

Importance of Periodical Technical Inspection (PTI) and Inspection Intervalls for Road Safety

Handout accompanying the Final Report

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Introduction

The long-term goal of the EU's 'Vision Zero in Road Traffic' strategy is: zero road deaths and serious injuries by 2050.

The interim target for 2030 – to reduce the number of road deaths and serious injuries by 50 per cent compared with 2020 – is, in all likelihood, set to be missed.

The German Federal Government's Road Safety Programme has set out the transport policy objective of reducing the number of road deaths by 40 per cent by 2030 compared with 2020, as part of the path towards Vision Zero.

In Germany, too, this target is expected to be missed by a significant margin.

Under the Pact for Road Safety, not only politicians but also other stakeholders in Germany have committed to contributing to Vision Zero through their own measures.

In addition to the area of action 'traffic behaviour', the areas of action 'infrastructure' and 'safe vehicle technology' also contribute to achieving the objectives of Vision Zero.

Given that there were around 19400 road deaths across Europe in 2025, that the overall decline is proceeding too slowly, and that the number of road deaths in Germany rose by 44 compared with 2024 to 2814, decisive measures to improve technical road safety are essential.

As one such targeted measure, the European Commission presented a proposal on 24 April 2025 to revise the Roadworthiness Package.

The planned amendment to the directives on the periodic roadworthiness testing of motor vehicles and their trailers and on the technical roadside inspection of commercial vehicles is intended both to significantly reduce the number of accidents resulting in fatalities or serious injuries and to cut road traffic emissions.

This study aims to provide answers as to what contribution the periodic roadworthiness testing of motor vehicles can make – and is already making – towards achieving the targets for reducing the number of fatalities and serious injuries.

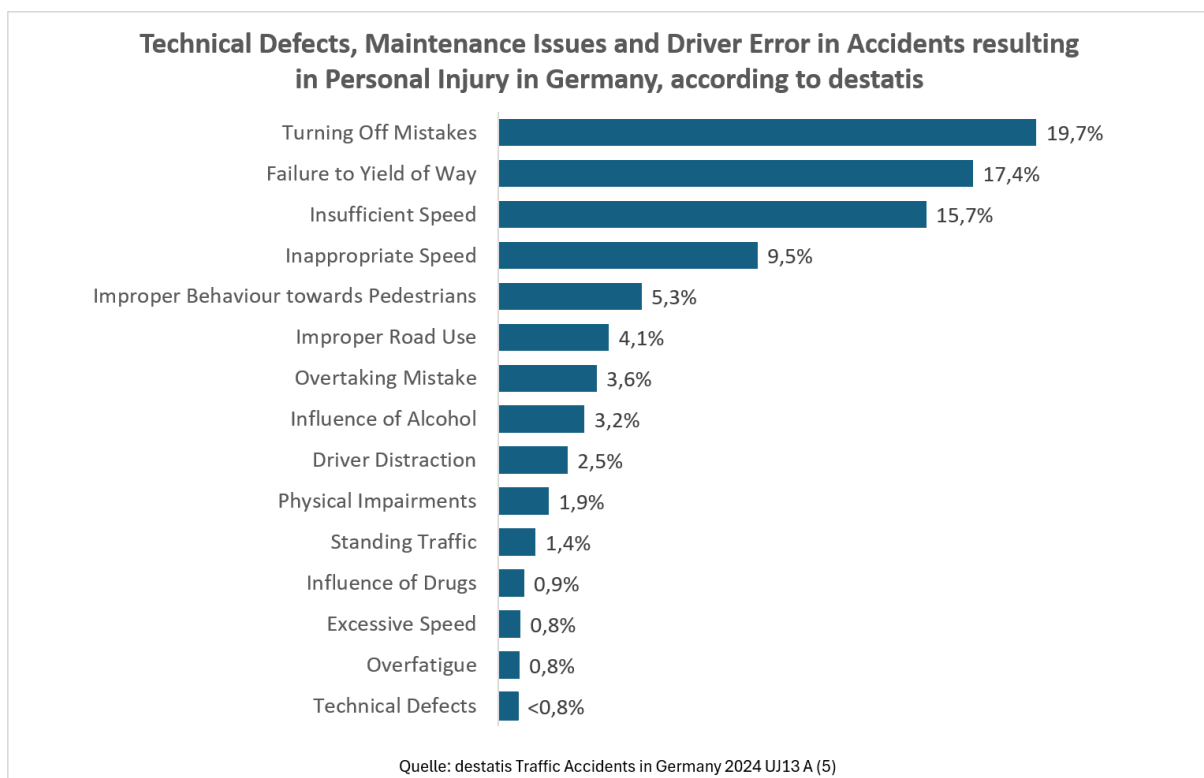
Results of the study

Technical defects relevant to road traffic accidents occur more frequently than indicated in the official road traffic accident statistics.

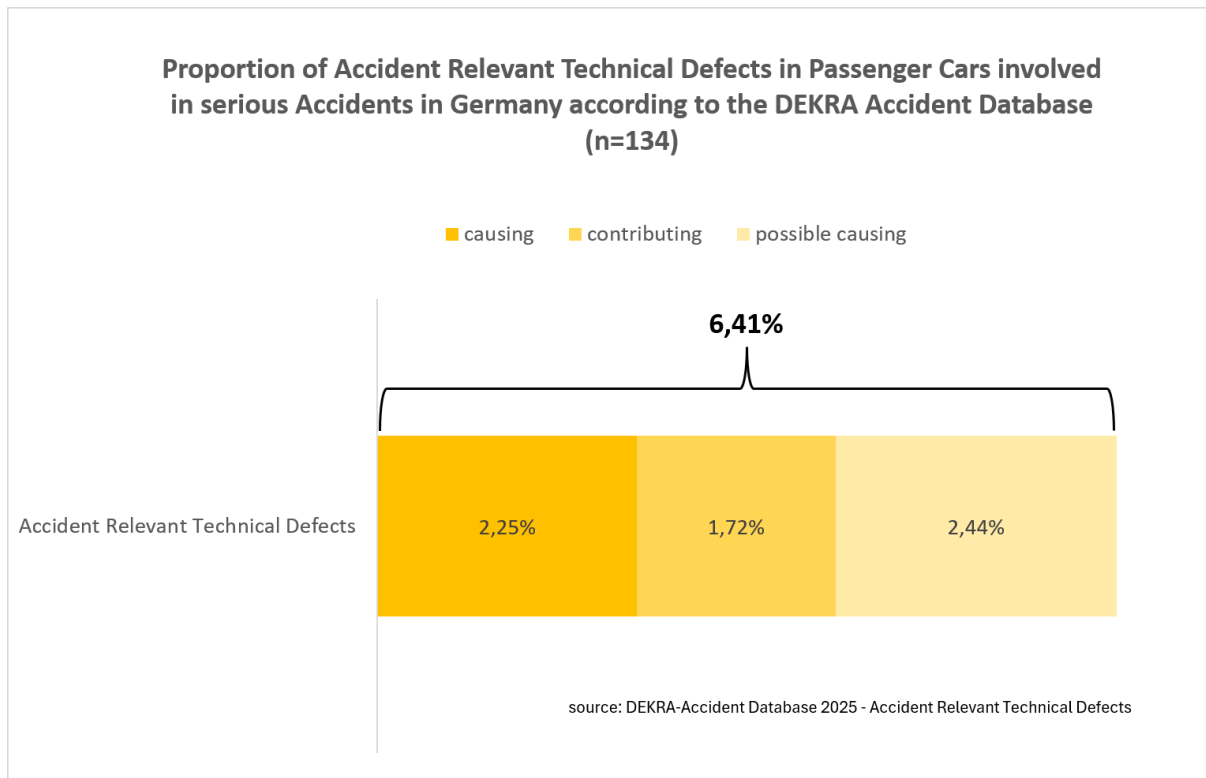
In 6.4 per cent of the passenger cars involved in serious road traffic accidents, technical defects relevant to the accident were identified which were the cause, a contributing factor or a possible cause of the accident.

