

Goods Vehicle Compliance and Condition 2005 Northern Ireland

Prepared by the Operational Research Unit
for the Driver and Vehicle Testing Agency



Department for
Transport



GOVERNMENT OPERATIONAL RESEARCH SERVICE

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1. Management Summary

1.1. Introduction

In June and July 2005, 880 heavy goods vehicles (HGVs) and 415 trailers were stopped by officers of the Driver and Vehicle Testing Agency (DVTA) in Northern Ireland and checked for roadworthiness defects and traffic offences. The checks were carried out on randomly selected vehicles at randomly selected roadside check sites across the whole Northern Ireland road network.

The Operational Research Unit (ORU) in the Department for Transport (DfT) developed the methodology used for these random checks, and analysed the information resulting from the checks. The results and analysis are contained in this report.

All HGVs on the road in Northern Ireland at the times of the check were eligible to be stopped and checked at the roadside. This included HGVs not registered in Northern Ireland.

This report is based on a sample of HGVs. A different sample of HGVs may produce slightly different results. Confidence intervals are given on results from a sample, and indicate the range of expected values. 95% confidence intervals have been used here, showing the range of values expected in 95% of samples.

1.2. Overall Level of Non-Compliance

Of the 880 HGVs checked, 508 had at least one roadworthiness defect or were committing at least one traffic offence (57.7%). This was broken down into 47 checks resulting in a prohibition and RE1¹ (5.3%), 68 checks resulting in an RE1 but no prohibition (7.7%), 137 resulting in a prohibition but no RE1 (15.6%) and 256 resulting in a verbal warning (29.1%).

Note that the results of checks are reported here at the highest severity of penalty. For example, if a vehicle received an RE1 for one offence and a prohibition or verbal warning for another, then it was categorised overall as having an RE1.

The overall non-compliance rate for all severities and all types of offences or defects was 57.7%, in a 95% confidence interval between 52.7% and 62.7%. The overall non-compliance rate for roadworthiness defects and traffic offences for prohibitions or prosecutions was 28.6%, in a 95% confidence interval between 24.0% and 33.2%.

1.3. Roadworthiness Non-Compliance

Of the 880 HGVs checked, 388 had a roadworthiness defect on **either the motor or trailer** (44.1%). Of these 388,

- 10 checks resulted in a prohibition and RE1 (1.1% of all 880 HGVs checked)
- 166 resulted in a prohibition (18.9% of all checks), and
- 212 resulted in a verbal warning (24.1% of all checks).

61 of the 176 prohibitions were issued with immediate effect (6.9% of all 880 checks) and 115 had delayed effect (13.1% of all checks).

Of the 880 HGVs checked, 359 had a roadworthiness defect on the **motor vehicle** (40.8%). Of these 359,

¹ An RE1 is the form completed when a driver is reported for prosecution

- 156 checks resulted in a prohibition or RE1 (17.7% of all 880 checks), and
- 203 resulting in a verbal warning (23.1% of all checks).

50 of the 156 prohibitions were issued with immediate effect (5.7% of all checks) and 106 had delayed effect (12.0% of all checks).

Of the 415 trailers checked, 60 had a roadworthiness defect on the **trailer** (14.5%). Of these 60,

- 35 checks resulted in a prohibition or RE1 (8.4% of all 415 trailers checked), and
- 25 resulted in a verbal warning (6.0% of all trailer checks).

15 of the 35 prohibitions were issued with immediate effect (3.6% of all trailer checks) and 20 had delayed effect (4.8% of all trailer checks).

A total of 10 checks resulted in an RE1 being issued, of which six resulted in a prosecution. Three of the prosecutions were for vehicle defects only, two were for trailer defects only and one was for a check where both vehicle and trailer had a serious defect.

The overall defect rate for **vehicle roadworthiness** was 40.8%, in a 95% confidence range of 35.8% to 45.8%. The overall rate of prohibitable or prosecutable vehicle roadworthiness defects was 17.7%, in a 95% confidence interval of 13.9% to 21.5%.

The overall defect rate for **trailer roadworthiness** was 14.5%, in a 95% confidence range of 9.5% to 19.5%. The overall rate of prohibitable or prosecutable trailer roadworthiness defects was 8.4%, in a 95% confidence range of 4.5% to 12.3%.

1.4. Other Offences and Traffic Regulation Non-Compliance

281 HGVs committed one or more other offences (31.9%). Of these,

- 5 resulted in an RE1 and a prohibition (0.6% of all 880 HGVs checked),
- 108 resulted in an RE1 but no prohibition (12.3% of all checks),
- 21 resulted in a prohibition but no RE1 (2.4% of all checks), and
- 147 resulted in a verbal warning (16.7% of all checks).

The most common offences were tachograph offences (12.6% of checks resulted in at least a verbal warning for a tachograph offence). Drivers' hours offences were the second most common offence (5.5% of checks resulted in at least a verbal warning).

113 checks resulted in at least one RE1 being issued for other offences. More than one RE1 was issued in some checks, resulting in a total of 158 RE1s issued. 72 of the checks resulted in a prosecution for at least one of their RE1s (63.7%). Of all 158 RE1s issued, 90 resulted in a prosecution (57.0%).

The overall rate for all severities of offences was 31.9%, in a 95% confidence range of 27.2% to 36.6%. The overall rate for prohibitable or prosecutable offences was 15.2% in a 95% confidence range of 11.6% to 18.8%.

1.5. Other Findings

1.5.1. Effect of Vehicle and Location Factors on Roadworthiness

Factors which appeared to have a relationship with roadworthiness defect rates are shown below. Factors in brackets did not have a significant effect on the overall

defect rate, but were linked to the severity of the penalty, or the number of defects per vehicle or per offending vehicle.

Factors linked to lower vehicle defect rate

- Newer vehicles
- (Republic of Ireland vehicles)
- Saturday checks
- Night checks
- (Morning checks)
- Checks in Londonderry
- (Checks in Fermanagh)
- (Three-axle vehicles)

Factors linked to higher vehicle defect rate

- Old vehicles
- (Northern Ireland vehicles)
- Friday checks
- (Monday checks)
- (Afternoon checks)
- Checks in Armagh
- (Checks in Londonderry)
- (Rigid vehicles)
- (Vehicles weighing under 10,000kg)
- (Tipper HGVs)
- Over a year since last annual test
- (9-12 months since last annual test)

There were relatively few checks on trailers, and therefore it was not possible to draw many statistically sound conclusions about the relationship between different trailer and location factors and trailer defect rates. The links which were statistically significant are shown below. Those in brackets did not have a significant effect on the overall defect rate, but were linked to the severity of penalty or number of defects per vehicle or per offending vehicle.

Factors linked to lower trailer defect rate

Factors linked to higher trailer defect rate

- (Northern Ireland trailers)
- Trailers pulled by Tipper HGVs

1.5.2. Effect of Vehicle and Location Factors on Other Offence Rates

Factors which appeared to have a relationship with other offence rates are shown below. Factors in brackets did not have a significant effect on the overall offence rate, but were linked to the severity of penalty or the number of offences per vehicle or per offending vehicle.

Factors linked to lower offence rate

- Newer vehicles
- Friday checks
- Vehicles operating their own account
- Checks in Antrim
- Checks in Belfast
- Max weight under 38,000kg
- (Max weight 10,000-19,000kg)
- Tankers

Factors linked to higher offence rate

- (Older vehicles)
- Wednesday checks
- Thursday checks
- (Afternoon checks)
- Hire and reward vehicles
- Checks in Down
- Checks in Fermanagh
- Max weight 38,000kg and over
- (Max weight 38,000-40,999kg)
- (Tippers)

1.5.3. Comparison with GB HGV Checks

The full differences between the GB and NI surveys are set out in section 4. In summary, the checks in Northern Ireland revealed significantly more vehicle defects (40.8% compared to 22.1%), significantly fewer trailer defects (14.5% compared to 18.9%) and significantly more offences (31.9% compared to 18.5%) than the GB survey. The difference between the vehicle defect rates and offence rates was statistically much larger than the difference in trailer defect rates. It is not possible to compare the proportion of checks without either a roadworthiness defect or an offence as this was not reported on in the GB survey. A comparison with the results from each of the eight GB traffic areas showed the same pattern as the GB survey average, but with some GB traffic areas having results which were not significantly different to Northern Ireland results.

2. Introduction

2.1. Background and Methodology

In June and July 2005, 880 heavy goods vehicles (HGVs) and 415 trailers travelling on Northern Ireland roads were stopped and checked by officers of the Driver and Vehicle Testing Agency (DVTA) for roadworthiness defects and traffic offences. The checks were carried out on randomly selected vehicles at randomly selected roadside check sites across the whole Northern Ireland road network.

The checks carried out in June and July 2005 were the first such random checks conducted by DVTA, and aimed to

- establish a baseline of non-compliance and roadworthiness, for benchmarking both within DVTA and also across similar organisations such as the Vehicle and Operator services Agency (VOSA) in Great Britain, and
- produce evidence for targeting specific vehicles and types of operations.

The Operational Research Unit (ORU) in the Department for Transport (DfT) developed the methodology used for these random checks, and analysed the information resulting from the checks.

The methodology used in these checks is based on that used by ORU and VOSA to develop a series of random checks on HGVs and other vehicles in Great Britain. It was designed to provide a statistically robust yet practical and repeatable process for assessing baseline roadworthiness and non-compliance levels. The methodology for these checks is described in Annex A.

All HGVs on the road in Northern Ireland at the times of the check were eligible to be stopped and checked at the roadside. This included non-Northern Ireland registered HGVs. In particular it was expected that there would be a reasonably high proportion of HGVs from the Republic of Ireland and from Great Britain.

The information in this report is based on forms completed at the roadside by DVTA examiners carrying out the checks. In some cases the forms were unable to be completed fully; where this has happened the relevant information was recorded as "not known" or "no response" and these responses were excluded from analysis.

Analysis of the information collected at the roadside was carried out and the results are presented in section 3 of this report. Some of the analysis focuses on compliance and roadworthiness for different types of vehicles or HGV operations. Wherever a difference in results for different types of vehicle or operations is said to be "statistically significant" it means that it can be said with 95% confidence that the difference is not due to random sampling variation. Details about the accuracy of the results are in Annex B.

In some cases, particular categories of vehicles may be in a statistically worse or better condition than vehicles in other categories, despite this being unclear from the graphs. In other cases there may be no statistically significant difference, in contradiction to what appears to be the case from the figures and graphs. This is due to sampling sizes; low numbers of vehicles in a particular category can appear to distort the results, and low numbers of vehicles can also prevent statistically valid conclusions being drawn from the results.

In this report, percentages may not add up to exactly 100% due to rounding.

2.2. Definitions

2.2.1. General definitions

In this report, the term 'defect' refers to a motor vehicle or trailer roadworthiness defect. The term 'offence' refers to a traffic offence. 'Non-compliance' refers to either a defect being present or an offence having been committed (or both).

Where it is stated in the report that there was no difference in defect rates (or offence rates) and there is no mention of severity or number of defects (or offences) then there was also no significant difference in either the severity or number of defects (or offences) between the different factors being considered.

For all types of offences and roadworthiness defects where more than one offence or defect was discovered, the severity of the action taken was assumed to be at the highest level, e.g. if both an immediate and a delayed prohibition was given, then the vehicle was considered to have been prohibited from further use with immediate effect.

In this report, the variables that might affect compliance rates have been referred to as factors. Each factor has several parts, and these have been referred to as categories.

2.2.2. Roadworthiness definitions

In the analysis of roadworthiness defects the following categories of offence have been used (in order of decreasing severity):

- Reported for prosecution (RE1 completed)
- Immediate prohibition
- Delayed prohibition
- Verbal warning - given where advisory items of minor defects were found which were not serious enough to warrant prohibition.

When an RE1 was completed for a roadworthiness defect the driver or operator were reported for prosecution. The results of whether or not they were prosecuted in these cases are set out in section 3.3.

The term defect rate refers to the proportion of motor vehicles (or trailers) checked that had a defect – whether it resulted in a verbal warning, prohibition or prosecution. The severity of defects refers to whether the defects found resulted in a verbal warning or prohibition.

It was possible for a motor vehicle or trailer to receive a prohibition or verbal warning for more than one defect. The average number of defects per vehicle refers to the number of individual defects recorded per check. Note that the type of defect was only recorded for prohibitable offences, so the number of defects refers to the number of prohibitable defects. The average number of defects per offending vehicle was also used in the analysis, and refers to the average number of prohibitable defects found on just those vehicles that had a defect. The most common defects found on all vehicles has also been reported for several different factors (the most common defects overall are listed in Table 1 and Table 2 for motor vehicles and Table 5 and Table 6 for trailers. The frequency of all defects is listed in Annex D).

An IM number is an identifier to signify which part of a vehicle or trailer had a defect. The full list of IM numbers with definitions showing what type of defect it refers to can be found on page 64 in section D1 (in the separate Annex file). During this survey IM

numbers were recorded for prohibitable defects only. If a vehicle had two or more defects of the same type (e.g. two defective lamps) then the corresponding IM number was recorded once for each defect found. In one instance the lamps identifier (IM number 63) was recorded six times under the motor vehicle section for a single check, meaning there were six different defective lights on that motor vehicle.

2.2.3. Offences definitions

For offences, the following categories of offence have been used (in order of decreasing severity):

- Reported for prosecution (RE1 completed)
- Prohibition
- Verbal warning

When an RE1 was completed for a traffic or other offence, the driver or operator were reported for prosecution. The results of whether or not they were prosecuted in these cases are set out in section 3.5.

It was possible for a check on a vehicle and its driver to result in an offence in more than one category of offence. Therefore in addition to the measures above, the analysis also covered the number of offences per vehicle, and the most common offences (the most common offences are covered in Annex D).

The offence rate refers to the proportion of vehicles committing a traffic offence (whether this resulted in verbal warning, prohibition or RE1). The severity of offences refers to whether an offence found resulted in a verbal warning, or prohibition and/or RE1. The number of offences per vehicle and offences per offending vehicle refer to the number of traffic offences discovered that resulted in at least a verbal warning.

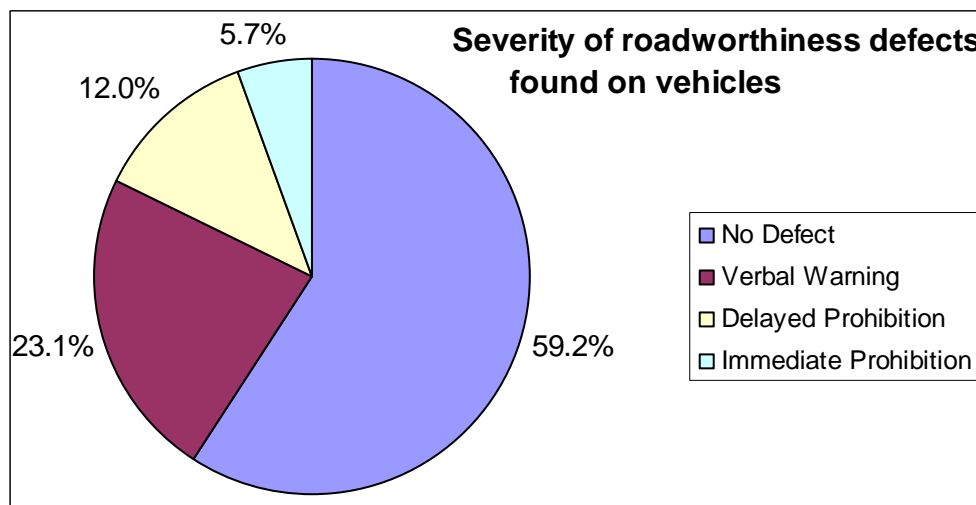
3. Results and Analysis

3.1. Motor vehicle Roadworthiness

3.1.1. Headline Results

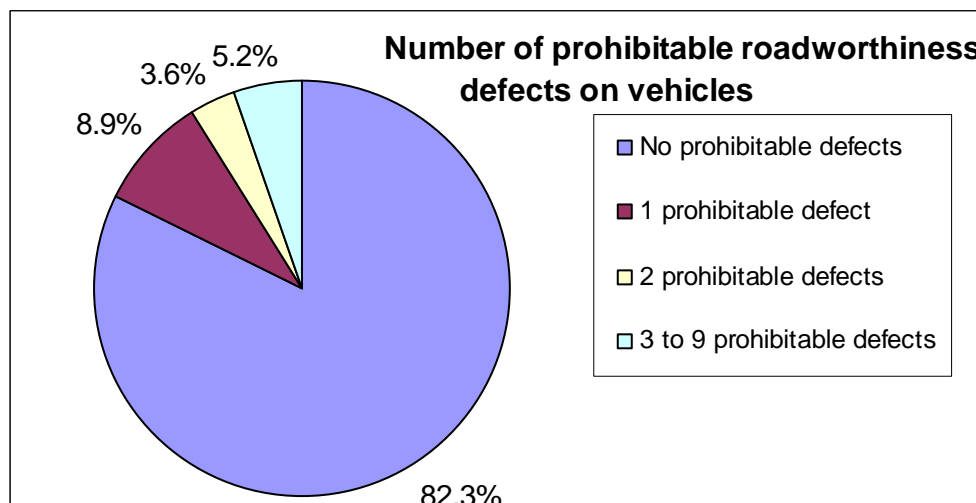
Of the 880 vehicles checked, 156 received a prohibition for one or more roadworthiness defects (17.7%). 12.0% received a delayed prohibition and 5.7% received an immediate prohibition. In addition, 23.1% of drivers or operators of vehicles checked received a verbal warning (Figure 1). Overall, 359 vehicles (40.8%) had some type of vehicle roadworthiness defect, whether a minor one resulting in a verbal warning or a more serious defect resulting in a prohibition. The tables containing these results can be found in section D1 (in the separate Annex file) on page 63.

Figure 1



Approximately half of prohibitions were issued for only one roadworthiness defect (8.9% of all checks). The incidence of multiple roadworthiness defects was less common, as shown in Figure 2.

Figure 2



The most common roadworthiness defects, for immediate and delayed prohibitions, are shown in Table 1 and Table 2.

Table 1

IM No	Immediately prohibitable defect type	Occurrences
8	Condition of Tyres	23
59	Brake Systems & Components	8
38	Service Brake Operation	7
11	Vehicle To Trailer Coupling	6
63	Lamps	5

Table 2

IM No	Delayed prohibitable defect type	Occurrences
63	Lamps	53
59	Brake Systems & Components	21
26	Speedometer and Tachograph	16
19	Security of Body	12
48	Suspension	12
22	Mirrors	11
33	Speed Limiter	11
23	Glass & View of Road	10
66	Direction Indicators and Hazard Warning Lamps	10

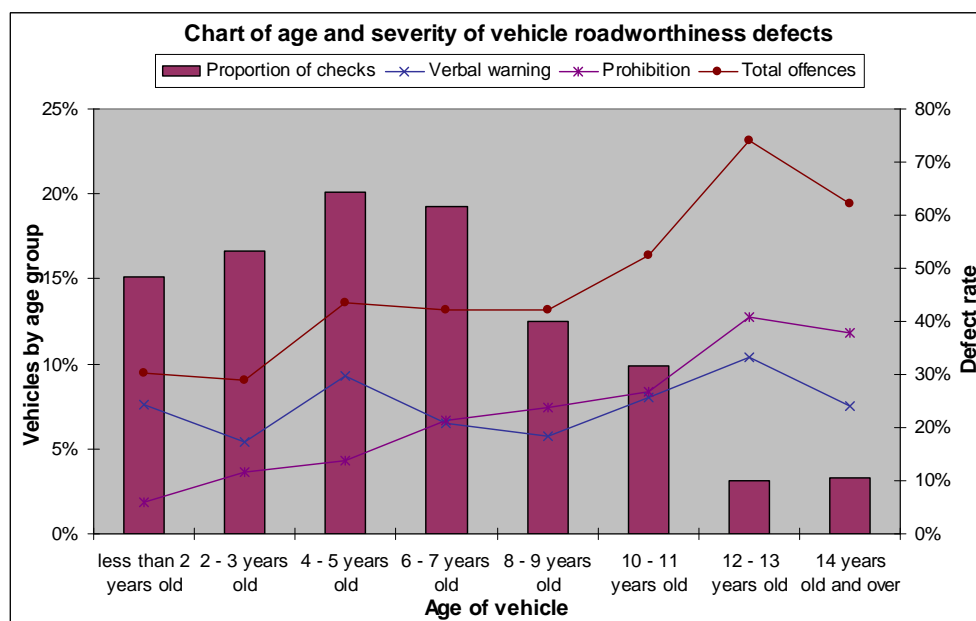
3.1.2. Exploratory Analysis of Motor Vehicle Roadworthiness

3.1.2.1. Age of Motor Vehicle

The 880 vehicles checked included HGVs of different ages, and nine where an age could not be determined. An age could not be calculated for the four vehicles that were not registered in Northern Ireland, Great Britain or Republic of Ireland, and for five registered in Northern Ireland that did not have a date of first registration recorded. The age profile of the vehicles checked is shown in Figure 3, overlaid on the prohibition rates and proportion of verbal warnings for each age group. The tables containing these results can be found in section D2 on page 67.

The results show that newer vehicles were less likely to have a roadworthiness defect. The two lowest age groups (less than two years and two-three years) had significantly lower defect rates than average, and groups 10-11 years old, 12-13 years old and 14 years old & over had significantly higher defect rates. The defects found on newer HGVs also resulted in less severe penalties. Of those vehicles that did have a defect, vehicles aged five years or less had a significantly smaller proportion of prohibitions to verbal warnings than those aged six years or more.

Figure 3



Older vehicles (aged 10 years and over) were significantly more likely to have a higher number of defects per vehicle than newer vehicles (those aged five years and under). Table 3 below sets out the proportion of vehicles that had no defect, one defect, two defects and three or more defects, as well as the average number of defects found both per vehicle checked and per offending vehicle only for these two age groups.

