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Compendium

Traffic Safety Statistics between Project Partner Countries (Egypt, Jordan and Lebanon, Poland, Spain and Sweden) and Internationally

Master Curriculum, Capacity Building and Network Development in Traffic Safety in Egypt, Jordan and Lebanon
AGREEMENT NUMBER – 2015–3172/001-001
Project reference number – 561768-EPP-1-2015-1-PL-EPPKA2-CBHE-JP

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Table of contents

EGYPT

Population: 82 056 378 • Income group: Middle • Gross national income per capita: US$ 3 140

INSTITUTIONAL FRAMEWORK

Lead agency	National Council for Road Safety
Funded in national budget	No
National road safety strategy	Yes
Funding to implement strategy	Not funded
Fatality reduction target	5% annually (2011–2020)

SAFER ROADS AND MOBILITY

Formal audits required for new road construction projects	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	No
Policies to encourage investment in public transport	No
Policies to separate road users and protect VRUs	No

SAFER VEHICLES

Total registered vehicles for 2013	7 037 954
Cars and 4-wheeled light vehicles	3 851 916
Motorized 2- and 3-wheelers	1 888 140
Heavy trucks	1 054 175
Buses	104 013
Other	139 710
Vehicle standards applied[a]	
Frontal impact standard	Yes
Electronic stability control	Yes
Pedestrian protection	Yes

[a] UNECE WP29.

POST-CRASH CARE

Emergency room injury surveillance system	Yes
Emergency access telephone numbers	123
Permanently disabled due to road traffic crash	—

DATA

Reported road traffic fatalities (2013)	6 700[b] (83% M, 17% F)
WHO estimated road traffic fatalities	10 466
WHO estimated rate per 100 000 population	12.8
Estimated GDP lost due to road traffic crashes	—

[b] Central Agency for Public Mobilization and Statistics. Defined as died at scene of crash.

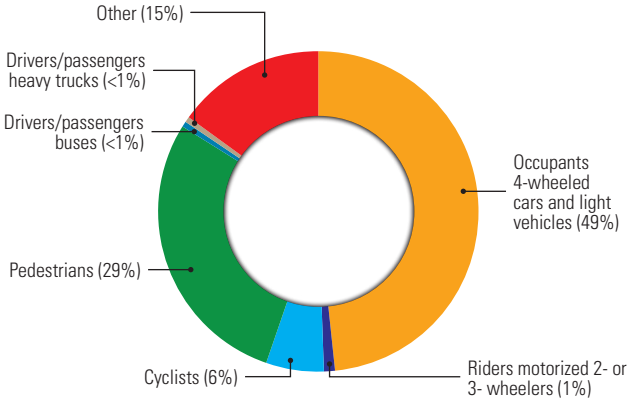
SAFER ROAD USERS

National speed limit law	Yes
Max urban speed limit	60 km/h
Max rural speed limit	90 km/h
Max motorway speed limit	100 km/h
Local authorities can modify limits	Yes
Enforcement	0 1 2 3 4 ⑤ 6 7 8 9 10
National drink–driving law	Yes[c]
BAC limit – general population	—
BAC limit – young or novice drivers	—
Random breath testing carried out	Yes
Enforcement	0 1 2 3 4 5 ⑥ 7 8 9 10
% road traffic deaths involving alcohol	—
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Law requires helmet to be fastened	No
Law refers to helmet standard	No
Enforcement	0 1 2 3 4 ⑤ 6 7 8 9 10
Helmet wearing rate	—
National seat-belt law	Yes
Applies to front and rear seat occupants	No
Enforcement	0 1 2 3 4 5 6 7 ⑧ 9 10
Seat-belt wearing rate	14%–19% Drivers[d], 3%–4% Front seats[d]
National child restraint law	No
Restrictions on children sitting in front seat	Yes
Child restraint law based on	—
Enforcement	—
% children using child restraints	—
National law on mobile phone use while driving	Yes
Law prohibits hand-held mobile phone use	Yes
Law also applies to hands-free phones	No
National drug-driving law	Yes

[c] Not based on BAC.

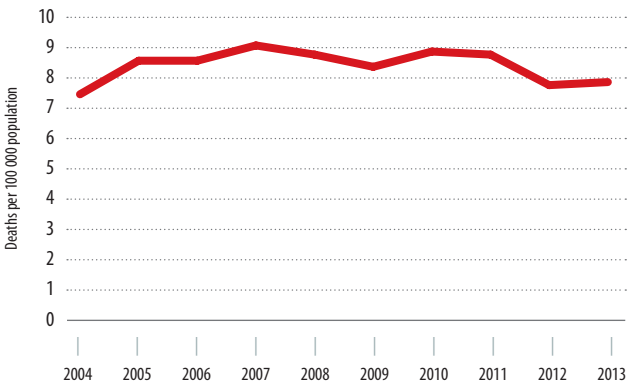
[d] 2011–2012, Risk factors for Road Traffic Injuries in Egypt: Findings from Two Cities (range reflects different principal roads).

DEATHS BY ROAD USER CATEGORY



Source: Health Directorate, Health Officers, Death Certificates (data from 2013).

TRENDS IN REPORTED ROAD TRAFFIC DEATHS



Source: Central Agency for Public Mobilization and Statistics.

Legislative review conducted by WHO. Vehicle safety data from UNECE WP29. Other data collected by questionnaire and cleared by General Authority for Roads, Bridges and Land Transport (GARBLT).

EGYPT

Population: 75 497 913

Income group: Middle

Gross national income per capita: $1 580

INSTITUTIONAL FRAMEWORK

Lead agency	**National Council for Road Safety**
Funded in national budget	**Yes**
National road safety strategy	**Yes**
Measurable targets	**No**
Funded	**No**

NATIONAL LEGISLATION

Speed limits set nationally	**Yes**
Local authorities can set lower limits	**No**
Maximum limit urban roads	**60 km/h**
Enforcement[a]	0 1 2 3 4 5 6 **7** 8 9 10
Drink–driving law	**Yes**
BAC limit – general population	**None**[b]
BAC limit – young or novice drivers	**None**[b]
Random breath testing and/or police checkpoints	**No**
Road traffic deaths involving alcohol	—
Enforcement[a]	0 1 2 3 **4** 5 6 7 8 9 10
Motorcycle helmet law	**Yes**
Applies to all riders	**No**
Helmet standards mandated	**No**
Helmet wearing rate	**70% Passengers**[c]
Enforcement[a]	0 1 2 3 4 5 **6** 7 8 9 10
Seat-belt law	**Yes**
Applies to all occupants	**No**
Seat-belt wearing rate	**70% Drivers**[c]
Enforcement[a]	0 1 2 3 4 5 6 **7** 8 9 10
Child restraints law	**No**
Enforcement[a]	**n/a**

[a] Enforcement score represents consensus based on professional opinion of respondents, on a scale of 0 to 10 where 0 is not effective and 10 is highly effective.
[b] Drink–driving not defined by BAC limit.
[c] 2003, Ministry of Interior.

