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PPR565

Effect of vehicle defects in road accidents

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Transport Research Laboratory

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by R W Cuerden, M J Edwards and M B Pittman

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	Effect of Vehicle Defects in Road Accidents
Client:	**Department for Transport,**
	(Dr B Moran)

The views expressed are those of the author(s) and not necessarily those of Department for Transport.

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Executive summary

All vehicles deteriorate in service and this can have an adverse impact upon safety and the environment. National and European legislation requires motorists to maintain their vehicles in a roadworthy condition, but not all do so. Roadworthiness testing exists to ensure that at least a minimum level of benefits in a vehicle's original design and manufacture are retained in service. A roadworthy vehicle may be defined as one in which there are no safety and/or emission related defects that would prevent the vehicle passing the periodic motor vehicle inspection scheme in its country of use. Mandatory inspections provide an immediate benefit, which then decreases over time, but do have an associated cost for motorists. It is important therefore, to ensure that the right balance is struck between road and vehicle safety and environmental standards on the one hand and the burden of legislation on the other.

European Union legislation requires a first roadworthiness test for cars no later than four years after first registration and no less frequently than once every two years thereafter. For more than 40 years, cars in Britain have been tested three years after first registration and annually thereafter. There have been considerable technological advances in vehicle safety, emissions and reliability since that period, which means that many manufacturers now issue warranties with new vehicles that are longer than three years. Many other countries, including France, Germany, Netherlands and Sweden, conduct checks at less stringent frequencies than Britain.

The objectives of this project were to:

1. With a focus on passenger cars, light vans (up to 3.5 tonnes) and motor cycles determine:
   a) the prevalence of vehicles with roadworthiness defects in the UK vehicle population;
   b) the prevalence of vehicles with roadworthiness defects in the UK vehicle crash population;
   c) the frequency and nature of crashes caused by vehicle defects in the UK;
   d) the contribution of MOT assessed vehicle defects to crash causation in UK; and
   e) the contribution of MOT assessed vehicle defects to casualty injury outcome in UK
2. Using data generated in (1) consider the likely impacts (if any) to road safety from changes to the MOT test frequency by vehicle age and time since last inspection. The test frequency scenarios considered were a first test at year 3, second at year 5 and annual thereafter i.e. 3,2,1,1; a first test at year 4 and annual thereafter i.e. 4,1,1,1; a 4,2,1,1 strategy and a 4,2,2,2.
3. Consider the likely impacts (if any) to road safety from changes to the MOT test frequency to retest on the basis of miles travelled since last inspection, rather than time or combination thereof.

In the UK in 2009 over 35 million (35,468,419) MOT tests were undertaken, the majority of these were for class 4 vehicles, mainly comprising passenger cars and light goods vehicles (33,535,019). Approximately 40 % of vehicles in the UK failed their initial (Normal) MOT tests, although this varied depending on vehicle class, vehicle age and mileage at the time of the test.

Accidents are infrequent events and those in which vehicle defects were a causation factor even more infrequent. In general, the sensitivity of accident databases to causation factors, especially vehicle based, is low. Whilst most databases feature some level of information about defects in a vehicle at the time of a crash, a full (destructive) inspection is required in order to determine actual roadworthiness. To date, in-depth databases have not been focussed on supporting full scale investigations into roadworthiness investigations. The study has concluded that:

- There is uncertainty with respect to the number of accidents which occur in the UK where vehicle defects are contributory. This is because no recent studies have been specifically undertaken to investigate these issues.
- This study has estimated that vehicle defects are likely to be a contributory factor in perhaps 3% of accidents in Great Britain.
- On average in 2009, approximately 40% of vehicles tested failed their initial (Normal) MOT test. In general,
    - as vehicles age, the rate of MOT failure increases, for cars this reaches nearly 60% when they are 13 years old; and
    - the greater the cumulative distance travelled, the higher the rate of MOT failure, for example all cars which had driven over 90,000 miles experienced above a 50% failure rate.
- There is no established link between MOT measured roadworthiness and vehicle defects contributing to accidents, other than the common sense approach, where the greater the number of defects, especially the most safety critical ones in the fleet at a given time, the greater the likelihood of accidents being caused, at least in part, by roadworthiness issues.
- This study investigated the effect on road safety (if any) associated with a change to MOT testing frequency and found that the greater the distance between inspection dates, the greater the likelihood of adverse road safety consequences. Two different theoretical models were developed and used to provide an estimate of the magnitude of the number of accidents and casualties which may occur annually due to less frequent MOT testing.
    - The first model consisted of a prediction based on a hypothetical relationship between MOT defects in the fleet and casualties. The 4,2,2,2 option yielded the largest predicted increases, with an additional 1,200-2,200 accidents per year, 16-30 fatalities and 180-330 serious casualties, based on 2009 road injury statistics.
    - The second model was based on a prediction based on a comparison with the German roadworthiness testing experience. For change to a bi-annual inspection regime it was estimated that there would be a 1.65 % increase in the number of accidents and casualties which equates to an additional 37 people killed and 407 seriously injured.
- Although both approaches are not ideal, largely due to a lack of data upon which assumptions have been based, they consistently indicated an increase in accidents and casualties. **However, it must be stressed that these are estimates only and further work would be required before a genuine quantification of the scale of these adverse road safety impacts will be known.**
- It was not possible to quantify the nature of the likely impacts (if any) to road safety from changes to the MOT test frequency, with a transition to retest on the basis of miles travelled since last inspection, rather than time or combination thereof. Although, on the data reviewed to date we believe the vehicle age is more important than miles travelled, partly because these two factors are related and partly because new vehicles which travel large distances are still likely to follow manufacturers' maintenance schedules and have regular service checks.
- Reducing the frequency of testing for newer vehicles is likely to have adverse road safety consequences, but these would be substantially greater for older vehicles as the data presented in this report already indicates their high MOT failure rates.

1 Introduction

All vehicles deteriorate in service and this can have an adverse impact upon safety and the environment. National and European legislation requires motorists to maintain their vehicles in a roadworthy condition, but not all do so. Roadworthiness testing exists to ensure that at least a minimum level of benefits in a vehicles original design and manufacture are retained in service. A roadworthy vehicle may be defined as one in which there are no safety and/or emission related defects that would prevent the vehicle passing the periodic motor vehicle inspection scheme in its country of use. Mandatory inspections provide an immediate benefit, which then decreases over time, but do have an associated cost for motorists. It is important therefore, to ensure that the right balance is struck between road and vehicle safety and environmental standards on the one hand and the burden of legislation on the other.

In Britain MOT tests are undertaken to check that vehicles are kept in a roadworthy condition, with the first test required for passenger cars when they are three years old and every year thereafter. The MOT certificate confirms that at the time of the test, without dismantling it, the vehicle under test meets the minimum acceptable environmental and road safety standards required by law. However, it doesn't mean that the vehicle is roadworthy for the length of time the certificate is valid. The MOT certificate is also no guarantee of the general mechanical condition of the vehicle and doesn't cover the mechanical condition of the engine, clutch or gearbox.

European Union legislation requires a first roadworthiness test for cars no later than four years after first registration and no less frequently than once every two years thereafter. For more than 40 years, cars in Britain have been tested three years after first registration and annually thereafter.

There have been considerable technological advances in vehicle safety, emissions and reliability since that period, which means that many manufacturers now issue warranties with new vehicles that are longer than three years. Many other countries, including France, Germany, Netherlands and Sweden, conduct checks at less stringent frequencies than Britain.

Figure 1-1 provides an overview of how MOT testing reduces the burden and costs directly related to poor vehicle roadworthiness, in terms of safety and environmental benefits. This diagram was adapted from a flow chart within the AUTOFORE project (AUTOFORE 2007b).

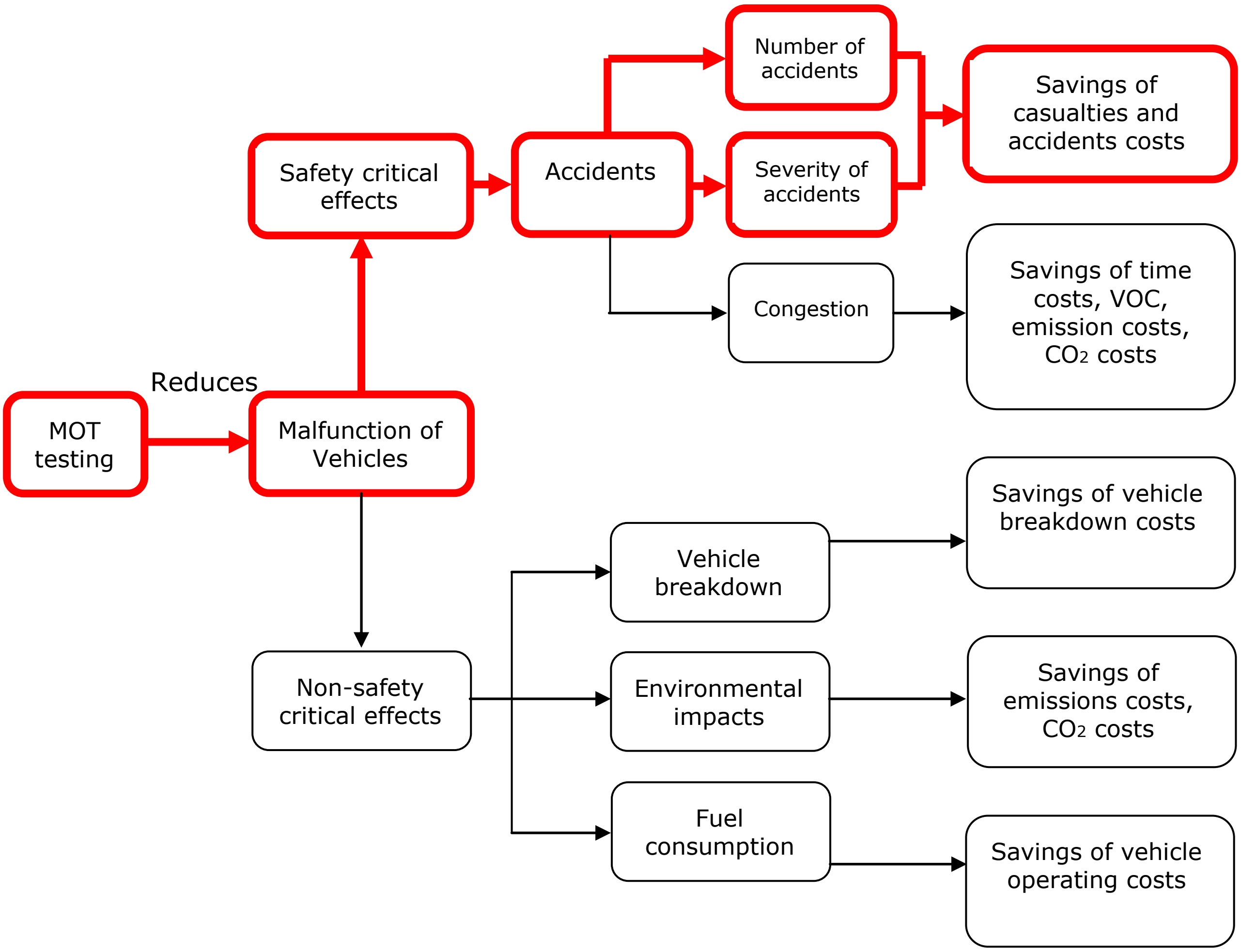

Figure 1-1: Overview of how MOT testing potentially reduces adverse affects of poor vehicle roadworthiness

The scope of this study is limited to a high level evaluation with respect to the road safety impacts only, which may be correlated with a reduction in the current frequency of MOT testing or changes away from annual inspections to ones based on cumulative mileage.

A substantial amount of data was reviewed as part of this project and where practicable this has been summarised within the main report and the data included in an Appendix.

2 Objectives

The objectives of this project were to:

1. With a focus on passenger cars, light vans (up to 3.5 tonnes) and motor cycles determine:
   a) the prevalence of vehicles with roadworthiness defects in the UK vehicle population;
   b) the prevalence of vehicles with roadworthiness defects in the UK vehicle crash population;
   c) the frequency and nature of crashes caused by vehicle defects in the UK;
   d) the contribution of MOT assessed vehicle defects to crash causation in UK; and
   e) the contribution of MOT assessed vehicle defects to casualty injury outcome in UK.
2. Using data generated in (1) consider the likely impacts (if any) to road safety from changes to the MOT test frequency by vehicle age and time since last inspection. The test frequency scenarios considered were a first test at year 3, second at year 5 and annual thereafter i.e. 3,2,1,1; a first test at year 4 and annual thereafter i.e. 4,1,1,1; a 4,2,1,1 strategy and a 4,2,2,2.
3. Consider the likely impacts (if any) to road safety from changes to the MOT test frequency to retest on the basis of miles travelled since last inspection, rather than time or combination thereof.

The methodology used to meet these objectives is set out in Section 4 (Approach).

3 Background

3.1 European legislation

The current basis of European legislation for Periodic Technical Inspection (PTI) for motor vehicles and their trailers is Directive 2009/40/EC which has recently been amended by Directive 2010/48/EU (5th July 2010) and EC recommendation 2010/378/EU (5th July 2010). Directive 2009/40/EC came into force on 26th June 2009 and is a recast of Directive 96/96/EC with some additions. It sets minimum inspection standards for:

- Vehicle identification
- Braking equipment
- Steering
- Visibility
- Lamps, reflectors and electrical equipment
- Axles, wheels, tyres and suspension
- Chassis and chassis attachments
- Other equipments such as seat belts and fire extinguishers (if fitted)
- Nuisance (noise and exhaust emissions)

It allows member states the following derogations to increase the stringency of the testing regime:

- Bring forward date for first compulsory roadworthiness test
- Shorten interval between compulsory tests
- Make testing of optional equipment compulsory
- Increase number of items tested
- Extend periodic test requirement to other categories of vehicles
- Prescribe additional tests
- Require for vehicles registered on their territory higher minimum standards for braking efficiency than those prescribed

The categories of vehicles subject to roadworthiness tests and the frequency of the tests is shown in Table 3-1.

Table 3-1: Directive 2009/40/EC minimum requirements categories of vehicles subject to roadworthiness tests and the frequency of the tests.

Categories of vehicle	Frequency of tests
1. Motor vehicles used for the carriage of passengers and with more than eight seats, excluding the driver's seat	One year after the date on which the vehicle was first used, and thereafter annually
2. Motor vehicles used for the carriage of goods and having a maximum permissible mass exceeding 3500 kg	One year after the date on which the vehicle was first used, and thereafter annually
3. Trailers and semi-trailers with a maximum permissible mass exceeding 3500 kg	One year after the date on which the vehicle was first used, and thereafter annually
4. Taxis, ambulances	One year after the date on which the vehicle was first used, and thereafter annually
5. Motor vehicles having at least four wheels, normally used for the road carriage of goods and with a maximum permissible mass not exceeding 3500 kg, excluding agricultural tractors and machinery	Four years after the date on which the vehicle was first used, and thereafter every two years
6. Motor vehicles having at least four wheels, used for the carriage of passengers and with not more than eight seats excluding the driver's seat	Four years after the date on which the vehicle was first used, and thereafter every two years

The frequency of tests for European member states in 2006 is shown in Appendix A (AUTOFORE 2007a). It can be seen that many member states have a test frequency higher than that demanded by the Directive.

On 5th July 2010 Directive 2009/40/EC was amended (adapted for technical progress) by Directive 2010/48/EU and EC recommendation 2010/378/EU.

Directive 2010/48/EU

This Directive updated the technical content of Directive 2009/40/EC to reflect the current state of vehicle technology and to facilitate further harmonisation of the inspection process amongst member states. The changes included:

- Requirements for information to be included on a roadworthiness certificate.
- Introduction of vehicle categories definitions according to Directive 2007/46/EC.
- Elaboration of inspection items in Annex II including addition of inspection methods and reasons for failures for all inspection items.
- Some Member States, e.g. the UK, have extended the PTI requirement to other categories of vehicles, e.g. L category vehicles, as permitted by the derogations noted above. Inspection methods and minimum mandatory reasons for failure for these categories of vehicles have been added.
- Introduction of a basic inspection for several electronic controlled systems: EBS, safety belt load limiters and pre-tensioners, airbags, SRS, ESC and OBD systems under certain conditions for gaseous emissions for petrol engines.

Member states must comply with Directive 2010/48/EU by 31st Dec 2011 with the exception of the roadworthiness certificate requirement for which the date is 31st Dec 2013.

Recommendation 2010/378/EU

This Recommendation has the objective to further harmonize the inspection process among Member States. It provides best practice guidelines that inspectors should be encouraged to use to assess deficiencies detected during PTIs. Defects should be categorized into three groups:

Minor defects

- No significant effect on the safety of the vehicle.
- Re-examination is not necessarily required.

Major defects

- May prejudice the safety of the vehicle or put road users at risk or that are more significant non-compliances.
- The use of the vehicle is subject to restrictions until it has passed a re-examination.

Dangerous defects

- Immediate risk to road safety.
- The vehicle should not be used any more on the road under any circumstances.
- If the vehicle can be repaired re-examination is required.

3.2 MOT information

Sections 45 to 48 of the Road Traffic Act 1988 provide the legislative basis for MOT testing. The purpose of the MOT test is to ensure that cars, other light vehicles (including some light goods vehicles), private buses and motor bicycles over a prescribed age are checked at least once a year to see that they comply with key roadworthiness and environmental requirements in the Road Vehicle Construction and Use Regulations 1986 and the Road Vehicle Lighting Regulations 1989 as amended. A Test Certificate is issued following successful completion of an examination.

The Test Certificate relates only to the condition of testable items at the time of the test and should not be regarded as evidence:

- of their condition at any other time;
- of the general mechanical condition of the vehicle; or
- that the vehicle fully complies with all aspects of the law on vehicle construction and use.

The test precludes the dismantling of parts of the vehicle although doors, boot lids and other means of access will normally need to be opened. In the case of motor bicycles, cover panels may also need to be removed or raised to examine the vehicle structure.

Detailed legislation on vehicles exempt from the MOT is set out in the Motor Vehicles Test Regulations 1981 regulation 6 (as amended), and in the Road Traffic Act 1988 Section 189. Examples of vehicles exempted from MOT testing include electrically propelled goods vehicles, track laying vehicles, vehicles constructed or adapted to form part of an articulated combination, works trucks, trailers, pedestrian controlled mechanically propelled vehicles and electrically powered pedal cycles. Legislation also exempts vehicles used in particular ways (e.g. travelling to and from test) or particular places (e.g. some islands) from the need to have a valid MOT test certificate. It should also be noted that even when a vehicle is not required to have a test certificate it must still be maintained in a roadworthy condition.

The MOT test is conducted principally at private garages and by some local authorities. These are authorised, or designated as appropriate, by the Vehicle and Operator Services Agency (VOSA), and known as Vehicle Testing Stations (VTS). VTS and their staff are subject to inspections by VOSA to ensure that testing is properly carried out using approved test equipment. Only specifically approved people may conduct tests, sign official test documents, and make database entries. VTS may only test those classes and types of vehicle that they are authorised to test and which are of a size and weight that can be accommodated on the authorised test equipment.

There are different classifications of vehicles on the UK's roads which are subject to different MOT tests and frequency.

Table 3-2 : The vehicles subject to test under the Regulations divided into their classes (Source: MOT Testing Data User Guide)

Class	Description	Age
1	Motor bicycles (with or without sidecars) up to 200 cm^3	3
2	All motor bicycles (including Class 1) (with or without sidecars).	3
3	3 wheeled vehicles not more than 450 kg unladen weight (excluding motor bicycles with side cars). (3 wheeled vehicles more than 450 kg unladen are in class 4.)	3
4	Cars, passenger vehicles, motor caravans, Private Hire Vehicles, Motor Tricycles, Quadricycles and dual purpose vehicles in all cases with up to eight passenger seats	3
	Goods vehicles not exceeding 3,000 kg Design Gross Weight (DGW).	3
	Taxis and ambulances in either case with up to eight passenger seats.	1
	Passenger vehicles, ambulances, motor caravans and dual purpose vehicles in all cases with nine to twelve passenger seats that; • are fitted with no more seat belts than the minimum required because of their construction; or • are identified as having been fitted with a type approved seat belt installation when built; or • have been tested as class 4A, 5A or 6A (PSV) with at least the same number of seat belts as are currently fitted.	1
4A	**The class 4A test is the normal class 4 test with the addition of a check on the installation of certain seat belts**. Passenger vehicles, ambulances, motor caravans and dual purpose vehicles in all cases with nine to twelve passenger seats that: • are fitted with more seat belts than the minimum required because of their construction and: • are not identified as having been fitted with a type approved seat belt installation when built; or • have not been tested as class 4A, 5A or 6A (PSV) with at least the same number of seat belts as are currently fitted.	1
5	Private passenger vehicles, ambulances, motor caravans and dual purpose vehicles in all cases with thirteen or more passenger seats (including community and play buses, etc.) that: • are fitted with no more seat belts than the minimum required because of their construction; or • are identified as having been fitted with a type approved seat belt installation to all seats when built; or • have been tested as class 5A or class 6A (PSV) with at least the same number of seat belts as are currently fitted.	1
5A	**The class 5A test is the normal class 5 test with the addition of a check on the installation of certain seat belts**. Passenger vehicles, ambulances, motor caravans and dual purpose vehicles in all cases with thirteen or more passenger seats (including community buses, etc.) that: • are fitted with more seat belts than the minimum required because of their construction and: • are not identified as having been fitted with a type approved seat belt installation when built; or • have not been tested as class 5A or class 6A (PSV) with at least the same number of seat belts as are currently fitted.	1
7	Goods Vehicles over 3,000 kg up to and including 3,500 kg DGW	3

3.2.1 MOT Database Scheme

Figure 3-1 provides an overview of the data groups and their respective relationship with each other.

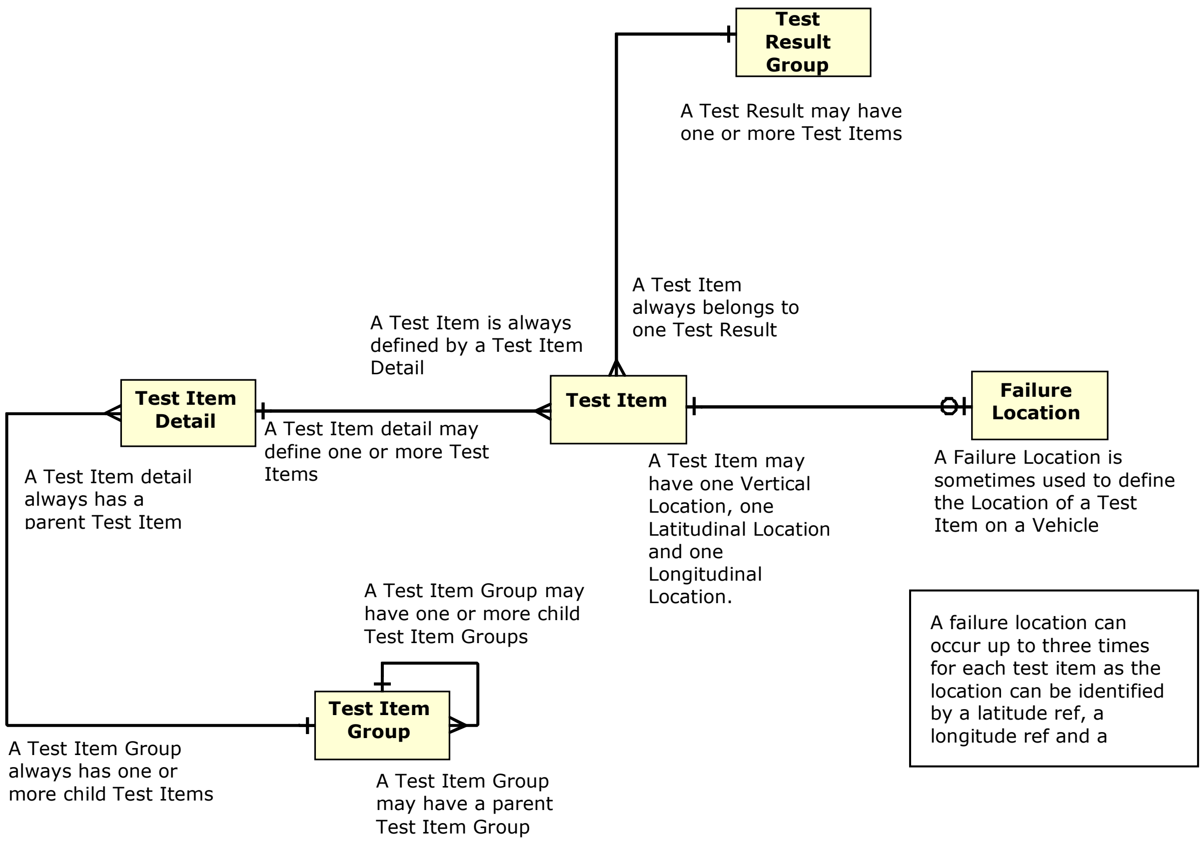

Figure 3-1: Entity relationship diagram for MOT database scheme (Source: MOT Testing Data User Guide)

The data is comprised of two main groups, each divided into calendar years.

- Test Result Group, with:
  - information about the time, place and final outcome of the MOT test; and
  - information about the vehicle tested.
- Test Item Group, which contains information about individual RfRs (Reasons for Rejection) discovered during the test.

The three remaining datasets contain further information about individual RfRs, and their characteristics.

At the time of writing, MOT test data was available from 1st January 2005 to 31st March 2010 inclusively. The MOT testing data release contains approximately 150 million tests, with 250 million associated test item records. However, MOT computerisation was not fully implemented across Great Britain until 1st April 2006, therefore the dataset is only complete from this date onwards.

Data from MOT tests in Great Britain from 2008 and 2009 were selected. The data encompasses all tests for which a valid MOT pass could have been a potential outcome and was analysed as part of this project (Section 5.1) to assess the prevalence of vehicle roadworthiness defects.

3.3 Accident data information

Accidents are infrequent events and those attributable to vehicle defects even more infrequent. In general the sensitivity of accident databases to causation factors, especially vehicle based, is low. Whilst most databases feature some level of information about defects in a vehicle at the time of a crash, a full (destructive) inspection is required in order to determine actual roadworthiness. To date, in-depth databases have not been focussed on supporting full scale investigations into roadworthiness investigations.

Section 5.2 investigates the prevalence of vehicles with roadworthiness defects in Great Britain in the road accident population using the accident database described below.

3.3.1 Reported road casualties in Great Britain (STATS19)

STATS19 is the national database in which reported traffic accidents that result in injury to at least one person are recorded, although it is acknowledged that a not all injury accidents are reported to police and recorded in the database. The database primarily records information on where the accident took place, when the accident occurred, the conditions at the time and location of the accident, details of the vehicles involved, and information about the casualties. Approximately 50 pieces of information are collected for each accident (Department for Transport 2007).

The severity of the casualties involved in the accident is assessed by the investigating police officer. Each casualty is recorded as being either slightly, seriously, or fatally injured. Fatal injury includes only casualties who died less than 30 days after the accident, not including suicides or death from natural causes. Serious injury includes casualties who were admitted to hospital as an in-patient. Slight injury includes minor cuts, bruises, and whiplash. The full definitions of these injury severities (and all other information recorded in STATS19) are given in the STATS20 document which accompanies the STATS19 form. These definitions are also available online at www.stats19.org.uk.

Between 1999 and 2004 a system of recording contributory factors was trialled in 15 Police forces around the country. This led to the national adoption of a contributory factor system in 2005. Using this system, the investigating police officer can record up to 6 factors which contributed towards the accident.

The accidents that are recorded in STATS19, including the contributory factors, are summarised annually in the Department for Transport "Road Casualties Great Britain" series (Department for Transport 2007) (now "Reported Road Casualties Great Britain").

3.3.2 VOSA accident database

The Vehicle and Operator Services Agency (VOSA) is an executive agency of the Department for Transport (DfT), with responsibility for monitoring and enforcement of vehicle roadworthiness. Part of VOSA's remit is to respond to police requests for inspections of vehicles following road traffic accidents, for purposes of public and other enquiries. The principal requirements of an examination are to:

- establish whether the mechanical condition of the vehicle caused or contributed to the accident;
- verify any allegations by the driver that the vehicle was faulty; and
- confirm that no mechanical defects or design faults were present prior to the accident in cases where charges for other offences are being laid against the driver.

Historically, VOSA inspections concentrated on goods vehicles over 3.5t (HGVs), passenger vehicles (PSVs) and a few other miscellaneous vehicle types. Many police forces have their own vehicle examiners for cars and motorcycles, and some also carry out their own inspections of larger vehicles, while others rely totally on VOSA for all examinations, regardless of vehicle type. Police forces also request VOSA to undertake examinations where there are political implications, especially for accidents which attract significant media attention.

Vehicle examinations on large vehicles usually take place at a commercial operator's premises, to which the accident-involved vehicle will have been towed under police instruction. However, in certain circumstances a preliminary examination may be carried out at the accident scene before the vehicle is towed away for the full inspection.

The data collected by VOSA examiners provides some information about the UK vehicle fleet condition, the occurrence of vehicle defects and the contribution of these defects to accidents. VOSA and the DfT aim to use the information gleaned during vehicle examinations to inform their policy decisions on road safety and accident reduction at a National level. This requirement is fulfilled by the VOSA Accident Database, a data resource that can be used for policy research in the field of vehicle and operator safety.

3.3.3 Fatals Intermediate Database

The Fatals Intermediate Database was developed by TRL under contract to the DfT. Fatal accident files acquired from nearly all police forces in England and Wales were examined, and information extracted for entry into the database. Although data are no longer being added to the database, it still contains details of 11,996 fatal accidents (18,379 vehicles, 17,612 of which are not pedal cycles). The accidents in the database cover the period 1986-98, though over 90% date from 1990-95.

3.3.4 On The Spot database

The On The Spot (OTS) accident data collection project was an in-depth accident research project which ran from 2000 to 2010, and was co-funded by the Department for Transport and the Highways Agency. The aim of the project was to collect detailed information regarding the causes and consequences of road traffic accidents, which could be used to assess and assist in the development of new accident countermeasures systems, be they, vehicle, road or behavioural. The project achieved this aim by sending teams of experienced investigators to the scenes of road traffic accidents at the same time as the emergency services, to collect detailed information regarding the vehicles, highways and behavioural aspects which could have influenced the accidents. The study collected this detailed data for all accidents irrespective of their accident severity. All of the data collected by the study is stored in a relational database, which enables detailed analysis of the causes and consequences of accidents to be undertaken.

In total the two OTS teams, based in the Thames Valley and Nottingham investigated 4,744 accidents; these investigations were undertaken within two geographically defined sample regions, following a strict sampling regime which ensured the distribution of accidents attended were representative of the national distribution of accidents as reported to the police.

OTS investigations were predominately undertaken at the scene of the accident, occasionally supplemented by inspections of the vehicles involved at recovery yards. These investigations were independent of the police, and were undertaken using observation methods to ensure that the OTS investigations did not hinder or interfere with any criminal investigation. The OTS investigators did not have any legal powers to seize a vehicle or undertake a mechanical inspection.

The information held within the database relating to vehicle defects, is therefore based in the most part on the observations of the OTS investigators at that the scene and thus any conclusion drawn from the following analysis must be taken within this context.

4 Approach

The evidence generated in this project is used to consider the likely impact of changing the frequency of the MOT test for passenger cars, light vans and motorcycles (but NOT minibuses, HGV's or buses) in the UK.

4.1 Objective 1: Prevalence and nature of vehicle defects

- An analysis of the **MOT scheme database** to determine the prevalence of vehicles with roadworthiness defects in the GB vehicle population. Test years 2008 and 2009 were analysed as part of this research programme.