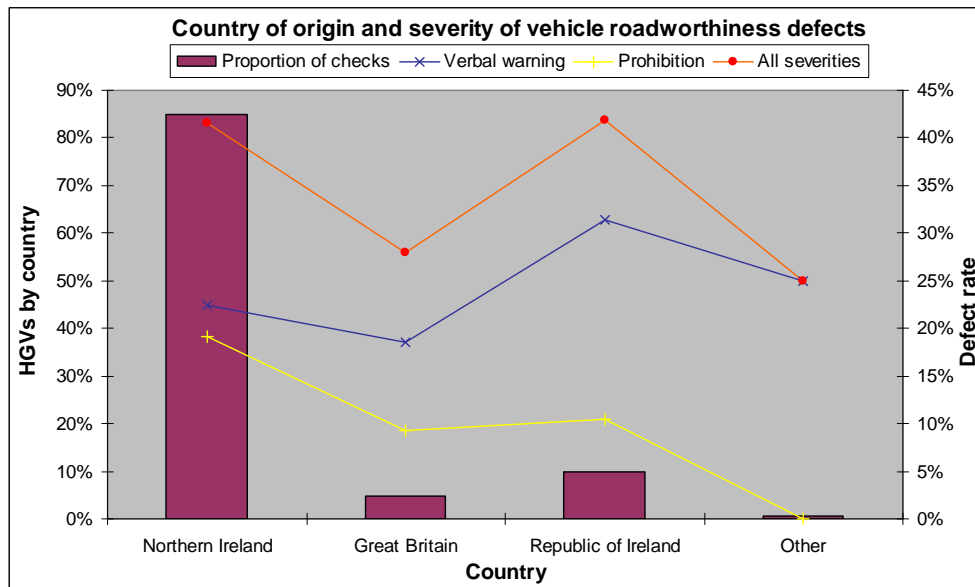
Table 3

Number of defects	Vehicles aged five and under	Vehicles aged 10 and over
No defects	89.2%	68.3%
1 defect	7.3%	4.2%
2 defects	1.3%	10.6%
3 or more defects	2.2%	16.9%
Average number of roadworthiness defects per vehicle checked	0.18	0.98
Average number of roadworthiness defects per offending vehicle	1.63	3.09
Total number in age group	452	142

3.1.2.2. Country of Origin

The majority of the vehicles checked were registered in Northern Ireland (84.9%), with smaller proportions from Great Britain (4.9%), Republic of Ireland (9.8%) and elsewhere (0.45%). The proportion of vehicles from each country is shown in Figure 4, overlaid on the prohibition rates and proportion of verbal warnings for HGVs from each country of origin. The tables containing these results can be found in section D4 on page 69.

Figure 4



Although there appears to be a difference in the defect rate for vehicles originating in different countries, the small number of vehicles from Great Britain and other countries in the sample means that it was not possible to draw statistically sound conclusions about this. However, of only those vehicles that did have a defect, it was significantly more likely to result in a prohibition if the vehicle was from Northern Ireland rather than from Republic of Ireland. Vehicles from Northern Ireland also had significantly more defects per vehicle than those checked from other countries.

3.1.2.3. Road Type

Checks were conducted on a range of road types across Northern Ireland, selected to produce a sample representative of Northern Ireland traffic. Figure 5 shows the distribution of vehicle checks across different road types, and how this compares to the overall distribution of roads across Northern Ireland (based on road length). There were no significant differences between the proportion of roads that were of each type and the proportion of checks in the sample carried out on each road type. Therefore we can say the sample was representative of the whole Northern Ireland road network.

Figure 5

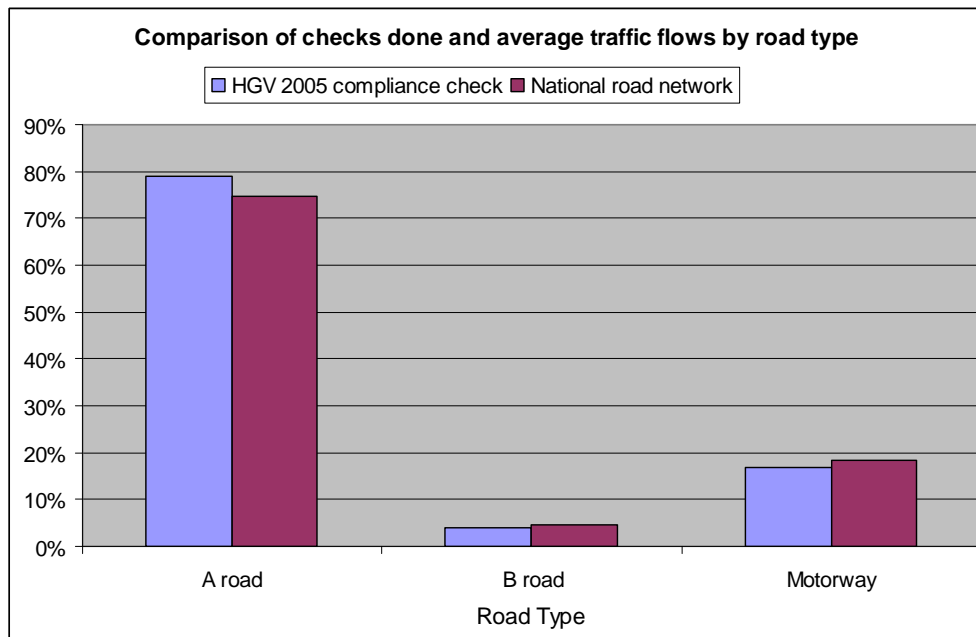
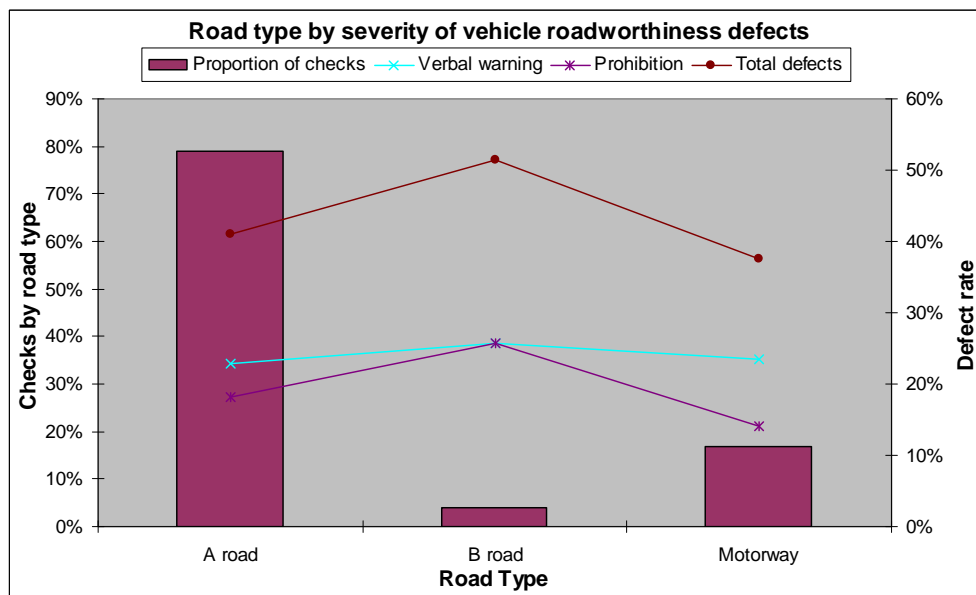


Figure 6 shows the proportion of checks carried out on different road types with the defect rate of vehicles stopped on each type. There were no significant differences in the defect rates of vehicles stopped on different road types. The tables containing these results can be found in section D5 on page 70.

Figure 6



3.1.2.4. Day of the Week

Checks were conducted on different days of the week, with the aim of producing a representative sample of vehicle traffic. No traffic volume information was available for Northern Ireland, so traffic volumes by day of week for Great Britain were used as a proxy for traffic flows in Northern Ireland. Figure 7 shows the distribution of vehicle checks across days of the week, and how this compares to the proportion of GB HGVs travelling on each day of the week. There were no significant differences between the national proportion of HGVs travelling on each day of the week and the

proportion of HGVs surveyed on each day. Therefore we can say the sample was representative of Northern Ireland traffic flows by day (assuming traffic in Northern Ireland follows a similar weekly pattern to that in Great Britain).

Figure 7

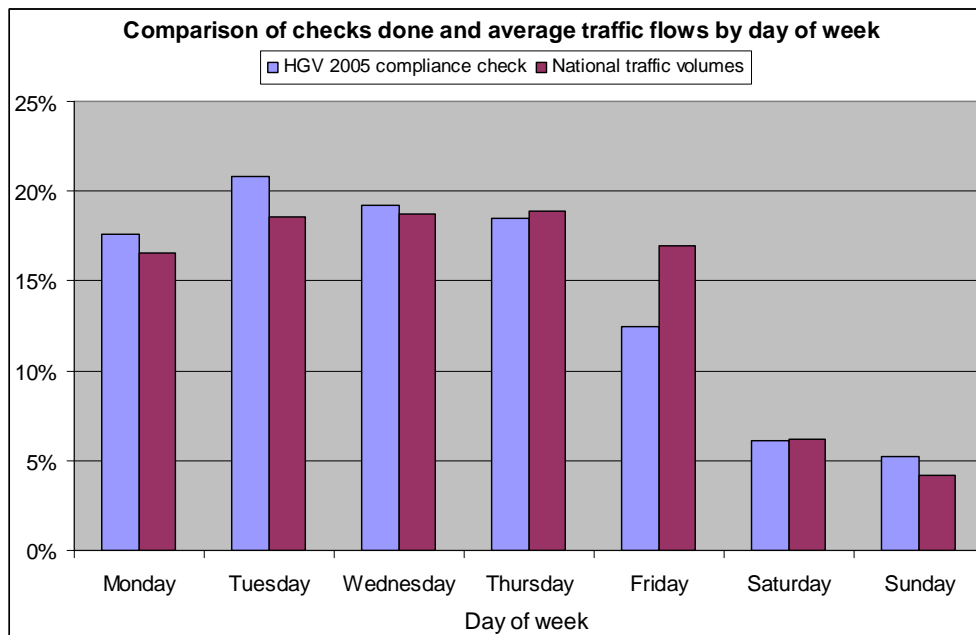
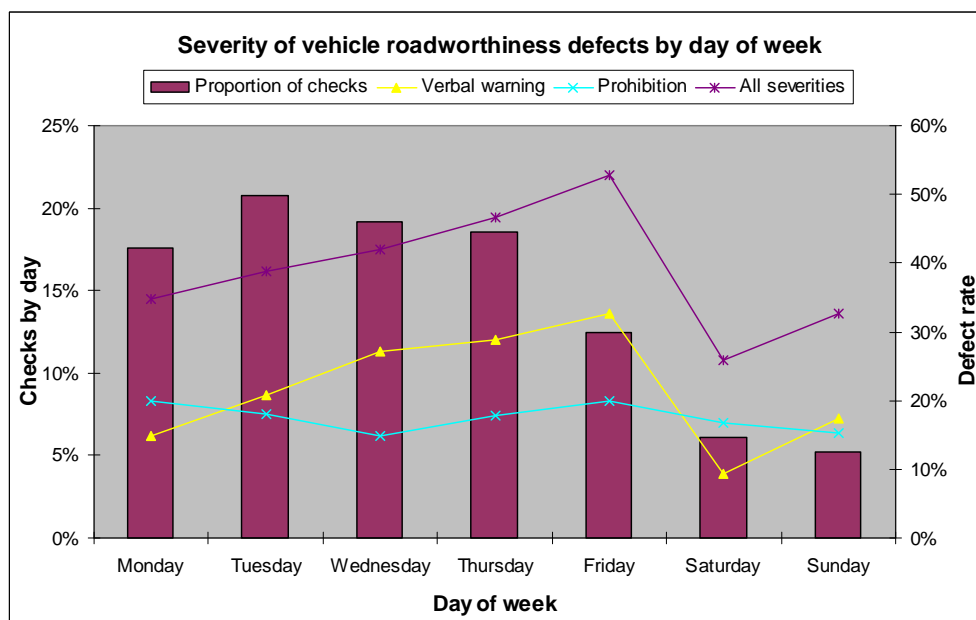


Figure 8 shows the proportion of checks carried out on each day of the week, overlaid on the prohibition rates and proportion of verbal warnings for each day of the week. The tables containing these results can be found in section D6 on page 71.

Figure 8



Analysis shows that Friday had a significantly higher defect rate for all severities of defects than other days of the week, and Saturday had a significantly lower rate. It also shows that of offending vehicles, vehicles checked on Monday were more likely to have a prohibition and less likely to have a verbal warning than vehicles checked on other days of the week. There were no significant differences in the number of defects per vehicle on different days of the week.

3.1.2.5. Time of Day

Checks were conducted at different times of day, with the aim of producing a representative sample of vehicle traffic. No traffic volume information was available for Northern Ireland, so traffic volumes by time of day for Great Britain were used as a proxy for traffic flows in Northern Ireland. Figure 9 shows the distribution of vehicle checks across times of the day, and how this compares to the proportion of GB HGVs travelling at each time of day. The differences seen were significant – more checks were carried out on HGVs travelling in the morning and less at night compared to the national proportion of traffic travelling at these times. Therefore we cannot say the sample was representative of Northern Ireland traffic flows by time of day. This has not had an adverse effect on the accuracy of the results - see Annex B for details.

Figure 9

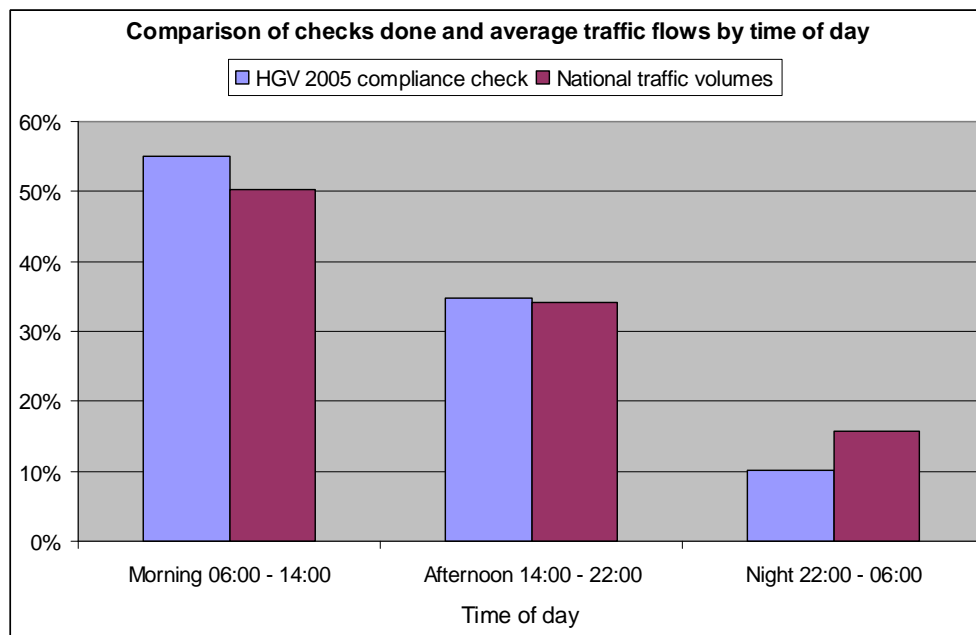
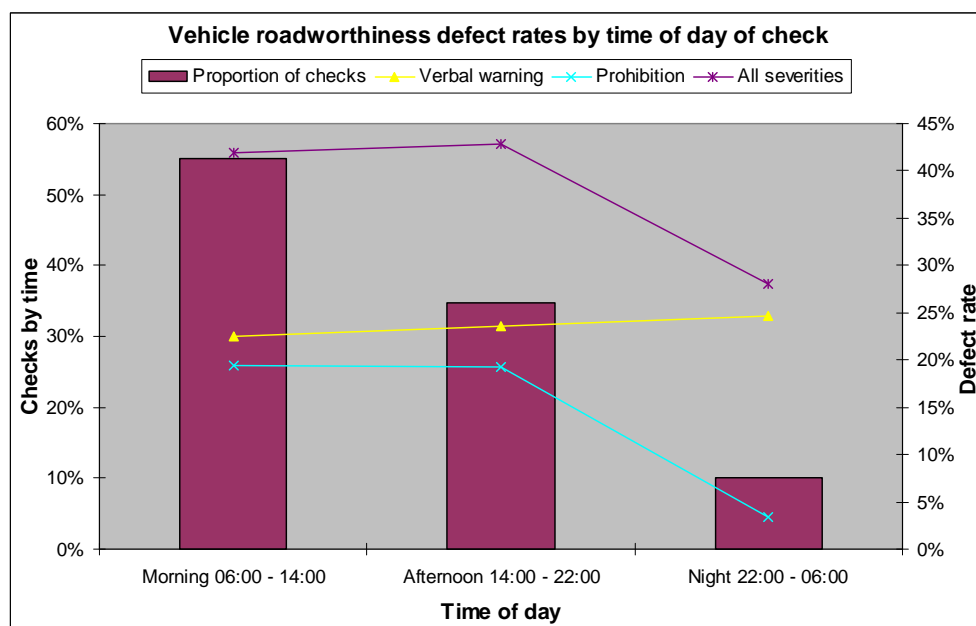


Figure 10 shows the proportion of checks carried out during three different time periods, Morning (06:00 - 14:00), Afternoon (14:00 - 22:00) and Night (22:00 - 06:00). The figure also shows the prohibition rates for each time period and the proportion of verbal warnings. The tables containing these results can be found in section D7 on page 72.

Vehicles checked at night had a significantly lower overall defect rate. There was also a significant difference in number of defects per vehicle with more defects found on vehicles checked in the morning than in the afternoon. Those checked in the morning had 0.46 defects per vehicle and 2.38 defects per offending vehicle. Checks in the afternoon revealed 0.35 defects per vehicle and 1.80 defects per offending vehicle. Due to the small numbers of checks at night it was not possible to test if there was a significant difference in the breakdown or the number of defects per vehicle at night compared to other times of the day.

Figure 10



3.1.2.6. Operating Account Type

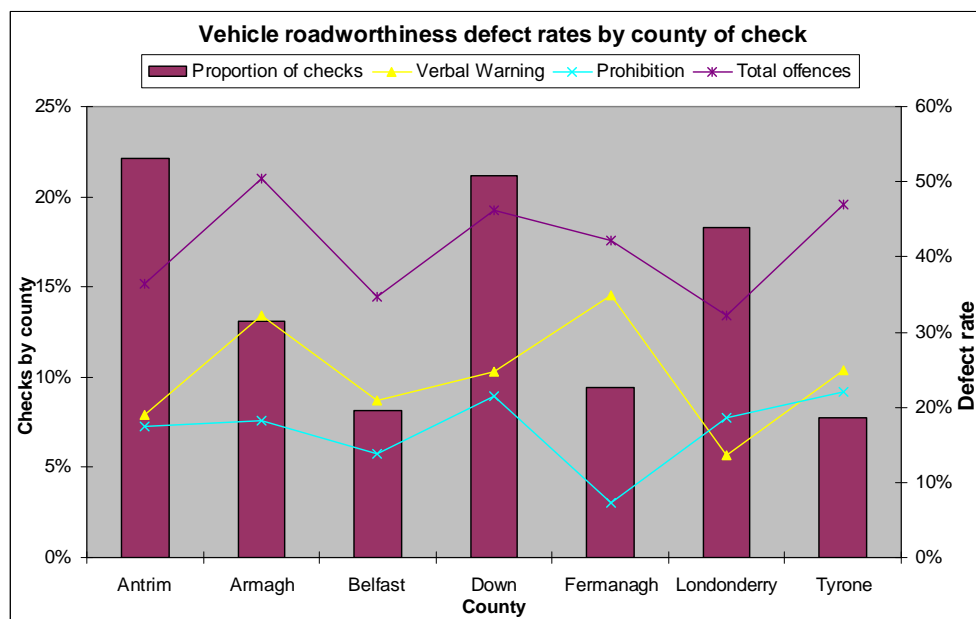
The operating account type could not be determined for 35 vehicles (4.0%). Of the remaining vehicles stopped, 57.2% were operating their own account and 42.8% were operating under hire and reward. There was no significant difference in offence rates for the different types of account, but those operating under their own account had statistically more defects per offending vehicle (2.54 per offending vehicle compared to 1.74 for those operating a hire and reward system). The tables containing these results can be found in section D8 on page 73.

3.1.2.7. Location of Check

Checks were carried out across all counties in Northern Ireland. Figure 11 shows the proportion of checks carried out in each county. The figure also shows the defect rates for each county. The tables containing these results can be found in section D9 on page 75.

Analysis shows that vehicles checked in Armagh were statistically more likely to have a defect than those checked in other counties. Vehicles checked in Londonderry were statistically less likely to have a defect than those in other counties, but the defects that were found on vehicles in Londonderry were significantly more likely to result in a prohibition rather than verbal warning when compared to other counties. Vehicles checked in Fermanagh had a significantly higher rate of verbal warnings and lower rate of prohibitions than average. This balanced out, and vehicles checked in Fermanagh did not have a significantly higher or lower overall defect rate than average. No significant difference in the number of defects per vehicle could be detected for any county.

Figure 11



3.1.2.8. Motor Vehicle Type

48.3% of vehicles stopped were articulated, 51.4% were rigid and 0.3% were a draw-bar combination. There were too few of a draw-bar combination for any reliable analysis of this type. Of the remaining types, there was no significant difference in defect rates or severity of defect, but rigid vehicles had significantly more defects per offending vehicle than articulated vehicles (2.55 compared to 1.62 on average). The tables containing these results can be found in section D10 on page 80.

