

The Canadian Vehicle Use Study

Challenges in Data Collection and Practical Sampling Design

P. Boily

Contents

- 1. Project Description**
- 2. Focus on Data Collection and Sampling**
- 3. Results**
- 4. Consulting Post-Mortem**

Project Description

Project Description

Canadian Vehicle Survey

- ❑ The **Canadian Vehicle Survey (CVS)** was sponsored by *Transport Canada* and *Natural Resources Canada* between 1999 and 2009.
- ❑ The quarterly survey employed a **two-stage sample design**: a sample of vehicles was selected and then a period of travel within the quarter was selected for each vehicle.
- ❑ Vehicles were grouped into **three categories**: *light vehicles* (passenger cars and light trucks/vans) and two types of *heavy vehicles*, based on the gross vehicle weight.
- ❑ A **paper questionnaire** was then mailed out to the owners of the selected vehicles, requesting that they record the *number of trips*, *distance driven*, and *fuel consumption* during the observation period.
- ❑ The CVS was hampered by **low participant response rates** (~20%) over its existence, caused in large part by the **burdensome paper collection** methods.
- ❑ The quality of the estimates was also weakened by **significant errors** in the way in which the on-road vehicle fleet was classified due to mistakes in the *Vehicle Identification Number (VIN)* decoding algorithm.

Project Description

CVS Paper Questionnaires

Light vehicles logbook:

Example 1 - Trip 1	Example 1 - Trip 2
1. Date / Time trip started: date <u>08/09</u> <u>07:05</u> <small>dd mm</small> <small>h:m</small> <input type="radio"/> a.m. <input type="radio"/> p.m. <input type="radio"/> 24hr	1. Date / Time trip started: date <u>08/09</u> <u>07:20</u> <small>dd mm</small> <small>h:m</small> <input type="radio"/> a.m. <input type="radio"/> p.m. <input type="radio"/> 24hr
2. Odometer reading at start: <u>74026</u> <small>km</small> <small>110 miles</small>	2. Odometer reading at start: <u>74042</u> <small>km</small> <small>110 miles</small>
3. Number of passengers (excluding driver) in each age group. Check "none" if there are no passengers. None <input type="radio"/> Under 6 years <input type="checkbox"/> 65 to 64 years <input type="checkbox"/> 5 to 14 years <input type="checkbox"/> 55 to 54 years <input type="checkbox"/> 15 to 19 years <input type="checkbox"/> 45 to 74 years <input type="checkbox"/> 20 to 24 years <input type="checkbox"/> 75 to 84 years <input type="checkbox"/> 25 to 34 years <input checked="" type="checkbox"/> 85 years and over <input type="checkbox"/>	3. Number of passengers (excluding driver) in each age group. Check "none" if there are no passengers. None <input type="radio"/> Under 6 years <input type="checkbox"/> 65 to 64 years <input type="checkbox"/> 5 to 14 years <input type="checkbox"/> 55 to 54 years <input type="checkbox"/> 15 to 19 years <input type="checkbox"/> 45 to 74 years <input type="checkbox"/> 20 to 24 years <input type="checkbox"/> 75 to 84 years <input type="checkbox"/> 25 to 34 years <input checked="" type="checkbox"/> 85 years and over <input type="checkbox"/>
4. Where did this trip start? (check one please only) 1 <input checked="" type="radio"/> Driver's home 2 <input type="radio"/> Someone else's home 3 <input type="radio"/> Driver's regular workplace 4 <input type="radio"/> Another workplace 5 <input type="radio"/> School/day care 6 <input type="radio"/> Shopping centre/bank/other place of personal business 7 <input type="radio"/> Medical/dental facility 8 <input type="radio"/> Leisure/entertainment/recreational facility/restaurant 9 <input type="radio"/> Gas station/head-stop 10 <input type="radio"/> Other (please specify) _____	4. Where did this trip start? (check one please only) 1 <input type="radio"/> Driver's home 2 <input type="radio"/> Someone else's home 3 <input type="radio"/> Driver's regular workplace 4 <input type="radio"/> Another workplace 5 <input type="radio"/> School/day care 6 <input type="radio"/> Shopping centre/bank/other place of personal business 7 <input type="radio"/> Medical/dental facility 8 <input type="radio"/> Leisure/entertainment/recreational facility/restaurant 9 <input type="radio"/> Gas station/head-stop 10 <input type="radio"/> Other (please specify) _____
5. Was this trip part of the driver's job? (example: deliveries, service calls) <input type="radio"/> Yes <input checked="" type="radio"/> No	5. Was this trip part of the driver's job? (example: deliveries, service calls) <input type="radio"/> Yes <input checked="" type="radio"/> No
6. Date / Time trip ended: date <u>08/09</u> <u>07:15</u> <small>dd mm</small> <small>h:m</small> <input type="radio"/> a.m. <input type="radio"/> p.m. <input type="radio"/> 24hr	6. Date / Time trip ended: date <u>08/09</u> <u>07:30</u> <small>dd mm</small> <small>h:m</small> <input type="radio"/> a.m. <input type="radio"/> p.m. <input type="radio"/> 24hr
7. Odometer reading at end: <u>74042</u> <small>km</small> <small>110 miles</small>	7. Odometer reading at end: <u>74051</u> <small>km</small> <small>110 miles</small>
8. Driver's sex <input checked="" type="radio"/> Male <input type="radio"/> Female	8. Driver's sex <input checked="" type="radio"/> Male <input type="radio"/> Female
9. Driver's age group: 1 <input type="checkbox"/> Under 20 years 6 <input type="checkbox"/> 55 to 64 years 2 <input type="checkbox"/> 20 to 24 years 7 <input type="checkbox"/> 65 to 74 years 3 <input type="checkbox"/> 25 to 34 years 8 <input type="checkbox"/> 75 to 84 years 4 <input checked="" type="checkbox"/> 35 to 44 years 9 <input type="checkbox"/> 85 years and over 5 <input type="checkbox"/> 45 to 54 years	9. Driver's age group: 1 <input type="checkbox"/> Under 20 years 6 <input type="checkbox"/> 55 to 64 years 2 <input type="checkbox"/> 20 to 24 years 7 <input type="checkbox"/> 65 to 74 years 3 <input type="checkbox"/> 25 to 34 years 8 <input type="checkbox"/> 75 to 84 years 4 <input checked="" type="checkbox"/> 35 to 44 years 9 <input type="checkbox"/> 85 years and over 5 <input type="checkbox"/> 45 to 54 years
10. Did you travel on any roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, what was the estimated distance travelled on roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? <u>7</u> <small>km</small> <small>110 miles</small>	10. Did you travel on any roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, what was the estimated distance travelled on roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? <u>7</u> <small>km</small> <small>110 miles</small>
11. Did you purchase fuel during this trip? <input checked="" type="radio"/> Yes, record purchase on page 22. <input type="radio"/> No	11. Did you purchase fuel during this trip? <input type="radio"/> Yes, record purchase on page 22. <input checked="" type="radio"/> No

Heavy vehicles logbook:

Trip Log		Please read the instructions on page 4 and on the "fold out" page before completing the trip log.	
24 hour clock (00:00 to 23:59)			
Date	Time	Odometer reading	Number of passengers (including driver)
08/09	00:00 to 01:00	74026	1
08/09	01:00 to 02:00	74026	1
08/09	02:00 to 03:00	74026	1
08/09	03:00 to 04:00	74026	1
08/09	04:00 to 05:00	74026	1
08/09	05:00 to 06:00	74026	1
08/09	06:00 to 07:00	74026	1
08/09	07:00 to 08:00	74026	1
08/09	08:00 to 09:00	74026	1
08/09	09:00 to 10:00	74026	1
08/09	10:00 to 11:00	74026	1
08/09	11:00 to 12:00	74026	1
08/09	12:00 to 13:00	74026	1
08/09	13:00 to 14:00	74026	1
08/09	14:00 to 15:00	74026	1
08/09	15:00 to 16:00	74026	1
08/09	16:00 to 17:00	74026	1
08/09	17:00 to 18:00	74026	1
08/09	18:00 to 19:00	74026	1
08/09	19:00 to 20:00	74026	1
08/09	20:00 to 21:00	74026	1
08/09	21:00 to 22:00	74026	1
08/09	22:00 to 23:00	74026	1
08/09	23:00 to 00:00	74026	1

Road type	Fuel purchased?
1 <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, what was the estimated distance travelled on roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? <u>7</u> <small>km</small> <small>110 miles</small>	<input type="checkbox"/> Yes, go to page 24. <input type="checkbox"/> No
2 <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, what was the estimated distance travelled on roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? <u>7</u> <small>km</small> <small>110 miles</small>	<input type="checkbox"/> Yes, go to page 24. <input type="checkbox"/> No
3 <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, what was the estimated distance travelled on roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? <u>7</u> <small>km</small> <small>110 miles</small>	<input type="checkbox"/> Yes, go to page 24. <input type="checkbox"/> No
4 <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, what was the estimated distance travelled on roads with posted speeds of 80 km/h (50 m.p.h.) or more during this trip? <u>7</u> <small>km</small> <small>110 miles</small>	<input type="checkbox"/> Yes, go to page 24. <input type="checkbox"/> No

<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> Other _____</p> <p><input type="checkbox"/> Dangerous goods</p>	<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p>
<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> Other _____</p> <p><input type="checkbox"/> Dangerous goods</p>	<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p>
<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> Other _____</p> <p><input type="checkbox"/> Dangerous goods</p>	<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p>
<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> Other _____</p> <p><input type="checkbox"/> Dangerous goods</p>	<p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p>

<p>Please record times in a 24 hr format, i.e. 00:00 - 10:00, 10:30:00 - 23:00.</p> <p>For example of different trip situations, please see pages 24 - 31.</p>	<p>Please record only one "purpose of trip" (it should be the main purpose).</p> <p>For example of different trip situations, please see pages 24 - 31.</p>	<p>All kilometers or miles travelled during the next 7 days should be accounted for.</p>	<p>All fuel purchases or purchases of other records should be accounted for.</p>	<p>The number of passengers should include any spare drivers but NOT the actual driver.</p> <p>Thank you very much for your time and participation.</p>
--	---	--	--	---

Project Description

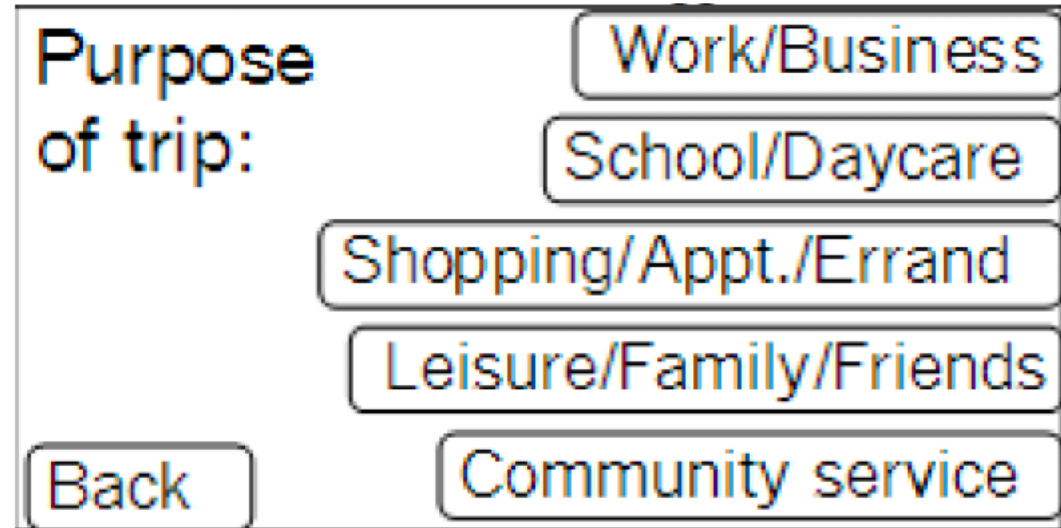
Canadian Vehicle Use Study (Pilot)

- ❑ As a result, *Transport Canada* decided to conduct a pilot **Canadian Vehicle Use Study** (CVUS), with improved methods, to validate (or invalidate) the CVS methodology and results.
- ❑ These included:
 - the use of **electronic data loggers** to reduce reporting burden,
 - the introduction of a more **robust vehicle identification number** (VIN) decoder to increase the accuracy of the in-scope fleet, and
 - a **modified sampling design** that includes potential additional strata to enhance the ability to carry out more detailed analyses of motor vehicle use.
- ❑ The pilot study was carried out in 2010–Q4 on $n = 1011$ light vehicles, selected via **simple random sampling** (SRS) from a list of vehicles registered with the *Ministry of Transportation of Ontario* (MTO) having an address whose *Forward Sortation Area* (FSA) code was associated with Ottawa and surrounding Ontario areas.
- ❑ **Vehicle-km traveled** (VKT) tallies were compared against corresponding CVS observations for 2009–Q4 ($n = 1016$).

