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IDSS 2023

12 – 14 November
Hobart



E-Scooters

Ivan Lebedev and Paul Driessen

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*This presentation has been prepared for the Actuaries Institute 2023 Injury and Disability Schemes Seminar.
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E-Scooters: *a crash course*

Ivan Lebedev and Paul Driessen

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Agenda

- A bit of history
- Promises and challenges
- E-Scooter regulations in Australia
- Triangulation of cost



A bit of history...

Image: Daily Mail, <https://www.dailymail.co.uk/news/article-9950573/Images-1916-E-Scooters-action-Suffragettes-ride-London.html>

Autoped

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- Production started in 1915 in the US
- Ran on petrol
- Could reach speeds of around 25 mph
- Weighed 45kg
- Declined in popularity once the war ended

Image: Smithsonian Magazine, <https://www.smithsonianmag.com/history/motorized-scooter-boom-hit-century-dockless-scooters-180971989/>



Modern e-scooters

- World-first e-scooter rental scheme appeared in 2017
- Rental e-scooters arrived in Australia in 2018
- First introduced in the Brisbane CBD area
- There are now trials ongoing in every Australian State and Territory



Image: ABC News, <https://www.abc.net.au/news/2023-01-22/escooters-melbourne-ballarat-trial-scooter-city-streets/101879480>

Promises

- Replace the need for cars to cover the 'first and last mile'
- Environmentally friendly – reduce CO₂ emissions and microplastic waste
- Reduce traffic congestion
- Fun to ride!



Challenges

- Not as environmentally friendly as they may seem
- Clutter the cities
- May seriously injure riders and pedestrians



ABC website 3 Nov 2023

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Search results for "e-scooter"

Refine Results

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- ☐ ABC News
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- ☐ ABC ADELAIDE
- ☐ Listen
- ☐ ABC MELBOURNE
- ☐ ABC PERTH

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Who foots the bill if you're in an Adelaide e-scooter accident?

Adelaide City Council Deputy Lord Mayor, Phillip Martin said, "People who are injured by scooters, that is third parties, have trouble getting an insurance claim through".

24 Oct 2023 / LISTEN



Parents urged to change mindset on e-scooters as accidents involving children surge

As the number of children presenting in Queensland emergency departments with e-scooter injuries rises sixfold, experts and parents worry it will take a death for the dangers of the device to be taken seriously.

26 Sep 2023 / ABC NEWS 3m read



Authorities issue e-scooter heat warning after children involved in scooter combustion

Firefighters say children were riding an e-scooter when it "combusted without warning". They say parts of the popular vehicles can pose significant fire risk.

31 Aug 2023 / ABC NEWS 1m read



Melbourne cracks down on e-scooter hoons

E-scooters will be fitted with cameras, geo-sensing technology and sirens.

11 Aug 2023 / ABC MELBOURNE



Study says up to 60% of e-scooter riders admitted to hospital are inebriated

CEO of the Pedestrian Council of Australia, Harold Scruby says, "Apart from making the footpath a hostile space, it makes people stop walking".

2 Aug 2023 / ABC ADELAIDE



E-scooter drunk in Melbourne? You could lose your driver's licence

Here are the rules you need to know before you get behind the handlebars.

1 Aug 2023 / ABC MELBOURNE



Serious e-scooter crash in Pilbara leaves police struggling with reckless riding

The 15-year-olds were airlifted to Perth after colliding with a ute in Karratha. Police and doctors fear there will be more incidents to come.

