

An investigation into the relationship between car weight and fatal collision rates in the UK

People driving heavier cars are disproportionately involved in more fatal collisions, and the average car weight is increasing in the UK. This short report summarises the key findings from an investigation into the relationship between car weight and documented collisions in the UK from 2019-2023.

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Introduction

In 2023, 1,624 people died in road collisions in Great Britain, a further 28,087 people were seriously injured. These figures are a stark reminder of the human cost of road collisions, highlighting the urgent need for effective measures to improve road safety. Despite claims of technological advancements from car manufacturers, road fatality and serious injury rates have stagnated, with no significant reduction since 2010.

There are many factors that impact crash victim severity during collisions. There is a lack of research on UK-specific collisions, and the role car characteristics such as car size has on the severity or likelihood of collisions.

The aim of this study is to gain an overall general understanding of the relationship between car weight and fatalities.

Methodology

This study looks at collisions involving cars between 500-2500kg, pedestrians, and cycles. The cars involved in the collisions have been matched to a car make and model which has been matched to a kerb weight in kg. The car make and model, as well as collision data has been provided by the DfT. The kerb weight data has been supplied by a third party.

Collisions investigated have been grouped under the following categories:

- **Car-Car** collisions - where two or more cars were involved and at least one car occupant was the collision victim.
- **Car-Bike** collisions - where at least one cycle user was the collision victim.
- **Car-Pedestrian** collisions - where at least one pedestrian was the collision victim.
- **All collisions** - includes all collisions where at least one car is involved (the above three categories in addition to one-car collisions with no other cars, pedestrians or cycles involved).

Collisions involving other vehicle types (such as vans, buses, motorbikes) have all been excluded.

In the UK there is no formal categorisation of different types of cars, in this study cars have been grouped based on kerb weight (the weight of a parked car with a full tank of fuel/battery, but without occupants or luggage.) under the following four categories:

- **500kg-1000kg**
- **1001kg-1500kg**
- **1501kg-2000kg**
- **2001kg-2500kg**

There are a small number of cars in the UK outside of the 500kg – 2500kg range, however these make up a very small proportion of the registered licensed cars in the UK. There were 32.7 million registered and licensed cars in the UK in 2023 between 500kg-2500kg. Most (62%) of these cars were between 1001-1500kg, with 29% over 1501kg, as shown in Figure 1.