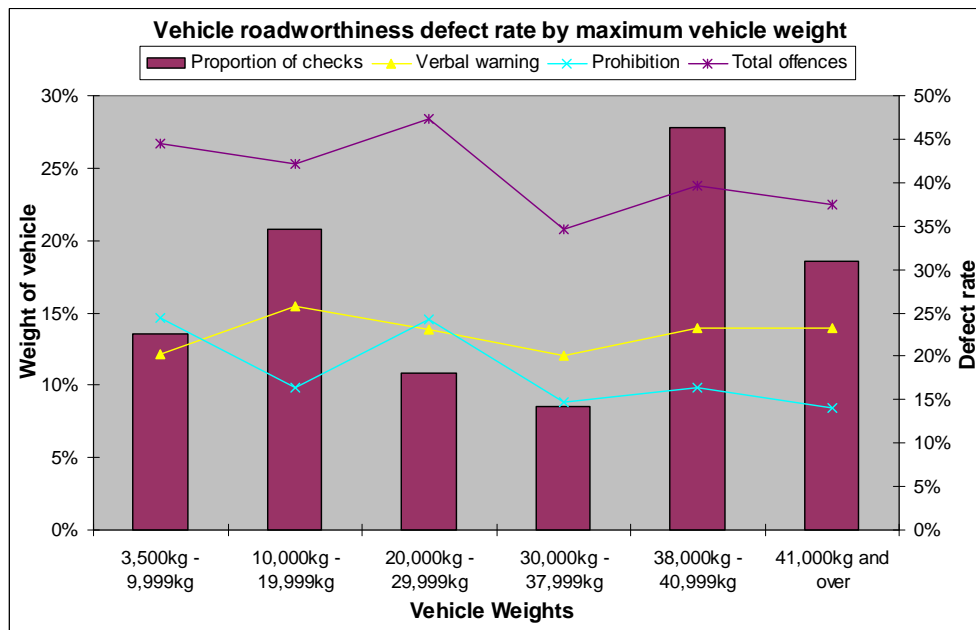
3.1.2.9. Number of Axles on the Motor Vehicle

Most HGVS checked had two axles (64.5%), with 28.5% having three axles and 6.9% having four. There was no significant difference in the defect rates for vehicles with differing numbers of axles. Three-axle vehicles did have significantly fewer defects per offending vehicle – 1.69 compared to 2.36 and 2.50 for two-axle and four-axle vehicles respectively. The tables containing these results can be found in section D12 on page 82.

3.1.2.10. Maximum Permissible Weight

Checks were carried out on vehicles with a variety of maximum permissible weights. Figure 12 shows the proportion of vehicles in each weight group. The graph also shows the prohibition rates for each weight group. The tables containing these results can be found in section D14 on page 83.

Figure 12

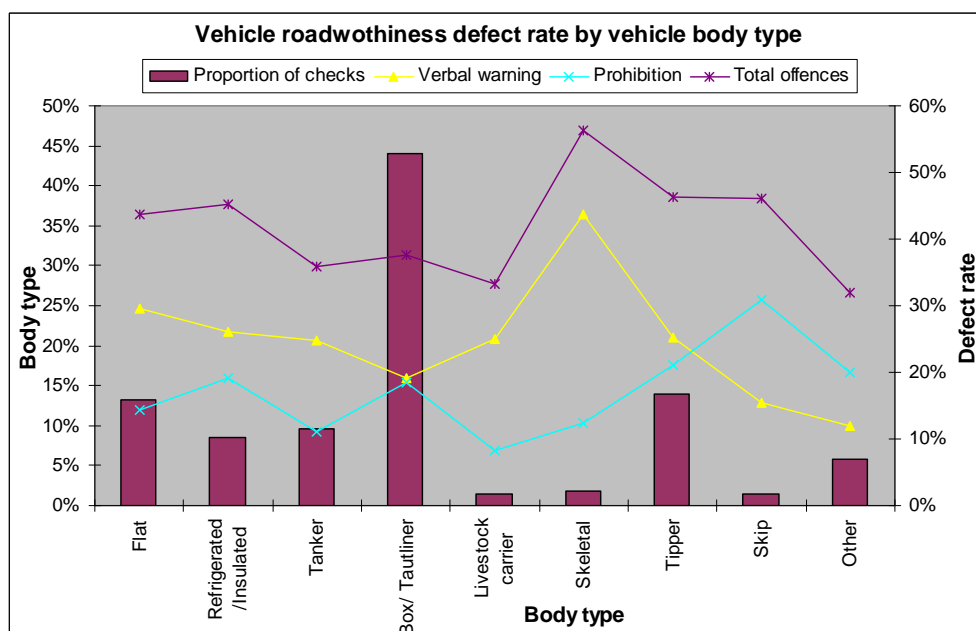


There were no significant differences in defect rates for vehicles of different weights. However, vehicles weighing less than 10,000kg had significantly more defects per offending vehicle – 3.28 compared to 1.90 for vehicles of other weights.

3.1.2.11. Body Type

Checks were carried out on vehicles with a variety of body types. The body type was not recorded for 29 vehicles, and so these were excluded from the body type analysis (these are different from the "Other" body type). Figure 13 shows the proportion of vehicles of each body type, and the prohibition rates for each body type. The tables containing these results can be found in section D15 on page 85.

Figure 13



There were no significant differences in defect rates for vehicles with different body types in the survey. This was partly due to the small number of vehicles with many

body types. For example, skeletal HGVs had the highest defect rate, but a wide variation is possible without signifying a statistically significant difference, as there were only 16 skeletal vehicles in the survey. However, tipper HGVs did have significantly more defects per offending vehicle than HGVs with other body types.

3.1.2.12. Test Centre Assessment

Only one check was carried out at a test centre. Therefore no further exploratory analysis can be carried out on this.

3.1.2.13. Time Since Last Roadworthiness Test

The time since each vehicle had been issued with a roadworthiness test certificate was compared to the defects found on that vehicle. This could only be calculated for the 747 HGVs from Northern Ireland, and there was no last test date recorded for 114 of these. The remaining 633 checks were included in this analysis. Figure 14 shows the distribution of time elapsed since the last roadworthiness test, overlaid with the defect rates by time elapsed since last test. Vehicles that had more than a year elapsed since their last annual test were significantly more likely to have a roadworthiness defect. Vehicles that had 274 to 365 days elapsed since their last test (9 to 12 months) did not have a higher defect rate, but defects found on these vehicles were more likely to result in a prohibition. The tables containing these results can be found in section D16 on page 88.

Figure 14

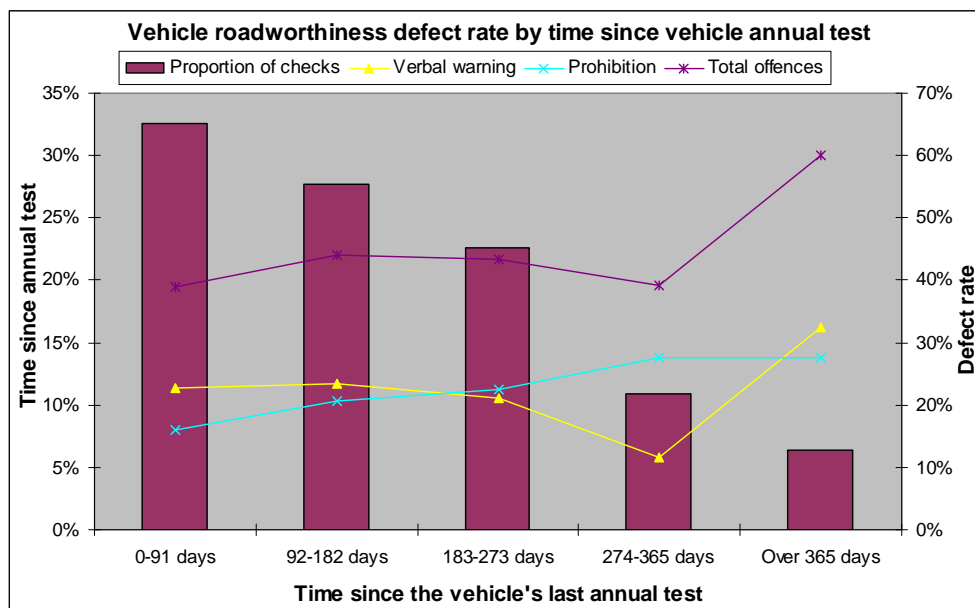


Table 4

Country of origin	Time since vehicle annual test	Vehicle testing traffic offence			Total vehicles	Proportion with offence
		Verbal warning	RE1	No offence		
Northern Ireland	0-91 days	1	2	203	206	1.5%
Northern Ireland	92-182 days	0	0	175	175	0.0%
Northern Ireland	183-273 days	0	0	143	143	0.0%
Northern Ireland	274-365 days	0	2	67	69	2.9%
Northern Ireland	Over 365 days	8	4	28	40	30.0%

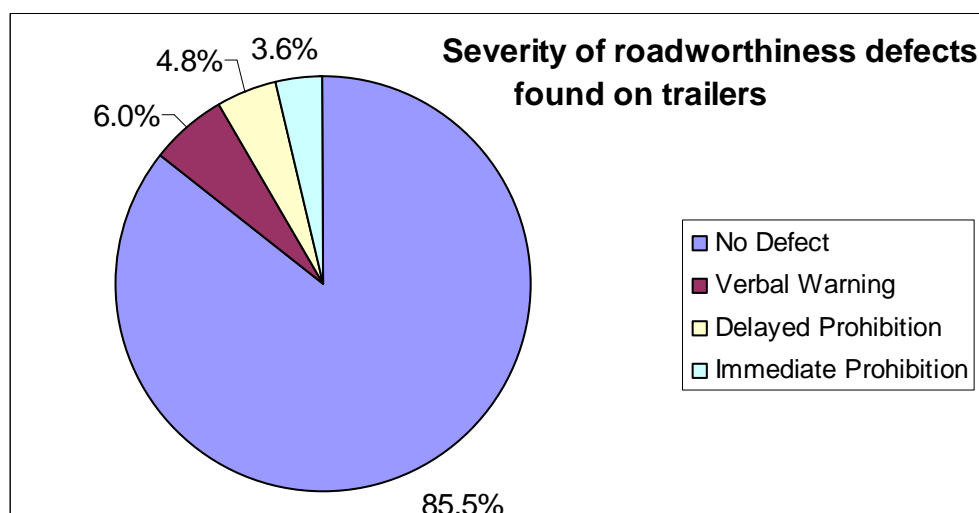
Table 4 shows the proportion of vehicles that received a roadworthiness testing offence against the time since their last annual test. Those with more than a year since their last test or those where the date of the last test was unknown had more offences than other groups, but some vehicles with less than a year since their last test received a testing offence.

3.2. Trailer Roadworthiness

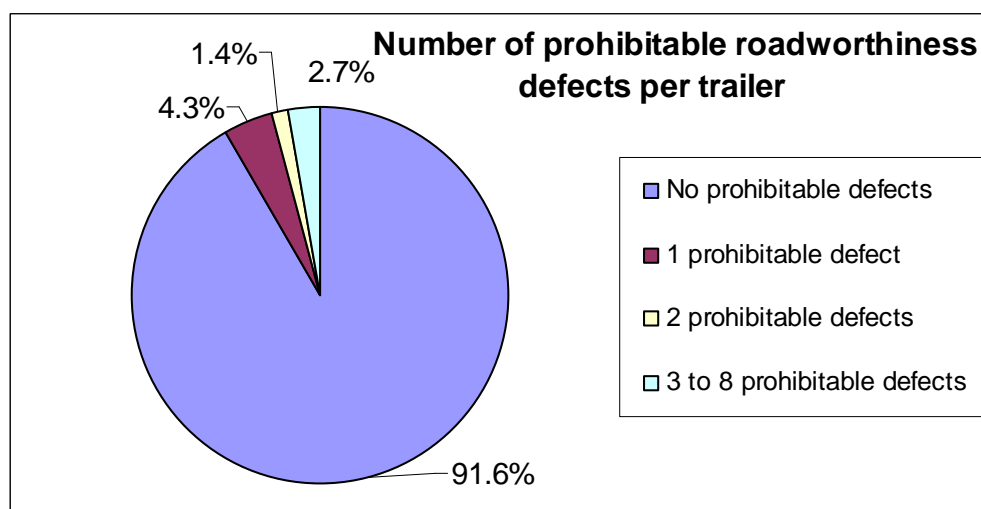
3.2.1. Headline Results

Of the 415 trailers checked, 35 received a prohibition for one or more roadworthiness defect (8.4%). 4.8% received a delayed prohibition and 3.6% received an immediate prohibition. In addition, 6.0% of drivers or operators of trailers checked received a verbal warning (Figure 15). Overall, 60 trailers (14.5%) had some type of defect, whether a minor one resulting in a verbal warning or a more serious defect resulting in a prohibition. The tables containing these overall results can be found in section D1 on page 63 (in the separate Annex file).

Figure 15



Checks on just over half of the trailers which received a prohibition revealed only one roadworthiness defect (4.3% of all trailers checked). The incidence of multiple roadworthiness defects was less common, as shown in Figure 16.

Figure 16

The most common trailer roadworthiness defects, for immediate and delayed prohibitions, are shown in the tables below (Table 5 and Table 6).

Table 5

IM No	Immediately Prohibitable Defect Type	Occurrences
38	Service Brake Operation	8
63	Lamps	6
8	Condition of Tyres	5

Table 6

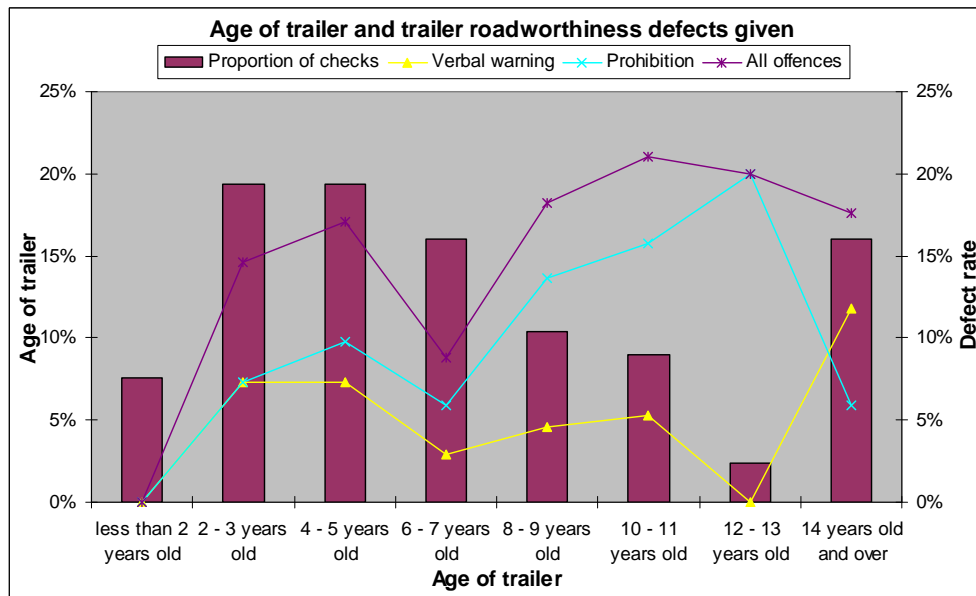
IM No	Delayed Prohibitable Defect Type	Occurrences
63	Lamps	18
59	Brake Systems & Components	8
48	Suspension	6
14	Spray Suppression, Wings & Wheel Arches	4
62	Rear Markings & Reflectors	4

3.2.2. Exploratory analysis of Trailer Roadworthiness

3.2.2.1. Age of Trailer

The age of the trailers checked was only available for 212 out of the 415 trailers, ranging from new to 32 years old. The proportion of trailers in each age group is shown in Figure 17, overlaid with the prohibition rates and proportion of verbal warnings for each age group. None of the differences seen were statistically significant, but this was mostly because the groups were either very small so a wide variation was expected, or in most cases were too small to include in the analysis at all. The tables containing these results can be found in section D3 on page 68.

Figure 17

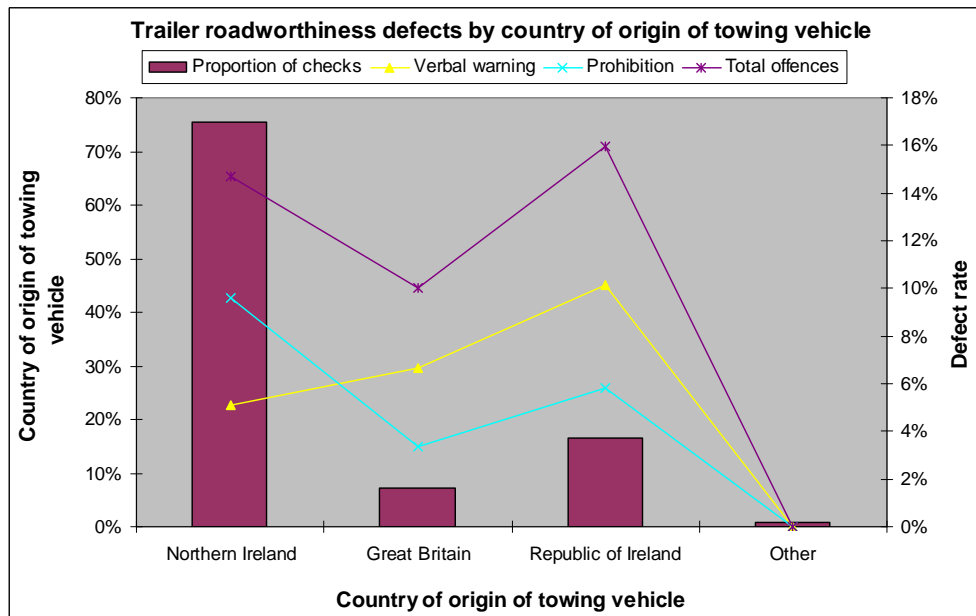


3.2.2.2. Country of Origin

As no other information was available, it has been assumed that the trailer originated in the same country as the vehicle pulling it. The majority of vehicles in the check were registered in Northern Ireland (84.9%), but vehicles registered outside Northern Ireland were significantly more likely to be pulling a trailer than those registered in Northern Ireland. 75.4% of trailers checked were being pulled by a HGV registered in Northern Ireland.

There were insufficient data in most categories for the analysis, so no difference in the overall rate of trailer defects could be found for different countries of origin. However, when looking at trailers with a defect, those where the pulling vehicle was registered in Northern Ireland were more likely to have a prohibitable defect than a defect receiving a verbal warning, when compared to trailers towed by vehicles registered in other countries. No difference in number of defects per vehicle could be detected. The tables containing these results can be found in section D4 on page 69.

Figure 18



3.2.2.3. Road Type

Checks were conducted on a range of road types across Northern Ireland, selected to produce a representative sample of traffic.

Figure 19 shows the proportion of trailer checks by road type and the defect rate by road type. There were no significant differences in defect rates, in the proportion of defects that were prohibitable or in the number of defects per vehicle by road type. The tables containing these results can be found in section D5 on page 70.

Figure 19

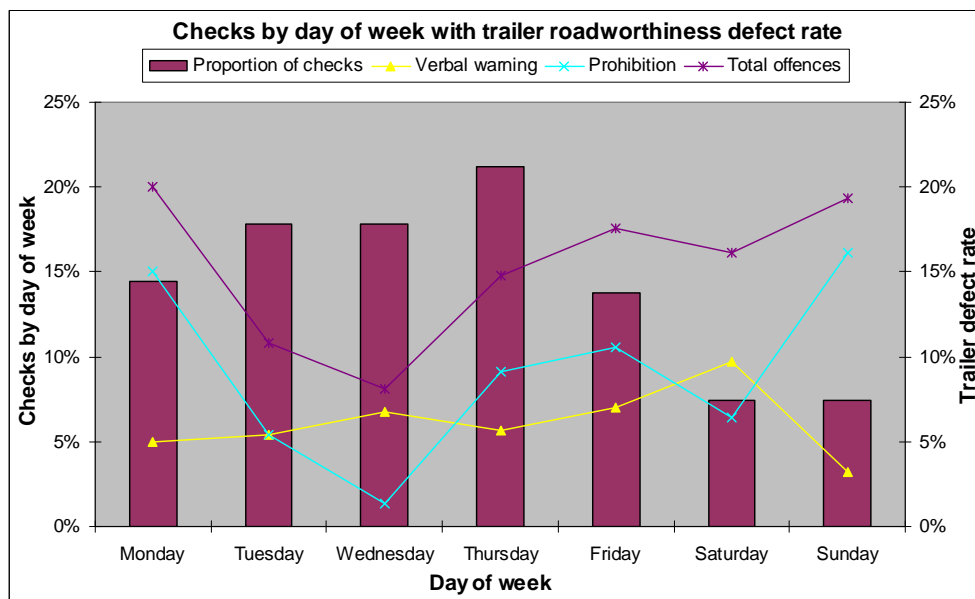


3.2.2.4. Day of the Week

Checks were conducted on different days of the week, with the aim of producing a representative sample of traffic. There were no national data available on the number of trailers travelling at different times of day so it was not possible to check that we

had the correct proportion of trailers in each time group. As stated in 3.1.2.4 the proportion of vehicles checked across the week was a representative sample of traffic. However, vehicles checked on Sunday were significantly more likely to be pulling a trailer and those on Monday and Tuesday were significantly less likely to be pulling a trailer. Figure 20 shows the proportion of checks on trailers carried out on each day of the week, overlaid with the prohibition rates for each day of the week. None of the differences seen were statistically significant, but this was mostly because the groups were very small so a wide difference does not signify a significant difference. In addition, all except one of the severity significance tests were invalid due to the small numbers. The tables containing these results can be found in section D6 on page 71.

