, or cost of repairs. No special measurements or observations requiring special skill or training are necessary.[8]

Some of the advantages in this as a severity cut-off point would come immediately to the minds of Michigan authorities who have worked with this as a reporting requirement. For example, there are instances in which a relatively small amount of damage can render the vehicle inoperable. And, there are other accidents in which very costly damages are incurred but the vehicle is still capable of being "propelled in the usual manner." The Institute recognizes these disadvantages but suggests that "before deciding on any cut-off point, the problem is to determine whether the advantages outweigh the disadvantages." (Brief mention is also made of special severity cut-off points for pedestrian and bicycle accidents.)[9]

The primary objective of the severity cut-off point, as proposed by the Institute, is to provide a better way of establishing traffic accident rates. A secondary

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[8] Ibid., p. 92.

[9] Ibid.

advantage would result in obtaining a fairly large quantity of "in-depth" accident information, which would be thoroughly processed, the accident factors presumably cross-correlated and, in short, subject to much greater analysis than is now practical for all reports in the files of most systems. (As indicated, not even injury accidents can serve as a reliable basis for this sort of "saturation" processing.)

This study is more concerned with the secondary features of the severity cut-off point, as outlined by the Institute--that is, the degree to which a cut-off point can be used and still provide for representativeness in the final tabulations. The Michigan reporting requirement, if used as a basis for severity cut-off, may or may not provide the desired representativeness.

As an alternative, the writer suggests that damage cost, as determined by the officer at the accident scene, might prove to be a better criterion. Dollar cost as a criterion was not looked upon with favor in the Institute's report, primarily because the estimates were thought to be too subjective. However, conversations with authorities in Michigan indicate that spot checks made on damage estimates made by officers and the actual repair costs

revealed that the estimates were fairly close--about 10 per cent on the average. (Cost estimates were said to be generally lower than actual costs because estimates based on surface damage may not reveal costly damage to a vehicle frame, motor, and so forth.)

In any event, it was generally agreed that the officer's ability to estimate costs with a reasonable degree of accuracy could be greatly enhanced with a minimal amount of training, preferably conducted by a knowledgeable body repairman.

IV. SUMMARY

The many users of traffic accident information are making demands upon police which they find difficult to meet because of limitations on manpower available to collect and process the information. In an effort to meet all possible uses, too much information is obtained and processed in some instances while too little information is obtained in others.

To meet this problem, some jurisdictions have completely abandoned the reporting of property damage accidents; others have limited the amount of information obtained; and ways of sampling have been discussed as a

means of conserving on manpower while still producing reliable information.

Policies and guidelines are needed to help resolve this conflict.

One authority suggests that the establishment of a traffic accident severity cut-off point is one of the most important needs, and recommends that damage to a vehicle, to the extent that it cannot be driven, be used as the criterion.

As an alternative, the writer suggests that vehicle damage, in terms of dollar cost, might be an equally effective cut-off point--at least for purposes of collecting and processing accident information "in-depth" on a certain number of accidents which, when summarized, will be reasonably representative of all accidents.

CHAPTER V

DISTRIBUTION OF TRAFFIC ACCIDENT FACTORS FOR SEVEN ACCIDENT-COST CATEGORIES

The data contained in the tables and charts which follow are designed to show how increasing increments of traffic accident dollar costs effect the relative representativeness of specific accident factors, such as day of week, age and sex of drivers, weather, vehicle condition, and the like.

The original information from which the tables were prepared was provided by the Grand Rapids Police Department, and includes 7,756 property damage accidents which were investigated and reported at the scene, or reported to the Traffic Bureau of this Department during the year 1959.

I. DATA DEVELOPMENT

The original data provided by the Grand Rapids Police Department was contained in over 200 separate schedules. These were subdivided (1) by accidents reported

at the scene and at the Bureau, (2) estimated cost of property damage incurred for seven cost categories; (a) $0.00 to $25.00, (b) $26.00 to $50.00, (c) $51.00 to $100.00, (d) $101.00 to $250.00, (e) $251.00 to $500.00, (f) $501.00 to $1,000.00, and (g) over $1,000.00; (3) by the specific accident factor and, (4) by month.

The numbers of accidents were first totaled for each accident factor by each of the seven cost categories. Then, because this study is concerned with the numbers of all accidents above each cost level (as contrasted with the number within a certain cost category), accumulative totals were developed. For purposes of making comparisons in frequency of occurrence between each cost level, the totals were converted into percentages.

This means that the first cost column includes the number of accidents incurring property damage of $1,000.00 or more; the second column, the numbers of accidents of $501.00 and above, including those in the previous column; the third column includes the total of the previous two, and so on.

In the discussion and interpretation of the data in these tables, the following terms will be used:

Cost category - or "cost level," includes all accidents above the specific level which is

being referred to.

Accident factor - includes such things as: day of week, time of day, police district, and so on.

Unit - this represents a subdivision within an accident factor, such as: Monday, Midnight, District #1, and so on.

Representative - or "representativeness," refers to the degree (expressed in terms of percentages) to which a particular accident factor, at a given cost level, compares to the percentages computed for this factor at all lower cost levels.