VEHICLE STANDARDS

Car manufacturers required to adhere to standards on	
Fuel consumption	**No**
Seat-belt installation for all seats	**No**

ROAD SAFETY AUDITS

Formal audits required for major new road construction projects	**Yes**
Regular audits of existing road infrastructure	**Yes**

PROMOTING ALTERNATIVE TRANSPORT

National policies to promote walking or cycling	**No**
National policies to promote public transportation	**Yes**

POST-CRASH CARE

Formal, publicly available pre-hospital care system	**Yes**
National universal access number	**Yes**

— Data not available.
n/a Data not required/not applicable.

DATA

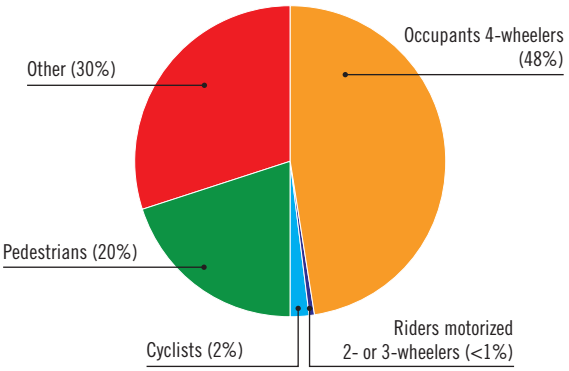
Reported road traffic fatalities (2007)
12 295[d] (70% males, 30% females)

Reported non-fatal road traffic injuries (2007)
154 000[e]

Costing study available
No

[d] Health data, defined as died at the crash scene.
[e] 2007, Health data.

DEATHS BY ROAD USER CATEGORY



Source: 2005, National Information Center for Health & Population

TRENDS IN ROAD TRAFFIC DEATHS

REGISTERED VEHICLES

4 300 000 total (2008)

Motorcars	**60%**
Motorized 2- and 3-wheelers	**19%**
Trucks	**18%**
Buses	**2%**
Other	**1%**

Data cleared by the Ministry of Health and Population.

JORDAN

Population: 5 924 245

Income group: Middle

Gross national income per capita: $2 850

INSTITUTIONAL FRAMEWORK

Lead agency	**Road Safety Council**
Funded in national budget	**No**
National road safety strategy	**Yes**[a]
Measurable targets	**n/a**
Funded	**n/a**

[a] Not formally endorsed by government.

NATIONAL LEGISLATION

Speed limits set nationally	**Yes**
Local authorities can set lower limits	**Yes**
Maximum limit urban roads	**50–80 km/h**
Enforcement[b]	0 1 2 3 4 5 **6** 7 8 9 10
Drink–driving law	**Yes**
BAC limit – general population	**0.08 g/dl**
BAC limit – young or novice drivers	**0.08 g/dl**
Random breath testing and/or police checkpoints	—
Road traffic deaths involving alcohol	—
Enforcement[b]	0 1 2 **3** 4 5 6 7 8 9 10
Motorcycle helmet law	**Yes**
Applies to all riders	**Yes**
Helmet standards mandated	**No**
Helmet wearing rate	—
Enforcement[b]	0 1 2 3 **4** 5 6 7 8 9 10
Seat-belt law	**Yes**
Applies to all occupants	**No**
Seat-belt wearing rate	**65% Drivers, 10% Front passengers**[c]
Enforcement[b]	0 1 2 3 4 **5** 6 7 8 9 10
Child restraints law	**No**
Enforcement[b]	**n/a**

[b] Enforcement score represents consensus based on professional opinion of respondents, on a scale of 0 to 10 where 0 is not effective and 10 is highly effective.
[c] 2006, Jordan Traffic Institute.

VEHICLE STANDARDS

No car manufacturers

ROAD SAFETY AUDITS

Formal audits required for major new road construction projects	**No**
Regular audits of existing road infrastructure	**No**

PROMOTING ALTERNATIVE TRANSPORT

National policies to promote walking or cycling	**No**
National policies to promote public transportation	**Yes**

POST-CRASH CARE

Formal, publicly available pre-hospital care system	**Yes**
National universal access number	**Yes**

— Data not available.
n/a Data not required/not applicable.

DATA

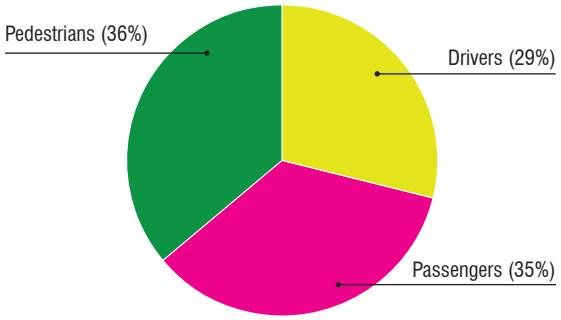
Reported road traffic fatalities (2007)
992[d] (80% males, 20% females)

Reported non-fatal road traffic injuries (2007)
17 969[e]

Costing study available
Yes (deaths and injuries)

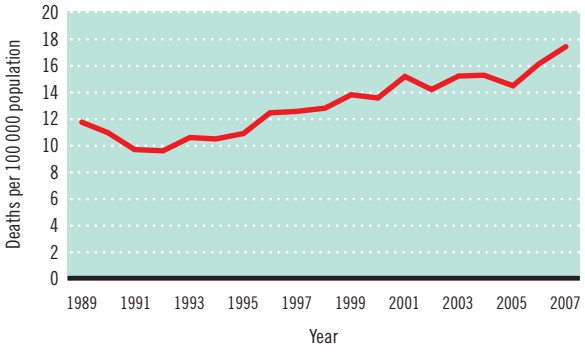
[d] Public Security Directorate/Jordan Traffic Institute data, defined as died within 30 days of the crash.
[e] Public Security Directorate/Jordan Traffic Institute data.

DEATHS BY ROAD USER CATEGORY



Source: 2007, Road Safety Youth Fund, Jordan

TRENDS IN ROAD TRAFFIC DEATHS



Source: Country questionnaire

REGISTERED VEHICLES

841 933 total (2007)

Motorcars	**65%**
Motorized 2- and 3-wheelers	**<1%**
Minibuses, vans, etc. (seating <20)	**12%**
Trucks	**18%**
Buses	**2%**
Other	**3%**

Data cleared by the Ministry of Health.