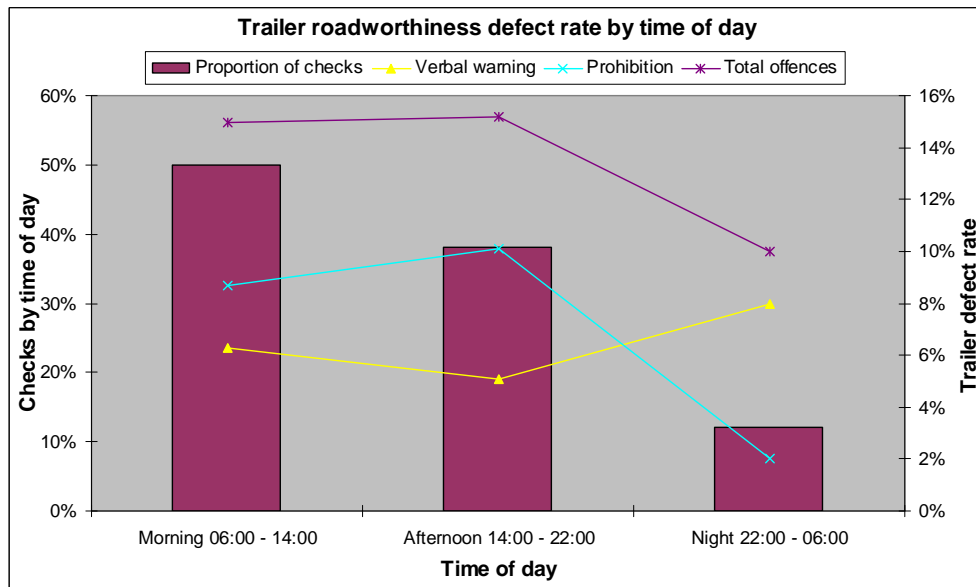
Figure 20



3.2.2.5. Time of Day

Checks were conducted at different times of day, with most checks carried out in the morning. There were no national data available on the number of trailers travelling at different times of day so it was not possible to check whether the sample was representative of the proportion of trailers on the road in each time group. Figure 21 shows the proportion of trailer checks carried out during three different time periods, Morning (06:00 - 14:00), Afternoon (14:00 - 22:00) and Night (22:00 - 06:00). The figure also shows the defect rates for each time period and proportion of verbal warnings. None of the differences were statistically significant, mainly because the groups were small so a wide variation does not necessarily signify a significant difference. The tables containing these results can be found in section D7 on page 72.

Figure 21



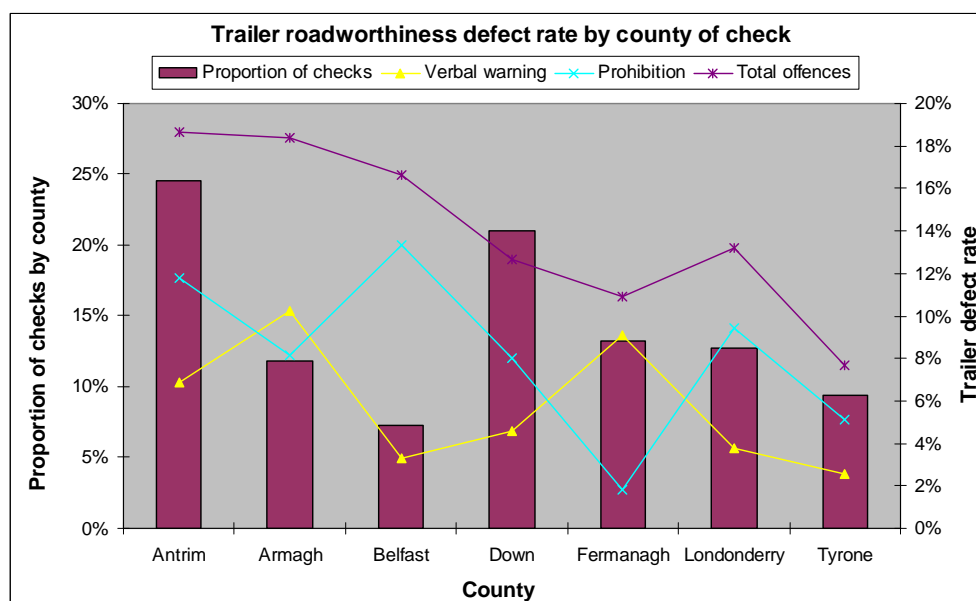
3.2.2.6. Operating Account Type

34.3% of trailers checked were being operated under the vehicle owners own account. 65.7% were operated under hire and reward. There was no significant difference in defect rates between the two different operation types. The tables containing these results can be found in section D8 on page 73.

3.2.2.7. Location of Check

Checks were carried out across all counties in Northern Ireland. Figure 22 shows the proportion of trailer checks carried out in each county. The figure also shows the trailer defect rates for each county. None of the differences in defect rates were statistically significant, mainly because the groups were either very small so a wide variation does not signify a significant difference, or they were too small to include in the analysis at all, making significance tests invalid. The tables containing these results can be found in section D9 on page 75.

Figure 22



3.2.2.8. Trailer Type

96.4% of trailers stopped were semi-trailers (400 trailers), and 3.6% (15 trailers) were draw-bar types. There were too few draw-bar type trailers to make any further analysis worthwhile. The tables containing these results can be found in section D11 on page 81.

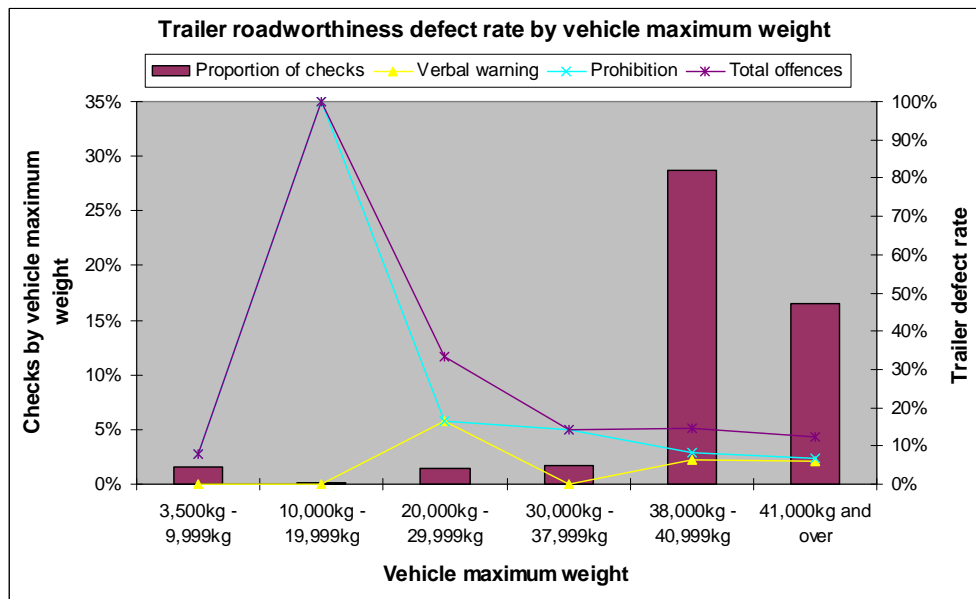
3.2.2.9. Number of Axles on the Trailer

The most common number of axles on a trailer was three (83.9%). There were 60 trailers with two axles (14.5%) and seven single-axle trailers (1.7%). It was not possible to detect any significant differences in defect rates between trailers with different numbers of axles. The tables containing these results can be found in section D13 on page 82.

3.2.2.10. Maximum Permissible Weight

Checks were carried out on vehicle and trailer combinations with a variety of maximum permissible weights. Figure 23 shows the proportion of vehicle + trailer combinations in each weight group. The graph also shows the defect rates for each weight group. There were no significant differences in defect rates, types or frequencies between vehicles in the top two weight categories. There were too few checks of vehicles in the smaller four weight categories that had trailers to analyse, making statistical tests invalid. The tables containing these results can be found in section D14 on page 83.

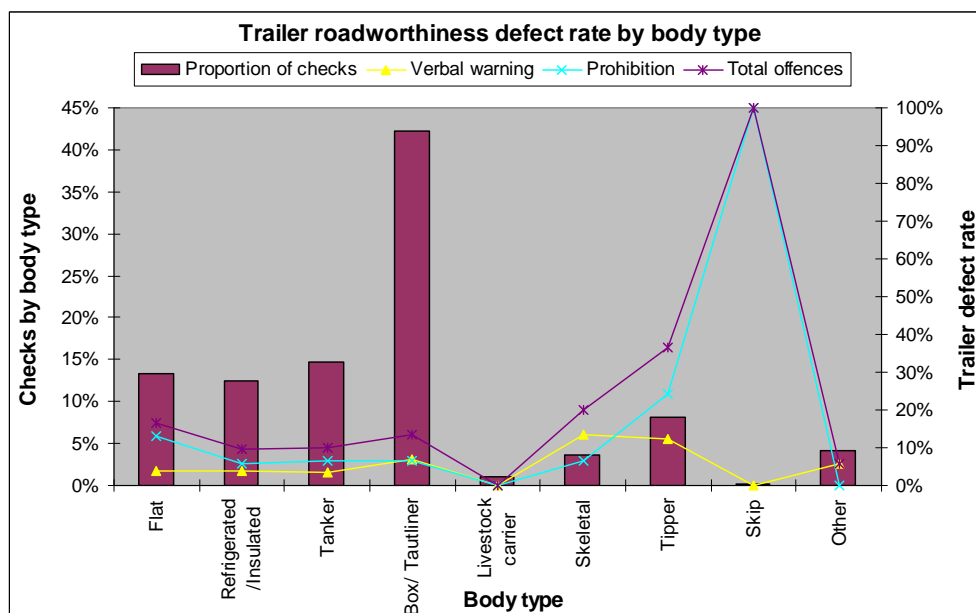
Figure 23



3.2.2.11. Body Type

Checks were carried out on trailers attached to vehicles with a variety of body types. Figure 24 shows the proportion of trailers attached to vehicles of each body type, and the trailer defect rates for each body type. There were not enough checks on many of the body types to detect any difference in defect rates, but tipper HGVs were significantly more likely to be pulling a trailer with a defect than other HGVs with a trailer. There were not enough checks to determine if these defects were more likely to result in verbal warnings or prohibitions, or to find any difference in number of offences per vehicle. The tables containing these results can be found in section D15 on page 85.

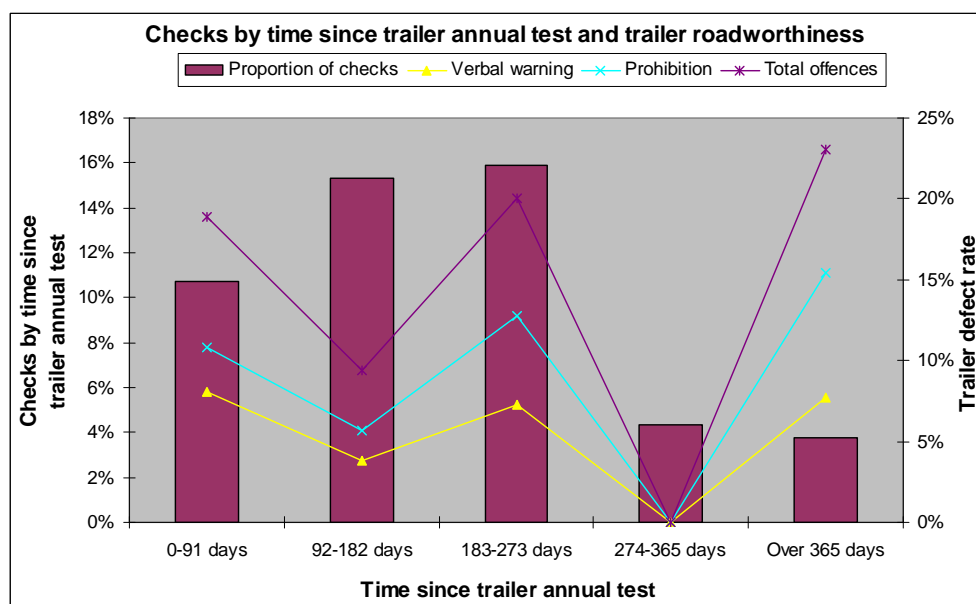
Figure 24



3.2.2.12. Time Since Last Roadworthiness Test

The time since each trailer had been issued with a roadworthiness test certificate was compared to the prohibitions on that trailer. This information was only available for 173 of the 415 checks with a trailer. Figure 25 shows the distribution of time elapsed since the last roadworthiness test, overlaid with the trailer prohibition rates. There were insufficient checks to determine if there were any differences in numbers of defects for trailers with different lengths of time since the last annual test. The tables containing these results can be found in section D17 on page 89.

Figure 25



3.3. Roadworthiness Prosecutions

There were only 10 checks where the driver was issued with an RE1 for roadworthiness defects. Four were issued where the vehicle alone had a prohibitable defect, five were issued where the trailer alone had a prohibitable defect and one was issued where both vehicle and trailer had a prohibitable defect.

Of the five checks where the vehicle had a prohibition, there were between one and six defects per vehicle. For the six trailer prohibitions there were between one and eight defects per trailer. There was a combination of both immediate and delayed prohibitions that resulted in an RE1 – it was not always one type of prohibition. As there were only 10 of these checks no further analysis was possible.

Of these 10 RE1s, six resulted in a prosecution. Three of the prosecutions were where the vehicle alone had a serious defect, two were where the trailer alone had a serious defect, and one was where both vehicle and trailer had a serious defect. Of the four that did not result in a prosecution, three were where the trailer alone had a serious defect and one was where the vehicle alone had a serious defect.

3.4. Traffic Offences

3.4.1. Headline Results

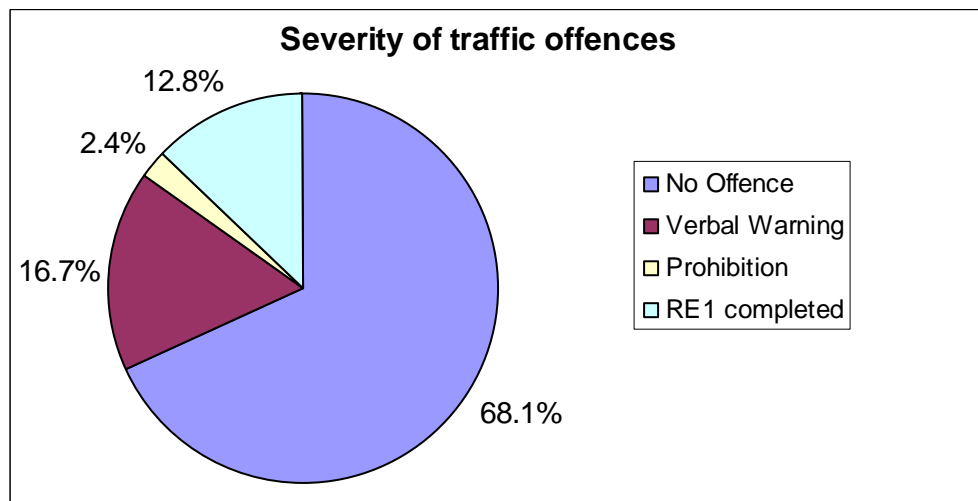
The roadside checks involved an inspection for other traffic offences (referred to as offences) not related to roadworthiness. These offences were categorised as follows:

- Dimensions

- Driver licence
- Vehicle weights
- Vehicle excise duty
- Tachograph
- Drivers hours
- Operator licensing - unlicensed operator
- Operator licensing - other offences
- Roadworthiness testing - vehicle
- Roadworthiness testing - trailer
- Number plates
- Insurance
- Other

Of the 880 checks carried out, 281 (31.9%) revealed an offence at some level. Of these, 147 checks (16.7% of all checks) resulted in a verbal warning for at least one offence, 21 checks (2.4% of all checks) warranted a prohibition for at least one offence and 113 checks (12.8% of all checks) resulted in the completion of an RE1 for at least one offence². 68.1% of checks were completely clear of offences (Figure 26). The tables containing these overall results can be found in section D1 on page 63 (in the separate Annex file).

Figure 26



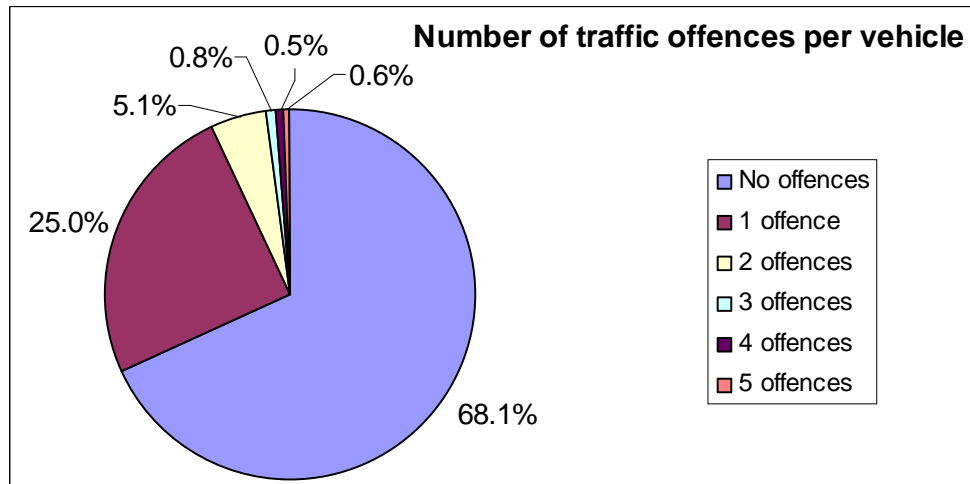
281 checks revealed offences. As more than one offence was found during some of these checks, the total number of offences was 372. Of these offences, the largest proportion were verbal warnings, closely followed by RE1s completed. Table 7 shows the frequency and proportion of offences in each severity category.

² Note that 26 checks resulted in a prohibition, but as five of these also resulted in an RE1 being completed for a different offence, only 21 checks had a prohibition as their most severe offence. Similarly, 164 checks resulted in a verbal warning, but 17 also resulted in either a prohibition, an RE1 being completed, or both. 147 checks had a verbal warning as their most severe offence.

Table 7

Severity of Offence	Frequency	Proportion
Verbal Warning	184	49.5%
Prohibition	30	8.1%
RE1 completed	158	42.4%

On average there were 0.42 offences per vehicle checked, and 1.32 offences per offending vehicle. Where an offence was found, most commonly there was only one offence. Figure 27 shows the distribution of number of offences per offending vehicle.

Figure 27

Some offences were more common than others. For example, there were 111 checks revealing a tachograph offence, but none with a dimensions offence. Table 8 shows the frequency of each offence by severity, the proportion of checks that had each type of offence and the proportion of offences that fell into each category.

Table 8

Offence Category	Verbal Warning	Prohibition	RE1s Completed	Total Offences	% Checks with this Offence	% All Offences in this Category
Dimensions	0	0	0	0	0.0%	0.0%
Driver licence	5	0	9	14	1.6%	3.8%
Vehicle weights	5	5	11	21	2.4%	5.6%
Vehicle excise duty	17	0	13	30	3.4%	8.1%
Tachograph	75	15	21	111	12.6%	29.8%
Drivers' hours	27	2	19	48	5.5%	12.9%
Operator licensing - unlicensed	5	5	19	29	3.3%	7.8%
Operator licensing – other	13	0	16	29	3.3%	7.8%
Road worthiness-vehicle	11	0	16	27	3.1%	7.3%
Road worthiness-trailer	8	0	24	32	3.6%	8.6%
Number plates	14	0	1	15	1.7%	4.0%
Insurance	0	0	6	6	0.7%	1.6%
Other	4	3	3	10	1.1%	2.7%
TOTAL	184	30	158	372		

3.4.2. Exploratory Analysis of Offences

3.4.2.1. Age of Motor Vehicle

The age profile of the vehicles checked is described in 3.1.2.1.

Checks on vehicles aged five years and under were significantly less likely to discover offences than checks on vehicles aged over 10 years old. 27.2% of vehicles aged five years and under had a offence at some level of severity, either verbal warning, prohibition or RE1, compared to 39.4% of vehicles aged 10 years and over. The difference was also significant when considering prohibitions and RE1s alone – 11.5% of checks on the newer vehicles had either a prohibition or RE1 (or both), compared to 23.2% of the older vehicles. The tables containing these results can be found in section D2 on page 67.