A few minor errors were detected in the totals of the original schedules provided. Most of these occurred in cost categories which included fairly large numbers of accidents and, generally, amounted to no more than two or three. These would not perceptively effect the final percentages, but does account for certain irregularities in totals of accidents reported in a few of the cost categories.

Percentages were rounded off to the nearest one-half of one per cent and, where the percentage point was

less than one, it was dropped.

A "Summary Table" was developed to show the disparities (in percentages) in the frequency of accident experience between each cost level for each accident factor. This is the heart of this particular study, for, briefly expressed, a perusal down each of the columns in this summary table will indicate just how far from being "representative" of all accidents the particular accident factor is at that cost level. For example, a figure of "3%" for any accident factor at, say the $251.00 cost level, means that this figure is within 3 percent of being representative of all accidents below this level for that factor. In short, the lower the percentage figure, the higher the degree of representativeness and vice-versa.

II. INTERPRETATION AND SIGNIFICANCE OF DATA

Only 45 traffic accidents were reported by the Grand Rapids Police Department which incurred damages estimated to cost $1,000.00 and above. A number this small could not be expected to produce reliable results in the final tabulations and undoubtedly accounts for the exceptionally wide disparities between the frequencies of involvement at this cost level, by various accident factors, and those of other cost levels. For this reason, this cost

category is excluded from the discussions of the individual tables.

As would be expected, there are certain accident factors which would correlate quite directly to accident costs. Vehicle speed would be one of these--the greater the speed, the greater would be the severity and, hence, property damage and costs. And, because speed is, in large measure, a function of the locality (in terms of commercial, residential, school, or open-country type of location), a fairly high correlation of accident cost to this factor might be expected. Comparisons of traffic accident costs by Police District (the districts having certain distinguishable "locality" characteristics) would also be expected to show a close correlation.

An examination of the Summary Table shows that there is, in fact, a rather marked mutual relationship between severity of costs and the factors mentioned (and underlined) above. This is reflected in the disproportionately high percentages shown at the higher costs levels for each of these factors. In other words, there is greater disparity in the percentages between the high and the low cost levels because the extent of damage is influenced by speed. Therefore, these factors will not show up as being

as "representative" as other factors are.

Table I, Day of Week: At an accident cost level of $251.00, all units in this factor are within 3 per cent of being representative of all accidents. Increasing the cut-off level to $501.00 would raise this figure to 7 per cent.

Table II, Hour of Day: There is only a difference of 5 per cent between accidents reported at the $501.00 cost category and all others below it.

Table III, Police District: This was one of the accident factors which was pointed out earlier as a mutual relationship to accident cost. Even so, there was but a difference of 6 per cent between all accidents above the $501.00 cost level and all below it, and a difference of only 3 per cent at the $101.00 cost level.

Table IV, Type of Vehicle: The $251.00 cost category for this particular accident factor shows a difference of 5 per cent between the frequencies of involvement for all units in all accidents below this level.

Table V, Residence of Drivers: This particular accident factor, and the two which follow, were particularly representative at the higher cost levels. There was a difference of only 2 per cent between the frequency of

this factor at the $501.00 level and all cost levels below it.

Table VI, Type of Driver's Licence: Here again is a difference of only 2 per cent between accidents reported at the $501.00 accident cost level and all of those below it.

Table VII, Age of Drivers: Besides there being only a difference of 2 per cent between accidents at the $501.00 cost level and all those below it for this factor, it is interesting to observe that there is a slight increase in involvement in the more costly accidents for ages between 25 and 45, and a slight diminishing of involvement in the more costly accidents for those in the older age groups.

Table VIII, Sex of Drivers: This accident factor, too, has a fairly high level of representativeness in the higher cost categories, a difference of 5 per cent at the $501.00 level. It is interesting to note that the frequency of involvement of men increases as accident costs increase, while the reverse holds for the involvement of women.

Table IX, Weather: This accident factor showed a moderate rate of representativeness at the various cost

levels. The $101.00 category showed a difference of 5 per cent and, the $251.00 showed a difference of 6 per cent.

Table X, Light Condition: This accident factor shows the greatest disparity of any thus far examined; a difference of 6 per cent at the $101.00 cost category, 11 per cent at the $251.00 cost category, and 19 per cent at the $501.00 cost category. There would appear to be a mutual relationship between hours of daylight and darkness (even with streets lighted) and accident costs. Such a finding is directly in line with the fact that there is a higher fatal accident rate during the hours of darkness than during daylight hours.

Table XI, Locality: The relationship of accident costs to this particular accident factor was discussed earlier in the general observations. The influence of vehicle speed is possibly responsible for this relationship which has resulted in a difference of 6 per cent at the $101.00 level, jumping to 15 per cent at the $251.00 cost level, and 16 per cent at the $501.00 cost level.

Table XII, Road Surface: This accident factor is fairly representative at the higher cost levels, reaching a difference of only 6 per cent at the $501.00 cost level.

Table XIII, Road Character: This factor, too, maintains a fairly high rate of representativeness at the higher cost levels, showing a difference of only 5 per cent at the $501.00 cost level.

Table XIV, Directional Analysis: The frequency of accidents which occur at an angle within an intersection is responsible for the fairly large disparity between the percentages shown at various cost levels. At $251.00 there is a difference of 13 per cent, and at $501.00 a difference of 16 per cent.

