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A STUDY OF SELECTED FACTORS RELATED
TO SNOWMOBILE TRAFFIC ACCIDENTS
IN THE STATE OF MICHIGAN

By

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ABSTRACT

A STUDY OF SELECTED FACTORS RELATED TO SNOWMOBILE TRAFFIC ACCIDENTS IN THE STATE OF MICHIGAN

By

Alfred S. King

The snowmobile has become a major part of the winter recreational lives for many Americans. The tremendous sales records also seem to substantiate the fact that it is here to stay. Along with the influx of these vehicles came the increased involvement of snowmobiles with other vehicles on our streets, rural roads, and highways. This involvement has brought about a disproportionate number of traffic accidents and injuries to snowmobile drivers and passengers during the seasonal months.

This descriptive study was designed to show specific factors that were most prominent in snowmobile traffic accidents throughout the State of Michigan during the 1969-70 season. With information gathered from traffic accident reports, driving records, and personal interviews, recommendations were made for: (a) the modification of the Michigan State UD-10 accident report

form in order to improve reporting of snowmobile accidents, (b) the educational needs of snowmobilers, (c) improving upon the snowmobile accident injury ratio, and (d) the reduction in the number of snowmobile accidents.

Design and Methodology

The population selected for the study consisted of all traffic oriented accidents which involved snowmobiles during the 1969-70 season in the State of Michigan. These were accidents which occurred on a public street or highway or on the right-of-way of these roads.

A total of 227 accidents, which included 239 drivers and snowmobiles, was found in the Michigan State Police files to make up the population for the study. The variables used were consistent with the information required for describing accidents on the Michigan State UD-10 accident report form. Driver records were secured and analyzed, and personal interviews were conducted with 23 drivers according to a driver profile questionnaire which was developed for the study. The study was reported in four major categories:

1. Snowmobile Registration
2. Non-fatal Accidents
3. Personal Interviews
4. Fatal Accidents

Major Findings

The most significant findings of the study are as follows:

1. Snowmobile registrations in Michigan soared to a total of 130,230 by June of 1970--almost an 86 per cent increase over 1969 registrations. This figure does not include many who failed to register their vehicle or are not required by law to do so.
2. Snowmobile non-fatal accidents reached a peak in the month of January when 30 per cent occurred.
3. Approximately one-fourth of the drivers had accidents while driving in a county other than the one of their residence.
4. The weekend days accounted for 77.09 per cent of all snowmobile accidents.
5. The time period of 4:01 p.m. through 12:00 p.m. was responsible for 55.06 per cent of the accidents reported.
6. Single-vehicle accidents accounted for 115 of the snowmobile accidents, and 112 involved another motor vehicle (including 12 other snowmobiles).
7. The average age of all snowmobile drivers involved in accidents was 27.69 years of age.

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The youngest was nine years old, the oldest 63. However, 18.41 per cent of the drivers were under 16 years of age.

8. Seventy per cent of all drivers received injuries as a result of their accident, and 42.29 per cent of these were serious.
9. Snowmobile drivers violated a traffic law in 57.28 per cent of the accidents.
10. An alcoholic beverage had been consumed by 21.76 per cent of the snowmobile drivers prior to their accidents.
11. Only 42.26 per cent of the drivers had clear driving records.
12. The major cause for the accidents was "driver carelessness" according to 34.78 per cent of the drivers personally interviewed.
13. One-half of the fatal accidents occurred on weekend days.
14. Ten of the twelve fatal accidents occurred in the time period 4:01 p.m. through 12:00 p.m.
15. Male drivers were involved in all reported fatal accidents and had an average age of 35.33 years of age. The youngest was 15 years of age, the oldest (2 of them) were 56 years old.

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16. One-half of the fatal accidents occurred when the driver attempted to cross a public road or enter a road from a driveway.
17. A most significant finding was revealed from the obtainable driving records of those operators involved in fatal accidents. Three of the seven drivers had extensive poor driving records.

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CHAPTER I

THE PROBLEM

The snowmobile has been unobtrusively on the American and Canadian scene since 1927.¹ That was the year Carl Eliason of Sagner, Wisconsin patented his first "motor toboggan" and Joseph Armand Bombardier of Valcourt, Quebec completed his version of the snowmobile, a propellor-driven sled.² Then came the snowmobile boom in the 1960's. Today Bombardier, Ltd. is one of the largest and best-known snowmobile builders. The number of manufacturers has now increased to approximately sixty United States and foreign producers.³ The 1969 sales in the United States numbered 285,000 units. The International Snowmobile Industry Association, the manufacturers organization, forecasts sales of 350,000 units for 1970, which amounts to a 23 per cent increase over the number sold during the 1969 season, and indicates that actual sales may come closer to the

¹Frank Donatien, "Snow Cruising," Travel, January, 1966, p. 40.

²"Snurfers, Skibobs and Snowmobiles," Changing Times, November, 1968, p. 14.

³Robert L. Horney, "Snowmobility," Parks and Recreation, October, 1969, p. 29.

half-million mark.⁴ These new units will add to the total of more than one million vehicles now estimated to be in use throughout the United States and Canada.⁵

Sales potential and the competitive market have now brought on tremendous increases in horse-power comparative to that between automobile manufacturers. When the first mass-produced snowmobiles made their appearance eleven years ago, a seven horse-power motor produced speeds up to thirty miles-per-hour. However, horse-power now ranges from ten to eighty and the speed record stands at 114.5 miles-per-hour. (An experimental model has gone 170 mph over a short course and the designer says the machine is capable of much more.)⁶ Cruising speed for the ordinary snowmobile fell into the twenty to thirty mile-per-hour range in the mid-sixties, but is now advertised to be fifty miles-per-hour.⁷

In five years snowmobiling has become the fastest growing winter sport in North America and a four-hundred million dollar industry.⁸ It has also brought about legislative concern as law enforcement agencies, irate

⁴Patrick J. Snook, "1969 Snowmobile Buyer's Guide," Field and Stream, October, 1969, p. 68.

⁵News item, New York Times, February 12, 1970.

⁶Jack Olsen, "Bad Show out in the Cold Snow," Sports Illustrated, March 16, 1970, p. 30.

⁷"A Red-Hot Winter for Snowmobiles," Business Week, January 10, 1970, p. 34.

⁸Ibid.

homeowners, nature lovers, timber companies, ecologists, and safety experts denounce the vehicles hedge-chopping, noise-making, and accident-prone tendencies.⁹

The average owner is young, married, and makes under 10,000 dollars per year.¹⁰ The price range is from 400 dollars for mini-scooters to 2,000 dollars and more for some deluxe models. The average price is about 900 dollars.¹¹ These figures point to the vast market and availability that has brought on the tremendous increase in numbers.

There is no question that the snowmobile gives solid evidence that it is here to stay as it presents another means for the average American to make use of his ever-increasing income and leisure time.¹² The growth of snowmobile clubs is phenomenal with approximately 1,500 in existence and reaching 112,500 members.¹³ There is a growing number of publications and a national organization (United States Snowmobile Association). The Association has a membership of over 10,000 members and is an

⁹Ibid.

¹⁰Ibid.

¹¹Herbert Shuldiner, "Get Ready for Your Winter Fun!" Popular Science, October, 1969, p. 122.

¹²"New Look of the North," Motor Boating, January, 1969, p. 265.

¹³Michael R. Hoffman, "Letter from the Publisher," Sno-mobile Times, October, 1970, p. 1.

officially chartered, nonprofit corporation devoted to the promotion of recreation and competitive snowmobiling.¹⁴

Although ninety per cent of the snowmobiles sold are for recreational purposes,¹⁵ racing is a growing spectacle that attracts many people each year. During the 1969-70 racing season attendance increases of up to 100 per cent were reported to the United States Snowmobile Association for annual events sponsored by various local clubs. The Association reported an attendance total of 650,000 for their 90-plus sanctioned events and conservatively estimate that the coming season will break the three-quarter million mark.¹⁶ The Ironwood, Michigan "Olympic Snowmobile Derby" drew a thousand contestants and 20,000 spectators in 1969.¹⁷ The Bangor, Maine Jaycees Paul Bunyan Championship of 1970 drew over 16,000 people for a five-hour program in ten-degree weather. This figure was the largest one-day attendance for any sporting event in the State of Maine during the previous year.¹⁸

¹⁴Horney, op. cit., p. 32.

¹⁵"Snurfers, Skibobs and Snowmobiles," op. cit., p. 14.

¹⁶Jerry Hoffman, "Snowmobile Racing Ushers in Era of Resplendency," Sno-mobile Times, October, 1970, p. 21.

¹⁷H. V. Bloomfield, "Snowmobiles: Boom or Bane?" American Forests, May, 1969, p. 50.

¹⁸Bud Leavitt, "Planning Snow Sled Expedition? . . . Maine Offers Ultimate," Snow-mobile Times, October, 1970, p. 37.

Snowmobile vehicle manufacturers are not the only ones capitalizing on their tremendous sales escalation. Equally excited are a number of companies that are now finding profits in accessories such as clothing, trailers, sled gloves, goggles, helmets, boots, and other extras that snowmobilers request.

Winter camping is another boon of the snowmobile craze, and some states are catering to their constituents by providing many new park facilities designed especially for snowmobiles. Sixty of Michigan's eighty-three counties now have special camping and recreational accommodations and plan a twenty per cent increase for the 1970-71 season. Michigan provides trails that run from forty to sixty miles one way between counties to eighty-mile trails through national and state forests. Also provided in these forests are general-use areas of 300 to 400 acres. One Michigan commercial firm plans to develop seven campgrounds around the state that will provide more than 5000 campsites and hundreds of acres of snowmobile terrain.¹⁹

The evidence of tremendous activity in the business world produced by the snowmobile leaves no doubt that this vehicle is here to stay and must be reckoned with for the safety of drivers, wildlife, and for the preservation of the environment in which it travels.

¹⁹Mike Wendland, "Winter Camping--an Arrival in Michigan," Sno-mobile Times, October, 1970, p. 54.

Michigan residents are among the most enthusiastic customers in the United States, according to the registration figures listed by the Sno-mobile Times magazine. It was noted that 69,251 snowmobiles were registered by Michigan residents during the 1968-69 season. This placed the State barely second to Minnesota in national state registrations which registered over 70,000 vehicles.²⁰ However, the latest statistics show Michigan has now registered 130,230 snowmobiles²¹ to top Minnesota, which now totals 114,950 registrations.²²

Snowmobile accidents in Michigan have increased considerably, and in alarming numbers, as the vehicles become more numerous. The 1968-69 season produced 573 reported accidents.²³ The 1969-70 season recorded 1,190 reported accidents.²⁴ However, the most startling statistic is the ratio of injuries to accidents. There were 562 injuries, including 12 fatalities, among the 573

²⁰"United States and Canada Snowmobile Regulations," Sno-mobile Times, November, 1969, p. 30.

²¹Michigan, Department of State, Michigan's Snowmobile Registration: 1969-70 (Lansing, Michigan: 1970).

²²"Across the Continent--Registration and Legislation," Sno-mobile Times, October, 1970, p. 8.

²³Michigan State Police, Report on Snowmobile Accidents, 1968-1969 Winter Season (Lansing, Michigan: August, 1969).

²⁴Michigan State Police, Report on Snowmobile Accidents, 1969-1970 Fiscal Year (Lansing, Michigan: August, 1970).

reported accidents in 1968-69²⁵ and 1,068 injuries, including 17 fatalities, reported among the 1,190 reported accidents during the 1969-70 season.²⁶

It is obvious through this review that involvement of snowmobiles in our nation, and particularly in the State of Michigan, is no passing fancy to be dealt with lightly. There must be immediate action taken to improve the safety for all persons involved in snowmobiling. This study is to be directed toward bringing forth information that will facilitate such action.

Statement of the Problem

The dramatic increase in the number of snowmobiles has brought with it many complications--particularly those pertaining to safe operation. Traffic accidents involving snowmobiles and the resulting injuries have increased by alarming numbers. It is anticipated that through this study much can be learned that will help to alleviate this growing problem.

Purpose of the Study

The purpose of this study was to find specific factors that were most prominent in snowmobile traffic accidents throughout the State of Michigan during the 1969-70 season. With information gathered from traffic

²⁵Michigan State Police (1969), loc. cit.

²⁶Michigan State Police (1970), loc. cit.

accident reports, driving records, and personal interviews, recommendations were made for: (a) the modification of the Michigan State UD-10 accident report form (Appendix A) in order to improve reporting of snowmobile accidents; (b) the educational needs of snowmobile drivers; (c) improving upon the snowmobile accident injury ratio; and (d) the reduction in the number of snowmobile accidents.

Assumptions

1. It was assumed that all information collected from the Michigan State Police accident report form (UD-10) is factual and objective.
2. It was assumed that the data collected from the driver record files of the Michigan Secretary of State was up to date and accurate.
3. It was assumed that data collected through personal interviews are true and accurate to the best knowledge of the person answering the questionnaire.

Importance of the Study

To this point in time there have been no studies in the State of Michigan concerning factors involved in snowmobile accidents. The only known relative studies that have been made elsewhere were in Canada, the State of New York and by the National Safety Council. All of these studies are admittedly limited in scope.

Delimitations

This study is intended to provide information derived from snowmobile accidents labeled "traffic" by

by the Michigan State Police. These accidents are those which occurred on a public street or highway, or on the right-of-way of a public street or highway. Non-traffic accidents--those which occurred beyond the right-of-way of a public street or highway--are not included as a part of the study because of the possibility of confusing the data about the two when making interpretations. Non-traffic snowmobile accidents should be the subject for a separate study.

It is recognized that this report will represent only a part of the overall snowmobile problem. Other specific problem areas such as destruction of flora and wildlife, noise level irritation, ecological concerns, etc., are acknowledged as being important but are not the subject of the study.

Definition of Terms

Accident Report

All motor vehicle accidents which occur in the State of Michigan must be recorded on the standard UD-10 accident report form. This same form was used to report the snowmobile accidents that are described in this study.

Driving Record

The driving records analyzed were the official records on file with the office of the Secretary of State Records Section. This information includes all accidents,

violations, and penalties that have been officially recorded for each driver.

Factors

Factors is used throughout the study when referring to those things which are suspect as contributors to the cause of snowmobile accidents.

Injuries

The injuries referred to in this study are only those which were the result of a snowmobile traffic accident.

Non-traffic Accident

This kind of accident involved a snowmobile and occurred beyond the right-of-way of a road. They are not included as a part of this study.

Post

In order to post, a snowmobile driver assumes a body position similar to that of a jockey riding a race horse.

Registration

All snowmobiles in the State of Michigan must comply with the 1968 Snowmobile Registration Law by being registered with the office of the Secretary of State.

Road or Roadway

These terms are used for reference to that portion of a highway which is improved, designed, or ordinarily used for vehicular travel, exclusive of the berm or shoulder.²⁷

Snowmobile

A snowmobile is a motor-driven snow sled.

Snowmobile Season or Season

The snowmobile season in the State of Michigan is the same as the fiscal year (July 1 through June 30).

Traffic Accident or Accident

These terms are interchangeably used to mean any accident involving a snowmobile on a roadway or shoulder of a roadway that resulted in death, injury, or property damage.²⁸

Organization of the Study

In Chapter II relevant literature is reviewed. It is recognized that the studies examined are limited in scope since small numbers of accidents make up the Universe. However, these are the only studies that have been completed pertaining to this area of interest.

²⁷J. Stannard Baker and William R. Stebbins, Jr., Dictionary of Highway Traffic (Evanston, Illinois: Traffic Institute, Northwestern University, 1964), p. 196.

²⁸Ibid., p. 241.

Chapter III contains the design of the study and the methodology involved in the gathering of data for presentation. The Universe is described as well as the sample used for personal interviews.

In Chapter IV data gathered from the Michigan accident report form, personal interviews, and driving records are tabulated in table and graphic form to depict particular relationships and accident facts.

The summary, conclusions, discussion, and recommendations are presented in Chapter V.

CHAPTER II

REVIEW IN RELATED LITERATURE

The decision to make this descriptive study depicting the involvement of snowmobiles in traffic accidents was made because there was very little known information concerning this growing problem. There was strong evidence that studies were needed, or just statistical reports compiled reflecting the numbers and kinds of snowmobile accidents. This was partially revealed through informal inquiries with insurance company representatives. Some insurance companies have noted a marked increase in claims resulting from snowmobile accidents. It was implied that many of these accidents were not investigated by, or reported to, law enforcement agencies.

Written evidence that accidents and injuries were becoming a problem with snowmobilers was indicated by the sudden influx of safety guides in the late 1960's. Two of the most prominent guides were written for and distributed by the International Snowmobile Manufacturers Association¹ and the National Safety Council.²

¹International Snowmobile Industry Association, Snowmobile Safety Handbook (Washington, D.C.: International Snowmobile Industry Association, 1968).

²Paul M. Prince, Snowmobiles, Safety Education Data Sheet No. 100 (Chicago: National Safety Council).

Another indication that the accident and injury lists of snowmobilers were growing too large was the experience shown by state legislatures in approving statutes to control and delineate the use of the vehicles. The four popular states for snowmobiles, Michigan, Minnesota, Wisconsin, and New York³ all have passed snowmobile laws within the past two years. New York's state legislature introduced more than 100 new bills on the subject of snowmobiles last year and passed another law.⁴ These new bills were primarily punitive in nature and favored restricting the use of snowmobiles to the owner's back yard.⁵

Michigan passed its first statute to register and regulate snowmobiles in 1968.⁶ However, this act is apparently too permissive and a revision has been made which will be presented for action by the legislature during its 1971 session.

Canada also has enacted snowmobile laws which are limited in scope, but individual provinces have begun the process of making vast revisions of these original statutes.

³"United States and Canada Snowmobile Regulations," Sno-mobile Times, November, 1969, pp. 30-31.

⁴Anne Tanner, "New York Adopts New Legislation," Sno-mobile Times, October, 1970, pp. 38-40.

⁵Ibid.

⁶Michigan, Department of State, Snowmobile Registration Act of 1968 (Lansing, Michigan: Snowmobile Registration Unit, Finance Division; Michigan Department of State, 1968).

The Province of Alberta passed their new law, "The Snow Vehicle Act," in 1969.⁷ Other provinces are now preparing bills to be presented this year.

The inappropriate snowmobile legislation passed by U.S. state legislatures and Canadian provinces seem to have been presented and accepted by inadequately informed legislators in an attempt to control a budding accident problem. The lack of information can only be blamed upon insufficient knowledge and few studies revealing the true accident problem. However, the compilation of accident statistics by law enforcement agencies and the appearance of some studies are promising to provide the basis for more appropriate future legislation.

Review of Literature

Dr. Richard W. McLay presented findings regarding snowmobile accidents in the State of Vermont during the International Snowmobile Conference at Albany, New York in 1969.⁸ McLay disclosed the results of a snowmobile accident survey which involved sixty-three case studies ranging from minor cuts and bruises to a fractured skull. The work was a study of the relationship of snowmobile

⁷C. J. Kenway, "Alberta Adopts Progressive, Far-Reaching Legislation," Sno-mobile Times, October, 1970, pp. 51-52.

⁸Richard W. McLay and Stanley Chism, "A Snowmobile Accident Study," (a report of the study given at the International Snowmobile Conference, Albany, New York, May 20-21, 1969).

operation to accidents. He involved personal interviews with the accident victims where possible.

McLay and Chism found what they described as "major hazards" in the operation of a snowmobile, through personal interviews with accident victims.

Major Hazards in the Operation
of a Snowmobile

1. Jumps
2. Lack of experience
3. Poor visibility
4. Speed
5. Alcohol
6. Barbed wire
7. Climbing over banks
8. Equipment not in repair
9. Thin ice

Noting in his accident survey that broken backs occurred when the driver or passenger failed to post upon negotiating a jump, McLay cited the experimental work carried out as a senior thesis project by Gaye and Titemore.⁹ Their experimental study hypothesized: If the magnitudes of the acceleration of the seat or of a sled being pulled could be determined, the forces felt by the driver or passenger could be estimated. Through the use

⁹J. H. Gaye and R. G. Titemore, "Acceleration of a Snowmobile Determined by High Speed Photography," (unpublished B.S. thesis, The University of Vermont, Burlington, 1969).

of a high-speed motion picture camera, the results of their work indicate that for an instant the base of the spine feels force 8.5 times the body weight on impact after a jump. They added that the actual force is probably much higher than this for a very short period of time, especially on icy snow.

The major conclusion to be drawn from their study is to avoid jumping, but if you must, make sure you post. Second, make sure you are completely familiar with the machine before jumping. Third, do not overdrive headlights. Night riding appears to be dangerous, especially on new trails or icy surfaces. Fourth, do not speed. Fifth, avoid alcohol. Sixth, make sure your equipment is in top shape before going out. Finally, remember that on thin ice the weight of your snowmobile is roughly equivalent to two extra people standing next to you.

Mortimer, et al.,¹⁰ investigated the snowmobile accident injury problem in their "Ergonomic Study of Snowmobiles" for the purpose of determining the extent of the anthropometric and human factors standpoint. In their opinion the snowmobile should be designed for maximum comfort and safety for the conditions in which it is used. Snowmobiles differ considerably in physical dimensions

¹⁰R. G. Mortimer, et al., "Ergonomic Study of Snowmobiles," a study made at the Highway Safety Research Institute, Ann Arbor, Michigan and supported, in part, by an Exploratory Research Grant from the National Safety Council, Chicago, Illinois, June 30, 1970).

that affect the operator's posture. However, a broader range of positions are necessary for operators when compared with the automobile because (1) snowmobile drivers are not restricted by licensing, (2) all controls are operated with the hands so the feet need not remain in one location, (3) body motion must be used to help maintain stability, (4) various positions such as sitting and kneeling are assumed depending upon the terrain and snow conditions, and (5) riders need to be able to extricate themselves rapidly in the event of a turnover. Mortimer found that there is no standardized design for snowmobiles that provides for all these factors and recommends that the snowmobile industry conduct a human factor's engineering analysis and incorporate the findings into snowmobile design now, rather than years later when rigidification of design would make changes more difficult.

The Mortimer study made the following specific recommendations for physical improvements to the snowmobile:

1. Windshields: A study should be conducted to determine optimal windshield structural design, dimensions, and placement. Protection should be provided for at least the 95th percentile male in the kneeling position. A sturdy, padded, steel rim around the windshield should be provided to protect riders from unseen wires, branches, and other objects.

