Department for Transport

Road Safety Research Report No. 57

Effectiveness of Motorway Services Areas in Reducing Fatigue-related and other Accidents

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EXECUTIVE SUMMARY

1. This report concerns the effectiveness of motorway service areas (MSAs) in reducing road-traffic crashes (RTCs), especially those that are sleep-related crashes (SRCs). It is in three parts: the relationship of fatal and injury RTCs to the location of MSAs, and a survey of why drivers stop at MSAs, followed by a general discusstion.

2. Sections of two motorways (X = 139 km and Y = 87 km) were chosen for their variation in facilities and different inter-MSA distances. Analyses of RTCs were over 2–3 year periods, and were based on detailed police files as these provide more information on RTC causation than STATS19 data.

3. A total of 682 crashes were investigated, of which 181 (26%) were considered to be SRCs. Further analyses were restricted to 16 km either side of 14 MSAs in order to assess whether there was a reduction in RTCs after an MSA compared with the same distance beforehand. Within these 16 km sections, a total of 355 RTCs were prior to the MSAs, and 304 were afterwards. This 14% reduction was not statistically significant. When these RTCs were sub-divided into SRCs and non-SRCs, there were 108 SRCs prior to MSAs and 84 afterwards. This 22% decrease was statistically significant ($p<0.05$), indicating that MSAs were associated with some crash reduction, but only with this type of RTC as all other non-SRCs showed a non-significant 11% drop. Moreover, there were large differences between MSAs in all these respects, with about half the MSAs seeming to have little or no beneficial effect on RTCs or SRCs.

4. The presence or absence of '*Tiredness Kills – Take a Break*' signs prior to an MSA did not seem to have any specific effects on local RTCs and SRCs. However, the survey indicated that drivers were aware of the signs in general.

5. The distance between adjacent MSAs in relation to this having an effect on the incidence of crashes showed no clear relationship (e.g. SRCs did not necessarily increase with distance apart).

6. RTCs varied by time of day, especially SRCs. The latter is largely due to the human body clock ('circadian rhythm'), with the greatest incidences of SRCs being 0000–0600h. However, and in general, MSAs seemed to offer no benefit with respect to SRCs during this particularly vulnerable period, which is a matter of concern.

7. Relatively, the greatest reduction in RTCs (especially SRCs) that might be attributed to an MSA involved cars. This was not apparent with goods vehicles (HGV, LGV, MGV and vans) although these vehicles showed some small reduction in SRCs.

8. Seasonally, MSAs seemed to be somewhat more effective in reducing RTCs and SRCs during the autumn and winter. Seasonal changes to weather and daylight must be borne in mind here.

9. Day of week effects were apparent, with MSAs being associated with decreases in RTC and SRC rates on Fridays, Saturdays, Sundays and Mondays, whereas on Thursdays and Tuesdays MSAs seemed to provide little or no benefits in this respect.

10. Our sample was too small to break down the analyses further into, for example, day of week by season, or season by time of day.

11. While facilities at both northbound and southbound sections of individual MSAs are usually very similar, there can be marked differences between the two sides in any effect on RTCs, especially SRCs. This may reflect contrasts between being near to a journey's end and its beginning.

12. Drivers stopping at MSAs were typically men aged 30 to 60 years, not on business-related journeys, and who were driving a car. The low proportion of business-related journeys, here, was in-line with the findings from our focus group. Even when there were car-driving passengers, the burden of driving primarily fell on one person.

13. Men were more likely to drive beyond two hours between stops, as would: drivers on business-related journeys; those driving at night; and those with a high annual mileage.

14. 'Using the toilet' was the dominant reason for stopping at an MSA, with 50% of stops being for less than 10 minutes. For most drivers, including those declaring 'tiredness' as a reason for stopping, a small café and/or shop supplying drinks and snacks, along with toilets, would probably be sufficient for their needs.

15. Coffee was the most popular drink purchased, and many drivers acknowledged that they had bought it in order to help stay awake, particularly if they had stopped driving because of tiredness. Nevertheless, there were still many drivers who seemed to be ignorant of this advantage of coffee (caffeine) and of the *Highway Code* guidelines in this respect.

16. Overall, this study points to a greater need to avoid 'tired driving', and that the attractiveness of 'Taking a Break at an MSA' requires further attention.

INTRODUCTION

"Motorway service stations exist to meet a road safety need by giving drivers somewhere to stop and rest" Lord Whitty.

From analyses of road crash investigation reports on a total of over 2,000 road-traffic collision (RTC) files obtained from UK police forces, we have found that sleepiness is a major cause of serious accidents on monotonous roads in Great Britain, especially motorways. Moreover, compared with RTCs as a whole, we have found that sleep-related crashes (SRCs) are more likely to result in death or serious injury. We have also shown that STATS19 has not been a reliable source of information on SRCs, and we have developed other techniques for identifying them. These techniques are now adopted by over half the police forces and have been successfully 'tested' in many court cases involving death by dangerous driving. Our analyses of SRCs, on behalf of the Department for Transport (DfT), have been the basis of road-crash audits that have also examined the influence of: time of day, day of week, type of driver, road lighting versus no lighting, road-traffic density (e.g. 'Sleep related vehicle accidents on sections of selected trunk roads and motorways in the UK, 1995–1998' – DfT Road Safety Report No. 22, 2001). In these respects, we have found, for example, that in relation to traffic flow rates, proportionately many more SRCs happen during the hours of midnight to 0600h and, typically, drivers causing SRCs are men, usually aged under 30 years.

We have also conducted laboratory studies of the processes of falling asleep at the wheel using a realistic, interactive and fully instrumented driving simulator that enables us to monitor and analyse automatically a variety of driving behaviours, as well as the electroencephalographic (EEG) status of the driver. We have used this system to evaluate practical methods that the driver can utilise to overcome sleepiness (findings from which are incorporated in the *Highway Code*), and we have shown that drivers are aware of their sleepiness prior to having SRCs. That is, sleepy drivers are responsible for their actions. The latter strongly points to the key to reducing SRCs being through driver education about the dangers of driving while sleepy and the need to take a break when tired. Given that the greatest prevalence of SRCs is on motorways, then motorway service areas (MSAs), together with motorway signs warning that '*Tiredness Kills — Take a Break*', can potentially have a major influence in reducing SRCs.

This project concerns a two-part study to investigate the effectiveness of MSAs in reducing all crashes, in particular SRCs, in a sample of UK motorways.

Part 1: Road crash audits

A comprehensive data collection and analysis of fatal and injury crashes were undertaken on sections of two motorways (X and Y). For the purpose of this study,

the two carriageways were treated as independent: motorway X (139 km northbound and southbound), motorway Y (86.7km northbound and southbound). These motorway sections were chosen as they contained MSAs differing in certain characteristics that may affect tired drivers.

Part 2: Survey of drivers using MSAs

This survey was to gain insight into the stopping behaviour of drivers at MSAs, in particular, how often they stopped, their reasons for stopping, and awareness of the DfT's advice and campaigns for sleepy motorists. We also conducted a focus group involving relevant drivers.

Notes

HGV/LGV/MGV Some police records are not clear about vehicle type. 'LGV' can mean Light Goods Vehicles, those vehicles up to 3.5 tonnes maximum permissible gross vehicle weight, or Long Goods Vehicles. 'MGV' refers to Medium Goods Vehicles, i.e. vehicles between 3.5 and 7.5 tonnes, and 'HGV' refers to Heavy Goods Vehicles, i.e. those vehicles over 7.5 tonnes maximum permissible gross vehicle weight. HGVs and MGVs are regulated vehicles and legally require tachographs. Note that 'vans' on police report forms may include vehicles of the van type constructed on a car chassis, or goods vehicles.

PART 1

ROAD CRASH AUDITS

1.1 Methodology

Detailed assessments of road-traffic crashes (RTCs) (fatal and injury) from motorways X (three years) and Y (two years) were made from data collected from police files, including accident report forms completed by the officer attending the scene of an accident and witness statements. STATS19 has not provided adequate information for the identification of sleep-related crashes (SRCs) and causation factors have to be assigned using the criteria below (Horne and Reyner, 1995).

Information on a wide range of characteristics was collected with the aim of identifying 'possible' or 'probable' SRCs. Data collected from the police files included the sex and age of the driver, the weather and lighting conditions at the time of the crash, and the location of the crash. 'Possible' or 'probable' SRCs were identified using the following criteria (Horne and Reyner, 1995):

1. Good weather conditions, clear visibility.
2. Breathalyser/blood alcohol levels below the legal driving limit.
3. No mechanical defects to the vehicle.
4. Elimination of 'speeding' and 'driving too close to the vehicle in front'.
5. Driver had no known medical disorder to cause the crash.
6. Vehicle either ran off the carriageway or ran into another vehicle that was clearly visible for several seconds beforehand – i.e. prolonged inattention.
7. No signs of pre-impact emergency swerving or braking, e.g. no skid marks before the impact.
8. The police officer at the scene suspected 'sleepiness'.

For the crash to be a 'possible' sleepiness crash, then criteria 1–7 must apply. For the crash to be 'probably' due to sleepiness, then criteria 1–8 must apply.

The selection of motorways and motorway service areas (MSAs) was based on the following criteria:

i. The availability of police accident files for the three-year period 2000–2002 inclusive (police files are only kept for three years before being destroyed).

ii. The selection of motorway sections that do not have a particularly high traffic flow (i.e. less than 100,000 vehicles per 24 h) as this can result in significant

periods of daily congestion and can lead to excessive numbers of 'shunts' that are sometimes difficult to assign to causation factors.

iii. A section of motorway without too many road junctions adjacent to the MSA (as this can confound findings with regard to MSAs having an effect on SRCs).

iv. A section of motorway with a series of MSAs having varying inter-MSA distance (e.g. 24–48 km (15–30 miles)), so that we can assess whether and to what extent there is a build-up of SRCs with increasing inter-MSA distance, and also in order to gauge to what extent these are reduced in vehicles after the MSAs.

Information on the available facilities at the MSAs on motorways X and Y was also collected. For the purpose of this report, both northbound and southbound services were treated as independent, making a total of 16 MSA sites over a total of 451 km of motorway carriageway.

Data were collected from motorway X over a distance of 139 km (86 miles). 424 vehicle crashes were analysed, with 118 being 'probable' or 'possible' SRCs (28%). The traffic flow averaged at 48,882 vehicles per 24 h. Motorway X is a three-lane motorway, primarily unlit, with the usual road markings.

Data were collected from motorway Y over a distance of 86.7 km (54 miles). 258 vehicle crashes were analysed, with 63 being 'probable' or 'possibly' SRCs (24%). The traffic flow averaged 80,311 vehicles per 24 h. Motorway Y is a three-lane motorway, primarily unlit, with the usual road markings.

1.2 Results

1.2.1 Sleep-related crashes

Overall, 682 crashes were investigated, 424 on motorway X and 258 on motorway Y. From these, on motorway X, 62 were found to be possibly and 56 were found to be probably SRCs. On motorway Y, 41 were found to be possibly and 22 were found to be probably SRCs. Overall, this gives an average of 26% of crashes being possibly or probably sleep related. This figure is similar to our other studies, (Reyner *et al*., 2001; Flatley *et al*., 2004).

Data on the age and sex of the drivers were analysed for 625 RTCs and 179 SRCs, see Tables 1.1 and 1.2. The average age of persons involved in SRCs was 39.2 years, similar to those involved in RTCs, 39.87 years. Again these findings are similar to our previous studies, where the average age of those involved in RTCs varied from 34 to 39 years.

The data on the sex of the drivers are also similar to our previous studies (Horne and Reyner, 1995), in that men are more likely to be involved in crashes, in both RTC

and SRCs. However, both the findings on age and sex may just be a reflection of the population of motorway drivers. There are no norms for motorway usage in the UK.

Table 1.1: Age of RTC and SRC drivers

Age group	RTCs	SRCs
17–30 y	190 (30.4%)	57 (31.8%)
31–40 y	173 (27.7%)	48 (26.8%)
41–50 y	118 (18.9%)	35 (19.6%)
51–60 y	80 (12.8%)	18 (10.1%)
61–70 y	36 (5.76%)	15 (8.4%)
70 y+	28 (4.48)	6 (3.3%)
Total*	**625**	**179**

Table 1.2: Sex of RTC and SRC drivers

Sex	RTCs	SRCs
Men	477 (75.6%)	142 (78.45%)
Women	154 (24.4%)	39 (21.45%)
Total*	**631**	**181**

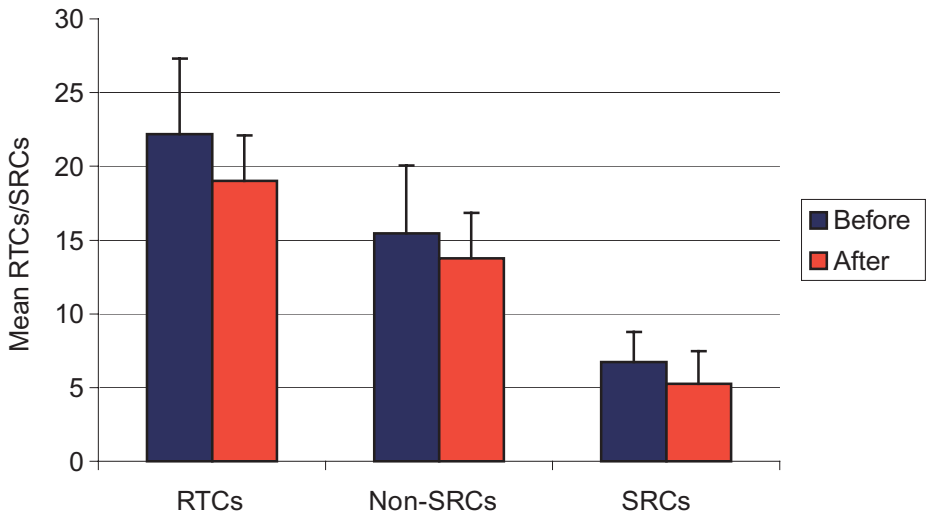
* Totals differ as some drivers were unable to give their age to a police officer at the time of the crash.

1.2.2 Do MSAs reduce crashes, particularly SRCs?

From the total of 682 crashes investigated, 355 (all causes) were in the 16 km (9.9 miles) prior to the MSAs, compared to 304 (all causes) in the 16 km after the MSAs. 16 km was a suitable distance for analysis as it allowed for 14 of the 16 MSA sites to be included, with the remaining two MSA sites being at the boundaries of the audit (i.e. their 'before' and 'after' data were incomplete).

When all crashes (RTCs) from 16 km before the 14 MSAs were compared with those for the 16 km after the respective MSAs (Figure 1.1), there was an average 14% reduction in these crashes, which was statistically insignificant ($t=1.65$, $df=13$, $p=0.061$). For SRCs, a total of 108 were in the 16 km before these MSAs compared with 84 in the 16 km afterwards. This 22% reduction was statistically significant ($t=1.85$, $df=13$, $p=0.043$) indicating that, as a group, these MSAs were associated with some reduction in SRCs. A similar comparison for the average 11% reduction in non-SRCs (i.e. RTCs minus SRCs), seen in Figure 1.1, was insignificant.

Figure 1.1: Mean and standard deviations of RTC, non-SRC and SRC rates per km in the 16 km before and after the 14 MSAs



Overall, these results show that MSAs were associated with a small reduction in RTCs, with a relatively greater reduction in SRCs. However, these MSAs varied considerably in their effectiveness at reducing crash rates. Part 1 Appendix, Tables 1.8–1.10, give data for individual MSAs with respect to RTCs, SRCs and non-SRCs. Here, it can be seen that about half the MSAs seem to have little or no beneficial effect on RTCs (Table 1.8) or SRCs (Table 1.9). In fact, MSAs F, J and M seem to be associated with a noticeable increase in all RTCs, and MSAs E and L with a marked rise in SRCs (Table 1.9). The reasons are unclear and probably differ between MSAs. For example, MSA J has poor facilities at night and, whereas the garage forecourt is open, the main service area is closed from 2300–0700 h. Other reasons are probably associated with the locations of the sites. For instance, MSA M is located just off the motorway, with access being via trunk roads.

MSAs B and C were associated with the largest decreases in RTC rates (Table 1.8), and A and D with the largest decreases in SRCs (Table 1.9). However, it should be noted that at MSAs B and C, the RTC rates were particularly high in the 16 km beforehand, being 2.4 and 2.13 per km respectively.

1.2.3 Crash outcome measures

RTCs involving injury are reportable under the Road Traffic Legislation Section 170 of the Road Traffic Act 1988, and under the DfT STATS19 system. STATS19 identifies ‘casualties’ as those killed or injured in an RTC. A ‘fatal accident’ is one in which at least one person is killed (but excluding confirmed suicides) within 30 days of the date of the accident. ‘Serious injury’ is identified by detention in hospital as an in-patient (either immediately or later), or any of the following injuries whether or not the person is detained in hospital: fracture, internal injury, burns (excluding friction burns), severe cuts and lacerations, crushing, concussion, severe

general shock requiring medical treatment, and death occurring 30 or more days after the accident. 'Slight injury' includes: minor injuries not necessarily requiring medical attention, whiplash, sprains, bruises and cuts not judged to be severe, and slight shock requiring roadside attention. This category includes injuries not requiring medical attention (DfT, 1999).

As highlighted in our previous studies (Reyner *et al*., 2001; Flatley *et al*., 2004), SRCs are more likely to involve fatalities than a 'typical' or 'average' RTC. This is because a sleepy driver takes little or no avoiding action before a crash, leading to a higher impact speed. The percentages of SRCs which are fatal and serious, both before and after the MSA, are more than double the comparable outcomes from the remaining non-SRCs (Table 1.3).

Table 1.3: 'Fatal', 'serious' and 'slight' RTCs, SRCs and non-SRCs in the 16 km before and after the MSA

	Before MSA				After MSA			
	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
SRCs	7 (6.5%)	28 (25.9%)	73 (67.6%)	108	10 (11.9%)	15 (17.85%)	59 (70.23%)	84
Non-SRCs	2 (0.8%)	28 (11.3%)	217 (87.9%)	247	4 (1.5%)	30 (11.5%)	227 (87%)	261
RTCs	9 (2.5%)	56 (15.8%)	290 (81.7%)	355	14 (4.6%)	45 (14.8%)	245 (80.6%)	304

1.2.4 Variations in facilities at MSAs

The facilities available at the individual MSAs vary widely (see Table 1.4.). Some have small hotels on site, and some have picnic areas. All have parking for both cars and HGVs, but the number of spaces available to HGVs ranged between 8 and 60. Available car parking spaces ranged from 100 to 275 spaces. Some MSAs are not preceded by '*Tiredness Kills – Take a Break*' signs. All these factors could influence whether a driver stops at the MSA. Inside all MSAs were restaurant and coffee facilities. However, some did not provide 24-hour restaurant facilities, although coffee was available from the petrol station forecourt. Coffee has been highlighted as a countermeasure to sleepiness (Horne and Reyner, 1996; Reyner and Horne, 1997, 2000), and its use in this respect is recommended in the *Highway Code*. Inspection of Table 1.4 reveals no obvious pattern between facilities available at MSAs and changes to RTC and SRC rates.

Table 1.4: Available facilities and concomitant changes in RTCs and SRCs

MSA	Availability of coffee over 24hr	'Tiredness kills' warning signs	Picnic areas	RTCs % decrease/ increase	SRCs % decrease/ increase	Non-SRCs % decrease/ increase	Distance from previous MSA	Distance from previous junction
A	Y	Y	N	19.07% inc	55.36% dec	49.3% inc	38 km	18 km
B	Y	Y	N	47.48% dec	44.93% dec	48.5% dec	42.1 km	3 km
C	Y	Y	Y	53.05% dec	39.68% dec	58.7% dec	25.1 km	5.5 km
D	Y	N	Y	26.04% dec	66.07% dec	6.2% dec	17.7 km	2.5 km
E	Y	Y	Y	20.44% dec	103.23% inc	46% dec	34.5 km	1.5 km
F	Y	Y	Y	31.16% inc	15.79% inc	37% inc	43.3 km	7.5 km
G	Y	Y	Y	42.33% dec	49.33% dec	36.4% dec	43 km	8.5 km
H	Y	Y	Y	21% dec	18.42% dec	22.2% dec	21 km	7 km
J	Y	N	Y	48.86% inc	0	62.3% inc	22.7 km	3.5 km
K	Y	N	Y	32.05% dec	43.18% dec	27.7% dec	18.4 km	7.5 km
L	Y	N	Y	4.17% dec	76% inc	21% dec	18.6 km	0
M	Y	N	Y	38.05% inc	10.71% dec	86% inc	20.4 km	0
N	Y	Y	Y	0	32.14% dec	19.1% inc	20.5 km	4 km
P	Y	Y	Y	23.31% dec	12% inc	38.9% dec	30.6 km	10 km

1.2.5 Brand of MSA and reduction of crashes

In the sample, data were collected from four 'brands' of service station, Moto (n=7), Roadchef (n=4), Welcome Break (n=1) and Independent (n=2). Overall, the three main chains of MSAs, Moto, Roadchef and Welcome Break, were associated with very similar reductions in RTCs, of around 30% (Table 1.5). However, this may just be a coincidence, especially with such small samples, and the possibility that they may be more able to locate at prime sites, whereas independent MSAs may be at some disadvantage or perhaps be not as well lit or advertised as the branded sites.

Table 1.5: 'Brand' of MSA

Brand of MSA	% increase/decrease of RTC
***Independent**	55.07% inc
Moto	30.9% dec
Roadchef	28.57% dec
***Welcome break**	32.14% dec

* Very small sample.

1.2.6 *Do 'Tiredness Kills – Take a Break' signs reduce SRCs?*

The '*Tiredness Kills – Take a Break*' signs are a relatively recent initiative on UK roads. Evaluation of their effectiveness is difficult, as they may contribute to an overall awareness of fatigue throughout a journey, and not just at the sight of an individual sign, which might specifically encourage drivers to stop soon. RTC and SRC data were analysed from MSA sites with and without signs. Figures 1.2, 1.3 and 1.4 show, respectively, the mean SRC, RTC and non-SRC rates per km before and after MSAs.

