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Canadian Vehicle Survey

Economic and Technical Review
Report EPS 3-AP-79-1

Air Pollution Control Directorate
March 1979

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CANADIAN VEHICLE SURVEY

Mobile Sources Division
Abatement and Compliance Branch
Air Pollution Control Directorate
Environmental Protection Service

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ABSTRACT

This report is the fourth in a series of publications on motor vehicle operations in Canada. It is a summary of the most useful results from a mail survey on the use of personal vehicles in major urban areas in the country. The survey was conducted by the staff of the Mobile Sources Division, Air Pollution Control Directorate, in April 1975. Seven cities were surveyed (Calgary, Edmonton, Montreal, Ottawa-Hull, Quebec, Toronto, Vancouver) and 5857 returned forms were analyzed.

The survey was intended to collect information on vehicle ownership, use and cost on the two most used vehicles in the household. The analysis of the data was biased towards specific informational requirements of the Mobile Sources Division. Many of the results, however, will be of interest to others working in the field and are intended to increase the knowledge of vehicle operations in Canada.

RÉSUMÉ

Ce rapport constitue le quatrième volet d'une série de publications ayant trait à l'usage des véhicules motorisés au Canada. On y fait la synthèse des données les plus pertinentes, obtenues lors d'un sondage postal, sur l'utilisation des automobiles de tourisme dans les principaux centres urbains du pays. L'enquête fut réalisée au mois d'avril 1975 par la Division des sources mobiles de la Direction générale de l'assainissement de l'air, dans les sept villes suivantes: Calgary, Edmonton, Montréal, Ottawa-Hull, Québec, Toronto et Vancouver. On a analysé 5 857 formules de réponse retournées par les informateurs.

Le but de cette enquête était de recueillir des informations sur la propriété, l'utilisation et le coût d'entretien des deux véhicules familiaux les plus utilisés au pays. L'analyse des données fut orientée vers les besoins spécifiques d'information de la Division des sources mobiles. Plusieurs résultats pourront toutefois intéresser d'autres groupes oeuvrant dans le même domaine et accroîtront, du même coup, les connaissances sur l'usage des véhicules au Canada.

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1.1 Background

Environment Canada is charged with the task of estimating the future trends in automotive air pollution and recommending abatement strategies. It is thus important that emission-related characteristics of the Canadian motor vehicle population be accurately known. Because there was limited knowledge of operational characteristics in Canada, Environment Canada has generated its own data base on the subject by undertaking a series of research surveys over the last few years. This is the fourth report in the series. The previous three were:

- Canadian Automobile Driver Survey (1);
- Canadian Taxi Survey (2);
- Canadian Urban Trucking Study (3).

The goal of this survey was to establish a data base on privately owned vehicles in major cities in Canada. Seven large cities were surveyed by means of a mail voluntary response questionnaire in April of 1975. The questionnaire was similar to that of the Canadian Automobile Driver Survey but recorded information on the two most used vehicles in the household as opposed to only the most used car in the previous survey.

While this survey's main objective was to develop information required for Environment Canada's assessment work, the data are of general interest to a variety of individuals and companies involved in assessing the road transportation system in Canada. Thus, in some instances the questionnaire and the subsequent analysis were expanded to cover questions of more general interest.

1.2 Scope

This report presents only the details of the surveying procedures and the more significant findings of the data analysis. The complete data set is available from the Mobile Sources Division, Air Pollution Control Directorate, Environment Canada, Ottawa, K1A 1C8.

2 SURVEY DESIGN AND RESPONSE

General guidelines were established for both the sample selection and questionnaire content. Using these guidelines, R.L. Polk Co. Ltd. prepared the mailing list and the Mobile Sources Division formulated the questions and form layout.

2.1 Sample Selection

The goal of the survey was to collect data from car-owning households in large cities in Canada. There was no attempt to make the sample representative of all cars in Canada as this would have required sampling households in small cities and rural areas. This biasing is consistent with Environment Canada's responsibility for assessing air pollution problems, which are generally most acute in the large urban centres.

The cities selected for sampling were:

Quebec City;
Montreal;
Ottawa-Hull;
Toronto;
Edmonton;
Calgary;
Vancouver.

These cities covered a variety of geographic and climatic regions and thus some differences attributable to geography and climate were discernible from the results.

In each city, a 2% sample of the total vehicle-owning population was compiled from provincial vehicle registration information. These households were carefully screened to avoid double surveying. In addition, the commercial vehicle owners (as identified by registration name) were excluded from the registration file*. The survey did not use follow-up mailings to increase the response rate because the experience gained from the Canadian Driver Survey indicated that a 25% response rate could be achieved with one mailing. With the questionnaire, each sample household was sent a pre-addressed, stamped return envelope to facilitate response.

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*The operation characteristics of the commercial operators is reviewed in the Canadian Urban Trucking Survey.

2.2 Questionnaire Design

The questionnaire, shown in Appendix A, posed 28 questions in all, under the following areas:

HOUSEHOLD DESCRIPTION - city, number of drivers, number of vehicles and annual income;
DESCRIPTION OF PRINCIPAL DRIVER - age, sex;
VEHICLE DESCRIPTION - age, number of cylinders, size class, make;
PURCHASE DATA - new/used, age and odometer reading at purchase;
FUEL USE - grade of fuel, city and highway fuel economy;
VEHICLE USE - total, non-urban, business;
COST OF REPAIR AND MAINTENANCE - total, engine, exhaust, accident, place of repair;
WORK TRIPS - place of work, distance, time, occupancy, modal distribution, parking location, parking cost.

The questions were posed with respect to the vehicle's operations as opposed to the driver's use of the vehicle. Thus, no estimates of total personal mobility can be made from the data collected. The survey was also limited to obtaining data on the two most used vehicles of the household. This, according to data developed in the earlier survey, would leave only 5% of the total private vehicle population outside the sample universe.

2.3 Survey Response

Out of the 25,000 questionnaires mailed, 23.4% were completed and returned. Of course, with such a substantial percentage of the population not responding the chance of biasing the response is present. The response rate and thus the reliability of the survey also varied from city to city as shown in Table 2.1. In general, the response rate was consistent across the cities. The most significant deviation was Quebec City at only 8.8% response; no adequate explanation could be given for the low return.

The representativeness of the survey responses was assessed by comparing survey results to known demographic statistics. The following comparisons could be made:

Vehicle Age Distribution: The survey data were compared on a city by city basis with the results of a units in operation census carried out by R.L. Polk Co. Ltd. in

TABLE 2.1 QUESTIONNAIRE RESPONSE RATE

City	Number Sent	Number Returned	% Response
Toronto	6 000	1 322	22.0
Montreal	6 000	1 344	22.4
Vancouver	5 000	1 110	22.2
Edmonton	2 500	651	26.0
Calgary	2 500	651	26.0
Ottawa-Hull	2 000	567	28.4
Quebec City	1 000	88	8.8
Total Survey	25 000	5 857	23.4

July, 1974. All cities were compared except Toronto and Ottawa-Hull which could not be compared because of inaccuracies in the Polk data. The results of the comparisons are illustrated in Figures 2.1a to 2.1e. The all cities' survey responses indicate a biasing towards newer vehicles. This could be the result of higher response rates from upper-income groups who own new vehicles. The response which is lower than the Polk response for the "zero"-year-old vehicles is probably due to the three-month difference between the Polk survey (July) and this (April) survey. It would appear that the survey is slightly biased towards newer cars and hence the global estimates are not completely representative of the total population.

Number of Vehicles per Household: A comparison of survey results to Statistics Canada estimates of the number of automobiles per household was made in Table 2.2. The survey results are significantly higher than Statistics Canada's values. This discrepancy is explainable by the probable response biasing towards higher-income groups and the fact that this survey was measuring all road vehicles in the household while Statistics Canada estimated only automobile ownership.

Vehicle Size: Using the Polk units in operation census a comparison of car sizes was assembled in Table 2.3. Although there are significant differences between the two estimates for the individual size groups, these biases could be the result of classification errors in this survey as vehicles were sized by respondents based on their own perception of the appropriate size class. It could, therefore, by hypothesized that a substantial classification error would occur between full size and intermediate and

TABLE 2.2 COMPARISON OF SURVEY RESULTS WITH STATISTICS CANADA'S HOUSEHOLD FACILITIES AND EQUIPMENT ESTIMATES

Number of Vehicles Per Household	Percentage of Households with Vehicles	
	Survey	Statistics Canada* (1975)
1	64.0	71.5
2	28.0	24.4
3	8.0	4.1

* Statistics Canada values are adjusted to exclude households not owning vehicles. They represent counts of owned automobiles only and do not include trucks, motorcycles or leased vehicles.

TABLE 2.3 COMPARISON OF SURVEY CAR SIZES TO R.L. POLK UNITS IN OPERATION CENSUS (1974) RESULTS

Size	Survey* (% of total)		Polk** (% of Total)	
Sub-compact	13.4	38.4	19.8	37.9
Compact	25.0		18.1	
Intermediate	24.9	61.4	34.0	62.1
Full-Size	36.5		28.1	

* Adjusted to exclude trucks, 4-wheel drives, motorcycles, motor homes.
** Based on the same seven cities as the survey.

between sub-compact and compact. When each of these two groups are summed, the two surveys display no significant difference between their estimates of "big" cars and "small" cars. Thus the size grouping bias indicates that the global values for all sizes of cars will be inaccurate although the amount of error will be small because of the high reliability of the big- and small-car groupings.