2. Seats: The seat should be designed to absorb the necessary amount of shock so that inexperienced and uninformed riders will not be injured. Adjustable seats are desirable. A warning lable about the consequences of failing to post should be permanently attached in an easy-to-read location.
3. Footrests: The inward slant of footrests should be incorporated on all vehicles. A roll bar for leg protection should be designed. A foot rest should be provided with a six-inch minimum width for a driver and passenger.
4. Handlebars: Handlebars should be positioned so that the arms do not get in the way of the legs or vice versa. The brake and throttle levers may need to be relocated. Improved steering control on turns. Hand grips or a seat strap should be provided for the passenger.
5. Body Angles: A variety of sitting and kneeling positions should be provided for both comfort and safety.

Other improvements to the snowmobile seem appropriate in order to reduce accidents on highways. The Traffic Safety magazine article, "What Happens When the Snowmobile Meets the Highway,"¹¹ reports that when the snowmobile, with its high noise level and low silhouette, crosses the path of highway traffic the results can be a fatal accident. (Eight such fatalities were reported nationally during the 1968-69 winter.) It seems that the

¹¹"What Happens When the Snowmobile Meets the Highway?" Traffic Safety, February, 1970, pp. 14-15.

reduction of the noise level should not be difficult. However, increasing the height of the silhouette may be more perplexing. An increase in the height could make the vehicle too cumbersome to feasibly use in wooded or other areas where operating space is restricted.

Physical improvements to the vehicle can be of great help in making snowmobiles more safe to operate and could be a factor in the reduction of accidents. In spite of these physical improvements, studies show that the operators are prime suspects in many accidents. Accident statistics for snowmobiles indicate a lack of good judgment on the part of many drivers. Negri's New York study points this factor out in his report on "Accidents Involving Snowmobiles."¹² Snowmobilers who drive on public roads should be extremely aware that their vehicle can stop and start much more quickly on ice or snow than automobiles. Snowmobile operators are also admonished to exercise caution when crossing public highways. Both of these general rules for safety were recommended in the New York study from information received through the investigation of ninety-three snowmobile accidents occurring in the State of New York during 1967 and 1968.

Additional recommendations indicated by Negri for increased safe control and manipulation of snowmobiles by

¹²D. B. Negri, Accidents Involving Snowmobiles--A Preliminary Review (Albany, New York: State Department of Motor Vehicles, Division of Research and Development, February, 1970).

their operators are of particular note. Young children should be skillfully guided and instructed in the use and operation of snowmobiles if they are to be permitted to drive. Also, parents should consider carefully the hazards of snowmobile operation before giving young children permission to use them.

Notable statistics found in this study revealed that of the 132 snowmobile occupants, sixty-three per cent were killed or injured. The body areas sustaining the highest frequency of injury were the legs and head. The operators ranged from ten to sixty years of age. More than half of the snowmobile accidents occurred on Saturday and Sunday. The afternoon and evening hours from three to eight p.m. accounted for fifty per cent of the accidents.

Although the Negri study included only 93 snowmobile accidents and included both traffic and non-traffic accidents, it served its purpose well in defining a growing need for greater concern to improve the safety of snowmobile operation.

The Canadian study of snowmobile accidents¹³ reported on 103 official accounts of collisions involving motorized snow vehicles on highways in Ontario from November, 1968, through March, 1969. The study came very close

¹³Ontario Department of Transport, Snowmobile Collisions on Highways and Roads in Ontario (prepared for the 1970 International Snowmobile Congress, Duluth, Minnesota by the Research Section, Ontario Department of Transport, Ontario, Canada, 1970).

to concurring with the New York report when it revealed that sixty-three per cent of all collisions occurred during the hours of darkness.

Seventy-three persons were killed or injured in the 103 reported accidents. Fifteen fatalities were recorded in fourteen snowmobile collisions with a vehicle or fixed object in the highway right-of-way. This high ratio of both fatalities and injuries to accidents seems to remain consistent in most reports on snowmobile accidents, whether they are labeled "traffic" or "non-traffic."

The involvement of alcohol is significant in this Canadian study. Twenty-seven per cent of the snow vehicle operators were described as "ability impaired" or "had been drinking." Fatal accident reports which indicated driver condition disclosed that fifty-eight per cent (7 of 12) had recorded blood alcohol content--most of them at high levels. Of these seven fatalities where alcohol concentrations were observed, four of the post-mortem blood tests revealed a blood alcohol content exceeding 0.17 per cent by weight.

Following the precedence being set in automobile accidents by young drivers, fifty-one per cent of snowmobile operators in reported collisions were twenty years of age or less. Thirteen per cent were under sixteen years of age.

Michigan Snowmobile Law

In 1968 the Michigan Legislature passed a law to register and regulate snowmobiles¹⁴ (Appendix D). The law required that snowmobiles be registered and numbered beginning in 1969. Some of the major provisions of the law are:

1. All snowmobiles must be registered except:
 - (a) If a snowmobile is used on the owner's property exclusively, or on lands under his control.
 - (b) If a snowmobile is exclusively operated in special snowmobile events of limited duration conducted according to pre-arranged schedules under permits from government units having jurisdiction.
2. Snowmobiles cannot drive upon the main traveled portion of any roadway, or on a highway or street within 10 feet of such roadway.
3. When a snowmobile is registered, it may be driven across highways when crossing is safe and does not hinder traffic. Snowmobiles must always yield the right-of-way to motor vehicles on the highway.
4. Snowmobiles cannot cross limited access highways or freeways.
5. Snowmobiles may drive on county road systems which are not maintained for motor vehicles during the winter.

¹⁴Michigan, Department of State, loc. cit.

6. Snowmobiles must have one headlight and one tail-light.
7. There are no age limits for operating snowmobiles.
8. Snowmobile accidents must be reported if they result in injury or death to any person or if there is property damage estimated at \$100 or more.
9. Dealers renting snowmobiles must carry liability insurance covering:
 - (a) \$10,000 bodily injury or death for one person in any one accident.
 - (b) \$20,000 bodily injury or death for two or more persons in any one accident.
 - (c) \$5,000 property damage.

Summary

The studies reviewed in this chapter present the basis for a concerted effort by any government wishing to stem the tide of increasing snowmobile accidents and injuries through the legislative processes.

Action in the educational field is appropriate for preparing new and present owners of snowmobiles through classroom instruction and in the art of handling their vehicles on all types of terrain according to the Mortimer¹⁵ study. Special attention should be paid to the proper

¹⁵ Mortimer, et al., loc. cit.

manipulation of jumps and the climbing of banks. Also, included in preparing operators for safe operation of their vehicles should be the awareness of particular hazards such as low-hanging tree limbs, single strands of a wire fence or chain restraints. Each of these hazards has taken their toll of snowmobile drivers. Thin ice, excessive speed, and poor visibility should also be cited as hazards to be reckoned with.

Mortimer¹⁶ also indicates that legislators could very well require the snowmobile industry to standardize particular safety equipment such as windshields, mufflers, seats, footrests, handlebars, and controls. The machine should be formed in a manner which will provide a variety of sitting and kneeling positions for both the comfort and safety of the operator. Upon providing these safety requirements, a manufacturer could then embellish their vehicles with distinguishing characteristics.

The New York¹⁷ and Ontario¹⁸ studies imply that law enforcement agencies will have to be better deployed in order to enforce laws controlling speeds, highway conflicts, and operational areas for snowmobiles. Accident investigation procedures will have to improve in order to provide more complete and accurate descriptive records and also increase the percentage of accidents reported.

¹⁶Ibid.

¹⁷Negri, loc. cit.

¹⁸Ontario, Department of Transport, loc. cit.

The Ontario¹⁹ study suggests that the problem of alcohol involvement with accidents can be expected to become more prominent in the future as it has with automobile casualties. This will undoubtedly be the most difficult of all problems to solve.

It is hoped that through this study most of the factors found to be of consequence in the studies discussed will be substantiated or dismissed as not being significant. It is also the purpose of this report to reveal any previously unreported factors that add to the snowmobile traffic accident problem.

In Chapter III the design and methodology used in the study for the purpose of gathering and analyzing data will be discussed.

¹⁹Ibid.

CHAPTER III

DESIGN AND METHODOLOGY

In this chapter a detailed explanation of the research design and the methods involved in treatment of the data is presented. The chapter includes: (1) selection of the sample; (2) selection of the sample for personal interview; (3) the nature of the variables; (4) the development of the personal interview questionnaire; (5) the procedures for collecting data, including: (a) 1969-70 snowmobile traffic accident report data, (b) driver records data, and (c) personal interview responses; (6) the treatment of data, including: (a) accident report data, (b) driver records data, and (c) personal interview data; and (7) the summary.

Selection of the Sample

The sample selected for this study consisted of all "traffic" accidents involving snowmobiles in the State of Michigan during the 1969-70 season. These accidents were labeled "traffic" by the Michigan State Police because they occurred on a public street, highway or thoroughfare, or on the right-of-way of these public roads.

"Non-traffic" accidents which occurred on trails, in fields, or other areas where snowmobiles are operated off public streets make up the remainder of accidents in Michigan during the 1969-70 snowmobile season, but are not the subject of this study.

Selection of the Sample for Personal Interviews

An arbitrary number of 23 snowmobile drivers who were involved in traffic accidents were selected for personal interviews. This number was determined to provide an approximate 10 per cent sample group. The volume of snowmobile traffic accidents in each county was used as a basis for the original selection of drivers. In order to have all areas of the State represented, geographical location was then considered. Upon identifying these geographical areas through county snowmobile traffic accident experience records, sex and age were considered for the final selection to satisfy those concerns. Two drivers were selected because of their availability as residents of the East Lansing area. It was felt that through this method a stratified, controlled, selected group could best be used to provide pertinent information regarding snowmobile drivers for use in this study. Therefore, the drivers to be interviewed were not randomly selected.

The Nature of the Variables

The descriptive variables regarding snowmobile accidents, which were selected as the basis for this study, were determined by their appearance on the standard Michigan UD-10 accident report form. Prior to this selection, a personal observation of the reports was made at the Michigan State Police accident records section in Lansing to verify their completeness. Consultation with personnel at the records section provided assurance that the reports offered the most reliable official snowmobile accident information available.

Driver records included were official data collected and compiled by the Michigan Secretary of State's office and were complete, up-to-date, and available.

Information gathered from the personal interviews was accepted as factual to the best knowledge of the driver providing the account. Since no threat is indicated to the respondent by the information asked in the personal interview, it was expected to be dependable.

The variables selected from the UD-10 accident report form in order to provide information for this study are:

Driver and Passengers (if pertinent)

Sex

Age

Driver's license

Driving experience

Involvement with alcohol

Residence

Violations

Vehicle

Mechanical defects (moving parts)

Physical defects

Use

Maneuver

Obstacle collided with

Damage

Deployment

Estimated Speed

Terrain, Weather, and Visibility Factors

Level

Obstructions

On Grade

Clear or Cloudy

Hillcrest

Rain

Wet

Snow

Dry

Straight Road

Snow or Ice

Curve

Chronology

Time of day

Day of week

Month

County of occurrence

Injuries (driver and passenger)

Fatal

Visible serious

Visible not serious

Not visible but indicated by victim

No injury

Development of the Personal
Interview Questionnaire

The Snowmobile Driver Profile Questionnaire (Appendix C) was developed in order to provide an instrument which would act as a guide for personal interviews.

The purpose of the questionnaire was to identify those characteristics which contributed substantially to the complete profile of the snowmobile drivers who have been involved in an accident.

Content areas of interest (Appendix B) were used for the grouping of specific questions. These content areas contained questions which were developed in order to determine:

Driver exposure

Driving environment

Driver experience

Educational needs

Two "open-ended" questions were developed in order to gain additional relative information concerning the vehicle condition and additional probable causal factors indicated by the driver. This information was accepted as being biased and therefore was not treated as if it were factual.

The Procedures for Collecting Data

The Michigan Snowmobile Accident Reports (UD-10)

The Safety and Traffic Division of the Michigan State Police provided access to their files containing all reported snowmobile accidents in the State of Michigan during the 1969-70 season. These accidents were recorded on the standard UD-10 accident form and filed according to the date of occurrence.

The "traffic" accident reports were separated from the "non-traffic" reports and the population drawn.

Driver Records

It was determined after consultation with Michigan State Police officials that the driver information needed for this study could be acquired from the driver record computer tapes kept in the Driver Records Section of the Michigan Department of State. Formal request was made in order to gain access to the computer information. The request was approved.

The drivers license number or birthdate for each operator was fed into the computer. The readout on the computer tape provided the following information:

1. Name of the driver
2. License identification number
3. Date of birth
4. Address
5. Date of original application for a license
6. Restrictions
7. Reportable accidents--place, date, type
8. Violation records--place, date, charge
9. Court action--place, date
10. Points charged against driver
11. Department of State License Appeal Board action
12. Suspension and revocation information
13. Re-examination information
14. Warning letter information

This same information was available for deceased drivers. However, deceased driver records are kept separately and for only a one-year period after death. A special request was made in order to obtain the records of fatally injured drivers.

Personal Interview Responses

The 23 drivers selected to be personally interviewed were contacted by phone. Identification of the researcher was made, followed by an explanation of the

project and its purposes. The respondent also was informed why he was selected to be personally contacted. All respondents agreed to answer the 21 questions in the questionnaire. The parents of the under-licensing-age drivers were asked for and gave permission for the interview with their youngster.

The Treatment of Data

Accident Report Data

A map of Michigan was used to depict the total number of 1970 snowmobile registrations throughout the State according to county. The accidents were also portrayed on the map corresponding to the number of occurrences per county.

Distribution tables were constructed to disclose the chronological accident data related to month of the year, day of the week, and time of the day. The time of day was broken into the following categories for reporting:

12:01 a.m.- 4:00 a.m.	12:01 p.m.- 4:00 p.m.
4:01 a.m.- 8:00 a.m.	4:01 p.m.- 8:00 p.m.
8:01 a.m.-12:00 a.m.	8:01 p.m.-12:00 p.m.

These time categories were selected in order to better point to times when a particular use of a snowmobile may determine the reason for movement and could reflect on the consequent accident.

Tables were constructed to show frequency, number, and percentages of the following variables as they were recorded on the accident report by the investigating officer:

Fatal and Non-fatal Accidents

Residence of Drivers
Driver Age and Sex
Vehicle Damage
Estimated Speed
Driver Injuries
Passenger Age
Passenger Injuries
Pedestrian Injuries
Weather
Light Conditions
Locality
Roadway Characteristics
Driving Maneuver
Type Road
Law Violation
Drinking Condition of Drivers
Vision Obstructions
Vehicle Defects

Driver Record Data

General discussion of the information gathered from the driving records was pursued and a circle graph

was constructed to depict the records of snowmobile drivers compiled as automobile drivers. The chart shows the numbers and percentages of drivers who fell into the following categories:

- No Accidents or Violations
- Accidents and/or Violations
- Under-Licensing-Age Drivers
- No Information Available

Personal Interview Questionnaire Data

The discussion of and reporting on the driving records of those interviewed and their sex and ages was followed by the questionnaire content area report. The content area report included the discussion of the data compiled and charts showing the number and per cent of particular responses. Questions and responses were listed according to the following areas of interest:

- Driver Exposure
- Driver Experience
- Driver Environment
- Educational Needs
- "Open-ended" Questions Regarding Vehicle Defects
and Probable Causes for the Accident According
to the Driver

Summary

It was felt that a descriptive study might reveal some common factors contributing to the cause of snowmobile

traffic accidents and provide information to base recommendations upon.

Through discussion and the use of frequency distributions and charts, the available information from accident records, driving records, personal interviews, and registration records could best be reported.

Because of the thorough use of accident records, recommendation for the modification of the Michigan UD-10 accident report form to facilitate better reporting of snowmobile accidents was made.

Presented in Chapter IV are the analysis and findings of this descriptive study.

CHAPTER IV

ANALYSIS OF THE DATA

Chapter III contained the guidelines for the design and methodology used in the study. This chapter will contain the analysis of the data collected and present it in verbal, graphic, and table form according to the aforementioned guidelines.

This study was designed to gather data about certain unique factors involved with snowmobile traffic accidents in the State of Michigan during the winter season of 1969-70.

Data from the Michigan UD-10 accident forms, the driver record computer tapes, and the personal interview questionnaires were recorded and tabulated by hand. The data were tabulated descriptively for analysis and discussion. The results of this tabulation were organized in the following manner for presentation and discussion:

1. Snowmobile Registration
2. Non-fatal Snowmobile Traffic Accidents

Number of Accidents

Residence of Drivers

Month and Day of Week Accidents Occurred

Time of the Day When Accidents Occurred

Young Drivers

Vehicle Damage

Single Snowmobile Accidents

Snowmobile-Motor Vehicle Collisions

Driver Age According to Sex

Driver Injuries

Passenger Injuries

Pedestrian Injuries

Weather at the Time of the Accident

Light Conditions at the Time of the
Accident

Locality Where Accidents Occurred

Roadway Characteristics Where Accident
Occurred

What Drivers Were Doing Before the Accident

Types of Roads and Roadways Where Accidents
Occurred

Law Violations

Drinking Condition of Drivers

Vision Obstructions

Vehicle Defects

Driver Records

3. Personal Interview Questionnaire Report

Driver Exposure

Driver Experience

Driver Environment

Educational Needs

"Open-ended" Questions

4. Fatal Accidents

Residence of Drivers

Month and Day of the Week Fatal Accidents
Occurred

Time of Day When Fatal Accidents Occurred

Young Drivers

Vehicle Damage

Driver Age and Sex

Causes of Fatal Injuries

Deployment of Snowmobiles in Fatal Accidents

Locality of Fatal Accidents

Law Violations

Weather, Surface Conditions, Visual Obstruc-
tions and Vehicle Defects Involvement
in Fatal Accidents

Fatal Accident Driver Records

Upon gaining access to the Michigan State Police files containing the reports on snowmobile accidents reported and recorded on the UD-10 accident forms for the 1969-70 winter season, 227 reports were found to make up the population of snowmobile traffic accidents involving 239 snowmobiles. Fatal snowmobile accidents were filed apart from other snowmobile accidents and an investigation of the reports revealed that 12 fatal accidents were traffic oriented. These 12 accidents were reported separately in this study.

Three drivers included in non-fatal accidents and one driver involved in a fatal accident were not Michigan residents. Data concerning the driving records of these drivers was not collected.

Analysis of the Data

Snowmobile Registration

The map below, Figure 4.1, shows the number of snowmobile registrations by county throughout the State. Table 4.1 indicates the number of registrations per county and the per cent that this number represents of total registrations in the State through June 3, 1970. It should be noted that the total number of registrations does not represent all snowmobiles operated in Michigan, since owners who operate snowmobiles on their land only or land under their control, and snowmobiles which are operated only in special snowmobile events, need not be registered by law.

Through the use of information found in Table 4.1, it was found that 15.43 per cent of all registrations were credited to the 15 counties in Michigan's upper peninsula.

Non-fatal Snowmobile Traffic Accidents

The 1969-70 Michigan snowmobile traffic accidents increased as the season peaked. Figure 4.2 reveals the increase vividly. The number of accidents began with the