Figure 1.2: Mean RTC rate per km before and after MSAs, with and without '*Tiredness Kills – Take a Break*' signs

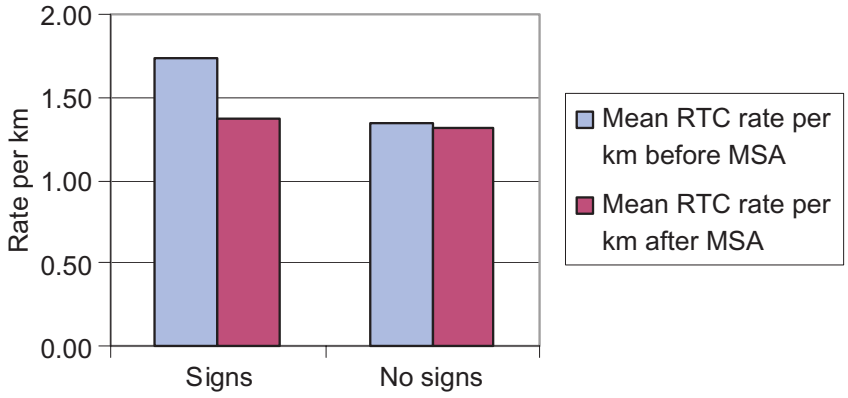


Figure 1.3: Mean SRC rate per km before and after MSAs, with and without '*Tiredness Kills – Take a Break*' signs

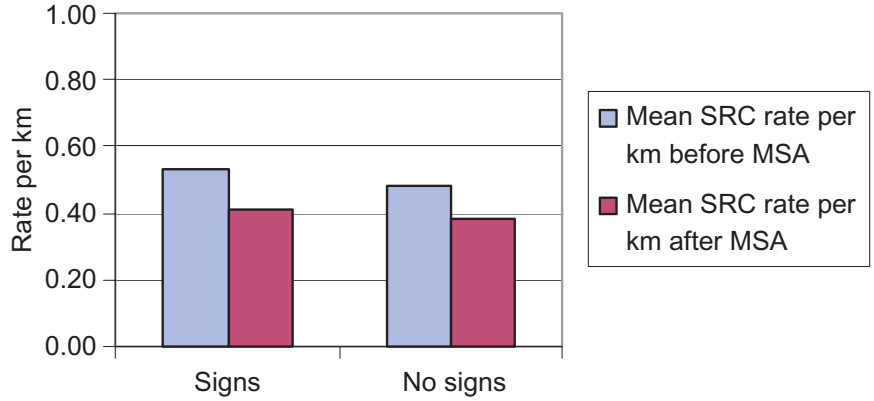
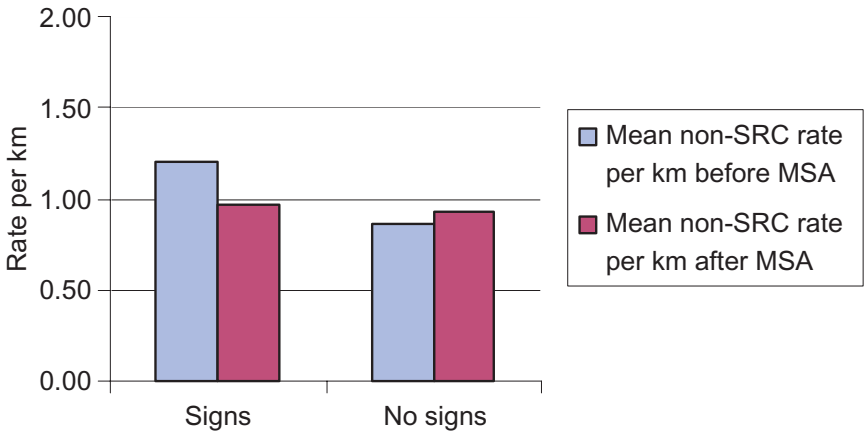


Figure 1.4: Mean non-SRC rate per km before and after MSAs, with and without '*Tiredness Kills – Take a Break*' signs



The results from the crash analyses suggest that signs are not having an immediate effect, as they are not associated with clear reductions in any crash rate for service areas having signs. Instead, the signs may be contributing to an overall heightened awareness of the general issue of fatigue.

1.2.7 Location of MSAs and distribution of RTCs and SRCs

The question of how far apart MSAs should be sited has been widely debated, and opinions suggest 24–48 km (15–30 miles) to be the optimum distance. The inter-MSA distance for MSAs in this sample (n=12) varied between 18 and 45 km. However, the results show no direct relationship between distance to the next MSA and the RTC or SRC rate per km.

For instance, Figure 1.5 shows that the distance from MSA H to the next MSA is 45 km, but the RTC rate per km (divided by traffic flow) over that 45 km is relatively low, at 0.00002 per km. For MSA A, the distance to the next MSA is only 26 km, but the RTC rate per km is 0.00004 per km, double that of MSA H. Figure 1.6 shows a similar overall finding for SRCs.

Figure 1.5: Distance to next MSA and RTC rate per km

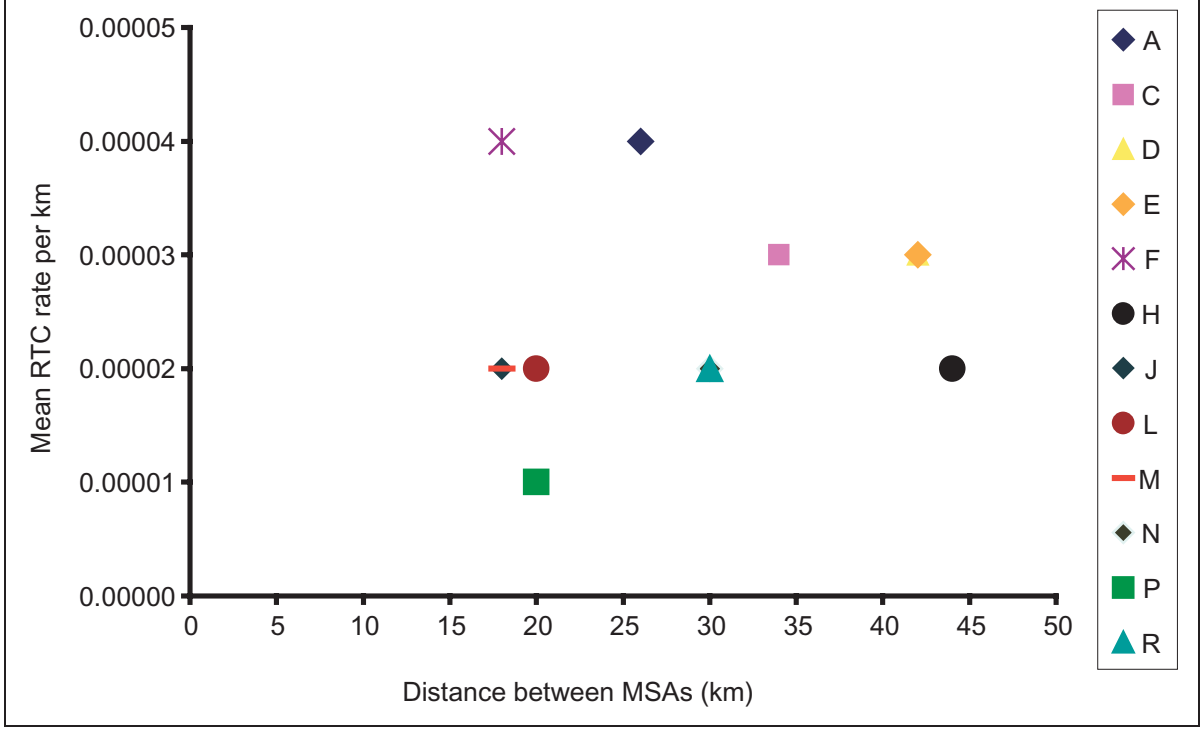


Figure 1.6: Distance to next MSA and SRC rate per km

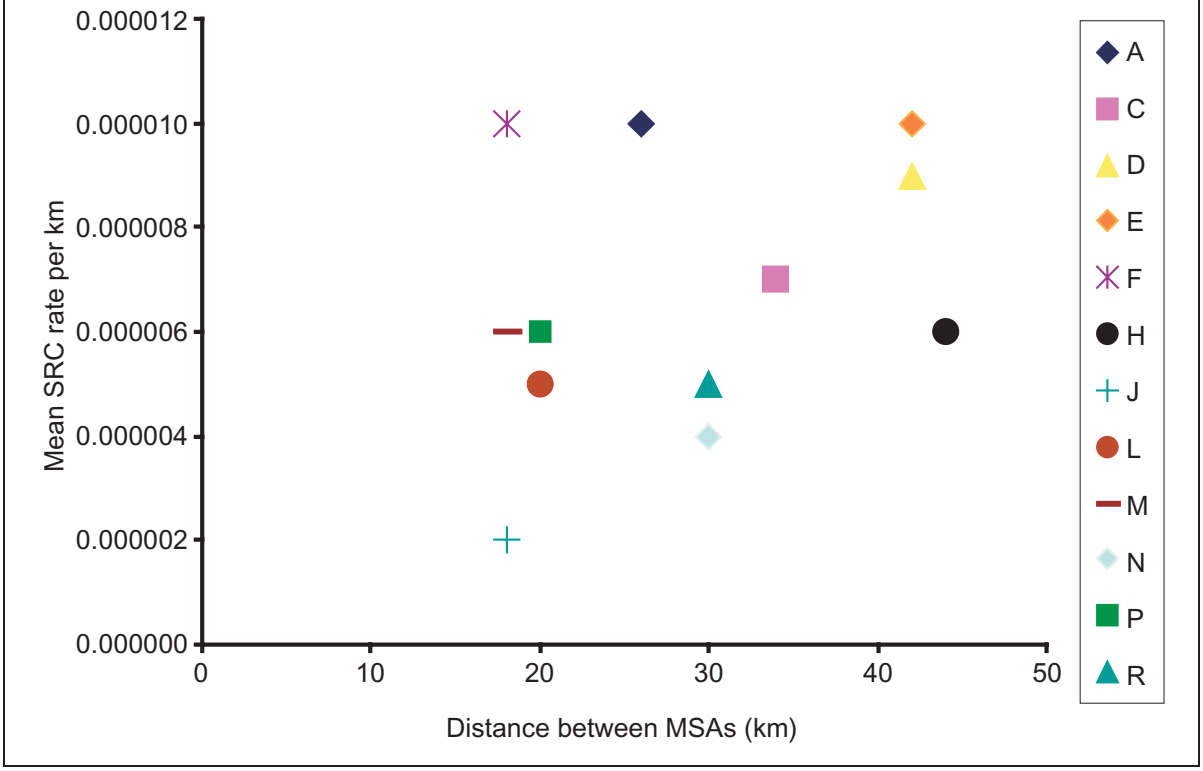


Figure 1.7 shows the average distribution of RTCs per km over the 16 km before and after all 14 MSAs. There is no specific build up of RTCs directly beforehand. Likewise there is no immediate fall in RTCs afterwards, followed by some build up, as one might expect. However, this anticipated situation for SRCs (Figure 1.8) is still not clear, as there seems to be a fall some 6 km before MSAs followed by a rise afterwards. The remaining non-SRCs (Figure 1.9) show no clear trends, indicating that any effects of MSAs on RTCs is mainly through SRCs.

Figure 1.7: Distribution of RTCs over 16 km before and after MSAs

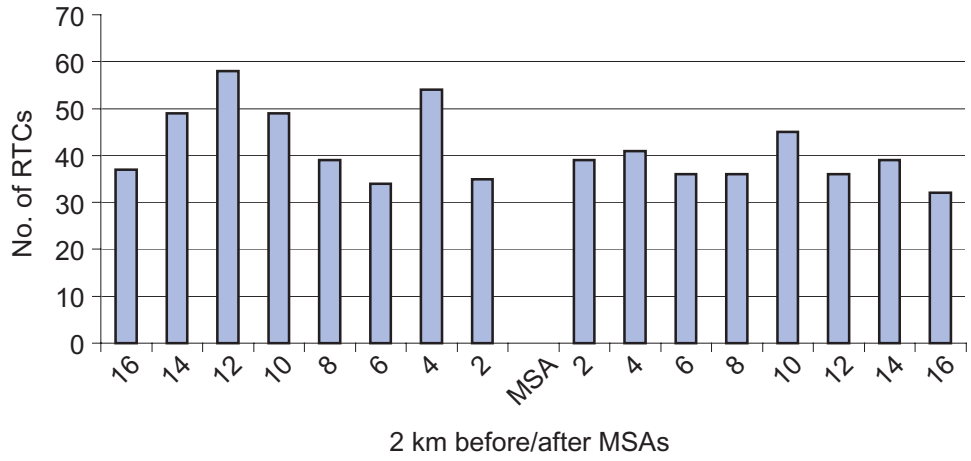


Figure 1.8: Distribution of SRCs over 16 km before and after MSAs

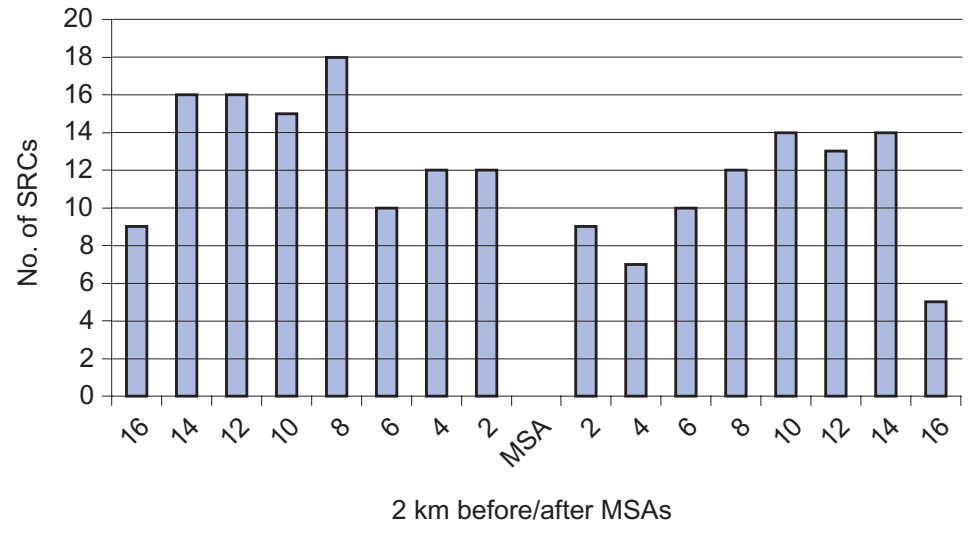
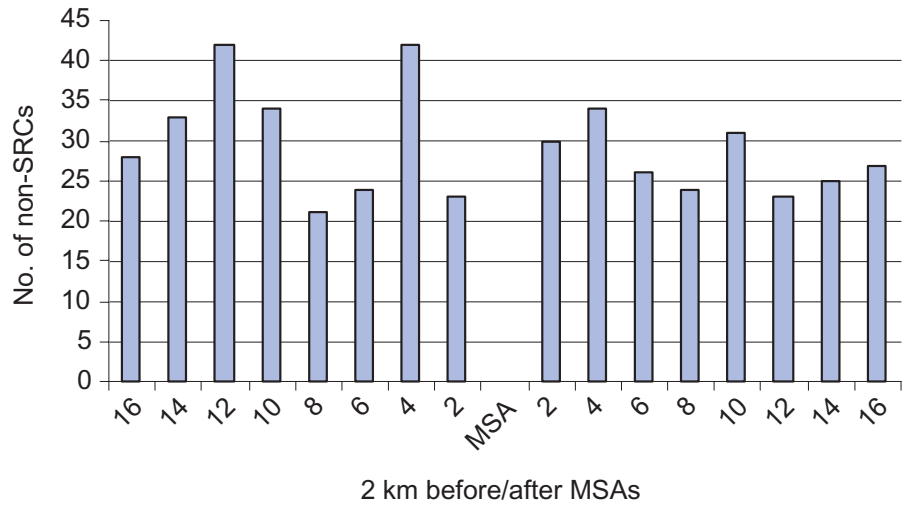


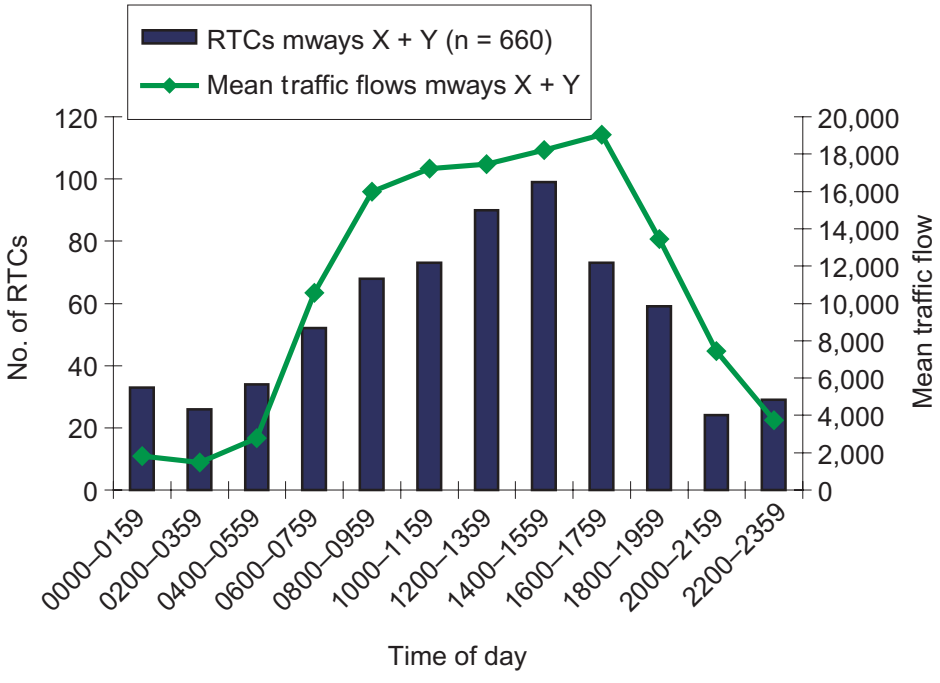
Figure 1.9: Distribution of non-SRCs over 16 km before and after MSAs



1.2.8 *Time of day and crash rates*

As expected, and as shown in previous studies, both RTC and SRC rates vary by time of day (Horne and Reyner, 1995), partly because of changes in traffic flow rates and, in the case of SRCs, largely because of the human body clock ('circadian rhythm'). The data obtained from motorway X and Y, shown in Figures 1.10 and 1.11, support these tenets.

Figure 1.10: Incidence of RTCs by time of day



In proportion to traffic flow, the greatest occurrence of SRCs is between 0000 h and 0600 h. Figure 1.11 shows the distribution of SRCs in relation to traffic flow, and Figure 1.12 expressing SRCs in proportion to traffic flow (blue line),

Figure 1.11: Incidence of SRCs by time of day

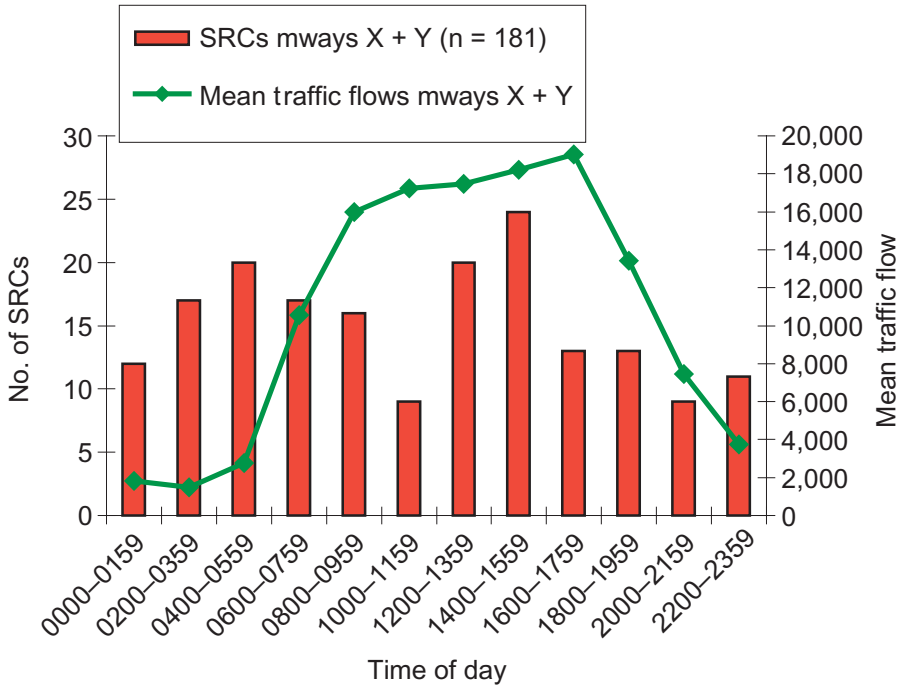


Figure 1.12: SRCs in proportion to traffic flow by time of day

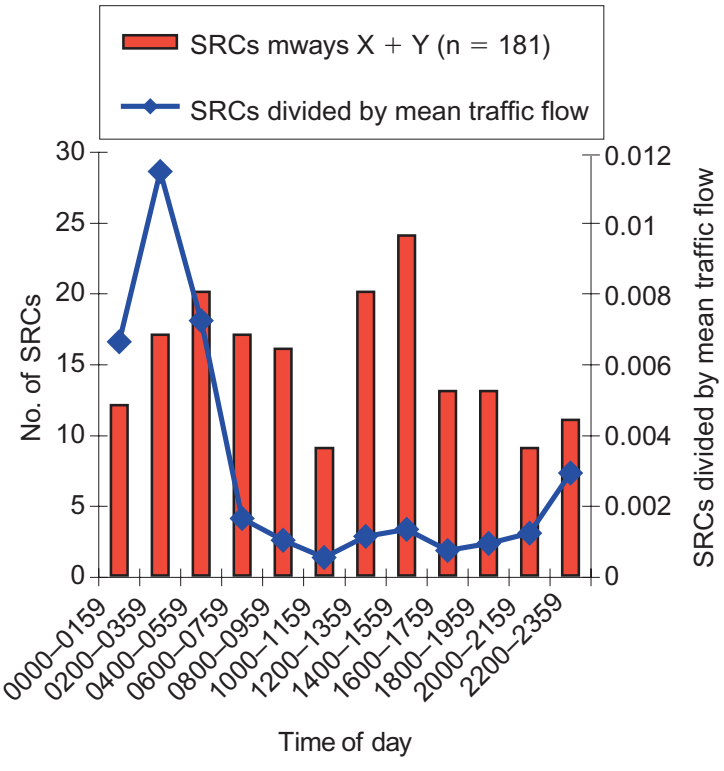


Figure 1.13 breaks down RTCs for before versus after MSA by time of day. While MSAs appear to be associated with some decrease in RTCs, particularly between 0600 h and 1000 h, this is not the case during 0200 h and 0600 h (shown 'ringed' in the figure), and perhaps between 2000 h and 2200 h. These effects seem to be largely through SRCs, as can be seen in Figure 1.14. It should be noted that drivers are most vulnerable to sleepiness in the small hours of the morning, and the apparent failure of MSAs to redress this, as reflected by the ringed portion of Figure 1.14, might be of concern. The patterns for non-SRCs (Figure 1.15) shows that MSAs seem to be effective between 0600 h and 1000 h, and perhaps again in the afternoon.