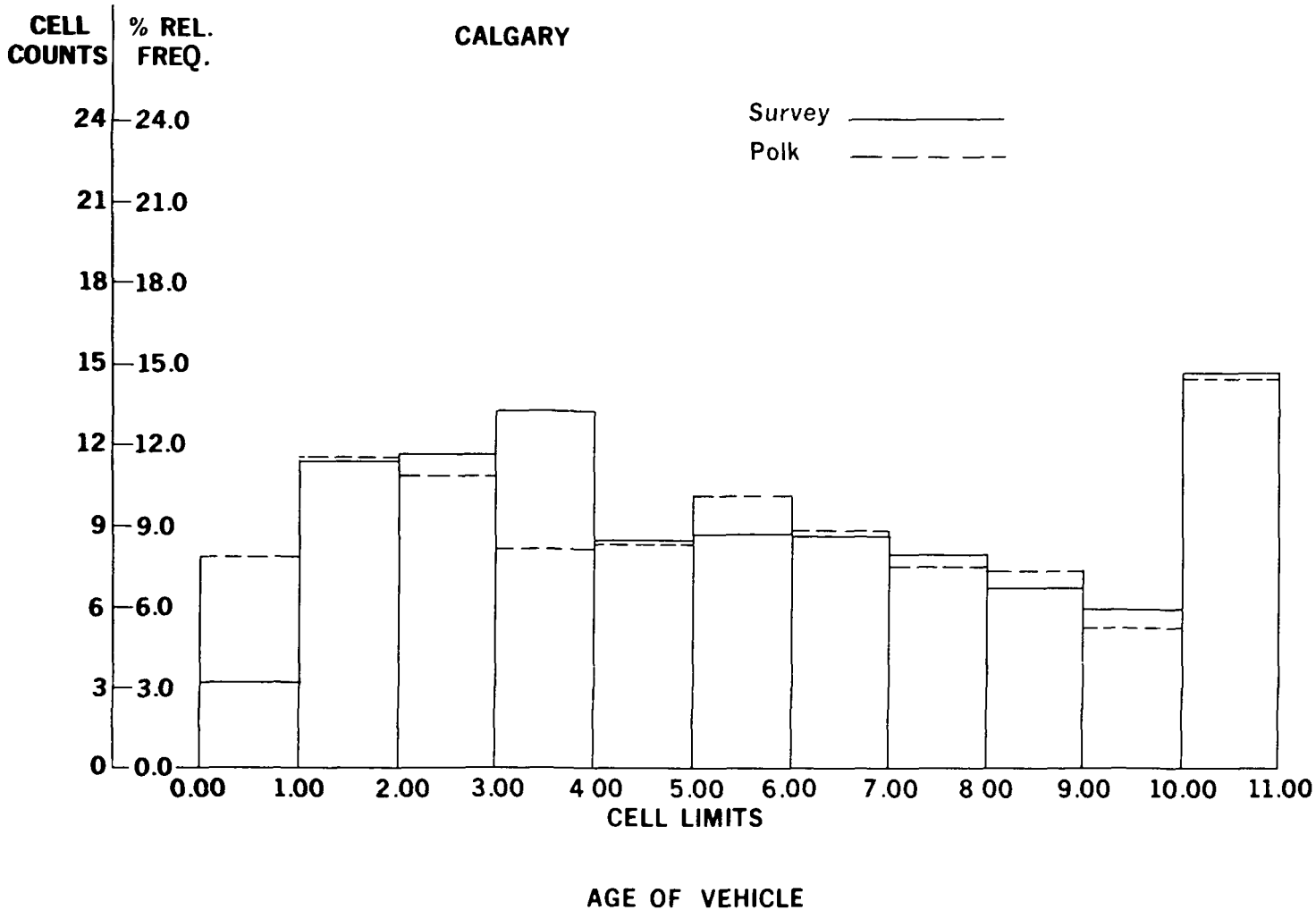

FIGURE 2.1a COMPARISON OF VEHICLE AGE DISTRIBUTIONS (SURVEY VERSUS POLK)

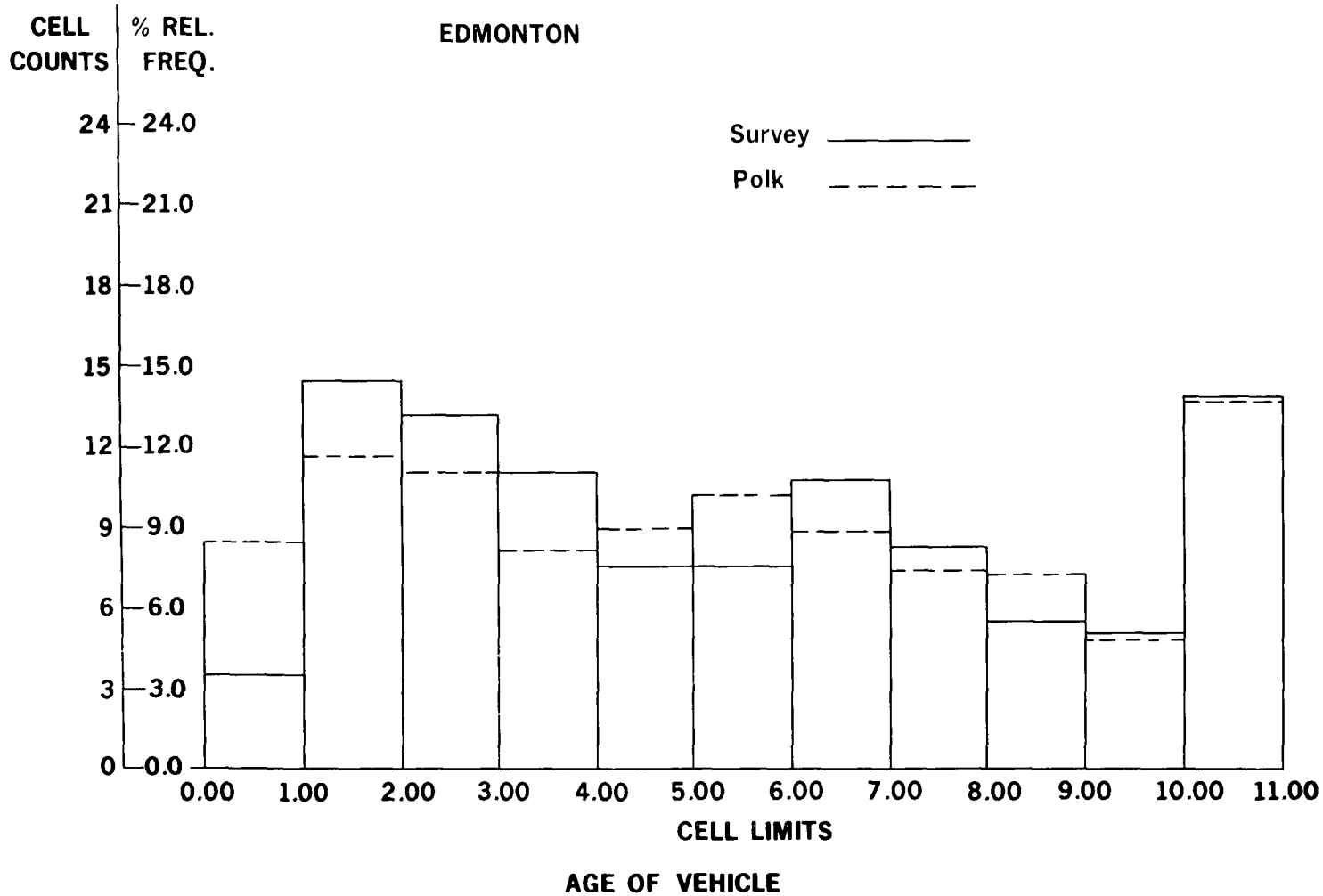

FIGURE 2.1b COMPARISON OF VEHICLE AGE DISTRIBUTIONS (SURVEY VERSUS POLK)

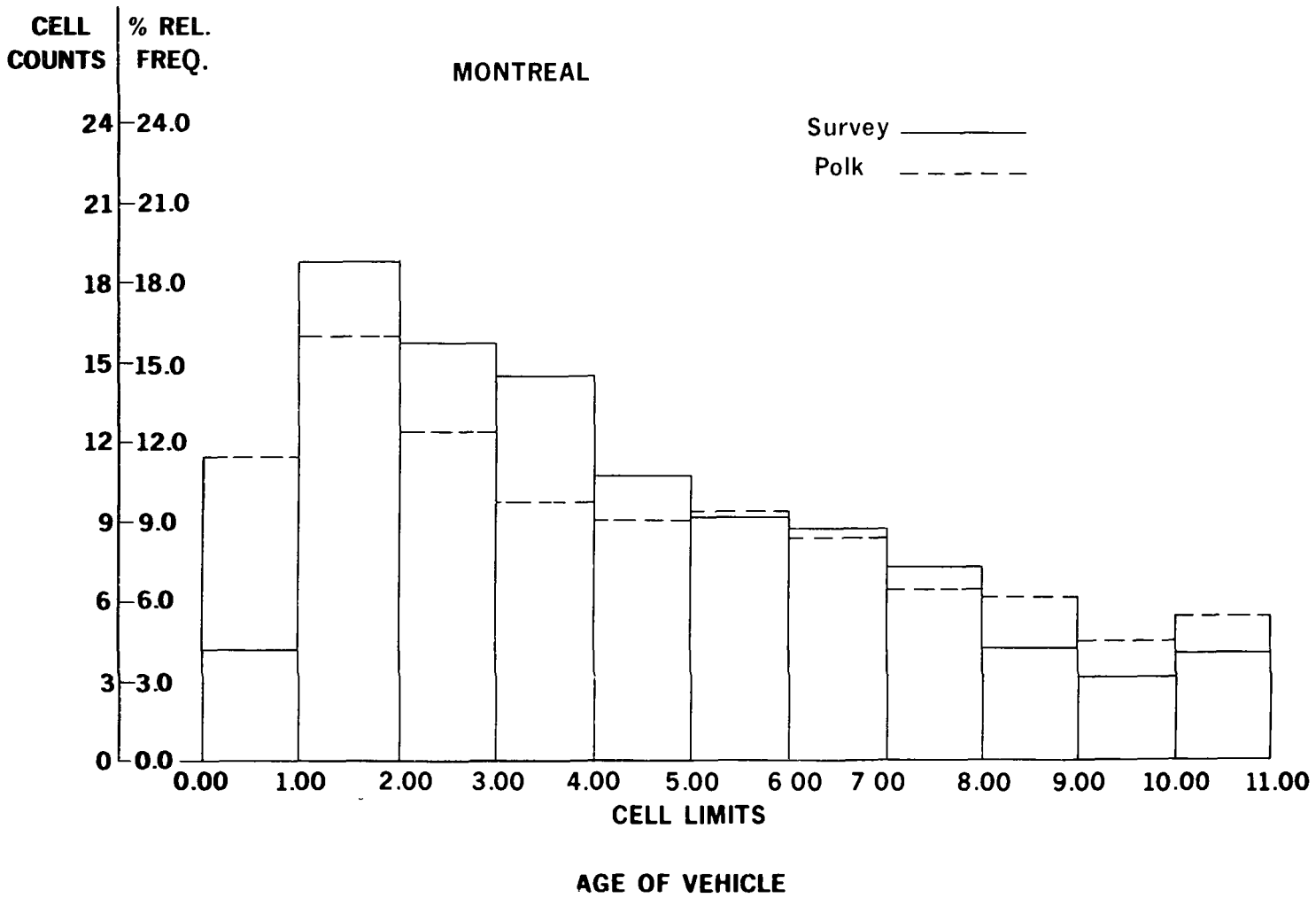

FIGURE 2.1c COMPARISON OF VEHICLE AGE DISTRIBUTIONS (SURVEY VERSUS POLK)