  The study investigated the prevalence of vehicle defects which contribute to MOT failures, including those with affect the roadworthiness (potential to contribute to an accident) and crashworthiness (potential to exacerbate injuries should a collision occur) vehicles.

- An analysis of the available **accident databases** to determine the prevalence of vehicles with roadworthiness defects in the UK vehicle crash population, including an assessment of the frequency and nature of crashes caused by vehicle defects.

  The contribution of MOT assessed vehicle defects to crash causation in GB and the associated causalities.

  To achieve these goals, the following sources of data have been analysed:

  - STATS19
  - VOSA Accident Database
  - Fatals Intermediate Database
  - On The Spot Database

The findings from the analysis for objective 1 are summarised in Section 5.

4.2 Objectives 2 and 3: Likely impacts to road safety (if any) to changes to MOT periodical inspections

- The influence of time (vehicle age and time since last inspection) and distance travelled between inspections on vehicle pass rate is considered.

  Objectives 2 and 3 are explored by a 'reasoned judgment' approach, including discussions with respect to the lack of certainty. The findings from Objective 1 are used where practicable to inform the evaluation of the likely impacts to road safety associated with any changes to MOT testing frequency.

  Two different methods are used to estimate the potential impact on British road casualties which could be associated with changes to the MOT test frequency:

  - Prediction based on a hypothetical relationship between MOT defects in the fleet and casualties; and a
  - Prediction based on a comparison of the German roadworthiness testing experience.

- Finally, some comments are provided with respect to the likely impacts (if any) to road safety from changes to the MOT test frequency, with a transition to retest on the basis of miles travelled since last inspection, rather than time or combination thereof.

The findings from the analysis for objectives two and three are summarised in Section 6.

5 Prevalence and nature of vehicle defects

5.1 The prevalence of vehicles with roadworthiness defects in the UK vehicle population

Table 5-1 highlights the potential outcome for each MOT test undertaken in Great Britain and the associated descriptions. In total, there were over 34 million MOT tests conducted in 2008 and over 35 million in 2009 (Table 5-2 and Table 5-3 respectively). Tests which were abandoned (ABA), aborted (ABR) or where the Nominated Tester (NT) refused to examine the vehicle (R) are all grouped as 'Other' as they represent less than 1% of all MOT tests.

Table 5-1: MOT test results

MOT test results	Code	Description
Pass	P	Test pass.
Fail	F	Test fail.
Pass with Rectification at Station	PRS	The process where minor defects may be rectified within one hour after the test, but before recording the result on the Vehicle Testing Station (VTS) device (as defined in MOT Testing Guide).
Abandon	ABA	The term used when a test cannot be completed because the Nominated Tester (NT) considers it unsafe to continue or because it becomes apparent during the test that certain items cannot be satisfactorily inspected. An appropriate fee may be charged for the test.
Abort	ABR	The term used when a test cannot be completed because of a problem with the testing equipment or the NT. No fee may be charged for the test.
Refusal to Test	R	An NT may refuse to test a vehicle for a number of specified reasons. If the presenter insists on documentation to show the Refusal then a test record will be created on the system.

Table 5-2: All MOT test (initial and retests) results by vehicle class (2008)

Vehicle Class	Test Result (initial and retests)				Total
	Pass	PRS	Fail	Other	
1	206,628 74.8%	19,187 6.9%	48,592 17.6%	1,868 0.7%	276,275 100.0%
2	635,632 83.2%	49,028 6.4%	75,083 9.8%	4,419 0.6%	764,162 100.0%
3	11,592 73.8%	950 6.0%	2,913 18.5%	257 1.6%	15,712 100.0%
4	22,290,739 68.4%	2,473,227 7.6%	7,595,635 23.3%	24,0291 0.7%	32,599,892 100.0%
5	45,027 71.0%	2,968 4.7%	14,441 22.8%	986 1.6%	63,422 100.0%
7	477,179 63.5%	42,495 5.7%	224,473 29.8%	7,863 1.0%	752,010 100.0%
Total	**23,666,797 68.7%**	**2,587,855 7.5%**	**7,961,137 23.1%**	**255,684 0.7%**	**34,471,473 100.0%**

Table 5-3: All MOT test (initial and retests) results by vehicle class (2009)

Vehicle Class	Test Result (initial and retests)				Total
	Pass	PRS	Fail	Other	
1	210,663 74.2%	21,826 7.7%	49,471 17.4%	1,960 0.7%	283,920 100.0%
2	650,609 82.4%	55,363 7.0%	78,844 10.0%	4,511 0.6%	789,327 100.0%
3	11,204 73.8%	942 6.2%	2,760 18.2%	271 1.8%	15,177 100.0%
4	22,734,458 67.8%	2,517,808 7.5%	8,029,712 23.9%	253,041 0.8%	33,535,019 100.0%
5	45,475 71.1%	3,282 5.1%	14,263 22.3%	950 1.5%	63,970 100.0%
7	491,383 62.9%	47,767 6.1%	233,705 29.9%	8,151 1.0%	781,006 100.0%
Total	**24,143,792 68.1%**	**2,646,988 7.5%**	**8,408,755 23.7%**	**2,68,884 0.8%**	**35,468,419 100.0%**

The distribution of all the test result outcomes for the different classes of vehicles is very similar for 2008 and 2009. Approximately 95% of all MOT tests conducted were for MOT class 4 vehicles, of which the majority were passenger cars.

Table 5-2 and Table 5-3 summarise the results for all the tests undertaken, **where some vehicles will be counted more than once.** This is mainly because some vehicles do not pass their initial test and are subsequently retested. Other reasons for a vehicle being tested more than once in a calendar year could include a vehicle being sold and the seller wishing to increase its value by offering the new purchaser a full (12 month) MOT certificate.

In order to prevent identification of individual vehicles or Vehicle Testing Stations, the MOT Scheme Database only holds anonymous data. Therefore, a consequence is that it is not possible to aggregate the data to identify an individual vehicle and to then further investigate how many vehicles had multiple MOT tests. It is not known how many vehicles initially failed a test, but then on the subsequent attempt passed or indeed how many never passed, or how many passed more than once at the first attempt in a given calendar year. It is however possible to make estimates of some of these potential scenarios.

The type of MOT test is differentiated in the MOT Scheme Database, as either a Normal (initial) test or a retest, where the retests have four different classifications (Table 5-4). There are a minority of vehicles, for which the Vehicle Testing Station (VTS) refused to test and the customer requested documentation.

There were 27,095,560 and 27,648,893 Normal tests in 2008 and 2009 respectively (Table 5-5 and Table 5-6). The distribution of the type of tests undertaken and their outcomes (results) is very similar for 2008 and 2009.

In 2009, Normal MOT tests accounted for approximately 78% of all MOT tests. In round numbers, 8.4 million vehicles failed their initial MOT test, whilst 7.8 million retests were undertaken in the same calendar year. Full retests (F) and Partial retests for minor items (PM) were very rare, collectively representing about 1% of all tests; whereas Partial retests where the vehicle was either repaired at the VRS (PR) or elsewhere (PL) represented 21% of all MOT tests.

Table 5-4: Type of MOT test

Type of MOT test	Code	Description
Normal MOT test	N	Full initial test.
Full retest	F	Full retest of vehicle. Derived by system, not selected by the (NT).
Partial retest (minor items)	PM	Free partial MOT retest when vehicle has left VTS for repair of minor items only, and returned by close of next working day.
Partial retest (repaired at VTS)	PR	Free partial MOT retest where vehicle has remained at VTS for repair.
Partial retest left VTS	PL	Chargeable (half standard fee) partial MOT retest when vehicle has left VTS for repair.
Refusal to test	RF	Refusal to test – customer requested documentation.

Table 5-5: All MOT test (initial and retests) results by Test Type (2008)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	16,380,929 60.5%	2,575,782 9.5%	7,910,841 29.2%	228,008 0.8%	27,095,560 100.0%
Full retest (F)	258,321 84.3%	6,463 2.1%	23,713 7.7%	17,884 5.8%	306,381 100.00%
Partial retest (minor items) (PM)	145,216 99.9%	30 0.0%	22 0.0%	102 0.1%	145,370 100.0%
Partial retest repaired at VRS (PR)	3,804,226 99.8%	1,593 0.0%	3,528 0.1%	3,061 0.1%	3,812,408 100.0%
Partial Retest left VTS (PL)	3,078,105 98.9%	3,987 0.1%	23,033 0.7%	6,238 0.2%	3,111,363 100.0%
Refusal to test (RF)	0 0.0%	0 0.0%	0 0.0%	391 100.0%	391 100.0%
Total	23,666,797 68.7%	2,587,855 7.5%	7,961,137 23.1%	255,684 0.7%	34,471,473 100.0%

Table 5-6: All MOT test (initial and retests) results by Test Type (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	16,414,220 59.4%	2,635,048 9.5%	8,360,893 30.2%	238,732 0.9%	27,648,893 100.0%
Full retest (F)	218,258 82.2%	6,229 2.3%	22,179 8.4%	18,794 7.1%	265,460 100.0%
Partial retest (minor items) (PM)	133,923 99.9%	21 .0%	21 .0%	74 0.1%	134,039 100.0%
Partial retest repaired at VRS (PR)	4,044,252 99.8%	1,486 .0%	3,339 .1%	3,489 0.1%	4,052,566 100.0%
Partial Retest left VTS (PL)	3,333,139 99.0%	4,204 .1%	22,323 .7%	7,355 0.2%	3,367,021 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	440 100.0%	440 100.0%
Total	24,143,792 68.1	2,646,988 7.5	8,408,755 23.7	268,884 0.8	35,468,419 100

5.1.1 *MOT failure rates by vehicle class, age and mileage*

VOSA has historically published MOT testing volumes and failure rates as part of their annual Effectiveness Report. These reports only include data from 'Normal' (initial) tests with outcomes of 'Pass', 'PRS' or 'Fail', all other tests are omitted.

VOSA calculate failure rates as follows:

Initial failure rate = (Test Fail Results + Test PRS Results) / Total Tests

Final failure rate = Test Fail Results / Total Tests

Where, Total tests = Test Pass Results + Test PRS Results + Test Fail Results

Table 5-7 compares the initial and final failure rates by vehicle class, with class 2 (motor bicycles $\geq$ 200cc) having the lowest initial and final failure rates; and class 7 (Goods Vehicles over 3,000 kg up to and including 3,500 kg DGW) experiencing the highest initial failure rates of about 50%.

Table 5-7: Summary of Initial and Final failure rates by Vehicle Class

Vehicle Class	2008		2009	
	Initial	Final	Initial	Final
1	28.8	20.6	29.5	20.5
2	17.8	10.8	18.7	11.0
3	29.8	22.5	29.7	22.2
4	39.5	29.8	40.6	30.9
5	34.7	28.8	34.7	28.1
7	49.1	41.2	50.0	41.5
Total	39.0	29.4	40.1	30.5

Whilst Table 5-7 provides the average Initial and Final failure rates for each class of vehicle, Figure 5-1 and Figure 5-2 highlight how both the failure rate measures change with respect to the age of the vehicle at the time of the test. For example, class 4 vehicles which were 3 years old at the time of their test (2006) in 2009, started with an initial failure rate of 21%, but by the time they were 13 years old (1996), this had increased to 56%.

The same overall pattern is seen for Initial and Final rates with respect to age, with classes 4 and 7 vehicles experiencing higher failure rates as they age, and motorcycles (classes 1 and 2) maintaining a more level performance over time. Interestingly there is some evidence that the lower engine capacity motorcycles (50cc) behave more like class 4 and 7 vehicles.

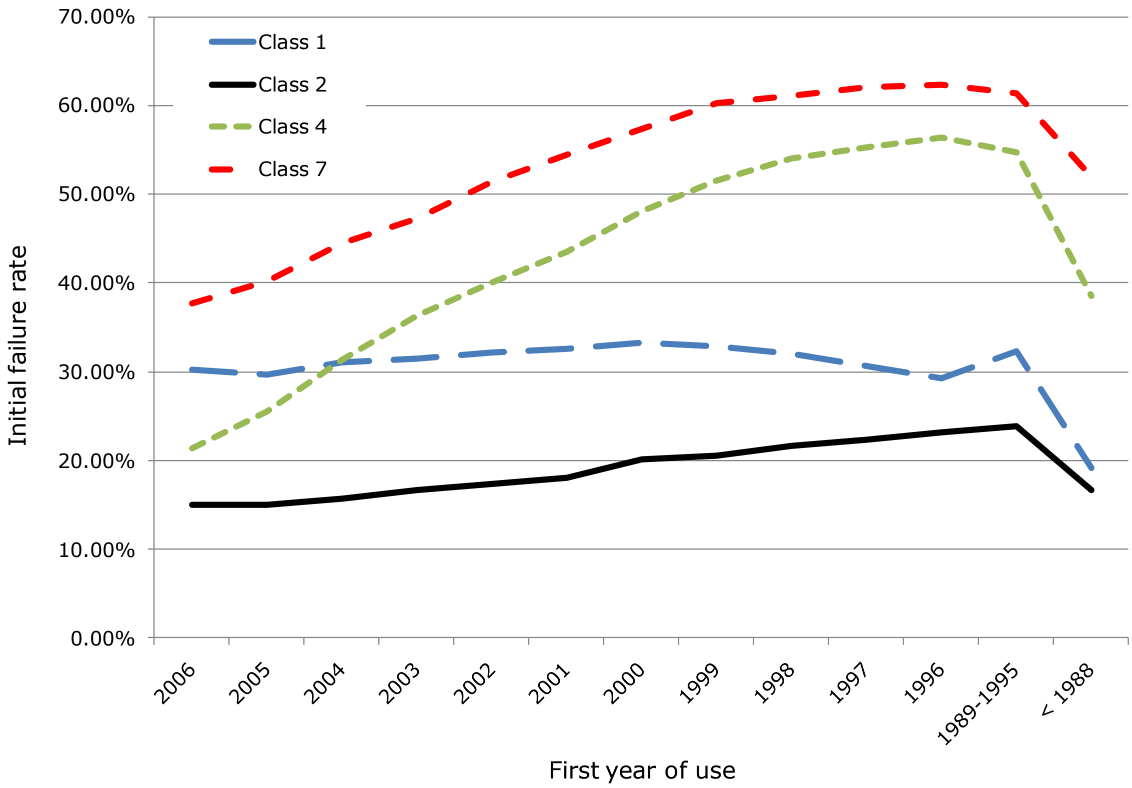

Figure 5-1: Initial MOT failure rate by first year of use (2009)

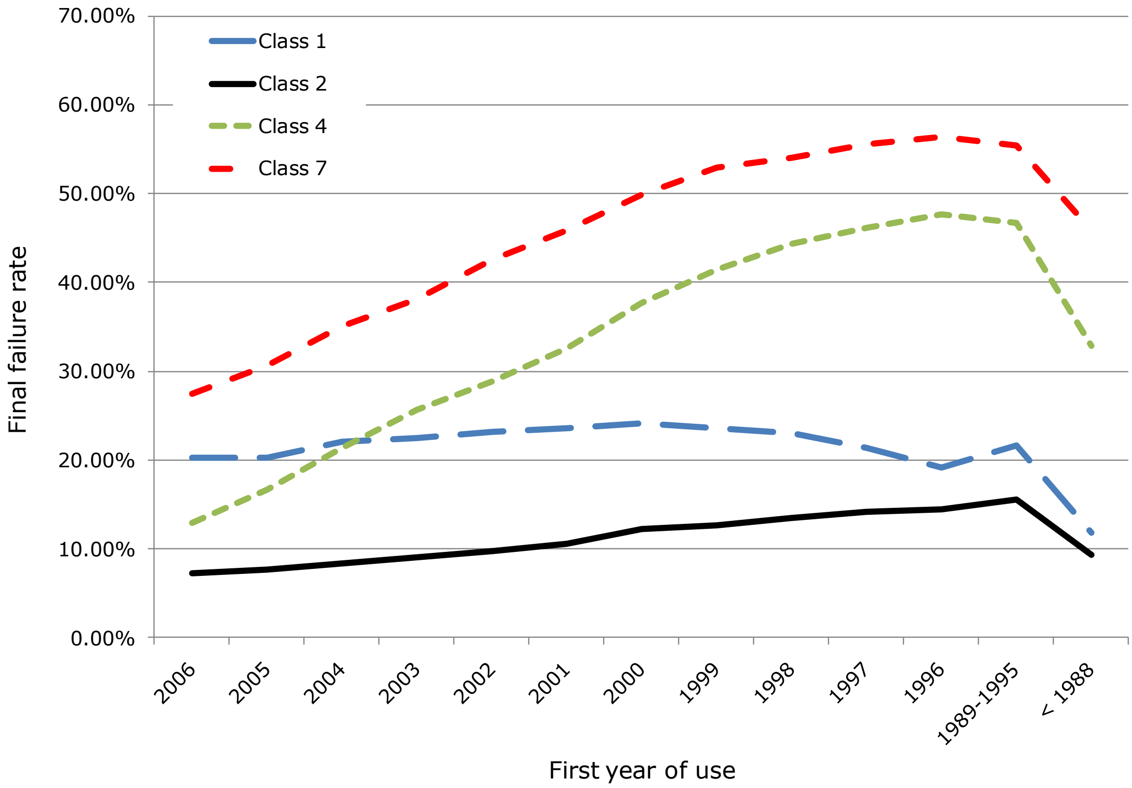

Figure 5-2: Final MOT failure rate by first year of use (2009)

Vehicle mileage was not found to be strongly related to motorcycle MOT failure rates and their overall mileages were significantly less than those observed for class 4 and 7 vehicles. Figure 5-3 highlights the rate of increase for Initial and Final MOT failure rates as the vehicles cumulative mileage increases.

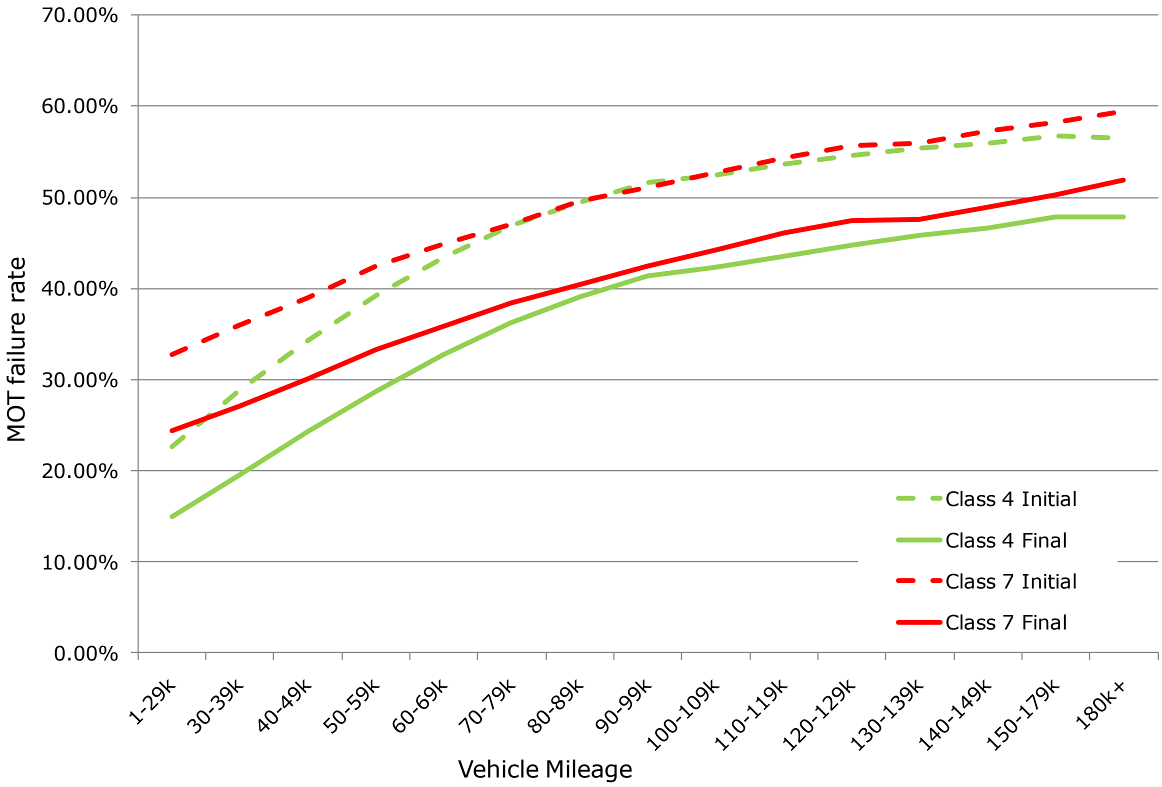

Figure 5-3: Initial and Final MOT failure rate by mileage at time of test

Figure 5-4 and Figure 5-5 compare the initial and final MOT failure rates for Class 4 vehicles by their mileage and age at the time of the test. The figures indicate that the initial and final failure rates increases more with respect to the age of the vehicle compared to the mileage. However, no in-depth statistical analysis has been undertaken to substantiate any significance associated with this observed trend.

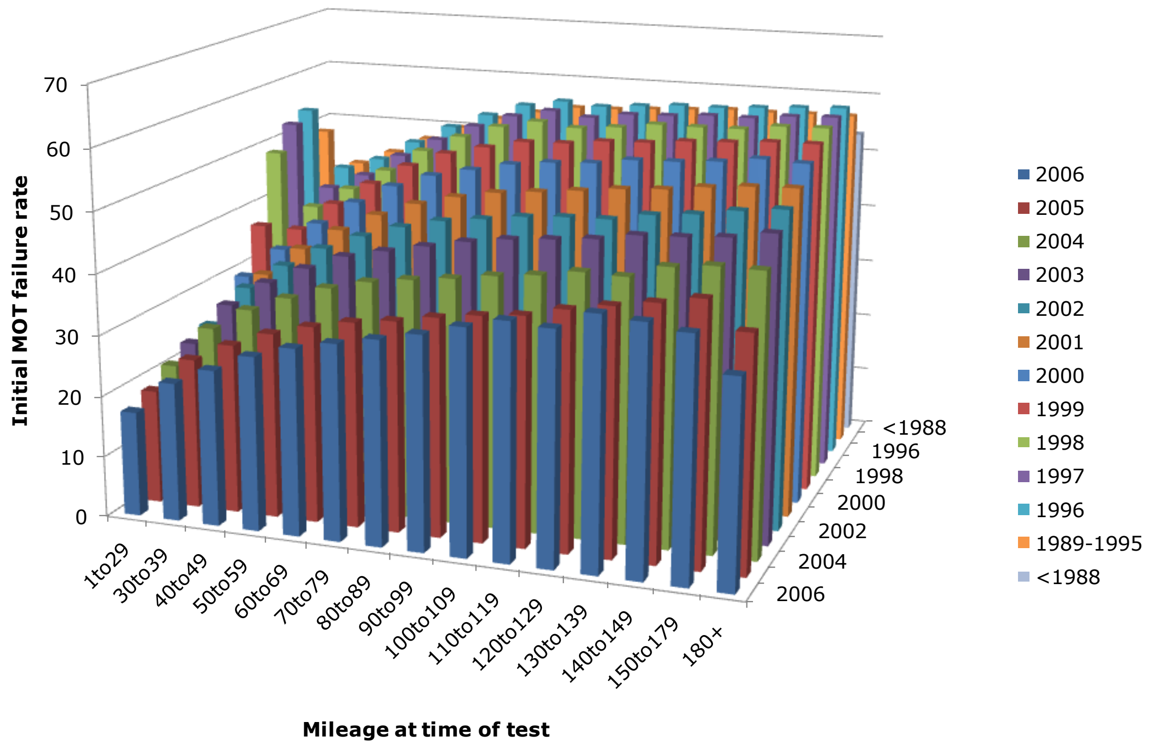

Figure 5-4: Class 4 initial MOT failure rate (percentage) by mileage and age of vehicle at time of test (2009)

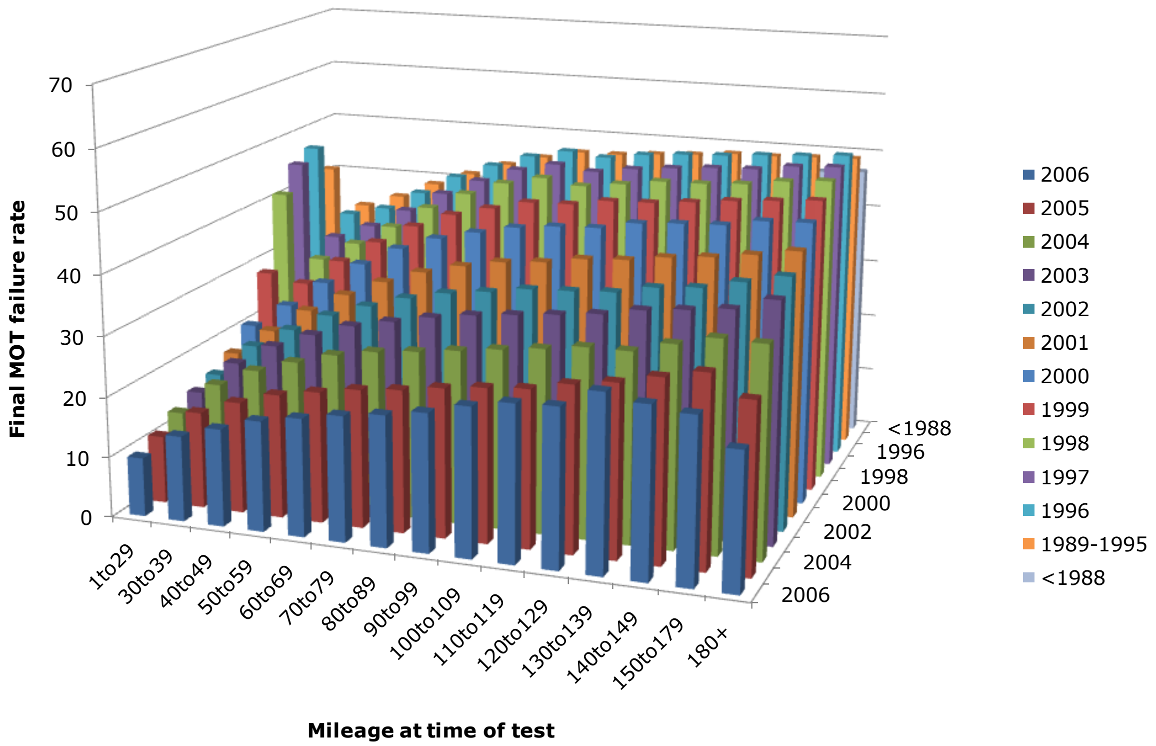

Figure 5-5: Class 4 final MOT failure rate (percentage) by mileage and age of vehicle at time of test (2009)

5.1.2 MOT test items, Reasons for Rejection

There were 8,360,893 vehicles which failed (F) their initial (Normal) MOT test in 2009, and a further 2,635,048 who passed but only with rectification at the station (PRS) (Table 5-6). For each of these vehicles the Reasons for Rejection (RfR) are reported. In addition, vehicles which pass or fail their initial MOT can be given Advisory (A) notices, which serve to warn the motorist of remedial maintenance or actions that are required soon. Appendix E (Table E-15 to Table E-18) provides a breakdown of the RfRs split by their type.

Table 5-8 compares the number of vehicles by Class by their MOT test result ('fail' or 'PRS') with the number of RfRs (excluding Advisory notices) associated with them. Vehicles of all classes with an MOT 'fail' result had a higher proportion of RfRs compared with those with a PRS result. Class 7 vehicles had the highest ratio of RfRs per vehicle, with an average 5.15 per vehicle identified as 'fail'; and 2.08 per vehicle identified as 'PRS'.

Table 5-8: Comparison of initial MOT results 'fail' and 'PRS' with number of RfR (2009)

	Initial (Normal) MOT test fail			Initial (Normal) MOT test PRS		
	No. Vehicles	No. RfRs	RfR per vehicle	No. vehicles	No. RfRs	RfR per vehicle
Class 1	49,076	148,625	3.03	21,629	31,248	1.44
Class 2	78,413	180,650	2.30	55,130	73,739	1.34
Class 4	7,986,125	29,025,122	3.63	2,506,899	4,727,655	1.89
Class 7	230,549	1,187,445	5.15	47,211	98,218	2.08

It was beyond the scope of this project to undertake a comprehensive review of the available data pertaining to the test items which constituted the Reasons for Rejection. However, the individual RfRs within their system groups have been correlated with the vehicle class. Therefore the percentages given in Table 5-9 relate to RfRs (including advisory notices) and not vehicles. Table 5-10 provides the system failure percentages excluding advisory notices.

Table 5-9: Summary of Reasons for Rejection (Fail, PRS and Advisory); 2009

System Failure	Class 1	Class 2	Class 4	Class 7
Number of RfR =	285,318	533,428	56,287,125	1,910,649
Lighting & signalling	25.5%	18.5%	18.0%	20.6%
Steering	25.5%	19.1%	3.0%	3.9%
Suspension			18.9%	21.4%
Brakes	19.4%	23.9%	25.3%	27.3%
Tyres	13.3%	18.3%	14.8%	7.5%
Road wheels			0.6%	0.2%
Seat belts			1.8%	2.6%
Body & structure	2.7%	1.4%	1.8%	4.0%
Drive system	5.6%	7.0%		
Fuel & exhaust	5.3%	7.4%	7.5%	3.8%
Drivers view of the road			6.9%	7.3%
Registration plate & VIN	1.6%	3.3%		

Table 5-10: Summary of Reasons for Rejection (Fail and PRS only); 2009

System Failure Number of RfR =	Class 1 179,873	Class 2 254,389	Class 4 33,752,777	Class 7 1,285,663
Lighting & signalling	39.0%	37.4%	28.2%	29.6%
Steering	19.9%	15.1%	2.8%	3.3%
Suspension			16.5%	15.9%
Brakes	17.2%	17.8%	19.3%	24.6%
Tyres	8.6%	10.8%	9.8%	4.5%
Road wheels			0.4%	0.2%
Seat belts			2.2%	2.9%
Body & structure	3.0%	2.2%	2.1%	4.8%
Drive system	4.1%	4.1%		
Fuel & exhaust	4.0%	4.1%	7.5%	3.9%
Drivers view of the road			9.0%	8.2%
Registration plate & VIN	2.5%	6.9%		

In addition, RfRs are categorised in the MOT Scheme Database as either minor, major or in some instances dangerous. It is recommended that future work considers the characteristics and nature of these classifications in more detail, especially their frequency with regards to vehicle age. It is interesting to note that vehicle Advisory notes were commonly awarded to brakes, tyres and suspension systems for all Classes of vehicle.

5.1.3 Summary of the findings

Examination of the MOT Scheme Database for tests performed in 2008 and 2009 showed that:

- For vehicle classes 1 to 7, the vast majority of which are class 4 (cars and light goods vehicles), on average about 40 % failed their initial (Normal) MOT test.
    - For vehicle classes 1 and 2 (motorcycles) the proportion that fail is much lower at an average of 21 % (with a higher rate for 50cc engine capacity).
    - For vehicle class 7 (light goods vehicles 3 to 3.5 tonne) the failure rate is highest at an average of 50 %.
- In general the proportion of failures increases with vehicle age and mileage although it is interesting to note that the proportion decreases for much older vehicles, i.e. those registered before 1998.
- For class 4 vehicles (cars and light goods vehicles) the most frequent test failure items (excluding advisory notes) referred to Lighting and signalling (28%) followed by brakes (19%) followed by suspension (17%) and tyres and wheels (10%). Other items were below 10%.
- For other classes of vehicles the pattern is similar with the notable exception that class 7 vehicles (light goods vehicles 3 to 3.5 tonne) tyres and wheels are a much lower proportion (5%), while brakes are higher (25%).
- The RfRs which could potentially directly affect the vehicles' crashworthiness performance, for example 'seat belts' and 'body and structure' items, were reported as follows:

- Class 4 – seat belts (2.2%), body and structure (2.1%); and
- Class 7 – seat belts (2.9%), body and structure (4.8%).