Table XV, Violations Indicated: It would appear that the more severe the accident, the greater will be the likelihood of a violation being noted on the accident report. It is difficult to say whether there are actually more violations in the more costly accidents or whether this is the result of more thorough investigation and follow-up of accidents in the higher cost categories. At $101.00 there was a difference of 12 per cent which jumps to a difference of 24 per cent at the $501.00 cost category.

Table XVI, Drinking by Drivers: There was a difference of 6 per cent at the $251.00 cost level and 9 per cent at the $501.00 cost level for this accident factor,

which shows a slight tendency to a mutual relationship between cost of accidents and drinking by drivers.

Table XVII, Condition of Drinking Drivers: The percentage differences for this accident factor are similar to those in the previous table; a difference of 7 per cent at the $251.00 cost level and 9 per cent at the $501.00 cost level. A close examination of the table will show a marked relationship between the numbers of drivers reported "drunk" and the high cost of the accident.

Table XVIII, Vehicle Condition: This table is actually separated into two parts, the first showing whether there was a vehicle defect, and the second noting the type of defect, if any. The first part shows a moderate rate representativeness, there being a difference of 5 per cent at the $101.00 cost level, a difference of 8 per cent at the $251.00 cost level, and 9 per cent at the $501.00 level.

The type of defect shows a rather severe change in percentage differences from the medium to the high cost levels; from a difference of 4 per cent at the $101.00 cost level to a difference of 39 per cent at the $501.00 cost level. Interestingly enough, this happens to be an inverse correlation. That is, looking at the unit

"brakes," one can see that the frequency of this vehicle defect is greatest at the lower cost levels.

Table XIX, Traffic Controls: This accident factor remains fairly representative up to the $251.00 cost level with a difference of only 3 per cent, but jumps to a difference of 8 per cent at the next cost level of $501.00.

Table XX, Speed of Vehicle: The mutual relationship of vehicle speed to vehicle damage cost was mentioned in the preceding general observations. It is reflected in the percentage difference of 11 per cent at the relatively low cost level of $101.00 which jumps to 21 per cent at the $501.00 cost level. Most of the accidents included in this study very likely occurred in areas where the speed limit was 35 miles per hour and under, which explains the grouping within the first four units under this category. There is a notable increase, however, in the frequency of involvement, in percentages, within the unit, "21 - 30 MPH," in the cost categories from lowest to highest.

TABLE I

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND DAY OF WEEK

DAY OF WEEK	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Sunday	7	16	29	10	103	9	264	8	389	8	470	7	554	7
Monday	6	13	29	10	158	13	490	15	742	15	921	14	1112	14
Tuesday	3	7	34	12	136	12	414	13	686	14	885	14	1101	14
Wednesday	4	9	36	13	169	14	476	15	750	15	930	15	1123	14
Thursday	6	13	29	10	171	15	447	14	674	13	861	13	1069	14
Friday	6	13	61	22	230	20	632	19	1015	20	1322	21	1600	21
Saturday	13	29	60	22	207	18	524	16	789	16	1026	16	1195	15
Not Stated									1					

TABLE II

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND HOUR OF THE DAY

HOUR OF THE DAY	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Midnight	7	16	16	6	48	4	83	3	116	2	136	2	148	2
1:00 A.M.	2	4	12	4	36	3	65	2	83	2	93	1	106	1
2:00	1	2	13	5	33	3	69	2	80	2	91	1	103	1
3:00	5	11	10	4	16	1	28		39		40		44	
4:00	0		3		9		12		16		16		18	
5:00	1	2	2		8		15		18		24		27	
6:00	0		10	4	36	3	92	3	138	3	174	3	207	3
7:00	0		9	3	55	5	135	4	205	4	249	4	298	4
8:00	1	2	7	3	52	4	152	5	260	5	331	5	400	5
9:00	1	2	8	3	33	3	116	4	187	4	238	4	274	4
10:00	0		3	1	37	3	123	4	198	4	254	4	321	4
11:00	0		3	1	39	3	136	4	227	5	320	5	395	5
Noon	2	4	18	6	63	5	180	6	272	5	330	5	397	5
1:00 P.M.	0		10	4	46	4	154	5	243	5	320	5	380	5
2:00	3	7	17	6	56	5	165	5	262	5	342	5	421	5
3:00	6	13	19	7	93	8	273	8	469	9	611	10	729	9
4:00	2	4	21	8	87	7	288	9	492	10	631	10	783	10
5:00	1	2	13	5	100	9	312	10	494	10	642	10	798	10
6:00	1	2	12	4	58	5	170	5	256	5	316	5	387	5
7:00	1	2	8	3	54	5	178	5	257	5	342	5	402	5
8:00	4	9	14	5	60	5	146	4	220	4	279	4	325	4
9:00	3	7	18	6	57	5	140	4	198	4	246	4	310	4
10:00	3	7	16	6	50	4	104	3	156	3	188	3	232	3
11:00	1	2	14	5	46	4	109	3	150	3	181	3	211	3
Not Stated	0		2		2		3		11		23		40	

