CAREC Road Safety and Sustainable Mobility Course

February 2024

Risk Factors: Motorcycles, Seat-belts, Child Restraints and Distraction

Dave Cliff, GRSP

Risks Associated with Motorcycle Usage

- They share traffic space often with other fast-moving motorized vehicles, and heavier vehicles (e.g., trucks and buses)
- They are less visible
- They lack physical protection

Motorcycle Use Risk

- Several studies have shown that the risk of being killed or injured in road crashes is significantly higher for motorcyclists than for car drivers over the same distance travelled (21 to 34 times greater) - New Zealand Ministry of Transport 2017 and Lin et al 2009

- A rider without a helmet is three times more likely to suffer severe brain damage than a rider with a helmet in the same type of crash - NHTSA 2008

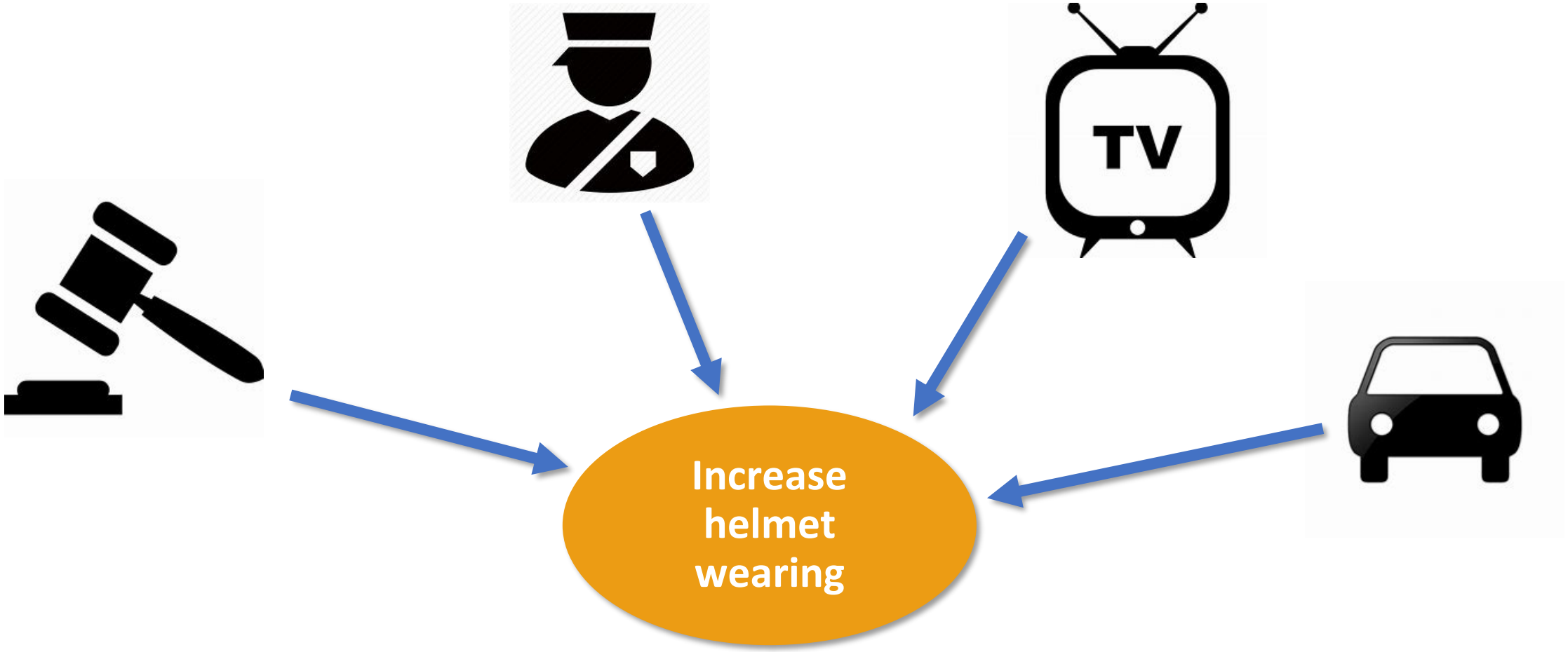
- Of motorcyclists involved in fatal crashes, 27 percent were affected by alcohol/drugs; 33 percent were travelling too fast for the conditions; and 47 percent were travelling too fast for the conditions and/or were affected by alcohol/drugs - New Zealand Ministry of Transport 2017

Risk Associated with Non-Use of Motorcycle Helmets

Head and neck injuries are the main causes of death, severe injury, and disability for motorcyclists.