Figure 1.13: RTCs in the 16 km before and after the MSAs

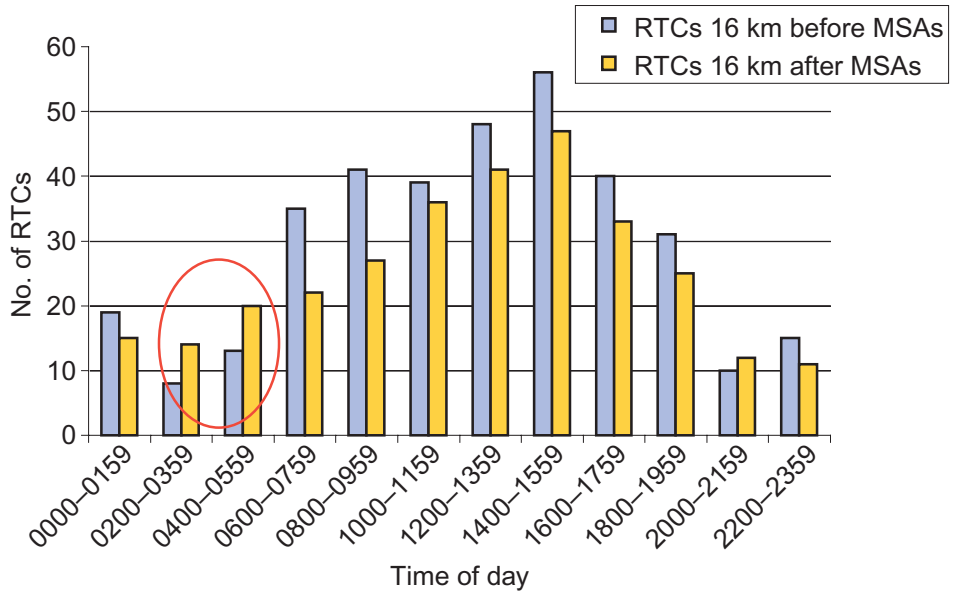


Figure 1.14: SRCs in the 16 km before and after the MSAs

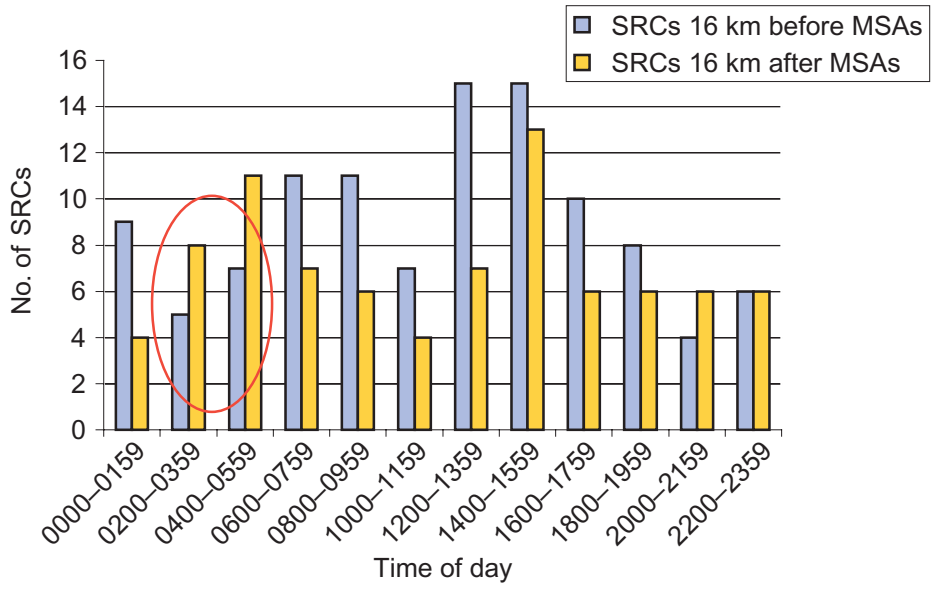
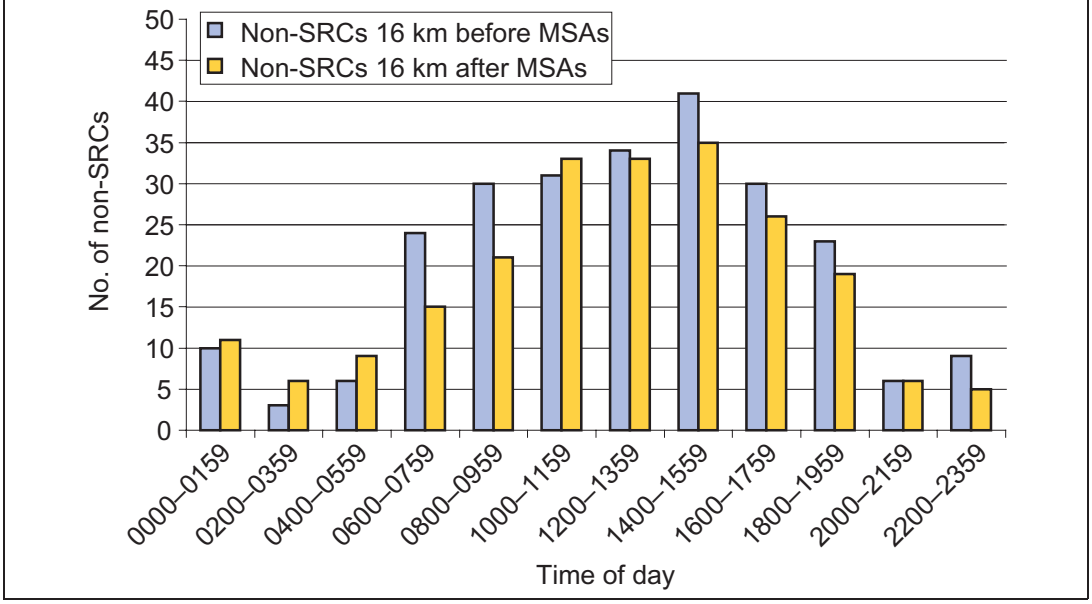


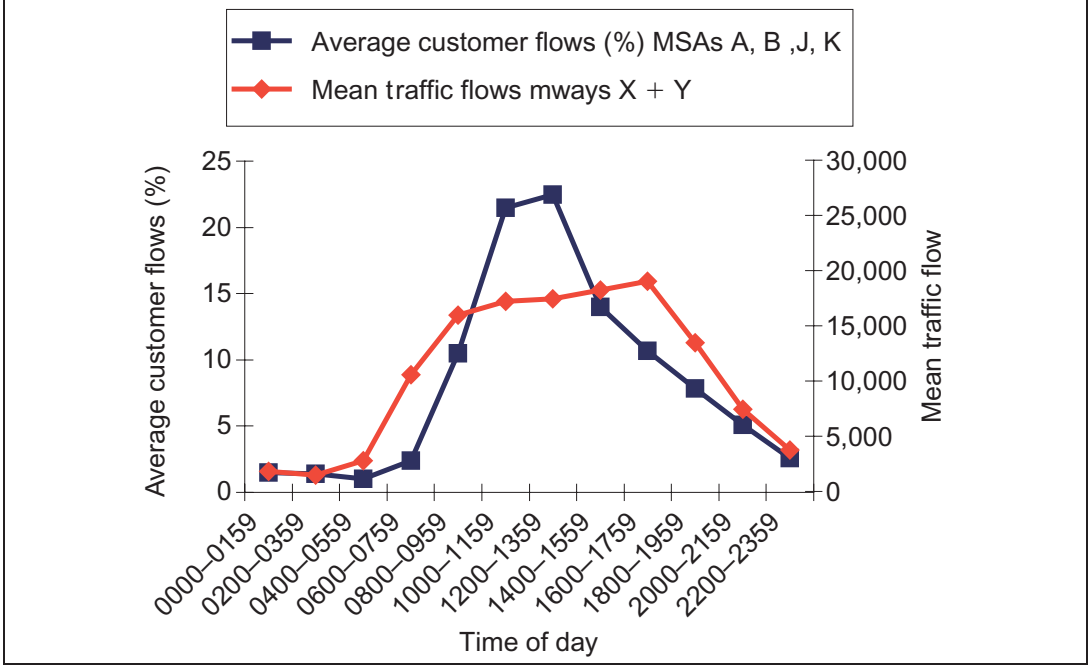
Figure 1.15: Non-SRCs in the 16 km before and after the MSAs



1.2.9 *Time of day and customer flow rates*

An indication of customer flow rates at MSAs A, B, J and K was obtained from the social survey results. As one might expect, customer flow rates are closely related to traffic density ($r=0.83$, $p<0.01$), as can be seen in Figure 1.16, with maximum numbers between 1000 h and 1400 h.

Figure 1.16: Average customer flow (%) and traffic flow by time of day



1.2.10 RTCs and SRCs for cars, goods and other vehicles

Figure 1.17 indicates that the greatest reduction in RTCs for before versus after MSAs involves cars. There is little or no such reduction in RTCs for 'goods' (HGV, LGV, MGV and vans) or other vehicles. Figure 1.18 shows a similar pattern for cars involved in SRCs, however, goods vehicles also reflect some reduction after MSAs, which seems to be balanced by an increase in non-SRCs for goods vehicles (Figure 1.19).

Figure 1.17: Vehicles involved in RTCs 16 km before and after MSAs

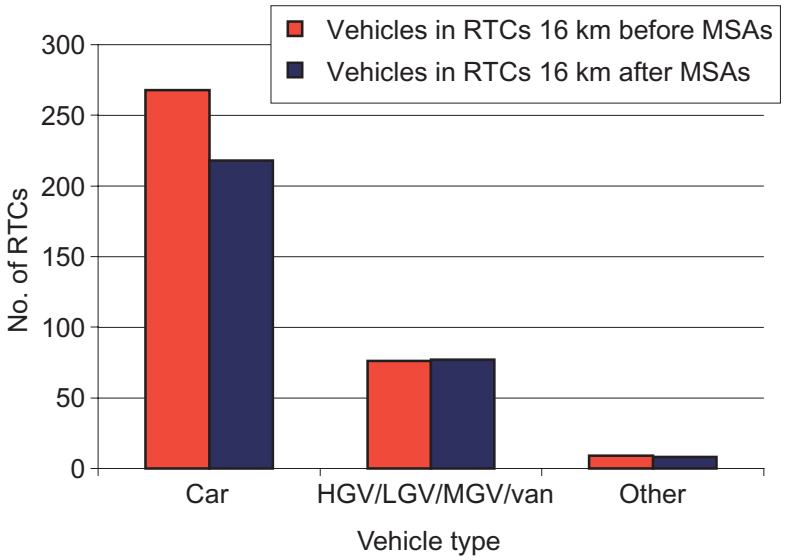


Figure 1.18: Vehicles involved in SRCs 16 km before and after MSAs

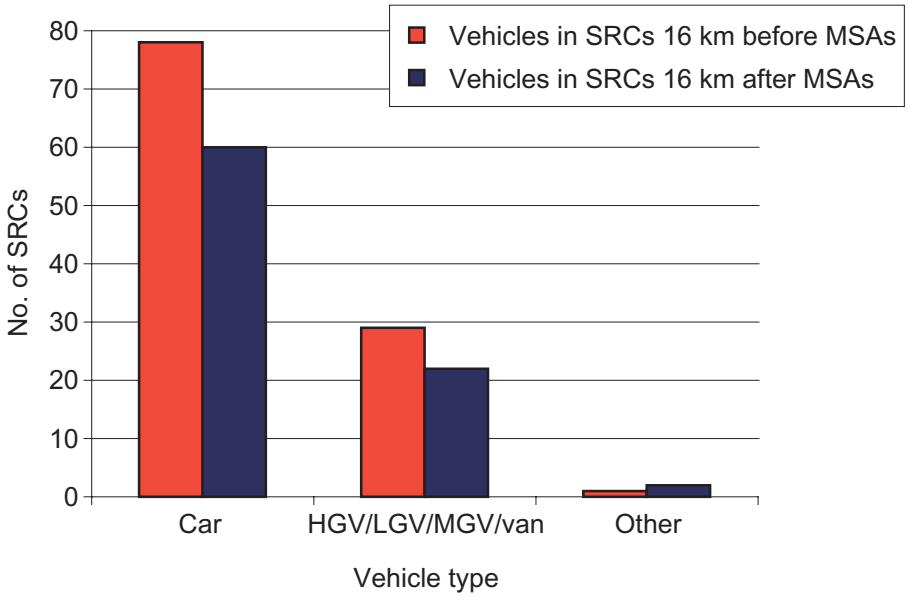
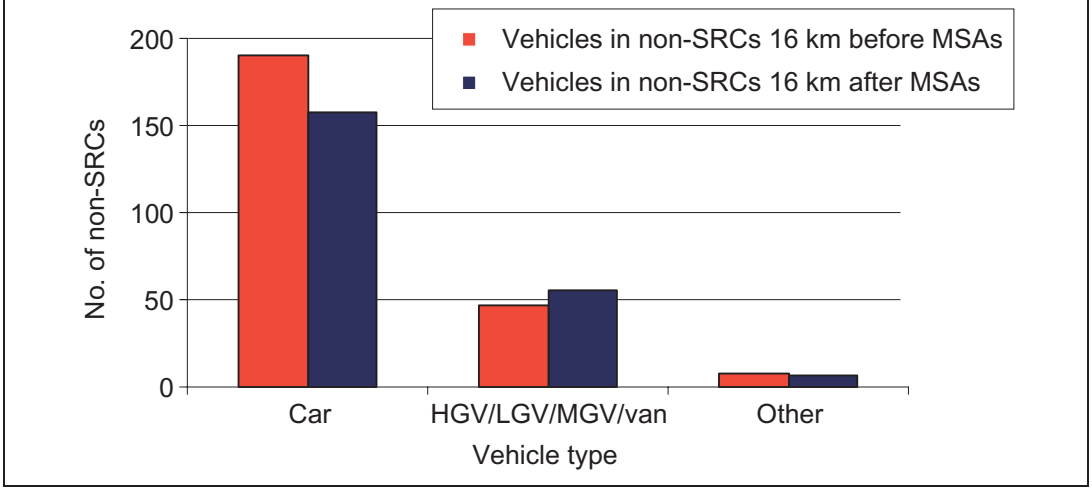


Figure 1.19: Vehicles involved in non-SRCs 16 km before and after MSAs



1.2.11 Seasonal variation

Seasonal variation in the apparent role of MSAs in relation to RTCs and SRCs is seen in Figures 1.20 and 1.21. The effect is only evident in the autumn and winter (October–March). The reasons for this are unclear, although seasonal changes to weather and daylight must be borne in mind here.

Figure 1.20: RTCs 16 km before and after the MSAs, by season

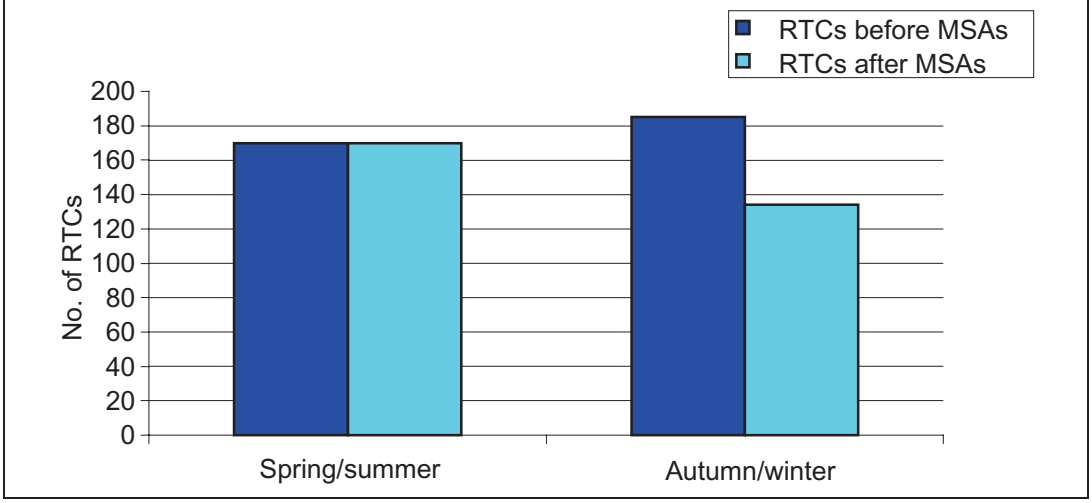
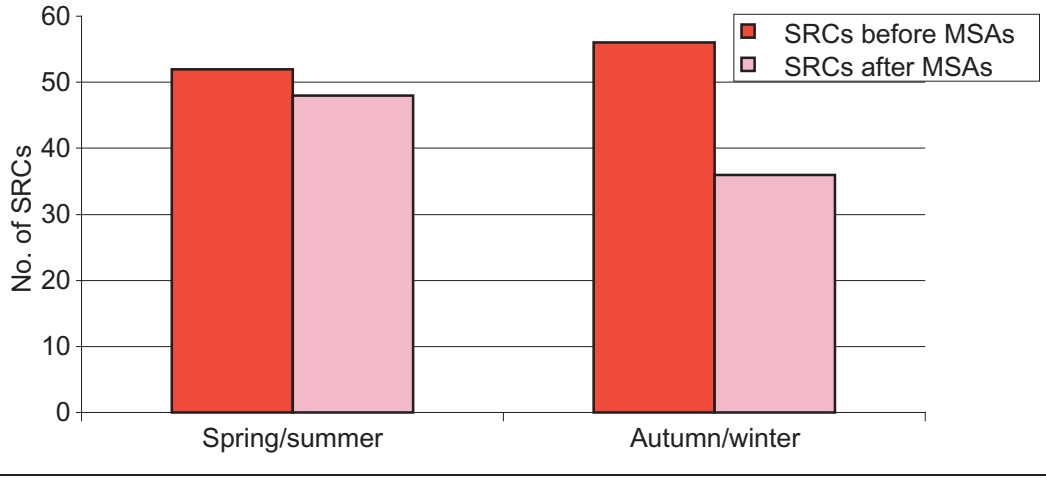


Figure 1.21: SRCs 16 km before and after the MSAs, by season



1.2.12 Day of week

Figures 1.22 and 1.23 show RTCs and SRCs 16 km before and after MSAs by day of week. Both figures show MSAs associated with a reduction in RTC and SRC rates on Fridays, Saturdays, Sundays and Mondays, whereas for Thursdays and Tuesdays MSAs seem to provide little or no benefits in these respects.

Figure 1.22: RTCS 16 km before and after the MSAs, by day of week

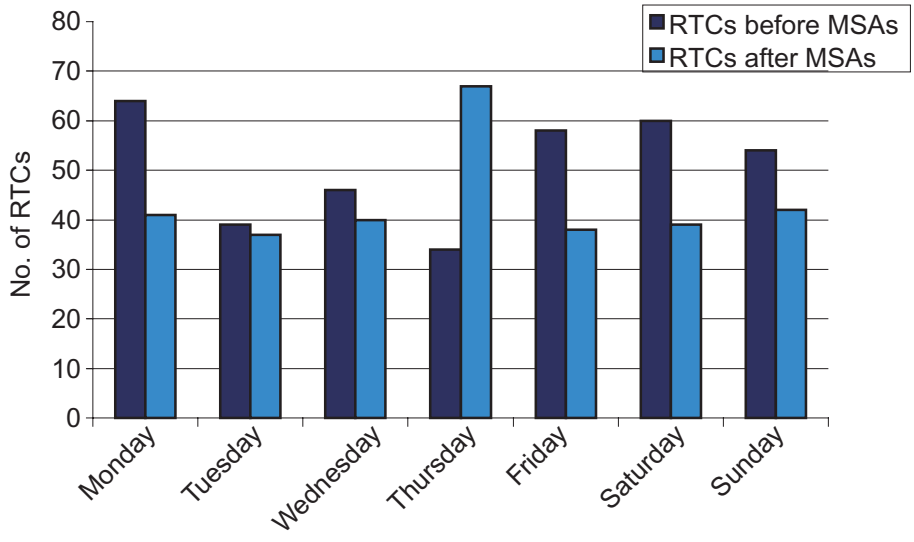
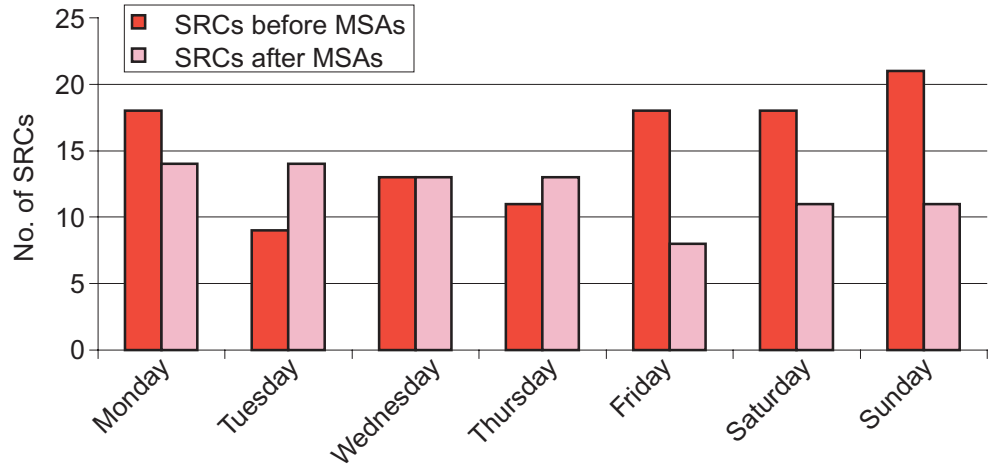


Figure 1.23: SRCs 16 km before and after the MSAs, by day of week



1.2.13 Are certain MSAs better than others in reducing SRCs in one or other direction and, if so, why?

In most cases, facilities at both northbound and southbound sections of an MSA are very similar. Usually, there is mutual pedestrian access via a motorway bridge. For these MSAs this should facilitate similar reductions in RTCs and SRCs for both motorway directions. MSAs A and B are the two sides of the same MSA on motorway X. Whereas RTCs show a contrasting effect, as can be seen in Table 1.6, where both sides are associated with a decrease in SRCs (Table 1.7). This situation is reflected by other MSAs in our sample, and may be due to the location of the MSA in respect to the journey's end and beginning.

Table 1.6: MSAs A and B – mean RTC rates

MSA	Mean RTC rate per km before MSA	Mean RTC rate per km after MSA	% decrease/increase
A	1.94	2.31	19.07% inc
B	2.4	1.2	50% dec

Table 1.7: MSAs A and B – mean SRC rates

MSA	Mean SRC rate per km before MSA	Mean SRC rate per km after MSA	% decrease/increase
A	0.56	0.25	55.36% dec
B	0.69	0.38	44.93% dec

1.3 Conclusions from the road crash audits

Data were collected from two motorways covering a total distance of 451 km (280 miles). Overall, 682 RTCs were investigated within the ranges of 16 MSAs. 181 (26%) of these RTCs were thought to be SRCs.

