



To: Transport & Health Policy Makers, & Practitioners
From: Prof Adrian Davis, TRI, Edinburgh Napier University
Date: 6th February 2023
Subject: Essential Evidence 4 Scotland No.63 Impact speed and pedestrian fatality risk

Top Line: A motor vehicle impact speed of 19mph has a 5% risk of killing a pedestrian. The risk increases over five times at 30mph.

Injuries and fatalities from road traffic crashes are a major public health problem. They account for the majority of deaths and disabilities due to all forms of injury worldwide. Pedestrians injured in motorised vehicle crashes constitute the largest group of traffic fatalities, which accounts for approximately 40,000 each year worldwide, and the number is predicted to increase. Speed has been identified as a key risk factor in such crashes.¹ Posted speed limits are strongly correlated with average travel speed. The higher the vehicle travel speed, the higher the impact speed will be, assuming other physical parameters are constant such as deceleration, perception reaction time, and braking effectiveness. The impact speed during a crash with a pedestrian is strongly related to the risk of a pedestrian fatality and, hence, to the speed limit. Therefore, the relationship between impact speed and risk of fatality can be considered to be a critical factor in making decisions regarding the setting of speed limits.

Rosen and colleagues reviewed the peer reviewed literature on pedestrian fatality risk as a function of car impact speed.² As impact speeds rise so do pedestrian fatalities. Their review included a study which developed a pedestrian fatality model capable of predicting pedestrian death in pedestrian-vehicle crashes.³ Pedestrian age, vehicle type, and collision speed obtained from reconstructing collected crashes were used as independent variables in the fatality model. The models suggest that pedestrian age, collision speed and vehicle type are the most important parameters leading to pedestrian fatality.

In a systematic review and meta-analysis, Hussain and colleagues reported on the impacts of different speeds on the probability of a pedestrian death.⁴ This included impact speeds of 20mph and 30mph. For pedestrians, it is not possible to fully eliminate the risk of a fatality. However, their results suggest an impact speed of 30 km/h (19mph) has on average a risk of a fatality of around 5%. The risk increases to 13% for an impact speed of 40 km/h (25mph) and 29% at 50 km/h (31mph). The researchers noted that their results provide support for prescribing speed limits of 30 and 40 km/h for high pedestrian active roads. These speed limits are commonly used by best practice countries that have the lowest road fatality rates and that practice a Safe System Approach⁵ to road safety. They concluded that Speed limits are an important regulation that can help reduce the kinetic energy and consequential injury severity in a crash. It is important for policy makers to prescribe speeds that are safe, i.e. survivable, for all road users.

¹ Hussain, Q., et al, 2019 The relationship between impact speed and the probability of pedestrian fatality during a vehicle-pedestrian crash: A systematic review and meta analysis, *Accident Analysis and Prevention*, 129, 241-249 <https://doi.org/10.1016/j.aap.2019.05.033>

² Rosén, E., Stigson, H., Sander, U. 2011 Literature review of pedestrian fatality risk as a function of car impact speed, *Accident Analysis and Prevention*, 41(1) <https://doi.org/10.1016/j.aap.2010.04.003>

³ Oh, C., et al, 2008 Development of probabilistic pedestrian fatality model for characterising pedestrian-vehicle collisions, *Int. Journal of Automotive Technology*, 9(2) DOI 10.1007/s12239-008-0024-7

⁴ Hussain et al, 2019.

⁵ See [Essential-Evidence-4-Scotland-No-6-Safe-Systems-Road-Safety.pdf \(napier.ac.uk\)](#)