Project Description

CVUS Electronic Loggers

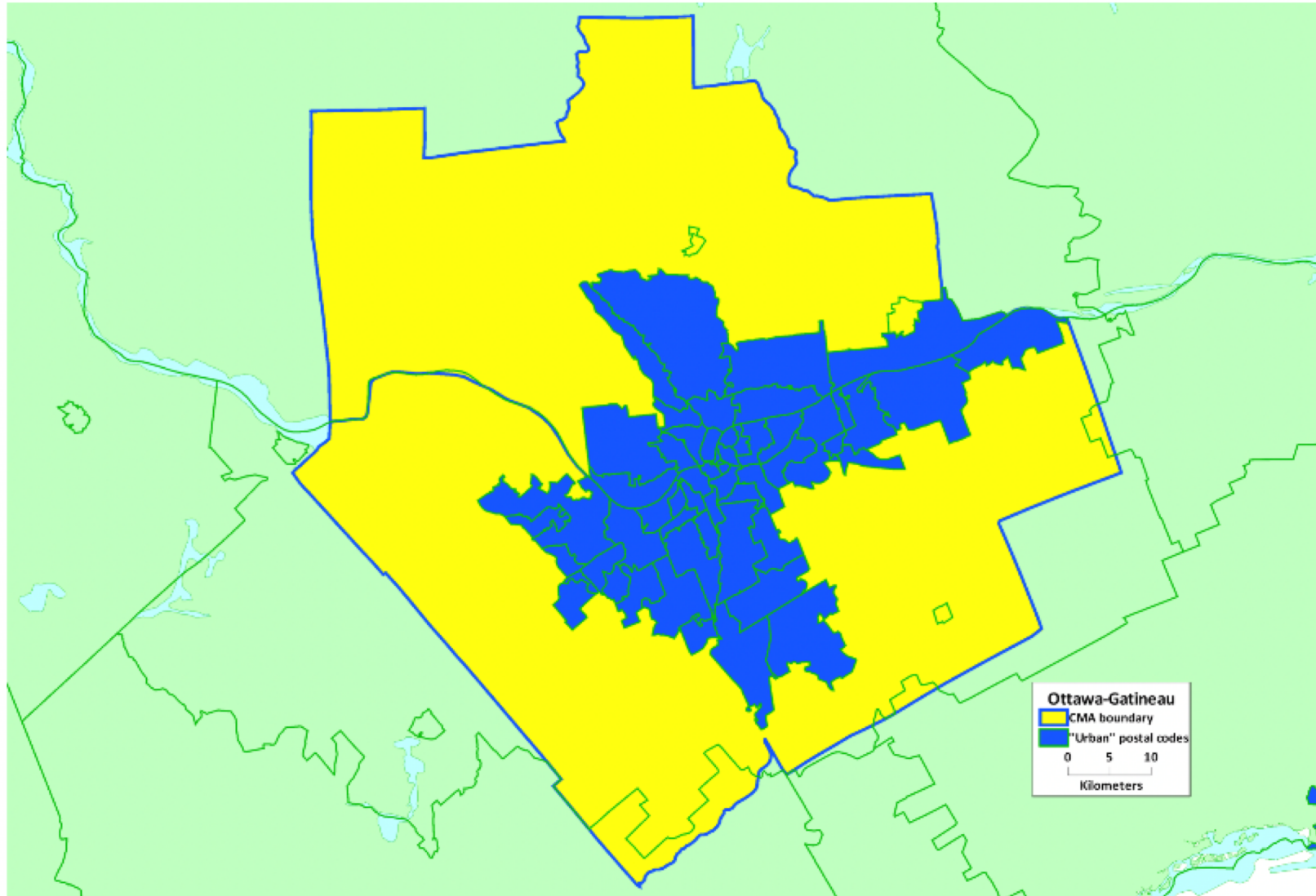
Main screen of electronic logger device:



- ❑ The logger device records accurate vehicle activity at one-second intervals (e.g. distance, time, speed, fuel, etc.) directly from the vehicle's engine.
- ❑ The logger touch screen captures the remaining trip questions.
 - Light: Driver Age/Sex, # Passengers, Trip Purpose, Fuel Information
 - Heavy: Trip Purpose, Facility Type (Origin), Configuration, Trailer Style, Cargo (Weight/Volume), Cargo Type (Best Description)

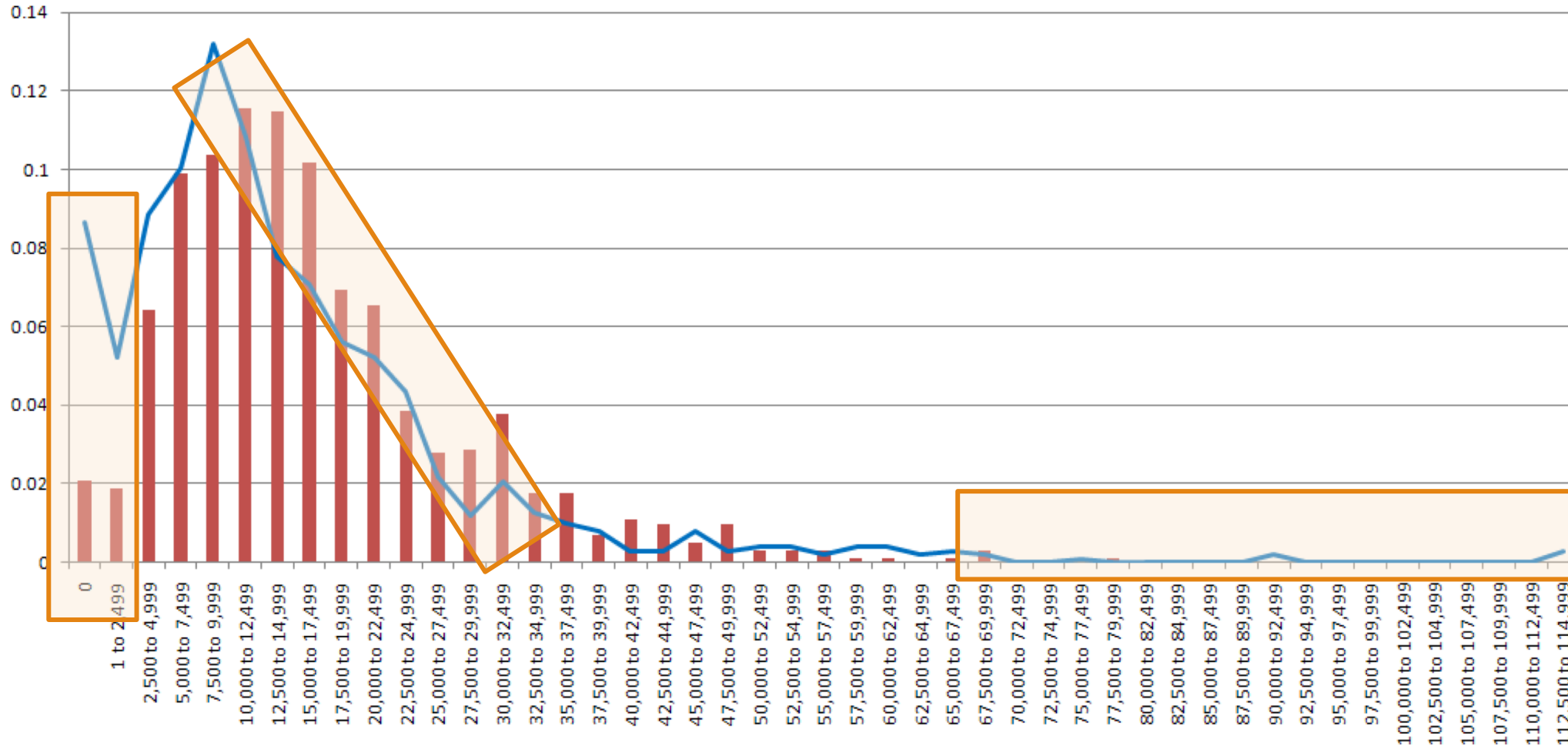
Project Description

Ottawa-Gatineau CMA + FSAs



Project Description

VKT Histograms – CVS (blue) vs. Pilot CVUS (red)



Project Description

CVS vs. Pilot CVUS

- ❑ Systematically, the Pilot CVUS has a smaller rate of observations at low VKT values, whereas that trend is reversed at medium values.

- ❑ The means and standard deviations of the distributions are substantially different:

$$\mu_{CVUS} = 16,716 \text{ km/year}$$

$$\sigma_{CVUS} = 11,616 \text{ km/year}$$

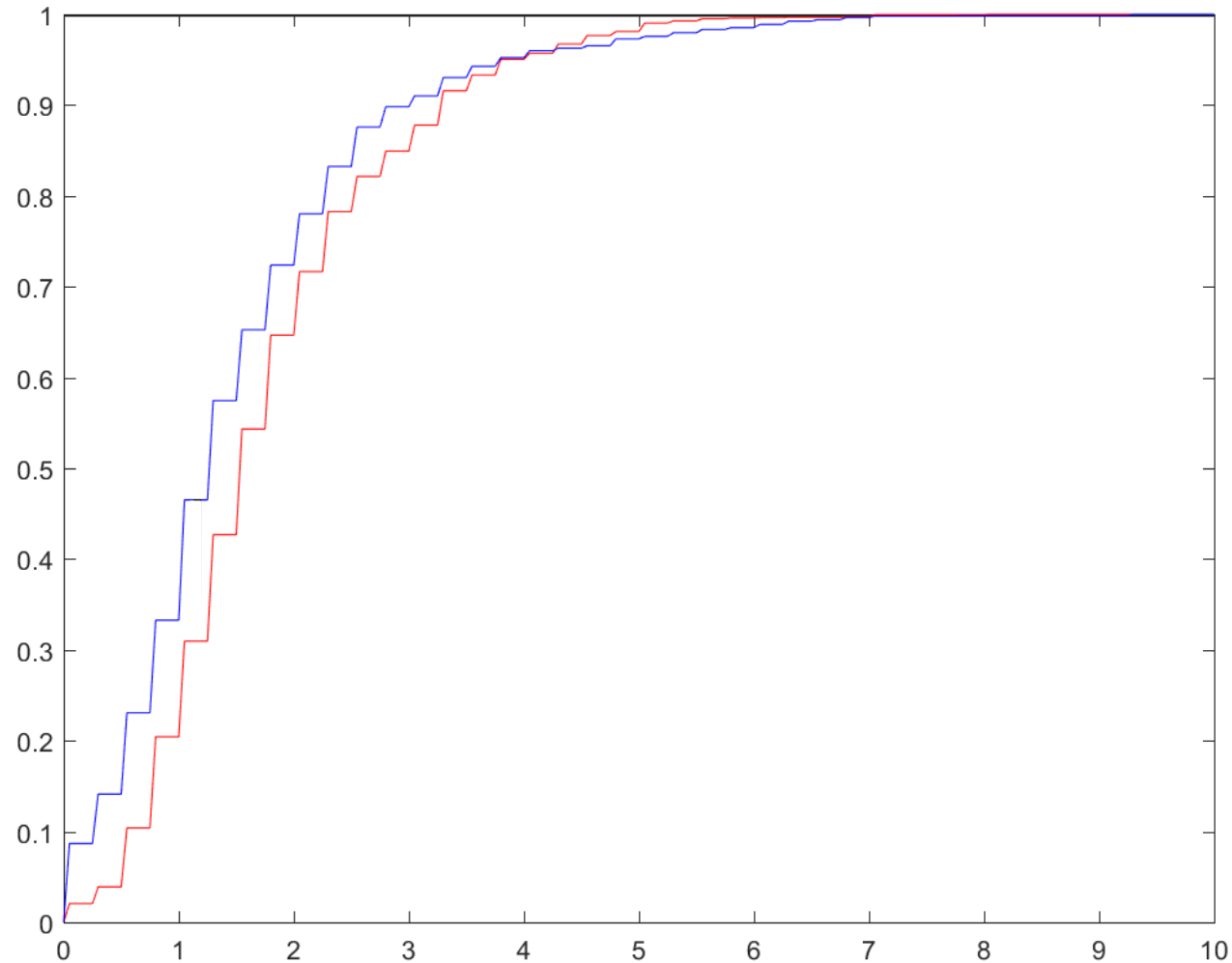
$$\mu_{CVS} = 14,237 \text{ km/year}$$

$$\sigma_{CVS} = 13,844 \text{ km/year}$$

- ❑ The proportion of non-active vehicle in the fleet was much higher in 2009 (8.7%) than it was in 2010 (2.1%).
- ❑ The distribution ranges are quite dissimilar: down to 79,500 km/year in 2010, from 112,500 km/year in 2009.
- ❑ The **Kolmogorov-Smirnov test** rejected the null hypothesis that the 2 samples were drawn from the same distribution at the 99.9% significance level.