TABLE III

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND POLICE DISTRICT

POLICE DISTRICT	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
# 1	5	11	20	7	80	7	208	6	304	6	366	6	430	6
# 2	4	9	18	6	68	6	181	6	293	6	398	6	476	6
# 3	6	13	65	23	294	25	893	28	1461	29	1920	30	2414	31
# 4	8	18	52	19	212	18	505	16	756	15	934	15	1083	14
# 5	1	2	8	3	51	4	165	5	247	5	302	5	361	5
# 6	4	9	29	10	126	11	386	12	594	12	756	12	918	12
# 7	11	24	28	10	102	9	270	8	413	8	519	8	621	8
# 8	2	4	14	5	69	6	197	6	324	6	394	6	461	6
# 9	2	4	31	11	110	9	272	8	415	8	521	8	616	8
# 10	2	4	13	5	60	5	165	5	234	5	301	5	370	5
Not Stated	0		0		1		5		5		5		5	

TABLE IV

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND TYPE OF VEHICLE

TYPE OF VEHICLE	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Passenger Car	70	92	477	93	2008	92	5549	92	8380	90	10471	89	12452	88
Passenger Car & Tra.	0		0		1		3		7		10		14	
Truck	4	5	26	5	123	6	372	6	693	7	967	8	1229	9
Truck & Trailer	2	3	4		16		39		65		76		94	
Other Trucks	0		0		2		13		16		28		31	
Farm Equipment	0		0		2		2		2		2		2	
Taxicab	0		2		13		36		59		71		90	
Bus	0		1		6		22		48		65		85	
School Bus	0		1		3		3		5		8		15	
Motorcycle	0		0		0		4		12		25		34	
Motorscooter	0		0		0		2		6		8		10	
Not Stated	0		1		1		3		8		20		29	

TABLE V

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND RESIDENCE OF DRIVERS

RESIDENCE OF DRIVERS	$1000.+		$ 501.+		$251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
City	53	70	340	66	1469	68	4050	67	6213	67	7816	66	9396	67
County	18	24	126	25	537	25	1505	25	2323	25	2988	25	3588	25
State	5	7	40	8	142	7	412	7	647	7	791	7	916	7
Out of State	0		5		22	1	69	1	100	1	125	1	142	1
Not Stated	0		1		5		12		20		34		46	

TABLE VI

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND TYPE OF DRIVER'S LICENSE

TYPE OF DRIVER'S LICENSE	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Operator's	47	63	335	66	1433	65	3984	66	6057	65	7646	65	9092	65
Chauffeur's	7	9	39	8	172	8	485	8	809	9	1014	9	1261	9
Beginner's	0		1	2	5		8		12		16		20	
Restricted	19	25	119	23	490	22	1356	22	2124	23	2707	23	3273	23
Not Licensed	0		3		12		35		53		68		78	
Other State	1	1	2		12		41		62		79		90	
None	0		0		0		0		0		0		1	
Military	0		0		0		0		0		0		1	
Not Stated	1	1	12	2	50	2	134	2	181	2	219	2	267	2

TABLE VII

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND AGE OF DRIVERS

AGE OF DRIVERS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Under 15 Years	0		0		1		8		12		17		22	
16 Years	3	4	7	1	29	1	88	1	119	1	151	1	176	1
17 Years	1	1	14	3	70	3	193	3	293	3	368	3	439	3
18 - 19 Years	6	8	35	7	162	7	482	8	745	8	920	8	1061	8
20 - 24 Years	15	20	84	16	336	15	955	16	1401	15	1790	15	2109	15
25 - 34 Years	19	25	128	25	546	25	1420	23	2190	24	2762	23	3232	23
35 - 44 Years	13	17	105	21	436	20	1160	19	1780	19	2215	19	2658	19
45 - 54 Years	10	13	65	13	278	13	860	14	1336	14	1714	15	2130	15
55 - 64 Years	6	8	41	8	197	9	578	10	890	10	1136	10	1393	10
64 - 74 Years	2	3	27	5	88	4	226	4	382	4	478	4	594	4
75 and Over	1	1	4		21		49		100	1	127	1	161	1
Not Stated	0		2		11		29		55		76		113	

TABLE VIII

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS BY COST CATEGORY AND SEX OF DRIVERS

SEX OF DRIVERS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Male	63	83	432	84	1778	82	4859	80	7444	80	9343	79	11186	79
Female	13	17	79	15	392	18	1175	19	1835	20	2378	20	2857	20
Not Stated	0		1		5		14		24		33		45	

TABLE IX

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND WEATHER

WEATHER	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Clear	21	47	142	51	573	49	1613	50	2623	52	3459	54	4265	55
Cloudy	16	36	80	29	341	29	889	27	1332	26	1642	26	1974	25
Raining	5	11	32	12	151	13	433	13	652	13	776	12	887	11
Snowing	3	7	23	8	100	9	290	9	406	8	499	8	584	8
Other	0		0		8		22		31		35		39	
Not Stated	0		0		0		0		2		5		6	

TABLE X

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND LIGHT CONDITION

LIGHT CONDITION	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Daylight	18	40	141	51	688	59	2091	64	3414	68	4428	69	5422	70
Dusk/Dawn	2	4	9	3	34	3	100	3	140	3	168	3	196	3
Street Lighted	25	56	121	44	432	37	1018	31	1439	29	1753	27	2056	27
Street Not Lighted	0		7	3	19	2	37	1	50		62		74	
Lighting Not Stated	0		0		0		0		0		1		2	
Not Stated	0		0		1		2		4		5		6	

