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DRIVER EXPOSURE SURVEY

A FIELD TEST OF THE TRIP-LOG METHOD

Final Report

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16. Abstract

A trip-log survey of driving exposure was conducted in Michigan in 1973 and 1974. The 1973 was presented in report UM-HSRI-SA-74-2. Responses in 1974 were obtained from 939 licensed drivers, a 31% response rate. Patterns of exposure in 1974 appeared to be very similar to those in 1973. However, the overall travel reduced by about 9.6%, due largely, it is assumed to the gasoline shortage and speed limit reduction in 1974.

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INTRODUCTION

The original final report on this contract, report UM-HSRI-SA-74-2, described the trip-log exposure survey in Michigan during 1973, and provided an analysis of the exposure data obtained from the survey. Subsequently, the contract was extended for one year so that comparable exposure data could be obtained for 1974. This report describes the 1974 survey and presents a comparison of the exposure data from the two years.

DESCRIPTION OF SURVEY

A trip-log survey was continued in Michigan during the calendar year 1974. A random sample of 3650 licensed drivers were selected as subjects, ten per day for 365 days. Each driver was assigned to a specific day of the year, and the trip-log form was mailed to the driver eight days in advance of the assigned day. Instructions on the form and in the official cover letter indicated that trips should be recorded or logged for all of the trips on which the person drove on the assigned date, and only on that date. An addressed, stamped envelope was included. Responses were received from 939 subjects, or 26.8% of the mailings, of which 235 indicated that they did not drive on the assigned date. There were also 44 invalid responses, primarily cases of trips being recorded for more than one day. Another 339 forms were returned because the addressees had moved, were absent or deceased. When the 44 invalid cases are counted and the 339 others are excluded, the equivalent response rate is 31.1%, compared to the 30.0% in 1973.

The subject drivers were identified by random selection from current lists of licensed Michigan drivers. Each month, a computer tape of the driver files was randomly selected at the Department of State computer facility. To accomplish the tape selection, a random number was generated within the range of the total number of tapes required for the full state file. For each month, the required number of subjects was determined, e.g., 310 for January, 280 for February. Depending on the number of records per tape (usually about 100,000), an interval was determined so that the sample would be uniformly distributed throughout the tape. A starting number was then randomly selected, and the required set of names and addresses was printed out on mailing labels. The first ten mailings for each month were assigned to

the first day of the month, the second ten to the second day, and so on through the month. The rationale for mailing each set eight days in advance of the assigned date was based on criteria of four days for delivery and four days for the recipient to prepare or anticipate completion of the form on the correct date.

The trip-log form is designed for ease of understanding and recording. The two driver variables - age and sex - are separated from the trip variables, and can be completed at any time before return mailing. The three vehicle variables (type, make/model, year) are at the left side for each trip. Most subjects use only one vehicle, and need not repeat the variables. The odometer reading at the beginning of each trip comes next, and is completed before the driving begins. At the end of the trip, the driver then records the odometer reading again, and checks day/night and road type. The only complexity involves trips which extend from dark to day (or vice versa) or include more than one road type. Most drivers were able to estimate the mileage breakdowns within a trip when necessary.

Coding of the forms was done by first calculating the mileage of each trip to the nearest tenth of a mile, and then breaking it down into the eight possible day/night vs. road type combinations. Thus many forms required only one data case, e.g., all mileage in day, and on a city street. Other forms required several separate data cases for each trip, e.g., part day/city street, part day/ rural freeway, part night/city street. The 704 forms with recorded trips required 1570 separate data cases. Another 82 data cases were added (equivalent of 40 responses) to account for the 15 days of missed data in September (caused by delay in obtaining a Michigan computer tape). The missing data was represented by a duplication of the 15 days of received September data, with appropriate weighting on a day-of-the-week basis.

The resulting 1974 computer file has 1652 separate data cases, representing the equivalent of 744 received trip logs. This compares with the 1973 data including 1617 cases from 743 responses.