Project Description

Cumulative Distributions – CVS (blue) vs. Pilot CVUS (red)



Data Collection and Sampling

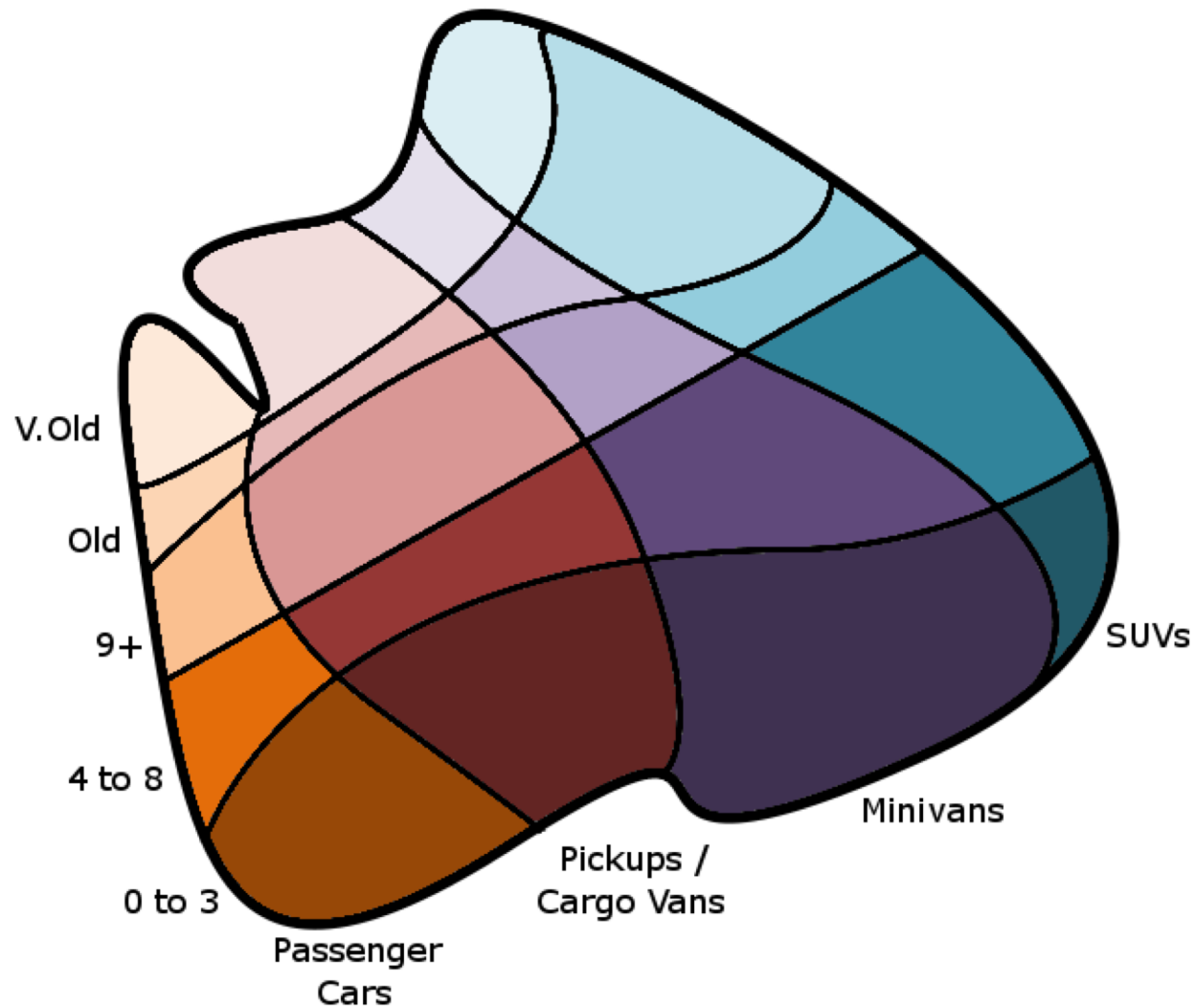
Survey Frame

- ❑ The **frame** consists of motor vehicle registration files provided by each jurisdiction, before the beginning of a quarter in order to minimize changes of address and maximize the accuracy of the fleet information.
- ❑ All the cars and trucks with GVW less than 4.5 metric tons define the **CVUS survey frame**.
- ❑ The CVUS survey frame excludes some **out-of-scope** (OOS) vehicles
 - motorcycles, trailers, cranes, buses, ambulances, fire trucks, farm equipment, motorhomes, police cars, etc.
- ❑ OOS vehicles are identified *via* the Polk VIN Decoder and other information in the registration file (vehicle type, model year and gross vehicle weight rating).
 - The VIN consists of a 17 character alpha-numeric code for all vehicles whose model year is 1981 or newer (pre-1981 vehicles use a different standard).
 - The first eleven characters define the make, model and other characteristics of the vehicle while the last six digits uniquely identify each vehicle.

Sampling Design

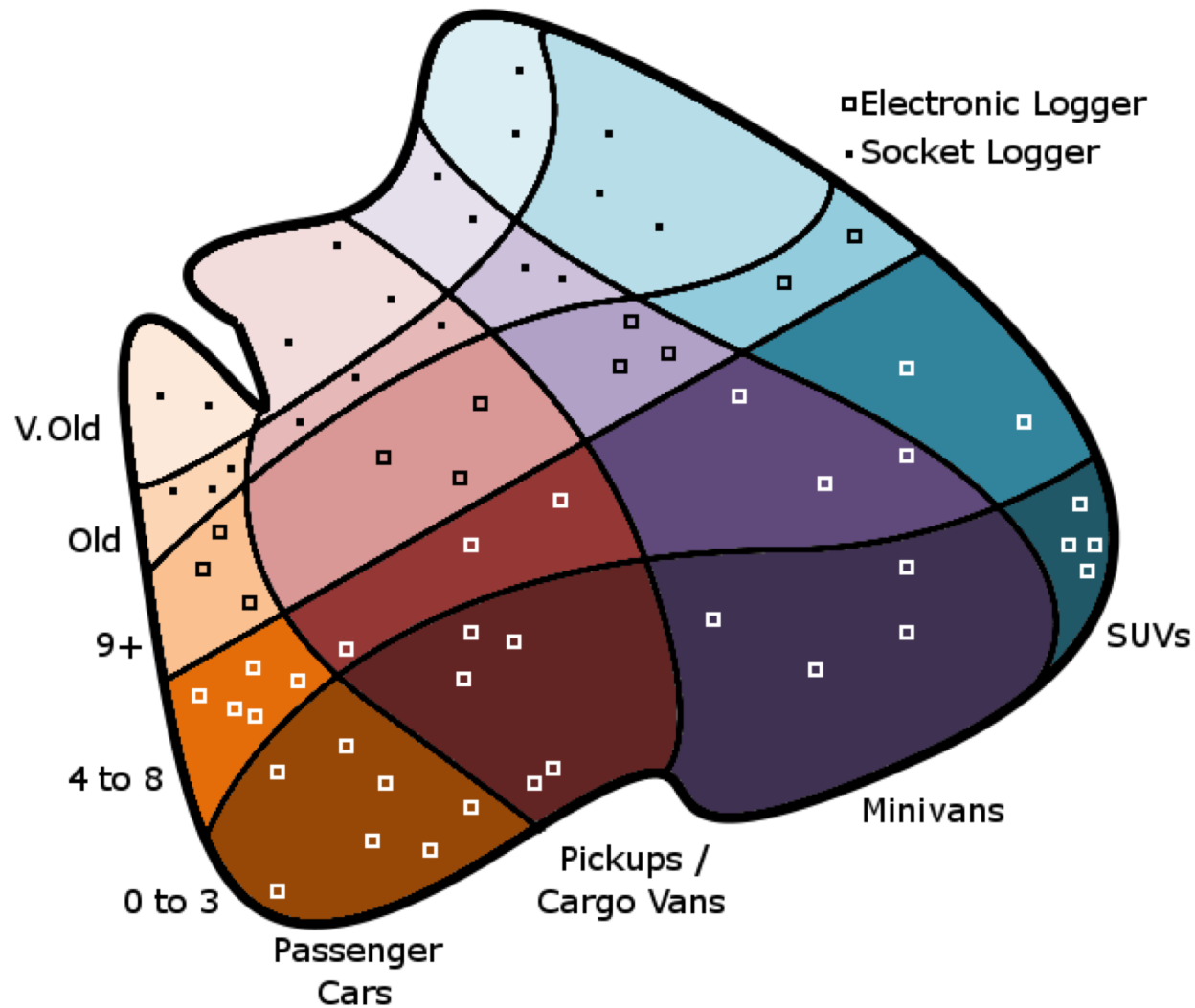
- ❑ From 2013 onwards, 6,000 vehicles are selected per quarter.
- ❑ Allocation for participating provinces:
 - 2,000 each for Quebec and Ontario
 - 1,000 each for Manitoba and Saskatchewan.
- ❑ The sample of each province is stratified by **type of vehicle** and **age category**; allocation to a stratum is proportional to the **square root of the population** in the stratum.
- ❑ At the Canadian level:
 - estimated **sample size** after non-response is 1,000 per quarter
 - produces a global confidence level of 95% and a 3% coefficient of variation
 - not the case for each group in a jurisdiction, but most small strata reach satisfactory levels on an **annual basis**
- ❑ The data collection process starts with an agreement with a province and the *vehicle registration service*.
- ❑ When the sample is selected, the list of the selected vehicles is sent to the province to get the contact information of the vehicle's owner.

Sampling Design and Vehicle Characteristics



- ❑ The sample design is that of a nested stratified sample survey
- ❑ The stratification variables are selected from the following:
 - ***Province/Territory** (13 jurisdictions)
 - **CMA/non-CMA**
 - **Vehicle Type** (PC, LT)
 - ***Vehicle Style** (PC, PT/CV, MV, SUV)
 - ***Vehicle Age** (E-loggers: newer vehicles, P/AS-loggers: older vehicles)

Sampling Design and Vehicle Characteristics



- Within a jurisdiction, allocation is proportional to stratum size
(until we get a better idea of the variance in each stratum)
- Between jurisdictions, allocation is roughly proportional to the square root of the fleet in the jurisdiction
(to avoid smaller jurisdictions being swamped by larger ones)

Data Collection

- ❑ A third party is hired to manage all the **communications** with the selected vehicle owners.
- ❑ Each sample is spread randomly in 13 batches to cover vehicle activities over the quarter.
- ❑ The owners of selected vehicles receive an official letter from TC inviting them to participate in the survey, and to respond *via* the TC website, by mail or through a toll-free number and provide some basic information about the **vehicle** and the **drivers**.
- ❑ If it is impossible to contact the owner, a **telephone matching** procedure is applied.
- ❑ Once the owners agree to participate, the third party sends the logger and cables, an information kit and the start and end dates of the data collection period.
- ❑ From the initiation of a first contact with a vehicle owner to the logger, it takes an average of 60 days (including the 21 survey days) to complete the data collection cycle.
- ❑ **Incentives** are provided for the return of the logger.
 - report detailing vehicle use compared to other drivers.
 - monetary rewards: Early Bird draw (\$500) for those returning the logger within 7 days after the end of the survey period; monthly draw (\$1000) for those completing the survey and returning it within the month.

Measured and Derived Values

Vehicle Age	Vehicle Style	Vehicle Type
0 TO 3	PASSENGER CAR	PASSENGER CAR
4 TO 8	MINIVAN	LIGHT TRUCK
9+	PICKUP/CARGO	
OLD	SUV	
V.OLD		

VEHICLE characteristics (strata)

Length Characteristics	Basic Characteristics	Derived Characteristics
Number of Study Days	Daily Number of Trips	Fuel Consumption Ratio (L/100km)
Number of Active Days	Daily Vehicle km Traveled	Idling Ratio
	Daily Passenger km Traveled	Average Vehicle Occupancy
	Daily Fuel Consumption (L)	Average Speed (km/h)
	Daily Driving Time (h)	Average Trip Length (km)
		Average Trip Duration (min)