JORDAN

Population: 7 273 799 • Income group: Middle • Gross national income per capita: US$ 4 950

INSTITUTIONAL FRAMEWORK

Lead agency	Department of Traffic Safety
Funded in national budget	No
National road safety strategy	Multiple Strategies
Funding to implement strategy	Partially funded
Fatality reduction target	1 death per 10 000 vehicle (2014–2016)

SAFER ROADS AND MOBILITY

Formal audits required for new road construction projects	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	No
Policies to encourage investment in public transport	Yes
Policies to separate road users and protect VRUs	No

SAFER VEHICLES

Total registered vehicles for 2013	1 263 754
Cars and 4-wheeled light vehicles	912 172
Motorized 2- and 3-wheelers	6 792
Heavy trucks	139 679
Buses	137 814
Other	67 297
Vehicle standards applied[a]	
Frontal impact standard	No
Electronic stability control	No
Pedestrian protection	No

[a] UNECE WP29.

POST-CRASH CARE

Emergency room injury surveillance system	No
Emergency access telephone numbers	911
Permanently disabled due to road traffic crash	13.5%[b]

[b] Traffic crashes in Jordan, Traffic Institute (data from 2013).

DATA

Reported road traffic fatalities (2013)	768[c] (81% M, 19%F)
WHO estimated road traffic fatalities	1 913 (95%CI 1 633–2 193)
WHO estimated rate per 100 000 population	26.3
Estimated GDP lost due to road traffic crashes	1.2%[d]

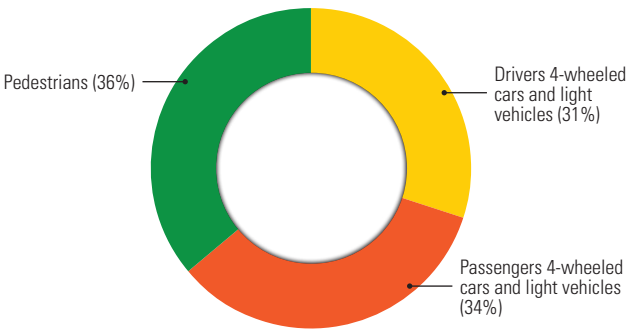
[c] Traffic crashes in Jordan, Traffic Institute. Defined as died within 30 days of crash.
[d] Traffic crashes in Jordan, Traffic Institute and General Statistics Department (data from 2013).

SAFER ROAD USERS

National speed limit law	Yes
Max urban speed limit	90 km/h
Max rural speed limit	120 km/h
Max motorway speed limit	120 km/h
Local authorities can modify limits	Yes
Enforcement	0 1 2 3 4 5 (6) 7 8 9 10
National drink–driving law	Yes
BAC limit – general population	< 0.08 g/dl
BAC limit – young or novice drivers	< 0.08 g/dl
Random breath testing carried out	Yes
Enforcement	0 1 2 3 (4) 5 6 7 8 9 10
% road traffic deaths involving alcohol	—
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Law requires helmet to be fastened	No
Law refers to helmet standard	Yes
Enforcement	0 1 2 3 (4) 5 6 7 8 9 10
Helmet wearing rate	—
National seat-belt law	Yes
Applies to front and rear seat occupants	No
Enforcement	0 1 2 3 4 5 (6) 7 8 9 10
Seat-belt wearing rate	42% Drivers[e]
National child restraint law	No
Restrictions on children sitting in front seat	Yes
Child restraint law based on	—
Enforcement	—
% children using child restraints	—
National law on mobile phone use while driving	Yes
Law prohibits hand-held mobile phone use	Yes
Law also applies to hands-free phones	No
National drug-driving law	Yes

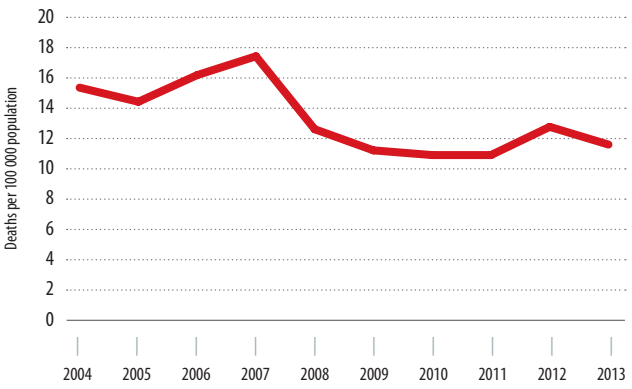
[e] 2003, Elmosaly and Elsabah study.

DEATHS BY ROAD USER CATEGORY



Source: Traffic crashes in Jordan, Traffic Institute (data from 2013).

TRENDS IN REPORTED ROAD TRAFFIC DEATHS



Source: Traffic crashes in Jordan, Traffic Institute (data from 2013).

Legislative review conducted by WHO. Vehicle safety data from UNECE WP29. Other data collected by questionnaire and cleared by Ministry of Health.

LEBANON

Population: 4 821 971 • Income group: Middle • Gross national income per capita: US$ 9 870

INSTITUTIONAL FRAMEWORK

Lead agency	No
Funded in national budget	—
National road safety strategy	Yes
Funding to implement strategy	Not funded
Fatality reduction target	No

SAFER ROADS AND MOBILITY

Formal audits required for new road construction projects	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	No
Policies to encourage investment in public transport	No
Policies to separate road users and protect VRUs	No

SAFER VEHICLES

Total registered vehicles for 2013	1 680 011
Cars and 4-wheeled light vehicles	1 429 179
Motorized 2- and 3-wheelers	96 278
Heavy trucks	140 757
Buses	13 797
Other	0
Vehicle standards applied[a]	
Frontal impact standard	No
Electronic stability control	No
Pedestrian protection	No

[a] UNECE WP29.

POST-CRASH CARE

Emergency room injury surveillance system	No
Emergency access telephone numbers	Multiple Numbers
Permanently disabled due to road traffic crash	18.0%[b]

[b] February 2012, WHO, Road Safety and Roadmap for Future in Lebanon, p. 42.

DATA

Reported road traffic fatalities (2013)	649[c] (77% M, 23%F)
WHO estimated road traffic fatalities	1 088 (95%CI 962–1 215)
WHO estimated rate per 100 000 population	22.6
Estimated GDP lost due to road traffic crashes	3.2–4.8%[d]

[c] Directorate General of the Internal Security Forces, Traffic Management Center for Greater Beirut, Urban Transport Development Project. Defined as unlimited time period following crash.