Over comparable 16 km distances there was an average 14% reduction in all RTCs from before to after the MSAs, which was not statistically significant. When RTCs were sub-divided into SRCs and non-SRCs, there was a 22% reduction in SRCs, which was statistically significant. The remaining 11% reduction in non-SRCs was not significant. There were large differences between MSAs in all these respects, with around half the MSAs seeming to have little or no beneficial effects on RTCs or SRCs. Possible reasons include differences in: i) proximity of the MSA to the motorways; and ii) in opening hours.

Some MSAs were not preceded by '*Tiredness Kills – Take a Break*' signs, and although we attempted to assess whether the signs were having an effect on all types of crash with regard to before versus after the relevant MSAs, nothing could be established. However, the signs could have contributed to an overall awareness of fatigue throughout a journey.

The distance between adjacent MSAs in relation to the incidence of crashes showed nothing of note (e.g. SRCs did not increase with distance apart).

All crash rates varied by time of day, partly because of changes in traffic flow and, in the case of SRCs, largely because of the human body clock ('circadian rhythm'). In proportion to traffic flow, the greatest incidences for SRCs occurred between 0000 h and 0600 h, to the extent that MSAs might appear to be associated with some decrease in RTCs, more so with SRCs, and mostly between 0600 h and 1000 h. However, this was not the case in the period 0200–0600 h, when MSAs generally seemed to be having no favourable effects. Given that drivers are most vulnerable to sleepiness in the small hours of the morning, the apparent failure of MSAs to redress this problem is of concern.

When apparent, the greatest overall reduction in all RTCs, especially in SRCs, for before versus after MSAs involved cars. There was little or no such a decrease in RTCs for goods (HGV, LGV, MGV and vans) or other vehicles, although there was some reduction in SRCs for goods vehicles. In contrast, there was a post-MSA increase in non-SRCs for goods vehicles.

Generally, there was a seasonal variation in the apparent role of MSAs in relation to RTCs and SRCs, with a relatively more beneficial effect during the autumn and winter (October–March). One must bear in mind the seasonal changes to weather and daylight here.

Overall, day of week effects were also evident, with MSAs apparently being associated with greater decreases in RTC and SRC rates on Fridays, Saturdays, Sundays and Mondays, compared with Thursdays and Tuesdays.

Our sample was too small to break down data, for example, into day of week by season, or season by time of day.

In most cases, facilities at both northbound and southbound sections of an MSA were similar, and usually there is mutual pedestrian access via a motorway bridge. Nevertheless, there were instances of marked differences between the two sides in any effect on RTCs, which might be the result of contrasts between being near to a journey's end and its beginning.

PART 2

SURVEY OF DRIVERS USING MSAs

2.1 Introduction

The main aim of this part of the project was to gain an insight into the characteristics of drivers stopping at motorway service areas (MSAs). In particular, we were interested in how often drivers were stopping, their reasons for stopping, their awareness of Department for Transport (DfT) guidelines on avoiding sleep-related crashes (SRCs), and their awareness of DfT campaigns related to SRCs.

The sampling was carried out over two fortnights. One in July 2003, on motorway X for both the northbound (MSA A) and southbound (MSA B) carriageways, and one in September 2003, on motorway Y, also for the northbound (MSA J) and southbound (MSA K) carriageways. Interviews covered all 24 hours of each day. Note that not all hourly slots were covered in both weeks – see Appendix A for the rotation pattern. The exception was MSA J which was closed throughout the night, except for the forecourt.

Interviews were carried out with drivers as they left the MSA to resume their journeys. Exit interviews were used as it was better to collect information on the actual visit to the MSA rather than intentions on arrival. The interviewers attempted an interview every 20 minutes with the next person to exit. In this way the interviews would be a fairly random sample of the customers over the period the interviewer was at the MSA. In addition, interviewers collected information on the total numbers of customers, so that it was possible to weight the data (this method is described in Appendix B).

Any survey is concerned about the impact of non-response. With a survey of this nature, where there is not a 'list' of respondents to work from, this will be a particular problem if there is a high level of refusals. Those who agree to respond can be potentially different from those that refuse. During an afternoon preliminary pilot study, particular consideration was given to this issue, but since there were very few refusals, this was not an issue for this particular survey. In the actual fieldwork, interviewers did not keep detailed logs of refusals, but general feedback from the interviewers confirmed that refusals were rare. Therefore, while this issue cannot be completely ignored, any bias from refusals should be small.

2.2 Methodology

As this was a 'one-to-one interview' at the MSA, it was necessary to keep the questionnaire short so that respondents would not lose interest. The aim was to keep

the interview to about five minutes. As a first stage, a focus group was undertaken in April 2003 (Appendix C) to gain insight into the way drivers use MSAs. It was also hoped that this would give information as to why some drivers do not use MSAs – something that the survey would be unable to do.

The first stage of the questionnaire design used insights from the focus group to frame areas of interest. For example, the focus group highlighted that drivers behaved quite differently depending on whether they were driving for business or not. They generally stopped much less when driving for business reasons. Related to this, we included information on the types of vehicle being driven, to distinguish between drivers stopping due to regulations (HGVs, PSVs) and those driving cars and small vans that are unregulated.

From the focus group, a clear barrier to stopping more regularly was the idea that MSAs were not value for money. Therefore, we included questions on reasons for stopping and satisfaction with the services available. While the main aim of the survey was not customer satisfaction, we wanted to get a feel for how much this may be putting drivers off using MSAs. Another interesting point was that participants in the focus group reported that they often drove past an MSA only to feel tired a few miles later. To consider this we included a question asking drivers if they would have stopped earlier if there had been an MSA.

Another aim of this survey was to collect information from drivers on their awareness of the various DfT guidelines and campaigns. Of particular interest was the potential impact of the '*Tiredness Kills – Take a Break*' blue signs prior to many MSAs. MSAs A and B were partly chosen as they had these signs, whereas MSAs J and K did not, but the question about the signs was still included as a control. Questions on the advertising campaigns were also included to see how aware drivers were of the issue of driving while tired. Questions were also asked about how regularly drivers were stopping (a stop was defined as getting out of the car for five minutes or more), and what they would do if they felt tired. In particular, we wanted to see if drivers were aware of the guidelines that the DfT have included in the *Highway Code*.

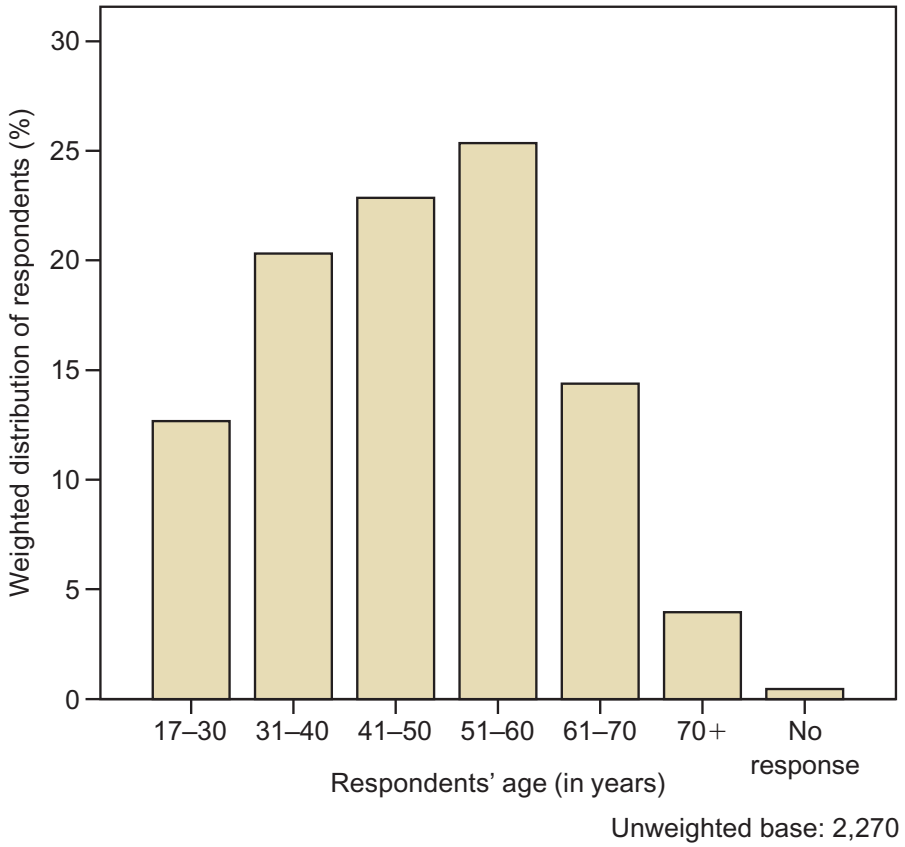
The questionnaire was tested as part of a small pilot study at MSA S on another motorway, designated as Z. This confirmed that the questionnaire flowed well and that interviews could be completed in the target time of five minutes. The pilot study also confirmed that drivers had sufficient interest in the topic and were generally very positive about taking part. There was concern that if drivers were targeted on exit, they may have been unwilling to delay the start of their onward journey. After reviewing the feedback from the pilot study, this did not reveal any additional issues to be corrected.

2.3 Results

2.3.1 Characteristics of drivers and their journeys

Over the four weeks 2,270 interviews were achieved with drivers at the two northbound and two southbound MSA sites. 81.6% of the respondents were male and this reduced slightly to 79.7% once the weights were introduced (see Appendix B). Figure 2.1 gives the weighted distribution of the drivers' ages.

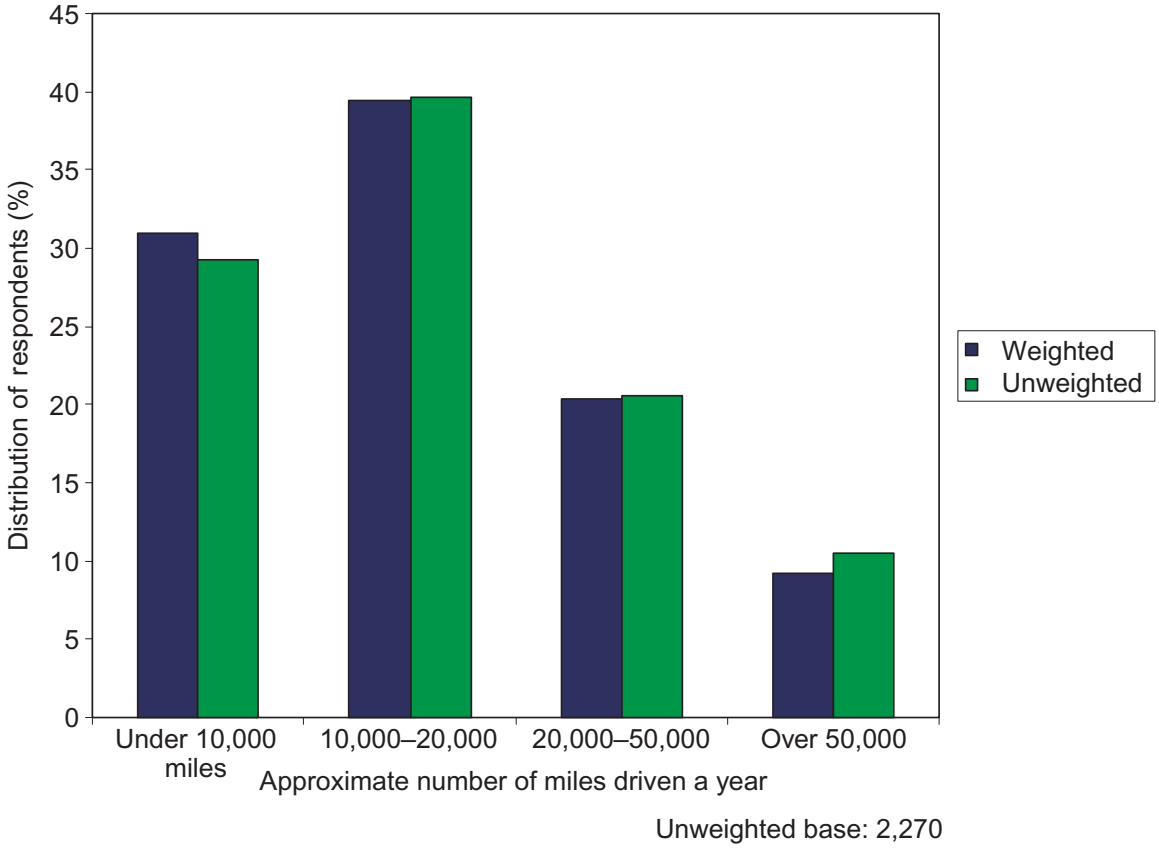
Figure 2.1: Distribution of the respondents' (male and female) ages



The distribution in Figure 2.1 suggests that the drivers using MSAs were between 30 years and 60 years, with over 25% in their fifties. Figure 2.1 gives an indication of who the respondents were but it does not suggest that those in their fifties are more likely to stop. The sex and age distribution of the respondents may reflect the characteristics of the typical motorway driver. Currently, no relevant norms are available for UK motorway drivers.

Figure 2.2 shows the weighted (and unweighted) distribution of the annual miles driven by the respondents.

Figure 2.2: Distribution of the respondents' mileage (weighted and unweighted)



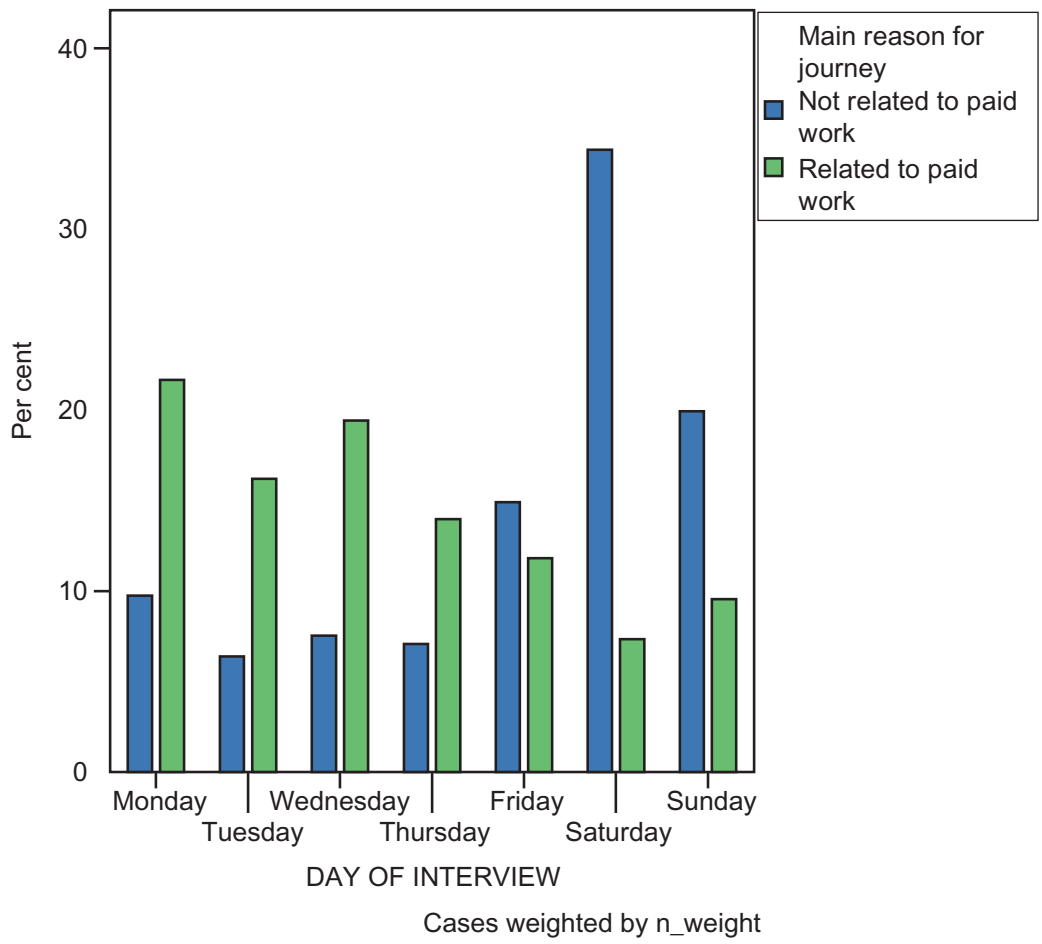
The distribution in Figure 2.2 shows that around 40% of the interviewed drivers gave an approximate annual mileage between 10,000 and 20,000 miles, but the survey covered respondents with a wide range of annual mileage. The weighted and unweighted distributions are shown together, to demonstrate that the weights have relatively little impact and that this is only in the under 10,000 and over 50,000 categories.

Drivers were asked whether the main reason for their journey was related to paid work. Overall, 31.5% of drivers said yes, although this was 36.0% for MSA sites A and B and only 24.3% for MSA sites J and K.[1]

The distribution of these responses according to the day of the week is shown in Figure 2.3. As might be expected, weekend stopping was much more likely to be associated with unpaid work.

[1] This difference is significant at the 0.1% level after controlling for the impact of weighting.

Figure 2.3: Day of the week for journey related or unrelated to paid work



The great majority of drivers not making a work-related journey (nearly 95%) were driving a car. For those on journeys related to paid work, Figure 2.4 shows the types of vehicle they were driving.

Figure 2.4: Types of vehicle driven by respondents on journeys related to paid work

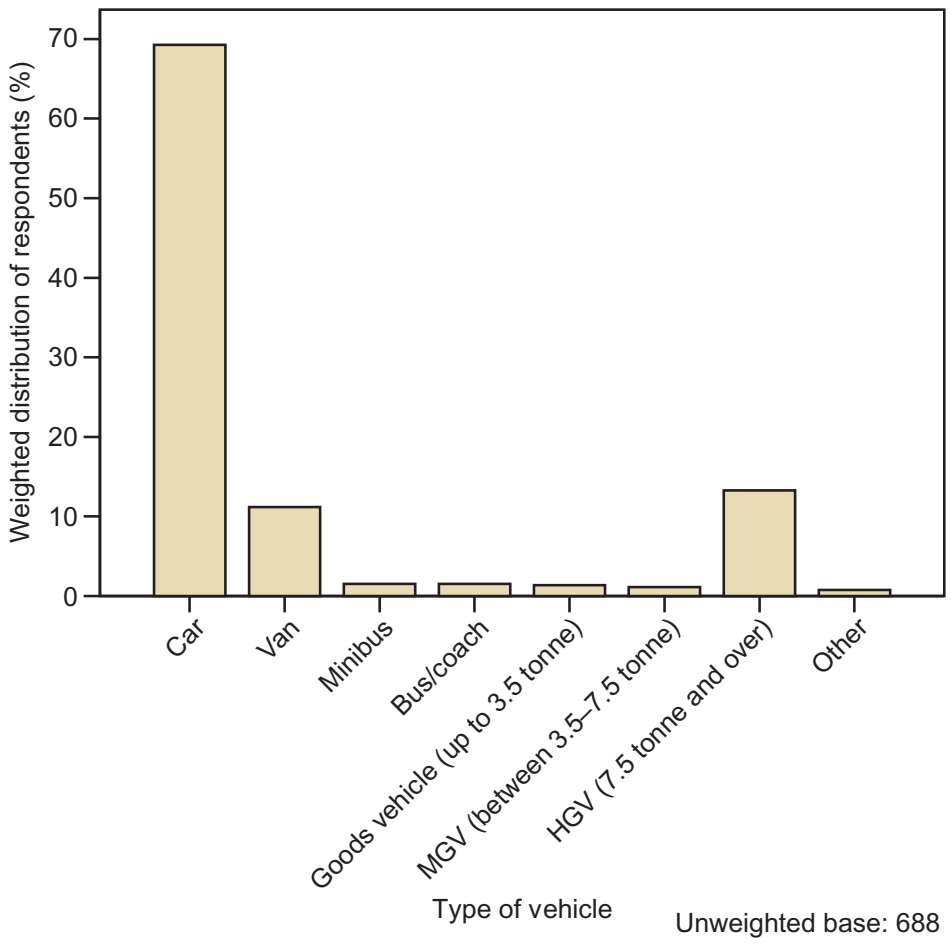


Figure 2.4 shows that most of the business-related journeys were made by car drivers, but the data also cover those driving goods vehicles and other passenger vehicles. Related to the types of vehicle, drivers were also asked whether they were using a tachometer. The numbers responding positively were small (only 5.4% of all drivers), being confined to those driving MGVs, HGVs and buses/coaches.

At the start of the interview drivers were also asked if they were travelling with passengers and 66.9% (weighted) reported that they were. Of those drivers who were sharing a vehicle (an unweighted base of 1,454 respondents), we asked about the passengers. In particular, 19.5% (weighted) of drivers reported having passengers aged under 12 years with them, and 24.8% (weighted) said that a passenger had either already shared some of the driving or would do so in a later part of the journey. Table 2.1 compares the distribution of drivers with passengers, for business versus non-business related journeys.

Table 2.1: The distribution of drivers with passengers by main reason for journey			
		Main reason for journey	
		Not related to paid work	Related to paid work
Are there passengers with you?	Yes	81.7%	34.6%
	No	18.3%	65.2%
Total count (unweighted)		**1,577**	**688**

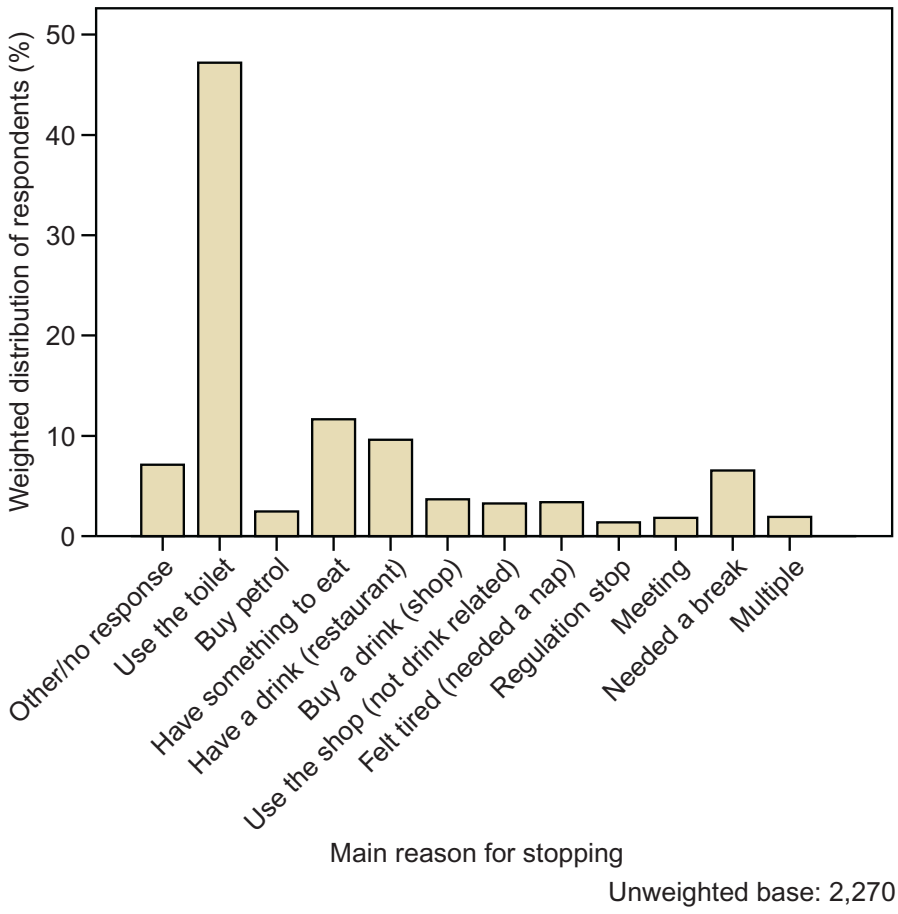
Note: The table excludes the five drivers for whom the main reason for their journey was missing and the two drivers with don't know/no response to the presence of passengers.