Vehicle defects identified as dangerous at the time of the MOT have not been considered due to the constraints of the project. Further work is recommended to assess the frequency and nature of these vehicles. Full data is presented in Appendix B and Appendix E.

5.2 The prevalence of vehicles with roadworthiness defects in the UK vehicle crash population

The main source of statistical information about injury road accidents in Great Britain is the STATS19 database, which is populated by the police under a system that has operated since 1949. The STATS19 database contains information about the accident, the vehicles involved and the casualties. In addition, Contributory Factors are recorded wherever practicable which include descriptions of vehicle defects, but these are very likely to underestimate their frequency as it is unusual for vehicles to be fully examined by the police or VOSA following an injury accident.

In 2009, there were 2,057, 21,997 and 139,500 reported fatal, serious and slight injury accidents in Great Britain and approximately 94%, 89% and 76% of these respectively were assigned Contributory Factors. Table 5-11 and Table 5-12 are re-produced from Reported Road Casualties Great Britain 2009 and highlight that approximately 2% of all injury severity accidents and 2% of all casualties were related to vehicle defects in some way.

Table 5-11: Contributory factors: Reported accidents[1] by severity: GB 2009

Contributory factor reported in accident	Fatal accidents		Serious accidents		Slight accidents		All accidents	
	Number	%	Number	%	Number	%	Number	%
Vehicle defects	**42**	***2***	**396**	***2***	**1,932**	***2***	**2,369**	***2***
Tyres illegal, defective or under inflated	17	*1*	165	*1*	678	*1*	860	*1*
Defective lights or indicators	2	*0*	28	*0*	152	*0*	182	*0*
Defective brakes	14	*1*	126	*1*	681	*1*	821	*1*
Defective steering or suspension	4	*0*	51	*0*	277	*0*	332	*0*
Defective or missing mirrors	0	*0*	2	*0*	11	*0*	13	*0*
Overloaded or poorly loaded vehicle or trailer	5	*0*	41	*0*	213	*0*	259	*0*
Total accidents	**1,935**	***100***	**19,566**	***100***	**106,684**	***100***	**128,185**	***100***

[1] Includes only accidents where a police officer attended the scene and in which a contributory factor was reported

Table 5-12: Contributory factors: Casualties in reported accidents[2] by severity: GB 2009

Contributory factor reported in accident	Fatal accidents		Serious accidents		Slight accidents		All accidents	
	Number	%	Number	%	Number	%	Number	%
Vehicle defects	**46**	***2***	**467**	***2***	**3,045**	***2***	**3,558**	***2***
Tyres illegal, defective or under inflated	20	*1*	196	*1*	1,168	*1*	1,384	*1*
Defective lights or indicators	2	*0*	31	*0*	207	*0*	240	*0*
Defective brakes	16	*1*	141	*1*	1,058	*1*	1,215	*1*
Defective steering or suspension	4	*0*	63	*0*	375	*0*	442	*0*
Defective or missing mirrors	0	*0*	2	*0*	17	*0*	19	*0*
Overloaded or poorly loaded vehicle or trailer	5	*0*	54	*0*	340	*0*	399	*0*
Total accidents	**2,094**	***100***	**22,146**	***100***	**155,407**	***100***	**179,647**	***100***

Illegal or defective tyres and defective brakes were the most common Contributory Factors recorded. The tables include all vehicle types, so it is not possible from these to correlate the Contributory Factors with specific vehicles of interest (Classes 1, 2, 4 and 7). Due to the nature of STATS19 only a very low confidence can be associated with these findings.

5.2.1 Review of in-depth accident databases

A full review of the evidence is presented in Appendix C. This section provides a summary of the key findings.

The relationship between accident causation and prevention is often discussed in terms of the contribution of the environment (including road), vehicles and/or humans in the accident. TRL on scene accident data collection studies in the 1970's found that the human elements dominated accident causation factors (95%). More recent work (Kirk *et al*. 2010; referenced through Cuerden *et al*.) using the UK's On The Spot (OTS) data collection project and the Contributory Factors 2005 data found the relationship highlighted in Figure 5-6. In summary:

- 96.9 % of OTS accidents have a human factor (74.4 % only a human factor) which is contributory;
- at least one environment (road) factor is present in 19.9% of OTS accidents, but only 1.1% have only road environment factors recorded; and
- vehicle factors are the least represented factor group, with 4.7% of OTS accidents having at least one very likely vehicle factor, but only 0.6% having only vehicle factors.

[2] Includes only accidents where a police officer attended the scene and in which a contributory factor was reported

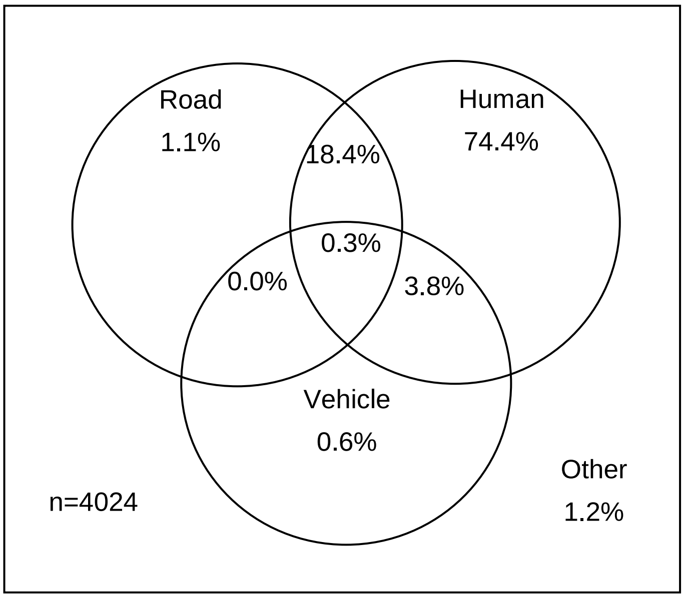

Figure 5-6: OTS Distribution of factor groupings - scene level, Contributory Factors 2005 (very likely) (Source: *Cuerden et al.* 2010*)*

Figure 5-6 does not differentiate between all vehicle defects and those which could be identified and corrected as part of the MOT. A further examination of OTS was undertaken to explore this further.

- For cars, light goods vehicles and motorcycles, about 2.5 % of the vehicles had a defect recorded that may have been detectable in an MOT prior to the collision. A further 1% of vehicles suffered a rapid tyre deflation prior to the collision which may have been the result of a tyre defect or a puncture.
- The percentage of vehicles with a defect which may have been detectable in an MOT generally appears to increase with the age and mileage of the vehicle.

Examination of the other in-depth accident databases yielded the following:

- VOSA accident database showed that:
  - Braking and tyre defects were found to be common contributory failure items for car and light goods vehicles
  - Braking, suspension and tyre defects were found to be the common contributory failure items for motorcycles.

    Note: it is not possible to base national estimates on these findings as the representativeness of the accidents examined by VOSA is not known.
- Fatals Intermediate Database showed that:
  - For cars, about 3% of vehicles had a vehicle defect that was a contributory factor to the accident.
    - These were tyre defect only (56%), brake defect only (12%), tyre with something else (12%), brakes with something else (11%).

    Note: The accidents in the database cover the period 1986-98, although over 90% date from 1990-95.

6 Likely impact to road safety (if any) to changes to MOT periodical inspections

The likely impacts (if any) to road safety from changes to the MOT test frequency by vehicle age and time since last inspection are investigated in this section. The following different test frequency scenarios are considered:

- first test at year 3, second at year 5 and annual thereafter, i.e. 3,2,1,1;
- first test at year 4 and annual thereafter, i.e. 4,1,1,1;
- first test at year 4, second at year 6 and annual thereafter, i.e. 4,2,1,1; and finally
- first test at year 4 and bi-annual thereafter, i.e. 4,2,2,2.

Where practicable, these potential testing strategies are compared with the current situation, which involves a roadworthiness and emission tests for most vehicles when they are three years old and every year thereafter (3,1,1,1).

Two different methods are used to estimate the potential impact on British road casualties which could be associated with changes to the MOT test frequency:

- Prediction based on a hypothetical relationship between MOT defects in the fleet and casualties; and a
- Prediction based on a comparison of the German roadworthiness testing experience.

Finally, some comments are provided with respect to the likely impacts (if any) to road safety from changes to the MOT test frequency, with a transition to testing on the basis of miles travelled since last inspection, rather than time or combination thereof.

6.1 Prediction based on a hypothetical relationship between MOT defects in the fleet and casualties

This approach consists of a theoretical model which has a number of limitations, principally due to the porosity of data available with respect to vehicle roadworthiness within the fleet and a lack of detailed knowledge regarding the scale and mechanisms by which vehicle defects contribute to accidents. However, we have assumed that any inaccuracy associated with the model will be of similar magnitude for each of the different test frequencies proposed.

There are three parts to this approach:

- Evaluation of the proportion of the vehicle fleet with defects.
  - Estimation of how changes to the MOT test regime could potentially influence the overall number of vehicles which fail an MOT annually.
- Correlation of MOT defects to accidents.
  - Develop a relationship between the proportion of vehicles which fail an MOT and vehicle defects which are contributory to injury road traffic accidents, by vehicle Class (MOT definitions).
- Predict the annual casualties based on changes to MOT test frequency
  - For the predicted number of MOT failures and the re-calculated estimates of contributory factors to accidents, assess the overall impact on casualties.

The model assesses how vehicle defects may contribute to accidents (roadworthiness). The model does not specifically account for how many people suffer more serious injury because of poor crashworthiness performance related to MOT defects, for example associated with seat belt or structural issues.

6.1.1 Proportion of vehicle fleet with defects

The proportion of MOT related defects in the vehicle fleet can be estimated based on the information presented in Section 5.1, where it is reported that approximately 40% of all vehicles tested failed an MOT in 2009. However, the MOT failure rates vary significantly between different Classes of vehicle and with respect to their age and cumulative mileage.

In addition, at the time of writing, there are a number of limitations and gaps in our knowledge with regards to MOT test data, these include:

- No precise quantification of the number of minor (non safety critical), serious and dangerous defects and their relative likelihood to contribute to or directly cause accidents.
    - For example, a broken number plate is very unlikely to cause a crash, whereas brakes found to be completely worn represent a magnitude of risk substantially higher.
    - An in-depth investigation of the rate and nature of the defects reported and the relative risk of different ones contributing to or directly causing accidents was beyond the scope of this work programme.
- The MOT certificate confirms that at the time of the test, without dismantling it, the vehicle under test meets the minimum acceptable environmental and road safety standards required by law. However, it doesn't mean that the vehicle is roadworthy for the length of time the certificate is valid.
    - For example, the vehicle may develop an MOT defect hours, weeks or months after the test, or indeed not at all in the annual inspection period.
    - This project has not specifically investigated how vehicles deteriorate with respect to time, due to normal use and the effects of age and/or mileage from the date the MOT certificate is awarded.
    - It is clear from the data that MOT defects occur over the current annual test cycle period, but the failure mechanisms fall beyond the practicable scope of this study.
    - Most importantly, the frequency with respect to time from inspection and the mechanisms associated with the most safety critical defects are not known.

Figure 6-1 gives a non-scaled schematic representation of how vehicle defects may increase, potentially exponentially with time. The first test is shown to appear when the vehicle is three years old (x axis) and every year thereafter. The figure outlines that all vehicles are brought to a roadworthy state immediately following an MOT pass, and then a proportion develop defects over the time period between tests. The nature of the deterioration, especially the onset of the most safety critical defects is not known, but is for ease of explanation assumed to be a hyperbolic function in Figure 1.

Figure 6-2 provides a different model of vehicle MOT measured system and structural deterioration, based on the assumption of an average linear relationship over the time between tests. In this model, vehicles develop defects at a constant rate, whereas in the model represented by Figure 1, defects are more likely to develop the greater the time from the MOT test date.

For Figures 6-1 and 6-2, the only data points which are known are shown by the red line, this represents the annual MOT failure percentage by the age of the vehicle at the time of the test. As vehicles age the number of MOT failures is seen to increase.

Figure 6-3 compares the two models (Figures 6-1 and 6-2) of vehicle MOT defect onset, non-linear and linear, each rising between the annual testing times and then falling to zero (fully compliant). This highlights the potential variation with respect to the number of vehicles in the fleet at any given time, which may or may not have MOT related defects.

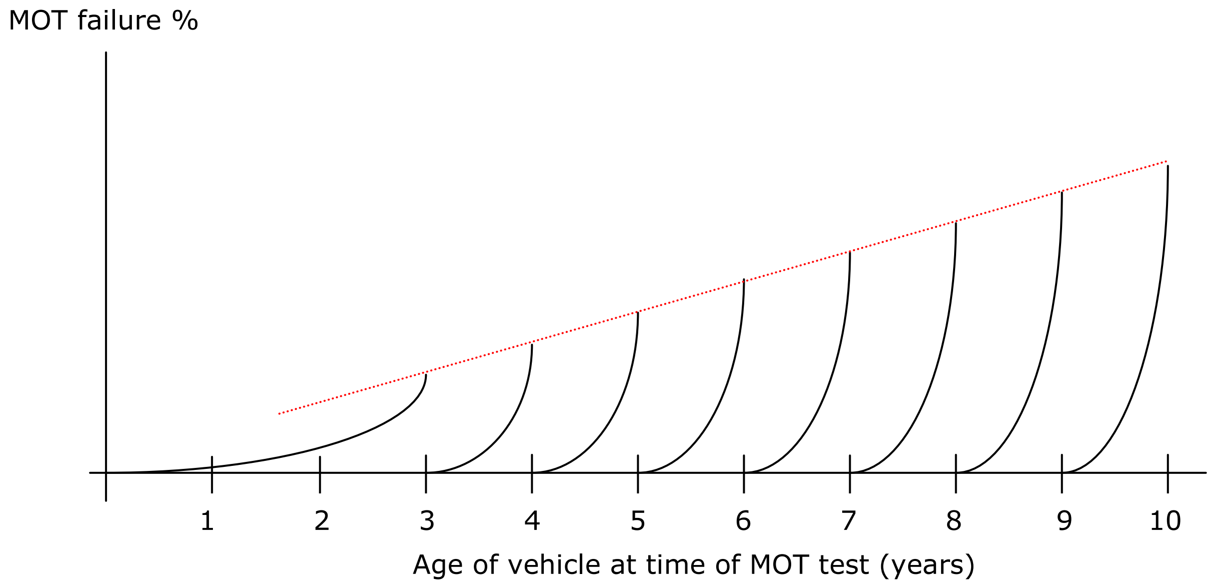

Figure 6-1: Non-linear failure model

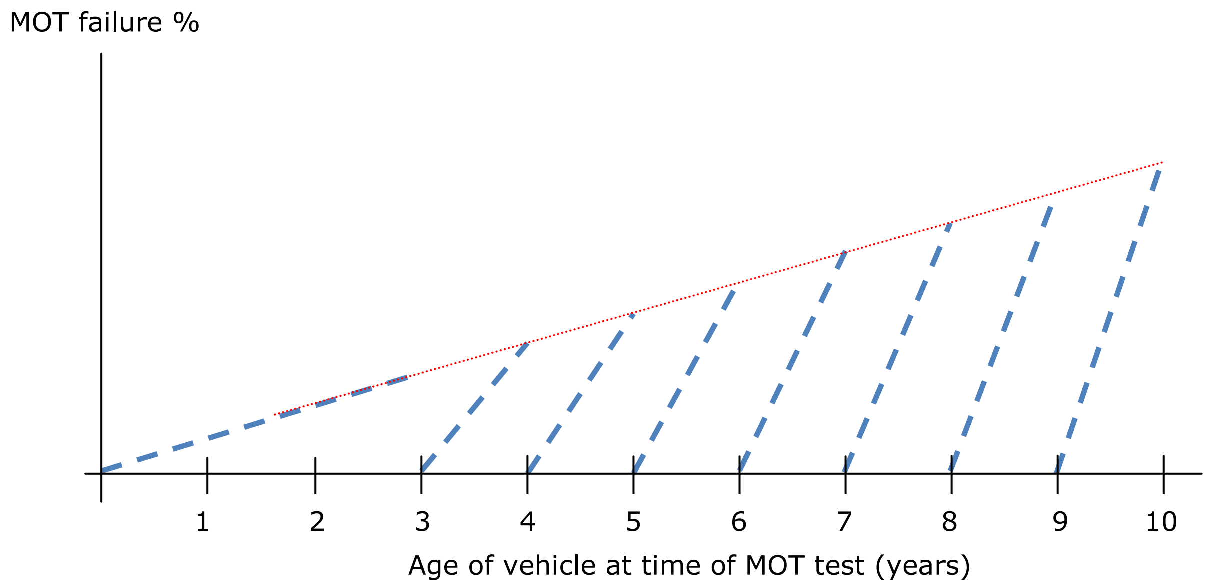

Figure 6-2: Linear failure model

Figure 6-3 only provides an indication of the proportion of vehicle defects currently within the fleet. It is possible that if vehicles develop safety critical defects in a non-linear way and these are not detected and corrected at annual MOT inspections, then a far higher proportion of un-roadworthy vehicles would be on the road.

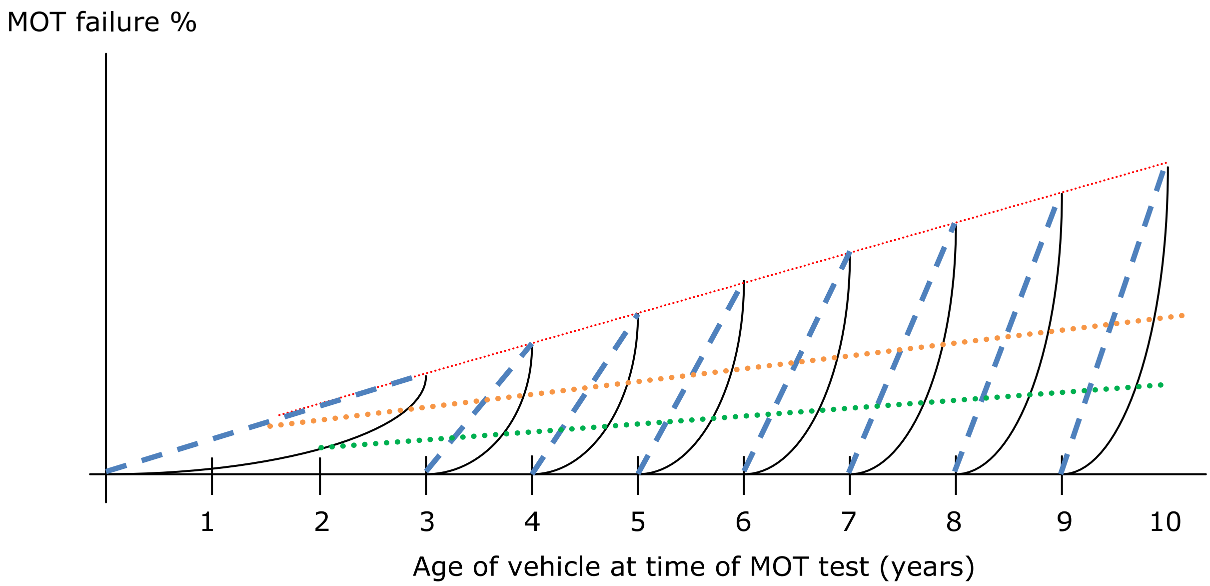

Figure 6-3: Potential range of 'MOT failure rate' in vehicle fleet model

Lower estimate of defects in vehicle population – based on non-linear model

Higher estimate of defects in vehicle population – based on linear model

6.1.2 Correlation of MOT defects to accidents

It is assumed that the number of road traffic accidents where vehicle defects were contributory factors or were more directly causative, is proportional to the number of vehicles on the road with defects present at any time. However, because of the uncertainty associated with quantifying the rate of vehicle defect onset following an MOT test and more importantly understanding this relationship for the most safety critical defects, the MOT failure rates for Classes 1, 2, 4 and 7 vehicles were chosen as the surrogate measures for vehicle roadworthiness compliance.

Response of public to changes to MOT test frequency

If the MOT test frequency was to change, by extending the time period between one, or a number of the current test intervals, this would remove the obligatory requirements for all the vehicles which were routinely checked at this time, and were then, where necessary brought back to a compliant state. This could lead to larger proportions of vehicles in the fleet being used with safety critical defects and subsequently contributing to or directly causing more accidents. Conversely, vehicle owners could largely compensate for this by following the law and maintaining their vehicles, regardless of the specific time intervals when MOT testing is required.

This is further complicated, for example, if the majority of safety critical defects occur 11 months after the award of the MOT, their current exposure on the road is low; but if these were then not detected for up to another 13 months (time of next test), this could have a significant and disproportionate effect of accidents. Whereas, if safety critical defects occur more evenly between the current testing points, this may then have a less dramatic effect on accident related casualties.

Further, it is not known how vehicle owners would react to any potential changes to MOT testing frequency. However, based on our own ad-hoc experience we believe that there are a wide range of motivations, attitudes and behaviours, which influence the decisions and actions associated with maintaining vehicles. It is therefore likely that there would be a diverse range of responses to any change in MOT testing regime, in line with current vehicle maintenance behaviours. These can be categorised between two extremes, those who diligently maintain their vehicles, and those who largely ignore all maintenance and roadworthiness responsibilities, with the remainder somewhere between the two ends of this spectrum.

We estimate that vehicle owners could be categorised as either those who 'pull' or 'push' with regards to maintaining their vehicles. The 'pullers' actively look to maintain their vehicle and positively take steps to ensure that it is kept roadworthy. The 'pushers' require a trigger to prompt them to take action with respect to looking after their vehicle, such as a warning light or in the worst cases a breakdown or significant failure of a component, the latter two forcing them to take action. In reality there is a grey area between 'pushers' and 'pullers', with some people intermittently adopting each of these behaviours, depending on their current situation, which could be influenced by their time availability, their inclination to check their vehicle, perhaps related to poor weather conditions or their finances at any given time.

This complex human element represents a significant unknown with regards to how a change to the MOT test regime may affect road safety, will people continue to maintain their vehicles to current standards or not? What influence does the age of the vehicle have with respect to the owner's motivation to maintain it?

To gain a greater insight into these issues, one could segment people into categories regarding their attitudes and motivations towards vehicle maintenance, some potential examples are presented below, but these are only our initial thoughts and do not represent any known groupings. Further, we do not have the data to quantify the proportions of people who would range from the most diligent to the poorest with regards to their propensity to maintain a vehicle in a roadworthy state, regardless of annual or bi-annual MOT test requirements.

Some example categorisation groups could be:

- Pullers:
  - On a weekly basis, those who check and maintain their vehicles to a full roadworthy state, including a full mechanical and system check, irrespective of MOT test frequency;
  - On a monthly basis, those who check and maintain their vehicles to a full roadworthy state, including a full mechanical and system check, irrespective of MOT test frequency;
- Intermittent Pullers:
  - On a monthly or seasonal basis, those who undertake some checks, for example tyre tread depth and washer fluid, but do not assess all safety critical components, for example brake pad or disk wear, resulting in a partial maintenance of the MOT roadworthiness systems, irrespective of MOT test frequency;
  - Those who follow annual or mileage prompted service appointments with qualified and approved engineers, irrespective of MOT test frequency;
- Pushers:
  - Only react when prompted by vehicle defects or issues with their vehicle, such as service warning lights (e.g. brake lining wear indicators), or MOT test frequency;
  - Those who postpone all actions, even when there are clear warning signs until absolutely necessary, only respond to vehicle breakdowns or significant failures and MOT tests.

Estimated proportion of vehicles with defects in the fleet associated with changes to MOT test frequency

At the time of writing, it is not possible to assess based on any referenced evidence, how British people would behave with respect to a change in the MOT testing frequency. In the best case, this would result in a safety neutral outcome, with everyone maintaining their vehicle roadworthiness as they currently do, regardless of the MOT regime change. In this scenario, the hypothesis is that the MOT does not drive or influence behaviour. In other words all motorists are 'pullers'.

The opposite hypothesis is that everyone would now relax regarding their diligence towards maintaining their vehicle roadworthiness as the MOT was the catalyst or lever which encouraged or led to people keeping their vehicle in a good state, in this scenario vehicle defects would increase substantially. In other words all motorists are 'pushers'.

Lower estimate – half conform assumption

The lower estimate assumes that half of vehicle owners routinely check their vehicles regardless of the MOT test frequency and criteria; and half use the MOT test time to annually trigger any necessary maintenance or service work required, we have called this the 'half conform assumption'. This is believed to be a **conservative assumption**, as the rate of the onset of vehicle defects is likely to increase with time (e.g. it is not linear).

Higher estimate – non-conform assumption

The higher estimate assumes that all owners whose vehicles currently fail an MOT would not routinely check their vehicles without an MOT test to trigger necessary maintenance work, termed the 'non-conform assumption'. MOT defects would not be rectified and would remain in the fleet.

Figure 6-4 highlights how the changes to vehicle failure rates were calculated based on the 'half conform assumption' (lower estimate), for the test frequency scenario where the first test is at year 3, the second at year 5 and annually thereafter (i.e. 3,2,1,1 etc).

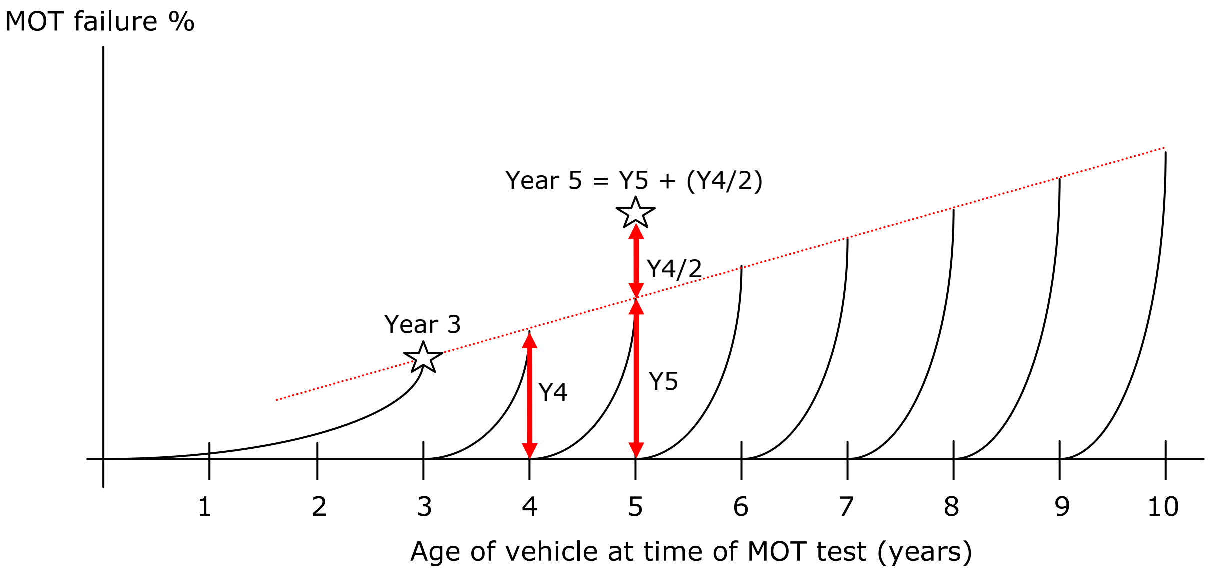

Figure 6-4: Non-linear 'MOT failure model rate' – adjusted MOT at year 3, 5, 1, 1 (lower estimate)

The model assumes the same failure rates by year as observed by the current testing regime, with the exception of Year 5; because it is assumed that only half of the vehicle owners in year 4 will rectify their MOT defects. The remaining half, stay in the vehicle fleet and are summed to the defects which were already seen in Year 5, whilst keeping the total number of cars tested in that year constant.

For the non-conform assumption (higher estimate), the equation shown in Figure 6-4 becomes:

Year 5 = Y5 + Y4

Table 6-1 highlights the predicted changes to initial MOT failure rates for class 4 vehicles, based on 2009 data and a change to a 4,2,2,2 regime. The overall number of tests undertaken remains constant with respect to the age of the vehicle at the time of test and cumulative totals. Examples of the calculation used to predict the failures are:

For, 2005: Lower estimate = (21.4%/2) + (25.5%) * 2,535,437 = 917,575

Higher estimate = (21.4%) + (25.5%) * 2,535,437 = 1,188,502

(Please note that percentages have been rounded to one decimal place, for lower estimate summed percentage was 36.19, presented as 36.2).

Table 6-1: Class 4 vehicles predicted change of Initial MOT failure rates (2009)

First year of use	Current Class 4: 3,1,1,1		Predicted Class 4: 4,2,2,2	
	Total*	Initial failure	Lower	Higher**
2007-2009	106,248	20,957 19.7%	20,957 19.7	20,957 19.7
2006	2,497,636	535,687 21.4%	535,687 21.4	535,687 21.4
2005 (4)	2,535,437	647,100 **25.5%**	917,575 **36.2**	1,188,502 **46.9**
2004	2,648,338	828,033 31.3%	828,033 31.3	828,033 31.3
2003 (6)	2,642,313	958,486 **36.3%**	1,370,619 **51.9**	1,783,136 **67.5**
2002	2,622,344	1,048,784 40.0%	1,048,784 40.0	1,048,784 40.0
2001 (8)	2,441,427	1,062,864 **43.5%**	1,550,900 **63.5**	2,039,169 **83.5**
2000	2,097,577	1,009,113 48.1%	1,009,113 48.1	1,009,113 48.1
1999 (10)	1,858,814	957,531 **51.5%**	1,403,794 **75.5**	1,851,733 **99.6**
1998	1,596,205	861,446 54.0%	861,446 54.0	861,446 54.0
1997 (12)	1,293,168	714,722 **55.3%**	1,064,567 **82.3**	1,293,168 **100.0**
1996	949,051	535,066 56.4%	535,066 56.4	535,066 56.4
1989-1995 (14+)	2,050,789	1,121,278 **54.7%**	1,698,806 **82.8**	2,050,789 **100.0**
≤ 1988	498,662	191,950 38.5%	191,950 38.5	191,950 38.5
Total	25,838,009	10,493,017 **40.6%**	13,037,296 **50.5%**	15,237,533 **59.0%**

*Note *: Total = 'Pass' + 'PRS' + 'Fail'; ** Limited to 100%*

This method represents a relatively simple approach and there are a number of confounding factors, not least that other events could trigger a repair or replacement part to be fitted before the MOT date. These could include intervention from the police or other enforcement agencies, or be related to accidents or breakdowns or general maintenance schedules. In addition, it is possible that some of the vehicles that failed and were brought back to a roadworthy state at Year 3 would also fail at Year 4, so there is a potential for double counting for a sub set of those which migrate into the following year with un-rectified defects. However, given that the characteristics and the rate of vehicle deterioration with regards to safety critical MOT defects from the time an MOT certificate is awarded are not well understood, this model is intended to give some indication of potential road safety effects.

Table 6-2 highlights the overall change in vehicle MOT failure rates for the different proposed options, using the 'half conform assumption'. The annual MOT failure rate increases from 40.1% to 49.8% based on 3,1,1,1 and 4,2,2,2 test frequencies respectively.