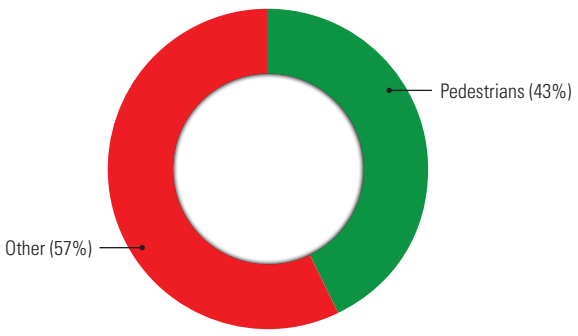
[d] May 2004, Proposals and Outlines for a Road Safety Master Plan for Lebanon, SweRoad, Sida Ref No: 2000 – 04865, page 25.

SAFER ROAD USERS

National speed limit law	Yes
Max urban speed limit	50 km/h
Max rural speed limit	70 km/h
Max motorway speed limit	100 km/h
Local authorities can modify limits	Yes
Enforcement	0 1 2 3 4 ⑤ 6 7 8 9 10
National drink–driving law	Yes
BAC limit – general population	≤ 0.05 g/dl
BAC limit – young or novice drivers	0.00 g/dl
Random breath testing carried out	Yes
Enforcement	0 1 2 3 4 ⑤ 6 7 8 9 10
% road traffic deaths involving alcohol	—
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Law requires helmet to be fastened	Yes
Law refers to helmet standard	Yes
Enforcement	0 1 ② 3 4 5 6 7 8 9 10
Helmet wearing rate	—
National seat-belt law	Yes
Applies to front and rear seat occupants	Yes
Enforcement	0 1 2 ③ 4 5 6 7 8 9 10
Seat-belt wearing rate	14% Drivers[e]
National child restraint law	Yes
Restrictions on children sitting in front seat	Yes
Child restraint law based on	Age
Enforcement	⓪ 1 2 3 4 5 6 7 8 9 10
% children using child restraints	—
National law on mobile phone use while driving	Yes
Law prohibits hand-held mobile phone use	Yes
Law also applies to hands-free phones	Yes
National drug-driving law	Yes

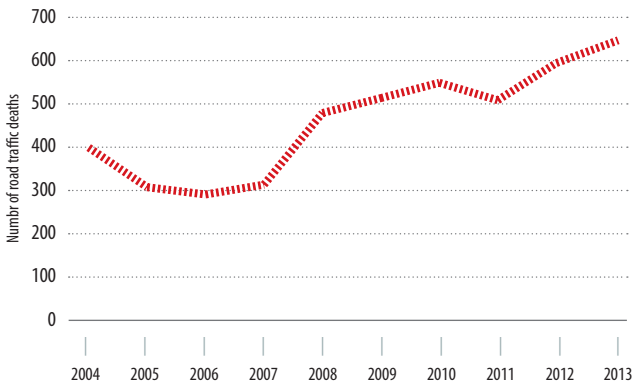
[e] 2004, WHO/ MoPH/ MoI/ AUB, Study on Road Safety in Lebanon, May 2004.

DEATHS BY ROAD USER CATEGORY



Source: Directorate General of the Internal Security Forces, Traffic Management Center for Greater Beirut, Urban Transport Development Project (data from 2013).

TRENDS IN REPORTED ROAD TRAFFIC DEATHS



Source: Directorate General of the Internal Security Forces, Traffic Management Center for Greater Beirut, Urban Transport Development Project.

Legislative review conducted by WHO. Vehicle safety data from UNECE WP29. Other data collected by questionnaire and cleared by Ministry of Transport and Ministry of Public Health.

LEBANON

Population: 4 099 115

Income group: Middle

Gross national income per capita: $5 770

INSTITUTIONAL FRAMEWORK	
Lead agency	No
Funded in national budget	n/a
National road safety strategy	Yes[a]
Measurable targets	n/a
Funded	n/a

[a] Not formally endorsed by government.

NATIONAL LEGISLATION	
Speed limits set nationally	Yes
Local authorities can set lower limits	Yes
Maximum limit urban roads	100 km/h
Enforcement[b]	0 1 2 3 **4** 5 6 7 8 9 10
Drink–driving law	Yes
BAC limit – general population	0.05 g/dl
BAC limit – young or novice drivers	0.05 g/dl
Random breath testing and/or police checkpoints	Yes
Road traffic deaths involving alcohol	—
Enforcement[b]	0 **1** 2 3 4 5 6 7 8 9 10
Motorcycle helmet law	Yes
Applies to all riders	Yes
Helmet standards mandated	No
Helmet wearing rate	—
Enforcement[b]	0 1 **2** 3 4 5 6 7 8 9 10
Seat-belt law	Yes
Applies to all occupants	No
Seat-belt wearing rate	15%[c]
Enforcement[b]	0 1 2 3 **4** 5 6 7 8 9 10
Child restraints law	No
Enforcement[b]	n/a

[b] Enforcement score represents consensus based on professional opinion of respondents, on a scale of 0 to 10 where 0 is not effective and 10 is highly effective.
[c] 2007, Internal Security Forces.

VEHICLE STANDARDS	
No car manufacturers	
ROAD SAFETY AUDITS	
Formal audits required for major new road construction projects	Yes
Regular audits of existing road infrastructure	No
PROMOTING ALTERNATIVE TRANSPORT	
National policies to promote walking or cycling	No
National policies to promote public transportation	No

POST-CRASH CARE	
Formal, publicly available pre-hospital care system	No
National universal access number	n/a

— Data not available.
n/a Data not required/not applicable.

DATA
Reported road traffic fatalities (2007) 497[d] (80% males, 20% females)
Reported non-fatal road traffic injuries (2007) 6 266[e]
Costing study available Yes (deaths and injuries)

[d] Internal Security Forces data, defined as died within 7 days of the crash.
[e] Internal Security Forces data.

DEATHS BY ROAD USER CATEGORY

TRENDS IN ROAD TRAFFIC DEATHS

REGISTERED VEHICLES
1 400 000[f] total (2007) Registered vehicle types: data not available

[f] Estimation by consensus group.

Data cleared by the Ministry of Public Health.

POLAND

Population: 38 216 635 • Income group: High • Gross national income per capita: US$ 13 240

INSTITUTIONAL FRAMEWORK

Lead agency	National Road Safety Council
Funded in national budget	Yes
National road safety strategy	Yes
Funding to implement strategy	Partially funded
Fatality reduction target	50% (2010–2020)

SAFER ROADS AND MOBILITY

Formal audits required for new road construction projects	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	Yes
Policies to encourage investment in public transport	Yes
Policies to separate road users and protect VRUs	Yes

SAFER VEHICLES

Total registered vehicles for 2012	24 875 717
Cars and 4-wheeled light vehicles	18 744 412
Motorized 2- and 3-wheelers	1 107 260
Heavy trucks	3 178 005
Buses	99 858
Other	1 746 182
Vehicle standards applied[a]	
Frontal impact standard	Yes
Electronic stability control	Yes
Pedestrian protection	Yes

[a] UNECE WP29.

