Powered two-wheelers road safety

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POWERED TWO-WHEELERS SAFETY

- Relatively small contribution to mobility improvement contrary to the striking amount of accidents in which powered two-wheelers are involved.

![Killed drivers per million vehicles in use per vehicle type](source: NTUA 2005)
Powered two wheeler fatalities made up more than 20% of the total number of road accident fatalities in 2004.

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TWO-WHEELER ACCIDENTS IN EUROPE

- In 2004, 5,484 occupants of motorcycles and mopeds were killed in road accidents in 14 EU countries.

- A reduction of 6% in powered two-wheeler riders' fatalities is noted during the decade 1995-2004 for the EU-14 countries.

- Between 1995 and 2004 the mortality rate (fatalities per million inhabitants) of powered two-wheeler users declined by 15% (from 20,1 in 1995 to 17,0 in 2004), compared with a 35% decrease (from 69,1 to 47,8) for car occupants.

- Moreover, the road accident risk concerning powered two wheelers (two wheeler fatalities per respective vehicle fleet) tends to decrease during the last years, throughout the European Union.
TWO-WHEELERS RISK PARAMETERS

Important reasons why powered two-wheeler riders have a higher accident risk are:

• the riding style (too fast for some motor drivers)
• poor visibility and recognisability by other road users
• high degree of vulnerability due to lack of protection

Also, in general, the powered two-wheeler rider:

• often fails to modify his speed to accommodate current conditions
• fails to recognise dangerous situations sufficiently
• is unaware of his own limitations and those of his motorcycle
• gives insufficient consideration to the perception capabilities of other road users
• lacks the skills needed in an emergency situation
• is insufficiently aware of his own vulnerability in the event of a collision
STRUCTURE AND CULTURE

- Road safety programs (with special provision for powered two-wheeler riders)
- Road safety authorities (with special provision for powered two-wheeler riders)
- User motivation for riding powered two-wheelers
- Conditions for riding powered two-wheelers
- Attitudes towards risk taking
- Climate
Available

- Road safety programs with special provision for powered two-wheelers (partly available)
- Conditions for riding two-wheelers
- Climate

Missing

- Road safety authorities (special provision for powered two-wheelers)
- User motivation for riding powered two-wheelers
- Attitudes towards risk taking
SAFETY MEASURES AND PROGRAMS

- Powered two wheeler driving lessons/compulsory training
- Legal access age
- Provisional driving licenses (according to driving experience)
- Helmet wearing law
- Compulsory periodical technical inspections
- Enforcement/penalty levels
- Quality of road design standards with respect to powered two-wheeler specifications (visibility, obstacle free, good carriageway conditions)
- Awareness raising campaigns related to powered two-wheeler riders
- Specific traffic regulation for powered two-wheelers
- Periodic revisions of driving licensing for powered two-wheeler drivers
- Systematic recording powered two-wheeler violations (implementation of 'point system')

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SAFETY MEASURES AND PROGRAMS

Available

- Powered two-wheeler users driving lessons/compulsory training
- Provisional driving licenses, according to driving experience (partly available)
- Legal access age
- Helmet wearing law
- Compulsory periodical technical inspections
- Enforcement/penalty levels
- Awareness raising campaigns related to powered two-wheeler riders
- Systematic recording powered two-wheeler violations (implementation of 'point system')

Missing

- Quality of road design standards (not always)
- Specific traffic regulation for two-wheelers
- Periodic revisions of driving license for two-wheeler drivers

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SAFETY PERFORMANCE INDICATORS

- Helmet/protective clothing wearing rate
- Alcohol and drugs related powered two-wheeler accidents
- Fatigue related powered two-wheeler accidents
- Speed related powered two-wheeler accidents
- Powered two-wheeler active safety systems (ABS etc)
- Degree of compliance with road design quality standards, with respect to powered two-wheelers
- Powered two-wheeler distribution in the vehicle fleet (by type and engine size)
- Comparisons to other modes of transport
- Data on PTW riders violations
- Data on technical inspection of powered two-wheelers
### SAFETY PERFORMANCE INDICATORS

**Available**

- Helmet wearing rate (partly available)
- PTW distribution in the vehicle fleet by type and engine size (partly available)
- Driving experience

**Missing**

- PTW riders under the influence of alcohol and drugs
- PTW speeding
- PTW riders under the influence of fatigue
- PTW active safety systems (ABS etc)
- Comparisons to other modes of transport
- Protective clothing wearing rate
- Data on technical inspection of powered two wheelers
- Degree of compliance with road design quality standards, with respect to PTWs
- Data on PTW riders violations

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FINAL OUTCOMES

- Number of killed powered two-wheeler riders
- Number of injured powered two-wheeler riders by injury severity type
- Powered two-wheeler riders' casualties by 1,000,000 inhabitants
- Powered two-wheeler riders' casualties by 1,000 veh-kms
- Reduction in powered two-wheeler accidents in relation to the total accident reduction
- Number of powered two-wheeler riders wearing helmet/safety equipment
- Relative rate for fatality proportions in PTW occupants by age group
**FINAL OUTCOMES**

**Available**

- Number of killed powered two-wheeler riders
- Number of injured powered two-wheeler riders by injury severity type
- Reduction in powered two-wheeler accidents in relation to the total accident reduction
- PTW riders' casualties by 1,000 veh-kms (partly available)
- PTW occupants casualties by 1,000,000 inhabitants
- Relative rate for fatality proportions in powered two-wheeler riders by age group

**Missing**

- Number of PTW casualties wearing helmet / safety equipment

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SOCIAL COSTS

- Costs due to powered two-wheeler fatal accidents
- Costs due to powered two-wheeler non-fatal accidents
- Costs related to material-damage-only powered two-wheeler accidents
- Harmonised Value of Statistical Life
SOCIAL COSTS

