EXPOSURE CHARACTERISTICS OF NORTH CAROLINA MOPED RIDERS

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ABSTRACT

The primary purpose of this study has been to collect and analyze moped exposure data specific to North Carolina. The objectives were to:

1. Identify basic exposure characteristics such as demographics of the moped rider, trip purpose, mileage, etc.;
2. Develop specific mileage exposure data with respect to both trip purpose and type of roadway traveled; and
3. Obtain rider opinions concerning moped safety and current law regulating the moped in North Carolina.

Two questionnaires were used to elicit responses from riders identified from warranty card data supplied by the leading manufacturers/distributors in North Carolina. In addition, moped accident data for 1979 were analyzed relative to 1976-1978 moped accident data and were also compared to the exposure data.

Results of the surveys show moped riders to be evenly distributed from age 16 into the 60's, with the mean age being 40 and the median 39. There are six times as many males as females, and 90 percent of the riders are white. Riders are also fairly well distributed by education, income group, and city population. The moped is certainly not confined to urban areas.

Where primary use is designated, commuting to work is indicated most often, about one-third of the time, with pleasure riding second at 29 percent. When all trip purposes are totaled (not just principal use), shopping/errands constitute the trip purpose most often identified. Slightly over one-fourth ride 10-24 miles per week, while overall about three-fourths ride less than 50 miles per week. Males are associated with higher weekly mileage, as are those who use the moped primarily for commuting to work. Average annual miles per rider are calculated to be about 1,330.

The majority of riders (54 percent) indicate that residential streets are their primary road type, while low ($\leq$45 mph) and high (>45 mph) speed rural roads are the second and third choices. About one-fourth carry passengers occasionally, and about one-fifth either sometimes or always wear a helmet when riding.

When asked to list what they perceive as hazardous, moped riders choose other drivers or vehicles (57 percent), the low speed and acceleration capability of the moped (10 percent), and the actions of the moped operator (10 percent). In regard to a series of questions concerning possible changes to

current N.C. law, riders slightly favor (51 percent to 49 percent) raising the top-speed capability and are decidedly against requiring a driver's license, helmet, insurance or registration, and lowering the minimum age.

A follow-up mileage survey revealed that the average number of miles actually ridden per week is just under 40. The largest number of weekly miles are concerned with commuting to work (11 miles), pleasure riding (9 miles) and shopping/errands (7 miles). Average weekly mileage is highest on residential streets (14 miles). Most riders travel very little under conditions of darkness.

The following rates were calculated from the mileage survey:

Incident rate (falls or accidents)	3.5 per 10,000 miles
Reportable accident rate	1 per 10,000 miles
Near miss rate	43 per 10,000 miles

There were 304 reported moped accidents in 1979, and approximately 30 percent of the moped riders were seriously injured or killed. Accident-involved riders are fairly equally distributed by age. Over 90 percent are male, and females appear underrepresented in accidents in terms of their exposure. There are fewer rural accidents than in the past. Some 30 percent of the accident-involved moped operators have been drinking, and virtually all of these are male. Twenty-one percent of the riders involved in 1979 accidents were found to have a suspended or revoked license at the time of the accident.

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ACKNOWLEDGEMENTS

Our appreciation is expressed to the many individuals and organizations contributing to this study. Foremost, we want to thank the Moped Association of America and the eleven moped manufacturers that supplied the necessary warranty data on moped purchasers in North Carolina. Without their cooperation and support this study would certainly not have been possible.

We would also like to thank Dr. Angell Beza, Associate Director for Research Design at the UNC Institute for Research in Social Science, for his helpful input in constructing the survey forms and for sharing his considerable knowledge and experience with us.

Here at HSRC, the list of contributors is long, but all deserve at the least our recognition and thanks. Most important we wish to thank our typists, Judy Hall, Martha Apple and Teresa Parks, for their help through all phases of the project, from compiling the seemingly endless mailing lists to typing this final report. Special thanks are also due our computer programmer, Frank Roediger, for the considerable time and effort he devoted to the project over these last several months.

Others at HSRC whom we would like to thank include Dr. Patricia Waller for her input in constructing the questionnaire; Dr. Donald Reinfurt and Dr. J. Richard Stewart for statistical consultation; our graphic artist, Nine Brinkhous, for help with the survey materials; Carol Carroll for help in collecting some of the warranty card data and for reviewing this final report; Forrest Council who also reviewed the report; and last but by no means least, Teresa Garrard, Armistead Sapp, Tom Heins and Terry Early for their assistance in sending out the survey forms, coding the returns, querying the DMV driver history file, and for generally always being available and willing when help was needed.

Finally, we would like to thank Mr. Joseph Register at the Division of Motor Vehicles for supplying the requested hard copies of the 1979 moped accident reports and also Mr. Curtis Yates with the N. C. Bicycle Program for his continued support and interest in the project.

CHAPTER 1. INTRODUCTION

Background

In 1975, 25,000 mopeds were sold in the United States. Now, five years later, the U.S. moped population is estimated at over one million, and this hybrid vehicle so popular in Europe for decades has emerged as a viable transportation mode on America's roadways as well.

North Carolina has shared in this boom, although in the absence of any statewide registration requirements no record exists of the number of mopeds in the state. That this number has increased is supported by the increasing numbers of mopeds being reported in accidents, from 105 in 1976 to over 300 in 1979. Figure 1.1 contains pictures of two popular moped models and summarizes current North Carolina law regulating the vehicle.

In the past the Highway Safety Research Center (HSRC) has carried out studies at both the natio[illegible] state levels to examine safety problems associated with the mope[illegible]e accomodation into the traffic stream. A two-volume re[illegible]hway Traffic Safety Administration (Hunter [illegible], Stewart and Stutts, 1979) predicts yearly numbers [illegible]e resulting numbers of injuries and deaths through the [illegible]rawing from available sales, usage and accident data from acro[illegible]y. At the state level, HSRC has more recently completed an analysis of N.C. moped accident data for the three-year period 1976-1978 (Hunter and Stutts, 1979b).

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As part of the NHTSA study, a thorough review was carried out of the moped literature, drawing heavily from European and other foreign sources. The review focused on both the accident and exposure characteristics of the moped. However, beyond numbers of mopeds, this search revealed relatively little with respect to exposure characteristics, particularly for the United States.

The primary purpose of the present study has been to collect and analyze moped exposure data specific to North Carolina. The objectives were to:

1. Identify basic exposure charcteristics such as demographics of the moped rider, trip purpose, mileage, etc.;

2. Develop specific mileage exposure data with respect to both trip purpose and type of roadway traveled; and

3. Obtain rider opinions concerning moped safety and current law regulating the moped in North Carolina.

The general approach followed was to solicit the cooperation of the industry in providing from their warranty card files the names and addresses of persons in the state purchasing mopeds over the past several years. The 4200+ persons so identified were mailed a four-page survey form designed to gather basic exposure data. A card enclosed with the survey form also asked for volunteers to participate in a more in-depth follow-up survey. From the resulting group of volunteers a stratified sample of 250 persons was selected to participate in the follow-up study, which entailed keeping a record of moped mileage by trip purpose and by type of roadway used over four consecutive weeks.

The survey methodology is reviewed in detail in the following chapter. Analysis of the resulting exposure data comprises the main portion of the report and is found in Chapters 3 (General Survey) and 4 (Follow-up Survey). As an added dimension to this project, Chapter 5 presents an up-dated analysis of N.C. moped accident data for 1979, drawing comparisons where possible with the collected exposure data. Chapter 6 concludes the report with a recap of major findings and discussion of pertinent issues, particularly with regard to laws regulating the vehicle in this state.

The remainder of this introductory chapter gives some basic background information on the popularity of mopeds in North Carolina and reviews some of the more recent literature dealing with moped exposure characteristics.

Number of Mopeds

As stated earlier, no count exists of the number of mopeds either sold or in use in North Carolina. The most likely source of such information would be vehicle registration files, but in North Carolina mopeds are not required to be registered with the Division of Motor Vehicles. Neither do moped operators have to be licensed; they are only required to be at least 16 years old.

In its previous reports HSRC has referenced an estimate of 10,000 mopeds in North Carolina given by the Moped Association of America (MAA) in the spring of 1978. For the purposes of the current study the MAA was again contacted for an updated estimate of mopeds in the state.

Lacking sales data at the state level, the MAA estimates are based on knowledge of total U.S. sales and the assumption that the individual states

share about equally in this market on a population basis. Adjustments can then be made either upwards or downwards to reflect moped popularity in a particular state. Thus, figures for such "popular" moped states as California and Florida would be adjusted upwards, and MAA also felt North Carolina to be slightly above the average in moped popularity.

MAA's estimates of the total numbers of mopeds in use nationwide are:

Date	Number
June 1978	425,000
June 1979	650,000
June 1980	1,000,000

Given a U.S. population of 214,659,000 based on the July 1976 census and a corresponding N.C. population of 5,469,000, North Carolinians would comprise 2.5 percent of the total U.S. population. Multiplying this proportion by the total number of mopeds in use yields the following estimates of mopeds for North Carolina:

Date	Number
June 1978	10,625
June 1979	16,250
June 1980	25,000

The 1979 figure of 16,000+ mopeds would be the one most applicable to the present study, based as it is on warranty card data primarily collected through the end of that year. Also, the accident data analyzed is for the year 1979.

For several reasons this estimate of 16,000+ mopeds in North Carolina may be high. For the 1979 NHTSA report projecting the numbers of mopeds in use nationwide and the resulting numbers of injuries and deaths, HSRC utilized as an estimate of the number of mopeds in a state that state's proportion of total motorcycle sales rather than the total U.S. population, since regional shipments of mopeds compared well with regional motorcycle sales. This proportion for North Carolina was

$$\frac{\text{21,291 motorcycles sold in N.C.}}{\text{1,036,944 motorcycles sold nationwide}} = .021$$

for 1977, the most recent year available at the time. Multiplying this by the 650,000 total mopeds in use in 1979 results in a figure of 13,650 mopeds, somewhat lower than the MAA estimate of 16,250.

Another factor that must be considered in estimating the total number of mopeds in use is the life expectancy of the vehicle, particularly now that a fairly large number of mopeds have been on the road in this country for four or five years or more. Such "scrappage" losses are not taken into consideration in MAA's estimate.

Again referencing the 1979 NHTSA report, a vehicle life expectancy model was developed which projected mopeds in use coresponding to various sales projections. Essentially this model assumed a median life expectancy of five years, so that 50 percent of the mopeds purchased in 1975 would still be on the road in 1980, 60 percent of those purchased in 1976, 70 percent of those purchased in 1977, etc. Without having specific year-by-year sales data for North Carolina, it is impossible to directly employ this function for estimating mopeds in use in this state. However, it seems reasonable to assume a further reduction in the estimated total number of mopeds in use in the state into the neighborhood of 10,000-12,000.

This range of 10,000-12,000 mopeds in North Carolina is more consistent with our original expectations regarding the percentage of total moped buyers in the state being contacted for this study. Although some of the eleven manufacturers obviously did not supply all of their warranty card data for North Carolina, the general feeling was that most of the available data were released for our survey purposes. As explained in greater detail in Chapter 2, the greatest gap in our data base would then be the estimated 30-40 percent of the buyers who do not return the warranty card along with persons purchasing mopeds of a make other than the 11 identified for this survey. Thus, our sample of 4,200 moped owners out of a total of 10,000-12,000 owners appears reasonable. Nevertheless, it must be stated that MAA believes North Carolina to be one of the stronger moped market states and stands firmly by its estimate of 16,000 mopeds in 1979 (and 25,000 in 1980). Lacking any statewide registration data, it is not possible to resolve these differences, and perhaps the best one can do is to set a broad range of from 10,000-16,000 mopeds in the state at the time of this survey.

Review of Recent Literature

As has already been noted, studies of the exposure characteristics of moped owners and/or operators are few, particularly here in the United States where the vehicle is still a rather new phenomenon. In Hunter and Stutts (1979a), the following U.S. consumer surveys were reviewed and utilized in the data analysis:

- A survey of 783 Batavus moped owners conducted by that manufacturer in January 1977;
- A 1977 study by Steyr-Daimler-Puch of America Corporation of 622 Puch moped purchasers living in the southeastern portion of the country;

- A Sports Illustrated survey of 591 moped buyers nationwide conducted in late 1977;
- A survey of approximately 1,000 riders reported on in the April 1978 issue of Popular Mechanics magazine;
- A Moped Biking report on 534 moped riders gathered from responses to two surveys printed in its May and September, 1978 issues;
- A survey conducted by the southern California based Moped Registration Service during the late summer and fall of 1978, resulting in 84 responses.

All of these surveys are discussed in some detail in the 1979 report. Since that time, HSRC has become aware of several additional studies which will be briefly highlighted below. These are:

- An Iowa survey of registered moped owners and primary riders;
- Two surveys of moped owners in three Australian states;
- An updated survey of Puch moped buyers;
- A Vespa survey based on warranty registrations received during 1979.

Iowa (1979)

The Iowa survey was carried out by the Iowa Department of Transportation, Office of Safety Programs, in the early part of 1979 and involved the mailing of questionnaires to a random sample of 1,000 owners of registered mopeds selected from the 7,900 owners identified in that state's vehicle registration files. Survey questions dealt with: (1) demographic characteristics of the moped owner, (2) mileage and trip characteristics, (3) accident experience and safety issues, and (4) rider suggestions for improving moped safety.

Some 530 persons responded to the survey for a response rate of 53 percent. Somewhat surprisingly, almost all of these (98 percent) had purchased their mopeds within the past year (i.e., 1978). Fifty-nine percent had purchased the moped for their own use, 34 percent for their son or daughter, and six percent for a spouse. The average age of the principal operator was 29 years, and 44 percent were 16 years old or younger[1]. Two-thirds of the riders were male, and 57 percent had a high school education or less while 20 percent had graduated from college. The median annual family income was $22,000, and 40 percent of the riders had incomes over $25,000.

[1]The minimum age for obtaining a license to operate a moped in Iowa is 14.

Concerning mileage and trip characteristics, the Iowa riders reported a median of 664 miles per year on their mopeds. Half of this riding was for fun only, while 40-50 percent was work related (commuting to work or school, shopping and errands, etc.). The majority of the riders said that they never wore a helmet, although in making suggestions for improving moped safety in Iowa, requiring helmet usage was second only to requiring turn signals on the moped.

Wigan and Carter (1980)

The Australian survey was actually two surveys, a pilot survey that was administered to new moped purchasers by dealers and distributors in Victoria and Western Australia (W.A.), and the subsequent survey of all registered moped and small motorcycle owners in South Australia (S.A.) as of December 1979. The first netted 147 responses and the second 176 responses definitely identified as mopeds.

Aside from the very different survey approaches, findings across the three survey jurisdictions are also not comparable due to varying age requirements for moped licensing. In Victoria, the minimum age is set at 18, the same as for motorcycles and other motor vehicles. In both W.A. and S.A. it is 16, although there is a difference here in that in South Australia 16-year-olds can also obtain a license to operate a car. The result is that the age distribution for W.A. moped riders was much lower -- over half under the age of 18. Considering just those riders aged 18 or older, however, over 80 percent of the riders in all three sample areas were over the age of 25.

Other findings from the surveys of particular relevance to the present study include the following:

1. The percentage of male moped owners/riders varied across the three states -- 85 percent for W.A., 76 percent for Victoria and only 59 percent in S.A.

2. Those under 18 years old in Victoria and W.A. almost unanimously agreed that pleasure/social visits, shopping, and personal business were all "essential" or "relevant" uses of their moped. Only 63 percent placed travel to school and 46 percent travel to work in one of these categories. Responses from those 18 or older were more varied. Seventy-two percent viewed travel to work as "essential" or "relevant", but personal business and shopping received similarly high ratings (76 percent and 75 percent, respectively).

3. The average weekly distance was 50.1 km (31.1 mi) for males and 36.8 km (22.8 mi) for females. This produced a calculated annual distance of 2100 km (1302 mi) for males and

1900 km (1178 mi) for females, with an overall annual distance of 2300 km (1426 mi). The mileage breakdown by trip purpose was:

Trip Purpose	Male	Female
To and from work	52%	37%
At work	8%	2%
Study	10%	1%
Shopping	15%	34%
Pleasure	15%	26%

4. The percentage of total distance traveled after dark was eight percent for males and four percent for females. Also, males tended to lend their mopeds out more to other riders. The percentage of added distance by other riders was 17 percent for males, three percent for females.

5. The rate of minor incidents involving little or no injury or vehicle damage was 19 per million kilometers for riders 25 and under, 17 per million kilometers for riders 26-45, and 42 per million kilometers for riders 46 and over. The distribution of total incidents by sex was fairly even at 55 percent male and 45 percent female. The two reported injury accidents represented an injury accident rate of about 30 per 10,000 vehicles, or one per million kilometers.

Puch, Vespa Surveys

American Bicyclist and Motorcyclist magazine reported the findings of a survey of Puch moped buyers in its October 1979 issue and a survey of Vespa moped buyers in its April 1980 issue. There was very little information on the procedures followed for either of the two surveys.

Briefly, the Puch survey revealed that 41 percent of its primary riders were under 23 years of age, 41 percent between ages 23 and 49, and 18 percent 50 or over. Overall 87 percent of the riders were male and 13 percent female, although for riders between the ages of 17 and 35, 40 percent were female. The reported uses were 34 percent recreation, 26 percent commuting, 14 percent shopping, 12 percent weekend personal transportation and 10 percent use on the job. The average family income for half of the purchasers was <$15,000, and 83 percent of the purchasers bought the moped for their own use.

The Vespa survey findings were less completely reported. Thirty-four percent of the primary operators of the Vespa mopeds were female. Nineteen percent of the riders were under 18, 21 percent aged 25-34 and 26 percent aged 35-49. Regarding use, 53 percent used the moped for shopping and 35 percent for

recreation. Personal transportation and commuting to work uses were also cited but percentages were not given.

Given this background, the following three chapters will describe the exposure surveys carried out under the present project for the N.C. Governor's Highway Safety Program and the resulting survey findings.

CHAPTER 2. SURVEY METHODOLOGY

Obtaining the Survey Sample

As already described in Chapter 1, mopeds in North Carolina are not required to be registered, and their operators are not required to hold a valid driver's license. Consequently there is no statewide record of the number of mopeds or the number of moped riders, and likewise no available listing of the names and addresses of persons owning or riding mopeds. In order to compile such a listing for use in a survey seeking to gather basic exposure data, HSRC needed to obtain the cooperation of the leading moped manufacturers and distributors operating in the state.

From conversations with the Moped Association of America (MAA) and with various local dealers, and from past analyses of North Carolina moped accident data, it was determined that the following manufacturers accounted for the vast majority of moped sales in the state:

AMF	Peugeot
Batavus	Puch
Columbia	Tomos
Garelli	Vespa
Honda	Yamaha
Motobecane	

Each of these manufacturers was contacted and asked to supply from its warranty card files the names and addresses of persons in North Carolina purchasing mopeds over the past several years. In this regard, the MAA was helpful in supporting our request and encouraging the industry's cooperation with this research effort.

Warranty card data were eventually obtained from all eleven of the manufacturers contacted. However, the process was slow, extending over a period of almost six months. There was understandably some "red tape" involved in releasing the warranty card data to HSRC. The primary factor behind the delay, however, was the absence of a computerized records keeping system at six of the general offices, so that the requested warranty card data for North Carolina had to be located and abstracted by hand. In fact, in order to obtain data from

two of the larger moped distributors in North Carolina (Garelli and Tomos), HSRC personnel traveled to their South Carolina offices to record the needed information from their files.

The end-product of this quest for warranty card data was a list of the names and addresses (and sometimes other information such as age, sex and reason for buying) of 4,210 persons in the state purchasing mopeds over the past several years. Table 2.1 gives the number and percentage of names and addresses supplied by each of the manufacturers. The largest contributors were Garelli, Motobecane, Honda and Tomos, followed at some length by AMF and Puch.

Table 2.1. Survey sample by moped manufacturer.

Manufacturer	Number	Percentage
AMF	317	7.5
Batavus	107	2.5
Columbia	109	2.6
Garelli	894	21.2
Honda	753	17.9
Motobecane	812	19.3
Peugeot	121	2.9
Puch	269	6.4
Tomos	686	16.3
Vespa	117	2.8
Yamaha	25	0.6
TOTAL	4210	100.0

The question of how representative these 4,200 names and addresses are of the total population of North Carolina moped buyers cannot be answered with certainty. As noted earlier, one can only estimate the total number of mopeds sold in the state. The fact that the obtained sample of 4,200 names is considerably lower than even the conservative estimate of 10,000-12,000 mopeds for 1979 (see Chapter 1) would seem to be due to a combination of:

1) The manufacturers' not supplying all of the available warranty card data on N.C. buyers;

2) The likelihood that a large percentage of moped purchasers and/or dealers might not fill in and return warranty cards to the regional office; and

3) Not including all makes of mopeds.

Regarding the first of these, most of the manufacturers indicated that they were supplying to the project all of the N.C. warranty card data available at the time. However, due to the confidential nature of the data the manufacturers did not always clearly specify the extent or range of the data being supplied, and for certain manufacturers (notably Puch, Batavus and Vespa) the data appear to be incomplete. For the most part the warranty data that were received were current through the last few months of 1979. Exceptions were the Puch data which were based on a June 1979 computer run and the Garelli and Tomos data which were current to March 1980.

As far as the completeness of a data file based on returned warranty cards, conversations with several of the sales managers for the companies suggested that warranty cards are returned for about 50-75 percent of the mopeds sold. Also, it appears that the individual retail stores play an important role in determining whether or not warranty information is returned to the regional offices. In some instances the dealer selling the moped may take the initiative in filling out and mailing in the warranty card; another dealer may leave this process entirely to the purchaser. The result is that the available listings of moped buyers sometimes appear clustered to certain key dealerships and thereby to certain areas of the state. Unfortunately, the extent to which any of this affects the representativeness of our total sample of 4,200 moped purchasers simply is not known.

Finally, regarding the presence in North Carolina of mopeds manufactured by companies other than the 11 contacted for warranty card data, examination of N.C. accident data has revealed that almost 20 percent of the mopeds involved in accidents are of an "other" make. Also, nine percent of the respondents to the general survey indicated that they were now riding an "other" make moped. Again, to what extent the exclusion of these other makes affects the representativeness of the file compiled for the present survey is not known.

Conducting the General Survey

The general survey was intended to yield basic data concerning moped usage in North Carolina. It was decided to develop a written questionnaire and to mail this to all of the 4,200 names obtained from the manufacturers' warranty card files.

Appendix A contains a copy of the survey questionnaire and cover letter. Both were constructed with the helpful input of Dr. Angell Beza, Associate Director for Research Design at the UNC Institute for Research in Social Science.

Dr. Beza has considerable experience in conducting population surveys and was able to offer suggestions for improving the questionnaire format.

The questionnaire was designed to be completed by the primary user of the moped, not necessarily its owner. Questions focused on: (1) demographic characteristics of the moped rider (age, sex, education, etc.); (2) riding experience (length of time riding, total mileage accumulated, etc.); (3) typical usage (weekly mileage, trip purpose, road types traveled, frequency of use, etc.); (4) accident encounters; and (5) opinions regarding moped safety and laws governing the vehicle in this state. Most of the questions were either of the check box format or short written response, although two called for ranking items in order of importance (Questions 6 and 8) and one called for a percentage breakdown of moped usage by season of the year (Question 12).

The general survey form was initially pilot tested during the month of May, 1980, on a sample of 200 owners randomly drawn from nine of the 11 lists obtained. (The lists from Garelli and Tomos were not available at the time.) In addition to field testing responses to the survey questions, HSRC was interested in determining to what extent a free highway safety T-shirt offer might affect the overall response rate[1]. Thus, at the bottom of the cover letter to half of the pilot questionnaires, there was a "P.S." offering by return mail a T-shirt to those who completed the forms.

The pilot survey yielded 69 responses, with 42 (61 percent) of these coming from persons receiving the T-shirt offer. Seven of the questionnaires were returned by the Post Office so that the effective sample size was 193 and the response rate was 69/193 or 36 percent.

Following a review of the returned survey forms, minor revisions were made to clarify instructions for answering a few of the questions. Unfortunately, even though the T-shirt incentive had apparently had the effect of increasing the response rate by 50 percent, it could not be extended to the full survey because of a shortage of "free" shirts from GHSP and the added expense and time involved in mailing the shirts back to the respondents.

Since some incentive for responding was still desirable, project personnel contacted a variety of sources for suggestions and recommendations. Ultimately it was decided to design and have printed a moped-sized bumper sticker that could be mailed along with each survey questionnaire. The bumper sticker would carry the slogan, "Mopeds save gas with class" printed in navy letters on a

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[1]The T-shirts were supplied by the Governor's Highway Safety Program and contained a slogan ("55 I Believe") supportive of the 55 mph maximum speed limit.

bright yellow vinyl background. An actual-size copy of the bumper sticker is shown in Figure 2.1. below.

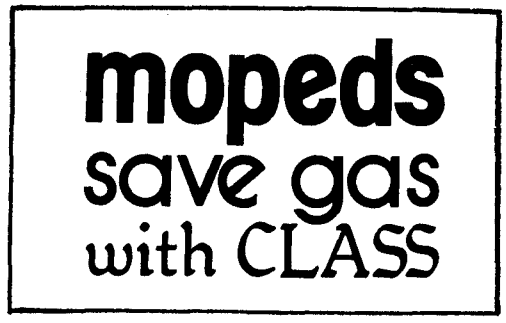

Figure 2.1. Moped bumper sticker mailed with the general survey questionnaire.

In addition to the revised survey form and bumper sticker, a pink 3"x8" card was printed to be enclosed with each questionnarie (see Appendix A). The card explained that volunteers were being sought for a more in-depth follow-up survey to be conducted later in the summer, and asked for the names and addresses of willing participants. Persons were also asked to indicate if they would like a summary of the survey findings.

The complete package of materials thus included the survey questionnaire and cover letter, bumper sticker, pink "volunteer" card and a postage-paid return address envelope. For better record-keeping and more efficient follow-ups, all of the survey forms were matched to the original mailing lists by a four digit code number printed on the back cover of the form. The survey packets were mailed out during the last week in May and first week in June to all 4,200 persons on the master file except those who had responded to the pilot survey.

A total of 912 responses were obtained, excluding the 69 returned from the pilot survey. For this later mailing, 465 forms (11 percent) were returned by the Post Office because of inadequate or incorrect addresses. For these an attempt was made to locate an updated address by querying the DMV driver license file and/or checking telephone directories available for some of the larger cities. As a result of this effort, approximately half of the returned forms were able to be remailed.

Also to improve on the number of responses, a second round of questionnaires was sent on August 1 to a random sample of 459 persons who had not responded to the first mailing[1]. This constituted approximately a 12

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[1]The number was limited to 459 because this was the number of survey forms available without having to order a second printing. Originally no follow-up mailing had been planned.

percent sample of the master file after those persons that the Post Office had been unable to locate had been deleted.

This second mailing resulted in only 45 additional survey forms being returned. Perhaps of greater significance is that another 40 (9 percent) of these second-mailing surveys were returned by the Post Office, even though they had not been returned just one month earlier. This suggests that the 11 percent rate of return found earlier may be too low, and that the actual percentage of forms not delivered may be 20 percent or greater.

All of this makes it difficult to report a response rate for the general survey, since the denominator (number of questionnaires delivered) is not precisely known. However, if one takes 3,700 as the denominator (4,200 minus approximately 500 forms not delivered), then an estimate for this rate is 981/3,700 or 27 percent.

In order to gain some insight as to why persons did not respond to the survey, another sample of 400 names was randomly drawn from the master file of non-respondents. Plans were to locate telephone numbers for these persons and then make as many telephone calls as needed to obtain 50 additional survey forms completed over the phone. All total, 97 persons were contacted.[1] Of these, 50 completed the survey questionnaire over the phone as indicated. For the remaining 47, 18 said they did not respond to the questionnaire becaused they were no longer riding their moped, with the most frequently cited reasons being ill health or the moped in need of repair. Another 17 indicated that they had sold their moped, and two that their moped had been stolen. Five persons said that they had never owned a moped, one person was traveling out of the country, and four persons had died. Thus, it appears that for one reason or another almost half of those not responding to the survey did not use a moped regularly.

All returned survey forms, including those completed over the phone, were coded for keypunching and storage on a computerized file.

Conducting the Weekly Mileage Survey

The purpose of the follow-up survey was to gather more detailed data on the day-to-day use of the moped over a one-month period. This was also a mail survey, with participants asked to fill out four postal cards summarizing their riding activities for four consecutive weeks in July. The postal cards were all identical except for being color-coded by week (Yellow - Week 1, Green - Week 2,

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[1] Correct telephone numbers could not be found for 189 persons (47 percent of the sample), and for another 115 persons (29 percent) there was no answer.

etc.). Questions on the card asked for:

1) Total weekly mileage on moped;
2) A breakdown of this mileage by trip purpose;
3) A breakdown of mileage by roadway type;
4) Percentage of nighttime riding; and
5) Number of accidents or "near miss" encounters.

These questions were presented on a 6"x12" card which folded to the 6"x4" postal card with HSRC's postage-paid return address on the outside. Attached to the postal card for the first week only was a list of supplemental questions, asking participants to indicate on a scale from 1 (Never) to 5 (Always) how often they rode:

- as close as possible to the right hand edge of the road
- a few feet out from the right hand edge
- in the center or slightly left of center of the traffic lane
- off the road completely (on shoulder)
- on bicycle paths or in designated bicycle lanes
- faster than 20 miles per hour
- against traffic (i.e., wrong way)
- with headlight on during the day
- using the pedals (not counting when starting the engine).

Copies of both the postal card and the list of supplemental questions are included in Appendix A. Also included is the cover letter that accompanied the survey materials. All materials were mailed out in a single packet during the last week in June.

Sample size for this survey was limited to 253 persons randomly selected from those who had returned the general survey form and who had indicated on the pink card their willingness to participate in such a follow-up effort. The sample of 253 was stratified by age, sex and region of the state to match the total sample of general survey respondents (approximately 625 at that time, four weeks into the survey). The distribution is shown in Table 2.2.

Stratifying in this manner helped to assure that the follow-up survey sample would be a reasonable subsample of all survey respondents. An alternative would have been to stratify the follow-up survey sample to resemble the full sample of 4,200 moped owners. However, while the region of state distribution might be determined directly from this file, age and sex distributions could not. (Age information was only available on some of the Batavus, Garelli and Motobecane moped owners, and sex of the moped owner was often unknown since initials frequently replaced first names.)

Table 2.2. Age, sex and region of state distribution for mileage survey sample.

Sex	Age	Region of State	Percent for General Survey Respondents (N = 627)	Mileage Survey Number	Mileage Survey Percent
Male	≤21	Coast	6.4	16	6.3
		Piedmont	11.3	28	11.1
		Mountain	1.1	3	1.2
	22-55	Coast	20.7	52	20.6
		Piedmont	24.2	61	24.1
		Mountain	1.6	4	1.6
	>55	Coast	12.4	31	12.3
		Piedmont	8.5	21	8.3
		Mountain	1.1	3	1.2
Female	≤21	Coast	1.6	4	1.6
		Piedmont	2.2	6	2.4
		Mountain	0.3	1	0.4
	22-55	Coast	2.2	6	2.4
		Piedmont	4.6	12	4.7
		Mountain	0.6	2	0.8
	>55	Coast	0.2	1	0.4
		Piedmont	0.8	2	0.8
		Mountain	0.0	0	0.0
			100.0	253	100.2

One approach to determining an age/sex/region of state distribution for the entire master file would be to utilize the information available on the DMV driver history file. This, in fact, had already been done for a subsample of 500 randomly selected names as part of an independent effort to estimate the percentage of moped owners with suspended or revoked drivers' licenses. For this sample of 500, 322 were located on the DMV file. Table 2.3 shows the overall age/sex/region of state distributions for both this DMV sample and the sample of general survey respondents used in stratifying the mileage survey sample. The two distributions agree well, except for a lower percentage of persons ≤ 21 for the DMV sample. This is to be expected, since many of these would not be locatable on the DMV file, especially those <16 years of age.

Table 2.3. Overall age, sex and region of state distributions for DMV sample and general survey respondents.

Variable	Level	Percent for DMV Sample (N = 322)	Percent for General Survey Respondents (N = 627)
Age	≤21	9.6	23.0
	22-55	67.7	54.1
	>55	22.7	23.0
Sex	Male	91.9	87.4
	Female	8.1	12.6
Region of State	Coast	41.3	43.5
	Piedmont	52.8	51.7
	Mountain	5.9	4.8

Since the participants for this weekly mileage survey were all volunteers, a fairly high response rate had been anticipated. However, towards the end of the one-month period it became apparent that almost half of the volunteers were not returning the postal cards. At this point, an effort was made to contact all non-respondents by telephone. Of the 115 non-respondents identified, 92 were eventually contacted, either personally or through some other family member. Ten of these indicated that they had either never received or lost the packet of survey materials. For these a new packet was mailed and the participants were encouraged to complete postal cards for at least the last two weeks. Some of the non-respondents contacted indicated that they had not returned the postal cards because for one reason or another (on vacation, sick, moped in need of repair, etc.) they had not been riding as usual. These persons were encouraged to return the cards, inserting zero mileage if this was the case and noting a reason at the bottom of the card. For the vast majority of those contacted, it was simply a matter of forgetting or being too busy to complete the weekly forms.

The final response rate for the weekly mileage survey was still not high. Only 104 (41 percent) returned all four survey cards (with the supplemental questions), and an additional 52 (21 percent) returned at least one card. As with the general survey, the returned postal cards were coded for keypunching and storage on a computerized file.

Representativeness of the Survey Findings

The representativeness of our survey sample of 4,200 moped owners, when compared with all moped owners in the state, has already been discussed. Basically it was noted that there may be some biases because the sample is based on warranty cards returned to the manufacturers and because it is limited to 11 popular moped makes. Whether or not these biases exist and to what extent cannot be determined. However, the fact that the survey sample likely comprises from 25 to 40 percent of the total moped population does increase confidence in its representativeness. Also, the estimated age, sex and region of state distributions for the sample (shown in Table 2.3) are consistent with expectations derived from available U.S. consumer studies and from knowledge of N.C. accident data.

The primary issue remaining to be addressed is how representative the 981 survey respondents are of all persons receiving the survey. Table 2.3 partly addresses this issue by comparing the age, sex, region of state distribution for about two-thirds of the respondents with the corresponding estimated distribution for the sample file[1]. The two distributions agree well, even though the one is based on moped owners and the other primary riders.

As described earlier, a second approach taken to assess the representativeness of findings from the general survey was to compare across selected variables the 981 respondents with the 50 non-respondents contacted by telephone. Table 2.4 gives the results of this comparison. All of the chi square values were non-significant except for the education and length of time riding variables. The non-respondents were generally less educated, with only one-third having earned a high school diploma. They also had been riding their mopeds for a longer period of time -- four out of five for over a year. Neither of these findings is surprising, as one would expect less educated persons to be less likely to respond to a mailed questionnaire. Also, those owning mopeds for a longer period of time might have lost some of their initial enthusiasm for the vehicle, again making them less likely to respond.

Although non-significant, a few of the other variables also showed noteworthy trends. The non-respondents had a higher percentage of riders 16 or under and 55 or over (groupings not shown in table). They also had somewhat lower incomes and tended to ride less and use the moped more for pleasure trips. All of these findings are quite consistent with expectations and lend support to the overall representativeness of the survey findings.

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[1]The final age/sex distribution for all 981 respondents varied only slightly from that shown in Table 2.3. See Tables 3.1 and 3.2.

Table. 2.4. Comparison of general survey respondents with non-respondents interviewed by telephone.

Variable	Level	Percentage for Respondents N=981	Percentage for Non-respondents N=50	X^2 (p-value)
Age	≤21	22.2 %	26.5 %	0.50
	>21	77.8	73.5	(p=0.48)
Sex	Male	86.4	90.0	0.52
	Female	13.6	10.0	(p=0.47)
Race	White	89.7	88.0	0.15
	Non-white	10.3	12.0	(p=0.70)
Income	<$10,000	26.5	40.0	3.53
	$10,000-$24,999	43.1	35.0	(p=0.17)
	≥$25,000	30.4	25.0	
Education	Grade school or some high school	43.8	67.4	
	Graduated high school	21.9	21.7	12.62 (p<.01)
	College, other	34.2	10.9	
Population	<1,000	16.4	12.8	
	1,000-9,999	24.7	27.7	0.58
	10,000-49,999	28.6	27.7	(p=.90)
	≥50,000	30.2	31.9	
Time Riding	<1 year	42.1	18.0	11.39
	≥1 year	57.9	82.0	(p<.001)
Weekly Mileage	<25 miles	50.6	59.2	1.37
	≥25 miles	49.4	40.8	(p=0.24)
Primary Use	Commuting to work	32.6	24.0	3.83
	Pleasure riding	29.2	42.0	(p=0.15)
	Other	38.2	34.0	
Helmet Use	Always, usually	21.7	22.0	0.00
	Occasionally, never	78.3	78.0	(p=96.3)

The telephone survey of non-respondents served another purpose in revealing the somewhat transient nature of the moped riding population. As noted earlier in this chapter, almost half of those contacted over the phone were no longer using their moped regularly either because it had been sold, was in need of repair, had been stolen or because of their own poor health.

There is also evidence that the rate for replacing one moped with another moped of a different make is high. When the questionnaires were mailed out, they were marked with a four digit number that identified their source. For example, the 317 survey forms sent to AMF moped riders were labeled 0001-0317, the 107 forms sent to Batavus riders 1001-1107, etc. When the forms were mailed back, it was then possible to compare this recorded make with the make reported by the primary rider in answer to Question 1.

Overall, it was found that almost 20 percent of the riders were riding a different make moped. That there was considerable variation in this "replacement" rate across makes probably reflects varied levels of satisfaction with the different moped makes. Also, however, it likely reflects the recentness of the warranty data supplied to HSRC (i.e., a manufacturer supplying data from only the more recent sales would be expected to have a lower replacement rate than one supplying data from several years back).

All of this discussion regarding the transitory nature of the moped and its rider in North Carolina contributes little to a review of the representativeness of survey findings. However, it does serve to point out the problems inherent in carrying out a survey of this sort and explains to some degree the lower than anticipated response rate.

Regarding the representativeness of the follow-up (mileage) survey findings, Table 2.5 compares the follow-up survey respondents with the general survey respondents for the same variables shown in Table 2.4. There are no significant differences across the two sample distributions with regard to age, sex, length of time riding, weekly mileage and income. However, the follow-up survey participants were significantly more likely to be white, to be better educated, to live in larger population centers, to use the moped more for commuting, and to wear a helmet. These differences are not unexpected, as one would anticipate that better educated persons, those who are more safety conscious and those who rely on the moped to meet basic transportation needs would be the more likely volunteers for a follow-up survey. Overall, it is felt that the follow-up survey participants were a reasonably representative subsample of all survey respondents.

Table. 2.5. Comparison of general survey respondents with follow-up survey respondents.