TABLE XI

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND LOCALITY

LOCALITY	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Commercial	18	40	122	44	486	45	1707	54	2833	57	3682	58	4560	60
Residential	25	56	144	52	538	50	1307	41	1942	39	2422	38	2852	37
School Playground	1	2	6	2	34	3	96	3	124	3	154	2	178	2
Open Country	1	2	5	2	11	1	26		33		41		43	
Other	0		1		5		12		14		16		21	
Not Stated	0		0		0		0		0		1		1	

TABLE XII

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND ROAD SURFACE

ROAD SURFACE	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Dry	26	58	155	56	630	54	1635	50	2588	51	3337	52	4107	53
Wet	13	29	76	27	299	25	873	27	1315	26	1601	25	1890	24
Snowy/Icy	6	13	47	17	244	21	734	23	1134	22	1463	23	1739	22
Other	0		0		1		4		7		12		13	
Not Stated	0		0		0		2		3		4		7	

TABLE XIII

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND ROAD CHARACTER

ROAD CHARACTER	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Straight	41	91	270	97	1145	98	3181	98	4949	98	6290	98	7606	98
Curve or Turn	4	9	8	3	29	2	67	2	98	2	127	2	150	2
Not Stated	0		0		0		0		0		0		1	
Level	35	78	211	76	907	77	2536	78	4011	79	5148	80	6257	81
Up or Down	10	22	67	24	262	22	697	21	1016	20	1246	19	1467	19
Hillcrest	0		0		0		0		0		2		2	
Not Stated	0		0		5		15		20		21		29	

TABLE XIV
COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND DIRECTIONAL ANALYSIS
(TWO MOTOR VEHICLE ACCIDENTS)

DIRECTIONAL ANALYSIS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Intersection														
Enter at Angle	17	38	94	34	361	31	827	25	1103	22	1266	20	1365	18
Same Direction														
Going Straight	0		2		18	2	63	2	130	3	171	3	242	3
One Turning	0		13	5	47	4	161	5	257	5	322	5	359	5
One Stopped	1	2	11	4	51	4	204	6	310	6	405	6	519	7
Others	0		0		1		10		27		44		56	
Opposite Direction														
Both Straight	0		0		6		18		27		31		37	
One Turning	1	2	17	6	68	6	163	5	196	4	213	3	231	3
Others	0		0		2		2		5		7		9	
Not Stated	0		0		0		0		0		0		1	
Non-Intersection														
Opposite Direction														
Both Moving	4	9	9	3	50	4	116	4	174	3	220	3	249	3
Same Direction														
Both Moving	1	2	9	3	56	5	240	7	465	9	656	10	852	11
One Parked	13	29	68	24	228	19	500	15	781	15	1021	16	1302	17
One Stopped	2	4	26	9	152	13	474	15	798	16	1032	16	1297	17
Parking In	0		1		2		26		38		48		61	
Parking Out	0		2		17	1	77	2	159	3	228	4	274	4
Entering Drive	0		6	2	17	1	73	2	111	2	135	2	149	2
Leaving Drive	1	2	2		32	3	133	4	228	5	332	5	399	5
Others	0		0		0		9		13		17		20	
Not Stated	0		0		0		0		1		1		1	

TABLE XIV (Continued)
COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND DIRECTIONAL ANALYSIS
(OTHER THAN TWO VEHICLES)

DIRECTIONAL ANALYSIS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Collision With:														
Train	0		2	1	4		6	1	8		10		10	
Bicycle:														
Intersection	0		0	1	0		0		1		2		8	
Non-Intersection	0		0	1	0		0		0		1		7	
Fixed Object														
Intersection	0		1		6		13		16		18		19	
Non-Intersection	0		1		7		13		23		27		39	
Other Object	0		1		0	2	6		9		11		19	
Overturned														
Intersection	0		0		1		1		1		1		1	
Non-Intersection	0		0		0		1		1		1		2	
Left Roadway														
Intersection	2	4	3	1	7		25		34		37		44	
Curve	1	2	1		5		8		11		15		17	
Non-Intersection	2	4	5	2	22	2	46	1	63	1	70	1	84	1
Other	0		2		7		24		47		66	1	73	
Not Stated	0		2		5		9		10		10		11	