Not wearing a helmet	Wearing a helmet
• Increases the risk of sustaining a head injury. • Increases the severity of head injuries. • Increases time spent in hospital. • Increases the likelihood of dying from a head injury.	• Decreases the risk and severity of injuries by about 72%. • Decreases the likelihood of death by up to 39%, with the probability depending on the speed of the motorcycle involved. • Decreases the costs of health care associated with crashes.

Effective interventions to ↑ helmet wearing



Use of Protective Equipment

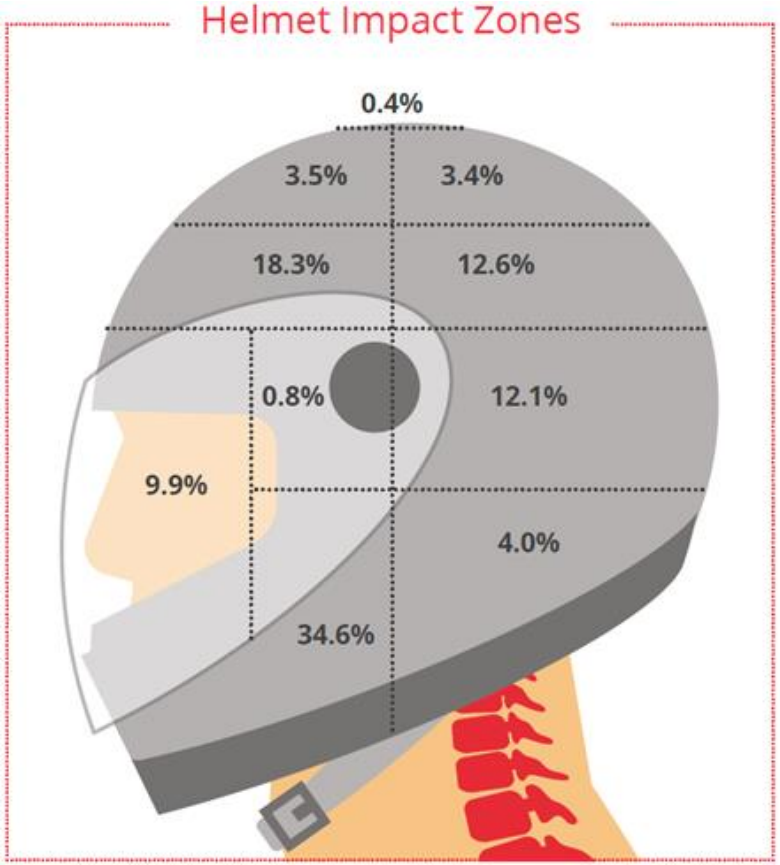
- Mandatory **wearing and fastening of an approved motorcycle helmet** - one that complies with one or more of the **approved international standards** (riders and passengers).
- **Protective & highly visible clothing** - protect from severe skin grazing and high visibility colours make riders more noticeable.
- **Gloves and footwear –** Protection from severe damage.

Optimal Protection: Helmets meet or exceed a recognised international standard, highly visible and offering full face protection

Simple to enforce

Motorcycle Helmets

- An open face helmet isn't as safe as a full-face helmet.
- Open face helmets offer no protection in some head/facial zones that have a high chance of impact in a crash.
- Full-face helmets reduce head and neck injuries in motorcycle crashes.
- White and highly visible helmets reduce risk of crashing ***(motorcyclist visibility is important e.g. daytime running lights, highly visible protective clothing).***



Helmet Types

Tropical

Half Head

Open Face

Full Face

Lowest to Highest Protection

Helmet quality varies widely and counterfeit, poor quality helmets are not uncommon

Over 30% of motor cyclist head impacts occur to the facial area!

ABS Preventing Motorcycle Crashes

- Almost half of all severe and fatal motorcycle crashes in motorcycles above 125 cc could be avoided by using motorcycle ABS – PTW Green Manual 2022
- On 1 January 2016 the European Union passed legislation for mandatory ABS installation on all motorcycles with an engine displacement greater than 125 cc.
- Researchers who reviewed fatal crashes in the US between 2013 and 2019 found that motor cycles equipped with ABS were involved in 22 percent fewer fatal crashes per 10,000 registered vehicle years - Insurance Institute for Highway Safety 2021

ABS (Anti-lock braking system) prevents wheels from locking during braking and may make users more confident to brake fully

Seat-belts

“Wearing a seat-belt reduces the risk of being ejected from a vehicle and suffering serious or fatal injury by between 40%-65%.”

World Report on Road Traffic Injury Prevention, 2004

The Facts

- A collision at 50 km/h has the same effect as a person falling from the **fourth floor** of a building.
- Two-thirds of crashes happen **less than 15 km** away from home.
- A collision can happen **even when the car is stopped**, for example at a traffic light.