Variable	Level	Percentage for General Survey Respondents N=981	Percentage for Follow-up Mileage Survey Respondents N=152	X^2 (p-value)
Age	≤21	22.2 %	20.4 %	0.25
	>21	77.8	79.6	(p=0.62)
Sex	Male	86.4	83.6	0.34
	Female	13.6	16.5	(p=0.34)
Race	White	89.7	95.4	4.94
	Non-white	10.3	4.6	(p<.05)
Income	<$10,000	26.5	18.6	5.26
	$10,000-$24,999	43.1	52.1	(p=0.07)
	≥$25,000	30.4	29.3	
Education	Grade school or some high school	43.8	33.6	
	Graduated high school	21.9	21.7	6.91 (p<.05)
	College, other	34.2	44.8	
Population	<1,000	16.4	11.5	
	1,000-9,999	24.7	16.9	8.73
	10,000-49,999	28.6	34.5	(p<.05)
	≥50,000	30.2	37.2	
Time Riding	<1 year	42.1	40.7	0.10
	≥1 year	57.9	59.3	(p=0.75)
Weekly Mileage	<25 miles	50.6	44.0	2.28
	≥25 miles	49.4	56.0	(p=0.13)
Primary Use	Commuting to work	32.6	40.5	6.0
	Pleasure riding	29.2	19.0	(p<.05)
	Other	38.2	40.5	
Helmet Use	Always, usually	21.7	29.6	4.65
	Occasionally, never	78.3	70.4	(p<.05)

CHAPTER 3. RESULTS FROM THE GENERAL SURVEY

This chapter presents results from the general survey of moped riders. A copy of the survey questionnaire appears in Appendix A. Usable responses were received from 981 riders. Table totals amounting to less than this value are due to missing observations in the data. The chapter will concern five major topics: (1) moped rider demographics, (2) rider experience, (3) typical riding patterns, (4) opinions on safety issues and the current North Carolina law, and (5) accident experience.

Presentation of the results will first involve discussion of the major variables shown in univariate tables. Interactions of a variable of interest with other variables will then be discussed. Chi-square statistics were utilized to examine the homogeneity of the distributions. Where significant differences of practical value were found, comment is made in the text; otherwise, there generally is no discussion. The comment is based on a cell-by-cell examination of the observed versus expected values within the crosstabulation to determine the sources of the major contributions to the overall chi-square statistic. The comments thus take the form of:

"more males than expected..."
"older riders are overrepresented..."
"younger riders are associated with..."

Crosstabulations of interest are contained in Appendix C.

Moped Rider Demographics

Moped rider age data are shown in Table 3.1. The particular age groupings were selected to match other HSRC moped studies and thus facilitate comparisons. While over half of the riders are in the 22-55 age group, over 20 percent are older than 55 years of age (a higher percentage than in the 16-21 age group). This may reflect the increased likelihood of older riders participating in the survey. Also of interest here is that over six percent of the respondents are less than 16 years old, even though North Carolina law states that the minimum rider age is 16. For the 57 under-aged respondents, most are 14 or 15 years old, but two of the respondents are 11 years old. The largest frequencies of riders appear in the 15, 16 and 17 year-old categories. The average age is 40, and the median age value is 39. The cumulative percentage age plot (Figure 3.1)

Table 3.1. Rider age.

Age	Number	Percent
<16	66	6.8
16-21	148	15.4
22-55	546	56.6
>55	204	21.2
Total	964	100.0

Table 3.2. Rider sex.

Sex	Number	Percent
Male	841	86.4
Female	132	13.6
Total	973	100.0

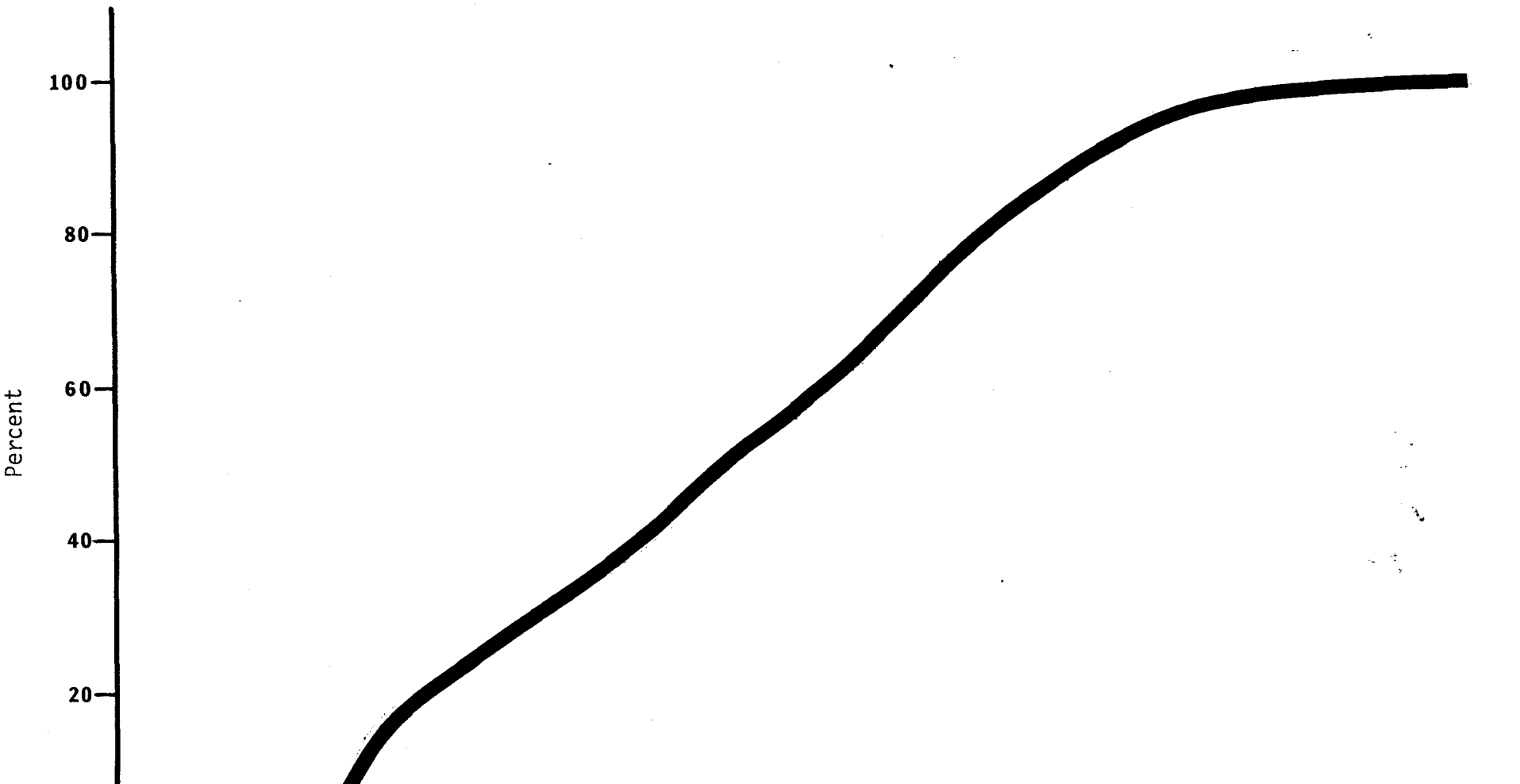

Figure 3.1. Cumulative percentage plot of moped rider age.

shows a very smooth transition from age 18 on into the 60's. Thus, moped riders are very evenly distributed among different age categories.

Comparing the age distribution for the respondents with the sample of 500 moped owners interrogated through Division of Motor Vehicle (DMV) driver history records reveals some differences. The DMV group had the following age distribution:

Age	Percent
≤21	9.6
22-55	67.7
>55	22.7

The differences in the first two groups (where the respondents show a higher percentage of younger riders) can probably be explained by the fact that most of the warranty cards were filled out by the owners, even though a younger family member may be the principal rider. Practically no riders under 16 years old would be found on the DMV records as they would not have been issued a license.

The sex of the respondents is shown in Table 3.2, and there are over six times as many males as females. The sample examined through the DMV records showed 92 percent male, eight percent female. This would indicate that the younger groups have a higher proportion of female riders.

Concerning race (Table 3.3), the vast majority of the riders are white. Blacks account for practically all of the non-white respondents.

Information about the annual income of the moped rider's family is presented in Table 3.4. Somewhat surprisingly, the largest proportion of respondents (≈27 percent) are found in the income group with earnings of less than $10,000 per year. Although all groups are fairly well represented, the $30,000+ group produced the next highest proportion (≈22 percent). This income variable did yield a fairly large number of non-responses, indicating that the riders perhaps felt uncomfortable in providing this information. Because these data were grouped, class interval midpoints were used to calculate the mean family income for all respondents combined. Utilizing an interval midpoint of $35,000 for incomes exceeding $30,000 resulted in a mean income value of $18,600.

The highest level of education variable (Table 3.5) also shows fairly balanced representation within the different groups. About one-fifth of the respondents have only a grade school education, one fifth have attended (or are currently attending) high school, and another one-fifth have completed high school. Some 18 percent have either graduated from college or performed post-graduate work. The "other" group includes business school, technical trade school, community college, special military training, etc.

The population of the cities or towns in which the moped riders live (Table 3.6) tends to follow the same trend of some of the other demographic variables

Table 3.3. Rider race.

Race	Number	Percent
White	871	89.7
Black	87	9.0
Indian	11	1.1
Other	2	0.2
Total	971	100.0

Table 3.4. Annual income of the moped rider's family.

Income	Number	Percent
< $10,000	233	26.5
$10,000-$14,999	150	17.1
$15,000-$19,999	131	14.9
$20,000-$24,999	98	11.1
$25,000-$29,999	73	8.3
≥ $30,000	194	22.1
Total	879	100.0

Table 3.5. Highest level of education.

Education	Number	Percent
Grade school	182	18.9
Attended high school	220	22.8
Graduated high school	201	20.9
Attended college	143	14.8
Graduated college	87	9.0
Post-graduate work	84	8.7
Other	47	4.9
Total	964	100.0

Table 3.6. City/town population.

Population	Number	Percent
Rural	119	12.9
500-999	33	3.6
1,000-2,499	64	6.9
2,500 -4,999	75	8.1
5,000-9,999	90	9.7
10,000-24,999	135	14.6
25,000-49,999	130	14.0
$\geq$ 50,000	280	30.2
Total	926	100.0

in that widespread variability is present. While some 30 percent live in cities with populations equal or greater than 50,000, another 13 percent live in rural areas of less than 500 inhabitants. Cities/towns with a population up to 10,000 account for slightly more than 41 percent of the respondents. Clearly, the moped rider in North Carolina is not confined to the larger urban areas. The earlier HSRC moped accident study (Hunter and Stutts, 1979b) showed that over a third of the moped accidents occur in non-urban areas.

Having now presented the basic demographic variables individually, some effort will be made to discuss interactions among the variables. Selected tables may be found in Appendix C, and their order follows the flow of the text. Although most of the riders are male, female riders tend to be younger. While about 14 percent of all riders are female, some 27 percent of those less than 16 are female. Only four percent of the riders over age 55 are female. The overall percentage of non-whites is about 11 percent, but 14 percent of those over 55 are non-white. Conversely, almost all (≈97 percent) of those under 16 are white.

Younger riders tend to be associated with higher family incomes. Over one-third of those in both the under-16 and 16-21 age groups have annual family incomes in excess of $30,000. The income distribution in the 22-55 age group is fairly equally spread, although one-fourth have incomes of less than $10,000 per year. Half of those over 55 years of age have incomes of less than $10,000 per year. Our follow-up telephone conversations revealed that many of these people are retired and living on their Social Security income.

Compared to the other age groups, the 22-55 age group has a much higher level of education. For those over age 55, slightly more than one-third have only a grade school education, while another 16 percent attended but did not graduate from high school. As would be expected, slightly over half of the 16-21 year olds are still attending (or attended) high school.

Riders living in cities of greater than 50,000 population tend to follow the basic age distribution presented in Table 3.1, although with slightly more under-16 riders and slightly less over-55 riders. In the rural areas (less than 500 inhabitants), the proportion of riders over age 55 is greater than expected.

When sex and race are examined, the white group follows the overall breakdown of about 86 percent male, but the non-white group is composed almost entirely of males (96 percent). Concerning family annual income, the proportion of females (≈8 percent) is lower than expected in the lower income groups

(<$15,000 per year) and higher than expected in the higher income groups. Where annual income exceeds $25,000, females constitute about 20 percent of the riders. Females are also associated with higher levels of education. About one-fifth of the college graduates and post-graduates are female, while only seven percent of those with only a grade school education are female.

The data show some rather clear socio-economic differences in regard to race. The white group is associated with higher levels of both education and income. Virtually all (≈97 percent) of the riders who either attended or graduated from college or did post-graduate work are white. Almost 60 percent of the non-white group earn less than $10,000 per year. Finally, the white group tends to live in cities or towns with larger populations, although the differences are not significant.

Rider Experience

At least two of the items in the survey relate directly to the experience of the moped rider. Length of time riding is shown in Table 3.7. Since the moped is a relatively new vehicle, it is not surprising that about 80 percent of the riders have two years or less experience. As expected, the younger riders (21 or under) tend to have less time riding than the other age groups. About one-fourth of the >55 age group have greater than two years of experience. There are slighly more males than expected with greater than two years experience, but half of the females (also more than expected) fall into the 1-2 year experience category. The female distribution accounts for about all of the statistically significant sex differences. There are no consistent trends when riding time is distributed by race.

Another measure of experience is total mileage on the moped, shown in Table 3.8. About half the riders have accumulated less than 1,000 total miles and another 45 percent between 1,000 and 5,000 miles. Few have exceeded 5,000 miles.

When total mileage is distributed by age, there are no significant differences. Males tend to be associated with higher mileage, accounting for over 93 percent of those with total mileage in excess of 2,500 miles. Under 500 miles, females account for about one-fifth of the total. Non-whites also are associated with higher mileage. For example, about one-fifth of those with total mileage greater than 5,000 are non-white. Probably related to the above

Table 3.7. Length of time riding.

Length of Time	Number	Percent
< 6 months	67	6.9
6 months - 1 year	341	35.2
1-2 years	382	39.4
> 2 years	180	18.6
Total	970	100.1

Table 3.8. Total mileage on the moped.

Mileage	Number	Percent
≤ 500	249	26.7
501-1000	199	21.3
1001-1500	126	13.5
1501-2500	163	17.5
2501-5000	135	14.5
> 5000	62	6.6
Total	934	100.1

is the fact that those in the lower income groups also have accumulated greater mileage. The opposite appears to be true for the highest income groups. Since income is highly correlated with education, the same tendencies hold when total mileage is distributed by education.

Typical Riding Patterns

Having examined rider experience, attention will now be focused on typical riding patterns. Pertinent variables include, among others, the primary use of the moped, average weekly mileage, typical trip length, primary types of roadways used, etc.

Uses of the Moped

. In the general survey, riders were asked to rank the uses they make of the moped from a list of categories. A breakdown of the primary use (i.e., that use asigned a ranking of "1") is shown in Table 3.9. Commuting to work was indicated most often, almost one-third of the time. Pleasure riding was a close second with a 29 percent response. Use in shopping or errands was third, and these three categories accounted for over three-fourths of the responses. It should be noted that about 24 percent of the respondents answered this question by checking all appropriate categories rather than ranking them in order of use, so that it was not possible to identify a primary or secondary use.

The secondary use of the moped (Table 3.10), or the next most frequent use (i.e., assigned a ranking of "2"), yielded different results. Almost one-fourth did not indicate a secondary use. Another one-fourth listed shopping or errands as the next most important use.

As a final look at this particular data, Table 3.11 shows the frequency with which any of the choices were checked. Using the moped for shopping trips or other errands was indicated by about two-thirds of the riders. Pleasure riding was checked slightly over 60 percent of the time. Visiting relatives or friends was the next most frequent choice, while commuting to work, already shown to be the most frequently cited primary use, was fourth.

Refocusing attention to the primary use variable shows that age effects are present. Commuting to work is favored by the 22-55 age group. Pleasure riding is overrepresented in the two youngest age groups but particularly in the less than 16 age category. Commuting to school is overrepresented in the 16-21 age

Table 3.9. Primary use of the moped.

Use	Number	Percent
Commuting to work	244	32.6
Pleasure riding	219	29.2
Shopping/errands	127	17.0
Trips to a specific place of recreation	56	7.5
Commuting to school	36	4.8
Visiting relatives or friends	35	4.7
Use in business or work (deliveries,etc.)	30	4.0
Other	2	0.3
Total	749	100.1

Table 3.10. Secondary use of the moped.

Use	Number	Percent
None indicated	186	24.8
Shopping/errands	185	24.6
Visiting relatives or friends	130	17.3
Pleasure riding	89	11.9
Trips to a specific place of recreation	75	10.0
Commuting to work	37	4.9
Use in business or work	26	3.5
Commuting to school	22	2.9
Other	1	0.1
Total	751	100.0

Table 3.11. Frequency with which all moped use possibilities were checked.

Use	Number	Percent
Shopping/errands	667	68.4
Pleasure riding	597	61.2
Visiting relatives or friends	534	54.8
Commuting to work	448	45.9
Trips to a specific place of recreation	351	36.0
Use in business or work	183	18.8
Commuting to school	146	15.0
Other	37	3.8

group. The youngest groups do not prefer to shop or run errands on the moped, but this is a popular choice of those over 55 years of age.

Differences are also present when primary use is distributed by sex. Males are somewhat overrepresented in the categories of commuting to work, shopping/errands, and the "other" combined category of use in business/work and visiting relatives or friends. On the other hand, females are overrepresented in commuting to school (almost 30 percent of this group), pleasure riding, and trips to a specific place of recreation.

Both pleasure riding and trips to specific places of recreation are directly proportional to the family's annual income. Where annual income exceeds $25,000, about 40 percent of the riders use the moped primarily for pleasure riding. By the same token, the more utilitarian uses of commuting to work and shopping/errands appear to be inversely proportional to income. Where annual income is less than $15,000, about 40 percent of the riders use the moped primarily for commuting to work.

Primary use distributed by education shows trends somewhat inconsistent with the above. Although commuting to work is the primary use by quite a few riders with a high school education or less, over 40 percent of those who attended (or are attending) college also indicate this is the preferred use of the moped. The same is true for the riders who have (or are obtaining) post-graduate experience. These same two groups (attended college and post graduate) are also somewhat overrepresented where commuting to school is the primary use. Pleasure riding is more associated with a high school education or less, although college graduates also enjoy pleasure riding. These "inconsistencies" are all probably explained by age effects. That is, in regard to primary use, income and education are likely co-varying along with age.

Commuting to work, commuting to school and trips to a specific place of recreation all appear to be directly proportional to population. Almost two-thirds of those who use the moped primarily to commute to school live in cities with populations exceeding 50,000. As one would expect, two-thirds of the trips to specific places of recreation are associated with cities of greater than 25,000 population. On the other hand, pleasure riding as the primary mode is quite frequent for all population groups but somewhat overrepresented in the rural and smaller town areas. Pleasure riding is particularly underrepresented in cities of greater than 50,000 population.

Weekly Mileage

Respondents were asked to indicate how many miles they ride in an average (or typical) week. The overall distribution is shown in Table 3.12. Slightly over one-fourth of the riders travel 10-24 miles per week. Overall, about three-fourths of the riders travel less than 50 miles per week. Utilizing a class interval midpoint value of 115 miles per week for the riders whose weekly mileage exceeds 100 yields a mean value of 36 miles per week for all riders combined.

When weekly mileage is distributed by age, no significant differences are present. Concerning sex, female riders are associated with fewer miles per week. Over one-fifth of those traveling less than 10 miles a week are female. (Females comprise only 14 percent of the riders surveyed.) Male riders are thus associated with higher weekly mileage and account for well over 90 percent of those who ride farther than 50 miles per week. No significant weekly mileage differences are shown by race, although there is a slight tendency for non-whites to be associated with higher mileage.

The overall tendency is for income to be inversely proportional to weekly mileage. The same tendency is true when education is examined. No differences are present when weekly mileage is distributed by population.

When primary use is examined, commuting to work or school is associated with higher weekly mileage, and pleasure riding typically yields lower weekly mileage. These results are consistent when compared with the experience variable of total mileage on the moped. Trips to a specific place of recreation and shopping/errand trips are also uses that result in lower weekly mileage.

Trip Length

Another variable concerned with the typical riding patterns is trip length, and respondents were asked to indicate the average length trip on the moped. Although the vast majority of the respondents appeared to answer this question correctly, some obviously misinterpreted the question and stated the longest trip they had ever made. For these the response was coded as "not stated". Table 3.13 shows the overall distribution for those apparently responding correctly to the question. The most frequent response (≈30 percent) was less than three miles. Over 80 percent of the riders typically travel less than 10 miles. In North Carolina, the moped clearly is used for basically short-haul transportation.

Table 3.12. Typical weekly mileage.

Miles	Number	Percent
< 10	220	22.8
10-24	269	27.8
25-49	210	21.7
50-74	132	13.7
75-100	83	8.6
> 100	52	5.4
Total	966	100.0

Table 3.13. Average length of a trip.

Length (Miles)	Number	Percent
0-2	280	30.5
3-4	234	25.5
5-9	246	26.8
≥ 10	159	17.3
Total	919	100.1

When distributed by age, both the <16 and >55 age groups tend to be associated with shorter trip lengths than the other age groups. Female riders tend to take shorter trips than male riders, although the differences are not significant. Whereas females account for about one-fifth of the trips less than three miles, they account for only 10 percent of those 10 miles and over. Non-whites are also associated with longer trip lengths. While representing only 10 percent of the moped riders overall, non-whites take about 17 percent of the trips 10 miles and over.

Trip length is basically inversely proportional to the family's annual income. College graduates and post-graduates tend toward shorter trip lengths, while those who attended (or are attending) or graduated from high school tend to take longer trips.

As one would expect, trip length is positively correlated with both total and weekly mileage but seems to have little relationship with time riding. Those who use the moped primarily for commuting to work average longer trip lengths. School trips are similar, but the trend is less established. Pleasure trips in general tend to be of shorter length but results are mixed.

Types of Roadways Used

On the questionnaire, riders were asked to rank five roadway types in order of frequency of use. This question was similar to the moped trip purpose question, and again a large percentage of the responses were incorrect or not usable. The distribution of responses (Table 3.14) for the primary type of roadway used (i.e., that assigned a ranking of "1") indicates that the majority ride most often on residential streets. Somewhat surprisingly, rural roads, where the speed differential between mopeds and other vehicles is likely to be greatest, occupy the second and third choices. Other city streets (heavy traffic or not) appear to be the primary route used by only 10 percent of the riders.

The secondary type of roadway used (as indicated on the survey form by a number "2" ranking) is shown in Table 3.15. When a response was given, downtown business streets were the most frequent choice. The frequency with which all roadway types were checked is given in Table 3.16, and residential streets were noted by over three-fourths of the riders. Rural roads with speed limits less than 45 miles per hour were checked by over 55 percent of the respondents. As can be seen by the percentage values, many of the respondents regularly use most all of the roadway types.

Table 3.14. Primary type of roadway used.

Roadway	Number	Percent
Residential streets	424	54.0
Rural roads, speed limit ≤ 45 mph	150	19.1
Rural roads, speed limit > 45 mph	124	15.8
Other major streets (heavy traffic) inside city limits	51	6.5
Downtown business streets	36	4.6
Total	785	100.0

Table 3.15. Secondary type of roadway used.

Roadway	Number	Percent
None indicated	235	29.9
Downtown business street	168	21.3
Other major streets (heavy traffic) inside city limits	119	15.1
Rural roads, speed limit ≤ 45 mph	115	14.6
Residential streets	89	11.3
Rural roads, speed limit > 45 mph	61	7.8
Total	787	100.0

Table 3.16. Frequency with which all roadway types were checked.

Roadway	Number	Percent
Residential streets	754	77.4
Rural roads, speed limit ≤ 45 mph	536	55.1
Downtown business streets	484	49.7
Rural roads, speed limit > 45 mph	440	45.3
Other major streets (heavy traffic) inside city limits	432	44.4

Further examination of the primary roadway used shows some age effects but no sex or race differences. As might be expected, the younger riders (<16 and 16-21) tend to be overrepresented on the residential streets. However, the <16 group is slightly overrepresented on rural roads with speed limits greater than 45 miles per hour and those over age 55 are overrepresented on rural roads with speed limits less than 45 miles per hour. Due to the likelihood of larger speed differential, these rural roads can be extremely dangerous places for a moped rider, but particularly for those under age 16. There is also a greater likelihood that the shoulders on rural roads are not as well maintained, making them unusable for general travel and a poor escape route if one is needed. About the only positive aspect here is that rural roads generally carry only modest amounts of traffic.

Higher income riders are overrepresented on residential and city streets, while lower income riders are overrepresented on the rural roads. The education variable is similar to income, where those with more education tend to ride on lower speed facilities. As an example, over 80 percent of the post-graduates ride primarily on residential streets.

Moped riders with high total mileage figures (>1500 miles) appear to be associated with high-speed rural roads, while those with low total mileage (≤1500 miles) are overrepresented on residential streets. The same comments apply when primary road type is distributed by weekly mileage. Shorter trips (<5 miles) tend to be made on residential streets, while the longer trips (≥5 miles) are associated with rural roads.

Frequency of Use

The general survey asked for information on how often the moped is used, and the responses are given in Table 3.17. Usage is quite frequent, as some 45 percent use the moped on a daily basis and another 30 percent ride several times a week. The age tendency for this variable is for more frequent usage by the younger groups and less frequent usage by the older groups. Males tend to ride more on a daily basis than females, and females are overrepresented in the "occasional" (once or twice a month or less) category.

When frequency of use is distributed by income, heavier usage is made by the lower income groups and lesser usage by the upper income categories. The education variable produces somewhat similar findings, in that more frequent use is made by those with less education.

Table 3.17. Frequency of use.

Interval	Number	Percent
Daily	431	44.5
Several times a week	278	28.7
Once or twice a week	182	18.8
Once or twice a month	51	5.3
Less than once a month	26	2.7
Total	968	100.0

Table 3.18. Weekday versus weekend riding.

Interval	Number	Percent
Mostly weekdays	238	24.5
Mostly weekends	121	12.4
Both weekdays and weekends	613	63.1
Total	972	100.0

Table 3.19. Time of day.

Time	Number	Percent
Before 10 a.m.	50	5.2
10 a.m. - 4 p.m.	130	13.4
After 4 p.m.	164	16.9
Morning and evening commuting hours	194	20.0
No specific time	432	44.5
Total	970	100.0

When frequency of use is distributed by length of time riding, there are no significant differences; however, there is a slight tendency for less frequent usage as length of time riding increases. Frequency of use is, of course, directly proportional to both total mileage and weekly mileage.

Examining primary use of the moped shows that those who commute to work or school tend to ride on a daily basis. Two-thirds of those who commute to work ride daily. On the other hand, pleasure riding is more of an occasional activity. When shopping/errands are the primary use, these trips are more often made several times a week. Occasional riders take shorter average trips, while those who ride daily are more associated with longer average trips (especially 10 miles or greater).

Riding by Part of the Week

About two-thirds of the respondents ride "both weekdays and weekends" (Table 3.18), while another one-fourth ride mostly on weekdays. The younger riders ($\leq$21) are overrepresented on "both weekdays and weekends", while the >55 group is highly overrepresented on weekdays. This was confirmed in some of the follow-up telephone conversations; the older riders seemed to consistently report that they did not like to ride on weekends, implying that the traffic situation was too busy during this period. More females than expected ride mostly on weekends. Consequently, female riders are somewhat underrepresented for the "both weekdays and weekends" category. Almost three-fourths of the non-white riders typically ride on "both weekdays and weekends."

When income is examined, it is apparent that the upper income groups are the ones that ride mostly on weekends with the lower income groups riding both portions of the week. Similar findings result from the education variable, in that the lesser educated are riding more than expected during both portions of the week. In short, and as one might expect, the moped appears to be more of a vehicle for basic transportation for the less educated and less wealthy groups. The better educated, higher income groups seem to have more of a single intended purpose, whether it be commuting to work or simple pleasure riding.

Moped riders whose primary use is commuting to work are overrepresented in the weekday only category, although about 60 percent of the commuters ride both weekdays and weekends. The same trend holds for those who commute to school. Pleasure riders are overrepresented in the weekend category, as are those who ride to a specific place of recreation.

About three-fourths of the riders with average trips of 10 miles or more ride on both weekdays and weekends. Those with the shortest trip lengths (1-2 miles) are overrepresented on weekends. The occasional rider tends to choose the weekend for moped activity.

Time of Day

Almost half of the respondents stated that they have no specific time during the day that they regularly ride. One-fifth ride mostly during the morning and evening commuting hours. Given the variety of uses of the moped, the variability in this distribution is not unexpected (Table 3.19).

The younger riders (both <16 and 16-21) are somewhat overrepresented in the "no specific time" category, while the >55 group is overrepresented in the before 10 a.m. and in the 10 a.m. - 4 p.m. periods. The 22-55 age group is overrepresented in the commuting period. Females do less than their share of riding during commuting hours and more than their share of riding during the "no specific time" category.

Unlike some of the earlier comparisons, distributing by income shows a great deal of variation and few, if any, trends. The upper income groups seem perhaps to do less than their share of commuting and more than their share of riding after 4 p.m.

The higher total mileage groups (>1500 miles) tend to ride more than their share during morning and evening commuting hours. The group with 500 total miles or less is highly overrepresented after 4 p.m. These same tendencies hold when time of day is distributed by average weekly mileage. Also worth noting here is that those who ride no specific time of the day are associated with higher mileage (both weekly and total).

Considering primary use of the moped, pleasure riders are highly overrepresented after 4 p.m. Those riding for pleasure avoid the peak periods, as do those who are shopping or running errands. Moped riders with short average trips (1-2 miles) are also highly overrepresented after 4 p.m., while those with long average trips ($\geq$10 miles) are underrepresented during this time. Riders traveling 10 miles or more on an average trip tend to ride at miscellaneous times.

Those who ride after 4 p.m. are overrepresented on residential streets and underrepresented on business streets. The commuters, of course, ride more than their share on the business streets. Those who ride at miscellaneous times are overrepresented on faster (>45 mph) rural roads.

Concerning frequency of use, the occasional rider is overrepresented during off-peak traffic times and underrepresented during the peak periods. The opposite is true for the daily rider.

Season of the Year

In order to obtain an estimate of the distribution of moped exposure over the seasons of the year, ideally, each respondent would have been asked to provide an estimate of his total exposure (mileage) for each of the four seasons. These, then, could have been summed over respondents and the distribution determined. It was felt, however, that good responses would not be obtained to such a question. Instead, each respondent was asked to give an estimate of his percentage distribution of exposure over the four seasons, and to give an estimate of his average weekly mileage. Simply averaging the percentage values for each season yields the following distribution:

Spring	26%
Summer	42%
Fall	22%
Winter	9%

Thus, summer produces the most riding followed by spring and then fall.

If all respondents had approximately the same weekly mileage or about the same seasonal distributions, then an average of the seasonal distributions (as shown above) should give a good estimate of the overall seasonal exposure distribution. Since neither of these conditions were strictly satisfied, however, estimates of seasonal exposure for each respondent were made using the following procedure.

Since the questionnaire was completed during the summer it was assumed that the average weekly mileage estimate most accurately reflected the respondent's summer mileage. Thus, an estimate of his summer exposure could be obtained by simply multiplying his average weekly mileage ($\bar{m}$) by 13 (assuming 13 weeks per season). For the other three seasons the average weekly mileage was first adjusted to reflect the respondent's estimated seasonal distribution. A general formula for estimating seasonal mileage is given by

$$\text{Mileage}_{(\text{season } s)} = \frac{(P_s)}{(P_{\text{summer}})} \quad (\bar{m}) \quad (13)$$

where s refers to any of the four seasons. These calculations yielded the following values:

Season	Total Miles	Percentage Distribution (Based on total miles)	Average Miles
Spring	301,720	27.5	365
Summer	372,606	33.9	451
Fall	265,308	24.1	321
Winter	158,950	14.5	192
Total	1,098,584	100.0	1,328

This percentage distribution differs from the one calculated by simple averaging above. The effects of the weekly mileage reduce the percentage of summer riding and increase the percentage of winter riding. This latter distribution should more fairly reflect the seasonal exposure. The average annual mileage, calculated by dividing the total number of season-miles by the number of respondents, is 1,328 miles.

Passengers

About three-fourths of the riders indicated that they never carry passengers, while about one-fourth said they do occasionally (Table 3.20). This is somewhat encouraging, in that most mopeds are simply not built to handle passengers. Only eight percent of the >55 group carry passengers occasionally while about half of the <16 and 16-21 age groups carry passengers occasionally. Surprisingly, females are overrepresented here; some 37 percent indicate that they carry passengers some of the time as opposed to 26 percent of the males. When income is considered, it is the higher annual income groups (>$25,000) that carry more than their share of passengers. Only those attending (or who attended) high school and college carry more passengers than expected when education is examined.

When passengers are carried, those riding less than two years tend to be overrepresented, with the opposite trend for those having ridden more than two years. Passengers are more likely to be carried by those who use the moped primarily for pleasure riding, trips to specific places of recreation, or commuting to school, whereas they are underrepresented among those who use the moped for work and shopping trips. Weekday riders are definitely disinclined to carry passengers. Additionally, those riding after 4 p.m. and at miscellaneous times are more likely to carry passengers. There were no significant differences when this variable was distributed by road type.

Table 3.20. Carrying of passengers.

Response	Number	Percent
Never	698	71.7
Occasionally	242	24.9
Often	33	3.4
Total	973	100.0

Table 3.21. Helmet use.

Response	Number	Percent
Always	153	15.7
Usually	59	6.0
Occasionally	111	11.4
Never	653	66.9
Total	976	100.0

Helmet Use

North Carolina law does not require moped riders to wear helmets when riding. Despite this fact, about one-fifth state that they either usually or always wear a helmet (Table 3.21). Another 11 percent occassionally wear a helmet. Although there are no significant age differences, the 22-55 age group tends to wear a helmet more than would be expected and both the younger groups and the >55 group less. There were no differences in helmet use by sex, race, income, or population. There is general variability within the education distribution, although it can be stated that post-graduates wear a helmet much more than would be expected. Overall, 40 percent of the post-graduates regularly use this protective device.

Helmet use tends to increase as weekly mileage increases, and about one-third of the riders who travel more than 100 miles per week usually wear a helmet. Helmets are more likely to be worn by those who primarily use the moped for commuting to work and less by those who primarily ride for pleasure. Longer trips also increase the probability of helmet use. No differences are found, however, when helmet use is distributed by primary road type, and riders who travel primarily on rural roads are no more inclined to use helmets.

Weekday riders use helmets more than would be expected. In like fashion, those who ride primarily during the morning and evening commuting hours are more likely to use a helmet. Finally, carrying passengers does not increase the likelihood of helmet use. Some 70 percent of the riders who carry passengers state that they never wear a helmet.

Use of the Moped by Other Riders

The survey asked if other people rode the moped regularly, and if so, respondents were asked to list other riders' age, sex, and miles per week. About 17 percent of the respondents indicated that others rode the moped regularly. In many cases more than one rider was listed. The overall age distribution of the other riders is shown in Table 3.22. This distribution is definitely shifted more toward younger riders than the one for the principal riders. Beside being younger, the other riders are more likely to be females -- 37 percent as opposed to 14 percent for the principal riders. Weekly mileage for the other riders is fairly small, with 44 percent riding less than 10 miles per week and 81 percent riding less than 25 miles per week (Table 3.23).

The lenders of the moped (i.e. the principal riders) have the following characteristics: less >55 and more 22-55 year-olds than expected; more females

Table 3.22. Other riders' age.

Age	Number	Percent
< 16	53	24.5
16-21	90	41.7
22-55	67	31.0
> 55	6	2.8
Total	216	100.0

Table 3.23. Other riders' weekly mileage.

Miles	Number	Percent
< 10	82	44.1
10-24	68	36.6
25-49	24	12.9
50-74	5	2.7
75-100	2	1.1
> 100	5	2.7
Total	186	100.1

than expected; more higher incomes (>$30,000) and less lower incomes (<$10,000) than expected; and more college graduates and post-graduates than expected.

Mileage trends are not well established here, but it appears that principal riders with lower weekly mileage totals are more apt to allow others to use the moped. Lenders are also more likely to have as their primary use pleasure riding or specific recreation trips. Thus, those who ride daily are less likely to lend. Lenders are also much more likely to carry passengers.

Rider Opinion on Various Moped Safety Issues

Several open-ended questions were used on the questionnaire to elicit responses about such topics as hazards to the moped rider, satisfaction with the vehicle, recommended safety changes, and possible changes in current North Carolina moped laws. Answers in the first three categories mentioned above are quite similar to those reported in other consumer surveys, while the responses regarding N.C. law reflect this state's particular approach to regulating the vehicle.

Hazards to the Moped Rider

When asked to list what they perceive as hazardous, moped riders tend to consistently choose items that fall into several major catagories. Up to three responses were accepted per questionnaire, and the complete distribution (including all responses) is shown in Table 3.24. Other drivers or vehicles are clearly chosen as the most important hazard. This item alone accounts for some 57 percent of the responses. Many of the riders complain about the actions of other drivers, such as acts of discourtesy, passing too close to the moped, failing to yield the right-of-way to the moped, etc. Riders also note that simply traveling on roads with heavy traffic is dangerous. Next on the list of hazards is the low speed and/or acceleration capabilities of the moped itself. Many state that their inability to keep up with traffic is a large problem. Others in this category state that they feel the 20 miles per hour top-speed capability is too low and prefer to see the top speed raised to 30-35 miles per hour. This particular hazard is chosen by more males and more riders in the 22-55 age group than expected. The highest annual income group and those with more education are also more likely to pick this response.

Somewhat surprisingly, the riders single themselves out as a hazard. Illegal actions of the operator, such as not signalling for turns, not obeying

Table 3.24. List of perceived hazards.

Hazard	Number of Times Chosen	Percent
Other drivers or vehicles (discourteous, passing too close,etc)	609	57.1
Low speed or acceleration capability	108	10.1
Actions of the moped opeator (failure to signal, failure to obey traffic signs, riding wrong side of road, etc)	105	9.8
Other (weather, nighttime riding, lack of bike lanes, etc)	78	7.3
Other vehicle factors (lights, brakes, conspicuity, etc)	75	7.0
Road conditions (potholes, loose gravel, no shoulders, etc)	57	5.3
Dogs	35	3.3
Total	1067	99.9

[1] The total exceeds 981 because up to three responses were coded per questionnaire.

traffic signs, riding on the wrong side of the road, etc. are cited frequently. Riding while intoxicated is also mentioned quite a few times. Males, riders older than 55, non-whites and those in the highest income group are over-represented insofar as noting this hazard is concerned.

Other vehicle factors are fairly regularly mentioned, and here the riders are concerned with better brakes, lights, and overall conspicuity. Young riders ($\leq$ 21 years old) and those with more education tend to cite such vehicle factors. The road condition hazard refers to potholes, no shoulders or poor shoulders, substances like loose gravel which can cause stability problems, etc. Females and the lower income groups are more likely to mention this hazard. The "other" category is essentially a catch-all group and includes such factors as inclement weather, nighttime riding, and the lack of bicycle or moped lanes.

In the earlier accident study (Hunter and Stutts, 1979b), dogs were found to be a prominent factor in single-vehicle accidents, but are cited as a hazard in this survey by only three percent of the respondents. The 22-55 age group, whites, and females are particularly likely to mention this hazard. Those with college educations and higher annual incomes, and those who live in cities with smaller populations also seem to be associated with this hazard.

Satisfaction with the Moped

Almost 88 percent of the respondents indicate that they are satisfied with their moped. Although this percentage is high, it compares well to other consumer surveys which have been taken in the past. When there is some dissatisfaction, the 16-21 age group has far more unhappy riders than expected.

As with the perceived hazards variable, up to three reasons for dissatisfaction were coded, and the complete distribution is given in Table 3.25. For the few complaints received, mechanical problems head the list. Next is inadequate speed and/or acceleration, which is also frequently cited as a perceived hazard. Problems with getting good service and parts are noted by about 18 percent of those who have a complaint. Thus, mechanical breakdowns and servicing account for over half of the complaints. The younger riders and those with lower family incomes tend to be overrepresented here.

In some of the follow-up telephone conversations, some of the riders tended to speak out (without prompting) on the problem of service. While a few of the major moped suppliers were critized, most of the servicing problems tended to revert to the smaller distributors. The high cost of repairs was also a recurring complaint. Numerous riders asked if HSRC could recommend a service center.

