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**TUTI Report 48-2005**

**North-Eastern Suburbs Travel Survey (NESTS)  
- 2005 Survey Results Report**

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# DRAFT

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## 1 Introduction

The Victorian Department of Infrastructure, as part of its long-term commitment to the development of sustainable transport policies and strategies, has taken a lead role in the implementation of large-scale TravelSmart programs. The objective of the Victorian TravelSmart Program is:

*To maximise sustainable travel and activity choices made by individuals, households and organisations through the utilisation of voluntary behaviour change tools.*

The Victorian TravelSmart Programs aims to achieve this objective by a combination of TravelSmart projects aimed at school, workplaces and communities.

The 2004 TravelSmart community project is designed to deliver a voluntary travel behaviour change methodology to approximately 30,000 households within the single local government area of Darebin. The objectives of the project are as follows:

- To achieve a change in travel behaviour of approximately 10% reduction in car trips and car kilometres, across the target population, without restricting personal activity, or adverse community or political reaction.
- To raise awareness of travel behaviour change, to facilitate a greater understanding of travel behaviour change, and to encourage positive attitudes towards travel behaviour change by the community, local and state government staff, and politicians.

To facilitate evaluation of the 2004 TravelSmart community project, a two-pronged monitoring program was commissioned by the Department. The evaluation project entailed:

- The conduct of a Before-and-After household travel survey of residents of Darebin, before and after the implementation of the TravelSmart project
- The conduct of a Trends Analysis using data available from public transport operators and VicRoads, to identify background trends in travel behaviour and to identify any specific changes in the study area of Darebin

This report is concerned with the “Before Survey” conducted as part of the first of the above monitoring exercises.

The North-Eastern Suburbs Travel Survey (NESTS) was a Survey of Day-to-Day Travel conducted in the North-Eastern Suburbs of Melbourne in March 2004 (the “Before Survey”) and in March 2005 (the “After Survey”). “Day-to-Day” travel includes all the everyday travel that people do as they go about their lives, such as going to and from work, going shopping, visiting friends, going to sporting events, and even just walking the dog!

The survey was designed and conducted by The Urban Transport Institute and I-view Pty Ltd, two companies with extensive experience in such surveys throughout Australia and overseas. The survey was conducted for the Victorian Department of Infrastructure.

The survey was conducted by delivering questionnaires to selected households and having them fill in these questionnaires describing the travel they do on a specific Travel Day. Each household was also asked to provide some limited information about

the people who live in that household. The completed questionnaires were then picked up from each household after their Travel Day. A week later, respondents were asked to complete a brief follow-up survey to report the total kilometres travelled by each household vehicle that week.

The North-Eastern Suburbs Travel Survey (NESTS) used four procedures in the field for the delivery and collection of survey materials. These four stages were:

- Sample Address Check and Delivery of Pre-Contact Letter
- Delivery of Questionnaire Survey Packs
- Collection of Questionnaire Survey Packs
- Delivery of Odometer Follow-Up Surveys

Following the conduct of the NESTS2004 Before Survey in March 2004, the NESTS2005 After Survey began with the first Travel Day on Tuesday 1st March 2005. A previous report has described the procedural results and unweighted data results obtained from the NESTS2004 survey. The purpose of this current report is to describe the procedural results and unweighted data results obtained from the NESTS2005 survey. Following this work, the results from the Before and After Surveys will be compared, and the results of the TravelSmart Evaluation will appear in a separate report.

## **2 A Summary of the Procedural Results**

While this report will concentrate on an analysis of the data obtained from the respondents, it is worth summarising the main procedural results in order to put the travel data results in context.

The NESTS2004 Before Survey procedures consisted of six main steps:

- Checking of Addresses and Delivery of Pre-Contact Letter
- Delivery of Survey Packs
- Placement of Motivational Phone Calls
- Collection of Completed Survey Packs
- Reminder Calls and Mailing
- Odometer Follow-Up Postcard Survey

The NESTS2005 After Survey was conducted in March 2005, 12 months after the Before survey. The intention of the survey was to identify changes in travel patterns that may have occurred after the implementation of TravelSmart. Because of the timing of Easter in 2005 (which was earlier than in 2004), the After Survey was run over 3 weeks, rather than the 4 weeks used in 2004. However, each household was surveyed on the same day of the week in 2005 as they were in 2004, while households surveyed over the Labour Day holiday weekend in 2004 were also surveyed over the Labour Day holiday weekend in 2005.

In some Before and After survey projects which aim to identify changes in travel behaviour due to a specific policy or project, the Before and After surveys are also conducted with a Control Group who have not been subjected to the policy or project,

as well as the Target Group who have been subjected to the policy or project. Such a procedure was not adopted in this project for four main reasons:

- Given the high penetration rate of TravelSmart within Darebin, there would be few households which would be unaffected by the program
- To find households unaffected by TravelSmart would mean selecting households from a different geographic region, which would introduce demographic and geographic differences into the Control Group
- The high cost of surveying the Control Group, given a fixed overall budget, would mean that the sample size for the surveys of the target group would have to be halved in size
- It was considered that an expansion of the planned Trend Analysis of secondary data sources would serve the purposes of the Control Group survey in identifying background changes in travel patterns.

For the above reasons, a Control Group household travel survey was not conducted for this evaluation. Rather, use was made of the Trends Analysis results (especially for the Metropolitan-wide changes in travel behaviour) to provide an indication of any background changes in travel behaviour that might underlie any changes in travel behaviour observed in the Before and After surveys.

Whereas the Before Survey was conducted with a random cluster sample of Darebin households, the After Survey was only conducted with those households that had responded to the Before Survey, since the overall sampling plan was to obtain about 900 households that had responded to both the Before and the After Surveys.

The survey instruments used in the After survey were identical to those used in the Before survey to avoid introducing differences in measurement techniques. The survey procedures were essentially the same, but with some differences in the Pre-Contact phase of the survey. Because the After survey was only conducted with households that had responded to the Before survey, it was known that they physically existed and therefore did not need to be located and checked again in the field. Therefore, no Pre-Contact visits were made to the addresses, and the Pre-Contact Letter (whose wording was changed to reflect the fact that this was a follow-on to the Before survey) was mailed to the households rather than personally delivered. Following that, all the phases of the Before survey were repeated exactly as performed in the Before survey.

## 2.1 *Delivery of Survey Packs*

Two days before each Travel Day, field staff attempted to deliver the Survey Packs to those households previously identified as being respondents to the NESTS2004 Before Survey. The method of delivery of the Survey Packs is shown in Figure 2.1. It can be seen that a majority (about 68%) were in fact delivered personally to a member of the household. Another 23% were left at the household with a postcard attached, while about 8% were refused by households at this stage. A total of 76% of households were contacted personally (including refusals). A small number of addresses (about 1%) were also found to be Sample Loss at this stage (mostly households that are clearly unoccupied, either visibly or via advice from neighbours), while very few Survey Packs (about 0.15%) could not be delivered (usually because access was prevented because of large dogs or other obstacles) and were mailed.

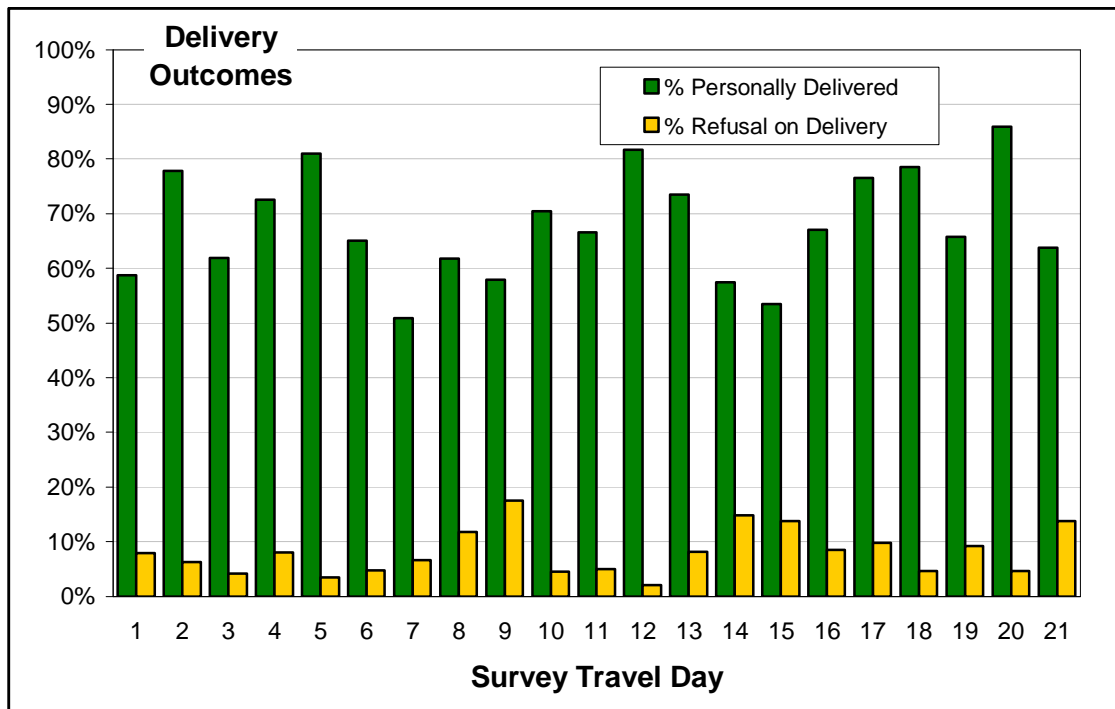


Figure 2.1 Type of Survey Pack Delivery

## 2.2 Motivational Calls

On the evening before each of the Travel Days, Motivational Phone Calls were placed to each household, where possible. The outcomes of the Motivational Calls are shown in Table 2.1. Across all households 77% were called in Weeks 1 through 3. Across the three weeks, an average of 51% of households were personally contacted. This was significantly higher than the 32% obtained in the Before Survey, because more households in the After Survey had a phone number available. The vast majority of these calls were well received, even though some households took this opportunity to refuse to participate in the survey.