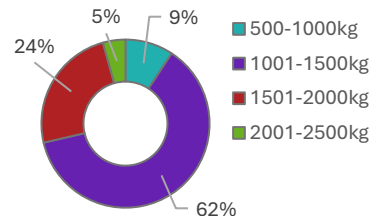


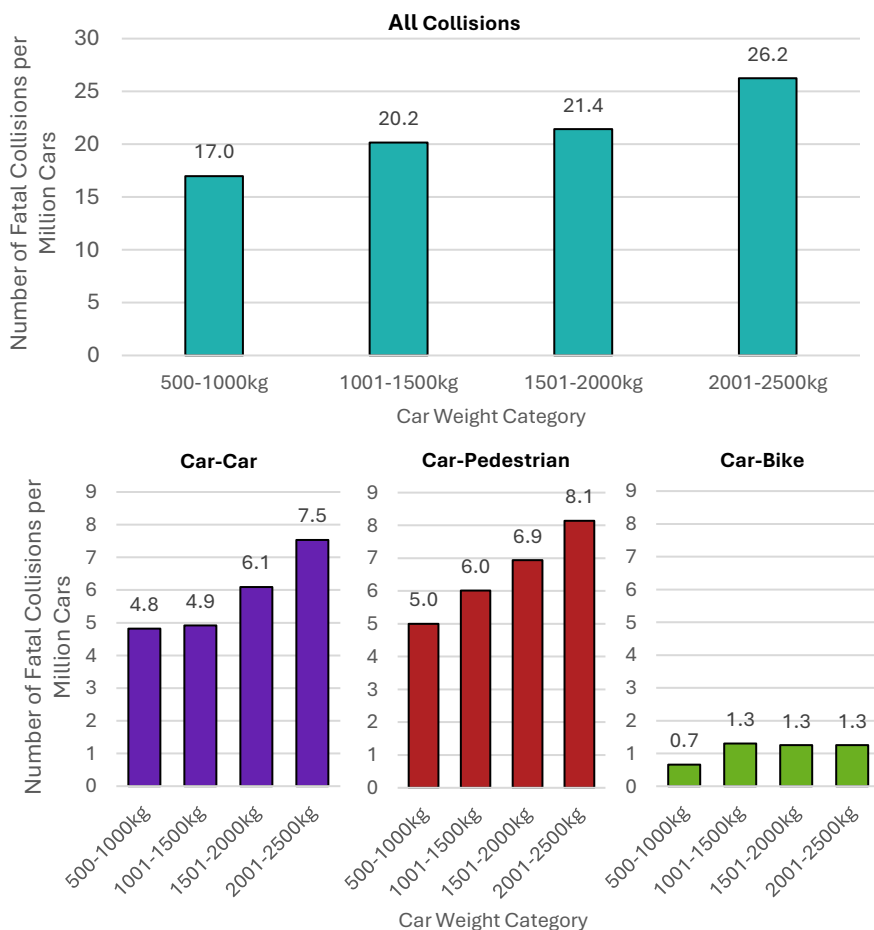
FIGURE 1: Distribution of Registered Cars by Weight Category in 2023 (Source: DfT df_VEH0124)

Key findings

Over 3000 fatal collisions between 2019-2023 were analysed in this study. The number of fatal collisions per 1 million registered cars in each weight category is shown in Figure 2.

Lighter cars (500-1000kg) have the lowest fatal collision rates per million cars across all collision types, indicating a lower relative risk compared to heavier cars.

FIGURE 2: Average Annual Fatal Collisions per 1 Million Cars by Weight Category (2019-2023)



As car weight increases, the number of fatal collisions rises, peaking at 26.2 for the heaviest cars (2001-2500kg) suggesting a higher likelihood of involvement in fatal collisions. This trend is consistent for Car-Car and Car-Pedestrian collisions.

In Car-Bike collisions, lighter cars have the lowest fatal collision rates per million cars, indicating they are less likely to be involved in fatal collisions with cycles compared to heavier cars, which show consistent fatality rates for cars in categories above 1001kg.

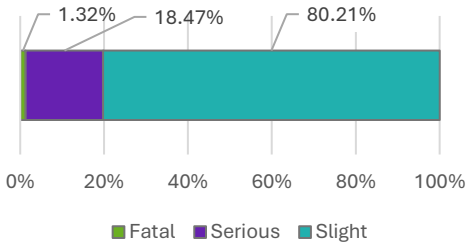


FIGURE 3: Average Distribution of Collisions for Cars Weighing 500-2500kg (2019-2023)

The distribution of fatal, serious and slight collisions for cars between 500-2500kg is shown in Figure 3.

The percentage of fatal collisions varies based on the type of collision and the weight of the car involved, as shown in Figure 4. Heavier cars (2001-2500kg) have the highest percentage of fatalities across all collision types. For collisions involving cars between 2001-2500kg, car-pedestrian collisions are the most severe, with 3.12% being fatal.

Car-bike collisions have a relatively low percentage of fatal collisions, potentially due to the smaller sample size or a weaker relationship between car weight and cycle fatality rates for cars over 1001kg.

In summary, Figure 4 indicates that collisions involving heavier cars (2001-2500kg) are more likely to be fatal collisions compared to collisions involving lighter cars (500-1000kg).

Car weight increase

For registered and licensed cars between 500-2500kg in the UK, the average weight is increasing. Figure 5 shows the increase is 69kg for all cars, and 189kg for new cars between 2014-2023. These observations suggest that the weight of cars is likely to continue increasing.