Figure 28

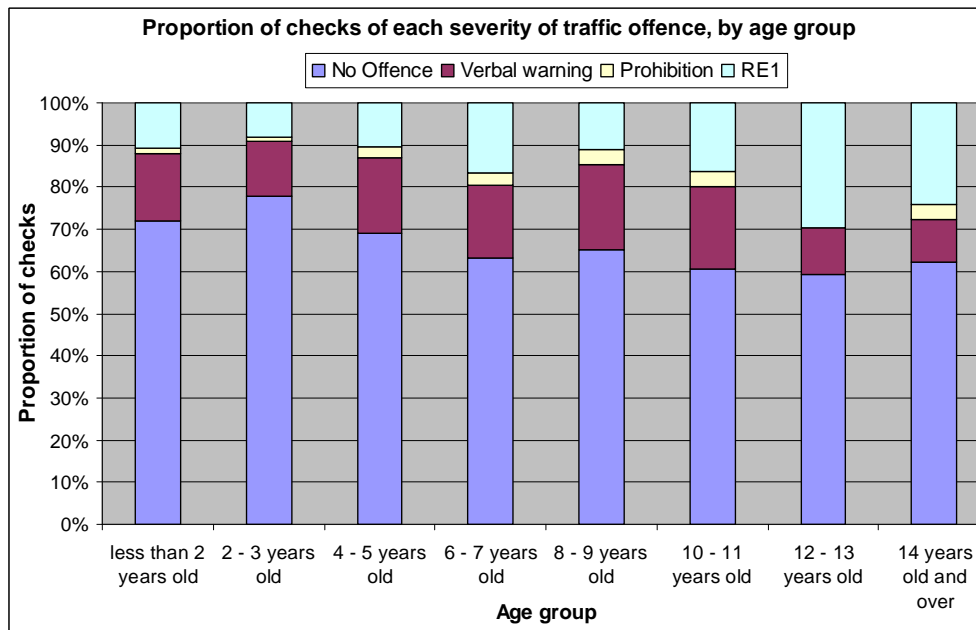
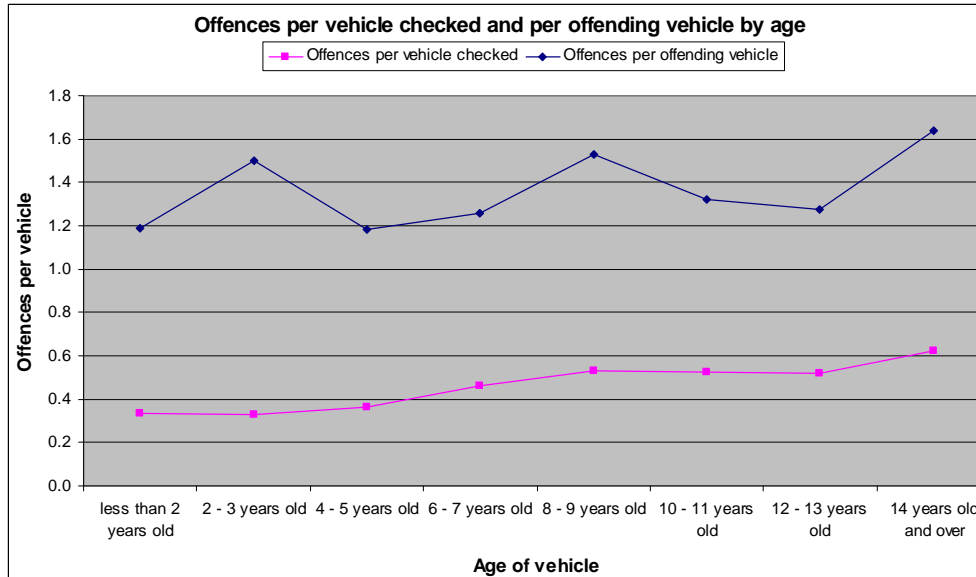


Figure 29 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by age group. Vehicles aged five years and under had significantly fewer offences per vehicle than those aged 10 years and over. There was no significant difference in the number of offences per offending vehicle.

Figure 29



3.4.2.2. Age of Trailer

The age profile of the trailers checked is described in 3.2.2.1.

Figure 30 shows the proportion of vehicles checked that resulted in offences of different severity for each trailer age category. The small sample sizes for some age groups meant that statistically robust analysis was not possible. The tables containing these results can be found in section D3 on page 68.

Figure 30

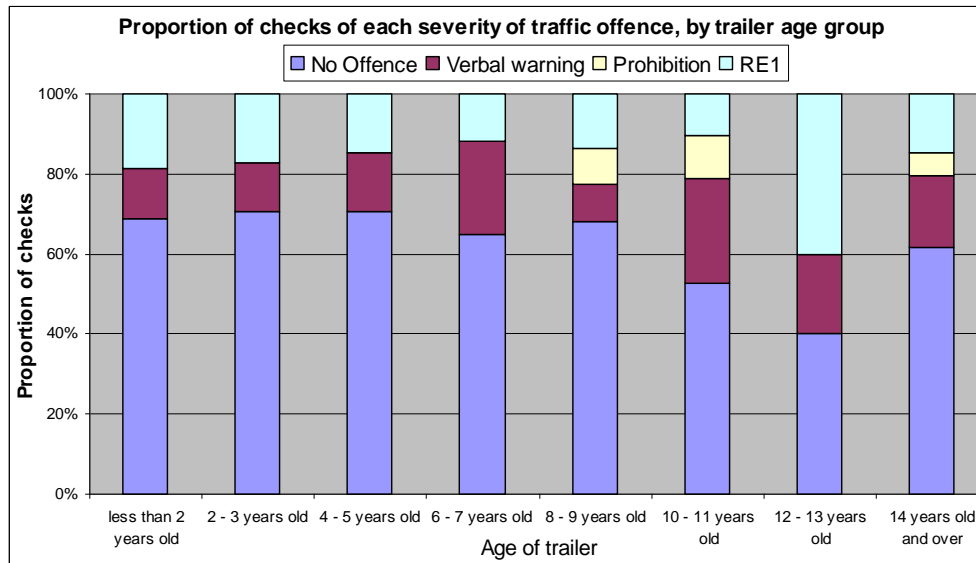
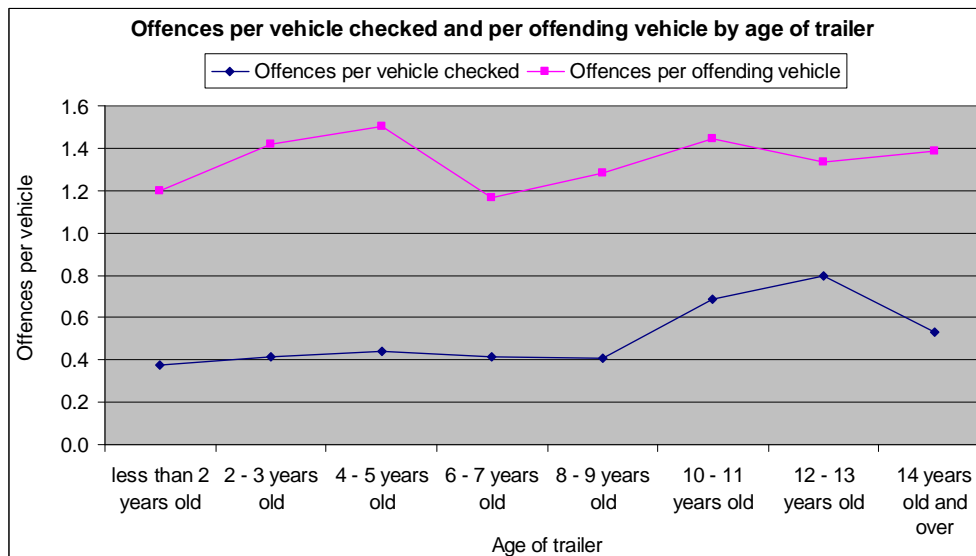


Figure 31 shows the average number of offences per vehicle/trailer checked, and average number of offences per offending vehicle, split by trailer age group. None of the differences in offences per vehicle seen were significant.

Figure 31



3.4.2.3. Country of Origin

The country of origin of the vehicles checked is described in 3.1.2.2.

The proportion of vehicle checks resulting in an offence at differing levels of severity is shown in Figure 32 for each country of origin. The small sample sizes for some countries of origin meant that statistically robust analysis was not possible. For example, there were only four checks on vehicles from countries outside Northern Ireland, Great Britain and the Republic of Ireland. The tables containing these results can be found in section D4 on page 69.

Figure 32

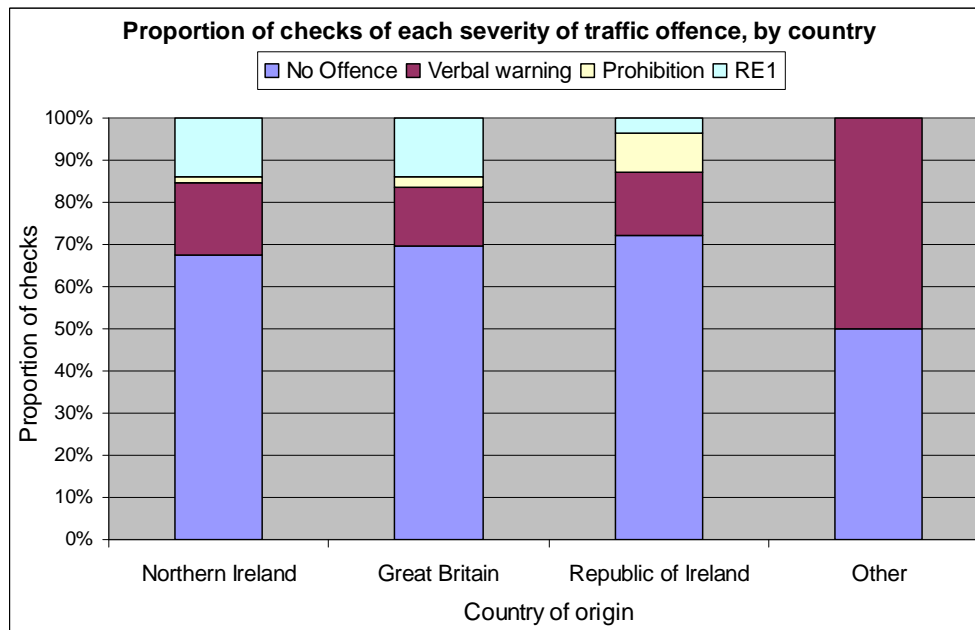
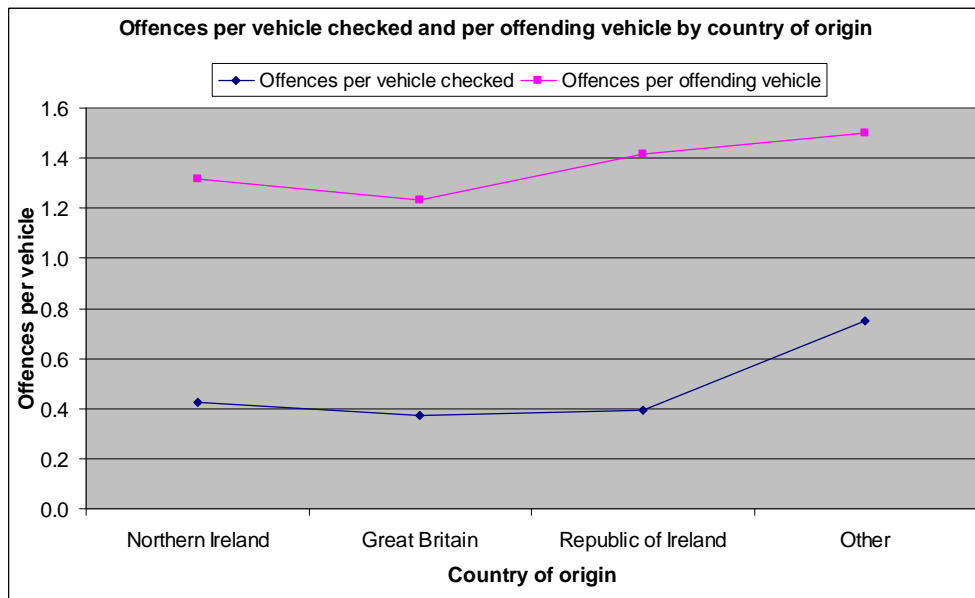


Figure 33 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by country of origin. There was no significant difference between either vehicles registered in Northern Ireland and other countries or between those registered in the Republic of Ireland and other countries. There were too few checks to test the significance of the results of vehicles from Great Britain or those from outside the United Kingdom and Ireland.

Figure 33



3.4.2.4. Road Type

The distribution of checks across different road type is shown in 3.1.2.3.

Figure 34 shows the offence rates for each road type, which were not significantly different. There were a small number of tests on roads in category B in particular and, although a statistical test was possible, a larger sample would give a better idea

whether or not road types were a significant factor in offence rates. The tables containing these results can be found in section D5 on page 70.

Figure 34

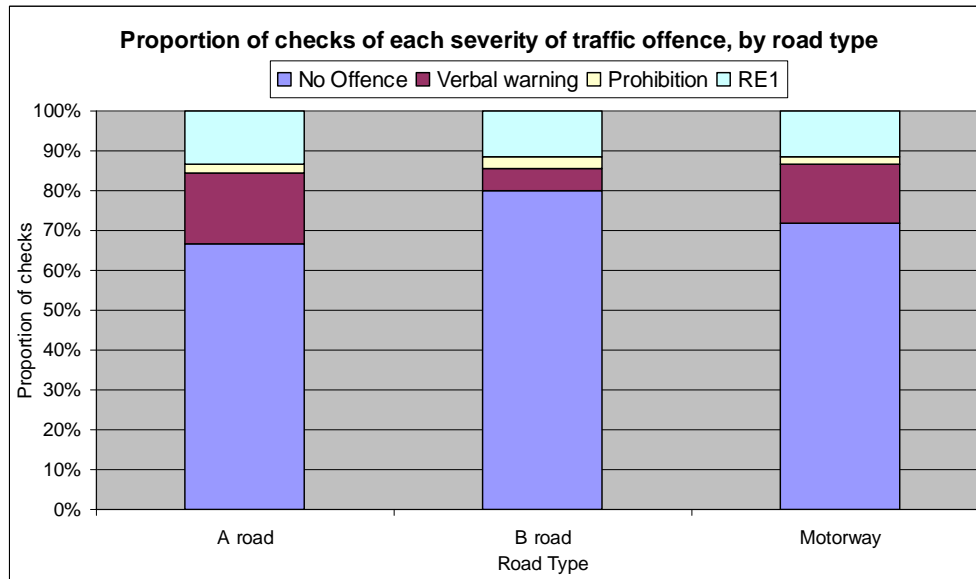
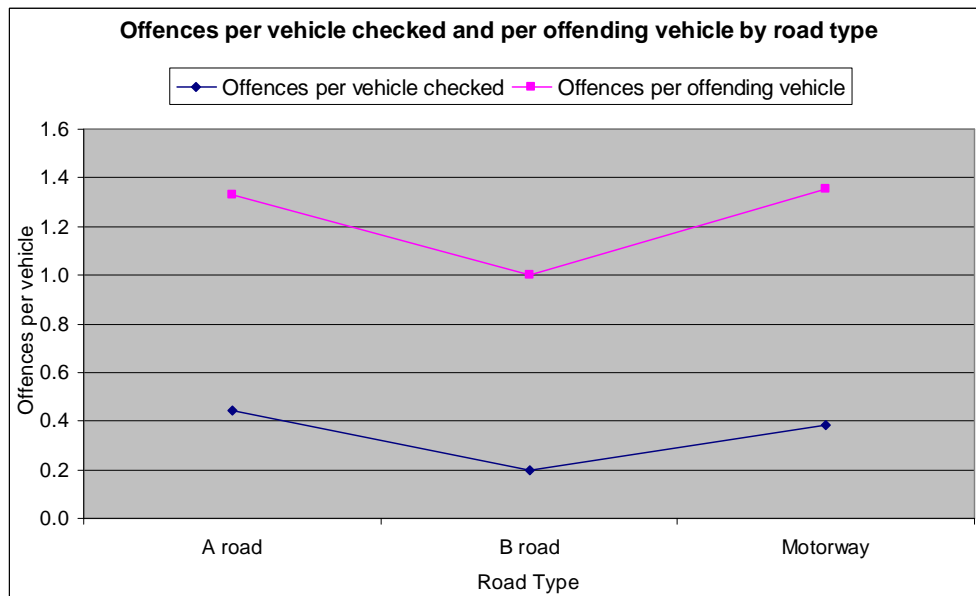


Figure 35 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by road type. There were too few vehicles checked on B roads to test whether the difference in offences per vehicle on these roads was significant. There was no significant difference in offences per vehicle between either A roads and the rest, or motorways and the other road types.

Figure 35



3.4.2.5. Day of the Week

The distribution of checks across different days of the week is shown in 3.1.2.4.

Figure 36 and the analysis that accompanies it shows that Wednesday and Thursday had a significantly higher offence rate (of any severity) than average, and vehicles checked on Friday had a significantly lower offence rate (of any severity). This was mainly due to the variation in proportion of verbal warnings, as none of these three

days of the week had significantly more or less offences that resulted in a prohibition or RE1. The tables containing these results can be found in section D6 on page 71.

Figure 36

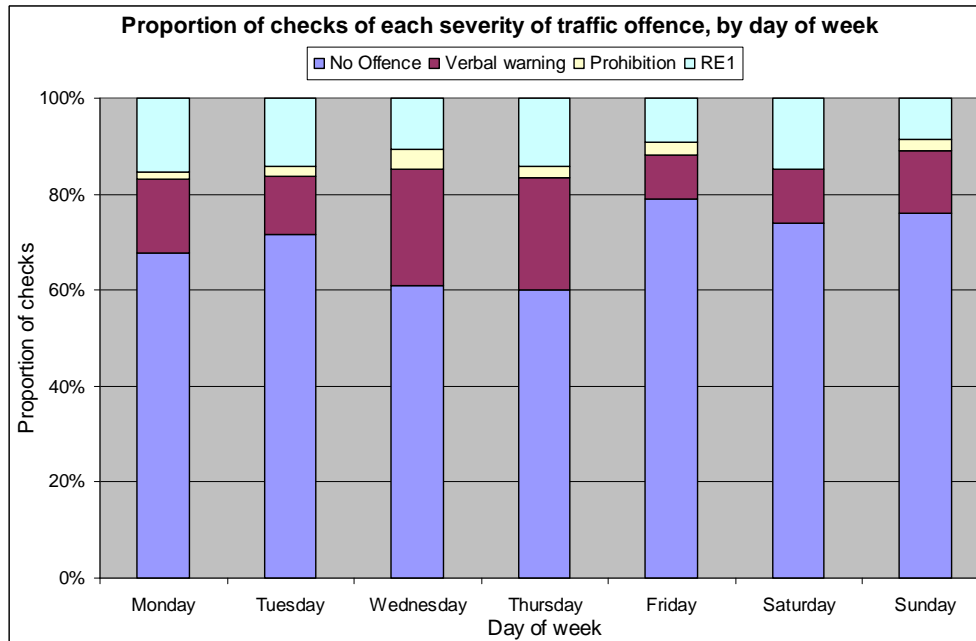
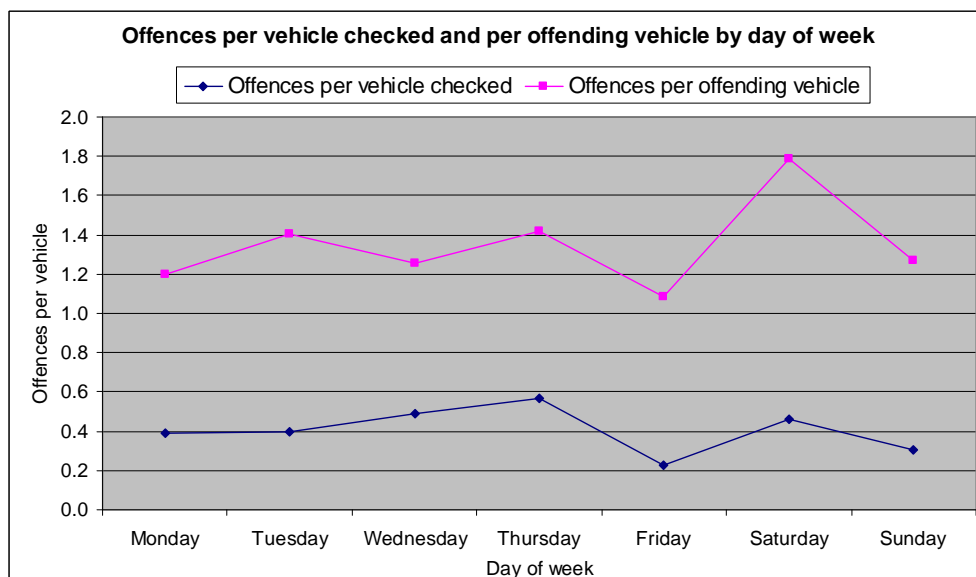


Figure 37 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by day of the week. There were insufficient checks on many days of the week to test whether the differences in offences per vehicle were significant, but Thursday did have more offences per vehicle than average. Where there were enough data for a valid test, there were no significant differences in number of offences per offending vehicle for any day of the week.

Figure 37



3.4.2.6. Time of Day

The distribution of checks across different time periods is shown in 3.1.2.5.

Figure 38 below shows the rate of offences at different times of day. Checks in the afternoon resulted in a significantly higher rate of prohibitions and RE1s than at the other times of day. As the afternoon had proportionately fewer verbal warnings the overall rate for offences at any severity level was the same for each of the three times of day. The tables containing these results can be found in section D7 on page 72.

Figure 38

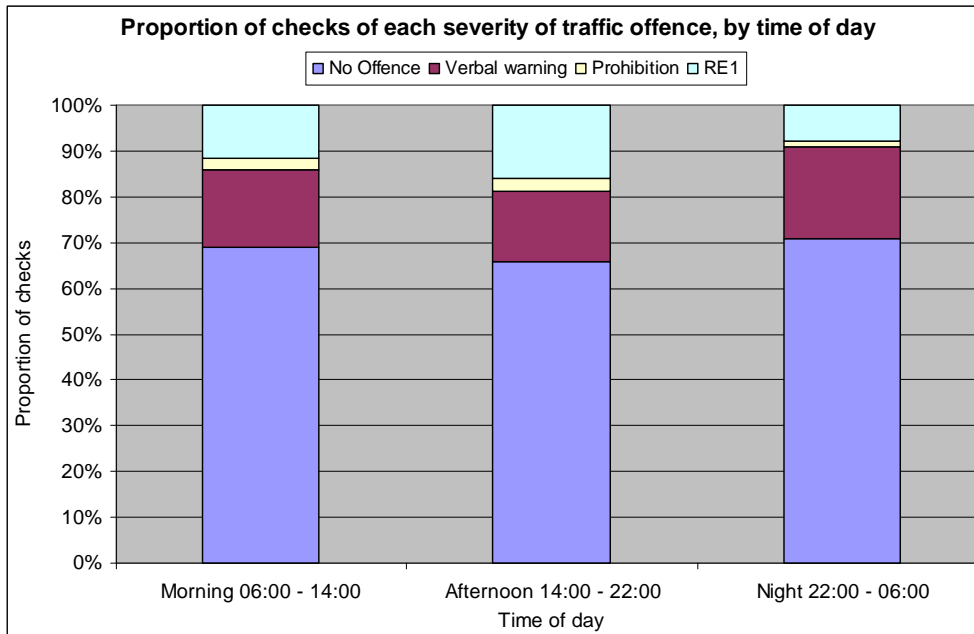
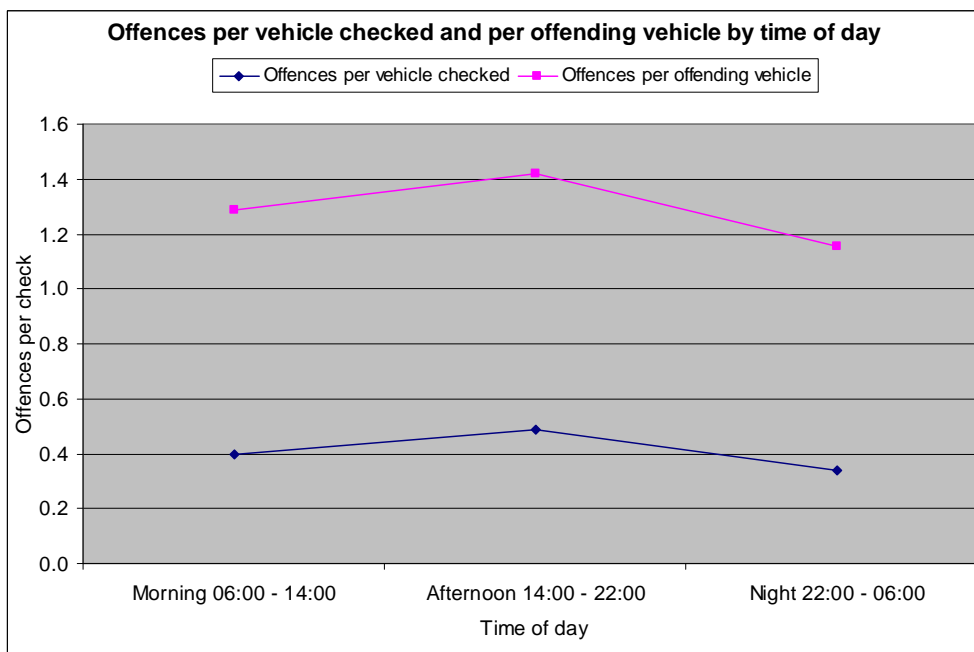


Figure 39 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by time period. There was no difference in offences per vehicles checked in the morning or afternoon, and too few vehicles stopped at night to test significance for this time period.