The analysis is based on a statistically validated extract from DEKRA's accident database, which is populated by traffic accident analysis experts operating nationwide. The extract comprises 2429 cases of technical inspections of passenger cars following road traffic accidents between 2014 and 2025.

Although the data obtained by the DEKRA experts is only to a limited extent comparable with the most common causes of accidents involving passenger car drivers resulting in personal injury, as recorded by the police, it is compared with the following figures.



Technical defects and driver errors in car accidents resulting in personal injury in Germany in 2024



Proportion of accident-related technical defects in vehicles involved in serious accidents in Germany, according to the DEKRA accident database

Technical defects relevant to accidents, accounting for a total of 6.4 per cent, rank higher than driving under the influence of alcohol or drugs, distracted driving, driving whilst overtired and speeding, whilst official road accident statistics show technical and maintenance defects to account for less than 0.8 per cent.

These discrepancies in the figures are due to fundamentally different data collection methods. For instance, the scope of data collection on the causes of accidents in police accident reports – which form the basis for the official accident statistics – is limited to a maximum of three entries per person involved in the accident and is generally based on features visible to police officers at the time of the accident report.

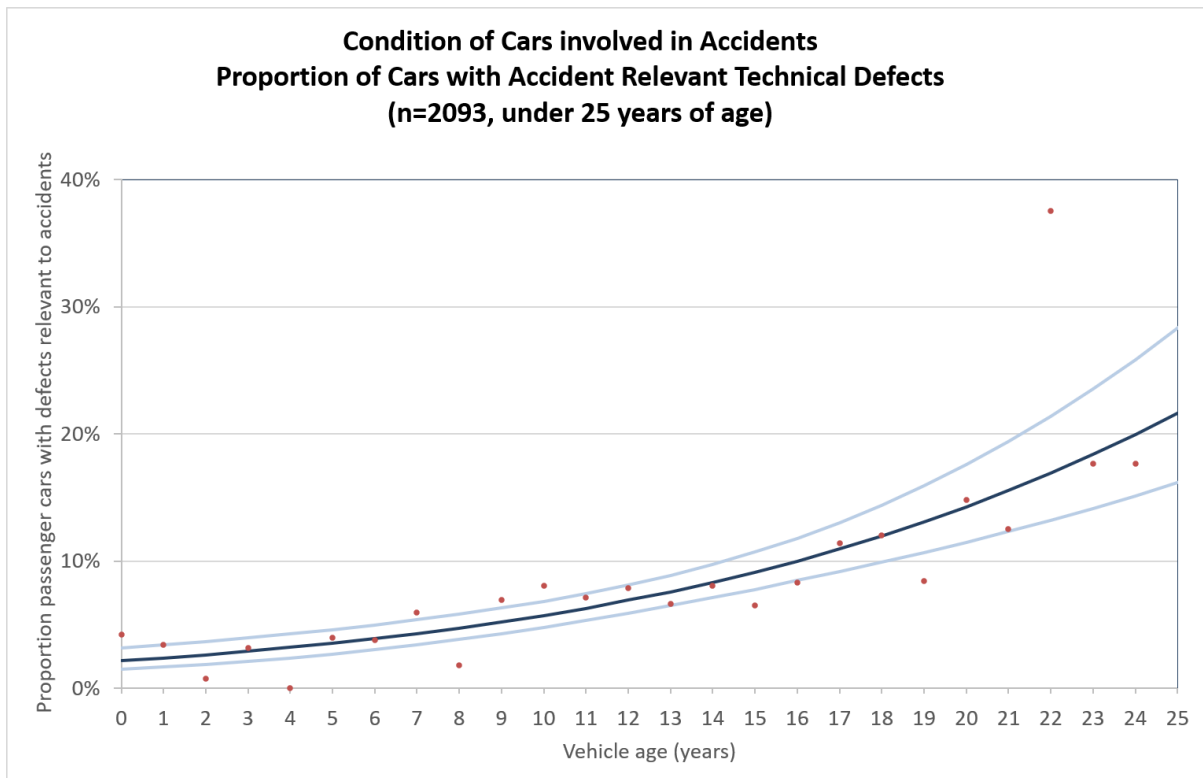
By contrast, the analyses underlying this study are based on technical vehicle inspections carried out by experts, whose scope of data collection regarding the causes of accidents involving the parties concerned is not limited and is additionally accompanied by the findings of an accident analysis report. Consequently, the causes of accidents in the experts’ accident analyses are defined more broadly and are not mutually exclusive with other causes of accidents.

For example, in an expert’s accident analysis, a reduction in the vehicle’s braking performance—which the expert has identified as being due to worn wheel brakes—is, alongside other factors such as driving at an inappropriate speed, a contributing cause of the accident, or of the consequences and severity of the accident.

The proportion of cars involved in accidents that have technical defects relevant to the accident increases significantly with the vehicle age.

It is evident that the proportion of cars with technical defects relevant to the accident that are involved in serious accidents resulting in personal injury rises significantly with the vehicles age.