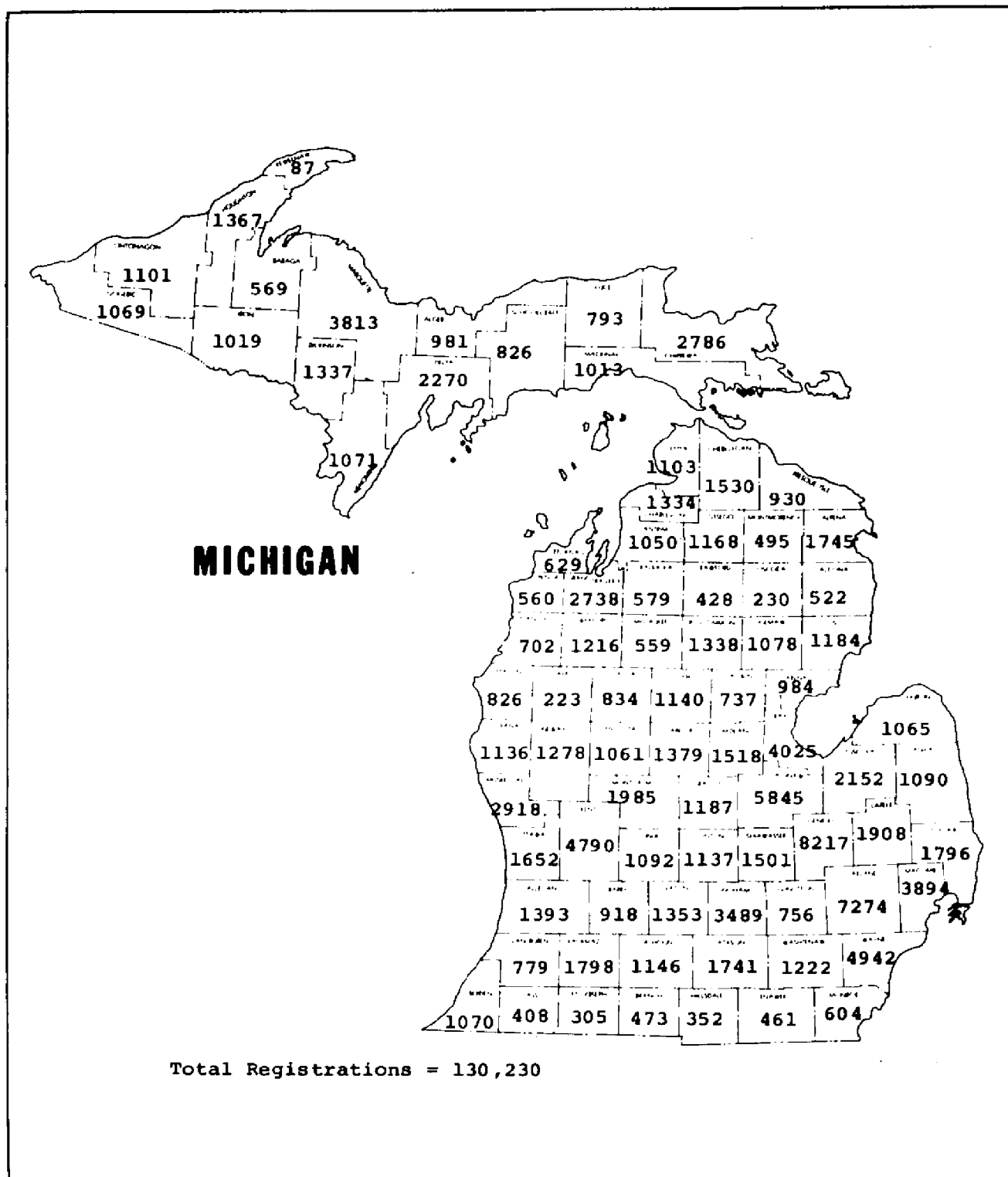


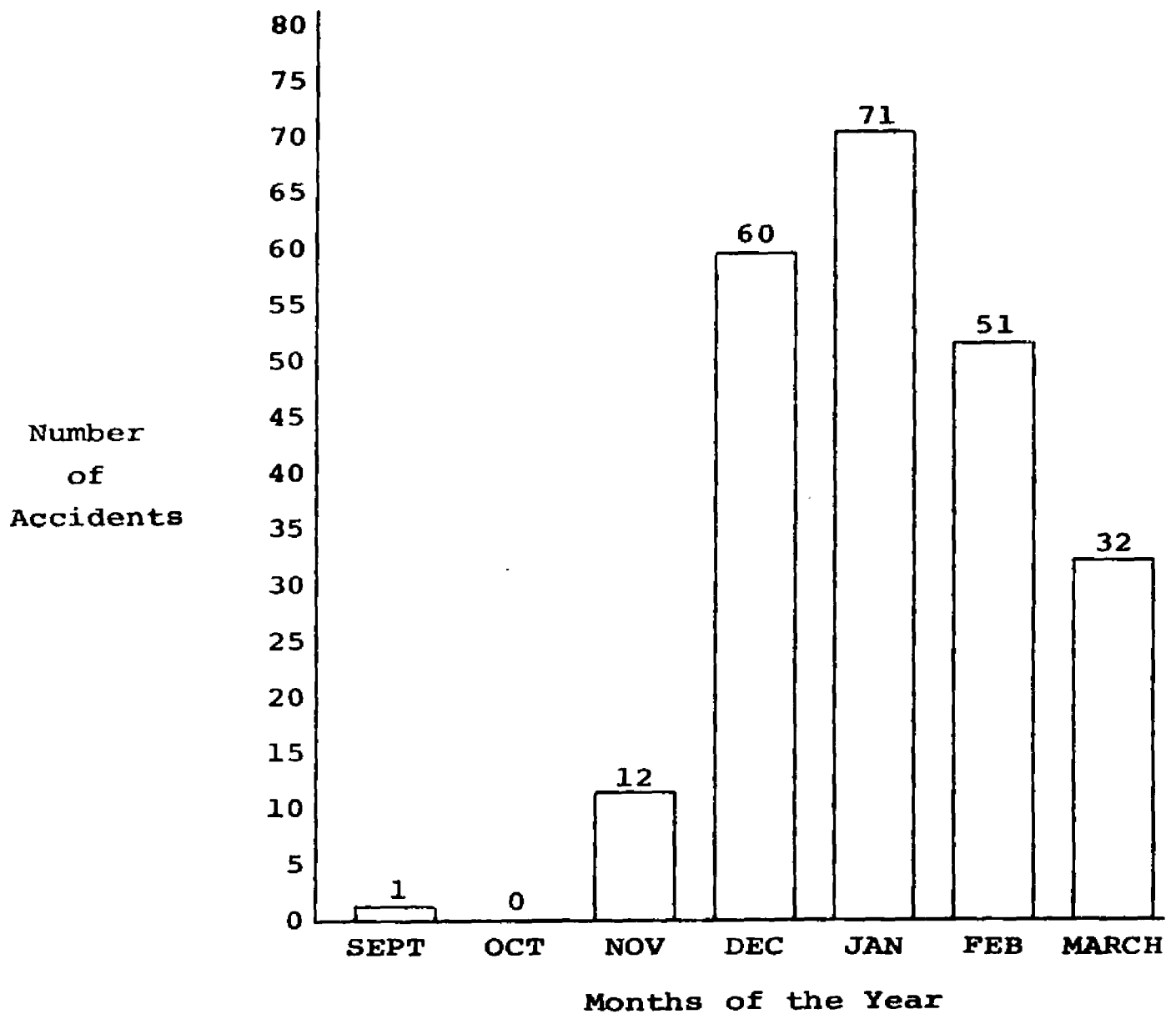
FIGURE 4.1.--1970 Michigan Snowmobile Registration by County

TABLE 4.1.--Distribution of Michigan Snowmobile Registrations by County

County	Number	Per Cent*	County	Number	Per Cent*
Alcona	522	.40	Lake	223	.17
Alger	891	.75	Lapeer	1,908	1.46
Allegan	1,393	1.06	Leelanau	629	.48
Alpena	1,745	1.33	Lenawee	461	.35
Antrim	1,050	.80	Livingston	756	.58
Arenac	984	.75	Luce	793	.60
Baraga	569	.43	Mackinac	1,013	.77
Barry	918	.70	Macomb	3,894	2.99
Bay	4,025	3.09	Manistee	702	.53
Benzie	560	.43	Marquette	3,813	2.92
Berrien	1,070	.82	Mason	826	.63
Branch	473	.36	Mecosta	1,061	.81
Calhoun	1,146	.87	Menominee	1,071	.82
Cass	408	.31	Midland	1,518	1.16
Charlevoix	1,334	1.02	Missaukee	559	.42
Cheboygan	1,530	1.17	Monroe	604	.46
Chippewa	2,786	2.13	Montcalm	1,985	1.52
Clare	1,140	.87	Montmorency	495	.38
Clinton	1,137	.87	Muskegon	2,918	2.24
Crawford	428	.32	Newaygo	1,278	.98
Delta	2,270	1.74	Oakland	7,274	5.58
Dickinson	1,337	1.02	Oceana	1,136	.87
Eaton	1,353	1.03	Ogemaw	1,078	.82
Emmet	1,103	.84	Ontonagon	1,101	.84
Genesee	8,217	6.30	Osceola	834	.64
Gladwin	737	.56	Oscoda	230	.17
Gogebic	1,069	.82	Otsego	1,168	.89
Grand			Ottawa	1,652	1.26
Traverse	2,738	2.10	Presque Isle	930	.71
Gratiot	1,187	.91	Roscommon	1,338	1.02
Hillsdale	352	.27	Saginaw	5,845	4.48
Houghton	1,367	1.04	St. Clair	1,796	1.37
Huron	1,065	.81	St. Joseph	305	.23
Ingham	3,489	2.67	Sanilac	1,909	1.46
Ionia	1,092	.83	Schoolcraft	826	.63
Iosco	1,184	.90	Shiawassee	1,501	1.15
Iron	1,019	.78	Tuscola	2,152	1.65
Isabella	1,379	1.05	Van Buren	779	.59
Jackson	1,741	1.33	Washtenaw	1,222	.93
Kalamazoo	1,798	1.38	Wayne	4,942	3.79
Kalkaska	579	.44	Wexford	1,216	.93
Kent	4,790	3.67	Foreign	337	.25
Keweenaw	87	.06			
			Total	130,230	

*Actual computed value rounded to the nearest hundredth.

Source: Reprinted from the records of the Michigan Secretary of State, Snowmobile Records Division.



Total accidents = 227

FIGURE 4.2.--Distribution of Accidents by Month

first substantial snow coverage in November and increased to the crest in January when over thirty per cent of all accidents occurred. However, the number of accidents remained high throughout the last two months of the season.

Snowmobile accidents tapered off during the month of March and abruptly stopped at the end of the month although Michigan experienced a substantial amount of snow due to storms in early April. The isolated accident, reported on September 9, 1969, was not due to early snows or the beginning of the season. That accident occurred under perfectly dry conditions and involved an automobile that had a windshield broken by a stone thrown from the track of a snowmobile.

The second map, Figure 4.3, lists the number of non-fatal snowmobile traffic accidents per county for the 1969-70 season and Table 4.2 indicates the number and per cent of the total non-fatal snowmobile traffic accidents which occurred by county. Eighteen counties reported no non-fatal snowmobile traffic accidents. However, three of these counties did report a fatal snowmobile traffic accident.

The number of upper peninsula snowmobile registrations indicates that there are more snowmobiles per capita in that area than in the lower peninsula, as expected, because of the weather conditions and open areas conducive to the operation of snowmobiles. However, information



FIGURE 4.3.--1969-70 Michigan Snowmobile Traffic Accidents*

*Excluding fatal accidents.

TABLE 4.2.--Distribution of Snowmobile Accidents by County*

County	Accidents	Per Cent**	County	Accidents	Per Cent**
Alcona	5	2.20	Lake	4	1.76
Alger	5	2.20	Lapeer	2	.88
Allegan	2	.88	Leelanau	1	.44
Alpena	8	3.52	Livingston	1	.44
Antrim	1	.44	Luce	3	1.32
Arenac	2	.88	Mackinac	6	2.64
Baraga	1	.44	Manistee	3	1.32
Bay	4	1.76	Marquette	11	4.84
Benzie	1	.44	Mecosta	1	.44
Berrien	2	.88	Menominee	1	.44
Branch	1	.44	Missaukee	1	.44
Calhoun	1	.44	Montcalm	2	.88
Cass	2	.88	Montmorency	4	1.76
Charlevoix	5	2.20	Muskegon	11	4.84
Cheboygan	2	.88	Newaygo	1	.44
Chippewa	12	5.29	Oakland	7	3.08
Clare	8	3.52	Oceana	3	1.32
Crawford	1	.44	Ogemaw	5	2.20
Delta	7	3.08	Ontonagon	2	.88
Dickinson	1	.44	Oscoda	1	.44
Emmet	3	1.32	Otsego	7	3.08
Genesee	1	.44	Ottawa	1	.44
Gladwin	3	1.32	Presque Isle	5	2.20
Gogebic	2	.88	Roscommon	7	3.08
Grand			Saginaw	6	2.64
Traverse	3	1.32	St. Clair	5	2.20
Houghton	3	1.32	Sanilac	8	3.52
Huron	1	.44	Schoolcraft	4	1.76
Iosco	4	1.76	Tuscola	4	1.76
Iron	1	.44	Van Buren	1	.44
Isabella	1	.44	Wayne	2	.88
Jackson	3	1.32	Wexford	7	3.08
Kalamazoo	1	.44			
Kalkaska	3	1.32			
			Total	227	

*Not including twelve fatal accidents.

**Actual computed value rounded to the nearest hundredth.

Note: 18 counties reported no snowmobile traffic accidents.

compiled from Tables 4.2 and 4.1 shows that traffic accidents reported account for 21.6 per cent of the total and registrations account for only 15.43 per cent of the total. This situation might be explained by the fact that many snowmobilers come from other parts of the State to ride their vehicles in the upper peninsula. Approximately one-fourth of the snowmobilers who had traffic accidents last year were not residents of the county where the accident occurred. This data is depicted in the following report on the residence of drivers.

Residence of drivers.--Of the 227 non-fatal accidents, which included 239 drivers, Table 4.3 shows that the majority, nearly 70 per cent, of these drivers were residents of the county where the accident occurred. Nearly one-fourth of the drivers were residents of other counties in Michigan, and less than seven per cent were unknown or out-of-state drivers.

TABLE 4.3.--Residence of Drivers Involved in Non-fatal Snowmobile Traffic Accidents

Residence	Number of Drivers	Per Cent*
County of Occurrence	166	69.45
Another Michigan County	57	23.85
Ohio	2	.84
Indiana	1	.42
Not recorded	13	5.44
Total	<u>239</u>	

*Actual computed value rounded to the nearest hundredth.

Month and day of the week accidents occurred.--

Table 4.4 indicates the number of traffic accidents per month during the 1969-70 season and the number of accidents that occurred on specific days of the week during each month. It is clearly apparent that the weekend days of Friday, Saturday, and Sunday are the most dangerous days for snowmobile drivers on or near the roadways in the State of Michigan. Weekend days accounted for 77.09 per cent (175) of all snowmobile accidents which occurred during the 1969-70 season. This pattern very well could reflect the vastly increasing recreational use of snowmobiles and the type of persons who are driving the majority of snowmobiles. The working man generally spends more of his time for recreational purposes on the weekend days. If he is a snowmobiler, he then has the time to follow longer trails and enjoy driving his snowmobile to many of the gatherings which are generally arranged at numerous campsites throughout the State by snowmobile clubs. Many summer trailer camps have begun year-around operation and cater specifically to the snowmobile trade throughout the winter season. With these many opportunities for travel and enjoyment throughout the formerly dormant months of the cold season, snowmobilers are taking to the trails and roadways in increasing numbers on the weekends.

TABLE 4.4.--Distribution of Accidents by Month and Day of the Week

1969-70 Months	<u>Day of the Week</u>							Total	Per Cent*
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday		
September					1			1	0.44
October									
November	3			1		7	1	12	5.29
December	12	5	9	4	3	12	15	60	26.43
January	23	4		4	8	12	20	71	31.28
February	16			3	3	8	21	51	22.47
March	11	2	1	1	3	3	11	32	14.10
Total	65	11	10	13	18	42	68	227	
Per Cent*	28.63	4.85	4.4	5.73	7.93	18.5	29.96		

*Actual computed value rounded to the nearest hundredth.

Time of day when accidents occurred.--Figure 4.4

was constructed to show the time of the day when snowmobile traffic accidents occurred. The peak time period for accidents was from 8:01 p.m. through 12:00 p.m. during which 28.63 per cent occurred. The time period from 4:01 p.m. through 8:00 p.m. followed closely, recording 26.43 per cent of all accidents. It should be noted that no snowmobile traffic accidents occurred within the time period 4:01 a.m. through 8:00 a.m. The combined dusk and dark hours from 4:01 p.m. to 4:00 a.m. claimed the bulk (70.48 per cent) of the accidents.

Although 35 accidents were reported for the total time period of 12:01 a.m. to 4:00 a.m., it was interesting to find that the majority of these accidents were clustered near the midnight hour. Eighteen accidents (54.29 per cent) reported in this category occurred during the first hour (12:01 a.m. to 1:00 a.m.) of the time period. Only seven accidents (20 per cent) occurred during the last two hours, from 2:01 a.m. to 4:00 a.m., of the four-hour time period.

Since the weekend days accounted for 77.09 per cent of all traffic accidents during the season, Figure 4.5 was constructed to show the breakdown of accidents which occurred on Friday, Saturday, and Sunday according to time of day. Again, the time period 8:01 p.m. through 12:00 p.m. leads in the number of accidents, followed closely by the time period 12:01 p.m. through 4:00 p.m. as was indicated

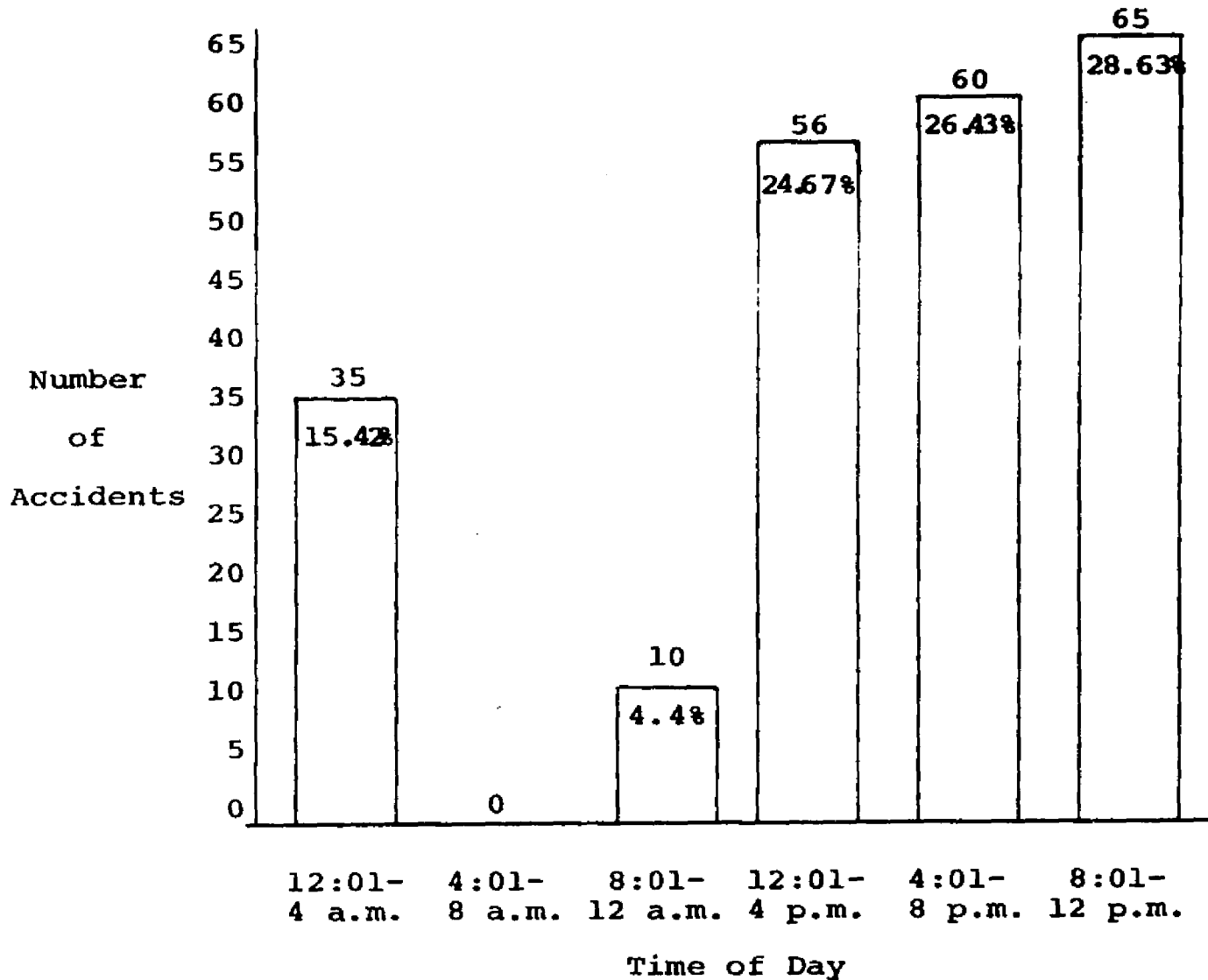


FIGURE 4.4.--Distribution of Snowmobile Traffic Accidents
by Time of Day

Total Accidents--227

One accident had no time reported.

*Actual computed value rounded to the nearest hundredth.

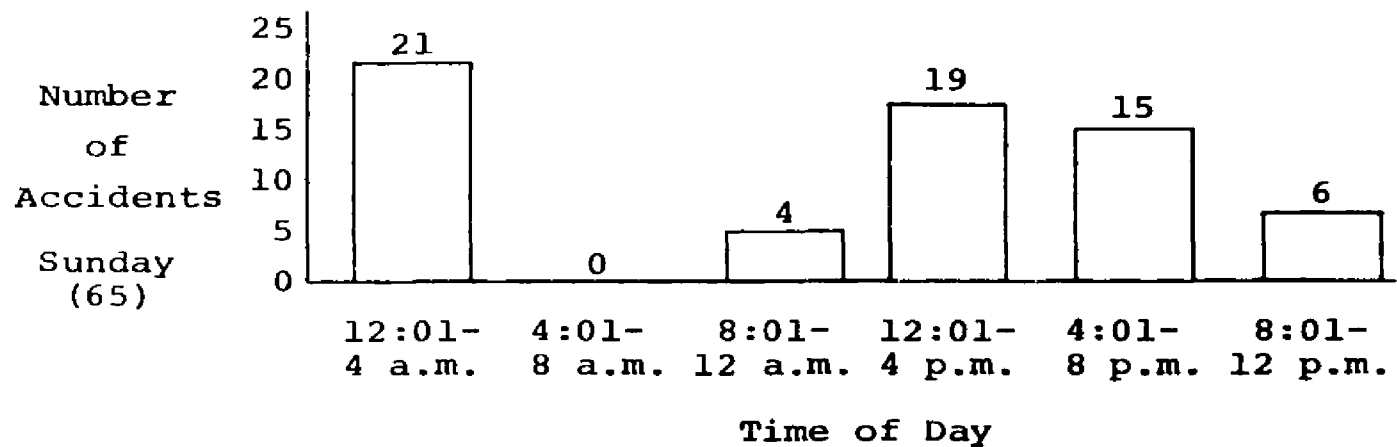
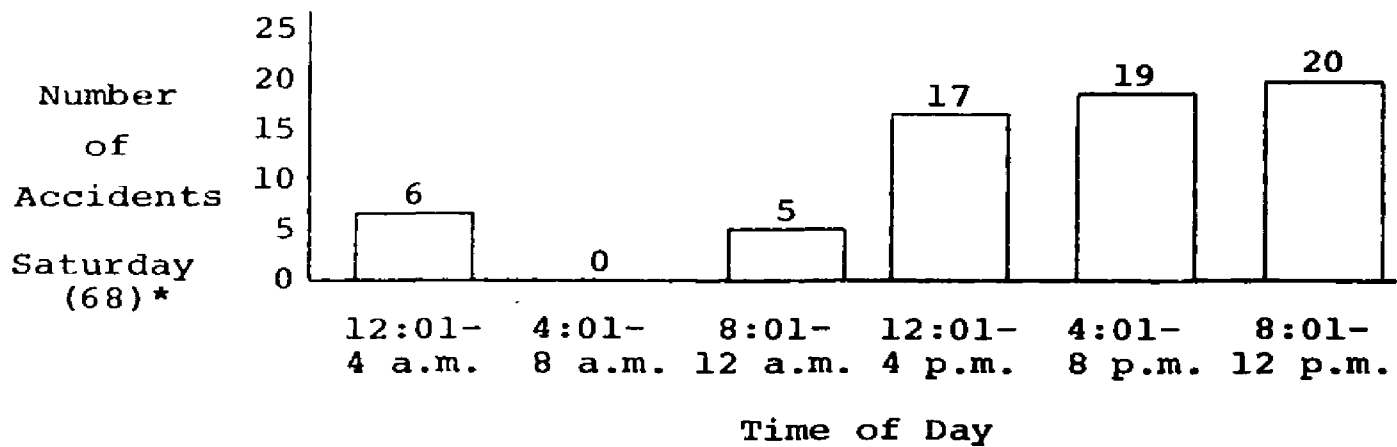
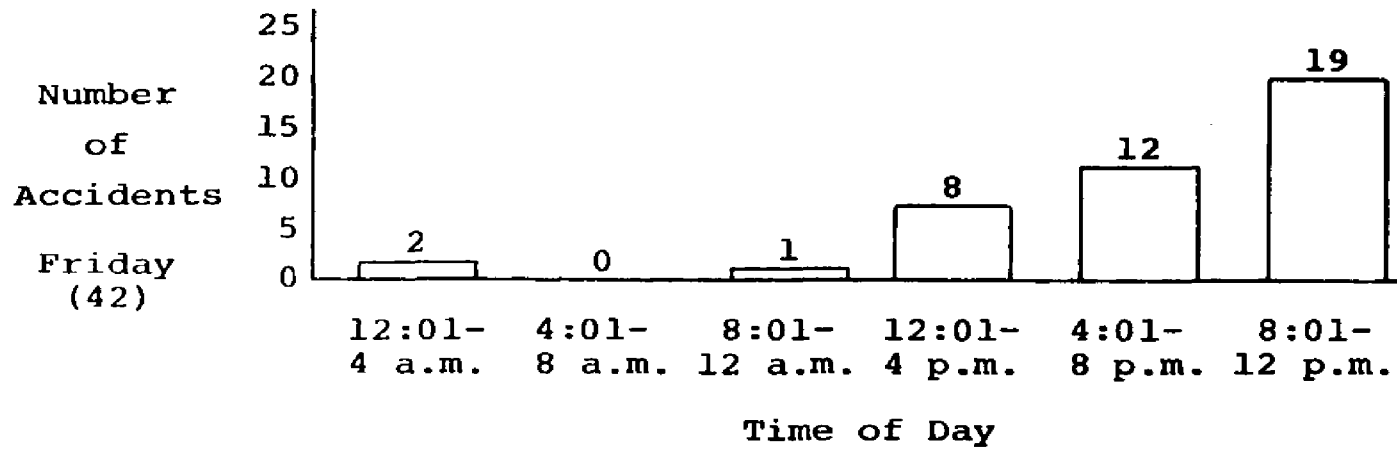


FIGURE 4.5.--Distribution of Weekend Accidents by Time of Day

*One Saturday did not have a time reported.

in the total accident count. It was noted that the combination of two consecutive time periods, Saturday 8:01 p.m. through 12:00 p.m. and Sunday 12:01 a.m. through 4:00 a.m., account for almost one-fourth (23.43 per cent) of all accidents that occurred on the weekends. However, this same combination of sequential time periods accounted for 43.3 per cent of all snowmobile traffic accidents during the season.