Available

• Costs due to powered two-wheeler fatal accidents
• Costs due to powered two-wheeler non-fatal accidents
• Costs related to material-damage-only powered two-wheeler accidents (partly available)

Missing

• Harmonised Value of Statistical Life

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COUNTRY EXAMPLE: GREECE

STRUCTURE AND CULTURE

• Road safety authorities with special provision for PTW: Not available
• Road safety programs with special provision for PTW: Not available
• User motivation for riding PTW: Not available
• Conditions for riding PTW: Not available
• Attitudes towards risk taking: Not known
• Climate: Favorable (mostly sunny and dry) during 3/4 of the year
• Carriageway conditions: Not good (in general)
• PTW traffic volume: Not available
COUNTRY EXAMPLE: GREECE

SAFETY MEASURES AND PROGRAMS

- PTW users driving lessons: Compulsory theoretical and practical training lessons and exams. Minimum age for each license category.
- Legal access age: 16 for mopeds, 18 for motorcycles up to 25kW, 21 for motorcycles regardless the engine power
- Provisional driving licenses (according to driving experience): see above
- Helmet wearing law: Obligatory
- Compulsory periodical technical inspections: Obligatory periodical technical inspections
- Enforcement/penalty levels: Defined in the Greek traffic law
- Quality of road design standards with respect to powered two-wheeler specifications: Not in satisfactory level
COUNTRY EXAMPLE: GREECE

SAFETY PERFORMANCE INDICATORS

• Helmet/protective clothing wearing rate: Not available
• Alcohol and drugs related PTW accidents: Partially available (alcohol only). In 2005 in Greece, 273 accidents occurred with at least one powered two-wheeler rider involved and at least one driver with an alcohol level above the legal limit.
• Speed related PTW accidents: Not available
• PTW active safety systems (ABS etc): Not available
• Degree of compliance with road design quality standards, with respect to powered two-wheelers: Not available
SAFETY PERFORMANCE INDICATORS (2)

• PTW distribution in the vehicle fleet: Available.
  In 2004 2,600,714 PTW’s were registered in Greece, out of 7,860,142 vehicles (including mopeds). Therefore: \( \frac{2,600,714}{7,860,142} = 0,33 \)

• Comparisons to other modes of transport: Available.
  Powered two-wheeler riders' deaths per million vehicles for 2005: \( \frac{457}{2,6} = 175,77 \)
  Passenger car occupants' deaths per million vehicles for 2005: \( \frac{816}{4,07} = 200,49 \)
COUNTRY EXAMPLE: GREECE

FINAL OUTCOMES

- Number of killed powered two-wheeler riders: Available.
  In 2005 in Greece 457 powered two-wheeler riders were killed.
- Number of injured PTW riders by injury severity type: Available.
  Seriously injured PTW riders for 2005 in Greece: 920
  Slightly injured PTW riders for 2005 in Greece: 7,569
- PTW riders' casualties by 1,000 veh-kms: Not available
- PTW riders' casualties by 1,000,000 inhabitants: Available. In 2005 in Greece 457 two-wheeler riders were killed and the population of Greece was 11 million people. The calculated indicator is \(\frac{457}{11} = 41.55\)
- Reduction in PTW accidents in relation to the total accident reduction: Available. Killed PTW riders in Greece in:
  1996: 541
  2005: 457
  People killed in road accidents in Greece in:
  1996: 2157
  2005: 1658

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COUNTRY EXAMPLE: GREECE

FINAL OUTCOMES (2)

• Relative rate for fatality proportions in PTW riders by age group: Available.
  Relative rate (deaths per million population): 111,58
  Killed powered two-wheeler riders aged 25-34 in 2005: 138
  Population aged 15-24 in 2005: 1,710,716
  Relative rate (deaths per million population): 80,67

• Number of powered two-wheeler riders wearing helmet/safety equipment: Not available
SOCIAL COSTS

- Costs due to powered two-wheeler fatalitities: Available
  457 powered two-wheeler riders' fatalities * 1.200.000 € per fatality = 548.400.000 €
- Costs due to powered two-wheeler non-fatal accidents: Not available
- Costs related to material-damage-only powered two-wheeler accidents: Not available
- Value of Statistical Life: 1.200.000€ for a person killed
USING THE PYRAMID STRUCTURE

- In general, the pyramid allows for a complete picture of the road safety phenomenon and useful insight on the road accidents causality.

- “Safety Performance Indicators” is the "weakest link"; in the middle of the pyramid impedes information flow.

- The links between the layers of the pyramid are as important as the layers.

- It is suggested to start from the “Safety Performance Indicators”, where the problem is identified and proceed to both sides.
PROBLEMS IDENTIFIED

• Difficult/impossible to find critical behavioural data through macroscopic and in-depth surveys
  - speeding
  - aggressiveness
  - alcohol
  - fatigue

• Difficult/impossible to establish relations between behavioural data and safety performance
RECOMMENDATIONS

• New methods beyond macroscopic and in-depth surveys to collect necessary data

• Behavioural experiments on sufficiently representative samples
  - Stated preference recording attitude
  - Revealed preference recording behaviour through observations

• Specialised analyses linking:
  - safety output with safety behaviour/performance
  - safety measures with safety performance
RECOMMENDATIONS FOR THE ERSO

European Road Safety Observatory

• Pan-European behaviour surveys/experiments
• Quantity and Quality Performance Indicators
• Enhanced with more knowledge to become a useful platform for exchange of information across Europe
• EU recommendations for common information data collection
• Intensive specialised analyses to link:
  - safety output with safety behaviour/performance
  - safety measures with safety performance