Table 3.25. Reasons for dissatisfaction.[1]

Reason	Number of Times Chosen	Percent
Mechanical problems	49	43.8
Inadequate speed and/or acceleration	23	20.5
Service problems	21	18.8
Safety aspects	11	9.8
Other	8	7.1
Total	112	100.0

[1]The total again includes multiple responses.

Recommended Safety Changes

As with the last two variables, up to three safety change recommendations were accepted. The list of changes (Table 3.26) shows that turn signals are mentioned about one-third of the time. This tendency has also been noted in some of the earlier consumer surveys.

Riders in the 22-55 and >55 age groups are more likely to mention turn signals as a need, along with the better educated and higher income groups. Also, those riders in larger cities seem to feel more of a need for turn signals. The speed/acceleration issue is again prominent and is thus mentioned for all three opinion variables so far. Better lights, mirrors, brakes, and horns are also listed with some frequency. Although the observations are too sparse to distribute broadly, whites, females and those in the largest cities tend to feel a need for these safety items.

The other vehicular changes include such things as improved tires, reflectors, exhaust pipe covers[1], shock absorbers, etc. as individual components. The need for a better built, sturdier vehicle is also often noted for this category. Finally, the non-vehicular factors include the need for special moped lanes, operator's license, insurance and helmets.

Recommendations Concerning Current North Carolina Law

As a lead-in to this question, respondents were given the following two sentences of information:

> N.C. law currently does not require a driver's license to operate a moped but does require that the operator be at least 16 years old. The top speed of the moped is set at 20 mph and there are no helmet, insurance, or vehicle registration requirements.

The respondents were then asked if they would recommend:

Requiring a driver's license?

Lowering the minimum age?

Raising the speed limit?

Requiring all riders to wear helmets?

Requiring insurance?

Requiring vehicle registration?

The complete set of responses is shown in Table 3.27. In turn, these will be discussed individually.

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[1]Quite a few of the riders mentioned that they had been burned when coming in contact with the exhaust pipe.

Table 3.26. Recommended safety changes.[1]

Safety Change	Number of Times Chosen	Percent
Turn signals	127	31.7
More speed and/or acceleration	59	14.7
Better lights	47	11.7
Better mirrors	21	5.2
Better brakes	20	5.0
Louder horn	19	4.7
Other vehicular changes	86	21.4
Other non-vehicular changes	22	5.5
Total	401	99.9

[1]The total includes multiple responses.

Table 3.27. Recommendations concerning current North Carolina law.

Recommendation	Percentage Approve	Percentage Disapprove	Percentage Not Stated
Require driver's license	18.8	69.8	11.4
Lower minimum age	21.8	64.5	13.7
Raise speed limit	51.1	38.2	10.7
Require helmet	33.3	54.1	12.5
Require insurance	12.6	73.6	13.8
Require registration	26.9	59.9	13.1

Require driver's license.

As discussed in Chapter 5 of this report, an estimated 20 percent of those persons purchasing mopeds in North Carolina have a recent history of a suspended or revoked driver's license. Moreover, the vast majority of these suspensions and revocations are alcohol-related. Many others also ride mopeds without a license, including young riders (some underaged) and some older people who have never obtained a license. Given this, it is not surprising to find that only 19 percent of the respondents indicated that they would favor this requirement.

Examining the breakdown more closely reveals that there are some age effects that bear on the decision. The less than 16 age group is important here, having less who approve and more who disapprove than expected. Income produces significant differences also, where more in the upper income brackets (especially those exceeding $30,000 per year) approve than expected. The opposite holds for the lower income groups. College graduates and post-graduates also tend to favor the requirement, while those with only a grade school education do not. Approval tends to be inversely proportional to total mileage, average weekly mileage, and trip length. Daily riders, who might also be less likely to have a valid license, tend to approve. Finally, more of those who regularly wear helmets (the more safety conscious) approve the measure than expected.

Lower minimum age.

Despite the facts that the moped is a relatively simple vehicle to operate and that six percent of the respondents are underaged, only about a fifth of the riders favor the lowering of the minimum age to less than 16 years old. Opinion varied in the follow-up telephone conversations where it was very apparent that some parents restricted younger operators to private property or lightly traveled routes, while others felt that their younger offspring could easily operate the moped in most of the traffic situations they faced.

Not surprisingly, the underaged (and less educated) operators heavily favor lowering the minimum age, while the opposite holds for those greater than 55 years old. High income groups, where the moped might be purchased for a younger family member, also favor the age lowering, while the lower annual income groups do not. Approval tends to be directly proportioned to length of time riding. Both those who lend the moped and carry passengers are favorable to the age-lowering concept. Concerning primary use, utilitarian riders tend to disapprove while pleasure riders are favorable. And as before, the more safety conscious helmet wearers view the idea with disfavor.

Raise speed limit.

Low speed and/or acceleration were consistently expressed as hazardous to the moped rider in the earlier portions of this section, and this tendency is continued here, as about half the respondents favor raising the maximum speed limit above 20 miles per hour (on a level surface). Many of the comments pertinent to this issue express the need for more speed to effectively keep up with traffic.[1] It should be noted that North Carolina is one of only six states with such a low top-speed capability. Most states have a 25 or 30 mile per hour maximum.

Examining some of the interactions, the 16-21 and 22-55 age groups tend to favor raising the speed limit, while the >55 group is definitely opposed. Males favor the concept while females do not. Those with a grade school education see no need to raise the speed limit, while all the other educational groups agree with the idea. The same type of trend is present in the population variable, where only those living in the rural (less than 500 inhabitants) areas disapprove.

Examining the experience and usage pattern variables shows that mileage traveled is a factor, in that agreement with the concept of raising the speed capability is directly proportional to total mileage traveled, average weekly mileage, and trip length. Daily commuters and riders using the moped for utilitarian purposes also like the concept, while the opposite is true for the pleasure riders. Helmet wearers and riders who regularly carry passengers likewise approve of the increased speed capability.

Require helmet.

Mandatory helmet usage continues to be a fairly sensitive subject in North Carolina, as attempts to overturn the motorcycle helmet use law continue. In recent years the trend nationally has been toward repeal of such laws for motorcyclists, with about half of the states overturning previously existing mandatory laws.[2] Given this background, it is somewhat surprising to find that about one-third of the respondents favor a helmet requirement for moped riders.

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[1]Riders are requesting increased speed capability when it is apparent that many of the mopeds presently in use will exceed 20 miles per hour anyway. See Chapter 4 for further detail.

[2]However, there now appears to be at least some movement toward reinstatement of these helmet use laws, especially in light of increased motorcyclist death rates in the states where the laws were overturned.

Whereas more of the 22-55 age group agree with the helmet law than expected, the >55 group is decidedly against the concept. Over half of the female riders favor the requirement. No differences are noted for the other demographic variables.

Concerning experience, there appears to be less of a need seen for a helmet the longer time one has been riding, but no differences are seen for the mileage variables. Those who consistently travel 10 or more miles per trip like the concept. Results are somewhat mixed for the primary roadway type variable, where more riders traveling primarily on business streets or lower speed rural roads favor the helmet requirement than expected, with the opposite holding for those traveling on residential streets and high speed rural roads. Finally, and as one would expect, over 80 percent of those who regularly wear helmets approve of a mandatory use law.

Require insurance.

As can be seen from Table 3.27, fewer riders approve of the concept of mandatory liability insurance than any of the other issues. The general comment made most often on the questionnaire or in telephone conversations was that an insurance requirement seemed like overregulation of a relatively simple vehicle. In other words, if bicycles don't need insurance, why do mopeds? Many even stated that an insurance requirement would prompt them to sell the moped and acquire a motorcycle. Since the vote here is overwhelmingly negative, only a few in-depth comments about the respondents will be made.

More of the 16-21 year olds favor the insurance requirement than expected, while the opposite is true for the 22-55 age group. The non-white indication is more positive than expected, as is the highest income group. Finally, those making the longest trips and the regular helmet wearers also have a more positive response than expected. The overall interactions here among the variables seem to be somewhat random and possibly divergent.

Require registration:

The concept of registration intended here is that of a statewide, centralized function. However, it is likely that the interpretation by the respondents varied considerably, especially when 27 percent approved of this concept as opposed to 12 percent who favored mandatory insurance, although mandatory registration would be a mild financial burden when compared with insurance. Quite a few of the respondents who favor registration rightfully state that the concept would aid in the recovery of stolen mopeds.

Where differences are noted in the demographic variables, the 16-21 age group and the non-whites have a more favorable response than expected, which is similar to the results for insurance. Commuters to school like the registration concept, perhaps with good reason, for school yards and campuses are likely locations for thefts. And comparable to the other results, more of the regular helmet wearers prefer registration than expected.

Purchase and/or use effects.

As a final question pertaining to the section on North Carolina law, respondents were asked if changes to any of the laws or concepts would have affected either the purchase or use of the moped. Slightly over half (≈53 percent) of the riders indicated that such changes would have had such an effect, while another 12 percent were unsure. Only about 35 percent stated that the changes would have been inconsequential. The majority of respondents indicated that the changes would have modified their initial purchase. Further elaboration revealed that the requirements for a driver's license and for insurance would have had the strongest consequence. This reinforces the findings reported in Table 3.27.

Accident Experience

A final item on the questionnaire had to do with the accident experience of the respondents. Riders were asked if they had ever been involved in a traffic accident and, if so, to provide some details. Another question was used to try to gather the same information for other riders of the moped. The data obtained here are sparse, as over 90 percent stated that they had not been involved in an accident.

Table 3.28 gives the information developed for the principal riders. Eighty-nine reported some accident involvement. Of these, around 25 percent reported an accident resulting in serious injury. This is consistent with the Class A injury data reported for 1976-1978 in the earlier North Carolina moped accident study (Hunter and Stutts, 1979b). The earlier data were based on accidents reported to the N.C. Division of Motor Vehicles. The accident data for other riders (Table 3.29) is minimal and provides little additional information. The great majority of these reported accidents resulted in either no injury or minor injury. Chapter 5 updates the reported accident experience for North Carolina moped riders.

Table 3.28. Accident experience for the principal riders.

Event	Number	Percent
1 accident, no injury	25	28.1
1 accident, minor injury	28	31.5
1 accident, serious injury	22	24.7
1 accident, no injury information	10	11.2
≥ 2 accidents, minor injury	3	3.4
≥ 2 accidents, serious injury	1	1.1
Total	89	100.0

Table 3.29. Accident experience for other riders.

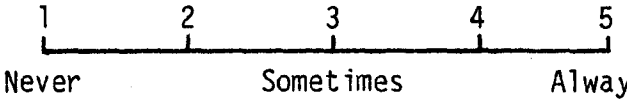
Event	Number	Percent
1 accident, no injury	11	32.4
1 accident, minor injury	16	47.1
1 accident, serious injury	4	11.8
1 accident, no injury information	3	8.8
Total	34	100.1

CHAPTER 4. RESULTS FROM THE FOLLOW-UP SURVEY

Method

The preceding chapter presented results from the general survey of riders identified from warranty cards, a survey which produced about 1,000 returned questionnaires. This chapter will concern a follow-up survey used to primarily gather weekly mileage data. Volunteer respondents were asked some detailed mileage questions that covered their weekly riding habits during the month of July 1980. Full details of both surveys are presented in Chapter 2, including comments about the representativeness of the respondents. In the results to follow and the subsequent discussion chapter, this data will be referred to simply as the follow-up survey.

The follow-up survey entailed a sheet of supplemental (one time only) questions concerning riding habits and a series of four fold-up postal cards for the last four weeks of July 1980. A reproduction of the postal card is included in Appendix A. The supplemental questions were attached to the first week postcard and consisted of the following:

> Use the scale below to answer the following set of questions.
> Write the correct number in the box.
>
> 
>
>
> How often do you ride
>
> - as close as possible to the right hand edge of the road ☐
> - a few feet out from the right edge ☐
> - in the center or slightly left of center of the traffic lane ☐
> - off the road completely (on shoulder) ☐
> - on bicycle paths or in designated bicycle lanes ☐
> - faster than 20 miles per hour ☐
> - against traffic (i.e. wrong way) ☐
> - with your headlight on during the day ☐
> - using your pedals (not counting when starting the engine) ☐

The follow-up survey was mailed to a stratified sample of 253 riders. These riders were chosen from a group of volunteers so that their age, sex, and location by region of the state matched these same characteristics for the respondents to the general survey (questionnaire). Overall, some 152 usable responses were obtained for a return rate of about 60 percent. In follow-up telephone conversations during the course of this survey, it was determined that many of the non-respondents simply were no longer riding their moped.

Analysis of Responses to Supplemental Questions

The respondents had no difficulty in rating their particular riding habits on a five point scale as called for by the supplemental questions, and virtually all answered these questions correctly. The overall results are shown in Figure 4.1, which is a graphical representation of the average ratings for each question (based on the five point scale).

The first four questions are related and pertain to lane position. It is assumed that moped riders typically stay very close to the right hand edge of the pavement because of the vehicle's low speed and acceleration capabilities. Answers to these four questions generally confirm this assumption. Almost 30 percent of the respondents indicated that they always ride in the far-right-hand lane position, and another 24 percent noted that they almost always use this position. Only 26 percent indicated that they never or almost never use this position. The composite rating is 3.46 for riding close to the right hand edge and 3.01 for a few feet out from the right hand edge. Only some three percent always ride near the center of the lane, and about two-thirds never utilize this position. Riding on the road shoulder appears to be done infrequently; slightly less than 20 percent gave this a rating of three or better.

Very few riders are able to utilize off-system bicycle paths or designated bicycle lanes. Less than seven percent noted that they frequently use these facilities (rating of four or five). Based on the comments written on the supplemental questions and some telephone conversations, it is apparent that moped riders see a need for more of these two-wheeled vehicle facilities and would use them if available. One can only speculate as to how bicyclists would receive moped riders on "their" facilities. It is interesting to note, however, that usage of bicycle paths and lanes by moped riders tends to be mandatory in Europe (Hunter and Stutts, 1979a).

By law, the top speed capability of a moped (on a level surface) in North Carolina is only 20 miles per hour. Only a handful of other states have a similar top speed threshold, as most laws are geared toward the 25-30 mile per

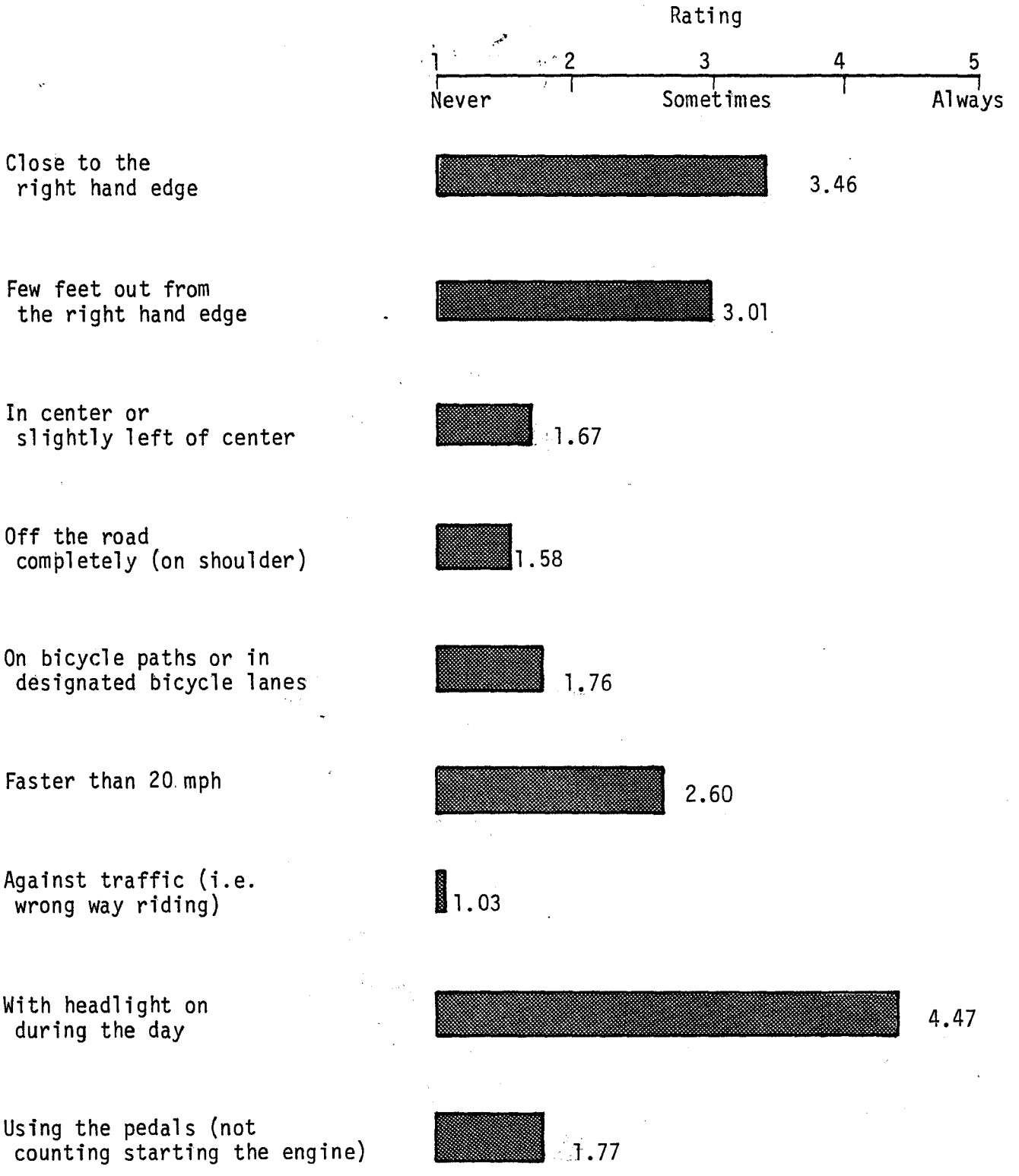


Figure 4.1 Bar graphs of the average ratings for the supplemental questions.

hour range. Notwithstanding the law, slightly over one-fourth of the respondents stated that they regularly exceed 20 miles per hour (rating of four or five). As seen in the opinion section of the questionnaire (Chapter 3), many favor changing the law so that the top speed capability would be increased.

Virtually all of the respondents indicated that they never ride against traffic (i.e., wrong way riding), although there is some indication of this maneuver in the accident data (Hunter and Stutts, 1979b). Somewhat surprisingly, over 80 percent stated that they almost always ride with their headlight on during the day, a conspicuity-increasing technique which has long been advocated for motorcyclists and is mandatory in North Carolina. Conversations with dealers, however, indicate that many mopeds are now wired so that the headlight is on when the engine is running.

The final question concerned the use of pedals except when starting the engine, such as for assistance in hill climbing or starting off from intersections. Almost 80 percent stated that such usage was a rarity (rating of one or two).

Analysis of the Weekly Mileage Data

General Approach

The main thrust of the follow-up survey was to generate weekly mileage data. Thus, riders were asked to record their total miles for the week and then to distribute the total miles by both type of trip and type of roadway used. The categories within type of trip and type of roadway were identical to the categories used on the earlier questionnaire.

The follow-up survey was mailed early enough so that all riders would hopefully begin on the same starting date, July 6, 1980. The dates on each card were manually filled in by HSRC in an attempt to have comparable time periods for each rider that participated. Thus, the riders were asked to monitor their riding activity for four consecutive weeks:

July 6, 1980 - July 12, 1980
July 13, 1980 - July 19, 1980
July 20, 1980 - July 26, 1980
July 27, 1980 - August 2, 1980

The four-week period was selected because of the inherent likelihood of individual rider mileage variation among weeks, especially during the summer.

The idea was then to average the mileage totals by the appropriate number of weeks for each respondent in an attempt to control for some of the variation.

Respondents were also asked to comment on whether their week of riding was typical, and these indications were coded for analysis. Typical riding was consistently indicated by 70-75 percent of the respondents for each of the four weeks. Examples of situations producing non-typical riding were vacation, repairs, bad weather, sickness or injury, etc. All of these factors had the effect of lowering the mileage totals. It was felt that all of the situations which produced atypical riding could easily occur in the activities of any moped rider. Consequently, it was decided that the most realistic way of averaging the mileage totals would be to include the atypical weeks. This, of course, had the effect of lowering all averaged values.

Average Weekly Mileage

The process described above was used to produce average values (i.e., a single estimate) of total miles, total miles by trip type, and total miles by roadway type for each respondent. These values were in turn averaged to produce the overall mean values shown Table 4.1. The total miles for all categories are not equivalent because of differing numbers of respondents for each. For example, a rider might indicate the total miles for the week but fail (or be unable) to distribute the total miles by one or perhaps both of the other categories.[1]

The average number of miles ridden per week was just under 40, which compares well with the questionnaire average of 36. Weekly variation was low, as seen in the average (total) miles per week:

Week 1	41 miles/week (n=151)
Week 2	39 miles/week (n=130)
Week 3	37 miles/week (n=115)
Week 4	39 miles/week (n=104)

When type of trip is considered, the largest number of weekly miles are associated with commuting to work (11), pleasure riding (9), and shopping or errands (7). These results are consistent with the primary use variable from the questionnaire. The general survey also indicated that about three-fourths of the riders ride less than 50 miles per week, which is also consistent with

[1]Two of the respondents who had missing mileage values for either trip type or roadway type had total miles of greater than 150 for the week. Losing such a data point caused the calculated means for these other variables to be quite lower.

Table 4.1. Average weekly mileage totals.

Total miles	40
By trip type:	
Commuting to work	11
Commuting to school	1
Recreation trips	3
Pleasure riding	9
Shopping/errands	7
Use in business or work	2
Visiting	4
Other	1
Total miles	38
By roadway type:	
Residential streets	14
Downtown business streets	5
Other major city streets	7
Rural roads, ≤45 mph	7
Rural roads, >45 mph	6
Private property	0
Total miles	39

the above. One area of disagreement is the fact that pleasure riding was associated with lower weekly mileage on the questionnaire and commuting to school with higher weekly mileage. The differences seen in Table 4.1 for these two trip types can possibly be explained by the timing of the follow-up. The month of July should produce only a small amount of commuting to school in that only colleges would be in session. Also, the age group that would otherwise be in school would be a likely group to shift to pleasure riding during this period.

Average weekly mileage was clearly highest on residential streets. This is consistent with the miles of pleasure riding and shopping trips indicated. The number of miles on major city streets (heavy traffic) is somewhat surprising, although work commuters (identified by trip type above) would likely have to travel on some of these routes.

Weekly Mileage by Rider Demographics

By using the four-digit identifier, the follow-up survey data could be linked with the earlier-developed questionnaire file. It was thus possible to distribute the values shown in Table 4.1 by other variables of interest. In this and the following section, basic tables of average weekly mileage by these other variables such as age, sex and primary use are presented in the text.

Tables that further distribute average weekly mileage by trip type and roadway type are contained in Appendix D.

Table 4.2 shows the total miles per week allocated among age groups. Here the 22-55 age group averaged about 50 miles per week, while both the 16-21 and >55 age groups averaged about 30 miles per week. The average mileage for the <16 group was considerably less. This follows some of the questionnaire results in that the youngest group is associated more with pleasure riding, and that pleasure riding yields lower weekly mileage. On the other hand, the 22-55 group is more associated with commuting to work which typically results in higher weekly mileage totals.

Table 4.2 Average weekly (total) mileage by age.

Age	Number of respondents	Average weekly (total) mileage
<16	10	17
16-21	21	30
22-55	87	50
>55	34	29

These trends were precisely the same when the total mileage values shown in Table 4.1 were separately partitioned by type of trip and type of roadway used for each age group (see Appendix D). In other words, the majority of the <16 group's weekly miles were for pleasure (8 miles) and on residential streets (11 miles). For the 22-55 group the largest number of miles were for commuting (17 miles), with residential (17 miles) and other major city streets (11 miles) being the preferred route choices. The >55 group accumulated more miles shopping (10 miles) and on residential streets (13 miles).

Table 4.3 concerns weekly mileage by sex, and the tendency is for males to accumulate more miles. Further examination showed that males were concerned with commuting to work (13 miles) and pleasure riding (9 miles) and rode primarily on residential streets (15 miles). Females tended to use the moped for shopping/errands (8 miles) and pleasure riding (7 miles) and also favored residential streets (12 miles).

Table 4.3. Average weekly mileage by sex.

Sex	Number of respondents	Average weekly (total) mileage
Male	127	42
Female	25	32

The vast majority of the respondents to the follow-up survey were white (Table 4.4), although the total weekly miles for both whites and non-whites were quite similar. The white group tended to commute to work (11 miles) and ride for pleasure (9 miles); the non-white group tended to commute to work (14 miles) and ride for shopping or errand trips (10 miles). Both groups favored residential streets.

Table 4.4. Average weekly miles by race.

Race	Number of respondents	Average weekly (total) mileage
White	145	40
Non-white	7	41

The follow-up respondents were fairly equally distributed by the family's annual income (Table 4.5). There was a slight tendency for lower income riders to accumulate more miles per week. The trip purpose results were quite varied and somewhat different from the questionnaire findings. For the follow-up survey, all the groups favored residential streets. Using the moped to commute to work seemed to increase along with income. Those in the lowest income group reported more miles for shopping (12 miles) and pleasure riding (11 miles) than any other uses. Where annual incomes exceeded $30,000, commuting to work was clearly the trip purpose generating the most miles (13 miles). The questionnaire findings showed that lower income riders were more associated with work trips and higher income riders with pleasure riding.

Table 4.5. Average weekly miles by income.

Income	Number of respondents	Average weekly (total) mileage
<$10,000	26	45
$10,000-$14,999	30	39
$15,000-$19,999	20	52
$20,000-$24,999	23	26
$25,000-$29,999	15	39
>$30,000	26	36

The education variable from both surveys tends to be more in agreement (Table 4.6). In all groups except those with only a grade school education, commuting to work is a popular trip purpose that generates 10-15 miles per week.

The grade school group accumulates the most miles from pleasure riding. All groups favor the residential streets. Somewhat surprisingly, college graduates report about 10 miles per week traveling on high-speed rural roads, although this tendency may have some relationship with income. In other words, the better educated, higher income groups may simply live farther from the central business district and be forced to utilize some of the rural roads for many kinds of trips. The grade school and <$10,000 income groups also generate over 10 miles per week on rural roads.

Table 4.6. Average weekly miles by education.

Education	Number of Respondents	Average weekly (total) mileage
Grade school	17	42
Attended high school	31	44
Graduated from high school	31	37
Attended college	24	45
Graduated from college	22	41
Post-graduate work	18	37
Other	8	32

The population tendencies (Table 4.7) for the follow-up survey also are similar to the questionnaire data, as mileages for commuting to work, commuting to school and trips to a specific place of recreation are all directly proportional to population (although weekly miles are very low for the latter two categories). Those respondents living in cities of 10,000-25,000 report an average of 24 miles per week for work trips. Travel by road type is obviously directly related to population, and those living in rural areas necessarily do more of their riding on rural roads.

Table 4.7. Average weekly miles by population.

Population	Number of respondents	Average weekly (total) mileage
Rural (<500)	13	26
500-999	10	26
2,500-4,999	11	35
5,000-9,999	8	39
10,000-24,999	29	54
25,000-49,999	22	46
>50,000	55	36

Weekly Mileage by Other Variables of Interest

The above discussion, centered around Tables 4.2 - 4.7, was concerned with weekly mileage as related to demographic characteristics of the riders. The following discussion pertains to weekly mileage as related to some of the other primary variables of interest from the general questionnaire.

There was good consistency between the weekly mileage values reported on the questionnaire and the actual miles ridden as reported in the follow-up. Also similar to the questionnaire was the fact that work trips were associated with higher weekly mileage and pleasure riding with lower weekly mileage. For example, those riders who stated on the questionnaire that their weekly mileage typically exceeded 100 miles had the following selected mileage values on the follow-up survey:

Average weekly (total) miles	85
Trip type:	
Pleasure riding	28
Commuting to work	41
Roadway type:	
Other major city streets	19
Rural roads, ≤45 mph	15
Rural roads, >45 mph	25

These high-mileage riders also travel quite a bit on rural roads and major city streets. In general, reported mileage on rural roads in the follow-up survey was directly proportional to average weekly mileage.

The primary use variable also showed good agreement between both surveys. Work trips as the primary use produced high weekly mileage (52 miles), while pleasure riding as the primary use resulted in a lower weekly mileage (24 miles).

On the questionnaire, those who used the moped primarily for work trips were associated with longer trip lengths. The same pattern was seen in the follow-up survey. Those whose trips typically exceeded 10 miles (from the questionnaire) generally rode about 77 miles per week in the follow-up, of which 24 miles were for work trips.

The surveys were also consistent when primary road type was examined (e.g., those who stated on the questionnaire that their primary riding was on major city streets corroborated this in the follow-up). Riding on rural roads was associated with pleasure riding.

Frequency of use is proportional to average weekly mileage, and those riding daily report an average of 55 miles per week. Those who ride frequently tend to commute to work, while pleasure riding is more common for those who ride infrequently.

Several other variables were examined including time of day, time of week, passenger presence and helmet use. Findings for the follow-up survey again matched well with the questionnaire.

Exposure During Conditions of Darkness

Riders of two-wheeled vehicles, compared to other four-wheeled vehicles, are at increased risk during the day because of their lack of conspicuity. At night the problem is even worse. In the follow-up survey, riders were asked to give the percentage of their total weekly miles that occurred under conditions of darkness. Since the follow-up was conducted in July when there is abundant daylight, one would expect the percentage of travel in the dark to be fairly low, and this was indeed the case. Simply averaging all the percentage values (including the many cases of zero percent travel at night) yielded a mean of seven percent.

Just as with the analysis of seasonal riding performed earlier for the general questionnaire results, it was felt that a better measure of exposure here would be based on a calculation of the total miles ridden under conditions of darkness. Thus, for each rider, an average number of dark miles was calculated by multiplying the reported percentage of riding under conditions of darkness by the total mileage given for that week, and then averaging the resulting dark-miles across all weeks reported to yield a single estimate of nighttime exposure per rider (i.e., sort of a smoothing process). Subsequent averaging of these smoothed, rider-specific dark-miles yielded an overall mean of six dark-miles per week.

It should be noted that almost half of these riders had zero mileage under conditions of darkness, and the median value for this distribution was about 0.4 dark-miles per week. Eliminating some of the extreme values (mean values of greater than 50 dark-miles per week for five riders) lowers the overall average to just three dark-miles per week.

A few other comments can be made concerning nighttime exposure, based on distributing the dark-miles per week by other variables reported in the general survey. The 16-21 age group had the highest weekly average, about 10 dark-miles

per week, while the 22-55 age group averaged seven dark-miles per week. Males averaged six dark-miles per week and females only three. Those attending college (10 dark-miles per week) and attending high school (nine dark-miles per week) had high weekly averages, but this is probably a further reflection of the age effects. Riders who stated in the general survey that their primary use was commuting to work averaged seven dark-miles per week. Finally, primary roadway type was examined, and the results here were somewhat surprising. The highest mean values were associated with those who ride mostly on rural roads (nine dark miles per week on rural roads with a speed limit greater than 45 mph and six dark-miles per week on rural roads with a speed limit of 45 mph or less). This particular combination of riding at night on the higher speed rural roads can only result in a situation of increased risk for the moped operator.

Analysis of Accident and "Near Miss" Data

The final question on the follow-up survey was designed to elicit information about any mishaps in which the moped rider was involved, such as accidents, falls, "near misses", etc. "Near misses" refer to situations in which an accident would have occurred if the moped rider had not taken action, such as rapid braking to avoid a vehicle turning in front of the moped. Examples were given to the respondents on sample forms which accompanied the cover letter for the follow-up. The actual wording of this section of the questionnaire follows:

> How many falls or accidents did you have during this seven day period? _____
>
> For how many of these falls or accidents did you receive some form of professional medical treatment (hospital, doctor's office, etc.)? _____
>
> For how many was there some personal injury and/or as much as $200 property damage? _____
>
> How many other "near miss" situations did you encounter that could have resulted in an accident? _____

THANK YOU. Please use the space below to add any other comments you wish about your riding experience this past week.

The idea was to generate numbers on incidents of various severity and to encourage the respondents to elaborate on these.

As might be expected, there were few accidents or falls reported, only seven over the entire four-week period. Only one of these was reported to require some form of professional medical treatment, and two resulted in some personal injury and/or $200 property damage (the threshold for being reportable to the North Carolina DMV). Near misses were more common, and a total of 85 were reported. The assumption is that the accident and fall information is reasonably correct, given that these incidents are easy to document. There is less certainty about the near misses. These should be relatively easy to recall, but reporting tendencies could easily vary by individual. That is, some might tend to dramatize and overreport, while others might think little of "close calls" and underreport.

It is possible to calculate rates from such information. Uncertainty notwithstanding, the rates will be calculated from the values as reported. One interesting rate, or ratio in this case, concerns the number of accidents per number of near misses. For all falls and accidents, there were over 12 times (85 near misses divided by seven accidents or falls) as many near misses as accidents or falls. Considering the reportable accidents, there were over 40 near misses for every accident.

The total mileage ridden over the four-week period was just under 20,000. Using this as a denominator produces the following rates:

Incident rate (falls or accidents)	35 per 100,000 miles (or 3.5 per 10,000 miles)
Reportable accident rate	10 per 100,000 miles (or 1 per 10,000 miles)
Near miss rate	430 per 100,000 miles (or 43 per 10,000 miles)

As a rough comparison, the overall North Carolina accident rate (for all vehicles) is about 370 accidents per 10^8 miles traveled. The equivalent moped reportable accident rate (10,000 accidents per 10^8 miles traveled) based on this survey is about 27 times higher.

It is also interesting to compare the moped accident rate from the follow-up survey with that from the general survey (questionnaire). By examining the dates, approximately 60 accidents were reported to have occurred

in the last year for the 981 questionnaire respondents. The total annual mileage (from the season calculations) for this group amounted to 1,099,000 miles. These values yield a rate of five reportable accidents per 100,000 miles, as opposed to 10 per 100,000 miles for the follow-up survey.

In reality, perhaps one-third of the 60 accidents briefly described in the questionnaire might not meet the reportable accident threshold as defined by the North Carolina DMV. This is based on the distribution of the accident variable on the questionnaire, which shows about one-third of the accidents resulting in no injury to the rider. Thus, a better reportable accident rate from the qeustionnaire might be closer to four accidents per 100,000 miles. On the other hand, our overall feeling is that the numbers reported in this section of the qeustionnaire are conservative, in that this part of the survey is more time-consuming for the individual. Instead of checking a box or filling in a number, a description of an event is required. Our assumption is that at least some failed to report the accident information. All these caveats aside, it would seem that a reasonable rate for mopeds would be five to ten accidents per 100,000 miles traveled.

CHAPTER 5. DESCRIPTIVE ANALYSIS OF 1979 N.C. MOPED ACCIDENT DATA

Introduction

In an earlier report to the North Carolina Governor's Highway Safety Program, HSRC gave an in-depth analysis of N.C. moped accidents for the three-year period 1976-1978 (Hunter and Stutts, 1979b). While the primary purpose of the present study was to collect exposure data on mopeds, HSRC has continued to update its accident files.

This chapter presents a descriptive analysis of the 1979 N.C. moped accident data and draws comparisons where possible with the exposure data collected under this project. Most of the tables are single variable frequency distributions and contain figures for 1976-78 moped accidents alongside the 1979 data wherever available. The 1976-78 figures are taken from the earlier report and are reshown here simply for the convenience of the reader. Comparisons of accident and exposure data in the text have been limited to the 1979 accident data, as it coincides most closely to the exposure survey period.

At the outset it should be noted that beginning January 1, 1979, North Carolina adopted a revised Standard Accident Report Form. Appendix B contains copies of both the old and new report forms. A major consequence of the shift to the new form has been that in recording accident type, a moped - motor vehicle accident is usually coded as "collision of motor vehicle with moped" rather than "rear end", "left turn, same roadway" or other listed codes which would be more descriptive of what actually took place. Also, single vehicle moped accidents are typically classified as private property accidents, with the result that a large proportion of the data on the Accident Report Form is not coded onto the DMV file.

To overcome these problems with the data, HSRC requested and obtained from the N.C. Division of Motor Vehicles hard copies of all of the 1979 moped accident reports. Accident narratives and diagrams were examined to reconstruct the accident sequence variables. At the same time, information not recorded for the "private property" accidents was coded, and one additional variable (party at fault) was created.

Another apparent by-product of the shift to the new accident report form has been an increase in the percentage of A-level (serious) injuries, probably due to the inclusion of the complete (but unaltered) definition of an A-level injury on the form itself. For <u>all</u> North Carolina accidents, the increase has

been almost fifty percent, from 2.6 percent in 1978 to 3.8 percent in 1979. For moped accidents only, the percentage increase has not been so high, as will be documented in the following section.

The remainder of this chapter examines: (1) the number and severity of moped accidents, (2) demographic characteristics of the moped operator, (3) when moped accidents occur, (4) where accidents occur, (5) collision characteristics, (6) causative factors in moped accidents and (7) the license status of moped operators. The analysis is primarily descriptive. Chi-square values were computed for some of the crosstabulations of the 1979 accident variables, but not for comparisons of the 1979 data with data for previous years.

Number and Severity of Accidents

In past years HSRC experienced some difficulty in constructing a moped accident file for North Carolina, since mopeds were not identified as a distinct vehicle type on the Standard Accident Report Form. With the revised form this is no longer the case, and particularly as police officers and the Highway Patrol become better acquainted with the vehicle the accident file should be an accurate reflection of reported moped accidents in the state. By law, any motor vehicle accident on a trafficway resulting in injury and/or $200 property damage must be reported to the Division of Motor Vehicles. Because it is viewed as a bicycle, it is likely that many moped accidents not involving another motor vehicle are not reported, even when injury is involved.

In 1979 the number of reported moped accidents in North Carolina totaled 304. This compares with the following counts for the years 1976-1978:

Year	Number of Accidents
1976	105
1977	126
1978	212
	443

Thus in three years time the number of reported moped accidents in the state has almost tripled. Part of this increase could reflect more accurate reporting. However, it is probably more closely tied to the increased popularity of the vehicle in the state.

Table 5.1 gives information on the severity of the moped accidents occurring in North Carolina. The 1979 accidents follow a distribution similar to previous years, with four percent of the operators killed and ≈70 percent

Table 5.1. Moped operator injury severity.

Injury Level	1976-78 Data	1979 Data
Killed	16 (3.8)	11 (3.6)
Class A (Serious)	92 (22.0)	84 (27.6)
Class B (Moderate)	196 (46.8)	129 (42.4)
Class C (Minor)	60 (14.3)	47 (15.5)
Not Injured	55 (13.1)	32 (10.5)
Not Occupied	--	1 (0.3)
Total	419	304

suffering serious or moderate injuries. The 25 percent increase in A-level injuries from the 1976-78 average is not unexpected considering the overall increase in A-level injuries with the new report form. Still, it is somewhat misleading in that the percentage of A-level injuries reported in 1978 alone was 26 percent (see Hunter and Stutts, 1979b).

Any comparison of this statewide accident data with the accident data resulting from the two exposure surveys is questionable, due to the small numbers for the latter. Of the 981 persons responding to the general survey, 89 reported some accident involvement and 64 reported that they had been in at least one accident resulting in injury. (See Table 3.28. This includes the 10 cases where injury information was not given.) If these ≈1,000 respondents are representative of the total population of riders in the state and if one assumes a population of 16,000 riders (MAA's estimate of the number of mopeds in the state as of July 1979), then one might expect 64 x 16 or 1,024 injury-producing moped accidents. This figure, even though not limited to one year, is high, suggesting underreporting of moped accidents and/or too high an estimate of the riding population in the state. Using HSRC's more conservative estimate of 10,000 mopeds in the state results in a predicted 640 (64 x 10) accidents, a figure closer to what the state has actually experienced over the past several years.