Unrestrained passenger ejected through windscreen

Role of Seat-belts

- Seat-belts reduce the consequences of a crash
- What happens if you don’t wear a seat-belt?
  - Continue to move at the same speed at which the car was travelling before the collision
  - Collision with the interior of the car
  - Collision with other occupants
  - Ejection from the car

Role of Seat-belts (Con’t)

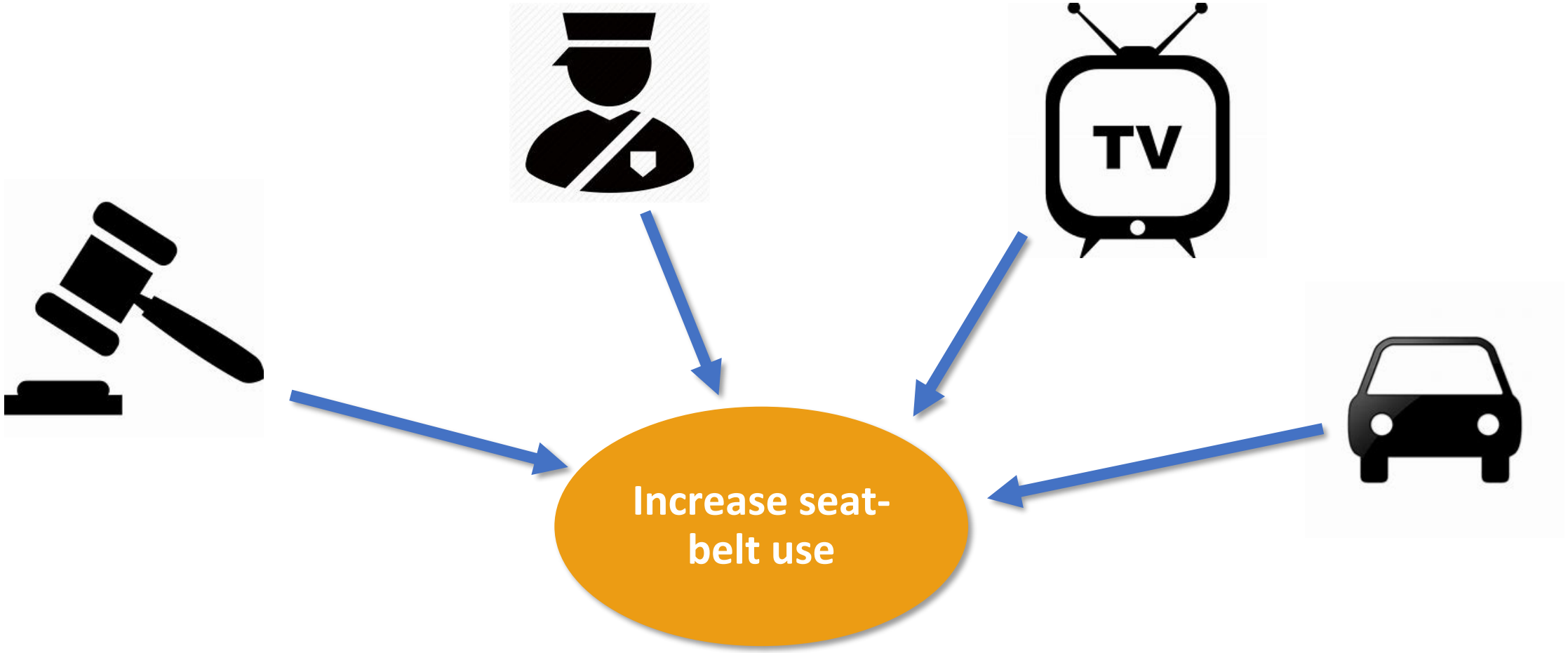
- **Seat-belts:** keep car occupants in seats
  - Reduce mechanical energy
  - Distribute forces of the crash over strongest body parts
  - Reduce risk of contact with the interior of the car
  - Prevent injury to other occupants
  - Prevent occupants from being ejected

Seat-belt Use and Reduction of Risk

- Using seat-belts significantly decreases the risk of death and injury for both:
  - Driver and front-seat passengers
  - Rear-seat passengers
- Rear seat passengers that are unrestrained also represent a danger for the persons sitting in the front.