For example, the proportion of cars involved in accidents with technical defects relevant to the accident is on average 2.9 per cent for vehicles aged 3 years, rising to an average of 9.2 per cent for 15-year-old vehicles. For 24-year-old vehicles, the proportion of cars with technical defects relevant to the accident is around 20 per cent in serious road accidents.



Proportion of passenger cars with technical defects relevant to accidents identified during technical inspections carried out in accordance with the accidents

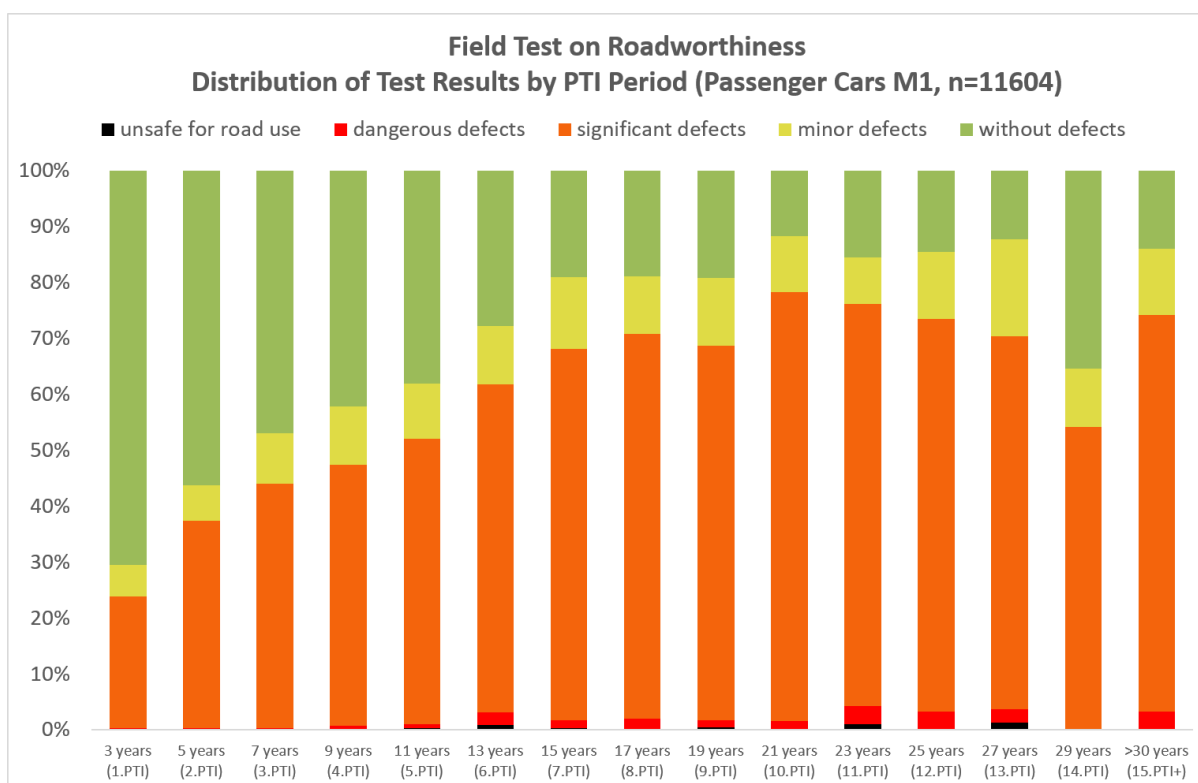
The proportion of passenger cars on the road with significant or dangerous technical defects increases with the vehicle age.

To highlight the proportion of technical defects in vehicles on the road, a statistically valid field sample of 11606 passenger cars was inspected by officially recognised experts and test engineers, who assessed the technical condition of the vehicles immediately prior to maintenance or repair in the run-up to the upcoming annual general inspection, in accordance with precise guidelines.

The findings revealed that one in two of the cars inspected was on the road with significant or dangerous defects.

It became apparent that the proportion of cars on the road with significant and dangerous technical defects rises with the vehicle ages.

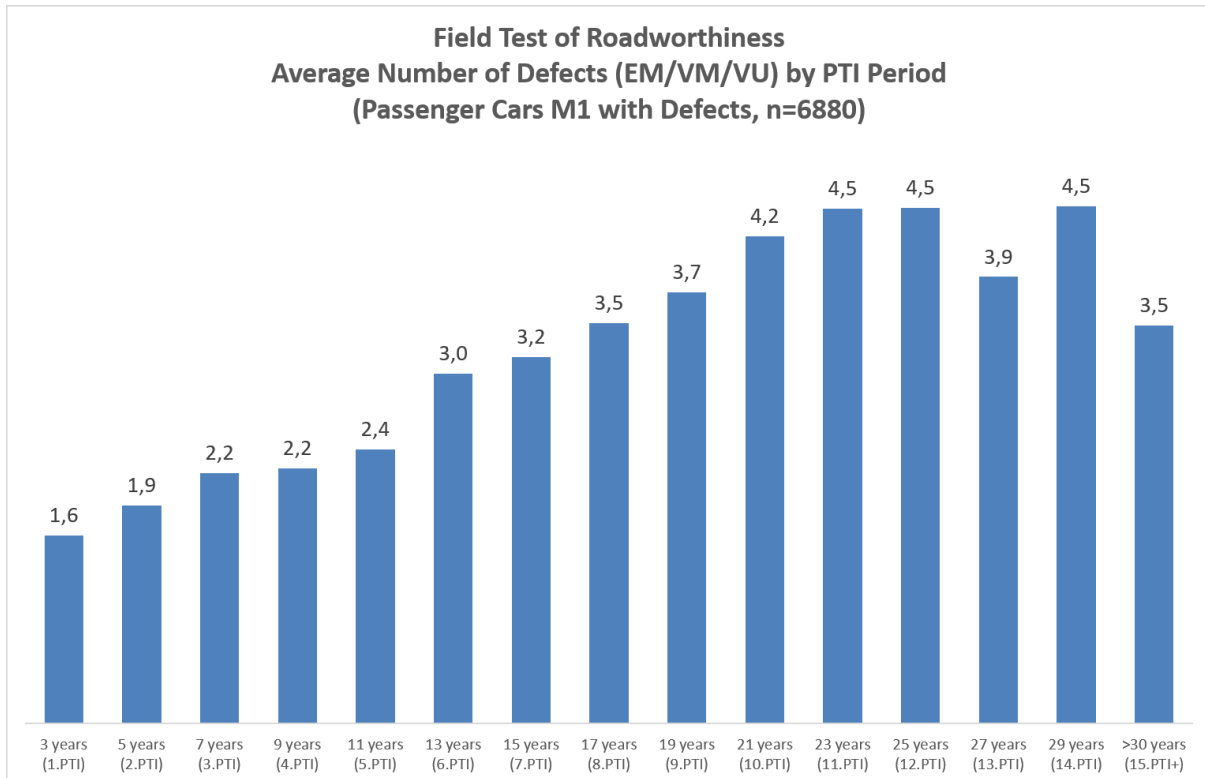
Whilst one in three cars aged 5 years has significant and dangerous defects, by the time they are around 15 years old, as many as two in three cars are on the road in such a technical condition.