Another basic table and one that reflects on the representativeness of our survey sample is moped make. This variable was hand coded for both the 1978 and 1979 data, but even so there is some margin for error due to the large range of possibilities coupled with a tendency for the investigating officer to sometimes report a specific model name rather than the more general brand name (e.g., Ciao instead of Vespa). Also, officers still sometimes write in only "moped" or "motobecane" (apparently non-specific) rather than any given make.

Given these caveats, Table 5.2 reports a decrease in the percentage of accidents involving Motobecane mopeds and an increase in the percentage involving Puch and Yamaha mopeds. Of course all of this is very closely tied to sales and exposure. And unfortunately, comparison with the exposure data returns for this survey must be made with extreme caution, since the distribution of returns is very much dependent on the original sample sizes obtained from the manufacturers, the quality of this data in terms of its recentness and completeness, etc. For example, the original sample size for Yamaha moped purchasers was only 25, so that one would hardly expect this to match well with the accident data. Basically, however, the exposure and accident distributions do agree fairly well, giving further credence to the representativeness of the general survey sample.

Table 5.2. Moped make.

Make	1978 Data	1979 Data	Exposure Data
AMF	10 (4.7)	13 (4.3)	49 (5.0)
Batavus	8 (3.8)	5 (1.6)	27 (2.8)
Columbia	3 (1.4)	5 (1.6)	8 (0.8)
Garelli	19 (9.0)	23 (7.6)	63 (6.4)
Honda	20 (9.4)	37 (12.2)	189 (19.3)
Motobecane	63 (29.7)	46 (15.1)	248 (25.3)
Peugeot	2 (0.9)	9 (3.0)	38 (3.9)
Puch	4 (1.9)	22 (7.2)	94 (9.6)
Tomos	29 (13.7)	31 (10.2)	126 (12.8)
Vespa	8 (3.8)	11 (3.6)	42 (4.3)
Yamaha	4 (1.9)	44 (14.5)	7 (0.7)
Other or not stated	42 (19.8)	58 (19.1)	90 (9.2)
Total	212	304	981

Moped Rider Demographics

The age distribution for moped operators involved in accidents is shown in Table 5.3 along with the age distribution of respondents to the general survey. One-third of the riders in accidents are under the age of 25, approximately another third between 25 and 49, and a final third 50 or over. If the survey respondents can be considered representative of all riders in the state, then younger riders are somewhat overinvolved in accidents. Only 27 percent of the exposure sample was 25 years old or less, but 33 percent of the accident-involved riders fell into this age category. At the same time, 34 percent of the exposure sample was 50 or over, compared with only 23 percent of the accident sample. It is possible that some of this difference could be due to differences in riding habits, and in particular average weekly mileage. However, Chapter 3 has reported no significant differences when age is distributed by weekly mileage.

Table 5.4 reports on moped operator sex. The percentage of female riders involved in accidents has increased from the 1976-78 total, but remains less than nine percent of all riders in accidents. Comparison with the exposure data suggests that females are underrepresented in accidents. This might be attributed at least in part to the finding from the general survey that females have a significantly lower average weekly mileage than males.

Table 5.5 on moped operator race shows a large increase in the percentage of black moped riders involved in accidents, from an average of 20 percent during 1976-78 to 27 percent in 1979. By comparison, fewer blacks are represented in the exposure survey. This may suggest an overinvolvement of blacks in accidents, but also likely reflects the findings reported earlier that the black survey respondents were less educated and from lower income families and that blacks as a whole might therefore be less likely to respond to the survey. There were also no reported mileage differences between whites and non-whites.

Crosstabulations of these demographic variables produced some interesting results which correspond well with what has already been reported for the general survey data. For the general survey, it was reported that female riders tended to be younger, and this is supported by the accident data. Some 38 percent of the female riders in accidents were 21 years old or less, compared with 25 percent for males. Also, 17 percent of the males were over 55, but none of the females belonged to this age category.

Concerning age and race, results were nonsignificant, although nonwhites were somewhat less likely to be in the 22-55 age group (52 percent nonwhite, 61

Table 5.3. Moped operator age.

Age	1976-78 Data	1979 Data	Exposure Data
< 16	43 (10.3)	33 (11.0)	66 (6.8)
16-19	48 (11.5)	34 (11.4)	119 (12.3)
20-24	47 (11.3)	32 (10.7)	72 (7.5)
25-29	37 (8.9)	26 (8.7)	61 (6.3)
30-39	48 (11.5)	65 (21.7)	165 (17.1)
40-49	75 (18.0)	41 (13.7)	157 (16.3)
50-59	70 (16.8)	36 (12.0)	187 (19.4)
60+	49 (11.8)	32 (10.7)	137 (14.2)
Total	417	299	964

Table 5.4. Moped operator sex.

Sex	1976-78 Data	1979 Data	Exposure Data
Male	405 (93.1)	277 (91.4)	841 (86.4)
Female	30 (6.9)	26 (8.6)	132 (13.6)
Total	435	303	973

Table 5.5. Moped operator race.

Race	1976-78 Data	1979 Data	Exposure Data
White	334 (77.5)	218 (72.0)	871 (89.7)
Black	84 (19.5)	82 (27.1)	87 (9.0)
Other	13 (3.0)	3 (1.0)	13 (1.3)
Total	431	303	971

percent white) and more likely to be in the >55 age group (22 percent nonwhite, 13 percent white). These results also correspond to those reported for the general survey.

Finally, examining sex by race, the non-whites were found to be almost all males (96.5 percent). For the exposure survey, this figure was also 96 percent.

In 33 of the reported moped accidents (11 percent), the moped operator was carrying a passenger. Compared with the moped operators these passengers were more likely to be female (30 percent) and were also younger. The age distribution for moped passengers was:

Age category	Number	Percent
10 or under	10	31.3
11-15	7	21.9
16-20	10	31.3
Over 20	5	15.6
	32[1]	100.1

When Accidents Occur

Table 5.6 presents information on the month of the year when North Carolina moped accidents occur. During 1979 there was a decrease in the proportion of winter-time accidents and an increase in the proportion of spring-time accidents. The greatest number of moped accidents occurred during the months of July and August. Almost 40 percent of the accidents occurred during the summer (June, July and August), compared with less than 10 percent during the winter (December, January and February). The seasonal breakdown of 1979 moped accidents is given below, along with the corresponding exposure survey data based on total miles traveled:

Season	Accident Percent	Exposure Percent
Spring	25.7	27.7
Summer	38.5	34.4
Fall	26.6	24.0
Winter	9.2	13.9
	100.0	100.0

Comparing the distributions, one finds slightly more accidents than expected in the summer and fall months, and slightly less in the winter and spring months.

Day of week information reported in Table 5.7 reveals a slight increase in the percentage of accidents occurring on weekdays and a corresponding decrease in weekend accidents. Overall during 1979, 71 percent of the moped accidents

[1] There was one case where passenger age was not stated.

Table 5.6. Month of the year.

Month	1976-78 Data	1979 Data
January	15 (3.4)	7 (2.3)
February	18 (4.1)	7 (2.3)
March	27 (6.1)	16 (5.3)
April	30 (6.8)	28 (9.2)
May	43 (9.7)	34 (11.2)
June	68 (15.3)	33 (10.9)
July	50 (11.3)	45 (14.8)
August	52 (11.7)	39 (12.8)
September	52 (11.7)	29 (9.5)
October	43 (9.7)	35 (11.5)
November	27 (6.1)	17 (5.6)
December	18 (4.1)	14 (4.6)
Total	443	304

Table 5.7. Day of the week.

Day of week	1976-78 Data	1979 Data
Monday	39 (8.8)	43 (14.1)
Tuesday	61 (13.8)	37 (12.2)
Wednesday	63 (14.2)	38 (12.5)
Thursday	74 (16.7)	46 (15.1)
Friday	58 (13.1)	51 (16.8)
Saturday	81 (18.3)	55 (18.1)
Sunday	67 (15.1)	34 (11.2)
Total	443	304

occurred on weekdays and 29 percent on weekends, compared with 67 percent and 33 percent for this breakdown for 1976-78. Saturday remained the most likely day for moped accidents, followed by Friday, Thursday and then Monday.

Related to this, 63 percent of the riders responding to the general survey reported that they rode on "both weekdays and weekends", although more were likely to only note "mostly weekdays" than "mostly weekends". Forty-four percent of the survey respondents said that they rode their mopeds daily. Also, as observed in Chapter 3, day of week is tied to primary use of the moped so that, for example, any increase in use for commuting to work or school should result in an increase in weekday usage (and correspondingly, weekday accidents).

The time of day distribution in Table 5.8 shows a decrease in the proportion of morning accidents and an increase in the proportion of mid-day accidents for the 1979 data as compared with the 1976-78 data. Still, almost half of the 1979 moped accidents occurred from 2-7 p.m., and an additional 21 percent after 7 p.m. Any comparison of this variable with the survey data is difficult, since 38 percent of the survey respondents indicated that they rode at "no special time" and another 20 percent said they rode during both morning and evening commuting hours.

Related to time of day is light condition. Table 5.9 shows that almost one-fourth of all moped accidents occurred under conditions of darkness. Even though one would expect a higher percentage of nighttime riding during the winter months, the fact that only seven percent of the total riding reported for the follow-up survey was "under conditions of darkness" emphasizes the higher risk associated with nighttime use of the moped.

A final variable to be highlighted in this section is weather condition (Table 5.10). Almost five percent of the 1979 moped accidents occurred in rainy weather, compared with three percent for 1976-78. Although there is no exposure data that directly links with this, a number of riders responding to the two surveys commented that they did not feel safe riding a moped in rainy or other bad weather conditions.

Where Accidents Occur

Data on locality and development type in Tables 5.11 and 5.12 show that slightly over half of the moped accidents occurred in urban areas, one-fourth in rural areas, and just under a fourth in areas with mixed development. The data

Table 5.8. Time of day.

Time of Day	1976-78 Data	1979 Data
Midnight-6 a.m.	17 (3.9)	13 (4.3)
6-11 a.m.	58 (13.3)	29 (9.5)
11 a.m.-2 p.m.	67 (15.4)	60 (19.7)
2-7 p.m.	198 (45.5)	138 (45.4)
7 p.m.-Midnight	95 (21.8)	64 (21.1)
Total	435	304

Table 5.9. Light condition.

Light Condition	1976-78 Data	1979 Data
Daylight	301 (71.8)	227 (74.7)
Dusk	18 (4.3)	7 (2.3)
Dawn	3 (0.7)	0 (0.0)
Dark-road lighted	43 (10.3)	37 (12.2)
Dark-road unlighted	54 (12.9)	33 (10.9)
Total	419	304

Table 5.10. Weather condition.

Weather Condition	1976-78 Data	1979 Data
Clear	342 (81.8)	243 (80.2)
Cloudy	63 (15.1)	46 (15.2)
Rain	12 (2.9)	14 (4.6)
Other	1 (0.2)	0
Total	418	303

Table 5.11. Locality.

Locality	1979 Data Number	Percent
Rural	77	25.4
Mixed	64	21.1
Urban	162	53.5
Total	303	100.0

Table 5.12. Development type.

Development Type	1979 Data Number	Percent
Farms, woods, pasture	65	21.5
Residential	149	49.2
Commercial	82	27.1
Institutional	5	1.7
Industrial	2	0.7
Total	303	100.2

for development type is similar, in that half of the reported accidents occurred in residential areas, 22 percent in areas of farms, woods and pastures, and 27 percent in commercial areas.

Data for previous years are not directly comparable due to changes introduced with the revised Accident Report Form. Breakdown of the locality variable for 1976-78 moped accidents was:

Open country	35.1%
Residential	33.4%
Business	30.6%
School & playground	0.9%
	100.0%

Comparing these percentages with those in Table 5.12, there is a clear trend away from rural accidents and toward residential area accidents.

This trend finds support in the exposure data. Over half of the riders responding to the general survey indicated that they rode primarily on residential streets. Nevertheless, over a third reported riding primarily on rural roads (see Table 3.14). For the mileage survey, 36 percent of the average weekly mileage was on residential streets, and 33 percent on rural roads.

Two other variables related to development type are road class and speed limit. Table 5.13 shows only slight differences in road type distributions for the 1976-78 and the 1979 data. Half of the moped accidents occurred on local streets, 20-25 percent on secondary routes (rural roads), and another 20-25 percent on U.S. and N.C. routes.

Related to the above, the speed limit variable exhibits a substantial increase in the percentage of accidents occurring on roadways with speed limits less than 25 mph and a corresponding decrease in accidents on 55 mph roadways (see Table 5.14). This shift parallels the shift from open country to residential accidents already observed and probably has some bearing on the injury severity distribution of the moped operators (i.e., the percentage of A-level injuries did not increase as much as expected with the introduction of the revised Traffic Accident Report Form in 1979).

A new variable coded for 1979 was road character, which defines the curvature and slope of the road segment where the accident occurred. Table 5.15 shows that 64 percent of the accidents occurred on straight, level road segments and an additional 18 percent on straight road segments with either an up or down grade (slope). Twelve percent of the accidents occurred at curves in roadways,

Table 5.13. Road class.

Road Class	1976-78 Data	1979 Data
Interstate	0 (0.0)	1 (0.3)
U.S. route	57 (12.9)	36 (11.9)
N.C. route	40 (9.0)	42 (13.9)
State secondary route (Rural paved & unpaved)	100 (22.6)	63 (20.8)
Local street	225 (50.8)	148 (49.0)
Other public road	0 (0.0)	2 (0.7)
Private road, property or driveway	21 (4.7)	10 (3.3)
Total	443	302

Table 5.14. Speed limit.

Speed Limit	1976-78 Data	1979 Data
< 25 mph	17 (4.1)	73 (25.6)
25-30 mph	33 (8.0)	25 (8.8)
35-40 mph	178 (42.9)	113 (39.6)
45-50 mph	64 (15.4)	35 (12.3)
55 mph	123 (29.6)	39 (13.7)
Total[1]	415	285

[1] Private property accidents are excluded along with the not stated cases.

Table 5.15. Road character.

Road Character	1979 Data Number	Percent
Straight, level	190	64.0
Straight, hillcrest	15	5.1
Straight, grade	52	17.5
Straight, bottom	5	1.7
Curve, level	22	7.4
Curve, hillcrest	3	1.0
Curve, grade	9	3.0
Curve, bottom	1	0.3
Total	297	100.0

Table 5.16. Road feature.

Road feature	1976-78 Data	1979 Data
Intersection of roadways	167 (40.2)	129 (42.7)
Driveway or alley intersection	53 (12.8)	42 (13.9)
Other[1]	195 (47.0)	10 (3.3)
No special feature		121 (40.1)
Total	415	302

[1] Median crossing, interchange ramp, bridge, underpass, etc.

with the majority of these being level curves.

One of the most critical roadway variables is road feature, which reports among other things on whether or not an accident was intersection related. Table 5.16 shows that 43 percent of the moped accidents reported in 1979 occurred at roadway intersections and another 14 percent at driveway or alley intersections, for a total of 57 percent. This is up slightly from the 1976-78 average of 53 percent and compares with a figure of 49 percent for all motor vehicle accidents in North Carolina (based on 1975-1978 accident data given in Hamilton, 1979). While only 15 respondents to the general survey specifically cited intersections as a safety hazard to moped operators, other frequently cited hazards such as other cars, traffic and lack of conspicuity would likely be intensified at intersections.

Collision Characteristics

Involvement type information is presented in Table 5.17. Two-thirds of the reported moped accidents involved a collision with another motor vehicle, while one-third were single vehicle accidents. These percentages are consistent for 1976-78 and 1979. Further analysis showed that 78 percent of the "other vehicles" were passenger cars or station wagons, 16 percent were trucks (most of these 2-axle trucks), and the remaining six percent other two-wheeled vehicles, pedestrians, etc.

Involvement type was found to interact with both age and race. Only nine percent of the <16 year-old riders were involved in single vehicle accidents, compared with a consistent 31-34 percent for the older age groups, a finding which may reflect both the lower level of alcohol usage and inexperience in interacting with other vehicles on the part of these younger riders. Also, only 16 percent of the non-whites were involved in single vehicle accidents, compared with 35 percent of the whites. There were no differences according to sex -- both males and females were equally distributed between the two involvement types.

More detailed accident type data is given in Table 5.18. As noted earlier, this information was not initially available for most of the 1979 data, since on the revised Accident Report Form moped - motor vehicle accidents are typically categorized as "collision of motor vehicle with moped" and the single vehicle accidents classified as private property accidents. The more specific accident type information was added to the file in the course of this project following a review of hard copies of the 1979 accident reports. The resulting accident type

Table 5.17. Involvement type.

Involvement Type	1976-78 Data	1979 Data
Single vehicle moped	126 (29.9)	92 (30.3)
Moped-motor vehicle(s)	285 (67.5)	209 (68.8)
Moped-pedestrian	6 (1.4)	2 (0.7)
Moped-bicycle or moped	5 (1.2)	1 (0.3)
Total	422	304

Table 5.18. Accident type (first harmful event)

Accident Type	1976-78 Data	1979 Data
Ran off road	55 (13.0)	38 (12.5)
Non-collision in road	44 (10.4)	37 (12.2)
Rear end or backing	42 (10.0)	25 (8.2)
Left turn	81 (19.2)	70 (23.0)
Right turn	19 (4.5)	21 (6.9)
Head on	9 (2.1)	6 (2.0)
Sideswipe	27 (6.4)	23 (7.6)
Angle (crossing)	107 (25.4)	64 (21.1)
Collision with:		
Pedestrian	6 (1.4)	2 (0.7)
Parked vehicle	11 (2.6)	11 (3.6)
Fixed or other object	7 (1.7)	3 (1.0)
Bicycle, Moped	5 (1.2)	1 (0.3)
Animal	9 (2.1)	3 (1.0)
Total	422	304

distribution for the 1979 data is comparable to that for the 1976-78 data except for a slight increase in the proportions of left and right turn accidents and a decrease in angle collisions.

For the 1979 data, single vehicle moped accidents were equally divided between ran-off-road and non-collision in road accidents (12-13 percent each). For collisions between mopeds and other motor vehicles, the left turn and the angle patterns were by far the most frequently cited, each accounting for 20-25 percent of the total. The angle category includes a variety of accident patterns, the most common being the crossing collision, where both the moped and motor vehicle are traveling straight through an intersection at right angles to one another.

Further insight to the nature of moped accidents comes from examining vehicle maneuver prior to the accident, as shown in Table 5.19. In almost three-fourths of the accidents, the moped was traveling straight ahead, and in 14 percent of the cases the moped was making a left turn. All other maneuvers, including right turns, were fairly infrequent antecedents of accidents.

Table 5.20 examines moped maneuver by other vehicle maneuver (for moped - motor vehicle accidents only). In 33 percent of the accidents, both the moped and the other vehicle were traveling straight ahead, and in an additional 11 percent of the accidents the moped was going straight and the motor vehicle was making some other non-turning movement (passing, changing lanes, slowing or stopping, etc.). The majority of the left turn collisions involved the moped going straight and the other vehicle turning (18 percent), rather than the reverse situation with the moped turning (7 percent). Similarly, in right turn accidents the other vehicle was more likely to be turning (7 percent vs 4 percent).

Region of impact data is shown in Table 5.21. Only the hand-coded 1978 data are used for comparison, since on the 1976-78 DMV files approximately 40 percent of the impact site data are missing[1]. Considering the lower unspecified rate for the 1979 data, the two distributions are similar except for a lower percentage of right side collisions for the 1979 data. In almost half of the accidents the moped was impacted in front, and in another 25-30 percent in the left side.

Again, considering both vehicles in moped - motor vehicle crashes, Table 5.22 shows that the most frequent impact site patterns were:

-Front of moped, right side of other vehicle (21 percent)
-Left side of moped, front of other vehicle (18 percent)
-Front of moped, front of other vehicle (16 percent)
-Left side of moped, right side of other vehicle (12 percent)

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[1]Coding of impact site for two-wheeled vehicles was facilitated on the 1979 Accident Report Forms by the addition of a drawing of a two-wheeled vehicle with appropriate location regions labeled.

Table 5.19. Vehicle maneuver (moped).

Vehicle Maneuver	1976-78 Data	1979 Data
Going straight ahead	304 (72.2)	222 (73.3)
Making right turn	10 (2.4)	12 (4.0)
Making left turn	66 (15.7)	41 (13.5)
Slowing or stopping	5 (1.2)	3 (1.0)
Starting in roadway	14 (3.3)	8 (2.6)
Passing	6 (1.4)	3 (1.0)
Changing lanes or merging	9 (2.1)	4 (1.3)
Other	7 (1.7)	11 (3.6)
Total	421	304

Table 5.20. Moped maneuver by other vehicle maneuver.

	Other Vehicle Maneuver				
Moped Maneuver	Going Straight	Turning Left	Turning Right	Other	Total
Going straight	68 (32.7)[1]	38 (18.3)	15 (7.2)	23 (11.1)	144 (69.2)
Turning left	15 (7.2)	0 (0.0)	1 (0.5)	17 (8.2)	33 (15.9)
Turning right	9 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)	9 (4.3)
Other	12 (5.8)	3 (1.4)	1 (0.5)	6 (2.9)	22 (10.6)
Total	104 (50.0)	41 (19.7)	17 (8.2)	46 (22.1)	208

[1] Percent of total (cell percent).

Table 5.21. Region of impact (moped).

Region of Impact	1978 Data	1979 Data
Front	92 (43.4)	137 (45.1)
Left side	47 (22.2)	90 (29.6)
Right side	17 (8.0)	17 (5.6)
Rear	16 (7.6)	32 (10.5)
Overturn or unspecified	40 (18.9)	28 (9.2)
Total	212	304

Table 5.22. Moped region of impact by other vehicle region of impact.

	Other Vehicle Region of Impact					
Moped Region of Impact	Front	Left Side	Right Side	Rear	Overturn or Unspecified	Total
Front	33 (15.8)[1]	12 (5.7)	43 (20.6)	9 (4.3)	0 (0.0)	97 (46.4)
Left side	37 (17.7)	2 (1.0)	24 (11.5)	3 (1.4)	3 (1.4)	69 (33.0)
Right side	11 (5.3)	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)	12 (5.7)
Rear	22 (10.5)	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)	23 (11.0)
Overturn or Unspecified	4 (1.9)	1 (0.5)	2 (1.0)	0 (0.0)	1 (0.5)	8 (3.8)
Total	107 (51.2)	15 (7.2)	71 (34.0)	12 (5.7)	4 (1.9)	209

[1] Percent of total (cell percent).

The moped was most likely to be impacted in the front (46 percent) or the left side (33 percent), whereas the other vehicle was most likely to be impacted in the front (51 percent) or right side (34 percent).

Causative Factors In Moped Accidents

There are many factors that can affect accident occurrence, including driver, vehicle and environmental factors. This section will examine these to the limited extent that they are reported in police-level investigations.

Table 5.23 gives information on road defects at the accident scene. For 92 percent of the accidents, no road defect was cited. However, loose material on the road surface was cited in five percent of the accident cases, up slightly from the 1976-78 average. Examination of another roadway variable, road surface condition, revealed that the roadway was described as "wet" in nine percent of the accidents, also up from the 1976-78 average of five percent.

The role of vehicle defects appears small, with some form of defect being cited for only 10 of the accident-involved mopeds (3.3 percent). The breakdown was:

Defective brakes	5 cases
Defective headlights	3 cases
Defective rear light	1 case
Defective tire	1 case

Several variables give information on the role of the moped operator in accident occurrence. Table 5.24 contains a breakdown of the violation indicated variable. In half of the reported accidents the moped operator was not cited for any violation. However, for the 1979 reported accidents, the moped operator was cited for driving under the influence of alcohol or drugs (DUI) in 16 percent of the cases, almost double the percentage for 1976-78[1]. Other frequently cited violations were safe movement violation (8 percent), traffic signal violation (6 percent) and failure to yield (5 percent).

Two other related variables are moped operator physical condition and sobriety. Concerning the first of these, 84 percent of the moped operators involved in accidents in 1979 were characterized as normal, 10 percent impaired due to medicine or drugs, and six percent ill, fatigued or otherwise physically

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[1]This may be due in part to the coding procedure followed for the 1979 data, whereby any DUI indication was always coded as Violation 1, the variable being reported here.

Table 5.23. Road Defect.

Road Defect	1976-78 Data	1979 Data
Loose material on surface	11 (2.6)	14 (4.6)
Low or soft shoulders	5 (1.2)	6 (2.0)
Road under construction	1 (0.2)	1 (0.3)
Holes, ruts, other defects	6 (1.4)	4 (1.3)
No defect	395 (94.5)	278 (91.8)
Total	418	303

Table 5.24. Moped operator violation.

Violation	1976-78 Data	1979 Data
Speeding	8 (1.8)	4 (1.3)
Failure to yield	29 (6.5)	15 (4.9)
Wrong side of road	15 (3.4)	4 (1.3)
Stop sign violation	13 (2.9)	17 (5.6)
Traffic signal violation	13 (2.9)	2 (0.7)
Following too closely	6 (1.4)	2 (0.7)
Improper turn	4 (0.9)	3 (1.0)
Improper or no signal	8 (1.8)	6 (2.0)
DUI	39 (8.8)	50 (16.4)
Safe movement violation	54 (12.2)	25 (8.2)
Improper passing	8 (1.8)	3 (1.0)
Other	17 (3.8)	20 (6.6)
No violation or not stated	229 (51.7)	153 (50.3)
Total	443	304

impaired. For the 1976-78 data, 92 percent of the moped operators were depicted as normal, although results are not directly comparable due to changes in the other variable levels with the revised form.

Moped operator sobriety is recorded in Table 5.25. For this variable, there is only a small increase in the percentage of cases involving alcohol. Nevertheless, the percentages are high. In 1976-78, 28 percent of the riders were reported to have been drinking, and in 1979 this figure was 30 percent.

The sobriety variable interacted strongly with both age and sex. Operators under the age of 21 were less likely to be cited for drinking. The age categories and corresponding percentages reported drinking were:

Age	Percent Drinking
<16	0.0
16-21	21.4
22-55	38.1
>55	34.1

Also, only four percent of the females were reported as drinking, compared with 33 percent of the males.

A final variable to be examined in this section is culpability, or which party was at fault in the moped accident. This is not a variable on the N.C. Accident Report Form, but it has been added to both the 1978 and 1979 files following examination of the hard copies of the accident reports. Generally it was found that in moped - motor vehicle crashes, the moped operator was more likely to be at fault than the other vehicle operator. Excluding single vehicle accidents and accidents where no fault could be determined (or where both parties were judged to be at fault), the moped operator was assigned culpability in 56 percent of both the 1978 and 1979 accidents. In this respect, moped accidents are more similar to bicycle than motorcycle accidents. That is, the literature has shown bicyclists to be much more likely at fault than motorcyclists in collisions with other vehicles.

Culpability also interacted with both age and sex. Females were more likely to be judged at fault, as were younger moped operators. For the 1979 moped - motor vehicle crashes, 72 percent of the females were judged at fault, compared with 55 percent of the males. Riders under the age of 16 were at fault in 82 percent of the accidents, those aged 16-21 in 73 percent of the accidents, those aged 22-55 in 45 percent of the accidents, and those over 55 in 55 percent of the accidents.

Table 5.25. Moped operator sobriety.

Sobriety	1976-78 Data	1979 Data
Not drinking	262 (71.6)	193 (69.7)
Drinking - ability impaired	59 (16.1)	51 (18.4)
Drinking - impairment unknown	45 (12.3)	33 (11.9)
Total[1]	366	277

[1] Those with unknown sobriety excluded from total.

License Status of Moped Operators

As has already been noted, North Carolina is one of only a few states not requiring moped operators to possess a valid driver's license. Because of this mopeds are frequently used as transportation by persons with suspended or revoked licenses or by those unable to meet licensing requirements due to medical problems, etc.

In a 1979 report to the Highway Safety Committee of the N.C. House of Representatives, HSRC addressed the issue of allowing persons with suspended or revoked licenses to legally operate mopeds on public roadways (see Hunter and Stutts, 1979b). Moped operators involved in accidents during a nine-month period in 1978 were checked against DMV driver history files to determine their licensing status. It was found that 27 percent of the operators had suspended or revoked licenses at the time of their collision. Fifteen percent had a valid N.C. license, 11 percent were underage, and for 45 percent no driver's license issuance information was given (indicating that these persons had probably never been issued a N.C. license). The remaining three percent could not be located via HSRC's remote terminal.

For this current study, a follow-up check was made on moped operators involved in accidents during 1979. The results were as follows:

Licensure	Number	Percent
Valid N.C. license or no license issuance information	144	47.5
Suspended or revoked license at time of accident	65	21.4
Other suspended or revoked license	36	11.9
Under 16 years of age at time of accident	31	10.2
Not found on file	27	8.9

The percentage of moped operators with a suspended or revoked license at the time of the accident has dropped from the 27 percent for 1978 to 21 percent for 1979. However, an additional 12 percent of the moped riders in accidents in 1979 had some record of a suspended or revoked license, either prior to or following the accident. (This group had not been differentiated from the valid license group for the previous year's analysis). The percentage of underaged riders in accidents in 1979 remained approximately the same at 10 percent.

Examination was also made of the reason for license supsension or revocation for the 101 affected moped operators. Two-thirds were found to be DUI related, with the remaining fairly equally distributed among the categories of driving while license suspended or revoked (10 percent), speeding or reckless driving (4 percent), excessive accumulation of points (6 percent), moving violations (5 percent) and other (8 percent).

The information presented above is for moped operators involved in accidents. However, with the sample data collected for the current exposure study it also became possible to estimate the percentage of moped owners (not riders) in the general population having some recent history of a suspended or revoked license. The procedure followed was to draw a random sample of 500 names from the total survey list of 4,200 moped owners in the state, and to check these with the DMV file for licensing information.

For this sample of 500, 94 (18.8 percent) had a recent history of a suspended or revoked license, 264 (52.8 percent) had no such history, and 142 (28.4 percent) were not able to be located on the file[1]. Once again, over two-thirds of the license suspensions or revocations were DUI-related.

The 95 percent confidence limit for the above estimate of 19 percent of the moped owners with suspended license histories is $\pm$ 3 percent, so that one can say based on this estimate that from 16 to 22 percent of the survey sample of 4,200 moped owners have had their driver's license suspended or revoked. Moreover, this is probably an underestimate, since it is likely that some of the 142 moped owners not located on the DMV file also had some history of a suspended or revoked license.

Caution should be taken in extending these percentages to the total population of moped riders in the state since (1) the survey sample consists of moped owners and not necessarily moped riders, and (2) as discussed in Chapter 2, the survey sample, which is based on warranty card data supplied by leading moped manufacturers and distributors in the state, may not be totally representative of all N.C. moped owners. Nevertheless, it does appear that a large percentage of persons in North Carolina do purchase and ride mopeds because of the absence of a licensing requirement. It also appears that those riders with suspended or revoked licenses are overrepresented in moped accidents.

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[1]This latter figure is higher than for the accident data, since much of the survey data was older and names were often incomplete (e.g., J. Smith instead of John Davis Smith). Also, no birth date, accident date, or other information was available for cross-referencing.

CHAPTER 6. SUMMARY AND DISCUSSION

The last few chapters have concentrated on the analysis and results of two different surveys and an update of an earlier accident study. Many tables and comparisons have been presented. Along with reiterating the goals and shortcomings of this study, this chapter will attempt to synopsize the most pertinent findings from the preceding chapters. Major issues, including possible changes in the current North Carolina moped legislation, will also be discussed. Finally, some comment will be made regarding further moped research activity in this state.

Objectives Versus Outcomes

This project had three major goals: (1) development of moped rider exposure characteristics, such as demographics, experience, types of trips, etc., (2) development of mileage data distributed by trip type and roadway type, and (3) comparison of the available exposure and accident data where possible, along with generally updating earlier accident findings. Two different survey instruments were used to satisfy the first two items, and moped accident report data for 1979 (including actual hard copies of the reports) were secured for the last item.

The gathering of moped exposure data in North Carolina is far from a simple venture, the largest obstacle being the lack of any sort of centralized registration system. As a result, we were forced to rely on lists of owner warranty cards provided by the largest manufacturers/distributors of mopeds in this state. The manufacturers/distributors were identified both from prior accident data and discussions with executives of the Moped Association of American (MAA), the national trade group. We received good cooperation from all of the manufacturers/distributors contacted, but the overall process was slower than originally anticipated. The major obstacle here was the lack of computerized information by several of the companies, thus necessitating manual searches for owners residing in North Carolina.

Since no centralized registration function exists, we could only speculate about the possible number of riders in the state that we should try to reach or subsequently be able to contact. The warranty card lists developed about 4,200

names, which was only about a fourth of the 16,000 or more mopeds predicted by MAA for 1979. Some of this difference is explained by the fact that only 50-75 percent of all moped owners/dealers fill in and return the warranty card, and also the fact that not all moped manufacturers were contacted for input to this study. As discussed in Chapter 1, however, HSRC also feels that the MAA estimate of 16,000 mopeds for North Carolina may be liberal, based as it is on the assumption that the states share about equally in the moped market on a population basis. A more conservative estimate based on North Carolina's percentage of U.S. motorcycle sales and adjusting for vehicle scrappage would be 10,000-12,000 mopeds. Taking all of this into consideration, we felt more comfortable about the 4,200 names and addresses generated for this study.

When the general survey was complete, we had received responses from just under 1,000 moped riders. Given the doubt concerning the total number of riders in the state, a nagging question persists -- how representative is this sample? There are, we think, some rather positive statements that can be made in this regard.

Complete questionnaire information was collected via telephone from 50 non-respondents, and more than twice this number were contacted. Many of those who did not respond simply were not riding anymore, generally because the moped had been sold. Sickness, costly repairs, etc. also were mentioned with some regularity. Those who did respond via the telephone matched up very well with the approximately 1,000 other respondents, giving some assurance that our sample of respondents was fairly representative.

A few caveats should be stated at this point. These surveys were intentionally performed in the summer months when riders are active in the hope of increasing our response rate. Compared to other seasons of the year, it was determined in the analysis that summer is the period of greatest activity. This, however, may result in responses that reflect higher mileage rather than a lower mileage value that is perhaps more representative of the entire year. We attempted to control for this in our seasonal mileage calculations. In addition, those who returned the survey may be a more enthusiastic group who, in turn, simply ride more than others. Finally, because of the demands of the survey, volunteers were used to complete the mileage follow-up. Since we were interested in week-to-week mileage by trip purpose and roadway type, it was felt

that only volunteers would take the effort to respond to such a request. These volunteers may also be a high-mileage group, although their mileage seemed to match well with that from the general survey. Even though all volunteers were used, the response rate was only 60-65 percent.

A Synopsis of the Results

The General Survey

1. About half of the riders are age 22-55, but over 20 percent are greater than 55 years old. Some seven percent are under the minimum age of 16. Riders are evenly distributed from age 16 on into the 60's.

2. There are over six times as many males as females. Females tend to be younger.

3. Almost 90 percent of the riders are white. The non-whites are almost all male.

4. About 27 percent of the respondents come from families with an annual income of less than $10,000, and another 22 percent have family incomes that exceed $30,000. Otherwise riders are fairly well distributed by income group. Young riders and females are associated with higher incomes. About two-thirds of the non-whites earn less than $10,000 per year.

5. Approximately one-fifth have a grade school education, another one-fifth attended or are attending high school, and one-fifth have completed high school. About 18 percent are college graduates or post-graduates. The 22-55 age group has the highest level of education. Of those over age 55, over one-third have only a grade school education. Females are also associated with higher levels of education.

6. Some 30 percent of the riders live in cities of greater than 50,000 population, but cities up to 10,000 population account for over 40 percent of the respondents. The moped is not confined to urban areas.

7. Four-fifths of the riders have two years or less riding experience. Older riders have more time riding.

8. About half have accumulated less than 1,000 total miles, and another 45 percent have ridden 1,000 - 5,000 miles. Total mileage increases with age, and males and non-whites are associated with higher mileage.

9. Where primary use was designated, commuting to work was indicated most often, about one-third of the time. Pleasure riding was second at 29 percent. Use for shopping/errands was third, and these three responses accounted for over 75 percent of the answers.

10. Commuting to work as the primary use is favored by the 22-55 age group and males. Pleasure riding is favored by the two youngest age groups and females. Females also favor commuting to school. Those over age 55 prefer to use the moped for shopping or errands. Pleasure riding and trips to specific places of recreation as the primary use are directly proportional to income, while commuting to work and shopping/errands are inversely proportional.

11. Examining the frequency with which any of the use categories was checked showed that using the moped for shopping/ errands was indicated by about two-thirds of the riders. Pleasure riding was next at 61 percent. Commuting to work, the most frequently cited primary use, was fourth at 46 percent.

12. Slightly over one-fourth ride 10-24 miles per week, while overall about three-fourths ride less than 50 miles per week. On the average, mopeds are ridden about 36 miles per week. Males are associated with higher weekly mileage, as are those who use the moped primarily for commuting to work. Weekly mileage decreases as rider education and income increase.

13. About 30 percent of the riders typically travel less than three miles per trip, while over 80 percent typically travel less than 10 miles per trip. Males, non-whites, and those who use the moped primarily for commuting to work are also associated with longer average trip lengths.

14. The majority of riders (54 percent) indicate that they ride primarily on residential streets, while low ($\leq$45 mph) and high (>45 mph) speed rural roads are the second and third choices. Younger riders (<22) are overrepresented on the residential streets, but the <16 group is overrepresented on the high speed rural roads. The higher income and better educated riders are overrepresented on residential and business streets, while the lower income riders are overrepresented on the rural roads. In general, low mileage variables tend to be associated with residential and city streets, while high mileage variables are associated with rural roads.

15. Some 45 percent use the moped daily, and another 30 percent ride several times a week. Usage declines with age and males ride more on a daily basis than females. Heavier usage is made by the lower income groups.

16. About two-thirds ride both weekdays and weekends, while another one-fourth ride mostly weekdays. The >55 age group is overrepresented on weekdays only. Females, those in the upper income groups and infrequent riders are more associated with weekend-only riding.

17. Almost half the respondents state they have no specific time during the day that they regularly ride, and one-fifth ride mostly during morning and evening commuting hours. The higher mileage variables tend to be associated with the commuting hours. Pleasure riders are highly overrepresented after 4 p.m.

18. Calculation of mileage by season yields the following distribution:

Spring	28%
Summer	34%
Fall	24%
Winter	14%

Average annual miles per rider are calculated to be about 1,330.

19. About three-fourths never carry passengers, while about one-fourth do occasionally. The younger (<22) riders, females, and higher income groups are overrepresented as far as carrying passengers is concerned. Passengers are also more likely to be carried by those who use the moped primarily for pleasure riding or for trips to specific places of recreation.

20. About one-fifth of the riders state that they either sometimes or always wear a helmet when riding, although there is no such legal requirement. The 22-55 age group wears the helmet more than expected and the other age groups less. Helmet use is directly proportional to mileage.

21. Other riders within a family or those who borrow a moped tend to be younger than principal riders. Other riders are also more likely to be female. Weekly mileage by other riders is fairly small.

22. When asked to list what they perceive as hazardous, moped riders choose other drivers or vehicles (57 percent), the low speed and acceleration capability of the moped (10 percent), and the actions of the moped operator (10 percent).

23. Some 88 percent say they are satisfied with their moped. When there is dissatisfaction, mechanical problems, inadequate speed and problems with parts and service are noted.

24. Recommended safety changes include turn signals, better speed and/or acceleration, and a host of other vehicle factors (improved tires, exhaust covers, etc.).

25. For a series of questions concerning possible changes to current N.C. law, the following positive responses are indicated:

Recommendation	Percentage Approve
Require driver's license	19%
Lower minimum age	22%
Raise speed limit	51%
Require helmet	33%
Require insurance	13%
Require registration	27%

The Follow-up Survey

1. Moped riders most often use the far-right-hand position of the lane when riding. Very few have off-system bicycle paths or designated bike lanes available to them. Over one-fourth regularly exceed 20 miles per hour, the top speed capability (on a level surface) by law. Over four-fifths always ride with their headlight on during the day.

