



Safe speeds and cyclist protective factors

Narelle Haworth

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Centre for Accident Research & Road Safety - Queensland

CARRS-Q is a joint venture initiative of the
Motor Accident Insurance Commission
and Queensland University of Technology



www.carrsq.qut.edu.au

Outline

- **Safe Speeds**
 - motor vehicle (MV) and cyclist speeds
- **Protective factors**
 - preventing crashes by improving visibility
 - reducing injury severity by helmets

How do cyclists get hurt?

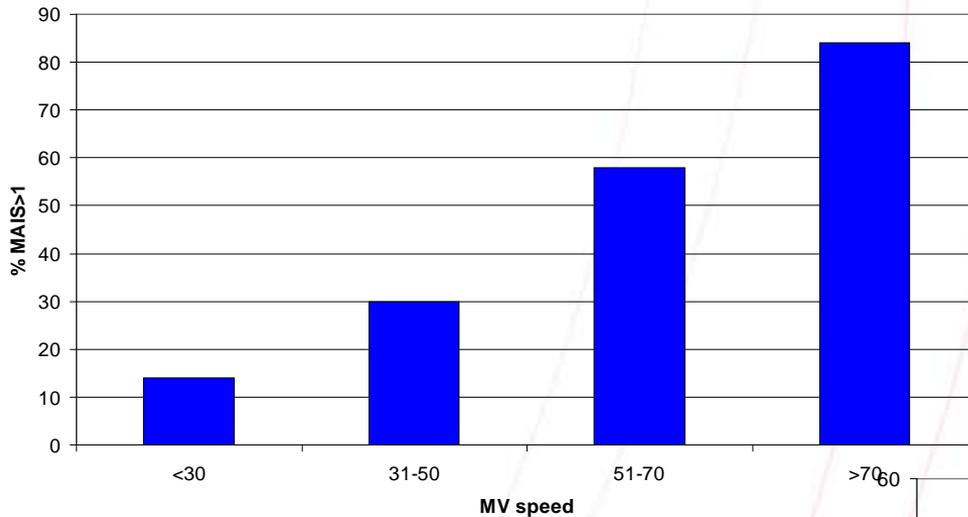
- Crash and non-crash injuries
- Crash injuries
 - our survey found 56% SV, 14% multiple bicycle, 25% bicycle-MV, 4% bicycle-ped
 - ED data show only 6-8% of cyclist injuries result from a collision with another vehicle (Scott et al., 2005)
 - 45% of cyclist hospital admissions are from “non-traffic land transport accidents” (Henley & Harrison, 2009)
 - 85% cyclist fatalities resulted from collisions with MVs (ATSB, 2006)
- So, crashes involving **MVs** aren't the only issue...

Speeds we need to consider...

- **Motor vehicle speeds** affect
 - likelihood of driver seeing cyclist and reacting in time
 - severity of injury to cyclist if crash occurs
- **Cyclist speeds** affect
 - likelihood of driver or ped or other rider seeing cyclist and reacting in time
 - likelihood of cyclist seeing MV or ped or other rider and reacting in time
 - severity of injury to cyclist or pedestrian or other rider if crash occurs