There is a strong implication that the number of accidents also reflects the peak periods of exposure by snowmobilers. Information revealed through personal interviews indicates that the majority of snowmobilers travel at the times when most accidents occurred on the weekend days.

Young drivers.--The young drivers, fifteen years old and younger, who are under licensing age contribute heavily to the number of snowmobile traffic accidents which occurred in the daylight hours. Figure 4.6 shows the distribution of these accidents and seems to indicate the reason for the 12:01 p.m. through 4:00 p.m. time period being so heavily populated when observing all accidents. It is shown in Table 4.5 that these underage drivers contribute considerably to the weekend numbers of traffic accidents. Over 70 per cent, 31 of 44, of the accidents among this group occurred on the weekend days of Friday, Saturday, and Sunday, according to the times indicated on the accident reports.

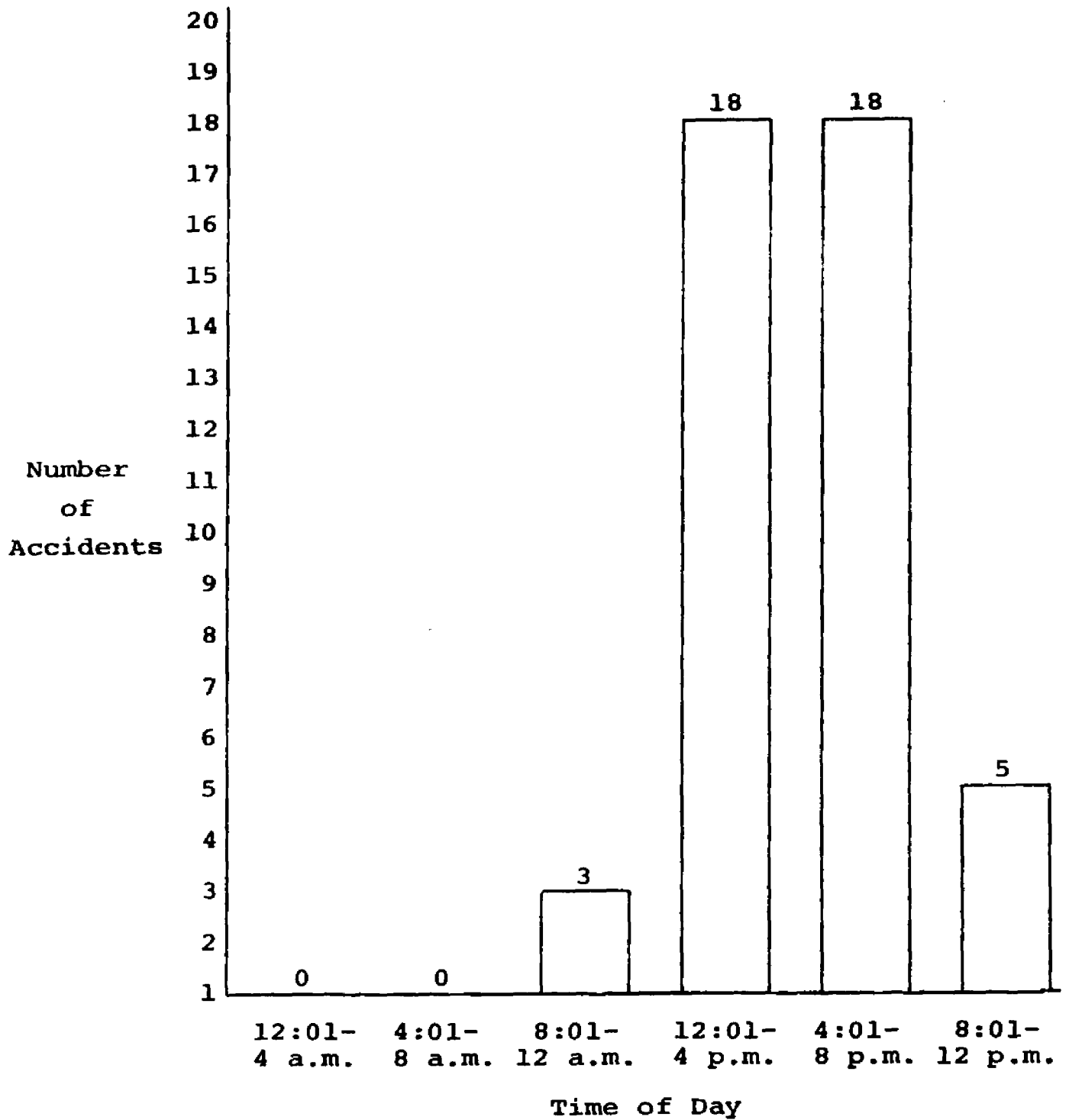


FIGURE 4.6.--Distribution of Accidents Involving Drivers under 16 Years of Age by Time of Day

TABLE 4.5.--Distribution of Drivers Under 16 Years of Age Involved in Accidents by Day of the Week

Day	Number of Drivers	Per Cent*
Sunday	11	25.00
Monday	3	6.82
Tuesday	1	2.27
Wednesday	3	6.82
Thursday	6	13.64
Friday	9	20.45
Saturday	11	25.00
Total	44	

*Actual computed value rounded to the nearest hundredth.

Vehicle damage.--Snowmobiles usually are damaged when involved in a traffic accident. Of the 239 snowmobiles involved in traffic accidents during the 1969-70 season, 67.37 per cent reported snowmobile damage. Table 4.6 indicates the parts of the vehicle that were most frequently reported damaged because of a traffic accident. It would appear, because of the number of reports indicating front end damage, that snowmobilers are more apt to hit objects than to be the victims of other motor vehicles.

Single snowmobile accidents.--Of the 227 recorded traffic accidents, 115 (50.66 per cent) were single snowmobile accidents and 112 (49.34 per cent) were accidents involving other motor vehicles, including twelve snowmobiles. The frequency distribution, Table 4.7, indicates the number of involvements by road and roadside objects, obstructions, and conditions in single snowmobile traffic

**TABLE 4.6.--Distribution of Damaged Parts of Snowmobiles
Involved in Traffic Accidents**

Damage	Vehicles*	Per Cent**
Drive Belt	1	.42
Side	24	1.00
Front	91	38.07
Ski	9	3.77
All parts	3	1.26
Windshield	15	6.28
Rear	10	4.18
Hood (cowling)	10	4.18
Handlebars	1	.42
Frame	2	.84
Steering	2	.84
Undercarriage	3	1.26
Bumper	2	.84
Seat	1	.42
Gas Tank	1	.42
Engine	1	.42
Total Loss (2 burned)	13	5.44
No Damage	61	25.52
Unknown	17	7.11

*Some vehicles reported multiple parts damaged.

**Actual computed value rounded to the nearest hundredth.

**TABLE 4.7.--Distribution of Road and Roadside Hazards
Involved in Single Snowmobile Traffic Accidents**

Hazard	Accidents	Per Cent*
Ditch	21	18.26
Rut	10	8.70
Tree	12	10.43
Ice	10	8.70
Snowbank	19	16.52
Fence	5	4.35
Guard Rail	3	2.61
Railroad Tracks	1	.87
Utility Pole Guy Wire	1	.87
Dog	2	1.74
Curb	1	.87
Mailbox	3	2.61
Pedestrian	3	2.61
Deer	2	1.74
Building	2	1.74
Road Sign	1	.87
Bridge	2	1.74
Unknown	17	14.78
Total	<u>115</u>	

*Actual computed value rounded to the nearest hundredth.

Note: Forty-eight drivers were thrown from their vehicle in these accidents.

accidents. It is apparent that snowbanks and ditches, named on 34.78 per cent of the accident reports, seem to present the greatest hazard to snowmobile operators who were involved in single vehicle traffic accidents. These two hazards in addition to icy conditions and ruts accounted for 52.18 per cent of the indicated reasons for single accidents. Drivers seem to be unable to cope effectively with these hazards, which results in loss of control and, usually, an accident causing property damage and/or bodily injury.

When problems arise in the operation of a snowmobile and control is lost, there is a great chance that the driver will fall or be thrown from the machine, especially in single snowmobile accidents. The accident reports describing the 115 single vehicle accidents show that 48 (41.74 per cent) of the drivers were thrown from their vehicles, 21 because the vehicle overturned and 27 fell or were thrown off because of loss of control or collision with a stationary object.

The seven accidents involving three pedestrians, two dogs, and two deer all occurred on the roadway in the evening and night hours. The pedestrian accidents could be attributed to darkness and lack of adequate vehicle lights. The four accidents involving animals seemed to be unavoidable, since all reports indicated that the animals darted into the paths of the snowmobiles.

One single accident involved the pulling of a boy who was holding on to the back of the machine. His feet slipped under the track on the snowmobile causing injury to his heel. Another single accident resulted from a sled being towed in a ditch. The sled overturned injuring one of five occupants slightly. The other accident involving a sled resulted in a broken leg to the sleigh rider who fell off when the snowmobile hit a bump in the roadway. A handicapped male driver was responsible for one other single vehicle accident. Because of the crippled condition of his right hand, the driver lost control of the snowmobile and collided with a bridge abutment, which resulted in serious bodily injuries.

Snowmobile-motor vehicle collisions.--Snowmobiles were involved in traffic accidents with another motor vehicle (including 12 snowmobiles) on 112 occasions, or 49.34 per cent of the 227 traffic accidents reported last season. In Table 4.8 the deployment factors which seemed to be most relevant to the cause of snowmobile-motor vehicle accidents are listed. The most obvious hazard for snowmobilers along and on the roadways appears to be parked vehicles. On 27 occasions--almost one-fourth of the accidents--snowmobiles collided with parked vehicles, and numbered among these accidents were five snowmobiles. Automobiles hit snowmobiles traveling in the same direction along the roadway on seven occasions. Four snowmobiles

TABLE 4.8.--Distribution of the Deployment Factors Most Relevant to the Cause of Snowmobile-Motor Vehicle Accidents

Deployment Factor	Accidents	Per Cent*
Snowmobile Stopped on Roadway	4	3.57
Snowmobile Crossing Roadway	18	16.07
Intersections of Roadway	9	8.03
Snowmobile Coming off Sidewalk	2	1.79
Snowmobile Coming from Parked Position	1	.89
Snowmobile Driving on Wrong Side of the Road	14	11.61
Snowmobile Pulled out of Driveway	8	7.14
Snowmobile Sideswiped Other Vehicle	3	2.68
Snowmobile Making U-Turn in Road	3	2.68
Snowmobile Making Left Turn	3	2.68
Snowmobile Hit Parked Vehicle	27	24.11
Car Turning to Driveway	4	3.57
Car Failed to Make Turn	1	.89
Car Pulled out of Driveway	2	1.79
No Particular Factor	13	11.61
Total	<u>112</u>	

*Actual computed value rounded to the nearest hundredth.

were stalled on the roadway and hit by automobiles. Fourteen snowmobiles had collisions while traveling on the wrong side of the roadway. Two of these involved other snowmobiles. These situations also produced eleven head-on collisions. On two occasions snowmobiles sideswiped other vehicles; one, another snowmobile, and the other an automobile (a Police Cruiser). Another accident was reported which involved a snowmobile which sideswiped an automobile and proceeded on to collide with another snowmobile. Snowmobiles attempting to cross the roadway are a very significant factor in the cause of collisions with motor vehicles. Eighteen of this kind of accident were reported. Four of these happened when snowmobilers were following a trail which led to the roadway. Intersection accidents accounted for nine collisions. Speed, judgment of the turning radius, and visual perceptions dominate the probable reasons for this particular group of accidents. Eight accidents involved snowmobiles pulling out of driveways. Two of these accidents were preceded by a faulty throttle which caused the vehicle to thrust into the street. Two accidents involved stones which were thrown from the track of the snowmobile; one hit the driver of a following snowmobile, and the other hit the windshield of a passing automobile.

Driver age according to sex.--The frequency distribution chart, Table 4.9, indicates male driver age and sex, and Table 4.10 indicates female age and sex. There were

TABLE 4.9.--Distribution of Male Drivers by Age

Age	Number of Drivers	Age	Number of Drivers	Age	Number of Drivers
9	3	28	1	46	2
10	1	29	9	47	1
11	6	30	9	48	2
12	5	31	3	49	0
13	3	32	2	50	0
14	9	33	5	51	2
15	13	34	9	52	1
16	7	35	4	53	4
17	6	36	4	54	1
18	7	37	3	55	1
19	5	38	2	56	1
20	5	39	4	57	0
21	3	40	7	58	1
22	3	41	1	59	0
23	3	42	2	60	1
24	5	43	0	61	0
25	7	44	2	62	0
26	9	45	2	63	1
27	8				

Total Number of Male Drivers = 195

Average Age = 26.56 years

Median Age = 26 years

Age Groups:

15 and under = 40
 16 - 24 = 44
 25 - 34 = 62
 35 - 44 = 29
 45 - 63 = 20

TABLE 4.10.--Distribution of Female Drivers by Age

Age	Number of Drivers	Age	Number of Drivers	Age	Number of Drivers
12	2	27	0	42	1
13	1	28	0	43	2
14	1	29	0	44	3
15	0	30	0	45	1
16	0	31	1	46	1
17	1	32	0	47	0
18	0	33	1	48	0
19	1	34	0	49	1
20	1	35	0	50	2
21	1	36	0	51	0
22	1	37	2	52	0
23	0	38	2	53	1
24	0	39	0	54	0
25	1	40	0	55	2
26	1	41	0	Unknown	1

Total Number of Female Drivers = 32

Average Age = 34.77 years

Median Age = 38 years

Age Groups:

15 and under = 4
 16 - 24 = 5
 25 - 34 = 4
 35 - 44 = 10
 44 - 55 = 8

twelve accidents that did not report the sex or age of the snowmobile driver. One female driver did not have an age recorded. Two accidents involving only snowmobiles were reported listing a male and a female driver. Eleven accidents involving only snowmobiles were reported to have both male drivers.

Of the 195 male drivers who were involved in 184 traffic accidents during the 1969-70 season, over 20 per cent (40) were under sixteen years of age. The youngest male involved as a driver in a snowmobile accident was nine years old, with three drivers of this age. On the other end of the age scale, the oldest driver was 63 years of age. The median age of 26 years reveals that older male drivers are involved in more snowmobile traffic accidents than younger drivers. This is the reverse of the national automobile accident statistics, which show young male drivers as having the highest degree of involvement in accidents of any age group.

Although only 32 female drivers were involved in snowmobile traffic accidents, the same trend is evident as with male drivers. More accidents included older female drivers. Fifty per cent of the females reported as drivers in snowmobile accidents were 38 years of age or older. There were four female drivers under sixteen years of age; but on the other end of the age scale there were five female drivers fifty years of age and older--the oldest being 55. The female group fell into two main

age categories: 22 years and under--the youngest being 12; and 37 to 55 years of age. The 23 through 36 age groups included only four female drivers.

If both male and female drivers are combined into one group, the average age is 27.69 years of age with the median age falling at 27 years. Both of these statistics are higher than would be expected, if compared to automobile drivers.

Driver injuries.--Table 4.11 clearly denotes that most drivers who have snowmobile traffic accidents are also going to suffer some kind of bodily injury. Of all drivers who had accidents last season, 69.5 per cent were injured to some degree, and more serious injuries (42.29 per cent) were suffered than any other kind. The reports also show that male drivers were victims of serious injury in a higher percentage of the accidents than females.

Of injuries that were specifically described on the accident reports, limbs of the body and their extremities were mentioned most frequently. The distribution of these specific injuries is listed in Table 4.12.

Passenger injuries.--The number of passengers on snowmobiles which were involved in snowmobile accidents was almost evenly divided between males and females. Males, Table 4.13, numbered 41 and females, Table 4.14, 38. Included as passengers were a male on a sled and a male being pulled without a sled. Three females who were on sleds are included.

TABLE 4.11.--Distribution of Driver Injuries by Sex and Type

	<u>Type of Injury</u>				Total
	A	B	C	O	
Male	85	33	16	61	195
Per Cent* of Total	43.59	16.92	8.21	31.28	
Female	11	6	7	8	32
Per Cent* of Total	34.37	18.75	21.87	25.00	
Total	96	39	23	69	227
Per Cent* of Total	42.29	17.18	10.13	30.40	

*Actual computed value rounded to nearest hundredth.

Code of Injury:

- A - Visible signs of injury, as bleeding wound or distorted member, or had to be carried from scene.
- B - Other visible injury, as bruises, abrasions, swelling, limping, etc.
- C - No visible injury but complaint of pain or momentary unconsciousness.
- O - No indication of injury.

TABLE 4.12.--Distribution of Reported Injuries According to Parts of the Body Injured

Part of Body Injured	Number of Drivers	Per Cent*
Head	15	25.00
Leg	20	33.33
Knee	4	6.67
Foot	2	3.33
Back	4	6.67
Body	2	3.33
Arm	2	3.33
Shoulder	6	10.00
Wrist	2	3.33
Hand	3	5.00
Total	60	

*Actual computed value rounded to nearest hundredth.

TABLE 4.13.--Distribution of Male Passenger Injuries by Age and Type

Age	Type	Injury	Age	Type	Injury	Age	Type	Injury
4		A	14		O	22		C
6		O	15		O	23		B
7		B	15		O	23		A
8		C	15**		A	25		C
11		O	15		O	26		C
12		O	15		A	26		O
12		O	15		A	27		B
12		O	15		A	34		A
12		O	16		O	35		O
13		O	17		O	37		A
13		O	18		A	39		O
13*		A	19		A	40		O
13		A	20		B	59		A
13		O	20		B			

*On sled being towed by snowmobile.

**Holding on rear of snowmobile.

Total Number of Male Passengers Injured = 41

Average Age of Male Passengers Injured = 19.365 years

Median Age of Male Passengers Injured = 15 years

Composite Account of Male Passenger Injuries

Type	Number	Per Cent*
A	13	31.71
B	5	12.20
C	4	9.74
O	19	46.35
Total	41	

*Actual computed value rounded to nearest hundredth.

Code of Injuries:

- A - Visible signs of injury, as bleeding wound or distorted members, or had to be carried from scene.
- B - Other visible injury, as bruises, abrasions, swelling, limping, etc.
- C - No visible injury, but complaint of pain or momentary unconsciousness.
- O - No indication of injury.

TABLE 4.14.--Distribution of Female Passenger Injuries by Age and Type

Age	Type	Injury	Age	Type	Injury	Age	Type	Injury
3		A	19		A	34		B
7		B	22**		C	34		A
8		A	22		A	35		A
8		O	23		C	36		B
9*		A	24		B	38		C
10		O	25		C	38		B
10		O	27		B	39		C
10		A	30		C	44		B
11		B	31		B	46		O
14		O	31		B	46		A
15		O	31*		A	52		O
15		O	32		C	58		A
17		O	32		O			

*On same sled being towed by automobile.

**On sled with four other passengers being towed by snowmobile.

Total Number of Female Passengers Injured = 38
 Average Age of Female Passengers Injured = 25.947 years
 Median Age of Female Passengers Injured = 26 years

Composite Account of Female Passenger Injuries

Type	Number	Per Cent*
A	12	31.58
B	10	26.32
C	7	18.42
O	9	23.68
Total	38	

*Actual computed value rounded to nearest hundredth.

Code of Injuries:

- A - Visible signs of injury, as bleeding wound or distorted member, or had to be carried from scene.
- B - Other visible injury, as bruises, abrasions, swelling, limping, etc.
- C - No visible injury but complaint of pain or momentary unconsciousness.
- D - No indication of injury.

Passengers were injured in 64.56 per cent of all traffic accidents and suffered some type of injury. More fell within the most serious injury classification than any other kind. Twelve passengers were thrown off snowmobiles of the 79 total accidents that involved passengers. Of the passenger injuries that were specifically described on accident reports, leg injuries numbered nine and head, back, and hand injuries were designated once.

Female passengers were more likely to be injured than males; however, both groups received a higher percentage (31.64 per cent) of serious injuries than any other kind. The difference in the ages of male and female passengers was notable. The male passengers median age was 15 years and their average age was 19.37 years. The female passenger median age was 26 years and their average age was 25.95 years.

Pedestrian injuries.--Three pedestrians were involved in snowmobile accidents and all received serious injuries. Pedestrians' ages ranged from the youngest, a male eleven years of age, to the oldest, a female forty years of age. The other pedestrian victim was a nineteen year old male. All pedestrians were hit by snowmobiles while they were in the roadway.