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Highway Safety Research Institute
The University of Michigan

Complete on

If unable to complete on above date please note the actual date: _____

Age: _____ Sex: ☐ Female ☐ Male

DRIVER'S RECORD OF TRIPS

Please keep this with you during the day and record information about each trip in which you are the driver. Do not include off-road driving (e.g., fields and trails). Record mileage readings at the beginning and end of each trip. A single trip is ended when you park the vehicle and stop the engine. (If you do not drive on this date, check here: ☐)

	VEHICLE DESCRIPTION: Check vehicle type, write down its make and model (e.g., Ford Fairlane Chevrolet Impala) and model year.							MILEAGE READINGS: Be sure to record mileage before starting each trip, and again at the end. EXAMPLES (32,566.7) (32,568.5)		DAY OR NIGHT: Check DAY if trip is in daylight. Check NIGHT if before dawn or after dark (headlights on). If part day and part night estimate mileage in each.		ROAD TYPE: If entire trip is on one road type, check that type. Otherwise estimate mileage on each road type.			
	Type					Make and Model	Model Year	Beginning of Trip	End of Trip	Day	Night	City Street	Urban Freeway	Rural Freeway	Other Rural Road or Highway
	Car	Truck	Bus	Motor-cycle	Other										
1															
2															
3															
4															
5															
6															
7															
8															

Use reverse side for additional trips.

Please return this form in the stamped envelope.

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE POLICE

OFFICE OF HIGHWAY SAFETY PLANNING

541 E. GRAND RIVER AVE. EAST LANSING, MICH. 48823

Dear Driver:

I am pleased to cooperate with the Highway Safety Research Institute at the University of Michigan in a survey to determine the types of driving and distances travelled by drivers in Michigan.

Your name has been selected at random among the licensed drivers in the state for participation in this survey. Nearly 2,000 other drivers will be involved throughout 1974 to represent the driving population in Michigan.

I urge you to share in this important work by completing the enclosed form. The information you supply will be held in the strictest confidence. The University research team will use the information collected to help in finding ways of reducing traffic accident losses (over 300,000 accidents occur in Michigan each year).

On the enclosed Driver's Record of Trips, a day and date are specified. Please complete the form for your driving on that day. Record only the trips when you are the driver, but not when you are a passenger. It is important that you return the form even if you have not driven on the selected day. A pre-addressed envelope is enclosed for your convenience.

If you do drive on the selected day but for some reason cannot complete the form, select another date and complete your Record. Do not pass the form on to another driver.

I hope you will find the survey interesting and that you will support this vital effort toward highway safety.

Sincerely,

Noel C. Bufe
Executive Director
Office of Highway Safety Planning

NCB/vlt

Enclosures

MICHIGAN
THE GREAT LAKE STATE

SUMMARY OF SURVEY RESPONSES

	Trips Recorded	No Trip	Invalid Records	Returned Blank	Returned Unopened	Absent or Dead
January	66	22	4	2	39	4
February	51	21	2	2	28	5
March	57	24	4	3	20	1
April	63	16	4	4	24	4
May	53	18	7	0	28	2
June	50	24	2	1	21	4
July	53	16	2	0	26	3
August	75	20	9	2	23	4
September	40	10	1	0	11	2
October	73	23	2	0	24	2
November	67	14	6	4	31	6
December	56	27	1	3	23	2
Total	704	235	44	21	298	39

EXPOSURE RESULTS

The total exposure represented by the 744 equivalent trip-logs is 34,656.6 miles. The mean exposure per day per driver in Michigan is estimated by dividing this total by 979 (number of drivers represented, including no-trip cases), resulting in 35.40 miles/day per driver. Based on a 365 day year, the estimate for mean exposure per driver in 1974 is 12,921 miles, a 9.6% reduction from the 14,297 miles estimate for 1973.

Seasonal and day-of-the-week trends in the exposure survey are shown in Tables 1 and 2. These and the other univariate tables were derived using an analysis of variance computer program. The months of February, March and April again show the lowest exposure. However, the following month, May, is much reduced from 1973, in which May had the highest exposure. On the other hand, exposure in August and September is greatly increased from 1973.

Mondays show the greatest exposure among days of the week, in 1974, whereas it was Thursdays in 1973. Sundays again have the least exposure, and Fridays again have the least exposure among work days.