Occupant position	Risk of fatality	Risk of serious injury	Risk of minor injury
Front seat (driver and front seat passengers)	–45 to –50%	–45%	–20 to –25%
Rear seat	–25%	–25%	–25%

Effective Interventions to ↑ SB-Wearing



The Role of the Law

- Law regulates many key aspects:
  - Obligation for **ALL** to wear seat-belts and enforcement mechanisms
  - Standards for seat-belts and for vehicle standards (fixture and fitting systems of seat-belts in the car)
  - International standards: UN Regulations No 14 and No 16

- Ban on overloading (for example 4 passengers in the rear of a car that only contains 3 seats and 3 seat-belts)

- Minimize exceptions (taxis, police, medical conditions, etc)

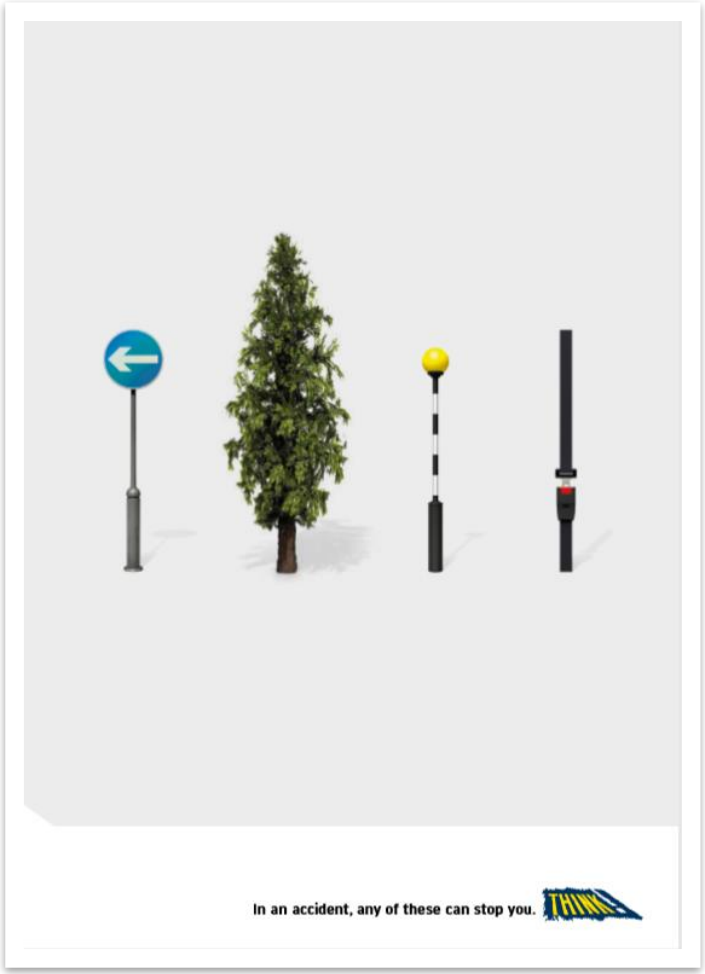
Enforcement Mechanisms

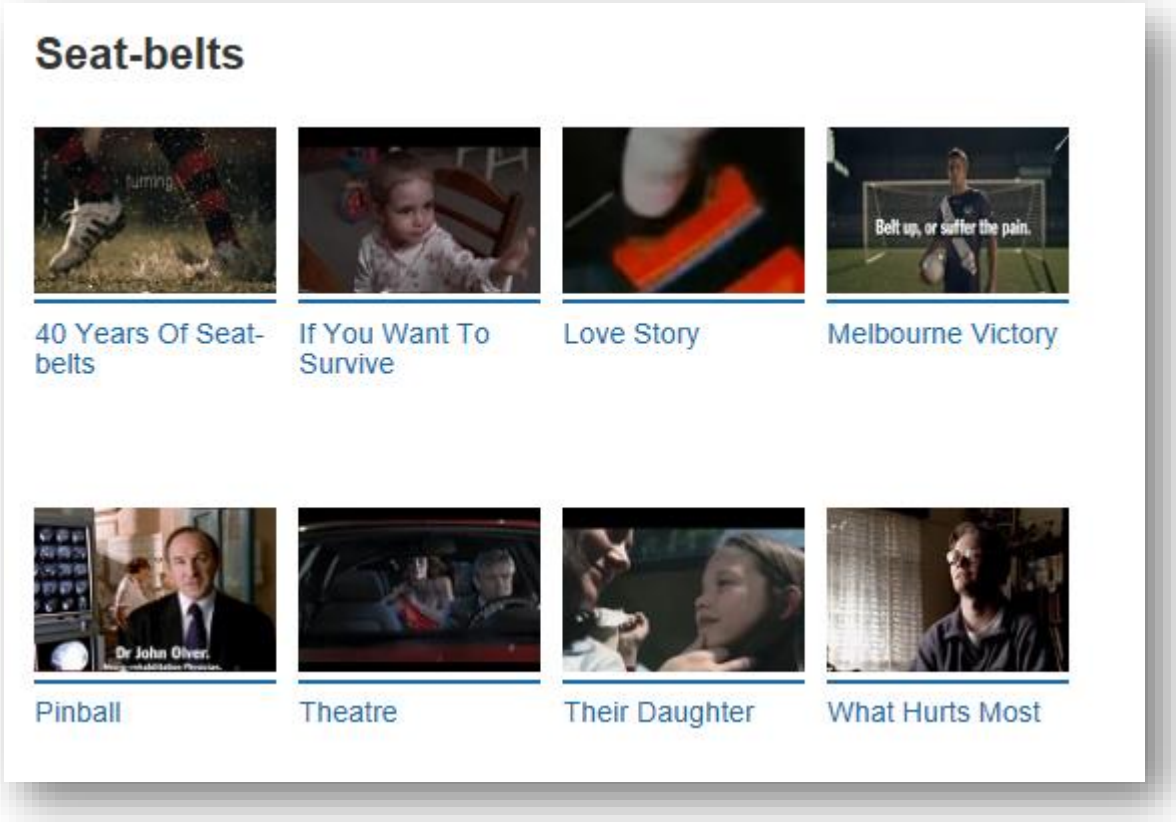
- Primary enforcement laws (PEL), *not* secondary enforcement laws (SEL).
  - PEL allow the police to stop a car for the sole reason of enforcing the seat belt provisions, while SEL requires the commission of another infraction.
- Penalties
  - Fines = most common form;
  - Other examples of effective penalties: demerit points, licence suspension.