Weather at the time of the accident.--Table 4.15 shows that 82.38 per cent of the accidents (187) occurred under clear or cloudy weather conditions. Thirty-seven

accidents occurred while it was snowing. No information concerning the weather was recorded on three accidents. No other kind of weather was recorded.

TABLE 4.15.--Weather Conditions at the Time of the Accident

Weather	Number of Accidents	Per Cent*
Clear or Cloudy	187	82.38
Snowing	37	16.30
Not Reported	3	1.32
Total	227	

*Actual computed value rounded to nearest hundredth.

Light conditions at the time of the accident.--

Information revealed in Table 4.16 shows that the majority of snowmobile accidents occurred during darkness. This period of the day accounted for 56.82 per cent of all snowmobile accidents which occurred. The daylight hours accounted for 39.64 per cent of all accidents. Only six accidents occurred at dusk and none at dawn. No information was recorded on two accidents.

TABLE 4.16.--Light Conditions at the Time of the Accident

Light Condition	Number of Accidents	Per Cent*
Daylight	90	39.65
Dusk	6	2.64
Darkness	129	56.83
Not Reported	2	.88
Total	227	

*Actual computed value rounded to nearest hundredth.

Locality where accidents occurred.--Table 4.17

indicates that most of the accidents occurred on roads or roadways in rural areas. However, it is worthy of note that nearly thirty per cent of all snowmobile traffic accidents occurred in residential areas. This information gives verification to the suspicion that snowmobiles are becoming a safety factor on the streets in our urban and suburban areas.

TABLE 4.17.--Distribution by Kind of Locality in Which Accidents Occurred

Locality	Accidents	Per Cent*
Manufacturing or Industrial	1	.44
Shopping or Business	13	5.73
Apartments	0	.00
School or Playground	3	1.32
One-Family Homes	68	29.96
Farms, Fields	72	31.72
Not Developed	57	25.11
Not Recorded	13	5.73
Total	227	

*Actual computed value rounded to nearest hundredth.

Roadway characteristics where accidents occurred.--

Table 4.18 denotes the characteristics of the roadway where accidents occurred. It appears that most accidents come about under ideal or expected conditions. However, snowmobile operators do have problems on curves and operating their vehicles safely on road grades and at hillcrests. It is noted in the descriptive reports of accidents that

icy surfaces present a control problem, particularly on occasions when this condition is come upon unexpectedly at curves or other points when a maneuver must be made.

TABLE 4.18.--Distributions of Roadway Characteristics on Where Accidents Occurred by Road Character and Surface

Surface Condition	<u>Surface</u>	
	Accidents	Per Cent*
Dry	12	5.29
Wet	12	5.29
Snow or Ice	196	86.34
No Information	7	3.08
Total	227	

Characteristic	<u>Character</u>	
	Accidents	Per Cent*
Straight	178	78.41
Curve	39	17.18
No Information	10	4.40
Total	227	
Level	167	73.57
On Grade	37	16.30
Hillcrest	13	5.23
No Information	10	4.40
Total	227	

*Actual computed value rounded to the nearest hundredth.

What drivers were doing before the accident.--The maneuvers that drivers were doing prior to the accidents are listed in Table 4.19. The indication is that the majority of drivers, nearly 70 per cent, were driving on a straight course before the traffic accident occurred. However, in 28.63 per cent of the accidents, drivers were involved in making a turn of some type.

TABLE 4.19.--Distribution by What Drivers Were Going to Do Before the Accident

Maneuver	Accidents	Per Cent*
Straight	155	68.28
Left Turn	14	6.17
Right Turn	5	2.20
U-Turn	4	1.76
Stopped	6	2.64
Start from Parked Position	3	1.32
Negotiating Curve	39	17.18
No Information	1	0.44
Total	227	

*Actual computed value rounded to nearest hundredth.

Types of roads and roadways where accidents occurred.--There were 239 snowmobiles involved in the 227 traffic accidents throughout Michigan during the 1969-70 season. Of these, 187 snowmobiles were being operated on the road.

Only 52 snowmobiles were being operated on the shoulder of a roadway prior to the accident. Table 4.20 denotes the type of road where the accidents occurred and

the number of snowmobiles traveling on or near the shoulder of that particular type road.

TABLE 4.20.--Distribution of Snowmobiles Operating on the Road or on the Shoulder by Road Type

Type Road	Operating on <u>Shoulder of Roadway</u>		<u>Operating on Roadway</u>	
	Snowmobiles Per Cent*		Snowmobiles Per Cent*	
U.S. Highway	2	3.85	3	1.60
State Highway	7	13.46	9	4.81
County Road	1	1.92	13	6.95
Rural Road	31	59.62	100	53.48
City Street	11	21.15	62	33.16
Total**	52	21.76	187	78.24

*Actual computed value rounded to nearest hundredth.

**Total snowmobiles = 239.

Estimated speed.--In Table 4.21 the estimated speed of drivers prior to the accident are listed. Although most drivers were traveling at an estimated speed of 25 m.p.h or less, it is of concern to note the speed capability of stock snowmobiles. One was estimated to be traveling at 70 m.p.h., and 30.55 per cent of the drivers were traveling in excess of 30 m.p.h. on a public road or roadway.

Law violations.--Table 4.22 contains the list of indicated violations which were recorded on accident reports. Although 184 violations were cited on the accident reports, only 53 citations were issued by law enforcement agencies.

TABLE 4.21.--Distribution of Estimated Speeds

Miles Per Hour	Drivers	Per Cent*	Miles Per Hour	Drivers	Per Cent*
0-5	13	5.48	45-50	3	1.26
5-10	30	12.55	50-55	4	1.67
10-15	22	9.21	55-60	1	.42
15-20	25	10.46	70	1	.42
20-25	31	13.10	Parked	9	3.89
25-30	22	9.21	Unknown	36	15.06
30-35	18	7.53			
35-40	14	5.86			
40-45	10	4.18	Total	139	

*Actual computed value rounded to nearest hundredth.

TABLE 4.22.--Distribution of Indicated Violations

Violation	Number	Per Cent*
Speed Too Fast	62	33.69
Failed to Yield Right of Way	25	13.04
Drove Left of Center	10	5.43
Passed Stop Sign	1	0.54
Improper Overtaking	1	0.54
Made Improper Turn	2	1.09
Improper Parking	2	1.09
Unregistered Snowmobile	15	8.15
Driving on Roadway	38	20.65
Driving on Wrong Side of Road	5	2.72
Failed to Make Good Observation	1	0.54
Failed to Have Vehicle Under Control	6	3.26
Careless Operation	5	2.72
Failed to Use Due Caution	1	0.54
Impeding Traffic	3	1.63
Defective Equipment	1	0.54
Driving on Sidewalk	2	1.09
Failure to Stop in Assured Distance	1	0.54
Improper or No Signal	2	1.09
Failure to Report Accident	1	0.54
Total	184	
<u>Accidents Involving Snowmobiles</u>		
Violations	130	57.28
No Violation	90	39.64
Unknown	7	3.08
Total	227	

Excessive speed was the most prominent violation reported. Of all citations 33.69 per cent fell into this group, and 20.65 per cent were cited for driving on the roadway. The accident reports revealed that in 130 accidents (57.28 per cent) which involved snowmobiles a law was violated by the snowmobile driver. It is also worthy of note that 6.27 per cent of all snowmobiles involved in traffic accidents were cited for not being registered.

Drinking condition of drivers.--The consumption of alcohol is a factor of concern in dealing with snowmobile traffic accidents. Table 4.23 shows that 21.76 per cent of snowmobile drivers had been drinking. Only one driver was described as being "under the influence", and it should be noted that he was not cited. There also was no citation for "impairment" issued to any drivers. A significant number of drivers, 17.15 per cent, had their drinking condition listed as "unknown."

TABLE 4.23.--Distribution of Drinking Condition of Drivers

Condition	Number	Per Cent*
Under the Influence	1	0.42
Not Under the Influence	51	21.34
Had Not Been Drinking	146	61.09
Condition Unknown	41	17.15

*Actual computed value rounded to nearest hundredth.

Vision obstructions.--Visual obstructions, listed in Table 4.24, were a reported factor in 10.13 per cent of the snowmobile traffic accidents. Ten accident reports indicated no information available, and 194 indicated that there were no visual obstructions prior to the accident.

TABLE 4.24.--Driver Vision Obstruction

Visual Obstruction Reported	Accidents	Per Cent*
Yes	23	10.13
No	194	85.46
Not Reported	10	4.41
Total	227	

*Actual computed value rounded to nearest hundredth.

Vehicle defects.--Throttle problems were the most numerous of vehicle defects described in traffic accident reports, as shown in Figure 4.7. Throttles were either stuck or frozen in the "wide-open" position and were reported as the major cause of the accident. Twenty-one snowmobile drivers (8.78 per cent) reported vehicle defects prior to their accident. However, 198 reports showed no defects and 20 reports listed this category as unknown.

Driver records.--The driving records or disposition of 239 snowmobile operators are depicted in Figure 4.8. The majority of licensed drivers (101 drivers or 42.26 per cent) who were involved in a snowmobile accident had clear

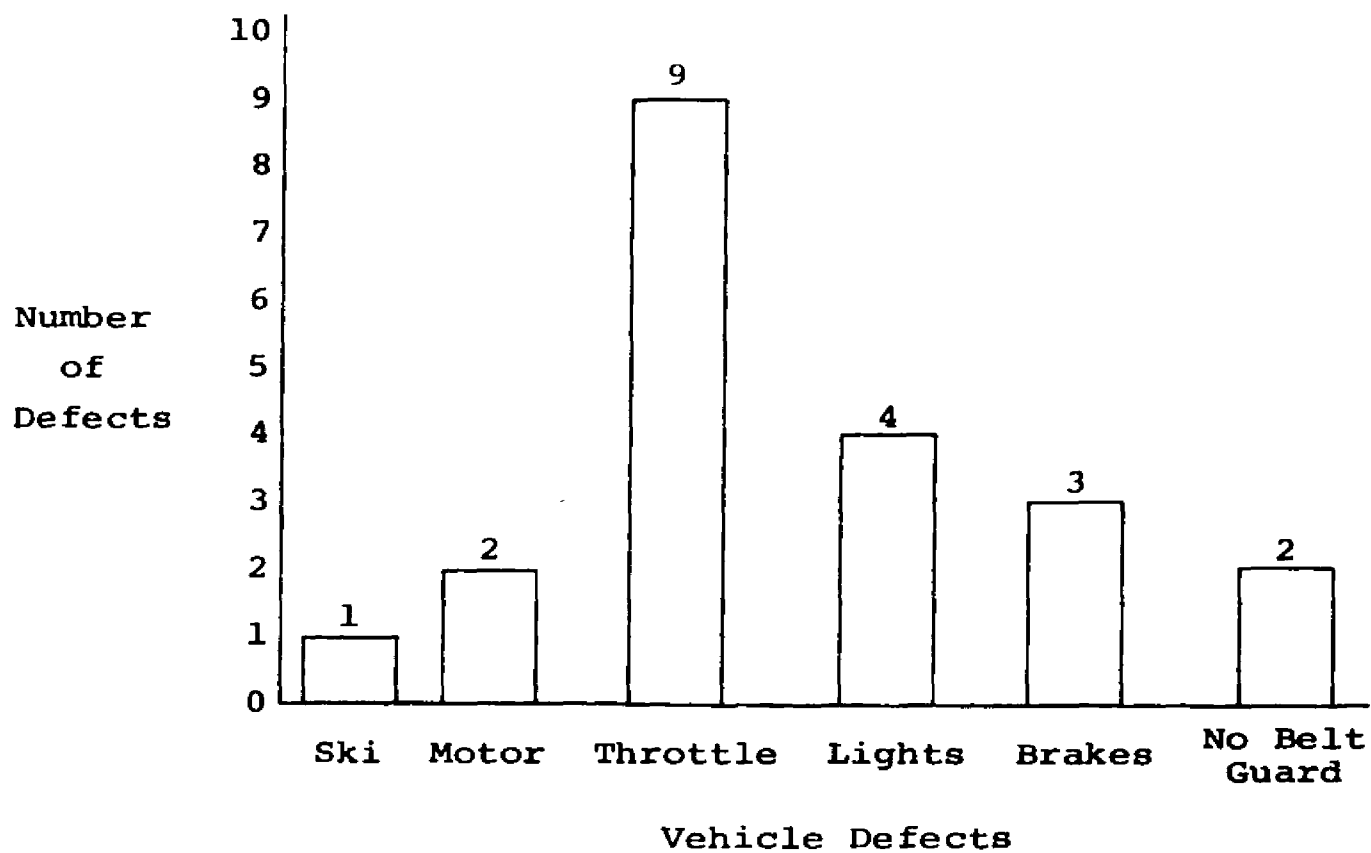
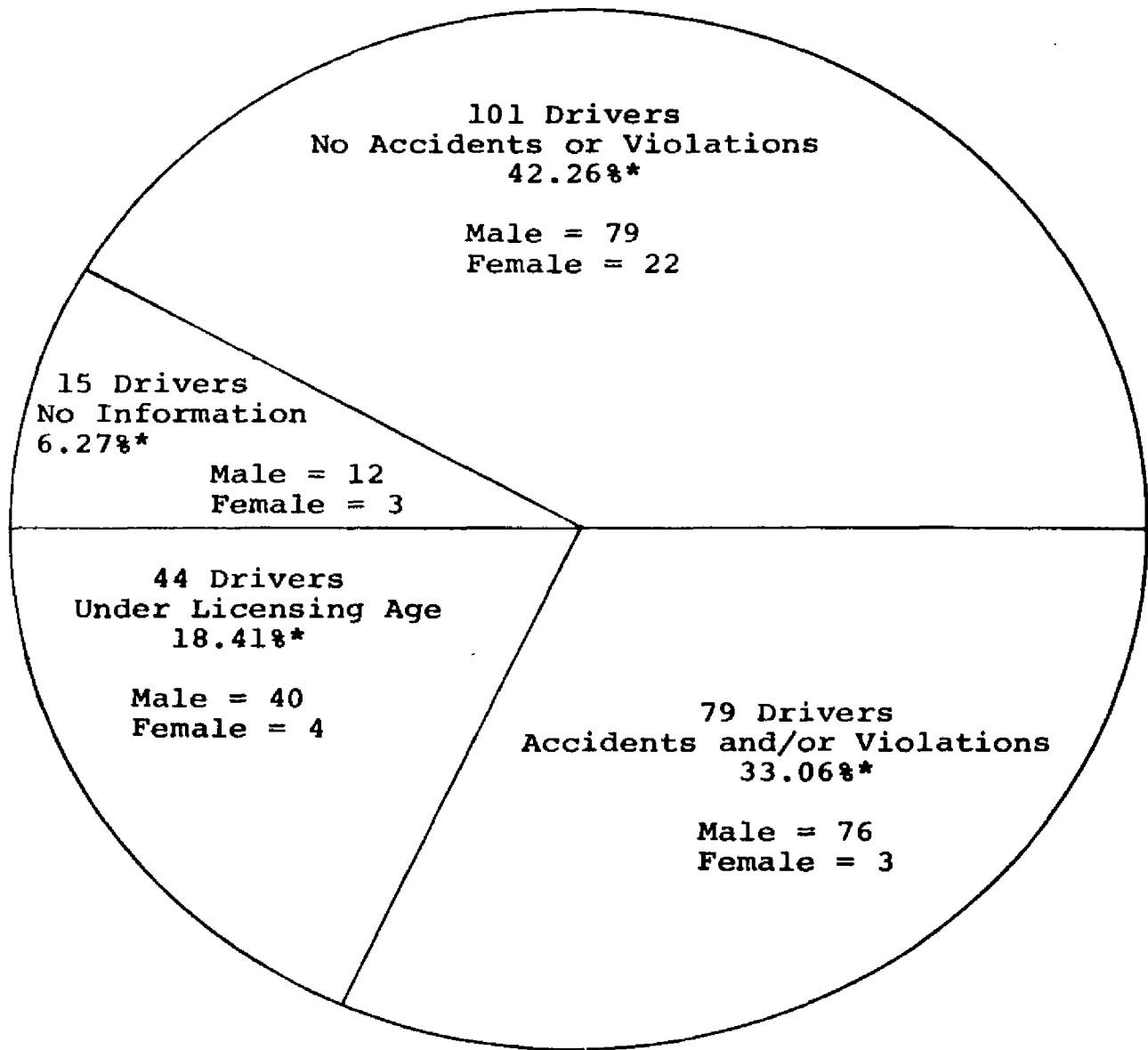


FIGURE 4.7.--Distribution of Vehicle Defects by Number



Total number of drivers = 239

FIGURE 4.8.--Distribution of Snowmobile Driver Records as Automobile Operators

*Actual computed values rounded to the nearest hundredth.

driving records. However, if all snowmobile operators were considered, the majority (123 drivers or 51.47 per cent) would be either (1) under licensing age or (2) have had accidents or violations recorded on their driving records.

The 79 drivers who had previous driving records were involved in 81 accidents resulting in the injury of 44 persons and were responsible for 183 violations.

Only three of 32 female drivers had a previous driving record. One female had been in an automobile accident and also had a violation. The other two females had violations only recorded.

Five males had been cited for being "under the influence" recorded on their driving records.

Personal Interview Questionnaire Report

This section contains the information collected through personal interviews from drivers located in the counties designated in Figure 4.9. The information was reported according to the following predetermined content areas of interest:

1. Driver Exposure
2. Driver Experience
3. Driver Environment
4. Educational Needs

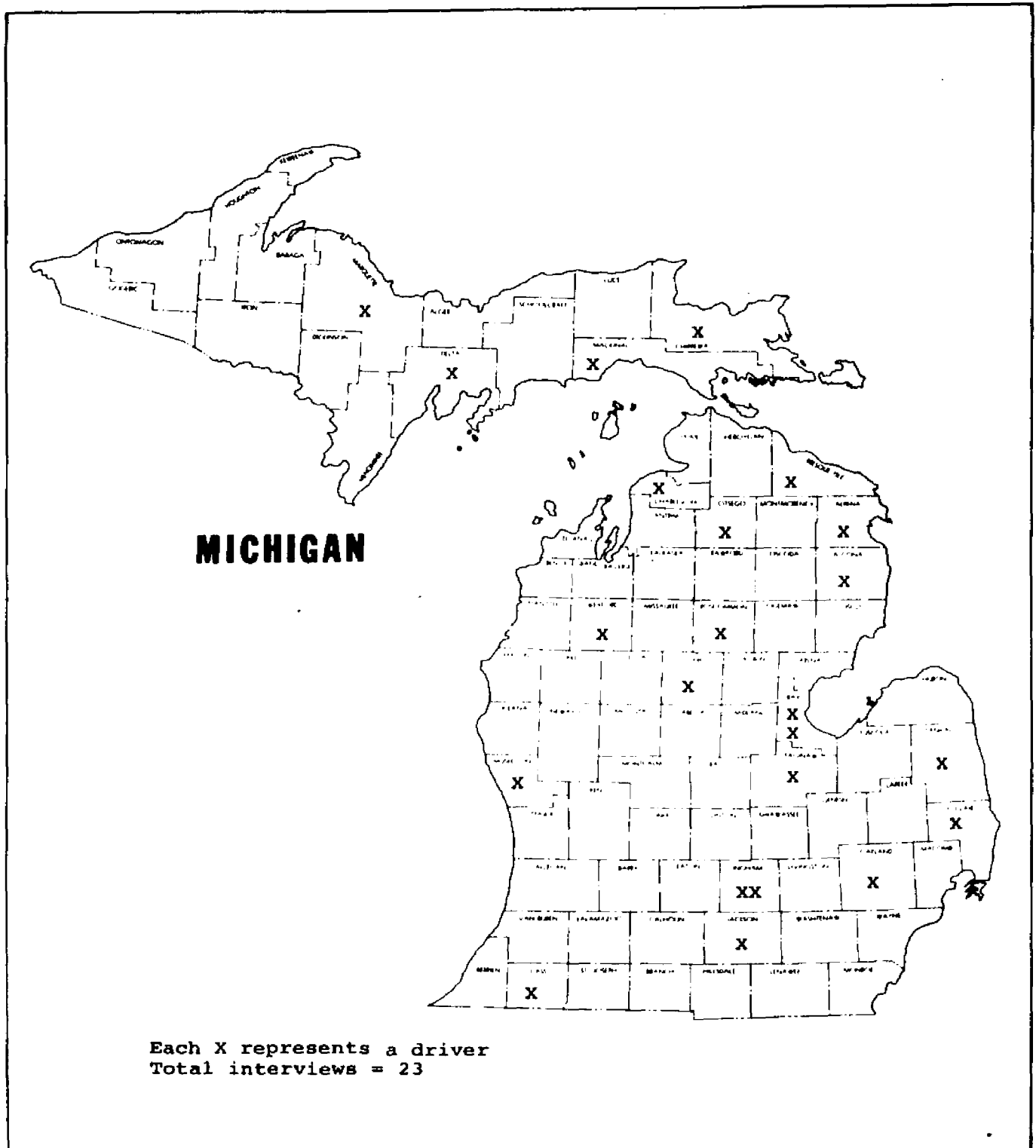


FIGURE 4.9.--Residence of Drivers Personally Interviewed
by County

Two "open-ended" questions were included in order to obtain the driver's assessment relative to vehicle defects that contributed to the accident and his thoughts concerning the major cause(s) of the accident.

Each of the 23 drivers interviewed had been in a snowmobile traffic accident during the 1969-70 season.

The driving records of those interviewed revealed that: (a) Fifteen drivers had no previous accidents or violations; (b) six drivers had been in a prior accident(s) or had received a citation for law violation(s); and (c) two drivers were underage.

The ages of the group interviewed included: seven females ranging from 17 through 45 years of age and sixteen males ranging from 9 through 51 years of age. Two males were under licensing age--the nine year old and a fourteen year old. All geographic areas of the State were represented by the drivers interviewed.

Driver exposure.--The responses dealing with the questions relevant to driver exposure are reported in Table 4.25.

The most obvious response in the table is that all drivers interviewed primarily used their snowmobile for recreational purposes.