MEASURED and **DERIVED** characteristics

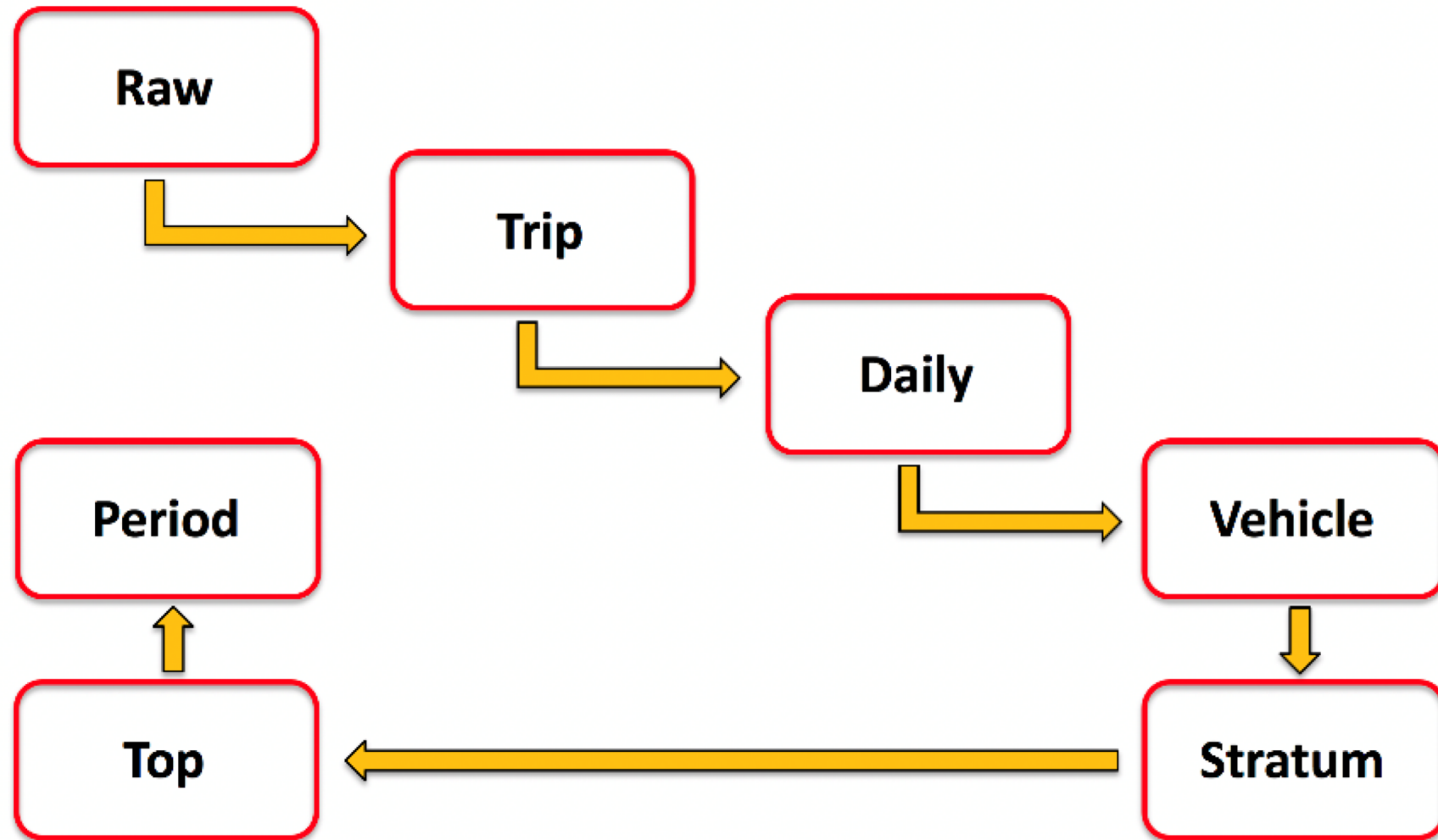
TRIP characteristics

Purpose	Driver Gender	Driver Age	Number of Passengers	Trip Length	Type of Day
UNKNOWN	UNKNOWN	UNKNOWN	DRIVER ONLY	0 km	WORKDAY
WORK/BUSINESS	FEMALE	16-24	DRIVER & 1 PASSENGER	1 km TO 5 km	WEEKEND
SCHOOL/DAYCARE	MALE	25-44	DRIVER & 2+ PASSENGERS	6 km TO 10 km	
SHOP/APP/ERRAND		45-64		11 km TO 15 km	
LEISURE/FAMILY/FRIENDS		65+		16 km TO 20 km	
COMMUNITY SERVICE				21 km TO 30 km	
				31 km TO 50 km	
				51 km TO 100 km	
				100+ km	

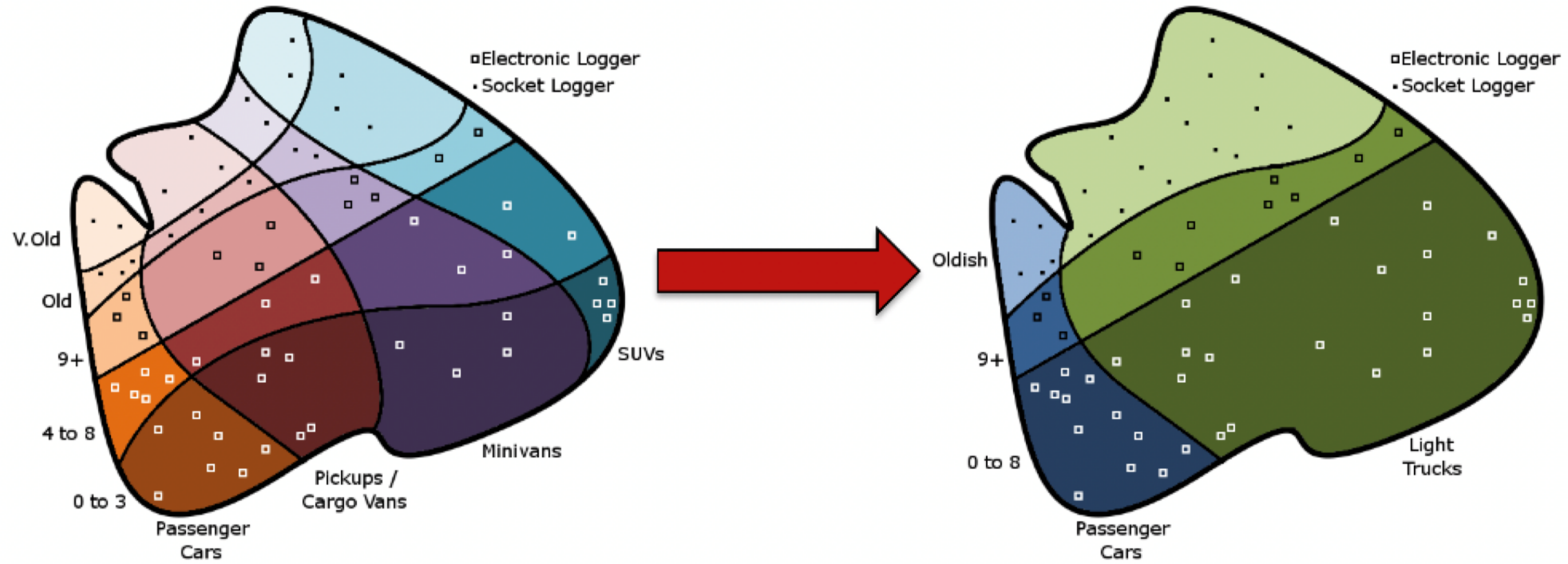
SUB-TRIP characteristics

Speed	Idling Type	Time of Day	Engine Temperature
IDLING	NOT IDLING	EARLY (06:00-08:59)	COLD (< 50°C)
1 km/h TO 24 km/h	IDLING DURING TRIP	MORNING (09:00-11:59)	WARM (50°C to 80°C)
25 km/h TO 49 km/h	TRIP START IDLING	MIDDAY (12:00-14:59)	HOT (> 80°C)
50 km/h TO 79 km/h	TRIP END IDLING	AFTERNOON (15:00-17:59)	NO DATA
80 km/h TO 99 km/h		EVENING (18:00-20:59)	
100 km/h TO 119 km/h		NIGHT (21:00-05:59)	
120+ km/h			

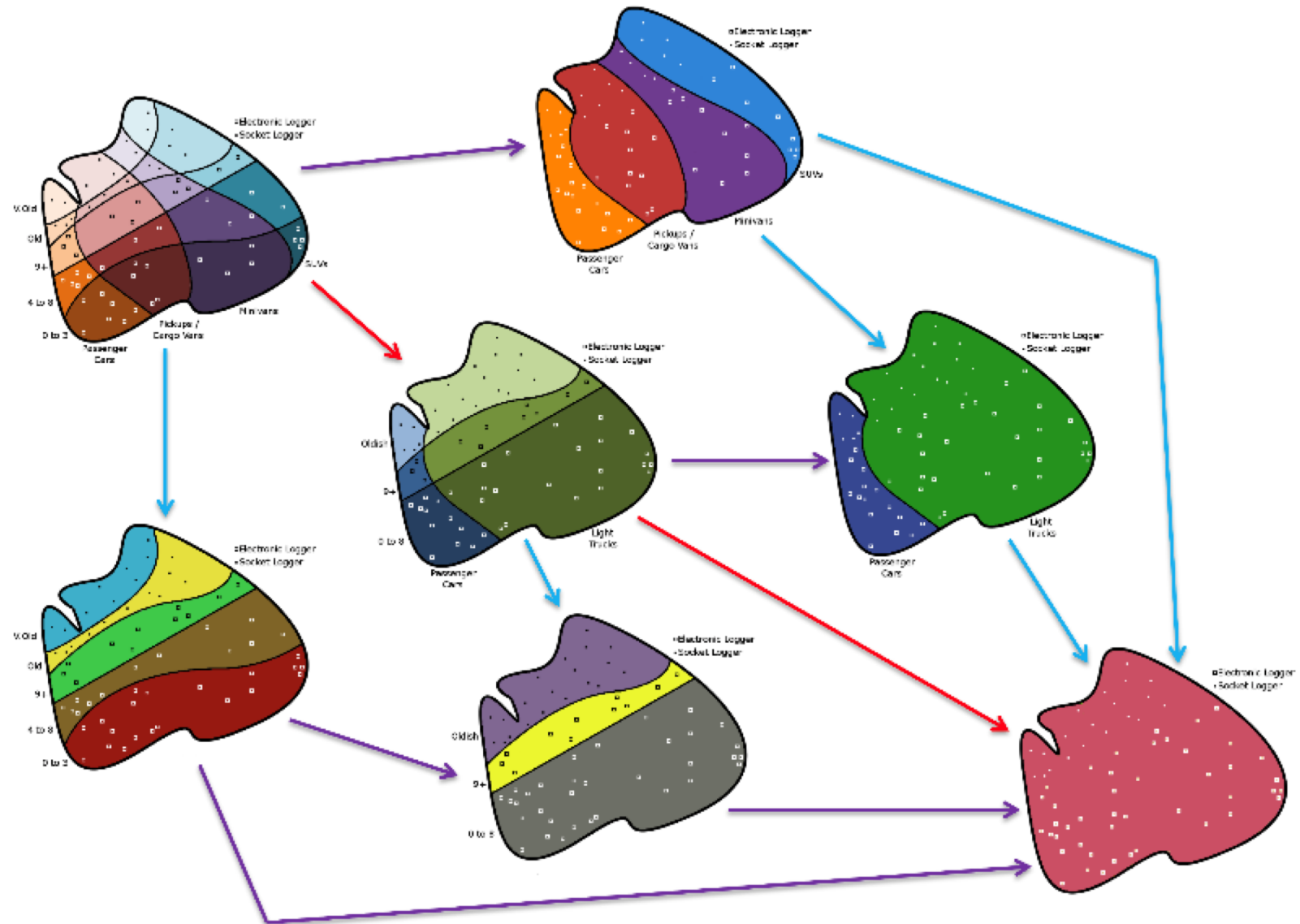
Estimate Levels



Stratum Aggregation



Stratification Tree



Data Processing

- ❑ Data cleaning and processing is done **internally**.
- ❑ It was initially thought that there would be no need for data cleaning, since data is collected automatically by the e-logger, but it turns out that there was a fair amount of **cleaning/imputing/validating** to do.
 - logger does not always work as intended
 - issues with the transponder sending signals
 - issues with the manual punching in of trip details
 - issues surrounding what constitutes a trip: A to B, B back to A; A to B, stopping at B for a while, B to C; etc.
- ❑ Files available to the analysts contain no **private information** about the vehicle owner.
- ❑ Private information is **encrypted** and accessible only to a limited number of persons.

Calculator

Strata	Fleet Size	Sample Size	y	cv	Sample cv		Confidence Intervals			
							95 %	90 %	85 %	80 %
1	4,449,799	536	41.60	3.1%	3.10%	a	39.07 - 44.13	39.48 - 43.72	39.74 - 43.46	39.95 - 43.25
2	6,999,388	473	48.60	3.4%	3.40%	a	45.36 - 51.84	45.88 - 51.32	46.22 - 50.98	46.48 - 50.72
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
Total	11,449,187	1009	45.88	2.46%	2.46%	a	43.67 - 48.09	44.02 - 47.73	44.26 - 47.50	44.43 - 47.32

Quality of Estimates (cv)
a: less than 5% (excellent)
b: between 5% and 10% (good)
c: between 10% and 15% (acceptable)
d: between 15% and 20% (use with caution)
e: between 20% and 35% (unreliable)
f: more than 35% (unusable)

If the sample size is smaller than 30, the quality of the estimate is no better than "d".

If the sample size is smaller than 20, the quality of the estimate is no better than "e".

Light green cells are editable.

Fleet Size and Sample Size values must be positive integers.

CV cells must be positive percentages (possibly greater than 100%).

Confidence Interval level cells must be positive percentages (contained strictly between 0% and 100%).

Calculator

		Numerator		Denominator		Derived Variable			
		y	cv	y	cv	y	cv		
Strata	1	41.60	3.1%	1	41.60	3.1%	1	1.57	7.5%
	2	48.60	3.4%	2	48.60	3.4%	2	1.58	8.2%
	3			3			3		
	4			4			4		
	5			5			5		
	6			6			6		
	7			7			7		
	8			8			8		

Quality of Estimates (cv)






- a: less than 5% (excellent)
- b: between 5% and 10% (good)
- c: between 10% and 15% (acceptable)
- d: between 15% and 20% (use with caution)
- e: between 20% and 35% (unreliable)
- f: more than 35% (unusable)

Light green cells are editable. Orange cells are outputs.