Case Study – New South Wales

- The state of New South Wales, Australia, funded awareness raising campaigns on seatbelts for years and wearing rates remained steady at around 20% to 25%.
- With the introduction of well promoted laws and enforcement, wearing rose sharply to 95%.
- Similar experiences exist in relation to speeding and drink-driving.

Raising Awareness





Vehicle Technologies

- Seat-belt
- Seat-belt reminders
- Air bags are an adjunct not a solution

Road Map for Safer Vehicles 2020 UN Regulations* for:	All New Models Produced or Imported	All Vehicles Produced or Imported
Frontal Impact (No.94) Side Impact (No.95)	2018	2020
Seat Belt & Anchorages (No.16 & 14)	2018	2020
Electronic Stability Control No.140 (GTR. 8)	2018	2020
Pedestrian Protection No.127 (GTR. 9)	2018	2020
Motorcycle Anti-Lock Brakes No.78 (GTR.3)	2018	2020
Autonomous Emergency Braking Systems	Highly Recommended	Highly Recommended

*or equivalent national performance requirements, with effective conformity of production

Challenges

- Importance of country context for the design of effective seat-belts programmes (what about second hand vehicles?).
- Weak compliance - especially among young people and rear-seated passengers, at night and in rural areas.
- Knowledge gap on seat-belt law and/or on effective role of seat-belts in reducing the injury risk.
- Lack of, or ineffective enforcement, lack of political will to enforce (including allocation of appropriate resources).
- Opposition from certain groups – commercial interest (cost of (retro) fitting), lobby groups (taxis).

Solutions

- **Enforcement is crucial**
  - Fear of being punished: most determinant factor for compliance
  - Strategically targeted at low compliance groups, places and times

- **Public campaigns** - Prepare the public and facilitate the implementation of the law
  - Raise awareness on the risks associated with not using seat-belts