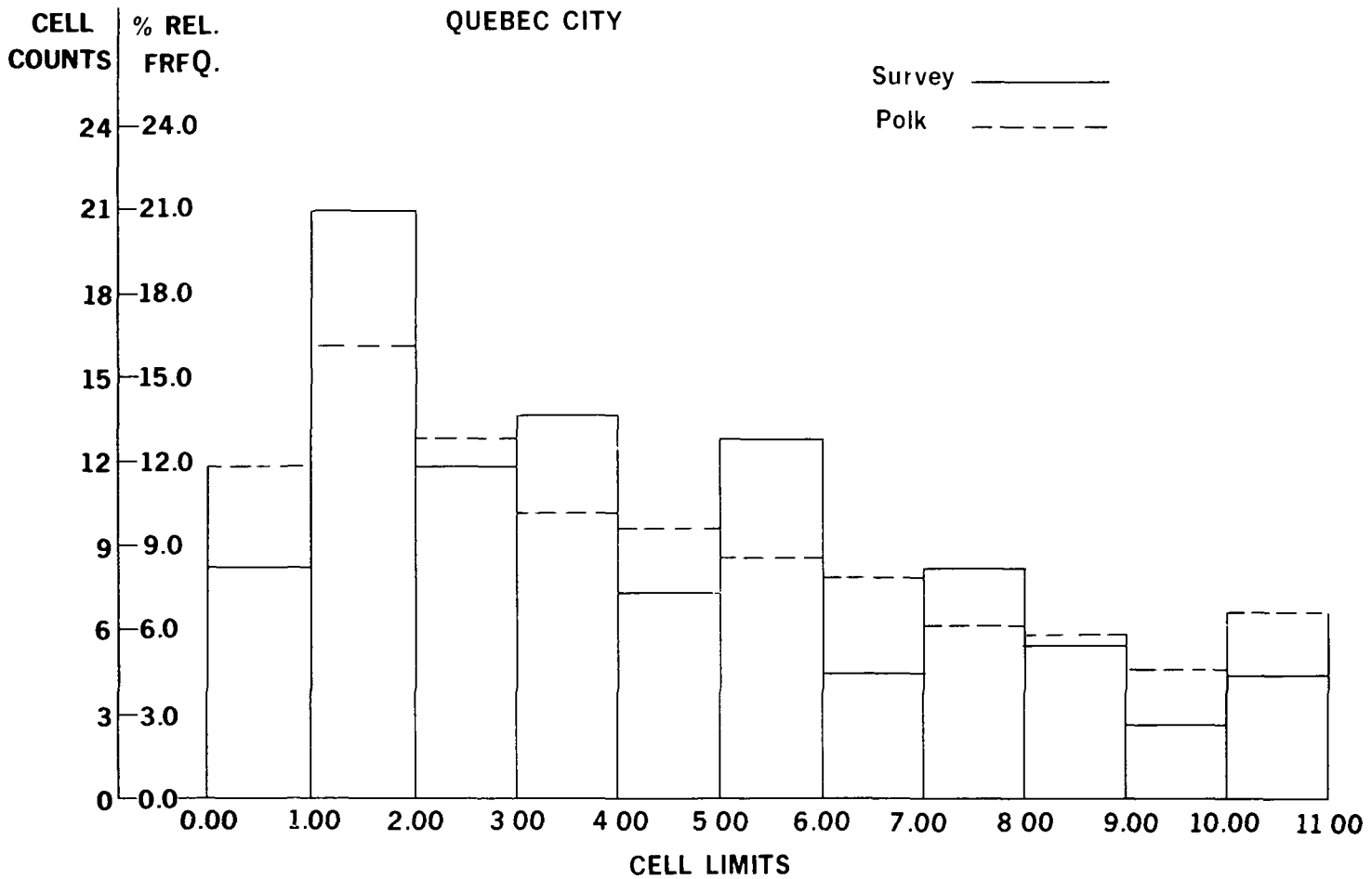

FIGURE 2 1 d COMPARISON OF VEHICLE AGE DISTRIBUTIONS (SURVEY VERSUS POLK)

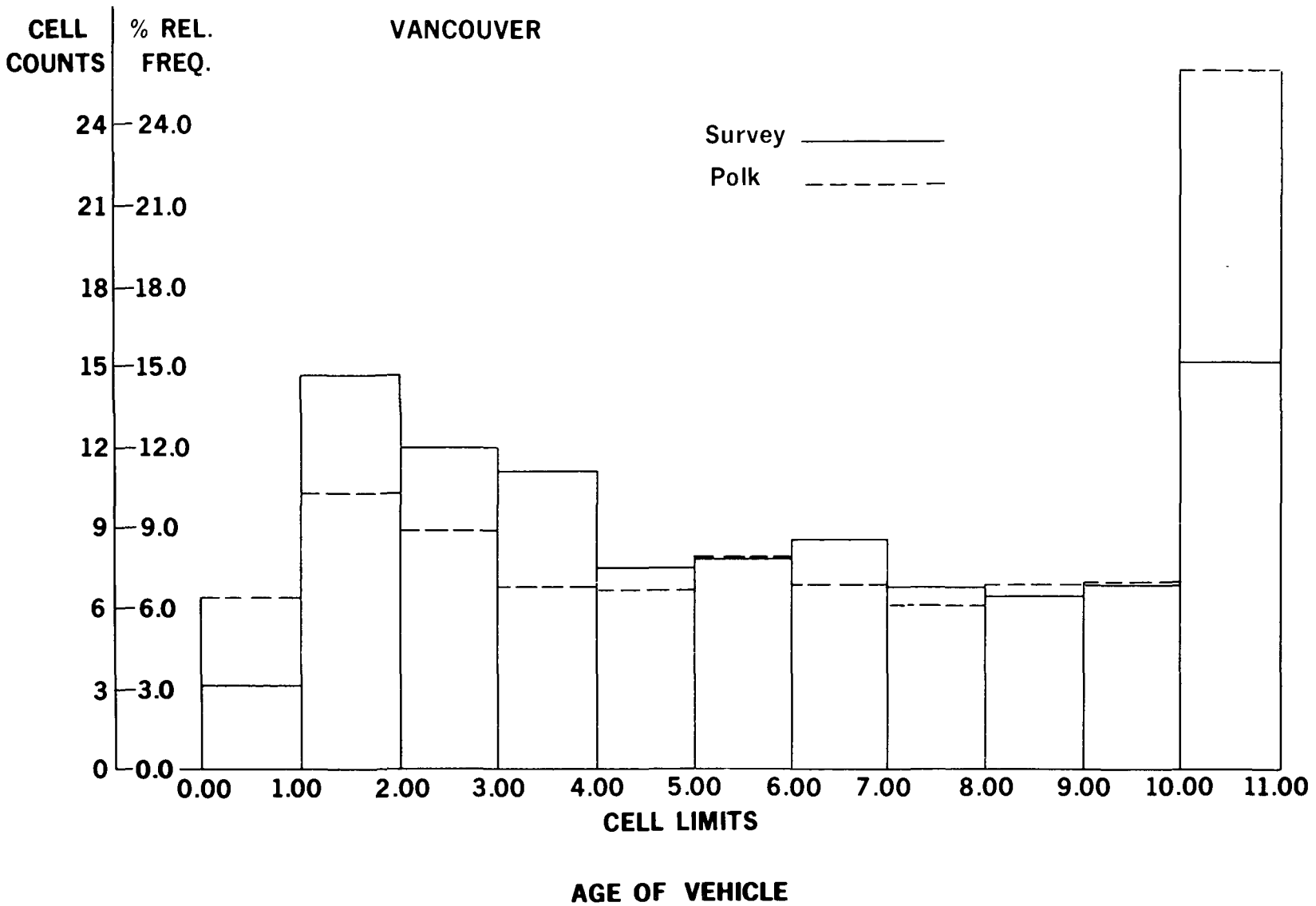

FIGURE 2.1 e COMPARISON OF VEHICLE AGE DISTRIBUTIONS (SURVEY VERSUS POLK)

In summary, the survey global results are significantly biased and therefore cannot be considered representative of the private vehicle population in the cities surveyed. The results may, however, be used on a disaggregate level with accuracy related to sample size and variation only. Thus, for example, although the total sample average fuel economy would not be accurate the average fuel economy by vehicle model year and size group would display no inherent biases.

3 VEHICLE OWNERSHIP CHARACTERISTICS

3.1 Vehicles Per Household

The distribution of car ownership per household was tabulated and the results are presented in Table 3.1. There appears to be a significantly higher vehicle ownership per family in the western cities. This trend is consistent with the results of the previous Canadian Driver Survey which indicated the following:

City	Average Number of Vehicles per Household
Edmonton	1.5
Montreal	1.2
Toronto	1.2
Vancouver	1.5

The reasons for the higher ownership rates in the West are unknown. One hypothesis could be that the ownership rate is a direct function of average income; however, as can be seen in Table 3.2, there is no correlation between average income per city and average vehicle ownership. The explanation may lie in differences in attitude, city form and average annual vehicle cost.

TABLE 3.1 DISTRIBUTION OF THE NUMBER OF CARS IN THE HOUSEHOLD BY CITY

Number of Vehicles Per Household	City							
	Cal	Edm	Mtl	Ott	Que	Tor	Van	Average
				- % -				
1	48	50	75	66	78	73	56	64
2	40	39	18	28	22	22	35	28
3	9	9	4	5	1	3	6	5
4	3	1	2	0	0	1	2	2
5+	1	1	1	1	0	1	1	1
Average	1.7	1.7	1.3	1.4	1.2	1.3	1.6	1.5

TABLE 3.2 RELATIONSHIP BETWEEN VEHICLE OWNERSHIP AND AVERAGE INCOME

City	Number of Vehicles per Household	Average Income ($)
Calgary	1.7	19 316
Edmonton	1.7	17 873
Montreal	1.3	16 562
Ottawa-Hull	1.4	21 105
Quebec	1.2	16 429
Toronto	1.3	19 922
Vancouver	1.6	19 284

Source: Statistics Canada publication 13-207 (1975)

The relationship between individual household income and vehicle ownership for three of the survey cities is shown in Table 3.3. In all income groups, the ownership rate is higher in the western cities. Even in the lowest income group (less than $11,000), 26% and 13% of the households in Edmonton and Vancouver respectively have more than one vehicle. These values compare with 9% in Toronto.

In all the cities, a strong positive correlation of family income to vehicle ownership rate exists even when the regional differences are discounted. In the highest income group ($41,000 +) between 16% and 28% of the families had more than three vehicles.

When these ownership trends are matched with the vehicle use characteristics (Chapter 4) significant differences in total miles per household appear between regions in Canada.

3.2 Income Effects on Vehicle Size and Age

Although there are regional influences on the average size and age of vehicles throughout Canada, the most important determinant of the vehicle size and age is household income. The relationship between size and income is shown in Table 3.4. This correlation is not as strong as one would expect. The low income groups do not buy the smaller, newer car but rather are the main consumer market for the larger, older car. This age-to-income relationship is shown in Table 3.5. While 14.5% of the families with

TABLE 3.3 NUMBER OF VEHICLES PER HOUSEHOLD AS A FUNCTION OF HOUSEHOLD INCOME

Household Income ($)	Number of Vehicles per Household				
	1	2	3	4	5
(Toronto)			- % -		
<10 999	91	8	1	0	0
11-15 999	82	16	1	1	0
16-20 999	71	26	2	1	0
21-25 999	58	35	5	1	1
26-30 999	56	34	7	3	0
>31 000	38	46	11	3	2
Total	73	22	3	1	1
(Edmonton)					
<10 999	74	25	1	0	0
11-15 999	58	33	6	1	2
16-20 999	35	52	13	0	0
21-25 999	35	44	16	4	1
26-30 999	22	60	16	2	0
>31 000	15	59	24	2	0
Total	50	39	9	1	1
(Vancouver)					
<10 999	87	13	0	0	0
11-15 999	66	30	4	0	0
16-20 999	48	46	6	0	0
21-25 999	38	52	6	3	1
26-30 999	25	50	18	6	1
>31 000	21	46	21	7	5
Total	56	35	6	2	1

income under $11 000 per year own 10-year-old or older cars, only 6.2% of the highest-income group ($41,000+) own such cars.

The trade-off is probably capital investment costs; however, this survey did not ask questions that would allow a financial analysis to be done. Future surveys may wish to probe this capital investment aspect further.

TABLE 3.4 DISTRIBUTION OF VEHICLE SIZE WITH HOUSEHOLD INCOME

Household Income ($)	Size of Vehicle			
	Sub-Compact	Compact	Intermediate	Full-size
		- % -		
1 000-10 999	21	22	19	19
11-20 999	45	47	49	47
21-30 999	23	19	21	21
31-40 999	6	7	7	7
41 000+	5	5	4	6

TABLE 3.5 DISTRIBUTION OF VEHICLE AGE WITH HOUSEHOLD INCOME

Household Income ($)	Vehicle Model Year										
	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965+
						- % -					
1 000-10 999	1.1	11.5	12.0	12.0	8.8	9.3	9.1	7.8	7.5	6.4	14.5
11-20 999	6.2	13.6	13.8	12.3	9.9	7.8	9.2	7.1	5.4	5.1	9.6
21-30 999	4.3	15.7	15.0	12.4	10.3	7.5	10.2	8.2	5.9	3.8	6.8
31-40 999	5.9	16.5	14.9	15.1	9.0	10.2	9.7	6.8	4.3	1.8	5.9
41 000+	6.8	21.8	17.2	16.2	9.1	8.8	4.9	4.2	2.9	1.9	6.2

4 VEHICLE USE CHARACTERISTICS

4.1 Annual Vehicle Use in 1974

Respondents were asked to estimate the total number of miles travelled per vehicle in 1974 (note that the survey was done in April 1975). They were also asked to estimate the percentage of this mileage travelled outside their urban area. Because of the wide variety of income groups, vehicle sizes, vehicle ages, driver ages and lengths of ownership, the global survey value predictably indicates a high degree of scatter in the annual use estimates. In addition, as pointed out in section 2.3, the entire sample was slightly biased towards newer vehicles. Thus any global value will not be representative of the true population.