CV cells must be positive percentages (possibly greater than 100%).

Results

Jurisdiction-Level Estimates

		1st Quarter, 2012 (Preliminary Results)														
Vehicle Registration Jurisdiction		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)
	 Canada ¹	12,241,791	966	21.7	16.8	3.9 ^a	38.4 ^b	63.4 ^b	4.4 ^a	0.91 ^a	9.7 ^b	19.9% ^a	1.5 ^a	37.5 ^a	8.7 ^b	12.2 ^c
QC	 Québec ²	4,462,084	23	21.5	13.5	2.4 ^d	23.9 ^a	40.9 ^a	2.6 ^d	0.59 ^d	6.8 ^b	14.9% ^c	1.2 ^b	27.8 ^b	6.8 ^d	9.9 ^c
ON	 Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^c	13.7 ^c
SK	 Saskatchewan ³	603,245	70	21.2	17.5	5.0 ^b	44.9 ^b	81.7 ^c	5.9 ^b	1.01 ^b	12.9 ^c	23.0% ^b	1.7 ^a	45.2 ^a	9.0 ^c	12.0 ^b

1. The Canadian estimates are compromised by the small sample sizes in Québec and Saskatchewan. These estimates are less reliable than they would otherwise be. They are presented here solely in the interest of completeness.


2. The Québec respondents consist entirely of late-comers from the 4th quarter of 2011. The data is unreliable and is not representative of Québec driving during the 1st quarter of 2012. It is presented here solely in the interest of completeness.

3. The small sample size for Saskatchewan is due to the late start of the study in that province: take note of the higher than expected coefficients of variation. While provincial estimates tend to be reliable, sub-provincial estimates have to be used with caution.

Quality of Estimates (cv)

- a: less than 5% (excellent)
- b: between 5% and 10% (good)
- c: between 10% and 15% (acceptable)
- d: between 15% and 20% (use with caution)
- e: between 20% and 35% (unreliable)
- f: more than 35% (unusable)

Vehicle Stratum Estimates

 Ontario – 1st Quarter, 2012																	
Trip Characteristics		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)	
Ontario		7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a	
VEHICLE TYPE AND AGE	0 TO 3	1,812,892	198	21.5	19.4	5.3 ^a	56.2 ^a	91.7 ^b	6.3 ^a	1.28 ^a	11.1 ^a	23.4% ^a	1.6 ^a	43.7 ^a	10.6 ^a	14.5 ^a	
	4 TO 8	2,725,830	373	22.5	18.9	4.9 ^a	46.2 ^a	76.1 ^a	5.3 ^a	1.09 ^a	11.4 ^a	22.5% ^a	1.7 ^a	42.5 ^a	9.5 ^a	13.4 ^a	
	9+	2,637,740	302	21.4	18.3	4.3 ^a	41.2 ^a	64.6 ^b	4.8 ^a	0.96 ^a	11.4 ^d	22.8% ^a	1.6 ^a	42.7 ^a	9.6 ^a	13.5 ^a	
	OLD																
	V.OLD																
	PASSENGER CAR	3,869,086	445	21.3	18.7	4.6 ^a	46.4 ^a	71.3 ^a	4.3 ^a	1.05 ^a	9.2 ^a	21.6% ^a	1.5 ^a	44.0 ^a	10.0 ^a	13.7 ^a	
	MINIVAN	823,659	116	21.7	19.1	5.2 ^b	48.7 ^b	97.8 ^b	6.8 ^b	1.24 ^b	13.4 ^b	25.6% ^a	2.0 ^a	39.3 ^a	9.4 ^b	14.4 ^b	
	PICKUP/CARGO	985,411	114	23.5	18.0	4.6 ^b	45.9 ^b	69.7 ^b	7.5 ^b	1.02 ^b	16.1 ^f	23.5% ^a	1.5 ^a	44.0 ^a	9.8 ^b	13.2 ^a	
	SUV	1,498,306	198	22.1	19.5	5.0 ^a	47.7 ^b	79.4 ^b	6.0 ^a	1.16 ^a	12.5 ^a	24.0% ^a	1.7 ^a	41.4 ^a	9.5 ^a	13.8 ^a	
	PASSENGER CAR	0 TO 3	884,661	85	22.0	20.0	5.2 ^a	54.4 ^b	85.8 ^b	4.8 ^b	1.24 ^b	8.8 ^a	22.8% ^a	1.6 ^a	43.7 ^a	10.5 ^b	14.4 ^a
		4 TO 8	1,436,536	194	21.3	18.6	4.6 ^a	46.5 ^b	73.0 ^b	4.3 ^b	1.04 ^a	9.2 ^a	20.8% ^a	1.6 ^a	44.6 ^a	10.1 ^b	13.6 ^b
		9+	1,547,889	166	21.0	18.0	4.3 ^a	41.7 ^b	61.5 ^b	4.0 ^b	0.95 ^b	9.4 ^a	21.6% ^a	1.5 ^a	43.7 ^a	9.7 ^b	13.4 ^a
		OLD															
		V.OLD															
	MINIVAN	0 TO 3	120,245	19	20.4	18.1	5.2 ^b	52.3 ^c	99.8 ^c	8.0 ^c	1.29 ^c	14.4 ^c	27.1% ^c	1.9 ^c	40.6 ^c	10.1 ^c	14.9 ^c
		4 TO 8	333,795	45	22.0	19.5	5.8 ^b	47.5 ^c	94.1 ^c	6.8 ^c	1.27 ^d	13.9 ^a	25.4% ^b	2.0 ^b	37.2 ^b	8.2 ^b	13.2 ^c
		9+	369,619	52	21.8	19.1	4.6 ^b	48.6 ^c	100.5 ^d	6.4 ^b	1.19 ^b	12.5 ^c	25.3% ^b	2.1 ^b	40.7 ^b	10.4 ^c	15.3 ^b
		OLD															
		V.OLD															
	PICKUP/CARGO	0 TO 3	251,869	27	20.6	18.0	5.8 ^d	71.1 ^d	114.4 ^e	10.8 ^c	1.45 ^d	15.2 ^d	21.5% ^c	1.6 ^d	48.7 ^d	12.1 ^d	14.9 ^d
4 TO 8		358,410	45	29.0	19.7	4.7 ^c	43.7 ^c	68.8 ^b	7.5 ^c	1.02 ^b	16.7 ^a	23.2% ^a	1.6 ^b	43.1 ^a	9.3 ^b	13.0 ^b	
9+		375,132	42	20.2	16.3	3.6 ^b	31.1 ^c	40.7 ^d	5.3 ^c	0.75 ^c	16.2 ^f	25.2% ^b	1.3 ^a	41.8 ^a	8.6 ^c	12.4 ^b	
OLD																	
V.OLD																	
SUV	0 TO 3	556,117	67	21.4	19.2	5.2 ^a	53.1 ^b	89.1 ^b	6.4 ^b	1.26 ^b	12.0 ^a	24.3% ^b	1.7 ^a	42.2 ^a	10.2 ^b	14.5 ^b	
	4 TO 8	597,089	89	21.7	19.0	5.1 ^b	46.1 ^b	78.1 ^b	5.7 ^b	1.15 ^b	12.2 ^a	24.4% ^b	1.7 ^a	40.3 ^a	9.0 ^b	13.4 ^a	
	9+	345,100	42	23.8	20.8	4.5 ^b	42.1 ^c	65.9 ^c	5.9 ^c	1.00 ^b	13.8 ^a	22.7% ^b	1.6 ^a	41.9 ^a	9.4 ^b	13.4 ^b	
	OLD																
	V.OLD																

Quality of Estimates (cv)


- a: less than 5% (excellent)
- b: between 5% and 10% (very good)
- c: between 10% and 15% (good)
- d: between 15% and 20% (acceptable)
- e: between 20% and 35% (use with caution)
- f: more than 35% (unreliable)

Vehicle Age

- 0 TO 3: 3 years old and younger
- 4 TO 8: between 4 and 8 years old
- 9+: 9 years old and older with model year post-1995
- OLD: model year between 1981 and 1995
- V.OLD: model year pre-1981

Values in columns may not add up or average (weighted) exactly to the corresponding column header due to round off errors.


Vehicle Stratum Estimates

 Ontario – 1st Quarter, 2012																	
Trip Characteristics		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)	
VEHICLE TYPE AND AGE (NRCan & TC)	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a	
	0 TO 8	4,538,722	571	22.1	19.1	5.1 ^a	50.2 ^a	82.3 ^a	5.7 ^a	1.17 ^a	11.3 ^a	22.8% ^a	1.7 ^a	43.0 ^a	9.9 ^a	13.8 ^a	
	9+	2,637,740	302	21.4	18.3	4.3 ^b	41.2 ^a	64.6 ^b	4.8 ^b	0.96 ^a	11.4 ^c	22.8% ^b	1.6 ^a	42.7 ^a	9.6 ^b	13.5 ^a	
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
	PASSENGER CAR	3,869,086	445	21.3	18.7	4.6 ^b	46.4 ^a	71.3 ^b	4.3 ^b	1.05 ^a	9.2 ^b	21.6% ^b	1.5 ^a	44.0 ^b	10.0 ^b	13.7 ^b	
	MINIVAN	823,659	116	21.7	19.1	5.2 ^b	48.7 ^b	97.8 ^b	6.8 ^b	1.24 ^b	13.4 ^b	25.6% ^b	2.0 ^a	39.3 ^b	9.4 ^b	14.4 ^b	
	PICKUP/CARGO	985,411	114	23.5	18.0	4.6 ^b	45.9 ^b	69.7 ^b	7.5 ^b	1.02 ^b	16.1 ^f	23.5% ^b	1.5 ^a	44.0 ^b	9.8 ^b	13.2 ^a	
	SUV	1,498,306	198	22.1	19.5	5.0 ^a	47.7 ^b	79.4 ^b	6.0 ^a	1.16 ^a	12.5 ^a	24.0% ^a	1.7 ^a	41.4 ^a	9.5 ^a	13.8 ^a	
	PASSENGER CAR	0 TO 8	2,321,197	279	21.6	19.1	4.8 ^a	49.5 ^a	77.9 ^b	4.5 ^a	1.12 ^a	9.0 ^a	21.6% ^a	1.6 ^a	44.3 ^a	10.3 ^a	13.9 ^a
	9+	1,547,889	166	21.0	18.0	4.3 ^b	41.7 ^b	61.5 ^b	4.0 ^b	0.95 ^b	9.4 ^a	21.6% ^a	1.5 ^a	43.7 ^a	9.7 ^b	13.4 ^a	
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
	MINIVAN	0 TO 8	454,040	64	21.6	19.1	5.6 ^b	48.8 ^c	95.6 ^b	7.1 ^f	1.28 ^c	14.0 ^a	25.9% ^b	2.0 ^a	38.1 ^a	8.7 ^b	13.7 ^b
	9+	369,619	52	21.8	19.1	4.6 ^b	48.6 ^c	100.5 ^c	6.4 ^b	1.19 ^b	12.5 ^c	25.3% ^b	2.1 ^b	40.7 ^b	10.4 ^c	15.3 ^b	
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
	PICKUP/CARGO	0 TO 8	610,279	72	25.5	19.0	5.2 ^b	55.0 ^b	87.6 ^c	8.9 ^b	1.20 ^b	16.1 ^d	22.5% ^b	1.6 ^a	45.4 ^b	10.5 ^b	13.8 ^b
	9+	375,132	42	20.2	16.3	3.6 ^b	31.1 ^c	40.7 ^c	5.3 ^c	0.75 ^c	16.2 ^f	25.2% ^b	1.3 ^a	41.8 ^b	8.6 ^c	12.4 ^b	
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
	SUV	0 TO 8	1,153,206	156	21.6	19.1	5.1 ^a	49.5 ^b	83.4 ^b	6.0 ^b	1.20 ^a	12.1 ^a	24.3% ^a	1.7 ^a	41.2 ^a	9.6 ^b	13.9 ^a
	9+	345,100	42	23.8	20.8	4.5 ^b	42.1 ^c	65.9 ^c	5.9 ^b	1.00 ^b	13.8 ^a	22.7% ^b	1.6 ^a	41.9 ^a	9.4 ^b	13.4 ^b	
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	