Table 2.1 Outcomes of Motivational Calls

Motivational Call Outcome	Week			Total
	1	2	3	
Motivational Call Not Attempted	89	75	143	307
Successful Contact	253	200	229	682
Answering machine	65	53	46	164
Refusal	4	3	5	12
No contact made	75	43	63	181
<b>TOTAL</b>	<b>486</b>	<b>374</b>	<b>486</b>	<b>1346</b>
% Call Attempted	82%	80%	71%	77%
% Successful Contact Made	52%	53%	47%	51%

## 2.3 Survey Pack Pickup

On the day after each of the Travel Days, field staff visited the households to collect completed Survey Packs. The type of pickup procedure undertaken on each day in the three weeks of the survey is shown in Figure 2.2 and summarised by week in Table 2.2.

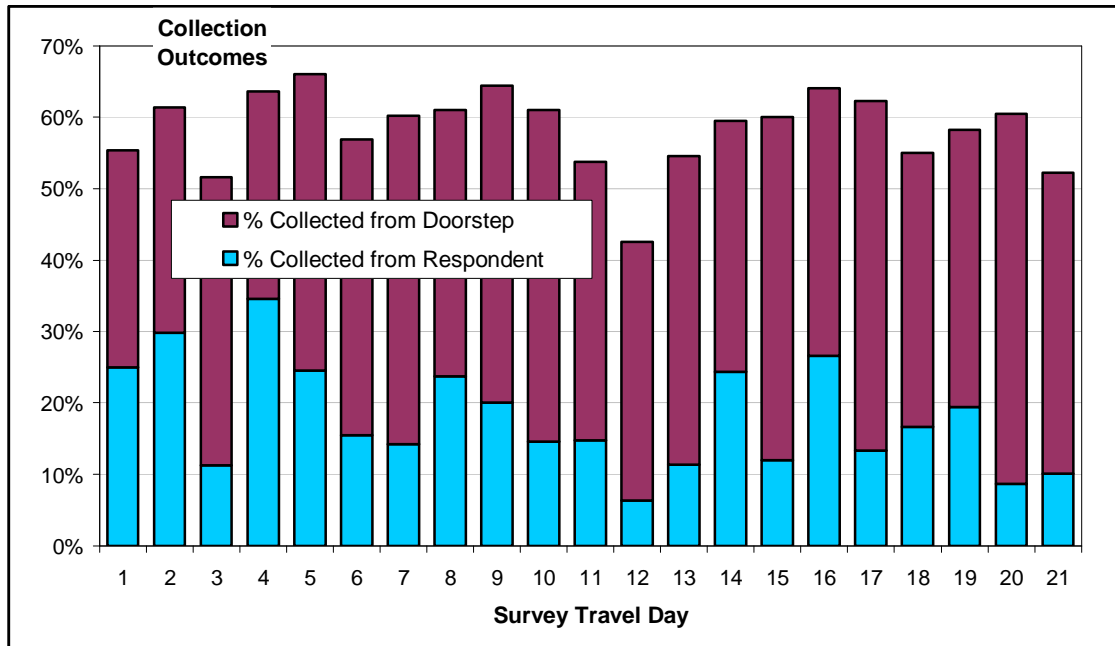


Figure 2.2 Collection Outcome by Day of Survey

Table 2.2 Type of Survey Pack Pickups

Pickup Method	Week			Total
	1	2	3	
From householder	93	54	66	213
From doorstep etc	167	131	190	488
Refusal - personally	11	12	12	35
Blank forms left on doorstep	20	12	27	59
R-P envelope left with householder	69	56	75	200
No contact - left a R-P envelope	77	60	66	203
Other	2	2	0	4
R-P Envelope Sent by Mail	5	5	3	13
No Collection Attempted	42	42	48	132
<b>TOTAL</b>	<b>486</b>	<b>374</b>	<b>487</b>	<b>1347</b>
% Collected from Respondent	21%	17%	15%	18%
% Collected from Doorstep	38%	40%	44%	41%
% Collected on Day	59%	57%	59%	58%

It can be seen that Survey Packs were picked up from households on the collection day on 58% of occasions, with more completed Survey Packs being collected from doorsteps and other places where the householder had left them (41%) than were collected personally from householders (18%). On about 7% of occasions, a refusal was encountered either personally (3%) or via uncompleted Survey Packs being left out for collection (4%).

On about 34% of occasions, a reply-paid envelope was left with or at the household for the Survey Pack to be returned in the mail. The Reply-Paid Envelope was returned with a completed questionnaire from about 48% of households where the envelope had been left.

## 2.4 Reminder Calls and Letters

One week after each Travel Day, households that had not yet responded and for whom a phone number was available were phoned to ask whether they have completed the

survey. If they have, they are reminded to send it back in the mail. If they have not completed the survey, they were asked the two non-response questions. For those households for whom a phone number was not available, or those who were not contactable by phone, a Reminder Letter was mailed out on the following day.

The incidence of the various types of reminders is shown in Table 2.3. About 24% of all households received reminders, with the remaining households not needing reminders because they had already responded or refused. In the first two weeks, about 58% of reminders were done by phone. These reminders were done by the same person who did the Motivational Calls. However, once the Motivational Calls stopped being made, it was uneconomical to have someone employed just to do the Reminder Calls. In the last week, therefore, most reminders were done by mail.

**Table 2.3 Incidence and Types of Reminders**

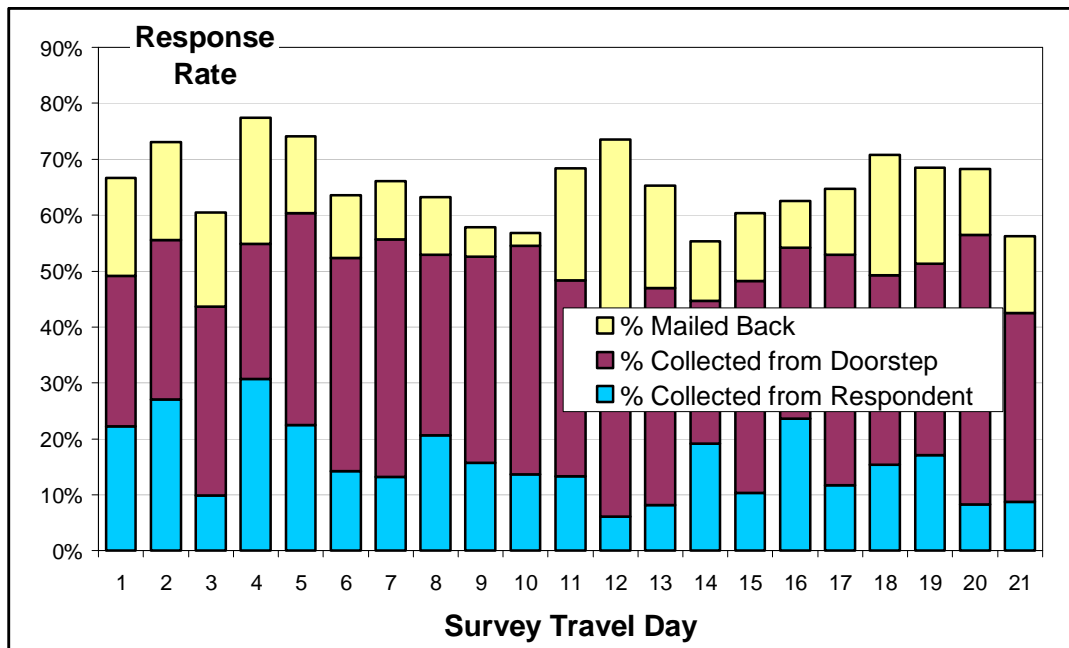
Reminder Method	Week			Total
	1	2	3	
No Reminder	369	292	365	1026
Phone Reminder	69	46	19	134
Reminder Letter	48	36	103	187
<b>TOTAL</b>	<b>486</b>	<b>374</b>	<b>487</b>	<b>1347</b>
% Reminded	24%	22%	25%	24%
Proportion Reminded by Phone	59%	56%	16%	42%
Proportion Reminded by Mail	41%	44%	84%	58%

## 2.5 Response Rates

A key measure of performance for the survey was the response rate achieved. It was for this reason that the personal delivery and pickup were instituted, along with the motivational and reminder calls. The response rates achieved from the Darebin area in the VATS survey was about 7% less than the Melbourne-wide average, and for this reason a lower-than-average response rate was again expected in Darebin. In the NESTS Pilot Survey and the NESTS2004 Before Survey, a response rate of 52% was achieved. The response rates achieved in the three weeks of the NESTS2005 After Survey are shown in Table 2.4 and Figure 2.3.

