



## SESSION 1.4 UNDERSTANDING RISKS

CONDUCTING ROAD SAFETY AUDITS & APPRAISALS

PRESENTED BY: RTS & AGTTC

6 – 7 June 2023



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## UNDERSTANDING RISK

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### Factors Influencing Exposure to Risk

**Economic factors**

- E.g. Social deprivation

**Demographic factors**

- E.g. Population density

**Land use planning**

- Influences length of trip and mode choice

**Commuter composition**

- Mixture of speed differential

**Road design**

- Diligence, standards, adherence, audits, value engineering.

SOURCE: WHO

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### Risk Factors Influencing Crash Involvement

**Road user choices**

- Inappropriate or excessive speed
- Travel in darkness
- Travel under influence/fatigued

**Roads design factors maintenance**

- Visibility,
- Radii,
- Crests/Sags (K-Values),
- Markings.

**Vehicle factors**

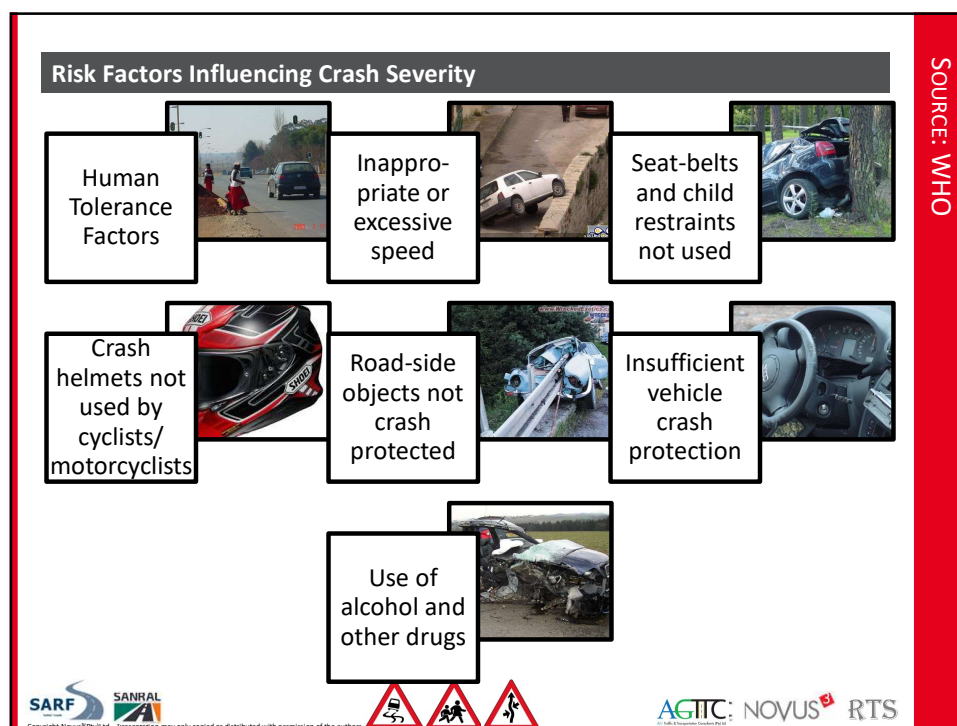
- Braking,
- Handling,
- Maintenance.

**Road user factors**

- Eyesight,
- Diabetes,
- Drugs, alcohol, medicine,
- Fatigue,
- Gender and age,
- Vulnerable users

SOURCE: WHO

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### Non Fatal Injuries – Top 20

The 20 leading non-fatal injuries sustained<sup>a</sup> as a result of road traffic collisions, world, 2002

Type of injury sustained	Rate per 100 000 population	Proportion of all traffic injuries
Intracranial injury <sup>b</sup> (short-term <sup>c</sup> )	85.3	24.8
Open wound	35.6	10.3
Fractured patella, tibia or fibula	26.9	7.8
Fractured femur (short-term <sup>c</sup> )	26.1	7.5
Internal injuries	21.9	6.3
Fractured ulna or radius	19.2	5.5
Fractured clavicle, scapula or humerus	16.7	4.8
Fractured facial bones	11.4	3.3
Fractured rib or sternum	11.1	3.2
Fractured ankle	10.8	3.1
Fractured vertebral column	9.4	2.7
Fractured pelvis	8.8	2.6
Sprains	8.3	2.4
Fractured skull (short-term <sup>c</sup> )	7.9	2.3
Fractured foot bones	7.2	2.1
Fractured hand bones	6.8	2.0
Spinal cord injury (long-term <sup>d</sup> )	4.9	1.4
Fractured femur (long-term <sup>d</sup> )	4.3	1.3
Intracranial injury <sup>b</sup> (long-term <sup>d</sup> )	4.3	1.2
Other dislocation	3.4	1.0

<sup>a</sup> Requiring admission to a health facility.  
<sup>b</sup> Traumatic brain injury.  
<sup>c</sup> Short-term = lasts only a matter of weeks.  
<sup>d</sup> Long-term = lasts until death, with some complications resulting in reduced life expectancy.