26 Jul 2023 / ABC NEWS 2m read



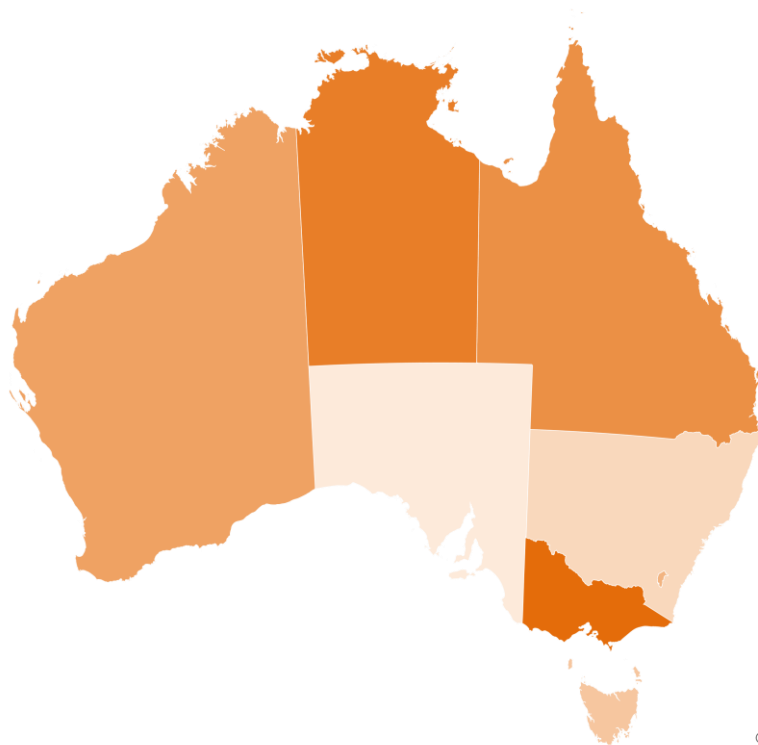
Perth e-scooter riders push for legislation change to allow heavier, faster devices

Petition for heavier and more powerful e-scooters in WA after riders call out "unreasonable" laws.

13 Jul 2023 / ABC NEWS 2m read



Jurisdictional scan



Are privately owned e-scooters legal?



Allowed on footpaths?



Rental scooters allowed on roads?

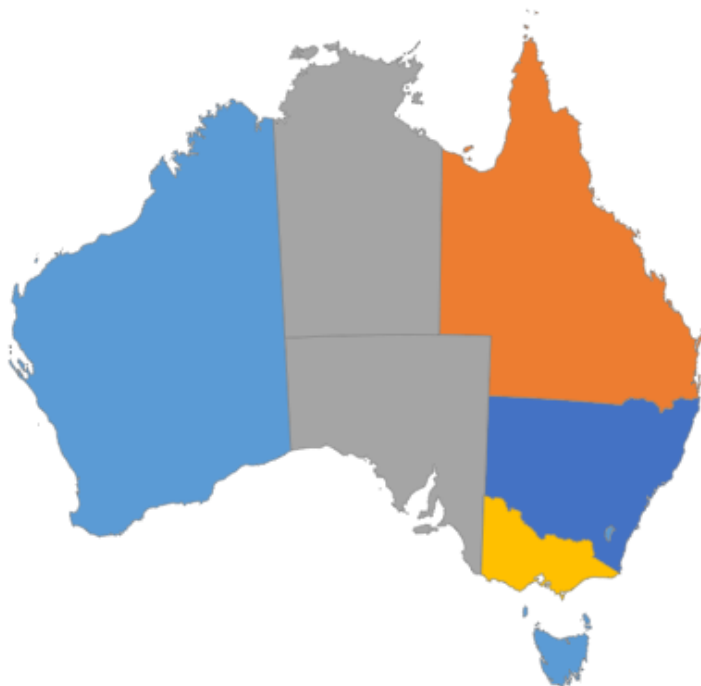
Jurisdiction	Rules	Max speed
SA	On local streets or to avoid an obstruction for up to 50m.	15 km/hr
TAS	On local streets	25 km/hr
VIC	On roads with a speed limit up to 60km/h	20 km/hr
NSW	On roads with a speed limit up to 50km/h	20 km/hr
ACT	On local streets only when there is no path, or it is impractical to ride on footpaths.	25 km/hr
QLD	On local streets, in bike lanes on roads with a speed limit of 50kmph or less, and in bike lanes on any road where the bike lane is separated from the road	25 km/hr
NT	Only to avoid an obstruction for up to 50m	15 km/hr
WA	On local streets and bike lanes on streets with a speed limit of 50kmph or less	25 km/hr