POST-CRASH CARE

Emergency room injury surveillance system	No
Emergency access telephone numbers	112
Permanently disabled due to road traffic crash	—

DATA

Reported road traffic fatalities (2013)	3 357[b] (76% M, 24% F)
WHO estimated road traffic fatalities	3 931
WHO estimated rate per 100 000 population	10.3
Estimated GDP lost due to road traffic crashes	1.9%[c]

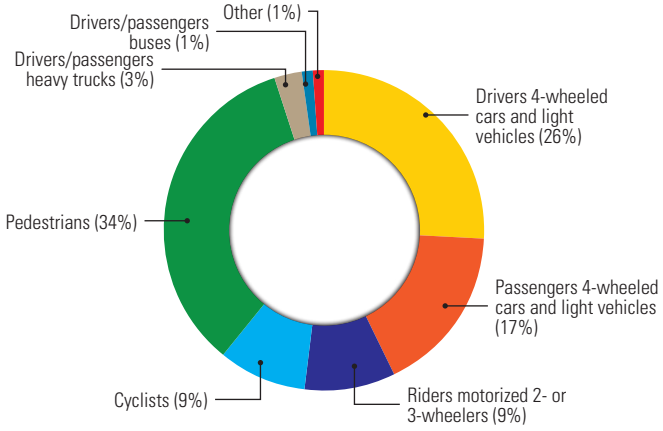
[b] Polish National Police Headquarters (System of evidence of accidents and collisions). Defined as died within 30 days of crash.
[c] 2012, Road and Bridge Research Institute, National Road Safety Council.

SAFER ROAD USERS

National speed limit law	Yes
Max urban speed limit	50 km/h[d]
Max rural speed limit	90 km/h
Max motorway speed limit	140 km/h
Local authorities can modify limits	Yes
Enforcement	0 1 2 3 4 ⑤ 6 7 8 9 10
National drink–driving law	Yes
BAC limit – general population	< 0.02 g/dl
BAC limit – young or novice drivers	< 0.02 g/dl
Random breath testing carried out	Yes
Enforcement	0 1 2 3 4 5 6 7 ⑧ 9 10
% road traffic deaths involving alcohol	16%[e]
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Law requires helmet to be fastened	No
Law refers to helmet standard	No
Enforcement	0 1 2 3 4 5 6 7 8 ⑨ 10
Helmet wearing rate	97% All riders[f]
National seat-belt law	Yes
Applies to front and rear seat occupants	Yes
Enforcement	0 1 2 3 4 5 6 ⑦ 8 9 10
Seat-belt wearing rate	84% Front seats[f], 59% Rear seats[f]
National child restraint law	Yes
Restrictions on children sitting in front seat	Yes
Child restraint law based on	Age/Weight/Height
Enforcement	0 1 2 3 4 5 6 7 ⑧ 9 10
% children using child restraints	88–89%[g]
National law on mobile phone use while driving	Yes
Law prohibits hand-held mobile phone use	Yes
Law also applies to hands-free phones	No
National drug-driving law	Yes

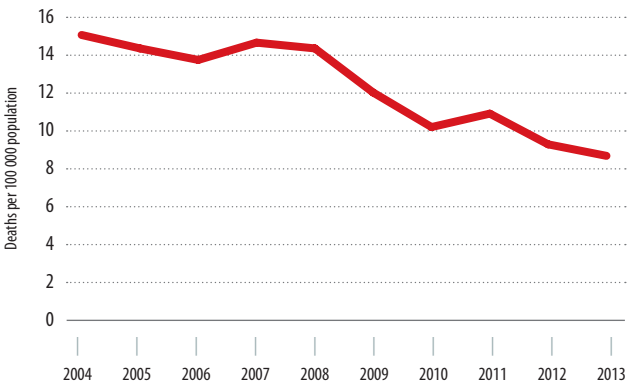
[d] 60 km/h from 23:00–05:00.
[e] 2013, Polish National Police Headquarters (System of evidence of accidents and collisions).
[f] 2013, Foundation for the Development of Civil Engineering, Gdańsk University of Technology, Cracow University of Technology, Secretariat of the National Road Safety Council.
[g] 2013, 89% - Front seats, 88% Rear seats. Foundation for the Development of Civil Engineering, Gdańsk University of Technology, Cracow University of Technology, Secretariat of the National Road Safety Council.

DEATHS BY ROAD USER CATEGORY



Source: 2013, Polish National Police Headquarters (System of evidence of accidents and collisions).

TRENDS IN REPORTED ROAD TRAFFIC DEATHS



Source: European Commission / Directorate General Energy and Transport.

Legislative review conducted by WHO. Vehicle safety data from UNECE WP29. Other data collected by questionnaire and cleared by Ministry of Infrastructure and Development.

SPAIN

Population: 46 926 963 • Income group: High • Gross national income per capita: US$ 29 920

INSTITUTIONAL FRAMEWORK

Lead agency	Directorate General of Traffic
Funded in national budget	Yes
National road safety strategy	Yes
Funding to implement strategy	Fully funded
Fatality reduction target	< 3.7 per 100 000 population (2011–2020)

SAFER ROADS AND MOBILITY

Formal audits required for new road construction projects	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	Yes
Policies to encourage investment in public transport	Yes
Policies to separate road users and protect VRUs	Yes

SAFER VEHICLES

Total registered vehicles for 2013	32 616 105
Cars and 4-wheeled light vehicles	26 574 614
Motorized 2- and 3-wheelers	4 998 320
Heavy trucks	520 098
Buses	59 892
Other	463 181
Vehicle standards applied[a]	
Frontal impact standard	Yes
Electronic stability control	Yes
Pedestrian protection	Yes

[a] UNECE WP29.

POST-CRASH CARE

Emergency room injury surveillance system	No
Emergency access telephone numbers	112
Permanently disabled due to road traffic crash	—

DATA

Reported road traffic fatalities (2013)	1 680[b] (76% M, 23% F)
WHO estimated road traffic fatalities	1 730
WHO estimated rate per 100 000 population	3.7
Estimated GDP lost due to road traffic crashes	1.0%[c]

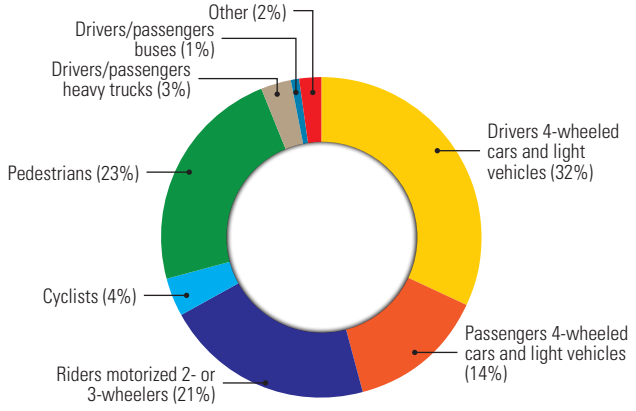
[b] Directorate General of Traffic. Defined as died within 30 days of crash.
[c] 2012, Directorate General of Traffic.