**Table 2.4 Overall Response Rates by Week**

Response Type	Week			Total
	1	2	3	
Respondent	332	236	313	881
Sample Loss	11	7	2	20
Refusal	80	75	99	254
Non-respondent	63	56	73	192
<b>TOTAL</b>	<b>486</b>	<b>374</b>	<b>487</b>	<b>1347</b>
Response Rate	70%	64%	65%	66%
% Collected from Respondent	19%	14%	14%	16%
% Collected from Doorstep	34%	35%	37%	35%
% Mailed Back	15%	14%	14%	14%



**Figure 2.4 Response Rates by Day of Survey**

It can be seen that the overall response rate was 66%. Response rates started out at 70% in Week 1, and then gradually fell to about 65% in Week 3. This response rate is significantly higher than that obtained in the Before Survey, which is not surprising given that the survey was only being done with households that had already responded to the Before Survey. It was, however, somewhat lower than the 75% assumed in the calculation of the overall sample size required.

The final procedural result of importance is the number of households available for comparison from the Before and After surveys. The original sample size calculations indicated that 900 households would be needed for comparison, in order to be able to detect a 10% difference in daily VKT per household with 95% confidence. Although Table 2.4 indicates that 881 households responded to the After Survey, not all of these will be available for comparison with the Before Survey, since the household at the address in the After Survey may not be the same as the household at the address in the Before Survey. Table 2.5 shows the nature of the composition of the 881 households that responded to the After Survey. It can be seen that the majority of responding households in the After Survey (77%) were exactly the same as the household at that address in the Before Survey (as identified by age, gender and first name of the household members). A small proportion (7%) were mostly or entirely different people in the household. The balance (16%) were basically the same composition, but with minor changes (e.g. an additional child, a new household member or a missing household member from 2004).

**Table 2.5 Composition of Households in After Survey**

Composition of Household	Number of Households
Exactly the Same as in Before Survey	682
Mostly the Same as in Before Survey	140
Mostly or Entirely Different to Before Survey	59

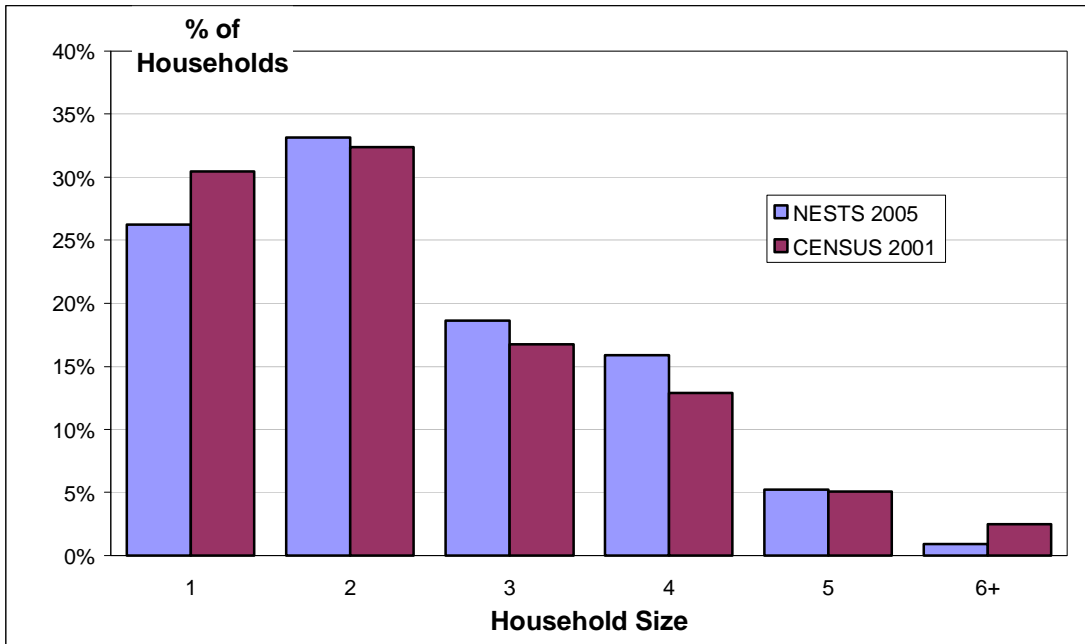
### 3 Unweighted Household Results

The unweighted results from the NESTS2005 Household Questionnaire are presented in this section. The geographic distribution of surveyed households is shown in Figure 3.1, for the entire NESTS2004 sample (left), the respondents to NESTS2004 (who became the sample for NESTS2005) (centre) and the NESTS2005 respondents (right). This figure shows a relatively even distribution of households across the entire study area for the NESTS2004 sample (since every CCD in the area was sampled from). The apparently unsampled area on the eastern side of the study area consists of industrial, commercial and parkland land-uses bordering on the Darebin Creek. The NESTS2004 and NESTS2005 respondents show a thinning of the households, but no apparent geographic bias in the respondents compared to the initial sample.



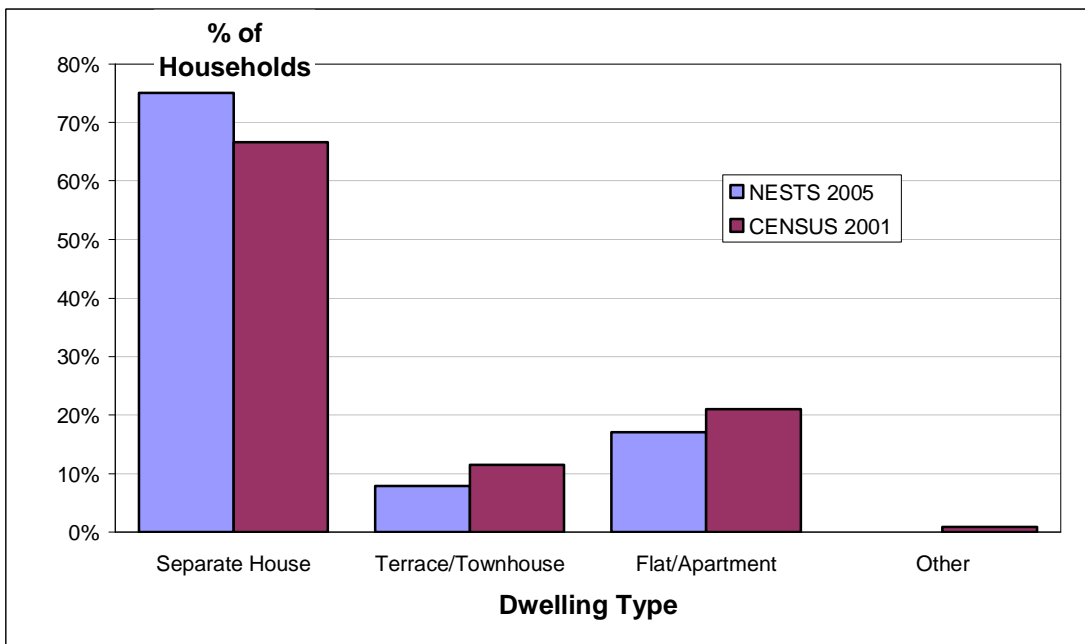
**Figure 3.1 Geographic Distribution of Households**  
 Left – NESTS2004 Sample  
 Centre – NESTS2004 Respondents (= NESTS2005 Sample)  
 Right – NESTS2005 Respondents

The distribution of household sizes (in terms of number of Usual Residents) recorded in the sample of NESTS2005 responding households is shown in Figure 3.2. Also shown in Figure 3.2 is the distribution of household size for the same study region of 168 CCDs, as recorded in the 2001 Census. The agreement between the NESTS2005 Usual Residents and the 2001 Census Usual Residents is good, especially considering that this is comparing the unweighted NESTS2005 data with the 2001 Census. It indicates that the NESTS2005 respondents, even though they have passed through two filters of responding to the 2004 and 2005 surveys, is still a good representative sample of the total population, in terms of household size. The only obvious difference, as with the NESTS2004 respondents is the slight under-representation of single person households. The average household size in NESTS2005 is 2.44, compared to 2.40 in the Census.



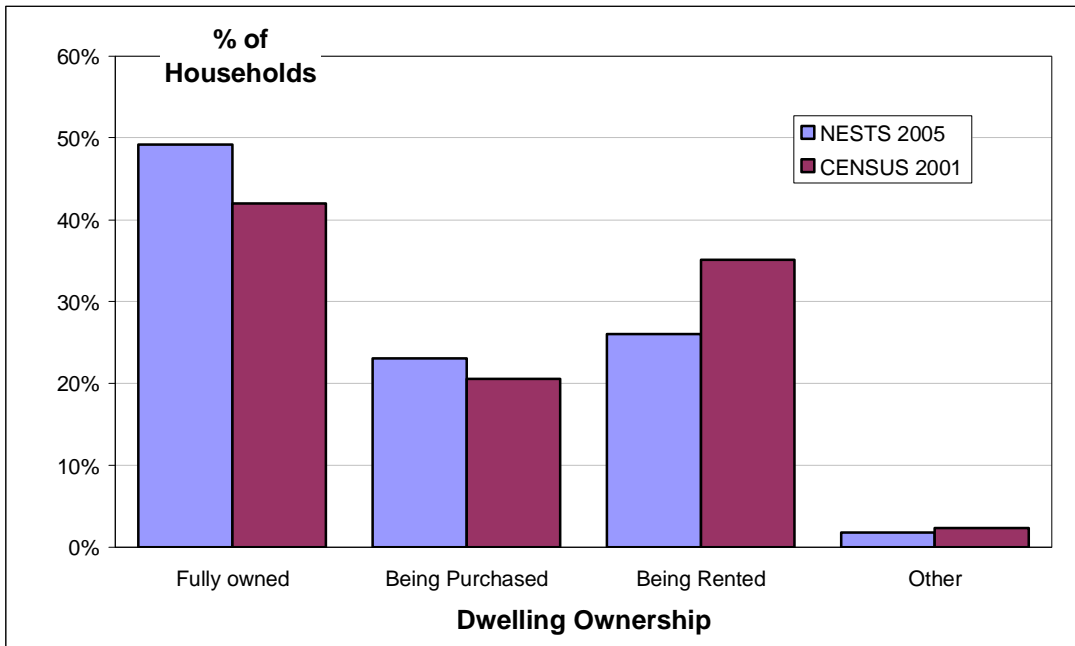
**Figure 3.2 Distributions of Household Size**

The type of dwelling in NESTS2005, as reported by the respondent, is shown in Figure 3.3. It can be seen that the split between single dwellings and multiple dwellings closely matches the 2001 Census, with NESTS2005 having slightly more Separate Houses than in the Census.



