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Canadian Vehicle Survey

Summary Report





May 2007

Canada

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Introduction

Since the fourth quarter of 1999, Statistics Canada has collected data on transportation activities in Canada through the *Canadian Vehicle Survey* (CVS). Prior to the CVS, there was no accurate estimate based on traffic data for the number of vehicle-kilometres (vehicle-km) and passenger-kilometres (passenger-km) travelled in Canada's road transportation sector. To address this issue, Transport Canada requested that Statistics Canada develop the CVS.

Since 2004, Natural Resources Canada (NRCan) has co-sponsored the CVS. Additional funding from this Department has enabled Statistics Canada to increase the sample size of the CVS and expand its scope to include a *fuel* component. Before this component was added to the CVS, fuel consumption in the road transportation sector was estimated based on data in the *Report on Energy Supply-Demand in Canada*.[1] The advantage of the CVS is that it provides estimates of fuel consumption using data on fuel purchases and on-road vehicle use. Through its support to the CVS, NRCan has access to data not only on fuel consumption, but also on the number of vehicles and distance travelled.

Report on Energy Supply-Demand in Canada

The *Report on Energy Supply-Demand in Canada* (RESD), produced annually by Statistics Canada, presents an energy balance sheet for the country and provides data on production, trade, interprovincial movements, conversion and energy consumption by sector. It should be noted that fuel consumption estimates appearing in this report are based on CVS data, and therefore differ from the estimates for the transportation sector in the RESD. The definitions are also different (for example, the RESD does not focus solely on road transportation in the transportation sector), and the estimates are produced using two very different methodologies. The information in the RESD is based mainly on annual surveys of energy availability (information on energy sales and distribution reported by suppliers) and various other data sources. The RESD compiles data from more than 13 different sources and provides estimates on energy supply and demand in Canada using detailed supply and distribution models. The CVS collects information directly from a sample of users (drivers) and provides an estimate of fuel consumption based on the data reported.

[1] For more information on the *Report on Energy Supply-Demand in Canada*, please visit www.statcan.ca/bsolc/english/bsolc?catno=57-003-XIB.

The purpose of this report on the CVS is to highlight the energy consumption of Canada's on-road vehicle fleet. The report examines the composition of this fleet, the main characteristics of vehicles in Canada, and their use. Certain behavioural characteristics of Canadian drivers are also presented.

The data will also enable NRCan to develop and refine its programs encouraging Canadians to make energy-efficient choices and reduce greenhouse gas (GHG) emissions.

These programs target personal, commercial and federal vehicle use, vehicle efficiency, and the promotion of alternative fuels and cleaner conventional fuels. For more information on these programs as well as the tools, financial incentives, free publications and other resources to help you conserve energy and reduce GHG emissions, visit the Web site of NRCan's Office of Energy Efficiency (OEE) at oee.nrcan.gc.ca.

Energy Use Data Handbook

The OEE at NRCan publishes the annual *Energy Use Data Handbook* (the Handbook), offering information on the composition, use and fuel consumption of Canada's road vehicle fleet. Information in the Handbook may differ from CVS estimates since it complements the CVS by drawing from other databases to evaluate trends in energy consumption in the Canadian economy.

For more information on the Handbook, consult the most recent edition, *Energy Use Data Handbook, 1990 and 1998 to 2004*, published in August 2006.

For more information on this publication or the OEE's services, please visit the Web site at oee.nrcan.gc.ca. You can also contact the OEE by e-mail at euc-cec@nrcan.gc.ca or by writing to:

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This report was prepared by Simon Vallières of the Demand Policy and Analysis Division of the OEE.[2]

[2] Indrani Hulan supervised the project and David McNabb was project leader. Jean-François Bilodeau and Linda Yuen helped NRCan to secure access to CVS data.

Obtaining CVS Data

Statistics Canada prepares the CVS using registration files from the Canadian Council of Motor Transport Administrators (CCMTA).* These data are held by the provincial and territorial governments, and their distribution is regulated under the privacy legislation in effect in each jurisdiction. Provincial and territorial government approval is required for access to CVS data and registration data.

In 2005, NRCan received permission to obtain anonymous information from Statistics Canada regarding the Canadian fleet of light and heavy vehicles. This information is organized by province and territory using the first three characters in the postal code or the forward sortation area code, and by maximum gross vehicle weight, fuel type and model year. This sorting is done for each year for which data are available.

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* The CCMTA is a non-profit organization comprising representatives of the provincial, territorial and federal governments of Canada who, through a collective consultative process, make decisions on administration and operational matters dealing with licensing, registration and control of motor vehicle transportation and highway safety. For more information on the CCMTA, please visit the organization's Web site at www.ccmta.ca/english/index.cfm.

Highlights

The following estimates are based on 2005 data from the Canadian Vehicle Survey (CVS):

- Approximately 18 million light vehicles, 320,500 medium trucks and 295,000 heavy trucks were in scope for the CVS, totalling about 18.6 million vehicles on Canadian roads.
- These vehicles travelled approximately 315.3 billion vehicle-km and 525.7 billion passenger-km in 2005, representing increases of about 2 percent and 10 percent, respectively, over data for the year 2000.
- On-road vehicles in Canada consumed approximately 29.5 billion litres of gasoline and 10 billion litres of diesel.
- Average gasoline consumption rates for light vehicles and medium trucks were 10.6 litres per 100 kilometres (L/100 km) and 26.5 L/100 km, respectively. Diesel consumption rates for medium and heavy trucks were 26.6 L/100 km and 35.1 L/100 km, respectively.
- A quarterly analysis shows that vehicle fuel efficiency seems to improve during the warmest months of the year. The major increase in gasoline prices late in the summer of 2005 appears to coincide with a change in driving habits and fuel consumption, even though fluctuations in fuel prices usually have very little short-term influence over drivers. However, since fuel consumption data are available for only eight consecutive quarters and since some data limitations exist, it is not currently possible to show a definite relationship between price increases at the pump and a change in driving habits, using CVS data.
- The number of light trucks in the light vehicle fleet seems to have increased since 2000.
- CVS data indicate that fuel consumption in L/100 km for light trucks is higher than for passenger cars.
- Despite the fact that "newer vehicles tend to be more fuel efficient than older models,"[3] CVS estimates show relatively little impact of vehicle age on gas consumption in L/100 km for light vehicles. However, vehicle age appears to affect the rate of diesel consumption among heavy vehicles.
- According to the CVS, the configuration of heavy vehicles and their type of activity could affect diesel consumption rates. In the latter case, a heavy truck involved in for-hire trucking consumes about 34.0 L/100 km, compared with 37.3 L/100 km in the case of private trucking. Owner-operators also get better fuel efficiency from their vehicles and have diesel consumption rates of 35.8 L/100 km.
- The CVS also shows that fuel consumption in L/100 km is better during highway driving for all types of vehicles. Similarly, vehicles are more fuel efficient during long-distance trips.
- The driver's age and gender does not seem to affect the fuel efficiency of gas-powered vehicles.

[3] OEE, oee.nrcan.gc.ca/transportation/personal/buying/vehicle-selection-tips.cfm.

Considerations When Analysing CVS Results

The *Canadian Vehicle Survey* is not a census. Despite Statistics Canada's efforts to maintain high standards of quality at all stages of the process, the estimates in this survey, as in all surveys, are inevitably prone to some degree of error.

Indicators are used to identify the quality of the estimates presented in this report. While the quality of CVS data is generally good, caution should be exercised when analysing the information. Readers should also bear in mind that the true value is likely within a confidence interval of the survey estimate.

Please refer to Annex A for information on the sources of errors affecting estimate quality and considerations for data analysis.

1 A Description of Canada's On-Road Vehicle Fleet

Canada's transportation sector includes activities related to transporting passengers and goods by road, rail, water and air. In 2004, this sector's energy consumption accounted for 29 percent of total secondary energy use in Canada.[4] Road transportation, the subject of the CVS, consumes more than three-quarters of this energy. Total greenhouse gas (GHG) emissions in the transportation sector – about 175 megatonnes of carbon dioxide equivalent emissions – accounted for 35 percent of the country's GHG emissions. Of all the end-use sectors, the transportation sector emits the most GHGs in Canada.[5]

The following section describes Canada's on-road vehicle fleet, its use and its energy consumption according to CVS data.

1.1 Number of vehicles

In 2005, the number of in-scope vehicles in the CVS totalled 18,608,297.[6] As shown in Table 1.1, this figure can be divided into two categories: light vehicles and heavy vehicles, the latter including medium and heavy trucks. Please note that in this report and for analysis purposes, we refer to the following three categories:

- light vehicles with a gross vehicle weight below 4.5 tonnes;
- medium trucks with a gross vehicle weight of 4.5 tonnes or more but less than 15 tonnes; and
- heavy trucks with a gross vehicle weight of 15 tonnes or more.

Table 1.1

Number of vehicles in Canada between 2000 and 2005, by vehicle type

Year	Light Vehicles		Medium Trucks		Heavy Trucks		Total	
2000	16,642,140	A	319,500	A	255,503	A	**17,217,143**	**A**
2001	16,790,536	A	330,043	A	253,648	A	**17,374,227**	**A**
2002	17,299,423	A	315,424	A	268,411	A	**17,883,258**	**A**
2003	17,547,499	A	321,878	A	278,848	A	**18,148,225**	**A**
2004	17,732,814	A	324,525	B	277,265	B	**18,334,605**	**A**
2005	17,993,468	A	320,635	B	294,193	B	**18,608,297**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

[4] Secondary energy use refers to the energy Canadians use to heat and cool their homes and workplaces, and to operate household appliances, vehicles and factories (OEE, *Energy Use Data Handbook, 1990 and 1998 to 2004*, August 2006).

[5] OEE, *Energy Use Data Handbook, 1990 and 1998 to 2004*, August 2006.

[6] See the glossary in Annex C for a definition of the number of in-scope vehicles in the CVS.

The light vehicle category is the largest, representing more than 95 percent of Canada's on-road vehicle fleet. Since 2000, the total number of vehicles seems to have increased; and of all vehicle categories, the heavy truck category has seen the biggest increase.

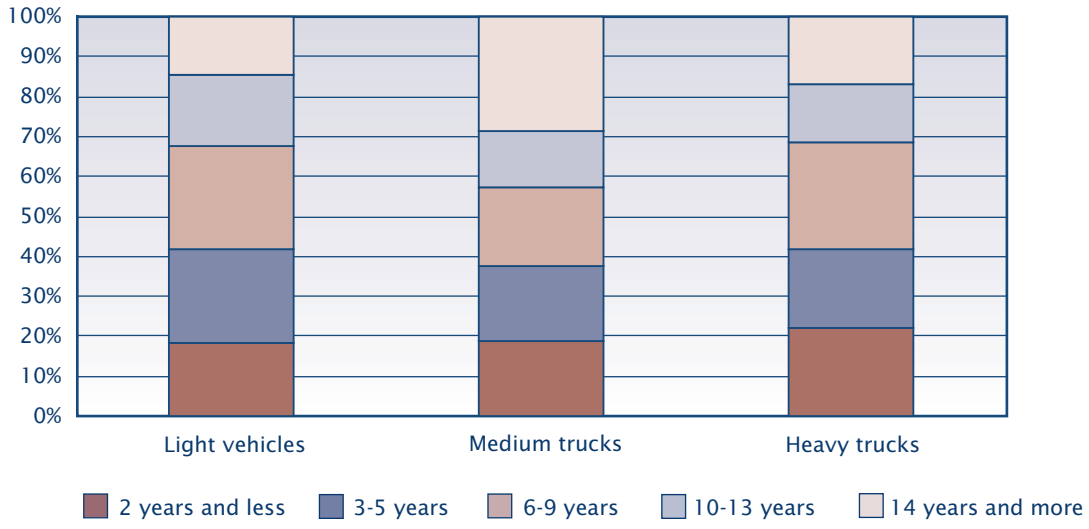
1.2 Principal characteristics of vehicles

The age of Canada's on-road vehicle fleet is an important issue for a variety of reasons. A vehicle's age, for example, is an important variable in analysing its use. As the OEE Web site states, "Newer vehicles tend to be more fuel efficient than older models."[7]

Figure 1.1 shows the distribution of in-scope vehicles in the CVS based on age. Note that light vehicles and heavy trucks exhibit similar characteristics. The average age of light vehicles and heavy trucks in Canada is 7.6 years, while the average age of medium trucks is 9.7 years. Medium trucks are the oldest vehicles, with more than 40 percent of the fleet being over 10 years old.

Figure 1.1

Age of Vehicle Fleet, 2005



[7] OEE, oee.nrcan.gc.ca/transportation/personal/buying/vehicle-selection-tips.cfm.

Another important factor is the type of fuel used in vehicles. In 2005, gasoline and diesel remained the two most frequently used fuels in the country. According to CVS estimates, more than 99 percent of vehicles used one of these fuels. In CVS estimates, "gasoline" includes three varieties of this fuel as well as gasoline-ethanol blends. These blends are interesting as they are suitable for most vehicles and available in more than 1,000 service stations in Canada. The other fuels used by Canadians and included in the CVS are propane, natural gas and ethanol. These alternative fuels offer several economic and environmental benefits. For example, they burn more cleanly and completely than gasoline and diesel, and produce fewer air pollutants and GHGs.[8]
Table 1.2 shows CVS estimates for the number of vehicles in Canada in 2005, according to fuel type. Note that gasoline dominates the light vehicle category, with 97 percent of vehicles using this fuel. Diesel is the primary fuel for heavy trucks. About two-thirds of vehicles in the medium truck category use diesel, while the rest of the fleet uses gasoline.

1.3 Vehicle use

CVS estimates show that in 2005, Canadians travelled more than 315 billion vehicle-kilometres. As Table 1.3 indicates, 91.3 percent of the distance travelled was by light vehicles, 6.8 percent by heavy trucks and 1.9 percent by medium trucks. The estimates appear to show a slight increase in distance travelled since 2000, although distribution of the total distance travelled among the various vehicle categories remains the same.

Table 1.2

Number of vehicles in Canada by vehicle type and fuel type

Fuel Type	Light Vehicles		Medium Trucks		Heavy Trucks		Total	
Gasoline	17,379,447	A	93,932	E		F	17,476,563	A
Diesel	541,406	E	217,210	C	290,451	B	1,049,067	D
Other		F		F		F		F
Total	**17,993,468**	**A**	**320,635**	**B**	**294,193**	**B**	**18,608,297**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

[8] For more information on renewable fuels (including gasoline-ethanol blends) and alternative fuels, and their availability in Canada, please visit www.vehicles.gc.ca.

Vehicle-Kilometres (vehicle-km)

Vehicle-kilometres is the distance travelled by vehicles on roads.

(For example, total vehicle-kilometres for a specific vehicle are the distance travelled by that vehicle on the road.)

Table 1.3

Number of vehicle-km (in millions of kilometres) in Canada between 2000 and 2005

Year	Light Vehicles		Medium Trucks		Heavy Trucks		Total	
2000	281,985.1	A	5,930.2	A	20,715.9	A	308,631.2	A
2001	283,380.4	A	6,476.0	A	18,577.2	A	308,433.6	A
2002	290,320.1	A	5,439.9	A	18,167.0	A	313,927.0	A
2003	286,617.9	A	6,172.7	A	18,606.1	A	311,396.7	A
2004	284,092.8	A	6,959.8	B	20,730.7	A	311,783.3	A
2005	287,722.4	A	6,020.5	B	21,554.4	A	315,297.3	A

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

The number of passenger-kilometres (passenger-km) is another variable that says a lot about Canadians' driving habits. In 2005, the number of passenger-km was about 526 billion kilometres, representing an increase of about 5 percent over 2004.[9] Table 1.4 presents the CVS estimates of the passenger-km since 2000. A comparison of Table 1.3 and Table 1.4 shows that medium and heavy trucks usually carry fewer passengers than light vehicles. This observation is not surprising since these two categories of vehicle are driven mainly for commercial purposes in Canada.

[9] Given the confidence interval associated with these estimates, the suggested trend may not actually be as evident in reality. For more information, please refer to Annex A.

Passenger-kilometres (passenger-km)

Passenger-kilometres is the sum of the distances travelled by individual passengers, including the driver. *(For example, total passenger-kilometres for a specific vehicle are the sum of the distances travelled by individual passengers in that vehicle.)* For light vehicles, respondents must declare the number of passengers during each trip. For heavy vehicles, the number of passengers is calculated as the average of the number of passengers at the start of each trip and the number of passengers at the end of each trip. Please refer to Annex B for the definition of "trip" for light and heavy vehicles.