Tables 3-10 present univariate mileage distributions for driver age and sex, vehicle type and year, car make and size, day vs. night, and road type. Notable changes in 1974 are higher relative exposure for women, trucks, smaller cars, older cars and rural roads.

TABLE 1

Month	1974 Mileage	1974 Percentage	1973 Percentage
January	3977.2	11.5	10.7
February	1776.4	5.1	5.6
March	2079.5	6.0	5.7
April	2361.3	6.8	6.5
May	2872.3	8.3	14.3
June	2600.4	7.5	8.7
July	2501.5	7.2	7.8
August	3907.6	11.3	8.4
September	4113.6	11.9	6.3
October	3059.2	8.8	10.0
November	3345.2	9.7	8.6
December	2062.6	6.0	7.3

TABLE 2

Day	1974 Mileage	1974 Percentage	1973 Percentage
Sunday	3721.8	10.8	10.3
Monday	6119.3	17.7	15.2
Tuesday	5458.2	15.8	15.9
Wednesday	5283.9	15.3	14.5
Thursday	5167.3	14.9	17.3
Friday	4493.6	13.0	12.5
Saturday	4372.5	12.6	14.3

(40.0 miles not classified by day)

TABLE 3

Age	1974 Mileage	1974 Percentage	1973 Percentage
16-20	2438.3	7.3	5.1
21-25	3984.7	11.9	9.3
26-30	2969.8	8.9	9.6
31-35	3384.4	10.1	13.0
36-40	3533.4	10.6	9.0
41-45	3482.9	10.4	11.6
46-50	3866.8	11.6	12.2
51-60	3735.5	11.2	17.8
61-70	4357.2	13.1	8.5
over 70	1606.7	4.8	3.9

(1296.9 miles not classified by age)

TABLE 4

Sex	1974 Mileage	1974 Percentage	1973 Percentage
Female	12,717.2	38.2	34.4
Male	20,600.8	61.8	65.6

(1338.6 miles not classified by sex)

TABLE 5

Vehicle Type	1974 Mileage	1974 Percentage	1973 Percentage
Passenger Car	27,795.3	80.6	88.2
Truck	6127.1	17.8	10.9
Bus	103.0	0.3	0.5
Motorcycle	109.6	0.3	0.1
Other	366.8	1.1	0.2

(154.8 miles not classified by vehicle type)

TABLE 6

Manufacturer	1974 Mileage	1974 Percentage	1973 Percentage
Buick	1525.5	4.5	9.9
Cadillac	622.2	1.8	0.4
Chevrolet	8317.5	24.3	20.6
Oldsmobile	3370.0	9.8	9.4
Pontiac	2414.8	7.0	6.8
Ford	7653.9	22.3	21.6
Lincoln	744.4	2.2	1.2
Mercury	1024.0	3.0	2.6
Chrysler	711.7	2.1	3.4
Dodge	2200.8	6.4	6.2
Imperial	181.0	0.5	0.1
Plymouth	2459.0	7.2	5.6
American	465.6	1.4	2.9
Volkswagen	842.1	2.5	3.9
Other	1743.3	5.1	5.5

(380.8 miles not classified by manufacturer)

TABLE 7

Car Size	1974 Mileage	1974 Percentage	1973 Percentage
Full Size	12,221.4	47.7	56.5
Intermediate	5232.7	20.4	17.3
Compact	7223.6	28.2	24.6
Other	968.3	3.8	1.6

(9010.6 miles not classified by car size)

TABLE 8

Year	1974 Mileage	1974 Percentage	1973 Percentage
52	-------	-----	-----
55	-------	-----	0.5
58	64.8	0.2	0.1
59	40.0	0.1	0.1
60	3.4	0.0	0.1
61	-------	-----	0.1
62	12.2	0.0	0.4
63	76.1	0.2	0.9
64	300.7	0.9	0.8
65	601.1	1.8	2.3
66	1916.7	5.7	3.5
67	1392.8	4.1	4.1
68	1879.4	5.5	9.2
69	1899.0	5.6	10.0
70	2416.3	7.1	7.5
71	5451.7	16.1	11.9
72	6192.9	18.3	23.5
73	7305.8	21.5	23.1
74	4189.0	12.4	2.0
75	215.1	0.6	-----