SAFER ROAD USERS

National speed limit law	Yes
Max urban speed limit	50 km/h
Max rural speed limit	90 km/h
Max motorway speed limit	120 km/h
Local authorities can modify limits	Yes
Enforcement	0 1 2 3 4 5 6 ⑦ 8 9 10
National drink–driving law	Yes
BAC limit – general population	≤ 0.05 g/dl
BAC limit – young or novice drivers	≤ 0.03 g/dl
Random breath testing carried out	Yes
Enforcement	0 1 2 3 4 5 6 7 ⑧ 9 10
% road traffic deaths involving alcohol	7–17%[d]
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Law requires helmet to be fastened	No
Law refers to helmet standard	Yes
Enforcement	0 1 2 3 4 5 6 7 8 ⑨ 10
Helmet wearing rate	99% Drivers[e], 99% Passengers[e]
National seat-belt law	Yes
Applies to front and rear seat occupants	Yes
Enforcement	0 1 2 3 4 5 6 7 8 ⑨ 10
Seat-belt wearing rate	91% Front seats[e], 81% Rear seats[e]
National child restraint law	Yes
Restrictions on children sitting in front seat	Yes
Child restraint law based on	Age/Weight/Height
Enforcement	0 1 2 3 4 5 6 7 ⑧ 9 10
% children using child restraints	88%[e]
National law on mobile phone use while driving	Yes
Law prohibits hand-held mobile phone use	Yes
Law also applies to hands-free phones	No
National drug-driving law	Yes

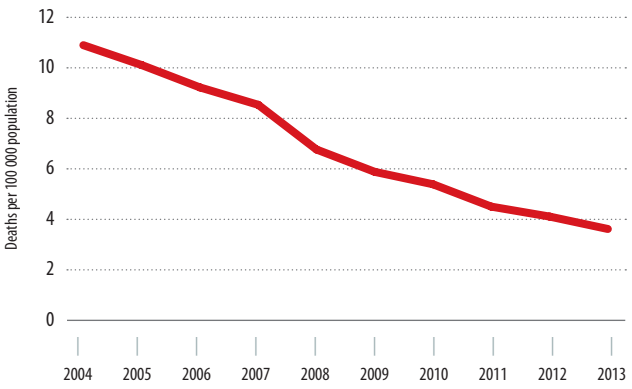
[e] 2012, 17% Males, 7% Females. WHO Global status report on alcohol and health 2014.
[d] 2012, Directorate General of Traffic.

DEATHS BY ROAD USER CATEGORY



Source: 2013, Directorate General of Traffic.

TRENDS IN REPORTED ROAD TRAFFIC DEATHS



Source: Directorate General of Traffic.

Legislative review conducted by WHO. Vehicle safety data from UNECE WP29. Other data collected by questionnaire and cleared by Ministry of Health, Social Services and Equality.

SWEDEN

Population: 9 571 105 • Income group: High • Gross national income per capita: US$ 61 760

INSTITUTIONAL FRAMEWORK

Lead agency	Swedish Transport Agency and Swedish Transport Administration
Funded in national budget	Yes
National road safety strategy	Yes
Funding to implement strategy	Partially funded
Fatality reduction target	50% (2007–2020)

SAFER ROADS AND MOBILITY

Formal audits required for new road construction projects	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	Yes
Policies to encourage investment in public transport	Yes
Policies to separate road users and protect VRUs	Yes

SAFER VEHICLES

Total registered vehicles for 2013	5 755 952
Cars and 4-wheeled light vehicles	4 981 525
Motorized 2- and 3-wheelers	358 145
Heavy trucks	79 130
Buses	13 986
Other	323 166
Vehicle standards applied[a]	
Frontal impact standard	Yes
Electronic stability control	Yes
Pedestrian protection	Yes

[a] UNECE WP29.

POST-CRASH CARE

Emergency room injury surveillance system	Yes
Emergency access telephone numbers	112
Permanently disabled due to road traffic crash	10.0%[b]

[b] 2013, STRADA hospital data, Swedish Transport Agency.

DATA

Reported road traffic fatalities (2013)	260[c] (75% M, 25% F)
WHO estimated road traffic fatalities	272
WHO estimated rate per 100 000 population	2.8
Estimated GDP lost due to road traffic crashes	< 1.0%[d]

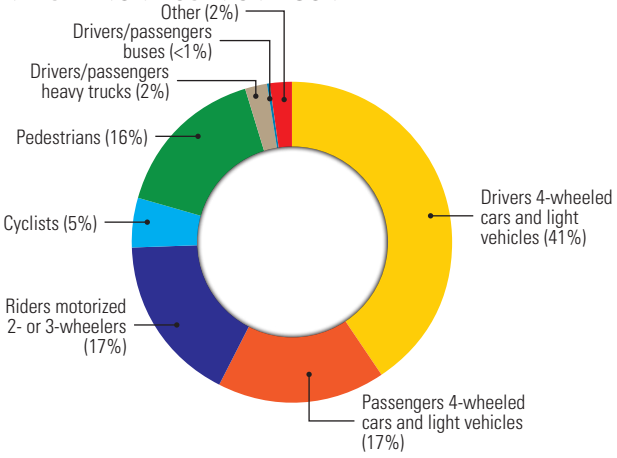
[c] Transport Analysis. Defined as died within 30 days of crash.
[d] 2010, International Traffic Safety Data and Analysis Group (IRTAD) Road Safety Annual Report 2011.