Non-business related journeys were more likely to include passengers or, alternatively, those on business-related journeys were more likely to travel alone.

2.3.2 Reasons for stopping and satisfaction with facilities

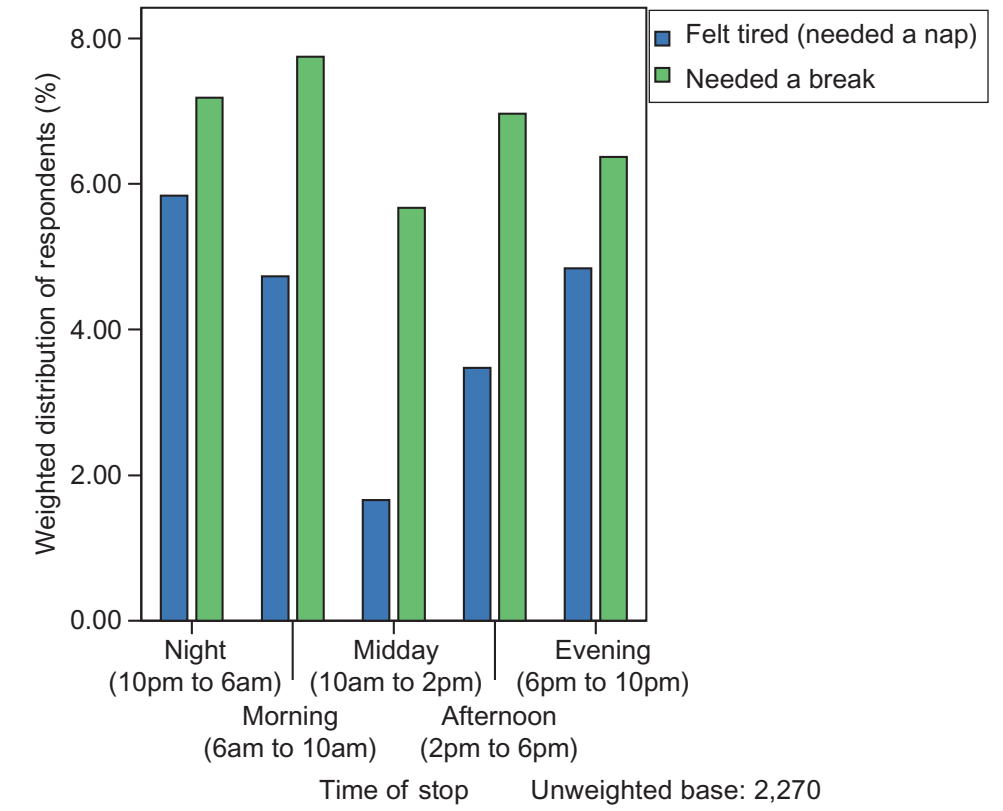
The interview-questionnaire provided a large number of alternatives for why drivers reported they had stopped at the MSA and whether they felt the stop had been worthwhile (given that they were being interviewed on exit). Figure 2.5 shows the popular main reasons (in a small number of cases drivers chose more than one reason).

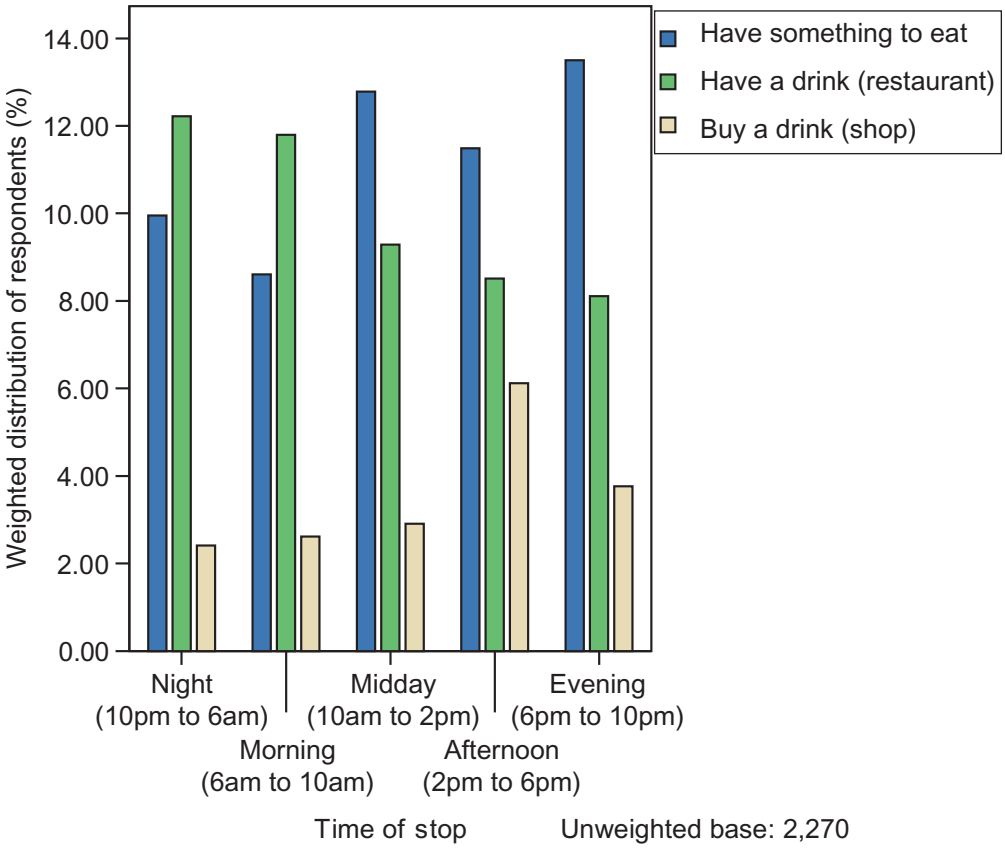
Figure 2.5: The main reason for stopping at the MSA



The dominant main reason was to use the toilet, and second was to use the restaurant for food or drink. The 'multiple' category represents the small number of drivers giving more than one main reason. Comparing across the days of the week, there was no real changes to the overall patterns in main reason. However, Figure 2.6 shows that across the time of day, 'feeling tired' was a more common main reason during the evening (1800–2200 h) and overnight (2200–0600 h). The response of 'needing a break' has a less obvious pattern, with the morning (0600–1000 h) having the highest percentage. Using the 'restaurant to eat' is more common during the day (1000–2200 h) while using the 'restaurant for a drink' is more apparent during the night and early morning (2200–1000 h). Buying a drink from the shop is generally low across the day, with the exception of the afternoon (1400–1800 h) when it was the main reason given by 6% of drivers.

Figure 2.6: Other main reasons for stopping by time of day





If **all** reasons for stopping are considered, 'using the toilet' still dominates, with 78.3% stating that this was one of the reasons for stopping. Table 2.2 gives the top 10 reasons for stopping and the percentage of drivers endorsing these. 'Using the toilet' was relatively less important at MSA sites J and K, whereas 'use of the restaurant' was more important. Interestingly, 23.2% of drivers stated 'needing a break/rest/relax' as a reason for stopping at MSA sites J and K and this is significantly different[2] from the 5.1% of drivers at sites A and B.

Table 2.2: Top 10 reasons for stopping (any reason) by MSA

Reason (top 10)	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Use the toilet	78.3	82.8	71.2
Have something to drink (from the restaurant etc.)	37.5	35.9	40.1
Have something to eat	24.7	22.4	28.5
Use the shop (to buy sweets, newspapers, toys, etc.)	15.8	16.1	15.4
Use the shop (to buy a drink)	13.8	15.9	10.5
Needed a break/rest/relax	12.1	5.1	23.2[2]
Buy petrol	8.4	9.8	6.1
Felt tired	5.8	6.7	4.4
Children needed a break	2.7	2.7	2.6
Meet a colleague/friend	2.1	2.8	1.0
Unweighted n	2,270	1,164	1,106

Figure 2.5 shows a small group of drivers who gave their main reason for stopping as 'feeling tired'. Table 2.3 concentrates on additional reasons given by these specific drivers. Although these numbers are small (unweighted base of 95 respondents), these drivers were more likely to have a drink compared to all drivers in Table 2.2. It is also noticeable that a small percentage of these drivers had a nap when at the MSA, as recommended by the *Highway Code*.

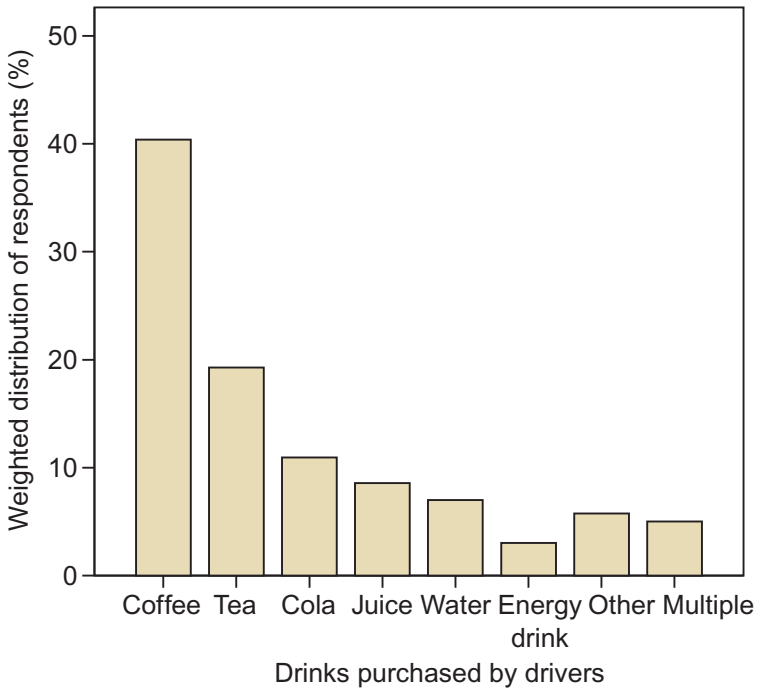
Table 2.3: Other reasons for stopping (if main reason felt tired) by MSA

Reason (top 10)	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Use the toilet	61.5	61.0	63.2
Have something to drink (from the restaurant etc.)	48.7	51.7	38.9
Have something to eat	24.7	24.1	26.3
Use the shop (to buy a drink)	16.9	16.9	16.7
Have a nap	16.9	15.3	22.2
Use the shop (to buy sweets, newspapers, toys, etc.)	9.1	5.1	22.2
Unweighted n	95	63	32

[2] The difference is significant at the 0.1% level after controlling for the impact of weighting.

Also of specific interest are all the drivers who purchased a drink and the types of drink purchased, as the *Highway Code* suggests that a driver should stop and have a (caffeinated) drink, particularly if they feel tired. For those who reported purchasing a drink as one of their reasons for stopping, Figure 2.7 shows the types of drink that were purchased.

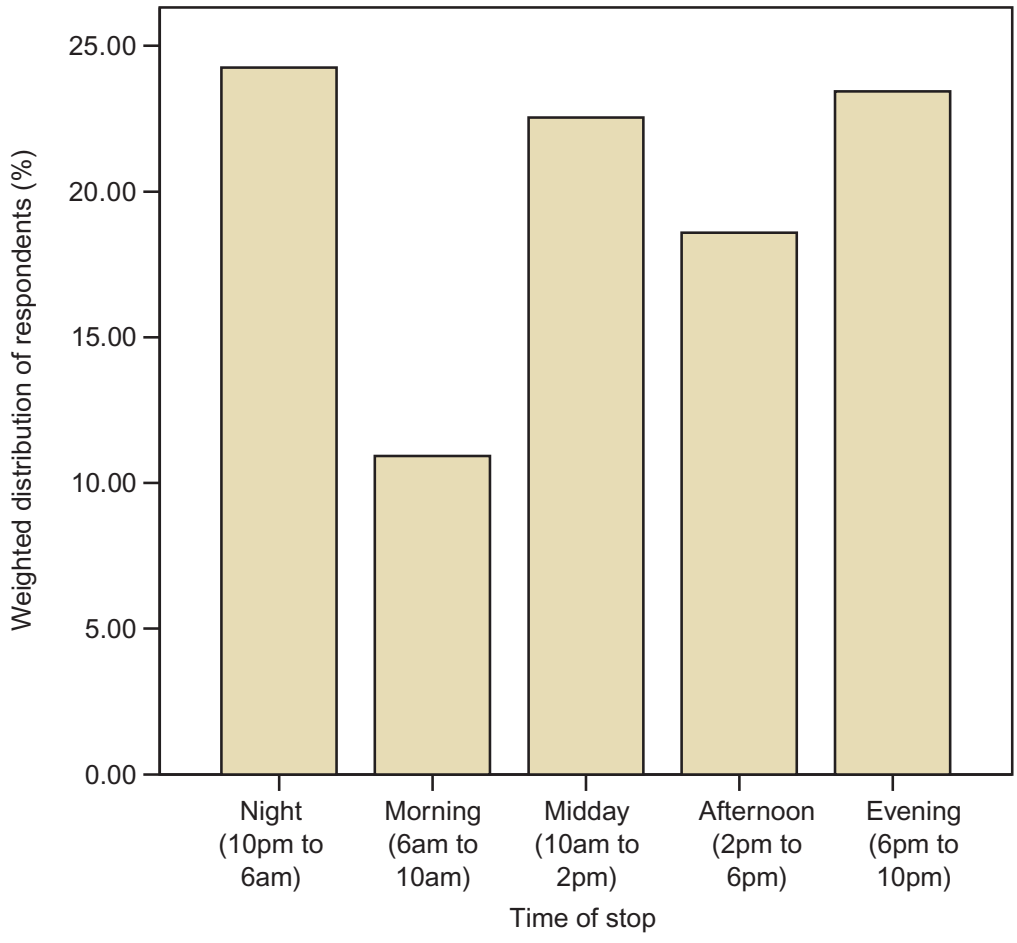
Figure 2.7: Types of drink purchased by drivers who reported stopping to get a drink



Unweighted base: 1,099

Coffee was a popular choice among those who purchased a drink. Note that Figure 2.7 excludes 27 respondents who did not give the type of drink or were unable to purchase a drink. Given that the driver had purchased a drink, they were also asked the reason why they had purchased that specific drink. Of those who purchased coffee, 20% stated that the reason was to help them stay awake, which compares to 11.9% across all drinks. Figure 2.8 looks at just the coffee drinkers to see if the percentage buying coffee to help stay awake varies by time of day.

Figure 2.8: Percentage of coffee drinkers who purchased it to help stay awake by time of stop

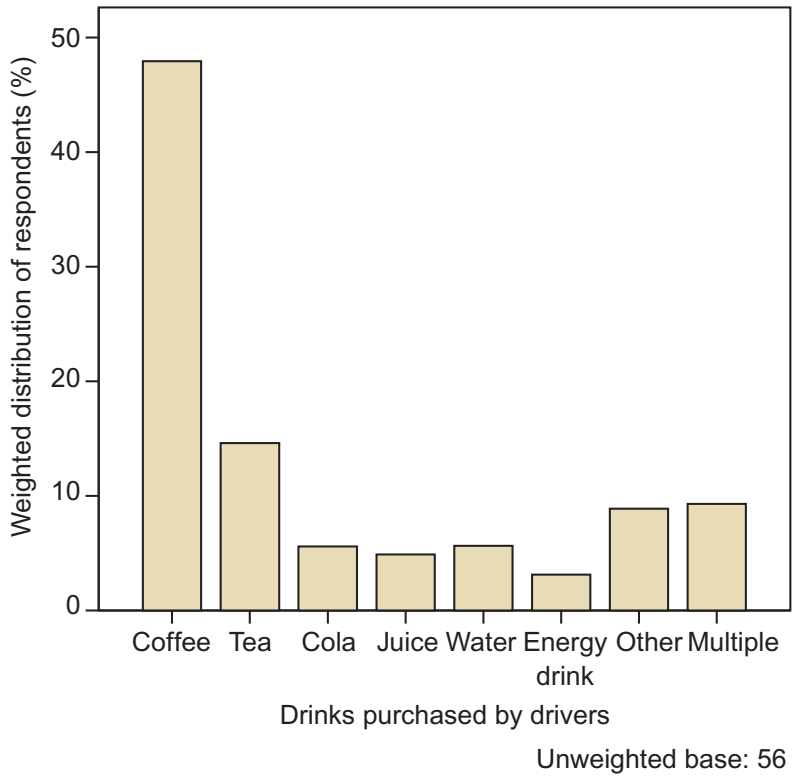


The percentage of drivers buying coffee to stay awake varies over the day, being more common in the evening (1800–2200 h) and during the night (2200–0600 h). Interestingly, although it is the caffeine content of coffee that helps to keep people awake, hardly any driver explicitly referred to the caffeine content as a reason for buying coffee.

While 'energy drinks' are another group of caffeinated drinks, Figure 2.7 shows that only a small number of drivers purchased these. However, nearly 56% of those who did so stated that they purchased the drink to help them stay awake. For the main drinks in Figure 2.7, the most common reason for purchasing a specific drink was that the driver always consumed that drink, e.g. 48.4% of those who purchased tea always drank tea. One exception (among the less common drinks) was the energy drinks, as only 5.7% of the drivers who purchased these stated that this was what they always drank.

If we specifically consider the drivers whose main reason for stopping was that they felt tired (Table 2.3) (unweighted base of 95 respondents), then 65.6% purchased a drink either in the restaurant or the shop. Figure 2.9 shows the types of drink purchased by those drivers.

Figure 2.9: Distribution of drinks purchased by drivers who stopped because they felt tired (main reason) and who also purchased a drink



Unweighted base: 56

Note that Figure 2.9 is based on a very small number of respondents, but compared to Figure 2.7 the percentage of coffee drinkers is similar. Among the latter (unweighted base of 31 respondents), the percentage who purchased coffee to help stay awake was close to 50%. While this is based on a small number of respondents, it does suggest that these coffee drinkers are choosing coffee for a different reason to those coffee drinkers among **all** drivers.

Overall, satisfaction with the MSAs was high. Over 96% (slightly higher in MSAs A and B and lower in MSA J and K) of drivers reported that the stop had been worthwhile in relation to their main reason for stopping. Of those who were not satisfied, over a quarter[3] reported cost as the reason. This links to the focus group where the participants mentioned cost as a prohibitive factor to using MSAs.

[3] Based on 69 responses.

Relating to all the reasons for stopping, 25.6% of drivers felt facilities could be improved. Of these people (unweighted base of 619 respondents), 8.6% mentioned that facilities should be open for longer periods, 19.4% commented on the food, 11.1% on the toilets, and 23.5% relating to the general quality of the MSAs. However, of those who felt the facilities could be improved, the dominant comments related to cost, with nearly 40% suggesting the MSAs should be cheaper.

2.3.3 *Knowledge of DfT guidelines and awareness campaigns*

While most of the drivers interviewed had not specifically stopped due to tiredness, we investigated what they would do if they felt tired. Nearly 90% stated they would be **very likely** to stop if they felt tired and over 95% would be **likely** or **very likely** to stop. Less than 2.5% stated they would be **unlikely** to stop. When asked what they would do once they had stopped, their main responses are shown in Table 2.4. (Drivers can report more than one activity.)

Table 2.4: Activities drivers would do if they stopped when feeling tired

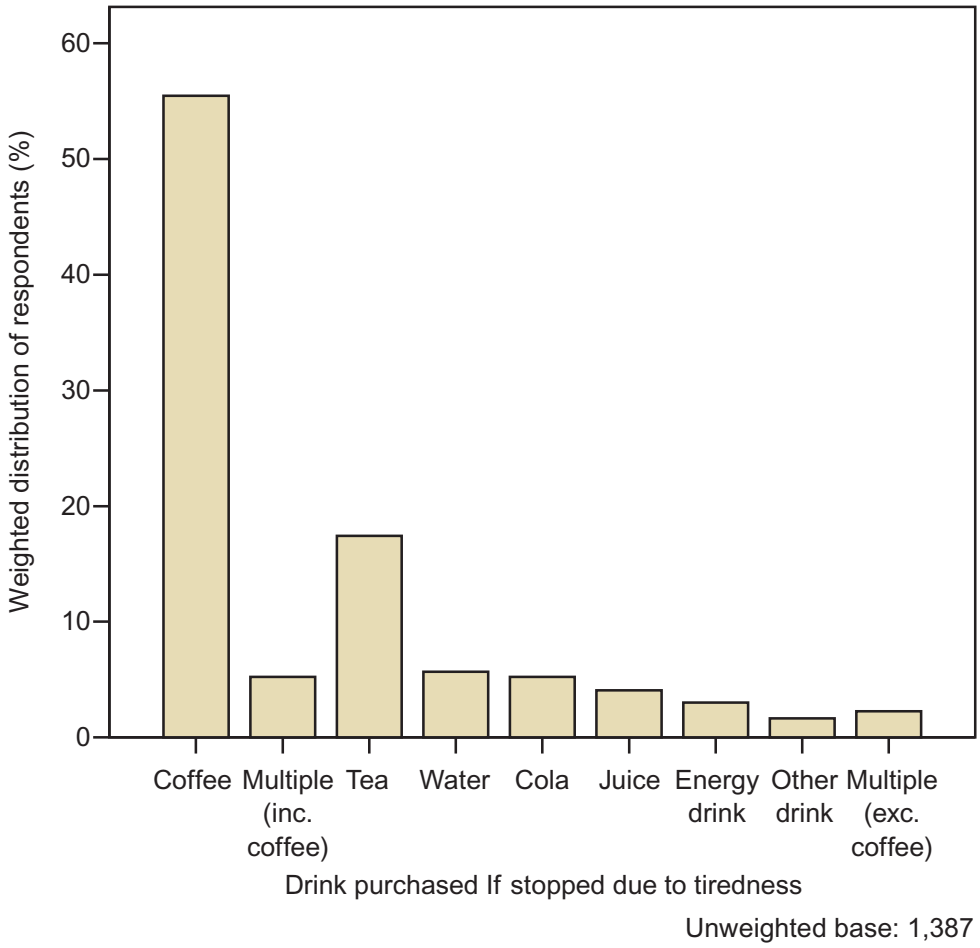
What drivers would do	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Get a drink	60.7	59.3	63.0
Stretch legs, walk about	46.9	51.1	40.3
Have a nap	26.7	24.5	30.1
Rest/relax	20.1	19.8	20.5
Go to the toilet	13.4	15.5	10.2
Get something to eat	6.1	5.3	7.2
Other	6.3	5.3	7.9
Unweighted n	2,270	1,164	1,106

The majority of drivers would follow the *Highway Code* advice and get a drink once they had stopped. The difference between the two MSAs is not statistically significant. Many drivers also suggested they would leave the car to exercise, presumably to try and wake themselves up. Over a quarter stated they would take a nap, also in-line with the *Highway Code* advice, and this is higher for MSAs J and K than MSAs A and B.[4] If the hypothetical actions reported in Table 2.4 are compared with the *real* actions of those who actually stopped because they felt tired (see Table 2.3), the percentages for these two key actions are lower in Table 2.3. While the percentages in Table 2.3 are based on small numbers, it suggests that while drivers know what they *should* do (as reflected in Table 2.4), what they *actually* do is rather different.