(799.6 miles not classified by year)

Table 9

Time of Day	1974 Mileage	1974 Percentage	1973 Percentage
Daylight	27,027.3	80.7	80.8
Night	6468.3	19.3	19.2

(1161.0 miles not classified by time of day)

TABLE 10

Road Type	1974 Mileage	1974 Percentage	1973 Percentage
Street	8218.6	28.5	32.0
Urban Freeway	3510.7	12.2	13.7
Rural Freeway	6266.7	21.7	24.6
Other Rural Road	10,844.1	37.6	29.7

(5816.5 miles not classified by road type)

Figure 1 is a chart of unique exposure classes produced by an Automatic Interaction Detector (AID) run on the 1974 survey computer file. It shows again--as in 1973--that the largest variability among data classes exists between the distributions of exposure values for the various types of road (street, urban freeway, rural freeway and other rural road or highway). Among these road types, the most significant change in 1974 is a sharp reduction in travel on rural freeways. The splitting variables on the left side of the chart under "street" travel are all basically the same as in 1973. However, the splitting variables in the middle and right of the chart under "Urban Freeway", "Rural Road", and "Rural Freeway" travel are different than in 1973. Specifically, the groups under "Urban Freeway and Rural Road" in 1974 are Day and Night, whereas in 1973 they were two Model Year groupings. And under "Rural Freeways" the groups are divided according to Vehicle Size, rather than Model Year as in 1973.

In the previously cited report, "Acquisition of Information on Exposure and on Non-Fatal Crashes," 18 unique exposure classes were recommended for use in future exposure analyses, based on AID runs from national exposure data collected in 1970. Table 11 presents the 1973 and 1974 Michigan exposure estimates for these classes. The most notable decrease in proportion of driving in 1974 is among males over 40 driving passenger cars on roads other than streets or freeways. The most notable increases are among males driving trucks or buses of years 1970-1975 on roads other than streets and freeways; and among females of ages 26-40 driving on roads other than streets and freeways.