Vehicle Stratum Estimates

Ontario – 1st Quarter, 2012																		
Canadian VEHICLE USE Study Powering Informed Decisions		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)		
Trip Characteristics																		
VEHICLE TYPE AND AGE (EC)	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^b	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^b	9.8 ^b	13.7 ^a		
		0 TO 3	1,812,892	198	21.5	19.4	5.3 ^a	56.2 ^b	91.7 ^b	6.3 ^a	1.28 ^a	11.1 ^a	23.4% ^a	1.6 ^a	43.7 ^a	10.6 ^a	14.5 ^a	
		4 TO 8	2,725,830	373	22.5	18.9	4.9 ^a	46.2 ^a	76.1 ^b	5.3 ^a	1.09 ^a	11.4 ^b	22.5% ^a	1.7 ^a	42.5 ^b	9.5 ^a	13.4 ^a	
		9+	2,637,740	302	21.4	18.3	4.3 ^a	41.2 ^a	64.6 ^b	4.8 ^a	0.96 ^a	11.4 ^d	22.8% ^a	1.6 ^a	42.7 ^b	9.6 ^a	13.5 ^a	
		OLD	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
		V.OLD	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
		PASSENGER CAR	3,869,086	445	21.3	18.7	4.6 ^a	46.4 ^a	71.3 ^b	4.3 ^a	1.05 ^a	9.2 ^b	21.6% ^a	1.5 ^a	44.0 ^b	10.0 ^a	13.7 ^a	
		LIGHT TRUCK	3,307,376	428	22.4	19.0	4.9 ^a	47.4 ^a	81.1 ^a	6.6 ^a	1.14 ^a	13.8 ^c	24.2% ^a	1.7 ^a	41.7 ^b	9.6 ^a	13.8 ^a	
			0 TO 3	884,661	85	22.0	20.0	5.2 ^a	54.4 ^b	85.8 ^b	4.8 ^a	1.24 ^b	8.8 ^a	22.8% ^a	1.6 ^a	43.7 ^a	10.5 ^b	14.4 ^a
			4 TO 8	1,436,536	194	21.3	18.6	4.6 ^a	46.5 ^b	73.0 ^b	4.3 ^a	1.04 ^a	9.2 ^a	20.8% ^a	1.6 ^a	44.6 ^a	10.1 ^b	13.6 ^a
			9+	1,547,889	166	21.0	18.0	4.3 ^a	41.7 ^b	61.5 ^b	4.0 ^a	0.95 ^b	9.4 ^b	21.6% ^a	1.5 ^a	43.7 ^b	9.7 ^b	13.4 ^a
			OLD	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
			V.OLD	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	
			0 TO 3	928,231	113	21.1	18.7	5.4 ^a	57.9 ^b	97.4 ^b	7.8 ^a	1.32 ^b	13.2 ^a	23.9% ^a	1.7 ^a	43.8 ^a	10.7 ^b	14.7 ^a
			4 TO 8	1,289,294	179	23.8	19.3	5.2 ^a	45.8 ^b	79.7 ^b	6.5 ^a	1.14 ^b	13.9 ^b	24.3% ^a	1.7 ^a	40.3 ^b	8.9 ^a	13.2 ^a
			9+	1,089,851	136	21.9	18.7	4.2 ^a	40.5 ^b	69.0 ^c	5.9 ^a	0.98 ^b	14.2 ^f	24.4% ^a	1.7 ^a	41.5 ^b	9.5 ^b	13.7 ^a
		OLD	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f		
		V.OLD	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f		

Vehicle Stratum Estimates

 Ontario – 1st Quarter, 2012																
Trip Characteristics		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)
VEHICLE TYPE AND AGE	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^b	1.6 ^a	42.9 ^a	9.8 ^b	13.7 ^a
	0 TO 8	4,538,722	571	22.1	19.1	5.1 ^a	50.2 ^a	82.3 ^a	5.7 ^a	1.17 ^a	11.3 ^a	22.8% ^a	1.7 ^a	43.0 ^a	9.9 ^a	13.8 ^a
	9+	2,637,740	302	21.4	18.3	4.3 ^a	41.2 ^b	64.6 ^b	4.8 ^a	0.96 ^b	11.4 ^c	22.8% ^b	1.6 ^b	42.7 ^b	9.6 ^b	13.5 ^a
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f
	PASSENGER CAR	3,869,086	445	21.3	18.7	4.6 ^a	46.4 ^a	71.3 ^a	4.3 ^a	1.05 ^a	9.2 ^a	21.6% ^a	1.5 ^a	44.0 ^a	10.0 ^a	13.7 ^a
	LIGHT TRUCK	3,307,376	428	22.4	19.0	4.9 ^a	47.4 ^a	81.1 ^a	6.6 ^a	1.14 ^a	13.8 ^c	24.2% ^a	1.7 ^a	41.7 ^a	9.6 ^b	13.8 ^a
	0 TO 8	2,321,197	279	21.6	19.1	4.8 ^a	49.5 ^b	77.9 ^b	4.5 ^a	1.12 ^a	9.0 ^a	21.6% ^b	1.6 ^b	44.3 ^b	10.3 ^b	13.9 ^a
	9+	1,547,889	166	21.0	18.0	4.3 ^a	41.7 ^b	61.5 ^b	4.0 ^b	0.95 ^b	9.4 ^a	21.6% ^b	1.5 ^b	43.7 ^b	9.7 ^b	13.4 ^a
	PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f
	0 TO 8	2,217,525	292	22.7	19.1	5.3 ^a	50.9 ^a	87.1 ^a	7.0 ^a	1.22 ^a	13.6 ^a	24.2% ^a	1.7 ^a	41.7 ^a	9.6 ^b	13.8 ^a
9+	1,089,851	136	21.9	18.7	4.2 ^a	40.5 ^b	69.0 ^c	5.9 ^b	0.98 ^b	14.2 ^f	24.4% ^b	1.7 ^b	41.5 ^b	9.5 ^b	13.7 ^a	
PRE '96	0	0	0.0	0.0	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.00 ^f	0.0 ^f	0.0% ^f	0.0 ^f	0.0 ^f	0.0 ^f	0.0 ^f	

Trip-Level Estimates

Ontario – 1st Quarter, 2012																
 Canadian VEHICLE USE Study Powering Informed Decisions		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)
Trip Characteristics																
PURPOSE	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a
	UNKNOWN				11.1	0.7 ^b	3.0 ^c	3.0 ^c	0.4 ^c	0.09 ^c	12.4 ^f	31.0% ^a	1.0 ^a	32.3 ^a	3.9 ^a	7.1 ^a
	WORK/BUSINESS				14.0	1.3 ^a	18.4 ^a	24.3 ^b	2.1 ^a	0.40 ^a	11.1 ^b	21.6% ^a	1.3 ^a	46.4 ^a	14.3 ^a	18.5 ^a
	SCHOOL/DAYCARE				9.0	0.2 ^b	1.3 ^b	2.5 ^b	0.2 ^b	0.04 ^b	13.2 ^a	28.3% ^a	1.9 ^a	32.1 ^a	6.9 ^b	13.0 ^b
	SHOP/APP/ERRAND				11.6	1.3 ^a	8.5 ^a	14.4 ^a	1.0 ^a	0.23 ^a	12.1 ^e	24.2% ^a	1.7 ^a	36.2 ^a	6.5 ^a	10.7 ^a
	LEISURE/FAMILY/FRIENDS				11.8	1.1 ^a	14.7 ^a	29.8 ^b	1.6 ^a	0.30 ^a	10.8 ^a	19.9% ^a	2.0 ^a	48.5 ^a	13.2 ^a	16.3 ^a
	COMMUNITY SERVICE				6.2	0.1 ^b	0.9 ^c	1.7 ^d	0.1 ^c	0.02 ^c	12.2 ^f	25.0% ^a	1.8 ^a	36.4 ^a	7.9 ^b	12.8 ^a
GENDER***	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a
	UNKNOWN				11.9	0.9 ^b	5.0 ^c	6.8 ^c	0.7 ^c	0.14 ^c	11.8 ^f	27.8% ^a	1.3 ^a	35.8 ^a	5.3 ^a	8.8 ^a
	FEMALE				16.0	1.6 ^a	15.8 ^b	25.9 ^b	1.7 ^b	0.38 ^a	11.6 ^a	23.0% ^a	1.6 ^a	42.5 ^a	10.3 ^a	14.5 ^a
	MALE				16.9	2.3 ^a	26.1 ^a	43.1 ^a	3.0 ^a	0.57 ^a	11.2 ^b	21.4% ^a	1.7 ^a	45.2 ^a	11.5 ^a	15.3 ^a
DRIVER AGE***	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a
	UNKNOWN				11.6	0.9 ^b	4.5 ^c	5.9 ^c	0.6 ^c	0.13 ^c	11.8 ^f	28.8% ^a	1.3 ^a	35.3 ^a	5.0 ^a	8.6 ^a
	16-24				11.9	0.2 ^d	1.9 ^d	2.9 ^d	0.2 ^d	0.04 ^d	8.3 ^a	17.3% ^b	1.2 ^a	33.8 ^a	8.2 ^c	11.3 ^b
	25-44				18.3	1.3 ^b	15.4 ^b	26.7 ^b	1.7 ^b	0.34 ^b	11.2 ^a	23.0% ^a	1.8 ^a	44.7 ^a	11.7 ^a	15.6 ^a
	45-64				17.8	1.8 ^a	19.1 ^b	30.8 ^b	2.2 ^b	0.44 ^a	11.3 ^c	21.8% ^a	1.6 ^a	43.5 ^a	10.8 ^a	14.9 ^a
	65+				16.7	0.6 ^b	5.9 ^c	9.5 ^c	0.7 ^c	0.14 ^b	11.5 ^a	20.5% ^a	1.6 ^a	42.5 ^a	9.4 ^b	13.2 ^a
OCCUPANTS	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a
	DRIVER ONLY				17.2	3.1 ^a	27.4 ^a	27.4 ^a	3.1 ^a	0.65 ^a	11.4 ^b	23.2% ^a	1.0 ^a	42.1 ^a	8.8 ^a	12.5 ^a
	DRIVER & 1 PASSENGER				13.5	1.5 ^a	17.1 ^a	37.7 ^a	2.0 ^a	0.39 ^a	11.3 ^a	22.1% ^a	2.2 ^a	43.7 ^a	11.5 ^a	15.8 ^a
	DRIVER & 2+ PASSENGERS				6.4	0.2 ^b	2.4 ^c	10.7 ^c	0.3 ^c	0.05 ^b	10.3 ^a	22.9% ^a	4.2 ^a	42.3 ^a	13.2 ^b	17.4 ^a

Quality of Estimates (cv)

- a: less than 5% (excellent)
- b: between 5% and 10% (very good)
- c: between 10% and 15% (good)
- d: between 15% and 20% (acceptable)
- e: between 20% and 35% (use with caution)
- f: more than 35% (unreliable)

Notes on Driver Age and Gender

The estimates provided in the DRIVER AGE and GENDER category are VEHICLE characteristics, not DRIVER characteristics. Without further information on the distribution of drivers in a given jurisdiction (by AGE and GENDER), the estimates of the basic characteristics (nTrips, VKT, PKT, Fuel, Use, UseNI) cannot be used to predict the average driving behaviour of various combinations of DRIVER AGE and GENDER for that jurisdiction.

Values in columns may not add up or average (weighted) exactly to the corresponding column header due to round off errors.

Trip-Level Estimates

Ontario – 1st Quarter, 2012																
Canadian VEHICLE USE Study Powering Informed Decisions		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Number of Trips	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Driving Time (h)	Fuel Consumption Ratio (L/100 km)	Idling Ratio	Average Vehicle Occupancy	Average Speed (km/h)	Average Trip Length (km)	Average Trip Duration (min)
Trip Characteristics																
TRIP LENGTH	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a
	0 km				4.6	0.1 ^b	0.0 ^f	0.1 ^f	0.0 ^f	0.01 ^d	0.0	96.0% ^a	0.0	2.2 ^d	0.8 ^f	5.5 ^f
	1 km TO 5 km				16.5	2.6 ^a	5.3 ^a	8.0 ^a	0.9 ^a	0.25 ^a	16.7 ^a	33.4% ^a	1.5 ^a	21.1 ^a	2.0 ^a	5.7 ^a
	6 km TO 10 km				12.3	0.8 ^a	5.8 ^a	8.9 ^a	0.8 ^a	0.18 ^a	13.2 ^a	26.1% ^a	1.5 ^a	31.4 ^a	7.2 ^a	13.7 ^a
	11 km TO 15 km				9.7	0.4 ^a	4.9 ^a	7.8 ^a	0.6 ^a	0.13 ^a	11.6 ^a	23.3% ^a	1.6 ^a	38.3 ^a	12.3 ^a	19.3 ^a
	16 km TO 20 km				8.6	0.2 ^b	4.0 ^b	6.2 ^a	0.4 ^b	0.09 ^b	11.0 ^a	19.9% ^a	1.5 ^a	44.6 ^a	17.3 ^a	23.4 ^a
	21 km TO 30 km				9.2	0.3 ^b	6.2 ^b	9.7 ^b	0.7 ^b	0.12 ^b	10.5 ^a	18.6% ^a	1.5 ^a	50.5 ^a	24.5 ^a	29.2 ^a
	31 km TO 50 km				10.0	0.2 ^b	8.0 ^b	12.5 ^b	0.8 ^b	0.14 ^b	10.0 ^a	15.1% ^a	1.5 ^a	58.0 ^a	38.1 ^a	39.7 ^a
	51 km TO 100 km				8.1	0.1 ^b	7.2 ^b	11.8 ^b	0.7 ^b	0.10 ^b	9.5 ^a	11.5% ^a	1.6 ^a	70.1 ^a	66.3 ^a	57.1 ^a
100+ km				3.4	0.0 ^c	5.5 ^c	10.8 ^c	0.5 ^c	0.06 ^c	9.6 ^a	6.4% ^b	1.9 ^b	87.7 ^a	160.1 ^a	109.7 ^a	
DAY TYPE	Ontario	7,176,462	873	21.8	18.8	4.7 ^a	46.9 ^a	75.8 ^a	5.4 ^a	1.09 ^a	11.3 ^b	22.8% ^a	1.6 ^a	42.9 ^a	9.8 ^a	13.7 ^a
	WORKDAY		873	15.7	14.0	5.0 ^a	48.9 ^a	73.2 ^a	5.6 ^a	1.16 ^a	11.3 ^b	22.9% ^a	1.5 ^a	42.3 ^a	9.7 ^a	13.8 ^a
	WEEKEND		866	6.2	5.3	4.1 ^a	41.8 ^a	82.4 ^b	4.7 ^a	0.93 ^a	11.3 ^b	22.6% ^a	1.9 ^a	45.0 ^a	10.2 ^a	13.6 ^a

BASIC characteristics add up to the provincial total.