Given that the *Highway Code* specifically suggests drivers should drink coffee, we asked those who reported they would get a drink, which drink they would buy. Figure 2.10 shows the types of drink drivers said they would purchase.

[4] The difference is significant at the 5% level after controlling for the impact of weighting.

Figure 2.10: Types of drink purchased by drivers who said they would buy a drink if they stopped when tired



Around 60% of drivers who said they would get a drink would buy coffee. The multiple category including coffee represents the 5% of drivers who would also buy another drink. When considering why a driver would choose a particular drink, nearly 70% of the coffee drinkers reported they would buy coffee because it would 'help them wake up'. Over three-quarters of the drivers who would buy an energy drink reported the same reason for that choice. Other drivers reported they would get a drink but the choice was not motivated by whether the drink would help them combat the tiredness. For example, 54% of those who said they would buy tea were simply choosing what they would always drink.

To check that it is not just drivers who were tired at the current stop reporting this behaviour, we compared the reasons behind purchases of drinks for the current stop with the reasons given for purchasing a drink for the hypothetical stop. This is shown in Table 2.5 for the drivers who gave information on drinks for both *stops*.

Table 2.5: The relationship between the reasons for drinks purchases at the current stop and a hypothetical stop when feeling tired

		Would purchase a drink to help wake up /stay awake (hypothetical stop if tired)		Total
		No	Yes	
Purchased drink to help wake up/ stay awake (current stop)	No	413 (53%)	273 (35%)	686 (88%)
	Yes	7 (1%)	85 (11%)	92 (12%)
Total		420 (54%)	358 (46%)	778
Unweighted base: 768				

From Table 2.5 it can be seen that 11% of drivers who reported buying a drink at the current stop to help wake up/stay awake would also buy a drink to help 'wake up' in the future if they stopped because they felt tired. 53% of drivers did not buy a drink to help wake up or stay awake at the current stop and would not do so in the future; 35% said they would do in the future.

The DfT has for some time been running a campaign on the dangers of driving when tired. From the surveys we can report on the impact of the campaign. Over 70% of the drivers reported being aware of the *Don't Drive Tired* campaign, with no difference between the MSAs. However, there is some variation by annual mileage, with 79.5% of those who drive over 50,000 miles being more aware of the campaign. During the survey, drivers were asked which specific parts of the campaign they recognised. Table 2.6 gives the proportion of drivers who reported an awareness of different aspects of the campaign.

Table 2.6: Awareness of the different aspects of the DfT campaign

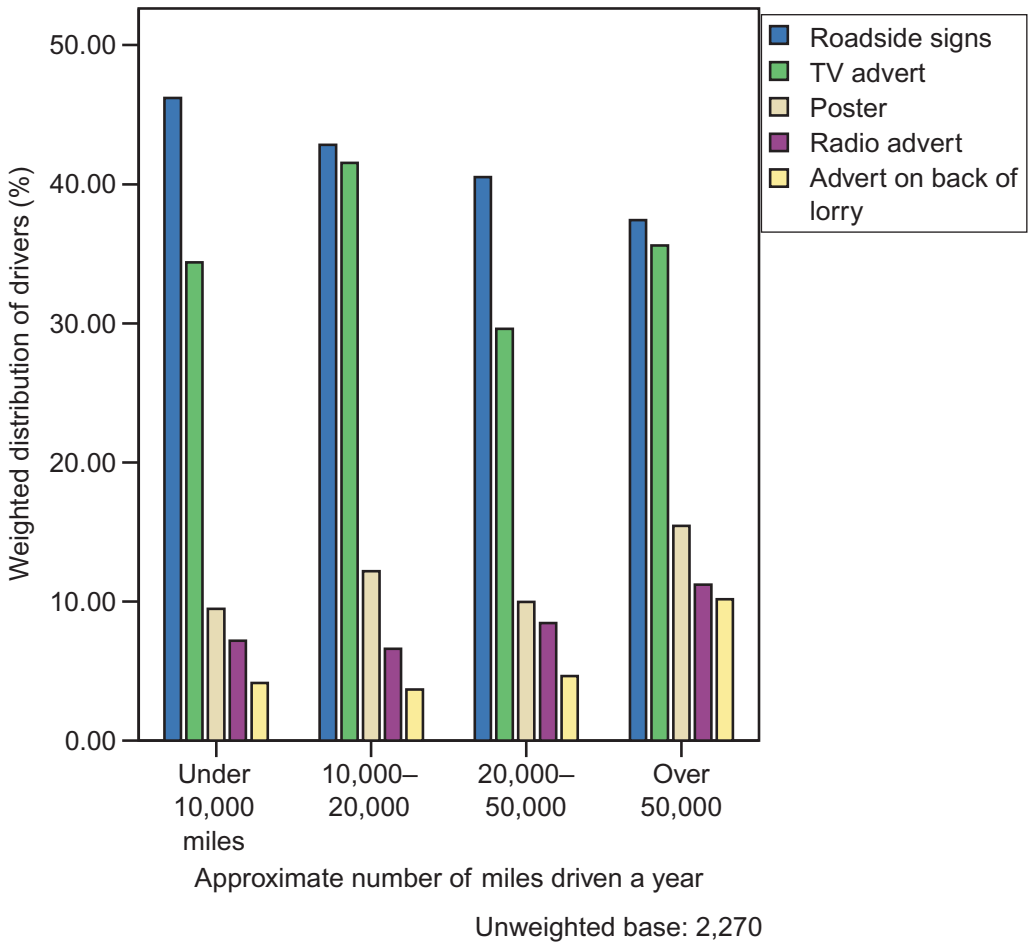
	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Roadside signs	42.9	41.7	44.8
TV advert	36.3	35.7	37.3
Poster	11.2	8.9	14.7
Radio advert	7.6	6.5	9.3
Advert on back of lorry	4.6	4.0	5.7
Leaflets	1.8	1.9	1.7
Not aware/not seen/no response	27.9	26.8	29.7
Unweighted n	2,270	1,164	1,106

When prompted, slightly more people are aware of specific aspects even if they do not directly relate those to an overall *Don't Drive Tired* campaign. The most popular aspect (drivers were picking as many as they recognised from a list shown by the interviewer), at both MSAs, was the roadside signs. The most noticeable difference[5] in responses from the two MSAs was poster coverage, with this being higher at

[5] The difference is significant at the 0.1% level after controlling for the impact of weighting.

MSAs J and K than MSAs A and B. There was also a difference for radio adverts, but this was not statistically significant. Figure 2.11 shows how awareness of each of the most noted aspects varies with mileage covered.

Figure 2.11: The percentage of drivers aware of the *Don't Drive Tired* campaign by their annual mileage



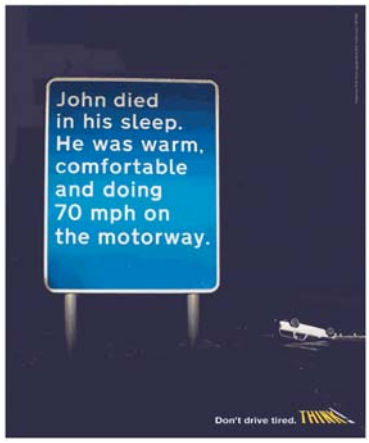
With respect to the '*Tiredness Kills – Take a Break*' roadside signs, the overall awareness of the roadside signs is the highest among the items of Table 2.6. However, Figure 2.11 shows that the awareness level drops among the high mileage drivers, whereas awareness of the less well-known aspects (posters, radio adverts, adverts on the back of lorries) tends to increase with the mileage driven.

Although drivers reported a low awareness of posters, all drivers were shown pictures of three posters used by the DfT. These are shown in Figure 2.12. The drivers were asked to identify any of the posters they recognised and the results are shown in Table 2.7.

Figure 2.12: The three posters shown to drivers

Poster A

Poster B



Poster C

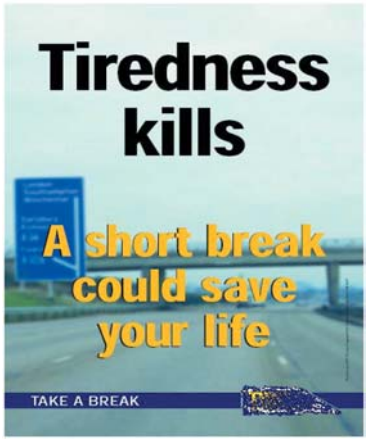


Table 2.7: Drivers who recognised the DfT posters

	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Don't drive tired (bed)	5.8	6.8	4.3
John died in his sleep	16.9	19.8	12.3
Tiredness kills . . .	60.1	58.9	62.1
Not seen/no response	30.4	29.3	32.0
Unweighted n	2,270	1,164	1,106

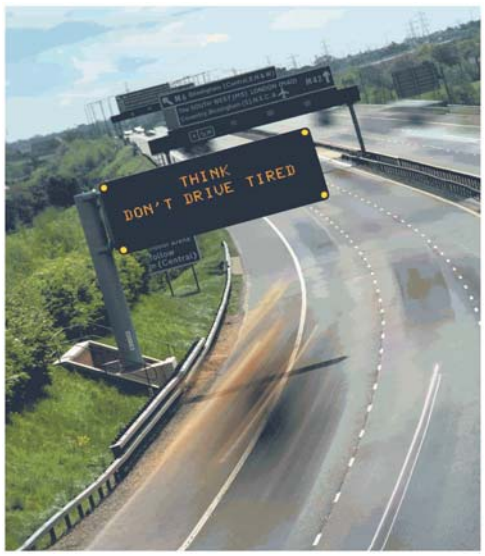
Drivers generally did not highlight specific awareness of the DfT campaign from the use of posters, and when shown the three posters 30.4% did not recognise any of them. However, from Table 2.7 the majority of drivers did recognise the '*Tiredness kills. . .*' poster, but only 5.8% recognised the rather less obvious '*Don't drive tired (bed)*' poster. For the '*John died in his sleep*' poster, which is linked to a very powerful TV advert, there was a difference[6] between the two MSAs.

Returning to Table 2.6, the unprompted awareness of the roadside signs is quite high among drivers. To see if the signs had any impact on behaviour, all drivers were shown pictures of the lit gantry sign and the permanent blue roadside signs, and were asked if they remembered seeing the signs (see Figure 2.13). The responses are given in Table 2.8.

[6] The difference is significant at the 0.1% level after controlling for the impact of weighting.

Figure 2.13: Gantry and roadside signs

Sign A



Sign B

Table 2.8: Drivers who recognised the roadside signs

	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Think! Don't drive tired (lit gantry sign)	48.6	53.6	40.7
Tiredness kills (blue sign)	95.5	94.2	97.6
Not seen/no response	2.1	2.3	1.8
Unweighted n	2,270	1,164	1,106

When prompted by a picture, the blue signs were recognised by nearly all drivers, although they had not necessarily connected seeing the blue signs with a specific campaign by the DfT. The lit gantry signs were less recognised and there was a difference[7] between the two MSAs. One reason for the initial choice of the two MSAs for this study was that there are blue signs directly before MSAs A and B, but not directly before MSAs J and K. Therefore, all drivers at both MSAs were specifically asked if they had seen the blue sign before the MSA and the responses are shown in Table 2.9.

Table 2.9: Drivers who reported seeing the blue sign before the MSA

Blue sign seen before the MSA?	Total (%)	MSAs A&B with blue sign (%)	MSAs J&K without blue sign (%)
Yes	57.1	68.1	39.8
No	40.1	29.1	57.5
No response	2.8	2.9	2.7
Unweighted n	2,270	1,164	1,106

[7] The difference is significant at the 0.1% level after controlling for the impact of weighting.

Not surprisingly, nearly 70% of all drivers reported seeing the signs at MSAs A and B, where they actually exist. Interestingly, there is a difference between the northbound (A) and southbound drivers (B), with those travelling south more likely to have seen the sign, although this is not significant. However, the impact of the sign observed, here, must be balanced against the 39.8% of drivers who reported seeing the signs at MSAs J and K, where they do not exist.

Given that a driver had *seen* a sign, they were asked if this impacted on their decision to stop, and this outcome is shown in Table 2.10.

Table 2.10: The influence of the blue sign on stopping

Stopped because of seeing the sign	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Yes	32.2	35.8	22.4
No	66.7	63.0	76.7
No response	1.1	1.2	0.9
Unweighted n	1,262	820	442

The sign does have an impact on the stopping behaviour of drivers and is *more effective* at MSAs A and B (where the signs exist). However, the direct impact is perhaps not that strong, given that 22% of drivers who *saw* a non-existent sign near MSAs J and K stopped because they had seen it. These findings suggest that the signs have a more general rather than a specific impact.

2.3.4 Stopping patterns

The stopping patterns of drivers and how these relate to the advice given in the *Highway Code* were also examined. An interesting comment from the focus group was that drivers frequently become tired quite suddenly and then have to drive some distance to the next MSA. In the survey, we asked drivers if they would have stopped if there had been an MSA 15 minutes earlier and the answers are presented in Table 2.11.

Table 2.11: Whether drivers would have stopped earlier if an MSA had existed

Stopped 15 minutes earlier if there had been an MSA?	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Yes	19.7	21.1	17.6
No	70.3	66.5	76.1
Don't know/no response	10.0	12.4	6.2
Unweighted n	2,270	1,164	1,106

About 20% would have stopped earlier if there had been an MSA. There is a difference[8] by direction of travel for MSAs A and B, with more southbound (A) drivers (over 80%) reporting they would not have stopped. Again, of specific interest are the responses of those drivers who had stopped because they felt tired and this is shown in Table 2.12.

Table 2.12: Drivers who stopped because they felt tired and would have stopped earlier if an MSA had existed

Stopped 15 minutes earlier if there had been an MSA?	Total (%)	MSAs A&B (%)	MSAs J&K (%)
Yes	31.2	27.6	42.1
No	62.3	63.8	57.9
Don't know/no response	6.5	8.6	0.0
Unweighted n	95	63	32

While Table 2.12 is based on small numbers, it does clearly suggest that a higher proportion of drivers who had stopped because they felt tired would have stopped 15 minutes earlier if there had been an MSA compared to those drivers who did not feel tired when they stopped. From this it appears that at least the 31.2% who report they would have stopped earlier were likely to have been driving that last 15 minutes feeling tired.

Related to the information in Table 2.11, data were obtained on how long the drivers had travelled for before the current stop, and how long they intended to drive before the next stop. Figures 2.14 and 2.15 show the **unweighted** distribution for these two questions, and the time drivers had spent at the current stop. Figure 2.14 shows that most drivers appeared to be stopping every one to two hours (in both cases the median time between stops was between 1 and 1.5 hours), while the modal length of a stop was five to ten minutes, see Figure 2.16. The generally short length of each stop was perhaps not surprising when considering that 'using the toilet' was the most popular reason.

[8] The difference is significant at the 1% level after controlling for the impact of weighting.

Figure 2.14: The time since last stop by drivers

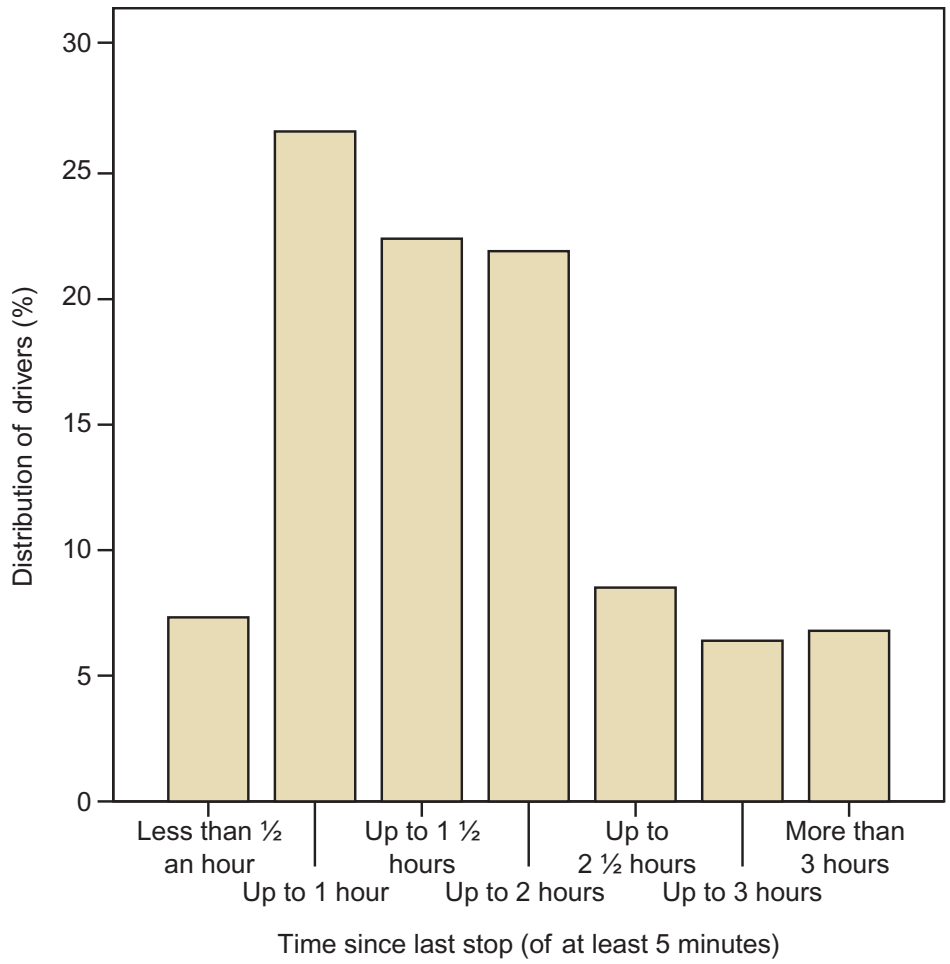


Figure 2.15: The expected time to next stop

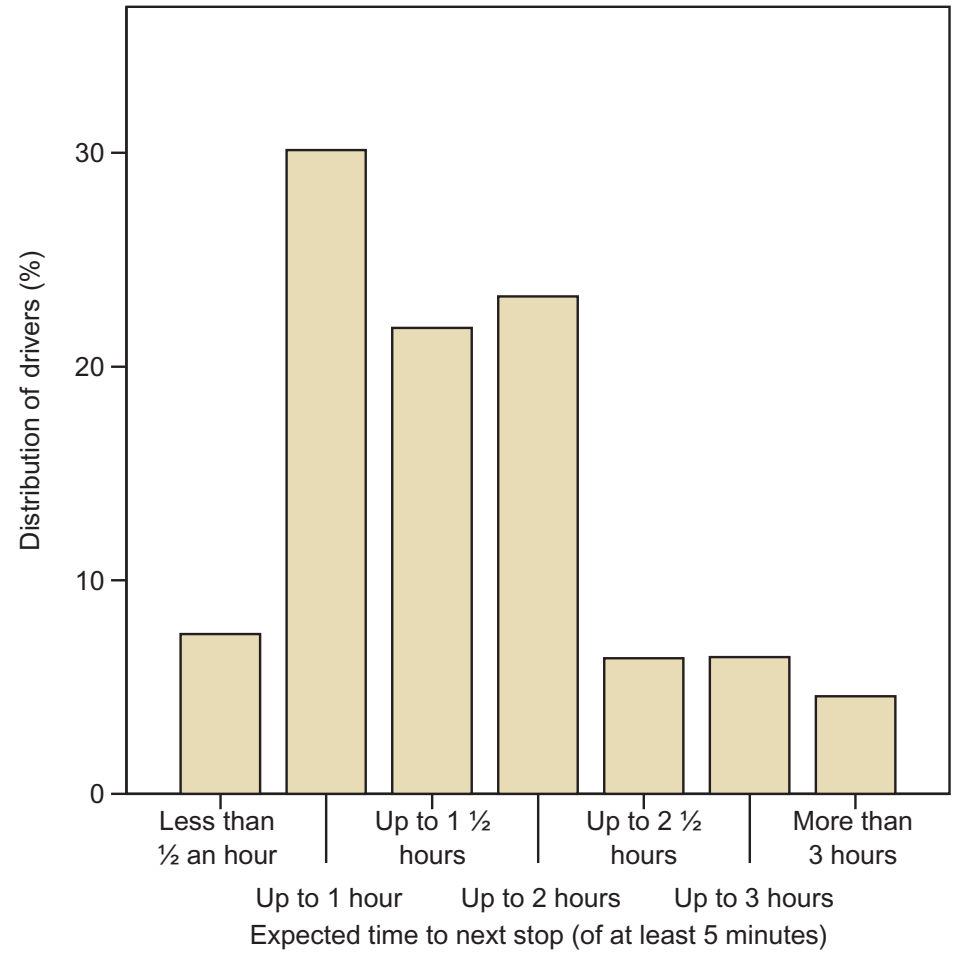
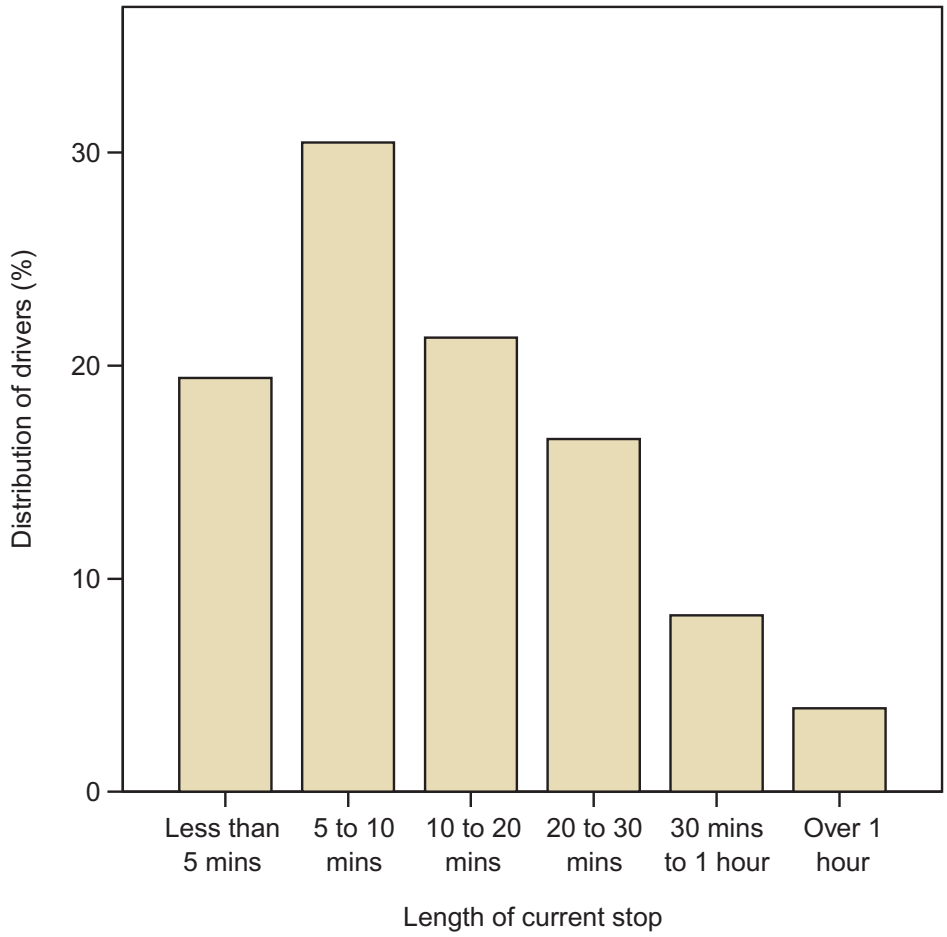


Figure 2.16: The length of current stop



Many drivers stop frequently (Figure 2.15), at intervals of less than 90 minutes, but a small percentage drive for long periods (over 150 minutes) without stopping. Table 2.13 shows the relationship between the time to the current stop and the time until the next stop.