Table 6-2: Lower estimate (half conform) prediction for Normal MOT test results by vehicle class and testing frequency (2009)

Vehicle Class	Initial failure rate (n = 27,410,161) – Different test frequency				
	3,1,1,1	3,2,1,1	4,1,1,1	4,2,1,1	4,2,2,2
1 & 2	204,247 21.4%	211,762 22.2%	212,248 22.1%	220,265 22.9%	252,237 26.3%
3	3,675 29.7%	3,675 29.7%	3,675 29.7%	3,675 29.7%	3,675 29.7%
4	10,493,017 40.6%	10,829,624 41.9%	10,783,492 41.7%	11,175,625 43.3%	13,037,296 50.5%
5	14,263 34.7%	14,263 34.7%	14,263 34.7%	14,263 34.7%	14,263 34.7%
7	277,760 50.00%	290,932 52.40%	290,383 52.30%	303,478 54.60%	343,358 61.80%
Total	10,992,962 40.1%	11,350,256 41.4%	11,304,061 41.2%	11,717,306 42.7%	13,650,829 49.8%

6.1.3 Predict the annual casualties based on changes to MOT test frequency

Section 5.2 presents how frequently vehicle defects were identified as contributory factors based on a review of the available accident data. However, the national road casualty statistics (Stats19) and in-depth accident data were not collected to specifically identify the roadworthiness of vehicles at the time of the collision, and therefore underestimate the relative importance of vehicle defects as contributory factors. The extent of this underestimate is not known. Where national data is recorded, vehicle defects are recorded to contribute to approximately 2% of all accidents. From the OTS sample, this increased to approximately 2.5%. For the purpose of this study, an estimate of 3% has been chosen to reflect the underestimate which is known to exist.

Table 6-3 provides a breakdown of all the accidents and associated casualties in 2009, which involved at least one of the MOT classes of vehicle, and therefore these respective columns are not mutually exclusive. This table was derived from Table 23c in Reported Road Casualties Great Britain: 2009; this is included in Appendix D along with the intermediary table which is then summarised in Table 6-3. The lower part of Table 6-3 gives an estimate of the number of accidents and casualties related to vehicle defects in 2009, for example, 52 fatalities could have been associated with car defects.

Table 6-3: Distribution of accidents and casualties involving different MOT classes of vehicle by injury severity (2009)

	Accidents & casualties involving								All accidents & casualties
	m/cs ≤ 50cc		m/cs > 50cc		Cars		LGVs		
	n	%	n	%	n	%	n	%	
Accidents	3,539	2.16	17,573	10.74	145,475	88.95	12,449	7.61	163,554
Casualties									
Killed	21	0.95	537	24.17	1,747	78.62	127	5.72	2,222
Serious	644	2.61	5,392	21.84	20,391	82.59	1,445	5.85	24,690
Slight	3,274	1.68	14,872	7.62	179,168	91.77	13,351	6.84	195,234
All	3,939	1.77	20,801	9.36	201,306	90.62	14,923	6.72	222,146
	Estimate of accidents & casualties associated with vehicle defects (3%)*								
Accidents	106.17	0.06	527.19	0.32	4364.25	2.67	373.47	0.23	4906.62
Casualties									
Killed	0.63	0.03	16.11	0.73	52.41	2.36	3.81	0.17	66.66
Serious	19.32	0.08	161.76	0.66	611.73	2.48	43.35	0.18	740.70
Slight	98.22	0.05	446.16	0.23	5375.04	2.75	400.53	0.21	5857.02
All	118.17	0.05	624.03	0.28	6039.18	2.72	447.69	0.20	6664.38

A linear relationship has been assumed between the number of vehicles which fail an MOT and the number of accidents that were at least in part caused by vehicle defects. For example, the average car MOT failure rate was 40.6% (Table 6-2) in 2009 and it is assumed that this is proportional to the number of accidents and casualties where vehicle defects were a contributory factor, estimated to be 3% (for all vehicle types). This yields the following:

Accident rate$_{Class4}$ = 0.07389 * Initial MOT failure rate

Accident rate$_{Class12}$ = 0.14019 * Initial MOT failure rate

Accident rate$_{Class7}$ = 0.06 * Initial MOT failure rate

Figure 6.5 provides a pictorial summary of this approach and suggests that between 1.5% and 6% of accidents are related to MOT measurable vehicle defects. The graph uses an MOT failure rate of 40%, which if extrapolated to a 100%, would result in between 3.75% and 15% of accidents being associated with vehicle defects.

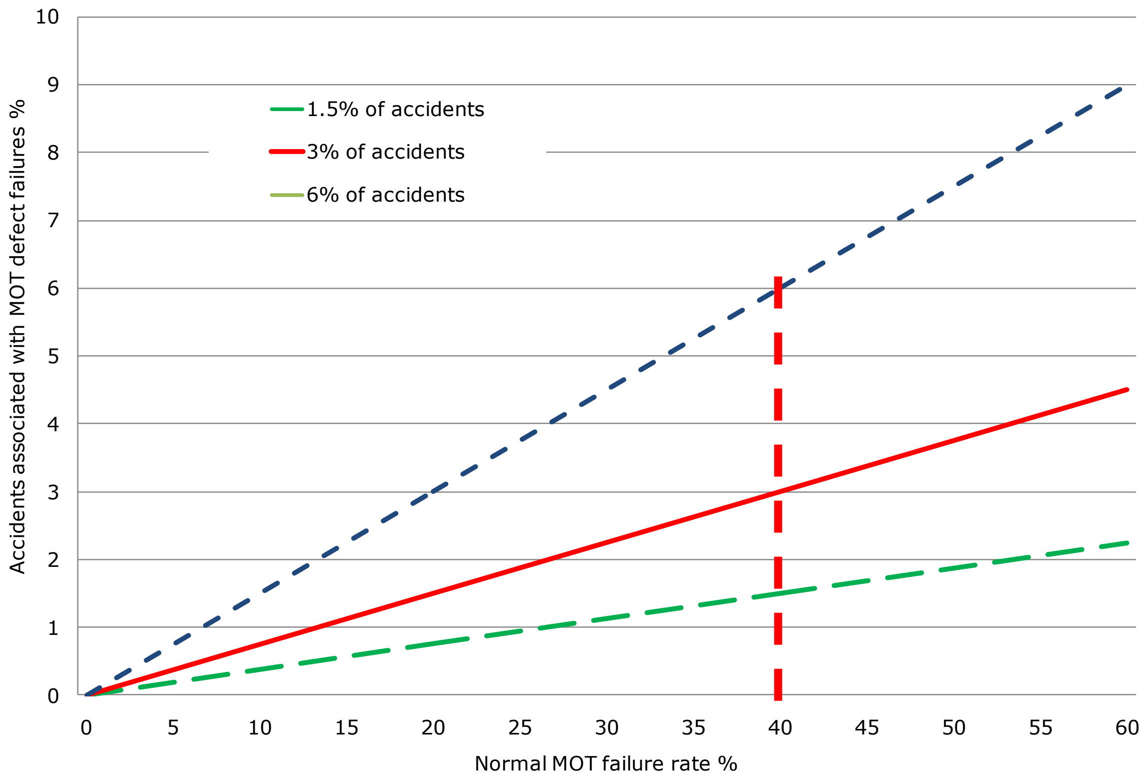

Figure 6-5: Hypothetical relationship between proportion of vehicles which fail an MOT and accidents associated with roadworthiness defects (proportion of accidents assumed for a 40.6% MOT failure rate)

The increase in the percentage of vehicle defects based on the 'half conform' and 'non-conform' assumptions (lower and higher estimates) were used to calculate functions; these were multiplied by the current accident data to provide estimates of the additional accidents and casualties that may occur if the MOT test frequency was to change.

The functions were calculated in two stages.

- Firstly by assessing the new accident rates for each vehicle class and MOT testing option. For example, the 4,2,2,2 option, class 4 vehicles resulted in the following changes to the accident rates:
  - Lower estimate: Accident $rate_{Class4}$ = 0.07389 * 50.5% = 3.73%
  - Higher estimate: Accident $rate_{Class4}$ = 0.07389 * 59.0% = 4.36%
- The second stage 'normalised' these new accident rates against the current rate:
  - Lower estimate: $Multiplier_{Class4}$ = 3.73/3 = 1.24
  - Higher estimate: $Multiplier_{Class4}$ = 4.36/3 = 1.45

Based on the assumption that 3% of accidents are related to vehicle defects, approximately 52 deaths were associated with car involved defect-accidents in 2009 (Table 6-3). Using the lower and higher multipliers outlined above, for the 4,2,2,2 testing option, this would increase those killed to between approximately 65 (1.24*52.41) and 76 (1.45*52.41) per year; or an additional 13 or 24 deaths associated with car defect-accidents. Table 6-4 and Table 6-5 highlight the findings of this approach for the half conform and non-conform assumptions respectively.

Table 6-4: Prediction of additional accidents and casualties associated with potential changes to MOT test frequency – 'half conform' or lower estimate

MOT test frequency	Predicted additional accidents & casualties involving				All accidents & casualties
	m/cs ≤ 50cc	m/cs > 50cc	Cars	LGVs	
	n	n	n	n	
3,2,1,1					
Accidents	3.91	19.40	141.20	17.73	159.47
Casualties					
Killed	0.02	0.59	1.70	0.18	2.17
Serious	0.71	5.95	19.79	2.06	24.07
Slight	3.61	16.42	173.90	19.01	190.36
All	4.35	22.96	195.39	21.25	216.60
4,1,1,1					
Accidents	3.46	17.17	113.68	16.99	138.86
Casualties					
Killed	0.02	0.52	1.37	0.17	1.89
Serious	0.63	5.27	15.93	1.97	20.96
Slight	3.20	14.53	140.01	18.22	165.75
All	3.85	20.33	157.31	20.36	188.60
4,2,1,1					
Accidents	7.60	37.73	285.14	34.60	323.30
Casualties					
Killed	0.05	1.15	3.42	0.35	4.39
Serious	1.38	11.58	39.97	4.02	48.81
Slight	7.03	31.93	351.19	37.10	385.92
All	8.46	44.67	394.58	41.47	439.12
4,2,2,2					
Accidents	24.11	119.74	1059.65	88.22	1186.32
Casualties					
Killed	0.14	3.66	12.73	0.90	16.12
Serious	4.39	36.74	148.53	10.24	179.09
Slight	22.31	101.33	1305.08	94.61	1416.11
All	26.84	141.73	1466.33	105.75	1611.31

The larger the time gap between MOT testing intervals, the larger the predicted number of additional accidents and casualties which may be attributed to vehicle defect contributory factors.

Based on 2009 road injury statistics, the 4,2,2,2 option yielded the largest predicted increases in accidents and casualties per year, with estimates ranging from between an additional:

- 1,200 – 2,200 accidents;
- 16 – 30 fatalities;
- 180 – 330 serious casualties; and
- 1,400 – 2,600 slight causalities.

Table 6-5: Prediction of additional accidents and casualties associated with potential changes to MOT test frequency – 'non conform' or higher estimate

MOT test frequency	Predicted additional accidents & casualties involving				All accidents & casualties
	m/cs ≤ 50cc	m/cs > 50cc	Cars	LGVs	
	n	n	n	n	
3,2,1,1					
Accidents	7.80	38.72	281.62	35.45	319.36
Casualties	0.00				
Killed	0.05	1.18	3.38	0.36	4.34
Serious	1.42	11.88	39.47	4.11	48.21
Slight	7.21	32.77	346.84	38.02	381.22
All	8.68	45.83	389.70	42.50	433.77
4,1,1,1					
Accidents	7.58	37.64	226.40	33.96	260.06
Casualties	0.00				
Killed	0.04	1.15	2.72	0.35	3.53
Serious	1.38	11.55	31.73	3.94	39.26
Slight	7.01	31.85	278.83	36.42	310.44
All	8.44	44.55	313.29	40.71	353.23
4,2,1,1					
Accidents	15.86	78.75	569.48	69.10	646.96
Casualties	0.00				
Killed	0.09	2.41	6.84	0.70	8.79
Serious	2.89	24.16	79.82	8.02	97.66
Slight	14.67	66.65	701.37	74.11	772.27
All	17.65	93.22	788.03	82.84	878.73
4,2,2,2					
Accidents	48.89	242.75	1977.89	176.42	2189.28
Casualties					
Killed	0.29	7.42	23.75	1.80	29.74
Serious	8.90	74.49	277.24	20.48	330.49
Slight	45.23	205.44	2435.98	189.20	2613.33
All	54.41	287.35	2736.97	211.47	2973.57

6.1.4 Limitations of the model

The model has made predictions based on a hypothetical relationship between all MOT defects (RfRs, excluding Advisory notices) in the fleet and casualties. However, a conservative lower estimate ('half conform') was made with regards to the number of vehicles within the fleet which may develop additional defects if roadworthiness testing intervals were extended. This was made because:

- The nature and rate of onset of vehicle safety critical defects with respect to the time of the last MOT inspection is not known.
- It is not known how vehicle drivers and owners will behave without an annual 'nudge' in the form of an MOT; to check their vehicles' roadworthiness compliance. It is unknown how much work is undertaken by the average person to ensure their vehicle passes an MOT test, and if this is constant throughout the year, or done in a concentrated effort just before examination.

Further, all the items (RfRs) that contribute to the annual MOT initial failure rate, from minor items which can be corrected within minutes, for example a defective rear number plate illumination bulb, to major and/or dangerous defects have all been grouped. It is recommended that more work should be undertaken to better understand the distribution and nature of these defects with respect to different classes of vehicle, their age and mileage.

Another key point to note is that the model was limited to assessing how vehicle defects may contribute to accidents (roadworthiness). The model does not specifically account for how many people suffer more serious injury because of poor crashworthiness performance related to MOT defects, for example associated with seat belt or structural issues. This is an area where more study could be undertaken to develop a better quantification of the relative size and nature of the group of accidents which have adverse injury outcome because of poor crashworthiness performance, due to MOT measureable defects.

Older vehicles are demonstrated to experience higher initial MOT failure rates, but this has not been correlated with accident data with respect to the age of the car and type of accident.

Finally, the assumption that vehicle defects in the fleet are directly related to contributory factors which lead to accidents has not been substantiated by this study. The correlation of drivers' behaviour and their vehicles' roadworthiness has not been investigated. There could be an intrinsic relationship with regards to their propensity to take risks and therefore experience accidents, and their general care of their vehicles, especially maintaining safety critical components and systems.

6.2 Prediction based on a comparison with the German roadworthiness testing experience

6.2.1 Introduction

The AUTOFORE project (AUTOFORE 2007a) was performed by CITA[3] and part funded by the EU. The purpose of the project was to recommend improvements in roadworthiness enforcement in the European Union to ensure that the benefits accruing from the original design and manufacture of vehicles are retained, where justified, throughout the life of those vehicles. The project was completed in 2007 and made the following recommendations:

- Recommendation 1 - Amend Directive 96/96/EC to increase the frequency of inspection for older light vehicles (Categories 5 and 6, as defined in the Directive).
    - The economic benefit of increased frequency of inspection of older light vehicles would be over 2 billion euros if vehicles of 8 years and over are inspected annually with a benefit-to-cost ratio of over 2. This is the minimum change that should be introduced. Although the benefit-to-cost ratio would be slightly reduced, introduction of annual inspection for vehicles 7 year and over would give higher benefits. As such, it should be considered seriously.
- Recommendation 2 – Amend Directive 96/96/EC to include the examination of safety relevant electronic systems that are already widely fitted (airbags, ABS and ESC).
    - The benefit-to-cost ratio of inspecting ESC systems alone is 2.6. Additional benefits will arise from testing other systems, such as ABS and airbag systems. Initially the inspection should include, at a minimum,

[3] CITA is an international not-for-profit association, based in Brussels, Belgium. It represents all types of organisations and stakeholders (government, private sector, dedicated inspection centres, garage-based test centres and test equipment manufacturers) who share a common interest in exchanging information, developing best practices and draft international standards in the field of road vehicle inspection.

observational checks on the system's completeness and functionality and for obvious signs of deterioration or deleterious alteration. Additional systems should be added when they become widely fitted. More comprehensive checks should be added when further work described in Recommendation 4 has been completed.

- Recommendation 3 - Amend the scope of Directive 96/96/EC to include two-wheeled motor vehicles (international categories L1 and L3).
  - Although an economic analysis could not be undertaken to quantify the magnitude of the benefits, good accident evidence supports the extension of the Directive to two-wheeled motor vehicles. There may be, however, problems with the inclusion of mopeds, but this objective should be pursued. Work should start in the near future on the preparation of a regulatory impact statement on these three recommendations.
- Recommendation 4 - To be able to develop the options for introduction by 2020, the following 3 projects should be initiated.
  - Undertake a new study ("AUTOFORE 2") to research the magnitude of the contribution of vehicle defects to accidents and to trial new inspection systems suitable for inspecting the functionality of electronically based technologies.
  - Undertake further work to develop methods of improving compliance and the effectiveness and efficiency of vehicle inspection.
  - Undertake further work to develop proposals for further harmonisation of European roadworthiness standards.

Several of these recommendations were implemented by the EC in the recent updates to Directive 96/96/EC, namely Directive 2009/40/EC, Directive 2010/48/EU and EC recommendation 2010/378/EU (see Section 3.1). However, Recommendation 1, 'Increase the frequency of inspection for older light vehicles to annually', has not been implemented.

As part of the work to develop 'Recommendation 1' CITA performed a cost-benefit analysis. The most comprehensive part of analysis was performed for the option "annual inspection of passenger cars". The benefit-assessment consisted of safety benefits (accident-cost savings, congestion-cost savings), environmental benefits (lower environmental pollution and carbon-dioxide emission of passenger cars with petrol engine) and fuel consumption savings. It was found that the safety benefits dominated the results. The other benefits (environmental benefits and fuel consumption) accounted only for one percent of the total benefits.

Details of this analysis are reported for Germany which has an inspection frequency regime of a first test in year 3 and biannually thereafter (3, 2, 2, 2, 2) (AUTOFORE 2007c). It is interesting to note that the German analysis found that:

- Technical defects cause approximately twice as many accidents involving older cars (> 8 years) as new cars
- The risk of accidents as a result of technical defects increases with the time from the last periodic motor vehicle inspection.

The methodology used in the current work to estimate the potential dis-benefits of changing the UK inspection regime was to reverse the calculation methodology used for the benefit analysis performed by the AUTOFORE project for Germany.

6.2.2 AUTOFORE analysis

To calculate the benefit of annual inspection for older cars the methodology used for the AUTOFORE analysis was as follows (Figure 6-2):

1. Determine number of accidents with passenger cars
2. Estimate proportion of these accidents 'caused by' technical defects (Between 2.5% and 9.1%), i.e. proportion of these accidents with a 'vehicle defect' as a main contributory factor
3. Estimate proportion of these related to cars > 7 years old (70%)
4. Estimate proportion of these related to cars inspected over 1 year ago (75%)
5. Estimate proportion of these which annual inspection would have prevented (80%)

Expressing this mathematically:

B_{8+} = 'Benefit of annual inspection of cars ≥ 8 years'

$N_{Biannual}$ = 'Number of accidents with passenger cars with bi-annual inspection'

N_{8+} = 'Number of accidents with passenger cars with annual inspection of older cars'

P = 'Proportion of accidents caused by technical defects'

Then $B_{8+} = N_{Biannual}*P*0.7*0.75*0.80 = N_{Biannual}*P*0.42$

Rearranging $N_{Biannual} = N_{8+} + N_{Biannual}*P*0.42$

$$N_{8+} = N_{Biannual}\,(1- P*0.42) \qquad (1)$$

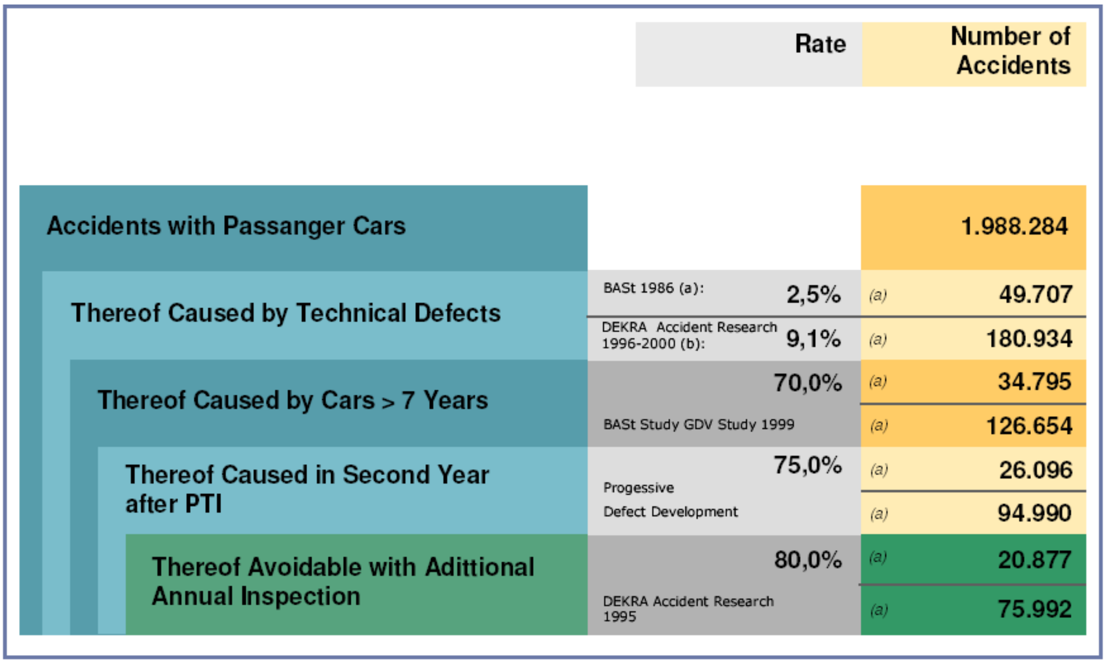

Figure 6-2: Methodology used by AUTOFORE project to estimate benefit for Germany of change in inspection frequency to annual testing of cars ≥ 8 years old.

An estimate of the benefit of annual inspection for cars greater than 3 years old can be made if the proportion in Step 3 is changed to represent cars greater than 3 years old. The TRL authors assumed that this was 90% on the basis of the data in the AUTOFORE report which showed that the defect rate increases with car age.

Expressing this mathematically

B_{3+} = 'Benefit of annual inspection of cars ≥ 3 years'

$N_{Biannual}$ = 'Number of accidents with passenger cars with bi-annual inspection'

N_{3+} = 'Number of accidents with passenger cars with annual inspection cars ≥ 3 years'

then $B_{3+} = N_{Biannual}*P*0.9*0.75*0.80 = N_{Biannual}*P*0.54$

Rearranging $N_{Biannual} = N_{3+} + N_{Biannual}*P*0.54$

$$N_{3+} = N_{Biannual} (1- P*0.54) \quad (2)$$

6.2.3 GB analysis

From the GB analysis of the prevalence and nature of defects above (Section 5), the number of accidents and casualties with the current inspection regime (3,1,1,1) are shown (Table 6-3). The number of accidents and casualties associated with vehicle defects was estimated to be 3%.

Using this information and equations (1) and (2) the increase in the number of accidents and casualties for a bi-annual inspection regime and a bi-annual inspection regime just for cars less than 8 years old in GB was estimated.

Note:

- The number of casualties was estimated using the assumption that they are directly related to the number of accidents
- The number of accidents and casualties for motorcycles and LGVs were estimated using the assumption that the proportions were the same as for cars.

N_{3+} = 'Number of accidents with passenger cars with annual inspection of cars ≥ 3 years', i.e. the current situation in GB

$N_{Biannual}$ = 'Number of accidents with passenger cars with bi-annual inspection'

N_{8+} = 'Number of accidents with passenger cars with annual inspection of older cars'

$P = 0.03$

The results are shown in Table 6-6 and Table 6-7. It can be seen that:

- For change to a bi-annual inspection regime it was estimated that there would be a 1.65 % increase in the number of accidents and casualties which equates to an additional 37 people killed and 407 seriously injured.
- For a change to a bi-annual inspection regime for cars less than 8 years old with an annual inspection for those greater or equal to 8 years it was estimated that there would be a 0.37% increase in the number of accidents and casualties which equates to an additional 8 people killed and 90 seriously injured.

Table 6-6: Increase in accidents and casualties for bi-annual inspection regime.

	For bi-annual inspection regime, increase in accidents & casualties involving								All accidents & casualties
	m/cs ≤ 50cc		m/cs > 50cc		Cars		LGVs		
	n	%	n	%	n	%	n	%	
Accidents	58	1.65	289	1.65	2,396	1.65	205	1.65	2,693
Casualties									
Killed	0	1.65	9	1.65	29	1.65	2	1.65	37
Serious	11	1.65	89	1.65	336	1.65	24	1.65	407
Slight	54	1.65	245	1.65	2,950	1.65	220	1.65	3,215
All	65	1.65	343	1.65	3,315	1.65	246	1.65	3,658

Table 6-7: Increase in accidents and casualties for a bi-annual inspection regime for cars less than 8 years old with an annual inspection for those greater or equal to 8 years.

	For bi-annual inspection regime for cars less than 8 years and an annual inspection for those greater or equal to 8 years, increase in accidents & casualties involving								All accidents & casualties
	m/cs ≤ 50cc		m/cs > 50cc		Cars		LGVs		
	n	%	n	%	n	%	n	%	
Accidents	13	0.37	64	0.37	532	0.37	46	0.37	598
Casualties									
Killed	0	0.37	2	0.37	6	0.37	0	0.37	8
Serious	2	0.37	20	0.37	75	0.37	5	0.37	90
Slight	12	0.37	54	0.37	656	0.37	49	0.37	714
All	14	0.37	76	0.37	737	0.37	55	0.37	813

6.2.4 Limitations of the model

This approach has a number of limitations, not least that the in-depth data used to evaluate the proportion and nature of defects in the German fleet was formed of a relatively small sample size and was undertaken over ten years ago.

Nonetheless, it represents an alternative model based on the experience of a similar European country.

6.3 Retest on the basis of miles travelled since last inspection

This project has not been able to quantify the nature of the likely impacts (if any) to road safety from changes to the MOT test frequency, with a transition to retest on the basis of miles travelled since last inspection, rather than time or combination thereof. In part this is because of the large variation in the distances different classes of vehicle travel with respect to their age.

However, what is clear is that for newer vehicles at least, higher mileage is related to greater MOT failure rates. As vehicles age, the mileage covered is less important, and we believe in general that the age of the vehicle dominates the likelihood of an MOT failure. Newer vehicles which travel larger distances are very likely to have a different driver demographic and use profile, with respect to journey types, compared to older and other vehicles which cover the average distances on an annual basis. This is likely to directly affect their accident risk propensity.

It is not known how these newer vehicles which cover above annual mileage are maintained, but we expect that most are likely to be used for business purposes and therefore will have the incentive to be well looked after to retain their warranty and economical value. If vehicles are not maintained in line with the manufacturers' specification their value is significantly reduced. So, if they are maintained correctly, it is then likely that they are kept in a good condition, perhaps even better than most other vehicles in the fleet, and their relative high MOT failure rates could be more to do with a function of MOTs and service intervals coinciding. In addition, as the service time intervals will be shorter for vehicles which cover larger distances, they will be inspected more frequently, which in theory will reduce the amount of time at least that a vehicle may have a safety critical defect.

7 Conclusions

The study has concluded that:

- There is uncertainty with respect to the number of accidents which occur in the UK where vehicle defects are contributory. This is because no recent studies have been specifically undertaken to investigate these issues.
- This study has estimated that vehicle defects are likely to be a contributory factor in perhaps 3% of accidents in Great Britain.
- On average in 2009, approximately 40% of vehicles tested failed their initial (Normal) MOT test.
- In general,
  - as vehicles age, the rate of MOT failure increases, for cars this reaches nearly 60% when they are 13 years old; and
  - the greater the cumulative distance travelled, the higher the rate of MOT failure, for example all cars which had driven over 90,000 miles experienced above a 50% failure rate.
- There is no established link between MOT measured roadworthiness and vehicle defects contributing to accidents, other than the common sense approach, where the greater the number of defects, especially the most safety critical ones in the fleet at a given time, the greater the likelihood of accidents being caused, at least in part, by roadworthiness issues.
- This study investigated the effect on road safety (if any) associated with a change to MOT testing frequency and found that the greater the distance between inspection dates, the greater the likelihood of adverse road safety consequences. Two different theoretical models were developed and used to provide an estimate of the magnitude of the number of accidents and casualties which may occur annually due to less frequent MOT testing.
  - The first model consisted of a prediction based on a hypothetical relationship between MOT defects in the fleet and casualties. The 4,2,2,2 option yielded the largest predicted increases, with an additional 1,200-2,200 accidents per year, 16-30 fatalities and 180-330 serious casualties, based on 2009 road injury statistics.
  - The second model was based on a prediction based on a comparison with the German roadworthiness testing experience. For change to a bi-annual inspection regime it was estimated that there would be a 1.65 % increase in the number of accidents and casualties which equates to an additional 37 people killed and 407 seriously injured.
- Although both approaches are not ideal, largely due to a lack of data upon which assumptions have been based, they consistently indicated an increase in accidents and casualties. **However, it must be stressed that these are estimates only and further work would be required before a genuine quantification of the scale of these adverse road safety impacts will be known.**
- It was not possible to quantify the nature of the likely impacts (if any) to road safety from changes to the MOT test frequency, with a transition to retest on the basis of miles travelled since last inspection, rather than time or combination thereof. However, on the data reviewed to date we believe the vehicle age is more important than miles travelled, partly because these two factors are related and partly because new vehicles which travel large distances are still likely to follow manufacturers' maintenance schedules and have regular service checks.

- Reducing the frequency of testing for newer vehicles is likely to have adverse road safety consequences, but these would be substantially greater for older vehicles as the data presented in this report already indicates their high MOT failure rates.

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Reported Road Casualties Great Britain: 2009 Annual Report. Department for Transport

Appendix A Frequency of testing in EU-25 states in 2006

		Year after start of operation of vehicle										
		1	2	3	4	5	6	7	8	9	10	...
Belgium	BE				S	T	T	T	T	T	T	T
Denmark	DK				S		T		T			
Germany	DE			S		T		T		T		
Greece	EL				S		T		T		T	
Spain	ES				S		T		T		T	T
France	FR				S		T		T		T	
Ireland	IE				S		T		T			
Italy	IT				S		T		T			
Luxembourg	LU			S	T	T	T	T	T	T	T	T
Netherlands	NL			S	T	T	T	T	T	T	T	T
Austria	AT			S		T	T	T	T	T	T	T
Portugal	PT				S		T		T	T	T	T
Finland	FI			S		T	T	T	T	T	T	T
Sweden	SE			S		T	T	T	T	T	T	T
United Kingdom	UK			S	T	T	T	T	T	T	T	T
Cyprus	CY	n.a.										
Czech Republic	CZ				S		T		T		T	
Estonia	EE			S		T		T		T	T	T
Hungary	HU	S			T			T		T		T
Latvia	LV	S	T	T	T	T	T	T	T	T	T	T
Lithuania	LT			S		T		T		T		T
Malta	MT	n.a.										
Poland	PL			S		T	T	T	T	T	T	T
Slovak Republic	SK			S	T	T	T	T	T	T	T	T
Slovenia	SI			S		T		T		T		T
EU 96/96					S		T		T		T	

Annotations: S = First inspection after start of operation
T = Next obligatory vehicle inspection after S
n.a. = not available
UK data refer to Great Britain only

Source: CITA (Ed.), General Questionnaire 2004, Brussels 2005; DEKRA Automobil GmbH (Ed.), International Strategies for Accident Prevention, Technical Road Safety – DEKRA Technical Paper 58/05, Stuttgart 2005, p. 21; Autofore, WP200; own research

Appendix B MOT Scheme Database all tests (2008 and 2009)

Technical Notes:

Appendix B documents the prevalence of vehicles with roadworthiness defects in the UK population based on the findings from **all MOT tests** (initial and retests).