DERIVED characteristics are weighted into the provincial total.

Subtrip-Level Estimates

Ontario – 1st Quarter, 2012										
Canadian VEHICLE USE Study Powering Informed Decisions		Fleet Size	Sample Size	Average Number of Study Days	Average Number of Active Days	Daily Vehicle km Traveled	Daily Passenger km Traveled	Daily Fuel Consumption (L)	Daily Non-Idling Time (h)	Daily Idling Time (h)
Sub-Trip Characteristics										
VEHICLE SPEED	Ontario	7,176,462	873	21.8	18.8	46.9 ^a	75.8 ^a	5.4 ^a	0.84 ^a	0.24 ^a
	IDLING					0.0 ^a	0.0 ^a	0.4 ^a	0.00 ^c	0.24 ^a
	1 km/h TO 24 km/h					2.1 ^a	3.4 ^a	0.6 ^a	0.18 ^a	0.00 ^a
	25 km/h TO 49 km/h					7.6 ^a	11.9 ^a	1.0 ^a	0.20 ^a	0.00 ^a
	50 km/h TO 79 km/h					15.2 ^a	24.0 ^a	1.4 ^a	0.24 ^a	0.00 ^a
	80 km/h TO 99 km/h					10.3 ^a	16.5 ^a	0.9 ^a	0.12 ^a	0.00 ^a
	100 km/h TO 119 km/h					9.7 ^b	16.7 ^b	0.9 ^b	0.09 ^b	0.00 ^a
	120+ km/h					2.0 ^c	3.4 ^c	0.2 ^c	0.02 ^c	0.00 ^a
IDLING TYPE	Ontario	7,176,462	873	21.8	18.8	46.9 ^a	75.8 ^a	5.4 ^a	0.84 ^a	0.24 ^a
	NOT IDLING					46.9 ^a	75.8 ^a	5.0 ^a	0.84 ^a	0.00 ^a
	IDLING DURING TRIP					0.0 ^a	0.0 ^a	0.2 ^a	0.00 ^a	0.15 ^a
	TRIP START IDLING					0.0 ^a	0.0 ^a	0.1 ^a	0.00 ^a	0.07 ^a
	TRIP END IDLING					0.0 ^a	0.0 ^a	0.0 ^a	0.00 ^a	0.02 ^b
TIME OF DRIVING	Ontario	7,176,462	873	21.8	18.8	46.9 ^a	75.8 ^a	5.4 ^a	0.84 ^a	0.24 ^a
	EARLY (06:00-08:59)					7.3 ^a	10.1 ^a	0.8 ^a	0.13 ^a	0.04 ^a
	MORNING (09:00-11:59)					7.1 ^a	11.8 ^a	0.9 ^a	0.13 ^a	0.04 ^a
	MIDDAY (12:00-14:59)					9.0 ^a	15.3 ^a	1.1 ^a	0.17 ^a	0.05 ^a
	AFTERNOON (15:00-17:59)					11.6 ^a	18.3 ^a	1.3 ^a	0.21 ^a	0.06 ^a
	EVENING (18:00-20:59)					7.1 ^a	12.3 ^b	0.8 ^a	0.12 ^a	0.03 ^a
	NIGHT (21:00-05:59)					4.8 ^b	8.0 ^b	0.5 ^b	0.08 ^b	0.02 ^b
ENGINE TEMP.	Ontario	7,176,462	873	21.8	18.8	46.9 ^a	75.8 ^a	5.4 ^a	0.84 ^a	0.24 ^a
	COLD (< 50°C)					1.5 ^a	2.2 ^a	0.4 ^a	0.05 ^a	0.05 ^a
	WARM (50°C to 80°C)					7.2 ^a	11.0 ^a	1.0 ^a	0.16 ^a	0.06 ^a
	HOT (> 80°C)					38.0 ^a	62.6 ^a	4.0 ^a	0.63 ^a	0.13 ^a
	NO DATA					0.1 ^f	0.1 ^f	0.0 ^f	0.00 ^f	0.00 ^f

If it is possible for **VEHICLES** to belong to two category, these categories **cannot** be combined.

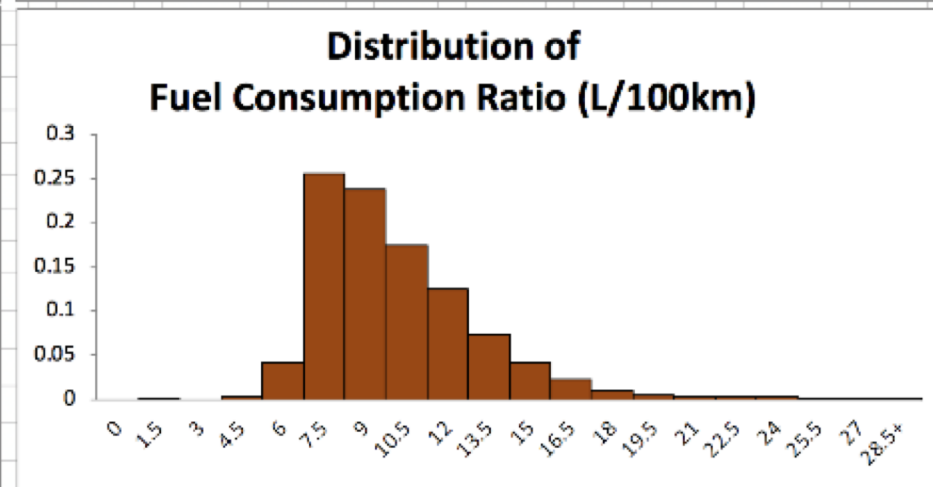
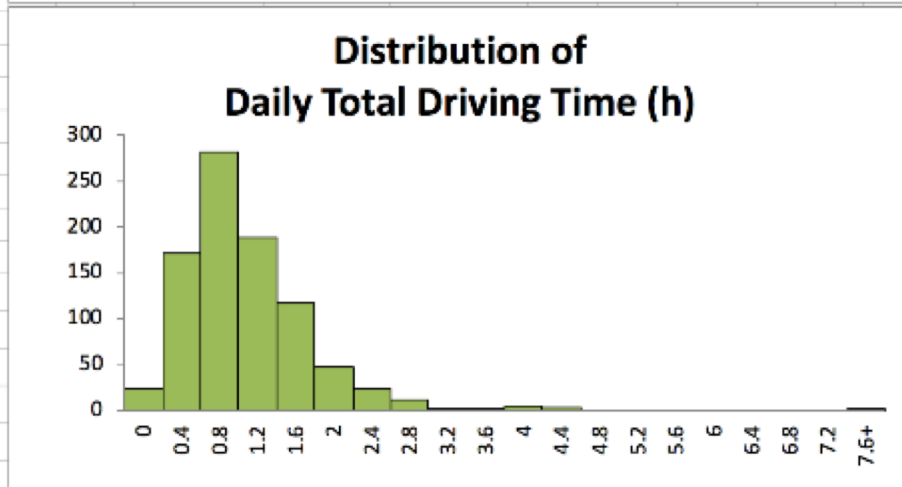
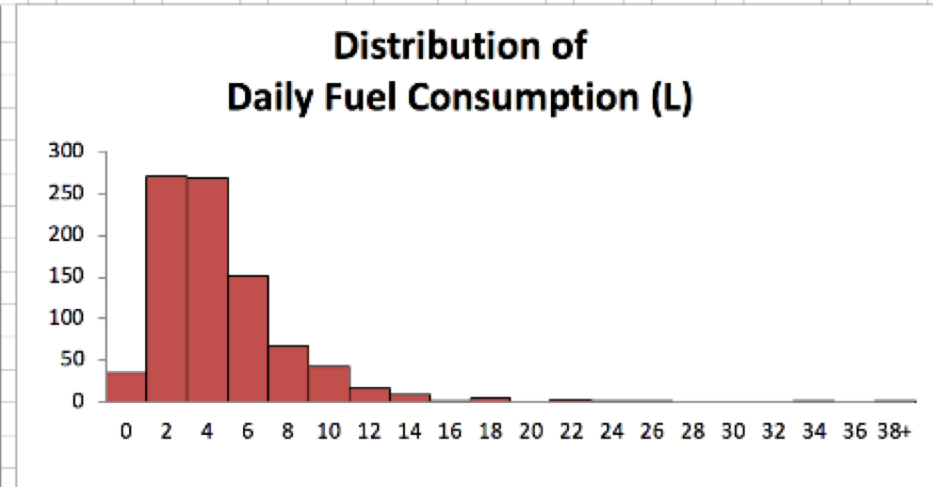
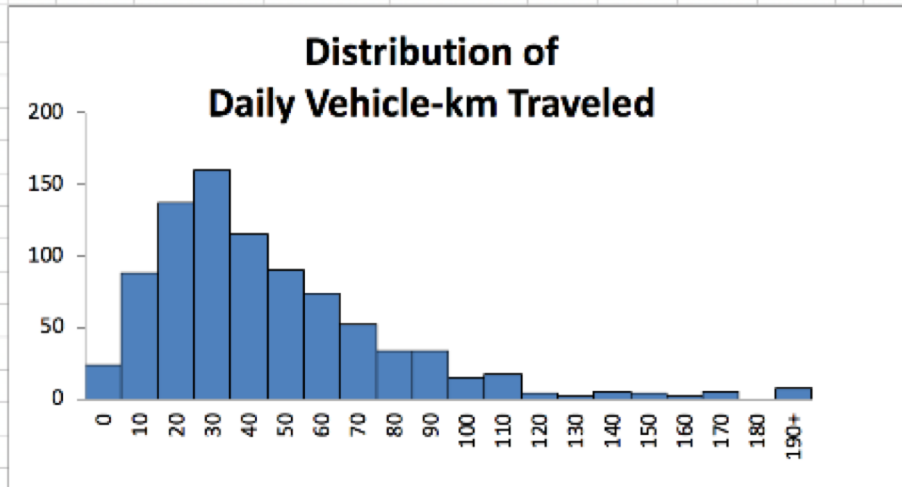