MV speeds and cyclist injury severity

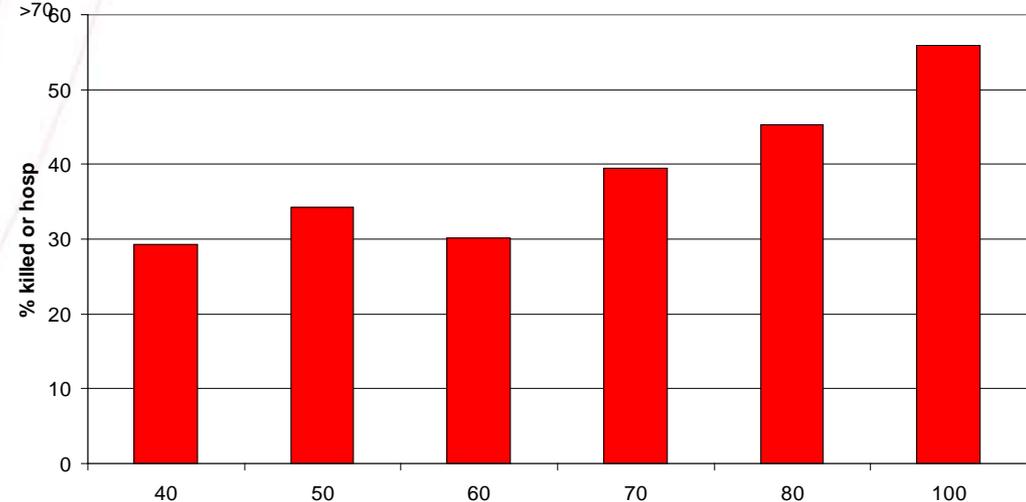
Serious injury and MV speeds



Richter et al. (2007)

Haworth et al. (2011)

Injury severity and speed limit



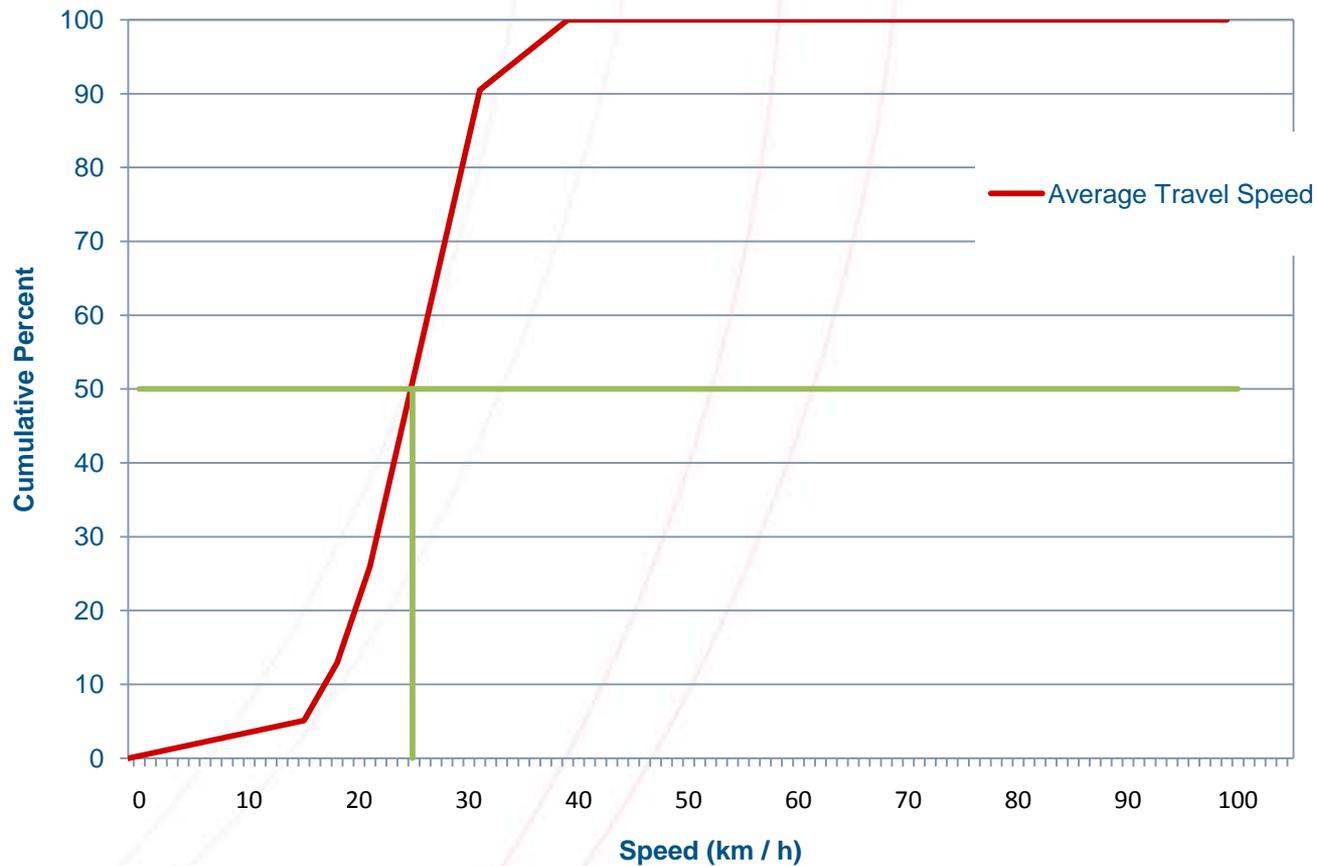
Vision Zero on Safe Speeds for cyclists

(Johansson, 2009, p.829)