Table 1.4

Number of passenger-km travelled (millions of kilometres) in the provinces between 2000 and 2005[10]

Year	Light Vehicles		Medium Trucks		Heavy Trucks		Total	
2000	475,073.9	A	n.a.		n.a.		475,073.9	A
2001	460,624.1	A	9,295.9	C	19,760.7	B	489,680.7	B
2002	470,579.7	A	7,551.5	B	20,413.8	B	498,545.0	B
2003	463,155.6	A	8,893.4	D	20,025.0	B	492,074.0	B
2004	469,461.9	A	9,224.8	B	22,577.4	A	501,264.1	A
2005	493,725.9	A	7,612.1	B	24,355.8	A	525,693.8	A

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

Another area of interest is the intensity with which Canadians use their vehicles, as demonstrated by two indicators:

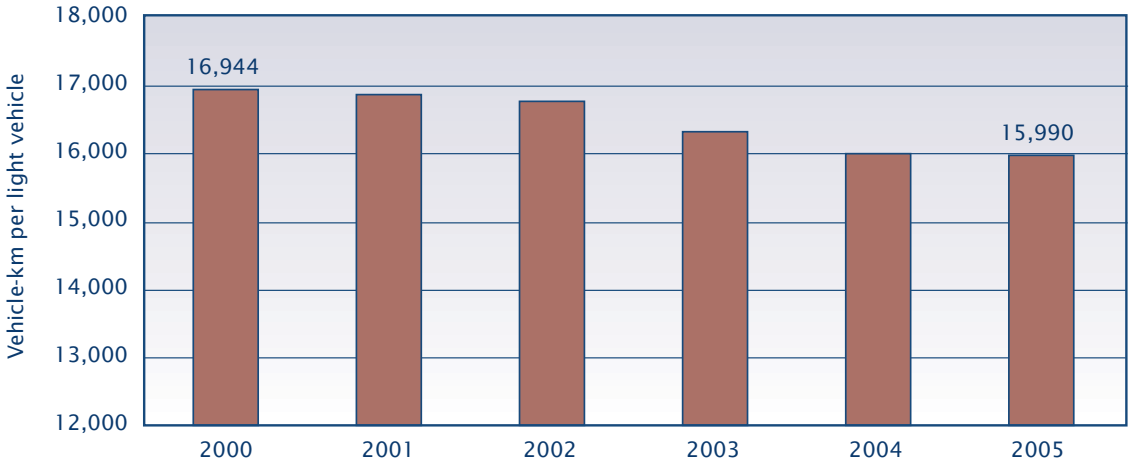
- the per capita number of vehicle-km or passenger-km travelled; and
- the number of vehicle-km travelled per in-scope vehicle.

According to the CVS, 9,770 vehicle-km and 16,290 passenger-km were travelled per capita in Canada in 2005. The second indicator tells us that, not surprisingly, heavy trucks are used the most intensively. The survey shows that, in 2005, each light vehicle, medium truck and heavy truck travelled an average annual distance of 15,990 km, 18,777 km and 73,266 km, respectively. The distance travelled per light vehicle appears to have decreased since 2000, as shown in the survey results presented in Figure 1.2. Section 4 highlights the differences in these results based on vehicle body type.

[10] Since trip information is not collected in the territories, estimates of passenger-km cannot be calculated. For more information on the survey's scope and methodology, please refer to Annex B.

Figure 1.2

Vehicle-km Travelled per Light Vehicle Between 2000 and 2005



1.4 Vehicle fuel consumption

Table 1.5 illustrates gasoline and diesel consumption in 2005, by type of vehicle. According to CVS estimates, the total consumption of gasoline and diesel in 2005 was approximately 29.5 billion litres and 10 billion litres, respectively.

Table 1.5

Fuel consumption (in millions of litres) in the provinces in 2005

Fuel Type	Light Vehicles		Medium Trucks		Heavy Trucks		Total	
Gasoline	29,219.6	C	230.4	E		F	29,457.1	C
Diesel	1,260.5	E	1,337.8	B	7,478.7	A	10,076.9	A

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

CVS data can be used to produce estimates of vehicle fuel efficiency. Table 1.6 shows estimated gasoline consumption rates based on vehicle type and fuel type for 2005. Light vehicles consumed 10.6 L/100 km; but as mentioned in section 4 of this report, gasoline consumption rates depend largely on vehicle size. The analysis in section 5 shows that a variety of factors affect the fuel consumption rates of medium and heavy trucks.

Table 1.6

Fuel consumption rates by vehicle type and fuel type in 2005

Type of Vehicle	Gasoline (L/100 km)		Diesel (L/100 km)	
Light vehicles	10.6	B	11.4	D
Medium trucks	26.5	C	26.6	A
Heavy trucks		F	35.1	A

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

2 Geographic Analysis

The CVS highlights regional, provincial and territorial variations in the composition and use of the vehicle fleet and in vehicle energy efficiency.

2.1 Composition of the on-road vehicle fleet in the provinces and territories

Provincial and territorial distribution of on-road vehicles in Canada shows that Ontario had the most vehicles in 2005, with a total of about 6.9 million in-scope vehicles. The next highest numbers were in Quebec (4.3 million), Alberta (2.4 million) and British Columbia (2.3 million). These four provinces represented more than 85 percent of all vehicles in Canada. Figure 2.1 shows that there is a high correlation between vehicle distribution in each region of the country and the population of these regions.[11]

Table 2.1

Number of vehicles in Canada in 2005 by type of vehicle and jurisdiction

Jurisdiction	Light Vehicles		Medium Trucks		Heavy Trucks		Total	
Newfoundland and Labrador	249,113	C	3,707	E	2,827	E	255,646	C
Prince Edward Island	76,093	C	1,395	E	2,487	E	79,975	C
Nova Scotia	522,676	B	6,973	E	8,094	D	537,743	B
New Brunswick	436,358	B	5,615	E	4,167	D	446,140	B
Quebec	4,204,345	B	47,537	E	39,781	C	4,291,663	B
Ontario	6,727,761	A	70,245	D	108,936	C	6,906,942	A
Manitoba	620,895	B	9,371	E	15,291	E	645,558	B
Saskatchewan	649,380	B	34,859	E	23,459	E	707,699	B
Alberta	2,207,016	B	81,188	D	72,667	C	2,360,871	B
British Columbia	2,252,578	B	57,455	E	13,867	D	2,323,900	B
Yukon	23,918	B	1,426	C	1,205	B	26,549	A
Northwest Territories	20,297	A	642	C	1,298	B	22,236	A
Nunavut	3,077	A	223	E		F	3,414	B
Total	**17,993,468**	**A**	**320,635**	**B**	**294,193**	**B**	**18,608,297**	**A**

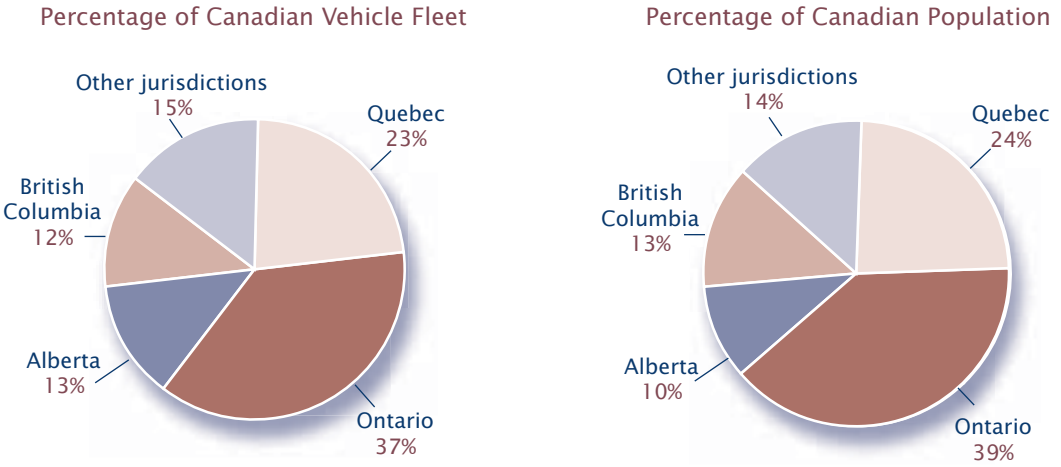
The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

[11] Population statistics are from Statistics Canada, *CANSIM, Table (for fee) 051-0001*.

Figure 2.1

Distribution of Vehicle Fleet and Population Among Provinces and Territories



Light vehicles represent more than 90 percent of the on-road vehicle fleet in all jurisdictions. Medium and heavy trucks represent slightly less than 10 percent of the fleet in the provinces and territories. The percentage of medium trucks in the on-road vehicle fleet is the largest in Nunavut, the Yukon, Saskatchewan and Alberta. This type of vehicle accounted for more than 3 percent of the fleet in these four jurisdictions in 2005. In comparison, medium trucks make up only 2 percent of the Canadian fleet. The percentage of heavy vehicles – that is, medium and heavy trucks – is greater in the fleets of the Prairies and territories than elsewhere in Canada.

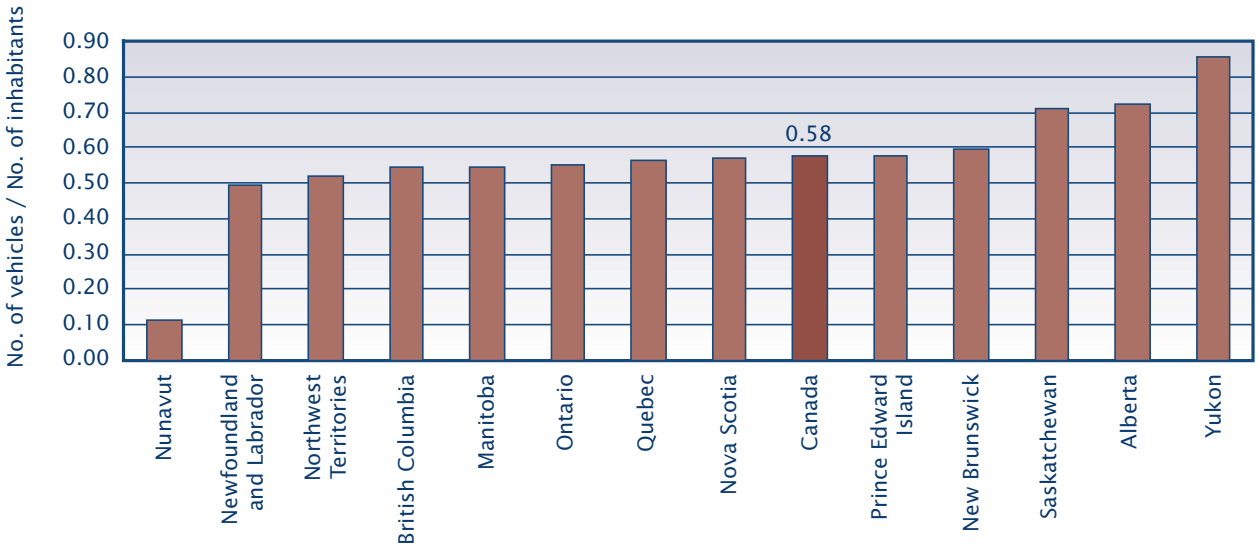
As shown in Figure 2.2, the per capita number of vehicles is fairly close to the Canadian average in each jurisdiction except for Nunavut, Saskatchewan, Alberta and the Yukon. The national average was slightly more than one vehicle per two persons in 2005. The per capita number of vehicles is above the national average in Saskatchewan, Alberta and the Yukon. It is interesting to note that Saskatchewan and the Yukon have very well-developed road systems in relation to their population. Transport Canada data show that, in these two jurisdictions, the number of kilometres of road per 1,000 inhabitants is much higher than the Canadian average.[12] Nunavut has the lowest number of vehicles per capita, with only one vehicle per 10 inhabitants in 2005. Unlike the Yukon and Saskatchewan, Nunavut has the least developed highway infrastructure.[13]

[12] Transport Canada, *Transportation in Canada 2004 – Annual Report*, 2005 www.tc.gc.ca/pol/en/report/anre2004/toc_e.htm.

[13] There were about 44 km of road per 1,000 inhabitants for all of Canada in 2004. Nunavut had less than 3.5 km per 1,000 inhabitants (Transport Canada, *Transportation in Canada 2004 – Annual Report*, 2005).

Figure 2.2

Per Capita Number of Vehicles, 2005



2.2 Vehicle use in the provinces and territories

As illustrated in Table 2.2, the CVS also shows regional differences for distance travelled and fuel consumption. Once again, there seems to be a strong correlation with population; the greatest distances travelled and the highest consumption of gasoline and diesel occurred in the most heavily populated regions.

Table 2.2

Distance travelled by province and territory, and fuel consumption by province in 2005[14]

Jurisdiction	Vehicle-km (in millions of km)		Passenger-km (in millions of km)		Gasoline (in millions of L)		Diesel (in millions of L)	
Newfoundland and Labrador	4,380.7	B	7,350.5	B		F	89.6	E
Prince Edward Island	1,327.6	C	2,282.0	C		F		F
Nova Scotia	10,072.9	B	16,196.1	B	879.7	E	292.3	D
New Brunswick	7,816.6	B	14,421.3	B	772.8	E	87.9	E
Quebec	66,488.3	B	110,692.7	B	5,792.7	E	2,145.5	C
Ontario	125,101.6	A	211,837.4	B	11,566.9	D	3,455.8	B
Manitoba	11,008.2	B	17,773.5	B	1,015.2	E	600.4	C
Saskatchewan	11,154.6	B	18,094.7	B	1,089.3	E	606.4	D
Alberta	44,145.9	B	74,615.6	B	4,320.5	E	2,202.1	B
British Columbia	32,914.0	B	52,430.2	B	3,466.2	E	572.6	E
Yukon	489.4	B	n.a.		n.a.		n.a.	
Northwest Territories	367.8	B	n.a.		n.a.		n.a.	
Nunavut	29.8	C	n.a.		n.a.		n.a.	
Total	**315,297.3**	**A**	**525,693.8**	**A**	**29,457.1**	**C**	**10,076.9**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

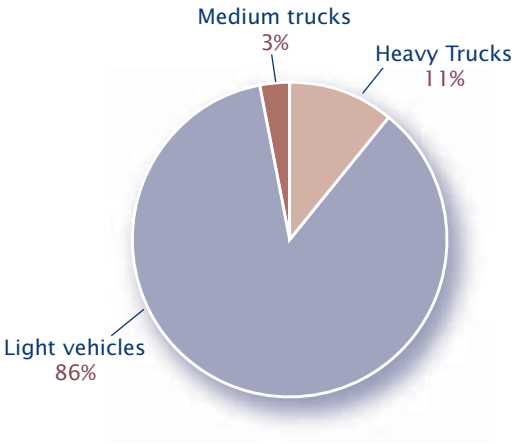
Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

As shown in Table 2.2, the CVS estimates that more than one-third of diesel consumption in 2005 was in the three Prairie provinces, although this region accounts for only slightly more than one-fifth of the distance travelled in all Canadian provinces and territories. This consumption may be linked to the high number of heavy vehicles in the vehicle fleet of these Western provinces. The number of heavy vehicles is also reflected in the distances travelled by the various types of vehicles, as shown in Figure 2.3. According to the CVS, light vehicles represent 91.5 percent of vehicle-km in Canada, but only 86 percent of kilometres travelled in the Prairies; medium trucks accounted for 3 percent of vehicle-km in the Prairies and heavy trucks, 11 percent.

[14] Since information on trips and fuel purchases is not collected in the territories, estimates of passenger-km and fuel consumption cannot be calculated. For more information on the survey's scope and methodology, please refer to Annex B.

Figure 2.3

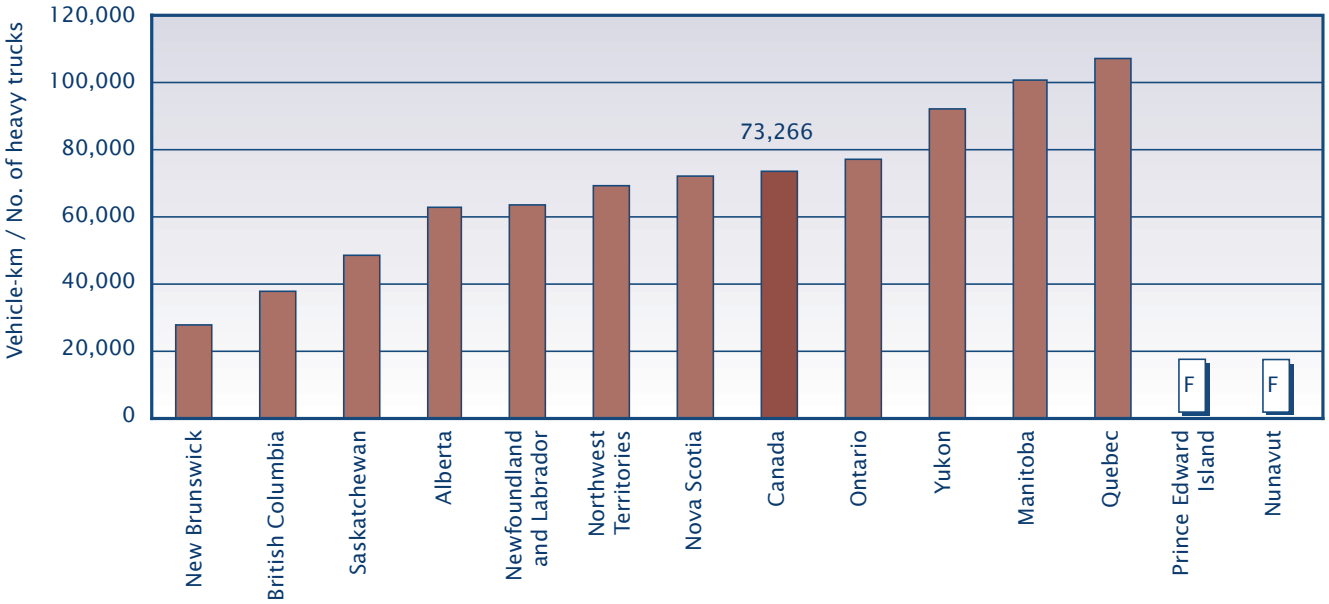
Percentage of Distance Travelled in the Prairies by Vehicle Type



Another variable that reveals some interesting provincial and territorial variations is the average number of vehicle-km travelled by each vehicle. The CVS shows that while there are some regional differences in the use of light vehicles and medium trucks, the distance travelled per vehicle is similar in most jurisdictions. However, the distance travelled per heavy truck appears to vary greatly from one jurisdiction to the next, as shown in Figure 2.4. The Canadian average of 73,266 km is exceeded in only three provinces and one territory: Ontario, Manitoba, Quebec and the Yukon. The CVS estimates that, in Manitoba and Quebec in particular, heavy trucks are used much more intensively than in the rest of Canada, travelling an average of more than 100,000 km each year. The survey shows that the annual distance travelled by a heavy truck is less than 50,000 km in three provinces: New Brunswick, Saskatchewan and British Columbia.

