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Effective interventions for preventing injuries in motorcyclists

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The burden of motorcycle injuries

- **Motorcycle riders account for between 50-70% of road users in SEARO region**
- **Over 313 million motorcycles world wide, 77% in Asia**
- **Fleet growing – from 1995 to 2006 from 20 to 100M in China, doubled in India, tripled in Indonesia**
- **Motorcyclists and scooter riders are at increased risk of crash, and more likely to die or be seriously injured than car occupants**
- **Increased risk for death and serious injury can be as high as 30-35X**
- **Range of different risk factors compared to high income settings**



Motorcycles and motorcyclists as proportions of all registered vehicles and road casualties

Country	All vehicles n	Motorcycles % motorcycles	All vehicles % motorcyclists	All road casualties
Singapore ^a	711,043	134,767	19.0	45.9
Philippines ^b	4,292,000	1,617,000	37.7	10.1
Malaysia ^c	12,868,930	5,859,195	48.2	59.5
Thailand ^d	25,100,000	17,800,000	70.9	73.6
Indonesia ^e	24,994,890	18,800,000	75.2	73.1
Cambodia ^f	447,428	336,502	75.2	86.2
Vietnam ^g	12,054,000	11,379,000	94.4	62.9
China (2005) ^h	NA	75,565,000	58.1	22.2
India (2008) ^{gi}	105,352,854	75,336,026	71.5	18.7

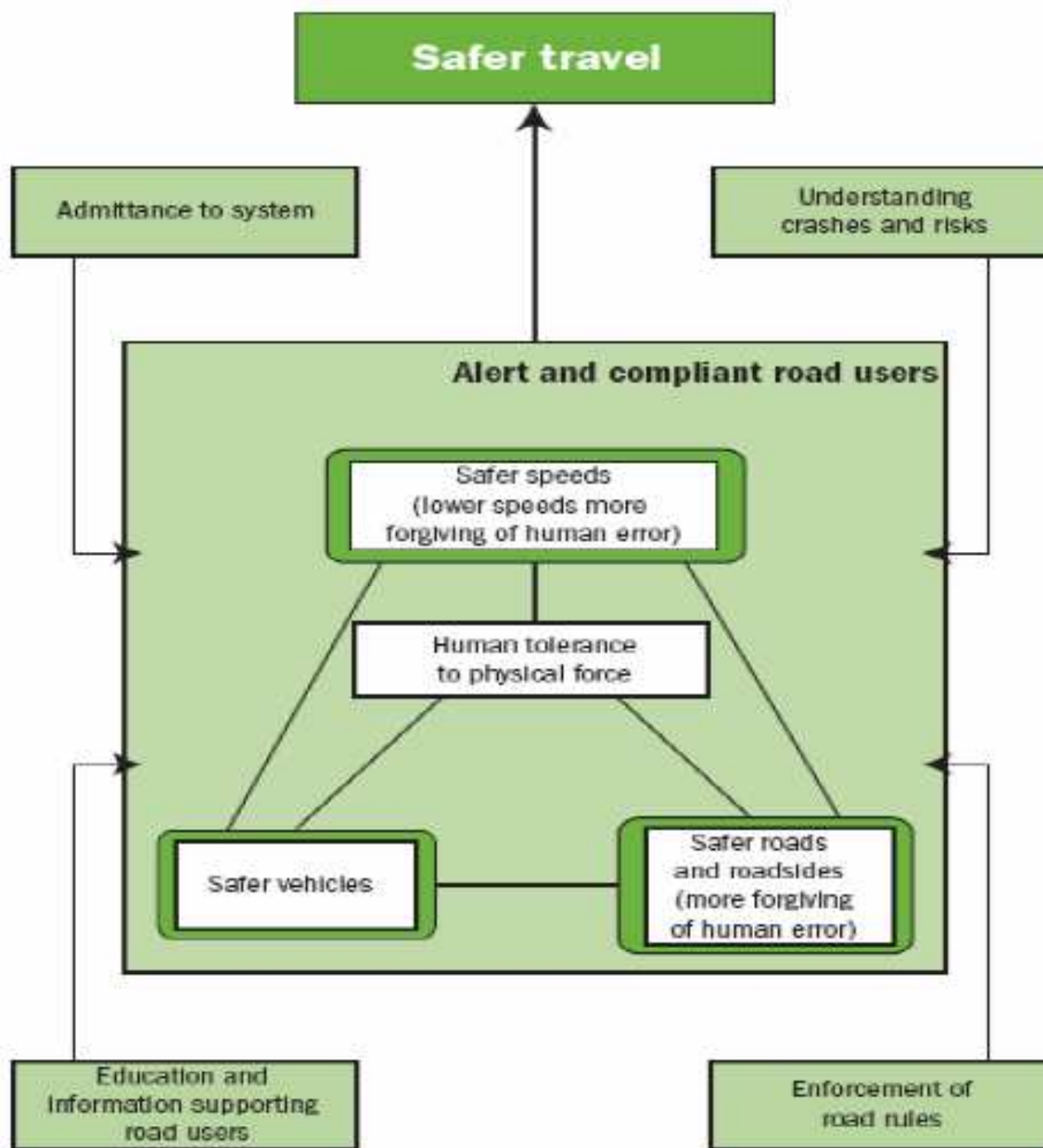
a.(ADB 2005f); b.(ADB 2005e); c.(ADB 2005d); d.(ADB 2005g); e.(ADB 2005c); f.(ADB 2005b); g.(ADB 2005h); h.(Traffic Administration Bureau),i. (Government of India 2010)

Motorcycle injuries

- **Many injuries low severity but can be disabling**
- **Significant head injuries**
- **Patterns of transport, road systems, number of passengers and loads carried vary from those in HIC**
- **Higher proportion of children carried, including unrestrained children and infants**
- **Most research on effective interventions carried out in HIC settings – questionable relevance?**