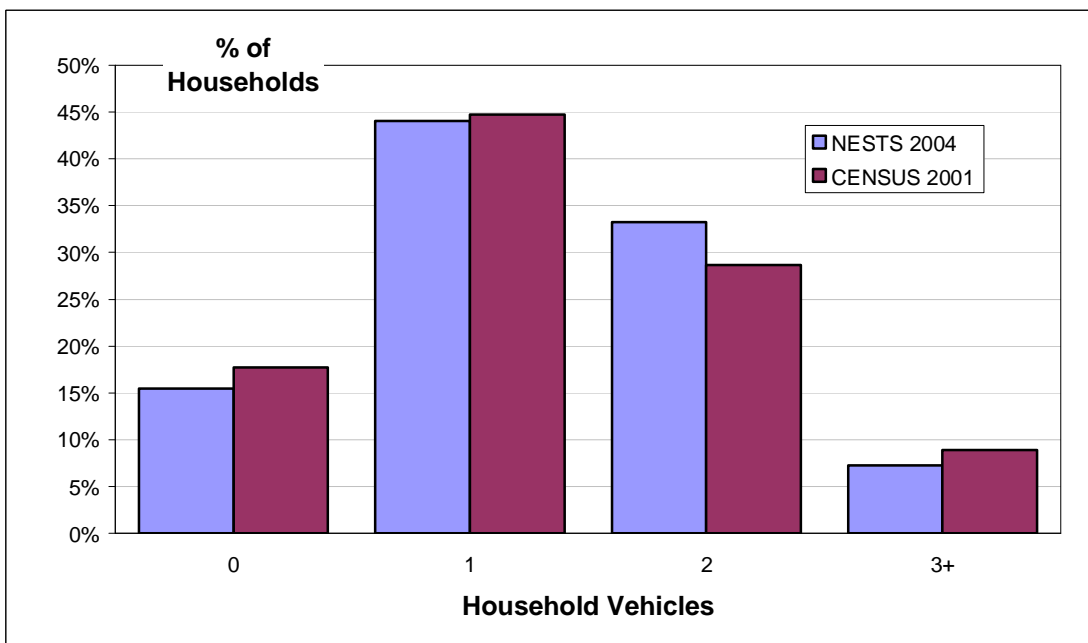
**Figure 3.3 Dwelling Type in NESTS2005 and Census**

The ownership of the dwelling in NESTS2005 is shown in Figure 3.4. It can be seen that, as in NESTS2004, the NESTS2005 respondents have more dwellings that are fully owned than in the Census. These are findings found in most travel surveys, where fully-owned separate houses are over-represented, compared to rented apartments.



**Figure 3.4 Dwelling Ownership in NESTS2005 and Census**

The distribution of vehicles per household is shown in Figure 3.5. The agreement between the NESTS2005 Vehicle Ownership and the 2001 Census Vehicle Ownership is very good, but with slightly fewer households in NESTS2005 having zero vehicles than in NESTS2004. Approximately 15% of the NESTS2005 sample and 18% of the Census population have no vehicles in the household, while the average vehicles per household in NESTS2005 is 1.35, compared to 1.31 in the 2001 Census.



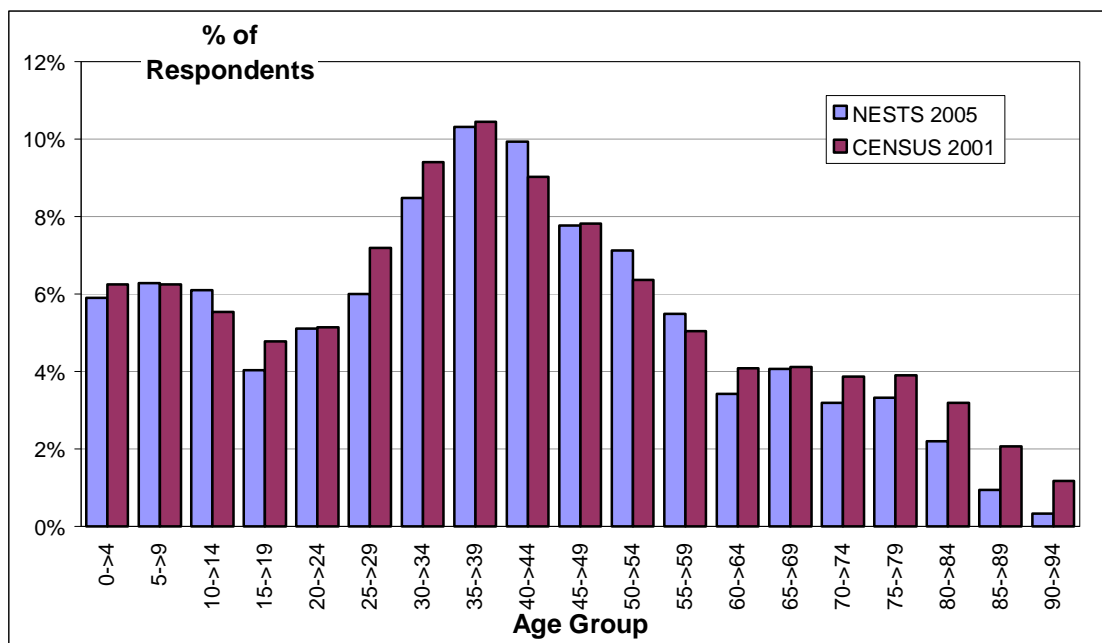
**Figure 3.5 Distributions of Vehicles per Household**

The above comparison between the unweighted NESTS2005 household demographics and the 2001 Census results is very encouraging, indicating that the NESTS2005 survey has still captured a very representative sample of households in the study area.

## 4 Unweighted Person Results

The unweighted results from the NESTS2005 Person Questionnaire are presented in this section.

The distribution of respondents by 5-year Age Groups is shown in Figure 4.1, and compared with the same data from the 2001 Census. It can be seen that NESTS2005 captures the double-hump of the age distribution for the under-5s and those in their early 30s. However, like NESTS2004, NESTS2005 tends to under-represent those aged over 60. NESTS2005 represents the Gender distribution well, with 47% of the NESTS2005 sample being male, compared to 48% in the Census.



**Figure 4.1** Age of Respondents in NESTS2005 and Census

A concern in the original survey design was that, being a written self-completion questionnaire, there might be a bias against completion of the questionnaire by those whose mother-tongue was not English. To investigate this, a question was asked about country of birth. The NESTS2004 results had shown that Australian-born respondents were equally represented in NESTS2004 and the 2001 Census. The results for NESTS2005 are shown in Table 4.1

**Table 4.1** Country of Birth of Respondents in NESTS2005 and Census

Country of Birth	NESTS 2005	CENSUS 2001
Australia	70%	67%
Italy	6%	6%
Greece	4%	6%
UK	4%	2%
China	1%	2%
Vietnam	1%	1%
Macedonia	1%	1%
Lebanon	1%	1%
NZ	1%	1%
India	1%	1%
Elsewhere	10%	10%

It can be seen that NESTS2005 appears to have a slight over-representation of those born in Australia (70%, compared to 67% in the Census). However, apart from the Greek population, no specific population group appears to be under-represented in NESTS2005.

The employment status of respondents in NESTS2005 and the Census is shown in Table 4.2. It can be seen that NESTS2004 provides a very representative picture of employment status by full-time and part-time by gender.