2. The average number of miles ridden per week in the mileage survey is just under 40. When type of trip is considered, the largest number of weekly miles are concerned with commuting to work (11 miles), pleasure riding (9 miles) and shopping/errands (7 miles). Average weekly mileage is clearly highest on residential streets (14 miles).

3. The 22-55 age group averages about 50 miles per week while both the 16-21 and >55 age groups average about 30 miles per week. For the 22-55 age group, the largest number of miles are for commuting to work (17 miles per week).

4. Males ride more miles per week than females (42 versus 32) Males are concerned with commuting to work (13) miles and pleasure riding (9 miles), while females tend to use the moped for shopping/errands (8 miles) and pleasure riding (7 miles). Both groups favor residential streets.

5. There is a slight tendency for the lower income groups to accumulate more miles per week. All income groups favor the residential streets. Where annual incomes exceed $30,000, commuting to work is clearly the trip purpose that generates the most weekly miles (13 miles).

6. Commuting to work is a popular trip purpose that generates 10-15 miles per week for all education groups except those with only a grade school education, whose mileage preference is pleasure riding.

7. Mileages for commuting to work, commuting to school and trips to a specific place of recreation are all directly proportional to population.

8. On the average, about six miles per week are ridden under conditions of darkness (out of an overall total of 40 miles per week). The 16-21 age group has the highest weekly average (10 dark-miles per week), and males average six dark-miles per week compared to three for females. Concerning road type, the highest mean values are associated with rural roads.

9. The following rates were calculated from the mileage survey only:

Incident rate (falls or accidents)	3.5 per 10,000 miles
Reportable accident rate	1 per 10,000 miles
Near miss rate	43 per 10,000 miles

Using information from both surveys, it would seem that a reasonable accident rate for mopeds would be five to ten reportable accidents per 100,000 miles traveled.

The Accident Data Update

1. There were 304 reported moped accidents in 1979, almost three times the number reported for 1976.

2. Approximately 30 percent of the moped riders involved in accidents are seriously injured or killed.

3. Accident-involved riders are fairly equally distributed by age. One-third are under the age of 25, one-third aged 25-40, and another third over 40. Approximately 10 percent of the riders are under the legal minimum age of 16.

4. Over 90 percent of the moped riders in accidents are male. Females appear underrepresented in accidents in terms of their exposure. Female riders are generally younger.

5. Three-fourths of the accident-involved moped riders are white, although the percentage of non-whites has increased. Almost all of the non-whites are male.

6. Almost 40 percent of the moped accidents occur during summer months, 10 percent during winter months.

7. Approximately two-thirds of the accidents occur on weekdays, one-third on weekends. The greatest percentage of accidents occurs on Saturday (18 percent). The percentage of weekday accidents has increased over the last few years.

8. Two-thirds of the moped accidents occur after 2 p.m., and about a fourth under conditions of darkness. Nighttime riding greatly increases the risk of accidents.

9. Over half of the moped accidents occur in urban areas, one-fourth in rural areas, and just under a fourth in areas of mixed development. There were fewer rural accidents in 1979.

10. The percentage of accidents on roads with a 55 mph speed limit has decreased from 30 percent during 1976-78 to 14 percent for 1979. At the same time, the percentage of accidents on <25 mph streets has increased.

11. The vast majority of accidents (95 percent) occur under favorable weather conditions and on dry roads.

12. Slightly over half of the accidents occur at roadway or driveway intersections.

13. Thirty percent of the reported moped accidents are single vehicle crashes. Almost all of the remaining involve collisions with other motor vehicles.

14. About a third of the moped - motor vehicle collisions involve left turns, and another third are angle or crossing collisions.

15. Concerning vehicle maneuver prior to the accident, in almost three-fourths of the cases the moped is traveling straight ahead, and in an additional 14-16 percent it is turning left. The other vehicle in moped - motor vehicle crashes is also most likely to be going straight (50 percent) or turning left (20 percent).

16. Related to the above, the moped is most likely to be impacted in the front or left side. For moped - motor vehicle crashes, the most frequent impact patterns are: front of moped, right side of other vehicle (21 percent); left side of moped, front of other vehicle (18 percent); and head-on (16 percent).

17. A surprisingly high 28-30 percent of the moped operators involved in accidents have been drinking. The likelihood of drinking increases with age, and virtually all of the offenders are male.

18. The moped operator was judged to be at fault in 56 percent of the collisions with motor vehicles. Compared to other operators, females are more likely to be at fault, as are young riders.

19. Twenty-one percent of the moped riders involved in accidents in 1979 were found to have had a suspended or revoked license at the time of their accident. Two-thirds of these were DUI-related.

Issues of Importance

Analyzing all of the available moped accident and exposure data gives rise to many possible topics for further discussion. Those felt to be most critical, especially considering the implications for North Carolina, are discussed below.

Use of the Moped

Over the past few years, there has been a prevailing feeling that mopeds are used primarily for recreation or fun. Some of the early industry materials and results from consumer surveys tend to reinforce this idea. Recently, however, the industry has been proclaimed a shift toward more utilitarian uses of the vehicle. The results from this project tend to agree with such a shift in usage, even though trips for recreation or pleasure are still prominent.

Observed shifts in several North Carolina accident variables are pertinent to this point. First, there were fewer rural accidents and more urban accidents than in the past. This is supported by the exposure data, where over half the respondents to the general survey indicated that they ride primarily on residential streets. Secondly, there has been a substantial increase in the proportion of accidents occurring on roadways with speed limits of 25 miles per hour or less and a corresponding decrease in accidents on the higher speed rural roads. The proportion of accidents on 55 mph speed limit roads has decreased from 30 percent during 1976-1978 to 14 percent in 1979.

Coupled with the above are the tendencies from the exposure surveys. In the general survey, commuting to work was shown to be the primary trip purpose, although pleasure riding was a fairly close second. Slightly different from primary use is the concept of the overall proportion of trips of any one kind, and for the latter shopping/errand trips ranked first among the choices. In the follow-up survey, the largest number of weekly miles is associated with commuting to work (11 versus 9 for pleasure riding). Further examination of the trip purpose variable shows that mileage for utilitarian trips is far ahead of that for recreation or pleasure.

What all of this implies is a desire by many to utilize the moped as an energy-saving means of basic transportation. In a time of ever-increasing transportation fuel costs, this notion should be carefully digested by planners and lawmakers.

Alcohol Effects

The earlier accident study (Hunter and Stutts, 1979b) showed that about 16 percent of the 1976-1978 accident-involved moped riders were impaired by the use of alcohol and another 12 percent drinking but with the amount of impairment unknown. The same tendencies are present in the 1979 accident data, and drinking with ability impaired has increased to 18 percent. These accident proportions for impairment are about two-and-one-half times the proportion for passenger car drivers and four times the proportion for motorcyclists.

The earlier accident study also found that some 27 percent of the moped operators in 1978 accidents had a suspended or revoked license at the time of the collision. For the 1979 accident data, this value dropped to 21 percent, although an additional 12 percent of the operators had a history of license suspension or revocation. Two-thirds of these suspensions and revocations are alcohol-related.

This project also examined a sample of the warranty card owners through Division of Motor Vehicles files to ascertain the proportion in the general population with a suspended or revoked license. It was determined that at least one-fifth of the moped operator population has a recent history of a suspended or revoked license, with alcohol again being the most prominent factor.

These proportions are all undoubtedly related to the provision in the N.C. law which allows moped ridership without any type of license. N.C. was one of the first states to pass any sort of moped laws, and now finds itself in disagreement with the vast majority of other states (currently 46) with moped laws on this particular issue (Moped Association of American, 1980). The simplicity of the moped and the feeling that it is more like a bicycle are perhaps the prime reasons the license or permit issue was initially dealt with so passively. The result, however, is a loophole in the law that allows personal motorized transportation to a group who would not otherwise enjoy the privilege legally. The consistency with which the effects of alcohol are shown in the increasing accident numbers highlights this part of the N.C. law as a serious candidate for reconsideration. Requiring a license or special moped permit of those who operate mopeds on the highway would be a hardship on few citizens and would remove a very large loophole in the state's laws relating to license suspension and revocation. Indeed, this should be a reasonable starting point for smooth accomodation of the moped onto North Carolina roads.

Other Possible Legislation

Since North Carolina's moped laws have been on the books for quite some

time now, it is perhaps appropriate at this stage to review the legislation. The goal here would be that of maximizing the safe use of the vehicle without discouraging the overall use of an energy-efficient means of personal transportation.

In this respect, the opinions of the moped riders in the general survey regarding possible changes in the law can be quite beneficial. With such a high percentage of riders having a suspended or revoked license and others who ride without a license (including those <16 years old), it is not surprising that only 19 percent favor the change requiring a license. If North Carolina lawmakers were to make this change, the fairest policy would seem to be that taken by most other states, in which either a regular driver's license or special moped permit is required. The permit would apply, for example, to those who have never obtained a driver's license (such as some of the older riders) or those whose physical impairments make obtaining a regular license extremely difficult. By showing proficiency in operating the moped and knowledge of rules of the road, these riders mentioned above could obtain a moped permit.

Notwithstanding the simplicity of operation of the moped, only about one-fifth of the respondents favor lowering the minimum age to less than 16 years old. Some seven percent of the respondents are less than 16, and 10 percent of the accident-involved group fall into this age category. Given that the accident data show that younger riders are more likely to be at fault, the riders' preference for not lowering the minimum age should be honored. Requiring a license or permit could have a positive impact on the underaged rider situation, in that enforcement of the minimum age law might be facilitated.

The issue that prompted the most approval would raise the top-speed capability of the moped (on a level surface) to greater than 20 miles per hour. Slightly over half the respondents favored this change. The lack of speed and/or acceleration was consistently expressed as an item of concern in other parts of the general survey where rider opinion was asked regarding riding hazards, dissatisfaction with the vehicle, and recommended safety changes.

One interesting fact here is that about one-fourth of the respondents to the follow-up survey stated that they consistently exceed the legal top speed of 20 miles per hour. In reality, this is not too surprising, since North Carolina is one of only a very few states with such a low top-speed requirement. If the vast majority of imported mopeds can travel faster than 20 mph, and if there is little means of enforcement of this provision, there is reason to think that many mopeds shipped to North Carolina and subsequently sold have not been

adjusted to the 20 mph requirement. Indeed, one representative of a smaller manufacturer stated that no special steps were taken to comply with this provision. An earlier conversation with another dealer revealed that only the literature accompanying the moped was changed to state a 20 mph top speed.

Whatever the underlying top-speed distribution, many moped riders adamantly state that more speed and acceleration would give them a safer vehicle because of a better ability to keep up with the traffic stream. Certainly the trend in other states and abroad is toward a faster vehicle. (According to the MAA, all of the one dozen states passing moped legislation within the past two years have opted for a 30 mph top speed.) It is clear that speed differential between vehicles is positively related with accident involvement. Since many mopeds are in non-compliance under the present situation, the allowance of a 25 or 30 mph top speed should at least be addressed. However, there appears to be little scientific evidence as to what constitutes an optimum safe speed.

Surprisingly, one-third of the riders favored a mandatory helmet law. This has even been a sensitive issue when applied to higher speed motorcycles in recent years, so support of this magnitude from riders of low-powered mopeds was unexpected. There was strong support from those who already wear a helmet when riding their moped, along with the 22-55 age group and females. The available accident data both here and abroad show that head injuries are prominent when moped accidents result in serious injuries. There is no question that research data show that helmet usage significantly mitigates such injuries.

However, passage of a mandatory helmet law would be difficult. Only four other states have some such provision for moped riders (Georgia, New York, Oklahoma and Tennessee). Many of the respondents to the general survey went so far as to say that they would sell their moped if such a law was passed. The prevalent industry feeling is that helmets are deleterious to sales and that while helmet usage might be encouraged it should not be required. Suffice it to say that introduction of such a measure would most assuredly meet with spirited debate.

There was very little support (12 percent) for mandatory insurance for moped riders, and many again stated that if such a requirement were forthcoming they would opt for a motorcycle. Support for mandatory registration was much higher (27 percent), but it was apparent from some of our follow-up telephone conversations that respondents were not exactly clear on the concept here -- the intended concept being a statewide, centralized process handled through the Division of Motor Vehicles. Registration would aid in the recovery of stolen

mopeds and would be a boon to research efforts like this one, but on the whole would probably not be a cost-beneficial program for DMV.

In reality, all of these legislative issues are interrelated. Rather than any piecemeal modification of the existing North Carolina law, what is needed is a look at developing a comprehensive package of moped legislation. For exmple, any increase in top-speed capability might affect both licensing and helmet law needs. Also, it may be the case that North Carolina should consider the bi-level approach taken by New York State, where different requirements apply to mopeds with $\leq$20 mph and >20 mph speed capabilities (although this could result in real problems for enforcement personnel). Whatever the course of action, this document should provide useful input.

The Future

As transportation fuel costs increase, mopeds will likely continue to gain in popularity. We feel it is important to continue to monitor the accident experience of these two-wheeled vehicles. And since North Carolina's laws differ from most other states, it will be important to see if this relates to differences in accident experience. Given the present situation, it is felt that this is as reasonable an attempt at a moped exposure study as can be expected, and only some form of centralized registration would aid in uncovering more riders. It is hoped that attempts at effective legislation will continue, especially as regards the licensing issue. Beyond that, other legislation or programs should be based on data like that we have compiled in this study, data that allows one to gear such efforts toward the moped riding population.

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APPENDIX A

Survey Forms

A.1 General Survey Cover Letter, Questionnaire and Information Card.

A.2 Follow-up (Mileage) Survey Cover Letter, Instructions, Sample Weekly Postcard and Supplemental Question Sheet

A.1. General Survey

THE UNIVERSITY OF NORTH CAROLINA
HIGHWAY SAFETY RESEARCH CENTER

CTP - 197A
CHAPEL HILL, NORTH CAROLINA 27514

TELEPHONE (919) 933-2202

Dear Moped Rider,

The University of North Carolina Highway Safety Research Center is interested in learning more about how mopeds are being used in our state. The leading moped manufacturers and distributors have helped by providing the names and addresses of North Carolina moped purchasers, including your own. We are contacting you to find out more about the use of your moped and to ask your opinions and suggestions for improving moped safety in North Carolina.

If you bought the moped primarily for your own use, would you please help us by filling out the following brief questionnaire, then returning it in the prepaid envelope? If someone else is the primary user of the moped, we would appreciate your passing the questionnaire on to them to complete. Our goal is to hear from as many North Carolina moped riders as possible.

Presently there are not many riders in the state, but we expect the number to increase with the rising costs of gasoline and new cars. Since the moped is such a new vehicle and not much is known about it, it is important for you to share your experience and thoughts with us. You are our best source of information, and we need your help.

Results from both this survey and a follow-up survey of a smaller sample of North Carolina moped riders will be presented in a report to the N.C. Governor's Highway Safety Program. We would also like to send those of you who are interested a summary of our findings.

If you have any questions about the survey or its intended use, please feel free to call collect at (919) 933-2202 during normal working hours. Of course any information that you provide will be kept entirely confidential and used for research purposes only.

Thank you for your help.

Jane Stutts

Jane C. Stutts
Research Associate

P.S. The enclosed yellow vinyl bumper sticker is self-sticking, removable, and specially sized to fit the rear fender of a moped. Whether or not you wish to use it on your own moped, please accept it as a token of our appreciation for responding to this survey.

North Carolina
Moped Questionnaire

If you own or ride more than one moped, please answer for the moped you use most often. Also, keep in mind that we are interested in the "typical" use of your moped. If your riding habits vary with seasonal changes in the weather, etc., please answer for an average week. Thank you!

1. What brand of moped do you ride? (Motobecane, Puch, etc.) _____

2. How long have you been riding this moped? (Check one.)

   ☐ Less than 6 months
   ☐ 6 months to 1 year
   ☐ 1 to 2 years
   ☐ More than 2 years

3. How many total miles has your moped been ridden? _____ miles

   Is this an estimate or based on an odometer reading?

   ☐ Estimate
   ☐ Odometer reading

4. Approximately how many miles do you ride in an average week? (Check one.)

   ☐ Less than 10 miles
   ☐ 10-24 miles
   ☐ 25-49 miles
   ☐ 50-74 miles
   ☐ 75-100 miles
   ☐ More than 100 miles

5. Do other people ride the moped regularly?

   ☐ Yes
   ☐ No

   If yes, please list their age and sex and the approximate number of miles per week.

Age	Sex	Miles per Week
___	___	_____
___	___	_____
___	___	_____

6. What do you use the moped for? (NUMBER in order of importance AS MANY AS APPLY. 1 is most important, 2 next most important, etc.)

   _____ Commuting to work
   _____ Commuting to school
   _____ Trips to a specific place of recreation
   _____ Recreational trips with no specific destination (pleasure riding)
   _____ Shopping/Errands
   _____ Use in business or work (deliveries, etc.)
   _____ Visiting relatives or friends

   Any other uses? (Please describe.)

   _____

   _____

7. What is the average length of a one-way trip on your moped? _____ miles

8. On what type of roadways do you ride? (NUMBER AS MANY AS APPLY in order of amount of usage or mileage. 1 is used most often, 2 next most often, etc.)

_____ Residential streets
_____ Downtown business streets
_____ Other major streets (heavy traffic) inside city or town limits
_____ Rural roads, speed limit 45 mph or less
_____ Rural roads, speed limit greater than 45 mph

9. About how often do you use your moped? (Check one.)

☐ Daily
☐ Once or twice a week
☐ Several times a week
☐ Once or twice a month
☐ Less than once a month

10. When during the week do you use your moped?

☐ Mostly on weekdays
☐ Mostly on weekends
☐ Both weekdays and weekends

11. What time during the day do you most often ride? (Check one.)

☐ Morning (before 10 a.m.)
☐ Midday (10 a.m. - 4 p.m.)
☐ Late afternoon or evening (after 4 p.m.)
☐ Morning and evening commuting hours
☐ No specific time

12. Approximately what percentage of your riding occurs in the various seasons? (The four percentages should add to 100%.)

Spring (March-May) _____%
Summer (June-Aug.) _____%
Fall (Sept.-Nov.) _____%
Winter (Dec.-Feb.) _____%
100 %

13. Do you carry passengers on your moped?

☐ Never
☐ Occasionally
☐ Often

14. Do you wear a helmet?

☐ Always
☐ Usually
☐ Occasionally
☐ Never

15. Have you ever been involved in a traffic accident while riding this moped?

☐ Yes
☐ No

If yes, please answer the following. If more than one accident, use back of questionnaire.

When did the accident occur? (month, year) _____

Were you (or any of your passengers) injured? Please describe. _____

_____

_____

_____

Briefly describe what happened. _____

_____

_____

16. Have any <u>other</u> <u>riders</u> had accidents on this moped?

☐ Yes ☐ No

If yes, please give date of accident (month, year): _____

Injuries (to operator and any passengers): _____

_____

_____

Description of the accident: _____

_____

_____

_____

17. What do you feel are the greatest hazards to moped operators? _____

_____

_____

18. Are you satisfied with your moped?

☐ Yes ☐ No

If No, please explain: _____

_____

_____

19. Would you recommend any safety changes to the vehicle itself?

☐ Yes ☐ No

If Yes, please explain: _____

_____

_____

20. N.C. law currently does not require a driver's license to operate a moped but does require that the operator be at least 16 years old. The top speed of the moped is set at 20 mph and there are no helmet, insurance, or vehicle registration requirements. Would you recommend:

	Yes	No
Requiring a driver's license?	☐	☐
Lowering the minimum age?	☐	☐
Raising the speed limit?	☐	☐
Requiring all riders to wear helmets?	☐	☐
Requiring insurance?	☐	☐
Requiring vehicle registration?	☐	☐

Would any such changes to the above laws have affected the purchase and/or use of your moped? Please comment. _____

_____

_____

_____

_____

Now for some information about yourself, would you please complete the following?

What is your age? _____

Your sex?

☐ Male
☐ Female

Your Race?

☐ White
☐ Black
☐ Indian
☐ Other

What is your family's total annual income?

☐ Under $10,000
☐ $10,000-$14,999
☐ $15,000-$19,999
☐ $20,000-$24,999
☐ $25,000-$29,999
☐ $30,000 or over

What is your highest level of education?

☐ Grade school
☐ Attended high school
☐ Graduated high school
☐ Attended college
☐ Graduated college
☐ Post-graduate work
☐ Other: _____

What is the population of the city/town where you live?

☐ Rural, or less than 500
☐ 500 to 999
☐ 1,000 to 2,499
☐ 2,500 to 4,999
☐ 5,000 to 9,999
☐ 10,000 to 24,999
☐ 25,000 to 49,999
☐ 50,000 or over

THANK YOU! PLEASE WRITE ANY OTHER COMMENTS YOU WISH ON BACK OF FORM.

Thank you very much for completing our questionnaire. If you would like a summary of the results of this survey, we need to have your name and current mailing address. We are also interested in getting back in touch with those of you willing to participate in a more indepth follow-up survey of a select group of moped riders. This survey will be conducted over a 4-6 week period in the summer and will seek to gather more specific information about the day-to-day use of the moped.

☐ Please send me the results of this survey.

☐ I would like to participate in the follow-up survey.

Name _____

Address _____

_____

Phone No. (for follow-up survey participants only)

_____
Area Code Number

A.2. Follow-up (Mileage) Survey

THE UNIVERSITY OF NORTH CAROLINA
HIGHWAY SAFETY RESEARCH CENTER
CTP - 197A
CHAPEL HILL, NORTH CAROLINA 27514
TELEPHONE (919) 933-2202

Dear Moped Rider,

Several weeks ago you completed a questionnaire designed to give us some first-hand information on how mopeds are being used in North Carolina. You also indicated your willingness to participate in a more in-depth follow-up survey. This package contains the materials for that survey. We appreciate your helpfulness in the past and are grateful for the opportunity to continue to learn from your riding experience.

This follow-up survey is designed to obtain more detailed information about the use of your moped over the next four weeks, based on the responses you give us on the four enclosed postcards. Each of the four postcards has been labeled with a different week, beginning with July 6-12. It is important that the four cards be filled out on four consecutive weeks, and that we receive a card from you each week. After filling out a card at the end of the week, simply fold it so that our address is on the outside, staple or tape it closed, and drop it in the mail to us.

Questions on the postcards primarily ask about mileage on your moped during that particular week. We realize that mileage can vary from week to week even under normal circumstances. However, if for some reason your riding pattern during one of the weeks is not at all typical (for example, if you are on vacation or sick), please note this in the space for comments at the bottom of the postcard. Even if you do not ride at all during a week, we would still want "0" miles filled in and the postcard mailed back.

Attached are a few sample forms that can be used as guidelines. Please look these over and then give me a call (collect, 919-933-2202) if you have any questions. Remember that all of the information you provide will be kept entirely confidential and used for research purposes only.

Once again, our thanks for sharing your riding experience with us. This fall we will be sending you the results of this and our earlier survey.

Sincerely,

Jane Stutts

Jane Stutts
Research Associate

WEEK 1

SUMMARY OF MOPED USE

for Week of SAMPLE through _____

1. Record the total number of miles you rode the moped during this seven day period. **29** Total miles

2. Use the following list to enter your weekly mileage (above) by type of trip taken.

Type of Trip	
Going to and from work	18
Going to and from school	
Trips to a specific place of recreation (swimming pool, gym, etc.)	
Recreational trips with no specific destination (pleasure riding)	4
Shopping/Errands	7
Use in business or work (deliveries, etc.)	
Visiting relatives or friends	
Other (describe) _____	
	29 Total miles

3. Now list your total weekly mileage by the type of roadway used.

Type of Roadway	
Residential streets	11
Downtown business streets	13
Other major streets (heavy traffic) inside city or town limits	
Rural roads, speed limit 45 mph or less	5
Rural roads, speed limit greater than 45 mph	
	29 Total miles

These numbers should all be the same

4. What percentage of this travel occurred under conditions of darkness? 15 percent

5. How many falls or accidents did you have during this seven day period? 0

   For how many of these falls or accidents did you receive some form of professional medical treatment (hospital, doctor's office, etc.)? 0

   For how many was there some personal injury and/or as much as $200 property damage? 0

   How many other "near miss" situations did you encounter that could have resulted in an accident? 2

THANK YOU. Please use the space below to add any other comments you wish about your riding experience this past week.

Both near miss situations happened at intersections. First occurred when driver of a car turned left in front of me. Second took place when a driver passed me and then quickly turned right, cutting me off. Had to brake fast in both cases, but did not fall.

SUMMARY OF MOPED USE — WEEK 2

for Week of SAMPLE through _____

1. Record the total number of miles you rode the moped during this seven day period. **11** Total miles

2. Use the following list to enter your weekly mileage (above) by type of trip taken.

Type of Trip	
Going to and from work	____
Going to and from school	____
Trips to a specific place of recreation (swimming pool, gym, etc.)	5
Recreational trips with no specific destination (pleasure riding)	6
Shopping/Errands	____
Use in business or work (deliveries, etc.)	____
Visiting relatives or friends	____
Other (describe) _____	____
	11 Total miles

3. Now list your total weekly mileage by the type of roadway used.

Type of Roadway	
Residential streets	4
Downtown business streets	3
Other major streets (heavy traffic) inside city or town limits	4
Rural roads, speed limit 45 mph or less	____
Rural roads, speed limit greater than 45 mph	____
	11 Total miles

These numbers should all be the same

4. What percentage of this travel occurred under conditions of darkness? 5 percent

5. How many falls or accidents did you have during this seven day period? 0

   For how many of these falls or accidents did you receive some form of professional medical treatment (hospital, doctor's office, etc.)? 0

   For how many was there some personal injury and/or as much as $200 property damage? 0

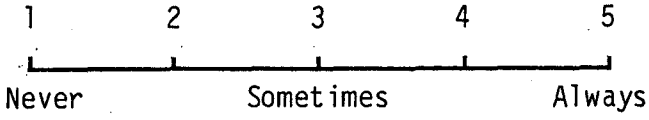
   How many other "near miss" situations did you encounter that could have resulted in an accident? 0

THANK YOU. Please use the space below to add any other comments you wish about your riding experience this past week.

This was not a typical week. Only rode 2 days. Moped was in shop for repairs other days.

SUPPLEMENTAL QUESTIONS
(For first week only)

Use the scale below to answer the following set of questions. Write the correct number in the box.



How often do you ride

- as close as possible to the right hand edge of the road ☐
- a few feet out from the right hand edge ☐
- in the center or slightly left of center of the traffic lane ☐
- off the road completely (on shoulder) ☐
- on bicycle paths or in designated bicycle lanes ☐
- faster than 20 miles per hour ☐
- against traffic (i.e. wrong way) ☐
- with your headlight on during the day ☐
- using your pedals (not counting when starting the engine) ☐

THANK YOU. Please use the space below to add any other comments you wish about the above questions.

APPENDIX B

North Carolina Traffic Accident Report Forms

B.1 "Old" Form - Revised 11/15/76

B.2 "New" Form - Revised 1/1/79

B.1. "Old" N.C. Traffic Accident Report Form.

In filling out these items on the back use the following examples:

1. LOCALITY
   1. Business
   2. Residential
   3. School & playground
   4. Open country
2. SPEED LIMIT
3. ROAD FEATURE
   1. Bridge or underpass
   2. Driveway
   3. Alley intersection
   4. Intersection of two roadways
   5. Non-intersection median crossover
   6. End or beginning of divided highway
   7. Other
4. ROAD SURFACE
   1. Concrete
   2. Smooth asphalt
   3. Coarse asphalt
   4. Gravel
   5. Dirt or sand
   6. Other
5. ROAD DEFECTS
   1. Loose material on surface
   2. Holes, deep ruts
   3. Low shoulders
   4. Soft shoulders
   5. Other defects
   6. Road under construction
   7. No defects
6. ROAD CONDITION
   1. Dry
   2. Wet
   3. Oily
   4. Muddy
   5. Snowy
   6. Icy
7. LIGHT CONDITION
   1. Daylight
   2. Dusk
   3. Dawn
   4. Darkness (street lighted)
   5. Darkness (street not lighted)
8. WEATHER
   1. Clear
   2. Cloudy
   3. Raining
   4. Snowing
   5. Fog
   6. Sleet or hail
9. TRAFFIC CONTROL
   1. Stop sign
   2. Yield sign
   3. Stop and go signal
   4. Flashing signal with stop sign
   5. Flashing signal without stop sign
   6. R. R. gate and flasher
   7. R. R. flasher
   8. Officer
   9. Other device
   10. No control present
10. OBJECT STRUCK (first only)
    1. Tree
    2. Utility pole
    3. Fence or fence post
    4. Guardrail or guardpost in median
    5. Guardrail or guardpost on shoulder
    6. Bridge
    7. Underpass
    8. Traffic island, curb, or median
    9. Sign or sign post
    10. Animal
    11. Ditch bank
    12. Parked vehicle
    13. Pedestrian
    14. Other object
    15. None
11. SOBRIETY
    1. Had not been drinking
    2. Drinking-ability impaired
    3. Drinking-unable to determine impairment
    4. Unknown
12. PHYSICAL CONDITION
    1. Ill
    2. Fatigued
    3. Asleep
    4. Other physical impairment
    5. Restriction not complied with
    6. Normal
    7. Condition not known
13. CHEMICAL TEST
14. PEDESTRIAN ACTION
    1. Crossing at intersection
    2. Crossing not at intersection
    3. Coming from behind parked vehicle
    4. Walking with traffic
    5. Walking against traffic
    6. Getting on or off vehicle
    7. Standing in road
    8. Working in road
    9. Playing in road
    10. Lying in road
    11. Other
    12. Not in road
15. VEHICLE MANEUVER
    1. Stopped in travel lane
    2. Parked out of travel lanes
    3. Parked in travel lanes
    4. Going straight ahead
    5. Changing lanes or merging
    6. Passing
    7. Making right turn
    8. Making left turn
    9. Making U turn
    10. Backing
    11. Slowing or stopping
    12. Starting in roadway
    13. Parking
    14. Leaving parked position
    15. Other
16. VEHICLE DEFECTS (List one or more)
    1. Defective brakes
    2. Defective headlights
    3. Defective rear lights
    4. Defective steering
    5. Defective tires
    6. Other defects
    7. Not known if defective
    8. No defects detected

DMV-349 (Rev. 11/15/76)

Do not write in this space

Patrol Area

LOCATION

Date of Accident 19 — Day of Week — Hour — A.M. ☐ P.M. ☐

Accident Occurred ☐ In ☐ Near City or Town of

In _____ County

Outside City or Town _____ Miles ☐ N ☐ E ☐ S ☐ W of ☐ Limits ☐ Center

On _____ Hwy. No. (I., U.S., N.C., R.P., R.U.) If No., or within corporate limits, identify by name

☐ Miles ☐ Feet (0 Ft. if Intersec.) ☐ N ☐ E ☐ S ☐ W At or From _____ Hwy. No., or Adjacent County Line Toward _____ Hwy. No., City, or Adjacent County Line

ACCIDENT TYPE

Ran off Road			Non-Collision in Road		Collision of Motor Vehicle in Road With:						
1. Right	2. Left	3. Straight Ahead	4. Overturn	5. Other in Road	6. Pedestrian	7. Parked Vehicle	8. Train	9. Bicycle	10. Animal	11. Fixed Obj.	12. Other Obj.

Collision of M.V. in Road With Another M. V.

13. Rear End Slow or Stop	14. Rear End Turn	15. Left Turn Same Roadway	16. Left Turn Cross Traffic	17. Right Turn Same Roadway	18. Right Turn Cross Traffic	19. Head On	20. Sideswipe	21. Angle	22. Backing

VEHICLE NO. 1

No. of Vehicles Involved

Driver: First Middle Last Name

Address:

City: State: Zip Code

Is above address same as on Driver's License? Yes ☐ No ☐

Race/Sex: Driver's Lic: State:

Date of Birth: Month Day Year Specify Restriction:

Member of Armed Forces Yes ☐ No. ☐ Veh. Year: Veh. Make: Veh. Type:

Lic. Plate No. State: Year:

VIN ODOM.

Owner:

Address:

City: State: Zip Code:

Parts Damaged (TAD) Amount of Damage $

Vehicle Drivable: Yes ☐ No ☐

Removed to:

Address:

By: Authority:

VEHICLE NO. 2 or PEDESTRIAN

Driver: First Middle Last Name

Address:

City: State: Zip Code

Is above address same as on Driver's License? Yes ☐ No ☐

Race/Sex: Driver's Lic. State:

Date of Birth: Month Day Year Specify Restriction:

Member of Armed Forces Yes ☐ No. ☐ Veh. Year: Veh. Make: Veh. Type:

Lic. Plate No. State Year:

VIN ODOM.

Owner:

Address:

City: State: Zip Code:

Parts Damaged (TAD) Amount of Damage $

Vehicle Drivable: Yes ☐ No ☐

Removed to:

Address:

By: Authority:

Other Property Damaged — Amt. of Dam. $ — Owner and Address

INJURY SECTION INSTRUCTIONS

Give injury class, restraint used, race, sex and age of all occupants in the space corresponding to the seat occupied. Names and addresses are necessary for persons who were injured. For type of Restraint (Res.) used: N – None, L – Lap Belt, LS – Lap and Shoulder, S – Shoulder Belt only, YR – Child Restraint System.

K=Killed | A=Incapacitating | B=Nonincapacitating – Injury other than K or A evident at the scene | C=No visible sign of injury but complaint of pain, momentary unconsciousness | O=No injury

SEAT	Inj cl	Res usd	Race, sex	Age	INJURED NAMES AND ADDRESSES First Name Last	SEAT	Inj cl	Res usd	Race sex	Age	INJURED NAMES AND ADDRESSES First Name Last
Left Front					DRIVER 1	Left Front					DRIVER 2 OR PEDESTRIAN
Center Front						Center Front					
Right Front						Right Front					
Left Rear						Left Rear					
Center Rear						Center Rear					
Right Rear						Right Rear					

Total No. Occupants — Total No. Inj. — Total No. Occupants — Total No. Inj.

Injured taken to:

WITNESSES Name — Address — Phone No.

Name — Address — Phone No.

Arrests: Name — Charge(s) — (Cit. No.)

Name — Charge(s) — (Cit. No.)

Sign Here — Officer's Rank and Name — Number — Department — Date of Report

REMARKS

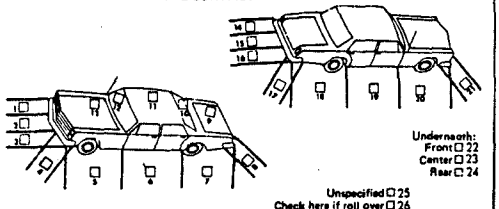
ADDED BY _____ (Initial)

TRAFFIC ACCIDENT REPORT
N. C. Division of Motor Vehicles
MAIL – Raleigh, N. C. 27611

In filling out these items on the back use the following examples:

1. LOCALITY
   1. Business
   2. Residential
   3. School & playground
   4. Open country
2. SPEED LIMIT
3. ROAD FEATURE
   1. Bridge or underpass
   2. Driveway
   3. Alley intersection
   4. Intersection of two roadways
   5. Non-intersection median crossover
   6. End or beginning of divided highway
   7. Other
4. ROAD SURFACE
   1. Concrete
   2. Smooth asphalt
   3. Coarse asphalt
   4. Gravel
   5. Dirt or sand
   6. Other
5. ROAD DEFECTS
   1. Loose material on surface
   2. Holes, deep ruts
   3. Low shoulders
   4. Soft shoulders
   5. Other defects
   6. Road under construction
   7. No defects
6. ROAD CONDITION
   1. Dry
   2. Wet
   3. Oily
   4. Muddy
   5. Snowy
   6. Icy
7. LIGHT CONDITION
   1. Daylight
   2. Dusk
   3. Dawn
   4. Darkness (street lighted)
   5. Darkness (street not lighted)
8. WEATHER
   1. Clear
   2. Cloudy
   3. Raining
   4. Snowing
   5. Fog
   6. Sleet or hail
9. TRAFFIC CONTROL
   1. Stop sign
   2. Yield sign
   3. Stop and go signal
   4. Flashing signal with stop sign
   5. Flashing signal without stop sign
   6. R. R. gate and flasher
   7. R. R. flasher
   8. Officer
   9. Other device
   10. No control present
10. OBJECT STRUCK (first only)
    1. Tree
    2. Utility pole
    3. Fence or fence post
    4. Guardrail or guardpost in median
    5. Guardrail or guardpost on shoulder
    6. Bridge
    7. Underpass
    8. Traffic island, curb, or median
    9. Sign or sign post
    10. Animal
    11. Ditch bank
    12. Parked vehicle
    13. Pedestrian
    14. Other object
    15. None
11. SOBRIETY
    1. Had not been drinking
    2. Drinking-ability impaired
    3. Drinking-unable to determine impairment
    4. Unknown
12. PHYSICAL CONDITION
    1. Ill
    2. Fatigued
    3. Asleep
    4. Other physical impairment
    5. Restriction not complied with
    6. Normal
    7. Condition not known
13. CHEMICAL TEST
14. PEDESTRIAN ACTION
    1. Crossing at intersection
    2. Crossing not at intersection
    3. Coming from behind parked vehicle
    4. Walking with traffic
    5. Walking against traffic
    6. Getting on or off vehicle
    7. Standing in road
    8. Working in road
    9. Playing in road
    10. Lying in road
    11. Other
    12. Not in road
15. VEHICLE MANEUVER
    1. Stopped in travel lane
    2. Parked out of travel lanes
    3. Parked in travel lanes
    4. Going straight ahead
    5. Changing lanes or merging
    6. Passing
    7. Making right turn
    8. Making left turn
    9. Making U turn
    10. Backing
    11. Slowing or stopping
    12. Starting in roadway
    13. Parking
    14. Leaving parked position
    15. Other
16. VEHICLE DEFECTS (List one or more)
    1. Defective brakes
    2. Defective headlights
    3. Defective rear lights
    4. Defective steering
    5. Defective tires
    6. Other defects
    7. Not known if defective
    8. No defects detected

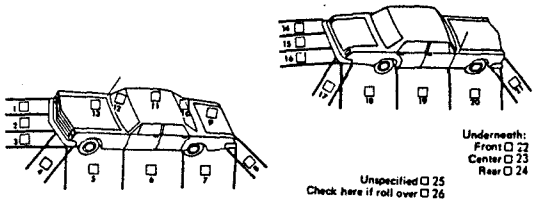
VEHICLE 1 POINT OF INITIAL CONTACT



Underneath: Front ☐ 22 Center ☐ 23 Rear ☐ 24

Unspecified ☐ 25
Check here if roll over ☐ 26

VEHICLE 2 POINT OF INITIAL CONTACT



Underneath: Front ☐ 22 Center ☐ 23 Rear ☐ 24

Unspecified ☐ 25
Check here if roll over ☐ 26

					VEHICLE 1	VEHICLE 2
1. Locality	9. Traffic Control	Not Operating ☐	Not Visible ☐			
2. Speed Limit		DRIVER 1	DRIVER 2 or PED.	15. Veh. Maneuver		
3. Road Feature	10. Object Struck			16. Veh. Defects		
4. Road Surface	11. Sobriety			17. Estimated Speed		
5. Road Defects	12. Physical Cond.			18. Tire Impressions(ft)		
6. Road Condition	13. Chem. Test	YES ☐ NO ☐	YES ☐ NO ☐	19. Distance Traveled After Impact (ft.)		
7. Light Condition						
8. Weather	14. Ped. Action					

INDICATE NORTH

Vehicle 1 was Traveling ☐ N ☐ E ☐ S ☐ W on

Vehicle 2 was Traveling ☐ N ☐ E ☐ S ☐ W on

DESCRIBE WHAT HAPPENED:

Vehicle 1	Vehicle 2	VIOLATION INDICATED
☐	☐	1. No. Violation Indicated
☐	☐	2. Excessive Speed
☐	☐	3. Yield Violation
☐	☐	4. Left of Center
☐	☐	5. Passing Violation
☐	☐	6. Stop S. or Yield S. Vio.
☐	☐	7. Traffic Signal Vio.
☐	☐	8. Safe Movement Vio.
☐	☐	9. Too Close
☐	☐	10. Improper Turn
☐	☐	11. Improper or No Signal
☐	☐	12. Improper Parking Location
☐	☐	13. Other Improper Driving

(describe) _____

EMERGENCY ASSISTANCE INFORMATION

INVESTIGATOR NOTIFIED ☐ a.m. ☐ p.m.
BY _____

INVESTIGATOR ARRIVED ☐ a.m. ☐ p.m.

