Session 1.4 Understanding Risks

Conducting Road Safety Audits & Appraisals

Presented by: RTS & AGTT

January 2022

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1

Understanding Risk

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Factors Influencing Exposure to Risk

SOURCE: WHO

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.

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Risk Factors Influencing Crash Involvement

SOURCE: WHO

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

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Risk Factors Influencing Crash Severity

SOURCE: WHO

Human Tolerance Factors

Inappro-priate or excessive speed

Seat-belts and child restraints not used

Crash helmets not used by cyclists/ motorcyclists

Road-side objects not crash protected

Insufficient vehicle crash protection

Use of alcohol and other drugs

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Non Fatal Injuries – Top 20

SOURCE: WHO

The 20 leading non-fatal injuries sustained[a] 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[b] (short-term[c])	85.3	24.6
Open wound	35.6	10.3
Fractured patella, tibia or fibula	26.9	7.8
Fractured femur (short-term[c])	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[c])	7.9	2.3
Fractured foot bones	7.2	2.1
Fractured hand bones	6.8	2.0
Spinal cord injury (long-term[d])	4.9	1.4
Fractured femur (long-term[d])	4.3	1.3
Intracranial injury[b] (long-term[d])	4.3	1.2
Other dislocation	3.4	1.0

[a] Requiring admission to a health facility.
[b] Traumatic brain injury.
[c] Short-term = lasts only a matter of weeks.
[d] 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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Risk Factors Influencing Severity of Post-Crash Injuries

Source: WHO

- Delay in detecting crash
- Presence of fire resulting from crash
- Leakage of hazardous materials
- Presence of alcohol and other drugs
- Difficulty rescuing or extracting people
- Insufficient pre-hospital care
- Insufficient emergency and hospital care

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Examples of factors affecting drivers' choice of speed

Source: WHO

- **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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Risks of casualty – Speed and Alcohol

SOURCE: WHO

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

Speed (km/h)	Speed (relative risk[a])	Blood alcohol concentration (g/dl)	Blood alcohol concentration (relative risk[b])
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

[a] Relative to a sober driver travelling at the speed limit of 60 km/h.
[b] Relative to driving with a zero blood alcohol concentration.
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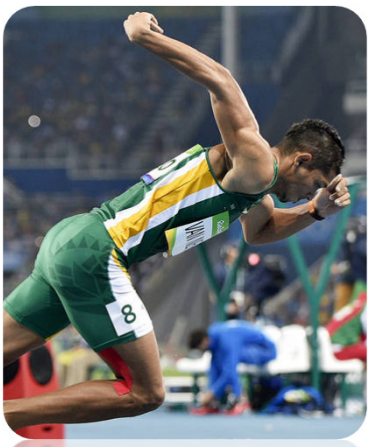
Vehicle speed and NMT safety

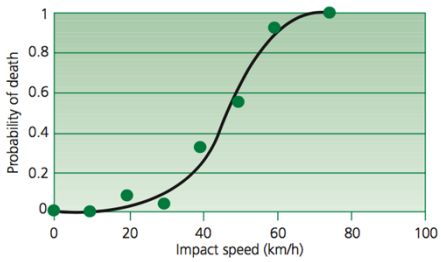
NEED FOR NMT SAFETY STUDIES

The human body can withstand impacts at speeds at which a person can run!

Likelihood of a fatality for road users increases exponentially with speed.



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



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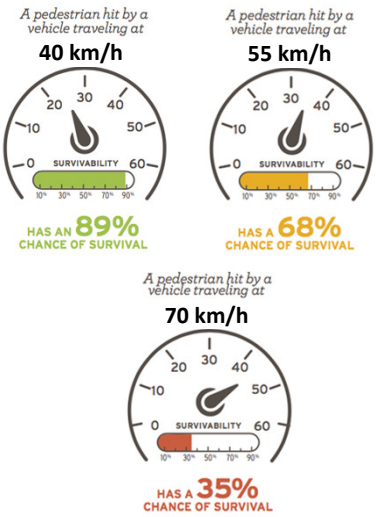
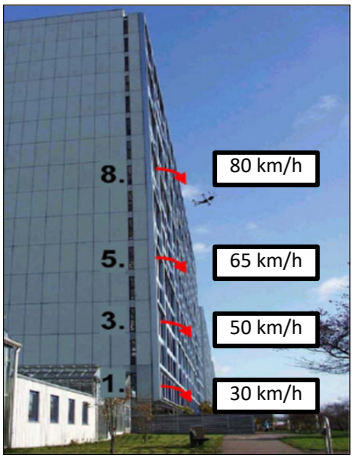
Vehicle speed and NMT safety





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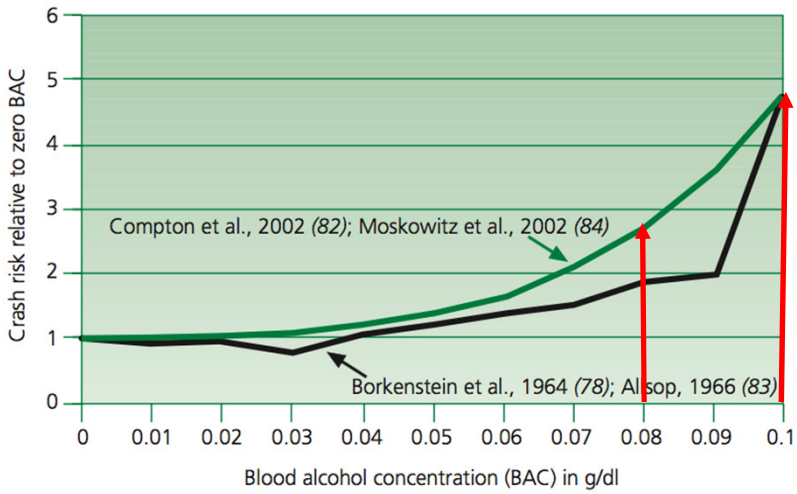
Relative Risk of Driver Involvement in Crashes



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SOURCE: WHO

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Likely Frequency of the Problem to Lead to a Crash

Likelihood	
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five to ten years
Improbable	Less often

SOURCE: RSM

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Likely Severity of the Resulting Crash

Severity of Resulting Crash	
Catastrophic	Likely **multiple deaths** such as: • High-speed, multi-vehicle crash on a freeway • Car runs into crowded bus stop • Bus and petrol tanker collide • Collapse of a bridge or tunnel
Serious	Likely **death or serious injury** such as: • High or medium-speed vehicle/vehicle collision • High or medium-speed collision with a fixed roadside object • Pedestrian or cyclist struck by a car
Minor	Likely **minor injury** such as: • Some low-speed vehicle collisions • Cyclist falls from bicycle at low speed • Left-turn rear-end crash in a slip lane
Limited	Likely **trivial injury to property damage** only such as: • Some low-speed vehicle collisions • Pedestrian walks into object (no head injury) • Car reverses into post

SOURCE: RSM

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Resulting Level of Risk SARSAM 2012

SOURCE: RSM

		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

The suggested treatment action shown 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.

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Resulting Level of Risk Very high standard

SOURCE: RSM

Resulting Level of Risk		Likelihood of Crash			
		Frequent	Probable	Occasional	Improbable
Likely Severity of Crash	Catastrophic	Intolerable	Intolerable	Intolerable	High
	Serious	Intolerable	Intolerable	High	Medium
	Minor	Intolerable	High	Medium	Low
	Limited	High	Medium	Low	Low

A first world country may define their Level of Risk at a higher standard.

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Risk and Suggested Treatment Action

SOURCE: RSM

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

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END OF LECTURE 4

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