Where Reasons for Rejection are presented in this section (Appendix B) all are included (**Fail, PRS and Advisory**), **for all MOT tests** (initial and retests).

B.1 Motor cycle roadworthiness, classes 1 and 2 – 2008 and 2009 MOT tests

Table B1-1: Class 1 and 2 MOT test results by year of first use of vehicle (2008)

First year of use	Test Result				Total
	Pass	PRS	Fail	Other*	
2006-2008	2242 73.8%	199 6.5%	371 12.2%	228 7.5%	3040 100.0%
2005	72282 82.1%	6109 6.9%	8943 10.2%	656 .7%	87990 100.0%
2004	73786 81.9%	5889 6.5%	9885 11.0%	501 .6%	90061 100.0%
2003	76916 81.7%	5995 6.4%	10765 11.4%	481 .5%	94157 100.0%
2002	74152 81.2%	5860 6.4%	10815 11.8%	493 .5%	91320 100.0%
2001	70446 80.3%	5719 6.5%	11157 12.7%	446 .5%	87768 100.0%
2000	65243 79.8%	5311 6.5%	10785 13.2%	418 .5%	81757 100.0%
1999	60554 80.3%	4937 6.5%	9462 12.6%	433 .6%	75386 100.0%
1998	48183 80.3%	3930 6.5%	7553 12.6%	373 .6%	60039 100.0%
1997	37888 80.3%	3217 6.8%	5844 12.4%	243 .5%	47192 100.0%
1996	25167 79.7%	2121 6.7%	4110 13.0%	187 .6%	31585 100.0%
1995	18725 79.5%	1585 6.7%	3101 13.2%	151 .6%	23562 100.0%
1988-1994	90714 77.6%	8211 7.0%	17299 14.8%	698 .6%	116922 100.0%
≤ 1987	125950 84.2%	9132 6.1%	13585 9.1%	978 .7%	149645 100.0%
Total	842248 81.0%	68215 6.6%	123675 11.9%	6286 .6%	1040424 100.0%

Table B1-2: Class 1 and 2 MOT test results by mileage (2008)

Mileage at time of test	Test Result				Total
	Pass	PRS	Fail	Other*	
Not Known	12405 64.4%	849 4.4%	2056 10.7%	3967 20.6%	19277 100.0%
1- 4,999	138032 85.7%	9473 5.9%	13031 8.1%	518 .3%	161054 100.0%
5,000- 9,999	161985 82.9%	12570 6.4%	20494 10.5%	439 .2%	195488 100.0%
10,000- 14,999	140150 81.2%	11483 6.7%	20599 11.9%	355 .2%	172587 100.0%
15,000- 19,999	108529 80.0%	9330 6.9%	17509 12.9%	268 .2%	135636 100.0%
20,000- 24,999	79490 79.0%	7031 7.0%	13844 13.8%	203 .2%	100568 100.0%
25,000- 29,999	57066 79.1%	5064 7.0%	9905 13.7%	139 .2%	72174 100.0%
30,000- 34,999	41037 78.6%	3564 6.8%	7522 14.4%	108 .2%	52231 100.0%
35,000- 39,999	28995 78.3%	2564 6.9%	5399 14.6%	69 .2%	37027 100.0%
40,000 +	74571 79.0%	6287 6.7%	13316 14.1%	221 .2%	94395 100.0%
Total	842260 81.0%	68215 6.6%	123675 11.9%	6287 .6%	1040437 100.0%

Table B1-3: Class 1 and 2 MOT test results by year of first use of vehicle (2008)

First year of use	Motorbike cc – Failure %				
	1-50	51-199	200-499	500-999	1000+
2006-2008	117 17.5%	166 15.5%	25 8.1%	48 7.2%	15 4.6%
2005	2353 18.7%	3149 15.5%	550 9.3%	2028 6.2%	861 5.3%
2004	2900 21.1%	2996 15.6%	655 10.7%	2637 7.1%	696 5.1%
2003	2970 20.8%	3262 16.3%	665 10.6%	3105 7.8%	763 5.5%
2002	2662 21.6%	3256 17.6%	664 10.8%	3333 8.5%	900 6.0%
2001	2757 21.2%	3326 18.7%	591 10.9%	3637 9.4%	846 6.5%
2000	2339 21.2%	2611 19.5%	624 12.3%	4312 10.7%	899 7.5%
1999	1490 21.3%	1571 18.1%	660 12.8%	4763 11.2%	978 8.2%
1998	800 21.6%	965 17.7%	603 13.3%	4357 11.9%	828 8.5%
1997	344 19.2%	590 16.1%	553 13.3%	3539 12.5%	818 8.8%
1996	180 18.3%	551 17.1%	472 14.0%	2313 13.0%	594 9.6%
1995	110 18.2%	383 18.2%	475 13.5%	1759 12.9%	374 10.1%
1988-1994	559 16.0%	2906 19.6%	3843 15.8%	7913 14.1%	2076 11.4%
≤ 1987	720 11.5%	3583 10.9%	3292 8.3%	5040 8.3%	950 9.9%
Total	20301 20.0%	29315 16.2%	13672 11.4%	48784 10.1%	11598 7.6%

Table B1-4: Class 1 and 2 MOT test results by mileage (2008)

Mileage at time of test	Motorbike cc – Failure %				
	1-50	51-199	200-499	500-999	1000+
Not Known	331 13.7%	421 13.7%	663 10.0%	509 9.4%	130 7.4%
1- 4,999	3415 14.0%	4362 10.7%	1658 7.4%	2815 5.0%	780 4.6%
5,000- 9,999	5812 19.1%	6245 15.5%	1254 8.5%	5824 6.9%	1359 5.3%
10,000- 14,999	4664 22.6%	6000 17.9%	1367 10.1%	7017 8.7%	1550 6.4%
15,000- 19,999	2975 24.7%	4427 18.9%	1475 11.7%	7172 10.7%	1460 7.2%
20,000- 24,999	1620 26.7%	3109 20.2%	1479 13.0%	6362 12.3%	1274 8.0%
25,000- 29,999	807 27.6%	1817 19.5%	1335 14.0%	4854 12.6%	1092 9.2%
30,000- 34,999	320 25.8%	1180 20.3%	1149 14.7%	3985 14.1%	888 9.8%
35,000- 39,999	181 29.0%	657 19.7%	894 14.9%	2947 14.6%	720 10.5%
40,000 +	176 23.6%	1097 17.7%	2398 15.4%	7299 14.1%	2345 11.6%
Total	20301 20.0%	29315 16.2%	13672 11.4%	48784 10.1%	11598 7.6%

Table B1-5: Classes 1 and 2: System failure for motor cycles by first year of use (2008)

First year of use	System Failure									Total
	Lighting & signalling	Steering & suspension	Brakes	Tyres & wheels	Fuel & exhaust	Body & structure	Drive system	Registration plat & VIN	Other	
2006-2008	626 28.5%	443 20.2%	440 20.0%	332 15.1%	98 4.5%	47 2.1%	119 5.4%	48 2.2%	44 2.0%	2197 100.0%
2005	13561 25.0%	9839 18.1%	11104 20.5%	10194 18.8%	3052 5.6%	881 1.6%	3626 6.7%	1416 2.6%	600 1.1%	54273 100.0%
2004	13830 23.0%	11626 19.3%	13010 21.6%	11182 18.6%	3663 6.1%	1061 1.8%	3785 6.3%	1439 2.4%	619 1.0%	60215 100.0%
2003	14747 22.2%	13654 20.6%	14365 21.7%	12249 18.5%	4228 6.4%	1154 1.7%	3885 5.9%	1426 2.2%	609 .9%	66317 100.0%
2002	14032 21.1%	14274 21.5%	15245 22.9%	12146 18.3%	4101 6.2%	1153 1.7%	3625 5.5%	1295 1.9%	610 .9%	66481 100.0%
2001	14448 20.8%	14939 21.5%	16370 23.5%	12367 17.8%	4479 6.4%	1362 2.0%	3788 5.4%	1131 1.6%	679 1.0%	69563 100.0%
2000	13566 19.8%	14795 21.6%	16470 24.0%	11519 16.8%	4765 7.0%	1322 1.9%	4173 6.1%	1303 1.9%	639 .9%	68552 100.0%
1999	11421 18.5%	13003 21.0%	15222 24.6%	10886 17.6%	4364 7.1%	1058 1.7%	4181 6.8%	1138 1.8%	562 .9%	61835 100.0%
1998	8903 17.8%	10410 20.9%	12708 25.5%	8606 17.2%	3678 7.4%	807 1.6%	3427 6.9%	902 1.8%	480 1.0%	49921 100.0%
1997	6947 17.7%	8152 20.8%	9759 24.9%	6616 16.9%	3033 7.7%	636 1.6%	2916 7.4%	660 1.7%	422 1.1%	39141 100.0%
1996	4835 17.7%	6027 22.0%	6693 24.5%	4585 16.8%	1998 7.3%	479 1.8%	1900 6.9%	487 1.8%	340 1.2%	27344 100.0%
1995	3480 17.3%	4604 22.9%	4862 24.2%	3298 16.4%	1508 7.5%	347 1.7%	1415 7.0%	340 1.7%	247 1.2%	20101 100.0%
1988-1994	21326 18.2%	29498 25.1%	27869 23.7%	16906 14.4%	7736 6.6%	2579 2.2%	8172 7.0%	1843 1.6%	1556 1.3%	117485 100.0%
≤ 1987	20478 21.9%	27770 29.7%	18031 19.3%	11519 12.3%	5377 5.8%	2237 2.4%	5331 5.7%	1231 1.3%	1374 1.5%	93348 100.0%
Total	162200 20.4%	179034 22.5%	182148 22.9%	132405 16.6%	52080 6.5%	15123 1.9%	50343 6.3%	14659 1.8%	8781 1.1%	796773 100.0%

Table B1-6: Classes 1 and 2: System failure for motor cycles by mileage at time of test (2008)

Mileage at time of test	System Failure									Total
	Lighting & signalling	Steering & suspension	Brakes	Tyres & wheels	Fuel & exhaust	Body & structure	Drive system	Registration plat & VIN	Other	
Not Known	3388 25.8%	3336 25.4%	2137 16.3%	1823 13.9%	812 6.2%	230 1.8%	713 5.4%	486 3.7%	196 1.5%	13121 100.0%
1- 4,999	21453 27.6%	18858 24.2%	13070 16.8%	11238 14.4%	4918 6.3%	1413 1.8%	3807 4.9%	2151 2.8%	905 1.2%	77813 100.0%
5,000- 9,999	28407 22.6%	25855 20.5%	25004 19.9%	24938 19.8%	8379 6.7%	2318 1.8%	6932 5.5%	2711 2.2%	1304 1.0%	125848 100.0%
10,000- 14,999	27373 21.1%	27409 21.1%	28714 22.1%	23440 18.1%	8587 6.6%	2451 1.9%	8152 6.3%	2380 1.8%	1260 1.0%	129766 100.0%
15,000- 19,999	22484 19.8%	24277 21.4%	26235 23.2%	19516 17.2%	7680 6.8%	2163 1.9%	7715 6.8%	2065 1.8%	1138 1.0%	113273 100.0%
20,000- 24,999	16884 18.9%	20042 22.4%	21466 24.0%	14885 16.6%	5779 6.5%	1707 1.9%	6261 7.0%	1486 1.7%	991 1.1%	89501 100.0%
25,000- 29,999	12064 18.2%	15145 22.8%	16447 24.8%	10514 15.9%	4512 6.8%	1209 1.8%	4686 7.1%	1013 1.5%	713 1.1%	66303 100.0%
30,000- 34,999	8861 17.4%	12097 23.8%	13025 25.6%	7522 14.8%	3304 6.5%	1018 2.0%	3770 7.4%	714 1.4%	595 1.2%	50906 100.0%
35,000- 39,999	6196 16.8%	8878 24.1%	9807 26.6%	5320 14.4%	2395 6.5%	702 1.9%	2605 7.1%	488 1.3%	460 1.2%	36851 100.0%
40,000 +	15090 16.2%	23142 24.8%	26243 28.1%	13209 14.1%	5715 6.1%	1912 2.0%	5702 6.1%	1165 1.2%	1219 1.3%	93397 100.0%
Total	162200 20.4%	179039 22.5%	182148 22.9%	132405 16.6%	52081 6.5%	15123 1.9%	50343 6.3%	14659 1.8%	8781 1.1%	796779 100.0%

Table B1-7: Class 1 and 2 MOT test results by year of first use of vehicle (2009)

First year of use	Test Result				Total
	Pass	PRS	Fail	Other	
2007-2009	2244 73.5%	216 7.1%	368 12.1%	224 7.3%	3052 100.0%
2006	70301 80.9%	6649 7.7%	9229 10.6%	674 .8%	86853 100.0%
2005	71841 81.5%	6363 7.2%	9516 10.8%	464 .5%	88184 100.0%
2004	68269 80.9%	5969 7.1%	9688 11.5%	470 .6%	84396 100.0%
2003	70136 80.4%	6199 7.1%	10405 11.9%	498 .6%	87238 100.0%
2002	67679 80.2%	5945 7.0%	10280 12.2%	445 .5%	84349 100.0%
2001	64079 79.6%	5652 7.0%	10340 12.8%	429 .5%	80500 100.0%
2000	59526 78.8%	5458 7.2%	10146 13.4%	427 .6%	75557 100.0%
1999	55676 79.3%	5110 7.3%	9065 12.9%	365 .5%	70216 100.0%
1998	44589 79.1%	4138 7.3%	7342 13.0%	284 .5%	56353 100.0%
1997	35293 79.0%	3256 7.3%	5903 13.2%	236 .5%	44688 100.0%
1996	23321 78.4%	2331 7.8%	3918 13.2%	180 .6%	29750 100.0%
1989-1995	93950 77.6%	9069 7.5%	17397 14.4%	684 .6%	121100 100.0%
≤ 1988	134360 83.5%	10833 6.7%	14718 9.1%	1088 .7%	160999 100.0%
Total	861264 80.2%	77188 7.2%	128315 12.0%	6468 .6%	1073235 100.0%

Table B1-8: Class 1 and 2 MOT test results by mileage at time of test (2009)

Mileage at time of test	Test Result				Total
	Pass	PRS	Fail	Other	
Not Known	13241 63.7%	1113 5.4%	2245 10.8%	4200 20.2%	20799 100.0%
1- 4,999	141944 84.7%	11144 6.7%	13966 8.3%	519 .3%	167573 100.0%
5,000- 9,999	162802 82.3%	14008 7.1%	20702 10.5%	421 .2%	197933 100.0%
10,000- 14,999	141351 80.5%	12738 7.3%	21163 12.1%	321 .2%	175573 100.0%
15,000- 19,999	110813 79.2%	10476 7.5%	18283 13.1%	273 .2%	139845 100.0%
20,000- 24,999	82431 78.9%	7836 7.5%	14080 13.5%	176 .2%	104523 100.0%
25,000- 29,999	59103 77.9%	5938 7.8%	10642 14.0%	148 .2%	75831 100.0%
30,000- 34,999	42555 78.0%	4063 7.4%	7845 14.4%	108 .2%	54571 100.0%
35,000- 39,999	30286 77.9%	2902 7.5%	5617 14.4%	76 .2%	38881 100.0%
40,000 +	76746 78.5%	6971 7.1%	13772 14.1%	229 .2%	97718 100.0%
Total	861272 80.2%	77189 7.2%	128315 12.0%	6471 .6%	1073247 100.0%

Table B1-9: Class 1 and 2 MOT test results – failure percentages by motor cycle cylinder capacity and by year of first use (2009)

First year of use	Motor cycle cc – Failure %				
	1-50	51-199	200-499	500-999	1000+
2007-2009	113 17.6%	184 16.3%	25 8.9%	36 5.6%	10 2.8%
2006	2239 19.3%	3449 15.9%	560 9.7%	2201 6.6%	780 5.3%
2005	2246 19.3%	3334 16.2%	612 10.0%	2412 7.2%	912 5.6%
2004	2537 21.8%	2900 16.3%	638 11.0%	2855 8.0%	756 5.6%
2003	2533 21.2%	3082 17.1%	707 11.7%	3261 8.6%	821 6.1%
2002	2206 21.5%	2935 17.9%	719 12.3%	3390 9.1%	1030 7.1%
2001	2244 21.2%	2895 18.6%	601 12.0%	3652 10.0%	948 7.4%
2000	1887 21.1%	2286 19.4%	573 12.2%	4410 11.4%	990 8.6%
1999	1176 20.9%	1498 19.1%	581 12.3%	4775 11.8%	1035 9.0%
1998	602 20.3%	910 18.7%	606 14.1%	4368 12.6%	856 9.0%
1997	317 20.3%	557 17.0%	558 14.3%	3578 13.3%	893 9.8%
1996	139 17.0%	465 16.1%	461 14.6%	2235 13.2%	618 10.3%
1989-1995	496 16.2%	2554 19.1%	3612 15.3%	8474 13.9%	2261 11.3%
≤ 1988	703 10.5%	3851 10.9%	3573 8.4%	5495 8.4%	1096 10.2%
Total	19438 19.8%	30900 16.2%	13826 11.3%	51142 10.3%	13006 7.9%

Table B1-10: Class 1 and 2 MOT test results – failure percentages by motor cycle cylinder capacity and by mileage (2009)

Mileage at time of test	Motorbike cc – Failure %				
	1-50	51-199	200-499	500-999	1000+
Not Known	388 15.0%	478 14.1%	715 9.8%	529 9.3%	135 7.4%
1- 4,999	3289 14.1%	4851 11.1%	1837 7.9%	3106 5.3%	880 4.9%
5,000- 9,999	5337 18.8%	6467 15.4%	1317 8.7%	6021 7.0%	1560 5.8%
10,000- 14,999	4443 22.3%	6198 17.9%	1482 10.7%	7287 9.0%	1753 6.8%
15,000- 19,999	2913 24.6%	4785 19.3%	1400 11.2%	7504 10.9%	1681 7.7%
20,000- 24,999	1576 25.5%	3135 19.5%	1395 12.4%	6529 12.1%	1445 8.5%
25,000- 29,999	799 27.0%	1950 19.6%	1345 14.0%	5323 13.2%	1225 9.4%
30,000- 34,999	374 26.9%	1214 20.2%	1062 14.0%	4264 14.3%	931 9.5%
35,000- 39,999	147 25.1%	713 19.5%	920 15.4%	3049 14.3%	788 10.7%
40,000 +	172 21.3%	1109 17.2%	2353 15.2%	7530 14.3%	2608 11.8%
Total	19438 19.8%	30900 16.2%	13826 11.3%	51142 10.3%	13006 7.9%

Table B1-11: Classes 1 and 2 MOT test items – System failure for motor cycles by first year of use (2009)

First year of use	System Failure									Total
	Lighting & signalling	Steering & suspension	Brakes	Tyres & wheels	Fuel & exhaust	Body & structure	Drive system	Registration plat & VIN	Other	
2007-2009	663 26.7%	506 20.4%	475 19.1%	396 15.9%	126 5.1%	58 2.3%	171 6.9%	51 2.1%	39 1.6%	2485 100.0%
2006	14419 24.2%	10973 18.5%	12103 20.4%	11199 18.8%	3316 5.6%	1001 1.7%	3950 6.6%	1909 3.2%	591 1.0%	59461 100.0%
2005	13699 22.2%	11384 18.4%	13301 21.5%	11625 18.8%	4045 6.6%	1006 1.6%	4162 6.7%	1854 3.0%	678 1.1%	61754 100.0%
2004	13703 21.4%	12473 19.5%	13821 21.6%	12021 18.8%	4415 6.9%	1026 1.6%	4065 6.4%	1883 2.9%	603 .9%	64010 100.0%
2003	14479 21.0%	13743 19.9%	15468 22.4%	12572 18.2%	4736 6.9%	1238 1.8%	4147 6.0%	1954 2.8%	625 .9%	68962 100.0%
2002	13706 20.0%	13948 20.4%	15558 22.7%	12724 18.6%	4806 7.0%	1176 1.7%	4110 6.0%	1778 2.6%	622 .9%	68428 100.0%
2001	13694 19.6%	14634 20.9%	16560 23.7%	12172 17.4%	4941 7.1%	1305 1.9%	4320 6.2%	1569 2.2%	691 1.0%	69886 100.0%
2000	13082 18.9%	14512 21.0%	16523 23.9%	11663 16.9%	4999 7.2%	1297 1.9%	4738 6.9%	1708 2.5%	622 .9%	69144 100.0%
1999	11266 17.8%	13183 20.8%	15712 24.8%	11070 17.5%	4592 7.2%	1104 1.7%	4447 7.0%	1387 2.2%	631 1.0%	63392 100.0%
1998	8703 16.9%	10715 20.8%	13021 25.2%	8920 17.3%	3906 7.6%	846 1.6%	3665 7.1%	1401 2.7%	425 .8%	51602 100.0%
1997	6993 16.9%	8669 21.0%	10274 24.8%	6983 16.9%	3311 8.0%	686 1.7%	3062 7.4%	988 2.4%	409 1.0%	41375 100.0%
1996	4655 16.8%	5974 21.5%	6894 24.8%	4645 16.7%	2120 7.6%	462 1.7%	2092 7.5%	649 2.3%	288 1.0%	27779 100.0%
1989-1995	21815 17.4%	30517 24.3%	29662 23.6%	18463 14.7%	8951 7.1%	2501 2.0%	9361 7.4%	2844 2.3%	1564 1.2%	125678 100.0%
≤ 1988	22572 21.0%	31029 28.8%	21138 19.6%	13636 12.7%	6476 6.0%	2500 2.3%	6631 6.2%	2102 2.0%	1502 1.4%	107586 100.0%
Total	173449 19.7%	192260 21.8%	200510 22.7%	148089 16.8%	60740 6.9%	16206 1.8%	58921 6.7%	22077 2.5%	9290 1.1%	881542 100.0%

Table B1-12: Classes 1 and 2 MOT test items – System failure for motor cycles by mileage at time of test (2009)

Mileage at time of test	System Failure									Total
	Lighting & signalling	Steering & suspension	Brakes	Tyres & wheels	Fuel & exhaust	Body & structure	Drive system	Registration plat & VIN	Other	
Not Known	3980 25.2%	3960 25.1%	2706 17.1%	1991 12.6%	1003 6.4%	294 1.9%	868 5.5%	746 4.7%	231 1.5%	15779 100.0%
1- 4,999	23962 26.7%	21316 23.7%	14779 16.5%	12866 14.3%	6154 6.9%	1664 1.9%	4698 5.2%	3280 3.7%	1075 1.2%	89794 100.0%
5,000- 9,999	29701 21.8%	27312 20.1%	26245 19.3%	27176 20.0%	9699 7.1%	2492 1.8%	8003 5.9%	4205 3.1%	1336 1.0%	136169 100.0%
10,000- 14,999	28426 20.0%	29070 20.5%	31177 22.0%	25836 18.2%	9920 7.0%	2590 1.8%	9820 6.9%	3663 2.6%	1337 .9%	141839 100.0%
15,000- 19,999	24088 19.2%	26344 21.0%	29088 23.1%	21918 17.4%	8882 7.1%	2276 1.8%	8933 7.1%	2929 2.3%	1197 1.0%	125655 100.0%
20,000- 24,999	18116 18.3%	21313 21.5%	23631 23.9%	16699 16.9%	6846 6.9%	1853 1.9%	7262 7.3%	2263 2.3%	975 1.0%	98958 100.0%
25,000- 29,999	13167 17.5%	16695 22.2%	18719 24.9%	12102 16.1%	5253 7.0%	1383 1.8%	5588 7.4%	1524 2.0%	741 1.0%	75172 100.0%
30,000- 34,999	9491 16.9%	12710 22.6%	14472 25.7%	8722 15.5%	3837 6.8%	995 1.8%	4331 7.7%	1108 2.0%	616 1.1%	56282 100.0%
35,000- 39,999	6700 16.4%	9513 23.3%	10864 26.6%	6138 15.0%	2695 6.6%	722 1.8%	2986 7.3%	750 1.8%	475 1.2%	40843 100.0%
40,000 +	15819 15.7%	24027 23.8%	28829 28.5%	14641 14.5%	6451 6.4%	1937 1.9%	6432 6.4%	1609 1.6%	1307 1.3%	101052 100.0%
Total	173450 19.7%	192260 21.8%	200510 22.7%	148089 16.8%	60740 6.9%	16206 1.8%	58921 6.7%	22077 2.5%	9290 1.1%	881543 100.0%

B.2 Cars, passenger vehicles and light goods vehicles roadworthiness, class 4 – 2008 and 2009 MOT tests

Table B2-1: Class 4 MOT test results by year of first use of vehicle (2008)

First year of use	Test Result				Total
	Pass	PRS	Fail	Other*	
2006-2008	97644 80.2%	8303 6.8%	12053 9.9%	3769 3.1%	121769 100.0%
2005	2344165 79.9%	221694 7.6%	341915 11.7%	25989 .9%	2933763 100.0%
2004	2416844 77.4%	246290 7.9%	437757 14.0%	21869 .7%	3122760 100.0%
2003	2386198 73.8%	273912 8.5%	552658 17.1%	20260 .6%	3233028 100.0%
2002	2360830 71.3%	291283 8.8%	640445 19.3%	20302 .6%	3312860 100.0%
2001	2208481 69.0%	279501 8.7%	694340 21.7%	19780 .6%	3202102 100.0%
2000	1923759 66.3%	237309 8.2%	723164 24.9%	18639 .6%	2902871 100.0%
1999	1753177 64.2%	215183 7.9%	746341 27.3%	18228 .7%	2732929 100.0%
1998	1589241 62.5%	185995 7.3%	749066 29.5%	18071 .7%	2542373 100.0%
1997	1340185 61.5%	149154 6.8%	672291 30.9%	16362 .8%	2177992 100.0%
1996	1027478 60.5%	108679 6.4%	549398 32.3%	13605 .8%	1699160 100.0%
1995	767945 60.1%	77202 6.0%	421723 33.0%	10853 .8%	1277723 100.0%
1988-1994	1656028 60.6%	152036 5.6%	900958 33.0%	24913 .9%	2733935 100.0%
≤ 1987	418749 69.0%	26684 4.4%	153518 25.3%	7642 1.3%	606593 100.0%
Total	22290724 68.4%	2473225 7.6%	7595627 23.3%	240282 .7%	32599858 100.0%

Table B2-2: Class 4 MOT test results by mileage at the time of test (2008)

Mileage at time of test	Test Result				Total
	Pass	PRS	Fail	Other*	
Not known	67890 22.7%	8312 2.8%	59814 20.0%	163467 54.6%	299483 100.0%
1- 29,999	3811782 79.9%	322379 6.8%	625078 13.1%	12536 .3%	4771775 100.0%
30,000- 39,999	2451962 75.9%	253951 7.9%	517348 16.0%	6473 .2%	3229734 100.0%
40,000- 49,999	2457635 72.6%	279656 8.3%	642789 19.0%	6536 .2%	3386616 100.0%
50,000- 59,999	2326584 69.6%	280261 8.4%	727155 21.8%	6715 .2%	3340715 100.0%
60,000- 69,999	2131824 67.2%	262753 8.3%	769141 24.3%	6587 .2%	3170305 100.0%
70,000- 79,999	1895387 65.3%	234060 8.1%	765974 26.4%	6491 .2%	2901912 100.0%
80,000- 89,999	1635471 63.9%	199755 7.8%	718838 28.1%	5981 .2%	2560045 100.0%
90,000- 99,999	1366704 62.8%	163685 7.5%	641664 29.5%	5613 .3%	2177666 100.0%
100,000- 109,999	1006173 62.4%	120954 7.5%	482110 29.9%	4098 .3%	1613335 100.0%
110,000- 119,999	794544 61.8%	93082 7.2%	394418 30.7%	3525 .3%	1285569 100.0%
120,000- 129,999	619303 61.2%	70961 7.0%	318161 31.5%	2872 .3%	1011297 100.0%
130,000 +	1725480 60.5%	183418 6.4%	933145 32.7%	9397 .3%	2851440 100.0%
Total	22290739 68.4%	2473227 7.6%	7595635 23.3%	240291 .7%	32599892 100.0%

Table B2-3: Percentage failure for Class 4 MOT test results by year of first use of vehicle and mileage at time of test (2008)

First year of use	Mileage at time of test							Total
	N/K	1-30K	30-60K	60-90K	90-120K	120-150K	150K +	
2006-2008	-	-	-	-	-	-	-	**9.9**
2005	5.7	9.0	13.6	17.1	19.5	21.1	19.1	**11.7**
2004	9.7	9.8	14.9	18.3	20.3	22.3	22.9	**14.0**
2003	13.8	11.3	16.9	20.5	22.5	23.9	25.5	**17.1**
2002	15.7	12.0	18.0	21.8	23.8	25.3	26.9	**19.3**
2001	19.8	13.2	19.3	23.4	25.6	26.9	28.5	**21.7**
2000	22.1	15.2	21.5	26.0	28.2	29.4	30.7	**24.9**
1999	24.7	19.4	23.1	27.8	29.8	30.8	31.9	**27.3**
1998	26.6	26.7	24.2	29.5	31.5	32.4	33.4	**29.5**
1997	28.0	30.0	25.5	30.4	32.5	33.4	34.3	**30.9**
1996	27.9	32.8	27.2	31.7	33.6	34.3	34.9	**32.3**
1995	26.0	32.5	28.0	32.3	34.1	34.8	35.6	**33.0**
1988-1994	23.7	31.5	28.8	32.1	33.9	34.7	35.1	**33.0**
≤ 1987	14.1	21.5	24.5	25.9	28.6	32.1	33.5	**25.3**
Total	**20.0**	**13.1**	**19.0**	**26.1**	**29.9**	**31.9**	**33.2**	**23.3**

Table B2-4 Class 4 MOT failure items by first year of use (2008)