Minimal legal age

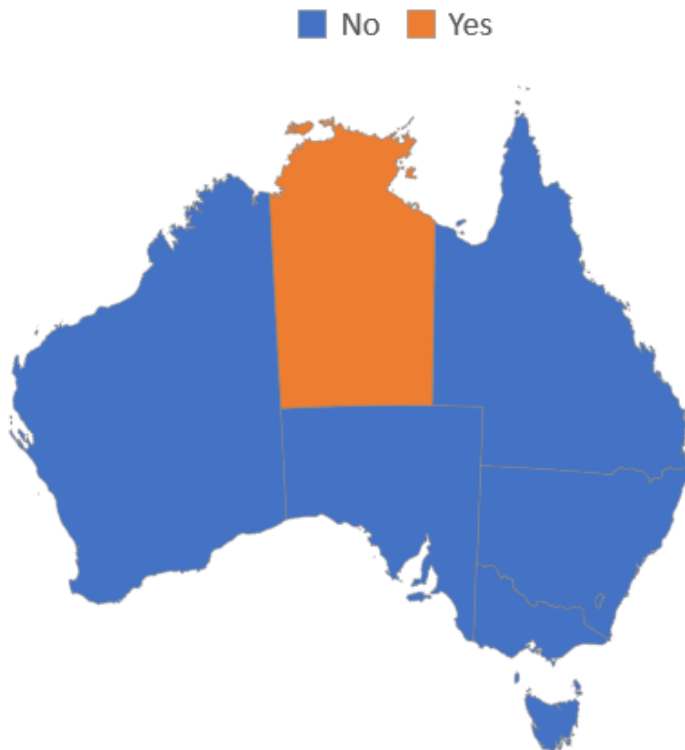


Speed limit on shared paths

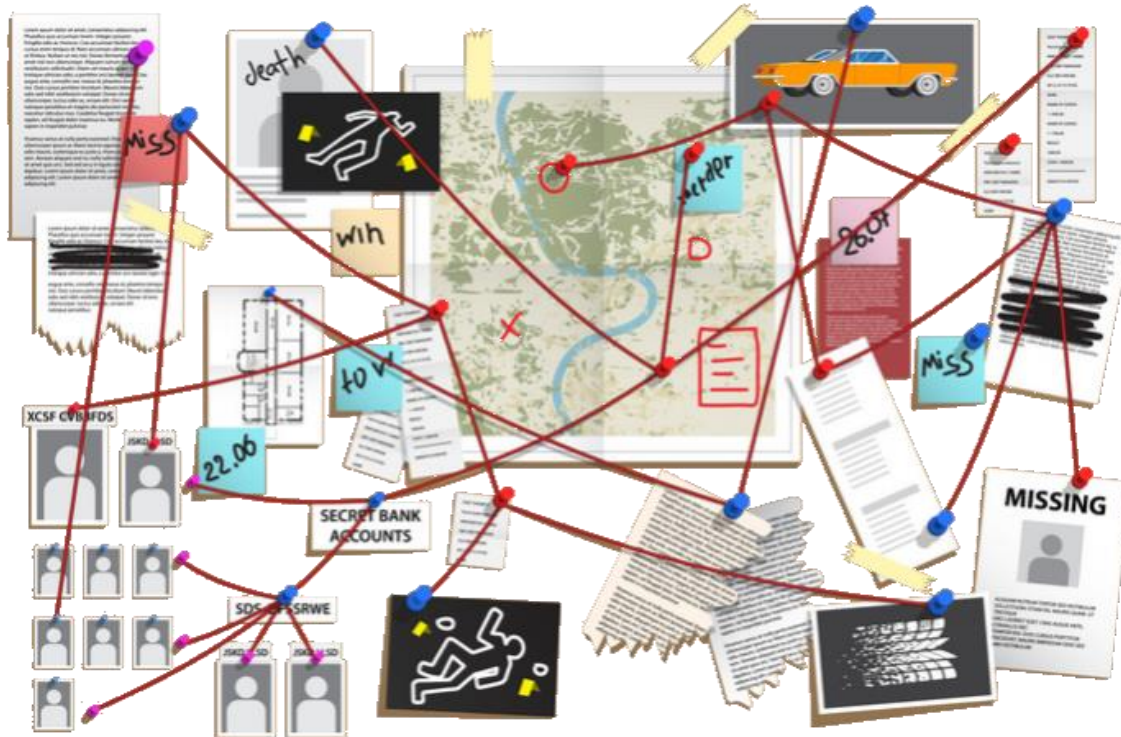
■ 10 ■ 12 ■ 15 ■ 20 ■ 25



Included in CTP scheme



Triangulating cost



- Scheme coverage
- Claim frequency
- Injury severity
- Claim cost

Coverage options



No coverage

- Largely the current situation

But if covered...

- Rental scooter arrangements only?
- What might be the mechanism for coverage?
 - CTP
 - Lifetime care
 - Workers' compensation (if journey claims)
 - Everything?
- Is coverage fault or no-fault?

SA CTP hypothetical

Using publicly available data, we work through a SA CTP example, *assuming e-scooter injuries are compensable*.

SA CTP is a:

- Fault-based scheme¹ so include only non-riders (pedestrians)