**Table 4.2 Employment Status of Respondents in NESTS2005 and Census**

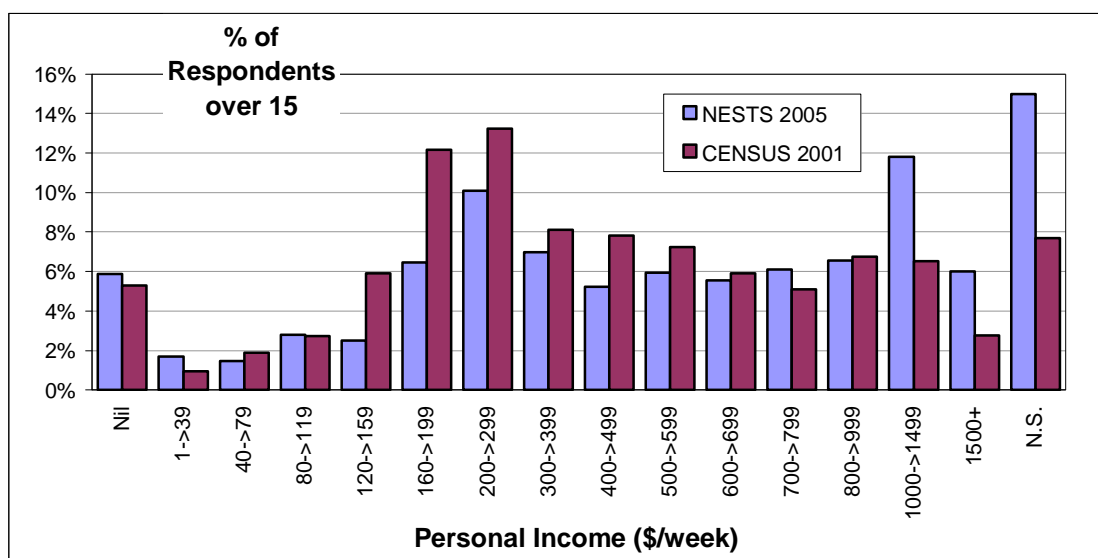
Employment Status		NESTS 2005	CENSUS 2001
Full-Time Work	Male	44%	43%
	Female	25%	27%
Part-Time Work	Male	11%	13%
	Female	22%	20%

The educational status of respondents in NESTS2004 and the Census is shown in Table 4.3. It can be seen that NESTS2004 provides a slight over-representation of primary and secondary students, compared to the Census.

**Table 4.3 Educational Status of Respondents in NESTS2005 and Census**

Educational Status	NESTS 2005	CENSUS 2001
Primary	9%	7%
Secondary	6%	5%
Tertiary	9%	10%

Income is often regarded as one of the more difficult “sensitive” questions in travel surveys, with many surveys reporting high non-response rates. The NESTS2005 results (for persons over 15, to be consistent with the Census) are shown in Figure 4.2, together with the 2001 Census results.

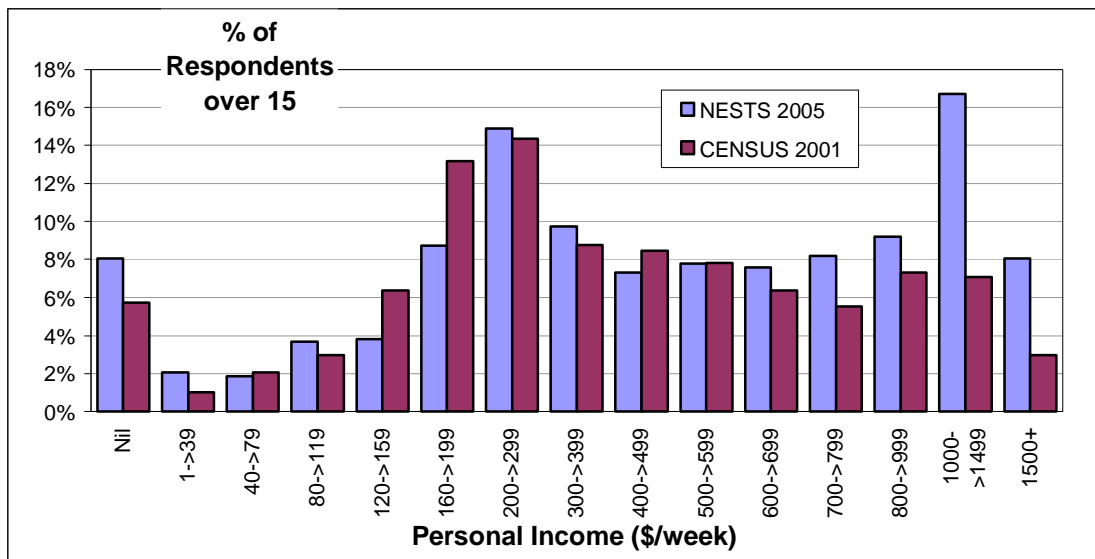


**Figure 4.2 Personal Weekly Income of Respondents over 15 Years of Age**

After deductive imputation has been applied to the NESTS2005 results (mainly imputation of the age pension for those who state they are age pensioners but do not

give an income, and imputation of zero income not in employment and not on other pension or unemployment benefits), it can be seen that the NESTS2005 results are a reasonable approximation of the Census results. NESTS2005 has 15% Not Stated (after deductive imputation), compared to 7.5% for the Census.

If one compares NESTS2005 with the Census only for those who report some form of income, as shown in Figure 4.3, then it can be seen that the agreement is fairly good, except for incomes between \$1000 and \$1500 per week, where NESTS05 has a much higher proportion of respondents.



**Figure 4.3 Personal Weekly Income of Respondents reporting Some Income**

The 15% Not Stated in NESTS2005 can be removed by applying hot-deck imputation, whereby missing income values are replaced with income values from similar respondents in the NESTS2005 data. The hot-deck imputation for NESTS2005 employed employment status, age and gender as the stratifying variables. A comparison of the personal income distribution before and after hot-deck imputation is shown in Figure 4.4. It can be seen that hot-deck imputation has slightly increased the proportion with income in the \$200-\$300 range, but has otherwise retained the shape of the pre-imputation distribution. The advantage of using hot-deck imputation is that now every respondent has an income for subsequent analyses.

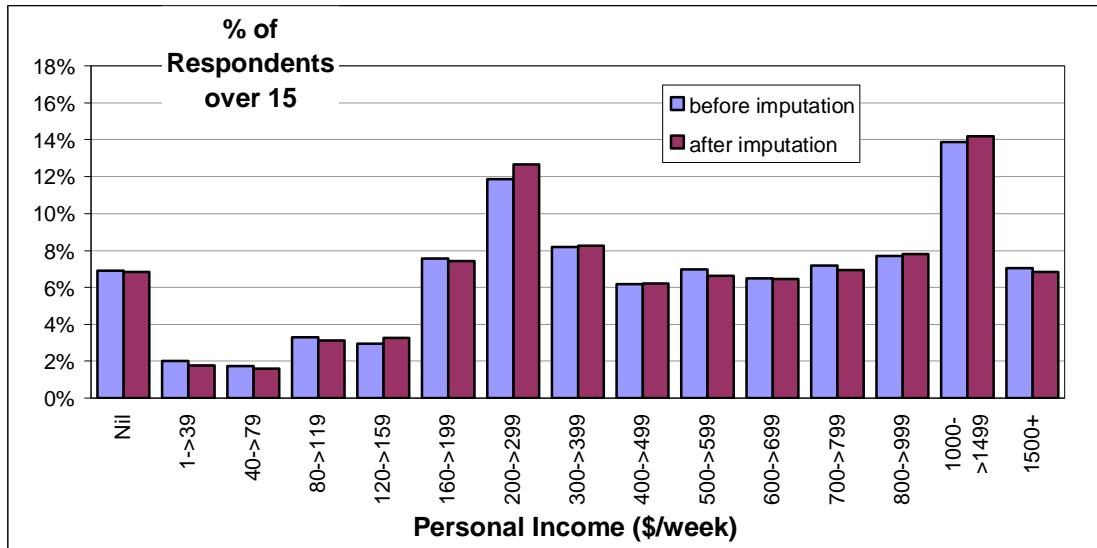


Figure 4.4 Personal Weekly Income for NESTS2005 before and after the use of Hot-Deck Imputation

## 5 Unweighted Vehicle Results

Each household was asked a range of questions about all vehicles owned or garaged at their household on the night before their Travel Day. The unweighted results from the NESTS2005 Vehicle Questionnaire are presented in this section. The majority of the vehicles (92%) were privately owned, with 7% being company car and only 0.8% being government vehicles.

Table 5.1 Ownership of Vehicle in NESTS2005

Ownership	% of Vehicles
Private	92%
Company	7%
Government	0.8%

Most of the vehicles were cars (84%) with another 7% being four-wheel-drive vehicles. Company (and government) vehicles were more likely to be 4WDs, utes or vans than were privately owned vehicles.

Table 5.2 Type of Vehicle by Vehicle Ownership in NESTS2005

Vehicle Type	Vehicle Ownership		TOTAL
	Private	Company/Govt	
Car	86%	71%	84%
4WD	7%	8%	7%
Motorcycle	2%	0%	2%
Ute	3%	10%	3%
Van	2%	9%	3%
Truck	0%	3%	0%
Other	0%	0%	0%

Toyotas were the most popular make of vehicle, followed by Fords and Holdens. Fords and Holdens were particularly popular as company vehicles (but care should be taken with the company cars results, given the relatively small sample size of company cars)

**Table 5.3 Top 10 Makes of Vehicle by Vehicle Ownership in NESTS2005**

Vehicle Make	Vehicle Ownership		TOTAL
	Private	Company/Govt	
Toyota	19%	14%	19%
Ford	17%	22%	17%
Holden	16%	26%	17%
Mitsubishi	9%	5%	8%
Mazda	6%	3%	6%
Nissan	6%	4%	6%
Hyundai	4%	1%	4%
Subaru	4%	2%	4%
Volkswagon	4%	3%	4%
Suzuki	2%	3%	2%

Whereas the top make of vehicle (Toyota) made up 19% of the vehicle fleet, the distribution of models was much more widespread, with the most popular model (Falcon) making up only 7% of the total, followed by Commodores, Corollas and Camrys.