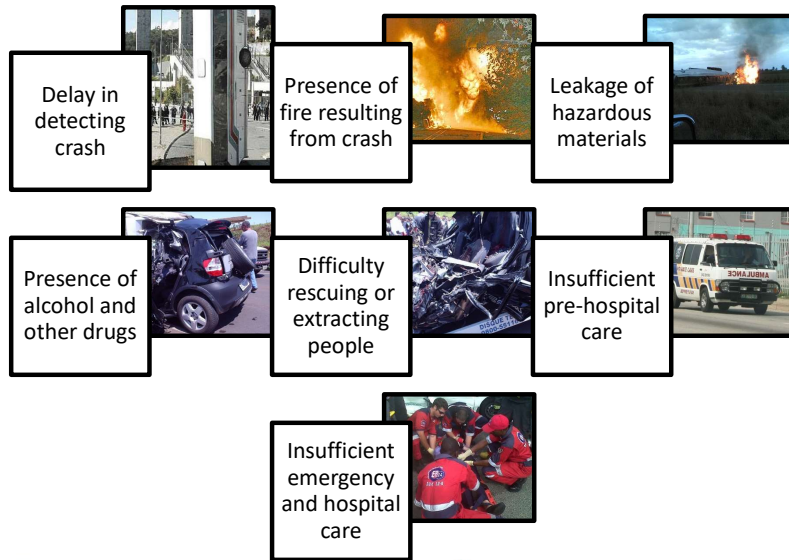
Source: WHO Global Burden of Disease project, 2002, Version 1.

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Source: WHO

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## Risk Factors Influencing Severity of Post-Crash Injuries



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SOURCE: WHO

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## Examples of factors affecting drivers' choice of speed

- Road**
  - Width
  - Gradient
  - Alignment
  - Surroundings
  - Layout
  - Markings
  - Surface quality
- Vehicle**
  - Type
  - Power/weight ratio
  - Maximum speed
  - Comfort
- Traffic**
  - Density
  - Consumption
  - Prevailing speed
- Environment**
  - Weather
  - Surface condition
  - Natural light
  - Road lighting
  - Signs
  - Speed limit
  - Enforcement
- Driver**
  - Age
  - Gender
  - Reaction time
  - Attitudes
  - Thrill-seeking
  - Risk acceptance
  - Hazard perception
  - Alcohol level
  - Ownership of vehicle
  - Circumstances of the journey
  - Occupancy of the vehicle



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SOURCE: WHO

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### Risks of casualty – Speed and Alcohol

#### Relative risks of involvement in a casualty crash for speed and alcohol

Speed (km/h)	Speed (relative risk <sup>a</sup> )	Blood alcohol concentration (g/dl)	Blood alcohol concentration (relative risk <sup>b</sup> )
60	1.0	0.00	1.0
65	2.0	0.05	1.8
70	4.2	0.08	3.2
75	10.6	0.12	7.1
80	31.8	0.21	30.4

<sup>a</sup> Relative to a sober driver travelling at the speed limit of 60 km/h.

<sup>b</sup> Relative to driving with a zero blood alcohol concentration.

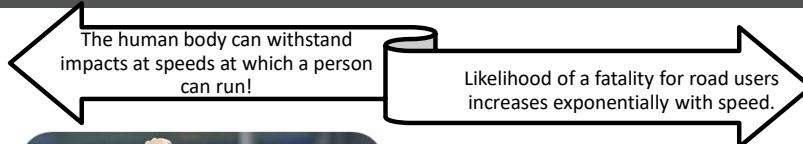
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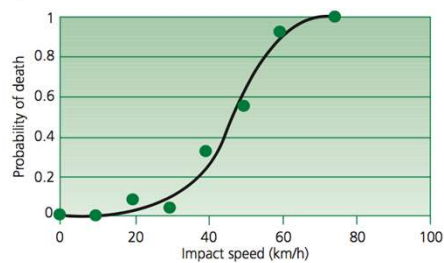
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### Vehicle speed and NMT safety



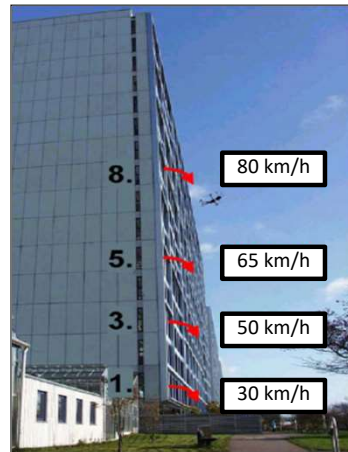
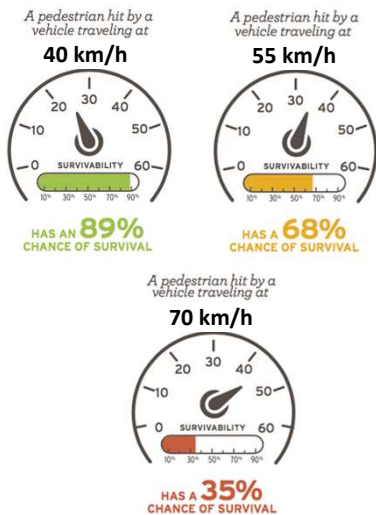
Pedestrian fatality risk as a function of the impact speed of a car