AMBULANCE ARRIVED ☐ a.m. ☐ p.m.

OTHER COMMENTS: _____

RESERVED FOR STATE USE:

	DRIVER 1		DRIVER 2	
20. Direction		21. Direction		26.
22. Charge		23. Charge		27.
24. Misc. Action		25. Misc. Action		28.

RESERVED FOR CITY OR OTHER USE:

B.2. "New" N.C. Traffic Accident Report Form.

ACCIDENT SEQUENCE CODES

1. VEHICLE MANEUVER/ PEDESTRIAN ACTION:
VEHICLE
1. Stopped in travel lane
2. Parked out of travel lanes
3. Parked in travel lanes
4. Going straight ahead
5. Changing lanes or merging
6. Passing
7. Making right turn
8. Making left turn
9. Making U turn
10. Backing
11. Slowing or stopping
12. Starting in roadway
13. Parking
14. Leaving parked position
15. Avoiding object in road
16. Other

PEDESTRIAN
17. Crossing at intersection
18. Crossing not at intersection
19. Coming from behind parked vehicle
20. Walking with traffic
21. Walking against traffic
22. Getting on or off vehicle
23. Standing in road
24. Working in road
25. Playing in road
26. Lying in road
27. Other in road
28. Not in road

2. ACCIDENT TYPE:
RAN OFF ROAD
1. Right
2. Left
3. Straight ahead

NON-COLLISION
4. Overturn
5. Other

COLLISION OF MOTOR VEHICLE WITH
6. Pedestrian
7. Parked vehicle
8. Train
9. Bicycle
10. Moped
11. Animal
12. Fixed object
13. Other object

COLLISION OF MOTOR VEHICLE WITH ANOTHER MOTOR VEHICLE
14. Rear end, slow or stop
15. Rear end, turn
16. Left turn, same roadway
17. Left turn, different roadways
18. Right turn, same roadway
19. Right turn, different roadways
20. Head on
21. Sideswipe
22. Angle
23. Backing

3. OBJECT STRUCK (excluding another motor vehicle in traffic)
1. None
2. Parked vehicle
3. Bicycle, moped
4. Pedestrian
5. Animal
6. Tree
7. Utility pole (with or without light)
8. Luminaire pole (non-breakaway)
9. Luminaire pole (breakaway)
10. Official highway sign (non-breakaway)
11. Official highway sign (breakaway)
12. Commercial sign
13. Guardrail end on shoulder
14. Guardrail face on shoulder
15. Guardrail end in median
16. Guardrail face in median
17. Shoulder barrier end } Non-Guardrail
18. Shoulder barrier face } Non-Guardrail
19. Median barrier end } Non-Guardrail
20. Median barrier face } Non-Guardrail
21. Bridge rail end
22. Bridge rail face
23. Overhead part of underpass
24. Pier on shoulder of underpass
25. Pier in median of underpass
26. Abutment (supporting wall of underpass)
27. Curb, median or traffic island
28. Catch basin or culvert on shoulder
29. Catch basin or culvert in median
30. Ditch bank
31. Mailbox
32. Fence or fence post
33. Construction barrier
34. Crash cushion
35. Other object (describe)

4. DISTANCE
1. In road
2. Right of road, 0-10 ft.
3. Right of road, 11-30 ft.
4. Right of road, over 30 ft.
5. Left of road, 0-10 ft.
6. Left of road, 11-30 ft.
7. Left of road, over 30 ft.

5. TRAILER TYPE:
NON-SEMI TRAILERS
BT = Boat
CT = Camper
UT = Utility
HE = Horse
HS = House trailer (mobile home)
TV = Towed vehicle
OT = Other

SEMI TRAILERS
TN = Tanker
VN = Van (enclosed trailer)
FB = Flatbed or platform
OS = Other semi

DMV-349 (Rev. 1/79)

TRAFFIC ACCIDENT REPORT — Send To: N. C. Division of Motor Vehicles, Raleigh, N. C. 27697

LOCATION

Date: ____ 19__ Day of Week: ____ Time: __ __ __ __ (24 Hour Clock)
Month Day Year

Accident Occurred in ____ County ☐ In ☐ Near Incorporated City or Town of ____

Outside City or Town ____ Miles ☐N ☐E ☐S ☐W of City or Town Limits

On ____
Hwy. No. (I., U.S., N.C., R.P., R.U.). If within corporate limit or no hwy. no., identify by street name. If ramp or service road, indicate on line.

RR. Crossing No.: ____

—● — — Miles ☐N ☐E ☐S ☐W At or from ____ Toward ____
____ Feet (0 ft. if intersec.)
Use Hwy. No., Street Name, or Adjacent County or State Line
Use Hwy. No., Street Name, Incorporated Town, or Adjacent County or State Line

Local Use

Patrol Area

Do not write in these spaces
DMV Report No.:

Date Received by DMV:

ACCIDENT SEQUENCE

1. VEHICLE MANEUVER/ PEDESTRIAN ACTION		2. ACCIDENT TYPE		3. OBJECT STRUCK AND 4. DISTANCE			
			MOST HARMFUL EVENT: Repeat code if same as for FIRST HARMFUL EVENT	Vehicle 1		Vehicle 2	
Veh. 1	Veh. 2 or Ped.	FIRST HARMFUL EVENT	Veh. 1 / Veh. 2 or Ped.	Object	Distance	Object	Distance

VEHICLE NO. 1

No of Units Involved: ____
Driver: ____ (First Middle Last Name)
Address: ____
City: ____ State: ____ Zip Code: ____
Same Address as on Driver's License? ☐ Yes ☐ No Driver's Phone No.: ____
Race/ Sex: ____ Driver's Lic.: ____ State: ____
Date of Birth: ____ (Month Day Year) Specify Restriction: ____
Veh. Year: ____ Veh. Make: ____ Veh. Type: ____ Trailer Type: ____
Lic. Plate No.: ____ State: ____ Year: ____
VIN: ____
Owner: ____
Address: ____
City: ____ State: ____ Zip Code: ____
(Parts TAD Damaged): ____ Estimated Damage: $ ____
Vehicle Drivable? ☐ Yes ☐ No
Removed to: ____
Address: ____
By: ____ Authority: ____

☐ VEHICLE NO. 2 ☐ PEDESTRIAN ☐ OTHER

Driver: ____ (First Middle Last Name)
Address: ____
City: ____ State: ____ Zip Code: ____
Same Address as on Driver's License? ☐ Yes ☐ No Driver's Phone No.: ____
Race/ Sex: ____ Driver's Lic.: ____ State: ____
Date of Birth: ____ (Month Day Year) Specify Restriction: ____
Veh. Year: ____ Veh. Make: ____ Veh. Type: ____ Trailer Type: ____
Lic. Plate No.: ____ State: ____ Year: ____
VIN: ____
Owner: ____
Address: ____
City: ____ State: ____ Zip Code: ____
(Parts TAD Damaged): ____ Estimated Damage: $ ____
Vehicle Drivable? ☐ Yes ☐ No
Removed to: ____
Address: ____
By: ____ Authority: ____

Other Property Damaged: ____
Estimated Damage: $ ____
Owner Name: ____
Address: ____

INJURY SECTION INSTRUCTIONS: Give Injury Class, Belt Usage, Race/Sex and Age of all Occupants in the space corresponding to the seat occupied (see codes at bottom). Names and addresses are necessary for persons who were injured.

Seat	Inj. Cl.	Belt Use	Race Sex	Age	Injured Names and Addresses First Name Last Name	Seat	Inj. Cl.	Belt Use	Race Sex	Age	Injured Names and Addresses First Name Last Name
Left Front					DRIVER 1	Left Front					DRIVER 2, PEDESTRIAN, OTHER
Center Front						Center Front					
Right Front						Right Front					
Left Rear						Left Rear					
Center Rear						Center Rear					
Right Rear						Right Rear					

Total No. Occupants: ____ Total No. Injured: ____
Total No. Occupants: ____ Total No. Injured: ____

Ambulance Requested? ☐ Yes ☐ No. If Yes, Ambulance Arrived At: __ __ __ __ (24 Hour Clock)

Injured Taken To: ____ (Treatment Facility and City or Town)

CODED BY ____ (Initial)

MARKS

Injury Class
K – Killed
A – Incapacitating (Injury obviously serious enough to prevent carrying on normal activities for at least 24 hours; e.g., massive loss of blood, broken bone)
B – Nonincapacitating (injury other than K or A evident at the scene)
C – No visible sign of injury but complaint of pain or momentary unconsciousness
O – No injury

Belt Use
1. None or not used
2. Lap only
3. Lap and shoulder
4. Child restraint system
9. Unable to determine

1. LOCALITY
1. Rural (< 30% developed)
2. Mixed (30% to 70% developed)
3. Urban (> 70% developed)

2. PREDOMINANT DEVELOPMENT TYPE
1. Farms, woods, pastures
2. Residential
3. Commercial
4. Institutional
5. Industrial

3. ROAD FEATURE
1. Bridge
2. Underpass
3. Driveway, public
4. Driveway, private
5. Alley intersection
6. Intersection of roadways
7. Non-intersection median crossing
8. End or beginning of divided highway
9. Interchange ramp
10. Interchange service road
11. Railroad crossing
12. Tunnel
13. Other (write in narrative)
14. No special feature

4. ROAD CHARACTER
1. Straight, level
2. Straight, hillcrest
3. Straight, grade
4. Straight, bottom (sag)
5. Curve, level
6. Curve, hillcrest
7. Curve, grade
8. Curve, bottom (sag)

5. ROAD CLASS
1. Interstate
2. U.S. route
3. N.C. route
4. State secondary route
5. Local street
6. Other public road
7. Private road, property or driveway

6. NUMBER OF LANES
Enter "0" if parking lot

7. ROAD CONFIGURATION
1. Undivided, one-way
2. Undivided, two-way
3. Divided

8. ROAD SURFACE
1. Concrete
2. Grooved concrete
3. Smooth asphalt
4. Coarse asphalt
5. Gravel
6. Sand
7. Soil
8. Other (write in narrative)

9. ROAD DEFECTS
1. Loose material on surface
2. Holes, deep ruts
3. Low shoulders
4. Soft shoulders
5. Other defects
6. Under construction
7. No defects

10. ROAD CONDITION
1. Dry
2. Wet
3. Muddy
4. Snowy
5. Icy
6. Other (write in narrative)

11. LIGHT CONDITION
1. Daylight
2. Dusk
3. Dawn
4. Darkness (street lighted)
5. Darkness (street not lighted)

12. WEATHER
1. Clear
2. Cloudy
3. Raining
4. Snowing
5. Fog, smog, smoke, dust
6. Sleet or hail

13. TRAFFIC CONTROL
1. Stop sign
2. Yield sign
3. Stop and go signal
4. Flashing signal with stop sign
5. Flashing signal without stop sign
6. RR gate and flasher
7. RR flasher
8. RR crossbucks only
9. Human control
10. Other (write in narrative)
11. No control present

14. VISION OBSTRUCTION
1. None
2. Vehicle window(s) obscured
3. Trees, crops, brush, etc.
4. Building(s)
5. Embankment
6. Sign(s)
7. Hillcrest
8. Parked vehicle(s)
9. Moving vehicle(s)
10. Blinded, headlights
11. Blinded, sunlight
12. Blinded, other lights
13. Other (write in narrative)

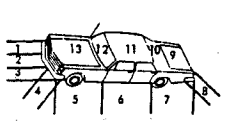
15. PHYSICAL CONDITION
1. Normal
2. Ill
3. Fatigued
4. Asleep
5. Impairment due to medicine or drugs
6. Other physical impairment
7. Restriction not complied with
8. Condition not known

16. INTOXICATION
1. Had not been drinking
2. Drinking – ability impaired
3. Drinking – unable to determine impairment
4. Unknown

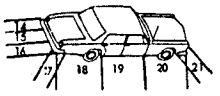
17. CHEMICAL TEST GIVEN

18. VEHICLE DEFECTS
(List one or more)
1. Defective brakes
2. Defective headlights
3. Defective rear lights
4. Defective steering
5. Defective tires
6. Other defects
7. Not known if defective
8. No defects detected

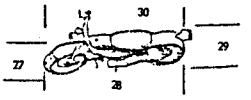
POINT(S) OF INITIAL CONTACT Write in Codes	
VEH. 1	VEH. 2



0. – No Contact



Underneath:
22. Front
23. Center
24. Rear
25. Rollover
26. Unknown



Motorcycle, Bicycle or Moped

ROADWAY INFORMATION				DRIVER 1	DRIVER 2 OR PED.		VEH. 1	VEH. 2
1. Locality		8. Road Surface				18. Vehicle Defects		
2. Development Type		9. Road Defects				19. Speed Limit (for each vehicle)		
3. Road Feature		10. Road Condition				20. Estimated Original Traveling Speed		
4. Road Character		11. Light Condition				21. Estimated Speed at Impact		
5. Road Class		12. Weather				22. Tire Impressions Before Impact (ft.)		
6. Number of Lanes		13. Traffic Control				23. Distance Traveled After Impact (ft.)		
7. Road Configuration		Operating	Visible					
		☐ Yes ☐ No	☐ Yes ☐ No					
			14. Vision Obstruction					
			15. Physical Condition					
			16. Intoxication					
			17. Chemical Test Given	☐ Yes ☐ No ☐ Refused	☐ Yes ☐ No ☐ Refused			

INDICATE NORTH

Vehicle 1 was Traveling ☐ N ☐ E ☐ S ☐ W on

Vehicle 2 was Traveling ☐ N ☐ E ☐ S ☐ W on

DESCRIBE WHAT HAPPENED:

WITNESSES: Name _____ Address _____ Phone No. _____

Name _____ Address _____ Phone No. _____

ARRESTS: Name _____ Charge(s) _____ (Cit. No.) _____

Name _____ Charge(s) _____ (Cit. No.) _____

Sign Here: _____ Officer's Rank and Name _____ Number _____ Department _____ Date of Report _____

VIOLATION INDICATED (Check as many violations as apply)

Driver 1	Driver 2		Driver 1	Driver 2		Driver 1	Driver 2	
☐	☐	1. No violation indicated	☐	☐	9. Minimum speed law	☐	☐	17. Improper or no signal
☐	☐	2. DUI/alcohol	☐	☐	10. Pass stopped school bus	☐	☐	18. Improper vehicle equipment
☐	☐	3. DUI/drugs	☐	☐	11. Passing on hill	☐	☐	19. Safe movement violation
☐	☐	4. Yield	☐	☐	12. Passing on curve	☐	☐	20. Following too closely
☐	☐	5. Stop sign	☐	☐	13. Other improper passing	☐	☐	21. Improper backing
☐	☐	6. Traffic signal	☐	☐	14. Improper lane change	☐	☐	22. Improper parking
☐	☐	7. Exceeding speed limit	☐	☐	15. Use of improper lane	☐	☐	23. Unable to determine
☐	☐	8. Exceeding safe speed	☐	☐	16. Improper turn	☐	☐	24. Other _____

RESERVED FOR CITY OR OTHER USE

RESERVED FOR STATE USE

	Driver 1	Driver 2
24. Direction		
25. Violation		
26. Mis. Action		
27. Charges		

28. Investigating Agency:

APPENDIX C

Supplemental Tables-
General Survey

APPENDIX C TABLE

TABLE OF I3 BY I4

I3 AGE I4 SEX

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	MALE	FEMALE	TOTAL
(NOT STATED)	4	12	1	.
	.	.	.	
	.	.	.	.
	.	.	.	
	.	.	.	
	.	.	.	
< 16 YEARS	0	48	18	66
	.	57.0	9.0	
	.	1.4	9.0	
	.	5.00	1.88	6.88
	.	72.73	27.27	
	.	5.79	13.74	
16-21	0	124	24	148
	.	127.8	20.2	
	.	0.1	0.7	
	.	12.92	2.50	15.42
	.	83.78	16.22	
	.	14.96	18.32	
22-55	2	464	80	544
	.	469.8	74.2	
	.	0.1	0.4	
	.	48.33	8.33	56.67
	.	85.29	14.71	
	.	55.97	61.07	
> 55 YEARS	2	193	9	202
	.	174.4	27.6	
	.	2.0	12.5	
	.	20.10	0.94	21.04
	.	95.54	4.46	
	.	23.28	6.87	
TOTAL	.	829	131	960
	.	86.35	13.65	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	26.228	DF= 3	PROB=0.0001
PHI	0.165		
CONTINGENCY COEFFICIENT	0.163		
CRAMER'S V	0.165		
LIKELIHOOD RATIO CHISQUARE	28.630	DF= 3	PROB=0.0001

APPENDIX C TABLE

TABLE OF I3 BY I5

I3 AGE I5 RACE

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	WHITE	NONWHITE	TOTAL
(NOT STATED)	5	11	1	.
	.	.	.	
	.	.	.	.
	.	.	.	
	.	.	.	
	.	.	.	
< 16 YEARS	0	64	2	66
	.	59.2	6.8	
	.	0.4	3.4	
	.	6.67	0.21	6.88
	.	96.97	3.03	
	.	7.44	2.02	
16-21	0	131	17	148
	.	132.7	15.3	
	.	0.0	0.2	
	.	13.66	1.77	15.43
	.	88.51	11.49	
	.	15.23	17.17	
22-55	2	493	51	544
	.	487.8	56.2	
	.	0.1	0.5	
	.	51.41	5.32	56.73
	.	90.63	9.38	
	.	57.33	51.52	
> 55 YEARS	3	172	29	201
	.	180.3	20.7	
	.	0.4	3.3	
	.	17.94	3.02	20.96
	.	85.57	14.43	
	.	20.00	29.29	
TOTAL	.	860	99	959
	.	89.68	10.32	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	8.195	DF= 3	PROB=0.0422
PHI	0.092		
CONTINGENCY COEFFICIENT	0.092		
CRAMER'S V	0.092		
LIKELIHOOD RATIO CHISQUARE	9.157	DF= 3	PROB=0.0273

APPENDIX C TABLE

TABLE OF I3 BY I6

I3 AGE I6 TOTAL FAMILY INCOME

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	<$10,000	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	$25,000-$30,000	>$30,000	TOTAL
(NOT STATED)	5	1	2	3	1	0	5	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
< 16 YEARS	14	1	5	9	5	10	22	52
	.	13.9	8.9	7.7	5.8	4.4	11.3	
	.	12.0	1.7	0.2	0.1	7.2	10.0	
	.	0.12	0.58	1.04	0.58	1.15	2.54	6.00
	.	1.92	9.62	17.31	9.62	19.23	42.31	
	.	0.43	3.38	7.03	5.15	13.70	11.64	
16-21	16	24	16	18	17	10	47	132
	.	35.3	22.5	19.5	14.8	11.1	28.8	
	.	3.6	1.9	0.1	0.3	0.1	11.5	
	.	2.77	1.85	2.08	1.96	1.15	5.42	15.22
	.	18.18	12.12	13.64	12.88	7.58	35.61	
	.	10.34	10.81	14.06	17.53	13.70	24.87	
22-55	47	116	101	82	58	48	94	499
	.	133.5	85.2	73.7	55.8	42.0	108.8	
	.	2.3	2.9	0.9	0.1	0.9	2.0	
	.	13.38	11.65	9.46	6.69	5.54	10.84	57.55
	.	23.25	20.24	16.43	11.62	9.62	18.84	
	.	50.00	68.24	64.06	59.79	65.75	49.74	
> 55 YEARS	20	91	26	19	17	5	26	184
	.	49.2	31.4	27.2	20.6	15.5	40.1	
	.	35.4	0.9	2.5	0.6	7.1	5.0	
	.	10.50	3.00	2.19	1.96	0.58	3.00	21.22
	.	49.46	14.13	10.33	9.24	2.72	14.13	
	.	39.22	17.57	14.84	17.53	6.85	13.76	
TOTAL	.	232	148	128	97	73	189	867
	.	26.76	17.07	14.76	11.19	8.42	21.80	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	109.533	DF= 15	PROB=0.0001
PHI	0.355		
CONTINGENCY COEFFICIENT	0.335		
CRAMER'S V	0.205		
LIKELIHOOD RATIO CHISQUARE	109.569	DF= 15	PROB=0.0001

APPENDIX C TABLE

TABLE OF I3 BY I7

I3 AGE I7 EDUCATION

FREQUENCY / EXPECTED / CELL CHI2 / PERCENT / ROW PCT / COL PCT	(NOT STATED)	GRADE SCHOOL	ATT HIGH SCHOOL	GRADHIGH SCHOOL	ATTENDED COLLEGE	GRADUATE COLLEGE	POST GRADUATE	TOTAL
(NOT STATED)	4	1	1	1	6	2	2	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
< 16 YEARS	1	27	35	1	1	1	0	65
	.	12.4	15.0	13.7	12.6	5.8	5.6	
	.	17.3	26.8	11.7	10.7	4.0	5.6	
	.	2.84	3.68	0.11	0.11	0.11	0.00	6.83
	.	41.54	53.85	1.54	1.54	1.54	0.00	
	.	14.92	15.98	0.50	0.54	1.18	0.00	
16-21	0	9	83	38	15	2	1	148
	.	28.2	34.1	31.1	28.6	13.2	12.8	
	.	13.0	70.2	1.5	6.5	9.5	10.8	
	.	0.95	8.73	4.00	1.58	0.21	0.11	15.56
	.	6.08	56.08	25.68	10.14	1.35	0.68	
	.	4.97	37.90	19.00	8.15	2.35	1.22	
22-55	6	71	70	129	137	63	70	540
	.	102.8	124.4	113.6	104.5	48.3	46.6	
	.	9.8	23.8	2.1	10.1	4.5	11.8	
	.	7.47	7.36	13.56	14.41	6.62	7.36	56.78
	.	13.15	12.96	23.89	25.37	11.67	12.96	
	.	39.23	31.96	64.50	74.46	74.12	85.37	
> 55 YEARS	6	74	31	32	31	19	11	198
	.	37.7	45.6	41.6	38.3	17.7	17.1	
	.	35.0	4.7	2.2	1.4	0.1	2.2	
	.	7.78	3.26	3.36	3.26	2.00	1.16	20.82
	.	37.37	15.66	16.16	15.66	9.60	5.56	
	.	40.88	14.16	16.00	16.85	22.35	13.41	
TOTAL	.	181	219	200	184	85	82	951
	.	19.03	23.03	21.03	19.35	8.94	8.62	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	295.378	DF= 15	PROB=0.0001
PHI	0.557		
CONTINGENCY COEFFICIENT	0.487		
CRAMER'S V	0.322		
LIKELIHOOD RATIO CHISQUARE	301.937	DF= 15	PROB=0.0001

APPENDIX C TABLE

TABLE OF I3 BY I8

I3 AGE I8 POPULATION OF CITY

FREQUENCY / EXPECTED / CELL CHI2 / PERCENT / ROW PCT / COL PCT	(NOT STATED)	RURAL	500-9999	10,000-24,999	25,000-49,999	> 50,000	TOTAL
(NOT STATED)	4	0	3	0	5	5	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
< 16 YEARS	0	11	11	6	9	29	66
	.	8.6	18.7	9.8	9.0	19.9	
	.	0.7	3.2	1.4	0.0	4.2	
	.	1.20	1.20	0.66	0.99	3.18	7.23
	.	16.67	16.67	9.09	13.64	43.94	
	.	9.24	4.25	4.44	7.20	10.55	
16-21	6	14	42	20	21	45	142
	.	18.5	40.3	21.0	19.4	42.8	
	.	1.1	0.1	0.0	0.1	0.1	
	.	1.53	4.60	2.19	2.30	4.93	15.55
	.	9.86	29.58	14.08	14.79	31.69	
	.	11.76	16.22	14.81	16.80	16.36	
22-55	34	59	149	78	69	157	512
	.	66.7	145.2	75.7	70.1	154.2	
	.	0.9	0.1	0.1	0.0	0.1	
	.	6.46	16.32	8.54	7.56	17.20	56.08
	.	11.52	29.10	15.23	13.48	30.66	
	.	49.58	57.53	57.78	55.20	57.09	
> 55 YEARS	11	35	57	31	26	44	193
	.	25.2	54.8	28.5	26.4	58.1	
	.	3.9	0.1	0.2	0.0	3.4	
	.	3.83	6.24	3.40	2.85	4.82	21.14
	.	18.13	29.53	16.06	13.47	22.80	
	.	29.41	22.01	22.96	20.80	16.00	
TOTAL	.	119	259	135	125	275	913
	.	13.03	28.37	14.79	13.69	30.12	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	19.676	DF= 12	PROB=0.0735
PHI	0.147		
CONTINGENCY COEFFICIENT	0.145		
CRAMER'S V	0.085		
LIKELIHOOD RATIO CHISQUARE	19.910	DF= 12	PROB=0.0688

APPENDIX C TABLE

TABLE OF I4 BY I5

I4 SEX I5 RACE

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	WHITE	NONWHITE	TOTAL
(NOT STATED)	6	0	2	. .
MALE	3	745 753.2 0.1 76.88 88.90 85.53	93 84.8 0.8 9.60 11.10 94.90	838 86.48
FEMALE	1	126 117.8 0.6 13.00 96.18 14.47	5 13.2 5.1 0.52 3.82 5.10	131 13.52
TOTAL	. .	871 89.89	98 10.11	969 100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	6.607	DF= 1	PROB=0.0102
PHI	-0.083		
CONTINGENCY COEFFICIENT	0.082		
CRAMER'S V	0.083		
LIKELIHOOD RATIO CHISQUARE	8.186	DF= 1	PROB=0.0042
CONTINUITY ADJ. CHI-SQUARE	7.097	DF= 1	PROB=0.0077

APPENDIX C TABLE

TABLE OF I4 BY I6

I4 SEX I6 TOTAL FAMILY INCOME

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	<$10,000	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	$25,000-$30,000	>$30,000	TOTAL
(NOT STATED)	4	4	0	0	0	0	0	.
	.	.	.	.	.	.	.	.
MALE	84	213	135	110	84	57	158	757
	.	198.1	129.8	113.3	84.8	63.2	167.8	
	.	1.1	0.2	0.1	0.0	0.6	0.6	
	.	24.34	15.43	12.57	9.60	6.51	18.06	86.51
	.	28.14	17.83	14.53	11.10	7.53	20.87	
	.	93.01	90.00	83.97	85.71	78.08	81.44	
FEMALE	14	16	15	21	14	16	36	118
	.	30.9	20.2	17.7	13.2	9.8	26.2	
	.	7.2	1.4	0.6	0.0	3.8	3.7	
	.	1.83	1.71	2.40	1.60	1.83	4.11	13.49
	.	13.56	12.71	17.80	11.86	13.56	30.51	
	.	6.99	10.00	16.03	14.29	21.92	18.56	
TOTAL	.	229	150	131	98	73	194	875
	.	26.17	17.14	14.97	11.20	8.34	22.17	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	19.357	DF= 5	PROB=0.0016
PHI	0.149		
CONTINGENCY COEFFICIENT	0.147		
CRAMER'S V	0.149		
LIKELIHOOD RATIO CHISQUARE	19.997	DF= 5	PROB=0.0013

APPENDIX C TABLE

TABLE OF I4 BY I7

I4 SEX I7 EDUCATION

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	GRADE SCHOOL	ATT HIGH SCHOOL	GRADHIGH SCHOOL	ATTENDED COLLEGE	GRADUATE COLLEGE	POST GRADUATE	TOTAL
(NOT STATED)	4	3	0	0	1	0	0	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
MALE	10	166	200	167	159	71	68	831
	.	154.9	190.4	174.0	163.6	75.3	72.7	
	.	0.8	0.5	0.3	0.1	0.2	0.3	
	.	17.29	20.83	17.40	16.56	7.40	7.08	86.56
	.	19.98	24.07	20.10	19.13	8.54	8.18	
	.	92.74	90.91	83.08	84.13	81.61	80.95	
FEMALE	3	13	20	34	30	16	16	129
	.	24.1	29.6	27.0	25.4	11.7	11.3	
	.	5.1	3.1	1.8	0.8	1.6	2.0	
	.	1.35	2.08	3.54	3.13	1.67	1.67	13.44
	.	10.08	15.50	26.36	23.26	12.40	12.40	
	.	7.26	9.09	16.92	15.87	18.39	19.05	
TOTAL	.	179	220	201	189	87	84	960
	.	18.65	22.92	20.94	19.69	9.06	8.75	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	16.603	DF= 5	PROB=0.0053
PHI	0.132		
CONTINGENCY COEFFICIENT	0.130		
CRAMER'S V	0.132		
LIKELIHOOD RATIO CHISQUARE	17.445	DF= 5	PROB=0.0037

APPENDIX C TABLE

TABLE OF I5 BY I6

I5 RACE I6 TOTAL FAMILY INCOME

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	<$10,000	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	$25,000-$30,000	>$30,000	TOTAL
(NOT STATED)	6	2	1	1	0	0	0	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
WHITE	87	179	135	120	93	67	190	784
	.	207.0	133.5	116.5	87.8	65.4	173.8	
	.	3.8	0.0	0.1	0.3	0.0	1.5	
	.	20.46	15.43	13.71	10.63	7.66	21.71	89.60
	.	22.83	17.22	15.31	11.86	8.55	24.23	
	.	77.49	90.60	92.31	94.90	91.78	97.94	
NONWHITE	9	52	14	10	5	6	4	91
	.	24.0	15.5	13.5	10.2	7.6	20.2	
	.	32.6	0.1	0.9	2.6	0.3	13.0	
	.	5.94	1.60	1.14	0.57	0.69	0.46	10.40
	.	57.14	15.38	10.99	5.49	6.59	4.40	
	.	22.51	9.40	7.69	5.10	8.22	2.06	
TOTAL	.	231	149	130	98	73	194	875
	.	26.40	17.03	14.86	11.20	8.34	22.17	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	55.342	DF= 5	PROB=0.0001
PHI	0.251		
CONTINGENCY COEFFICIENT	0.244		
CRAMER'S V	0.251		
LIKELIHOOD RATIO CHISQUARE	54.429	DF= 5	PROB=0.0001

APPENDIX C TABLE

TABLE OF I5 BY I7

I5 RACE I7 EDUCATION

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	GRADE SCHOOL	ATT HIGH SCHOOL	GRADHIGH SCHOOL	ATTENDED COLLEGE	GRADUATE COLLEGE	POST GRADUATE	TOTAL
(NOT STATED)	5	2	0	1	2	0	0	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
WHITE	10	146	187	180	180	85	83	861
	.	161.6	197.5	179.6	168.8	78.1	75.4	
	.	1.5	0.6	0.0	0.7	0.6	0.8	
	.	15.22	19.50	18.77	18.77	8.86	8.65	89.78
	.	16.96	21.72	20.91	20.91	9.87	9.64	
	.	81.11	85.00	90.00	95.74	97.70	98.81	
NONWHITE	2	34	33	20	8	2	1	98
	.	18.4	22.5	20.4	19.2	8.9	8.6	
	.	13.2	4.9	0.0	6.5	5.3	6.7	
	.	3.55	3.44	2.09	0.83	0.21	0.10	10.22
	.	34.69	33.67	20.41	8.16	2.04	1.02	
	.	18.89	15.00	10.00	4.26	2.30	1.19	
TOTAL	.	180	220	200	188	87	84	959
	.	18.77	22.94	20.86	19.60	9.07	8.76	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	40.938	DF= 5	PROB=0.0001
PHI	0.207		
CONTINGENCY COEFFICIENT	0.202		
CRAMER'S V	0.207		
LIKELIHOOD RATIO CHISQUARE	46.142	DF= 5	PROB=0.0001

APPENDIX C TABLE

TABLE OF I19 BY I3

I19 PRIMARY USE OF MOPED I3 AGE

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	< 16 YEARS	16-21	22-55	> 55 YEARS	TOTAL
(NOT STATED)	7	5	25	130	65	.
	.	.	.	.	.	.
	.	.	.	.	.	
	.	.	.	.	.	
	.	.	.	.	.	
	.	.	.	.	.	
COMMUTING	6	6	43	192	33	274
	.	22.6	45.6	154.2	51.5	
	.	12.2	0.1	9.2	6.7	
	.	0.81	5.82	25.98	4.47	37.08
	.	2.19	15.69	70.07	12.04	
	.	9.84	34.96	46.15	23.74	
TO RECREATION	0	9	13	31	3	56
	.	4.6	9.3	31.5	10.5	
	.	4.1	1.5	0.0	5.4	
	.	1.22	1.76	4.19	0.41	7.58
	.	16.07	23.21	55.36	5.36	
	.	14.75	10.57	7.45	2.16	
PLEASURE RIDING	4	36	51	100	28	215
	.	17.7	35.8	121.0	40.4	
	.	18.8	6.5	3.7	3.8	
	.	4.87	6.90	13.53	3.79	29.09
	.	16.74	23.72	46.51	13.02	
	.	59.02	41.46	24.04	20.14	
SHOPPING,ERRANDS	0	1	9	64	53	127
	.	10.5	21.1	71.5	23.9	
	.	8.6	7.0	0.8	35.5	
	.	0.14	1.22	8.66	7.17	17.19
	.	0.79	7.09	50.39	41.73	
	.	1.64	7.32	15.38	38.13	
OTHER, MISC.	0	9	7	29	22	67
	.	5.5	11.2	37.7	12.6	
	.	2.2	1.5	2.0	7.0	
	.	1.22	0.95	3.92	2.98	9.07
	.	13.43	10.45	43.28	32.84	
	.	14.75	5.69	6.97	15.83	
TOTAL	.	61	123	416	139	739
	.	8.25	16.64	56.29	18.81	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	136.544	DF= 12	PROB=0.0001
PHI	0.430		
CONTINGENCY COEFFICIENT	0.395		
CRAMER'S V	0.248		
LIKELIHOOD RATIO CHISQUARE	135.819	DF= 12	PROB=0.0001

APPENDIX C TABLE

TABLE OF I19 BY I4

I19 PRIMARY USE OF MOPED I4 SEX

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	MALE	FEMALE	TOTAL
(NOT STATED)	4	204	24	.
	.	.	.	
	.	.	.	.
	.	.	.	
	.	.	.	
	.	.	.	
COMMUTING	2	242	36	278
	.	237.7	40.3	
	.	0.1	0.5	
	.	32.48	4.83	37.32
	.	87.05	12.95	
	.	37.99	33.33	
TO RECREATION	0	47	9	56
	.	47.9	8.1	
	.	0.0	0.1	
	.	6.31	1.21	7.52
	.	83.93	16.07	
	.	7.38	8.33	
PLEASURE RIDING	1	175	43	218
	.	186.4	31.6	
	.	0.7	4.1	
	.	23.49	5.77	29.26
	.	80.28	19.72	
	.	27.47	39.81	
SHOPPING,ERRANDS	1	112	14	126
	.	107.7	18.3	
	.	0.2	1.0	
	.	15.03	1.88	16.91
	.	88.89	11.11	
	.	17.58	12.96	
OTHER, MISC.	0	61	6	67
	.	57.3	9.7	
	.	0.2	1.4	
	.	8.19	0.81	8.99
	.	91.04	8.96	
	.	9.58	5.56	
TOTAL	.	637	108	745
	.	85.50	14.50	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	8.281	DF= 4	PROB=0.0818
PHI	0.105		
CONTINGENCY COEFFICIENT	0.105		
CRAMER'S V	0.105		
LIKELIHOOD RATIO CHISQUARE	8.196	DF= 4	PROB=0.0847

APPENDIX C TABLE

TABLE OF I19 BY I6

I19 PRIMARY USE OF MOPED I6 TOTAL FAMILY INCOME

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	<$10,000	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	$25,000-$30,000	>$30,000	TOTAL
(NOT STATED)	33	86	26	31	12	10	34	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
COMMUTING	22	63	53	42	39	21	40	258
	.	55.8	47.0	37.9	32.6	23.9	60.7	
	.	0.9	0.8	0.4	1.2	0.4	7.1	
	.	9.26	7.79	6.18	5.74	3.09	5.88	37.94
	.	24.42	20.54	16.28	15.12	8.14	15.50	
	.	42.86	42.74	42.00	45.35	33.33	25.00	
TO RECREATION	1	2	9	6	7	9	22	55
	.	11.9	10.0	8.1	7.0	5.1	12.9	
	.	8.2	0.1	0.5	0.0	3.0	6.3	
	.	0.29	1.32	0.88	1.03	1.32	3.24	8.09
	.	3.64	16.36	10.91	12.73	16.36	40.00	
	.	1.36	7.26	6.00	8.14	14.29	13.75	
PLEASURE RIDING	26	23	31	32	21	21	65	193
	.	41.7	35.2	28.4	24.4	17.9	45.4	
	.	8.4	0.5	0.5	0.5	0.5	8.4	
	.	3.38	4.56	4.71	3.09	3.09	9.56	28.38
	.	11.92	16.06	16.58	10.88	10.88	33.68	
	.	15.65	25.00	32.00	24.42	33.33	40.63	
SHOPPING,ERRANDS	9	38	23	15	12	7	23	118
	.	25.5	21.5	17.4	14.9	10.9	27.8	
	.	6.1	0.1	0.3	0.6	1.4	0.8	
	.	5.59	3.38	2.21	1.76	1.03	3.38	17.35
	.	32.20	19.49	12.71	10.17	5.93	19.49	
	.	25.85	18.55	15.00	13.95	11.11	14.38	
OTHER, MISC.	11	21	8	5	7	5	10	56
	.	12.1	10.2	8.2	7.1	5.2	13.2	
	.	6.5	0.5	1.3	0.0	0.0	0.8	
	.	3.09	1.18	0.74	1.03	0.74	1.47	8.24
	.	37.50	14.29	8.93	12.50	8.93	17.86	
	.	14.29	6.45	5.00	8.14	7.94	6.25	
TOTAL	.	147	124	100	86	63	160	680
	.	21.62	18.24	14.71	12.65	9.26	23.53	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	66.219	DF= 20	PROB=0.0001
PHI	0.312		
CONTINGENCY COEFFICIENT	0.298		
CRAMER'S V	0.156		
LIKELIHOOD RATIO CHISQUARE	69.140	DF= 20	PROB=0.0001