Figure 2.4

Annual Distance Travelled by a Heavy Truck According to Jurisdiction, 2005



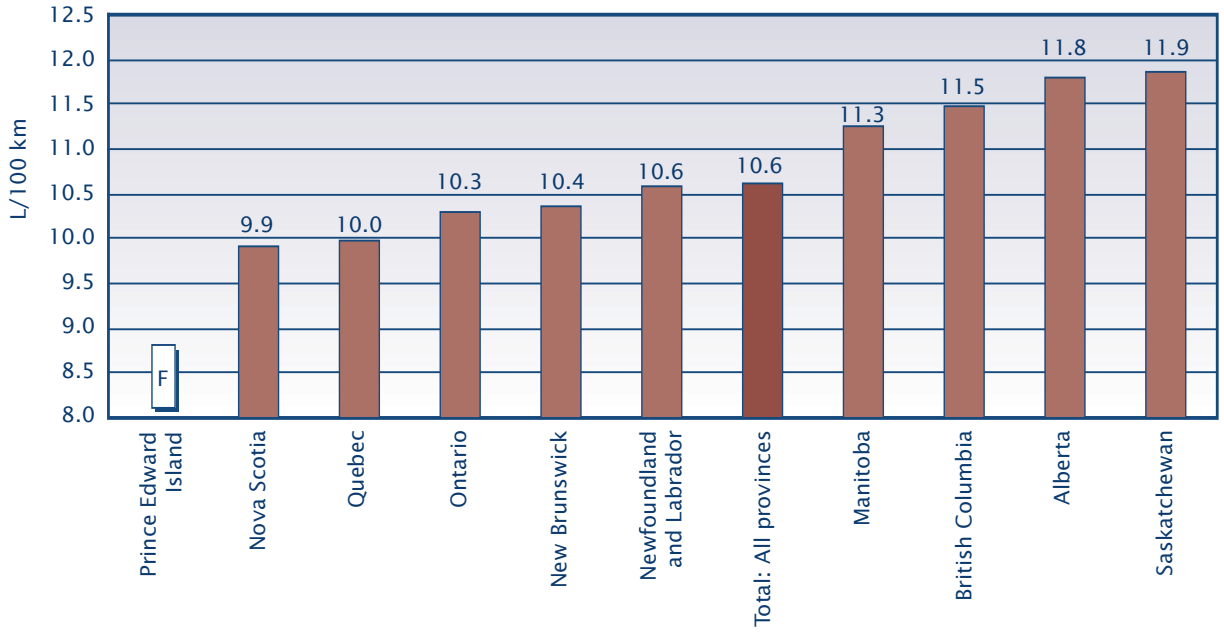
The letter F indicates an estimate that is too unreliable to be published.

2.3 Provincial fuel consumption rates

Interprovincial variations also emerge with regard to vehicle fuel efficiency. Figure 2.5 illustrates the CVS estimates for gasoline consumption rates among light vehicles in the provinces in 2005.

Figure 2.5

Gas Consumption (L/100 km) by Province for Light Vehicles, 2005



The letter F indicates an estimate that is too unreliable to be published.

The CVS findings presented in Figure 2.5 show that the four provinces with the highest gasoline consumption rates are located west of Ontario. Fuel efficiency rates for light vehicles appear fairly consistent among the other provinces and are slightly better than the Canadian average. The regional differences highlighted in Figure 2.5 can be related to the composition of the vehicle fleet, which differs from one province to the next. For example, CVS estimates in Figure 2.6 show that the percentage of light trucks – vans, sport utility vehicles (SUVs) and pickups – in the light vehicle fleet seem to be higher in the provinces west of Ontario. Section 4 of this report shows that light trucks consume more fuel per 100 km, according to CVS data. The CVS estimates also show that a larger percentage of light vehicles in the Prairie provinces and British Columbia are more than 14 years old. These older vehicles are also more likely to have lower fuel efficiency, as stated in section 4.

Figure 2.6

Regional Differences in Light Vehicle Fleet, 2005

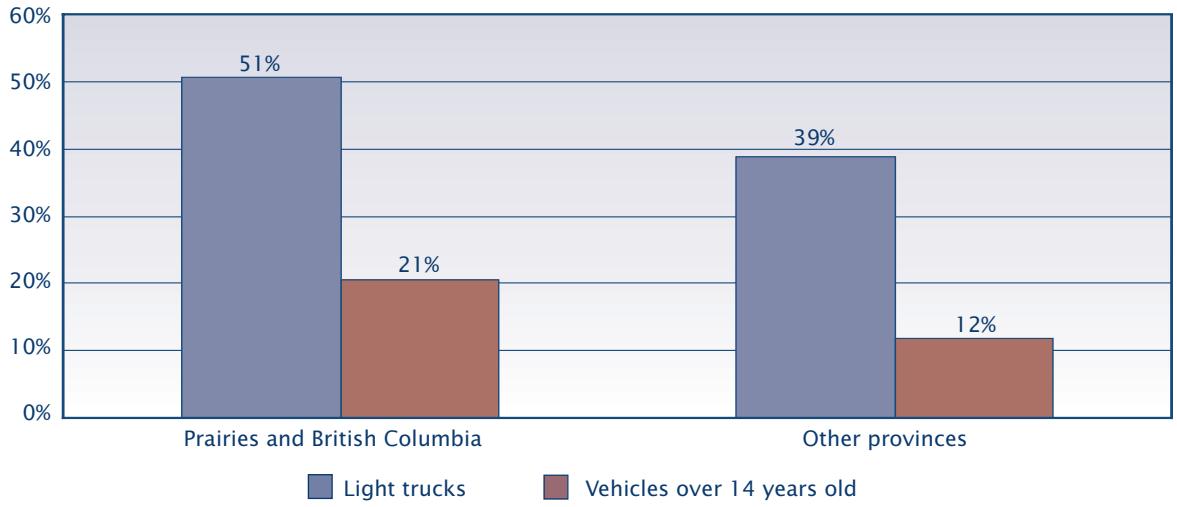


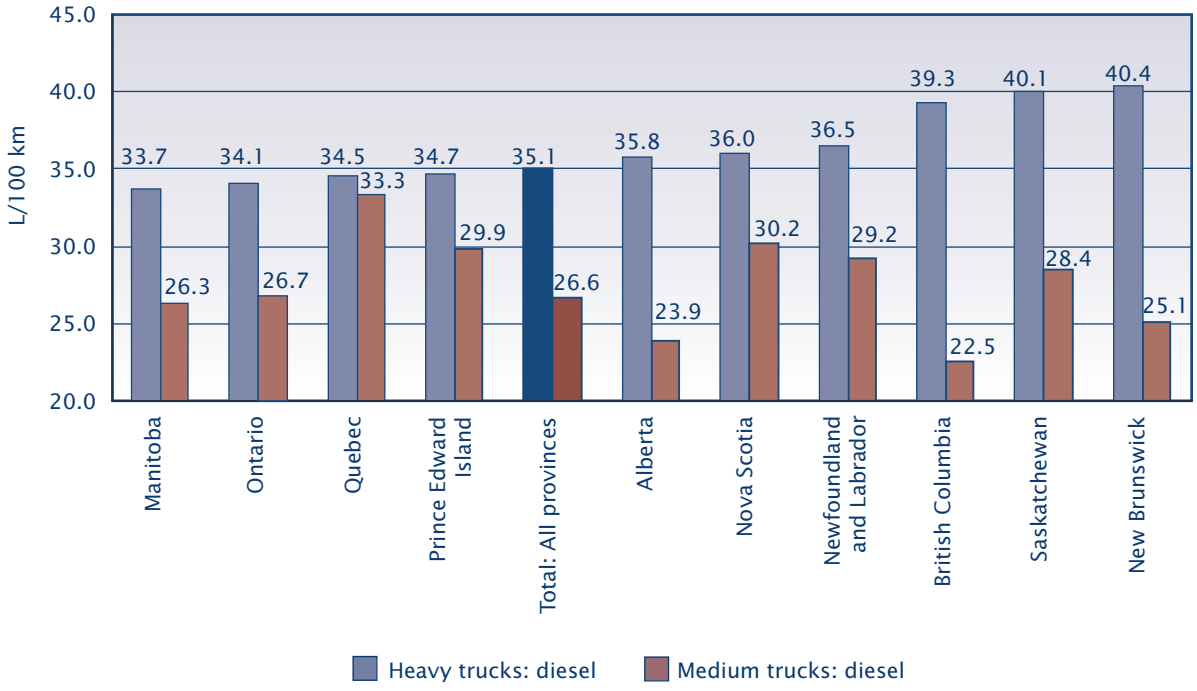
Figure 2.7 shows diesel consumption rates per 100 km for medium and heavy trucks. It is interesting to note that, according to the CVS, the fuel efficiency of heavy trucks is slightly above the Canadian average in Quebec, Ontario and Manitoba, the three provinces where they are driven the most extensively.[15]

British Columbia, Saskatchewan and New Brunswick seem to show a slightly higher diesel consumption rate for their heavy truck fleet. The fuel efficiency of medium trucks varies greatly from one province to the next and does not seem to have any correlation with the fuel efficiency of heavy trucks.

[15] Given the confidence interval associated with these estimates, the suggested results may not actually be as evident in reality. For more information, please refer to Annex A.

Figure 2.7

Diesel Consumption (L/100 km) by Province for Heavy Vehicles, 2005



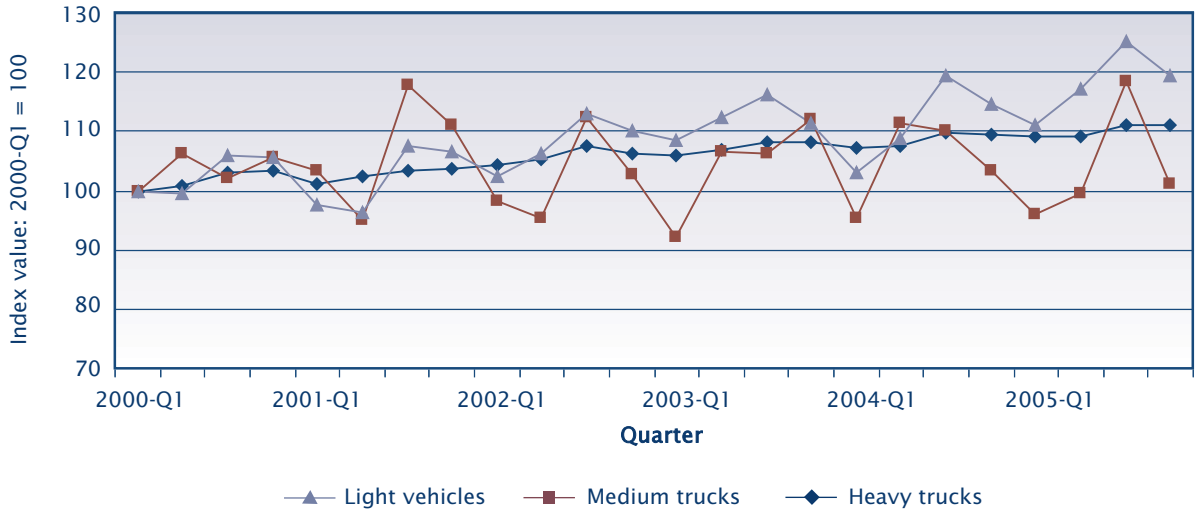
3 Quarterly Analysis

3.1 Number of vehicles per quarter

According to the CVS, there appear to be seasonal variations in the number of vehicles traveling on the roads and in the use of these vehicles. In general, the number of vehicles tends to be slightly lower during the coldest months from January to March (first quarter – Q1). However, the number of vehicles in the fleet is slightly higher in summer during the second and third quarters (Q2 and Q3). This could be partially explained by the fact that some vehicles are put away for part of the year, usually in the winter. Figure 3.1 illustrates the quarterly evolution of the number of in-scope vehicles, as estimated by CVS for 2000–2005. This figure shows that the number of vehicles in the Canadian on-road vehicle fleet appears to have increased since 2000. This is particularly true for light vehicles and heavy trucks. The number of medium trucks seems much more variable. Moreover, the medium and heavy truck fleets seem generally subject to greater quarterly fluctuations than the light vehicle fleet.

Figure 3.1

Quarterly Trends in the Number of In-Scope Vehicles Between 2000 and 2005
(Index Value: 2000-Q1 = 100)

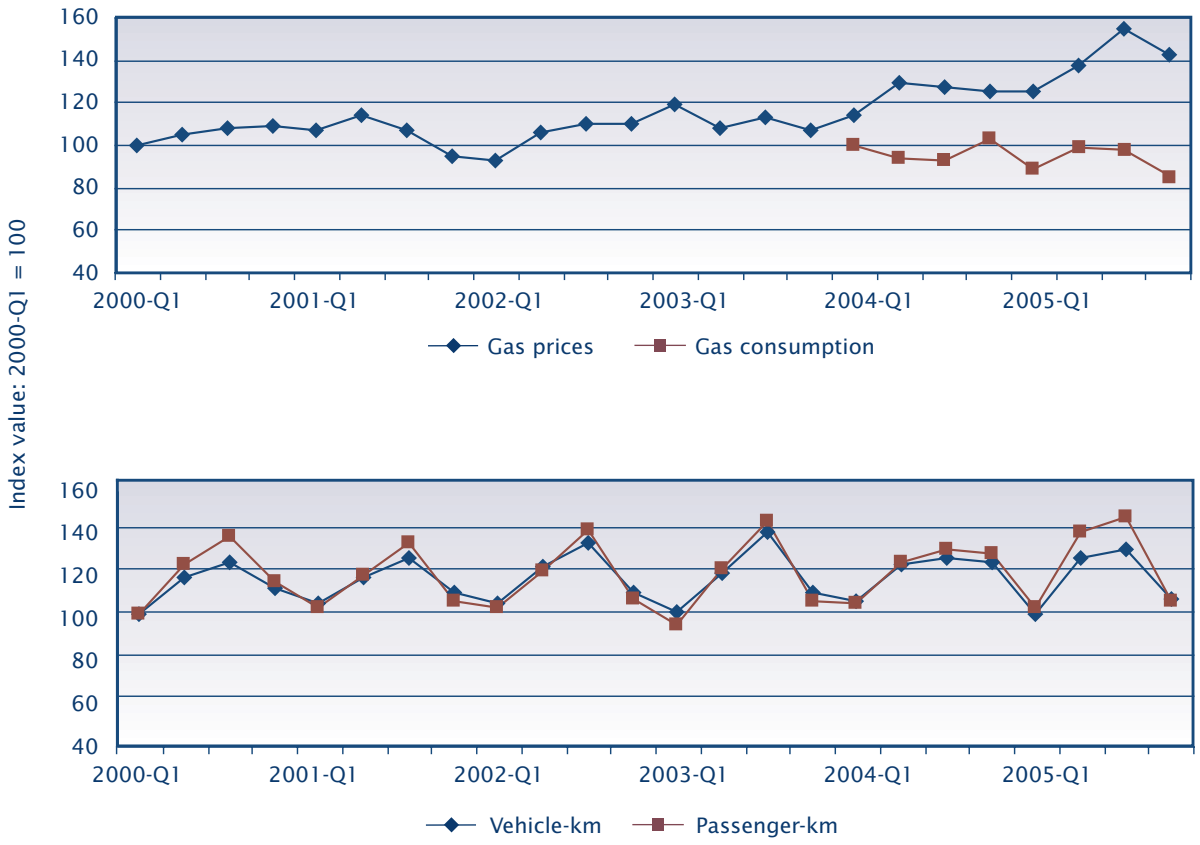


3.2 Quarterly use of light vehicles

The vehicle fleet trends noted in the preceding figure are also reflected in vehicle use. For example, as shown in Figure 3.2, CVS estimates indicate that light vehicles are used less during the first quarter, the coldest part of the year.

Figure 3.2

Quaterly Trends in Distance Travelled and Gas Consumption for Light Vehicles
(Index Value: 2000-Q1 = 100)*



* The index value is 2004-Q1 = 100 for gasoline consumption.