In analyzing the data city by city, there are mileage trends that appear related to geographic location. These are shown in Table 4.1. Although not statistically significant, it is tempting to hypothesize a slight decrease in annual car use in western Canada. This could result from the higher number of cars per household in the western cities but might also be influenced by the proximity of recreational opportunities, a higher use of air travel and, in the case of Vancouver, the high degree of congestion associated with non-urban travel. Intuitively, the annual use of vehicles is influenced by a number of socio-economic and demographic variables. An analysis of the relationships of annual vehicle use to the most significant of these factors follows.

TABLE 4.1 ESTIMATED NUMBER OF MILES PER VEHICLE IN 1974 BY CITY

City		Average Number of Miles	
Calgary	Prairie	8 948 (6 109)*	8 703 (5 778)
Edmonton		8 310 (5 442)	
Montreal	Eastern	9 497 (6 163)	9 310 (6 056)
Ottawa-Hull		9 298 (5 721)	
Quebec		9 309 (6 204)	
Toronto		9 025 (6 141)	
Vancouver		8 464 (5 450)	

* Values in parentheses are standard deviations.

4.1.1 Vehicle Age and Size. Cross-tabulations of vehicle use by age and size are presented in Tables 4.2, 4.3 and 4.4 for eastern cities, prairie cities and Vancouver respectively. In general, increasing age and vehicle use are negatively related in a linear fashion. There are, however, major perturbations in some of the series between the fourth and seventh years of operation. At this point in the vehicle's life there appears to be a rise in the annual mileage. No definitive explanation of the effect has been developed, although it has been suggested that this increase may reflect the acquisition of used cars as principal household vehicles.

4.1.2 Split Between Urban and Non-Urban Miles. Of specific interest in the estimation of urban emission patterns is the number of miles travelled by vehicles in the urban area. To approximate this mileage, respondents were asked to estimate what percentage of the vehicle's annual mileage was done outside their urban area. This use was expressed on the questionnaire form as inter-city and major recreational trips. This definition of non-urban is admittedly broad and leaves much to the respondent's perception of "urban area". It is doubtful, however, that a more exact description would have improved the accuracy of response as the percentage is based on an annual perception that in all likelihood is not exact. The results obtained do, however, show remarkable consistency.

The data were analyzed with respect to vehicle size and age for each city surveyed. The results are presented in Table 4.5 and 4.6. There appears to be no strong relationship between vehicle size and the percentage of mileage indicated as urban, according to Table 4.5. In general, the sub-compact cars have the highest percentage of urban driving, although this does not hold for all cities. For all cars, the highest urban use was in Vancouver with Ottawa-Hull the second highest. In the case of Vancouver, the combination of overall low mileage and a high urban component results in an urban mileage estimate close to the survey average for the other cities which had higher total mileages but lower urban percentages. Thus the vehicles in Vancouver, while having as much use in the city, exhibited abnormally low non-urban use, possibly for the reasons proposed in Section 4.1.

4.1.3 Family Characteristics and Vehicle Use. The most significant family characteristics influencing the number of miles travelled by a vehicle are:

household income;
number of vehicles in the household;
number of licensed drivers.

TABLE 4.2 DISTRIBUTION OF MILES TRAVELLED IN 1974 BY MODEL YEAR AND BY VEHICLE SIZE (EASTERN CITIES)

Model Year	Miles Travelled by Vehicle					
	Sub-Compact	Compact	Intermediate	Full-Size	Trucks/ 4-Wheel Drives	Total
1974	8 926	8 064	9 266	12 094	9 959	9 463
1973	11 829	10 356	11 339	11 206	12 250	11 070
1972	9 392	9 591	9 618	11 147	13 769	10 106
1971	9 549	9 431	9 264	9 720	7 500	9 490
1970	9 052	7 923	9 413	11 012	9 107	9 653
1969	6 958	7 675	9 035	9 575	9 611	8 846
1968	10 236	6 864	8 590	8 898	5 544	8 435
1967	5 850	6 978	9 068	7 435	5 943	7 581
1966	6 444	5 119	8 288	7 067	2 729	6 849
1965+	2 500	7 521	4 867	6 839	2 963	6 132

TABLE 4.3 DISTRIBUTION OF MILES TRAVELLED IN 1974 BY MODEL YEAR AND BY VEHICLE SIZE (PRAIRIE CITIES)

Model Year	Miles Travelled by Vehicle					
	Sub-Compact	Compact	Intermediate	Full-Size	Trucks/ 4-Wheel Drives	Total
1974	8 057	7 046	10 798	10 472	9 196	9 219
1973	10 339	9 500	10 813	11 694	10 500	10 724
1972	9 029	8 163	8 592	12 922	9 870	10 302
1971	7 400	9 555	10 407	10 728	4 393	9 490
1970	9 675	5 959	10 166	9 991	8 667	9 159
1969	7 907	7 655	7 515	8 907	7 542	8 225
1968	10 375	6 688	9 980	8 582	7 288	8 591
1967	10 625	5 500	8 571	8 647	7 125	8 403
1966	6 625	5 383	7 262	7 938	4 600	7 270
1965+	5 900	5 772	4 964	5 998	4 296	5 588

TABLE 4.4 DISTRIBUTION OF MILES TRAVELLED IN 1974 BY MODEL YEAR AND BY VEHICLE SIZE (VANCOUVER)

Model Year	Miles Travelled by Vehicle					
	Sub-Compact	Compact	Intermediate	Full-Size	Trucks/ 4-Wheel Drives	Total
1974	8 216	7 193	8 248	11 839	8 884	8 424
1973	11 419	9 907	11 000	10 833	8 115	10 452
1972	8 824	9 525	8 767	12 665	6 875	9 605
1971	9 000	8 526	10 750	9 263	10 200	9 114
1970	9 761	6 909	9 983	8 908	9 714	8 758
1969	9 025	6 766	9 786	8 171	8 708	8 262
1968	7 808	7 729	8 500	10 593	10 400	8 869
1967	5 733	7 568	7 304	7 065	8 167	7 105
1966	9 222	6 804	8 476	7 986	3 900	7 689
1965+	5 983	6 019	6 773	6 417	8 429	6 574

TABLE 4.5 PERCENTAGE OF TOTAL MILES IN 1974 THAT WERE URBAN BY VEHICLE SIZE

City	Vehicle Size					
	Sub-Compact	Compact	Intermediate	Full-Size	Trucks/ 4-Wheel Drives	Total
Calgary	66	63	65	62	41	61
Edmonton	62	69	62	62	49	62
Montreal	67	58	62	59	48	60
Ottawa-Hull	70	62	68	64	53	65
Quebec	61	58	67	64	69	63
Toronto	60	63	58	59	52	60
Vancouver	71	72	69	68	61	69

TABLE 4.6 PERCENTAGE OF TOTAL MILES IN 1974 THAT WERE URBAN BY VEHICLE AGE

	Vehicle Age										
City	1	2	3	4	5	6	7	8	9	10	Total
Calgary	52	59	63	62	60	63	62	67	59	61	61
Edmonton	59	60	61	62	60	64	66	61	64	68	62
Montreal	61	59	60	60	65	55	59	61	60	50	60
Ottawa-Hull	59	64	62	67	66	69	68	64	66	71	65
Quebec	65	57	60	56	64	78	61	65	67	76	63
Toronto	60	59	60	63	61	63	63	54	56	54	60
Vancouver	68	65	66	72	69	70	72	72	69	72	69

Driver age, also an obvious factor, was eliminated as a usable variable because the survey was aimed at the car as opposed to the driver.

Household Income: The effect of household income on vehicle use is shown in Table 4.7. In all cities car use decreases significantly in the very low income groups. Presumably operating costs (parking, gas, oil, tires) are a significant influence on vehicle use at these income levels (ownership costs should not affect use). This operating cost sensitivity is rapidly eliminated as incomes increase. Although there is significant scatter in the trend, it appears that a plateau of vehicle use is attained in the low- to middle-income groups. As income continues to increase the per vehicle use declines. This declining trend is misleading because the total household mileage increases as ownership of more than one vehicle becomes commonplace and other travel modes (e.g., air) are more frequently used.

Household Size and Vehicle Ownership: The influence of both the number of cars and drivers in the household on total household vehicle use is indicated in Table 4.8. Clearly, the total mileage per household is more sensitive to the number of cars than to the number of potential drivers. Where there were two drivers in a one-vehicle household there was a 17% increase in total mileage and a 12% increase in urban mileage. If a third driver is added, these increases are roughly doubled.

In comparison, adding another vehicle increases the total mileage by between 62 and 72% above the one-car household. The percentage increase in total miles due to

TABLE 4.7 MILES TRAVELLED BY VEHICLES IN 1974 AS A FUNCTION OF HOUSEHOLD INCOME

Household Income	City*					
	Cal	Edm	Mtl	Ott	Tor	Van
1 000-5 999	(6 300)**	5 600	7 000	(6 000)	8 700	7 300
6-8 999	9 000	10 200	8 900	(6 400)	9 000	7 300
9-11 999	7 600	10 100	10 600	10 000	8 300	8 500
12-14 999	11 600	9 500	12 600	9 600	9 000	9 100
15-17 999	9 100	8 400	12 000	11 200	9 400	9 100
18-20 999	9 000	8 800	10 100	8 700	10 100	9 100
21-23 999	9 500	9 200	11 400	8 300	10 300	9 600
24-26 999	10 600	9 200	11 000	8 800	9 000	9 400
27-29 999	(8 500)	(7 100)	(11 100)	9 700	11 400	9 600
30-32 000	8 800	9 300	7 900	8 700	10 200	9 600
33-35 999	(8 300)	***	18 000	9 700	9 500	9 500
36 000+	10 300	9 200	11 000	10 700	8 400	8 800
TOTAL	9 400	9 600	10 800	9 600	9 700	9 000

* Quebec City was eliminated because of the low response rate.
** Values in parentheses indicate a high uncertainty due to small sample size (less than 25).
*** Only one response.

TABLE 4.8 INFLUENCE OF FAMILY CHARACTERISTICS ON TOTAL HOUSEHOLD MILES IN 1974

Number of Drivers in Household	Average Number of Household Miles					
	One-Vehicle Household			Two-Vehicle Household		
	Total	Urban	Non-Urban	Total	Urban	Non-Urban
1	8 805	5 827	2 978	14 466	5 850	8 616
2	10 274	6 521	3 753	16 696	10 858	5 838
3	11 065	7 670	3 395	18 978	12 989	5 989

the addition of drivers in the two-vehicle family is about the same as in the one-car household. This relationship is dramatically different for the urban mileage component. The urban mileage increases only marginally with the introduction of a second car in a one-driver household (presumably this is a measure of the saturation level for any one prime driver in the city).

In this case, most of the increase is in the non-urban component, which increases 190% over the one-car owner use. When a second driver is added to a two-vehicle family, the total urban family miles travelled increases 85% over the one-driver case. This rate of travel growth slackens to 20% with the addition of a third driver.