Distribution of passenger cars by test result and PTI period

The analysis of the field sample also shows that the number of significant and dangerous defects identified increases with the age of the vehicles.

For example, an average of 1.6 significant or dangerous defects were found in the cars aged around 3 years that were found to be faulty, whilst for cars aged around 15 years, the figure was already more than 3 significant and dangerous defects.



Average number of defects by PTI period

The report by Deutsche Autotreuhand (DAT) also shows that the number of servicing appointments and the associated costs per car begin to fall again from the sixth year onwards as the vehicle ages.

Three out of four owners of older cars say they visit a car repair shop to have their annual roadworthiness test carried out.

The results of the field test of roadworthiness on technical defects in vehicles on the road, in conjunction with the average of one repair per car (aged over six years) within two years as identified in the DAT Report, suggest that the necessary repairs to these defects often only take place in connection with the mandatory general inspection required every two years. For this reason, a FORSA consumer survey was commissioned as part of the study, targeting owners of older cars regarding their behaviour towards the maintenance, repair and disposal of their vehicles.

Three out of four vehicle owners stated that they had taken their older car (over 12 years old) to a car repair shop in the last four years to have the roadworthiness test carried out.

If the cost of a necessary repair exceeds the value of the vehicle, car owners tend to hand the vehicle over for scrapping.

Only one in four car owners stated that they would still have the vehicle repaired in such cases.

The FORSA survey also revealed that, among the car owners of vehicles over 12 years old who were surveyed, when buying their next car

- 11 per cent would be most likely to choose a new car,
- 13 per cent would be most likely to choose a year-old car,
- 38 per cent would be most likely to choose a used car (between 2 and 6 years old),
- 14 per cent would be most likely to choose a used car (between 6 and 12 years old) and
- 6 per cent would be most likely to opt for a second-hand car (over 12 years old)

For 9 per cent of the car owners surveyed who own cars over 12 years old, buying another car is generally out of the question once they have parted with their (old) vehicle.

The proportion of older cars in the fleet has risen sharply in recent years (the Havana effect).

According to KBA statistics, the average age of passenger cars in the fleet has risen from 8.1 years in 2010 to 10.6 years in 2025. This increase is due to the steady rise in the number of passenger cars over 12 years old.

The average age of passenger cars at the time of their final decommissioning (scrapping or other forms of disposal) has risen steadily and currently stands at over 18 years; this is also known as the 'Havana Effect'. For cars aged between 12 and 25 years, final decommissioning is often linked to the failure to be issued with an inspection sticker. These cars are no longer on the road in Germany and are disposed of in other ways. It can therefore be inferred that roadworthiness test intervals are linked to the number of vehicles taken off the road each year.

From the age of 25 years onwards, the reduction in the vehicle stock slows down, and the fleet increasingly consists of well-maintained collector's cars and classic cars, for which the defect rate is significantly lower.

Forecast of the impact of vehicle inspection intervals on the number of passenger cars in Germany

It can be assumed that, with an annual technical inspection for older cars, the necessary repairs to rectify defects will be required more frequently, which further calls into question the cost-effectiveness of such a scheme and must be taken into account when forecasting future car ownership figures.

As the extent of the impact of changed inspection intervals on the fleet of older cars cannot be clearly estimated, the researchers have drawn up three scenarios for the development of the fleet of cars older than 12 years by 2035.

Scenario A:

The annual inspection intervals have no impact on the development of the fleet. This means that the fleet of older cars will continue to grow until 2035 at an annual rate similar to that of the past 10 years.

Scenario B:

The annual inspection intervals for older cars mean that annual growth rates up to 2035 will be less pronounced than in the past.

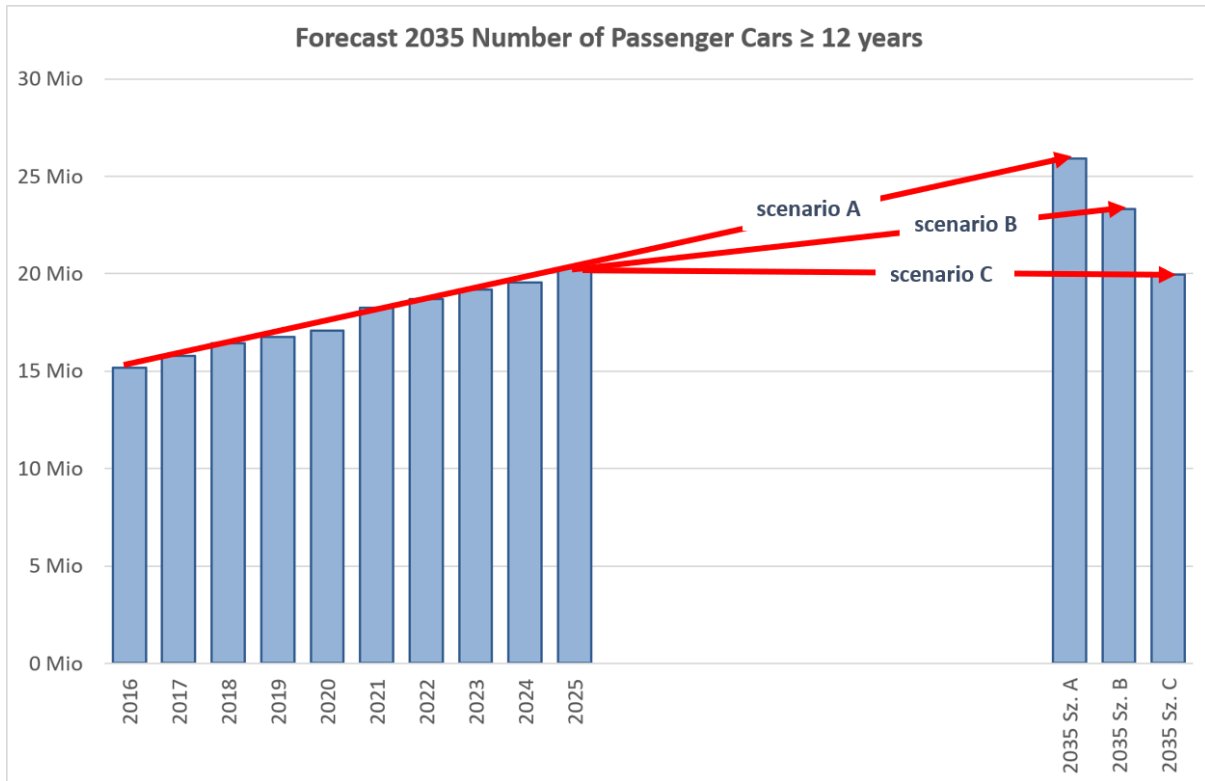
In this scenario, it has been specifically stipulated that the fleet of older passenger cars will continue to grow until 2035, but that the annual growth rates will be only about half as high as in the last 10 years, leading to a reduction in the Havana effect.