Histograms

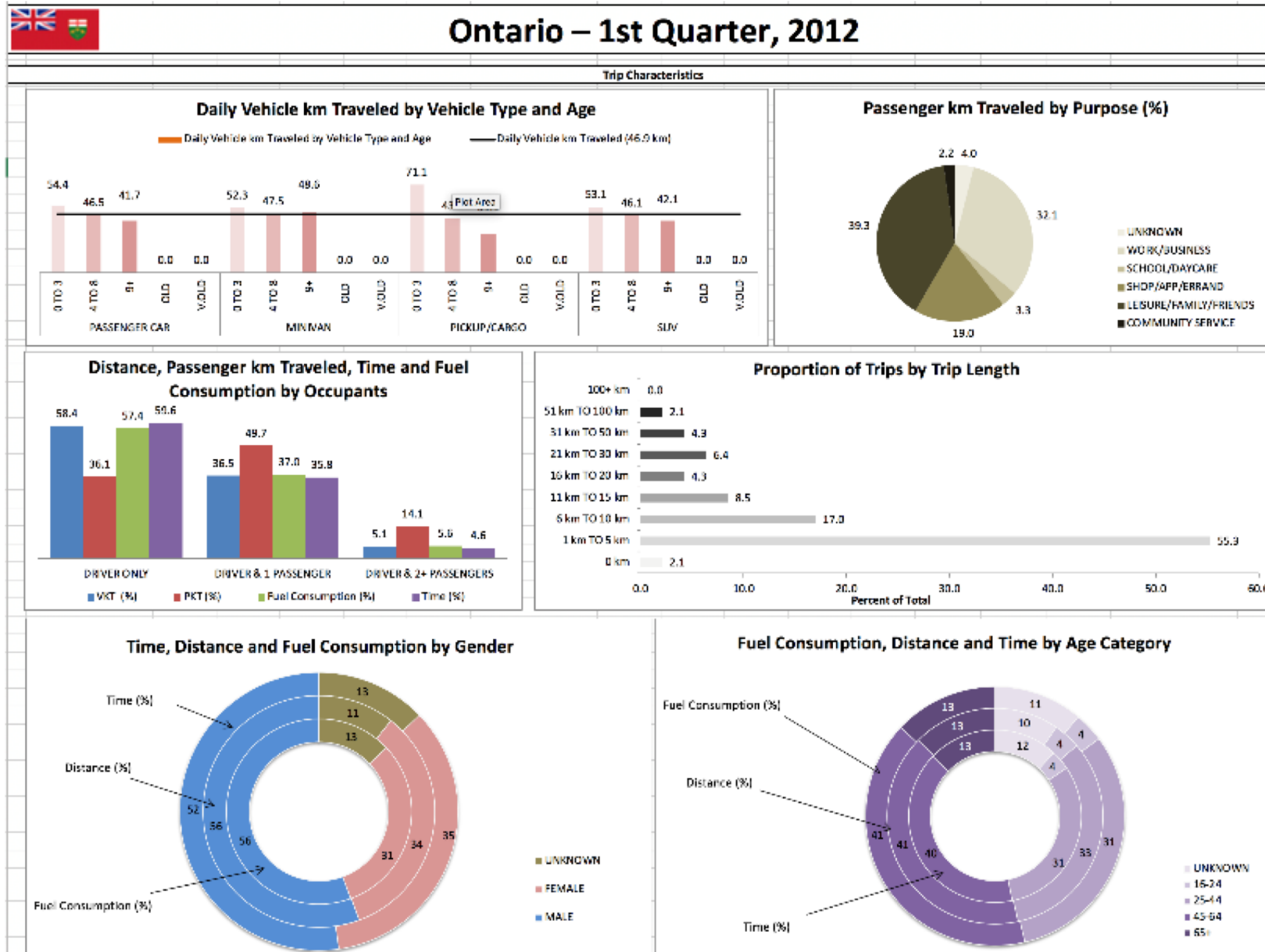


Ontario – 1st Quarter, 2012

Histograms



Trip-Level Charts

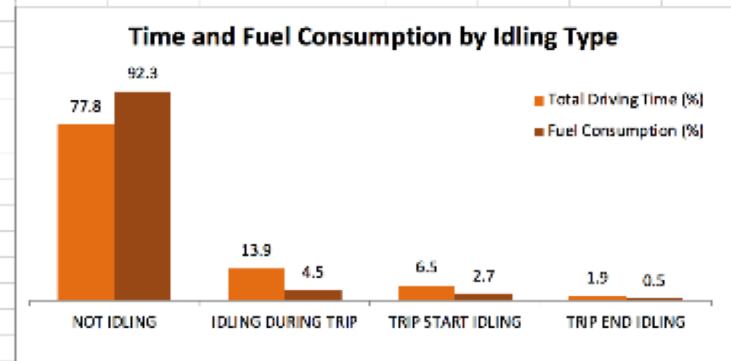
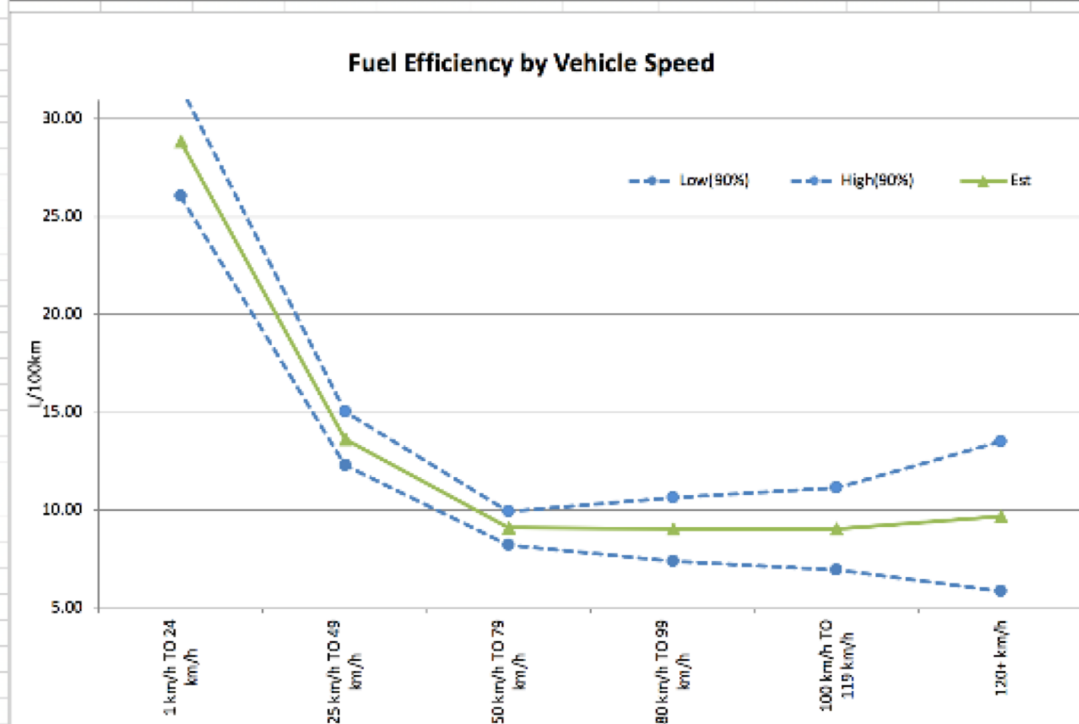
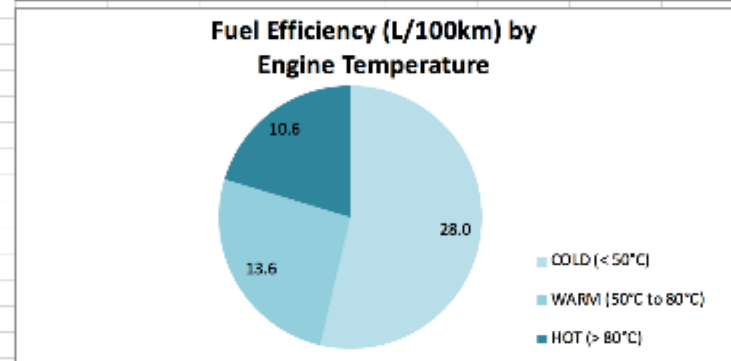
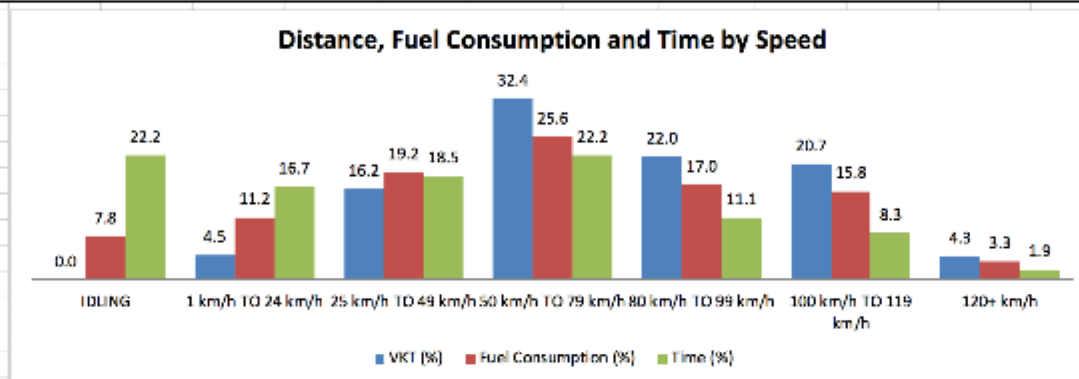
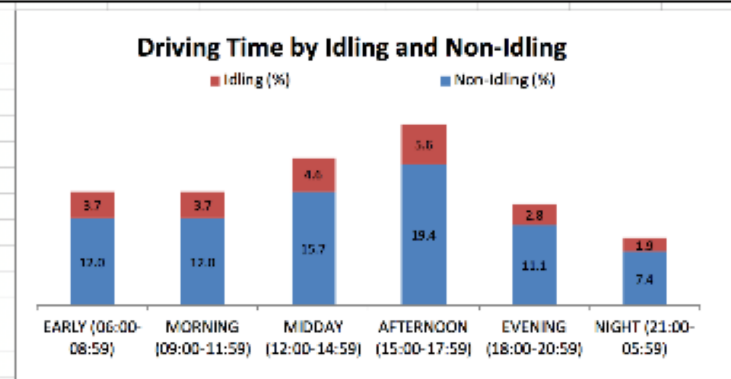


Subtrip-Level Charts



Ontario – 1st Quarter, 2012

Sub-Trip Characteristics

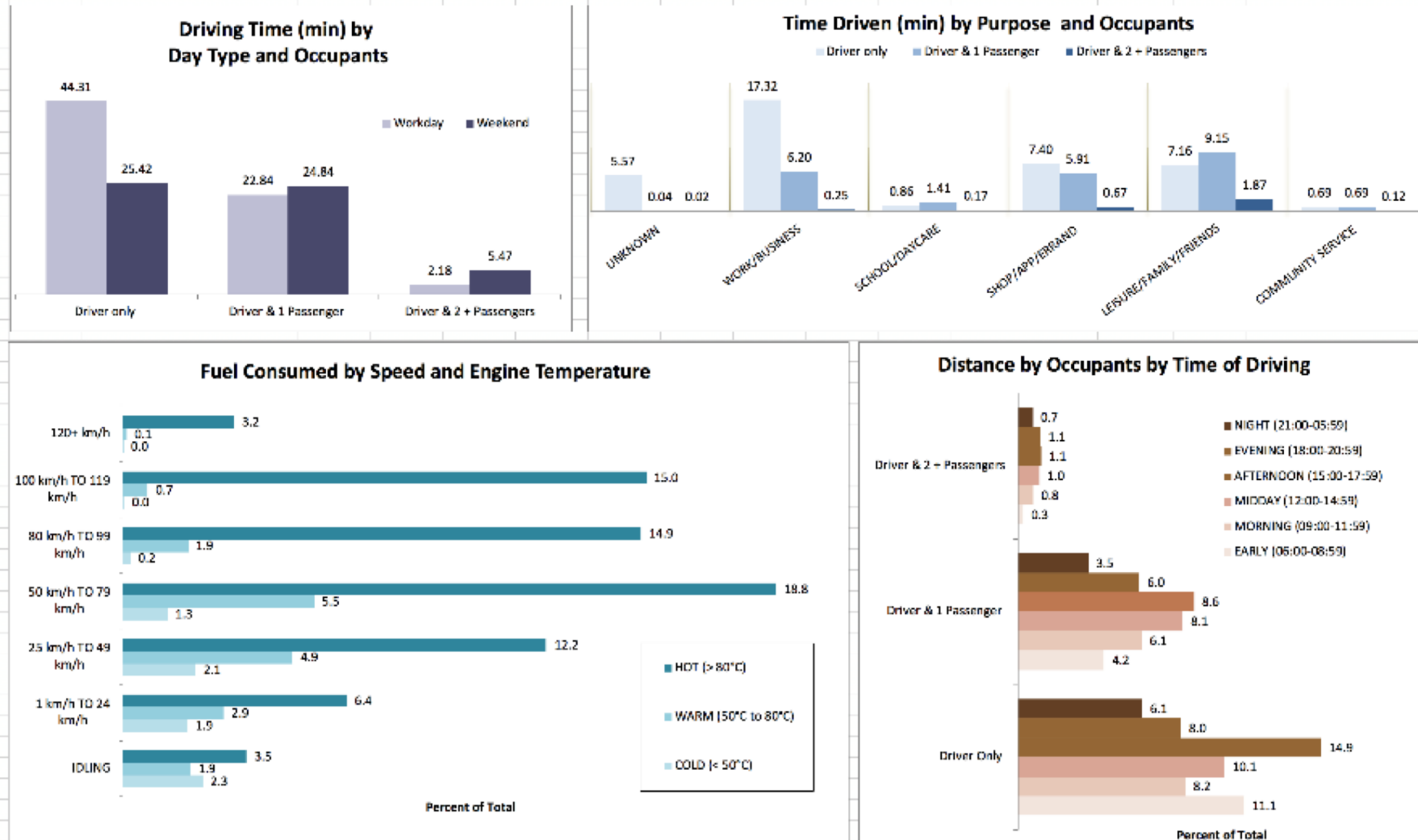


Mixed Characteristics



Ontario – 1st Quarter, 2012

Mixed Characteristics



Consulting Post-Mortem

Consulting Post-Mortem

- ❑ CVS management team was **steadfast** in its refusal to update their survey methodology
 - lack of respect for client's abilities and domain expertise
 - “anger” at TC taking away a BIG contract
- ❑ Not all jurisdictions joined
- ❑ A number of sampled drivers had **privacy concerns** related to electronic recording devices
 - speeding
 - responsibility in a collision
- ❑ Some electronic loggers were **stolen**/not returned...
- ❑ Local post office was **not prepared to handle the high volume** of loggers being sent and returned on a monthly basis
- ❑ High turnover in third party telephone agents, which lead to inexperienced agents
- ❑ CVUS was cancelled in 2016
- ❑ Extract from “Methodology of the CVUS” provides details on the early stages of the CVUS