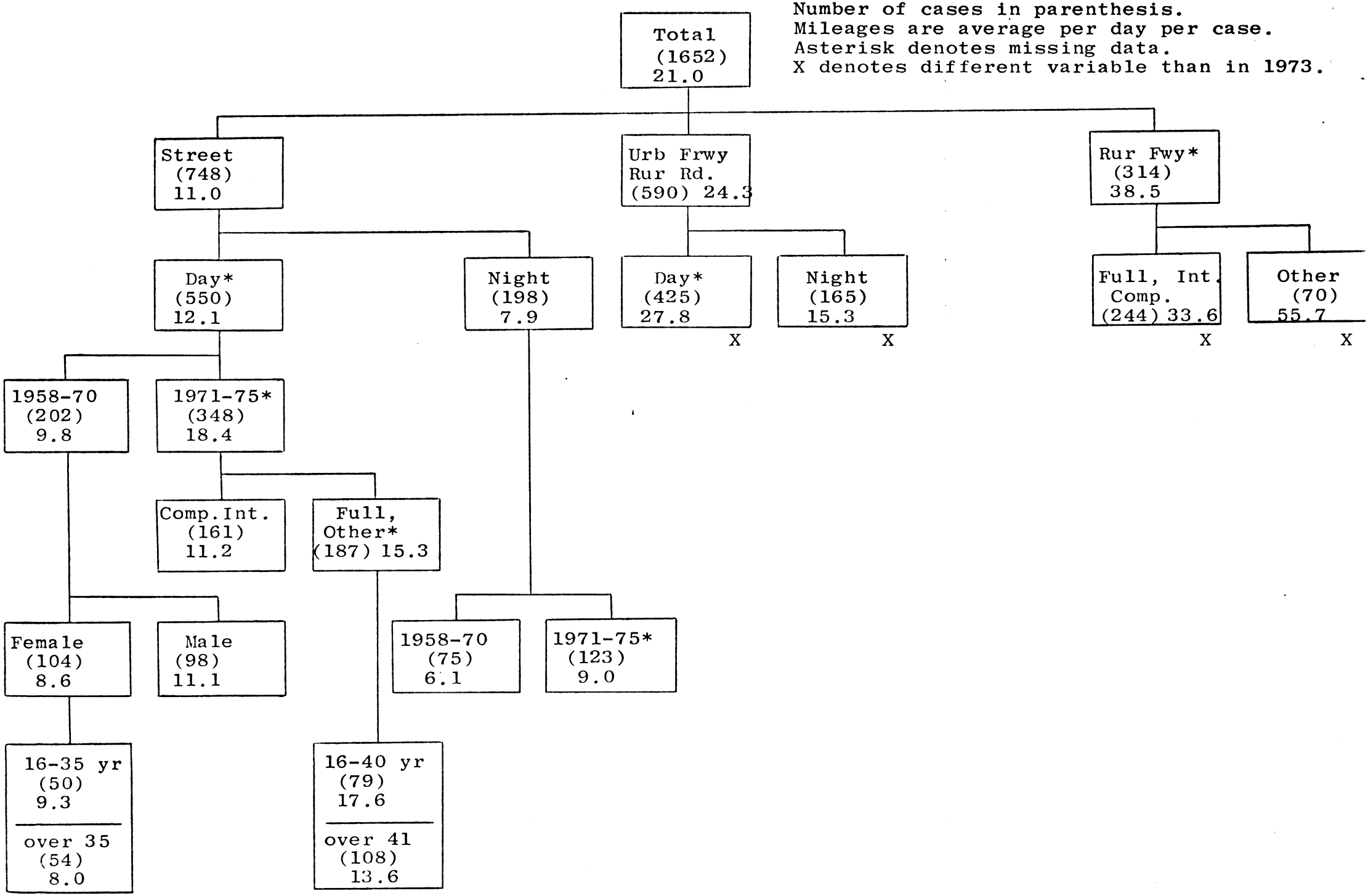

Figure 1 - Exposure Hierarchy, 1974 Data

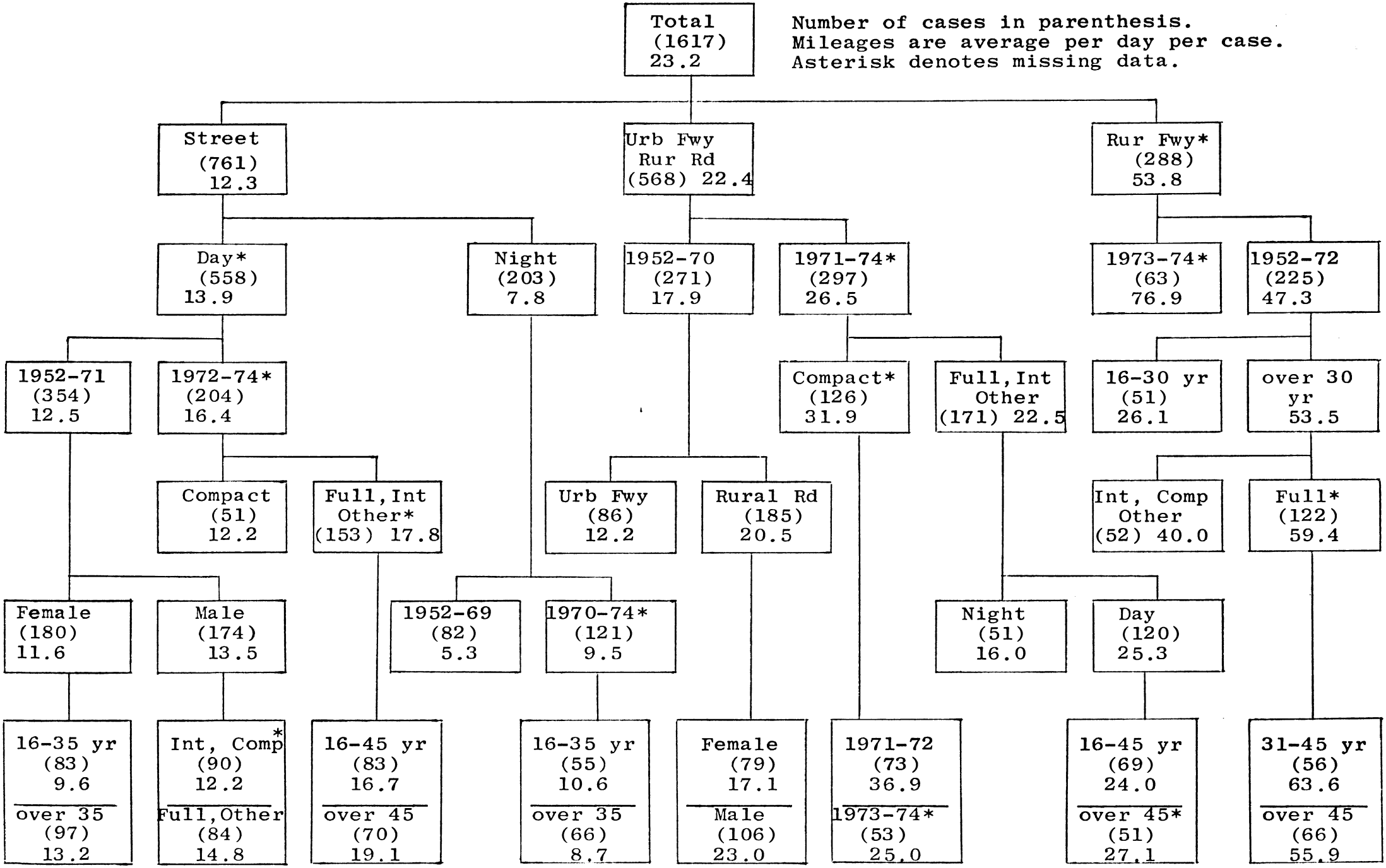

Figure 2 - Exposure Hierarchy, 1973 Data

TABLE 11

Eighteen Exposure Classes, Michigan 1973 and 1974

Class	1974 Mileage	1974 Percent	1973 Percent
Male, Passenger Car, Age 16-25, Street	635.2	2.3	1.9
Male, Passenger Car, Age 16-25, Other Road	1906.0	7.0	6.0
Male, Passenger Car, Age 26-40, Street, Day	894.8	3.3	3.6
Male, Passenger Car, Age 26-40, Street, Night	367.2	1.3	1.5
Male, Passenger Car, Age 26-40, Other Road Day	1823.2	6.7	9.9
Male, Passenger Car, Age 26-40, Other Road Night	710.0	2.6	2.5
Male, Passenger Car, Age over 40, Street	1904.3	7.0	9.6
Male, Passenger Car, Age over 40, Other Road	3852.5	14.1	19.3
Male, Other Vehicle, Street, Model Year 70-75	584.7	2.1	1.9
Male, Other Vehicle, Street, Model Year 52-69	130.8	0.5	0.4
Male, Other Vehicle, Other Road, Model Year 70-75	3747.2	13.7	5.3
Male, Other Vehicle, Other Road, Model Year 52-69	498.4	1.8	1.0
Female, Age 16-25, Street	825.3	3.0	4.4
Female, Age 16-25, Other Road	1389.6	5.1	4.2
Female, Age 26-40, Street	1275.7	4.7	3.6
Female, Age 26-40, Other Road	2366.7	8.7	5.3
Female, Age over 40, Street	1264.5	4.6	5.5
Female, Age over 40, Other Road	3169.2	11.6	14.0
	27,340.3		

7,316.3 miles unclassified due to missing data

CONCLUSIONS AND RECOMMENDATIONS:

1. The 1974 survey strengthened a previous conclusion that a one-day trip-log exposure survey by mail on an annual, statewide basis is feasible and relatively inexpensive.

2. The 1974 survey response rate was 31%, which is not satisfactory for generation of valid statistics. This survey method need not be tested again until a time when the response rate can be improved by means such as reminder letters to initial non-respondents.

3. Similarity of the 1974 response rate with the 1973 response rate of 30% indicates that if there are factors causing a bias in response rate among various classes of subjects, the factors may be consistent from year to year and therefore independent of the gasoline shortage and 55 mph speed limit. If this is true, some of the major differences among proportions of travel between 1973 and 1974 may be hypothesized as being caused by either the gasoline shortage or 55 mph speed limit.