APPENDIX C TABLE

TABLE OF I19 BY I7

I19 PRIMARY USE OF MOPED I7 EDUCATION

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	GRADE SCHOOL	ATT HIGH SCHOOL	GRADHIGH SCHOOL	ATTENDED COLLEGE	GRADUATE COLLEGE	POST GRADUATE	TOTAL
(NOT STATED)	4	62	58	53	22	18	15	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
COMMUTING	5	35	39	55	86	21	39	275
	.	44.8	60.5	55.3	62.8	25.8	25.8	
	.	2.2	7.7	0.0	8.6	0.9	6.8	
	.	4.76	5.30	7.47	11.68	2.85	5.30	37.36
	.	12.73	14.18	20.00	31.27	7.64	14.18	
	.	29.17	24.07	37.16	51.19	30.43	56.52	
TO RECREATION	0	6	13	10	10	10	7	56
	.	9.1	12.3	11.3	12.8	5.3	5.3	
	.	1.1	0.0	0.1	0.6	4.3	0.6	
	.	0.82	1.77	1.36	1.36	1.36	0.95	7.61
	.	10.71	23.21	17.86	17.86	17.86	12.50	
	.	5.00	8.02	6.76	5.95	14.49	10.14	
PLEASURE RIDING	3	37	68	46	31	21	13	216
	.	35.2	47.5	43.4	49.3	20.3	20.3	
	.	0.1	8.8	0.2	6.8	0.0	2.6	
	.	5.03	9.24	6.25	4.21	2.85	1.77	29.35
	.	17.13	31.48	21.30	14.35	9.72	6.02	
	.	30.83	41.98	31.08	18.45	30.43	18.84	
SHOPPING,ERRANDS	2	25	21	27	31	13	8	125
	.	20.4	27.5	25.1	28.5	11.7	11.7	
	.	1.0	1.5	0.1	0.2	0.1	1.2	
	.	3.40	2.85	3.67	4.21	1.77	1.09	16.98
	.	20.00	16.80	21.60	24.80	10.40	6.40	
	.	20.83	12.96	18.24	18.45	18.84	11.59	
OTHER, MISC.	3	17	21	10	10	4	2	64
	.	10.4	14.1	12.9	14.6	6.0	6.0	
	.	4.1	3.4	0.6	1.5	0.7	2.7	
	.	2.31	2.85	1.36	1.36	0.54	0.27	8.70
	.	26.56	32.81	15.63	15.63	6.25	3.13	
	.	14.17	12.96	6.76	5.95	5.80	2.90	
TOTAL	.	120	162	148	168	69	69	736
	.	16.30	22.01	20.11	22.83	9.38	9.38	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	68.489	DF= 20	PROB=0.0001
PHI	0.305		
CONTINGENCY COEFFICIENT	0.292		
CRAMER'S V	0.153		
LIKELIHOOD RATIO CHISQUARE	67.977	DF= 20	PROB=0.0001

APPENDIX C TABLE

TABLE OF I19 BY I8

I19 PRIMARY USE OF MOPED I8 POPULATION OF CITY

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	RURAL	500-9999	10,000-24,999	25,000-49,999	> 50,000	TOTAL
(NOT STATED)	19	34	77	36	21	45	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
COMMUTING	15	15	63	43	41	103	265
	.	31.6	68.8	36.8	40.5	87.3	
	.	8.7	0.5	1.0	0.0	2.8	
	.	2.10	8.84	6.03	5.75	14.45	37.17
	.	5.66	23.77	16.23	15.47	38.87	
	.	17.65	34.05	43.43	37.61	43.83	
TO RECREATION	0	4	9	7	13	23	56
	.	6.7	14.5	7.8	8.6	18.5	
	.	1.1	2.1	0.1	2.3	1.1	
	.	0.56	1.26	0.98	1.82	3.23	7.85
	.	7.14	16.07	12.50	23.21	41.07	
	.	4.71	4.86	7.07	11.93	9.79	
PLEASURE RIDING	12	42	57	27	30	51	207
	.	24.7	53.7	28.7	31.6	68.2	
	.	12.2	0.2	0.1	0.1	4.3	
	.	5.89	7.99	3.79	4.21	7.15	29.03
	.	20.29	27.54	13.04	14.49	24.64	
	.	49.41	30.81	27.27	27.52	21.70	
SHOPPING,ERRANDS	6	12	36	13	18	42	121
	.	14.4	31.4	16.8	18.5	39.9	
	.	0.4	0.7	0.9	0.0	0.1	
	.	1.68	5.05	1.82	2.52	5.89	16.97
	.	9.92	29.75	10.74	14.88	34.71	
	.	14.12	19.46	13.13	16.51	17.87	
OTHER, MISC.	3	12	20	9	7	16	64
	.	7.6	16.6	8.9	9.8	21.1	
	.	2.5	0.7	0.0	0.8	1.2	
	.	1.68	2.81	1.26	0.98	2.24	8.98
	.	18.75	31.25	14.06	10.94	25.00	
	.	14.12	10.81	9.09	6.42	6.81	
TOTAL	.	85	185	99	109	235	713
	.	11.92	25.95	13.88	15.29	32.96	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	43.921	DF= 16	PROB=0.0002
PHI	0.248		
CONTINGENCY COEFFICIENT	0.241		
CRAMER'S V	0.124		
LIKELIHOOD RATIO CHISQUARE	44.102	DF= 16	PROB=0.0002

APPENDIX C TABLE

TABLE OF I13 BY I3

I13 AVG WEEKLY MILEAGE I3 AGE

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	< 16 YEARS	16-21	22-55	> 55 YEARS	TOTAL
(NOT STATED)	2	2	2	5	4	.
	.	.	.	.	.	.
< 10 MILES	3	11	26	123	57	217
	.	14.6	33.3	123.4	45.6	
	.	0.9	1.6	0.0	2.8	
	.	1.16	2.73	12.93	5.99	22.82
	.	5.07	11.98	56.68	26.27	
	.	17.19	17.81	22.74	28.50	
10-24 MILES	5	17	34	157	56	264
	.	17.8	40.5	150.2	55.5	
	.	0.0	1.1	0.3	0.0	
	.	1.79	3.58	16.51	5.89	27.76
	.	6.44	12.88	59.47	21.21	
	.	26.56	23.29	29.02	28.00	
25-49 MILES	5	20	35	108	42	205
	.	13.8	31.5	116.6	43.1	
	.	2.8	0.4	0.6	0.0	
	.	2.10	3.68	11.36	4.42	21.56
	.	9.76	17.07	52.68	20.49	
	.	31.25	23.97	19.96	21.00	
50-74 MILES	2	9	24	69	28	130
	.	8.7	20.0	74.0	27.3	
	.	0.0	0.8	0.3	0.0	
	.	0.95	2.52	7.26	2.94	13.67
	.	6.92	18.46	53.08	21.54	
	.	14.06	16.44	12.75	14.00	
75+ MILES	0	7	27	84	17	135
	.	9.1	20.7	76.8	28.4	
	.	0.5	1.9	0.7	4.6	
	.	0.74	2.84	8.83	1.79	14.20
	.	5.19	20.00	62.22	12.59	
	.	10.94	18.49	15.53	8.50	
TOTAL	.	64	146	541	200	951
	.	6.73	15.35	56.89	21.03	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	19.374	DF= 12	PROB=0.0799
PHI	0.143		
CONTINGENCY COEFFICIENT	0.141		
CRAMER'S V	0.082		
LIKELIHOOD RATIO CHISQUARE	19.683	DF= 12	PROB=0.0733

APPENDIX C TABLE

TABLE OF I13 BY I4

I13 AVG WEEKLY MILEAGE I4 SEX

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	MALE	FEMALE	TOTAL
(NOT STATED)	1	12	2	.
	.	.	.	
	.	.	.	
	.	.	.	.
	.	.	.	
	.	.	.	
< 10 MILES	0	174	46	220
	.	190.2	29.8	
	.	1.4	8.8	
	.	18.14	4.80	22.94
	.	79.09	20.91	
	.	20.99	35.38	
10-24 MILES	2	224	43	267
	.	230.8	36.2	
	.	0.2	1.3	
	.	23.36	4.48	27.84
	.	83.90	16.10	
	.	27.02	33.08	
25-49 MILES	1	184	25	209
	.	180.7	28.3	
	.	0.1	0.4	
	.	19.19	2.61	21.79
	.	88.04	11.96	
	.	22.20	19.23	
50-74 MILES	2	122	8	130
	.	112.4	17.6	
	.	0.8	5.3	
	.	12.72	0.83	13.56
	.	93.85	6.15	
	.	14.72	6.15	
75+ MILES	2	125	8	133
	.	115.0	18.0	
	.	0.9	5.6	
	.	13.03	0.83	13.87
	.	93.98	6.02	
	.	15.08	6.15	
TOTAL	.	829	130	959
	.	86.44	13.56	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	24.617	DF= 4	PROB=0.0001
PHI	0.160		
CONTINGENCY COEFFICIENT	0.158		
CRAMER'S V	0.160		
LIKELIHOOD RATIO CHISQUARE	26.129	DF= 4	PROB=0.0001

APPENDIX C TABLE

TABLE OF I13 BY I6

I13 AVG WEEKLY MILEAGE I6 TOTAL FAMILY INCOME

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	<$10,000	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	$25,000-$30,000	>$30,000	TOTAL
(NOT STATED)	3	4	1	0	2	0	5	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
< 10 MILES	23	37	34	30	22	21	53	197
	.	52.0	33.9	29.8	21.8	16.6	42.9	
	.	4.3	0.0	0.0	0.0	1.2	2.4	
	.	4.27	3.92	3.46	2.54	2.42	6.11	22.72
	.	18.78	17.26	15.23	11.17	10.66	26.90	
	.	16.16	22.82	22.90	22.92	28.77	28.04	
10-24 MILES	23	63	31	40	30	26	56	246
	.	65.0	42.3	37.2	27.2	20.7	53.6	
	.	0.1	3.0	0.2	0.3	1.3	0.1	
	.	7.27	3.58	4.61	3.46	3.00	6.46	28.37
	.	25.61	12.60	16.26	12.20	10.57	22.76	
	.	27.51	20.81	30.53	31.25	35.62	29.63	
25-49 MILES	20	47	44	25	24	14	36	190
	.	50.2	32.7	28.7	21.0	16.0	41.4	
	.	0.2	3.9	0.5	0.4	0.2	0.7	
	.	5.42	5.07	2.88	2.77	1.61	4.15	21.91
	.	24.74	23.16	13.16	12.63	7.37	18.95	
	.	20.52	29.53	19.08	25.00	19.18	19.05	
50-74 MILES	19	43	14	19	5	5	27	113
	.	29.8	19.4	17.1	12.5	9.5	24.6	
	.	5.8	1.5	0.2	4.5	2.1	0.2	
	.	4.96	1.61	2.19	0.58	0.58	3.11	13.03
	.	38.05	12.39	16.81	4.42	4.42	23.89	
	.	18.78	9.40	14.50	5.21	6.85	14.29	
75+ MILES	14	39	26	17	15	7	17	121
	.	32.0	20.8	18.3	13.4	10.2	26.4	
	.	1.6	1.3	0.1	0.2	1.0	3.3	
	.	4.50	3.00	1.96	1.73	0.81	1.96	13.96
	.	32.23	21.49	14.05	12.40	5.79	14.05	
	.	17.03	17.45	12.98	15.63	9.59	8.99	
TOTAL	.	229	149	131	96	73	189	867
	.	26.41	17.19	15.11	11.07	8.42	21.80	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	40.767	DF= 20	PROB=0.0040
PHI	0.217		
CONTINGENCY COEFFICIENT	0.212		
CRAMER'S V	0.108		
LIKELIHOOD RATIO CHISQUARE	42.502	DF= 20	PROB=0.0024

APPENDIX C TABLE

TABLE OF I13 BY I7

I13 AVG WEEKLY MILEAGE I7 EDUCATION

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	GRADE SCHOOL	ATT HIGH SCHOOL	GRADHIGH SCHOOL	ATTENDED COLLEGE	GRADUATE COLLEGE	POST GRADUATE	TOTAL
(NOT STATED)	2	5	1	3	1	1	2	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
< 10 MILES	3	31	44	46	48	30	18	217
	.	40.4	50.0	45.2	43.1	19.6	18.7	
	.	2.2	0.7	0.0	0.6	5.5	0.0	
	.	3.26	4.63	4.84	5.05	3.15	1.89	22.82
	.	14.29	20.28	21.20	22.12	13.82	8.29	
	.	17.51	20.09	23.23	25.40	34.88	21.95	
10-24 MILES	6	44	54	56	52	28	29	263
	.	48.9	60.6	54.8	52.3	23.8	22.7	
	.	0.5	0.7	0.0	0.0	0.7	1.8	
	.	4.63	5.68	5.89	5.47	2.94	3.05	27.66
	.	16.73	20.53	21.29	19.77	10.65	11.03	
	.	24.86	24.66	28.28	27.51	32.56	35.37	
25-49 MILES	3	34	60	38	34	19	22	207
	.	38.5	47.7	43.1	41.1	18.7	17.8	
	.	0.5	3.2	0.6	1.2	0.0	1.0	
	.	3.58	6.31	4.00	3.58	2.00	2.31	21.77
	.	16.43	28.99	18.36	16.43	9.18	10.63	
	.	19.21	27.40	19.19	17.99	22.09	26.83	
50-74 MILES	1	39	26	26	27	3	10	131
	.	24.4	30.2	27.3	26.0	11.8	11.3	
	.	8.8	0.6	0.1	0.0	6.6	0.1	
	.	4.10	2.73	2.73	2.84	0.32	1.05	13.77
	.	29.77	19.85	19.85	20.61	2.29	7.63	
	.	22.03	11.87	13.13	14.29	3.49	12.20	
75+ MILES	2	29	35	32	28	6	3	133
	.	24.8	30.6	27.7	26.4	12.0	11.5	
	.	0.7	0.6	0.7	0.1	3.0	6.3	
	.	3.05	3.68	3.36	2.94	0.63	0.32	13.99
	.	21.80	26.32	24.06	21.05	4.51	2.26	
	.	16.38	15.98	16.16	14.81	6.98	3.66	
TOTAL	.	177	219	198	189	86	82	951
	.	18.61	23.03	20.82	19.87	9.04	8.62	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	46.840	DF= 20	PROB=0.0006
PHI	0.222		
CONTINGENCY COEFFICIENT	0.217		
CRAMER'S V	0.111		
LIKELIHOOD RATIO CHISQUARE	50.691	DF= 20	PROB=0.0002

APPENDIX C TABLE

TABLE OF I13 BY I19

I13 AVG WEEKLY MILEAGE I19 PRIMARY USE OF MOPED

FREQUENCY / EXPECTED / CELL CHI2 / PERCENT / ROW PCT / COL PCT	(NOT STATED)	COMMUTES	TRIPS TO RECREAT.	PLEASURE RIDING	SHOPPING ERRANDS	OTHER, MISC.	TOTAL
(NOT STATED)	4	2	2	4	0	3	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
< 10 MILES	41	23	12	94	37	13	179
	.	67.4	13.1	52.1	30.8	15.5	
	.	29.3	0.1	33.6	1.2	0.4	
	.	3.12	1.63	12.74	5.01	1.76	24.25
	.	12.85	6.70	52.51	20.67	7.26	
	.	8.27	22.22	43.72	29.13	20.31	
10-24 MILES	64	78	15	48	42	22	205
	.	77.2	15.0	59.7	35.3	17.8	
	.	0.0	0.0	2.3	1.3	1.0	
	.	10.57	2.03	6.50	5.69	2.98	27.78
	.	38.05	7.32	23.41	20.49	10.73	
	.	28.06	27.78	22.33	33.07	34.38	
25-49 MILES	51	67	15	39	24	14	159
	.	59.9	11.6	46.3	27.4	13.8	
	.	0.8	1.0	1.2	0.4	0.0	
	.	9.08	2.03	5.28	3.25	1.90	21.54
	.	42.14	9.43	24.53	15.09	8.81	
	.	24.10	27.78	18.14	18.90	21.88	
50-74 MILES	30	51	6	24	14	7	102
	.	38.4	7.5	29.7	17.6	8.8	
	.	4.1	0.3	1.1	0.7	0.4	
	.	6.91	0.81	3.25	1.90	0.95	13.82
	.	50.00	5.88	23.53	13.73	6.86	
	.	18.35	11.11	11.16	11.02	10.94	
75+ MILES	42	59	6	10	10	8	93
	.	35.0	6.8	27.1	16.0	8.1	
	.	16.4	0.1	10.8	2.3	0.0	
	.	7.99	0.81	1.36	1.36	1.08	12.60
	.	63.44	6.45	10.75	10.75	8.60	
	.	21.22	11.11	4.65	7.87	12.50	
TOTAL	.	278	54	215	127	64	738
	.	37.67	7.32	29.13	17.21	8.67	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	108.732	DF= 16	PROB=0.0001
PHI	0.384		
CONTINGENCY COEFFICIENT	0.358		
CRAMER'S V	0.192		
LIKELIHOOD RATIO CHISQUARE	113.054	DF= 16	PROB=0.0001

APPENDIX C TABLE

TABLE OF I24 BY I3

I24 RDWY TYPE MOST USED I3 AGE

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	< 16 YEARS	16-21	22-55	> 55 YEARS	TOTAL
(NOT STATED)	2	6	16	116	56	.
	.	.	.	.	.	.
RESIDENTIAL STS	8	40	80	223	73	416
	.	32.4	71.3	232.3	80.0	
	.	1.8	1.1	0.4	0.6	
	.	5.19	10.39	28.96	9.48	54.03
	.	9.62	19.23	53.61	17.55	
	.	66.67	60.61	51.86	49.32	
CITY BUS.DIST	3	1	14	57	12	84
	.	6.5	14.4	46.9	16.1	
	.	4.7	0.0	2.2	1.1	
	.	0.13	1.82	7.40	1.56	10.91
	.	1.19	16.67	67.86	14.29	
	.	1.67	10.61	13.26	8.11	
RURAL < 45 MPH	1	8	17	82	42	149
	.	11.6	25.5	83.2	28.6	
	.	1.1	2.9	0.0	6.2	
	.	1.04	2.21	10.65	5.45	19.35
	.	5.37	11.41	55.03	28.19	
	.	13.33	12.88	19.07	28.38	
RURAL > 45 MPH	3	11	21	68	21	121
	.	9.4	20.7	67.6	23.3	
	.	0.3	0.0	0.0	0.2	
	.	1.43	2.73	8.83	2.73	15.71
	.	9.09	17.36	56.20	17.36	
	.	18.33	15.91	15.81	14.19	
TOTAL	.	60	132	430	148	770
	.	7.79	17.14	55.84	19.22	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	22.473	DF= 9	PROB=0.0075
PHI	0.171		
CONTINGENCY COEFFICIENT	0.168		
CRAMER'S V	0.099		
LIKELIHOOD RATIO CHISQUARE	24.658	DF= 9	PROB=0.0034

APPENDIX C TABLE

TABLE OF I24 BY I6

I24 RDWY TYPE MOST USED I6 TOTAL FAMILY INCOME

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	<$10,000	$10,000-$14,999	$15,000-$19,999	$20,000-$24,999	$25,000-$30,000	>$30,000	TOTAL
(NOT STATED)	25	71	27	33	10	6	24	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
	.	.	.	.	.	.	.	
RESIDENTIAL STS	38	65	57	44	57	40	123	386
	.	88.3	67.1	53.4	48.0	36.5	92.7	
	.	6.2	1.5	1.7	1.7	0.3	9.9	
	.	9.18	8.05	6.21	8.05	5.65	17.37	54.52
	.	16.84	14.77	11.40	14.77	10.36	31.87	
	.	40.12	46.34	44.90	64.77	59.70	72.35	
CITY BUS.DIST	4	18	15	12	8	6	24	83
	.	19.0	14.4	11.5	10.3	7.9	19.9	
	.	0.1	0.0	0.0	0.5	0.4	0.8	
	.	2.54	2.12	1.69	1.13	0.85	3.39	11.72
	.	21.69	18.07	14.46	9.64	7.23	28.92	
	.	11.11	12.20	12.24	9.09	8.96	14.12	
RURAL < 45 MPH	20	46	27	22	14	10	11	130
	.	29.7	22.6	18.0	16.2	12.3	31.2	
	.	8.9	0.9	0.9	0.3	0.4	13.1	
	.	6.50	3.81	3.11	1.98	1.41	1.55	18.36
	.	35.38	20.77	16.92	10.77	7.69	8.46	
	.	28.40	21.95	22.45	15.91	14.93	6.47	
RURAL > 45 MPH	15	33	24	20	9	11	12	109
	.	24.9	18.9	15.1	13.5	10.3	26.2	
	.	2.6	1.4	1.6	1.5	0.0	7.7	
	.	4.66	3.39	2.82	1.27	1.55	1.69	15.40
	.	30.28	22.02	18.35	8.26	10.09	11.01	
	.	20.37	19.51	20.41	10.23	16.42	7.06	
TOTAL	.	162	123	98	88	67	170	708
	.	22.88	17.37	13.84	12.43	9.46	24.01	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	62.413	DF= 15	PROB=0.0001
PHI	0.297		
CONTINGENCY COEFFICIENT	0.285		
CRAMER'S V	0.171		
LIKELIHOOD RATIO CHISQUARE	66.926	DF= 15	PROB=0.0001

APPENDIX C TABLE

TABLE OF I24 BY I7

I24 RDWY TYPE MOST USED I7 EDUCATION

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	GRADE SCHOOL	ATT HIGH SCHOOL	GRADHIGH SCHOOL	ATTENDED COLLEGE	GRADUATE COLLEGE	POST GRADUATE	TOTAL
(NOT STATED)	3	62	47	40	27	10	7	.
	.	.	.	.	.	.	.	.
RESIDENTIAL STS	4	46	101	74	90	47	62	420
	.	65.4	94.2	87.7	88.8	41.9	41.9	
	.	5.7	0.5	2.1	0.0	0.6	9.6	
	.	5.97	13.10	9.60	11.67	6.10	8.04	54.47
	.	10.95	24.05	17.62	21.43	11.19	14.76	
	.	38.33	58.38	45.96	55.21	61.04	80.52	
CITY BUS.DIST	0	7	15	17	27	13	8	87
	.	13.5	19.5	18.2	18.4	8.7	8.7	
	.	3.2	1.0	0.1	4.0	2.1	0.1	
	.	0.91	1.95	2.20	3.50	1.69	1.04	11.28
	.	8.05	17.24	19.54	31.03	14.94	9.20	
	.	5.83	8.67	10.56	16.56	16.88	10.39	
RURAL < 45 MPH	6	37	33	33	28	8	5	144
	.	22.4	32.3	30.1	30.4	14.4	14.4	
	.	9.5	0.0	0.3	0.2	2.8	6.1	
	.	4.80	4.28	4.28	3.63	1.04	0.65	18.68
	.	25.69	22.92	22.92	19.44	5.56	3.47	
	.	30.83	19.08	20.50	17.18	10.39	6.49	
RURAL > 45 MPH	4	30	24	37	18	9	2	120
	.	18.7	26.9	25.1	25.4	12.0	12.0	
	.	6.9	0.3	5.7	2.1	0.7	8.3	
	.	3.89	3.11	4.80	2.33	1.17	0.26	15.56
	.	25.00	20.00	30.83	15.00	7.50	1.67	
	.	25.00	13.87	22.98	11.04	11.69	2.60	
TOTAL	.	120	173	161	163	77	77	771
	.	15.56	22.44	20.88	21.14	9.99	9.99	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	72.100	DF= 15	PROB=0.0001
PHI	0.306		
CONTINGENCY COEFFICIENT	0.292		
CRAMER'S V	0.177		
LIKELIHOOD RATIO CHISQUARE	75.647	DF= 15	PROB=0.0001

APPENDIX C TABLE

TABLE OF I24 BY I13

I24 RDWY TYPE MOST USED I13 AVG WEEKLY MILEAGE

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	< 10 MILES	10-24 MILES	25-49 MILES	50-74 MILES	75+ MILES	TOTAL
(NOT STATED)	5	34	58	39	26	34	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
	.	.	.	.	.	.	
RESIDENTIAL STS	7	111	116	97	54	39	417
	.	100.1	113.5	92.0	57.0	54.3	
	.	1.2	0.1	0.3	0.2	4.3	
	.	14.32	14.97	12.52	6.97	5.03	53.81
	.	26.62	27.82	23.26	12.95	9.35	
	.	59.68	54.98	56.73	50.94	38.61	
CITY BUS.DIST	1	13	26	21	12	14	86
	.	20.6	23.4	19.0	11.8	11.2	
	.	2.8	0.3	0.2	0.0	0.7	
	.	1.68	3.35	2.71	1.55	1.81	11.10
	.	15.12	30.23	24.42	13.95	16.28	
	.	6.99	12.32	12.28	11.32	13.86	
RURAL < 45 MPH	1	40	34	32	24	19	149
	.	35.8	40.6	32.9	20.4	19.4	
	.	0.5	1.1	0.0	0.6	0.0	
	.	5.16	4.39	4.13	3.10	2.45	19.23
	.	26.85	22.82	21.48	16.11	12.75	
	.	21.51	16.11	18.71	22.64	18.81	
RURAL > 45 MPH	1	22	35	21	16	29	123
	.	29.5	33.5	27.1	16.8	16.0	
	.	1.9	0.1	1.4	0.0	10.5	
	.	2.84	4.52	2.71	2.06	3.74	15.87
	.	17.89	28.46	17.07	13.01	23.58	
	.	11.83	16.59	12.28	15.09	28.71	
TOTAL	.	186	211	171	106	101	775
	.	24.00	27.23	22.06	13.68	13.03	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	26.189	DF= 12	PROB=0.0101
PHI	0.184		
CONTINGENCY COEFFICIENT	0.181		
CRAMER'S V	0.106		
LIKELIHOOD RATIO CHISQUARE	25.251	DF= 12	PROB=0.0137

APPENDIX C TABLE

TABLE OF I24 BY I19

I24 RDWY TYPE MOST USED I19 PRIMARY USE OF MOPED

FREQUENCY EXPECTED CELL CHI2 PERCENT ROW PCT COL PCT	(NOT STATED)	COMMUTES	TRIPS TO RECREAT.	PLEASURE RIDING	SHOPPING ERRANDS	OTHER, MISC.	TOTAL
(NOT STATED)	139	16	2	19	17	3	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
RESIDENTIAL STS	39	140	34	122	61	28	385
	.	146.9	30.0	111.3	61.2	35.6	
	.	0.3	0.5	1.0	0.0	1.6	
	.	20.23	4.91	17.63	8.82	4.05	55.64
	.	36.36	8.83	31.69	15.84	7.27	
	.	53.03	62.96	61.00	55.45	43.75	
CITY BUS.DIST	4	46	6	6	17	8	83
	.	31.7	6.5	24.0	13.2	7.7	
	.	6.5	0.0	13.5	1.1	0.0	
	.	6.65	0.87	0.87	2.46	1.16	11.99
	.	55.42	7.23	7.23	20.48	9.64	
	.	17.42	11.11	3.00	15.45	12.50	
RURAL < 45 MPH	32	41	5	43	16	13	118
	.	45.0	9.2	34.1	18.8	10.9	
	.	0.4	1.9	2.3	0.4	0.4	
	.	5.92	0.72	6.21	2.31	1.88	17.05
	.	34.75	4.24	36.44	13.56	11.02	
	.	15.53	9.26	21.50	14.55	20.31	
RURAL > 45 MPH	18	37	9	29	16	15	106
	.	40.4	8.3	30.6	16.8	9.8	
	.	0.3	0.1	0.1	0.0	2.8	
	.	5.35	1.30	4.19	2.31	2.17	15.32
	.	34.91	8.49	27.36	15.09	14.15	
	.	14.02	16.67	14.50	14.55	23.44	
TOTAL	.	264	54	200	110	64	692
	.	38.15	7.80	28.90	15.90	9.25	100.00

STATISTICS FOR 2-WAY TABLES

CHI-SQUARE	33.277	DF= 12	PROB=0.0009
PHI	0.219		
CONTINGENCY COEFFICIENT	0.214		
CRAMER'S V	0.127		
LIKELIHOOD RATIO CHISQUARE	38.159	DF= 12	PROB=0.0001

APPENDIX D

Supplemental Tables-
Follow-up (Mileage) Survey

Table D.1. Age = <16.

Total miles (n = 10)	17
By trip type: (n = 10)	
Commuting to work	0
Commuting to school	0
Recreation trips	3
Pleasure riding	8
Shopping/errands	1
Use in business or work	0
Visiting	5
Other	0
By roadway type: (n = 10)	
Residential streets	11
Downtown business streets	1
Other major city streets	0
Rural roads, <45 mph	8
Rural roads, >45 mph	1
Private property	1

Table D.2. Age = 16-21.

Total miles (n = 21)	30
By trip type: (n = 20)	
Commuting to work	4
Commuting to school	2
Recreation trips	5
Pleasure riding	5
Shopping/errands	2
Use in business or work	0
Visiting	3
Other	1
By roadway type: (n = 20)	
Residential streets	8
Downtown business streets	2
Other major city streets	3
Rural roads, <45 mph	11
Rural roads, >45 mph	3
Private property	0

Table D.3. Age 22-55.

Total miles (n = 87)	50
By trip type: (n = 87)	
Commuting to work	17
Commuting to school	1
Recreation trips	3
Pleasure riding	11
Shopping/errands	8
Use in business or work	2
Visiting	5
Other	1
By roadway type: (n = 85)	
Residential streets	17
Downtown business streets	6
Other major city streets	11
Rural roads, $\leq$45 mph	7
Rural roads, $\geq$45 mph	9
Private property	0

Table D.4. Age = >55.

Total miles (n = 34)	29
By trip type: (n = 34)	
Commuting to work	7
Commuting to school	0
Recreation trips	2
Pleasure riding	6
Shopping/errands	10
Use in business or work	2
Visiting	2
Other	1
By roadway type: (n = 33)	
Residential streets	13
Downtown business streets	4
Other major city streets	4
Rural roads, $\leq$45 mph	6
Rural roads, $\geq$45 mph	2
Private property	0

Table D.5. Sex = Male.

Total miles (n = 127)	42
By trip type: (n = 126)	
Commuting to work	13
Commuting to school	1
Recreation trips	3
Pleasure riding	9
Shopping/errands	7
Use in business or work	2
Visiting	4
Other	1
By roadway type: (n = 123)	
Residential streets	15
Downtown business streets	5
Other major city streets	7
Rural roads, $\leq$45 mph	8
Rural roads, $\geq$45 mph	6
Private property	0

Table D.6. Sex = Female.

Total miles (n = 25)	32
By trip type: (n = 25)	
Commuting to work	7
Commuting to school	1
Recreation trips	3
Pleasure riding	7
Shopping/errands	8
Use in business or work	2
Visiting	5
Other	0
By roadway type: (n = 25)	
Residential streets	12
Downtown business streets	2
Other major city streets	8
Rural roads, $\leq$45 mph	5
Rural roads, $\geq$45 mph	5
Private property	1

Table D.7. Race = White.

Total miles (n = 145)	40
By trip type: (n = 144)	
Commuting to work	11
Commuting to school	1
Recreation trips	3
Pleasure riding	9
Shopping/errands	7
Use in business or work	2
Visiting	4
Other	1
By roadway type: (n = 141)	
Residential streets	14
Downtown business streets	5
Other major city streets	8
Rural roads, <45 mph	7
Rural roads, ≥45 mph	6
Private property	0

Table D.8. Race = Non-white.

Total miles (n = 7)	41
By trip type: (n = 7)	
Commuting to work	14
Commuting to school	0
Recreation trips	6
Pleasure riding	5
Shopping/errands	10
Use in business or work	0
Visiting	6
Other	0
By roadway type: (n = 7)	
Residential streets	18
Downtown business streets	12
Other major city streets	1
Rural roads, <45 mph	7
Rural roads, ≥45 mph	4
Private property	0

Table D.9. Income = < $10,000.

Total miles (n = 26)	45
By trip type: (n = 26)	
Commuting to work	7
Commuting to school	0
Recreation trips	3
Pleasure riding	11
Shopping/errands	12
Use in business or work	1
Visiting	9
Other	3
By roadway type: (n = 24)	
Residential streets	13
Downtown business streets	5
Other major city streets	7
Rural roads, ≤45 mph	6
Rural roads, >45 mph	11
Private property	0

Table D.10. Income = $10,000-$14,999.

Total miles (n = 30)	39
By trip type: (n = 30)	
Commuting to work	8
Commuting to school	2
Recreation trips	2
Pleasure riding	11
Shopping/errands	9
Use in business or work	3
Visiting	3
Other	1
By roadway type: (n = 29)	
Residential streets	12
Downtown business streets	7
Other major city streets	8
Rural roads, ≤45 mph	5
Rural roads, >45 mph	6
Private property	0

Table D.11. Income = $15,000-$19,999.

Total miles (n = 20)	52
By trip type: (n = 19)	
Commuting to work	16
Commuting to school	1
Recreation trips	3
Pleasure riding	12
Shopping/errands	8
Use in business or work	2
Visiting	5
Other	0
By roadway type: (n = 19)	
Residential streets	17
Downtown business streets	9
Other major city streets	8
Rural roads, ≤45 mph	6
Rural roads, >45 mph	5
Private property	1

Table D.12. Income = $20,000-$24,999.

Total miles (n = 23)	26
By trip type: (n = 23)	
Commuting to work	8
Commuting to school	2
Recreation trips	4
Pleasure riding	4
Shopping/errands	5
Use in business or work	0
Visiting	3
Other	0
By roadway type: (n = 23)	
Residential streets	10
Downtown business streets	3
Other major city streets	6
Rural roads, ≤45 mph	4
Rural roads, >45 mph	3
Private property	0

Table D.13. Income = $25,000-$29,999

Total miles (n = 15)	39
By trip type: (n = 15)	
Commuting to work	19
Commuting to school	2
Recreation trips	1
Pleasure riding	8
Shopping/errands	4
Use in business or work	1
Visiting	3
Other	1
By roadway type: (n = 15)	
Residential streets	14
Downtown business streets	2
Other major city streets	10
Rural roads, $\leq$45 mph	5
Rural roads, $\geq$45 mph	9
Private property	0

Table D.14. Income = > $30,000

Total miles (n = 26)	36
By trip type: (n = 26)	
Commuting to work	13
Commuting to school	0
Recreation trips	3
Pleasure riding	6
Shopping/errands	5
Use in business or work	3
Visiting	2
Other	1
By roadway type: (n = 26)	
Residential streets	19
Downtown business streets	4
Other major city streets	6
Rural roads, $\leq$45 mph	7
Rural roads, $\geq$45 mph	3
Private property	0

Table D.15. Education = Grade School.

Total miles (n = 17)	42
By trip type: (n = 17)	
Commuting to work	4
Commuting to school	0
Recreation trips	2
Pleasure riding	12
Shopping/errands	8
Use in business or work	4
Visiting	8
Other	4
By roadway type: (n = 16)	
Residential streets	14
Downtown business streets	5
Other major city streets	5
Rural roads, ≤45 mph	13
Rural roads, >45 mph	5
Private property	1

Table D.16. Education = Attended high school.

Total miles (n = 31)	44
By trip type: (n = 30)	
Commuting to work	12
Commuting to school	1
Recreation trips	3
Pleasure riding	11
Shopping/errands	5
Use in business or work	1
Visiting	6
Other	1
By roadway type: (n = 29)	
Residential streets	11
Downtown business streets	7
Other major city streets	7
Rural roads, ≤45 mph	5
Rural roads, >45 mph	6
Private property	0

Table D.17. Education = Graduated high school.

Total miles (n = 31)	37
By trip type: (n = 31)	
Commuting to work	14
Commuting to school	0
Recreation trips	2
Pleasure riding	7
Shopping/errands	9
Use in business or work	1
Visiting	4
Other	1
By roadway type: (n = 31)	
Residential streets	14
Downtown business streets	5
Other major city streets	4
Rural roads, ≤45 mph	11
Rural roads, ≥45 mph	7
Private property	0

Table D.18. Education = Attended college.

Total miles (n = 24)	45
By trip type: (n = 24)	
Commuting to work	11
Commuting to school	2
Recreation trips	3
Pleasure riding	12
Shopping/errands	6
Use in business or work	0
Visiting	4
Other	1
By roadway type: (n = 24)	
Residential streets	16
Downtown business streets	5
Other major city streets	11
Rural roads, ≤45 mph	7
Rural roads, ≥45 mph	5
Private property	0

Table D.19. Education = Graduated college.

Total miles (n = 22)	41
By trip type: (n = 22)	
Commuting to work	11
Commuting to school	0
Recreation trips	3
Pleasure riding	10
Shopping/errands	9
Use in business or work	3
Visiting	3
Other	0
By roadway type: (n = 22)	
Residential streets	13
Downtown business streets	3
Other major city streets	9
Rural roads, $\leq$45 mph	5
Rural roads, $\geq$45 mph	10
Private property	0

Table D.20. Education = Post-graduate.

Total miles (n = 18)	37
By trip type: (n = 18)	
Commuting to work	15
Commuting to school	5
Recreation trips	3
Pleasure riding	2
Shopping/errands	8
Use in business or work	2
Visiting	1
Other	0
By roadway type: (n = 18)	
Residential streets	19
Downtown business streets	5
Other major city streets	9
Rural roads, $\leq$45 mph	1
Rural roads, $\geq$45 mph	2
Private property	0

Table D.21. Education = Other.

Total miles (n = 8)	32
By trip type: (n = 8)	
Commuting to work	13
Commuting to school	0
Recreation trips	4
Pleasure riding	8
Shopping/errands	4
Use in business or work	2
Visiting	1
Other	0
By roadway type: (n = 7)	
Residential streets	11
Downtown business streets	2
Other major city streets	8
Rural roads, ≤45 mph	10
Rural roads, ≥45 mph	8
Private property	0

Table D.22. Population = Rural (< 500).

Total miles (n = 13)	26
By trip type: (n = 13)	
Commuting to work	0
Commuting to school	0
Recreation trips	5
Pleasure riding	7
Shopping/errands	6
Use in business or work	0
Visiting	3
Other	3
By roadway type: (n = 12)	
Residential streets	1
Downtown business streets	1
Other major city streets	1
Rural roads, ≤45 mph	16
Rural roads, ≥45 mph	13
Private property	0

Table D.23. Population = 500-999.

Total miles (n = 10)	26
By trip type:	
Commuting to work	1
Commuting to school	0
Recreation trips	1
Pleasure riding	9
Shopping/errands	7
Use in business or work	1
Visiting	7
Other	0
By roadway type: (n = 10)	
Residential streets	7
Downtown business streets	5
Other major city streets	4
Rural roads, $\leq$45 mph	5
Rural roads, $\geq$45 mph	4
Private property	1

Table D.24. Population = 2,500-4,999.

Total miles (n = 11)	35
By trip type: (n = 11)	
Commuting to work	10
Commuting to school	1
Recreation trips	1
Pleasure riding	11
Shopping/errands	4
Use in business or work	5
Visiting	2
Other	0
By roadway type: (n = 11)	
Residential streets	7
Downtown business streets	5
Other major city streets	10
Rural roads, $\leq$45 mph	7
Rural roads, $\geq$45 mph	6
Private property	0

Table D.25. Population = 5,000-9,999.

Total miles (n = 8)	39
By trip type: (n = 8)	
Commuting to work	11
Commuting to school	0
Recreation trips	2
Pleasure riding	17
Shopping/errands	4
Use in business or work	0
Visiting	4
Other	1
By roadway type: (n = 8)	
Residential streets	12
Downtown business streets	4
Other major city streets	5
Rural roads, ≤45 mph	5
Rural roads, >45 mph	14
Private property	0

Table D.26. Population = 10,000-24,999.

Total miles (n = 29)	54
By trip type: (n = 29)	
Commuting to work	24
Commuting to school	0
Recreation trips	2
Pleasure riding	12
Shopping/errands	9
Use in business or work	2
Visiting	4
Other	1
By roadway type: (n = 27)	
Residential streets	19
Downtown business streets	7
Other major city streets	13
Rural roads, ≤45 mph	6
Rural roads, >45 mph	7
Private property	0

Table D.27. Population = 25,000-49,999.

Total miles (n = 22)	46
By trip type: (n = 21)	
Commuting to work	8
Commuting to school	1
Recreation trips	3
Pleasure riding	5
Shopping/errands	12
Use in business or work	2
Visiting	7
Other	3
By roadway type: (n = 21)	
Residential streets	15
Downtown business streets	5
Other major city streets	6
Rural roads, ≤45 mph	9
Rural roads, ≥45 mph	6
Private property	1

Table D.28. Population = > 50,000.

Total miles (n = 55)	36
By trip type: (n = 55)	
Commuting to work	12
Commuting to school	2
Recreation trips	3
Pleasure riding	6
Shopping/errands	6
Use in business or work	1
Visiting	3
Other	1
By roadway type: (n = 55)	
Residential streets	18
Downtown business streets	5
Other major city streets	6
Rural roads, ≤45 mph	5
Rural roads, ≥45 mph	2
Private property	0

Table D.29. Average weekly mileage = < 10 miles.