Figure 3.2 also shows that fuel consumption varied greatly in 2004 and 2005. While fuel consumption seems to have increased in the fourth quarter (Q4) of 2004 and in the second quarter of 2005, the CVS shows that it decreased considerably in the first and fourth quarters of 2005. Given these findings, it is also interesting to note that fuel prices increased frequently during the second and third quarters of 2005. Using CVS data on distance travelled, Statistics Canada recently conducted a study that concluded that an increase in the growth rate of fuel prices in a given month has a negative impact on the total distance travelled three months later.[16] Therefore, perhaps the major increases in gas prices in the second and third quarters of 2005 are linked to changes in behaviour, which would then translate into a decrease in the distance travelled by light vehicles and in their fuel consumption. It is possible that Canadians adopted more fuel-efficient driving habits with the rapid and sudden increase in gas prices. However, since data on fuel consumption are available for only eight consecutive quarters and since some data limitations exist, it is not currently possible to show a definite relationship between price increases at the pump and a change in driving habits using CVS data. In addition, caution should be exercised when analysing the data since the demand for fuel is generally thought to be unchanging or inelastic in the short term, which means that an increase in prices at the pump would have little or no short-term impact on the amount of fuel consumed. That being said, it will be interesting to see if CVS data demonstrates a more tangible relationship in the future.

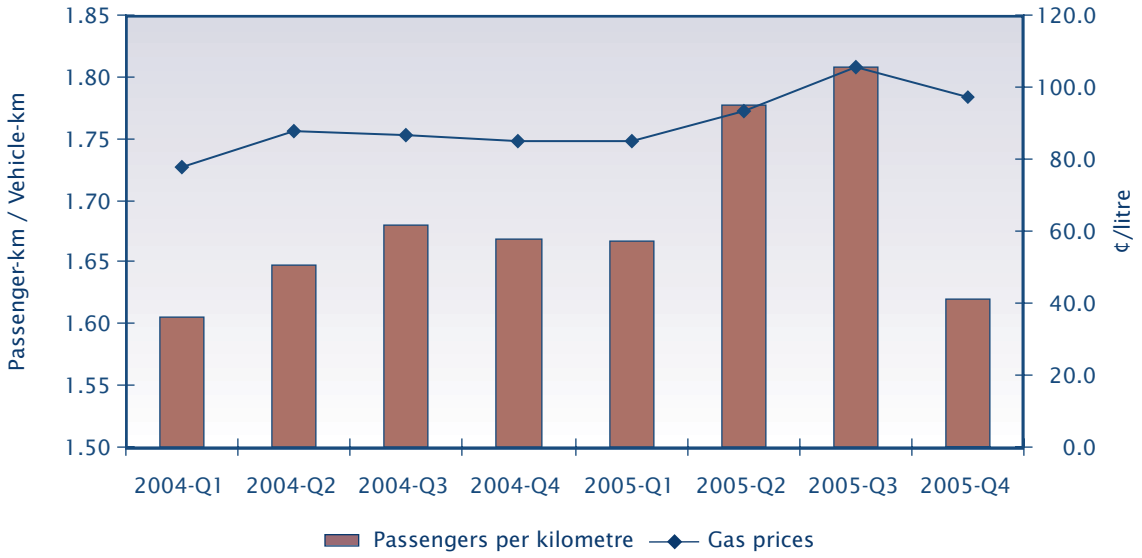
It is also interesting to note that, according to CVS data, there seems to be a major increase in the number of passenger-km travelled in relation to the number of vehicle-km travelled during the second and third quarters of 2005. The gap between the increase in the number of passenger-km and the number of vehicle-km seems to become more pronounced during the third quarter of each year. This may be partially explained by the fact that more Canadians go on holiday and organize family trips during the summer (July to September) than at any other time of year. However, CVS data show that the gap between these two variables appeared to be more pronounced in 2005. It is interesting to note that these findings coincide with gas price increases of more than 23 percent between April and September 2005.[17] The CVS findings in Figure 3.3 illustrate how the number of passengers per kilometre travelled, an indicator of vehicle occupancy rate, seems to have increased during the second and third quarters of 2005, the period when gas prices were increasing. Again, a direct relationship cannot be established based on the available estimates, but in the coming years, it will be interesting to see if CVS data will show an impact of increased prices at the pump on Canadians' desire to carpool.

[16] Martin Beaulieu, Statistics Canada, *Canadian Vehicle Survey – Time Series Analysis*. Ottawa, February 2006.

[17] This figure corresponds to the increase in the average retail price (taxes included) in Canada, based on retail prices recorded in 10 cities. Source: Natural Resources Canada.

Figure 3.3

Quarterly Trends in Number of Passengers per Kilometre Travelled by Light Vehicles in the Provinces, and Quarterly Trends in Gas Prices, 2004 and 2005



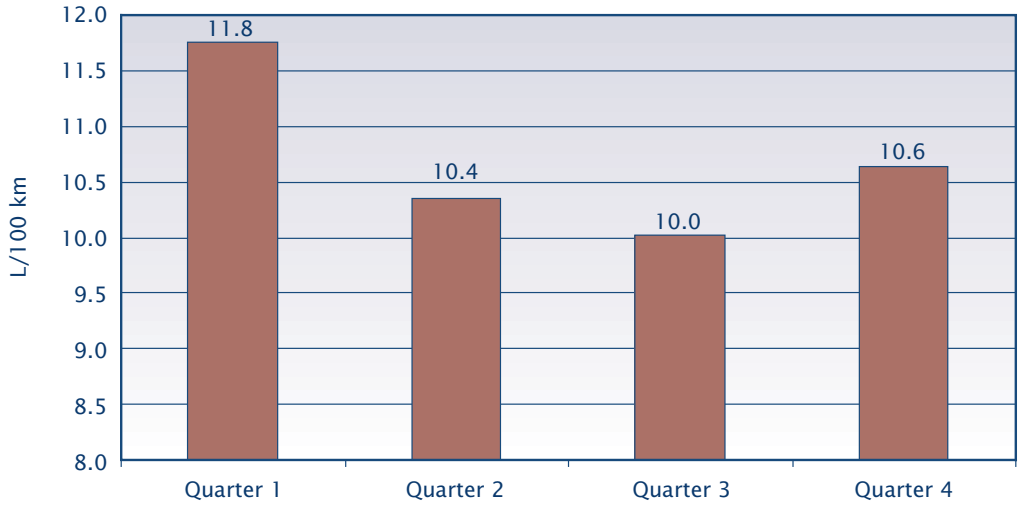
Vehicle fuel efficiency is another factor that could be related to quarterly fluctuations in gas consumption. Gas consumption is affected not only by the distance travelled and driver behaviour, but also by temperature, as shown in the *Fuel Consumption Guide* produced annually by NRCan.[18] Figure 3.4 shows that the fuel efficiency of gasoline-powered light vehicles is better during the warmer months (second and third quarters). In addition, many people let their vehicles idle in cold weather, which adds to fuel consumption in the winter,[19] which could also have partially affected the findings in Figure 3.4.

[18] For more information on the *Fuel Consumption Guide*, visit the OEE Web site at oee.nrcan.gc.ca/transportation/personal-vehicles-initiative.cfm.

[19] The OEE Web site has a wealth of information on idling myths and facts: oee.nrcan.gc.ca/transportation/personal-vehicles-initiative.cfm.

Figure 3.4

Gasoline Consumption (L/100 km) by Light Vehicles in the Provinces for All Quarters of 2005



3.3 Quarterly use of heavy vehicles

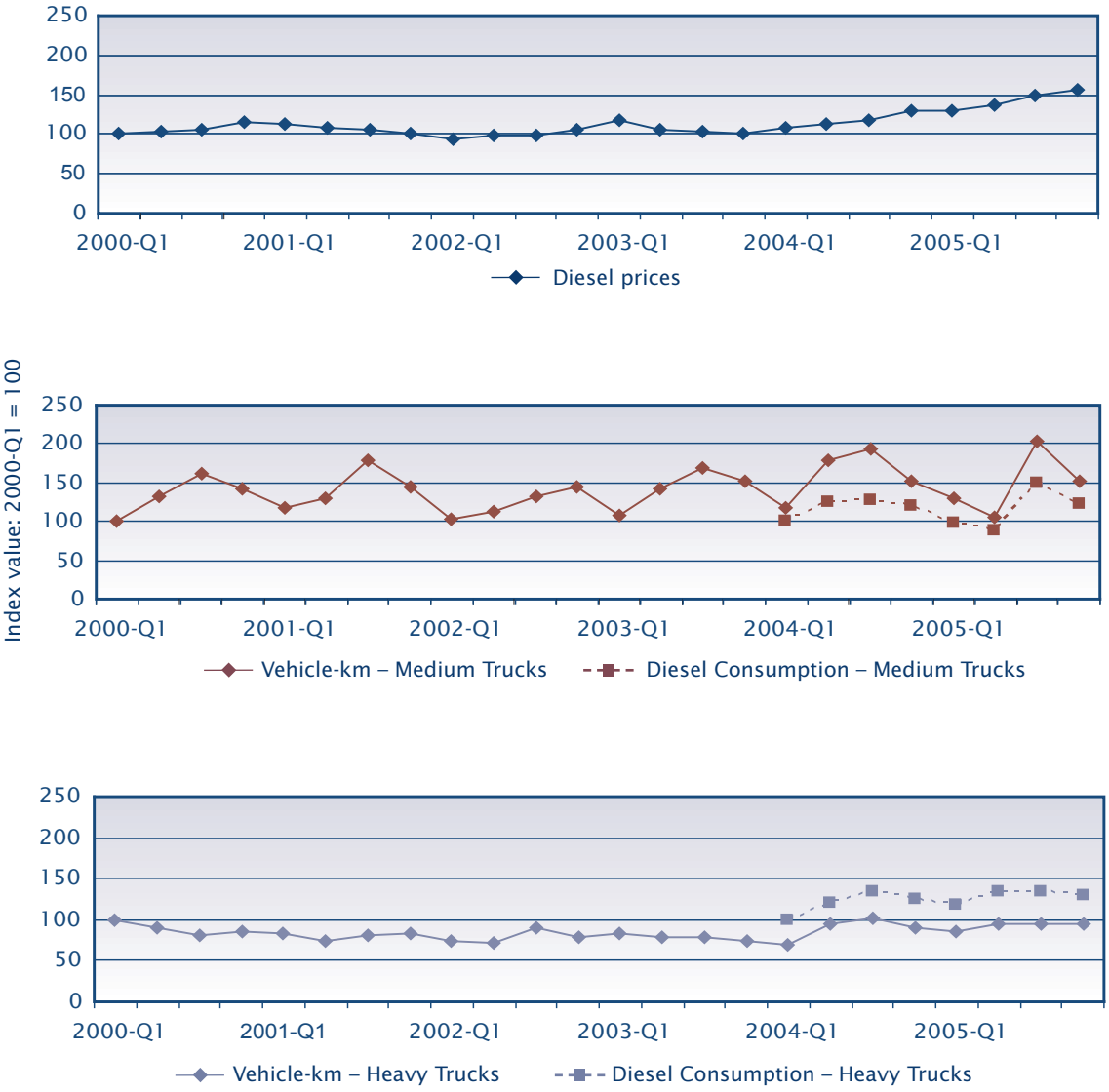
The use of heavy vehicles can also be affected by seasonal fluctuations. Figure 3.5 shows CVS estimates of quarterly variations in distance travelled and diesel consumption by medium and heavy trucks, as well as quarterly changes in diesel prices in Canada.

Figure 3.5 shows greater seasonal variations in the use of medium trucks than heavy trucks. In fact, the number of vehicle-km travelled by heavy trucks seems relatively stable throughout the year. The data also show that diesel consumption by medium and heavy trucks, as for light vehicles, is closely tied to distance travelled. The steady increase in diesel prices since the end of 2003 seems, however, to have had little impact on heavy vehicle use in Canada.[20]

[20] This corresponds to the increase in the average retail price (tax included) in Canada, based on retail prices recorded in 10 cities. Source: Natural Resources Canada.

Figure 3.5

Quarterly Trends in Distance Travelled and Diesel Consumption by Heavy Vehicles
(Index Value: 2000-Q1 = 100)*

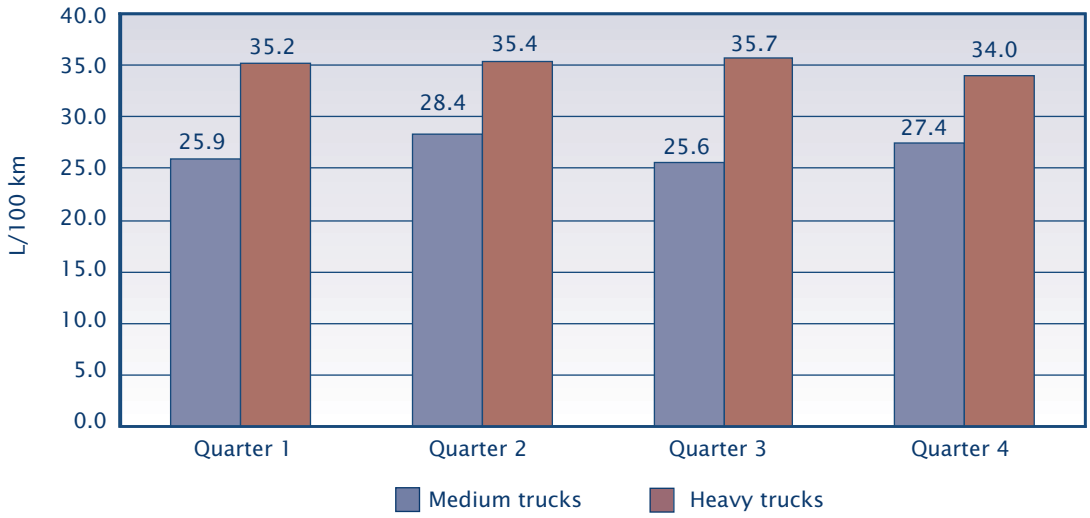


* The value index for diesel consumption is 2004-Q1=100.

It is worth examining whether diesel consumption is affected by outdoor temperature as well as variations in distance travelled. Figure 3.6 illustrates CVS estimates for the fuel efficiency of diesel-powered medium and heavy trucks for the four quarters of 2005. Diesel consumption rates do not appear to vary from quarter to quarter and, thus, are not related to outdoor temperature. It will be interesting to see if these findings are confirmed in the future.

Figure 3.6

Diesel Consumption (L/100 km) by Medium and Heavy Trucks in the Provinces for All Quarters of 2005



4 Light Vehicles

4.1 Light vehicles – Vehicle body type

More than 95 percent of the vehicles on Canadian roads fall into the category of light vehicles. The light vehicle fleet consists of cars, station wagons, vans, SUVs and pickups. These vehicles are used primarily for private purposes; the CVS states that more than 80 percent of the vehicle-km travelled by light vehicles constitute trips unrelated to the driver's work.

Vehicle body type is a key factor for analysis. Table 4.1 illustrates the body types in the light vehicle fleet in 2005. Cars make up most of the fleet, followed by pickups, vans and SUVs. Note that vans have a higher number of vehicle-km and passenger-km than pickups. This finding might be explained by the van's popularity as a family vehicle. SUVs accounted for less than 10 percent of the light vehicle fleet and the distance travelled in 2005.

Table 4.1

Light vehicles by vehicle body type, 2005

Body Type	Number		Vehicle-km (in millions of km)		Passenger-km (in millions of km)	
Car	10,021,194	B	154,315.3	A	249,688.0	A
Station wagon		F	5,118.4	E	7,947.9	E
Subtotal – Passenger vehicles	**10,327,397**	**B**	**159,433.8**	**A**	**257,635.9**	**A**
Van	2,890,313	C	53,565.2	B	111,704.2	B
SUV	1,414,012	D	23,323.5	C	45,039.4	C
Pickup	3,290,579	C	49,490.2	B	76,839.3	B
Other		F	1,909.7	E		F
Subtotal – Light trucks	**7,666,071**	**B**	**128,288.7**	**A**	**236,090.0**	**B**
Total – Light vehicles	**17,993,468**	**A**	**287,722.4**	**A**	**493,725.9**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

As shown in Table 4.1, there are two categories of light vehicle:[21]

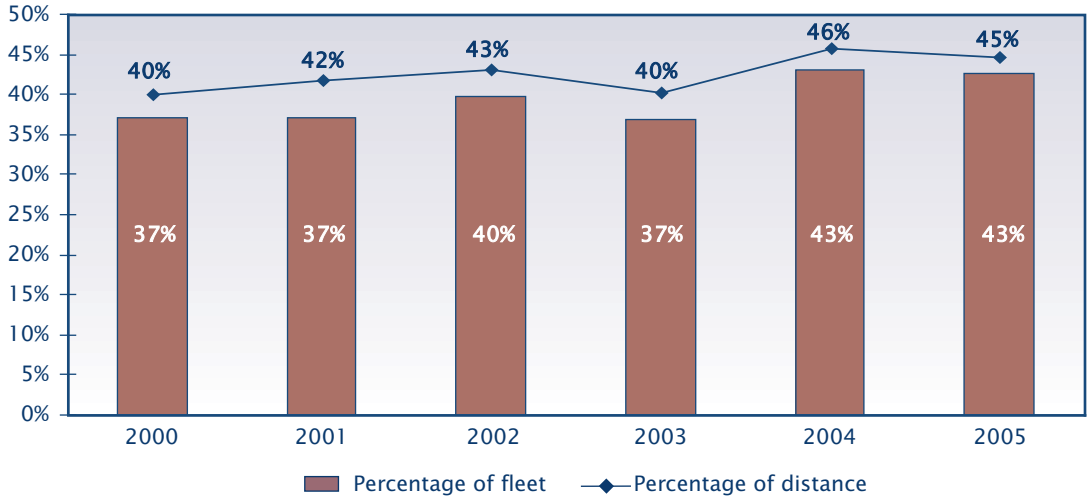
- Passenger vehicles: including cars and station wagons; and
- Light trucks: including vans, SUVs and pickups.