In contrast to this very elastic response of urban mileage to car and driver characteristics, the non-urban mileage is relatively unaffected by demographic changes. The largest anomaly in the non-urban vehicle mileage is in the case of one driver and two cars. Here, there is a large non-urban component, which could result from the ownership of a second "special purpose" vehicle such as a van, truck or four-wheel drive. This vehicle could be used exclusively for recreational purposes. This category of owner, however, is a very small percentage (2%) of the total population and is relatively unimportant.

In summary, the number of urban miles travelled per household is the most sensitive component and exhibits the highest elasticity with respect to the number of vehicles in the family. Non-urban vehicle use appears to be affected little by changes in either the number of drivers or vehicles in the household.

4.2 Commuting Trips

A very large percentage of the vehicles surveyed were used for daily commuting to and from work. The vast majority (65%) of cars are used every day for commuting. The full distribution of the responses is presented graphically in Figure 4.1. It is clear that the prime use of cars is commuting, with more than 80% of cars used on more than 50% of the working days for the commuting trip.

The information on distance to work and percentage of days the car was used for commuting was multiplied by 500 (250 working days x 2, i.e., to and from work) to estimate total annual commuting mileage.

This estimated total annual commuting mileage was then compared with the total annual mileage. The results are presented in Table 4.9.

While the percentages vary by city, there is definitely a higher percentage of total travel used for commuting in the large cities (approximately 35%) than in the medium cities (approximately 30%).

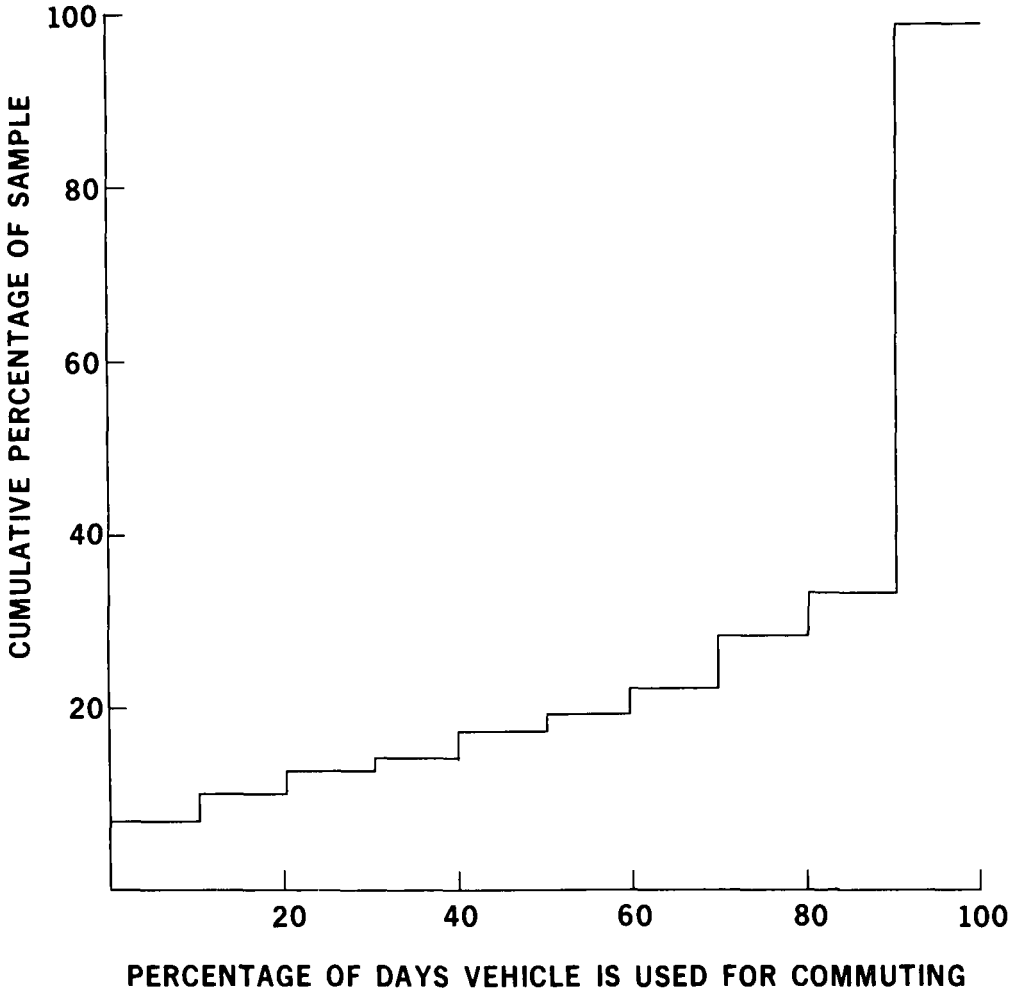

FIGURE 4.1 CUMULATIVE DISTRIBUTION OF THE PERCENTAGE OF DAYS THE VEHICLE IS USED FOR COMMUTING

TABLE 4.9 PERCENTAGE OF TOTAL MILES THAT IS FOR COMMUTING

City	%
Calgary	31
Edmonton	31
Montreal	35
Ottawa-Hull	27
Quebec	23*
Toronto	35
Vancouver	36

* Statistically weak

The survey results also indicated that the commuting car is used as a personal transport mode as 78% of the vehicles contain only the driver (see Table 4.10). If the commuting vehicle has more than two occupants it is a statistical rarity, as it accounts for less than 4% of the total vehicle population occupancy.

TABLE 4.10 COMMUTING VEHICLE OCCUPANCY DISTRIBUTION

Number of Occupants	Percentage of Vehicles	Cumulative %
1	77.9	77.9
2	17.0	94.8
3	2.9	97.7
4	1.4	99.1
5+	0.9	100.0

There is an obvious trade-off for the car user between distance from work and commuting time. The distribution for these two parameters is shown in Table 4.11 and 4.12. Both distributions appear highly concentrated (because of the "one-tailed" nature of the distribution, standard deviations are not an accurate statistical measure) about the means. It is of interest that as many cars travel less than 10 minutes for a one-way commuting trip as those travelling for more than 30 minutes. However, the most

TABLE 4.11 COMMUTING TIME (one way)

Time Interval (Min)	Percentage of Trips	Cumulative %
<10	22.0	22.0
11-20	42.0	64.1
21-30	23.5	87.6
31-40	6.4	93.9
41-50	4.0	98.0
51-60	1.3	99.3
61-70	0.2	99.5
71-80	0.1	99.6
81-90	0.2	99.8
91-100	0.1	99.9
101-110	0.0	99.9
111-120	0.1	100.0

TABLE 4.12 COMMUTING DISTANCE (one way)

	Percentage of Total Trips	
Distance (Miles)	Large Cities	Medium Cities
1-4	27.9	35.0
5-9	35.0	41.1
10-14	19.2	16.3
15-19	9.0	3.4
20-29	5.9	2.3
30+	3.0	1.1

important fact appears to be that the vast majority of cars travel 10 to 30 minutes. As most cars take more than 10 minutes for the drive train and emissions to stabilize, most of the work trip will occur with above-normal emission rates because of cold engine effects on emissions.

This distance to work is of less interest because emissions are less dependent on it than on the engine "on" time. The distribution for distance to work (Table 4.12) illustrates a broader spread about the mean and a significantly greater commuting distance in the larger cities. In all cities, however, the average commuting distance was less than 10 miles.

The average trip distance was related to household income to test for any strong income sensitivity. The observations from this analysis are as follows (Table 4.13):

While the distance to work increases initially with income, a reversal of this trend occurs above $25,000 in the large cities (Toronto, Montreal, Vancouver) and $15,000 in the medium cities (Quebec, Ottawa-Hull, Calgary, Edmonton);

The lowest average distance occurs in the highest-income group in the large cities and in the lowest-income group in the medium cities;

The overall significance of income is small as the range of variation of the means is low (1.8 miles in the large cities and 1.6 miles in the medium cities).

TABLE 4.13 RELATIONSHIP OF COMMUTING DISTANCE TO INCOME

Income Group	Average Commuting Distance (Miles)	
	Large Cities	Small Cities
<10 000	9.4	6.5
11-15 000	9.6	8.1
16-20 000	10.5	7.8
21-25 000	10.5	7.9
26-30 000	9.7	7.7
>30 000	8.7	7.7

While detailed explanation of these trends is not the purpose of this report, it would appear that increased income affords the possibility of a slightly better housing location with respect to place of work (e.g., living in the old established district near the business core of the city).

4.3 Business Use

The use of the vehicle for business was estimated as a percentage of the total annual mileage. Naturally, not all vehicles surveyed were used for business travel; however, a large percentage (44%) indicated some business use. Table 4.14 shows that of the vehicles reporting business use, almost half of the total mileage per year was for business. The largest recorded percentages for business miles were for the full-size cars (47%) and trucks/4-wheel drives (60%). When adjustment is made for the reporting frequency, the average percentage of business miles is 20% for all cars/trucks. Again, large cars and light trucks have the highest percentage of business use.

TABLE 4.14 PERCENTAGE OF TRAVEL FOR BUSINESS PURPOSES

Vehicle Size	Percentage Reporting Business Use	Percentage of Miles Reported as Business	Percentage of Miles Reported as Business for All Vehicles
Sub-Compact	42	43	18
Compact	39	44	17
Intermediate	43	43	19
Full-Size	46	47	22
Trucks/4-Wheel Drives	56	60	34
Total	44	46	20

5 VEHICLE PURCHASING CHARACTERISTICS

5.1 Vehicle Age at Time of Purchase

The age of the vehicle at time of purchase is of interest because of its connection to the possible state of emission control at time of registration transfer. This study found that for all the cities combined, 61% of all vehicles currently owned were bought new while the remaining 39% were bought used. This ratio varied among the cities as shown in Table 5.1.

TABLE 5.1 VEHICLE USE STATUS AT TIME OF PURCHASE

	Vehicle Use Status (% of Total)	
City	New	Used
Calgary	50	50
Edmonton	60	40
Montreal	67	33
Ottawa-Hull	70	30
Quebec	80	20
Toronto	70	30
Vancouver	58	42
All Cities	61	39

The age distribution at time of purchase for the used cars is highly skewed toward vehicles one to two years old as shown in Table 5.2. Over 60% of the used cars were under three years old according to these results. This statistic may have significant implications for emission control or safety programs which are keyed on inspection at change of ownership.

5.2 Odometer Reading at Time of Purchase

Of equal interest is the relative use the car had before the current owner purchased it. The cumulative distribution of odometer readings for the used vehicles at time of purchase is presented in Figure 5.1. In this figure, these used car values are compared with the entire sample odometer distribution. There appears to be a significant

TABLE 5.2 AGE OF USED VEHICLE WHEN PURCHASED

Years	Absolute Frequency	Relative Frequency (%)	Cumulative Frequency (%)
0	100	3.3	3.3
1	697	23.1	26.4
2	631	20.9	47.3
3	404	13.4	60.7
4	302	10.0	70.7
5	243	8.1	78.8
6	172	5.7	84.5
7	133	4.4	88.9
8	98	3.3	92.2
9	58	1.9	94.1
10	56	1.9	96.0
11	50	1.0	97.0
12	27	0.9	97.0
13	12	0.4	98.3
14	9	0.3	98.6
15	41	1.4	100.0
Total	3013	100.0	100.0

difference in the two distributions with the median mileage of the used cars being 800 miles less than that of the total population. This shifting is predictable because of the tendency of the consumer to buy the lowest-mileage vehicle possible and the occasional incidence of odometer tampering.