**Table 5.4 Top 10 Models of Vehicle by Vehicle Ownership in NESTS2005**

Vehicle Model	Vehicle Ownership		TOTAL
	Private	Company/Govt	
Falcon	7%	12%	7%
Commodore	6%	15%	7%
Corolla	6%	1%	5%
Camry	5%	5%	5%
Magna	4%	2%	4%
Laser	3%	0%	3%
Astra	2%	3%	2%
Excel	2%	2%	2%
Lancer	2%	1%	2%
Pulsar	2%	2%	2%

The distribution of vehicle ages, in total, was relatively uniform over the past 15 years. However, company vehicles were much more likely to be under 5 years old (63%) compared to private vehicles (22%). The average age of a company vehicle was only five years (with a median age of two years), whereas the average age of a private vehicle was 11 years (with a median age of 10 years).

**Table 5.5 Year of Vehicle by Vehicle Ownership in NESTS2005**

Vehicle Age	Vehicle Ownership		TOTAL
	Private	Company/Govt	
0	0%	3%	1%
1	4%	23%	5%
2	5%	17%	6%
3	6%	14%	6%
4	7%	8%	7%
0->4	22%	63%	25%
5->9	26%	16%	25%
10->14	24%	12%	23%
15->19	14%	3%	13%
20->24	10%	1%	9%
25+	5%	2%	5%

The majority of all vehicles (62%) were 4-cylinder vehicles, with another 33% being 6-cylinder vehicles. However, company vehicles were more likely to be 6-cylinder vehicles (60%) than 4-cylinder vehicles (35%).

**Table 5.6 Number of Vehicle Cylinders by Vehicle Ownership in NESTS2005**

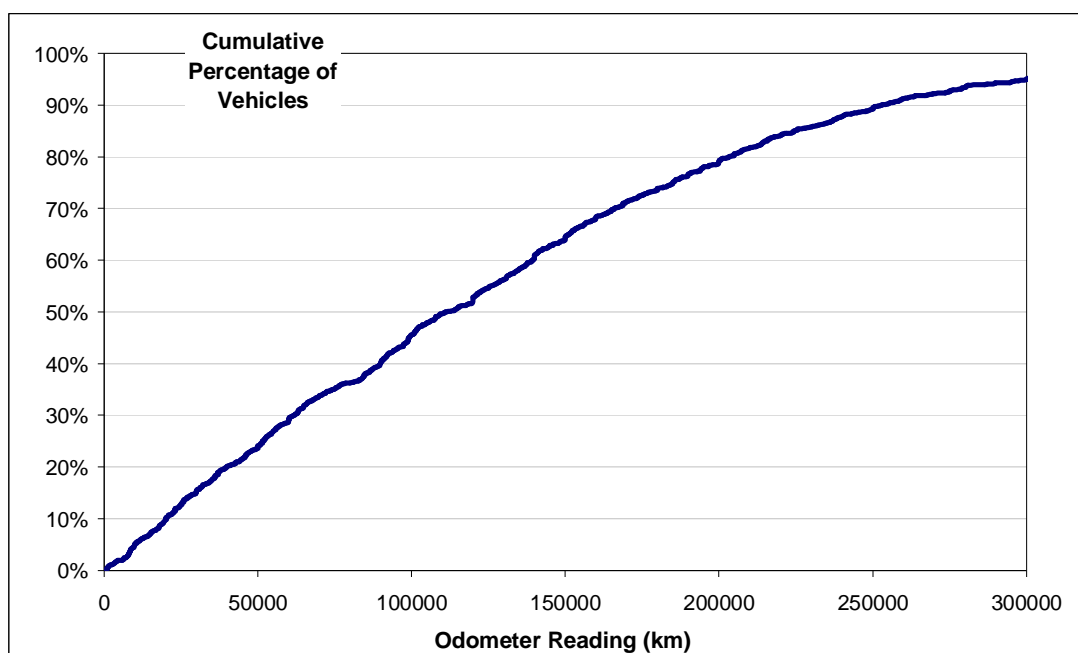
Cylinders	Vehicle Ownership		TOTAL
	Private	Company/Govt	
1	0%	0%	0%
2	1%	0%	1%
3	0%	0%	0%
4	64%	35%	62%
5	0%	1%	0%
6	31%	60%	33%
8	3%	4%	3%
Grand Total	100%	100%	100%

Most vehicles used petrol (96%), with relatively few using LPG gas (5%) or diesel (3%). These percentages do not sum to 100% because some vehicles used more than one type of fuel.

**Table 5.7 Type of Fuel Used in NESTS2005**

Fuel Type	% of Vehicles
Petrol	96%
Gas	5%
Diesel	3%

In addition to asking about the characteristics of each vehicle, respondents were asked to provide the current odometer reading for each vehicle. This information was provided for 89% of vehicles, and the cumulative distribution of the odometer readings is shown in Figure 5.1.

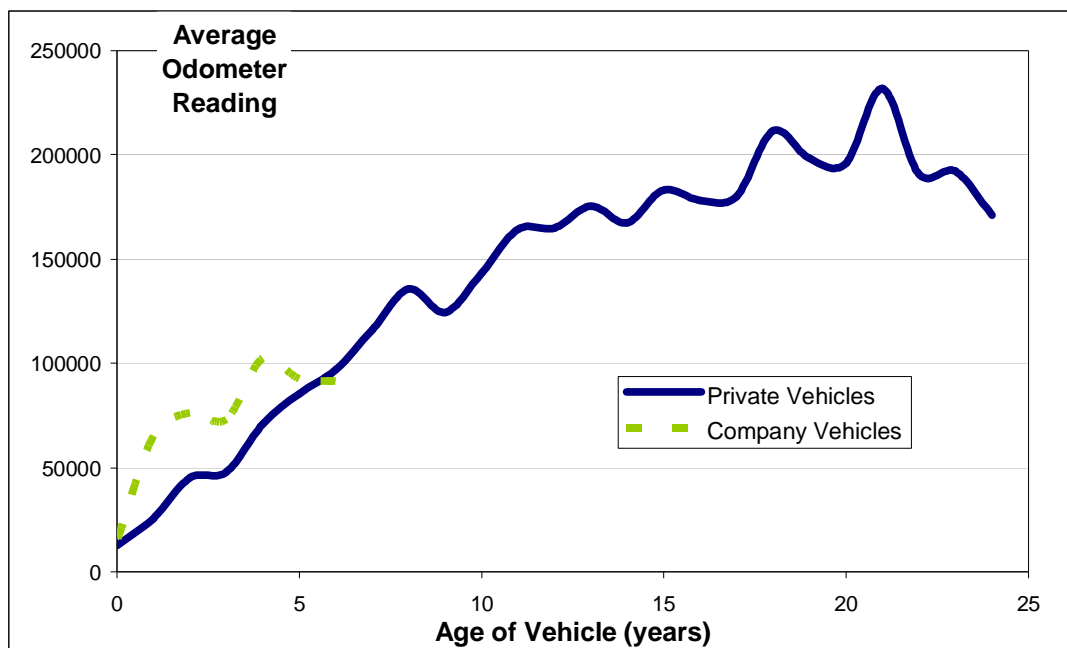


**Figure 5.1 Cumulative Distribution of untrimmed Odometer Readings**

The distribution is relatively smooth, with two outstanding features. Firstly, when compared with the NESTS2004 odometer readings, the number of readings with very low kilometres has reduced dramatically (from 5% down to virtually zero). This is a result of greater attention being placed, during the Motivational Phone call, on reminding respondents to record their odometer reading and not their trip-meter reading. Secondly, about 5% of readings are still greater than 300,000 kms. While

most of these would be valid readings (especially for older vehicles), it was clear that some of these readings (for relatively young vehicles) are mistaken readings involving juxtaposition of digits or inclusion of the tenths of kilometres found on some vehicle odometers. To avoid the possibility of these very high values affecting the subsequent analyses, the odometer readings were 5% trimmed, with the bottom and top 5% of readings being ignored.

To check the overall reasonableness of these odometer readings, the average odometer reading (using the 5% trimmed data) was calculated as a function of the age of the vehicle, for private and company vehicles, as shown in Figure 5.2. Three features of the graph are worth noting. Firstly, for the private vehicles, the odometer reading rises fairly uniformly per year up to a vehicle age of about 11 years (the average age) at a rate of about 14,000 km per year, which is approximately the average annual kilometres for passenger vehicles in Victoria, as recorded in the ABS Survey of Motor Vehicle Usage. Secondly, beyond this age, the kilometres per extra year of vehicle age rises at a decreasing rate, reaching a maximum average kilometres travelled of about 200,000 at age 20. Beyond this age the average odometer reading starts to fall. This finding has been observed in other studies of vehicle use, and is caused by the scrapping of older vehicles with higher kilometrage, leaving only the older vehicles with relatively lower kilometrage. Thirdly, for the limited age range of company vehicles, it can be seen that the average annual kilometres is higher than for private vehicles of the same age.



**Figure 5.2 Average Odometer Reading as a function of Vehicle Age**

It was noted earlier that the very low odometer readings observed in NESTS2004 had largely been removed in NESTS2005. Another problem with the odometers readings in NESTS2004 was where respondents rounded off their odometer reading. While the overall magnitude of these readings is probably satisfactory (and has been used on the construction of Figure 5.2 above), they will be of little use in calculating kilometres travelled during the week when they are compared with another (potentially rounded-off) odometer reading at the end of the week. As an indication of rounding-off, any odometer reading that was an exact multiple of 1000 km was assumed to be rounded-

off. Approximately 25% of all readings in NESTS2005 fell into this category. A more complete analysis of the weekly kilometres, derived from the follow-up odometer survey, is provided later in this report.