Figure 39

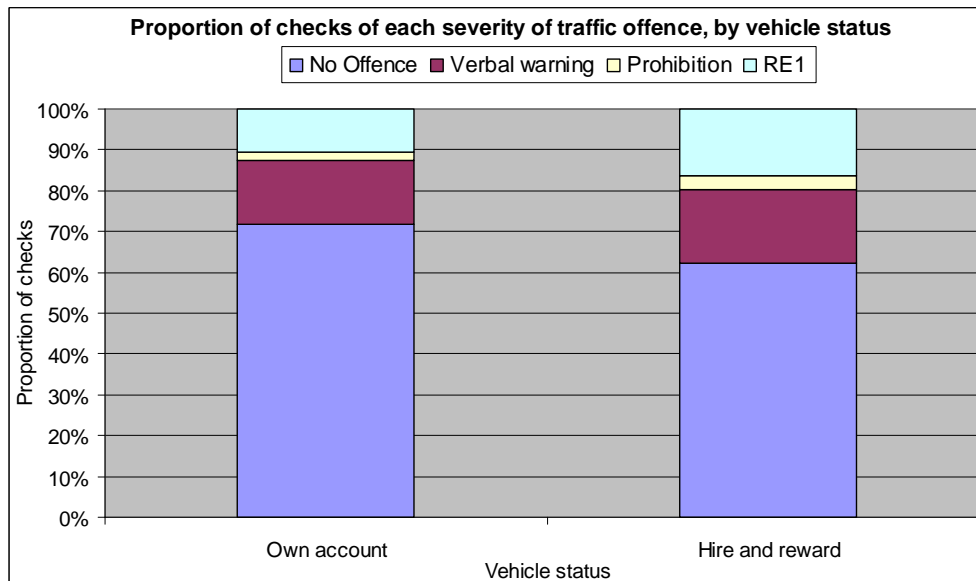


3.4.2.7. Operating Account Type

The proportion of operators with different account types is given in 3.1.2.6.

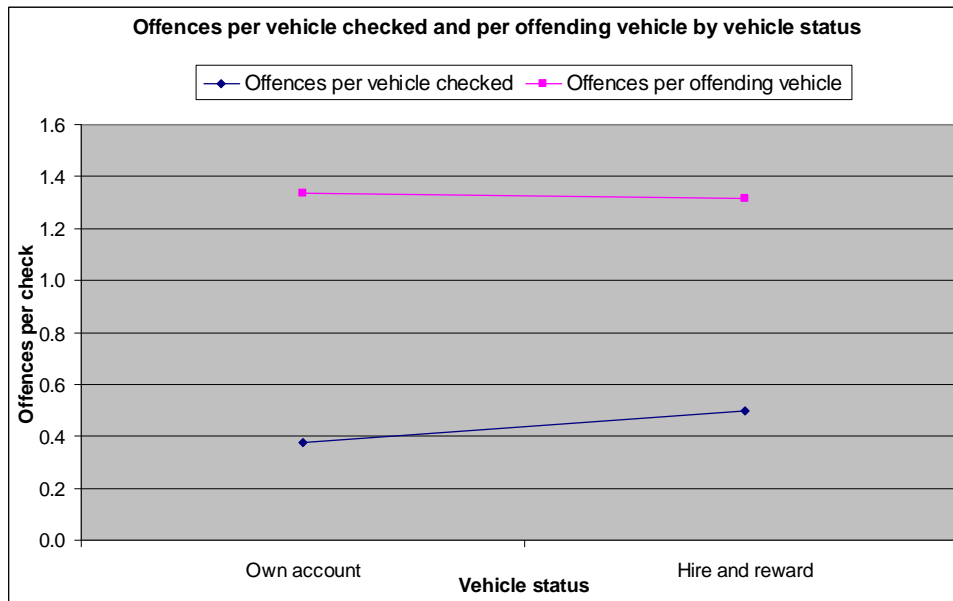
Vehicles operated on their own account had significantly lower offence rates than vehicles operated under hire and reward (Figure 40). Overall 28.2% of own account vehicles were committing an offence of any severity compared to 37.8% of hire and reward vehicles, and 12.4% were committing offences resulting in either a prohibition or RE1 compared to 19.6% for hire and reward vehicles. Both these two differences were significant. The tables containing these results can be found in section D8 on page 73.

Figure 40



Vehicles operated under the hire and reward scheme had a significantly higher number of offences per vehicle. The average number of offences was 0.50 per vehicle compared to 0.38 for own account vehicles. There was no significant difference in the number of offences per offending vehicle (1.31 per hire and reward vehicle compared to 1.34 per own account vehicle). This is shown in Figure 41 below.

Figure 41



3.4.2.8. Location of Check

Checks were carried out across all counties in Northern Ireland (see 3.1.2.7).

Vehicles checked in Antrim and Belfast had significantly lower offence rates than vehicles checked in other counties. Vehicles checked in Down and Fermanagh had significantly higher offence rates than those in other counties. However, there was no significant difference in the severity of offences. Figure 42 below shows the differences in offence rates by county. The tables containing these results can be found in section D9 on page 75.

Figure 42

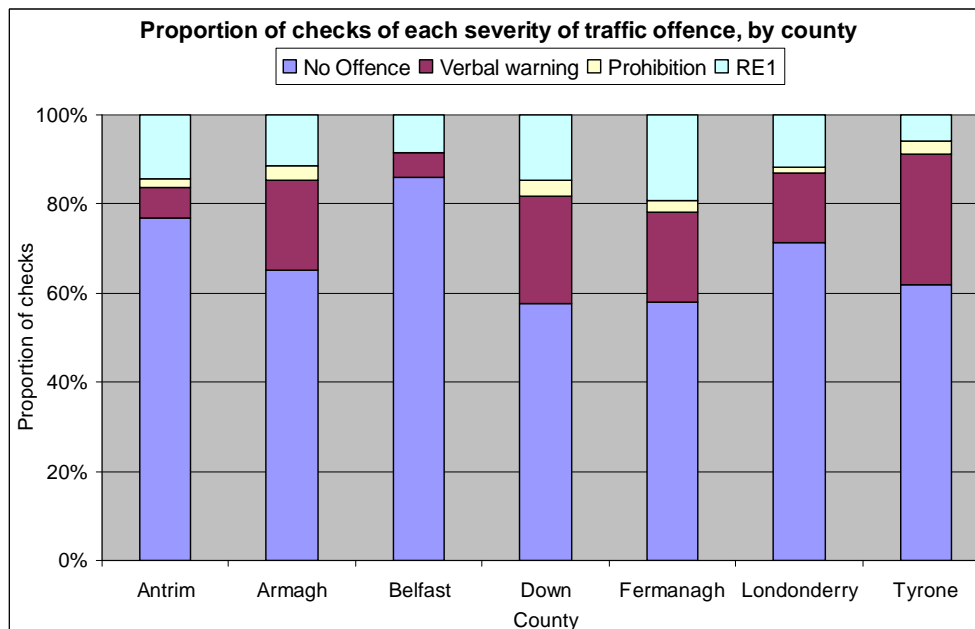
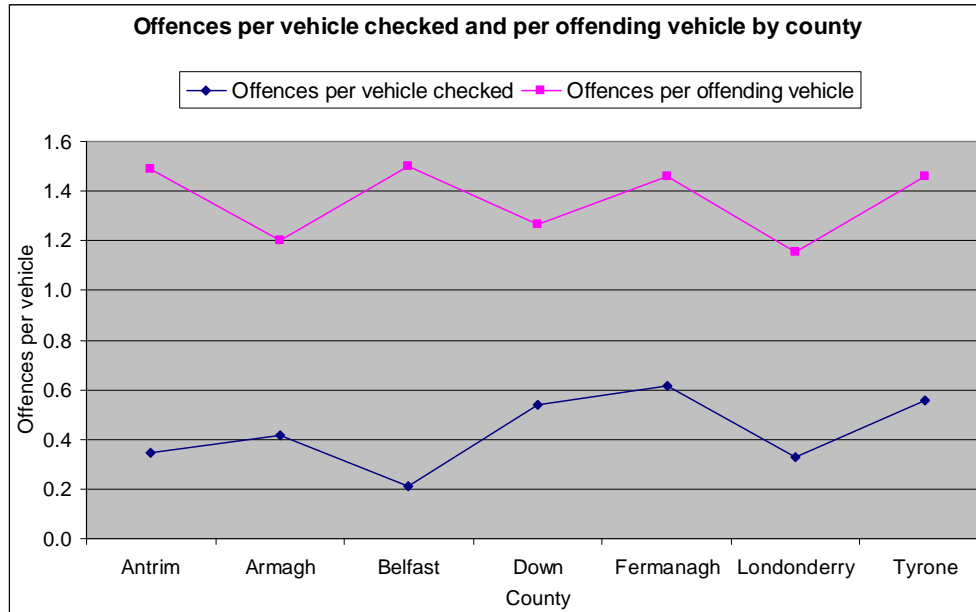


Figure 43 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by county. There were too few checks in several counties to test whether or not the differences were significant. However, checks in Antrim revealed significantly less offences per vehicle than average, and

checks in Down revealed significantly more. There was no significant difference in the number of offences per offending vehicle for any county.

Figure 43



3.4.2.9. Motor Vehicle Type

The proportion of checks carried out on different vehicle types is shown in 3.1.2.8.

Figure 44 shows the difference in the offence rates for each vehicle type. There was no significant difference in the offence rates of each vehicle type. Note that there were only three checks on draw bar vehicles so a significance test on these vehicles was invalid. The tables containing these results can be found in section D10 on page 80.

Figure 44

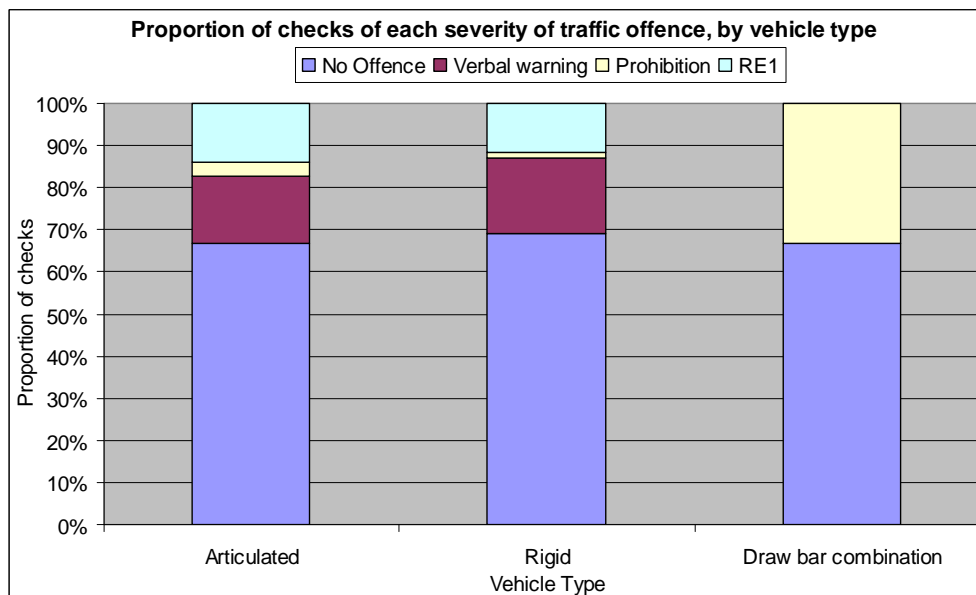
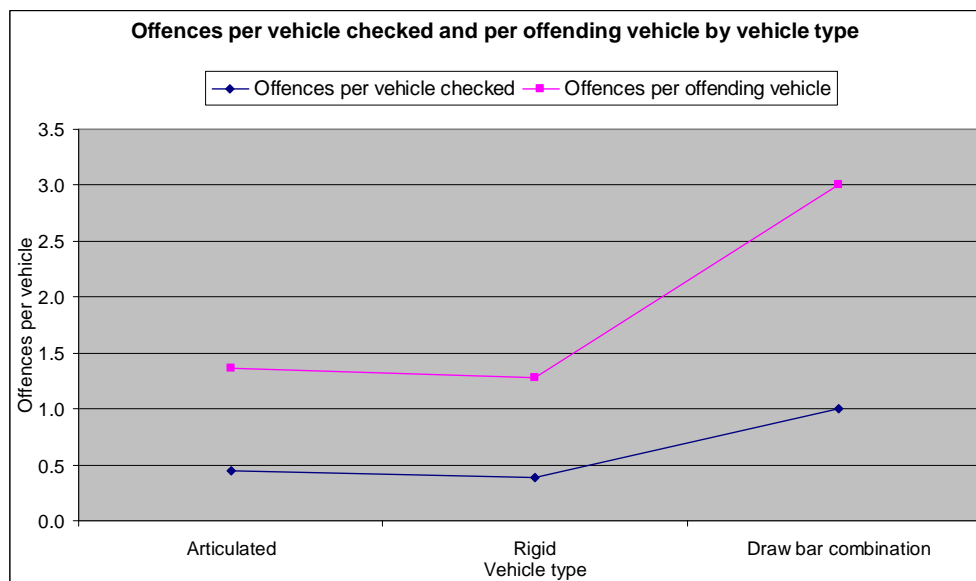


Figure 45 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by vehicle type. There were too few

checks of draw bar combination HGVs to test for significance. No significant difference was found between articulated and rigid vehicles.

Figure 45



3.4.2.10. Number of Axles on the Motor Vehicle

There were no significant differences in offence rates for vehicles with differing numbers of axles. The tables containing these results can be found in section D12 on page 82.

3.4.2.11. Maximum Permissible Weight

The proportion of checks carried out on vehicles of different weights is shown in 3.1.2.10.

When the weight groups were combined to give two groups, vehicles with a maximum permissible weight under 38,000kg and those 38,000kg and over, there was a significant difference in the proportion of checks resulting in a prohibition or RE1 for offences. 12.7% of the lighter vehicles had a prohibition or an RE1 compared to 18.1% of those in the heavier group. The offence rate for every weight group is shown in Figure 46. The tables containing these results can be found in section D14 on page 83.

Figure 46

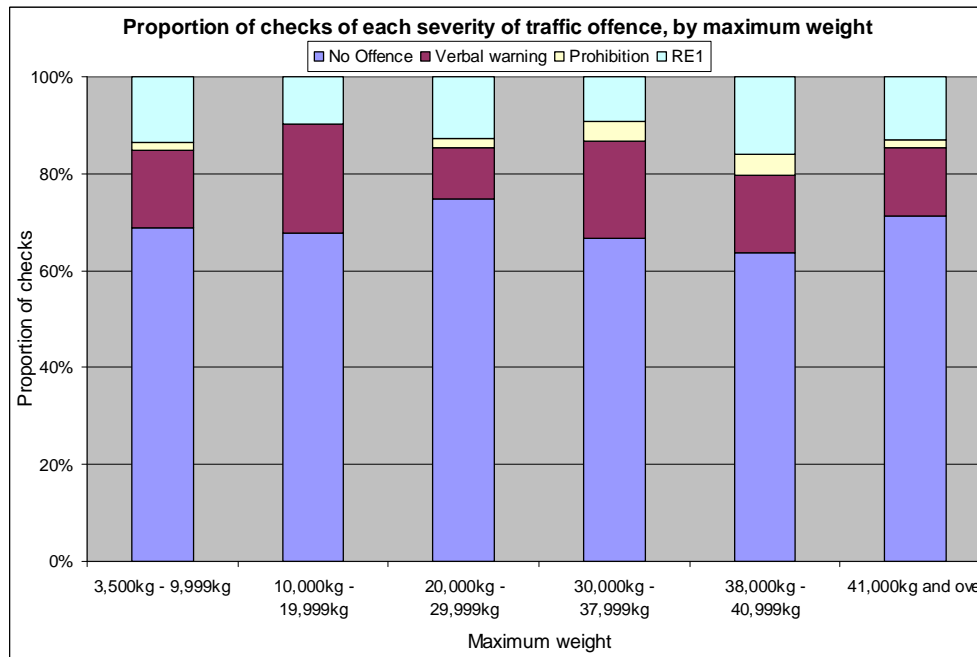
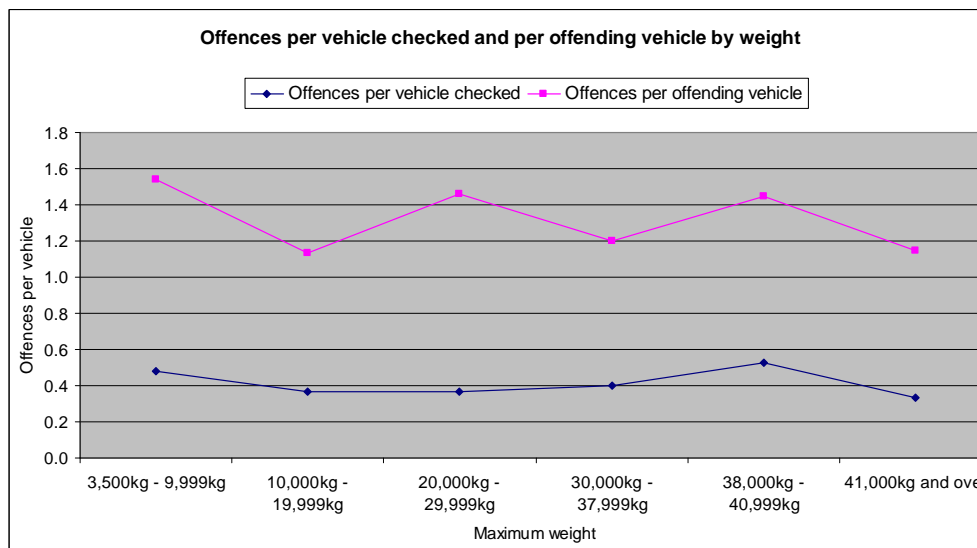


Figure 47 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by vehicle weight. There were insufficient vehicles checked in certain weight groups to test if there was any significant difference in the results. Of the other groups, those with a weight 10,000-19,000kg had significantly less offences per offending vehicle, and those weighing 38,000-40,999kg had significantly more offences per offending vehicle.

Figure 47



3.4.2.12. Body Type

The proportion of checks carried out on vehicles of different body types is shown in 3.1.2.11. Tankers had a significantly lower than average overall offence rate for any severity level, but the rate of prohibitions or RE1s on their own was not significantly lower. Tippers had a significantly higher rate of prohibitions and RE1s for offences, although the overall tipper offence rate was not different from average when all offence severities were combined. The detail of offence rates by body type is shown

in Figure 48. The tables containing these results can be found in section D15 on page 85.