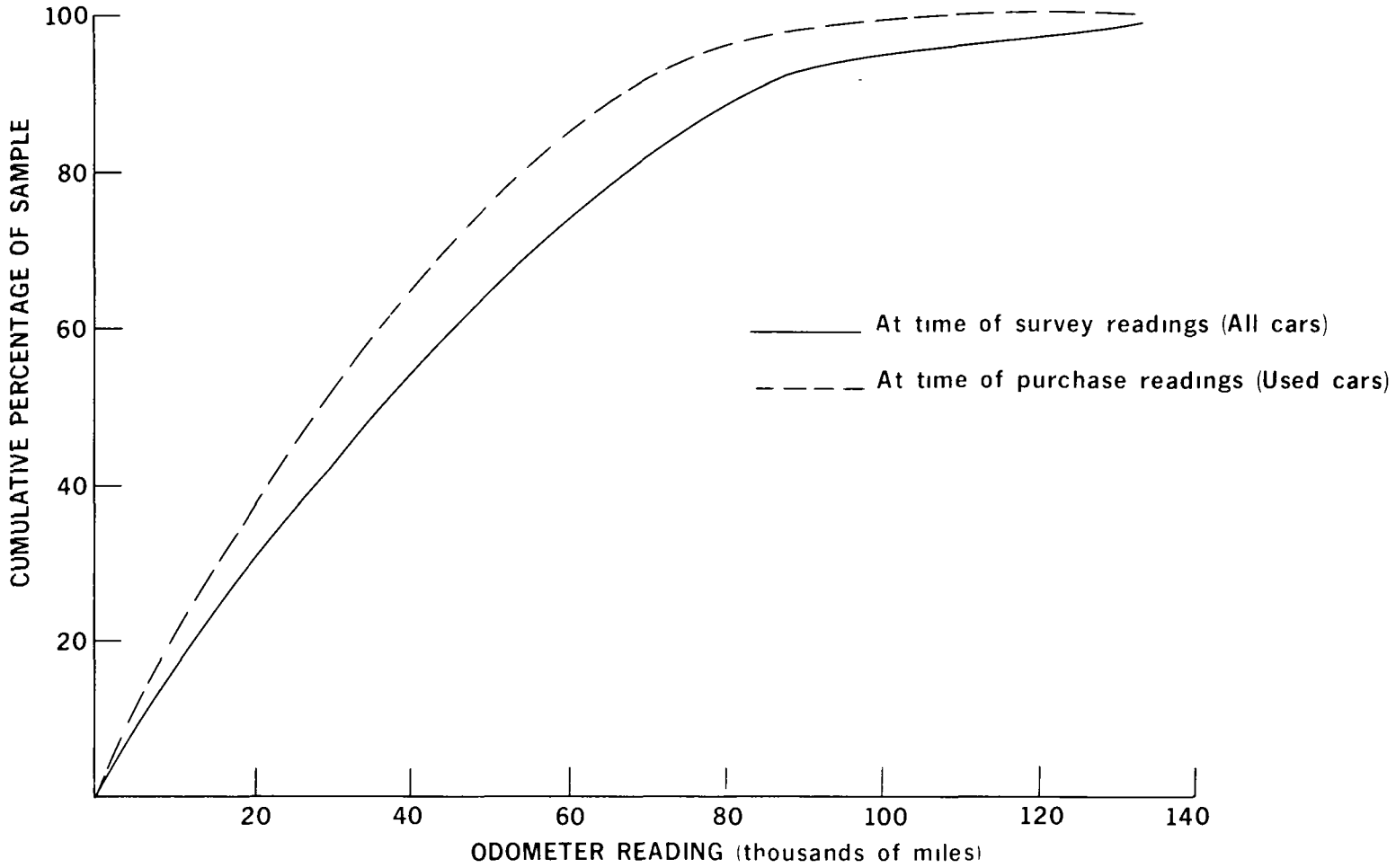

FIGURE 5 1 COMPARISON OF ODOMETER DISTRIBUTIONS FOR CURRENT READINGS AND READINGS AT TIME OF USED CAR PURCHASE

6 PARKING AT WORK

6.1 Parking Location

The survey asked the respondents to classify the parking facility used at work into one of four categories:

on street;
unheated lot;
lot with outlets;
heated lot.

The main reason for this question was to gain an appreciation of the ambient conditions in which the vehicles are stored during working hours*. The results presented in Table 6.1 show a difference in characteristics between the large, "warm" cities and the smaller, "cold" cities. While 6-13% of the vehicles are, or have the potential of, being heated in the large cities, this percentage increases to 38-40% in the medium cities.

TABLE 6.1 PARKING CATEGORY BY PLACE OF WORK, LARGE AND MEDIUM CITIES

	Large Cities*		Medium Cities**	
Parking Category	City Centre	Suburban	City Centre	Suburban
On Street	24.6%	15.5%	17.7%	19.8%
Unheated Lot	62.3	78.4	44.0	50.2
Lot with Outlets	3.6	4.4	27.3	37.4
Heated Lot	9.5	1.7	11.0	2.5
	100.0	100.0	100.0	100.0

* Montreal, Toronto, Vancouver

** Calgary, Edmonton, Ottawa-Hull, Quebec.

Surprisingly, there is a shift towards more on-street parking in the larger cities. This higher on-street parking incidence is somewhat counter-intuitive and may warrant further investigation.

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* The previous Canadian Automobile Driver Survey establishes estimates of the overnight parking characteristics.

6.2 Perceived Cost of Parking

Estimates of monthly parking charges directly incurred by the respondents were matched with the city size and parking location. The results are presented in Table 6.2. The distributions of costs are highly skewed with 62-68% of the downtown parkers and 81-88% of the suburban parkers perceiving no parking costs. Again, the results of the city-size comparison are counter-intuitive, with a higher percentage (7%) of the large-city parkers indicating no direct cost.

TABLE 6.2 PARKING COST AT PLACE OF WORK, LARGE AND MEDIUM CITIES

Parking Cost $ per Month	Large Cities*		Medium Cities**	
	City Centre	Suburban	City Centre	Suburban
No Cost	68.1%	88.3%	61.6%	80.6%
1-5	3.7	6.7	9.5	14.0
6-10	5.0	1.6	7.6	2.5
11-15	5.4	1.0	5.2	1.5
16-20	4.2	1.2	6.4	0.3
21-25	3.4	0.5	4.3	0.1
26-30	3.0	0.3	1.9	0.6
31-35	1.6	0.2	3.5	0.4
36+	0.0	0.2	0.0	0.0
	100.0	100.0	100.0	100.0

* Montreal, Toronto, Vancouver

** Calgary, Edmonton, Ottawa-Hull, Quebec

The picture portrayed of parking costs by the survey seems to indicate that there is a very low economic penalty associated with the current use of parking at work. The cost distributions would seem to imply a proportional response of vehicle use to parking charges, as very few commuters use their cars when they have to pay for parking at work.

7 VEHICLE FUEL CONSUMPTION

7.1 City Fuel Economy Estimates

The respondents were asked to estimate, for each vehicle owned, the average fuel economy achieved for both city and highway driving. Figures 7.1 and 7.2 were developed to show the influence vehicle size and model year have on perceived fuel economy. The graph clearly indicates the negative effect vehicle weight (as indicated by size class) has on both city and highway fuel economies.

Although the fuel economy for any one size class has remained relatively stable, there has been an average decrease in fuel economy over the time span for all car sizes but compacts. The results of linear regression analysis of the data are presented in Table 7.1. The analysis indicates that the highest rates of change (decrease) have occurred in the intermediate and full-size cars, which lost approximately 0.3 miles per gallon per year over the 10-year spread in model years. Sub-compacts, on the other hand, show only half the rate of decline and compacts actually gained 0.12 to 0.16 miles per gallon in the 10 years. The reason for the increasing fuel economy of compacts may be that European cars accounted for a greater share of the compact market in the late 1960s and early 1970s.

TABLE 7.1 AVERAGE ANNUAL CHANGE IN FUEL ECONOMY

Size Class	Average Annual Change* (miles/gal)	
	City	Highway
Sub-Compact	-0.13	-0.06
Compact	+0.12	+0.16
Intermediate	-0.32	-0.31
Full-Size	-0.28	-0.26
Trucks/4-Wheel Drives	-0.27	-0.25

* Average for model years 1965-1974.

No statistically significant differences were found between fuel economy estimates by size and age for various cities in the survey. However, differences were found between North American and off-shore products. The data for these two groups are