First year of use	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
2006-2008	17833 21.9%	2193 2.7%	6453 7.9%	18962 23.3%	23554 29.0%	1045 1.3%	899 1.1%	325 .4%	1278 1.6%	7800 9.6%	966 1.2%	81308 100.0%
2005	425449 18.1%	63070 2.7%	179753 7.7%	569095 24.3%	736846 31.4%	26364 1.1%	17784 .8%	6510 .3%	47220 2.0%	244146 10.4%	29381 1.3%	2345618 100.0%
2004	546563 17.9%	96607 3.2%	317586 10.4%	803874 26.4%	806940 26.5%	27719 .9%	20642 .7%	7940 .3%	128809 4.2%	256252 8.4%	34174 1.1%	3047106 100.0%
2003	686376 17.9%	112601 2.9%	529670 13.8%	970371 25.3%	877769 22.9%	30223 .8%	24861 .6%	11313 .3%	245922 6.4%	296140 7.7%	48900 1.3%	3834146 100.0%
2002	839907 18.5%	120240 2.6%	731040 16.1%	1148676 25.3%	908979 20.0%	32658 .7%	32035 .7%	16096 .4%	318795 7.0%	337899 7.4%	58804 1.3%	4545129 100.0%
2001	935180 18.5%	126420 2.5%	876496 17.3%	1338843 26.4%	884869 17.5%	33101 .7%	42693 .8%	24864 .5%	379708 7.5%	363843 7.2%	58385 1.2%	5064402 100.0%
2000	941547 17.5%	148605 2.8%	1026843 19.1%	1417223 26.3%	798564 14.8%	32653 .6%	60517 1.1%	46270 .9%	479154 8.9%	362969 6.7%	75298 1.4%	5389643 100.0%
1999	1040745 18.3%	158122 2.8%	1095330 19.3%	1503118 26.4%	754154 13.3%	32597 .6%	76179 1.3%	67092 1.2%	516357 9.1%	371335 6.5%	72683 1.3%	5687712 100.0%
1998	1019414 17.5%	156689 2.7%	1193828 20.5%	1532881 26.3%	714219 12.2%	29449 .5%	113627 1.9%	109151 1.9%	523494 9.0%	365687 6.3%	72833 1.2%	5831272 100.0%
1997	880858 16.6%	143513 2.7%	1129315 21.3%	1383789 26.1%	613188 11.6%	25301 .5%	125839 2.4%	124880 2.4%	471372 8.9%	327536 6.2%	71044 1.3%	5296635 100.0%
1996	694086 15.8%	126155 2.9%	974054 22.2%	1138314 26.0%	476093 10.9%	19599 .4%	111114 2.5%	125499 2.9%	395429 9.0%	263210 6.0%	59903 1.4%	4383456 100.0%
1995	526900 15.6%	110474 3.3%	769930 22.8%	848205 25.1%	352367 10.4%	13898 .4%	91332 2.7%	111459 3.3%	307333 9.1%	199373 5.9%	47192 1.4%	3378463 100.0%
1988-1994	1059381 14.8%	267478 3.7%	1745665 24.4%	1689960 23.6%	687270 9.6%	24934 .3%	240083 3.4%	311573 4.4%	620727 8.7%	418863 5.8%	95379 1.3%	7161313 100.0%
≤ 1987	210706 17.5%	76775 6.4%	299385 24.8%	271880 22.5%	64917 5.4%	4250 .4%	36934 3.1%	72394 6.0%	82903 6.9%	72695 6.0%	13228 1.1%	1206067 100.0%
Total	9824945 17.2%	1708942 3.0%	10875348 19.0%	14635191 25.6%	8699729 15.2%	333791 .6%	994539 1.7%	1035366 1.8%	4518501 7.9%	3887748 6.8%	738170 1.3%	57252270 100.0%

Table B2-5: Class 4 vehicles MOT failure items by system by mileage at time of test (2008)

Mileage at time of test	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
Not Known	72169 19.5%	12752 3.4%	66651 18.0%	94553 25.5%	44756 12.1%	1925 .5%	6039 1.6%	9885 2.7%	31497 8.5%	23316 6.3%	6721 1.8%	370264 100.0%
1-29,999	696265 15.5%	110758 2.5%	742450 16.5%	1088982 24.2%	947828 21.0%	34898 .8%	95205 2.1%	95493 2.1%	277272 6.2%	361929 8.0%	52394 1.2%	4503474 100.0%
30,000-59,999	2173573 16.3%	332748 2.5%	2213931 16.6%	3513726 26.3%	2561811 19.2%	91924 .7%	175227 1.3%	156766 1.2%	1008019 7.5%	975177 7.3%	158647 1.2%	13361549 100.0%
60,000-89,999	2938170 17.5%	463253 2.8%	3232101 19.2%	4294546 25.5%	2449220 14.6%	97875 .6%	298907 1.8%	294347 1.8%	1404362 8.4%	1122059 6.7%	215402 1.3%	16810242 100.0%
90,000-119,999	2125767 17.9%	381098 3.2%	2407929 20.2%	3037769 25.5%	1523067 12.8%	61145 .5%	216317 1.8%	233493 2.0%	995277 8.4%	764777 6.4%	160885 1.4%	11907524 100.0%
120,000-149,999	1084512 17.7%	227019 3.7%	1291028 21.1%	1562995 25.5%	722862 11.8%	28574 .5%	113726 1.9%	133237 2.2%	491210 8.0%	383285 6.3%	85558 1.4%	6124006 100.0%
150,000 +	734498 17.6%	181320 4.3%	921269 22.1%	1042624 25.0%	450186 10.8%	17450 .4%	89119 2.1%	112152 2.7%	310868 7.4%	257211 6.2%	58563 1.4%	4175260 100.0%
Total	9824954 17.2%	1708948 3.0%	10875359 19.0%	14635195 25.6%	8699730 15.2%	333791 .6%	994540 1.7%	1035373 1.8%	4518505 7.9%	3887754 6.8%	738170 1.3%	57252319 100.0%

Table B2-6: Class 4 MOT test results by year of first use of vehicle (2009)

First year of use	Test Result				Total
	Pass	PRS	Fail	Other*	
2007-2009	96663 79.6%	8651 7.1%	12357 10.2%	3736 3.1%	121407 100.0%
2006	2273923 80.2%	213113 7.5%	323778 11.4%	25913 .9%	2836727 100.0%
2005	2294923 77.4%	227670 7.7%	420650 14.2%	21561 .7%	2964804 100.0%
2004	2367094 73.5%	263325 8.2%	566689 17.6%	21341 .7%	3218449 100.0%
2003	2336227 70.4%	283222 8.5%	677920 20.4%	21008 .6%	3318377 100.0%
2002	2300938 68.2%	293044 8.7%	759061 22.5%	21410 .6%	3374453 100.0%
2001	2136953 66.3%	269068 8.3%	797993 24.7%	21055 .7%	3225069 100.0%
2000	1830181 63.9%	220388 7.7%	794218 27.7%	19609 .7%	2864396 100.0%
1999	1612561 62.1%	189494 7.3%	774350 29.8%	18557 .7%	2594962 100.0%
1998	1374715 60.8%	154361 6.8%	713476 31.6%	17115 .8%	2259667 100.0%
1997	1108509 60.1%	119482 6.5%	600965 32.6%	14720 .8%	1843676 100.0%
1996	809656 59.5%	82876 6.1%	456664 33.6%	11544 .8%	1360740 100.0%
1989-1995	1747358 60.1%	164344 5.7%	966214 33.3%	27365 .9%	2905281 100.0%
≤ 1988	444745 68.7%	28769 4.4%	165371 25.6%	8097 1.3%	646982 100.0%
Total	22734446 67.8%	2517807 7.5%	8029706 23.9%	253031 .8%	33534990 100.0%

Table B2-7: Class 4 MOT test results by mileage at the time of test (2009)

Mileage at time of test	Test Result				Total
	Pass	PRS	Fail	Other*	
Not known	71594 22.4%	8519 2.7%	62642 19.6%	176469 55.3%	319224 100.0%
1- 29,999	3801684 79.9%	320363 6.7%	623097 13.1%	11906 .3%	4757050 100.0%
30,000- 39,999	2456830 75.6%	252156 7.8%	535622 16.5%	6169 .2%	3250777 100.0%
40,000- 49,999	2484947 72.0%	281357 8.2%	678609 19.7%	6374 .2%	3451287 100.0%
50,000- 59,999	2381729 69.0%	284565 8.2%	776854 22.5%	6674 .2%	3449822 100.0%
60,000- 69,999	2194628 66.6%	270332 8.2%	824631 25.0%	6712 .2%	3296303 100.0%
70,000- 79,999	1960023 64.7%	241235 8.0%	820587 27.1%	6518 .2%	3028363 100.0%
80,000- 89,999	1690185 63.3%	205038 7.7%	767548 28.8%	6088 .2%	2668859 100.0%
90,000- 99,999	1407450 62.2%	167986 7.4%	680550 30.1%	5622 .2%	2261608 100.0%
100,000- 109,999	1046857 61.8%	125799 7.4%	517568 30.5%	4416 .3%	1694640 100.0%
110,000- 119,999	821742 61.2%	96463 7.2%	420589 31.3%	3575 .3%	1342369 100.0%
120,000- 129,999	638310 60.7%	73465 7.0%	336555 32.0%	2945 .3%	1051275 100.0%
130,000 +	1778479 60.0%	190530 6.4%	984860 33.2%	9573 .3%	2963442 100.0%
Total	22734458 67.8%	2517808 7.5%	8029712 23.9%	253041 .8%	33535019 100.0%

Table B2-8: Percentage failure for Class 4 MOT test results by year of first use of vehicle by mileage at time of test (2009)

First year of use	Mileage at time of test							Total
	N/K	1-29K	30-59K	60-89K	90-119K	120-149K	150K +	
2007-2009	-	-	-	-	-	-	-	***10.2***
2006	4.5	8.9	13.4	16.9	19.3	21.6	19.4	***11.4***
2005	8.6	10.0	15.1	18.4	20.2	22.1	22.8	***14.2***
2004	12.7	11.6	17.6	21.1	22.8	24.3	25.8	***17.6***
2003	15.7	12.8	19.3	23.1	25.1	26.5	27.9	***20.4***
2002	17.8	13.6	20.3	24.4	26.4	27.6	29.2	***22.5***
2001	21.3	15.0	21.4	26.0	28.2	29.4	30.7	***24.7***
2000	23.1	17.3	23.5	28.5	30.5	31.7	32.6	***27.7***
1999	26.2	22.5	25.0	30.0	32.1	33.0	33.7	***29.8***
1998	27.6	30.5	26.0	31.4	33.3	34.0	34.8	***31.6***
1997	27.6	32.9	27.1	32.0	34.0	34.7	35.5	***32.6***
1996	27.7	34.0	28.4	32.9	34.7	35.4	35.9	***33.6***
1989-1995	23.8	31.2	28.7	32.5	34.3	35.0	35.4	***33.3***
≤ 1988	13.5	21.5	24.4	26.2	28.7	32.1	33.5	***25.6***
Total	***19.6***	***13.1***	***19.6***	***26.8***	***30.5***	***32.5***	***33.6***	***23.9***

Table B2-9: Class 4 MOT failure items by first year of use (2009)

First year of use	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
2007-2009	19484 22.7%	2016 2.4%	6397 7.5%	20051 23.4%	25377 29.6%	1086 1.3%	1005 1.2%	376 .4%	1205 1.4%	7787 9.1%	1003 1.2%	85787 100.0%
2006	395427 17.4%	51784 2.3%	164374 7.2%	534812 23.6%	759403 33.5%	32298 1.4%	17731 .8%	7256 .3%	32281 1.4%	241126 10.6%	31774 1.4%	2268266 100.0%
2005	511863 17.2%	100316 3.4%	324994 10.9%	790034 26.6%	817634 27.5%	32449 1.1%	19676 .7%	8031 .3%	86135 2.9%	250957 8.4%	33189 1.1%	2975278 100.0%
2004	704848 17.7%	144490 3.6%	537113 13.5%	1043882 26.2%	918412 23.1%	36298 .9%	26928 .7%	11080 .3%	211379 5.3%	304073 7.6%	43970 1.1%	3982473 100.0%
2003	847106 17.6%	154005 3.2%	786915 16.3%	1237702 25.7%	958195 19.9%	39292 .8%	33084 .7%	16536 .3%	340672 7.1%	348146 7.2%	61100 1.3%	4822753 100.0%
2002	998184 17.9%	160566 2.9%	1011347 18.2%	1441194 25.9%	975614 17.5%	40754 .7%	44433 .8%	25129 .5%	401967 7.2%	390758 7.0%	71656 1.3%	5561602 100.0%
2001	1064095 17.6%	168990 2.8%	1155125 19.1%	1662030 27.4%	933188 15.4%	41340 .7%	64254 1.1%	41446 .7%	452909 7.5%	408101 6.7%	70418 1.2%	6061896 100.0%
2000	1029385 16.4%	183514 2.9%	1298689 20.7%	1698187 27.1%	823850 13.1%	38885 .6%	93675 1.5%	73561 1.2%	554791 8.8%	392826 6.3%	84939 1.4%	6272302 100.0%
1999	1074743 17.1%	179206 2.9%	1319692 21.0%	1687602 26.9%	752857 12.0%	37145 .6%	107382 1.7%	95999 1.5%	565418 9.0%	380368 6.1%	80885 1.3%	6281297 100.0%
1998	949339 16.0%	162012 2.7%	1310790 22.1%	1569013 26.5%	664478 11.2%	31002 .5%	145646 2.5%	139203 2.4%	526620 8.9%	348226 5.9%	76240 1.3%	5922569 100.0%
1997	772983 15.3%	138601 2.7%	1159453 22.9%	1320902 26.1%	538946 10.7%	24703 .5%	144846 2.9%	144095 2.9%	444044 8.8%	297506 5.9%	69817 1.4%	5055896 100.0%
1996	571451 14.7%	112857 2.9%	915935 23.6%	1010456 26.0%	393623 10.1%	17966 .5%	115057 3.0%	127800 3.3%	342591 8.8%	223657 5.8%	54843 1.4%	3886236 100.0%
1989-1995	1165514 14.3%	294776 3.6%	2011948 24.6%	1999448 24.5%	764748 9.4%	31479 .4%	272720 3.3%	335109 4.1%	709117 8.7%	466749 5.7%	119685 1.5%	8171293 100.0%
≤ 1988	234948 17.2%	84711 6.2%	345407 25.3%	307482 22.5%	73158 5.4%	4776 .3%	43519 3.2%	77461 5.7%	95377 7.0%	80134 5.9%	18752 1.4%	1365725 100.0%
Total	10339370 16.5%	1937844 3.1%	12348179 19.7%	16322795 26.0%	9399483 15.0%	409473 .7%	1129956 1.8%	1103082 1.8%	4764506 7.6%	4140414 6.6%	818271 1.3%	62713373 100.0%

Table B2-10: Class 4 vehicles MOT failure items by system by mileage at time of test (2009)

Mileage at time of test	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
Not Known	78475 19.0%	15003 3.6%	77773 18.9%	106309 25.8%	47698 11.6%	2292 .6%	7123 1.7%	10148 2.5%	34606 8.4%	25255 6.1%	7392 1.8%	412074 100.0%
1- 29,999	690072 15.1%	110055 2.4%	769853 16.9%	1099816 24.1%	987679 21.6%	42127 .9%	98404 2.2%	93512 2.0%	254088 5.6%	362802 7.9%	56495 1.2%	4564903 100.0%
30,000- 59,999	2253687 15.7%	385013 2.7%	2475666 17.2%	3828746 26.7%	2734552 19.0%	113815 .8%	190487 1.3%	160143 1.1%	1021539 7.1%	1026899 7.2%	170671 1.2%	14361218 100.0%
60,000- 89,999	3118711 16.7%	540056 2.9%	3732304 20.0%	4845495 26.0%	2668971 14.3%	120051 .6%	340108 1.8%	315118 1.7%	1505206 8.1%	1204092 6.5%	235955 1.3%	18626067 100.0%
90,000- 119,999	2263200 17.0%	433422 3.3%	2770100 20.9%	3466608 26.1%	1669760 12.6%	75406 .6%	254387 1.9%	256017 1.9%	1083295 8.2%	824143 6.2%	181955 1.4%	13278293 100.0%
120,000- 149,999	1153354 16.9%	252573 3.7%	1470160 21.6%	1780881 26.1%	795129 11.7%	34846 .5%	135037 2.0%	145830 2.1%	531971 7.8%	415222 6.1%	97625 1.4%	6812628 100.0%
150,000 +	781874 16.8%	201722 4.3%	1052329 22.6%	1194951 25.7%	495698 10.6%	20936 .4%	104410 2.2%	122317 2.6%	333802 7.2%	282004 6.1%	68178 1.5%	4658221 100.0%
Total	10339373 16.5%	1937844 3.1%	12348185 19.7%	16322806 26.0%	9399487 15.0%	409473 .7%	1129956 1.8%	1103085 1.8%	4764507 7.6%	4140417 6.6%	818271 1.3%	62713404 100.0%

B.3 Light goods vehicles (3,000-3,500kg) roadworthiness (Class 7)

Table B3-1: Class 7 MOT test results by year of first use of vehicle (2008)

First year of use	Test Result				Total
	Pass	PRS	Fail	Other*	
2006-2008	2782 70.9%	317 8.1%	666 17.0%	160 4.1%	3925 100.0%
2005	61222 69.7%	6510 7.4%	19081 21.7%	1024 1.2%	87837 100.0%
2004	61913 68.2%	6426 7.1%	21635 23.8%	854 .9%	90828 100.0%
2003	56104 66.7%	5546 6.6%	21810 25.9%	694 .8%	84154 100.0%
2002	53508 65.1%	5015 6.1%	22915 27.9%	734 .9%	82172 100.0%
2001	50996 63.1%	4576 5.7%	24465 30.3%	734 .9%	80771 100.0%
2000	41538 61.4%	3414 5.0%	22077 32.6%	628 .9%	67657 100.0%
1999	33595 59.9%	2715 4.8%	19258 34.3%	540 1.0%	56108 100.0%
1998	31470 59.5%	2350 4.4%	18548 35.1%	514 1.0%	52882 100.0%
1997	25599 58.5%	1825 4.2%	15833 36.2%	473 1.1%	43730 100.0%
1996	17971 57.7%	1220 3.9%	11596 37.2%	345 1.1%	31132 100.0%
1995	13033 57.1%	842 3.7%	8660 38.0%	281 1.2%	22816 100.0%
1988-1994	23600 56.7%	1481 3.6%	15795 38.0%	725 1.7%	41601 100.0%
≤ 1987	3848 60.2%	257 4.0%	2134 33.4%	157 2.5%	6396 100.0%
Total	477179 63.5%	42494 5.7%	224473 29.8%	7863 1.0%	752009 100.0%

Table B3-2: Class 7 MOT test results by mileage at the time of test (2008)

Mileage at time of test	Test Result				Total
	Pass	PRS	Fail	Other*	
Not known	2628 25.9%	212 2.1%	2437 24.0%	4868 48.0%	10145 100.0%
1- 29,999	29492 71.2%	2519 6.1%	9039 21.8%	346 .8%	41396 100.0%
30,000- 39,999	21734 70.8%	2005 6.5%	6792 22.1%	148 .5%	30679 100.0%
40,000- 49,999	26837 69.3%	2578 6.7%	9132 23.6%	170 .4%	38717 100.0%
50,000- 59,999	30761 67.9%	2821 6.2%	11501 25.4%	194 .4%	45277 100.0%
60,000- 69,999	33839 66.5%	3178 6.2%	13642 26.8%	218 .4%	50877 100.0%
70,000- 79,999	35312 65.8%	3172 5.9%	14977 27.9%	198 .4%	53659 100.0%
80,000- 89,999	35855 64.4%	3306 5.9%	16351 29.4%	191 .3%	55703 100.0%
90,000- 99,999	35017 63.3%	3173 5.7%	16925 30.6%	214 .4%	55329 100.0%
100,000- 109,999	31329 62.7%	2905 5.8%	15580 31.2%	178 .4%	49992 100.0%
110,000- 119,999	28665 62.0%	2610 5.6%	14797 32.0%	159 .3%	46231 100.0%
120,000- 129,999	26093 61.8%	2278 5.4%	13718 32.5%	142 .3%	42231 100.0%
130,000 +	139617 60.2%	11738 5.1%	79582 34.3%	837 .4%	231774 100.0%
Total	477179 63.5%	42495 5.7%	224473 29.8%	7863 1.0%	752010 100.0%

Table B3-3: Class 7 vehicles MOT failure items by system by first year of use (2008)

First year of use	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
2006-2008	1352 28.7%	142 3.0%	817 17.4%	1153 24.5%	517 11.0%	22 .5%	54 1.1%	50 1.1%	54 1.1%	498 10.6%	47 1.0%	4706 100.0%
2005	35761 25.6%	4302 3.1%	29113 20.8%	34408 24.6%	14792 10.6%	434 .3%	1745 1.2%	1375 1.0%	1843 1.3%	14217 10.2%	1658 1.2%	139648 100.0%
2004	39278 24.1%	5761 3.5%	36851 22.6%	41113 25.2%	16194 9.9%	454 .3%	2110 1.3%	1607 1.0%	3208 2.0%	14545 8.9%	1868 1.1%	162989 100.0%
2003	38261 22.9%	5259 3.1%	38579 23.0%	44105 26.3%	15493 9.3%	480 .3%	2510 1.5%	1664 1.0%	4506 2.7%	14399 8.6%	2169 1.3%	167425 100.0%
2002	40157 21.6%	6199 3.3%	43470 23.4%	51118 27.5%	15817 8.5%	475 .3%	2979 1.6%	1975 1.1%	6896 3.7%	14301 7.7%	2235 1.2%	185622 100.0%
2001	42363 20.4%	8210 4.0%	45057 21.7%	61106 29.5%	16884 8.1%	518 .2%	3859 1.9%	2795 1.3%	8812 4.2%	15679 7.6%	2149 1.0%	207432 100.0%
2000	37050 18.8%	8692 4.4%	45361 23.1%	54733 27.8%	14451 7.4%	446 .2%	4436 2.3%	5366 2.7%	9719 4.9%	13739 7.0%	2591 1.3%	196584 100.0%
1999	32262 18.3%	7922 4.5%	41504 23.6%	45883 26.1%	11966 6.8%	376 .2%	4929 2.8%	8192 4.7%	9443 5.4%	11453 6.5%	2007 1.1%	175937 100.0%
1998	30405 17.3%	7220 4.1%	41122 23.4%	46810 26.6%	12125 6.9%	442 .3%	5973 3.4%	9992 5.7%	8829 5.0%	10885 6.2%	1991 1.1%	175794 100.0%
1997	26107 17.0%	5965 3.9%	36314 23.6%	40885 26.5%	10271 6.7%	370 .2%	5394 3.5%	10023 6.5%	7615 4.9%	9301 6.0%	1774 1.2%	154019 100.0%
1996	19179 16.6%	4878 4.2%	27018 23.3%	28752 24.8%	7526 6.5%	294 .3%	4732 4.1%	9335 8.1%	5666 4.9%	7031 6.1%	1418 1.2%	115829 100.0%
1995	12860 15.1%	3802 4.5%	20500 24.0%	19702 23.1%	5317 6.2%	257 .3%	4292 5.0%	8002 9.4%	4416 5.2%	5135 6.0%	1022 1.2%	85305 100.0%
1988-1994	22664 14.4%	8624 5.5%	40190 25.6%	34193 21.7%	8968 5.7%	397 .3%	7604 4.8%	16175 10.3%	7579 4.8%	9083 5.8%	1775 1.1%	157252 100.0%
≤ 1987	3462 16.9%	1149 5.6%	4585 22.3%	5048 24.6%	934 4.6%	26 .1%	870 4.2%	1753 8.5%	1273 6.2%	1196 5.8%	220 1.1%	20516 100.0%
Total	381161 19.6%	78125 4.0%	450481 23.1%	509009 26.1%	151255 7.8%	4991 .3%	51487 2.6%	78304 4.0%	79859 4.1%	141462 7.3%	22924 1.2%	1949058 100.0%

Table B3-4: Class 7 vehicles MOT failure items by system by mileage at time of test (2008)

Mileage at time of test	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
Not known	4515 22.1%	781 3.8%	4128 20.2%	5663 27.8%	1167 5.7%	41 .2%	508 2.5%	1095 5.4%	870 4.3%	1301 6.4%	321 1.6%	20390 100.0%
1- 29,999	13164 18.1%	3096 4.3%	16542 22.8%	17489 24.1%	6085 8.4%	210 .3%	2581 3.6%	4305 5.9%	2629 3.6%	5654 7.8%	825 1.1%	72580 100.0%
30,000- 39,999	9951 19.6%	1960 3.9%	11012 21.7%	12887 25.4%	5499 10.8%	159 .3%	1330 2.6%	1562 3.1%	1566 3.1%	4274 8.4%	497 1.0%	50697 100.0%
40,000- 49,999	13882 19.9%	2646 3.8%	14919 21.4%	18133 26.0%	7193 10.3%	236 .3%	1639 2.4%	2017 2.9%	2306 3.3%	5980 8.6%	712 1.0%	69663 100.0%
50,000- 59,999	17705 19.9%	3537 4.0%	19121 21.5%	23622 26.6%	8621 9.7%	276 .3%	1984 2.2%	2544 2.9%	3061 3.4%	7500 8.4%	952 1.1%	88923 100.0%
60,000- 69,999	21589 19.9%	4327 4.0%	23951 22.1%	28377 26.1%	10204 9.4%	341 .3%	2555 2.4%	3228 3.0%	3913 3.6%	8853 8.2%	1249 1.2%	108587 100.0%
70,000- 79,999	23833 19.5%	4898 4.0%	27535 22.6%	31998 26.2%	10681 8.7%	364 .3%	3049 2.5%	3860 3.2%	4640 3.8%	9791 8.0%	1426 1.2%	122075 100.0%
80,000- 89,999	26559 19.5%	5554 4.1%	31255 22.9%	35879 26.3%	11358 8.3%	393 .3%	3588 2.6%	4604 3.4%	5222 3.8%	10503 7.7%	1587 1.2%	136502 100.0%
90,000- 99,999	27770 19.2%	5958 4.1%	33627 23.3%	37200 25.7%	11646 8.1%	403 .3%	3904 2.7%	5567 3.8%	5939 4.1%	10864 7.5%	1721 1.2%	144599 100.0%
100,000- 109,999	26292 19.5%	5533 4.1%	31002 23.0%	35421 26.3%	10736 8.0%	333 .2%	3516 2.6%	4708 3.5%	5645 4.2%	10040 7.4%	1568 1.2%	134794 100.0%
110,000- 119,999	25514 19.6%	5218 4.0%	30445 23.3%	34256 26.3%	9973 7.6%	332 .3%	3467 2.7%	4948 3.8%	5497 4.2%	9189 7.0%	1595 1.2%	130434 100.0%
120,000- 129,999	23695 19.3%	4868 4.0%	28613 23.3%	32221 26.3%	9127 7.4%	315 .3%	3401 2.8%	5135 4.2%	5184 4.2%	8624 7.0%	1367 1.1%	122550 100.0%
130,000 +	146693 19.6%	29749 4.0%	178331 23.9%	195863 26.2%	48965 6.6%	1588 .2%	19965 2.7%	34731 4.6%	33387 4.5%	48889 6.5%	9104 1.2%	747265 100.0%
Total	381162 19.6%	78125 4.0%	450481 23.1%	509009 26.1%	151255 7.8%	4991 .3%	51487 2.6%	78304 4.0%	79859 4.1%	141462 7.3%	22924 1.2%	1949059 100.0%

Table B3-5: Class 7 MOT test results by year of first use of vehicle (2009)

First year of use	Test Result				Total
	Pass	PRS	Fail	Other*	
2007-2009	2779 70.5%	327 8.3%	675 17.1%	163 4.1%	3944 100.0%
2006	63715 69.2%	7424 8.1%	19804 21.5%	1105 1.2%	92048 100.0%
2005	60192 68.2%	6503 7.4%	20783 23.5%	788 .9%	88266 100.0%
2004	58527 65.9%	6161 6.9%	23281 26.2%	783 .9%	88752 100.0%
2003	52437 64.6%	5357 6.6%	22626 27.9%	720 .9%	81140 100.0%
2002	49940 62.6%	4973 6.2%	24153 30.3%	718 .9%	79784 100.0%
2001	46825 61.2%	4498 5.9%	24503 32.0%	691 .9%	76517 100.0%
2000	37099 59.7%	3197 5.1%	21221 34.2%	594 1.0%	62111 100.0%
1999	28760 58.2%	2441 4.9%	17685 35.8%	525 1.1%	49411 100.0%
1998	26091 57.8%	2145 4.8%	16453 36.4%	463 1.0%	45152 100.0%
1997	20727 57.1%	1594 4.4%	13546 37.3%	401 1.1%	36268 100.0%
1996	14074 56.9%	982 4.0%	9354 37.8%	309 1.3%	24719 100.0%
1989-1995	25997 56.6%	1862 4.1%	17308 37.7%	737 1.6%	45904 100.0%
≤ 1988	4219 60.4%	303 4.3%	2313 33.1%	152 2.2%	6987 100.0%
Total	491382 62.9%	47767 6.1%	233705 29.9%	8149 1.0%	781003 100.0%

Table B3-6: Class 7 MOT test results by mileage at the time of test (2009)

Mileage at time of test	Test Result				Total
	Pass	PRS	Fail	Other*	
Not known	2768 25.7%	331 3.1%	2432 22.5%	5255 48.7%	10786 100.0%
1-29,999	29674 72.6%	2760 6.8%	8148 19.9%	302 .7%	40884 100.0%
30,000-59,999	82676 68.9%	8432 7.0%	28430 23.7%	524 .4%	120062 100.0%
60,000-89,999	107279 64.9%	10828 6.6%	46642 28.2%	557 .3%	165306 100.0%
90,000-119,999	98408 62.2%	9572 6.1%	49633 31.4%	545 .3%	158158 100.0%
120,000-149,999	71207 60.4%	6883 5.8%	39405 33.4%	384 .3%	117879 100.0%
150,000-179,999	43927 59.5%	4071 5.5%	25604 34.7%	257 .3%	73859 100.0%
180,000-209,999	24550 59.1%	2193 5.3%	14659 35.3%	130 .3%	41532 100.0%
210,000 +	30894 58.8%	2697 5.1%	18752 35.7%	197 .4%	52540 100.0%
Total	491383 62.9%	47767 6.1%	233705 29.9%	8151 1.0%	781006 100.0%

Table B3-7: Class 7 vehicles MOT failure items by system by first year of use (2009)

First year of use	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
2007-2009	1385 28.2%	175 3.6%	717 14.6%	1404 28.6%	545 11.1%	12 .2%	56 1.1%	38 .8%	51 1.0%	472 9.6%	61 1.2%	4916 100.0%
2006	36133 24.9%	4944 3.4%	27012 18.6%	38811 26.7%	16642 11.5%	508 .3%	1712 1.2%	1390 1.0%	1446 1.0%	14914 10.3%	1791 1.2%	145303 100.0%
2005	38529 23.5%	5401 3.3%	35609 21.7%	43813 26.7%	17084 10.4%	525 .3%	2128 1.3%	1579 1.0%	2768 1.7%	14682 9.0%	1746 1.1%	163864 100.0%
2004	42336 22.1%	7708 4.0%	43696 22.9%	52070 27.2%	18431 9.6%	485 .3%	2678 1.4%	1863 1.0%	4399 2.3%	15382 8.0%	2150 1.1%	191198 100.0%
2003	39849 21.0%	6817 3.6%	42310 22.3%	55077 29.0%	16911 8.9%	424 .2%	3009 1.6%	2041 1.1%	5870 3.1%	14853 7.8%	2501 1.3%	189662 100.0%
2002	42381 19.8%	8370 3.9%	48026 22.5%	63693 29.8%	17605 8.2%	532 .2%	3825 1.8%	2611 1.2%	8647 4.0%	15538 7.3%	2581 1.2%	213809 100.0%
2001	42365 18.6%	10009 4.4%	47195 20.8%	72496 31.9%	17802 7.8%	536 .2%	4529 2.0%	3674 1.6%	9914 4.4%	16166 7.1%	2588 1.1%	227274 100.0%
2000	34944 17.0%	9236 4.5%	46609 22.7%	59953 29.2%	14579 7.1%	412 .2%	5702 2.8%	7499 3.7%	9623 4.7%	13904 6.8%	2811 1.4%	205272 100.0%
1999	29282 16.5%	7963 4.5%	41983 23.6%	47270 26.6%	11761 6.6%	377 .2%	6141 3.5%	10966 6.2%	9008 5.1%	10865 6.1%	2378 1.3%	177994 100.0%
1998	26573 15.7%	6303 3.7%	41144 24.3%	44668 26.4%	11041 6.5%	376 .2%	6733 4.0%	11688 6.9%	8047 4.8%	10149 6.0%	2317 1.4%	169039 100.0%
1997	21931 15.5%	5483 3.9%	34313 24.2%	37563 26.5%	9033 6.4%	354 .2%	5893 4.2%	10748 7.6%	6518 4.6%	7942 5.6%	2030 1.4%	141808 100.0%
1996	15369 15.4%	4019 4.0%	24095 24.2%	24231 24.3%	6466 6.5%	246 .2%	4470 4.5%	9050 9.1%	4652 4.7%	5509 5.5%	1487 1.5%	99594 100.0%
1989-1995	25741 14.0%	8956 4.9%	46971 25.5%	41075 22.3%	10839 5.9%	467 .3%	9152 5.0%	18415 10.0%	8786 4.8%	10743 5.8%	2840 1.5%	183985 100.0%
≤ 1988	3690 16.0%	1216 5.3%	5472 23.7%	5604 24.2%	1027 4.4%	56 .2%	998 4.3%	1888 8.2%	1497 6.5%	1324 5.7%	353 1.5%	23125 100.0%
Total	400508 18.7%	86600 4.1%	485152 22.7%	587728 27.5%	169766 7.9%	5310 .2%	57026 2.7%	83450 3.9%	81226 3.8%	152443 7.1%	27634 1.3%	2136843 100.0%

Table B3-8: Class 7 vehicles MOT failure items by system by mileage at time of test (2009)

Mileage at time of test	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
Not Known	4443 20.3%	847 3.9%	4725 21.6%	6224 28.4%	1381 6.3%	58 .3%	543 2.5%	1175 5.4%	868 4.0%	1341 6.1%	320 1.5%	21925 100.0%
1- 29,999	12312 18.7%	2693 4.1%	13879 21.0%	16967 25.7%	5905 8.9%	192 .3%	2194 3.3%	3287 5.0%	2349 3.6%	5296 8.0%	922 1.4%	65996 100.0%
30,000- 59,999	43271 19.4%	8422 3.8%	44386 19.9%	62959 28.2%	24236 10.9%	763 .3%	5058 2.3%	5943 2.7%	6669 3.0%	18734 8.4%	2831 1.3%	223272 100.0%
60,000- 89,999	75388 19.0%	16345 4.1%	86878 21.9%	110947 27.9%	35594 9.0%	1176 .3%	9781 2.5%	11763 3.0%	13539 3.4%	30807 7.8%	4899 1.2%	397117 100.0%
90,000- 119,999	84121 18.6%	19014 4.2%	102809 22.8%	123629 27.4%	35943 8.0%	1130 .3%	12338 2.7%	16877 3.7%	17392 3.9%	32489 7.2%	5760 1.3%	451502 100.0%
120,000- 149,999	69292 18.3%	15302 4.0%	88889 23.5%	102603 27.1%	27682 7.3%	824 .2%	11071 2.9%	16313 4.3%	15565 4.1%	25567 6.8%	5092 1.3%	378200 100.0%
150,000- 179,999	46695 18.4%	9971 3.9%	60357 23.8%	68527 27.0%	17431 6.9%	524 .2%	7355 2.9%	12323 4.9%	10444 4.1%	16586 6.5%	3436 1.4%	253649 100.0%
180,000- 209,999	27805 18.6%	5999 4.0%	36410 24.3%	40649 27.1%	9819 6.6%	312 .2%	4022 2.7%	7134 4.8%	6292 4.2%	9423 6.3%	1913 1.3%	149778 100.0%
210,000 +	37181 19.0%	8007 4.1%	46819 24.0%	55223 28.3%	11775 6.0%	331 .2%	4664 2.4%	8635 4.4%	8108 4.1%	12200 6.2%	2461 1.3%	195404 100.0%
Total	400508 18.7%	86600 4.1%	485152 22.7%	587728 27.5%	169766 7.9%	5310 .2%	57026 2.7%	83450 3.9%	81226 3.8%	152443 7.1%	27634 1.3%	2136843 100.0%

Appendix C In-depth accident data

The prevalence of vehicles with roadworthiness defects in the UK crash population

C.1 VOSA Accident Database

Table C1-1 looks at year of manufacture for the various vehicle classes. Most of the very old vehicles are either buses or semi-trailers. A relatively large proportion of vehicles in the "Other (non-trailer)" category (mostly agricultural tractors) also appear in the oldest age group, as do a significant proportion of motorcycles (compared to the proportions of cars, HGVs and LGVs). However, for all vehicle classes, the age distributions peak in the 2001-2007 range, although the number of vehicles of unknown age is very high – 20% overall, and particularly high for motorcycles and some types of trailer.