- “1. Vulnerable road users should not be exposed to motorised vehicles at speeds exceeding 30 km/h.
- 2. If 1. cannot be satisfied then separate or reduce the vehicle speed to 30 km/h.”
- “It should be noted that a separation is always a physical separation (typically a barrier)...Spatial separation could be ... different roads for different traffic elements (e.g. bicycle roads)”
- “Where driving speeds are 50 km/h ... pedestrians and bicyclists do not cross between crossings and speeds are reduced to 30 km/h where vulnerable road users cross.”
- “In 50+ km/h environment vulnerable road users are never mixed with cars.”

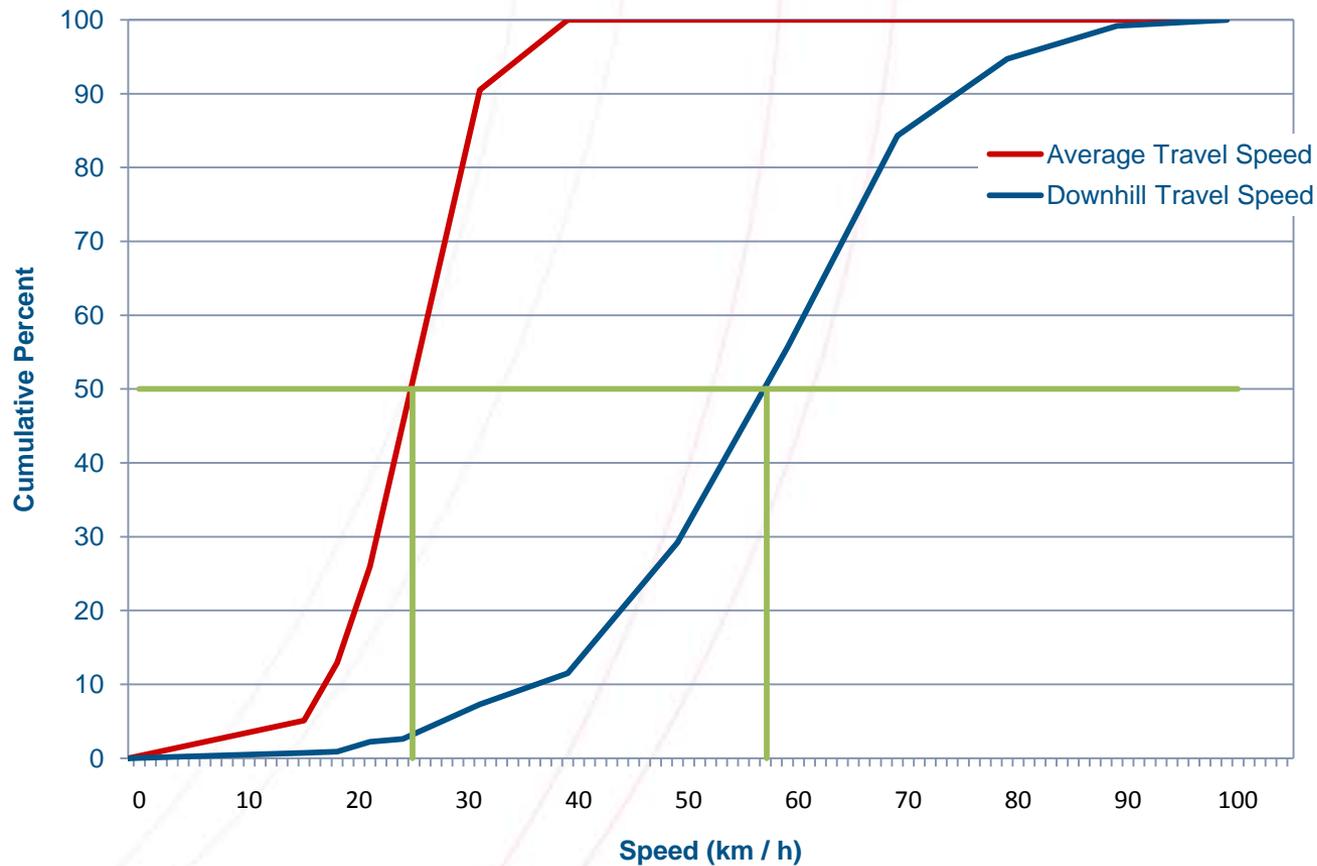
Average cyclist speeds

(CARRS-Q survey data)