Figure 48

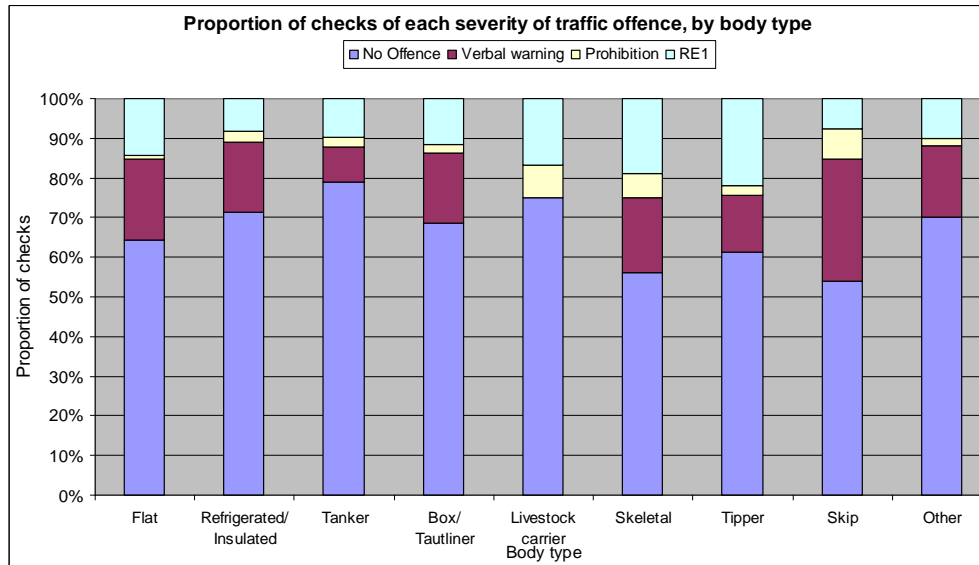
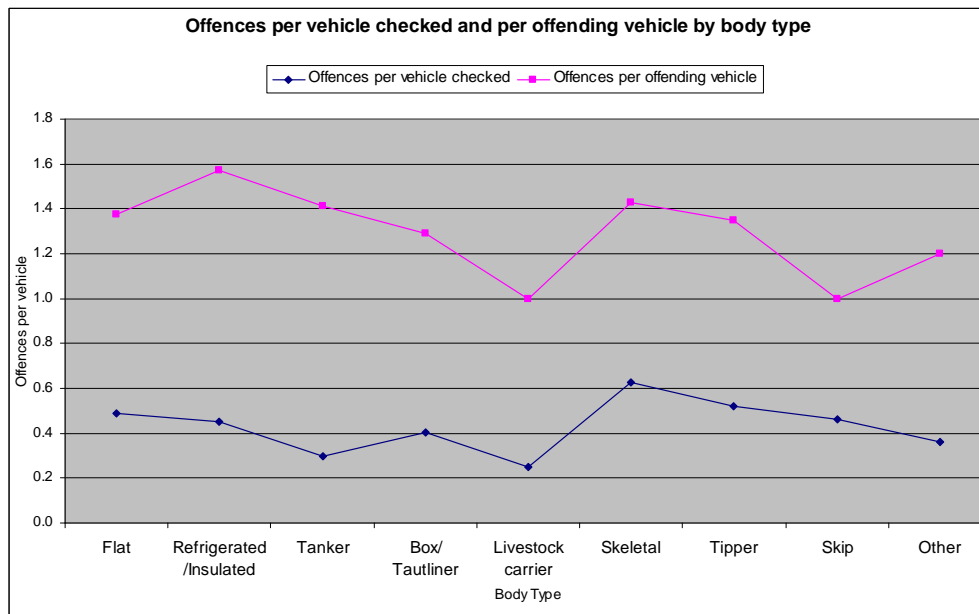


Figure 49 shows the average number of offences per vehicle checked, and average number of offences per offending vehicle, split by body type. There were insufficient checks on many of the body types to test for significant differences, and on all those types where there were sufficient checks there was no significant difference.

Figure 49



3.4.2.13. Use of Weighbridges

Weight offences could only be detected on vehicles that were weighed. Only 55 of the vehicles checked were weighed. Of these, 25 were weighed on a DVTA weighbridge, and 30 were weighed on a public or private weighbridge. Overall, 38.2% of weighed vehicles were committing a weight offence – with five given a verbal warning, a further five given a prohibition and 11 issued an RE1. Of the vehicles in this survey 48.0% of vehicles weighed on a DVTA weighbridge were

committing an offence compared to 30.0% weighed on a public or private weighbridge, but as there were so few checked it was not possible to say whether or not this difference was statistically significant. The tables containing these results can be found in section D18 on page 91.

3.5. Offence Prosecutions

There were 113 checks that had at least one RE1 completed for an offence. These checks were reported for prosecution, and 72 of the checks resulted in a prosecution (63.7%). As some checks had more than one offence resulting in a RE1, a total of 158 RE1s were issued for offences. The prosecution rate was lower for all RE1s (57.0%) than for checks with an RE1, as some checks resulted in several RE1s, some that were successfully prosecuted and some that were not. In these cases, the check was counted as successfully prosecuted, but some of the individual RE1 offences were not. Table 9 shows the number of offences resulting in an RE1 per check with the results of the prosecution.

Table 9

Number of RE1s Per Check	Number of Checks	Total RE1s on These Checks	Number Prosecuted	Prosecution Rate
0	767	0	0	N/A
1	88	88	55	62.5%
2	13	26	16	61.5%
3	6	18	6	33.3%
4	4	16	11	68.8%
5	2	10	2	20.0%
TOTAL	880	158	90	57.0%

Some types of offence had more RE1s issued than others, and some were more likely to result in a prosecution for those RE1s. Table 10 shows the number of RE1s and the number resulting in a prosecution for each type of offence.

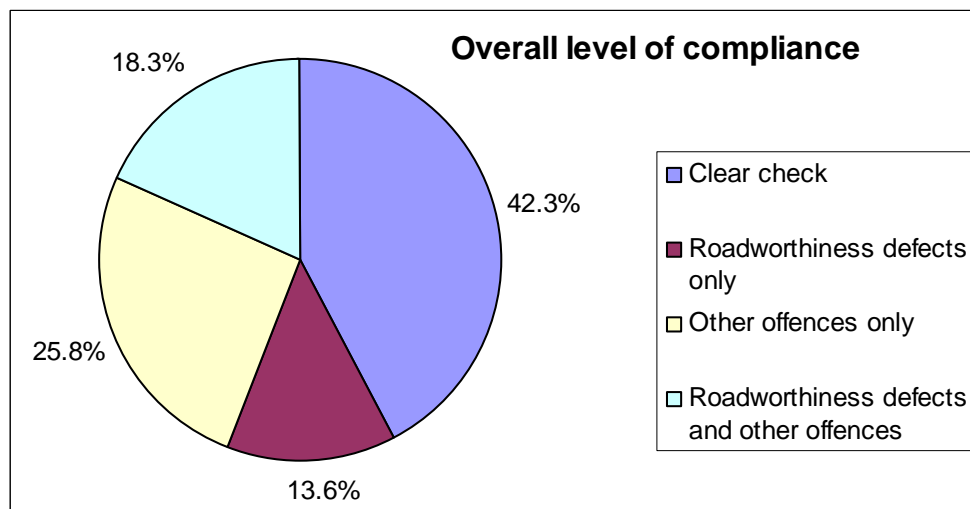
Table 10

Offence Category	RE1s Resulting in Prosecution	RE1s not Resulting in Prosecution	Total RE1s	Prosecution Rate
Dimensions	0	0	0	N/A
Driver licence	4	5	9	44.4%
Vehicle weights	8	3	11	72.7%
Vehicle excise duty	11	2	13	84.6%
Tachograph	15	6	21	71.4%
Drivers' hours	10	9	19	52.6%
Operator licensing - unlicensed	12	7	19	63.2%
Operator licensing - other	11	5	16	68.8%
Road worthiness- vehicle	7	9	16	43.8%
Road worthiness- trailer	9	15	24	37.5%
Number plates	0	1	1	0.0%
Insurance	3	3	6	50.0%
Other	0	3	3	0.0%
TOTAL	90	68	158	57.0%

3.6. Overall Level of Non-Compliance

The overall level of compliance is shown in Figure 50 below. 42.3% of all checks revealed no defects, 13.6% revealed a roadworthiness defect but no traffic offence, 25.8% revealed traffic offences but no roadworthiness defects and 18.3% revealed both roadworthiness defects and other offences.

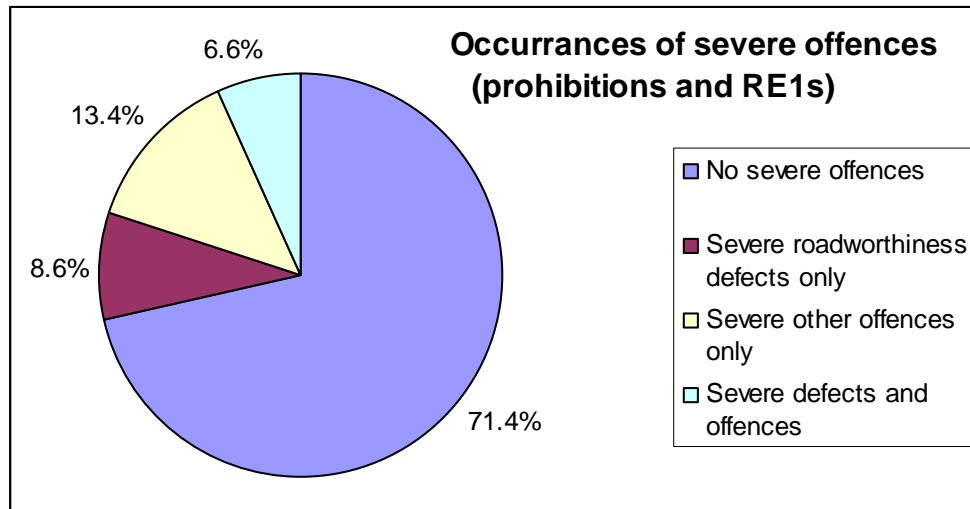
Figure 50



Just over half of the cases of non-compliance resulted in a verbal warning – 50.4% of all checks with a defect resulted in a verbal warning, 49.6% had a prohibition, RE1 or both. Figure 51 shows only the checks that had a more severe defect or offence, broken down by whether this was a roadworthiness defect, other offence or both. This shows that there were more checks with severe traffic offences alone (13.4%)

compared to roadworthiness defects alone (8.6%). 6.6% had a severe defect and severe offence. Nearly three quarters had no severe defect or offence (71.4%).

Figure 51



There were 115 checks that had RE1s issued to them, with 77 resulting in a prosecution (67.0%). 10 checks had an RE1 for a roadworthiness defect, and six of these resulted in a prosecution (60.0%). 113 checks had an RE1 for an offence, of which 72 resulted in a prosecution (63.7%). Note that eight checks had an RE1 for both defects and offences.

4. Comparison with Great Britain HGV Fleet Compliance Check Results

4.1. Introduction

This was the first year that a baseline compliance check has been carried out on HGVs in Northern Ireland. A check has been carried out in Great Britain since 1997 for the Vehicle and Operator Services Agency (VOSA). Generally the figures from the GB survey show a slightly decreasing non-compliance rate year-on-year. The results of the 2005 GB survey are not yet available, so the comparison in this section is to the 2004 GB results.

The initial setup and analysis of the results of this Northern Ireland survey has been carried out by the Operational Research Unit (ORU) of the UK Department for Transport. ORU have carried out the setup and analysis of several of the GB surveys. Therefore the general methodology is similar in both, although operational differences have caused some small differences (such as there being 23 different operational teams in GB compared to only one in Northern Ireland). One key difference between the two surveys was that the GB survey only checked vehicles registered in GB (under VOSA's operating scheme) whereas from this Northern Ireland survey all vehicles could be checked, regardless of country of origin.

Tables containing all section 4 results can be found in section D19 on page 91.

4.2. Motor Vehicle Roadworthiness

The overall vehicle roadworthiness defect rate detected in this survey of vehicles on Northern Ireland's roads was 40.8%. The equivalent rate found in the GB survey was 22.1%. This is a highly significant difference. In the Northern Ireland survey 17.7% received a prohibition or RE1 and 23.1% received a verbal warning. In the GB survey 11.3% received a prohibition and 10.8% received a verbal warning (known as an Inspection Notice).

4.3. Trailer Roadworthiness

The overall trailer roadworthiness defect rate detected in this survey of vehicles on Northern Ireland roads was 14.5%. The equivalent rate found in the GB survey was 18.9%. This is a significant difference. In the Northern Ireland survey 8.4% received a prohibition or RE1 and 6.0% received a verbal warning. In the GB survey 12.9% received a prohibition and 6.0% received a verbal warning.

4.4. Traffic Offences

The offence rate detected in this survey of vehicles on Northern Ireland's roads was 31.9%. The equivalent rate found in the GB survey was 18.4%. This is a highly significant difference. In the Northern Ireland survey 15.3% received a prohibition or RE1 and 16.7% received a verbal warning. In the GB survey 8.9% received a prohibition or were reported for prosecution, and 9.5% received a verbal warning.

4.5. Overall Compliance

VOSA treats vehicle defects and traffic offences completely separately, and has not reported the combined overall level of compliance. From this Northern Ireland survey the overall level of non-compliance – the proportion with either a vehicle defect, a trailer defect or committing a traffic offence – was 57.7% (i.e. 42.3% of checks were completely clear of offences and defects). As this was not reported on in the GB survey no comparison can be made.

4.6. Comparison to Individual Traffic Areas from the VOSA Survey

Great Britain is split into eight traffic areas. The results from each individual traffic areas were compared to the results found in this Northern Ireland fleet compliance check.

The results of the individual traffic areas followed a similar pattern to that shown by Great Britain as a whole. All GB traffic areas had lower motor vehicle defect rates than Northern Ireland, higher trailer defect rates and lower traffic offence rates. But whilst the overall GB results were significantly different from the Northern Ireland results, the results for some individual traffic areas were **not** significantly different.

Table 11 below shows which GB traffic areas had a lower or higher defect and offence rate than the rates found in this Northern Ireland survey. Where it is stated in the table there was no difference this means that there was no statistically significant difference.

Table 11

GB Traffic Area	Motor Defects	Trailer Defects	Other Offences
Scotland	Lower	No difference	Lower
North West	Lower	Higher	Lower
West Midlands	Lower	No difference	Lower
Wales	Lower	No difference	Lower
West	Lower	No difference	Lower
South East and Metropolitan	No difference	No difference	Lower
East	Lower	Higher	Lower
North East	Lower	No difference	Lower

Table 11 does not show the severity of the offences. When checks that resulted in no offence or a verbal warning were combined and compared to more severe offences the results are very similar to those found in the table above. The main difference is that four out of the eight GB traffic areas had a higher severe trailer defect rate than Northern Ireland (see Table 12).

Table 12

GB Traffic Area	Severe Motor Defects	Severe Trailer Defects	Severe Other Offences
Scotland	Lower	No difference	Lower
North West	Lower	No difference	Lower
West Midlands	Lower	Higher	No difference
Wales	Lower	No difference	Lower
West	Lower	No difference	Lower
South East and Metropolitan	No difference	Higher	Lower
East	Lower	Higher	Lower
North East	Lower	Higher	Lower

The three charts below show a comparison of the results from the Northern Ireland fleet compliance check with the results from each individual GB traffic area and the GB fleet compliance check average. Figure 52 compares the motor vehicle defect rate in the two surveys, Figure 53 compares the trailer defect rates and Figure 54 compares the offence rates.

Figure 52

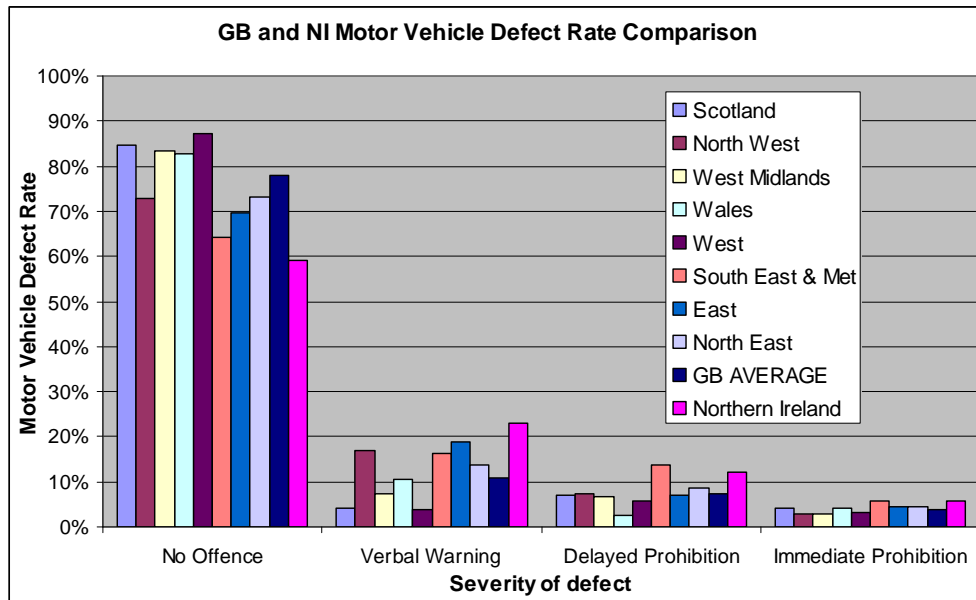


Figure 52 above shows that the Northern Ireland fleet compliance check revealed a lower proportion of defect-free motor vehicle checks than any of the GB traffic areas (although one of the GB traffic areas was not significantly different to the Northern Ireland survey). The Northern Ireland fleet compliance check revealed a higher proportion of checks resulting in a verbal warning for motor vehicle defects (again one area was not significantly different).

Figure 53

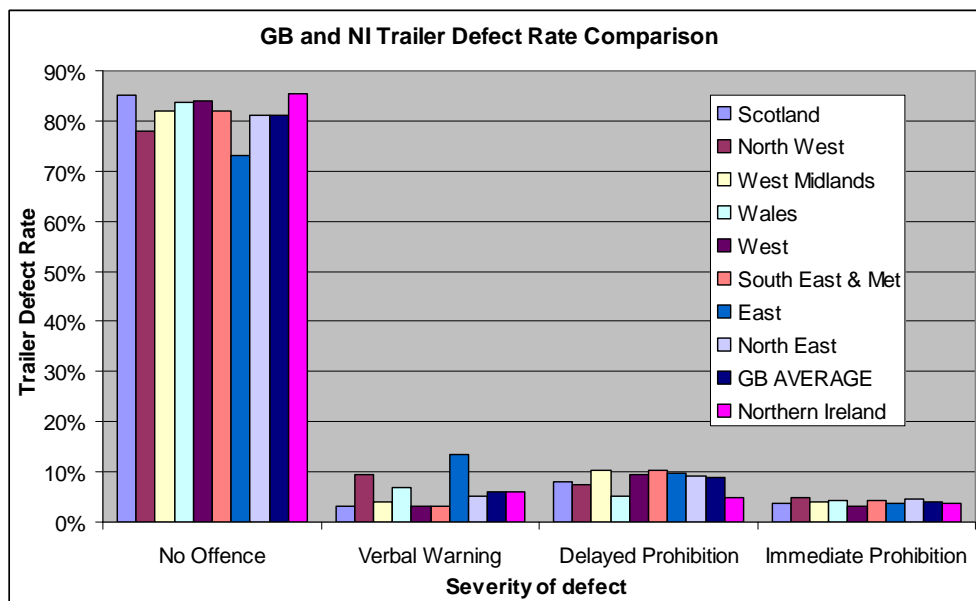


Figure 53 above shows that the Northern Ireland fleet compliance check revealed a higher proportion of defect-free trailer checks than any of the GB traffic areas (although only two of the GB traffic areas were significantly different to the Northern Ireland survey). This chart also shows that the Northern Ireland fleet compliance check revealed fewer prohibitions for trailer defects. Four of the differences in prohibitions were statistically significant.

Figure 54

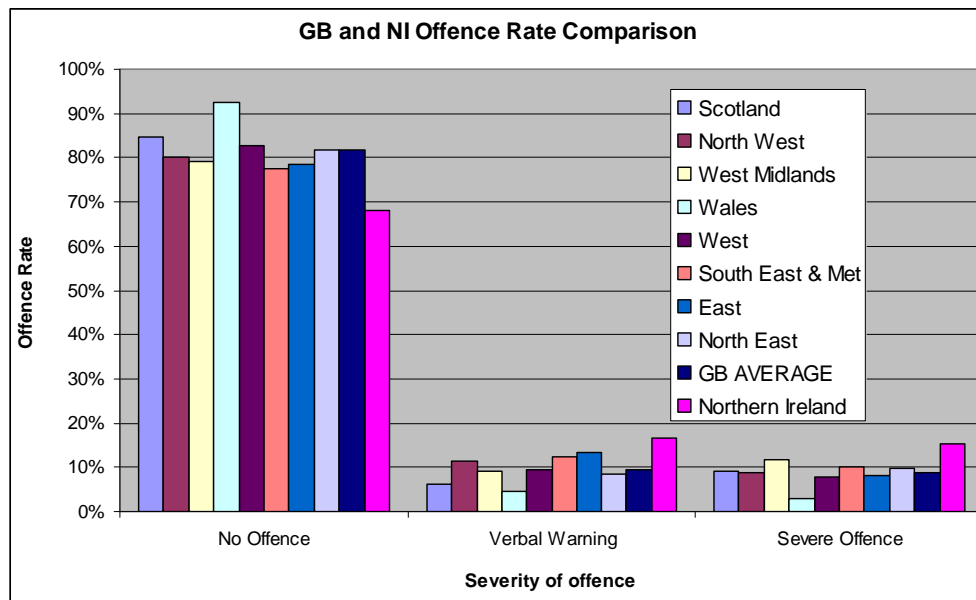


Figure 54 above shows that the Northern Ireland fleet compliance check revealed a lower proportion of offence-free checks, and Table 11 shows that the lower result from the Northern Ireland fleet compliance check was significantly different to each of the GB traffic areas. The chart also shows that the Northern Ireland fleet compliance check had a higher proportion of checks that revealed an offence that resulted in severe offence, and the same is true of verbal warnings. Most of these differences were significant.

4.7. Summary of Comparison of the Surveys

In summary, the checks in Northern Ireland revealed significantly more motor vehicle defects, significantly fewer trailer defects and significantly more offences than the GB survey. The difference in vehicle defect rates and offence rates was much larger than the difference in trailer defect rates. As it was not reported on in the GB survey it is not possible to compare the proportion of totally compliant checks in the two surveys. The results from each of the eight individual GB traffic areas were compared to the Northern Ireland results. In every case the outcome was either the same as that for the GB average (lower motor vehicle defect rates, higher trailer defect rates and lower offence rates in the GB survey) or there was no significant difference between the results from that traffic area and the results of the Northern Ireland survey.

5. Conclusions

5.1. Summary of Results

5.1.1. Type of Non-Compliance

The overall level of compliance was 42.3%. This is the proportion of all checks that revealed no defects. 13.6% revealed a roadworthiness defect but no other offences, 25.8% revealed traffic offences but no roadworthiness defects and 18.3% revealed both roadworthiness defects and other offences.