The majority of drivers (73.92 per cent) rode snowmobiles 11 or more hours per week. This figure could very well indicate that many snowmobilers spend as much

TABLE 4.25.--Distribution of Responses to Questions
Relevant to Driver Exposure

Question	Responses	Per Cent*
2. Number of hours generally driven per week		
0-10 hrs.	6	26.09
11-20 hrs.	9	39.13
21-30 hrs.	6	26.09
31+ hrs.	2	8.70
3. Usual time of day driving**		
8:00 a.m.-12:00 a.m.	0	0.00
12:01 p.m.- 4:00 p.m.	3	13.04
4:01 p.m.- 8:00 p.m.	8	34.78
8:01 p.m.-12:00 p.m.	14	60.87
12:01 a.m.- 8:00 a.m.	3	13.04
4. Primary use of snowmobile		
Recreation	23	100.00
Racing	0	0.00
Work	0	0.00
5. Particular days of week most driving done***		
Sunday	15	65.22
Monday	4	17.39
Tuesday	4	17.39
Wednesday	4	17.39
Thursday	5	21.74
Friday	5	21.74
Saturday	13	56.52
6. Drive everyday during the season		
Yes	13	56.52
No	10	43.48
7. Hours driven prior to the accident		
0 - 2	10	43.48
2 - 4	8	34.78
4 - 6	5	21.74
6+	0	0.00

*Actual computed value rounded to the nearest hundredth.

**Five drivers reported driving in two time periods.

***Eleven drivers named more than one day.

or more time on a snowmobile than in an automobile during the season. Related to this statement is the fact that 56.52 per cent of those interviewed drive everyday throughout the snow months.

A very conspicuous statistic reported is the days of the week and time of day when most snowmobilers usually drive. The days, Saturday and Sunday, and the time of day, 8:01 p.m. - 12:00 p.m., are congruent with the days and time when most snowmobile accidents occurred.

Driving fatigue did not seem to play a major part in the accidents of those who were interviewed. Approximately 78 per cent of the drivers had driven four or less hours prior to their accidents, and more than half of these had driven less than two hours.

Driver experience.--The responses dealing with the questions relevant to driver experience are reported in Table 4.26.

A notable statistic in this category is the number of months of experience driving a snowmobile. Approximately 48 per cent of those interviewed reported three months or less driving experience prior to the accident. However, 52.17 per cent had from 21 to 84 months of driving experience. It was also noted that 8 of 10 drivers reporting 12 to 84 months of experience had driven in the same area where the accident occurred on former occasions.

TABLE 4.26.--Distribution of Responses to Questions
Relevant to Driver Experience

Question	<u>Responses</u>		Total	Per Cent*
	Male	Female		

1. Months of snowmobile driving experience prior to accident	<u>Months</u>				
	0	0	3	3	13.04
	1	3	0	3	13.04
	2	1	2	3	13.04
	3	2	0	2	8.70
	12	0	1	1	4.35
	15	1	0	1	4.35
	24	6	1	7	30.43
	60	1	0	1	4.35
	72	1	0	1	4.35
	84	1	0	1	4.35

9. Hours of instruction prior to driving a snowmobile alone	<u>Hours</u>				
	None	9	2	11	47.83
	Less than 1	5	4	9	39.13
	1	0	1	1	4.35
	2	0	0	0	0.00
	3+	2	0	2	8.70

16. First time driving snowmobile in area where accident occurred					
	Yes	6	5	11	47.83
	No	10	2	12	52.17

*Actual computed value rounded to the nearest hundredth.

Five of the seven females interviewed had two months or less driving experience. The two other females reported 12 and 24 months of experience, respectively.

The two under-licensing-age males, nine and twelve years old, both reported 24 months of driving experience. Both also reported that they had never driven in the area where the accident occurred prior to the accident.

It seems most significant that 86.96 per cent of those interviewed had less than one hour of instruction in the operation of a snowmobile. Of this group, over 50 per cent had no instruction at all.

Driving in an unfamiliar area did not seem to show significance since one more driver reported driving in a familiar area than reported that he was not, when the accident occurred.

Driver environment.--The responses dealing with the questions relevant to driver environment are reported in Table 4.27

Each driver indicated that the snowmobile was registered in the county of his residence and the majority of drivers (78.26 per cent) revealed that they usually drove in their home county.

Many accidents (39.13 per cent) occurred where the surface was described as packed snow. This condition might point to steering control problems, or lack of traction on this kind of surface, or excessive speed.

TABLE 4.27.--Distribution of Responses to Questions Relevant to Driver Environment

Question	Responses	Per Cent*
8. Depth of snow prior to accident		
Packed	9	39.13
1 - 6 inches	7	30.43
6 - 12 inches	3	13.04
12+ inches	4	17.39
14. Usually drive in county of residence		
Yes	18	78.26
No	5	21.74
15. Snowmobile registered in home county		
Yes	23	100.00
No	0	0.00
17. Driving on trail prior to accident		
Yes	20	86.96
No	3	13.04
18. Wearing safety equipment		
Yes	11	47.83
No	12	52.17

*Actual computed value rounded to nearest hundredth.

These responses could also indicate that many snowmobiles are traveling on the roads or streets, since 69.56 per cent of the drivers were operating on six inches or less of snow. However, an overwhelming majority of drivers (86.96 per cent) reported that they were riding on a snowmobile trail. This might indicate that the roads and roadways are being used by many snowmobilers as part of a designated trail.

Nearly half (47.83 per cent) of the drivers reported that they wore safety equipment. In spite of this acceptable general figure, further query of these drivers revealed that: only two drivers were wearing complete safety equipment (helmet, goggles and clothing), three were wearing helmets only, three wore goggles only, and three were wearing protective clothing only.

Educational needs.--The responses dealing with the questions relevant to driver educational needs are reported in Table 4.28.

It is evident that most snowmobile drivers (69.57 per cent) who received verbal or no instruction were not adequately prepared for the operation of the vehicle. This information indicates that the majority of drivers who were interviewed taught themselves how to operate the machine. This fact also leads to other implications, the most prominent pointing toward the necessity for a standardized instructional program. It is also apparent that snowmobile dealers have not involved themselves extensively with operational instructions, since nine revealed that this instruction came from either a friend or a parent. Adding to this concern for operational instructions involving the vehicle is the fact that only 47.83 per cent of all drivers interviewed had received a basic driver education course. This statistic was notable since the average age of the drivers interviewed was 27.43 years of age.

The majority of drivers (56.52 per cent) reportedly were familiar with the Michigan Snowmobile Law. All of these drivers cited their own initiative for gaining this information. However, much concern should be acknowledged for the large minority (43.48 per cent) of drivers who were not familiar with the Law.

Over one-half of the snowmobiles driven by the drivers interviewed (56.52 per cent) did not have insurance coverage on their vehicles.

TABLE 4.28.--Distribution of Responses to Questions Relevant to Determining Educational Needs

Question		Responses	Per Cent*
10.	Kind of instruction prior to driving snowmobile		
	Verbal	5	21.74
	Behind-the-Wheel	7	30.43
	None	11	47.83
11.	Who gave instruction		
	Dealer	3	13.04
	Parent	4	17.39
	Friend	5	21.74
12.	Had taken driver education course		
	Yes	12	52.17
	No	11	47.83
13.	Familiar with Michigan snowmobile law		
	Yes	13	56.52
	No	10	43.48
18.	Snowmobile covered by insurance		
	Yes	10	43.48
	No	13	56.52

*Actual computed value rounded to the nearest hundredth.

"Open-ended" questions.--The responses dealing with the "open-ended" questions relevant to the driver's opinion concerning vehicle defects that contributed to the accident and his thoughts dealing with the major causes of the accident are reported in Table 4.29.

Lighting problems which were mentioned as the most prominent vehicle defect by drivers is high on the list of reported traffic accidents also. This defect may very well be of major concern because of the vast amount of night driving done by snowmobilers. Throttle problems were noted by drivers to a lesser extent; however, this deficiency led the list of defects for all reported traffic accidents.

The most conspicuous major cause for accidents listed by drivers is carelessness upon the part of the operator. This cause in addition to inexperience made up 60.87 per cent of the responses in this category. Only four drivers believed that their accident was unavoidable.

It would appear that the major cause of snowmobile accidents, as assessed by the drivers involved, pointed toward the need for increased activity for educating snowmobilers in the safe operation of their vehicles.

TABLE 4.29.--Distribution of Responses to the "Open-ended" Questions Concerning Vehicle Defects and Major Causes for the Accident

Question	Responses	Per Cent*
21. Vehicle defects noted by driver		
Throttle	2	8.70
Lighting	5	21.74
None	16	69.57
22. Major causes of accident according to the driver**		
Visual conditions	3	13.04
Turning difficulty	1	4.35
Lost control	3	13.04
Not alert	2	8.70
Carelessness	8	34.78
Inexperience	6	26.09
Speed	4	17.39
Unavoidable accident	4	17.39

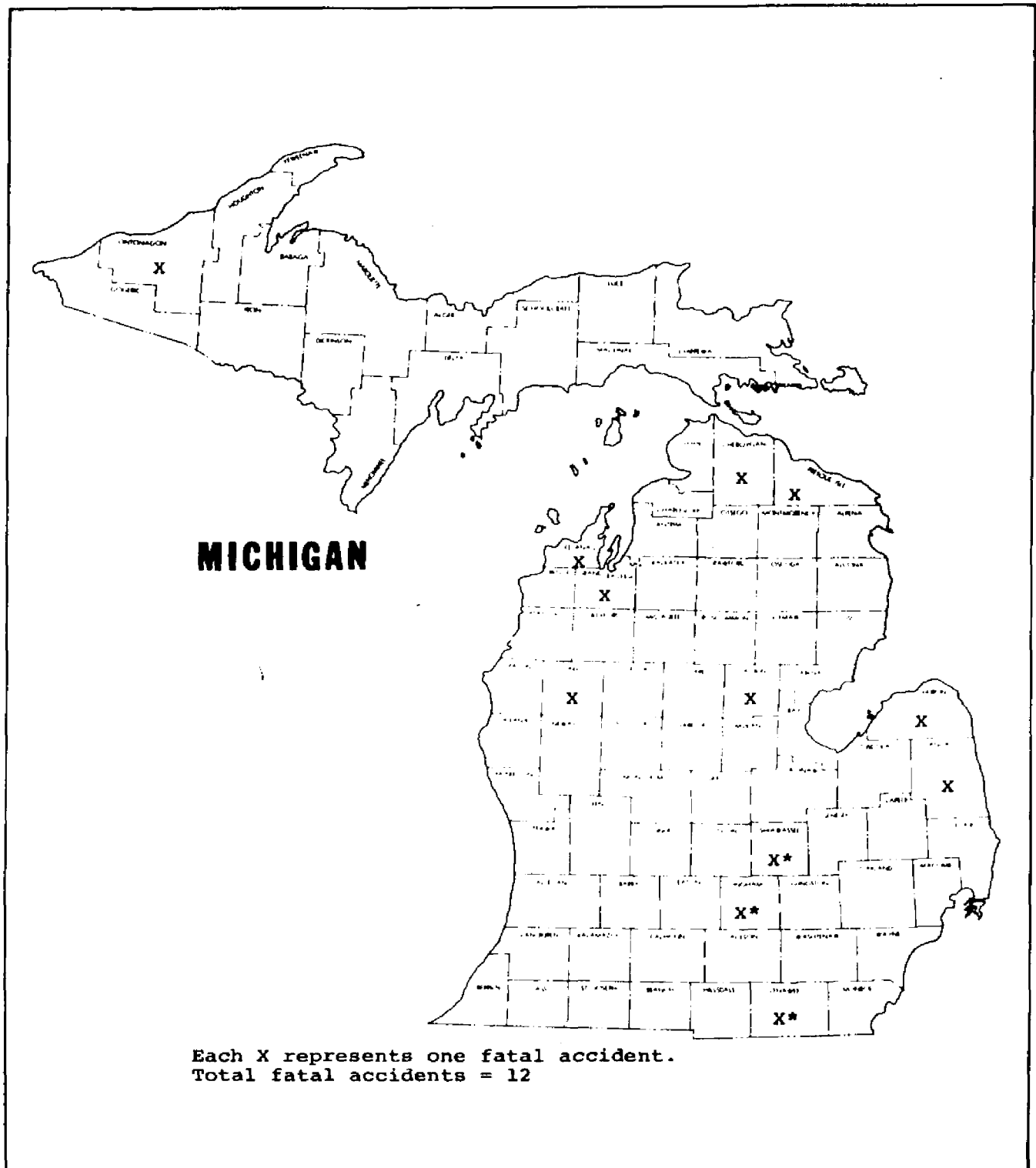
*Actual computed value rounded to the nearest hundredth.

**Eight drivers indicated more than one cause.

Fatal Accidents

The map of Figure 4.10 depicts the twelve fatal snowmobile traffic accidents reported to the Michigan State Police during the 1969-70 season. This number represents 66.67 per cent of the eighteen total fatal snowmobile accidents recorded by the State police last year.

No county reported more than one fatal accident, and three counties--Ingham, Lenawee, and Shiawassee--did not report any other snowmobile traffic accidents.



*The only snowmobile traffic accident reported was a fatal one.

**FIGURE 4.10.--1969-70 Fatal Snowmobile Traffic Accidents
by County**

All of the fatalities were operators of the snowmobile involved in the accident with the exception of two. One of these exceptions was a female passenger who was thrown into a tree when the driver failed to negotiate a turn because of icy conditions. The driver jumped from the vehicle and was not injured. The other exception was a 15 year old male riding on a sled with three other male youngsters which was hit by an automobile when the sled slid over the center line on a curve.

Nine fatal accidents involved automobiles and one included a semi-truck. The other two were single snowmobile accidents. In one of these accidents, the victim (a passenger) was thrown off the vehicle into a tree, and the other was found overturned at a street intersection on top of the driver.

Residence of drivers.--Eight of the twelve drivers involved in fatal accidents were residents of the county where the accident occurred. One driver was a resident of California, and the remaining three were residents of other counties in Michigan.

Month and day of the week fatal accidents occurred.--In Table 4.30 data depicting the month and day when fatal accidents occurred during the 1969-70 season are shown.

The peak month for fatal accidents was December when 41.67 per cent of these accidents occurred. This

TABLE 4.30.--Distribution of Fatal Accidents by Month and Day of the Week

1969-70 Month	<u>Day of the Week</u>							Total	Per Cent*
	Sun	Mon	Tues	Wed	Thurs	Fri	Sat		
December	1	1	1	1	1			5	41.67
January				1			1	2	16.67
February			1			1	2	4	33.33
March	1							1	8.33
Total	2	1	2	2	1	1	3	12	

*Actual computed value rounded to the nearest hundredth.

data contrasts with the non-fatal accident reports which show January as the peak month for accidents.

A relationship is noticeable when comparing days of the week when non-fatal and fatal accidents occurred. Approximately 77 per cent of the non-fatal accidents occurred during the weekend days of Friday, Saturday, and Sunday; while only 50 per cent of the fatalities occurred during these days.

It may be worthy of note to see that each day of the week was represented by at least one fatal accident.

Time of day when fatal accidents occurred.--The time of day when fatal accidents occurred is depicted in Figure 4.11. The period of darkness from 8:01 p.m. to 12:00 p.m. claimed 58.33 per cent of the fatal accidents, and the combined periods of dusk and darkness from 4:01 p.m.

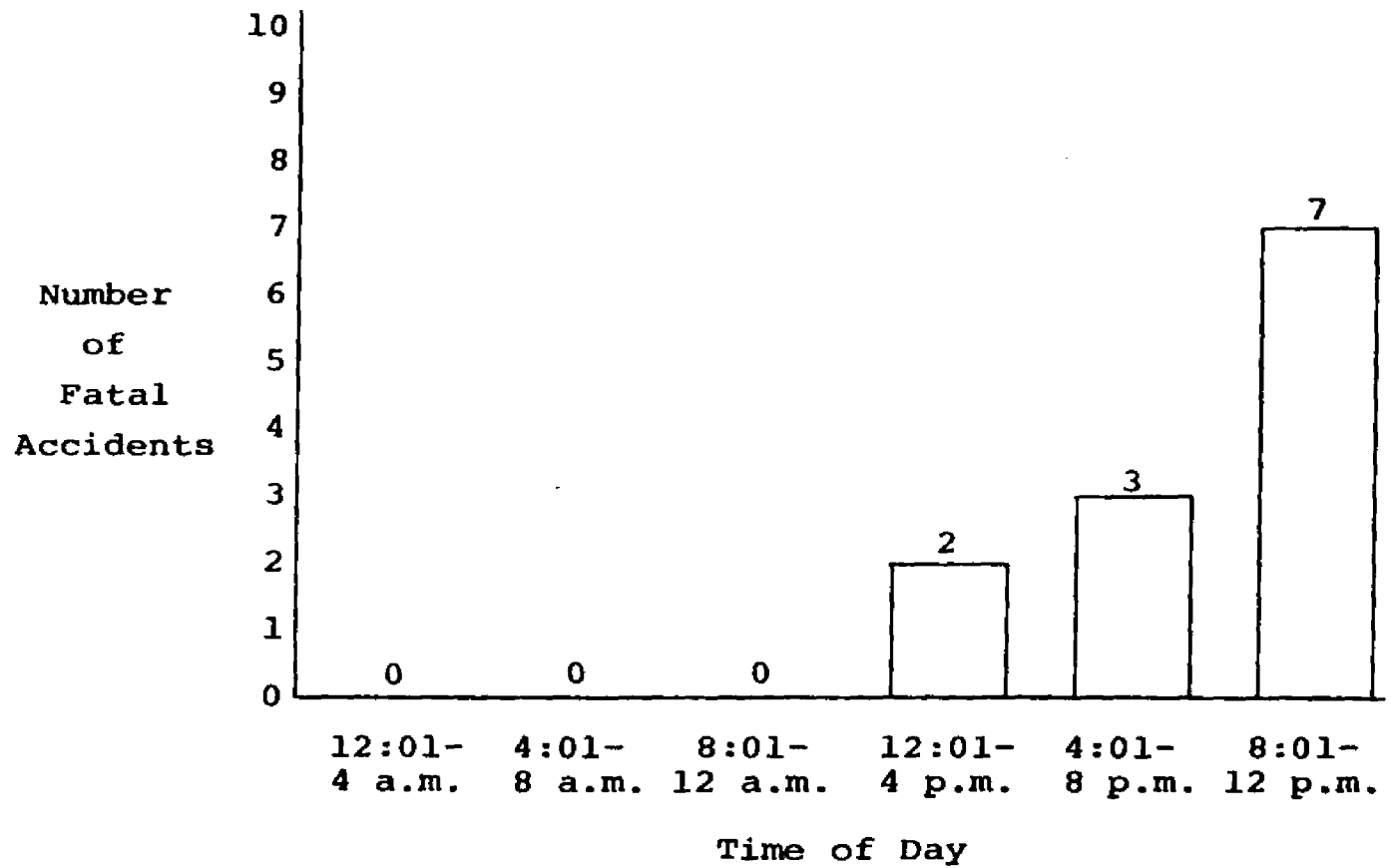


FIGURE 4.11.--Distribution of Fatal Accidents by Time of Day

to 12:00 p.m. accounted for 83.33 per cent of all the fatalities. These same time periods were also very prominent with non-fatal accidents when 55.06 per cent of the accidents were reported. Only three fatal accidents were reported to have occurred under daylight conditions.

Vehicle damage.--Vehicle damage in fatal snowmobile accidents is reported in Table 4.31. Eight of the snowmobiles received considerable damage in the fatal accidents. Three of the eight were reported to be total losses. Three other snowmobiles received minor damage, and the one towing a sled was not damaged.

TABLE 4.31.--Distribution of Vehicle Damage to Snowmobiles Involved in Fatal Accidents

Damage	Vehicles	Per Cent*
Total Loss	3	25.00
Extensive	5	41.67
Minor	3	25.00
None	1	8.33
Total	12	

*Actual computed value rounded to nearest hundredth.

Driver age and sex.--The ages of drivers involved in fatal snowmobile traffic accidents are represented in Figure 4.12. All of the drivers were male. Fifty per cent of the drivers fell between the ages of 25 and 44. This figure is much higher than would be expected, if compared to national automobile driver statistics. However,

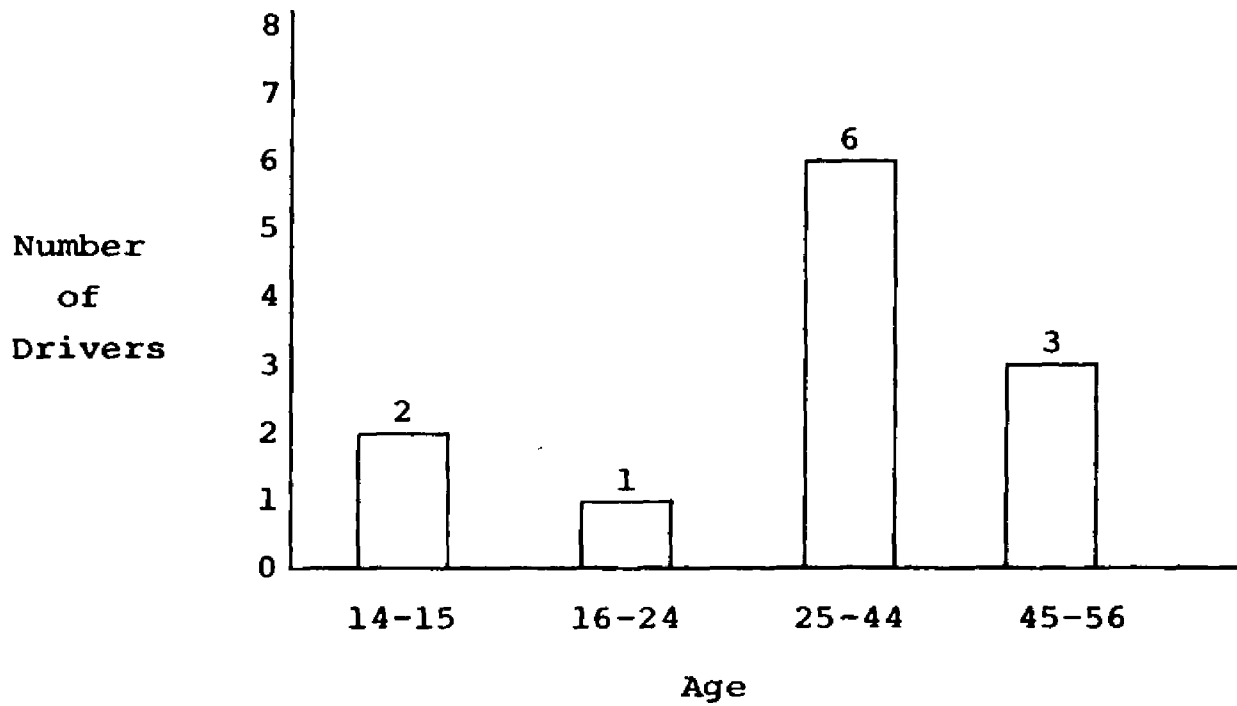


FIGURE 4.12.--Distribution of Drivers in Fatal Snowmobile Traffic Accidents by Age

snowmobile drivers' ages proved to be older when dealing with non-fatal accidents also. It is interesting to note that the six drivers included within this group actually fell in the age group from 30 to 41 years of age. The average age, consequently, was higher than that recorded for non-fatal accidents, 35.33 years of age.