## 6 Unweighted Stops Results

The unweighted results from the NESTS2005 Stops Questionnaire are presented in this section for persons aged 5 or more. While the reconstruction of the Travel Diaries for persons under 5 has been performed to obtain the population estimates of travel for the region, they have not been included in the data used for the before and after surveys to evaluate the TravelSmart project, since those under 5 have no decision-making power for independent travel that might be influenced by TravelSmart. In addition, while the Stops file has been converted into a Trips file to obtain the population estimates of travel for the region, the Trips file is not used in the TravelSmart evaluation, since the Trips file loses valuable information about feeder modes for public transport trips, including a substantial proportion of non-motorised mode travel. Therefore, all the TravelSmart evaluation is based on the information in the Stops file for those aged 5 and above.

The average number of Stops per Day per Person (aged 5 or more) is 3.97, with 22% of people making no Stops on their Travel Day. The distribution of Stops per Day per Person is shown in Figure 6.1, together with the results for VATS (1994-96) for the same group of 168 CCDs. For VATS, the average stops per person per day was 3.58, with 24% of respondents making no trips on their Travel Day. It therefore appears that NESTS2004 is measuring stops with approximately the same level of precision as in VATS.

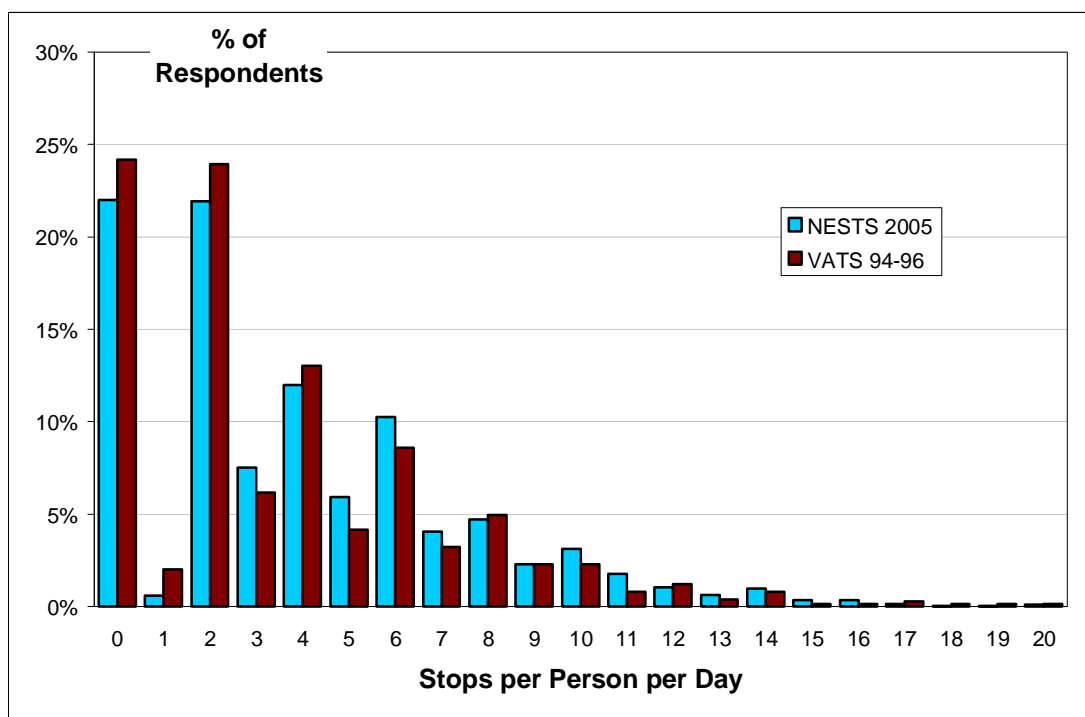


Figure 6.1 Number of Stops per day per Person (aged 5 or more)

The types of destination place visited during the day are shown in Table 6.1. Residences (including the respondents home), transport locations (such as bus stops and train stations), shops and workplaces are the most commonly visited locations.

**Table 6.1 Destination Places of Stops**

Destination Place	% of Stops
Transport Location	21%
Residence	37%
Workplace	10%
Natural Feature	1%
Educational Venue	7%
Shop	14%
Personal Business Venue	4%
Social Venue	4%
Recreational Venue	2%
Other	0%

The reasons why these places are visited are shown in Table 6.2. Going home, change mode, buying something and work-related purposes are the main reasons for making trips.

**Table 6.2 Destination Purposes of Stops**

Destination Purpose	% of Stops
Change Mode	20%
Accompany	2%
Buy Something	12%
Pickup/deliver Something	2%
Chauffeur	6%
Education	3%
Work	10%
Go Home	29%
Personal Business	4%
Social	9%
Recreational	3%
Other	0%

The modes used to get to these destinations are shown in Table 6.3, along with the corresponding figures from VATs 1994-96.

**Table 6.3 Mode of Transport Used on Trip Stages**

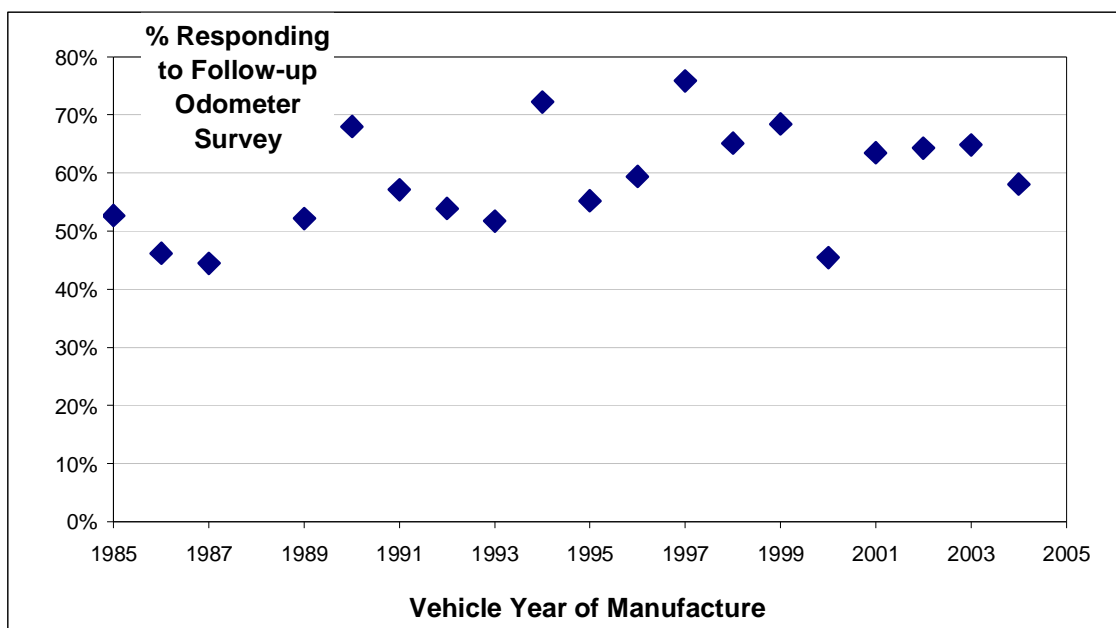
Mode of Transport	% of Stops	
	NESTS 2005	VATS 94-96
Vehicle Driver	38%	34%
Vehicle Passenger	17%	20%
Motorcycle	0%	0%
Walking	31%	35%
Bicycle	3%	1%
Taxi	1%	0%
Train	4%	3%
Tram	5%	3%
School Bus	0%	0%
Public Bus	1%	3%
Other	0%	0%

It can be seen that the private car is the dominant form of transport, with 55% of stops being served by private car. This is similar to the overall result from VATS (54%), but NESTS2005 has a higher proportion of these stops as a car driver, compared to as a car passenger. The proportion of stops by public transport is slightly higher in NESTS2005 (10%) than in VATS (9%), while the proportion by non-motorised transport is very similar (34% cf 36%) but with a higher proportion by bicycle in NESTS2005 (3% cf. 1%). Overall, however, the modal share results appear not to have changed significantly over the past 10 years in Darebin, with the possible exception of an increase in car driver trips.