- **Advocacy**
  - Bringing implementation issue as a political priority

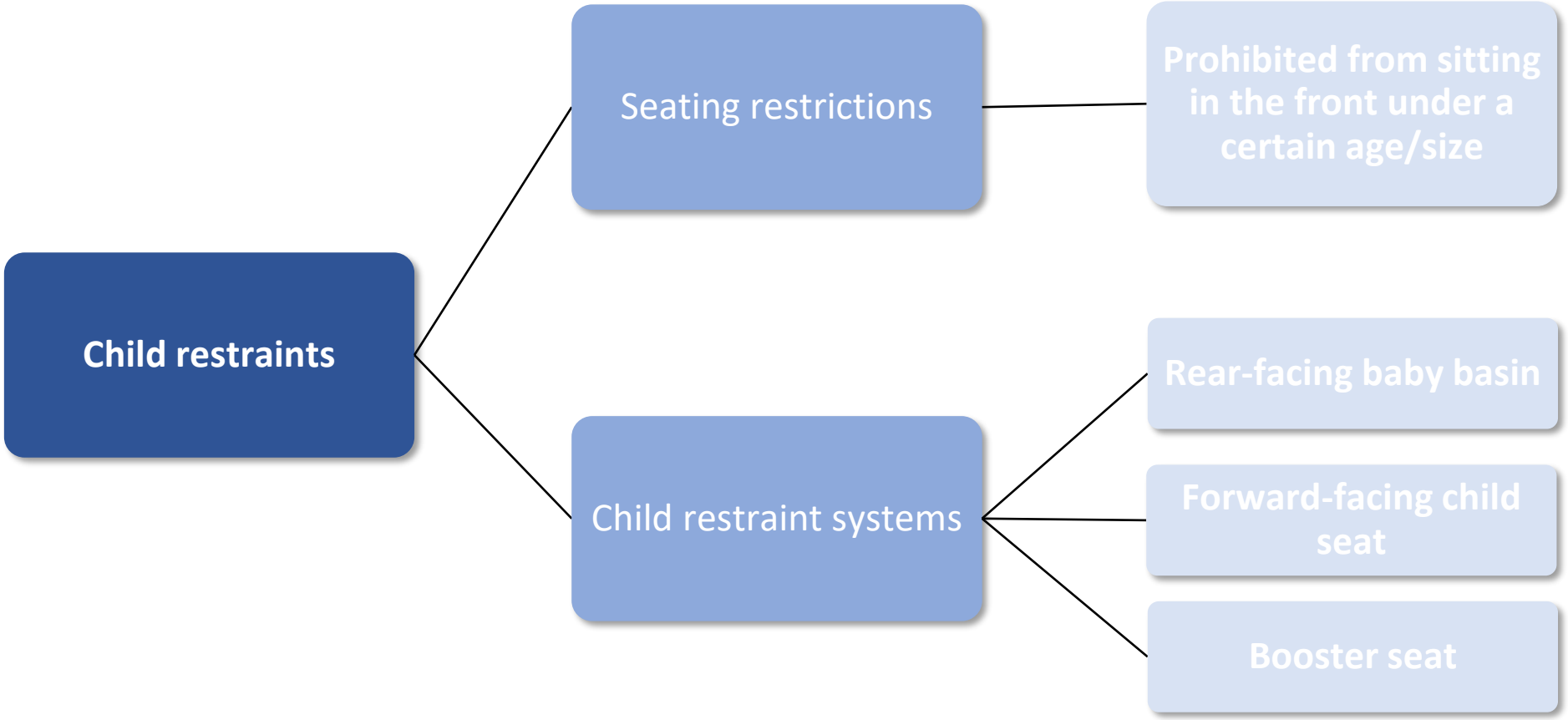
Child Restraints

“Child restraints can reduce deaths among infants by ~ 70% and deaths of small children, aged 1-4, by 54% in the event of a crash.”

Youth and road safety, 2008

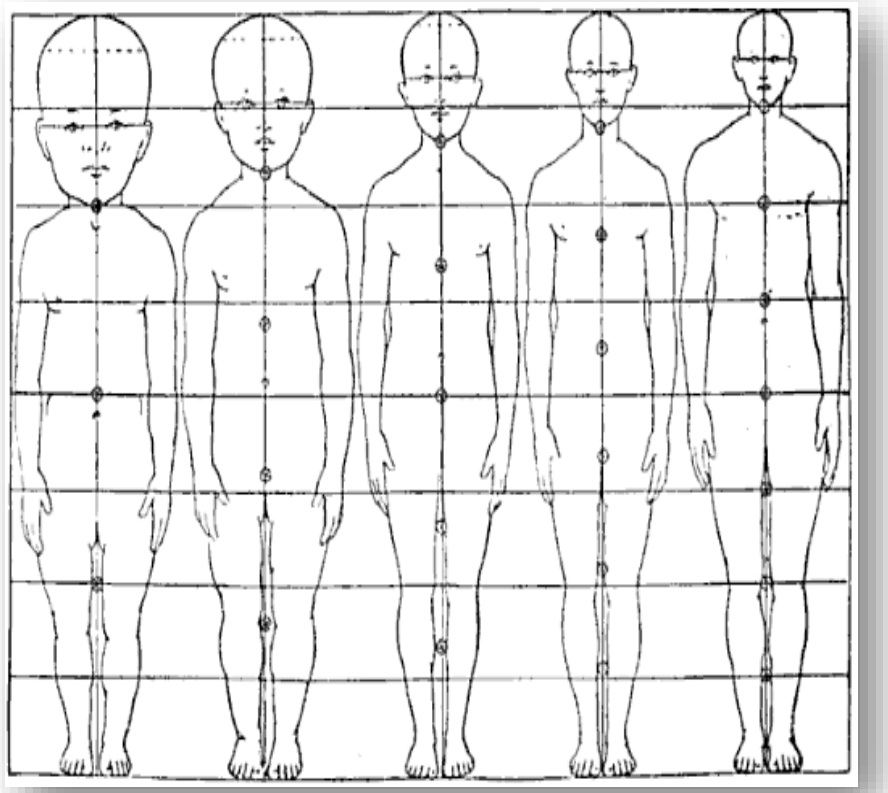
Why Use Child Restraints?