Most surprising is the almost complete absence of drivers in the 16 - 24 years of age group. One 23 year old was listed within this group. However, the non-fatal report also revealed this group to be comparatively small.

Two drivers involved in fatal accidents were under licensing age. Both were males, 14 and 15 years old. The fifteen year old driver was fatally injured in his accident. The fourteen year old was not injured, but a 15 year old passenger was on a sled being towed and was fatally injured.

Causes of fatal injuries.--The cause of death was specifically stated in five of the twelve accident reports. Three were directly related to skull fractures, one passenger on a sled expired because of a fractured curvical vertebra and the other driver due to internal injuries.

Death came instantly to three of the twelve drivers; one lived two days; one lived for 25 days; and five apparently died at the scene or enroute to the hospital.

The female passenger who was thrown into a tree lived for two days. The male passenger on a sled being towed was killed instantly. The driver in both of these cases did not suffer any injury.

Deployment of snowmobiles in fatal accidents.--

In all but one of the fatal accidents, it seems apparent that more alert and prudent operation of the snowmobile could have prevented the accident.

The deployment factors relative to the snowmobile when the accident occurred are listed in Table 4.32. The list shows that fifty per cent of the fatal accidents took place when a snowmobile proceeded to cross the roadway or enter the roadway from a driveway. It should be noted here that one driver was traveling on the railroad tracks and was injured fatally attempting to cross a major highway. Two other snowmobiles hit parked cars, and two more were on the wrong side of the road. Turning procedures were involved in three of the twelve fatal accidents.

It is evident from the non-fatal accident reports that these same deployment factors dominate as causal factors in most snowmobile traffic accidents.

TABLE 4.32.--Distribution of Deployment Factors Most Relevant to the Cause of Snowmobile Fatal Accidents

Deployment Factors	Number	Per Cent*
1. Hillcrest on wrong side of road	1	8.33
2. Crossed center line on curve	1	8.33
3. Hit parked car	2	16.67
4. Came out of driveway	3	25.00
5. Crossing highway	3	25.00
6. Failed to negotiate turn at "T" intersection--hit tree	1	8.33
7. Undetermined cause	1	8.33
Total	12	

*Actual computed value rounded to the nearest hundredth.

Locality of fatal accidents.--The fatal accidents were split equally between urban and rural areas with each accounting for six of the accidents. However, the most important data related to this category is that six, or fifty per cent, of the fatal accidents occurred on a U.S. highway or a Michigan State highway. Four of the other accidents occurred on city streets, and only two fatalities occurred on rural roads.

These statistics vividly point out the danger of operating snowmobiles on regularly traveled roadways.

Law violations.--Table 4.33 contains the list of indicated violations which were recorded on fatal accident reports. Driving on the roadway and driving left

TABLE 4.33.--Distribution of Indicated Violations

Violation	Number	Per Cent*
Drove Left of Center	3	25.00
Drove on Roadway	3	25.00
Speed Too Fast	1	8.33
Failed to Yield Right of Way	2	16.67
Made Improper Turn	1	8.33
Careless Operation	1	8.33
Driving Under the Influence	1	8.33
Total	12	

*Actual computed value rounded to the nearest hundredth.

of center made up fifty per cent of these violations. Both of these violations were prominent in non-fatal accidents also. Excessive speed, which led the non-fatal listings, was named only once in the fatal accident reports.

Driving under the influence was reported in one fatal accident and alcohol was involved in another.

Weather, surface condition, visual obstructions, and vehicle defects involvement in fatal accidents.--

Weather conditions were consistent in all but one fatal accident. Rain was reported in one accident, but the remaining eleven accidents occurred under clear or cloudy weather conditions.

Seven reports listed the surface condition as snowy or icy; three accidents occurred on wet surfaces; and one accident took place on a dry surface.

Visual obstructions were reported in one accident, and one report had this category marked as "unknown." The remaining ten accident reports indicated "no visual obstructions."

Vehicle defects were unknown in seven accidents, probably due to the condition of the snowmobile after the accident. Five accident reports stated "no defects," but one driver, who lived for 25 days after his accident, apparently claimed that the throttle stuck on the snowmobile.

Fatal accident driver records.--There were four driving records unavailable for this study. Two drivers were underage, 14 and 15 years of age, and therefore had no records. One driver was from California, and the other driver had no record of having a Michigan driver's license, although he apparently was a resident of the State and 56 years old.

Two drivers had no accidents or violations recorded. Two drivers had received one citation each, one for reckless driving in 1961, and the other for improper passing in 1964.

Three drivers proved to have extensive driving records. One had been involved in five accidents and received eight citations for varied violations since 1964. He also had his driving restricted for a one year period following a conviction for driving under the influence

of liquor. He was 34 years of age at the time of his fatal accident.

Another driver had seven accidents listed on his record in addition to eleven violations since 1962. Six of his violations were for speeding. He also had his driving privileges lifted for a three month period for driving under the influence of liquor. He was 34 years of age at the time of his fatal accident.

The third driver had been in two accidents and had been issued 21 citations since 1963. His driver's license had been suspended on four different occasions for having an unsatisfactory driving record and had been returned just over two months prior to his fatal accident. He was 23 years of age.

The driver who was operating the snowmobile on which the passenger was killed had been involved in two prior accidents since 1965.

Summary

Presented in Chapter IV was an analysis of the data obtained from 227 non-fatal and 12 fatal 1969-70 snowmobile traffic accident reports obtained from the Michigan State Police, Records Section. Also included in this chapter was an analysis of all readily available driving records of those drivers who were involved in the non-fatal and fatal snowmobile traffic accidents and an analysis of the personal interview questionnaire responses.

The chapter was divided into four major sections: (1) snowmobile registration, (2) the non-fatal snowmobile traffic accident report, (3) the personal interview questionnaire response report, and (4) the fatal snowmobile traffic accident report.

Tables, maps, histograms, and one circle graph were constructed to more vividly show compiled frequencies and percentages.

The major findings were explained for each section and sub-section throughout the chapter.

In Chapter V the summary, conclusions, discussion, and recommendations will be reported.

CHAPTER V

SUMMARY, DISCUSSION AND CONCLUSIONS, AND RECOMMENDATIONS

In the preceding chapter the analysis of the data gathered for this study was presented. In this chapter the following may be found: (1) a summary of the information gathered, (2) discussion and conclusions, (3) general recommendations including recommendations for revision of the Michigan UD-10 accident report forms, and (4) recommendations for further study.

Summary

It was the purpose of this study to find specific factors that were most prominent in snowmobile traffic accidents throughout the State of Michigan during the 1969-70 winter season. The information gained about these factors was to be used to make recommendations for:

(a) the modification of the Michigan State accident report form (UD-10) in order to better report snowmobile accidents; (b) the educational needs of snowmobile drivers; (c) improving upon the snowmobile accident injury ratio; and (d) the reduction in the number of snowmobile accidents.

The data on 1969-70 snowmobile traffic accidents was collected from 227 non-fatal and 12 fatal accident reports on file with the Michigan State Police, Records Section. The driving records were obtained from the Michigan Secretary of State, Driver Records Section.

Information collected from personal interviews was standardized through the use of a questionnaire developed according to the content areas of interest relative to:

1. Driver Exposure
2. Driver Experience
3. Driver Environment
4. Educational Needs

Two "open-ended" questions were included to gain information concerning vehicle defects and probable causes of the accident as revealed by the drivers.

The data was reported in four major categories:

1. Snowmobile Registration
2. Non-fatal Accidents
3. Personal Interview Report
4. Fatal Accidents

The variables used in the study included factors relevant to time, the driver and passengers, the vehicle, injuries, terrain, weather, visibility, and observations recorded by the investigating officer.

Data was tabulated in frequency distributions showing percentages in chart and graphic forms in order to vividly depict the variables.

Non-fatal and fatal accidents were analyzed and reported separately.

Snowmobile Registration

Snowmobile registrations were listed by county showing the number registered and the per cent of the total registered for each county. Registrations seemed to reflect population centers and increased proportionately in the northern lower peninsula and upper peninsula as would be expected due to available operating area and weather conditions. Over 15 per cent of all registrations were credited to counties in the upper peninsula.

Review of the Major Findings in Non-fatal Accidents

There were 227 non-fatal snowmobile traffic accidents recorded in Michigan during the 1969-70 winter season. Eighteen counties did not record any non-fatal snowmobile traffic accidents. However, three of these counties did report a fatal accident.

The upper peninsula accounted for 21.6 per cent of all non-fatal accidents although registering only 15.43 per cent of all vehicles. This could have come about through the fact that many snowmobilers drive in counties

other than the one of their residence. Approximately one-fourth of the drivers who had traffic accidents were not residents of the county where the accident occurred.

Snowmobile accidents began to increase steadily from November and reached a peak in January when 30 per cent occurred. The final accident of the season was recorded on March 29, 1970.

The weekend days of Friday, Saturday, and Sunday accounted for 77.09 per cent of all snowmobile accidents. This figure seems to reflect that the dominant use of snowmobiles is for recreational purposes.

The most dangerous time period for driving a snowmobile was 8:01 p.m. through 12:00 p.m. during which 28.63 per cent of all accidents occurred. The hours from 4:01 p.m. through 4:00 a.m. accounted for 70.48 per cent of the accidents.

Young drivers under licensing age contribute heavily to the number of daylight accidents. These inexperienced drivers had 70 per cent of their accidents on weekend days. The most dangerous time period for this group is from 12:01 p.m. through 4:00 p.m.

Snowmobiles are usually damaged when involved in a traffic accident. During the 1969-70 season 67.37 per cent of snowmobiles involved in traffic accidents reported damage. Front-end damage was most likely to occur and was reported on 38.07 per cent of snowmobiles involved in accidents.

One half of the 227 traffic accidents reported last season were single snowmobile accidents. Snowbanks and ditches present the largest problem to snowmobilers as 34.78 per cent of single vehicle accidents were reportedly caused by these two hazards.

The driver was thrown from his snowmobile in 41.74 per cent of the single snowmobile accidents last season, either falling off after losing control or because the vehicle overturned. One handicapped driver was involved in a single vehicle accident.

Snowmobiles collided with other motor vehicles, including 12 snowmobiles, on 112 occasions or 49.34 per cent of all traffic accidents. Parked cars seem to be the greatest hazard to snowmobilers in this category. On 27 occasions--almost one-fourth of the collisions in this group--a snowmobile hit a parked vehicle.

Snowmobiles were involved in head-on collisions in 11 different accidents. Eighteen were hit crossing the roadway and fourteen were involved in accidents when they were traveling on the wrong side of the road.

The average age of all snowmobilers involved in traffic accidents was 27.69 years of age.

One hundred ninety-five male drivers were involved in 184 of the 227 accidents last season. Forty male drivers, or 20.51 per cent, were under licensing age. The youngest male driver was 9 years old and the oldest 63 years of age. The average male age was 26.56 years.

Thirty-two female drivers were involved in accidents. Their average age was 34.77 years. The female drivers were almost devoid of a middle age group. They primarily fell into the young group (under 22) or the older group (37 through 55 years of age). Four females were under licensing age, the youngest being 12 years old.

Seventy per cent of all drivers involved in accidents during 1969-70 were injured, and 42.29 per cent of the injuries were serious. Male drivers were more frequently seriously injured than female drivers.

Leg and head injuries, respectively, were mentioned most frequently as the kind of injury suffered by drivers.

Passengers were injured in 64.56 per cent of the 79 accidents that involved them. Forty-one males and thirty-eight females were injured. Three females and one male were passengers on a sled being towed.

More serious injuries were reported for passengers than any other kind, and leg injuries were most often mentioned on the accident report.

The male passenger median age was 15 years old. The female median age was 26 years old.

Three pedestrians were hit by snowmobiles and all three were seriously injured. The pedestrians were hit while they were in the driving lanes of the road.

Fifty-seven per cent of all accidents occurred during the hours of darkness.

Although most accidents occurred on rural roads or roadways, 29.96 per cent occurred in urban residential areas.

A straight course was being followed by 68.28 per cent of the drivers prior to their accident; however, 28.63 per cent were involved in a turning maneuver.

Accident reports revealed that snowmobilers had violated a law in 57.28 per cent of their accidents. Although 184 law violations were indicated on the accident reports, only 53 drivers were actually cited. Excessive speed was the most prominent violation, accounting for 33.69 per cent of the total number. Nine drivers had estimated speeds in excess of 45 m.p.h. One driver had an estimated speed of 70 m.p.h.

Accident reports show that 21.76 per cent of snowmobile drivers had been drinking. One driver was reported to be "under the influence" but was not cited.

Vehicle defects were recorded in 8.78 per cent of the accident reports. Throttle problems dominated this category, followed by lighting and brake defects.

Review of the Major Findings in the Driver Records Report

Driving records revealed that 42.26 per cent of licensed drivers had clear records. One-third of the drivers had previous accidents and/or violations. However, 51.47 per cent of the drivers were under licensing age or had a driving record.

Those who had a driving record averaged having one accident and over two violations per driver.

Three of the thirty-two female drivers had a driving record.

Five males had convictions for being "under the influence" on their records.

Review of the Major Findings in the Personal Interview Report

Twenty-three personal interviews were reported. Respondents were chosen on the basis of geographical representation throughout the State, sex, age, and the accident experience of the county.

All respondents reported using their snowmobiles primarily for recreational purposes.

Of all drivers interviewed, 73.92 per cent reported that they rode snowmobiles 11 hours or more per week. They usually rode on weekends during the hours of 8:01 p.m. through 12:00 p.m.

The interviews revealed that 47.82 per cent of these drivers had only three months or less experience. Five of the seven females reported two months or less snowmobile driving experience prior to their accident.

The two under licensing age drivers both reported 24 months of driving experience.

A major portion--over 86 per cent--of the drivers reported riding on a snowmobile trail prior to the

accident although they were on the road or road right-of-way at the time of the accident.

Some kind of safety equipment was worn by 47.83 per cent of the drivers; however, only two of the twenty-three drivers wore helmets, goggles, and protective clothing.

Most drivers, 69.57 per cent, received verbal instruction only prior to driving a snowmobile for the first time.

Less than one hour of instruction prior to driving a snowmobile was reported by 89.96 per cent of the drivers.

Over three-fourths (78.26 per cent) of the drivers reported that most of their driving was done in their home county.

Of the drivers interviewed, 47.83 per cent had not taken a basic driver education course.

Most of the drivers, 56.52 per cent, did not have insurance coverage on their snowmobile.

Insufficient lighting and throttle problems were most often mentioned as vehicle defects contributing to the cause of accidents.

The drivers revealed that their own carelessness was the major cause for most accidents.

Review of the Major Findings in the Fatal Accidents

Twelve, or 66.67 per cent, of the 18 fatal snowmobile accidents reported last season occurred on a public road.

Nine of the twelve fatal accidents involved a motor car traveling on a public road. Only two fatalities were single snowmobile accidents.

All except one of the fatal traffic accidents occurred in the more-populated lower peninsula of the State.

Fifty per cent of the fatal accidents occurred on the weekend days, and 58.33 per cent of the fatalities occurred in the hours of darkness between 8:01 p.m. and 12:00 p.m. The time period of 4:01 p.m. to 12:00 p.m. accounted for 83.33 per cent of the fatal traffic accidents.

All drivers in the fatal accidents were male and most were 30 years of age or older. The oldest driver was 56 years old, and two were under licensing age. The youngest was 14 years old.

Two of the persons fatally injured were passengers, one on the snowmobile and the other on a sled being towed.

Fifty per cent of the fatal accidents occurred when snowmobiles entered the road from a driveway or were attempting to cross a road.

Fifty per cent of the fatal accidents occurred on a U.S. or State highway. Four fatalities occurred on city streets.

Alcohol was reported to be involved in two fatal accidents.

One fatal accident report placed the responsibility for the accident on a vehicle defect.

Three drivers involved in the twelve fatal accidents had extensive driving records.

Discussion and Conclusions

The findings of this study seem to indicate that the problems of snowmobiling, although still in its infant stage, are not being adequately met by snowmobile drivers, enforcement agencies, manufacturing companies, state licensing agencies or legislators. Each of these groups has a responsibility to snowmobiling and should become involved immediately.

The tremendous increase in registrations has only begun. Sales have skyrocketed during the past few years and, consequently, have lured over 60 manufacturers producing more than 400 different models into the field. Many snowmobiles, that are running presently, have not been properly registered, which was indicated by the 8.15 per cent which were involved in traffic accidents and were not registered.

The snowmobile has been presented to the public as a "fun" machine built for winter recreation. Misuse caused by many inexperienced drivers, who have treated the operation of the snowmobile too casually, has brought about numerous unnecessary deaths and injuries that could very

well have been avoided through proper training and understanding about the operation and limitations of the machine.

Manufacturers are to be admonished about their concern for safety. The stability and control required to keep the snowmobile upright in critical unexpected turning maneuvers must be improved in order to reduce the many accidents caused by these deficiencies. Insufficient lighting and throttle control problems are also areas that manufacturers must improve to provide a safe vehicle for customers. Lighting is of particular concern because of the great amount of snowmobile operation during the hours of darkness. Throttle problems were directly related to one death and nine non-fatal accidents.

It also seems apparent from personal interviews with driver-owners, that safe operational instructions do not appear to be included in each sales transaction as frequently as care and maintenance information.

Law enforcement agencies appear to notice many snowmobile driver violations but seldom cite them, even when accidents occur. It appears that the mandate is not clearly evident to these agencies that action is expected from them to enforce the State Snowmobile Regulations.

State licensing agencies have a tremendous job to do with the registration process involved with each vehicle and are progressing well. However, it would seem that at

this point insufficient emphasis has been placed upon the necessity for drivers to know and adhere to the State regulations that apply to snowmobilers.

Legislators have indicated their awareness of the need for effective legislation to control the use of snowmobiles through the Snowmobile Registration Act of 1968. This law has probably reduced the number of accidents and injuries that would have occurred had there been no law. However, because of the accident experiences recorded during the past two years, it is apparent that legislators must determine whether continued dependence upon this 1968 law will bring about a desirable reduction in snowmobile accidents.

Recommendations

It is the considered feelings of the researcher that safe and enjoyable snowmobiling in the State of Michigan can best be facilitated if the following recommendations are instituted:

1. The State Legislature should enact into law snowmobile regulations that will:
 - a. Set a minimum age limit for operators of snowmobiles.
 - b. Further restrict the use of snowmobiles on U.S., State, and County highways, and regularly traveled city streets and rural roads.

- c. Designate areas for unrestricted use of snowmobiles.
 - d. Require safety helmets and goggles to be worn by all snowmobile operators.
2. That manufacturers or their sales representatives accept the responsibility for:
- a. Requiring every snowmobile manufacturer to develop and include with each sale an owner's guide which will contain directions for the safe operation of that particular model snowmobile and general information on snowmobile safety.
 - b. Continuous research and development of better safety equipment and design for snowmobiles and to incorporate these improvements into each new model.
 - c. Initiating a program through the International Snowmobile Industry Association which will provide snowmobile safety information to the general public through the public media.
3. Law enforcement agencies should more vigorously enforce snowmobile regulations.
4. That the Michigan UD-10 Accident Report form be revised to include the following information:
- a. Snowmobile horse-power.
 - b. Size and number of tracks on the snowmobile.

- c. Months of snowmobile driving experience by the operator.
 - d. Whether the snowmobile was owned, rented, or borrowed by the driver.
 - e. Specify the "surface traveled upon" to be dry, ice, or snow and depth of the snow.
 - f. Maneuver being attempted by the driver, i.e., crossing the road.
 - g. Snowmobile registration number.
 - h. Whether passenger was an occupant of the snowmobile or was being towed on another vehicle.
 - i. Any physical handicaps of the driver.
 - j. Insurance coverage on the vehicle and driver.
5. The public schools should consider providing the following programs for the training and safety of snowmobile drivers:
- a. An after-school voluntary snowmobile driver training program.
 - b. A snowmobile driver training program offered through an adult education program.
 - c. Assembly programs for all students relevant to safe snowmobiling.

Recommendations for Further Study

1. A parallel study should be done on non-traffic snowmobile accidents.
2. An appropriate study of the various state snowmobile laws is needed to provide legislators with adequate information for making decisions pertaining to future snowmobile legislation.
3. A study of various kinds of snowmobile safety equipment to increase the safe operation of the machine appears to be necessary.
4. Studies are also needed which will assess the effects of snowmobile operation on wilderness flora and fauna.