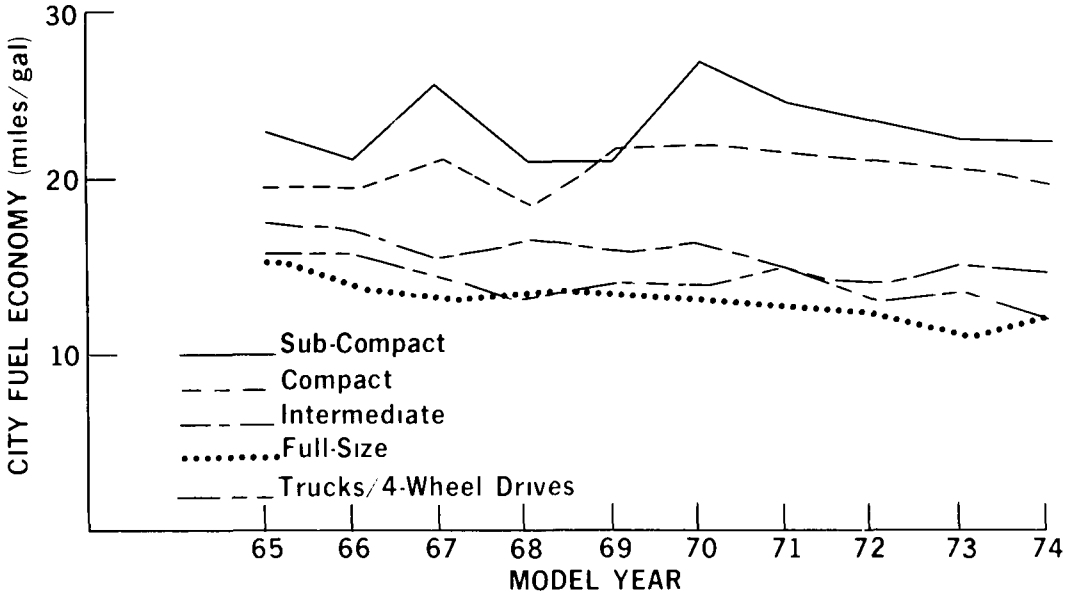

FIGURE 7 1 INFLUENCE OF MODEL YEAR ON CITY FUEL ECONOMY

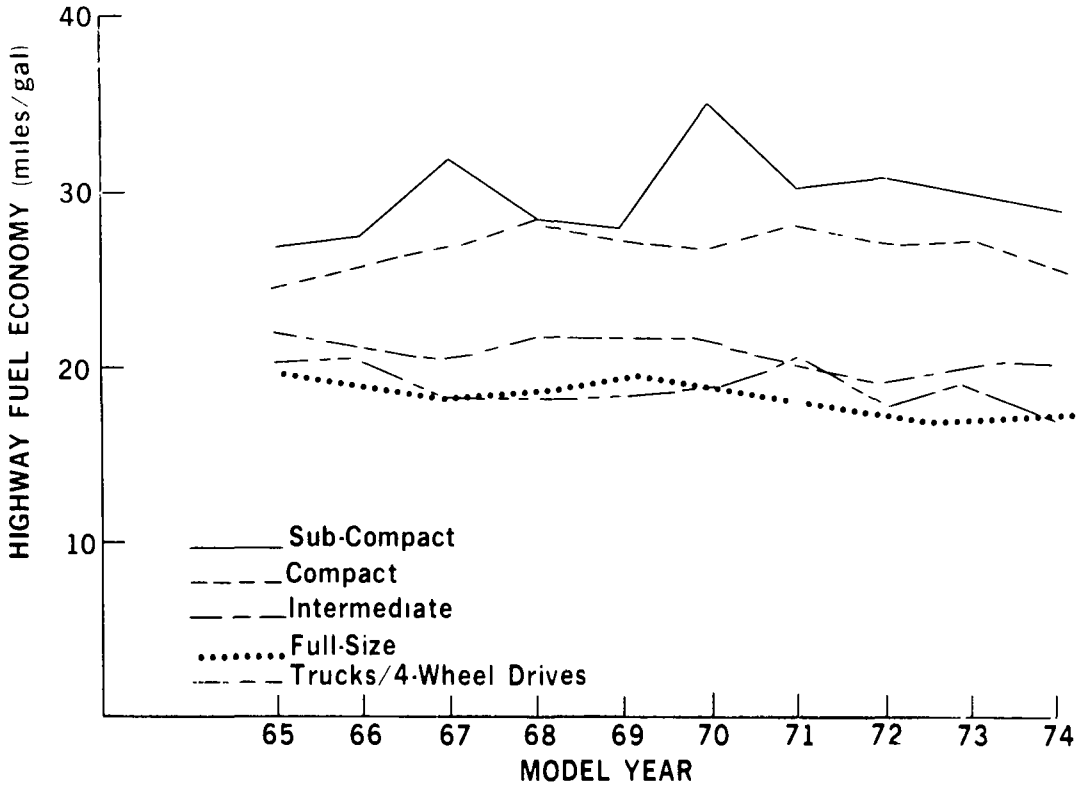

FIGURE 7.2 INFLUENCE OF MODEL YEAR ON HIGHWAY FUEL ECONOMY

presented in Table 7.2 by size and age. The estimated fuel economies of off-shore vehicles, for city and highway driving, were an average 35% and 32% higher than those of North American vehicles. These large differences may be due to any or all of the following factors:

off-shore vehicles are generally lighter than their North American counterparts;

off-shore vehicles have a higher installation rate of standard (more efficient) transmissions;

North American vehicles have slightly higher engine displacements and lower compression ratios.

TABLE 7.2 EFFECT OF ORIGIN OF VEHICLE ON FUEL ECONOMY

Model Year	City Fuel Economy (miles/gal)				Highway Fuel Economy (miles/gal)			
	Sub-Compact		Compact		Sub-Compact		Compact	
	NA	Off-shore	NA	Off-shore	NA	Off-shore	NA	Off-shore
1974	19	25	18	24	24	32	23	30
1973	20	24	17	22	26	31	22	29
1972	18	24	17	24	23	31	22	29
1971	18	25	18	24	23	32	23	30
<1970	17	26	17	24	23	33	22	29

The data could not be analyzed to determine how much of the difference could be explained by the above factors; however, it is probable that essentially all of the difference will be accounted for by them.

7.2 Type of Fuel Used

Estimates of the percentage of vehicles using the various grades of fuel were developed and presented in Table 7.3. A clear trend is revealed for the greater use of unleaded gasoline for the more recent models, particularly the intermediate and full-size vehicles. For the 1975 vehicles unleaded gasoline accounted for 50% of the fuel use for the large cars and an average of 22% for the smaller cars. This differential between vehicle sizes is eliminated for the 1973 and older vehicles.

TABLE 7.3 FUEL TYPE NORMALLY USED BY SIZE AND MODEL YEAR OF VEHICLE

	Sub-Compact			Compact			Intermediate			Full-Size			Trucks/4-Wheel Drives		
Model Year	Reg.	Prem.	Unl.	Reg.	Prem.	Unl.	Reg.	Prem.	Unl.	Reg.	Prem.	Unl.	Reg.	Prem.	Unl.
1975	67*	7	26	73	9	18	43	7	50	42	7	51	70	7	23
1974	78	12	10	72	16	12	72	11	17	68	16	16	84	10	6
1973	66	26	8	75	21	4	76	12	12	79	11	10	79	17	4
1972	54	41	5	62	33	5	71	23	6	77	18	5	86	14	0
1971	58	40	2	57	42	1	72	26	2	70	27	3	74	26	0
<1970	66	34	0	75	25	0	69	31	0	60	40	0	80	20	0
ALL	65	30	5	70	26	4	70	23	7	65	30	5	80	17	3

* Percentage of model year market by size class.

In the 1970 and older cars, regular-grade gasoline accounts for approximately 60% of fuel sales. For the model years 1971-74, the smaller cars use a somewhat higher percentage of premium gasoline because of the influence of European and Japanese small-displacement engines. Trucks use a higher percentage of regular gasoline which again is related to design characteristics.

8 VEHICLE SERVICING

8.1 Choice of Servicing Agent

For the purposes of this survey, the vehicle servicing market was divided into five groups:

dealer;
independent garage;
gasoline station;
independent mechanic;
do-it-yourself.

The choice of where servicing is done is a function of the vehicle use (or age) and household income, with the former apparently the most significant explanatory variable. The relationship of servicing location to odometer reading is presented graphically in Figures 8.1 and 8.2, which indicate a difference between the North American and off-shore makes. This difference is presumably due to the greater availability of alternative service locations for North American vehicles.

Both figures show what appears to be a rapid decrease in the percentage of servicing done by dealers. The lost dealer market is shifting primarily to independent garages and gasoline stations. This shift could be influenced by the following parameters:

labour rates;
service credibility;
location accessibility;
cost of parts;
service availability.

As vehicles become older and are transferred down the income ladder, more and more of the service work is "do-it-yourself".

In the high-mileage vehicles this component accounts for 40% of the North American service market and 30% of the off-shore market.

8.2 Cost of Vehicle Servicing

The survey respondents were asked to estimate their annual vehicle servicing costs in the following categories:

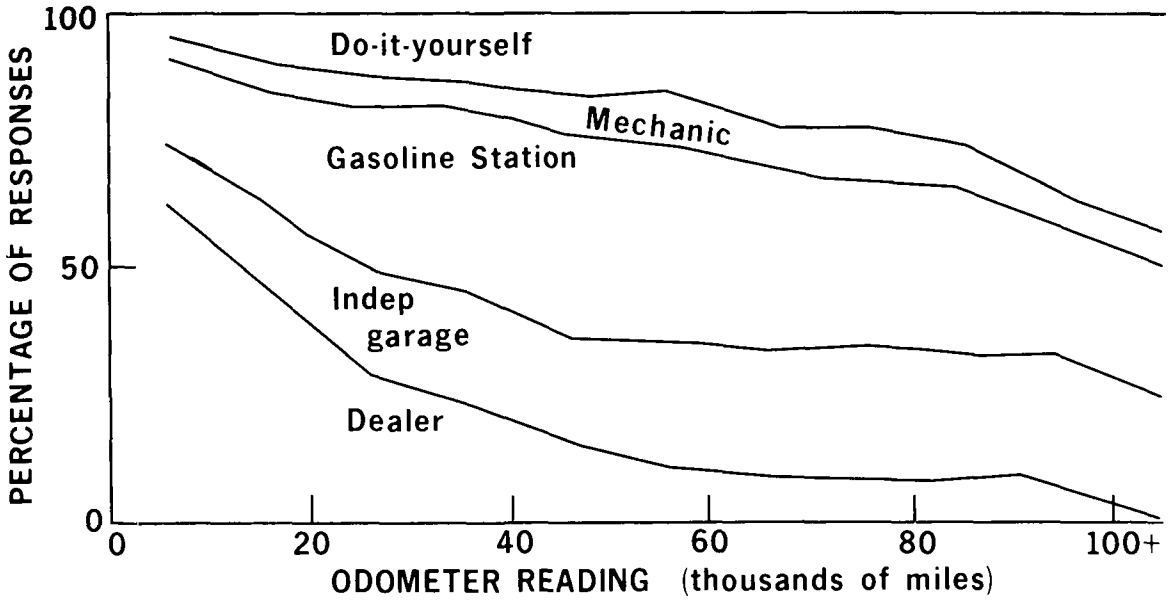

FIGURE 8.1 NORTH AMERICAN VEHICLES REPAIR LOCATION AS A FUNCTION OF ODOMETER READING

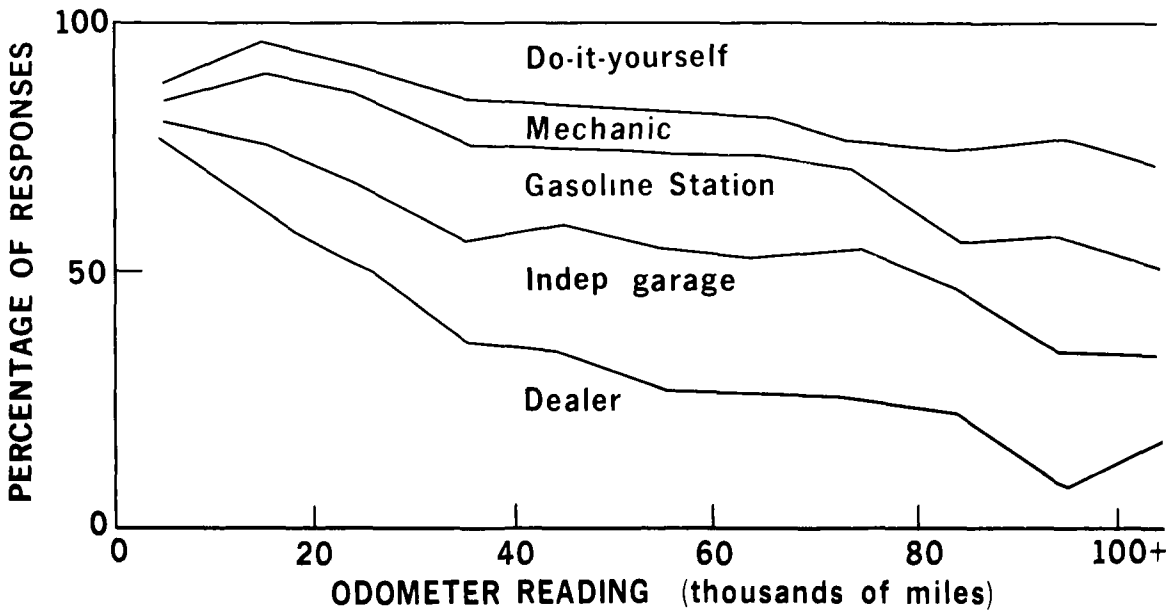

FIGURE 8.2 OFF-SHORE VEHICLES REPAIR LOCATION AS A FUNCTION OF ODOMETER READING

total;
engine;
exhaust;
repairs due to accidents.

The data were analyzed on the basis of age, make (North American/off-shore) and size of vehicle. The results are presented in Tables 8.1 and 8.2. It is evident that the annual servicing cost increases with the size and age of the vehicle. The increase in cost with age is non-uniform and peaks between the fifth and seventh year of operation. The decline after this time may be due to a decrease in the level of vehicle maintenance or the shift to lower labour cost (do-it-yourself) servicing.

8.3 Annual Repair Costs Due to Accidents

The survey solicited estimates of the repair costs incurred during the previous year as the result of accidents. Of all the surveyed vehicles 13.6% provided estimates of costs. Thus, this is an estimate of the total percentage of vehicles involved in accidents in 1974. This is consistent with Transport Canada* estimates which indicate that 9.2% of all passenger cars were involved in reportable accidents of $200 or more in 1974. The results from this survey should be higher because any accident, regardless of cost, should have been recorded.