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## Vehicle speed and NMT safety

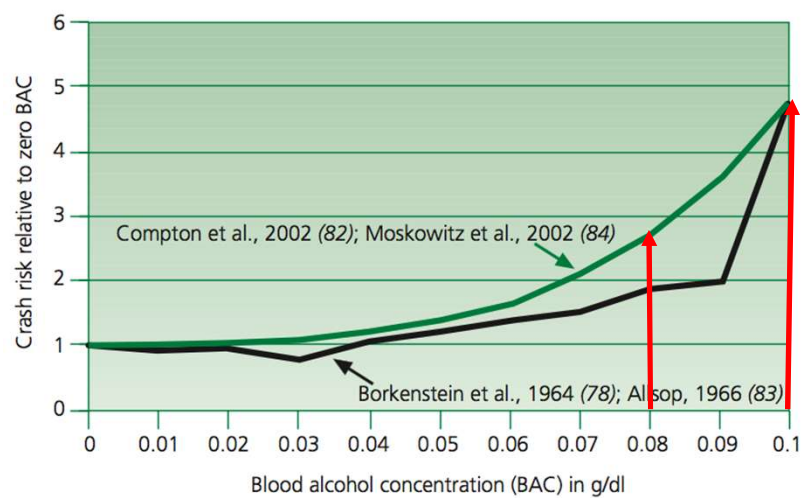


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## Relative Risk of Driver Involvement in Crashes

### Relative risk of driver involvement in police-reported crashes



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### Likely Frequency of the Problem to Lead to a Crash

SOURCE: RSM

Likelihood	
<b>Frequent</b>	One or more per month
<b>Probable</b>	One or more per year (but less than one per month)
<b>Occasional</b>	Once every one to three years
<b>Improbable</b>	Less frequent than once in three years



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### Likely Severity of the Resulting Crash

SOURCE: RSM

Severity of Resulting Crash	
<b>Catastrophic</b>	Likely <b>multiple deaths</b> such as: <ul style="list-style-type: none"> <li>• High-speed, multi-vehicle crash on a freeway</li> <li>• Car runs into crowded bus stop</li> <li>• Bus and petrol tanker collide</li> <li>• Collapse of a bridge or tunnel</li> </ul>
<b>Serious</b>	Likely <b>death or serious injury</b> such as: <ul style="list-style-type: none"> <li>• High or medium-speed vehicle/vehicle collision</li> <li>• High or medium-speed collision with a fixed roadside object</li> <li>• Pedestrian or cyclist struck by a car</li> </ul>
<b>Minor</b>	Likely <b>minor injury</b> such as: <ul style="list-style-type: none"> <li>• Some low-speed vehicle collisions</li> <li>• Cyclist falls from bicycle at low speed</li> <li>• Left-turn rear-end crash in a slip lane</li> </ul>
<b>Limited</b>	Likely <b>trivial injury to property damage</b> only such as: <ul style="list-style-type: none"> <li>• Some low-speed vehicle collisions</li> <li>• Pedestrian walks into object (no head injury)</li> <li>• Car reverses into post</li> </ul>



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### Resulting Level of Risk SARSAM 2012

		FREQUENCY			
		Frequent	Probable	Occasional	Remote
SEVERITY	Catastrophic	Intolerable	High	High	Medium
	Serious	High	High	Medium	Medium
	Minor	High	Medium	Medium	Low
	Negligible	Medium	Medium	Low	Low

SOURCE: RSM



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### Risk and Suggested Treatment Action

Risk	Suggested Treatment Action
Intolerable	The safety concern <b>"must"</b> be corrected, even if the cost is high
High	The safety concern <b>"should"</b> be corrected or the risk significantly reduced, even if the treatment cost is high
Medium	The safety concern <b>"should"</b> be corrected or the risk significantly reduced if the treatment cost is moderate, but not necessarily high
Low	The safety concern <b>"should"</b> be corrected or the risk reduced if the treatment cost is low

The suggested treatment action shown in Step 4 is indicative only. Road authorities should review the levels of risk that they would be prepared to take and develop a particular policy pertaining to the utilisation of Risk Assessment as part of road safety auditing and revise the suggested treatment actions to fit such a policy. This policy should then be implemented consistently.

SOURCE: RSM



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END OF LECTURE 4

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