- With most of the compensation going to serious injuries

1. Children under 17 years are covered regardless of fault

Claim frequency – who?

Riders



- Riders may claim in no-fault schemes
- And are vulnerable if e-scooters operate on road

Pedestrians



- Pedestrians may be injured if e-scooters operate on footpaths

Passengers



- E-scooters regularly carry passengers

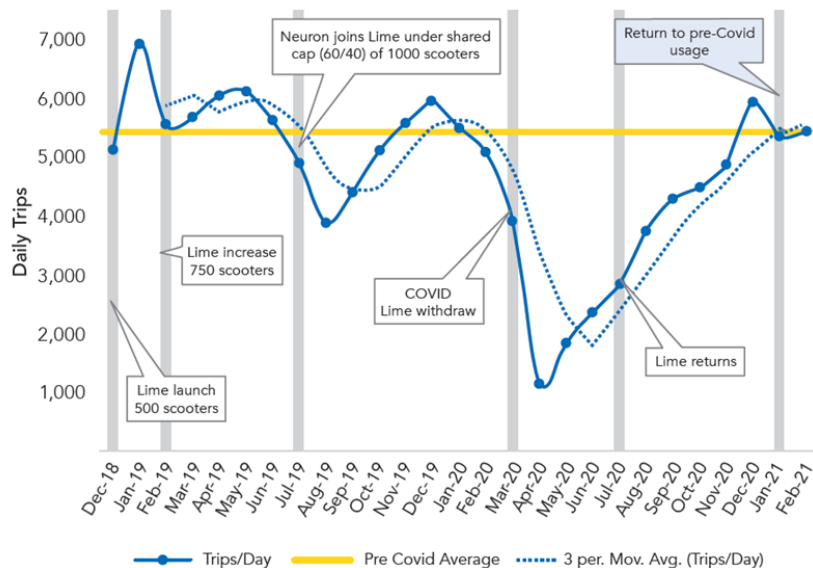
- [illegible]

1. Where the Expected Average Cost (EAC) allows for the expected mix of claims by severity

Number of trips

■ Annual risk cost =

$$= [(No. scooters) \times (trips / scooter / year) \times (injury rate / trip) \times (\% NRI)] \times [EAC]$$



SA CTP hypothetical

There are about 1,750 rental e-scooters on Adelaide roads.