As illustrated in Figure 4.1, CVS data show that the popularity of light trucks seems to have increased, with some fluctuations, since 2000.[22] In 2005, light trucks accounted for 43 percent of the country's light vehicle fleet, compared to 37 percent in 2000. They accounted for 45 percent of the distance travelled by the light vehicle fleet in 2005, compared to 40 percent at the start of the decade.

Canadians use passenger cars and light trucks in different ways. Using the data on vehicle-km and passenger-km travelled (see Table 4.1), we can determine the passenger-km/vehicle-km ratio, an indication of the average vehicle occupancy rate. As shown in Figure 4.2, CVS estimates indicate that this ratio rose to 1.62 for passenger cars and 1.84 for light trucks in 2005. Therefore, according to the CVS, light trucks (vans, SUVs and pickups) carried slightly more passengers per vehicle-km travelled than passenger cars.[23] Figure 4.2 also shows findings from 2000 to 2004.

Figure 4.1

Proportion of Light Trucks in the Light Vehicle Fleet Between 2000 and 2005



[21] Natural Resources Canada regularly distinguishes between two groups of light vehicles, as shown in the online glossary at oee.nrcan.gc.ca/corporate/statistics/neud/dpa/home.cfm.

[22] Given the confidence interval associated with these estimates, the suggested trend may not actually be as evident in reality. For more information, please refer to Annex A.

[23] Given the confidence interval associated with these estimates, the suggested result may not actually be as evident in reality. For more information, please refer to Annex A.

Figure 4.2

Average Number of Passengers per kilometre Travelled for Light Vehicles by Vehicle Body Type in the Provinces Between 2000 and 2005

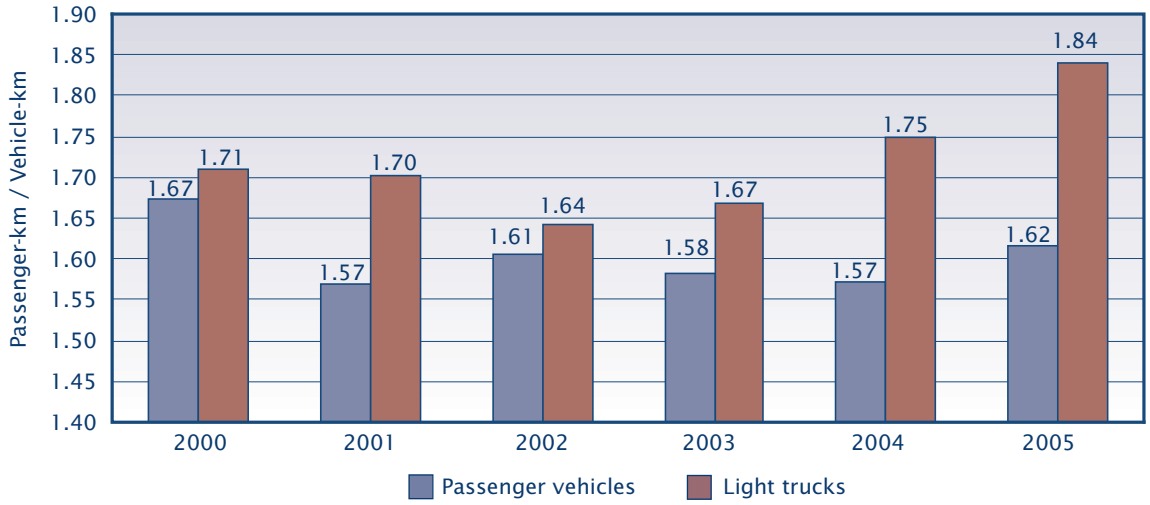
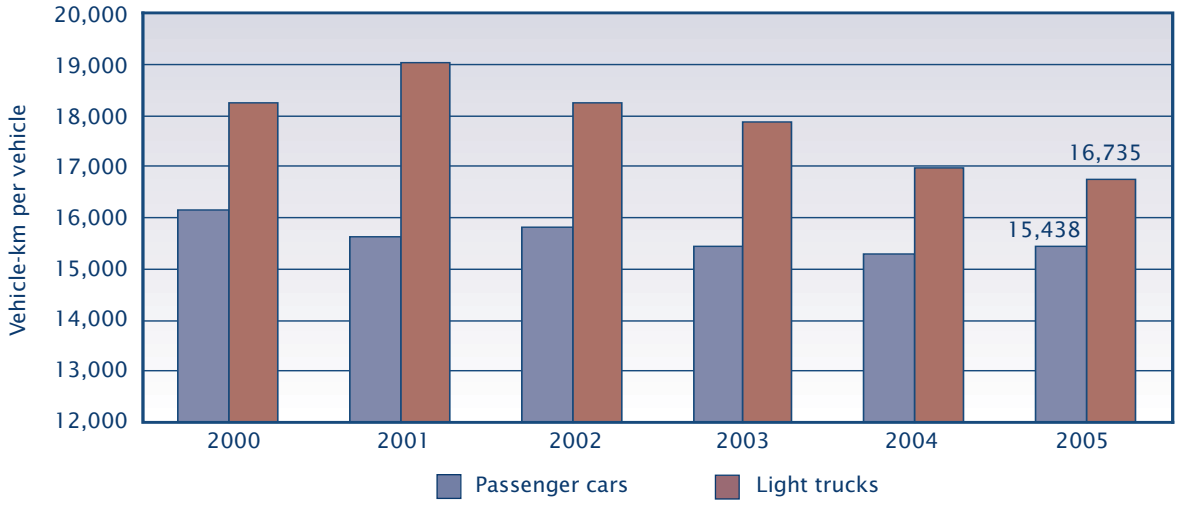


Figure 4.3

Vehicle-km Travelled per Light Vehicle by Vehicle Body Type, Between 2000 and 2005



Differences emerge regarding the number of vehicle-km travelled per vehicle. Figure 4.3 shows that a light truck travels more vehicle-km than a passenger car, on average. The number of vehicle-km travelled per vehicle seems to be more consistent for passenger cars than for light trucks, which show a slight decrease since 2001.[24]

Given current CVS estimates of fuel consumption, if Canadians' seemingly growing interest in light trucks is confirmed or intensified in the coming years, total fuel consumption by light vehicles may increase. Table 4.2 shows total fuel consumption and the fuel consumption rate (in L/100 km) by vehicle body type and fuel type for 2005. The first section of this table shows that total gasoline consumption by light trucks is greater than for passenger vehicles. This observation can be compared with the fuel consumption rates that follow. The rate of gas consumption appears to increase with the size of the vehicle. Therefore, CVS results indicate that cars and station wagons offer better fuel efficiency than light trucks as they seem to consume 3.5 L/100 km less in gas. As such, an increased use of larger vehicles such as vans, SUVs and pickups could lead to an increase in fuel consumption.

Table 4.2

Effect of light vehicle size on fuel consumption in the provinces, 2005

Body Type	Fuel Consumption (millions of L)				Fuel Consumption Rate (L/100 km)			
	Gasoline		Diesel		Gasoline		Diesel	
Car	13,621.8	D		F	9.1	C		F
Station wagon		F	n.a.			F	n.a.	
Subtotal – Passenger vehicles	**14,121.5**	**D**		**F**	**9.1**	**C**		**F**
Van	6,049.0	E		F	11.5	D		F
SUV	2,909.9	E		F	12.7	E		F
Pickup	5,948.5	E	875.8	E	14.0	C	13.3	D
Subtotal – Light trucks	**15,098.2**	**C**	**1,028.6**	**E**	**12.6**	**B**	**13.5**	**D**
Total – Light vehicles	**29,219.6**	**C**	**1,260.5**	**E**	**10.6**	**B**	**11.4**	**D**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

[24] Given the confidence interval associated with these estimates, the suggested trend may not actually be as evident in reality. For more information, please refer to Annex A.

Effects of More Light Trucks on Canadian Roads

The CVS appears to indicate an increase in the popularity of light trucks (vans, SUVs and pickups), which are said to be less fuel efficient than smaller passenger cars. According to the OEE's *State of Energy Efficiency in Canada 2006*, the increase in the size and power of new vehicle models, which is partially explained by a greater demand for light trucks, may have been somewhat offset by improvements in energy efficiency.

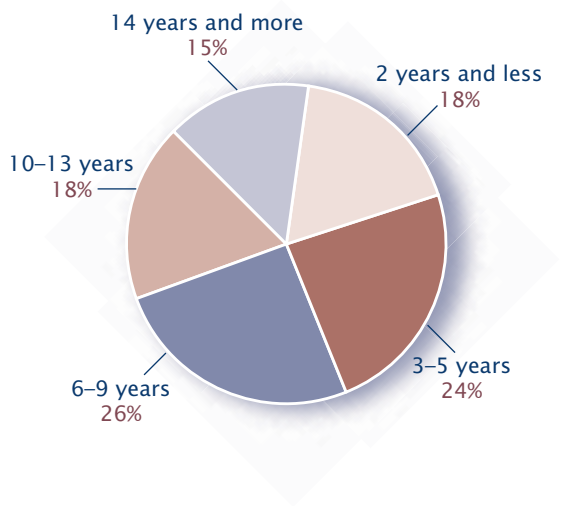
The effects of this trade-off may not be obvious at first glance. Replacing an average passenger vehicle with an average light truck will increase total fuel consumption in the light vehicle fleet. However, the light trucks may have replaced large cars whose gas consumption rate (in L/100 km) is not necessarily better. If not for the vans and SUVs, which are increasingly more common, we would likely see more large cars on the road.

4.2 Age of light vehicles

Another important characteristic of a vehicle is its model year or age, as newer vehicles are usually considered to be more energy efficient.[25] Figure 4.4 illustrates Canada's light vehicle fleet in 2005, by age of vehicle.

Figure 4.4

Age Distribution of Light Vehicles, 2005



The results presented in Figure 4.4 show that about two-thirds of the light vehicles on Canadian roads in 2005 were less than 10 years old. Nearly one-third of the fleet consisted of older vehicles, which are likely to consume more fuel if, for example, they are not well maintained.[26]

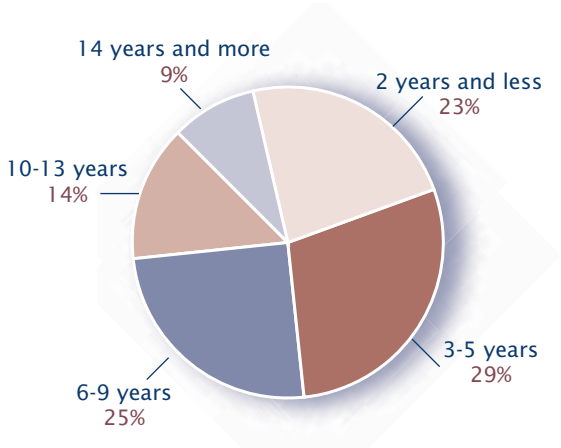
These older vehicles are not driven a great deal given their share of the vehicle fleet. More than three-quarters of the distance travelled in 2005 by light vehicles was by vehicles less than 10 years old, as shown in the estimates in Figure 4.5. CVS data show that, in 2005, about 52 percent of the total distance driven was by vehicles under five years old. In comparison, the CVS shows that about 48 percent of the distance driven by light vehicles in 2000 was by vehicles under five years old.

[25] OEE, oee.nrcan.gc.ca/transportation/personal-vehicles-initiative.cfm.

[26] The OEE Web site provides a wealth of information on the advantages of well-maintained vehicles: oee.nrcan.gc.ca/transportation/personal-vehicles-initiative.cfm.

Figure 4.5

Percentage of Vehicle-km Travelled by Light Vehicles According to Age, 2005



The percentages illustrated in Figure 4.5 can be linked to the fact that each newer vehicle is driven more vehicle-km annually than older vehicles, on average. Figure 4.6 shows that the intensity of use of newer light vehicles is about twice that of older vehicles.

Figure 4.7 illustrates the gasoline consumption rate of light vehicles by age. According to these estimates, the age of light vehicles seems to have relatively little impact on fuel consumption per 100 km among vehicles less than 14 years old, despite the fact that newer vehicles tend to be more fuel efficient than older models. The fuel efficiency of these vehicles varies between 10.0 L/100 km and 10.7 L/100 km. It is therefore possible that other factors, such as driving habits and weather conditions, may have an equal, if not greater, impact on the actual fuel consumption rate per 100 km. The lower efficiency of vehicles over 14 years old may be related in part to poorer vehicle maintenance, to the fact that large cars were more popular at that time, and to a higher average fuel consumption rate for new vehicles 14 years ago.[27]

[27] OEE, *The State of Energy Efficiency in Canada, Report 2006*. Ottawa, 2006.

Figure 4.6

Average Vehicle-km Travelled per Light Vehicle According to Vehicle Age, 2005

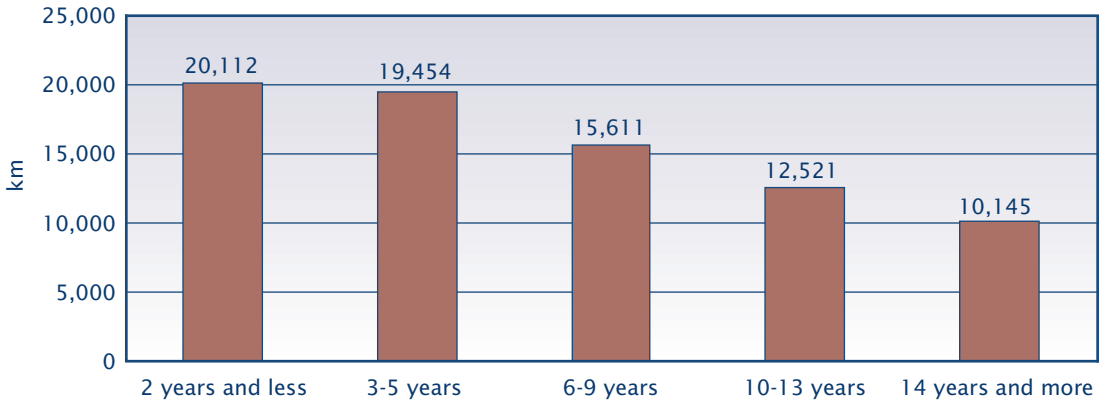
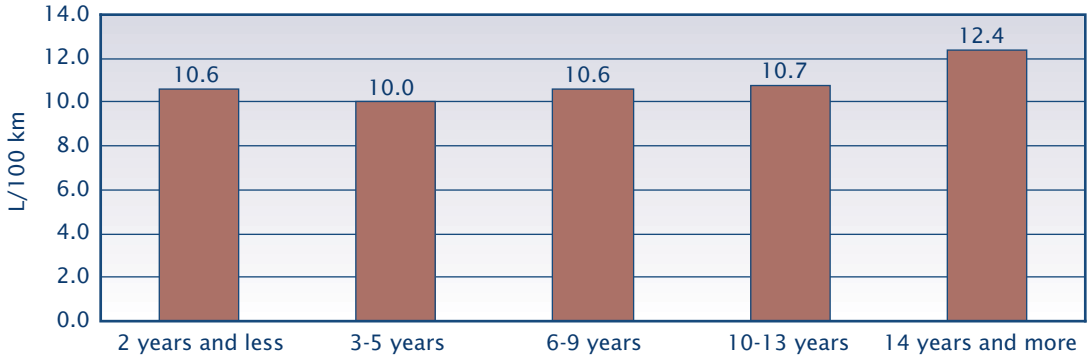


Figure 4.7

Gasoline Consumption (L/100 km) of Light Vehicles in the Provinces, 2005



5 Heavy Vehicles: Medium and Heavy Trucks

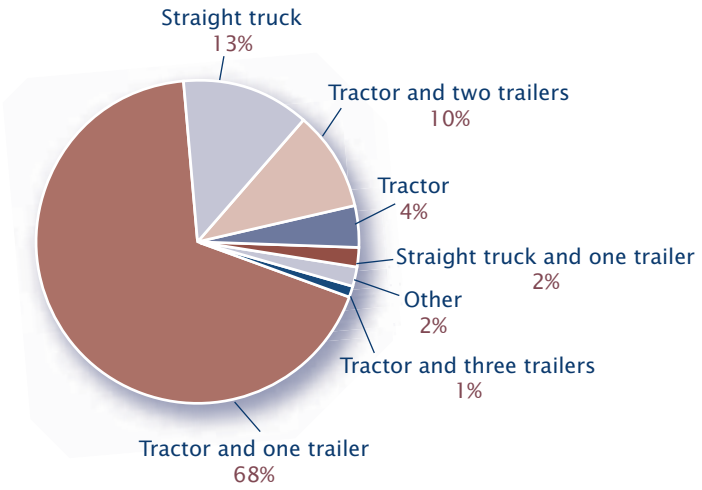
The CVS points out that heavy vehicles, unlike light vehicles, are used mainly for commercial purposes. The characteristics of this type of use can affect the energy consumption of this segment of Canada's on-road vehicle fleet.