Table 2.13: Relationship between time since last stop and time to next stop (unweighted)

		Time to next stop							
		Less than 0.5	**Up to 1**	**Up to 1.5**	**Up to 2**	**Up to 2.5**	**Up to 3**	**More than 3**	**Total**
Time since last stop	Less than 0.5	35[1] (1.6%)	71[1] (3.2%)	22[2] (1%)	20[2] (0.9%)	3[3] (0.1%)	6[3] (0.3%)	6[3] (0.3%)	163 (7.3%)
	Up to 1	61[1] (2.7%)	245[1] (11%)	125[2] (5.6%)	100[2] (4.5%)	23[3] (1%)	29[3] (1.3%)	15[3] (0.7%)	598 (26.7%)
	Up to 1.5	29[2] (1.3%)	145[2] (6.5%)	170[2] (7.6%)	114[2] (5.1%)	21[3] (1%)	17[3] (0.8%)	6[3] (0.3%)	502 (22.5%)
	Up to 2	20[2] (0.9%)	121[2] (5.4%)	96[2] (4.3%)	179[2] (8%)	35[3] (1.6%)	25[3] (1.1%)	13[3] (0.6%)	489 (21.9%)
	Up to 2.5	6[3] (0.3%)	32[3] (1.4%)	39[3] (1.7%)	55[3] (2.5%)	32[4] (1.4%)	20[4] (0.9%)	7[4] (0.3%)	191 (8.5%)
	Up to 3	6 (3.3%)	31[3] (1.4%)	17[3] (0.8%)	28[3] (1.2%)	13[4] (0.6%)	30[4] (1.3%)	18[4] (0.8%)	143 (6.4%)
	More than 3	10[3] (0.5%)	28[3] (1.2%)	18[3] (0.8%)	25[3] (1.1%)	15[4] (0.7%)	16[4] (0.7%)	37[4] (1.6%)	149 (6.7%)
	Total	167 (7.5%)	673 (30%)	487 (21.8%)	521 (23.3%)	142 (6.3%)	143 (6.4%)	102 (4.6%)	2,235

Notes:
a) This matrix can be categorised into four groups of drivers, identified by the superscript number, and defined in the text below
b) 35 drivers are excluded either because they did not respond (n=5), because they would not be driving the next journey (n=11), or because they did not know the length of the next journey (n=19).

From Table 2.13 we can identify four groups to represent the stopping behaviour of drivers for further analysis:

Group 1 – Those who always stop very regularly (both journeys less than one hour).

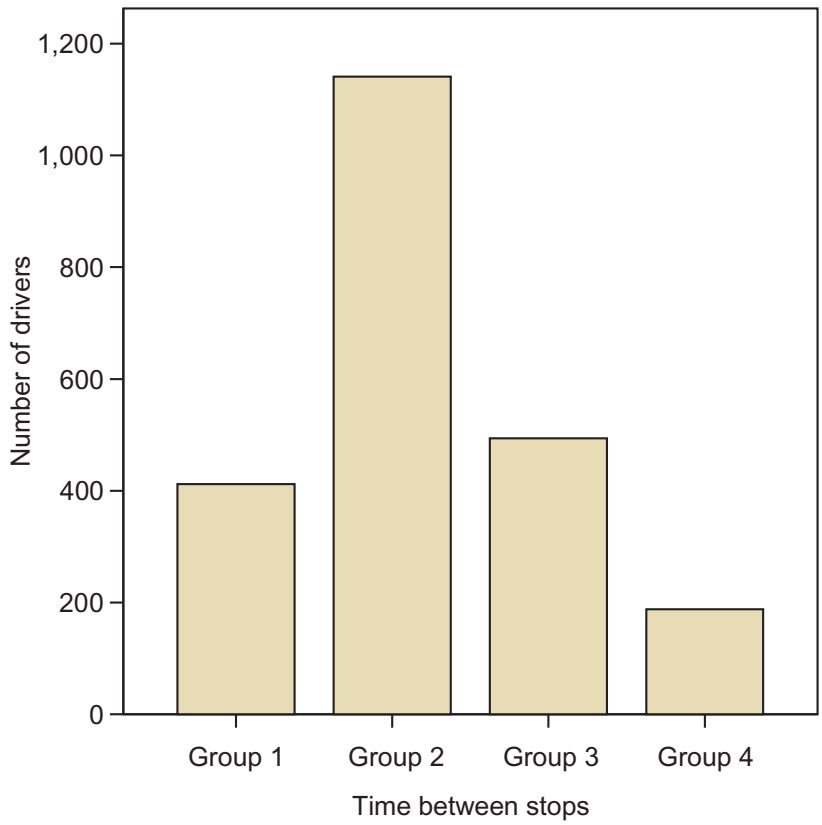
Group 2 – Those who always stop within the guidelines (no journey more than two hours).

Group 3 – Those who sometimes have a long drive (one journey more than two hours).

Group 4 – Those who always have a long drive (both journeys over two hours).

The aim of this further analysis was to identify the characteristics associated with each group. In particular, the type of driver who falls into group 4 (188 in the data) and to a lesser extent group 3. Multinomial logistic regression was used, which is a method for identifying whether a particular characteristic is associated with the probability of a driver falling into one of the four groups, when controlling for other characteristics of the driver. The distribution of the outcomes is given in Figure 2.17.

Figure 2.17: Distribution of drivers by their stopping behaviour



Drivers in group 2 were the most frequent, being drivers who have neither journeyed over two hours nor for less than one hour. In the model the following variables were investigated:

- Age – not significant so removed from the final model.
- Sex – significant at the 5% level.
- Miles driven in a year – significant at the 1% level.
- Day of week – significant at the 5% level.
- Time of day – significant at the 1% level.
- Location and direction – significant at the 1% level.
- Purpose of journey – significant at the 10% level.
- Awareness of DfT campaign – not significant so removed from the final model.
- Very likely to stop if tired – not significant so removed from the final model.
- Passenger(s) under 12 – significant at the 1% level.
- Sharing the driving – significant at the 1% level.

The final model comprises eight characteristics. To look at these, we considered a 'reference' driver: female, driving over 50,000 miles a year, stopping on a Sunday evening, southbound on motorway Y, driving alone and on a business-related journey. We then change one characteristic about the driver and see the impact it has on their probability of being in each of the four groups.

Table 2.14: Predicted probabilities from the final model

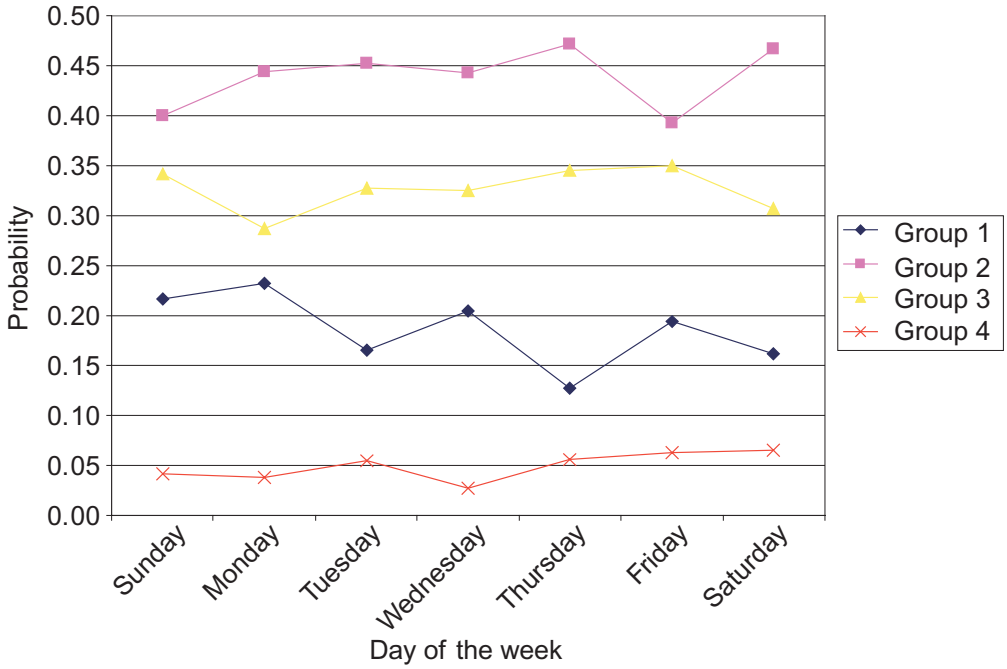
Behaviour	Reference driver	Passengers under 12 years	Sharing the driving	Driver is male	Journey is NOT for business
Group 1	0.22	0.13	0.14	0.17	0.20
Group 2	0.40	0.38	0.42	0.39	0.47
Group 3	0.34	0.45	0.38	0.38	0.28
Group 4	0.04	0.04	0.05	0.06	0.04

From Table 2.14, it can be seen that when the driver has passengers under 12 years of age, the model predicts this will increase the chance that they have at least one of the two journeys over two hours (group 3 probability goes from 0.34 to 0.45), which is not what would be expected. If the driving is being shared, this has a similar impact, which is what would be expected. Male drivers are more likely to be in groups 3 and 4 (over two hours between stops), and non-business journeys are more likely to have regular stops as also reported by the focus group.

In Figure 2.18a it can be seen that the day of the week has a significant impact but the pattern is not particularly clear. Those driving on Fridays and Saturdays have an increased risk of being in group 4, but there is not an obvious *weekend* effect as Sunday is not the same. From Figure 2.18b a clearer impact for *time of day* is apparent, with the chance of long durations between stops (groups 3 and 4) being higher at night, while shorter durations are more likely around lunchtime and in the afternoon. Interestingly, Figure 2.18c shows a significant difference between the MSAs, with those on motorway sections X being more likely to make longer journeys between stops. Finally, Figure 2.18d shows the impact of *annual mileage,* and, as expected, those who drive further stop less regularly.

Figure 2.18: Predicted probabilities for changing different aspects of the journey

(a) Day of the week



(b) Time of day

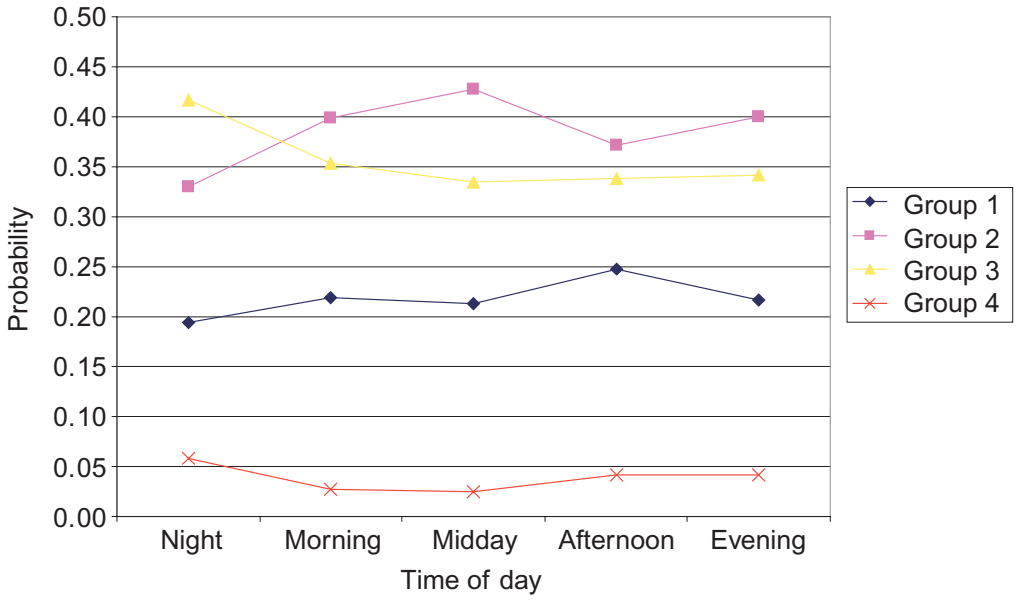
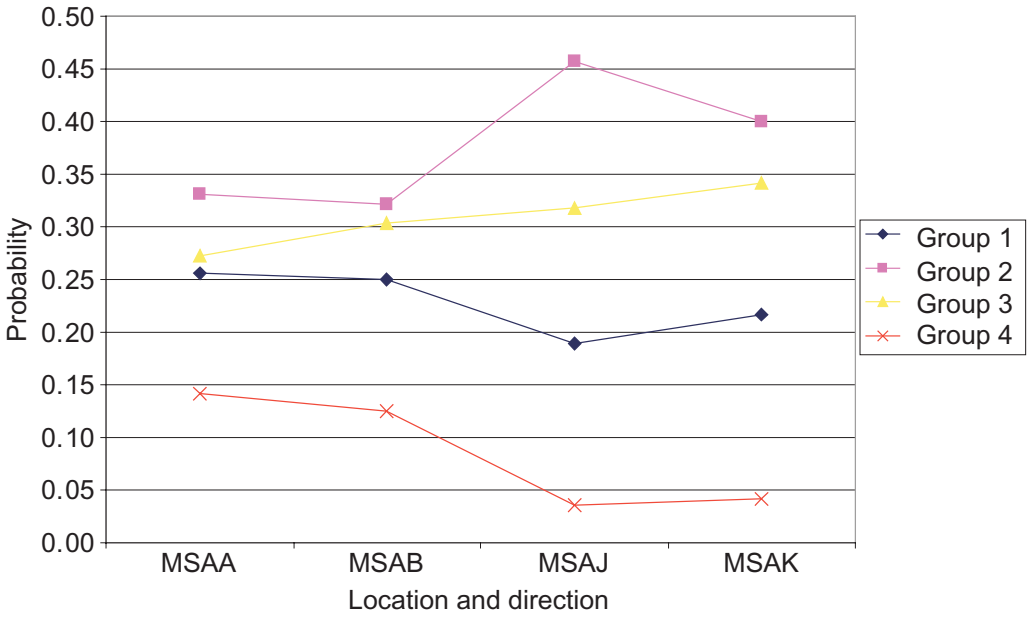
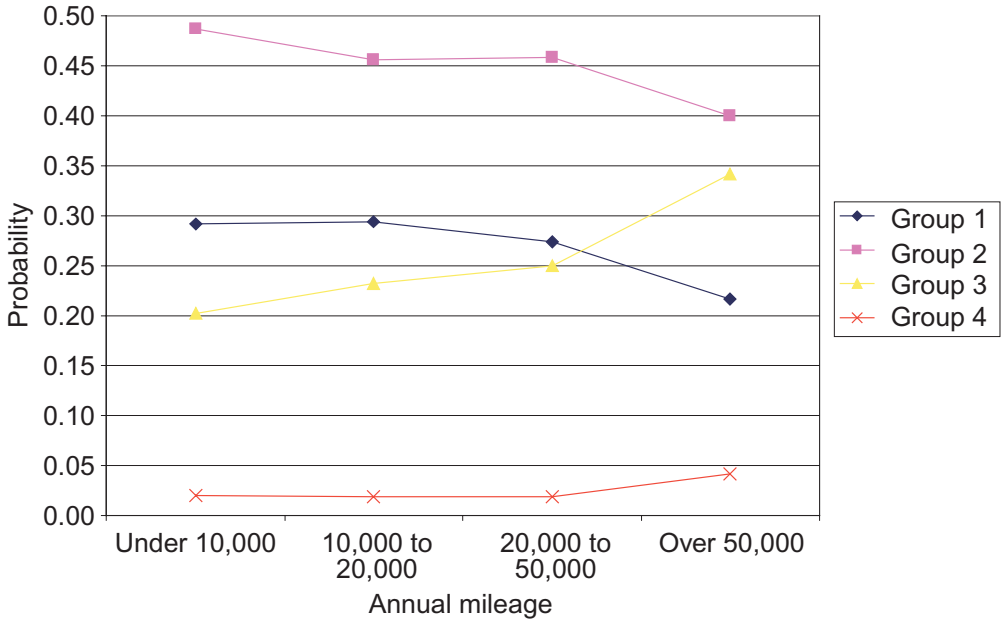


Figure 2.18: (Continued)

(c) Location and direction of journey



(d) Annual mileage of the driver



2.4 Conclusions from the survey

The results of the survey give a general picture of the drivers who stop at MSAs, their reasons for stopping, satisfaction with MSAs, knowledge of DfT campaigns, and driving times between stops.

Looking at the basic characteristics, most of the drivers who are stopping at MSAs are male, aged 30 to 60, not on business-related journeys, and driving a car. While we cannot say that these drivers are more likely to stop, as we do not know the characteristics of those not stopping, the relatively low proportion of business-related journeys among the drivers stopping at the MSAs suggests drivers on these journeys stop less. This is also in-line with the findings of the focus group.

Given that the focus group highlighted that, when on business journeys, drivers tended to stop less, having no passenger in the car probably increases the risk of falling asleep even more. However, only a quarter of the drivers on non-business related journeys with passengers reported that they were sharing the driving with a passenger. In some cases it is because the passengers are all too young, but it does highlight that even when there are passengers, the burden of driving still primarily falls on one person. In the case of business-related journeys, again, only a quarter of the drivers with passengers were sharing the driving.

Whether one considers the *main* reason for stopping or *all* reasons for stopping, 'using the toilet' dominates. The duration of most stops is also short, with 50% of drivers stopping for less than 10 minutes. Table 2.2 shows that few drivers are using the full range of services available at these MSAs. It suggests that for most drivers a small café and/or shop supplying drinks and snacks, along with toilets, would probably be sufficient. If we consider just the tired drivers (those in Table 2.3), similar facilities would also be sufficient.

The DfT have now included guidelines about what to do when tired in the *Highway Code*. These recommend having a nap and drinking coffee. There is some evidence in the survey that this message is being taken on board by drivers. Coffee is the most popular drink purchased and many drivers acknowledge they were buying it to specifically help them stay awake, particularly if they had stopped driving because they felt tired. This is backed-up by what drivers reported they *would* do if they stopped when feeling tired (see Figure 2.10). However, there is still a reasonable proportion of drivers who did not say they would do anything related to the guidelines, perhaps due to a lack of knowledge.

Overall awareness that the DfT have been concerned with driving while tired is high (over 70% of drivers), and Table 2.6 shows that the TV campaign and the roadside signs and posters are reaching a reasonable proportion of drivers. If we link this to the results in Table 2.7 and Table 2.8 (where drivers were prompted with images of the posters and signs), the message is even more positive, particularly for the simple

'*Tiredness Kills*' poster and the blue '*Tiredness Kills – Take a Break*' signs. Concentrating explicitly on the blue signs, the survey suggests that the placement of the sign on motorway X (MSAs A and B) did have a direct positive impact on the decision to stop. However, Table 2.10 shows that on motorway Y, at MSAs J and K, drivers also claimed to have stopped because of the sign when in fact it did not exist. While this suggests the direct impact of seeing the sign on motorway X is not great, it also suggests that the general placement of the signs is having a positive impact.

In the final section, we looked at the characteristics of drivers that are associated with their driving time between stops. From this, male drivers were more likely to drive beyond two hours between stops, as were those on business-related journeys. Interestingly, the model we introduced also suggests that those with passengers aged under 12 years will also drive for longer times between stops. Time of day is also important, with those driving at night being more likely to make longer journeys between stops. Drivers on motorway X, and those with high annual mileage, tended to stop less.

PART 3

GENERAL DISCUSSION

Ours is a limited study and our conclusions are made only in the light of our findings. The overall effect of MSAs in appearing to reduce all RTCs is statistically non-significant. Nevertheless, with regard to SRCs alone, MSAs appear to have some effect, as reflected by a 22%, significant reduction in SRCs. However, there were large differences between MSAs in all these respects, with several MSAs seeming to have little or no beneficial effect on RTCs or SRCs. This differential effect can be apparent on one side of an MSA compared with the other. Possible reasons include differences in: i) proximity of the MSA to the motorways; and ii) in opening hours. Of course, there may be other factors resulting in the reduction of SRCs, other than MSAs.

'*Tiredness Kills – Take a Break*' signs before a given MSA did not seem to confer any particular advantage with respect to RTCs, and neither did the increasing distance between adjacent MSAs. Our survey also indicated that specific signs did not influence a decision to stop. However, drivers tended not to be aware of specific signs, but were aware of the signs in general.

The time of day plays an important role in the effectiveness of MSAs in relation to RTCs and SRCs. The latter is very much influenced by the human body clock ('circadian rhythm'). Although the greatest incidence of SRCs occurs in the small hours of the morning, MSAs seemed ineffective in reducing these crashes in the period between 02:00h and 06:00h.

The most noticeable overall reduction in all RTCs, especially in SRCs, with regard to before versus after MSAs, involved cars. All other vehicle crash rates seemed largely unaffected by MSAs.

Interestingly, and in general, any real beneficial effect of MSAs in relation to RTCs and SRCs seemed mostly confined to the autumn and winter; a finding which may be partly associated with the increased daily darkness and poorer road conditions.