Assume 5 trips per e-scooter per day

$$= 1,825 \text{ trips / scooter / year}$$

Estimated no. trips / year = 3.19m

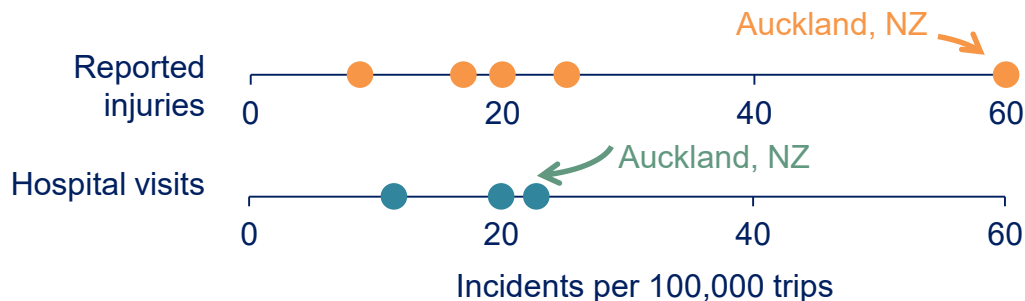
Rates of injury



■ Annual risk cost =

$$= [(\text{No. scooters}) \times (\text{trips / scooter / year}) \times (\text{injury rate / trip}) \times (\% \text{ NRI})] \times [\text{EAC}]$$

Reported injury and hospital visit rate by study



SA CTP hypothetical

Incidents per 100,000 trips: ~10 to 25

Translates to indicative range of incidents per scooter per year: ~0.2 to 0.5

... but NZ as high as 1.0!

For SA:

Assume 0.4 incidents per scooter per year

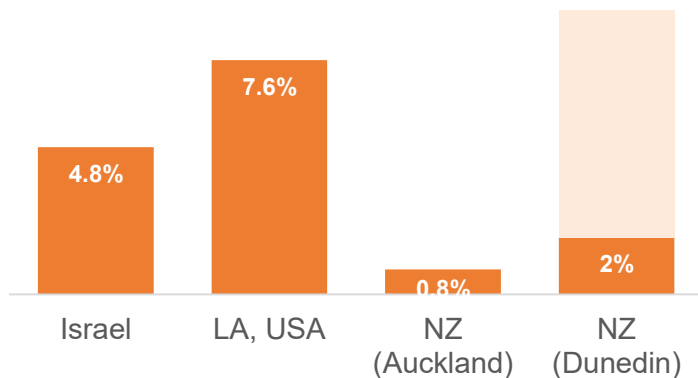
(i.e. about 22 injuries per 100,000 trips)

Non-rider (pedestrian) injuries

■ Annual risk cost =

$$= [(\text{No. scooters}) \times (\text{trips / scooter / year}) \times (\text{injury rate / trip}) \times (\% \text{ NRI})] \times [\text{EAC}]$$

Pedestrian injury rate



- Should dual passengers be included?
- Data is poor (can include pedestrians injured by parked scooters)

SA CTP hypothetical

Let's assume only e-scooters injuring **pedestrians** on footpaths is compensable in SA:

- Assume 3% pedestrian injuries
 - 1,750 rental e-scooters
 - 0.4 incidents per scooter per year
- **21 pedestrian injuries per year**
- **1.2% claim frequency**
- **~8x the scheme average frequency**