5.1 Heavy vehicle configuration

Vehicle configuration is a very important characteristic of the trucks being driven on Canadian roads. In the case of medium trucks, straight trucks account for more than 80 percent of the distance travelled in 2005. Heavy trucks are used in a much greater variety of configurations. Figure 5.1 provides estimates for the number of vehicle-km travelled by heavy trucks, based on configuration. Tractors with one trailer account for slightly more than two-thirds of the distance travelled in 2005 by heavy trucks, followed by straight trucks and tractors with two trailers.

Figure 5.1

Distance Travelled by Heavy Trucks According to Configuration, 2005

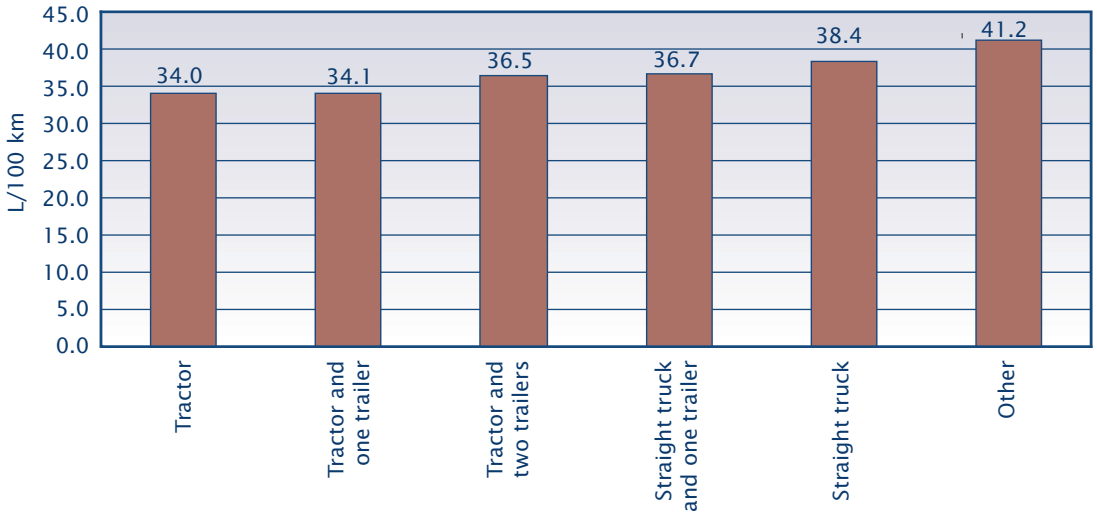


Tractors pulling two trailers are becoming increasingly common on the road. The percentage of the distance travelled by these "road trains" in relation to the total distance travelled by heavy trucks has nearly doubled since 2000. According to an Environment Canada report on atmospheric emissions in the trucking industry, the increased use of this type of configuration could have benefits in terms of energy consumption. The efficiency of heavy trucks increases with the total weight of the vehicle. This means that less energy is consumed per tonne-kilometre (t-km) when the weight of the transported merchandise is increased. Since their transport capacity is greater than that of trucks with only one trailer, road trains can consume relatively less energy per tonne of merchandise transported.[28] CVS data appear to support this statement. The results presented in Figure 5.2 show that diesel consumption by tractors pulling two trailers is higher than that of tractors pulling only one trailer by only about 2 L/100 km. Given that their transport capacity is greater than that of trucks with just one trailer, road trains appear to consume less diesel per tonne of merchandise transported.

[28] Environment Canada, *Trucks and Air Emissions*. Ottawa, September 2001.

Figure 5.2

Diesel Consumption (L/100 km) According to Heavy Truck Configuration in the Provinces, 2005



The results presented on this figure pertain only to vehicles with a gross weight of 15 tonnes or more (heavy trucks).

Note: An estimate was available for the diesel consumption per 100 km of tractors pulling three trailers. However, this estimate was based on information regarding a small number of trips since this configuration is not very common on Canadian roads. The validity of this estimate is therefore uncertain.

5.2 Trip purpose for heavy vehicles

In 2005, service calls and the transport of goods and equipment were the main reasons for heavy vehicle trips in Canada. However, the CVS shows that slightly more than 10 percent of the vehicle-km travelled by heavy trucks occurred when the trucks were empty.[29] If we add the percentage of trips during which the trucks were only partially full, we see that a significant percentage of the distance travelled in 2005 was not optimal with regard to energy consumption.[30] In terms of energy efficiency and given that the performance of a truck or a heavy vehicle fleet is determined by the amount of fuel consumed per tonne of goods transported, reducing the distance travelled when empty has to be beneficial.

[29] An estimate for medium trucks is not possible with the available data.

[30] It is not possible, using CVS data, to establish the specific load rates of vehicles transporting goods.

Table 5.1

Trip purposes for medium and heavy trucks in the provinces, 2005

Trip Purpose	Vehicle-km (in millions of km)			
	Medium Trucks		Heavy Trucks	
Service call	975.3	E	1,411.9	E
Carrying goods or equipment	3,602.9	C	16,087.5	B
Empty		F	2,861.1	C
Other work purpose	496.6	E		F
Non-work purpose	611.0	E	841.8	E
Total	**6,020.5**	**B**	**21,554.4**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

5.3 Heavy vehicles – Activity type

Most truck traffic on Canadian roads is related to one of the following activities:

- For-hire trucking – a company transports goods as its principal activity;
- Private trucking – a company transports goods as a secondary activity that is part of the distribution process of its primary output; and
- Owner-operators – persons who transport goods either independently or for one of the above-mentioned companies.

Table 5.2 illustrates the number of in-scope medium and heavy trucks in the CVS, based on their type of activity.

Figure 5.3 illustrates the distance travelled by heavy vehicles according to activity type.

Table 5.2

Number of in-scope medium and heavy trucks in the CVS, by activity type in the provinces, 2005

Activity Type	Number of In-Scope Vehicles in the CVS			
	Medium Trucks		Heavy Trucks	
For-hire trucking		F	135,988	D
Owner-operator trucking	44,922	E	63,888	E
Private trucking	183,632	C	67,055	E
Other activity type	57,484	E		F
Total	**318,344**	**B**	**291,576**	**B**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

Figure 5.3

Distance Travelled by Medium and Heavy Trucks in the Provinces According to Activity Type, 2005

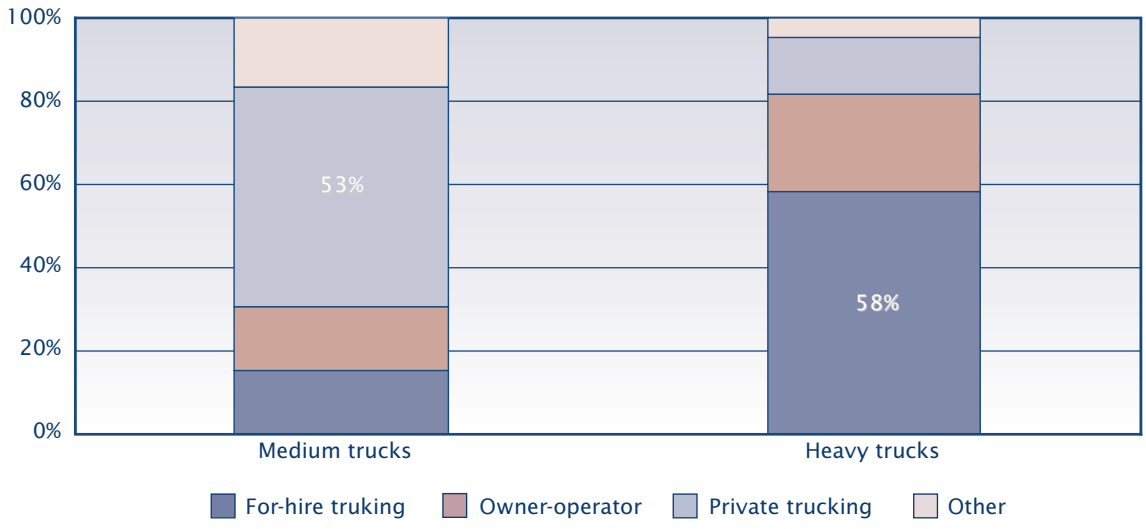


Figure 5.3 highlights some major differences between medium and heavy trucks. Private trucking accounts for more than half the distance travelled by medium trucks: several companies that handle the distribution of their products have a truck, such as a straight truck, that they use for deliveries. However, the heavy truck category is dominated by for-hire and owner-operated trucking.[31] Therefore, heavy vehicles belonging to for-hire trucking firms or owner-operated firms account for more than 80 percent of the distance travelled by heavy trucks.

Table 5.3 provides estimates regarding the fuel consumption and efficiency of heavy vehicles. It appears that diesel consumption per 100 km, especially for heavy trucks, can be affected by activity type. According to the CVS, heavy trucks belonging to for-hire trucking firms or owner-operators consume less diesel per 100 km than those belonging to private firms. This finding may be explained by the fact that companies whose main activity is trucking may have more interest in reducing truck-operating costs. Other explanations may involve vehicle age and trip length.

Table 5.3

Activity type for diesel-powered medium and heavy trucks in the provinces, 2005

Activity Type	Diesel Consumed (in millions of L)				Consumption Rate (L/100 km)			
	Medium Trucks		Heavy Trucks		Medium Trucks		Heavy Trucks	
For-hire trucking	215.2	E	4,217.0	B	26.6	C	34.0	A
Owner-operator	223.5	E	1,805.7	B	28.3	C	35.8	A
Private trucking	697.8	D	1,081.3	C	25.9	B	37.3	A
Other	201.3	E	374.6	D	27.4	C	38.5	C
Total	**1,337.8**	**B**	**7,478.7**	**A**	**26.6**	**A**	**35.1**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

[31] While most owner-operators are connected with for-hire trucking firms, some can be connected with private trucking firms. (Transport Canada, *Truck Activity in Canada – A Profile*, March 2003)

5.4 Age of heavy vehicles

According to the CVS, the heavy truck fleet is similar to the light vehicle fleet in terms of age distribution. Medium trucks, however, were older than both other categories of vehicle in 2005. As a result, there were more medium trucks over 10 years of age in the survey scope during 2005. Figure 5.4 illustrates the age distribution of the medium and heavy truck fleets.

While more than 40 percent of medium trucks were over 10 years old in 2005, only 32 percent of heavy trucks were in that age group. Figure 5.4 also shows that the percentage of vehicles less than five years old is similar for both medium trucks and heavy trucks. As shown in Figure 5.5, these newer vehicles are the most used among both medium trucks and heavy trucks. Differences emerge for older vehicles. Vehicles over 10 years of age accounted for only 10 percent of the distance travelled by heavy trucks in 2005, but accounted for more than 20 percent of the distance travelled by medium trucks.

Figure 5.4

Distribution of Medium and Heavy Trucks According to Age, 2005

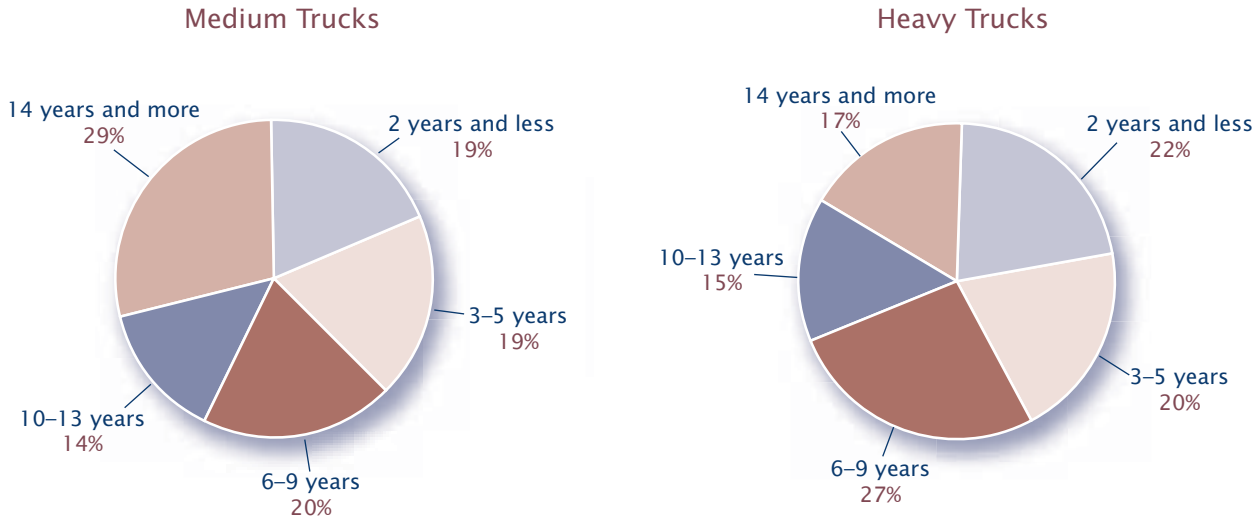
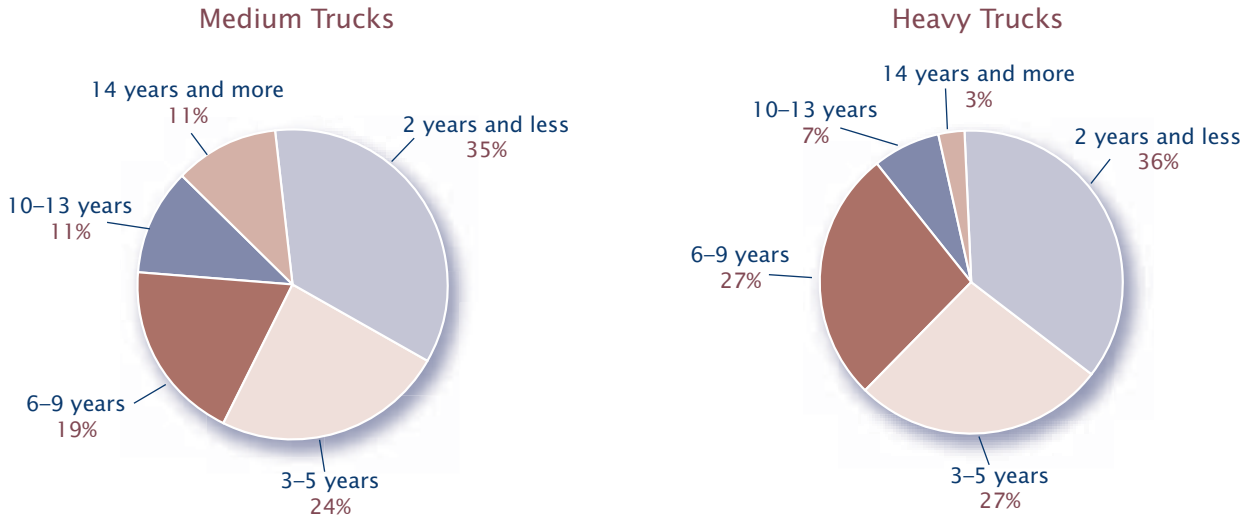


Figure 5.5

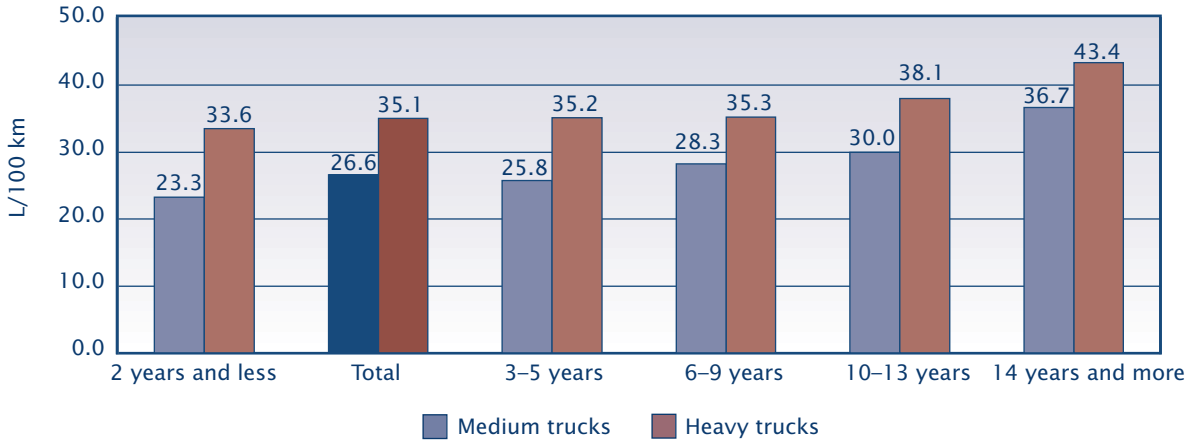
Distribution of Vehicle-km Travelled by Medium and Heavy Trucks, According to Age, 2005



The age of the medium truck fleet can have some effect on the fleet's energy efficiency, even if the older vehicles are used less. Figure 5.6 shows that older heavy vehicles usually consume more fuel per 100 km than newer vehicles. Therefore, in the case of both medium and heavy trucks, diesel consumption in L/100 km among vehicles older than 10 years appears to be higher than the average consumption of the vehicle fleet. Consequently, an older fleet of medium or heavy trucks could consume more fuel.