Total miles (n = 26)	19
By trip type: (n = 26)	
Commuting to work	1
Commuting to school	1
Recreation trips	1
Pleasure riding	8
Shopping/errands	6
Use in business or work	0
Visiting	2
Other	0
By roadway type: (n = 26)	
Residential streets	8
Downtown business streets	3
Other major city streets	2
Rural roads, ≤45 mph	2
Rural roads, >45 mph	4
Private property	0

Table D.30. Average weekly mileage = 10-24 miles.

Total miles (n = 40)	25
By trip type: (n = 39)	
Commuting to work	6
Commuting to school	1
Recreation trips	4
Pleasure riding	3
Shopping/errands	4
Use in business or work	1
Visiting	1
Other	1
By roadway type: (n = 39)	
Residential streets	9
Downtown business streets	3
Other major city streets	3
Rural roads, ≤45 mph	1
Rural roads, >45 mph	4
Private property	1

Table D.31. Average weekly mileage = 25-49 miles.

Total miles (n = 41)	39
By trip type: (n = 41)	
Commuting to work	9
Commuting to school	2
Recreation trips	3
Pleasure riding	10
Shopping/errands	10
Use in business or work	1
Visiting	4
Other	0
By roadway type: (n = 39)	
Residential streets	15
Downtown business streets	5
Other major city streets	9
Rural roads, ≤45 mph	6
Rural roads, >45 mph	7
Private property	0

Table D.32. Average weekly mileage = 50-74 miles.

Total miles (n = 21)	60
By trip type: (n = 21)	
Commuting to work	21
Commuting to school	1
Recreation trips	4
Pleasure riding	9
Shopping/errands	7
Use in business or work	2
Visiting	8
Other	3
By roadway type: (n = 21)	
Residential streets	20
Downtown business streets	7
Other major city streets	10
Rural roads, ≤45 mph	17
Rural roads, >45 mph	5
Private property	0

Table D.33. Average weekly mileage = 75-100 miles.

Total miles (n = 14)	74
By trip type: (n = 14)	
Commuting to work	25
Commuting to school	0
Recreation trips	4
Pleasure riding	14
Shopping/errands	13
Use in business or work	5
Visiting	9
Other	3
By roadway type: (n = 14)	
Residential streets	30
Downtown business streets	12
Other major city streets	14
Rural roads, $\leq$45 mph	20
Rural roads, $\geq$45 mph	6
Private property	0

Table D.34. Average weekly mileage = > 100 miles.

Total miles (n = 8)	85
By trip type: (n = 8)	
Commuting to work	41
Commuting to school	0
Recreation trips	1
Pleasure riding	28
Shopping/errands	4
Use in business or work	5
Visiting	5
Other	1
By roadway type: (n = 7)	
Residential streets	12
Downtown business streets	3
Other major city streets	19
Rural roads, $\leq$45 mph	15
Rural roads, $\geq$45 mph	25
Private property	0

Table D.35. Primary use = Commuting to work.

Total miles (n = 49)	52
By trip type: (n = 49)	
Commuting to work	25
Commuting to school	1
Recreation trips	3
Pleasure riding	7
Shopping/errands	7
Use in business or work	2
Visiting	4
Other	0
By roadway type: (n = 49)	
Residential streets	18
Downtown business streets	7
Other major city streets	13
Rural roads, ≤45 mph	8
Rural roads, ≥45 mph	7
Private property	0

Table D.36. Primary Use = Commuting to school.

Total miles (n = 9)	32
By trip type: (n = 9)	
Commuting to work	3
Commuting to school	11
Recreation trips	4
Pleasure riding	5
Shopping/errands	6
Use in business or work	0
Visiting	2
Other	0
By roadway type: (n = 9)	
Residential streets	19
Downtown business streets	3
Other major city streets	7
Rural roads, ≤45 mph	1
Rural roads, ≥45 mph	2
Private property	0

Table D.37. Primary use = Trips to a specific place of recreation.

Total miles (n = 10)	25
By trip type: (n = 10)	
Commuting to work	3
Commuting to school	0
Recreation trips	5
Pleasure riding	3
Shopping/errands	5
Use in business or work	1
Visiting	2
Other	3
By roadway type: (n = 10)	
Residential streets	6
Downtown business streets	2
Other major city streets	3
Rural roads, <45 mph	17
Rural roads, ≥45 mph	6
Private property	0

Table D.38. Primary use = Pleasure riding.

Total miles (n = 23)	24
By trip type: (n = 23)	
Commuting to work	0
Commuting to school	0
Recreation trips	3
Pleasure riding	13
Shopping/errands	3
Use in business or work	2
Visiting	2
Other	1
By roadway type: (n = 22)	
Residential streets	11
Downtown business streets	2
Other major city streets	1
Rural roads, <45 mph	8
Rural roads, ≥45 mph	2
Private property	1

Table D.39. Primary use = Shopping/errands.

Total miles (n = 20)	31
By trip type: (n = 20)	
Commuting to work	3
Commuting to school	0
Recreation trips	2
Pleasure riding	10
Shopping/errands	12
Use in business or work	1
Visiting	2
Other	0
By roadway type: (n = 20)	
Residential streets	13
Downtown business streets	3
Other major city streets	2
Rural roads, <45 mph	8
Rural roads, >45 mph	4
Private property	1

Table D.40. Primary use = Use in business or work.

Total miles (n = 10)	18
By trip type: (n = 10)	
Commuting to work	4
Commuting to school	0
Recreation trips	1
Pleasure riding	4
Shopping/errands	3
Use in business or work	0
Visiting	4
Other	1
By roadway type: (n = 10)	
Residential streets	8
Downtown business streets	0
Other major city streets	1
Rural roads, <45 mph	0
Rural roads, >45 mph	7
Private property	0

Table D.41. Primary road type = Residential street.

Total miles (n = 78)	36
By trip type: (n = 78)	
Commuting to work	11
Commuting to school	2
Recreation trips	3
Pleasure riding	8
Shopping/errands	8
Use in business or work	1
Visiting	3
Other	0
By roadway type: (n = 78)	
Residential streets	20
Downtown business streets	5
Other major city streets	6
Rural roads, ≤45 mph	4
Rural roads, >45 mph	3
Private property	0

Table D.42. Primary road type = Business streets.

Total miles (n = 5)	37
By trip type: (n = 5)	
Commuting to work	17
Commuting to school	0
Recreation trips	4
Pleasure riding	4
Shopping/errands	5
Use in business or work	1
Visiting	3
Other	1
By roadway type: (n = 5)	
Residential streets	22
Downtown business streets	9
Other major city streets	4
Rural roads, ≤45 mph	1
Rural roads, >45 mph	2
Private property	0

Table D.43. Primary road type = Other major streets.

Total miles (n = 10)	48
By trip type: (n = 10)	
Commuting to work	31
Commuting to school	1
Recreation trips	2
Pleasure riding	1
Shopping/errands	8
Use in business or work	3
Visiting	2
Other	1
By roadway type: (n = 10)	
Residential streets	6
Downtown business streets	7
Other major city streets	27
Rural roads, $\leq$45 mph	3
Rural roads, $\geq$45 mph	10
Private property	0

Table D.44. Primary road type = Rural roads ($\leq$ 45 mph).

Total miles (n = 23)	38
By trip type: (n = 23)	
Commuting to work	7
Commuting to school	0
Recreation trips.	4
Pleasure riding	13
Shopping/errands	6
Use in business or work	3
Visiting	4
Other	1
By roadway type: (n = 22)	
Residential streets	6
Downtown business streets	3
Other major city streets	4
Rural roads, $\leq$45 mph	17
Rural roads, $\geq$45 mph	7
Private property	1

Table D.45. Primary road type = Rural roads (> 45 mph).

Total miles (n = 13)	35
By trip type: (n = 13)	
Commuting to work	9
Commuting to school	0
Recreation trips	1
Pleasure riding	9
Shopping/errands	5
Use in business or work	4
Visiting	3
Other	2
By roadway type: (n = 13)	
Residential streets	3
Downtown business streets	2
Other major city streets	5
Rural roads, ≤45 mph	13
Rural roads, ≥45 mph	18
Private property	0

Total miles

By trip type:

- Commuting to work
- Commuting to school
- Recreation trips
- Pleasure riding
- Shopping/errands
- Use in business or work
- Visiting
- Other

By roadway type:

- Residential streets
- Downtown business streets
- Other major city streets
- Rural roads, ≤45 mph
- Rural roads, ≥45 mph
- Private property

APPENDIX E

Sampling of Comments by Respondents to the General Survey

42 year-old male
The moped is a very sensible and economic approach to the OPEC stranglehold on our nation. For good weather, short distance trips on paved roads of 25-35 mph speed limits, it can't be beat -- it is also great fun to drive. Let's keep politics away from this little machine. Any laws/restrictions should be geared toward safety of operation --- not more $ for insurance companies or the D.M.V. 30 mph would be much more realistic and also would be safer. 20 mph does tend to make you a sitting duck.

78 year-old male
I love my moped because I can get around with such saving of gas. I am glad to know that you people are making this survey. This is something I have been wishing for since I got my moped. I hope each moped owner will use it with care, so the record will be good, and the law will be on our side, but if we act a fool with them it will make an ugly picture for the moped. I have only good to say for the moped when it is used as it should be used.

62 year-old male
Let's not change something we need more of, and under normal operation is satisfactory as is.

25 year-old male
I think the public needs to be further educated about mopeds. I have felt many times that some drivers resent having to "put up" with us on "their" streets. In connection, I cannot stress too much the need to raise the maximum allowable speed. The one comment I've heard repeated by many moped riders is "It has enough power to get you into trouble, but not enough to get you out". I have seriously concluded that in order to operate the vehicle safely in traffic, a minimum of 3½ to 5 hp and a speed of 35-40 mph are necessary to "get out of trouble". In fact, I currently drive an "illegal" machine with 2 hp and a top speed of 35. It isn't quite enough, though. I'm not terribly worried about being arrested, but I do like to be law-abiding. If that sounds too fast, require helmets and registration. I also think this survey can be of great service. Perhaps it's paranoia, but I feel a lot of people would like nothing better than to see mopeds restricted further. They think we're dangerous, because they run into us all the time, and we're un-American because we only spend $2-$3 per month on gas. I do not have a driver's license, nor do I plan to get one in the future. I have never liked cars, and had a serious transportation problem before I discovered mopeds. If license, insurance, and/or registration were required, I would have most definitely been "priced out". With only $5 per month for gas, I can travel anywhere in Raleigh as fast or faster than a car, without the necessity of paying $190 per six months for the "privilege" of being allowed to travel freely. The advent of the license-less moped is the most revolutionary idea in transportation for poor people I have ever seen. I can't stress enough the change it has made in my life. Sorry for rambling, but I feel very strongly about this. Please pass on my feelings and their intensity, if possible. Thank you.

24 year-old male
While living in France I owned a moped which is a common mode of travel there. The attraction there (besides low gas mileage) is the small amount of bureaucratic handling of mopeds. It is ideal for young and old. It is not uncommon to see a very old man or woman shopping on their moped. The accident rate is very low because of automobile drivers' respect for this mode of transportation. However, in the U.S. drivers have no respect for any slow-moving vehicle on the highway. I have been yelled at and hit at on my moped for no reason; however, in France I only encountered courteous and accomodating auto drivers. As gas prices keep rising along with car prices, I think a more healthy attitude toward the moped will develop.

15 year-old female
I think mopeds are great if they are used right. Personally I love to ride mine everywhere. I'm just a moped lover. I'm crazy about mine. If you need anything else please write back because I love to tell how much riding my moped means to me.

52 year-old female
They would be nice on gas if they were faster and if we had a "bike trail to work" -- it's just too dangerous for me. The fast cars nearly run you off the road just like they do joggers! That's why we sold ours and went back to driving cars! We only rode them a few times for pleasure but really intended on driving them to work.

29 year-old female
Mopeds are great alternatives to bikes and cars, especially in-town. Traffic laws need to be clearer (eg. do mopeders drive in center of lane or to the right side of the road like a bike? In three lane traffic, if one wants to turn left, does one go from extreme right (curb) over to left lane? Riding on sidewalks?), and automobile drivers need to take mopeds on the road more seriously (similar hazards for motorcycle and bike riders). Too often cars ignore them, pull out in front of them, etc.

47 year-old male
The moped seems hazardous to others because of its low speed. If the speed were increased I believe the hazard to others would be reduced as well as the hazard to the driver. BUT if I can predict -- if the speed were increased, the government would feel responsible to lay their regulatory garbage on the rider (helmet, license, etc.). I hate this -- since I should have a right to take my chances as long as I don't hurt someone else. I once had a small motorcycle -- loved it -- But, -- helmet! insurance! registration! inspection! license! -- aaaaarrrgggghhhh -- drowned in regulations!

45 year-old male
It seems that everyone is trying to get mopeds off the highways. It is an energy saving machine. The state government should do all in its power to promote these energy saving weapons -- such as raise the speed limit for them to a point where they can safely enter the flow of traffic on highways, or pave a strip on the side of all highways for mopeds and bikes.

46 year-old female
More advertising through TV or newspapers would do moped riders a service. I feel mopeds are the answer to a housewife's errand problem. The bikes are easy to operate and light-weight enough for a woman to handle. Status keeps many women from riding. What's wrong with making ends meet and conserving energy too? (P.S. I can ride two children on my bike, plus books, odds and ends, etc.) I love it!

63 year-old male
People who loose their driver's license drive tractors on roads for that reason, and lots of the tractors are faster and a lot more dangerous than a moped. So I would think if a moped driver has to have a license and insurance, others should too. I have a license and I am thankful for it and try to keep it.

26 year-old male
It is evident by this survey that it is becoming increasingly hard for anyone to have anything without someone trying to stick their hands in the pie. I have to list it for taxes along with personal property but outside that nothing -- which is why I bought one. I do not mean to be rude by saying this, but as a free citizen being given the right to speak, I intend to inform you that your survey isn't appreciated. My moped isn't the safest way to move one's self along a busy highway I'll admit. For me it comes in very handy for many things and conserves fuel and money too. It is by my own risk that I chose to have this form of transportation, but today it makes sense. This is my only concern, please do not mess it up with government reform.

58 year-old male
I hope my answers will not contribute to more regulation of operators and use of mopeds. If so, where and when will it stop? Will the bicyclist and bicycle be next? Then there is the jogger.

50 year-old male
I believe that if registration, license and insurance becomes the law, people will not buy a moped. I have a license and drive a car, and insurance rate on a vehicle is high. I understand that it's been recommended to state congress. I believe it's a gimick to help the insurance companies to make more money. I can go faster on a ten speed bicycle, but they aren't regulated by a 20 mile an hour speed law.

35 year-old female
My son rides a moped and I personally feel they are as safe as a bike or maybe safer - he also has a Raleigh bike. I do not allow it out in winter weather but see no harm if a driver decides. I would not allow him to own a motorcycle. To me a moped is a glorified bicycle for a lazy person. I hope he will be as lucky and safe when he starts to drive a car.

25 year-old male
There has been a lot of controversy over the use of mopeds in this state. From my experience the safe operation of a moped is based entirely on the driver himself. If one is careful and operates the vehicle as he should, we wouldn't have the problems we hear about today. I've driven 2100 miles in all weather (snow included) and have not been close to an accident. There are a large number of careless moped operators and something should be done (registration, etc) to curb their activities. It is a shame that a few can bring on the negative image that is associated with moped operators.

58 year-old male
Two problems confront moped operators. 1) Prevention of theft. Businesses do not provide racks for locking mopeds or bicycles. Mopeds can be picked up and carried off even with ignition locked off and a chain locked through wheels. I would use the moped more often if I could find an appropriate place to secure it. 2) Antagonism of some auto drivers. Some drivers view them as unacceptable obstacles to traffic. We are years away from the acceptance found in other countries. One participant in a radio talk-back show said, "Only drunks who have lost their driver's license ride mopeds". There was much agreement on this point!

32 year-old male
Being in Spain for three years and the owner of a moped there, I find it difficult to accept gas waste and $1.20 per gallon. If mopeds are truly in the immediate future a "path" or superior shoulder should be devised on all roads. Too many auto drivers still do not accept mopeds, therefore endangering the mopedist often. If a moped-portion of the road were available, perhaps this problem would be alleviated and perhaps more persons would utilize and purchase mopeds. Also, the cost of moped repairs is almost 15 times higher here than in Spain. My last check-up here (also some specific items repaired) cost $70.00. Unfortunately, this happens about every 2-3 months. Therefore, I have just sold my moped for a mid-sized motorcycle which I can have maintained at lesser prices.

17 year-old male
Twenty mph is an unrealistic speed. We average 30 mph on ours. This would be a better limit.

54 year-old female
It would be nice if all roads had a paved three-foot strip on each side of them (some do). The mopeds could ride on the strips and the cars could have the road. I ride just as close to the right of the road as I can, giving the cars as much room as possible to go around me. I do think that mopeds should be licensed. If you use the road, you should help pay for it. But not the insurance company.

43 year-old male
Moped was bought for son to operate. He is the only operator of this moped. In my personal opinion there would be more mopeds used if there were not so much widespread theft of them and if convenient places were available to park and lock these vehicles. I think a dead man's switch should be

installed on the seat of the vehicle so the motor would stop unless vehicle is in neutral. Therefore, in the event that you were thrown from the vehicle or thrown by accident, you would not be pinned and stomped by the vehicle. This way, when you leave the seat for any reason and the vehicle is in gear, the motor would stop automatically. I am in the process of making this switch and having it passed into law by the General Assembly.

17 year-old male
Without my moped it would create a hardship on me and my family.

17 year-old male
I think that a major problem is the low speed limit. If the speed limit could be raised to 35 mph, the moped could keep up with traffic, and cars wouldn't want to pass so much.

56 year-old male
I am disabled but not handicapped, and I love my moped. It is cheaply operated -- 15,221 miles on less than $20.00 for gas and oil. Can't beat that, right?

37 year-old male
Mopeds could become a very effective method of conserving energy providing government does not pass laws such as registration, insurance, helmets, etc. that would discourage their use.

47 year-old male
Please get the drunk driver off the road and off the moped. They lost their license and get on the moped and ride drunk.

53 year-old female
1) I feel that if a moped rider does not have to have a driver's license, he should have to have completed some kind of safety training. 2) I feel very strongly that the existing age limit law be enforced. Too many parents are buying mopeds as toys for their under-16 children and nothing is being done to stop it or keep these kids off public streets.

19 year-old male
While riding my moped I have noticed that some of the state roads have bicycle lanes along the side; however, these lanes are usually very short and exist very scarcely. I feel that with the increasing amount of bicycle and moped traffic on N.C. highways, it would be to everyone's advantage and safety for such bike lanes to be added in a larger number throughout the state. I would also like some attention brought to the present insurance situation. Thank you.

38 year-old female
I would enjoy using a moped more for shopping, errands, short trips, etc, but I'm scared to be in heavy traffic because most people won't acknowledge any rights. And you always think how easily they can be stolen while you're in a store.

54 year-old female
As a member of our City Council and also as a community banker, it is our responsibility -- and privilege -- to be trailblazers for constructive alternatives.

62 year-old male
Although I own four motor vehicles, I enjoy using my moped as a way of conserving fuel. It is a safe mode of transportation if used properly. I do not think that the use of a moped should at any time be on an Interstate Highway. The moped is used by people that have not ever had any type of transportation before in their lives and to regulate it to the extent of helmets, insurance, and registration will be too much trouble and will be uncomfortable as to the helmet. We have too much government interference in our lives already with about half not working.

58 year-old male
I got this moped because it was costing approximately $10.00 a week to drive my auto. I thought I could save for myself and my country. But it's beginning to look like the poor working man hasn't got a chance anymore. Someone is always figuring a way to rip him off. So I am trying to tell you just like it is. That's the reason I got this moped to save myself money and gas. I wish some of our legislators would do the same.

51 year-old male
I recently rode my moped on a 5-mile trip, from my home to my office. I can save $75.00 or more per month on fuel reductions. I don't know whether it is safe enough. There is no lane for me to travel in. Autos and trucks frighten you. They don't give you enough clearance. I wish it were more safe. I'm sure I would get great pleasure riding the moped to and from work.

35 year-old male
I think that to obtain a license our laws are too lenient. We have far too many people on the roads today that actually should not be driving. Our traffic laws should be stiffened to keep drunks and drug users off the roads. The moped is a fine means of transportation, and I feel sure that in years to come we will see more of them; there is a need to make other drivers of larger vehicles aware of the mopeds on the road.

27 year-old male
The public should be informed that moped drivers are authorized to use public roads. Whenever I drive I stay as far to the right as possible, being courteous to the auto drivers, but some people will drive up beside you, tell you to get off the road or else. I have even had one man try to run me off the road because I didn't get off the road when he said to.

37 year-old male
I would like to see better classification as to what is a moped. There are a lot on the highways that aren't really mopeds and they are going to ruin everything for the moped owners. A lot of people have motorbikes and call them mopeds to beat having to have license, etc. I would love to see the police clamp down on non-moped owners and leave the real moped owners alone. A moped is a bicycle form motorbike with bicycle type tires and should not exceed 20 mph.

35 year-old male
Drivers of automobiles and other licensed vehicles should be made (by law) to go around mopeds. Instead they (auto drivers) blow their horn behind mopeds if they are traveling in the middle of the right-hand lane on double or triple lane street. If moped travels one foot away from right gutter it is dangerous if steady or heavy traffic exists. Cars seem to come too fast and too close. In this case, it is better for the moped driver to stay in center of right-hand lane and force cars to pass on left. Mopeds should stay off Interstate Highways and avoid roads (if possible) where speed limit is above 45 mph. The purpose is to provide cheap transportation; therefore, if registration, insurance, helmet are necessary to operate moped, it will defeat the purpose and people will stop buying mopeds and purchase bigger motorcycles (for almost the same money). Since the increase in gasoline prices, moped prices have sky rocketed. It is almost to the point now where some kind of price control is needed. Top of the line Puch mopeds, for example, sell for nearly $1,000.00. I also own a car which I drive on rainy days. Car to moped gasoline ratio is 10:1.

57 year-old female
I didn't stand much chance to learn to drive a motor vehicle as a youth, so I never got a driver's license. I never tried for one. The moped seems an easy way to get around in the city. No strings attached.

71 year-old male
I tried to get driver's license a few years ago. I missed a few questions and failed, so I kept peddling a bike. I believe some get licenses that don't deserve them, but that is the law. I was at one time an alcoholic. I kicked the habit 30 years ago. Thank God I did. When I ride my bike I try to keep my hands on the handlebars and on the throttle and brakes and my eye on the trail in hopes the Blessed Savior will guide me to the destination. I am not perfect. I try to have faith in God. I believe we ought to have license and insurance and helmet, but I don't believe there would be near as many moped riders. I peddle a bike some to keep me in shape. I haul my groceries on my moped. I thought I was too dumb to get a good message like this. I will try not to let it go to my head. Hope you can read this message. May God bless you all. Barney the Bike Rider.

46 year-old male
Moped laws should remain the same to give people like me a way out if you get too many traffic violations. You still have things to do that cost too much by taxi and a lot of places to go that buses do not go. Do what you can to keep the state off of moped owners' backs. Thank you. P.S. If you have to ride a moped, you find out how much a car means to you and your getting around.

36 year-old male
When we bought our moped, it was a Christmas gift for our son. It is used only by him for occasional riding on the trails around our home. We did not know you had to be 16 to ride it on the public roads. It wouldn't be a bad idea if the kids that ride mopeds could be issued a permit of sorts if they could show they could handle them responsibly. As fast as these 10 speeds can reach, I don't believe the mopeds are half as dangerous, and I've ridden them both and I'm his mom, I'm also a motorcycle rider as he is.

39 year-old male
The State of N.C. has used the argument for requiring licenses for moped operators because so many drunk drivers who lose their licenses get a moped. A more reasonable solution would be for the dealer to be required to check license bureau, etc. to see if prospective buyer has had his license revoked for traffic violations and if so make it an offense to sell any motor vehicle to such a person. In the case an individual is selling the moped he should also be required to check and upon penalty be fined if he sells a motorized vehicle to a person who has had their license revoked. Reputable moped riders should not be penalized for some convicted lawbreakers offense. We want to prove ourselves as responsible and law abiding citizens so our streets and highways will remain open to us and promote safety and good rules of the road wherever our little gas saving hummer beckons to take us. I am very interested in this survey and program. I hope that our state will be on the side of the moped commuter as we are indeed doing our part in conserving energy.That ought to count something in our favor.

24 year-old female
As a working mother of one child I have to drive my car every day to take my child to the day care center and then drive to work. If there was a moped where I could also take my child on it, that would sure save me a lot of gas and money. Maybe a sidecar or a child seat like for bicycles could be the answer. Maybe we could also build moped ways next to the main streets for moped and bicycle riders only, so it wouldn't be too dangerous to drive on the same road with the car operators.

15 year-old male
Like everything new, a lot of people immediately condemn mopeds. But from a practical point, there are many times more reasons for encouraging the use of them than restricting them. Mopeds should be treated as bicycles with government's involvement mainly with educating the public about the use and safety of them.

29 year-old female
I feel the general public is beginning to find the idea of mopeds very appealing for a number of reasons. With the high cost of automobiles, the moped takes the place of the second car in the family. For short trips to the grocery, they save time parking, stopping and starting. Two years ago I would never have believed the savings would be so noticeable. I certainly hope NC will realize the future of the moped as transportation and vote favorably on new legislation so as not to make a hassle out of a pleasure.

64 year-old male
Most mopeds will exceep the 20 mph speed limit; hwoever, it is so small as to be a very unimportant factor. Most will do 27 mph which in most instances will keep the moped up with city traffic. However, it has brought to my attention that some overzealous police are attempting to make something of this. I believe their time and attention could be used to a better advantage in working on some real crime, drugs, robberies, etc.

23 year-old female
I am thoroughly pleased and very enthusiastic about moped use. It was an ideal choice -- I recommend it to everyone. I got a car a couple of months ago, and I much prefer riding my moped. It's only bad when it's very cold, when it's raining, when I need to take passengers, or when I need to take large loads (it's fine for regular shopping, including grocery shopping). At all other times it is 100% the vehicle of choice.

56 year-old female
Moped riders are doing more than a fair share in conserving oil -- don't penalize them with taxes and over regulation. Autos are the villains more than mopeds. There are some irresponsible moped riders - particularly kids - but don't penalize the whole population of riders in order to control them.

33 year-old female
A moped is my only means of transportation. It's inexpensive to run, it's easily repaired, it conserves gas. I am doing my part to conserve natural resources and pollution and by doing this I believe I should be entitled to some benefits such as 1) a company that will insure me against theft without my having to pay a small fortune; 2) courtesy from auto drivers; 3) a choice of whether to have insurance or not, not a mandatory law. These are the only things I ask and I don't think it's too much. A new Puch mopedcosts $850.00 and my Batavus was $600.00 and the Batavus has almost been stolen and I had it securely locked to a stationary post. I would like some kind of inexpensive insurance against theft.

40 year-old male
I am visually handicapped and cannot obtain a driver license. The moped is my transportation.

58 year-old female
When I was in Europe this past September I saw little old ladies riding mopeds and decided that it was for me. (I'm a little old lady). I've worked out a system of buying all my staples once a month and then using my moped for buying produce and dairy products weekly. I also go to a nearby shopping center on it and to some meetings at Duke. I would like to see moped lanes put on Old Chapel Hill Road as a commuter road between Chapel Hill and Durham, also 751. My husband also rides a moped (a Puch) for small errands and occasionally goes to work on it at the Research Triangle going a long way to get there to avoid Highway 54. He would use it more often if 54 had a bicycle lane.

53 year-old male
Discourage legislature from requiring insurance and license tags! The argument that drunks drive mopeds is invalid! Drunks drive cars and are a danger to pedestrians, bicyclists, and moped operators!

28 year-old male
I believe that the state government shouldn't waste any more of our tax dollars on moped regulations and should be finding a way to save and conserve energy for more worthwhile things to better our economy, just like mopeds do. My mopeds have saved a lot of energy that otherwise my car would have consumed, four or five times more. They are economically resourceful. Please encourage better features for them in the future for better safety.

73 year-old male
It took a long time for me to learn to ride my bike. I hadn't ridden a bike since I was a young boy, so I took many a spill from it and bumped my forehead. I have a sizable nose and I landed on my nose last time and blacked both of my eyes. It jarred my head so that I did not know much for about two or three weeks, so I haven't ridden it since January. I hope to someday if my wife will let me.

56 year-old male
My moped is a big help to me. I do not drive a vehicle. This is my only transportation. Without it I could not do what farming I do.

49 year-old male
I would like to say, with gas and oil getting higher, more people are taking to two wheels, bicycles, mopeds, and motorcycles, people who normally would not. This I think is going to create many accidents to those who have little or no experience with mopeds. Mopeds are not really a new vehicle. It is rather new for the U.S., but in Europe they have been in use for years. I would personally like to see new operators have some rider education before operating a moped, or at least a test of ability. Also, the moped rider should remember that all other vehicles have the right of way because they (the cars, trucks, etc.) have registration, license, insurance, and as of now the moped does not require any of these. So if I ride the moped I always give the right of way whenever it is in question. It's a lot safer. Ride safe.

26 year-old male
I think they should spend less money on express routes for cars and more money on routes for mopeds and motorcycles, restricting cars from these areas. There are more young people getting killed every day on bikes because of where they're having to ride! Thanks.

42 year-old male
I feel stupid when I am riding a moped with a motor to do the work going down the road and a person on a 10-speed bicycle can pass at a faster speed than a moped will run.

46 year-old male
I would like to see the speed raised to 35 mph so the moped would not back up traffic on certain streets. I don't mean to say that traffic piles up, just that drivers are impatient with bikes of any type.

44 year-old male
It seems to me that as much gas as a moped saves and the price is negotiable, why then aren't there more people with them? Quite a puzzle.

58 year-old female
Admittedly, I am a chicken when it comes to riding my moped, unless someone else is with me on a similar vehicle. In the beginning I had right much trouble -- caused from dirt in the carburetor -- and got stranded pretty far away from home. All this destroyed some of my confidence. Now I feel, as you do, that more and more mopeds will hit the road and I won't feel like such as oddball. I am also a little weary of being assured I am going to get killed on this thing -- if you can ride a bicycle, you can ride a moped.

35 year-old male
I taught high school math in N.C. public schools for six years and am a Vietnam veteran. Since my first moped, I have enjoyed riding immensely. I live in a converted school bus, and make my living in diverse pursuits. My moped is part of the reason I have enjoyed real peace of mind of late.

15 year-old male
Persons who are to ride should be given a test to insure they can safely operate a moped on public roads and streets. Age should not matter down to 14 years old. A special "moped operator" license could be issued. Alcohol consumption should be the same as required with a regular drivers license.

22 year-old male
I have experience commuting for about seven years on two-wheeled vehicles (motorcycles, bicycles, moped). Of these, the moped is by far the most practical commuter vehicle for the average person. The gas mileage, maintenance free, lower speeds, etc. give it advantages over a motorcycle. Yet it is primarily a self-powered vehicle more suitable for carrying things, longer hauls, and luxury over a bicycle. Education should be the key for promoting these vehicles, as well as insuring their safety on the streets. There is nothing worse than a moped rider that is unknowledgable facing a motorist that is uneducated about other forms of vehicles. Riding a two-wheeled vehicle is absolutely the best education in defensive driving techniques obtainable.

16 year-old female
I think as a teenager it gives us a way of getting around without needing the car or license, and it doesn't take much gas to ride.

17 year-old male
I feel the mopeds are just as safe as bikes, because I have ridden both of them many miles. As a matter of fact, I feel in cities if the speed limit of mopeds is 30 that the mopeds are more safe than the bicycle, because the speed is practically equal to cars and you can drive in your lane on your side of the

road instead of side walks. Also, the mopeds should not be considered motorcycles. I would enjoy answering any other questions you have on mopeds from the rider's point of view. Thank you. P.S. I hope you take strong consideration of my view, and if the mopeds do become motorcycles, mine will be "For Sale".

62 year-old male
The moped is an obviously marvelous method for fun transportation plus energy savings. Its speed and "pick-up" speed particularly should be raised to 35 mph in order to keep pace with traffic flow in city zones. The moped's low visibility (motorcycles as well) would be improved drastically with mandatory flag plus hazard and turn signals. In addition, a 12-volt battery system would support a decent small distinct "air horn" for mopeds only, that is an air horn with a tone assigned to mopeds only.

51 year-old female
I truly believe mopeds are coming here in the same numbers that they exist in Europe. We need to educate the general public to take extra care with alternative vehicle drivers -- we are saving gas so that they can drive! It's a perfect short trip vehicle. Rule about 16 years of age before driving needs to be enforced. Do not lower age limit. This would make mopeds toys -- they are not toys.

50 year-old male
I keep this moped down at the farm. I feel that I save from $15 to $20 a week on gas back and forth to store for supplies, etc. For the investment I think they are fine things.

72 year-old male
I have had three mopeds: one Motobecane traded for new after 3,000 miles, second Motobecane stolen after approximately 4,000 miles, now have Peugeot at 1,500 miles. The most likely times for an easy fall with a moped are when starting or stopping. This is because of front wheel tendency to weave at speed of less than 8 mph or when rounding a corner on wet surface or loose gravel. It would be better if a moped could keep up with 35 mph traffic rather than all cars passing too close. A ten-speed bicycle can easily pass me. I own no other mode of transportation and never will again.

43 year-old female
I know I would enjoy my moped much more if I did not have to contend with so many cars on the same roads I travel -- most of them seem to be aggravated by moped riders! I use mine only to go to and from my tennis games a little over one mile from home. I would love to use it to go to pick up small items or small amounts of groceries, but that would mean traveling on a very busy in-town road, and it is just too scary. The riding of the moped itself, I think is very easy and perfectly safe at 20 mph. Obviously it must be simple as both my children can ride and handle it probably better than I can; however, I would not be in favor of lowering the age limit more than one year as their "road sense" is not well enough developed before 14-15 years(even that I'm not sure about). The best place and most fun to ride a moped is in Bermuda where the cars go at 20 mph too! The roads are narrow, twisty and hilly but at least you are not intimidated by cars and without a doubt these few days were the most fun I ever had moped riding!!

55 year-old male
My wife has a moped also. We enjoy our bikes very much. We are sober, responsible people. We do not abuse our rights to ride our bikes. There are ten bikes in our group. When we ride on a Sunday afternoon, we hunt back roads out of the way of traffic and never race or drag with our bikes. We all observe the 20 mph we are allowed. We are all 35 years and older (too old for Hells Angels, so we are the geritol gang). With gas prices the way they are, we go to the grocery store for milk and bread and small items with less gas than it takes to crank the average car. I have had a moped for about four years, but last year we bought new Batavas bikes when my wife started riding. So far as drivers' licenses, there are people who can't read and write and can't get drivers' licenses but are good decent people; they can ride mopeds to their work and run errands on them. Otherwise, other folks would be required to help them. I think drunks and disreputable people should not be allowed the right to ride mopeds and give them a bad name. I could go on forever about the merits and pros and cons of mopeds.

61 year-old male
I have owned four mopeds. I know of 18,000 actual miles that I have put on two mopeds. Of course it's more than that, I don't remember the exact miles I put on the other two. To me they are far more safe than a bicycle, for instance going up hill, it is absolutely impossible for a person to sit on a seat on a bicycle and look straight ahead without weaving from 8 inches to a foot. You do not have this problem with a moped. I strongly indorse that the power be increased to at least 2 horsepower. This is for safety purposes, like climbing hills and bridges. I hope this information will be of help to you. I am 100% totally and permanently disabled. I live on a V.A. pension and would be absolutely impossible for me to own and maintain an automobile at the rate of insurance and other expenditure. Thanks.

35 year-old female
I am aware of a movement underway by the N.C. Bicycle Committee to introduce legislation requiring all mopeds to have licensed operators. I feel this is unfair and defeats the entire purpose of owning a moped. Certainly I would have preferred a larger bike that had no speed governor on it, but I had no choice. I feel that the only way a moped may be more dangerous than other motor bikes is its limited speed and power. I find motorists have been very courteous to me, and I make every attempt to move as safely as possible in traffic and not hold up automobiles by riding as far right as possible.

39 year-old male
The moped is a good thing. I only spend less than $1 each week for fuel. I have no N.C. driver's license and the moped is a life saver for me. My business is about one mile away and I can make it on my bike. Without it I would be lost. It also saves money on short trips to the market. I have four children and there's always something to pick up. It saves driving the car.

55 year-old male
These vehicles are incredible energy savers. I have by actual check counted 184 miles per gallon of gas. Many of the regulations you're thinking of would only tend to discourage purchase of mopeds. Total cost of owning a moped would be prohibitive. Let's keep things as they are. Thanks for allowing me to express my opinion.

31 year-old female
I sold my car and bought a moped. I am well versed on the N.C. laws concerning them as the statistics read. I would very much like to know of any pending legislation concerning mopeds. I would be glad to help you in your work in any way. When I first moved to Charlotte 19 months ago, I hardly ever saw a moped. Now they are all over the place and a really friendly bunch too. Not long ago I ran out of gas about 3 ½ miles from home, and a moped rider stopped to help by giving me his 2-cycle oil. I would like to see some kind of theft protection. In Charlotte mopeds cannot be registered with the city -- they fall between bicycles and other motors. Theft insurance is very difficult to find and outrageously priced. I have a difficult time using that, however, to force required registration. I would like to see some kind of voluntary registration.

31 year-old male
Comment to the safety on the streets and highways. Build one to two yard wide moped or bicycle-ways on the roadside as protection for the moped or bicycle riders from cars and trucks; also, it helps to save some money for repairing the road shoulders.

58 year-old male
I purchased my moped for one reason and one reason only, that was so I could afford to ride to work and make a living. I also own a pick-up truck, but I had a son in college at that time and he used the truck and the gas bills were so much I could not afford another auto in order to get to work. I ride mine only to work,not for pleasure.

43 year-old female
I know quite a few old men that use their motor bike for their only means of transportation to get groceries and other things they need, because they can't afford a car or to hire someone to take them where they need to go. Some of them don't have a driver's license and can't get one. I think the motorbike is wonderful in aiding them.

55 year-old male
If you are not a defensive driver you better not get on a moped. -- And please do not ride too close to the edge of the highway -- you are only asking for trouble.

16 year-old male
Mopeds are nice. They should be very popular in the near future. I am very pleased with mine -- it gets me where I want to go with no trouble or money.

60 year-old male
I think they are real nice for people 50 years old and older who are still active, and those on low fixed incomes to use for errands, shopping, etc. as well as being real energy savers. I would appreciate a summary of your survey.

63 year-old male
Keep the moped on the road. It saves gas with class. Thank you.

61 year-old male
My moped is used within a radius of 3 miles from my home. I'm on my third gallon of gas for the mileage shown on the form. So far, by using the moped I'm saving approximately $25.00 per month on my gas credit card. That is the bottom line as to why it was purchased.

59 year-old male
No one convicted of driving under the influence of alcohol should be allowed to operate a moped, bicycle, horse or any other type of transportation on the right aways of public highways, streets or whatever. Thank you very much for sending me this questionnaire and giving me the chance of telling you my opinion of the above comment.

46 year-old male
It would be nice if we got some kind of credit for owning and riding a moped in these days of energy conservation.

40 year-old male
If this questionnaire is leading up to putting insurance and license and vehicle registration on mopeds, you might as well forget it and it will also hurt the sell of mopeds to the customers as well as the dealers.

48 year-old male
When riding my moped, I ride it as if I were riding my bike. I keep to the right as much as I can and let cars pass me when possible. I enjoy riding it and hope more people will use them. The more that start using them, will give us more respect from drivers on the highway.