TABLE XV

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND VIOLATIONS INDICATED

VIOLATIONS INDICATED	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Over Limit	2	4	4	1	8		9		10		10		13	
Excessive Speed	27	54	118	42	436	37	974	30	1203	24	1306	21	1369	18
Right of Way														
Stop Sign	5	10	29	10	111	10	285	9	386	8	452	7	495	7
Red Flasher	3	6	6	2	13	1	21		31		35		36	
R-O-W Sign	1	2	8	3	29	2	65	2	82	2	88	1	95	1
Left Turn	1	2	14	5	61	5	155	5	184	4	193	3	200	3
Leaving Alley/Drive	1	2	3	1	30	3	128	4	233	5	345	6	426	6
Others	0		11	4	59	5	155	5	203	4	222	4	238	3
Disregarded														
Stop & Go	2	4	22	8	76	7	149	5	183	4	198	3	212	3
Stop Sign	4	8	18	6	65	6	108	3	134	3	152	2	156	2
Red Flasher	0		3	1	5		10		11		11		12	
Posted Sign	0		0		0		5		8		11		13	
Improper Lane Use.	1	2	3	1	16	1	84	3	187	4	264	4	361	5
Others	0		1		2		5		7		7		12	
Improper Turns	0		4	1	44	4	160	5	277	6	382	6	459	6
One-Way Street	1	2	3	1	4		18		20		25		29	
Wrong Side	0		1		22	2	44	1	65	1	81	1	96	1
Followed Too Close	0		13	5	68	6	337	11	671	14	910	15	1122	15
Improper Passing	0		0		12	1	36	1	70	1	93	1	115	2
Fail to Signal	0		0		2		9		16		23		26	
Improper Starting	0		3	1	18	2	87	3	182	4	265	4	343	5
Other Violations	2	4	15	5	88	8	381	12	803	16	1198	19	1647	22

TABLE XVI

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS BY COST CATEGORY AND DRINKING BY DRIVERS

DRINKING BY DRIVERS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Drinking	15	20	69	13	212	10	379	6	477	5	535	5	600	4
Not Drinking	60	79	438	86	1943	89	5622	93	8747	94	11090	94	13320	95
Not Stated	1	1	5		20		47		79		119	1	158	1

TABLE XVII

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND CONDITION OF DRINKING DRIVERS

CONDITION OF DRINKING DRIVERS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Drunk	4	27	15	22	32	15	65	17	77	16	85	16	95	16
Impaired	2	13	15	22	40	19	59	16	72	15	77	14	85	14
Not Impaired	8	53	34	49	121	57	210	55	258	54	288	54	323	54
Not Known	1	7	5	7	19	9	45	12	70	15	85	16	97	16

TABLE XVIII

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND VEHICLE CONDITION

VEHICLE CONDITION	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Defective	3	4	9	2	60	3	132	2	177	2	207	2	230	2
Not Defective	55	72	392	77	1700	78	4907	81	7764	83	9976	85	12076	86
Not Stated	18	24	111	22	415	19	1009	17	1362	15	1561	13	1772	13
Type of Defect														
Lights	3	100	5	56	16	27	28	21	35	20	38	18	39	17
Brakes	0		3	33	36	60	89	67	122	69	144	70	160	70
Other	0		1	11	8	13	15	11	20	11	25	12	31	13

TABLE XIX

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND TRAFFIC CONTROLS

TRAFFIC CONTROLS	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
With Control	18	40	124	45	501	43	1243	38	1782	35	2156	34	2535	33
No Control	27	60	154	55	673	57	2005	62	3263	65	4259	66	5219	67
Type														
Railroad Sign	0		1		5	1	16	1	25	1	27	1	36	1
Officer/Watchman	0		1		2		4		8		10		12	
Stop & Go Lights	6	33	54	44	246	49	636	51	917	51	1121	52	1331	52
Stop Sign/Signal	10	56	58	47	206	41	498	40	716	40	868	40	1007	40
Warning Signs	1	6	3	2	16	3	29	2	34	2	39	2	43	2
Other Signs	0		0		1		2		3		4		7	
One-Way Street	0		0		0		0		1		1		1	
Lane Markings	0		0		0		0		4		6		8	
Right-of-Way Signs	1	6	7	6	25	5	58	5	74	4	80	4	90	4

TABLE XX

COMPARATIVE DISTRIBUTION OF TRAFFIC ACCIDENTS
BY COST CATEGORY AND SPEED OF VEHICLES

SPEED OF VEHICLES	$1000.+		$ 501.+		$ 251.+		$ 101.+		$ 51.+		$ 26.+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Stopped	6	8	72	14	334	15	1006	17	1583	17	2068	18	2555	18
1 - 10 MPH	9	12	66	13	380	17	1420	23	2612	28	3713	32	4809	34
11 - 20 MPH	20	27	112	22	568	26	1700	28	2596	28	3115	27	3538	25
21 - 30 MPH	22	29	202	39	743	34	1648	27	2143	23	2420	21	2664	19
31 - 35 MPH	8	11	26	5	67	3	108	2	121	1	136	1	145	1
36 - 40 MPH	5	7	14	3	25	1	37		42		45		49	
41 - 50 MPH	3	4	9	2	17		27		31		33		35	
51 - 60 MPH	0		0		2		2		4		4		7	
61 - 70 MPH	1	1	1		1		1		2		2		2	
71 - 80 MPH	0		0		0		0		0		0		0	
Over 80 MPH	0		0		0		0		0		0		0	
Not Stated	2	3	10	2	38	2	99	2	169	2	218	2	284	2