Figure 5.6

Diesel Consumption (L/100 km) by Medium and Heavy Trucks in the Provinces, According to Age, 2005



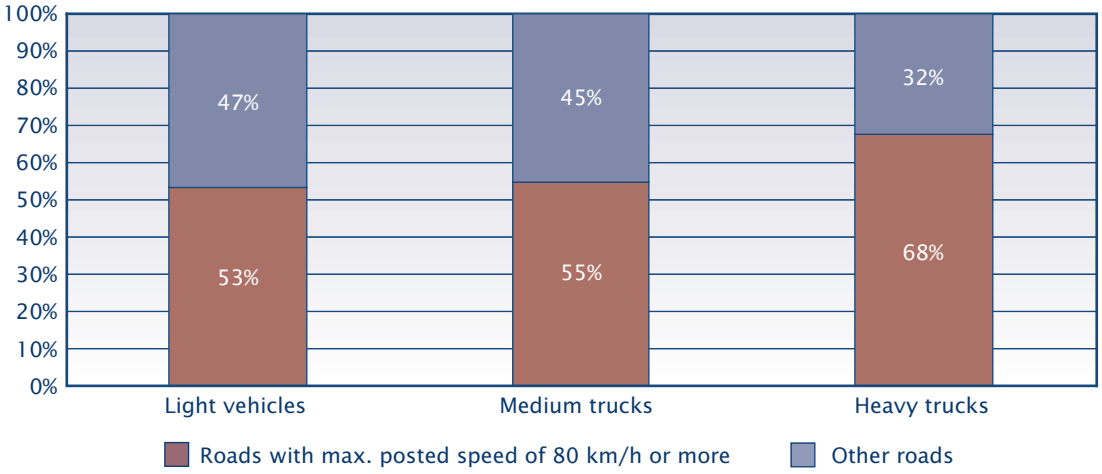
6 Trip Analysis

6.1 Road types used by vehicles

NRCan produces an annual *Fuel Consumption Guide*, which provides Canadians with information on the fuel consumption of new light vehicles.[32] Fuel consumption rates are always presented for city and highway driving. Fuel efficiency is better in the latter case, as testing for highway driving is conducted at a higher average speed and without idling. CVS data do not allow for a direct comparison with the information in the Guide, since the Guide's definition of highway driving is not limited to expressways. However, the CVS findings in Figure 6.1 do allow for a comparable analysis as they present the percentage of distance travelled on highways with a maximum speed limit of 80 km/h or more, compared to the distance travelled on roads with lower speed limits.

Figure 6.1

Distribution of Distance Travelled in the Provinces by Road Type, 2005



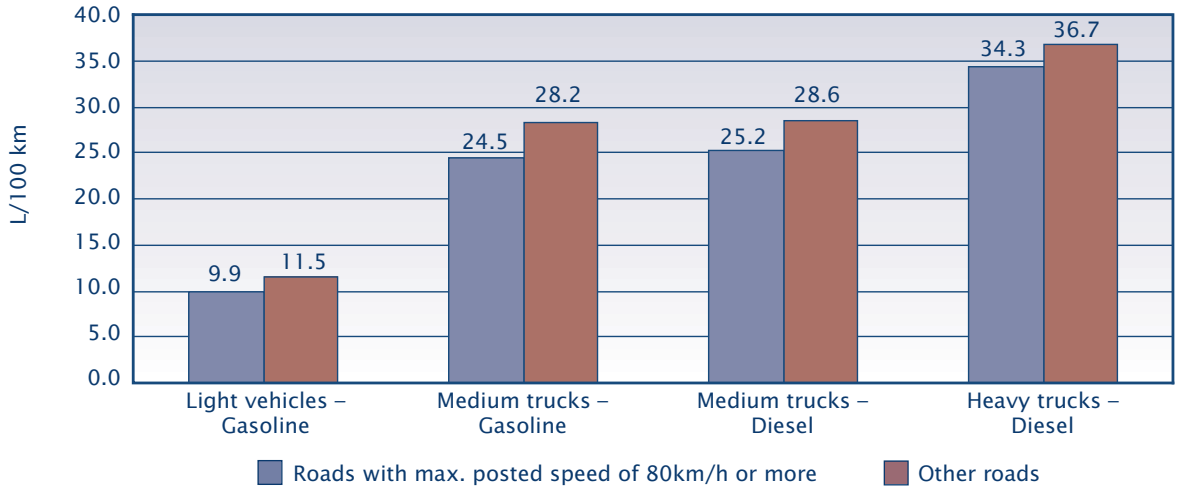
According to the estimates in Figure 6.1, light vehicles and medium trucks make less use than heavy trucks of roads with a maximum speed limit of 80 km/h or more. While about 55 percent of the vehicle-km travelled by these vehicles is on roads with a maximum speed limit of 80 km/h or more, more than 65 percent of the distance travelled by heavy trucks is on expressways.

Figure 6.2 illustrates the fuel efficiency of vehicles by road type. The findings show that fuel consumption per 100 km is indeed affected by road type, as stated in the *Fuel Consumption Guide*. CVS estimates of fuel efficiency for each category of vehicle are therefore better on expressways (maximum speed of 80 km/h or more), where infrequent stops are made.

[32] For more information on the *Fuel Consumption Guide*, please visit oee.nrcan.gc.ca/transportation/tools/fuelratings/fuel-consumption.cfm.

Figure 6.2

Fuel Consumption (L/100 km) by Road Type in the Provinces, 2005



6.2 Rush hour and fuel consumption

Light vehicles constitute the main means of daily transportation for most Canadians. Table 6.1 shows the distances travelled in 2005 by light vehicles according to place of origin and destination. About 15 percent of the 288 billion km travelled by light vehicles in 2005 were from the driver's home to work or back home again. Most of the trips for which the place of origin or destination is the driver's main place of work take place during rush hour, when traffic is heavy. The traffic jams that are common at this time of day have several impacts on the environment. According to a Transport Canada report on the cost of urban congestion in Canada, between 470 and 570 million litres of fuel are wasted each year in traffic jams in the country's largest urban areas. This wasted fuel means an annual increase of 1.2 to 1.4 megatonnes of GHGs due to traffic congestion.[33]

[33] Transport Canada, *The Cost of Urban Congestion in Canada*. Ottawa, 2006.

Table 6.1

Vehicle-km travelled by light vehicles in the provinces by origin and destination, 2005

	Destination											
Origin	Driver's Home		Driver's Regular Workplace		Store, Bank, Other Place of Personal Business		Leisure, Entertainment or Recreational Facility, Restaurant		Other		Total	
Driver's home	54,559.5	B	23,201.5	B	9,714.8	D	9,587.1	E	36,443.0	C	133,508.8	A
Driver's regular workplace	20,881.7	B	9,113.1	D		F		F	4,158.7	E	37,945.8	B
Store, bank, other place of personal business	11,342.2	D		F	5,353.2	E		F	5,039.2	E	23,679.2	C
Leisure, entertainment or recreational facility, restaurant	9,702.2	D		F		F		F		F	19,051.1	C
Other	34,570.0	C		F	5,575.8	E	6,057.4	E	22,966.6	D	72,887.9	B
Total	**131,055.5**	**A**	**37,456.7**	**B**	**24,384.2**	**C**	**20,799.0**	**C**	**73,374.5**	**B**	**287,722.4**	**A**

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

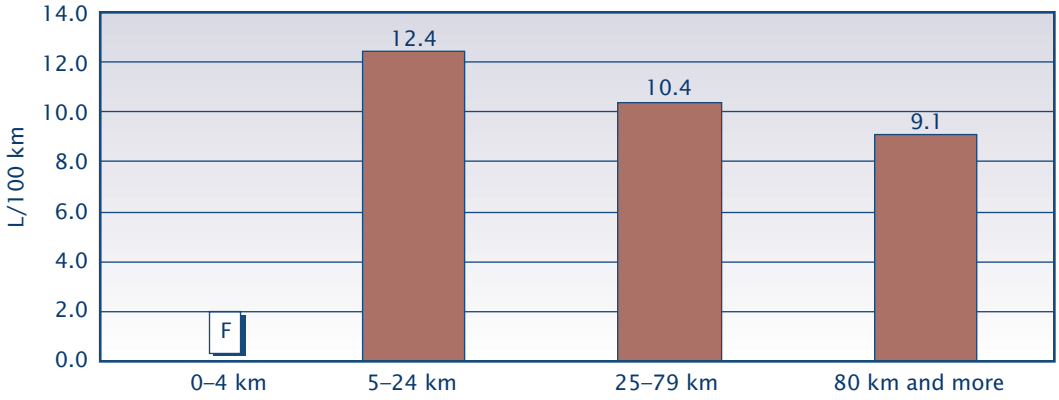
Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

Census data from 2001 show that most Canadians travel less than 25 km to get to work. Only 13 percent of all workers travel more than 25 km to get to their regular workplace.[34] The CVS shows that trips of less than 25 km do seem to represent about 60 percent of the distance travelled by Canadians in light vehicles to get to or return from their regular workplace. CVS data also allow us to compare the rate of gasoline consumption of light vehicles based on trip length (see Figure 6.3).

[34] Statistics Canada, *Where Canadians Work and How They Get There, Census 2001*, Catalogue No. 96F0030XIE2001010. Ottawa, 2003.

Figure 6.3

Gasoline Consumption (L/100 km) by Light Vehicles in the Provinces According to Trip Length, 2005



The letter F indicates an estimate that is too unreliable to be published.

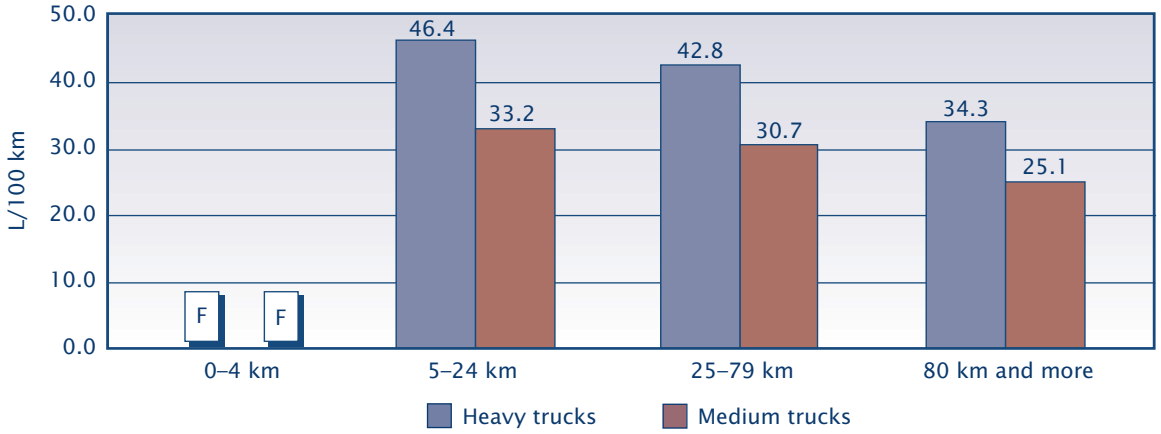
Figure 6.3 appears to indicate that the fuel efficiency of light vehicles is lower during short-distance trips. It should be pointed out that while the fuel efficiency of these vehicles is better over longer distances, this does not mean that less gasoline is consumed or that long trips save on gas. A variety of factors can contribute to the findings shown in Figure 6.3. For example, given that many of these short trips are not on expressways, there will be more frequent stops, which could make fuel consumption increase. Furthermore, if a significant percentage of these trips take place during rush hour, there may be more traffic jams. Finally, if a motor does not reach its optimum operating temperature, it is likely to burn more fuel, as is often the case during very short trips.[35]

The CVS results in Figure 6.4 show that the same observations can be made for medium and heavy trucks.

[35] OEE, oee.nrcan.gc.ca/transportation/personal/driving/autosmart-maintenance.cfm.

Figure 6.4

Diesel Consumption (L/100 km) by Heavy Vehicles in the Provinces According to Trip Length, 2005



The letter F indicates an estimate that is too unreliable to be published.

6.3 Driver's age and gender

Canadians' driving habits may vary based on certain socio-economic characteristics. The driver's gender is one such characteristic that may be thought to affect driving habits and vehicle choice. The driver's age can also help to explain these variables since age affects the type of car needed to meet work and family requirements. This section examines the possible impacts of gender and age on Canadians' driving habits and the fuel efficiency of their vehicles.

Table 6.2 shows that, according to the CVS, gasoline-powered vehicles of all categories driven by men travel twice as many vehicle-km and passenger-km as those driven by women.[36]

Table 6.2

Use of gas-powered vehicles by gender of driver, 2005

	Men		Women	
Vehicle-km (in millions of km)	184,503.7	A	91,246.8	B
Passenger-km (in millions of km)	329,244.4	B	146,251.1	B

The letter to the right of each estimate indicates its quality: A – Excellent, B – Very good, C – Good, D – Acceptable, E – Use with caution, and F – Too unreliable to be published.

Due to rounding, the numbers in the tables may not add up, and some data may differ slightly from one table to the next.

[36] Gasoline-powered vehicles include both light vehicles and medium trucks.

Figure 6.5 illustrates fuel consumption rates in L/100 km for gas-powered vehicles, by gender of driver. The CVS results indicate that there does not seem to be a major difference between the fuel efficiency of vehicles driven by men and those driven by women.

Driver's age also seems to have very little impact on vehicle fuel efficiency. Figure 6.6 shows that the gas consumption rate (L/100 km) of vehicles driven by persons between 25 and 54 years old is basically the same as that of vehicles driven by persons 55 years old and over. There is not enough information available to determine the fuel efficiency of vehicles driven by persons under the age of 25.

Therefore, contrary to some views, the CVS shows that as a whole, drivers' gender and age have no impact on the fuel consumption rates of vehicles.

Figure 6.5

Gasoline Consumption (L/100 km) in the Provinces According to Driver's Gender, 2005

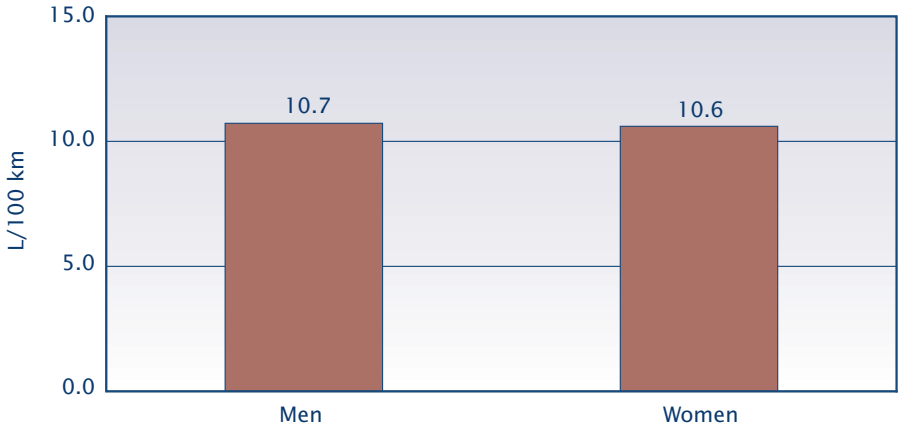
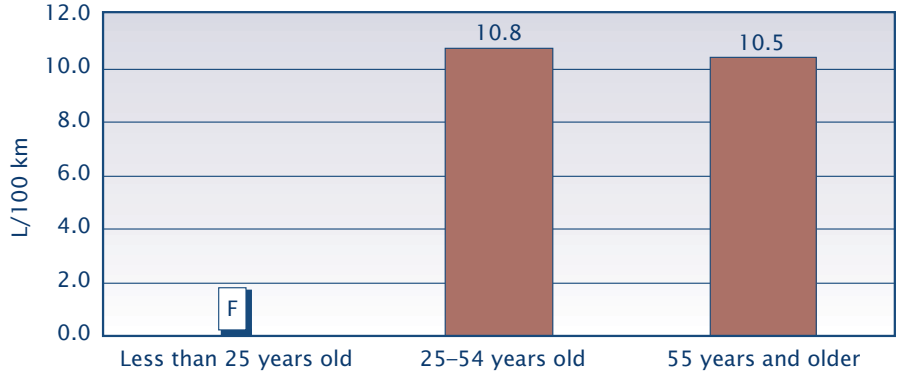


Figure 6.6

Gasoline Consumption (L/100 km) in the Provinces According to Driver's Age, 2005



The letter F indicates an estimate that is too unreliable to be published.

Annex A

Note on Data Quality and Interpretation of Results

The *Canadian Vehicle Survey* (CVS) is a quarterly vehicle-based survey. It provides quarterly and annual estimates of the distance travelled by on-road vehicles in Canada and their fuel consumption.[37]

In 2005, there were 21,915 vehicles in the sample from the 10 provinces, and 10,988 vehicles in the sample from the territories. Since participation is voluntary, a certain percentage of these samples included non-respondents. The response rate was about 65 percent for the provinces and 15 percent for the territories, resulting in a good response rate for the CVS compared with similar surveys conducted elsewhere in the world.