Scenario C:

Shortening the inspection intervals for older passenger cars means that the number of older passenger cars – those aged between 12 and 25 years – will remain unchanged at the 2025 level until 2035, and therefore no increase would be recorded.

Consequently, none of the three scenarios assumes a reduction in the number of older passenger cars.

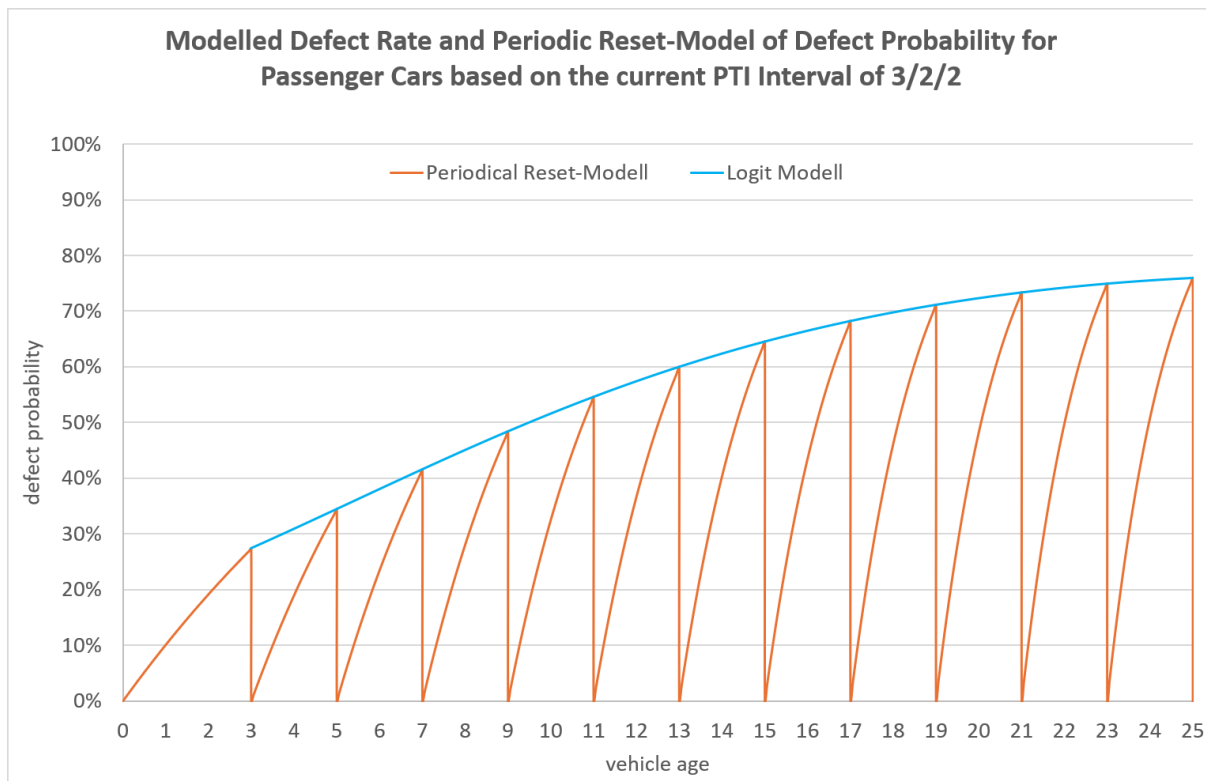
Figure 5 below shows the impact of the scenarios in 2035 compared with the previous trend in the number of vehicles from 2016 to 2025.



Forecast 2035 number passenger cars at age of 12 years or more in scenarios A, B, C

Passenger cars with significant and dangerous defects on the road, depending on the inspection intervals

Based on the results of the field sample and the fact that vehicles are only issued with a roadworthiness certificate following a successful general inspection if they do not have any significant or dangerous defects, a periodic reset model of the probability of defects in vehicles as a function of vehicle age was established.



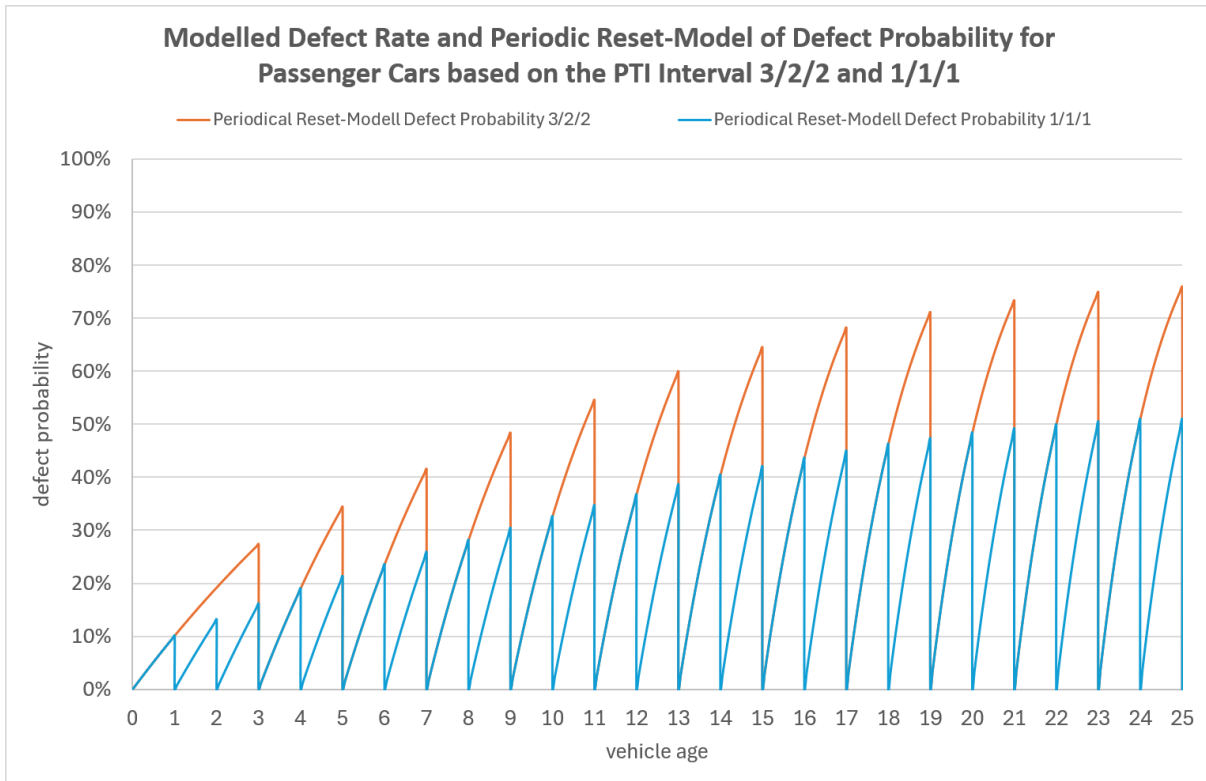
Modelled defect rate for PTI test interval of 3/2/2