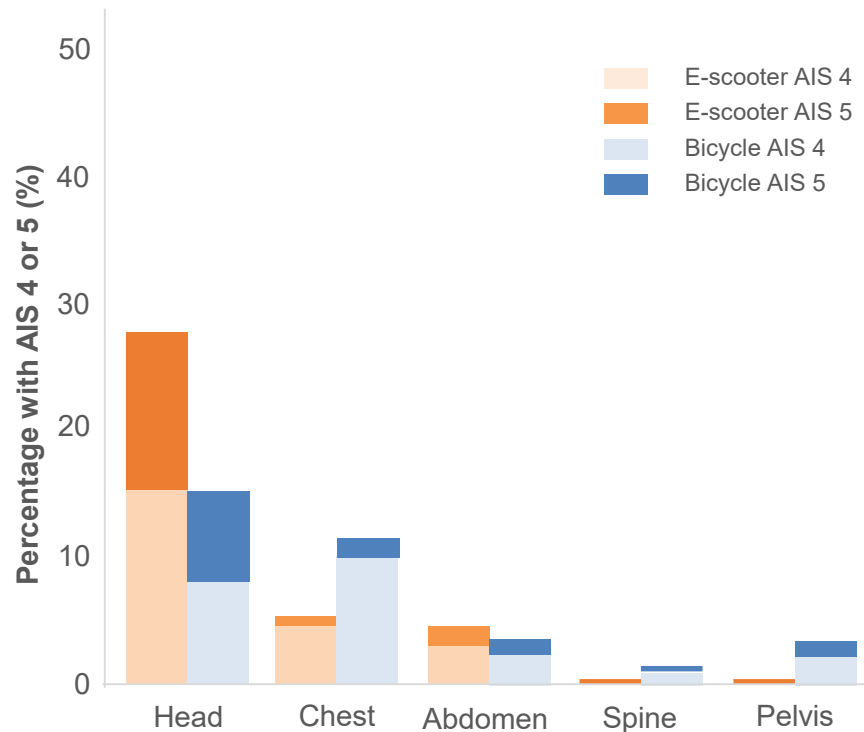
Expected average cost - claim severity



Claim severity



- Most studies we observed showed a high propensity for severe head injuries from e-scooter incidents
- UK study indicates e-scooter severe head injuries more prevalent than from cycling
- Injuries to chest/abdomen also feature
- Rarely do medical studies differentiate between riders, passengers, pedestrians



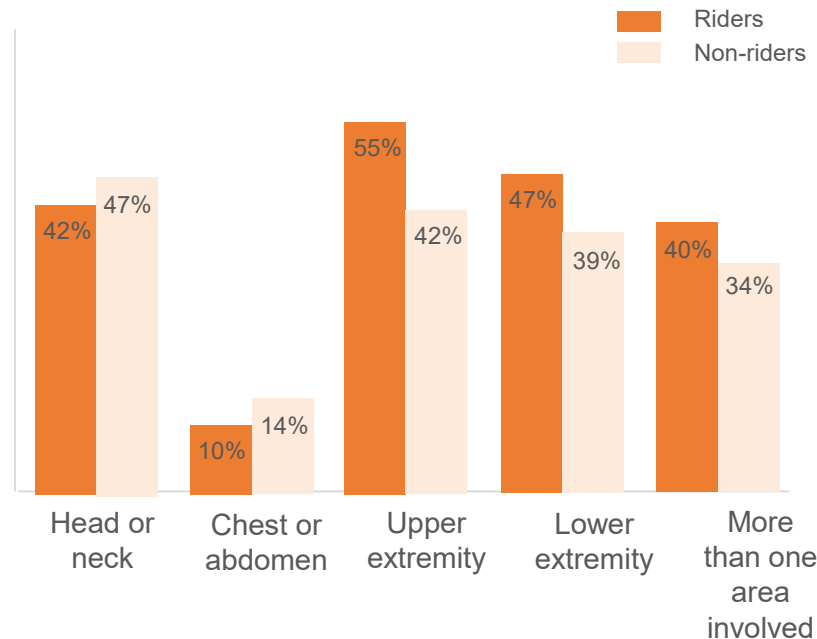
Major trauma among E-Scooter and bicycle users: a nationwide cohort study (Clough, et al) London

Claim severity



- And when studies do differentiate between riders and non-riders (e.g. proportion of injuries) ...
- ... the relative severity of the injuries is not revealed

Riders compared to non-Riders



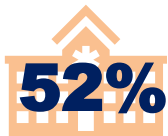
E-scooter related injuries: Using natural language processing to rapidly search 36 million medical notes (Ioannides, et al) Israel

Claim severity [EAC]



Hospitalisation of reported incidents

Hospital
visit



Hospital
admission



Critical
care



Injury



8% of
hospital
visits in
Queensland¹

SA CTP hypothetical

Let's assume pedestrians are similarly injured to riders but only TBI meet SA CTP's injury severity threshold for future economic losses:

- 21 pedestrian injuries per year
- Assume 50% (i.e. ~11) hospitalisations
- 8% of hospitalisation have ISV8+
 - **~\$22,500 per hospitalisation**
 - **~\$11,250 per pedestrian injury**

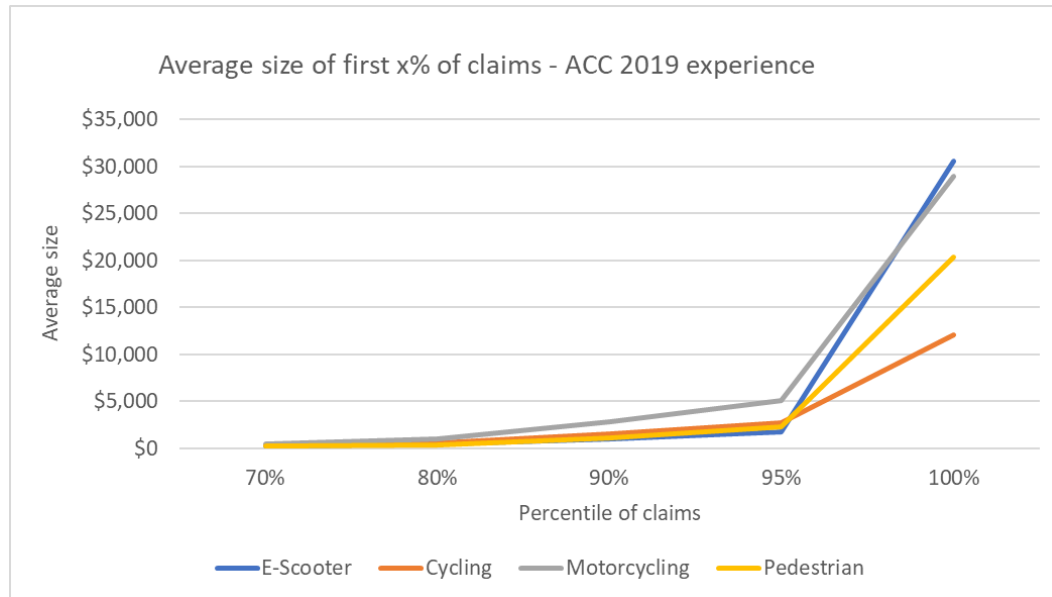
1. Electric personal MObility DEvices Surveillance (E-MODES) study: Injury presentations to emergency departments in Brisbane, Queensland (Vallmuur, et al)

- [illegible]

1. Where the Expected Average Cost (EAC) allows for the expected mix of claims by severity

Comments/observations

- Would no-fault be 33x as much?
- Auckland study (extrapolated to 1 year) indicated:
 - Hospital expenses of \$550/scooter
 - Total healthcare expenses of \$1,200/scooter!
- Heavily dependent on occurrence (or not) of very serious, costly injuries



Concluding remarks



- Lots of information but not always fit-for-purpose. Take care in using it!
- Nevertheless, it is possible to cobble together an indicative estimate of the cost of injuries from e-scooters
- Suggests that stand-alone costs (per e-scooter) are material, driven by the small number of very serious injuries
- The uncertainty in those estimates is very high
- We have not addressed many related issues. E.g.
 - Policy issues, such as equity with other sources of personal injury on the roads
 - Road surface uniformity
 - Potential impact of dedicated lanes
 - Safety developments (GPS speed limiters, collision detectors, ...)

1896 Peugeot with C.S. Rolls driving and man with red flag walking at the front.
Captions are provided by our contributors.



One of three accompanying persons, while any Locomotive is in Motion, shall precede such Locomotive on Foot by not less than Sixty Yards, and shall carry a Red Flag constantly displayed, and shall warn the Riders and Drivers of Horses of the Approach of such Locomotives, and shall signal the Driver thereof when it shall be necessary to stop.

Locomotives on Highways Act (1865)

Red Flag requirement was dropped in 1896.



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Thank you

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