Impact of car weight increase

Based on the findings of this study, which highlight the correlation between car weight and fatal collisions, it is likely that fatal collisions will increase if the trend of rising car weight continues.

FIGURE 4: Fatal Collisions as a Percentage of All Collisions by Weight Class (2019-2023 Average)

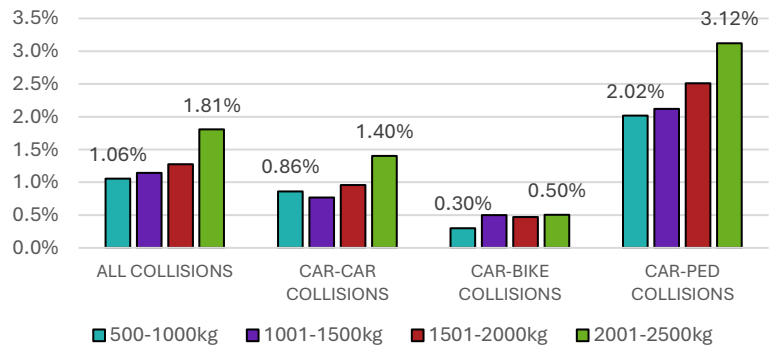
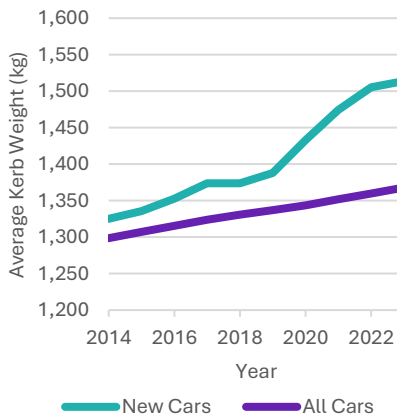


FIGURE 5: Average weight of licensed registered cars (new, and all) in the UK between 500kg-2500kg (2014-2023)



Heavier cars have more kinetic energy than lighter cars when travelling at the same speed and therefore have the potential to do more damage in a collision.

Speed reduction has been shown to be effective in reducing the number and severity of collisions, however car weight should also be considered alongside speed reduction measures.

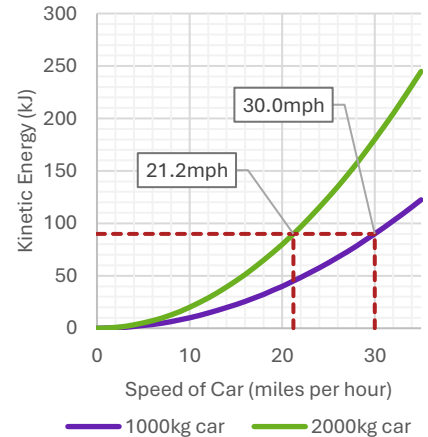
A 2000kg car has twice the kinetic energy of a 1000kg car if they are both travelling at 30mph. For the kinetic energy to be the same, the 2000kg car would have to be travelling at 21.2mph. This is illustrated in Figure 6.

Interventions

To reduce average car weight in the UK, changes could be implemented through various channels:

- Central government could introduce taxation on heavier cars or ban their future sale via the Road Vehicles (Construction and Use) Regulations.
- Local authorities could adjust parking policies to charge higher fees for heavier cars.
- Engineering bodies should maintain existing dimensions and regulations regarding car size, compelling manufacturers to design within these bounds e.g., parking bay size and weight limits in multistorey car parks.

FIGURE 6: Impact of Car Speed and Car Weight on Kinetic Energy



- The DVLA could impose additional licensing requirements for heavier cars.

Summary

This study finds that heavier cars are more likely to be involved in fatal collisions and average car weight in the UK is increasing, which may lead to a rise in fatal collisions if the trend continues. Reducing car weight could mitigate the severity and frequency of collisions.

This summary note will be followed by a further academic study later in 2025.

Contributors

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Disclaimer

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