The annual vehicle costs incurred by these accidents are presented in Table 8.3. There is a significant difference between the reported costs for North American ($444) and off-shore ($521) vehicles. When these values are adjusted and averaged across all vehicles, the average annual costs were $55 for North American and $93 for off-shore vehicles, a difference of 69%. In addition, there appears to be some correlation of vehicle size to cost although this trend is not entirely consistent. While the imports indicate a consistent increase as vehicle size increases, the North American vehicles show the highest cost for sub-compact cars, with the other sizes equal in cost. Trucks apparently incur much lower accident costs, in the order of 50% of the passenger car value.

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*Estimates obtained from Transport Canada, Road and Motor Vehicle Safety Branch.

TABLE 8.1 ANNUAL COST OF VEHICLE SERVICING BY VEHICLE SIZE AND TYPE OF SERVICE

Size of Vehicle	North American Vehicles			Off-shore Vehicles		
	Total Cost R & M*	Engine R & M	Exhaust R & M	Total Cost R & M	Engine R & M	Exhaust R & M
Sub-Compact	195.91	133.28	57.90	246.40	162.02	54.78
Compact	246.79	132.28	59.14	297.95	170.18	64.14
Intermediate	277.89	152.20	64.62	319.64	197.76	75.75
Full-Size	332.06	157.52	65.92			
Trucks/4-Wheel Drives	388.65	188.38	68.25	186.72	149.92	50.92
Average	300.34	152.99	64.48	274.32	169.62	64.15

* Repairs and Maintenance

TABLE 8.2 INFLUENCE OF VEHICLE AGE AND SIZE ON TOTAL SERVICING COSTS

Age of Vehicle	North American Vehicles					Off-shore Vehicles			
	Sub-Compact	Compact	Intermediate	Full-Size	Trucks/ 4-Wheel Drives	Sub-Compact	Compact	Intermediate/ Full-Size	Trucks/ 4-Wheel Drives
1 year	150.18	196.00	158.84	250.71	233.51	204.01	346.14	248.76	106.25
2 year	127.97	319.34	236.94	302.72	417.20	235.86	275.95	241.33	104.26
3 year	243.33	213.32	271.41	350.22	349.67	266.19	253.28	301.35	116.40
4 year	183.09	276.07	336.05	313.67	365.75	282.51	419.03	352.47	304.56
5 year	244.00	236.53	309.98	362.15	490.75	279.18	293.60	323.06	300.43
6 year	270.78	275.55	347.92	361.21	316.86	247.64	274.65	503.57	576.80
7 year	225.71	272.55	316.98	393.46	530.81	221.14	328.88	367.08	103.20
8 year	358.00	237.51	337.51	330.30	920.14	211.60	231.24	310.42	135.00
9 year	258.33	287.03	249.38	396.66	255.00	375.38	201.94	132.50	320.00
10 or over	312.20	184.75	237.04	334.57	332.93	132.44	139.48	250.94	268.86
Average	195.91	246.79	277.89	332.06	388.65	246.40	297.95	319.64	186.72

TABLE 8.3 ANNUAL REPAIR COSTS DUE TO ACCIDENTS

Vehicle Size	North American Vehicles			Off-shore Vehicles		
	% Reporting Accidents	Average Repair Cost	Population Avg Accident Cost	% Reporting Accidents	Average Repair Cost	Population Avg Accident Cost
		$	$			
Sub-Compact	15.0	499	75	19.8	430	85
Compact	14.0	399	56	16.4	600	98
Intermediate	13.5	400	54			
Full-Size	11.2	498	56			
Trucks/4-Wheel Drives	7.5	375	28	21.4	172	37
Average	12.3	444	55	17.8	521	93

REFERENCES

1. Environment Canada, Canadian Automobile Driver Survey, EPS 3-AP-73-10, Ottawa, 1973.

2. Environment Canada, Canadian Taxi Survey, EPS 3-AP-74-4, Ottawa, 1974.

3. Environment Canada, Canadian Urban Trucking Study, EPS 3-AP-74-7, Ottawa, 1974.

APPENDIX A

SURVEY QUESTIONNAIRE

Environment Canada Environnement Canada

CANADIAN VEHICLE SURVEY
(PART IV – PERSONAL VEHICLES IN URBAN AREAS)

DEAR VEHICLE OWNER,

THIS QUESTIONNAIRE IS PART OF A CONTINUING SERIES DESIGNED TO PROVIDE INFORMATION ON THE OWNERSHIP AND OPERATION OF MOTOR VEHICLES IN CANADA. YOUR ASSISTANCE WOULD BE APPRECIATED IN SUPPLYING INFORMATION SO THAT A GREATER UNDERSTANDING OF THE ROLE OF THE MOTOR VEHICLE IN THE CANADIAN ENVIRONMENT MAY BE ESTABLISHED

PLEASE ANSWER BY FILLING IN THE BOXES [0][0][0] OR CHECKING THE APPROPRIATE CIRCLE ✓

INFORMATION SHOULD INDICATE THE OPERATION OF PRESENTLY OWNED VEHICLE(S)

INFORMATION ABOUT THE HOUSEHOLD

1 IN WHICH CITY DID YOU RESIDE AS OF JULY 1, 1974?
TORONTO ○ 1 MONTREAL ○ 2 VANCOUVER ○ 3 EDMONTON ○ 4 CALGARY ○ 5 OTTAWA HULL ○ 6
QUEBEC CITY ○ 7 NONE OF THE ABOVE ○ 8

2 HOW MANY LICENSED DRIVERS ARE THERE IN THE HOUSEHOLD? [ ][ ]

3 HOW MANY VEHICLES (AUTOS LIGHT TRUCKS VANS MOTORCYCLES MOTOR HOMES) ARE THERE IN THE HOUSEHOLD? [ ][ ]
(EXCLUDE SNOWMOBILES)

4 WHAT WAS THE TOTAL HOUSEHOLD INCOME IN 1974? $ [ ][ ][ ] 000

NOTE IF MORE THAN TWO VEHICLES ANSWER FOR MOST USED TWO

INFORMATION ON THE VEHICLE(S) OPERATION		VEHICLE 1	VEHICLE 2
5 AGE OF PRINCIPAL DRIVER		[ ][ ]	[ ][ ]
6 SEX OF PRINCIPAL DRIVER	MALE	○ 1	○ 1
	FEMALE	○ 2	○ 2
7 YEAR OF MANUFACTURE		19[ ][ ]	19[ ][ ]
8 NUMBER OF CYLINDERS (IF ROTARY INDICATE ZERO)		[ ]	[ ]
9 WHAT TYPE OF VEHICLE IS IT?	SUB COMPACT	○ 1	○ 1
	COMPACT	○ 2	○ 2
	INTERMEDIATE	○ 3	○ 3
	FULL SIZE	○ 4	○ 4
	LIGHT TRUCK OR VAN	○ 5	○ 5
	4-WHEEL DRIVE	○ 6	○ 6
	MOTORCYCLE	○ 7	○ 7
	MOTOR HOME	○ 8	○ 8
10 MAKE OF VEHICLE	NORTH AMERICAN	○ 1	○ 1
	EUROPEAN	○ 2	○ 2
	JAPANESE	○ 3	○ 3
11 WHAT TYPE OF FUEL DO YOU NORMALLY USE?	REGULAR GAS	○ 1	○ 1
	PREMIUM GAS	○ 2	○ 2
	LEAD FREE GAS	○ 3	○ 3
	DIESEL FUEL	○ 4	○ 4
12 WAS THIS A USED VEHICLE WHEN PURCHASED?	YES	○ 1	○ 1
	NO	○ 2	○ 2
IF YES, HOW OLD WAS IT WHEN PURCHASED?		[ ][ ] YEARS	[ ][ ] YEARS
TO THE NEAREST 500 MILES, HOW MANY MILES WERE ON THE VEHICLE?		[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]

OVER

INFORMATION ON THE VEHICLE(S) OPERATION		VEHICLE 1	VEHICLE 2
13 TO THE NEAREST 500 MILES HOW MANY MILES WERE TRAVELLED BY THE VEHICLE IN 1974?			
14 HOW MANY OF THESE MILES WERE OUTSIDE YOUR URBAN AREA? (VACATION INTERCITY TRIP, ETC)			
15 WHAT IS THE TOTAL MILEAGE ON THIS VEHICLE?			
16 WHAT IS THE VEHICLE S FUEL ECONOMY (MILES PER GALLON) ?	HIGHWAY		
	CITY		
17 WHAT WERE THE REPAIR AND MAINTENANCE COSTS FOR THE VEHICLE IN 1974 (EXCLUDE COSTS INCURRED BY ACCIDENTS)?			
	TOTAL	$	$
	ENGINE	$	$
	EXHAUST	$	$
18 WHAT WERE THE REPAIR COSTS DUE TO ACCIDENTS IN 1974?		$	$
19 WHERE DO YOU PRESENTLY HAVE THE ENGINE TUNED UP ?	DEALER	○ 1	○ 1
	INDEPENDENT GARAGE	○ 2	○ 2
	GAS STATION	○ 3	○ 3
	INDEPENDENT MECHANIC	○ 4	○ 4
	DO IT YOURSELF	○ 5	○ 5
20 WHERE IS THE PRINCIPAL DRIVER S PLACE OF EMPLOYMENT?	CENTER CITY	○ 1	○ 1
	SUBURBAN	○ 2	○ 2
	RURAL	○ 3	○ 3
	WORK OUT OF HOME	○ 4	○ 4
	RETIRED/UNEMPLOYED	○ 5	○ 5
21 WHAT PERCENTAGE OF THE VEHICLE S MILEAGE IS FOR BUSINESS PURPOSES? (EXCLUDE COMMUTING)		%	%
22 OUT OF 100 WORKING DAYS HOW MANY DAYS IS THIS VEHICLE USED FOR COMMUTING TO A PLACE OF EMPLOYMENT?			
23 HOW MANY PASSENGERS (INCLUDE DRIVER) ARE USUALLY IN THE COMMUTING VEHICLE?			
24 WHAT IS THE TOTAL COMMUTING TRIP LENGTH (ONE WAY)?		MILES	MILES
25 WHAT PERCENTAGE OF THE COMMUTING DISTANCE IS TRAVELLED ON THE FOLLOWING TRANSPORT MODES?	PRIVATE VEHICLE	%	%
	PUBLIC TRANSIT	%	%
	WALKING OR BICYCLE	%	%
26 NORMALLY, WHAT IS THE TOTAL COMMUTING TIME? (ONE WAY)		MINUTES	MINUTES
27 AT WORK, HOW IS THE VEHICLE PARKED?	ON THE STREET	○ 1	○ 1
	IN AN UNHEATED LOT/GARAGE	○ 2	○ 2
	IN AN UNHEATED LOT/GARAGE WITH ELECTRICAL OUTLETS	○ 3	○ 3
	IN A HEATED LOT/GARAGE	○ 4	○ 4
28 AT WORK, WHAT ARE YOU CHARGED FOR PARKING PER MONTH? (DOLLARS)		$	$

THANK YOU FOR YOUR TIME AND EFFORT IN ANSWERING THIS QUESTIONNAIRE FOR FURTHER INFORMATION ON THIS AND OTHER SURVEYS WRITE TO

MOBILE SOURCES DIVISION
AIR POLLUTION CONTROL DIRECTORATE
ENVIRONMENT CANADA
OTTAWA ONTARIO
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