SAFER ROAD USERS

National speed limit law	Yes
Max urban speed limit	50 km/h
Max rural speed limit	110 km/h
Max motorway speed limit	120 km/h
Local authorities can modify limits	Yes
Enforcement	0 1 2 3 4 5 (6) 7 8 9 10
National drink–driving law	Yes
BAC limit – general population	0.02 g/dl
BAC limit – young or novice drivers	0.02 g/dl
Random breath testing carried out	Yes
Enforcement	0 1 2 3 4 5 6 7 (8) 9 10
% road traffic deaths involving alcohol	19%[e]
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Law requires helmet to be fastened	Yes
Law refers to helmet standard	Yes
Enforcement	0 1 2 3 4 5 6 7 (8) 9 10
Helmet wearing rate	90-97% Drivers[f], 90–97% Passengers[f]
National seat-belt law	Yes
Applies to front and rear seat occupants	Yes
Enforcement	0 1 2 3 4 5 6 7 (8) 9 10
Seat-belt wearing rate	98% Front seats[g], 84% Rear seats[g]
National child restraint law	Yes
Restrictions on children sitting in front seat	No
Child restraint law based on	Age/Height
Enforcement	0 1 2 3 4 5 6 (7) 8 9 10
% children using child restraints	96%[g]
National law on mobile phone use while driving	Yes
Law prohibits hand-held mobile phone use	No
Law also applies to hands-free phones	No
National drug-driving law	Yes

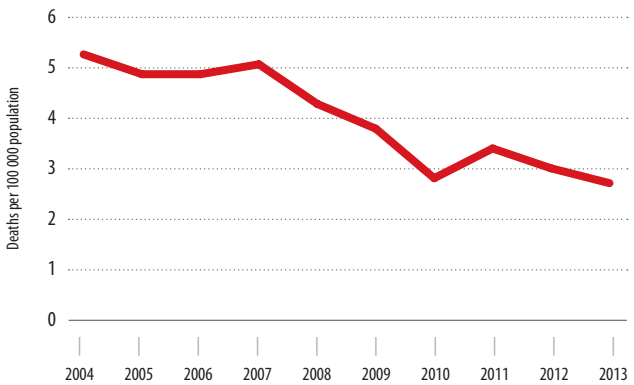
[e] 2013, Swedish Transport Administration.
[f] 2003, The Swedish National Road and Transport Research Institute (VTI), Travel Survey (Resor i Sverige).
[g] 2013, The Swedish National Road and Transport Research Institute (VTI), The use of seat belts in Sweden 2013.

DEATHS BY ROAD USER CATEGORY



Source: 2013, Transport Analysis.

TRENDS IN REPORTED ROAD TRAFFIC DEATHS



Source: Transport analysis.

Legislative review conducted by WHO. Vehicle safety data from UNECE WP29. Other data collected by questionnaire and cleared by Ministry of Enterprise, Energy and Communications.

Abstract

The increasing trend in the number of road fatalities has raised a big concern for people and organizations especially health organizations. Some countries have been able to keep the road fatality rates as low as possible while others have been able to improve their road safety program and get to very lower road fatality rates in time. On the other hand, some countries of middle income level have failed to progress their road safety program mostly because of insufficient attention to important parameters. This work compares the statistics as well as implemented road safety strategies between Sweden, Poland, Spain, Egypt, Jordan, Lebanon and Iran. The aim of this work is to derive a strategic solution for middle income countries by analyzing the statistics from different perspectives. Data of International Road Federation 2013 catalogue and also data of WHO global status report on road safety have been very useful for this research.

Keywords: IRF, WHO, Road fatalities, traffic risk factors, injury accidents trend

1. Introduction

According to [1], during the recent decade, out of all countries in the world the number of road fatalities have been decreased among eighty-eight of them. However, as reported by WHO, the total number of road fatalities is still high with the total number of 1.24 million per year. It is so unacceptable that this many people are losing their lives due to inadequate attention or inefficient actions and policies that are made in many countries. According to WHO and as shown in figure 1, in only 28 countries which posses only 7% of world population laws addressing five main road accident risk factors have been regulated. These risk factors imply restrictions for speed, drink driving, wearing helmet, wearing seat-belts and child restraints. Since 2008, the number of countries with strict enforcements about five risk factors hasn't increased at all. Among the 28 countries who have settled regulations for the risk factors, in only four (Estonia, Finland, France and Portugal), the enforcement laws are evaluated as "good". This means that even for relatively successful countries, much more work is needed to ensure the effectiveness of these laws.

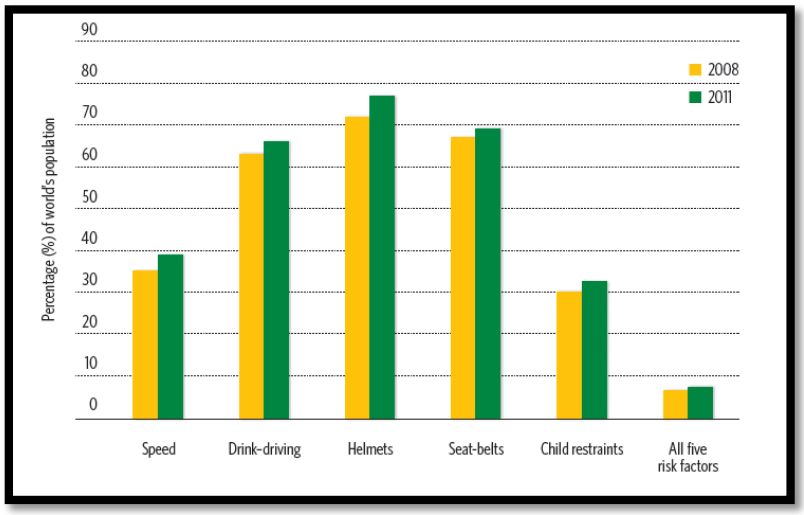


Figure 1. WHO [1] figure of five key accident risk factors for the year 2008 and 2011

Since there exists a large gap in road traffic laws and enforcements between different countries, road fatality rates have been inhomogeneously distributed among regions. Figure 2 shows how road death rates vary among regions with different income levels. Evidently, the subject becomes problematic in middle-income countries with having 20 people dying on the roads out of every 100000 users while in high-income countries this rate is lowest at 8.7 per 100000 users. The victims are mostly pedestrians and cyclists and among middle income countries only a few of them have policies in place to protect this specific group of road users.

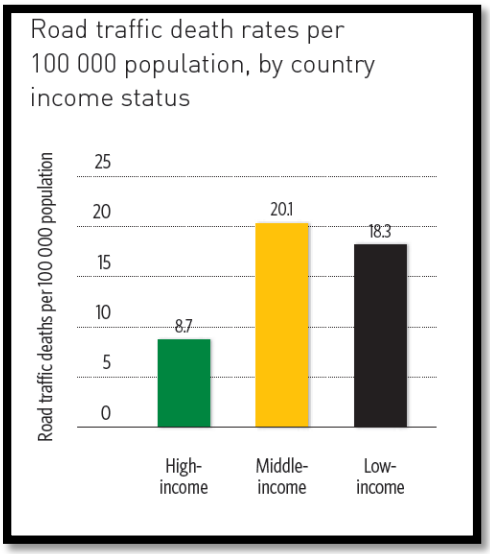


Figure 2. WHO [1] figure of 2013 showing that middle income countries have the highest share of road fatalities

Besides income level, the other factor which has recently attracted our attention to middle income countries is motorization level. Figure 3 indicates three important facts at a time; 80% per cent of road traffic deaths occur in middle-income countries which posses 72% of world's population. However, they only have 52% of world's vehicles registered which indicates that these countries have a fairly high rate of road fatalities relative to their motorization level. This means that it is a high time the authorities in such countries had to take serious action in response to road fatalities rate.