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APPENDICES

APPENDIX A

MICHIGAN STATE POLICE ACCIDENT

REPORT FORM UD-10

STATE OF MICHIGAN OFFICIAL TRAFFIC ACCIDENT REPORT

No. of sheets attached.....		Department.....		Complaint No.....	
TIME	Date..... 19..... Day of Week..... at..... A.M..... P.M.....			File Class Number.....	
LOCATION	County..... City..... Twp..... Sec.....		Highway or street on which accident occurred (Name)..... Trunkline No..... County Road No.....		
	AT ITS INTERSECTION WITH (street, highway or R. R. crossing).....				
	OR				
	IF NOT AT INTERSECTION: (feet or miles or fractions thereof).....		N S E W		
of (intersecting street, highway, city, village, county line or R.R.)..... Special reference..... Use to indicate more precise location: valley, house number, stream, milepost, underpass, or other landmark.					
Damage to property other than vehicles..... Name object and state nature of damage In roadway ☐ , or feet from N S E W edge of roadway Name and address of owner of object struck.....			CODE OF INJURY (Use only the most serious one in each space for injury.) K - Dead A - Visible signs of injury, as bleeding wound or distorted member, or had to be carried from scene. B - Other visible injury, as bruises, abrasions, swelling, limping, etc. C - No visible injury but complaint of pain or momentary unconsciousness. D - No indication of injury.		
VEHICLE NO. 1	Year..... Make..... Type.....		Year, No., & State of Reg.....		ICC No..... MPSC No.....
	Parts of vehicle damaged.....		Vehicle removed to:.....		By:.....
	Owner.....		St. or RR.....		City..... State.....
	Driver.....		St. or RR.....		City, County, State.....
	Driver's License.....		Reg. Op. Lic. ☐		Date of Birth.....
	State..... Number.....		Other ☐		Specify Type and/or Restrictions..... Month, Day, Year.....
	OCCUPANTS				AGE SEX INJURY
	Front Center.....		Address.....		
	Front Right.....		Address.....		
	Rear Left.....		Address.....		
VEHICLE NO. 2, Pedestrian or Bicycle	Year..... Make..... Type.....		Year, No., & State of Reg.....		ICC No..... MPSC No.....
	Parts of vehicle damaged.....		Vehicle removed to:.....		By:.....
	Owner.....		St. or RR.....		City..... State.....
	Driver.....		St. or RR.....		City, County, State.....
	Driver's License.....		Reg. Op. Lic. ☐		Date of Birth.....
	State..... Number.....		Other ☐		Specify Type and/or Restrictions..... Month, Day, Year.....
	OCCUPANTS				AGE SEX INJURY
	Front Center.....		Address.....		
	Front Right.....		Address.....		
	Rear Left.....		Address.....		
Injured taken to..... By.....					
WEATHER (Check one) ☐ Clear or cloudy ☐ Raining ☐ Snowing ☐ Fog ☐ Other (specify).....		LIGHT CONDITION (Check one) ☐ Daylight ☐ Dusk or dawn ☐ Darkness		KIND OF LOCALITY (Check one) ☐ Mfg or industrial ☐ Shopping or business ☐ Apartments ☐ School or playground ☐ One family homes ☐ Farms, fields ☐ Not developed	
CONSTRUCTION (Check one) ☐ Concrete ☐ Blacktop ☐ Gravel ☐ Dirt or sand ☐ Other (specify).....		SURFACE (Check one) ☐ Dry ☐ Wet ☐ Snowy or icy ☐ Other (specify).....		CHARACTER (Check two) ☐ Straight road ☐ Curve ☐ Level ☐ On grade ☐ Hillcrest	
				CONDITION (Check one) ☐ Defect (describe)..... Low shoulder, slippery when wet, etc. ☐ No defect	
WITNESSES	Name.....		Address.....		Age..... Sex.....
	Name.....		Address.....		Age..... Sex.....
	Name.....		Address.....		Age..... Sex.....

This form is prescribed by Commissioner, Michigan State Police pursuant to Section 622, Act 300, P.A. 1949, as amended.

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ALL APPLICABLE SCHEDULES MUST BE CHECKED. OFFICER'S CONSIDERED OPINION SHOULD BE GIVEN IF FACTS ARE NOT OBTAINABLE.

WHAT DRIVERS WERE GOING TO DO BEFORE ACCIDENT				ROAD TYPE (Check one or more for each driver)	
Driver No. 1 was headed N S E W on _____ at _____ MPH		Street or Highway		Driver 1 2	
Driver No. 2 was headed N S E W on _____ at _____ MPH				☐ 1 driving lane ☐ 2 driving lanes ☐ 3 driving lanes ☐ 4 or more lanes ☐ Divided roadway (limited access) ☐ Divided roadway (other) ☐ One way street ☐ Unpaved - any width	
DRIVER ☐ 1 ☐ 2 (Check one for each driver) ☐ Go straight ahead ☐ Overtake ☐ Make right turn ☐ Make left turn ☐ Make U turn ☐ Slow or stop ☐ Start in traffic lane ☐ Start from parked position ☐ Back ☐ Remain stopped in traffic lane ☐ Remain parked					
WHAT PEDESTRIAN WAS DOING Pedestrian was going N S E W ☐ Along ☐ Across or into _____ From _____ To _____ (Check one) Street Name, Highway No. N.E. corner to S.E. corner, or west to east side, etc.					
☐ Crossing or entering at intersection ☐ Crossing or entering not at intersection ☐ Getting on or off vehicle ☐ Walking in roadway—with traffic ☐ Walking in roadway—against traffic ☐ Standing in roadway ☐ Pushing or working on vehicle ☐ Other working in roadway ☐ Playing in roadway ☐ Other in roadway ☐ Not in roadway					
VIOLATION INDICATED (Check one or more for each driver) DRIVER ☐ 1 ☐ 2 Speed too fast ☐ Failed to yield right of way ☐ Drove left of center ☐ Improper overtaking ☐ Passed stop sign ☐ Disregarded traffic signal ☐ Followed too closely ☐ Made improper turn ☐ Improper or no signal ☐ Improper parking location ☐ Other improper driving (describe) _____ ☐ No violation indicated			APPARENT PHYSICAL CONDITION (Check one or more as applicable) DRIVER ☐ 1 ☐ 2 PED. ☐ Ill ☐ Fatigued ☐ Asleep ☐ Other impairment (describe) _____ ☐ Normal ☐ Condition not known ☐ Restriction on license complied with ☐ Restriction on license not complied with (describe) _____		
DRINKING CONDITION (Check one) DRIVER ☐ 1 ☐ 2 PED. HAD BEEN DRINKING ☐ Under the influence ☐ Not under the influence ☐ Influence not known ☐ HAD NOT BEEN DRINKING ☐ NOT KNOWN IF DRINKING ☐ CHECK IF APPLICABLE ☐ Chemical test given VISION OBSTRUCTION (Check one or more for each driver) DRIVER ☐ 1 ☐ 2 ☐ Windshield or windows (describe) _____ ☐ Bldgs., signs, bushes, crops, embankment, parked cars, etc. (describe) _____ ☐ No vision obstruction		VEHICLE CONDITION (Check one or more) VEHICLE ☐ 1 ☐ 2 ☐ Defective brakes ☐ Defective lights ☐ Defective steering ☐ Defective tires ☐ Other defective equipment (specify) _____ ☐ Not known if defective ☐ No defect		TRAFFIC CONTROL (Check one or more) ☐ Stop sign ☐ Stop and go signal ☐ Officer or watchman ☐ R.R. gates or signals ☐ Other (specify) _____ ☐ Control not functioning, inadequate or obscured (describe) _____ ☐ No traffic control present	
INDICATE ON THIS DIAGRAM WHAT HAPPENED 1. Draw heavy lines to show streets 2. Name streets 3. Draw arrow pointing north 4. Show veh. and ped. thus: Vehicles → 1 2 ← Pedestrians ○ ← 5. Show angle of collision INDICATE NORTH BY ARROW N					
REMARKS AND RECOMMENDATIONS Inspect scene for need of traffic engineering? ☐ Yes (explain) Re-examine driver for license competency? ☐ #1 ☐ #2 (explain) 					
POLICE RECORD Arrest: Name _____ Charge _____ Arrest: Name _____ Charge _____ Reported by (name) _____ Address _____ Date received _____ Time _____ ☐ AM ☐ PM Report received by (officer) _____ Investigator _____ Signature and Rank _____ Badge No. _____ Station or Department _____ Investigated at scene? ☐ Yes ☐ No Photographs taken? ☐ Yes ☐ No Complaint closed by: ☐ Arrest ☐ Other Date _____ Post No. _____					

Use complaint form or sheet of paper for more extensive remarks or diagram

APPENDIX B

**LIST OF QUESTIONS ACCORDING TO
CONTENT AREA OF INTEREST**

PERSONAL INTERVIEW QUESTIONNAIRE
ACCORDING TO CONTENT AREA
OF INTEREST

General Statement: To identify those characteristics which will help in forming a more complete profile of snowmobile drivers who have been involved in accidents, as they pertain to driver exposure, experience, environment, and educational needs.

Specific Objectives

A. To determine driver exposure.

Questions

2. How many hours do you generally drive per week during the season?
___ 0-10 ___ 10-20 ___ 20-30 ___ 31 and above
3. What time of the day do you usually drive?
___ 8-12 a.m. ___ 12-4 p.m. ___ 4-8 p.m.
___ 8-12 p.m. ___ 12-8 a.m.
4. For what primary purpose do you use your snowmobile?
___ Recreation ___ Racing ___ Work
5. Do you drive a snowmobile everyday during the season?
___ Yes ___ No
6. What days of the week do you do most of your driving?
___ None ___ Su ___ M ___ T
___ W ___ T ___ F ___ Sa

7. Had you been driving a prolonged period of time on the day of the accident?

☐ 0-2 hrs. ☐ 2-4 hrs. ☐ 4-6 hrs. ☐ over 6 hrs.

B. To determine driver experience.

Questions

1. How much experience in driving a snowmobile did you have prior to your accident?

☐ Mos.

9. How many hours of instruction did you receive before driving a snowmobile by yourself?

☐ None ☐ Less than 1 hr. ☐ 1 hr.

☐ 2 hrs. ☐ 3 hrs. or more

16. Is this the first time you have driven your snowmobile in the area where the accident happened?

☐ Yes ☐ No

C. To determine driving environment.

Questions

8. How deep was the snow that you were operating in prior to the accident?

☐ Packed ☐ 1-6 inches ☐ 6-12 inches

☐ Over 12 inches

14. Do you usually drive your snowmobile in the county of your residence?

☐ Yes ☐ No

15. In what county is your snowmobile registered?

☐ Residence ☐ Other

17. Were you driving on a trail or where other snowmobiles had traveled?

☐ Yes ☐ No

19. Were you wearing any safety protective equipment?
☐ No ☐ Helmet ☐ Goggles ☐ Clothing

D. To determine educational needs.

Questions

10. What kinds of instruction did you receive?
☐ Verbal ☐ Behind-the-wheel ☐ NA
11. Who gave you the instruction?
☐ Dealer ☐ Parent ☐ Friend ☐ NA
12. Have you taken a basic driver education course?
☐ Yes ☐ No
13. Are you familiar with the Michigan law pertaining to snowmobiles?
☐ Yes ☐ No
18. Did you have insurance coverage on your snowmobile?
☐ Yes ☐ No

The "open-ended" questions included in the questionnaire:

20. Was there anything physically or mechanically wrong with the snowmobile that you feel helped cause the accident?
21. Describe the major causes of your accident.

APPENDIX C

SNOWMOBILE DRIVER PROFILE

QUESTIONNAIRE

SNOWMOBILE DRIVER PROFILE QUESTIONNAIRE

FOR PERSONAL INTERVIEW

1. How much experience in driving a snowmobile did you have prior to your accident?
___ Mos.
2. How many hours do you generally drive per week during the season?
___ 0-10 ___ 11-20 ___ 21-30 ___ 31 and above
3. What time of the day do you usually drive?
___ 8-12 a.m. ___ 12-4 p.m. ___ 4-8 p.m. ___ 8-12 p.m.
___ 12-8 a.m.
4. For what primary purpose do you use your snowmobile?
___ Recreation ___ Racing ___ Work
5. Do you drive a snowmobile every day during the season?
___ Yes ___ No
6. What days of the week do you do most of your driving?
___ None ___ Su ___ M ___ T ___ W ___ T ___ F ___ Sa
7. Had you been driving a prolonged period of time on the day of the accident?
___ 0-2 hrs. ___ 2-4 hrs. ___ 4-6 hrs. ___ Over 6 hrs.
8. How deep was the snow that you were operating in prior to the accident?
___ Packed ___ 1-6 inches ___ 6-12 inches

9. How many hours of instruction did you receive before driving the snowmobile by yourself?
☐ None ☐ Less than 1 hr. ☐ 1 hr.
☐ 2 hrs. ☐ 3 hrs. or more
10. What kind of instruction did you receive?
☐ Verbal ☐ Behind-the-wheel ☐ NA
11. Who gave you the instruction?
☐ Dealer ☐ Parent ☐ Friend ☐ NA
12. Have you taken a basic driver education course?
☐ Yes ☐ No
13. Are you familiar with the Michigan law pertaining to snowmobiles?
☐ Yes ☐ No
14. Do you usually drive your snowmobile in the county of your residence?
☐ Yes ☐ No
15. In what county is your snowmobile registered?
☐ Residence ☐ Other
16. Is this the first time you have driven your snowmobile in the area where the accident happened?
☐ Yes ☐ No
17. Were you driving on a trail or where other snowmobiles had traveled?
☐ Yes ☐ No
18. Did you have insurance coverage on your snowmobile?
☐ Yes ☐ No
19. Were you wearing any safety protective equipment?
☐ No ☐ Helmet ☐ Goggles ☐ Clothing

20. Was there anything physically or mechanically wrong with the snowmobile that you feel helped cause the accident?

21. Describe the major causes of your accident.

APPENDIX D
SNOWMOBILE REGISTRATION
ACT OF 1968

STATE OF MICHIGAN

Snowmobile Registration Act of 1968

(Act 74 – P.A. 1968)



AN ACT to register and regulate snowmobiles.

The People of the State of Michigan enact:

Sec. 1. As used in this act:

- (a) "Operator" means any person who operates or is in actual physical control of a snowmobile.
- (b) "Owner" means any person, other than a lienholder, having the property in or title to a snowmobile entitled to the use or possession thereof.
- (c) "Operate" means to ride in or on and to control the operation of a snowmobile.
- (d) "Person" means an individual, partnership, corporation, the state and any of its agencies or subdivisions, and any body of persons whether incorporated or not.
- (e) "Snowmobile" means any motorized vehicle designed for travel primarily on snow or ice steered by wheels, skis or runners.
- (f) "Snowmobile dealer" means any person engaged in the sale of snowmobiles.
- (g) "Highway or street" means the entire width between the boundary lines of every way publicly maintained when any part thereof is open to the use of the public for purposes of vehicular travel.
- (h) "Roadway" means that portion of a highway improved, designated, or ordinarily used for vehicular travel. If a highway includes 2 or more separate roadways the term roadway refers to any such roadway separately, but not to all such roadways collectively.

Sec. 2. Snowmobiles are exempt from all taxes and fees imposed on vehicles under the provisions of Act No. 300 of the Public Acts of 1949, as amended, being sections 257.1 to 257.923 of the Compiled Laws of 1948.

Sec. 3. Except as otherwise provided, no snowmobile shall be operated within this state unless registered by the owner as provided in this act. No registration is required for a snowmobile operated exclusively on lands owned or under the control of the snowmobile owner.

Sec. 4. Beginning January 1, 1969 and each 3 years thereafter, the owner of each snowmobile requiring registration by this state shall file an application for registration with the secretary of state on forms provided by him. The application shall be signed by the owner of the snowmobile and shall be accompanied by a fee of \$5.00 if submitted in the first year of the 3-year registration period; \$3.00 if submitted in the second year, and \$2.00 if submitted in the third year. Upon receipt of the application in approved form, the secretary of state shall enter it upon the records of his office and issue to the applicant a certificate of registration containing the number awarded to the snowmobile, the name and address of the owner and such other information as the secretary of state deems necessary. The certificate of registration shall be pocket size and shall accompany the vehicle and be made available for inspection upon demand by any peace officer.

Sec. 5. (1) The owner of any snowmobile having been issued a certificate of registration for the snowmobile shall paint on or attach in a permanent manner to each side of the forward half of the snowmobile the identification number in block characters of good proportion, not less than 3 inches in height, reading from left to right. The numbers shall contrast so as to be distinctly visible and legible. No number other than the number awarded to a snowmobile under this act, or granted reciprocity under this act, shall be painted, attached or otherwise displayed on either side of the forward half of the snowmobile.

(2) There may be issued not earlier than 90 days prior to the expiration date of a certificate a registration renewal decal or other device indicating that the certificate of registration is in full force and effect. Display of the decal or other device shall be as prescribed by rule adopted by the secretary of state.

(3) Initial certificates of registration awarded pursuant to this act shall expire on December 31, 1971, and thereafter certificates of registration and renewals thereof shall expire at the end of each 3-year interval from December 31, 1971, unless sooner canceled.

Sec. 6. (1) The owner of any snowmobile shall notify the secretary of state within 15 days if the snowmobile is destroyed or abandoned, is sold or an interest therein transferred either wholly or in part to another person, or if his address no longer conforms to the address appearing on the certificate of registration. The notice shall consist of a surrender of the certificate of registration on which the proper information shall be noted on a place to be provided. When the surrender of the certificate is by reason of the snowmobile being destroyed or abandoned, the secretary of state shall cancel the certificate and enter such fact in his records and the number may be then reassigned.

(2) If the surrender is by reason of a change of address on the part of the owner, the new address shall be recorded by the secretary of state and upon payment of a fee of \$1.00 a certificate of registration bearing such information shall be returned to the owner. The transferee of a snowmobile registered under this act, within 15 days after acquiring it, shall make application to the secretary of state for transfer to him of the certificate of registration issued to the snowmobile, giving his name, address and the number of the snowmobile and pay to the secretary of state a fee of \$1.00. Upon receipt of the application and fee the secretary of state shall transfer the certificate of registration issued for the snowmobile to the new owner. Unless the application is made and the fee paid within 15 days, the snowmobile shall be deemed to be without certificate of registration and a person shall not operate the snowmobile until a certificate is issued.

(3) If any certificate of registration is lost, mutilated or illegible, the owner of the snowmobile may obtain a duplicate of the certificate upon application and payment of a fee of \$2.00.

Sec. 7. A snowmobile dealer or manufacturer, upon application to the secretary of state upon forms provided by him, may obtain certificates of registration for use in the testing or demonstrating of such snowmobile upon payment of \$10.00 for each registration. Certificates of registrations so issued may be used by the applicant only in the testing or demonstrating of snowmobiles by temporary placement of the numbers on the snowmobile being tested or demonstrated. Any 1 certificate issued pursuant to this section may be used on only 1 snowmobile at any given time. The temporary placement of numbers shall be as prescribed by this act or rules adopted hereunder.

Sec. 8. The department of state may award any certificate of number directly or may authorize any person to act as its agent for the awarding thereof. All records of the department of state made or kept pursuant to this act shall be public records except as otherwise provided herein.

Sec. 9. (1) A dealer shall maintain in safe operating condition all snowmobiles, rented, leased or furnished by him. The dealer, his agents or employees shall explain the operation of the snowmobile being rented, leased or furnished and if such dealer, his agent or employee believes the person to whom the snowmobile is to be rented, leased or furnished is not competent to operate such snowmobile with competency to himself and to the safety of others, he shall refuse to rent, lease or furnish the same.

(2) Any dealer renting, leasing or furnishing any snowmobile shall carry a policy of liability insurance subject to limits exclusive of interests and costs, with respect to such snowmobile, as follows: \$10,000.00 because of bodily injury to or death of 1 person in any 1 accident and subject to said limit for 1 person, \$20,000.00 because of bodily injury to or death of 2 or more persons in any 1 accident, and \$5,000.00 because of injury to or destruction of property or others in any 1 accident, or the alternative, demand and be shown proof that the person renting, leasing or being furnished a snowmobile carries liability policy of at least the type and coverage as specified above.

Sec. 10. A snowmobile registered in another state or in a province of Canada to a nonresident of this state may be operated within the state under authority of such registration not to exceed 20 days.

Sec. 11. The revenue received under this act shall be deposited in the state treasury. The legislature may make annual appropriations to the several state agencies responsible for administration of the provisions of this act to implement its provisions and to the department of conservation for the development and maintenance of snowmobile trails on lands under the control of the department.

Sec. 12. No person shall operate a snowmobile upon the main traveled portion of any roadway, as defined in section 55 of Act No. 300 of the Public Acts of 1949, being section 257.55 of the Compiled Laws of 1948, or on a highway or street within 10 feet of such roadway with the following exceptions:

(a) Properly registered snowmobiles may cross public highways, except limited access highways and freeways as defined in Act No. 300 of the Public Acts of 1949 if such crossing can be made in safety and it does not interfere with the free movement of vehicular traffic approaching from any direction on such highway. The snowmobile operator shall yield the right of way to all vehicular traffic upon any highway.

(b) Snowmobiles may be operated on highways in the county road systems which are not maintained for winter wheel vehicular traffic by removal of snow.

(c) Snowmobiles may be operated on a street and highway during a period of emergency, when so declared by a police agency having jurisdiction, when travel by conventional automotive equipment is not possible.

(d) Snowmobiles may be operated on the highways within the restrictions set forth herein for the purposes of crossing bridges and culverts.

(e) Snowmobiles may be operated on county highways not having 10 or more feet of traversable right of way outside the traveled portion of the roadway as far off the roadway as possible.

(f) Snowmobiles may be operated on a street or highway for a special snowmobile event of limited duration which is conducted according to a prearranged schedule under permit from the governmental unit having jurisdiction.

(g) Whenever it is impractical to gain immediate access to an area adjacent to a public highway where a snowmobile is to be operated, the vehicle may be operated adjacent and parallel to the highway for the purpose of gaining access to the area of operation. This subsection shall apply to the operation of a snowmobile from the point where the vehicle is unloaded from a motorized conveyance to and from the area where the snowmobile is to be operated when loading and unloading cannot be effected in the immediate vicinity of the area of operation without causing a hazard to vehicular traffic approaching

from either direction on the highway. Loading or unloading must be accomplished with due regard to safety at the nearest possible point to the area of operation.

Sec. 13. No snowmobile shall be operated in this state unless it has at least 1 headlight, 1 taillight and adequate brakes capable of producing deceleration at 14 feet a second on level ground at a speed of 20 miles an hour.

Sec. 14. Any city or village may pass an ordinance regulating the operation of snowmobiles if the ordinance meets substantially the minimum requirements of this act.

Sec. 15. No person shall operate a snowmobile:

(a) At a rate of speed greater than is reasonable and proper having due regard for conditions then existing.

(b) While under the influence of intoxicating liquor or narcotic drugs, barbitol or any derivative of barbitol.

(c) During the hours from $\frac{1}{2}$ hour after sunset to $\frac{1}{2}$ hour before sunrise without displaying a lighted headlight and a lighted taillight.

(d) In any nursery, planting area, or natural area of forest reproduction and when growing stock may be damaged.

(e) Unless it is equipped with a muffler in good working order and in constant operation to prevent excessive or unusual noise and annoying smoke.

(f) While transporting thereon a bow or a firearm unless the same be securely encased.

Sec. 16. The operator of a snowmobile involved in an accident resulting in injuries to or death of any person, or property damage in an estimated amount of \$100.00 or more, or some person acting for him, or the owner of the snowmobile having knowledge of the accident, shall immediately by the quickest means of communication notify a state police officer or officers, or the sheriff's office of the county wherein the accident occurred, or to the office of the police department of the municipality wherein the accident occurred.

Sec. 17. Any person who violates the provisions of this act is guilty of a misdemeanor.

Sec. 18. This act shall take effect on September 1, 1968.

This act is ordered to take immediate effect.

SNOWMOBILE REGISTRATION UNIT
FINANCE DIVISION
MICHIGAN DEPARTMENT OF STATE
Lansing, Michigan 48918

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