Generally, MSAs seemed to have relatively more benefit with respect to reducing RTCs and SRCs, over the weekend, and less so for Tuesdays and Thursdays. Our sample is too small to break down data, for example, into day of week by season, or season by time of day.

Our survey shows that most of the drivers stopping at MSAs are men, aged 30 to 60, not on business-related journeys, and driving a car. The relatively low proportion of business-related journeys among the drivers stopping at the MSAs is in-line with the

findings of our focus group. Even when there are car driving passengers during all journeys, the burden of driving primarily falls on one person.

'Using the toilet' is the main reason for stopping at an MSA, with the duration of the stop often being only for 10 minutes. For most drivers a small café and/or shop supplying drinks and snacks, along with toilets, would probably be sufficient for their needs, even for 'tired' drivers.

Coffee is the most popular drink purchased and many drivers acknowledged that they were buying it to specifically help them stay awake, particularly if they had stopped driving because they felt tired. Nevertheless, there are still a conspicuous number of drivers who seem to be ignorant of this benefit of coffee and of the *Highway Code's* guidelines in this respect.

A statistical model applied to the survey data also showed that male drivers were more likely to drive beyond two hours between stops, as would those on business related journeys. Interestingly, those with passengers aged under 12 years will also drive for longer times between stops. Time of day is again important, as those driving at night are more likely to make longer journeys between stops (as are those with a high annual mileage).

Driving in the small hours on a monotonous motorway leaves most drivers particularly vulnerable to SRCs (which are more likely to have a severe outcome). This is because of sleep loss, the daily circadian trough, and a possible reluctance to take a break at an MSA, for presumably various reasons, which need further exploration.

Clearly, though, both the need to avoid 'tired driving' and the attractiveness of 'Taking a Break at an MSA' require further attention.

PART 1: APPENDIX

Tables 1.8–1.10 show changes in RTCs, SRCs and non-SRCs in the 16 km after individual MSAs compared with 16 km before.

Table 1.8: RTC rates per km per MSA

MSA	Mean crash rate per km before MSA	Mean crash rate per km after MSA	% decrease/ increase
A	1.94	2.31	19.07% inc
B	2.4	1.2	50% dec
C	2.13	1	53.05% dec
D	1.7	1.25	26.47% dec
E	1.81	1.44	20.44% dec
F	1.38	1.81	31.16% inc
G	1.63	0.94	42.33% dec
H	1.19	0.94	21% dec
J	0.88	1.31	48.86% inc
K	1.56	1.06	32.05% dec
L	1.44	1.38	4.17% dec
M	1.13	1.56	38.05% inc
N	1.5	1.5	0% inc/dec
P	1.63	1.25	23.31% dec
Mean	1.59	1.35	

Table 1.9: SRC rates per km per MSA

MSA	Mean crash rate per km before MSA	Mean crash rate per km after MSA	% decrease/ increase
A	0.56	0.25	55.36% dec
B	0.69	0.38	44.93% dec
C	0.63	0.38	39.68% dec
D	0.56	0.19	66.07% dec
E	0.31	0.63	103.23% inc
F	0.38	0.44	15.79% inc
G	0.75	0.38	49.33% dec
H	0.38	0.31	18.42% dec
J	0.19	0.19	0
K	0.44	0.25	43.18% dec
L	0.25	0.44	76% inc
M	0.56	0.5	10.71% dec
N	0.56	0.38	32.14% dec
P	0.5	0.56	12% inc
Mean	0.48	0.38	

Table 1.10: Non-SRC rate per km per MSA			
MSA	**Mean crash rate per km before MSA**	**Mean crash rate per km after MSA**	**% decrease/ increase**
A	1.38	2.06	49.3% inc
B	1.69	0.87	48.5% dec
C	1.5	0.62	58.7% dec
D	1.13	1.06	6.2% dec
E	1.5	0.81	46% dec
F	1	1.37	37% inc
G	0.88	0.56	36.4% dec
H	0.81	0.63	22.2% dec
J	0.69	1.12	62.3% inc
K	1.12	0.81	27.7% dec
L	1.19	0.94	21% dec
M	0.57	1.06	86% inc
N	0.94	1.12	19.1% inc
P	1.13	0.69	38.9% dec
Mean	1.1	0.98	10.9% dec

PART 2: APPENDIX A

ROTATION PATTERN

Table 2.15 below gives the rotation pattern that was used at MSAs A and B. It was slightly modified for MSAs J and K once it was found that overnight interviews could not be obtained on MSA J.

Table 2.15: The rotation pattern used at the MSAs

Week one				Week two			
Day	**Time**	**North**	**South**	**Day**	**Time**	**North**	**South**
Mon	12am–4am	10	10	Mon	12am–4am		
	4am–8am				4am–8am	10	10
	8am–2pm	15	15		8am–2pm	15	15
	2pm–8pm	15			2pm–8pm		15
	8pm–12am	10			8pm–12am		10
Tues	12am–4am			Tues	12am–4am		10
	4am–8am	10			4am–8am		
	8am–2pm	15			8am–2pm		15
	2pm–8pm		15		2pm–8pm	15	
	8pm–12am		10		8pm–12am	10	
Wed	12am–4am			Wed	12am–4am	10	
	4am–8am		10		4am–8am		
	8am–2pm		15		8am–2pm	15	
	2pm–8pm	15			2pm–8pm		15
	8pm–12am	10			8pm–12am		10
Thur	12am–4am	10		Thur	12am–4am		
	4am–8am				4am–8am		10
	8am–2pm	15			8am–2pm		15
	2pm–8pm		15		2pm–8pm	15	
	8pm–12am		10		8pm–12am	10	
Fri	12am–4am		10	Fri	12am–4am		
	4am–8am				4am–8am	10	
	8am–2pm		15		8am–2pm	15	
	2pm–8pm	15	15		2pm–8pm	15	15
	8pm–12am	10	10		8pm–12am	10	10
Sat	12am–4am			Sat	12am–4am	10	10
	4am–8am	10	10		4am–8am		
	8am–2pm	15	15		8am–2pm	15	15
	2pm–8pm	15	15		2pm–8pm	15	15
	8pm–12am	10	10		8pm–12am	10	10
Sun	12am–4am	10	10	Sun	12am–4am		
	4am–8am				4am–8am	10	10
	8am–2pm	15	15		8am–2pm	15	15
	2pm–8pm	15	15		2pm–8pm	15	15
	8pm–12am	10	10		8pm–12am	10	10

PART 2: APPENDIX B

WEIGHTING

To calculate the weights, each day was split into 12 two-hour slots. Therefore, in the data there are potentially two (MSA A and MSA B, i.e. north and south, and MSA J and MSA K, i.e. north and south) by two by seven (Monday to Sunday) by two (two weeks of interviews) by 12 (two-hour slots) slots. Many have no information as interviews were not attempted in all slots. When interviews were taking place, the interviewers collected basic flow data in short time intervals throughout the two-hour period by counting customers as they left the MSA. While only an approximate measure, the interviewers could not distinguish between drivers and passengers, it does give us an idea of when the MSAs were particularly busy and when they were quiet. Therefore, the first stage of the weight is defined as:

$$w_1 = \frac{\text{Average flow in the specific two-hour slot}}{\text{Achieved interviews in the two-hour slot}}$$

What w_1 does is adjust the relative importance of respondents based on whether the achieved number of interviews was high or low relative to the flows at that particular time. At the second stage, w_1 was then adjusted to reflect that some time slots and some days were more represented than others. Therefore the second stage weight is defined as $w_2 = w_1 \times df_{md} \times tf_{mt}$, where df_{md} is the day factor for MSA m (1, 2) and day of the week d (1,. . .,7) defined as:

$$df_{md} = \frac{\text{Total number of time slots on day d at MSA m (48 at A \& B and 42 at J \& K)}}{\text{Number of slots on day d at MSA m with interviews}}$$

and tf_{mt} is time factor for MSA m (1, 2) and time of day t (1,. . .,12) defined as:

$$tf_{mt} = \frac{\text{Total number of time slots at time t and MSA m (28, 14 at J \& K during the night)}}{\text{Number of slots at time t and MSA m with interviews}}$$

What w_2 does is further adjust the relative importance of respondents based on how often the day of the week (or the time of day) is represented in the rotation pattern. At the final stage, w_2 was then scaled to give $w_f = w_2/\sum w_2 \times 2{,}270$ so that the weighted sample size equalled the achieved sample size.

PART 2: APPENDIX C

FOCUS GROUP STUDY

Introduction

This report presents the findings of a focus group discussion undertaken to inform the development of a DfT survey to ascertain the effectiveness of motorways service areas in reducing SRCs.

The focus group was conducted on 22 May 2003 at the University of Southampton. There were eight participants who were recruited using a telephone sift which aimed to identify people who drove regularly on motorways and a mix of ages and genders. The participants were taken through a question route that was developed to reflect the broad objectives of the DfT project and to inform the strategy of the optimal data collection location for the subsequent questionnaire survey. The questionnaire covered five broad areas: use of MSAs; experience and views on driving when tired; decision to use MSAs; public awareness of Government initiatives to reduce fatigue-related traffic accidents; and views on the preferred location at MSAs for participation in a Government survey on driver tiredness.

The next section presents the analysis of the focus group discussion transcript and is presented under the five broad headings described above.

Use of MSAs

1. Participants' use of MSAs varied between every day, every other day – several times a week, once or twice a month and not at all.

2. Participants stopped at MSAs for a variety of reasons. Some participants said they stopped at MSAs to buy the newspaper, a drink and/or a snack. A couple of participants also said that they used MSAs to meet people as part of their work. A couple of participants said they stopped at MSAs to eat sandwiches that they had prepared at home, but that they did not use the facilities of the MSAs, except perhaps the toilet. Two female participants said that they stopped at MSAs if they were tired as they felt it was a safe place to stop. In contrast, male participants said that they would not necessarily stop at an MSA if they felt tired. Only one participant stopped at an MSA to purchase petrol. All the participants said that they had at some time or other stopped at an MSA simply to use the toilets and had then continued on their journey.

3a. Participants gave a number of reasons as to what they liked about MSAs. These included the fact that MSAs were often open 24 hours a day, that you could find everything you wanted in one place, and that they were reliable and clean. As one informant highlighted:

> *"I normally go there for a purpose – to get that drink, to get that meal or to go to the toilet and they always serve that purpose. They might not be luxurious or cheap, but you always know that you get what you want when you stop there."*

Female participants mentioned safety as their main reason for stopping at an MSA, as one informant highlighted:

> *"I think it's the safety angle. You know that you can just stop, get out of the car and stretch your legs – but that there are lots of other people around."*

Safety was also mentioned by one male participant as being a contributory factor to his use of MSAs.

3b. The aspects of MSAs that participants disliked were the high price of food and beverages purchased from either the shop, café or restaurant; poor customer service, particularly in the restaurant; and the high price of petrol.

4. Overall most of the participants felt that the facilities were adequate for their needs, although a number of participants felt that MSAs were not places where one felt encouraged to relax – rather one pulled over for a purpose and left again.

5. The overwhelming majority of participants said that they would stop at MSAs more often if the prices of food, drink and petrol were more competitive.

Participants also noted that some MSAs were not open 24 hours a day, or that in some the restaurant or shop closed early.

With the exception of only one participant, all participants felt that there were not enough MSAs. A number of informants highlighted that there were large stretches of motorway with no services. Participants felt that the lack of MSAs was a contributory factor in them, at times, driving while tired, as highlighted by the following quote: *"I go past a sign for a MSA and then see a sign that says the next one isn't for 25–30 miles up the road. I didn't feel tired but 15 minutes later I did and I found it a struggle to get to the next one."*

This point was repeated by a female participant: *"There should be more – you can't tell when you're going to feel tired can you and I wouldn't stop anywhere else – so you end up putting yourself at risk by continuing to drive when you feel tired."*

6. For those participants who used MSAs less frequently, their reasons were due to the high price of petrol and the pressure from employers to meet scheduled appointments. It should be noted that many of the participants felt under pressure to meet work-related commitments and, as a result, took less breaks than they felt they should when driving. The following quotes emphasise these points:

> *"I don't have time. I'm under real pressure from my employer to meet deadlines, make appointments. Also MSAs are expensive and I'm not given adequate expenses to cover regular use of MSAs."*

> *"In the past I used to stop at MSAs, but I've found that petrol's cheaper at Sainsbury's so it's more cost-effective to get it on the way home. Sandwiches, I tend to make my own – I tend to find they're a bit more expensive at MSAs and those are probably the reasons why I don't stop."*

7. Overall, participants agreed that they would use MSAs more often if there were more of them, if their prices were cheaper, and if the quality of the restaurant facilities and customer service was improved.

Many of the participants also said that they would be much more inclined to use MSAs if there was somewhere that they could relax and eat their own sandwiches, without necessarily feeling that they had to purchase something from the MSA. In addition, participants also felt that the cheaper petrol that was now available at supermarkets had changed their use of MSAs in recent years. A number of participants said that if MSAs provided cheaper petrol they would be more inclined to fill up with petrol at an MSA and, as a result, would also stop to take a break. This point is highlighted by the following quote:

> *"If petrol was cheaper at MSAs you'd just say – oh I feel a bit tired or I'm a bit low on petrol, I'll stop and take a break, but people don't bother now they just keep pushing themselves. You say to yourself oh, I might as well carry on to my destination and fill up later."*

8. Participants said that their use of MSAs varied depending on whether they were driving for business or pleasure. Participants noted, for example, that they stopped at MSAs more frequently if they were travelling for pleasure and with family or friends as opposed to if they were travelling unaccompanied and on a work-related journey. All participants observed that they felt considerably less tired when driving if they took more breaks and if they were accompanied. The following quotes highlight these points:

> *"On a work related trip I might not even stop at all – but if I'm driving for pleasure, if I'm doing a long trip I might stop at least once – I find this much less stressful, I feel much less tired. If I'm on my own with work I get pent-up and drive through the tiredness and stress."*

"I stop much more if I'm with the family. . . with the children. We take our own food but we still stop and I feel much better."

The type of facilities used at MSAs by participants did not tend to vary if they were driving for business or pleasure, although many of the participants commented on how they tended to stop at MSAs for much longer if they were travelling on a non-work related journey.

Experience and views on driving when tired

1. Many of the participants said that they had, at some time or other, driven when feeling tired. Around half the participants said that they drove when feeling tired on a regular basis, i.e. a couple of times a week. This is highlighted below:

"I do feel tired when I'm driving. It's that little nod – that you think oops. That split second when you realize you're going to fall asleep."

"I often feel very tired – but because of the pressure I'm under with work I drag myself through it. I drive for long stretches feeling very tired."

In contrast, another participant noted that they never felt tired when driving and attributed this mainly to the fact that their work schedule rarely required them to drive for more than one and a half to two hours without stopping. Conversely, this same participant noted that when driving for pleasure, they tended to drive for much longer periods without a break simply because they were eager to arrive at their destination.

Many of the participants noted that they felt much less tired when driving if they were accompanied, as highlighted below:

"It's worse if you are not with a work colleague. You just push yourself because you want to get there or you just want to get home at a reasonable time."

"I feel more tired if I haven't got the kids with me or if I'm on my own in the car."

2. Participants noted a number of reasons which they felt contributed to feeling tired while driving. A number of participants said that boredom, the monotony of motorway driving and the length of the journey contributed to them feeling tired. Participants also mentioned bad weather and night-time driving as contributing to them feeling tired. A couple of participants also said that they felt that the time their journey started made a difference to how tired they might feel. If, for example, their journey had started earlier than usual.

Participants also mentioned the time of day as affecting how they felt when driving. A number of participants said that they felt much more tired when driving in the afternoons than in the morning. The time most frequently mentioned by participants was around 4pm.

Individual responses regarding factors contributing to tiredness included lack of sleep the night before, age and the day of the week. The following quote embraces a number of the above points:

> *"It depends on the circumstances I think. Depends on how long you're driving – if you've had a hectic week already. If you've been out the night before. If you've got a hangover. In normal circumstances you're alright – its just everything that adds on top of it that makes it worse."*

3. None of the participants said that they thought about or planned the amount of sleep they had before driving. Participants also said that they did not alter the amount of sleep they had depending on the duration of particular journeys. A number of reasons were given, as highlighted below:

> *"I think you become hardened to it, don't you."*

> *"I think you feel confident that you can get up in the morning and get going – you might start to feel a bit ropey sort of mid-afternoon and then if you do I tend to sort of get that little nodding feeling on a long stretch of road. If I do, I might pull in and see if I can have 10 minutes. It doesn't sort of work out that way because I'm a light sleeper anyway and so any sort of background noise will wake me up."*

One participant commented that if they were going on a long journey they did not go to bed earlier the night before, rather they compensated by sleeping longer the following evening.

4. All the participants felt that the frequency with which people put themselves and others at risk when driving was high. A number of participants drew on their own personal experiences to highlight this point:

> *"I know I've driven when I shouldn't have – but there hasn't been anywhere available. At times I've been really tired and thought shall I pull over – but there's been no service station and I don't know where I am and you don't know who's around."*

> *"It's not so bad for a chap to pull over on the side of the road on his own for 10 minutes – but I wouldn't feel comfortable as a woman doing that. If there was a service station I would feel inclined to pull over. Motorway*

service stations make me feel safe, they're well lit, there's plenty of people and a lot of them have CCTV."

"Yes, I've often put myself and others at risk – because at the end of the day you just want to get to where you're going. You don't want to necessarily take a break."

One participant said that they had felt so tired on a journey that they had started to hallucinate.

A number of participants, both male and female, said that they often did not have a choice as to whether they could stop if they felt tired. The reasons given were pressure from employers to make appointments and meet deadlines. Others said that the amount of hours that they had to drive on a daily basis meant that they often did not have time to recover from day to day.

5. None of the participants knew what percentage of road accidents was caused by tiredness, but they all thought it was probably quite high, although at times probably quite difficult to prove. Many of the participants said that driver tiredness was not a subject that they heard or read much about, except if there was an incident which was reported on the news.

Decision to use MSAs

1. While the overwhelming majority of participants agreed that it was important to stop on long journeys – several admitted that they often did not stop for the reasons highlighted above. Others said that they felt there was no set rule and that it was down to one's *"own judgement on that day"*.

2. The general consensus was that people should not drive for longer than one and a half to two hours before stopping. However, a number of participants commented that this might vary depending on the length of the journey and the number of appointments they had to make for work. A female participant added that she often drove for longer than this due to a lack of MSAs to stop at.

3. Participants said that they tended not to plan breaks before starting their journey, although many of the participants said that they planned the first break. Participants reported that subsequent breaks tended to be dictated by how they were doing in terms of meeting work schedules and if they had been held up in traffic, for example. Participants added that it was these type of factors that then placed them at risk. This is highlighted by the following quote:

"You definitely plan the first one and then the rest of it falls in around it, you know, how busy the traffic is – how late you've been made – then you try and play catch up then – that's probably when it gets a bit dangerous."

One participant noted that they always tried to leave before the traffic started to build up in the morning so that they always knew where they were going to stop for their first break. A number of participants said that they did not plan their breaks but that this often resulted in them putting themselves and others at risk. This is highlighted below:

> *"I was late anyway and I thought I won't stop at a MSA even though I felt really I ought to. I didn't and I really regretted it. I ended up having to pull off just on some junction because I was so tired and I really thought I was going to fall asleep. . . . . "*

A couple of female participants said that they felt the lack of MSAs made it difficult for them to plan breaks. These participants said that it was difficult to predict when one might feel tired – *"you can think your alright – then even 10–15 minutes later you can't keep your eyes open"* – but that when they did there was not always a service area to pull in at and, for reasons of safety, they were not prepared to pull in anywhere else.

4. The average length of time that participants were prepared to drive before stopping for a break varied. Most of the participants said that they tried to stop after about one and a half to two hours. Some of the participants said that they did not really plan when to stop and a number said that their pattern of stopping for breaks was variable. A couple of participants said that they tried not to stop – even though they knew that they should. The reasons given for not stopping were pressure of work and wanting to arrive at their destination at a certain time and not wanting to be flexible over this.

5. All of the participants agreed that they felt much better after they had stopped, although a number of participants added that this did also depend on how long the break had been.

6. Regarding the length of time that participants stopped for a break on a journey – responses tended to cluster around pressure of work to make meetings, as highlighted below:

> *"It depends on how long you've got before the next job. If it's pleasure you tend to take your time – if it's business it's usually rush in – get what you need and rush out."*

Public awareness of Government initiatives to reduce SRCs

1. None of the participants were really aware of any Government initiatives to try and reduce SRCs. One participant recalled that they thought they might have seen

something on the television some while ago and another mentioned seeing flashing lights over the motorway which they thought might have been part of a Government campaign to create awareness as to the dangers of driving when tired.

2. A number of participants recalled having seen the motorway signage *'Tiredness Kills – Take a Break*'.

These participants felt that *'Tiredness Kills – Take a Break*' signs definitely prompted one to stop at an MSA – particularly if you were starting to feel tired anyway. In contrast, other participants said that their pattern of driving and of taking breaks had not really changed over the years despite the fact that they were aware of a number of sleep-related accidents that had been reported in the news, such as the Selby rail crash.

3. All of the participants said that they would like to see high-profile Government initiatives to reduce SRCs. Participants felt that any initiatives should be hard hitting in order to make an impact, and a number of participants cited the Government's *'Don't Drink and Drive'* campaign as being an example of a successful initiative and of a message which had stuck in people's minds.

4. As mentioned above, participants were not aware of the percentage of traffic accidents caused by driver tiredness, but many of the participants said that these statistics should be built into any advertising campaign in order to raise public awareness as to the extent of the risk.

5. The overwhelming majority of participants felt that Government or corporate guidelines should be issued which informed people as to a) the signs of tiredness so that drivers might take punitive action, b) the ideal time one should drive before taking a break, and c) actions which drivers might take to help reduce their risk of tiredness when driving.

6. Participants felt extremely strongly about the need for the Government to involve employers in reducing the risk to employees of SRCs. Many of the participants felt that their employers were not doing enough to minimise the risk to employees of having SRCs. Again, many of the participants said that they felt pressurised by employers to meet increasing numbers of appointments in a working day and, as a result, a number of participants noted that they were driving for longer without a break in order to try and meet these demands. This point is highlighted by the following informant:

> *"Employers are pushing you to drive longer or in your own time – which isn't necessarily what people are going to do so they'll not take a break so that they're not working in their own time."*

All the participants said that they would welcome and adhere to corporate guidelines regarding driving and the dangers of driving while tired.

Views on the preferred location at MSAs for participation in the survey on driver tiredness

Participants were asked where at a service station they would be most inclined to participate in a Government survey.

None of the participants said that they would agree to be interviewed when they were going into an MSA.

A number of the participants said that they would prefer to be interviewed while having a coffee or eating a sandwich in the restaurant. Another participant suggested that questionnaires could be left on tables in the café/restaurant for customers to complete. A number of participants said that they would be happy to be interviewed in the shop or in the foyer area. Two participants said that they would not mind be interviewed while filling up with petrol.

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