Table C1-1: Vehicles by Year of Manufacture and Vehicle Class

Vehicle class	Year of manufacture												Totals	
	1964-80		1981-90		1991-95		1996-2000		2001-07		Unknown			
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
Car	6	0.2	121	5.3	354	15.5	616	24.5	828	31.1	572	23.4	2497	100
HGV (>7.5t)	6	0.3	48	2.7	159	8.9	557	29.5	1174	43.6	353	14.9	2297	100
LGV (<=7.5t)	5	0.9	29	4.7	56	8.8	176	27.9	334	44.2	97	13.5	697	100
M/cycle etc	6	1.7	27	7.2	24	5.8	75	19.6	126	32	128	33.7	386	100
P/cycle	0	0	0	0	0	0	0	0	0	0	18	100	18	100
Minibus	0	0	4	4.5	6	5.6	30	30.3	53	47.2	15	12.4	108	100
Bus/coach	22	1.5	159	10.3	205	12.1	572	32	764	31.5	253	12.5	1975	100
SPV	1	1.7	2	3.4	10	19	13	22.4	28	39.7	9	13.8	63	100
Tlr (drawbar)	2	1.1	4	3.4	13	12.4	23	23.6	30	25.8	44	33.7	116	100
Tlr (semi)	17	1.8	75	8.4	90	9	248	25.8	444	32.6	269	22.5	1143	100
Tlr (NFS)	0	0	1	2.7	2	5.4	2	5.4	15	24.3	29	62.2	49	100
Other (non-tlr)	7	8.6	3	1.7	8	10.3	14	15.5	47	37.9	30	25.9	109	100
Unknown	0	0	0	0	0	0	7	28	2	8	17	64	26	100
Totals	72	0.9	473	5.9	927	11.4	2333	27	3845	35.3	1834	19.5	9484	100

Table C1-2 compares the distribution of vehicle classes in the database with the distribution of vehicles where at least one defective system was discovered at the examination.

Overall, the two distributions are very similar. LGVs, HGVs and cars (in that order) are over-represented among defective vehicles, while buses/coaches and semi-trailers are under-represented.

Table C1-2: Vehicles by whether Defective and Vehicle Class

Vehicle class	All vehicles		Defective vehs	
	Num	%	Num	%
Car	2497	26.3	1701	27.3
HGV	2297	24.2	1569	25.2
LGV	697	7.3	539	8.7
Minibus	108	1.1	59	0.9
Bus/coach	1975	20.8	1187	19.1
M/cycle etc	386	4.1	257	4.1
P/cycle	18	0.2	8	0.1
SPV	63	0.7	47	0.8
Tlr (drawbar)	116	1.2	72	1.2
Tlr (semi)	1143	12.1	656	10.5
Tlr (NFS)	49	0.5	37	0.6
Other (non-tlr)	109	1.1	79	1.3
Unknown	26	0.3	13	0.2
Totals	9484	100.0	6224	100.0

Table C1-3 gives more detail by showing which vehicle systems were found to be defective. There are ten systems to each vehicle, so that there are 73,500 valid system records in the database. Of these, 19,430 were defective. Note that it is possible for a vehicle to have more than one defective system.

Table C1-3: Defective Systems by System Type and Vehicle Class

Vehicle class	Defective system												Totals	
	Bodywork & Chassis		Braking		Lighting		Steering & Suspension		Transmission & Other		Wheels & Tyres			
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
Car	1267	27.8	659	28.6	917	27.3	1419	40.5	967	38.9	1477	45.8	6706	34.5
HGV	1161	25.5	564	24.5	897	26.7	852	24.3	626	25.2	653	20.3	4753	24.5
LGV	446	9.8	248	10.8	328	9.8	333	9.5	248	10.0	308	9.6	1911	9.8
Minibus	35	0.8	16	0.7	24	0.7	30	0.9	21	0.8	32	1.0	158	0.8
Bus/coach	884	19.4	296	12.8	627	18.7	369	10.5	343	13.8	222	6.9	2741	14.1
M/cycle etc	171	3.8	149	6.5	128	3.8	224	6.4	183	7.4	185	5.7	1040	5.4
P/cycle	1	0.0	4	0.2	1	0.0	2	0.1	3	0.1	4	0.1	15	0.1
SPV	35	0.8	16	0.7	27	0.8	28	0.8	20	0.8	23	0.7	149	0.8
Tlr (drawbar)	46	1.0	40	1.7	41	1.2	18	0.5	7	0.3	35	1.1	187	1.0
Tlr (semi)	430	9.4	254	11.0	294	8.8	162	4.6	34	1.4	213	6.6	1387	7.1
Tlr (NFS)	32	0.7	24	1.0	22	0.7	10	0.3	2	0.1	18	0.6	108	0.6
Other (non-tlr)	43	0.9	30	1.3	45	1.3	47	1.3	23	0.9	47	1.5	235	1.2
Unknown	8	0.2	6	0.3	7	0.2	7	0.2	6	0.2	6	0.2	40	0.2
Totals	4559	100.0	2306	100.0	3358	100.0	3501	100.0	2483	100.0	3223	100.0	19430	100.0

Vehicle systems have been grouped in this table to save space. Comparing the various column percentages with those in the Total column, cars are over-represented among vehicles with Steering & Suspension, Transmission & Other and particularly Wheel & Tyre defects. HGVs, on the other hand, are under-represented as regards Wheel & Tyre defects, but slightly over-represented among vehicles with Bodywork & Chassis and Lighting defects. For LGVs, no one system stands out as being more likely than the others to be defective. Minibuses are under-represented as regards Braking defects, but the numbers here are rather small to be reliable. Defects in buses/coaches seem more likely to be found in the Bodywork & Chassis and Lighting systems, and less likely to affect the Steering & Suspension and Wheels & Tyres. Defects on m/cycles are more likely to affect the Braking, Steering & Suspension and particularly the Transmission & Other systems, while these vehicles are under-represented as regards Bodywork & Chassis and Lighting defects. There are too few p/cycle defects for reliable conclusions to be drawn, and SPVs are fairly uniformly represented across the defective system types. For all types of trailers, Braking defects stand out as being the most likely, followed (for drawbar and semi-trailers) by Lighting defects. Semi-trailers are also over-represented among Bodywork & Chassis defects. The Other (non-trailer) class of vehicles is under-represented as regards Transmission & Other defects, but numbers in this category are again quite small.

Table C1-4 is a repeat of Table C1-3, but restricted to vehicles involved in fatal and serious accidents only. The total number of defective systems here was 9,348 and these related to 2,947 defective vehicles (in fatal/serious accidents). The 19,430 defective systems seen in Table C1-3 related to 6,224 defective vehicles. The number of defective systems per defective vehicle is thus slightly higher in fatal/serious accidents than in all accidents, even though the simple presence of defects is not a predictor of involvement in more severe accidents.

The association of particular defects with particular classes of vehicle is almost identical to that seen in Table C1-3 and discussed above. There is no indication that particular types of defects are associated with more severe accidents

Table C1-5, Table C1-6 and Table C1-7 list the defect systems for motor cycles, cars and light goods vehicles by whether the defect was or was not contributory to the accident.

Table C1-4: Defective Systems by System Type and Veh. Class (Fatal & Serious Accidents Only)

Vehicle class	Defective system												Totals	
	Bodywork & Chassis		Braking		Lighting		Steering & Suspension		Transmission & Other		Wheels & Tyres			
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
Car	601	27.6	309	28.5	416	25.8	687	39.3	444	37.3	670	43.7	3127	33.5
HGV	655	30.1	295	27.2	510	31.6	481	27.5	365	30.6	357	23.3	2663	28.5
LGV	243	11.2	120	11.1	172	10.7	184	10.5	138	11.6	155	10.1	1012	10.8
Minibus	16	0.7	6	0.6	9	0.6	14	0.8	8	0.7	16	1.0	69	0.7
Bus/coach	305	14.0	104	9.6	210	13.0	151	8.6	122	10.2	74	4.8	966	10.3
M/cycle etc	69	3.2	64	5.9	52	3.2	98	5.6	66	5.5	76	5.0	425	4.5
SPV	21	1.0	5	0.5	18	1.1	14	0.8	11	0.9	16	1.0	85	0.9
Tlr (drawbar)	21	1.0	18	1.7	20	1.2	6	0.3	4	0.3	16	1.0	85	0.9
Tlr (semi)	199	9.1	135	12.5	169	10.5	79	4.5	14	1.2	114	7.4	710	7.6
Tlr (NFS)	16	0.7	11	1.0	11	0.7	5	0.3	1	0.1	7	0.5	51	0.5
Other (non-tlr)	27	1.2	15	1.4	24	1.5	28	1.6	17	1.4	32	2.1	143	1.5
Unknown	3	0.1	2	0.2	3	0.2	2	0.1	1	0.1	1	0.1	12	0.1
Totals	2176	100.0	1084	100.0	1614	100.0	1749	100.0	1191	100.0	1534	100.0	9348	100.0

Table C1-5: Defective systems by system type and whether contributory (motor cycles)

Motor cycle defective system	Contributory?										Totals	
	Yes		Likely		Possible		No		Unknown			
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
Bodywork	0	0.0	0	0.0	0	0.0	4	7.7	2	11.1	6	5.9
Braking	0	0.0	1	50.0	6	20.7	11	21.2	3	16.7	21	20.8
Chassis & attachments	0	0.0	0	0.0	0	0.0	5	9.6	1	5.6	6	5.9
Lighting	0	0.0	0	0.0	3	10.3	7	13.5	2	11.1	12	11.9
Steering	0	0.0	0	0.0	3	10.3	2	3.8	1	5.6	6	5.9
Suspension	0	0.0	1	50.0	5	17.2	4	7.7	1	5.6	11	10.9
Transmission	0	0.0	0	0.0	2	6.9	5	9.6	1	5.6	8	7.9
Tyres	0	0.0	0	0.0	10	34.5	6	11.5	3	16.7	19	18.8
Wheels	0	0.0	0	0.0	0	0.0	5	9.6	2	11.1	7	6.9
Other	0	0.0	0	0.0	0	0.0	3	5.8	2	11.1	5	5.0
Totals	0	0.0	2	100.0	29	100.0	52	100.0	18	100.0	101	100.0

Table C1-6: Defective Systems by System Type and Whether Contributory (cars)

Car defective system	Contributory?										Totals	
	Yes		Likely		Possible		No		Unknown			
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
Bodywork	1	9.1	0	0.0	4	3.1	71	11.4	12	10.5	88	9.9
Braking	7	63.6	8	57.1	31	24.2	79	12.7	12	10.5	137	15.4
Chassis & attachments	0	0.0	0	0.0	1	0.8	50	8.0	9	7.9	60	6.7
Lighting	0	0.0	0	0.0	10	7.8	86	13.8	10	8.8	106	11.9
Steering	0	0.0	0	0.0	3	2.3	60	9.6	9	7.9	72	8.1
Suspension	0	0.0	0	0.0	8	6.3	66	10.6	9	7.9	83	9.3
Transmission	0	0.0	0	0.0	3	2.3	27	4.3	10	8.8	40	4.5
Tyres	2	18.2	4	28.6	52	40.6	108	17.4	20	17.5	186	20.9
Wheels	1	9.1	0	0.0	6	4.7	55	8.8	9	7.9	71	8.0
Other	0	0.0	2	14.3	10	7.8	20	3.2	14	12.3	46	5.2
Totals	11	100.0	14	100.0	128	100.0	622	100.0	114	100.0	889	100.0

Table C1-7: Defective Systems by System Type and Whether Contributory (LGVs)

LGV defective system	Contributory?										Totals	
	Yes		Likely		Possible		No		Unknown			
	Num	%	Num	%	Num	%	Num	%	Num	%	Num	%
Bodywork	3	6.7	0	0.0	0	0.0	34	15.7	4	16.0	41	12.5
Braking	16	35.6	7	53.8	12	41.4	37	17.1	8	32.0	80	24.3
Chassis & attachments	5	11.1	0	0.0	0	0.0	14	6.5	0	0.0	19	5.8
Lighting	0	0.0	0	0.0	2	6.9	40	18.4	6	24.0	48	14.6
Steering	1	2.2	0	0.0	3	10.3	12	5.5	0	0.0	16	4.9
Suspension	1	2.2	1	7.7	2	6.9	24	11.1	1	4.0	29	8.8
Transmission	2	4.4	1	7.7	0	0.0	7	3.2	0	0.0	10	3.0
Tyres	1	2.2	4	30.8	5	17.2	30	13.8	3	12.0	43	13.1
Wheels	14	31.1	0	0.0	0	0.0	7	3.2	0	0.0	21	6.4
Other	2	4.4	0	0.0	5	17.2	12	5.5	3	12.0	22	6.7
Totals	45	100.0	13	100.0	29	100.0	217	100.0	25	100.0	329	100.0

Considering motor cycles (Table C1-5), it is clear that braking, suspension and tyre defects predominate among those considered which could possibly have contributed to the accident. Braking and tyre defects were also found to be common contributory failure items for cars and LGVs (Table C1-6 and Table C1-7).

There is no indication that the presence of defects is associated with increased accident severity although among defective vehicles, those involved in fatal or serious accidents tend to have more defective systems than those in slight or damage only accidents.

There is no indication that defects in particular vehicle systems are more associated with fatal or serious accidents.

However, due to the nature of the VOSA database it is not possible to base national estimates on these findings as the representativeness of the accidents examined by VOSA is not known.

C.2 Fatals Intermediate Database

The Fatals Intermediate Database was developed by TRL under contract to the DfT. Fatal accident files acquired from nearly all police forces in England and Wales were examined, and information extracted for entry into the database. Although data are no longer being added to the database, it still contains details of 11,996 fatal accidents (18,379 vehicles, 17,612 of which are not pedal cycles). The accidents in the database cover the period 1986-98, though over 90% date from 1990-95.

Key to Causation for Table C2-1 codes:

28 Tyres: Wrong pressure

29 Tyres: Deflation before impact

30 Tyres: Worn/insufficient tread

31 Defective lights/signals

32 Defective brakes

33 Other

Table C2-1: Accidents by Vehicle Type and First Causation Factor

Vehicle type	Causation code						Total
	28	29	30	31	32	33	
Moped		2					2
M/cycle		6	4	5	8	12	35
M/c combination						2	2
Invalid tricycle						1	1
3-wheel car						1	1
Taxi						1	1
Car		32	10	1	13	27	83
Minibus etc		2	1				3
PSV						2	2
LGV		6			4	9	19
HGV		2	1	2	27	20	52
OMV				3	3	5	11
Totals	0	50	16	11	55	80	212

Table C2-1 is based on the Causation Coding framework developed by TRL. It only gives information about the vehicle which was considered to be primarily to blame for the accident. The Fatals IDB also contains defect information at individual vehicle level, including whether or not the defect was likely to have been contributory. Defects are considered under a number of headings: Lights, Tyres, Steering, Suspension, Brakes and general Mechanical or Electrical failure. This is summarised in Table C2-2. In this table, the numbers in the "Contributory" column refer to vehicles where at least one defect was considered contributory. Other defects may have been present and may or may not also have been contributory.

Among the 118 M/cycles with contributory defects, 48 were tyre defects only, 21 were brake defects only, 17 were tyre with something else and 17 were brakes with something else. Four were tyres and brakes only.

Among the 383 cars with contributory defects, 216 were tyre defects only, 47 were brake defects only, 45 were tyre with something else and 44 were brakes with something else. 19 were tyres and brakes only.

Among the 35 LGVs with contributory defects, 18 were tyre defects only, 7 were brake defects only and 3 were tyres and brakes only.

Among the 72 HGVs with contributory defects, 9 were tyre defects only, 36 were brake defects only, 5 were tyre with something else and 7 were brakes with something else. 3 were tyres and brakes only.

Table C2-2: **Vehicles by Vehicle Type and Presence/Contribution of Defects**

Vehicle type	Defects				Vehicles in database		Contrib/ Present %
	Present		Contributory				
	No.	%	No.	%	No.	%	
Moped	5	0.3	3	0.5	77	0.4	60.0
M/scooter	2	0.1	0	0.0	21	0.1	0.0
M/cycle	248	12.6	118	18.3	1786	10.1	47.6
M/c combination	3	0.2	2	0.3	8	0.0	66.7
Invalid trike	2	0.1	1	0.2	10	0.1	50.0
3-wheel car	4	0.2	2	0.3	33	0.2	50.0
Taxi	12	0.6	1	0.2	86	0.5	8.3
Car	1285	65.3	383	59.4	11516	65.4	29.8
Minibus etc	19	1.0	5	0.8	138	0.8	26.3
Bus/coach	18	0.9	3	0.5	440	2.5	16.7
LGV	139	7.1	35	5.4	1171	6.6	25.2
HGV	189	9.6	72	11.2	2083	11.8	38.1
OMV	38	1.9	18	2.8	224	1.3	47.4
ONMV	4	0.2	2	0.3	11	0.1	50.0
Goods >3.5 <7.5t	1	0.1	0	0.0	1	0.0	0.0
Goods >7.5t	0	0.0	0	0.0	7	0.0	-
Totals	1969	100.0	645	100.0	17612	100.0	32.8

C.3 On The Spot database

In total 4,744 accidents which were investigated by the OTS project (Phase 1, 2 and 3 inclusive, database OTS3n). These accidents involved 8,799 vehicles.

The following table gives a breakdown of these vehicles by vehicle type.

Table C3-1: Number of vehicles in OTS

Vehicle Type	Number of vehicles	%
Car	6,660	75.7
Light goods <3.5 tonnes	512	5.8
Heavy Goods	457	5.2
Bus	132	1.5
Motorcycle	476	5.4
Pedal Cycle	183	2.1
Pedestrian	303	3.4
Other (e.g. horse and cart etc.)	21	0.2
Unknown, because untraced	55	0.6
Total	8,799	100.0

The sample of vehicles for consideration for these analyses is restricted to:

- Cars;
- Light goods Vehicles (tonnes <3.5); and
- Motorcycles.

Therefore a total of 7,648 vehicles were considered for these analyses, which were involved in a total of 4,621 accidents.

Of these 7,648 vehicles involved, 333 were reported to have had a defect at the time of the accident (4%), of these 194 were reported by the OTS investigators to have had at least one defect that may have been detectable in an MOT prior to the collision (2.5%). A further 82 vehicles had defects which may have occurred just prior to the collision or could have been detected for sometime during an MOT, e.g. the majority of these 82 vehicles suffered a rapid tyre deflation prior to the collision. This deflation could have been a result of a tyre defect (e.g. perishing of the side wall) or perhaps the result of nail puncturing the tyre, as it is not possible to discern if a recent MOT would have been able to detect these defects, it has been decided to classify these defects as non MOT failures.

Of the 194 vehicles with a MOT defect which may have been detectable for some time, 80 were noted to have been contributory to the cause of the accident (Table C3-2).

Table C3-2: MOT defects which were contributory

Defect group	Cars		LCV		Motorcycle		Total	
	No.	%	No.	%	No.	%	No.	%
Tyre	28	43.8	3	37.5	1	12.5	32	40.0
Tyre and lights	2	3.1	0	0.0	1	12.5	3	3.8
Lights	2	3.1	0	0.0	2	25.0	4	5.0
Brakes	20	31.3	3	37.5	3	37.5	26	32.5
Steering	8	12.5	0	0.0	0	0.0	8	10.0
Other	4	6.3	2	25.0	1	12.5	7	8.8
Total	64	100.0	8	100.0	8	100.0	80	100.0

Of the 82 temporary failures, 68 were noted to have contributed to the cause of the accident.

Table C3-3: Temporary defects which were contributory

Defect group	Cars		LCV		Motorcycle		Total	
	No.	%	No.	%	No.	%	No.	%
Tyre	46	80.7	5	71.4	4	100.0	55	80.9
Lights	1	1.8	0	0.0	0	0.0	1	1.5
Brakes	4	7.0	1	14.3	0	0.0	5	7.4
Steering	4	7.0	0	0.0	0	0.0	4	5.9
Other	2	3.5	1	14.3	0	0.0	3	4.4
Total	57	100.0	7	100.0	4	100.0	68	100.0

The following provides an overview of the distribution of vehicle defects that would have been detected in an MOT, compared to the total vehicle population contained within the OTS database.

Table C3-4: Distribution of MOT defects compared with all OTS vehicles by injury severity

		Police severity					
		Fatal	Serious	Slight	Non Injury	Not Known	Total
Cars	MOT defect	4	10	81	66	1	162
	Total	130	631	3151	2680	68	6660
	% with MOT defects	3.1	1.6	2.6	2.5	1.5	2.4
LCV	MOT defect	1	1	7	7	0	16
	Total	19	56	245	190	2	512
	% with MOT defects	5.3	1.8	2.9	3.7	0.0	3.1
Motorcycles	MOT defect	3	5	8	0	0	16
	Total	35	137	262	41	1	476
	% with MOT defects	8.6	3.6	3.1	0.0	0.0	3.4
Total	MOT defect	8	16	96	73	1	194
	Total	184	824	3658	2911	71	7648
	% with MOT defects	4.3	1.9	2.6	2.5	1.4	2.5

Due to the low number of vehicles which were reported to have had a defect that would have been detected in an MOT, it is not possible to discern if the presence of an MOT defect would have had a significant influence on the overall severity of an accident.

Table C3-5: Distribution of MOT defects compared with all OTS vehicles by their age

		Age of vehicle at time of accident (years)						
		< 3	3 to 6	7 to 9	10 to 14	15+	Not Known	Total
Cars	MOT defect	14	23	34	63	22	6	162
	Total	1250	1866	1326	1458	323	437	6660
	% with MOT defects	1.1	1.2	2.6	4.3	6.8	1.4	2.4
LCV	MOT defect	3	6	2	4	0	1	16
	Total	154	192	50	50	14	52	512
	% with MOT defects	1.9	3.1	4.0	8.0	0.0	1.9	3.1
Motorcycles	MOT defect	5	4	2	3	1	1	16
	Total	157	145	62	60	32	20	476
	% with MOT defects	3.2	2.8	3.2	5.0	3.1	5.0	3.4
Total	MOT defect	22	33	38	70	23	8	194
	Total	1561	2203	1438	1568	369	509	7648
	% with MOT defects	1.4	1.5	2.6	4.5	6.2	1.6	2.5

The percentage of vehicles which were reported to have had a defect that would have been detectable in an MOT appears to generally increase with the age of the vehicle at the time of the accident for all vehicle types.

Table C3-6: Distribution of MOT defects compared with all OTS vehicles by their mileage

		Mileage of vehicle at time of accident					
		<30K	30-59K	60-89K	90K+	Not known	Total
Cars	MOT defect	13	20	36	46	47	162
	Total	728	777	792	980	3383	6660
	% with MOT defects	1.8	2.6	4.5	4.7	1.4	2.4
LCV	MOT defect	2	0	4	6	4	16
	Total	51	44	50	81	286	512
	% with MOT defects	3.9	0.0	8.0	7.4	1.4	3.1
Motorcycles	MOT defect	10	0	0	1	5	16
	Total	223	40	9	6	198	476
	% with MOT defects	4.5	0.0	0.0	16.7	2.5	3.4
Total	MOT defect	25	20	40	53	56	194
	Total	1002	861	851	1067	3867	7648
	% with MOT defects	2.5	2.3	4.7	5.0	1.4	2.5

The percentage of vehicles which were reported to have had a defect that would have been detectable in an MOT appears to generally increase with the mileage of the vehicle at the time of the accident for all vehicle types.