The overall non-compliance rate for all severities and all types of offences or defects was 57.7%, in a 95% confidence interval between 52.7% and 62.7%.

5.1.2. Severity of Non-Compliance

42.3% of checks revealed no defects or offences. 29.1% revealed a defect or offence that required a verbal warning. 15.6% revealed a defect or offence that resulted in a prohibition but not an RE1, 7.7% revealed an offence or defect that resulted in an RE1 but no prohibition and 5.3% resulted in both a prohibition and an RE1.

The overall non-compliance rate for roadworthiness defects and traffic offences for prohibitions or prosecutions was 28.6%, in a 95% confidence interval between 24.0% and 33.2%.

A total of 77 of the 115 checks with an RE1 resulted in a prosecution (67.0%). This was made up of 71 checks (61.7%) that received a prosecution for an offence alone, five checks (4.3%) that received a prosecution for a defect alone and one check (0.9%) that received a prosecution for both a defect and offence.

5.1.3. Roadworthiness Non-Compliance

Of the 880 HGVs checked, 388 had a roadworthiness defect on ***either the motor or trailer*** (44.1%). Of these 388,

- 10 checks resulted in a prohibition and RE1 (1.1%)
- 166 resulted in a prohibition (18.9%), and
- 212 resulted in a verbal warning (24.1%).

61 of the 176 prohibitions were issued with immediate effect (6.9% of all checks) and 115 had delayed effect (13.1% of all checks).

Of the 880 HGVs checked, 359 had a roadworthiness defect on the ***motor vehicle*** (40.8%). Of these 359,

- 156 checks resulted in a prohibition or RE1 (17.7%), and
- 203 resulting in a verbal warning (23.1%).

50 of the 156 prohibitions were issued with immediate effect (5.7% of all checks) and 106 had delayed effect (12.0% of all checks).

Of the 415 trailers checked, 60 had a roadworthiness defect on the ***trailer*** (14.5%). Of these 60,

- 35 checks resulted in a prohibition or RE1 (8.4%), and
- 25 resulted in a verbal warning (6.0%).

15 of the 35 prohibitions were issued with immediate effect (3.6% of all trailer checks) and 20 had delayed effect (4.8% of all trailer checks).

A total of 10 checks resulted in an RE1 being issued, of which six resulted in a prosecution. Three of the prosecutions were for vehicle defects only, two were for trailer defects only and one was for a check where both vehicle and trailer had a serious defect.

The overall defect rate for **vehicle roadworthiness** was 40.8%, in a 95% confidence range of 35.8% to 45.8%. The overall rate of prohibitable or prosecutable vehicle roadworthiness defects was 17.7%, in a 95% confidence interval of 13.9% to 21.5%.

The overall defect rate for **trailer roadworthiness** was 14.5%, in a 95% confidence range of 9.5% to 19.5%. The overall rate of prohibitable or prosecutable trailer roadworthiness defects was 8.4%, in a 95% confidence range of 4.5% to 12.3%.

5.1.4. Other Offences and Traffic Regulation Non-Compliance

281 HGVs committed one or more other offences (31.9%). Of these,

- Five resulted in an RE1 and a prohibition (0.6%),
- 108 resulted in an RE1 but no prohibition (12.3%),
- 21 resulted in a prohibition but no RE1 (2.4%), and
- 147 resulted in a verbal warning (16.7%).

The most common offences were tachograph offences (12.6% of checks resulted in at least a verbal warning for a tachograph offence). Drivers' hours offences were the second most common offence (5.5% of checks resulted in at least a verbal warning).

113 checks resulted in at least one RE1 being issued for other offences. More than one RE1 was issued in some checks, resulting in a total of 158 RE1s issued. 72 of the checks resulted in a prosecution for at least one of their RE1s (63.7%). Of all 158 RE1s issued, 90 resulted in a prosecution (57.0%).

The overall rate for all severities of offences was 31.9%, in a 95% confidence range of 27.2% to 36.6%. The overall rate for prohibitable or prosecutable offences was 15.2% in a 95% confidence range of 11.6% to 18.8%.

5.1.5. Comparison with 2004 GB Survey

Checks in Northern Ireland revealed significantly more motor vehicle defects than checks in Great Britain (40.8% compared to 22.1%), significantly fewer trailer defects (14.5% compared to 18.9%) and significantly more offences (31.9% compared to 18.5%). The difference between the vehicle defect rates and offence rates was statistically much larger than the difference in trailer defect rates. It was not possible to compare the proportion of checks without either a roadworthiness defect or an offence as this was not reported on in the GB survey. A comparison with the results from each of the eight GB traffic areas showed the same pattern as the GB survey average, but with some GB traffic areas having results which were not significantly different to Northern Ireland results.

5.2. Effect of Different Vehicle and Location Factors

5.2.1. The list below shows the effect different vehicle, location and time factors had on the vehicle roadworthiness defect rate:

- Newer vehicles were less likely to have a vehicle roadworthiness defect than older vehicles. The defects found on newer HGVs were also less severe. Older vehicles

were significantly more likely to have a higher number of defects per vehicle than newer vehicles.

- There was no significant difference in the defect rate for vehicles originating in different countries. However, of only those vehicles that did have a defect, it was significantly more likely to be prohibitable if the vehicle was from Northern Ireland rather than from Republic of Ireland. Vehicles from Northern Ireland also had significantly more defects per vehicle than those from other countries.
- There were no significant differences in the defect rates of vehicles stopped on different road types.
- Checks on Friday revealed a significantly higher defect rate than other days of the week, and Saturday had a significantly lower rate. Of offending vehicles, those checked on Monday were more likely to have a prohibition and less likely to have a verbal warning than vehicles checked on other days of the week.
- Vehicles checked at night had a significantly lower defect rate overall. Vehicles checked in the morning had significantly fewer defects per vehicle than vehicles checked in the afternoon.
- There was no significant difference in defect rates for vehicles operating under the different types of account or different vehicle status.
- Vehicles checked in Armagh were statistically more likely to have a defect than those checked in other counties. Vehicles checked in Londonderry were statistically less likely to have a defect than those in other counties, but the defects that were found on vehicles in Londonderry were significantly more likely to result in a prohibition rather than verbal warning when compared to other counties. Vehicles checked in Fermanagh had a significantly higher rate of verbal warnings and lower rate of prohibitions than average. This balanced out, and these vehicles did not have a significantly higher or lower overall defect rate than average.
- There was no significant difference in defect rates or severity of defect for different types of vehicle, but rigid vehicles had significantly more defects per offending vehicle than articulated vehicles.
- There was no significant difference in the defect rates for vehicles with differing numbers of axles, but three-axle vehicles did have significantly fewer defects per offending vehicle.
- There were no significant differences in defect rates for vehicles of different maximum permissible weights. However, vehicles weighing under 10,000kg had significantly more defects per offending vehicle.
- There were no significant differences in defect rates for vehicles with different body types. However, tipper HGVs did have significantly more defects per offending vehicle.
- Only one check was carried out at a test centre. Therefore no further exploratory analysis was carried out on this.
- Vehicles that had their last annual test more than 12 months before the check were significantly more likely to have a roadworthiness defect. Defects on vehicles that had 274 to 365 days elapsed since their last test (9 to 12 months) were more likely to result in a prohibition.

5.2.2. As there were so few checks with trailers, it was not possible to detect any significant difference in trailer defect rates for most factors. Some factors however did have an effect on the defect rate of the trailer:

- Although there was no significant difference in the trailer defect rate by country, defects on trailers from Northern Ireland were more likely to result in a prohibition.
- Tipper HGVs were significantly more likely to be pulling a trailer with a defect than other HGVs with a trailer.

5.2.3. The list below shows the effect different factors had on the offence rate for other offences.

- Checks on vehicles aged five years and under were significantly less likely to discover offences than checks on vehicles aged over 10 years. Newer vehicles were also significantly less likely to have an offence that resulted in a prohibition or RE1. Vehicles aged five years and under had significantly fewer defects per vehicle than those aged 10 years and over, but there was no difference in the number of defects per offending vehicle.
- There were no significant differences in the offence rates by age of trailer.
- There were no significant differences in the offence rates by country of origin of vehicle.
- There were no significant differences in the offence rates by road type.
- Checks on Wednesday and Thursday revealed significantly more vehicles committing an offence than average, and vehicles checked on Friday were significantly less likely to be committing an offence. Vehicles checked on Thursday had more offences per vehicle than average, but not significantly more offences per offending vehicle.
- The overall rate for offences was the same for each time period used, but offences found in the afternoon were significantly more likely to result in a prohibition or RE1 than at the other times of day.
- Vehicles operated on their own account were committing significantly fewer offences than vehicles operated under hire and reward. These vehicles also had a significantly higher rate of prohibition and RE1s. Vehicles operated under the hire and reward scheme had more offences per vehicle, but not more offences per offending vehicle.
- Vehicles checked in Antrim and Belfast were committing significantly fewer offences of all severity levels than vehicles checked in other counties. Vehicles checked in Down and Fermanagh were committing significantly more offences than those in other counties. Checks in Antrim revealed significantly less offences per vehicle than average, and checks in Down revealed significantly more. However, in both these two counties there was no difference in the rate of offences per offending vehicle.
- There were no significant differences in the offence rates by vehicle type.
- There were no significant differences in the offence rates by number of vehicle axles.
- Vehicles with a maximum permissible weight of 38,000kg and over had significantly more prohibitions and RE1s than those with a weight under 38,000kg. Vehicles with a weight 10,000-19,000kg had significantly less offences per offending vehicle, and those weighing 38,000-40,999kg had significantly more offences per offending vehicle.

- Tankers had a significantly lower overall offence rate. Tippers had a significantly higher rate of prohibitions and RE1s for offences, although the overall tipper offence rate was not different from average when all severities of offence were combined.

5.3. Correlation of Different Factors

5.3.1. Comparing Each Factor to Whether a Trailer was Present

Some of the variables considered in this report were correlated. As an example, the list below shows which categories of each factor included HGVs that were more likely to be towing a trailer. 47% of the HGVs stopped were towing a trailer.

- Newer vehicles were more likely to be towing a trailer – 61% of vehicles less than two years old had a trailer, compared to 36% of those eight-nine years old, 34% of those aged 10-11 years old, 19% of those aged 12-13 and 21% of those aged 14 years old or over. These differences were much greater than would be expected by random variation.
- Overall, 77% of non-NI registered vehicles were pulling a trailer compared to 42% of those registered in NI.
- Vehicles travelling on a motorway were significantly more likely to be pulling a trailer than other vehicles – 56% were towing a trailer compared to 45% for the average of vehicles stopped on A and B roads.
- Vehicles checked on Sunday were significantly more likely to be pulling a trailer and those checked on Monday and Tuesday were significantly less likely to be pulling a trailer.
- Vehicles checked in the morning were significantly less likely to be pulling a trailer than those in the afternoon and evening.
- Vehicles under hire and reward were much more likely to be pulling a trailer – 72% had a trailer, compared with only 28% of vehicles operating their own account.
- The smaller weight categories were much less likely to be pulling a trailer – only 8% of vehicles with a maximum weight under 38,000kg had a trailer compared to 92% of vehicles with a maximum weight 38,000kg or over.
- Three-axle vehicles were also significantly more likely to be pulling a trailer – 66% of them were, compared to 44% of two-axle vehicles and only 1.6% (one of 61) of four-axle vehicles.
- Vehicles in Fermanagh were significantly more likely and those in Londonderry were significantly less likely to be pulling a trailer than average.
- Articulated vehicles were much more likely to be pulling a trailer, with 96% towing compared to only 1% of rigid vehicles.
- Vehicles of refrigerated and tanker body types were significantly more likely to be towing a trailer than average, and vehicles of tipper and other body types were significantly less likely to be pulling a trailer.

5.3.2. The analysis above shows that vehicles with a trailer were more likely to be newer, travelling on a motorway on Sunday in the afternoon or evening, operating under hire and reward, heavy, three-axled, driving in Fermanagh, articulated, non-NI registered, and be a refrigerated or tanker HGV. This means some of these factors could be correlated. When factors are correlated, an apparent relationship between one factor and compliance rates might actually be an effect of a relationship between

a second correlated factor and compliance rates. The first factor might not actually directly affect compliance rates at all.

5.4. Recommendations

It is beneficial to have as large a sample as practical to ensure results are robust. If the sample size is too small, it can be difficult to test differences seen in the results, and to compare results from year to year.

In some cases, analysis of vehicle and location factors has not been possible due to small numbers in the different category groups. The survey aimed to include 15 checks at 86 different locations, resulting in 1290 checks in total. ORU did not explicitly state that the 15 checks were all to be on motor vehicles, with any trailers drawn by these motor vehicles to be checked as well. With hindsight this explicit statement should have been made. All 86 check sites were used in this compliance survey, but due to a misunderstanding about the quota for each site as described above, not every check site yielded 15 motor vehicle checks, but 1295 checks on "units" (motor vehicle or trailer) were carried out across these sites.

In future it might be beneficial to ensure that the full quota of motor vehicles is checked, and for ORU to ensure that the instructions and terminology used are clear. This is particularly important if DVTA are interested in the trailer defect rate for different variables, the results of factors with many categories, year on year comparisons, or minority categories. An example of a factor with many categories was body type, which had nine categories, and so when the data is split into this many categories the number in each can get very small. An example of a minority category is B roads. There are not many road types, so the data is not split many ways, but the number of checks on B roads was much smaller than on A roads and motorways (in order to get a representative sample of the national road network).

As is expected, a few checks had errors in either the roadside input or in the data entry of paper forms. Several elements can be cross-checked from one part of the form to another, such as roadworthiness defects (which are in questions 21-22 and 26). However, the offences cannot be cross-checked. Therefore in future surveys DVTA could consider having an extra field on the form – either total number of offences, or highest severity of offence (or ideally both). This would add extra burden to both roadside examiners and data entry staff, but would enable cross checking of the offence section.

The data entry database had many automatic checks but one further check to compare question 26 with questions 21-22 would be worthwhile.

In future it might be worth considering combining questions 21 and 22 to have one question asking if there is a defect with response options not applicable (for trailers), no, verbal warning, delayed prohibition and immediate prohibition. This would mean only one data entry is required instead of three.

Annex A - Methodology

A.1 Selection of Check Sites and the Sampling Framework

In the survey both the selection of roadside check sites and the selection of vehicles at those sites was as random as possible. ORU took a full list of every road in Northern Ireland with its road length and selected the sites at random, based on road length (so the chance of selection was proportional to road length). ORU had no pre-knowledge about any road in the country, so no bias in site selection was possible. ORU also produced a list of backup sites so that if any were not available for operational reasons (such as road closures due to roadworks) the DVTA could choose a road of the same road type from the backup list. Some sites were not available and some backup sites had to be chosen. In particular, some check sites in certain areas were not available for security and staff safety reasons.

The list of sites chosen was stratified, so that the same proportion of A roads, B roads and Motorways in the survey reflected the proportion of these roads nationally. Ideally stratification should have been done based on traffic volumes on these roads, but this information was not available. Once the check sites were chosen, they were randomly allocated a time slot (6am-2pm, 2pm-10pm, 10pm-6am) and a day of the week, in accordance with the HGV traffic volumes at different times of day and days of the week. This traffic volume information was not available for Northern Ireland traffic but was available for HGVs travelling in Great Britain, so this was used as an approximation.

The aim of stratifying by road type, time of day and day of week was to try to ensure a sample that was representative of all HGVs travelling in Northern Ireland. For example, if only A roads and Motorways had been used, small lorries doing local journeys could have been completely missed from the survey. As the stratification was by road length rather than road volume we cannot say every mile travelled had an equal chance of being stopped, but rather every road mile had an equal chance of having a check site on it. As smaller roads have lower traffic volumes, it could be that vehicles on these roads have been slightly over-sampled.

The selection of vehicles at each site was also as random as possible. Vehicles were stopped so that each one passing a point had an equal chance of being stopped – vehicles were not stopped based on their apparent condition. Independent members of staff randomly selected vehicles to be stopped by the examiners in order to make sure there was no targeting towards those that looked in worse condition.

The number of checks carried out at each site used was also an important consideration in terms of the overall accuracy of the results. The checks will not pick up a truly random sample as the HGVs passing any check site could have similar characteristics. For example, a check site situated near a port may have a greater likelihood of stopping large HGVs registered in a different country than checks carried out at another site. Any correlation between vehicles checked at the same site would reduce the level of accuracy, so that the more check sites used for a given sample size (and therefore a smaller number of checks at each site), the greater the level of accuracy.

A.2 Sample Size Required

In an ideal, theoretical sample, one vehicle would be "sampled" from each one of a number of randomly selected locations. For practical reasons, a number of vehicles needed to be stopped at each roadside check site. The number of vehicles stopped at each site is referred to as the "cluster size" when calculating the sample size required and associated accuracy of the results of the survey.

It is possible that there is a relationship between the vehicles that travel past a particular check site, and that these vehicles may have similar characteristics. For example, a check site situated near a manufacturing plant may have a greater likelihood of stopping large, bulk good carrying HGVs than checks carried out at another site. This potential correlation between vehicles passing each check site means that as the cluster size increases, the sample size also needs to increase, to compensate for any correlation between vehicles stopped at one site. The correlation factor used for this survey was $\rho = 0.1^3$.

The sample size needed for a given level of accuracy in cluster sampling is determined by:

- the non-compliance rate being measured
- the correlation within clusters (where known). For the purpose of this sample it was assumed to be 0.1 (see above), and was an estimate
- the size of the clusters (i.e. the number of checks conducted at each site).

A sample size of 1290 HGVs was proposed, based on an assumption of a non-compliance rate of 16%, a cluster size of 15 motor vehicles and an accuracy level of $\pm 2.5\%$ at the 95% confidence level. This resulted in 86 roadside check sites being used. ORU did not explicitly state that the total of 1290 checks referred to 1290 motor vehicle checks but should have done, and due to this 86 sites were used but the resulting sample size was 880 motor vehicles (68.2% of the target). 415 of these had a trailer.

A.3 Measures of Non-Compliance Rates

As it was thought that the type of road that an HGV was travelling on could be a factor in the likelihood of discovering a roadworthiness defect or traffic offence it was decided to randomly select locations for checks stratified by road type (see section A.1 above). Data were available on the lengths of roads of different road types in Northern Ireland and this was used to build the sample.

Each kilometre of road had an equal chance of having a check site located on it. Each HGV was stopped randomly, but HGVs travelling on roads with relatively low traffic volume levels had greater chance of being involved in the survey than those travelling on roads with higher traffic volumes. No account was taken of traffic volumes on different roads, as this data were not available for all roads.

The measures used in the analysis are described in section 2 of the report.

A.4 Analysis of the Results

Once the survey had taken place, the completed forms were returned to DVTA. The data in the forms were entered into a database. The data were then checked for consistency and then analysed by ORU and a report of the results was produced.

³ The value of ρ for cluster samples typically ranges from 0 to 0.5

Annex B – Accuracy of the Results

The accuracy of the results is dependent on an unbiased, representative sample of an adequate size. 880 HGVs were stopped and checked, with a maximum of 15 HGVs checked at one location on a given day (or 13 trailers). This sample size and cluster size (the number of vehicles checked at one location/date) gives an accuracy level of between +/- 3.6% and +/- 5.0%. The 95% confidence intervals on the results that this level of accuracy generates are given in Table 13:

Table 13

Sample Size and Cluster Effect	Value	Lower limit	Upper limit	Range
Prohibitable roadworthiness defect rate - vehicle	17.7%	13.9%	21.5%	+/- 3.8%
All severities of roadworthiness defect rate - vehicle	40.8%	35.8%	45.8%	+/- 5.0%
Prohibitable roadworthiness defect rate - trailer	8.4%	4.5%	12.3%	+/- 3.9%
All severities of roadworthiness defect rate - trailer	14.5%	9.5%	19.5%	+/- 5.0%
Other offence rate - prohibitions or prosecution	15.2%	11.6%	18.8%	+/- 3.6%
Other offence rate - All severities of offence	31.9%	27.2%	36.6%	+/- 4.7%
Overall offence rate – roadworthiness and traffic offences, prohibitions or prosecution	28.6%	24.0%	33.2%	+/- 4.6%
Overall offence rate – roadworthiness and traffic offences, all severities of offence	57.7%	52.7%	62.7%	+/- 5.0%

The check sites were sampled so that there would be the same proportion of checks done on each road type as the proportion of roads that are of each type in Northern Ireland. Similarly, the proportion of checks done at each time of day and day of week were chosen to match the national profile of traffic flows across the week (using GB traffic flows as a proxy for NI traffic flows). The proportion of checks carried out on each road type and on each day of the week matched the national picture. However, for operational reasons there were significantly more checks done in the morning and fewer in the evening than required to match the national profile. Checks carried out in the evening revealed significantly fewer roadworthiness defects than during other times of day. Therefore if we had the correct proportion of checks at each time of day we might expect the overall non-compliance rate seen in the survey to be slightly lower. The results have been weighted so that under-represented times of day have been scaled up and over-represented times of day have been scaled down. The results of this weighting are shown in Table 14. This shows that the non-compliance level for all measures reported on decreased with the weighting. The weighted results fall well within the confidence intervals detailed in Table 13.

Table 14

Compliance Type	Actual Results	Weighted Results
Prohibitable roadworthiness defect rate – vehicle	17.7%	16.8%
All severities of roadworthiness defect rate - vehicle	40.8%	40.0%
Prohibitable roadworthiness defect rate - trailer	8.4%	8.1%
All severities of roadworthiness defect rate - trailer	14.5%	14.3%
Other offence rate - prohibitions or prosecution	15.2%	14.9%
Other offence rate - All severities of offence	31.9%	31.8%
Overall offence rate – roadworthiness and traffic offences, prohibitions or prosecution	28.6%	27.7%
Overall offence rate – roadworthiness and traffic offences, all severities of offence	57.7%	57.1%