TABLE XXI
SUMMARY TABLE
EFFECT OF TRAFFIC ACCIDENT COST CATEGORIES
UPON ANALYSIS OF ACCIDENT FACTORS

Accident Factor	$ 26.+	$ 51.+	$101.+	$251.+	$501.+	$1,000.+
Day of Week	1%	1%	2%	3%	7%	14%
Hour of Day	1	1	1	3	5	14
Police District	1	2	3	6	8	18
Type of Vehicle	1	2	4	4	5	4
Residence of Drivers	1	1	1	1	2	4
Type of Driver's License	0	0	1	1	2	3
Age	0	1	1	2	2	5
Sex	0	1	1	3	5	4
Weather	1	2	5	6	4	11
Light Condition	1	2	6	11	19	29
Locality	2	3	6	15	16	19
Road Surface	1	2	3	4	6	10
Road Character	1	2	3	4	5	3
Directional Analysis	2	4	7	13	16	20
Violation Indicated	3	6	12	19	24	36
Drinking by Drivers	1	1	2	6	9	16
Condition of Drinking Driver	1	1	4	7	9	11
Vehicle Condition	1	3	5	8	9	14

TABLE XXI (Continued)
SUMMARY TABLE
EFFECT OF TRAFFIC ACCIDENT COST CATEGORIES
UPON ANALYSIS OF ACCIDENT FACTORS

Accident Factor	$ 26.+	$ 51.+	$101.+	$251.+	$501.+	$1,000.+
Type of Defect	1	3	4	10	39	83
Traffic Controls	1	2	5	10	12	7
Traffic Controls (Type)	0	1	1	3	8	19
Speed of Vehicles	2	6	11	17	21	22

This table shows the relationship of traffic accident costs to the degree of representativeness of accident factors for each of seven cost categories. The figures shown in each column indicate the percertage differences of representativeness to all lower cost categories. For example, a 3% figure in the fourth column means that this figure is within 3% of being totally representative of all accidents in all lower cost categories. The lower the percentage, the higher the degree of representativeness.

III. SUMMARY OBSERVATIONS

Although the data contained in the preceding tables was developed for the primary purpose of supporting a hypothesis or establishing a null hypothesis, the information shows interesting areas for possible additional study. The relationship of accident costs to involvement by age and sex of drivers, by violations involved, condition of drinking drivers, and by type of vehicle defect, are just a few.

Generally, there seems to be a fairly high level of representativeness in most accident factors at a property damage cost level of $250.00. It would appear, therefore, that a traffic accident severity cut-off point, in terms of cost of property damage, could be established at this level. This is not an arbitrary determination. It is made on the basis of two facts: (1) moving downward to the next lowest cost category ($101.00) would generally result in only a slight improvement in the degree of representativeness, but (2) doing so would make a considerable difference in the numbers of accidents which would have to be investigated at that lower level.

Property damage accidents reported by the Grand Rapids Police Department are distributed as follows:

COST	PER CENT OF TOTAL ACCIDENTS
$ 26 and above	82.7%
51 and above	65.0%
101 and above	41.8%
251 and above	15.1%
501 and above	3.5%
1,000 and above	.6%

Accordingly, if the suggested accident cost severity cut-off point were used in the Grand Rapids Police Department, this would mean that only 15% of all property damage accidents would have to be thoroughly investigated and the information thoroughly processed to accomplish the objectives of the cut-off point as stated earlier.

The accident reporting ratio of the Grand Rapids Police Department indicates that they take reports on property damage accidents in relatively greater numbers than is the case in many police departments. This would mean that a traffic accident property damage severity cut-off point of $250.00, if used by other departments, might result in a somewhat higher percentage of accidents to be thoroughly investigated than is shown for Grand Rapids.

A quick perusal down the column of percentages under

the $251.00 cost level in the Summary Table will show that there are only a few accident factors which are not within 10% in their degree of representativeness. For the most part, these include speed, and the factors related to speed, as discussed earlier.

There are one or two other items which border on the fringe area of being representative. However, it should be remembered that the objective is to find a cost level which is generally representative--and the one suggested appears to be so. Further, data on those items which show a lower rate of representativeness would still be obtained and summarized in the normal collection and processing activities. To iterate, the severity cut-off point, as established, is to serve as a guide, investigating the types of accidents that should be investigated and processed in depth. And, it is worthy of repeating and emphasizing here; the severity cut-off point is not intended to serve as a guide in determining which accidents will be reported and which will not. For the many reasons cited earlier, at least basic information is needed on virtually all traffic accidents.

Implications of the severity cut-off point. The traffic accident severity cut-off point could serve to

meet two basic and somewhat related needs: (1) it could result in improvements in both the quantity and quality of traffic accident reporting, investigation and accident data processing, and (2) it would help the police administrator in resolving the conflict between the increasing demands made by the many users of accident information and his ability to provide the manpower to collect and process it.

In practical terms, this means that an officer, after estimating property damage costs of a traffic accident, would know whether this is one that is to be thoroughly investigated, or one on which only the information in the basic accident report is to be obtained. If it is one which is to be investigated (as contrasted to one which would be reported), he would, using supplementary forms, obtain detailed information on such things as surface marks left by vehicles, vehicle equipment defects, trip plan, condition of drivers, provide accident reconstruction summaries--in short, provide more answers to the question of "why" the accident occurred. (Information of this type would also be obtained for all fatal and certain classes of personal injury accidents, and for property damage accidents below the "severity cut-off point" as

special circumstances might warrant--the collection of evidence to support a conviction for a traffic violation, for example.)

The information thus obtained would be more thoroughly processed, cross-correlations made between certain accident factors, and special studies conducted.

By eliminating the collection of superflous information on property damage accidents below the severity cut-off point, time thus saved could be spent in the important work of traffic law enforcement, "on the street."