Prior to the roadworthiness tests, the model shows a good correlation between the predicted defect rates and the defect rates observed in the field sample of passenger cars.

A successful roadworthiness test periodically reduces the probability of defects to zero (reset).

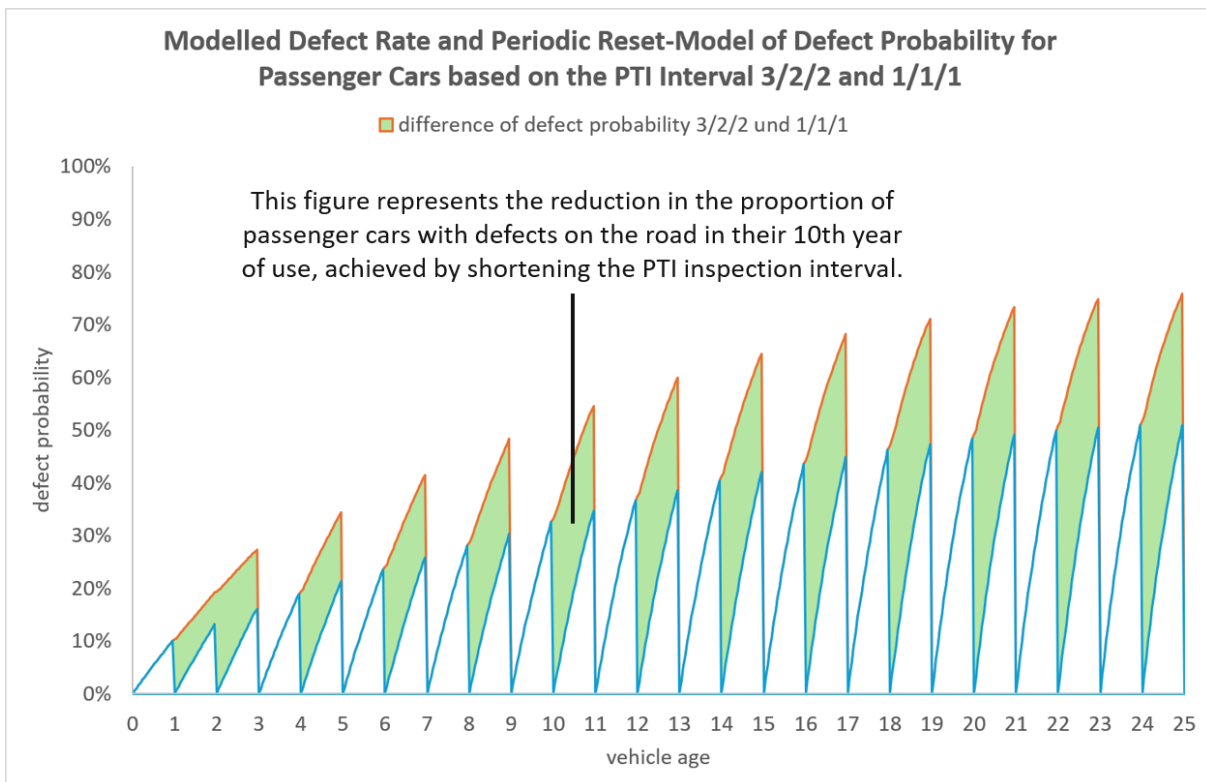
The model thus serves as a basis for determining the reduction potentials according to scenarios A, B and C, depending on the inspection intervals.

By way of example, the following figures compare the defect probabilities for annual PTI inspection intervals of 3/2/2 and 1/1/1.



Modelled defect rate for PTI test intervals of 3/2/2 and 1/1/1

The resulting differences in the probabilities of defects represent the potential for reducing defects.