What is Meant by Child Restraints?



How Do CRS Work?

- CRS cannot prevent a crash, but they can reduce the consequences of the impact:
  - Keeping children in their seats and preventing them colliding with the interior and being ejected from the vehicle.
  - Distributing the forces of a crash over the strongest parts of the body.
- CRS are designed for children:
  - Cope with children's developmental stages and accommodate their size and weight.



The Facts

Child restraints reduce the likelihood of a fatal crash by:

Approx.
70%
among infants

Between
54%-80%
among young children

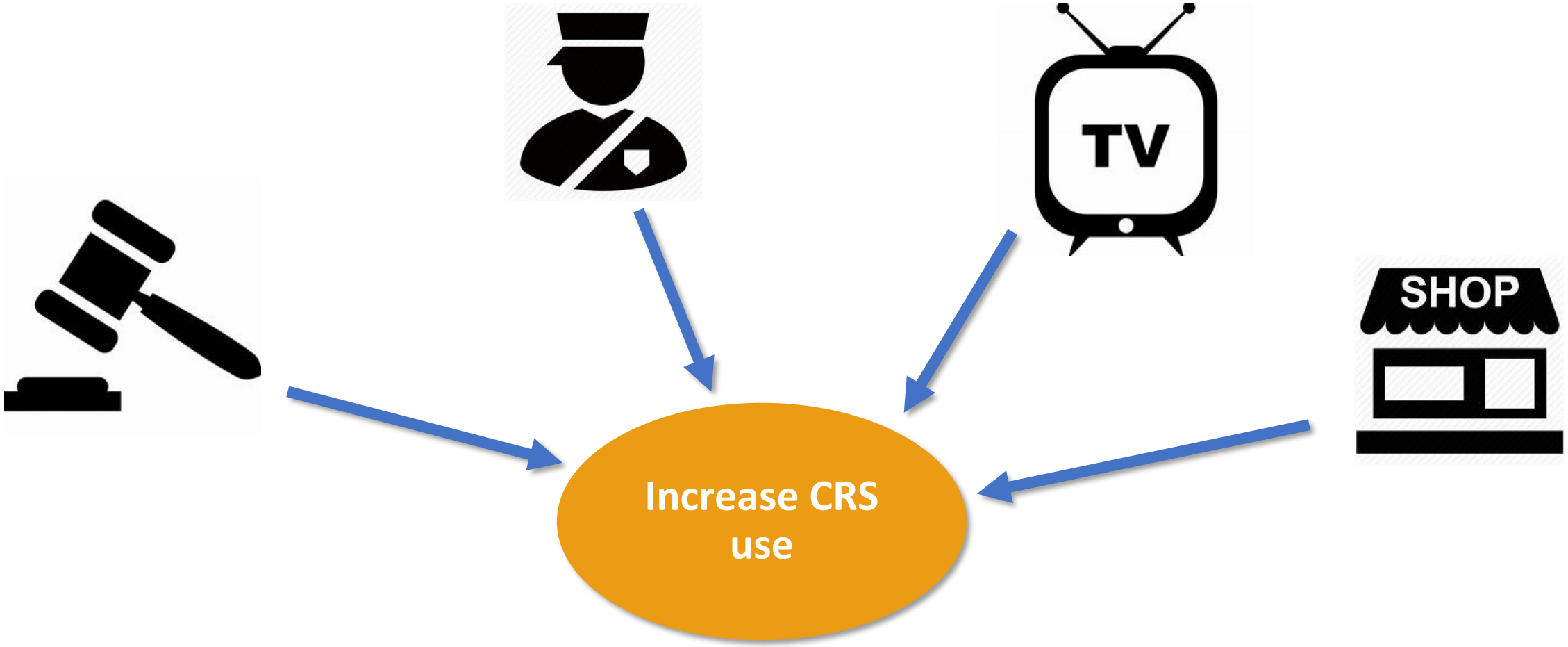
Features of Child Restraint Systems

- CRS need to meet safety standards
  - To avoid CRS that look safe but are not
- Types of standards
  - international
  - national

UN Regulation 44	UN Regulation 129
In force till the end of the transition period (yet to be determined)	In force from 9 July 2013
Classification based on mass (weight) of the child	Classification based on stature (height) of the child
No side-impact protection	Side impact protection
ISOFIX and seat belt-use	Integral harness ISOFIX
	Rearward facing position for child restraint until 15 months