Appendix D Reported accidents, vehicle users and pedestrian casualties: by combination of vehicles

Table D-1: Reported accidents, vehicle users and pedestrian casualties: by combination of vehicles (2009)

Accidents involving vehicle A	Single	Two vehicle accidents			Three or more vehicle accidents[4]			Total
		Veh A	Veh B	All	Veh A	Other Vehs	All	
Accidents involving Motorcycle 50cc & under	728	-	-	2,624	-	-	187	3,539
User casualties	612	2,549	249	2,798	176	175	351	3,761
of which: killed	2	9	0	9	5	5	10	21
seriously injured	144	400	17	417	27	27	54	615
Pedestrians hit by m/cs	171	7	0	7	0	0	0	178
of which: killed	0	0	0	0	0	0	0	0
seriously injured	29	0	0	0	0	0	0	29
Accidents involving Motorcycle over 50cc	3,877	-	-	12,442	-	-	1,254	17,573
User casualties	3,560	12,504	1,377	13,881	1,302	1,245	2,547	19,988
of which: killed	121	242	8	250	93	64	157	528
seriously injured	1,244	3,101	105	3,206	434	354	788	5,238
Pedestrians hit by m/cs	748	44	7	51	7	7	14	813
of which: killed	7	2	0	2	0	0	0	9
seriously injured	142	8	0	8	2	2	4	154
Accidents involving Cars	37,897	-	-	91,174	-	-	16,404	145,475
User casualties	24,623	92,836	32,267	125,103	25,953	72	29,362	179,088
of which: killed	429	460	253	713	170	503	242	1,384
seriously injured	3,361	5,063	5,258	10,321	1,629	36	2,132	15,814
Pedestrians hit by cars	20,611	1,185	166	1,351	220	4	256	22,218
of which: killed	299	41	6	47	13	11	17	363
seriously injured	4,185	283	38	321	60	3,409	71	4,577
Accidents involving LGVs	1,788	-	-	8,047	-	-	2,614	12,449
User casualties	685	2,948	7,613	10,561	1,110	8	2,179	13,425
of which: killed	10	18	58	76	8	59	16	102
seriously injured	103	217	701	918	61	23	120	1,141
Pedestrians hit by LGVs	1,261	89	100	189	25	2	48	1,498
of which: killed	17	3	1	4	2	6	4	25
seriously injured	251	19	21	40	7	1,069	13	304
All accidents	50,296	-	-	96,631	-	-	16,627	163,554
User casualties	33,909	-	-	131,472	-	-	29,878	195,259
of which: killed	586	-	-	841	-	-	295	1,722
seriously injured	5,405	-	-	11,383	-	-	2,357	19,145
Pedestrians hit by cars	25,174	-	-	1,450	-	-	263	26,887
of which: killed	426	-	-	55	-	-	19	500
seriously injured	5,137	-	-	335	-	-	73	5,545

[4] Casualties in accidents with three or more vehicles have been estimated based on a scaling technique

Table D-2: Table 23c reproduced from RRCGB (2009)

23c Reported accidents, vehicle user and pedestrian casualties: by combination of vehicles: all areas [1]: 2009

Accidents/Casualties

Vehicle A	Single vehicle: No pedestrian	Single vehicle: With pedestrian	Two vehicle accidents by vehicle type B: Pedal cycle	M'cycle 50cc & under	M'cycle over 50cc	Car	Bus or coach	Light goods vehicle	Heavy goods vehicle	Any[2] other vehicle	All two[3] vehicle accidents	All accidents with three or more vehicles	All accidents with vehs of type `A'
Pedal cycle													
Accidents involving	458	271	79	55	212	14,008	408	911	271	176	16,123	517	17,369
User casualties	464	77	104	44	183	13,897	383	905	268	172	15,959	564	17,064
of which: killed	6	1	0	0	3	51	4	7	18	2	85	12	104
seriously injured	177	14	28	8	34	1,937	56	122	69	28	2,282	133	2,606
Pedestrians hit by cycles	0	275	3	0	0	10	2	0	1	1	17	0	292
of which: killed	0	0	0	0	0	0	0	0	0	0	0	0	0
seriously injured	0	64	0	0	0	0	1	0	0	1	2	0	66
Motorcycle 50cc and under													
Accidents involving	561	167	55	48	41	2,233	31	139	37	37	2,624	187	3,539
User casualties	571	41	21	63	27	2,198	27	138	37	35	2,549	176	3,337
of which: killed	2	0	0	0	0	7	0	1	1	0	9	5	16
seriously injured	139	5	2	9	0	343	3	27	9	7	400	27	571
Ped'ns hit by m/cs to 50cc	0	171	0	2	0	2	0	0	0	3	7	0	178
of which: killed	0	0	0	0	0	0	0	0	0	0	0	0	0
seriously injured	0	29	0	0	0	0	0	0	0	0	0	0	29
Motorcycle over 50cc													
Accidents involving	3,145	732	212	41	208	10,599	136	822	236	186	12,442	1,254	17,573
User casualties	3,321	239	105	25	294	10,693	130	827	243	185	12,504	1,302	17,366
of which: killed	120	1	1	0	11	174	2	23	21	10	242	93	456
seriously injured	1,208	36	12	3	77	2,658	32	194	75	50	3,101	434	4,779
Ped'ns hit by m/cs +50cc	0	748	0	0	0	34	2	2	1	5	44	7	799
of which: killed	0	7	0	0	0	0	0	0	1	1	2	0	9
seriously injured	0	142	0	0	0	8	0	0	0	0	8	2	152
Car													
Accidents involving	17,926	19,971	14,008	2,233	10,599	51,480	2,314	5,346	3,561	1,613	91,174	16,404	145,475
User casualties	24,276	347	365	161	1,093	78,799	1,399	5,397	4,220	1,379	92,836	25,953	143,412
of which: killed	428	1	0	0	4	322	18	27	79	10	460	170	1,059
seriously injured	3,330	31	17	5	64	4,099	88	332	352	106	5,063	1,629	10,053
Pedestrians hit by cars	0	20,611	18	0	7	883	100	84	43	48	1,185	220	22,016
of which: killed	0	299	0	0	0	34	1	1	4	1	41	13	353
seriously injured	0	4,185	4	0	0	205	33	18	12	11	283	60	4,528
Bus or coach													
Accidents involving	2,623	1,319	408	31	136	2,314	77	191	83	74	3,315	465	7,722
User casualties	3,120	65	45	10	17	2,161	181	223	106	93	2,838	294	6,317
of which: killed	7	0	0	0	0	5	0	0	0	1	6	1	14
seriously injured	224	4	2	0	1	81	6	11	8	7	116	12	356
Pedestrians hit by buses	0	1,349	4	0	0	24	2	3	0	1	34	4	1,387
of which: killed	0	36	2	0	0	0	1	0	0	0	3	1	40
seriously injured	0	277	0	0	0	5	1	1	0	0	7	1	285
Light goods vehicle													
Accidents involving	566	1,222	911	139	822	5,346	191	289	261	88	8,047	2,614	12,449
User casualties	677	8	19	4	32	2,116	78	377	274	48	2,948	1,110	4,743
of which: killed	10	0	0	0	0	6	2	4	6	0	18	8	36
seriously injured	102	1	0	0	1	118	6	31	49	12	217	61	381
Pedestrians hit by LGVs	0	1,261	1	0	0	53	7	17	9	2	89	25	1,375
of which: killed	0	17	0	0	0	2	0	1	0	0	3	2	22
seriously injured	0	251	0	0	0	15	2	1	1	0	19	7	277
Heavy goods vehicle													
Accidents involving	382	372	271	37	236	3,561	83	261	184	89	4,723	1,536	7,013
User casualties	418	10	6	1	7	446	21	62	219	27	790	301	1,519
of which: killed	4	0	1	0	0	0	0	0	6	1	8	2	14
seriously injured	67	1	1	0	0	24	1	6	38	1	71	36	175
Pedestrians hit by HGVs	0	387	0	0	0	27	2	9	8	4	50	7	444
of which: killed	0	58	0	0	0	3	0	0	1	0	4	3	65
seriously injured	0	111	0	0	0	8	2	1	2	0	13	3	127
Any other vehicle A[2]													
Accidents involving	224	347	176	37	186	1,613	74	88	89	77	2,341	619	3,531
User casualties	266	9	5	4	18	756	33	61	75	95	1,048	178	1,501
of which: killed	6	0	0	0	1	10	1	0	1	0	13	4	23
seriously injured	65	1	0	1	5	97	3	9	12	6	133	25	224
Ped'ns hit by these vehs	0	362	0	0	0	16	1	2	1	4	24	0	386
of which: killed	0	9	0	0	0	1	0	0	1	0	2	0	11
seriously injured	0	76	0	0	0	2	0	1	0	0	3	0	79
All vehicles[3]													
Accidents involving	25,885	24,411	16,123	2,624	12,442	91,174	3,315	8,047	4,723	2,341	96,631	16,627	163,554
All vehicle user casualties	33,113	796	16,525	2,798	13,881	125,103	4,909	10,561	6,013	2,987	131,472	29,878	195,259
of which: killed	583	3	87	9	250	713	33	76	134	37	841	295	1,722
seriously injured	5,312	93	2,316	417	3,206	10,321	305	918	645	344	11,383	2,357	19,145
Pedestrian casualties	0	25,174	40	7	51	1,351	148	189	105	88	1,450	263	26,887
of which: killed	0	426	2	0	2	47	4	4	10	4	55	19	500
seriously injured	0	5,137	6	0	8	321	45	40	26	15	335	73	5,545

1 Includes cases where area was not reported.
2 Includes other motor and non-motor vehicles.
3 Includes cases where vehicle type was not reported.

Appendix E MOT Scheme Database Normal tests only (2009)

Table E-1: Class 1 MOT test (initial and retests) result by vehicle class (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	169,107 70.0%	21,629 9.0%	49,076 20.3%	1,817 0.8%	241,629 100.0%
Full retest (F)	3,798 88.7%	129 3.0%	256 6.0%	99 2.3%	4,282 100.0%
Partial retest (minor items) (PM)	429 99.5%	0 .0%	1 .2%	1 0.2%	431 100.0%
Partial retest repaired at VRS (PR)	18,762 99.8%	12 .1%	13 .1%	16 0.1%	18,803 100.0%
Partial Retest left VTS (PL)	18,567 98.9%	56 .3%	125 .7%	23 0.1%	18,771 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	4 100.0%	4 100.0%
Total	210,663 74.2%	21,826 7.7%	49,471 17.4%	1,960 0.7%	283,920 100.0%

Table E-2: Class 2 MOT test (initial and retests) result by vehicle class (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	581,181 80.8%	55,130 7.7%	78,413 10.9%	4,289 .6%	719,013 100.0%
Full retest (F)	5,842 90.7%	142 2.2%	290 4.5%	167 2.6%	6,441 100.0%
Partial retest (minor items) (PM)	1,221 99.8%	1 .1%	0 .0%	2 .2%	1,224 100.0%
Partial retest repaired at VRS (PR)	30,753 99.8%	21 .1%	17 .1%	23 .1%	30,814 100.0%
Partial Retest left VTS (PL)	31,612 99.3%	69 .2%	124 .4%	28 0.1%	31,833 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	2 100.0%	2 100.0%
Total	650,609 82.4	55,363 7.0	78,844 10.0	4,511 0.6	789,327 100

Table E-3: Class 3 MOT test (initial and retests) result by vehicle class (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	8,713 68.9%	931 7.4%	2,745 21.7%	262 2.1%	12,651 100.0%
Full retest (F)	162 92.0%	5 2.8%	5 2.8%	4 2.3%	176 100.0%
Partial retest (minor items) (PM)	51 100.0%	0 .0%	0 .0%	0 0.0%	51 100.0%
Partial retest repaired at VRS (PR)	849 99.6%	1 .1%	0 .0%	2 0.2%	852 100.0%
Partial Retest left VTS (PL)	1,429 98.8%	5 .3%	10 .7%	3 0.2%	1,447 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	0 .0%	0 .0%
Total	11,204 73.8	942 6.2	2760 18.2	271 1.8	15,177 100

Table E-4: Class 4 MOT test (initial and retests) result by vehicle class (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	15,344,998 58.9%	2,506,899 9.6%	7,986,125 30.6%	224,503 0.9%	26,062,525 100.0%
Full retest (F)	198,261 81.9%	5,644 2.3%	20,143 8.3%	17,925 7.4%	241,973 100.0%
Partial retest (minor items) (PM)	129,832 99.9%	20 .0%	20 .0%	67 0.1%	129,939 100.0%
Partial retest repaired at VRS (PR)	3,909,898 99.8%	1,398 .0%	3,121 .1%	3,315 0.1%	3,917,732 100.0%
Partial Retest left VTS (PL)	3,151,469 99.0%	3,847 .1%	20,303 .6%	6,808 0.2%	3,182,427 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	423 100.0%	423 100.0%
Total	22,734,458 67.8%	2,517,808 7.5%	8,029,712 23.9%	253,041 0.8%	33,535,019 100.0%

Table E-5: Class 5 MOT test (initial and retests) result by vehicle class (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	32,481 64.2%	3,248 6.4%	13,985 27.7%	862 1.7%	50,576 100.0%
Full retest (F)	754 80.1%	13 1.4%	122 13.0%	52 5.5%	941 100.0%
Partial retest (minor items) (PM)	217 99.5%	0 .0%	0 .0%	1 0.5%	218 100.0%
Partial retest repaired at VRS (PR)	5,002 99.6%	5 .1%	13 .3%	4 0.1%	5,024 100.0%
Partial Retest left VTS (PL)	7,021 97.4%	16 .2%	143 2.0%	29 0.4%	7,209 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	2 100.0%	2 100.0%
Total	45,475 71.1	3,282 5.1	14,263 22.3	950 1.5	63,970 100

Table E-6: Class 7 MOT test (initial and retests) result by vehicle class (2009)

Test Type	Test Result				Total
	Pass	PRS	Fail	Other	
Normal MOT Test (N)	277,740 49.4%	47,211 8.4%	230,549 41.0%	6,999 1.2%	562,499 100.0%
Full retest (F)	9,441 81.1%	296 2.5%	1,363 11.7%	547 4.7%	11,647 100.0%
Partial retest (minor items) (PM)	2,173 99.9%	0 .0%	0 .0%	3 0.1%	2,176 100.0%
Partial retest repaired at VRS (PR)	78,988 99.6%	49 .1%	175 .2%	129 0.2%	79,341 100.0%
Partial Retest left VTS (PL)	123,041 98.2%	211 .2%	1618 1.3%	464 0.4%	125,334 100.0%
Refusal to test (RF)	0 .0%	0 .0%	0 .0%	9 100.0%	9 100.0%
Total	491,383	47,767	233,705	8151	781,006

Table E-7: Class 1 Normal (initial) MOT test results by year of first use of vehicle (2009)

First year of use	Normal MOT Test Result – Class 1 Vehicles				Total
	Pass	PRS	Fail	Other*	
2007-2009	963 64.0%	142 9.4%	284 18.9%	115 7.6%	1504 100.0%
2006	18838 69.2%	2718 10.0%	5440 20.0%	246 .9%	27242 100.0%
2005	18739 69.8%	2494 9.3%	5424 20.2%	175 .7%	26832 100.0%
2004	16667 68.5%	2195 9.0%	5336 21.9%	146 .6%	24344 100.0%
2003	16880 68.0%	2222 9.0%	5540 22.3%	172 .7%	24814 100.0%
2002	14701 67.4%	1940 8.9%	5010 23.0%	164 .8%	21815 100.0%
2001	14357 67.0%	1907 8.9%	5024 23.4%	150 .7%	21438 100.0%
2000	11261 66.3%	1531 9.0%	4088 24.1%	100 .6%	16980 100.0%
1999	7342 66.6%	1019 9.2%	2586 23.5%	71 .6%	11018 100.0%
1998	4356 67.6%	575 8.9%	1476 22.9%	33 .5%	6440 100.0%
1997	2770 69.0%	370 9.2%	849 21.1%	27 .7%	4016 100.0%
1996	2183 70.2%	312 10.0%	591 19.0%	24 .8%	3110 100.0%
1989-1995	9140 67.3%	1422 10.5%	2933 21.6%	92 .7%	13587 100.0%
≤ 1988	30906 80.3%	2782 7.2%	4495 11.7%	302 .8%	38485 100.0%
Total	169103 70.0%	21629 9.0%	49076 20.3%	1817 .8%	241625 100.0%

Table E-8: Class 2 Normal (initial) MOT test results by year of first use of vehicle (2009)

First year of use	Normal MOT Test Result – Class 2 Vehicles				Total
	Pass	PRS	Fail	Other*	
2007-2009	1007 79.3%	72 5.7%	82 6.5%	109 8.6%	1270 100.0%
2006	43388 84.4%	3901 7.6%	3733 7.3%	392 .8%	51414 100.0%
2005	44730 84.6%	3847 7.3%	4047 7.7%	266 .5%	52890 100.0%
2004	43064 83.8%	3742 7.3%	4297 8.4%	302 .6%	51405 100.0%
2003	44121 83.0%	3945 7.4%	4807 9.0%	288 .5%	53161 100.0%
2002	43998 82.3%	3971 7.4%	5204 9.7%	256 .5%	53429 100.0%
2001	40748 81.5%	3715 7.4%	5256 10.5%	253 .5%	49972 100.0%
2000	39445 79.5%	3893 7.8%	6006 12.1%	292 .6%	49636 100.0%
1999	40409 79.0%	4061 7.9%	6426 12.6%	264 .5%	51160 100.0%
1998	33812 77.9%	3537 8.1%	5814 13.4%	236 .5%	43399 100.0%
1997	27401 77.2%	2873 8.1%	5015 14.1%	197 .6%	35486 100.0%
1996	17710 76.5%	2003 8.6%	3308 14.3%	140 .6%	23161 100.0%
1989-1995	70243 75.8%	7582 8.2%	14318 15.4%	552 .6%	92695 100.0%
≤ 1988	91101 82.9%	7987 7.3%	10100 9.2%	742 .7%	109930 100.0%
Total	581177 80.8%	55129 7.7%	78413 10.9%	4289 .6%	719008 100.0%

Table E-9: Class 4 Normal (initial) MOT test results by year of first use of vehicle (2009)

First year of use	Normal MOT Test Result – Class 4 Vehicles				Total
	Pass	PRS	Fail	Other*	
2007-2009	85291 77.6%	8632 7.9%	12325 11.2%	3703 3.4%	109951 100.0%
2006	1961949 77.8%	212688 8.4%	322999 12.8%	25103 1.0%	2522739 100.0%
2005	1888337 73.9%	227302 8.9%	419798 16.4%	20481 .8%	2555918 100.0%
2004	1820305 68.2%	262761 9.8%	565272 21.2%	19795 .7%	2668133 100.0%
2003	1683827 63.3%	282508 10.6%	675978 25.4%	19084 .7%	2661397 100.0%
2002	1573560 59.6%	292179 11.1%	756605 28.6%	19022 .7%	2641366 100.0%
2001	1378563 56.0%	268138 10.9%	794726 32.3%	18367 .7%	2459794 100.0%
2000	1088464 51.5%	219253 10.4%	789860 37.4%	16682 .8%	2114259 100.0%
1999	901283 48.1%	188356 10.0%	769175 41.0%	15410 .8%	1874224 100.0%
1998	734759 45.6%	153249 9.5%	708197 44.0%	14211 .9%	1610416 100.0%
1997	578446 44.3%	118519 9.1%	596203 45.7%	12248 .9%	1305416 100.0%
1996	413985 43.2%	82158 8.6%	452908 47.2%	9605 1.0%	958656 100.0%
1989-1995	929511 44.8%	162764 7.8%	958514 46.2%	23455 1.1%	2074244 100.0%
≤ 1988	306712 60.6%	28391 5.6%	163559 32.3%	7335 1.4%	505997 100.0%
Total	15344992 58.9%	2506898 9.6%	7986119 30.6%	224501 .9%	26062510 100.0%

Table E-10: Class 7 Normal (initial) MOT test results by year of first use of vehicle (2009)

First year of use	Normal MOT Test Result – Class 7 Vehicles				Total
	Pass	PRS	Fail	Other*	
2007-2009	2175 65.2%	327 9.8%	672 20.2%	160 4.8%	3334 100.0%
2006	44714 61.5%	7378 10.1%	19633 27.0%	1031 1.4%	72756 100.0%
2005	40258 59.2%	6475 9.5%	20612 30.3%	710 1.0%	68055 100.0%
2004	36392 54.9%	6119 9.2%	23037 34.8%	693 1.0%	66241 100.0%
2003	30985 52.3%	5308 9.0%	22377 37.8%	603 1.0%	59273 100.0%
2002	27218 48.1%	4923 8.7%	23872 42.2%	604 1.1%	56617 100.0%
2001	24019 45.1%	4434 8.3%	24179 45.4%	584 1.1%	53216 100.0%
2000	17805 42.1%	3140 7.4%	20879 49.4%	470 1.1%	42294 100.0%
1999	13094 39.3%	2390 7.2%	17399 52.2%	434 1.3%	33317 100.0%
1998	11656 38.4%	2109 7.0%	16184 53.4%	374 1.2%	30323 100.0%
1997	9094 37.5%	1547 6.4%	13312 54.8%	325 1.3%	24278 100.0%
1996	6136 37.2%	951 5.8%	9169 55.6%	247 1.5%	16503 100.0%
1989-1995	11828 37.9%	1818 5.8%	16968 54.3%	624 2.0%	31238 100.0%
≤ 1988	2365 46.8%	292 5.8%	2256 44.6%	140 2.8%	5053 100.0%
Total	277739 49.4%	47211 8.4%	230549 41.0%	6999 1.2%	562498 100.0%

Table E-11: Number and rate of Initial MOT failures by Vehicle Class and first year of vehicle use (2009)

First year of use	Number & rate of Initial failures by Vehicle Class				Total (incl. Class 3 & 5)
	1	2	4	7	
2007-2009	426 30.7%	154 13.3%	20,957 19.7%	999 31.5%	24,372 20.0%
2006	8,158 30.2%	7,634 15.0%	535,687 21.4%	27,011 37.7%	579,673 21.9%
2005	7,918 29.7%	7,894 15.0%	647,100 25.5%	27,087 40.2%	691,539 25.7%
2004	7,531 31.1%	8,039 15.7%	828,033 31.3%	29,156 44.5%	874,350 31.3%
2003	7,762 31.5%	8,752 16.6%	958,486 36.3%	27,685 47.2%	1,004,332 36.1%
2002	6,950 32.1%	9,175 17.3%	1,048,784 40.0%	28,795 51.4%	1,095,372 39.7%
2001	6,931 32.6%	8,971 18.0%	1,062,864 43.5%	28,613 54.4%	1,108,779 43.2%
2000	5,619 33.3%	9,899 20.1%	1,009,113 48.1%	24,019 57.4%	1,050,097 47.5%
1999	3,605 32.9%	10,487 20.6%	957,531 51.5%	19,789 60.2%	992,820 50.7%
1998	2,051 32.0%	9,351 21.7%	861,446 54.0%	18,293 61.1%	892,356 53.2%
1997	1,219 30.6%	7,888 22.4%	714,722 55.3%	14,859 62.0%	739,723 54.4%
1996	903 29.3%	5,311 23.1%	535,066 56.4%	10,120 62.3%	552,083 55.6%
1989-1995	4,355 32.3%	21,900 23.8%	1,121,278 54.7%	18,786 61.4%	1,168,505 53.3%
≤ 1988	7,277 19.1%	18,087 16.6%	191,950 38.5%	2,548 51.9%	221,931 33.7%
Total	70,705 29.5%	133,542 18.7%	10,493,017 40.6%	277,760 50.0%	10,995,932 40.1%

Table E-12: Number and rate of Final MOT failures by Vehicle Class and first year of vehicle use (2009)

First year of use	Number & rate of Final failures by Vehicle Class				Total (incl. Class 3 & 5)
	1	2	4	7	
2007-2009	284 20.4%	82 7.1%	12,325 11.6%	672 21.2%	14,535 11.9%
2006	5,440 20.2%	3,733 7.3%	322,999 12.9%	19,633 27.4%	352,690 13.3%
2005	5,424 20.3%	4,047 7.7%	419,798 16.6%	20,612 30.6%	451,053 16.8%
2004	5,336 22.1%	4,297 8.4%	565,272 21.3%	23,037 35.1%	599,200 21.4%
2003	5,540 22.5%	4,807 9.1%	675,978 25.6%	22,377 38.1%	710,020 25.5%
2002	5,010 23.1%	5,204 9.8%	756,605 28.9%	23,872 42.6%	792,038 28.7%
2001	5,024 23.6%	5,256 10.6%	794,726 32.6%	24,179 45.9%	830,344 32.3%
2000	4,088 24.2%	6,006 12.2%	789,860 37.7%	20,879 49.9%	822,071 37.2%
1999	2,586 23.6%	6,426 12.6%	769,175 41.4%	17,399 52.9%	796,801 40.7%
1998	1,476 23.0%	5,814 13.5%	708,197 44.4%	16,184 54.0%	732,721 43.7%
1997	849 21.3%	5,015 14.2%	596,203 46.1%	13,312 55.6%	616,277 45.4%
1996	591 19.2%	3,308 14.4%	452,908 47.7%	9,169 56.4%	466,589 47.0%
1989-1995	2,933 21.7%	14,318 15.5%	958,514 46.7%	16,968 55.4%	994,541 45.4%
≤ 1988	4,495 11.8%	10,100 9.3%	163,559 32.8%	2,256 45.9%	182,006 27.6%
Total	49,076 20.5%	78,413 11.0%	7,986,119 30.9%	230,549 41.5%	8,360,886 30.5%

Table E-13: Class 4 Normal MOT test results by mileage at time of test (2009)

Mileage at time of test	Normal MOT Test Result – Class 4 Vehicles				Total
	Pass	PRS	Fail	Other*	
Not known	40868 15.3%	8453 3.2%	61951 23.2%	155906 58.4%	267178 100.0%
1- 29,999	3220420 77.2%	319715 7.7%	620620 14.9%	11211 .3%	4171966 100.0%
30,000- 39,999	1943202 71.1%	251663 9.2%	534137 19.5%	5778 .2%	2734780 100.0%
40,000- 49,999	1835864 65.6%	280688 10.0%	676585 24.2%	5812 .2%	2798949 100.0%
50,000- 59,999	1643683 60.7%	283718 10.5%	774001 28.6%	5999 .2%	2707401 100.0%
60,000- 69,999	1419462 56.4%	269371 10.7%	820959 32.6%	5956 .2%	2515748 100.0%
70,000- 79,999	1197155 53.0%	240148 10.6%	816371 36.1%	5653 .3%	2259327 100.0%
80,000- 89,999	985408 50.3%	203965 10.4%	762998 39.0%	5267 .3%	1957638 100.0%
90,000- 99,999	790358 48.2%	166980 10.2%	676050 41.3%	4897 .3%	1638285 100.0%
100,000- 109,999	577359 47.3%	124988 10.2%	514134 42.1%	3844 .3%	1220325 100.0%
110,000- 119,999	443464 46.2%	95751 10.0%	417620 43.5%	3131 .3%	959966 100.0%
120,000- 129,999	337928 45.2%	72855 9.7%	334060 44.7%	2577 .3%	747420 100.0%
130,000- 139,999	252256 44.5%	53857 9.5%	258971 45.7%	2104 .4%	567188 100.0%
140,000- 149,999	185523 43.9%	39014 9.2%	196617 46.5%	1528 .4%	422682 100.0%
150,000- 179,999	296968 43.1%	61342 8.9%	328434 47.6%	2838 .4%	689582 100.0%
180,000+	175080 43.3%	34391 8.5%	192617 47.7%	2002 .5%	404090 100.0%
Total	15344998 58.9%	2506899 9.6%	7986125 30.6%	224503 .9%	26062525 100.0%

Table E-14: Class 7 Normal MOT test results by mileage at time of test (2009)

Mileage at time of test	Normal MOT Test Result – Class 7 Vehicles				Total
	Pass	PRS	Fail	Other*	
Not known	1469 17.0%	324 3.8%	2365 27.4%	4476 51.8%	8634 100.0%
1- 29,999	22207 66.7%	2750 8.3%	8067 24.2%	275 .8%	33299 100.0%
30,000- 39,999	16295 63.7%	2251 8.8%	6902 27.0%	136 .5%	25584 100.0%
40,000- 49,999	19131 60.7%	2832 9.0%	9411 29.8%	158 .5%	31532 100.0%
50,000- 59,999	20411 57.1%	3300 9.2%	11817 33.1%	189 .5%	35717 100.0%
60,000- 69,999	21459 54.9%	3493 8.9%	13981 35.8%	163 .4%	39096 100.0%
70,000- 79,999	21453 52.8%	3523 8.7%	15537 38.2%	154 .4%	40667 100.0%
80,000- 89,999	20689 50.2%	3723 9.0%	16615 40.3%	165 .4%	41192 100.0%
90,000- 99,999	19842 48.7%	3504 8.6%	17212 42.3%	175 .4%	40733 100.0%
100,000- 109,999	17397 47.1%	3159 8.5%	16256 44.0%	144 .4%	36956 100.0%
110,000- 119,999	15400 45.5%	2787 8.2%	15529 45.9%	150 .4%	33866 100.0%
120,000- 129,999	13578 44.1%	2533 8.2%	14535 47.2%	130 .4%	30776 100.0%
130,000- 139,999	11876 43.8%	2280 8.4%	12853 47.4%	100 .4%	27109 100.0%
140,000- 149,999	9987 42.5%	1970 8.4%	11441 48.7%	107 .5%	23505 100.0%
150,000- 179,999	20917 41.6%	3999 7.9%	25195 50.1%	213 .4%	50324 100.0%
180,000+	25629 40.4%	4783 7.5%	32833 51.7%	264 .4%	63509 100.0%
Total	277740 49.4%	47211 8.4%	230549 41.0%	6999 1.2%	562499 100.0%

Reasons for Rejection (RfRs)

Table E-15: Class 1 vehicles Normal MOT test RfR by system (2009)

RfR Type	System Failure									Total
	Lighting & signalling	Steering & suspension	Brakes	Tyres & wheels	Fuel & exhaust	Body & structure	Drive system	Registration plat & VIN	Other	
Advisory	2,444 2.3%	36,777 34.9%	24,354 23.1%	22,529 21.4%	7,873 7.5%	2,245 2.1%	8,665 8.2%	0 0.0%	558 0.5%	105445 100.0%
Fail	52,201 35.1%	33,074 22.3%	26,750 18.0%	12,932 8.7%	6,312 4.2%	4,718 3.2%	6,418 4.3%	3,640 2.4%	2,580 1.7%	148625 100.0%
PRS	17,997 57.6%	2,768 8.9%	4,177 13.4%	2,552 8.2%	917 2.9%	767 2.5%	901 2.9%	893 2.9%	276 0.9%	31248 100.0%
Total	72,642 25.5%	72,619 25.5%	55,281 19.4%	38,013 13.3%	15,102 5.3%	7,730 2.7%	15,984 5.6%	4,533 1.6%	3,414 1.2%	285318 100.0%

Table E-16: Class 2 vehicles Normal MOT test RfR by system (2009)

RfR Type	System Failure									Total
	Lighting & signalling	Steering & suspension	Brakes	Tyres & wheels	Fuel & exhaust	Body & structure	Drive system	Registration plat & VIN	Other	
Advisory	3,642 1.3%	63,596 22.8%	82,222 29.5%	70,504 25.3%	28,981 10.4%	1,778 0.6%	27,201 9.7%	0 0.0%	1,116 0.4%	279,040 100.0%
Fail	50,828 28.1%	33,111 18.3%	38,882 21.5%	21,489 11.9%	8,354 4.6%	4,159 2.3%	8,089 4.5%	12,247 6.8%	3,491 1.9%	180,650 100.0%
PRS	44,353 60.1%	5,268 7.1%	6,363 8.6%	5,878 8.0%	2,024 2.7%	1,515 2.1%	2,282 3.1%	5,248 7.1%	808 1.1%	73,739 100.0%
Total	98,823 18.5%	101,975 19.1%	127,467 23.9%	97,871 18.3%	39,359 7.4%	7,452 1.4%	37,572 7.0%	17,495 3.3%	5,415 1.0%	533,429 100.0%

Table E-17: Class 4 vehicles Normal MOT test RfR by system (2009)

RfR Type	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
Advisory	614,509 2.7%	759,690 3.4%	5,078,730 22.5%	7,754,848 34.4%	5,022,730 22.3%	196,991 0.9%	279,883 1.2%	295,668 1.3%	1,688,067 7.5%	837,550 3.7%	5,711 0.0%	22,534,377 100.0%
Fail	6,489,610 22.4%	906,947 3.1%	5,380,532 18.5%	6,314,875 21.8%	3,029,895 10.4%	129,593 0.4%	715,545 2.5%	677,031 2.3%	2,423,540 8.3%	2,227,057 7.7%	730,497 2.5%	29,025,122 100.0%
PRS	3,016,689 63.8%	32,165 0.7%	176,604 3.7%	186,822 4.0%	274,108 5.8%	11,740 0.2%	14,854 0.3%	19,196 0.4%	122,458 2.6%	795,746 16.8%	77,273 1.6%	4,727,655 100.0%
Total	10,120,808 18.0%	1,698,802 3.0%	10,635,866 18.9%	14,256,545 25.3%	8,326,733 14.8%	338,324 0.6%	1,010,282 1.8%	991,895 1.8%	4,234,065 7.5%	3,860,353 6.9%	813,481 1.4%	56,287,154 100.0%

Table E-18: Class 7 vehicles Normal MOT test RfR by system (2009)

RfR Type	System Failure											Total
	Lighting & signalling	Steering	Suspension	Brakes	Tyres	Road wheels	Seat belts	Body & structure	Fuel & exhaust	Drivers view of the road	Other	
Advisory	13,528 2.2%	32,177 5.1%	203,508 32.6%	204,332 32.7%	84,154 13.5%	2,035 0.3%	13,280 2.1%	15,473 2.5%	22,494 3.6%	33,489 5.4%	516 0.1%	624,986 100.0%
Fail	309,505 26.1%	41,926 3.5%	202,614 17.1%	311,616 26.2%	55,593 4.7%	2,203 0.2%	36,832 3.1%	60,363 5.1%	47,902 4.0%	93,594 7.9%	25,297 2.1%	1,187,445 100.0%
PRS	70,605 71.9%	732 0.7%	2,389 2.4%	5,087 5.2%	2,739 2.8%	203 0.2%	482 0.5%	1,063 1.1%	1,889 1.9%	11,591 11.8%	1,438 1.5%	98,218 100.0%
Total	393,638 20.6%	74,835 3.9%	408,511 21.4%	521,035 27.3%	142,486 7.5%	4,441 0.2%	50,594 2.6%	76,899 4.0%	72,285 3.8%	138,674 7.3%	27,251 1.4%	1,910,649 100.0%

Effect of vehicle defects in road accidents

All vehicles deteriorate in service and this can have an adverse impact upon safety and the environment. Roadworthiness testing exists to ensure that at least a minimum level of benefits in a vehicle's original design and manufacture are retained in service. This study provides a high level overview of the likely impacts (if any) to road safety from changes to the MOT test frequency by vehicle age and time since last inspection. Two different theoretical models were developed and used to provide an estimate of the magnitude of the number of accidents and casualties which may occur annually due to less frequent MOT testing. Reducing the frequency of testing for newer vehicles will have adverse road safety consequences, but these would be substantially greater for older vehicles as the data presented in this report already indicates their high MOT failure rates. Although the theoretical models are not ideal, largely due to a lack of data upon which assumptions have been based, they consistently indicated an increase in accidents and casualties. However, it must be stressed that these are estimates only and further work would be required before a genuine quantification of the scale of these adverse road safety impacts will be known.

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