A Safe System approach

- **Seeks to eliminate deaths and serious injuries by implementing known effective interventions from all inter-related aspects of road safety**
- **Represents radical shift from assigning vast majority of responsibility to road users to a shared system of responsibility between road users and system designers**
- **A “forgiving” system that recognises that human errors do occur but can be corrected**
- **Similar approach in aviation, rail, shipping (also mining etc.)**



The Haddon Matrix for Injury Control

PHASES	FACTORS		
	Human	Vehicle	Environment
Pre-Event	Alcohol, speed distraction, passengers	Bike/tyre defects Overloading	Poor road design Urban planning
Event	Helmet use Protective clothing	Bike design	Fixed objects on side of road
Post-Event	Knowledge of first aid	First aid kit available	Emergency medical response

Major risk factors for motorcycle injury

Environment

Factors influencing exposure to risk:

- Economic factors
- Demographic factors
- Land use
- Travel modes
- Road design



Interventions – environment

- **Road design – separated traffic**
 - Malaysia – exclusive motorcycle lane
 - USD 12850/death averted
 - High costs because of engineering – future lanes cheaper?



Interventions - environment

- **Traffic mix (MC vs heavy vehicle)**
- **Unforgiving roadside objects**
- **Road condition** (potholes, slippery surfaces etc)
- **Traffic calming – slow speeds**
 - Traffic calming/appropriate road design effective in reducing speed
 - Requires investment in infrastructure
 - Cost effective
- **Alternatives**
 - Effective public transport
 - Avoid shift to private car use

Major risk factors for motorcycle injury

People

- Driver inexperience (training and licensing)
- Speed
- Alcohol & other drugs
- Distractions



Interventions – people (1)

- **Effective driver licensing and training systems**
 - Unknown effectiveness but aids enforcement
- **Management of passenger/goods carriage**
 - Enforcement and education
 - Availability of alternatives
 - Unknown effectiveness
- **Alcohol/distraction**
 - Known risk factors
 - Enforcement and education effective
- **Speed**
 - Enforcement based approaches (effective)

Interventions – people (2)

- **Enforcement of road rules, traffic signals**
 - Effective, requires enforcement and education
- **Safe vehicles**
 - Well maintained, no defects
 - Registration and maintenance system (? Cost effectiveness?)
- **Overloading of vehicles**
 - Passengers
 - Goods
 - Need alternatives
 - Enforcement effective

Interventions – people (3)

▪ **Helmets**

- Very effective for reducing head injury and death
- Design issues for children – mechanics of injury poorly understood; need for light-weight design
- Motorsport helmet standard for children 6 yrs + may be appropriate
- Unknown effectiveness of black-market helmets/locally manufactured

▪ **Protective clothing**

- Effective at reducing injury, esp impact protectors
- Expensive and impractical in hot weather
- Need for management of heat stress issues (R&D)

Major risk factors for motorcycle injury

Vehicle

- Vehicle condition
- Vehicle design
- Visibility



Interventions - vehicle

- **Regulation of vehicles**

- Bike type (size of engine, wheels, design)
- Safety features
- Maintenance

- **Visibility**

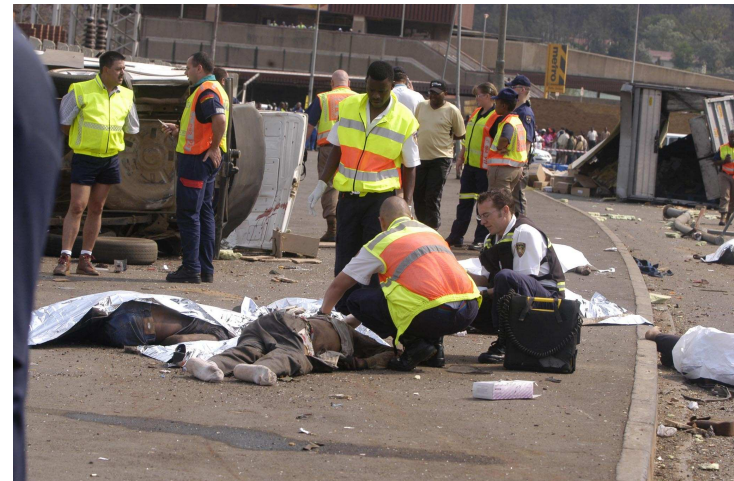
- Visibility enhancement materials
- Modest (if any) effectiveness

Major risk factors for motorcycle injury

Injury severity

Risk factors influencing severity of post-crash injuries

- Human tolerance, health
- First response, emergency medical care
- Chain of medical care from pre-hospital to rehabilitation



Interventions – medical care

- Development of cost effective first response/emergency care
- Benefits all traumatic injury/RTI
- Improvements in medical care/trauma management

Most urgent needs - people

- **Legislative, enforcement, social marketing initiatives around:**
 - Helmet use
 - Drink driving
 - Distraction
 - Passenger carriage/overloading
- **Need for research on these?**
 - Potentially research needed to identify most effective communication campaigns
 - On how to encourage Government investment/police support
 - Police attitudes to enforcement and interventions to improve?

Most urgent needs - people

▪ **Helmets**

- Development of appropriate helmet standard for children > 2 years
- No consensus on experts regarding children < 2 so discourage MC use
- Work to develop light weight helmet for tropical conditions; with appropriate safety rating
- Work to regulate manufacture and sale of helmets
- Licensing, training and registration
 - Some road safety benefits
 - Aid understanding of road rules
 - Aids enforcement

Most urgent needs - environment

- **Separation of traffic**
- **Speed management via engineering and use of speed detection devices (cameras)**