Traffic records report forms and systems of records analysis could also benefit through the application of the severity cut-off point. After a trial period, using the severity cut-off point, it may be found that certain accident factors contained in the basic report could be eliminated--or at least excluded from the costly and time-consuming processes of tallying, code-punching, summarizing, and analyzing. Time saved in this activity might more productively be spent in running special studies for accident prevention purposes.

Additional studies needed. This study represents the first known attempt to measure the effect of various

traffic accident cost categories upon the analysis of traffic accident information. There may be better ways of reaching the objectives stated above. And, the hypothesis of this study certainly needs to be tested in practical application.

One basic assumption made in this study is that officers' estimates of property damage costs are fairly accurate. Even though spot checks indicate they are, additional studies should be conducted to ascertain if this is truly the case.

Early in this Chapter, it was noted that the number of accidents in the property damage cost category of $1,000 and above is small and, because of this, the tabulations of frequency of involvement for certain factors may not be reliable. Even though the severity cut-off point established in this thesis is considerably below that level, additional studies should be made in which a larger number of traffic accidents is included in that cost category.

It would be beneficial, in fact, to repeat this study, using larger numbers in each category, to allow for even greater reliability in the tabulations of each accident factor. Further, the accident experience reported in this study is almost exclusively urban in

character. A study similar to this, but using state-wide experience, should be undertaken to see what changes might be reflected in the degree of representativeness at various cost levels, and also to determine the feasibility of applying the recommended severity cut-off point to a state-wide accident records system.

CHAPTER VI

SUMMARY AND CONCLUSIONS

I. SUMMARY

Traffic accident information is an essential beginning point for all accident prevention activities. It is from accident information that new laws are developed to keep pace with ever-changing needs; that enforcement is directed more effectively to errant driving behavior; that the right kind of engineering improvements are applied where they will do most good; that greater specificity and sophistication is possible in public information and public safety education activities. The facts about traffic accidents lend intelligent direction to the attack against one of this nation's most serious social problems.

Demands for more and better traffic accident information is accelerating at a rate with which police agencies, the usual collectors and processers of traffic accident information, cannot keep pace.

Lacking specific policies and guidelines, many agencies are collecting and processing accident information

which, in many instances, is superflous. This is done at the expense of obtaining and making available more "in-depth" accident information which is needed for many types of special studies.

One noted traffic records authority has suggested that an important first step in meeting this growing problem would be that of establishing a traffic accident severity cut-off point. Assuming that the information obtained on accidents at and above the severity point, once established, was reasonably representative of that of all accidents, these could be thoroughly investigated and the information obtained thoroughly processed and used for special studies. This authority recommends that damage to a vehicle, to the extent that it cannot be driven in the usual manner, be used as the criterion for the severity cut-off point.

As an alternative, the writer suggests that vehicle damage, in terms of dollar cost, might be an equally effective cut-off point. This is essentially the hypothesis of this study and, to validate this or establish a null hypothesis, data obtained on 7,756 property damage accidents reported by the Grand Rapids Police Department was used. The information provided by this department in some 200 separate schedules was subdivided by seven categories

of cost and by specific "accident factor"--that is, information relating to time, location, violations involved, road condition, speed of vehicles, and the like.

The data in the schedules was subjected to various computations, the final result being a series of 20 tables which show the comparative distributions of traffic accidents by cost category and specific accident factor.

Examination of the tables reveals that there is a fairly high degree of representativeness in most accident factors at a property damage dollar cost level of $250.00. It would appear, therefore, that a traffic accident severity cut-off point, in terms of dollar cost of property damage, could be established at this level.

In practical application, this means that an officer, after estimating property damage costs of a traffic accident, would know whether this is one that is to be thoroughly investigated or one on which only the information in the basic accident report would be obtained. The information obtained on accidents above the severity cut-off point would be thoroughly processed, cross-correlations made between certain accident factors, and special studies conducted.

The severity cut-off point is not intended to serve

as a guide in determining which accidents will be reported and which will not. At least basic information is needed on virtually all traffic accidents for many purposes other than establishing traffic accident trends.

II. NEED FOR FURTHER STUDY

One basic assumption made in this study is that a police officer's estimates of property damage costs are fairly accurate. Even though spot checks indicate they are, additional studies should be conducted to ascertain just how true this is.

It would be beneficial to repeat this study, using larger numbers of traffic accidents in each cost category, to allow for even greater reliability in the tabulations of each accident factor. And, because the accident experience reported in this study is almost exclusively urban in character, a study similar to this, but using state-wide experience, should be undertaken to see what changes, if any, might be reflected in the degree of representativeness at various cost levels.

This study represents but one step toward finding a solution to the difficulties which police agencies are currently experiencing in meeting the demands of the users of traffic accident information. Other techniques have

been suggested and still other tried. A good deal of additional study and research is needed to resolve this problem. The importance of good traffic accident records information to traffic accident prevention cannot be over-estimated.

III. CONCLUSION

The data and information obtained and discussed in this study supports the key hypothesis; it is possible to establish a traffic accident severity cut-off point, expressed in terms of dollar cost of property damage; with the summarized information obtained on accidents above this point remaining consistent with summarized information on all accidents.

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