All About Child Restraints

Effective Interventions to Increase CRS Use



Role of the Law

- Effectiveness of law to increase CRS use
  - Limitations of voluntary schemes

- Law regulates many key aspects
  - Obligation to use child restraints
  - Enforcement mechanisms (including penalties)
  - Standards for CRS
  - Vehicle standards : fixture systems (ISOFIX)

Enforcement Mechanisms

- Set penalties – fine: most common penalty for CR laws
- Identify responsible person: in most cases the driver
- Provide primary enforcement law (PEL)
  - The law should not limit the ability of the police to stop the car to enforce the CR provisions; i.e. no additional condition (such as the commission of another infraction) should be required

Public Awareness

Main Challenges

- Lack of compliance with CR law - several contributing factors:
  - Parents do not recognize CRS as the safest way to transport children in the car *(Belief that holding a child will protect them)*
  - Parents are not aware of the existence of a CR law and/or do not feel exposed to fines (lack of enforcement)
  - CRS are expensive or difficult to find
- Availability and affordability
- Misuse (e.g. premature graduation, incorrect fixture, loose strapping) - affects effectiveness of CRS in protecting children

Solutions

- Put in place and enforce a strong child restraint law
- Distribution schemes (loan, low-cost rental, give-aways schemes) and education programmes
- Incentives schemes (rewards for buying or using) and education programmes
- Community wide information and enforcement campaigns
- Insufficient evidence to support education only approaches

Distracted Driving

“Distraction plays a role in the causation of 5% to 25% of car-crashes.”

(Hurts et al., 2011)

What is Distraction?

- Sources of distraction
  - INTERNAL e.g. tuning a radio, talking on mobile
  - EXTERNAL e.g. looking at billboards

- Driver distraction can be one of 4 types
  - Visual (e.g. looking away from the road)
  - Manual (e.g. dialling on a mobile, leaning over to tune the radio
  - Cognitive (reflecting on a subject of conversation)
  - Auditory (e.g. device is turned up so loud it masks other sounds)

Effects of Mobile Phone Use on Driving

- Using mobile phones can cause drivers to take their:
  - eyes off the road (visual distraction);
  - minds off the road (cognitive distraction);
  - hands off the steering wheel (physical distraction)
- Several driving tasks are impaired (longer reaction times, inability to maintain correct lane position, slower braking times, shorter following distances).
- Impact of distraction on driving depends on complexity of distracting task, duration and frequency, as well as road situation.

Effects of Mobile Phone on Crash Risk

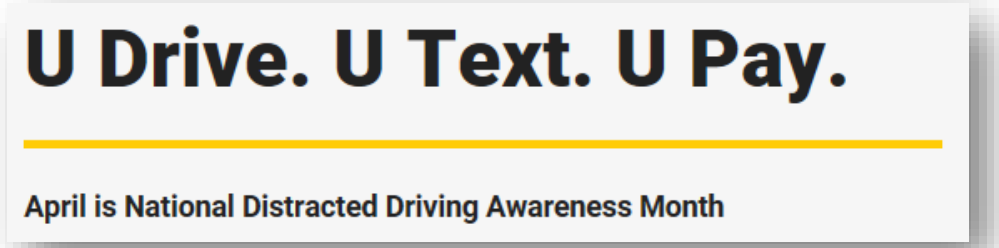
- Drivers using mobile phone are **FOUR times** more likely to be involved in a crash.
- Similar risk for **hand-held and hands-free** phones due to cognitive distraction.
- Effect of age and sex:
  - young and novice drivers: a high-risk group
  - elderly: more tasks at the same time, increased reaction time
- **Text messaging**: much higher crash risk

Approaches to Reduce Distracted Driving

- Legislation:
  - Safe driving laws (e.g., careless or dangerous driving some states in Australia).
  - 138 countries have laws prohibiting hand-held
  - 31 countries prohibit hand-held and hands-free
- Sustained enforcement
- Data collection: move to add mobile phone to crash reporting forms
- Social marketing campaigns to increase awareness of the risks and penalties associated with mobile phone use.

Mobile phone use detection cameras

Texting and Driving



Source: https://www.trafficsafetymarketing.gov/get-materials/distracted-driving/u-drive-u-text-u-pay

Challenges

- Enforcement is difficult, particularly with respect to hands-free phones and blue tooth devices.
- In vehicle technologies increasingly desired by consumer in high end vehicles.
- Overlap with other technologies, e.g., GPS, satellite navigation etc.
- Legislation needs to keep pace with rapidly changing technological environment.

Thank You!