Average and downhill speeds

(CARRS-Q survey data)



Effects of cyclist riding speeds

- Relatively little research on effect on SV crashes, but
- Hitting the ground or a fixed object at more than 30 km/h is likely to cause significant injury
- Too fast for the conditions in 19% fatal non-collision crashes (Knowles et al., 2009)
- Perplexing results of the Taupo Bicycle Study (Thornley et al., 2011)
 - lower average speed (<20 km/h) associated with increased crashes and days off work*, higher average speed (>30 km/h) associated with less days off work**
 - not speed at time of the crash
 - may be confounded with riding skill, but adjusting for experience made little difference
 - “faster riders may more easily integrate with traffic flow and be more readily perceived by riders”
 - don’t know if SV or MV crash and higher average speeds may be in lower traffic locations

Cyclist self-protection

- Principles and pragmatism
 - we aren't going to fix driver behaviour or road infrastructure or change speed limits overnight
- Crash prevention by making us more visible
- Injury prevention by measures to reduce injury severity in the event of a crash

Visibility aids

- Rider more visible
 - brighter clothing, helmet for well-lit conditions
 - retroreflective clothing for low-light conditions
- Bike more visible
 - bright coloured bicycle
 - lights and reflectors
- Predictability
 - rider location/positioning and manoeuvres

Prevalence of use of visibility aids

- Always use rear light in dark/low-light conditions
 - 92% Taupo, 90% Qld
- Always use front light
 - 87% Taupo, 84% Qld
 - but lack of frontal conspicuity more important contributor to crashes than rear (Gale 1998)
- Wear fluoro clothing/accessories
 - 30% always Taupo, 14% always/almost always Qld
 - higher for females Taupo
- Wear bright coloured clothing/accessories
 - 43% always/almost always Qld
- Wear reflective clothing/accessories
 - 21% always/almost always Qld

Experimental studies of visibility aids

- Cochrane Review (Kwan & Mapstone, 2009)
- Daytime:
 - fluorescent yellow, red and orange improved detection and recognition
 - yellow was best non-fluoro
- Night-time:
 - lamps and flashing lights
 - retroreflective material in red and yellow
- Other factors: road condition, contrast, weather, street lighting, background clutter, vehicle roadworthiness
- Survey: Riders and peds over-estimate their own visibility (Wood et al., 2009)
- Static versus flashing lights - phi-phenomenon

Crash studies of visibility aids

- No randomised controlled trials
- Confounded by risk taking, riding locations, riding times
- Surveys have high distances ridden, adults, road bikes and low severity of self-reported crashes
- Taupo Bicycle Study (Thornley et al., 2011)
 - riders who always wore fluorescent colours had 8x fewer days off work from bicycle crash injury in last year (cf never wear)
 - controlled for age group, gender, average cycling speed, years of experience, bunch riding, distance ridden per year
- Motorcycle case-control study – high visibility clothing associated with 37% lower injury risk (Wells et al., 2004)
- Need for more controlled studies

Bicycle helmets

- Cochrane Review concluded wearing bicycle helmet associated with 69% reduction in risk of head, brain injuries (Thompson et al., 2009)
 - 65% reduction in risk facial injury
 - whether MV involved in crash or not
- Our analyses of Police-reported crash data showed helmet wearing halved the risk of head injuries (Haworth et al., 2011)
- Taupo study – not always wearing a helmet associated with 3x rate injury resulting in presentation to health professional

Conclusions

- Speed of both motor vehicles and cyclists is important for cyclist safety
- Improving visibility appears to reduce injuries
- Helmets are a useful approach to preventing the most serious injuries
- We should not let our principles lead us into unrealistic practices

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Questions?

n.haworth@qut.edu.au



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