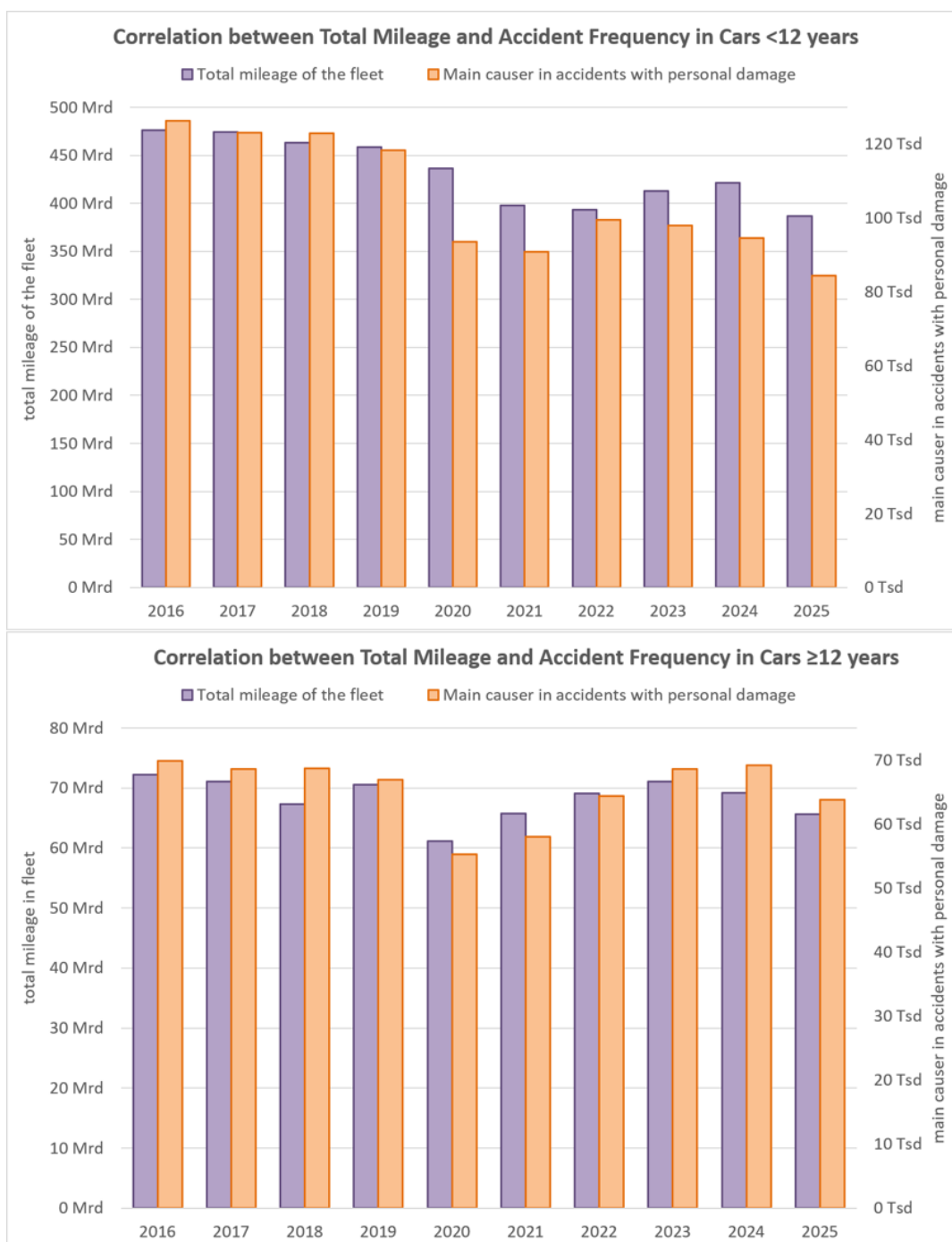
Determining the differences between various PTI inspection intervals

In conclusion, it can be stated that the introduction of an annual roadworthiness test will lead to a significant reduction in the proportion of passenger cars on the road with serious and dangerous defects.

The relationship between the number of passenger cars, mileage and accident rates

In order to draw conclusions from forecasts of the number of passenger cars in a particular age group regarding the frequency of being the primary cause of an accident, the proportional behaviour of total mileage within that group was determined as the product of the number of passenger cars and average mileage.

The figures below illustrate this strong correlation.



Correlation total mileage and accident frequency for newer and older passenger cars in Germany, 2016–2025

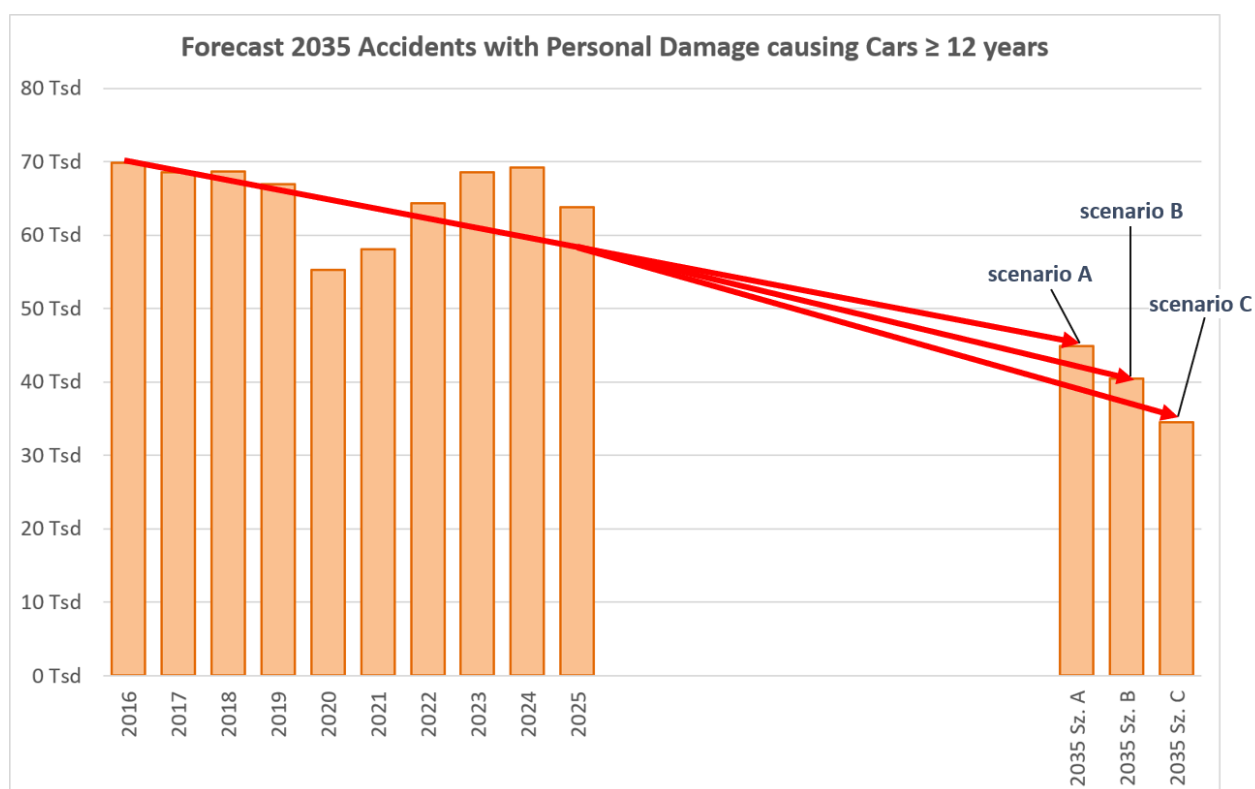
The following points can now be derived or summarised from the above considerations:

- Total mileage is calculated as the product of the number of vehicles in the fleet and the average mileage per vehicle for the respective vehicle age or age group.
- Assuming a constant accident risk per unit of mileage, a change in total mileage leads to an approximately proportional change in the number of primary causers of accidents involving personal injury within the same age group.
- A change in the vehicle fleet alone can only be applied approximately proportionally to accident frequency if the average mileage per vehicle remains unchanged. If the mileage changes, the trend in the vehicle fleet must be adjusted accordingly based on the total mileage.