## 7 Odometer Survey Results

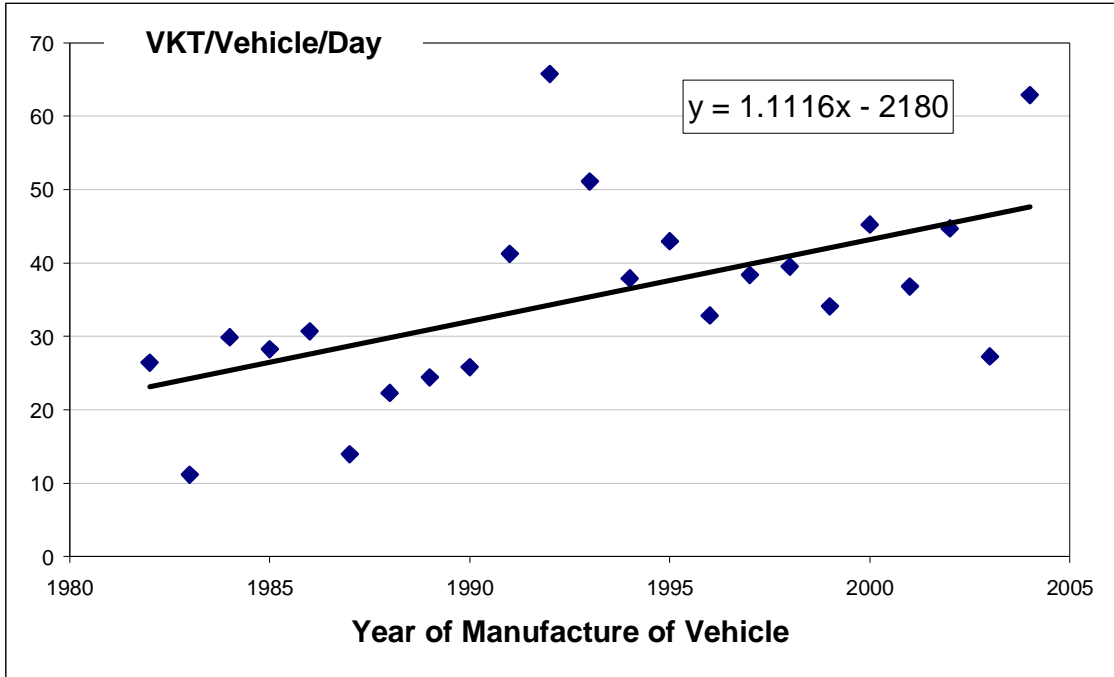
Those households providing useful odometer readings in the questionnaire survey were contacted again a week later with a postcard survey, asking them to provide a second odometer reading for each vehicle so that the weekly VKT could be calculated. The unweighted results from the NESTS2004 Odometer Survey are presented in this section.

Of the 687 vehicles for which a useful odometer reading was obtained in the initial survey, replies to the postcard follow-up survey were obtained from 417 vehicles (61%). Figure 7.1 shows the variation in this response rate by the age of the vehicle, where it can be seen that higher response rates were obtained for newer vehicles.



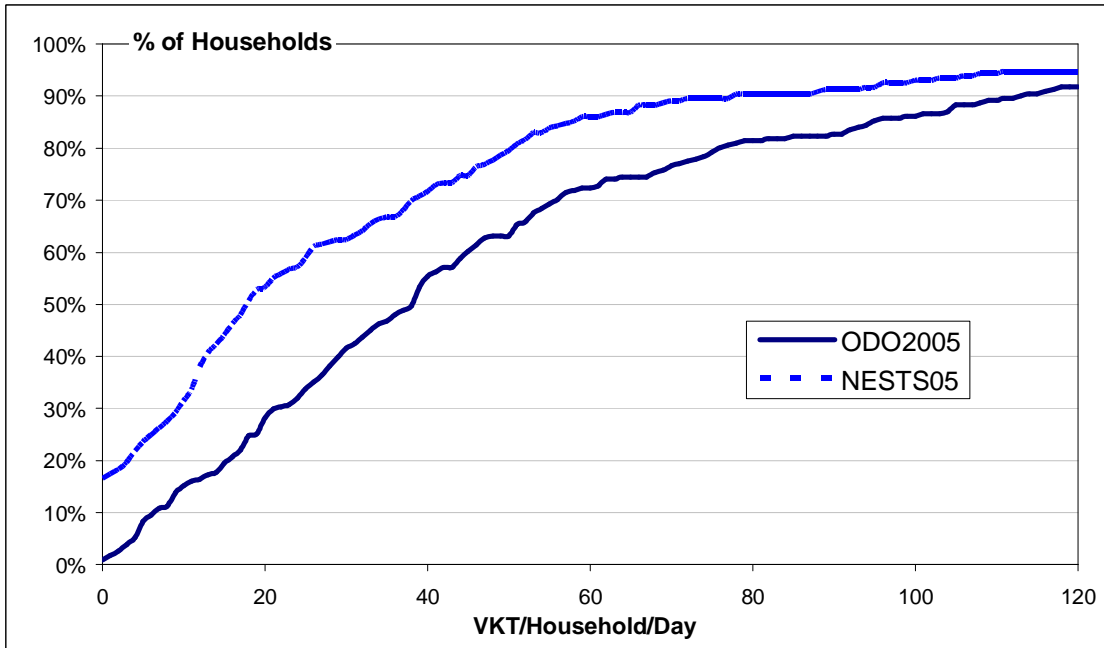
**Figure 7.1 Response to Follow-up Odometer Survey by Age of Vehicle**

Figure 5.2 above had shown that older vehicles perhaps travel less kilometres, with the marginal increase in VKT slowing as the age of the vehicle increased. This finding is confirmed by examining the actual VKT per vehicle per day (as measured in the odometer follow-up survey) as a function of the age of the vehicle, as shown in Figure 7.2. It can be seen that new vehicles travel about 45 km/day, decreasing to about 20 km/day as the vehicle ages to about 25 years of age.



**Figure 7.2 VKT/Vehicle/Day by Age of Vehicle**

The odometer survey is one way of measuring VKT. Another way is by means of the travel diary completed by each respondent. By estimating the total distance travelled as a car driver by each household, an estimate of total VKT per household per day can be obtained. This can then be compared with the total VKT for all vehicles in a household as estimated by the odometer survey. The cumulative distributions of these two measures of VKT are shown in Figure 7.3, while some summary statistics are provided in Table 7.1.



**Figure 7.3 Cumulative Distributions of VKT/Household/Day from Odometer and Diary Surveys**

**Table 7.1 VKT/Household/Day Statistics from Odometer and Diary Surveys**

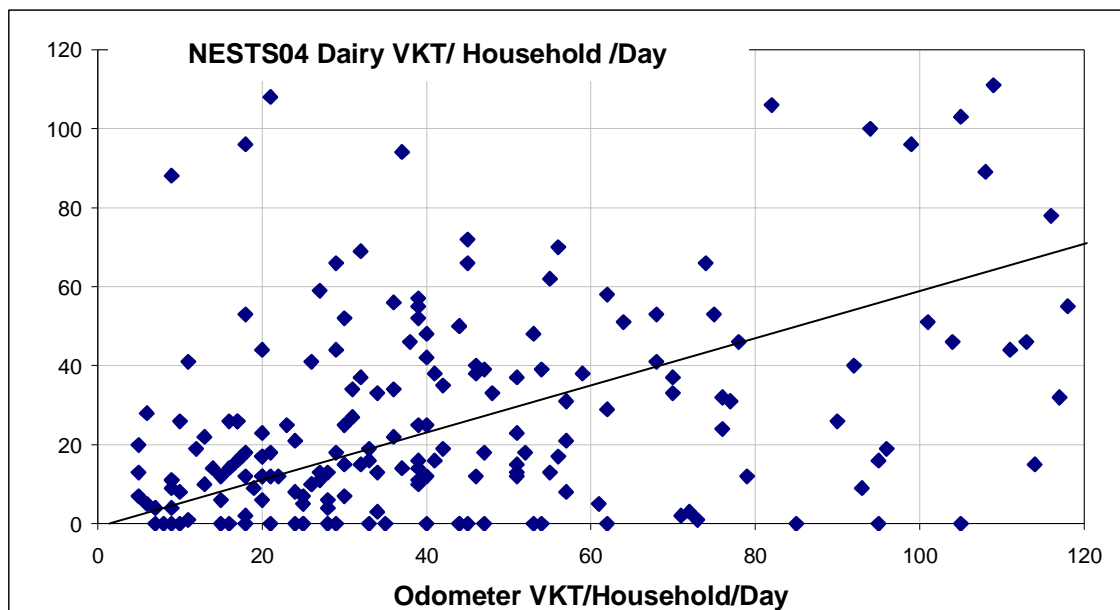
	ODO2005	NESTS2005
Average VKT/Household/Day	46	26
Median VKT/Household/Day	38	18
S.D. VKT/Household/Day	35	26
CoV VKT/Household/Day	0.77	1.01

Figure 7.3 shows that the NESTS2004 travel diary VKT results are lower than the odometer survey results. This is due to at least two reasons. Firstly, the travel diary VKT estimates are based on straight-line distances between origin and destination, whereas the odometer distances are actual distances. Depending on the network configuration, it is known from previous studies in Melbourne that the actual distance is about 35% longer than the straight-line distance. Secondly, it is possible that not all vehicle trips are recorded in the travel diaries, leading to an under-reporting of VKT in the diaries. Table 7.1 confirms the differences in average and median VKT/household/day between the odometer and diary surveys.

Figure 7.3 also illustrates another major difference between the distributions of VKT. Whereas only 1% of households reported zero kilometres travelled in a household vehicle during the week in the odometer survey, 17% of households reported no VKT on their Travel Day in the diary survey (even though they may have been used on other days of the week).

Finally, Table 7.1 highlights the difference in VKT variability between the two types of survey. As indicated by the Coefficient of Variation (CoV), the odometer survey (which measures VKT across a week) has significantly less variation between households than the diary survey (which measures VKT on a single travel day). This has implications for the ability to detect a specific difference in VKT in a before and after survey situation.

The VKT measured in both surveys may be compared further by plotting the values measured for each household by each method, as shown in Figure 7.4.



**Figure 7.4 VKT/Household/Day from Odometer and Diary Surveys**

It can be seen that while there is a general correlation between the two measures, the correlation is far from perfect. Many households have zero VKT in the one-day travel diary, but significant average daily VKT in the odometer survey. Conversely, many households have high VKT in their travel diary on their travel day, but lower average daily VKT across the entire week. Given the differences in measurement of VKT, both measures should be used in making any comparisons between the before and after surveys.