While considerable effort is exerted to ensure that high standards are maintained throughout all survey operations, the resulting estimates are inevitably subject to a certain degree of error. The total survey error is defined as the difference between the survey estimate and the true value for the population. The total survey error consists of two types of errors: sampling and non-sampling.

Sampling errors occur because we are studying only a segment of the population rather than conducting a census. Factors such as sample size, sample design and estimation method affect the sampling error. If the population is very heterogeneous, as is the case for the CVS, a large sample size is needed to reduce sampling errors. In addition, the CVS relies on a stratified sample design to divide the population into similar groups, thereby reducing sampling errors by producing estimates for homogeneous groups. These estimates are then aggregated to produce estimates for the entire population.

Each estimate in the report is associated with a coefficient of variation (CV), which is the basis for determining an all-encompassing quality indicator. CVs measure the sampling error of the estimates, and take into account variability due to non-response and imputation. CVs are also used to establish confidence intervals (*I*), which express the accuracy of an estimate in concrete terms. The *I* indicates the level of confidence according to which the true value of a characteristic of the population under study occurs within certain limits. For example, an *I* of 95 percent, *I(0.95)*, implies that if the sampling were repeated indefinitely, with each sample providing a different *I*, 95 percent of the intervals would contain the true value.[38]

[37] Annex B provides more information on the scope and methodology of the CVS.

[38] Satin, A and W. Shastry, Statistics Canada, *Survey Sampling: A Non-mathematical guide*, 2nd edition, Catalogue No. 12-602E. Ottawa, 1993, p. 14.

To illustrate how all of these concepts are linked, let's take as an example a CVS estimate stating that on-road vehicles travelled 315.3 billion vehicle-km in Canada in 2005. This is an excellent estimate since it has a CV of 0.026 and, therefore, a quality indicator of "A." To determine the *I* of 95 percent attributed to this estimate, we perform the following calculation:[39]

I(0.95) = [315.3 *billion x (*1 − 1.96 *x CV),* 315.3 *billion x (*1 + 1.96 *x CV)*]

I(0.95) = [315.3 *billion x (*1 − 1.96 *x* 0.026*),* 315.3 *billion x (*1 + 1.96 *x* 0.026*)*]

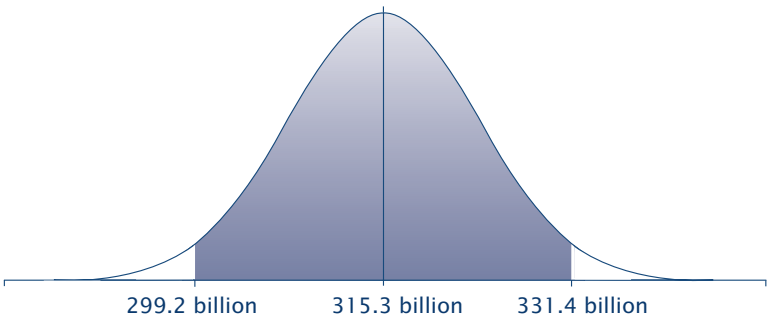
I(0.95) = [299.2 *billion*, 331.4 *billion*]

Based on this *I*, we can state with a 95 percent degree of confidence that the distance travelled in Canada in 2005 is between 299.2 billion and 331.4 billion vehicle-km. The smaller the *I*, the greater the chances that the survey estimate is close to the true value. Figure A-1 illustrates the *I* for the preceding example.

It is important to remember the confidence interval when analysing survey results. Table A-1 is a reference for readers who want to assess the *I* attributed to an estimate based on the quality indicators in this report. Note that the report uses stringent standards identified by Statistics Canada for determining whether an estimate is "excellent" or "very good."

Figure A-1

95 Percent Confidence Interval for CVS Estimate of Vehicle-km Travelled in Canada in 2005



[39] If we assume a normal distribution, the *I* of 95 percent corresponds to the estimate plus or minus about two times the standard error. The standard error is equal to the square root of the variance, which corresponds to the product of the estimate and the CV.

Table A-1

Range of the confidence intervals attributed to CVS estimates

Quality Indicator	Quality of Estimate	Coefficient of Variation	Range of the Confidence Intervals
A	Excellent	Less than 5%	Estimate ± 0% to 9.9%
B	Very good	5% – 9.9%	Estimate ± 10% to 19.9%
C	Good	10% – 14.9%	Estimate ± 20% to 29.9%
D	Acceptable	15% – 19.9%	Estimate ± 30% to 39.9%
E	Use with caution	20% – 34.9%	Estimate ± 40% to 69.9%
F	Too unreliable to be published	35% or more	Estimate ± 70% and over

Non-sampling errors can also contribute to the total survey error. This second type of error can occur at almost any stage of the survey. In particular, errors can arise when a respondent provides incorrect information, does not answer a question or misinterprets a question. Non-sampling errors can also arise when data are being processed. Some of these errors will be cancelled over a large number of observations, but systematically occurring errors will contribute to a bias in the estimates. For example, if persons demonstrating similar characteristics consistently tend not to respond to the survey, a bias may result in the estimates. Some non-sampling errors are difficult to quantify and are not reflected by quality indicators. However, the CVS quality indicators take into account variance due to non-response and imputation, and as such, account for some of the non-sampling errors. Other measures such as survey response rate and imputation rate can also serve as indicators for non-sampling errors.

Annex B

Scope and Methodology of the Canadian Vehicle Survey

This section summarizes the methodology used in the *Canadian Vehicle Survey*, conducted by Statistics Canada on behalf of Transport Canada and Natural Resources Canada in 2004 and 2005. More information is available in the *Canadian Vehicle Survey: Annual 2005 (Revised)*, produced by the Transport Division of Statistics Canada.[40]

General description

The CVS is a voluntary survey of vehicles that is conducted quarterly. The survey design also allows for calculation of annual estimates based on the data collected during the four quarters. The survey population consists of all motor vehicles registered in Canada at any time in 2005 that have not been scrapped or salvaged. Buses (since 2004), motorcycles, off-road vehicles (e.g. snowmobiles) and special equipment (e.g. cranes, snowplows) are excluded from the registration lists used in the sample.

The survey population is derived from the vehicle registration lists sent by the governments of the 10 provinces and three territories to Statistics Canada three months before the reference period. This population differs slightly from the population of interest, as vehicles that were registered less than three months before the quarter began, or during the quarter, are not included in that quarter's sample (the sample for each quarter is derived from the population of the preceding quarter).

The registration lists received by Statistics Canada undergo a rigorous preparation procedure:

- out-of-scope vehicles are removed;
- vehicles with expired registration are removed;
- records with duplicate Vehicle Identification Numbers (VIN) within a given list are removed, leaving the one updated most recently; and
- records with irregular data are verified.

The most recent set of prepared lists is used to select the sample for each quarter. These sets of vehicle lists and the days within the respective quarter constitute the survey population.

Survey design

The CVS uses a two-stage sample design. A sample of vehicles is selected in the first stage, and a sample of consecutive days within the quarter is selected in the second stage. All vehicles from the survey population are stratified into 78 strata according to vehicle type, jurisdiction and vehicle age. Then, a systematic sample of vehicles (first-stage sample) is selected from the survey population in order to spread the sample over all regions. In the second stage, a first reporting day within the quarter is randomly assigned to each vehicle that had been selected in the first stage. Within each stratum, the first reporting day is evenly spread over the quarter to ensure a uniform number of responses over time and for each day of the week. This step is not applied to the vehicles registered in the three territories since only odometer readings are collected.[41]

[40] Statistics Canada, *Canadian Vehicle Survey: Annual 2005 (Revised)*. Catalogue No. 53-223-XIE. www.statcan.ca/bsolc/english/bsolc?catno=53-223-X.

[41] Less information is collected in the territories so as not to overload respondents. They are asked to participate in several surveys a year.

The sample from the 10 provinces consisted of 21,915 vehicles for the four quarters of 2005. The sample from the three territories consisted of 10,988 vehicles.[42] Table B-1 shows the number of vehicles sampled in the provinces and territories in 2005, by type of vehicle.

Table B-1

Number of vehicles in sample by jurisdiction and vehicle type

Jurisdiction	Light Vehicles	Medium Trucks	Heavy Trucks	Total
Newfoundland and Labrador	886	225	208	1,319
Prince Edward Island	554	159	182	895
Nova Scotia	1,120	293	282	1,695
New Brunswick	1,086	281	232	1,599
Quebec	2,316	558	488	3,362
Ontario	2,631	622	669	3,922
Manitoba	1,148	299	340	1,787
Saskatchewan	1,065	417	363	1,845
Alberta	1,628	590	531	2,749
British Columbia	1,803	601	338	2,742
Total for provinces	**14,237**	**4,045**	**3,633**	**21,915**
Yukon	1,528	1,152	444	3,124
Northwest Territories	3,032	651	834	4,517
Nunavut	2,980	228	139	3,347
Total for territories	**7,540**	**2,031**	**1,417**	**10,988**
Total for Canada	**21,777**	**6,076**	**5,050**	**32,903**

[42] A larger sample in the territories enables Statistics Canada to compensate for a lower response rate in these jurisdictions.

Data collection

Data collection for the vehicles sampled is conducted differently in the provinces than in the territories. In the provinces, the registered owners of the sampled vehicles are contacted for a Computer-Assisted Telephone Interview (CATI). During the CATI, the following information is collected about each sampled vehicle:

- vehicle type;
- fuel type used;
- distance driven the previous week;
- some information about anticipated vehicle use during the following six weeks;
- current odometer reading;
- some vehicle maintenance information; and
- some information on the household characteristics.

Respondents are then asked to complete a trip log. If they agree, the trip log is mailed out to them. There were two types of logs: one for light vehicles, and one for medium and heavy trucks. Respondents receiving a light vehicle log are requested to record information for 20 consecutive trips made in the selected vehicle, beginning on the assigned first reporting day. Respondents have to record a new trip each time the driver enters the vehicle or a passenger enters or exits the vehicle.[43] Respondents receiving a heavy vehicle log (medium and heavy trucks) are requested to record information for all the trips made in the selected vehicle over the assigned seven-day period. A new trip begins if there is a stop made of over 30 minutes, if the driver changes, if the reason for the trip or the use of the vehicle changes, if the truck configuration is modified, or if the truck goes from full to empty or the reverse. The following information is recorded for each trip:

- start and stop dates and times;
- start and stop odometer readings;
- starting point and destination (light vehicles) or trip purpose (heavy vehicles);
- number and age group of passengers (light vehicles) or number of passengers at the start and end of the trip (heavy vehicles);
- gender and age group of the driver;
- total cost, per unit cost and amount of fuel purchased;
- distance travelled on roads with posted speed limit of 80 km/h or more;
- truck configuration (heavy vehicles); and
- dangerous goods (heavy vehicles).

Since 2004, when NRCan became co-sponsor of the CVS, respondents have been asked to continue recording fuel purchases until they reported two fill-ups or five purchases, or until the 28-day reporting period was over.

Less information is collected in the territories. Statistics Canada sends a questionnaire at the beginning of the quarter and one at the end, asking for an odometer reading so that the distance travelled during the quarter can be identified. Other information is also collected regarding the vehicle's status (still owned, sold or scrapped), body style and type of fuel used.

[43] This definition has been used as of the first quarter of 2004, and is different from that used in previous versions of CVS.

Data edit and imputation

Once all the necessary information for the survey has been collected, Statistics Canada conducts a series of computerized and manual verifications to ensure that the records are consistent and that there are no errors as a result of data capture. Missing values and data found to be in error are imputed by another automated system using different imputation rules depending on the vehicle, available information and type of data to be imputed. For example, data can be imputed based on responses to other questions or by using data from similar vehicles. The imputed data are examined again for completeness and consistency.

Response rate

Statistics Canada defines the CVS response rate as the number of vehicles for which the respondents have provided full or partial answers to the questions concerning vehicle-km only, divided by the total number of vehicles in the sample. Table B-2 illustrates the response rates obtained for each quarter by vehicle type.

Table B-2

Response rate for the *Canadian Vehicle Survey* – All provinces (in percentages)

Quarter	Light Vehicles	Medium Trucks	Heavy Trucks
Quarter 1	66.7	68.8	71.2
Quarter 2	63.9	65.0	69.1
Quarter 3	67.2	66.4	63.2
Quarter 4	61.8	63.2	62.6
Annual	**64.9**	**65.8**	**66.4**

All territories (in percentages)

Quarter	Light Vehicles	Medium Trucks	Heavy Trucks
Quarter 1	13.1	10.6	15.4
Quarter 2	15.9	13.6	18.8
Quarter 3	14.9	12.7	16.4
Quarter 4	14.9	11.7	12.2
Annual	**14.7**	**12.1**	**15.6**

The response rate for the *fuel* component of the CVS is lower than the response rates in the preceding tables. While the exact response rate for this part of the survey is not available, Table B-3 shows that 4,316 respondents reported their fuel purchases for 21,415 vehicles sampled in the provinces in 2005. Therefore, the data on fuel consumption has a high imputation rate, which helps to explain the lower quality of fuel consumption estimates in this report.

Estimates and quality indicators

Estimates are based on the principle that each vehicle in the sample represents a certain number of vehicles in the population of interest. A sample weight is therefore assigned to each vehicle in the sample, and the purpose of the final set of weights is to reflect as closely as possible the characteristics of the vehicle population during the reference period.

All estimates for 2004 and 2005 presented in this report were produced using an estimate module developed by Statistics Canada. This module also calculates the coefficient of variation (CV), reflecting the quality of each estimate. The CV takes into account variability due to sampling, and variability due to non-response and imputation. For example, a variance due to relatively high imputation has a negative effect on the quality of fuel consumption estimates. Estimates with a CV of more than 35 percent are not reliable enough to be published. Table B-4 describes the indicators used in this report to describe the quality of estimates. For more information on the methodology used in the *Canadian Vehicle Survey*, please contact the Transport Division, Statistics Canada, at

Transport Division
Statistics Canada
Ottawa ON K1A 0T6
Tel.: 1-866-500-8400
E-mail: transportationstatistics@statcan.ca

Table B-3

Number of respondents reporting their fuel purchases – All provinces and vehicle types

Number of Purchases	Number of Respondents
0	1,754
1	697
2	875
3	288
4	171
5	531
Total	**4,316**

Table B-4

Indicators for coefficients of variation

Coefficient of Variation	Indicator of Quality	Quality of Estimate
Less than 5%	A	Excellent
5% to 9.9%	B	Very good
10% to 14.9%	C	Good
15% to 19.9%	D	Acceptable
20% to 34.9%	E	Use with caution
35% or over	F	Too unreliable to be published

Annex C
Glossary

Alternative fuel

Alternative fuels include all fuels other than standard ones (gasoline and diesel) used in road transportation. The most common alternative fuels in Canada are propane and compressed natural gas.

Fuel consumed

In the *Canadian Vehicle Survey*, fuel consumed is the fuel used to operate a vehicle. This variable is determined for each vehicle based on declared fuel purchases and distance travelled.

Fuel consumption rate

The fuel consumption rate is the amount of fuel (in litres) used by a vehicle to travel 100 kilometres. This rate is expressed in L/100 km and can be calculated based on actual road conditions or in the laboratory.

Heavy trucks

In the *Canadian Vehicle Survey*, the heavy truck category includes all heavy vehicles with a gross vehicle weight of 15 tonnes or more.

Heavy vehicles

In the *Canadian Vehicle Survey*, this combined category includes medium trucks and heavy trucks that share several traits in terms of use.

Light trucks

In the *Canadian Vehicle Survey*, light trucks are a sub-category of light vehicles and include pickups, vans and SUVs.

Light vehicles

In the *Canadian Vehicle Survey*, the light vehicle category includes all vehicles with a gross vehicle weight of less than 4.5 tonnes.

Medium trucks

In the *Canadian Vehicle Survey*, the medium truck category includes all heavy vehicles with a gross vehicle weight of 4.5 tonnes or more but less than 15 tonnes.

Number of in-scope vehicles in the CVS

The number of in-scope vehicles is an estimate of the average number of vehicles registered during the quarter based on the registration lists from jurisdictions and survey responses. This estimate may differ slightly from the number of vehicles on the registration lists because it includes all survey findings. Note that the number of in-scope vehicles includes both vehicles used and those not used on the roads during the reference period.

Passenger-kilometres (passenger-km)

Passenger-kilometres is the sum of the distances travelled by individual passengers, the driver being considered one of the passengers. (*e.g. total passenger-kilometres for a specific vehicle would be the sum of the distances travelled by individual passengers in that vehicle.)* For light vehicles, respondents must report the number of passengers for each trip. For heavy vehicles, the number of passengers is calculated as the average of the number of passengers at the beginning of each trip and the number of passengers at the end of each trip.

Passenger vehicle

Passenger vehicles are a sub-category of light vehicles and include cars and station wagons.

Tonne-kilometre (t-km)

A tonne-kilometre is the transportation of one tonne over a distance of one kilometre.

Vehicle-kilometres (vehicle-km)

Vehicle-kilometres is the distance travelled by vehicles on roads. *(e.g. total vehicle-kilometres for a specific vehicle would be the distance travelled by that vehicle on the road.)*