The general inspection and its inspection intervals influence trends in the number of accidents

In order to accurately determine the potential for reducing the number of road traffic accidents involving personal injury in Germany, only the number of passenger cars – as the main cause of accidents – from the year 2025 was conservatively used as a basis.

In line with the correlation, the projected changes in the vehicle stock for scenarios A, B and C also affect the accident rate of older passenger cars, which are the main cause of accidents. The accident rate resulting from these changes in the vehicle stock is shown in the figure below.



Scenario figures for accidents involving personal injury caused by older passenger cars in 2035, according to scenarios A, B and C

The change in the vehicle fleet under Scenario B, resulting from the slower growth in the number of older cars up to 2035, also leads to a reduction in car-related accidents resulting in personal injury in 2035

If the number of older passenger cars remained constant between 2025 and 2035, as in Scenario C, the number of accidents caused by these older passenger cars in 2035 would be reduced further.

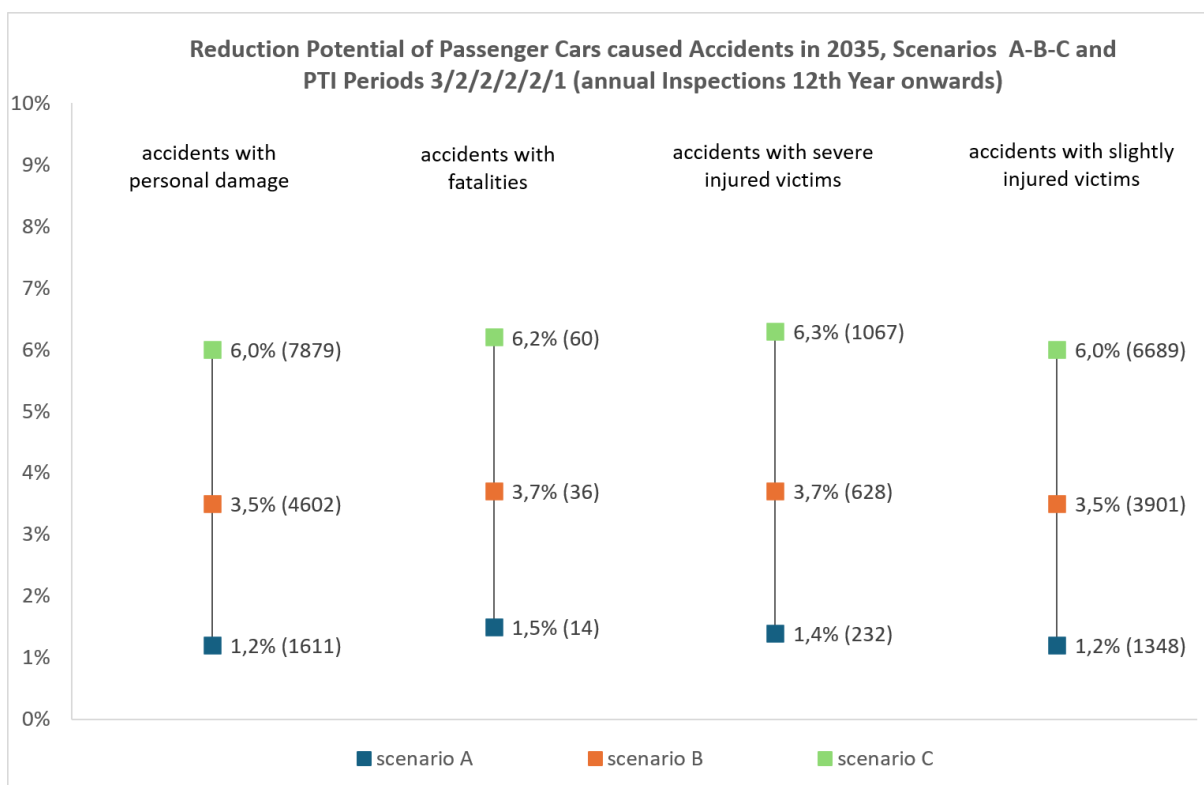
For each scenario, the distribution of accident-causing cars was then modelled according to vehicle age and multiplied by the probability of accident-related defects. The resulting number of accidents resulting in personal injury due to accident-related

defects was subsequently reduced by the potential for defect reduction. This yields the number of accidents resulting in personal injury, taking into account an annual roadworthiness test.

To determine the reduction potentials, the expected reduction in accidents resulting from the reduction of accident-related technical defects was subsequently calculated for each scenario and presented for different roadworthiness test intervals (annual roadworthiness test from a specific vehicle age).

Building on these foundations, the potential benefits of changing the PTI inspection interval for scenarios A, B and C were calculated in terms of the reduction in the number of car-related accidents resulting in personal injury.

The figure below summarises, using the example of the introduction of an annual roadworthiness test for vehicles aged 12 years or older, the reduction in accidents resulting in personal injury, broken down further into accidents resulting in fatalities, serious injuries and minor injuries.



Reduction potential of passenger car caused accidents due to PTI intervall 3/2/2/2/1 in 2035 scenarios A, B, C

As there are often several casualties per accident, the potential for reducing the number of fatalities, serious injuries and minor injuries at an individual level is even greater.

If an annual roadworthiness test were introduced for vehicles younger or older than 12 years, the potential for reduction or increase would be correspondingly higher or lower.

Conclusion

In accidents involving personal injury and passenger cars, technical defects in the car are a contributing factor in an average of 6.4 per cent of cases. When this figure is compared with the main causes of accidents recorded by the police, it ranks ahead of driving under the influence of alcohol or drugs, fatigue, distraction and speeding.

If the proportion of technical defects relevant to accidents is plotted against the age of the vehicle, a clear correlation with age becomes apparent. Whilst the proportion stands at 2.9 per cent for vehicles aged 3 years, it rises to over 20 per cent for vehicles aged 24 years.

Annual general inspections and their inspection intervals are already of great importance for road safety.

Depending on when annual general inspections begin and on trends in the car fleet up to the year 2035, the reduction in car-related accidents resulting in personal injury varies between 1 and 7 per cent.

If the reduction is considered in terms of the number of people involved in these accidents (fatalities, serious injuries and minor injuries), the potential is even greater.

In summary, it is clear that the general inspection and the repairs required in this context are of vital importance for road safety.

As well as being of enormous importance for road safety, the inspection intervals for older cars have a significant impact on the average economic lifespan of these vehicles and, consequently, on the increase in the number of older vehicles on the road.