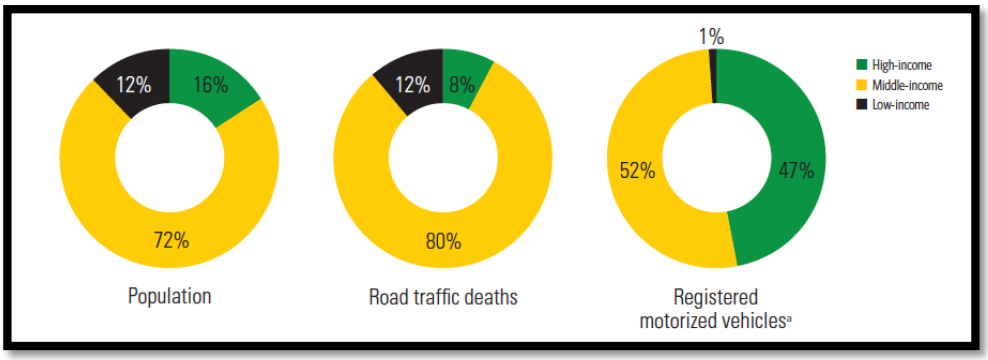


Figure 3. WHO [1] figure comparing motorization level and road fatalities in different regions

According to [3], during an accidents, some people are subjected to non-fatal injuries. The severity level of injuries vary with different ranges. Some can be treated and healed immediately without needing any medical care while some others might result to permanent disability. To have the data of road fatalities harmonized, a 30-day definition is recommended for road traffic deaths by WHO. More than 90 countries now use this definition and in those the definition is changed, the data has been normalized by WHO. Therefore, all the data used in this work are normalized and feature a relatively good reliability.
The next chapters focus on a comparative analysis in road safety quality level among seven countries of interet. Three European countries (Sweden, Poland and Spain) are chosen as representatives for high income countries while 4 others (Egypt, Jordan, Lebanon and Iran) represent road safety situation in middle-income countries in the Middle-East. The author's intention for comparison between countries, as the first priority, is to show in which countries the road fatality rates are become more problematic in time. This is done by comparing the statistics of different kind among countries of interest. Chapters 2 focuses on injury accidents, road fatalities, road expenditures and road network density data of the countries respectively. In the second stage (chapter 3), the focus is on discovering the critical elements which have played a key role in high income countries to have the road fatality rates decreased in time. In chapter 4, data reliability issue from WHO perspective is briefly discussed and at last in chapter 5 the conclusion and suggestions are presented.

2. Road safety comparison from different perspectives

The main focus of this section is to highlight the contrast between different countries in the quality of road safety program. Figure 4 shows how different number of injury accidents could happen in different countries. The figure has been drawn based on mostly the data of International Road Federation(IRF) [4]. It is seen from the figure that Egypt, has the lowest number of injury accidents followed by Lebanon and Poland. Spain and Sweden are seen to have relatively considerable number of accidents. However, it is seen that both have been able to decrease the accidents number within an eight-year period. It is noteworthy to mention that these data are normalized for every hundred thousand inhabitants. This means that countries with a relatively low population such as Sweden have in fact, a less share of injury accidents. Knowing that Iran is a highly populated country, the number of accidents in total is dramatically high. The condition for Iran gets worse when we notice that the rates are greatly increasing in time. In the next chapter we analyze how the statistics vary when road fatalities rate are counted.

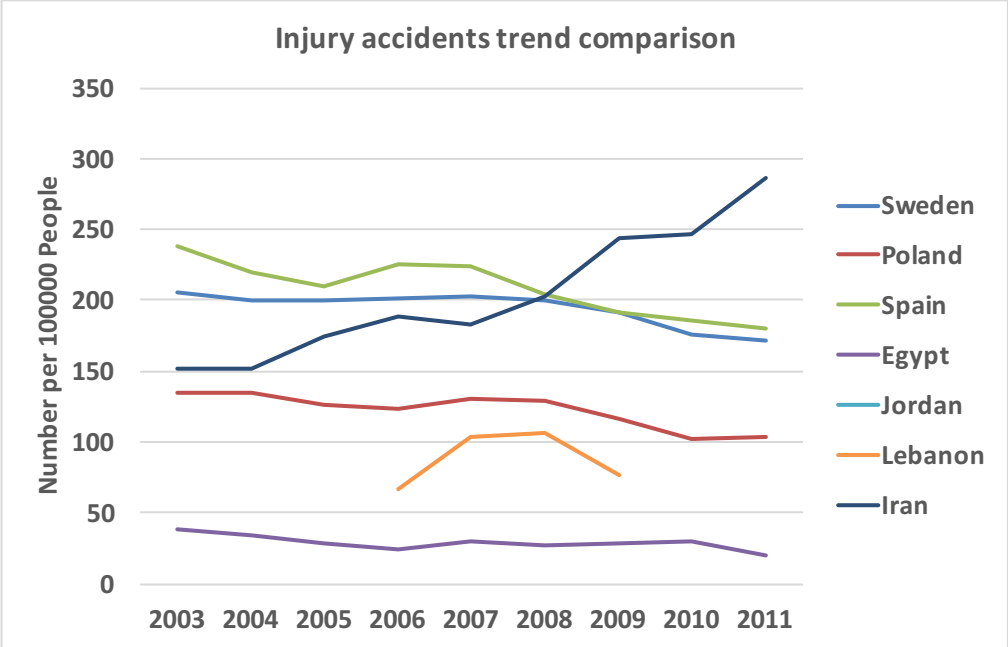


Figure 4. comparison between number of injury accidents per 100 000 people

Road fatalities

In the previous section, the analysis didn't result to a reliable conclusion while countries of interest have different population. Here figure 5 compares the road fatality rates per hundred thousand inhabitants between the same countries. This figure helps us better realize which countries have a better situation as it shows how many of the users are harmed in the accidents. In contrast to previous section, we see that Sweden with the lowest fatality rates is among the best-made policy countries. Although many accidents are occurred in Sweden, a very few percentages are harmed. The statistics for Spain show that the nation has been very successful in decreasing the fatalities rate by almost reaching to Sweden record by 2013. On the contrary, the situation gets tricky for Egypt and Lebanon because not only they have not been successful in keeping the statistics low but also the wrong policies have resulted in higher fatality rates in time. Poland and Jordan have better situation as it seems that they will be able to improve their road safety policies within time. The situation is again at worst conditions for Iran. The road fatality rates are drastically increasing. This is very unfortunate and unacceptable for a middle income country to lose their people this easily due to poor policies and ignorance.

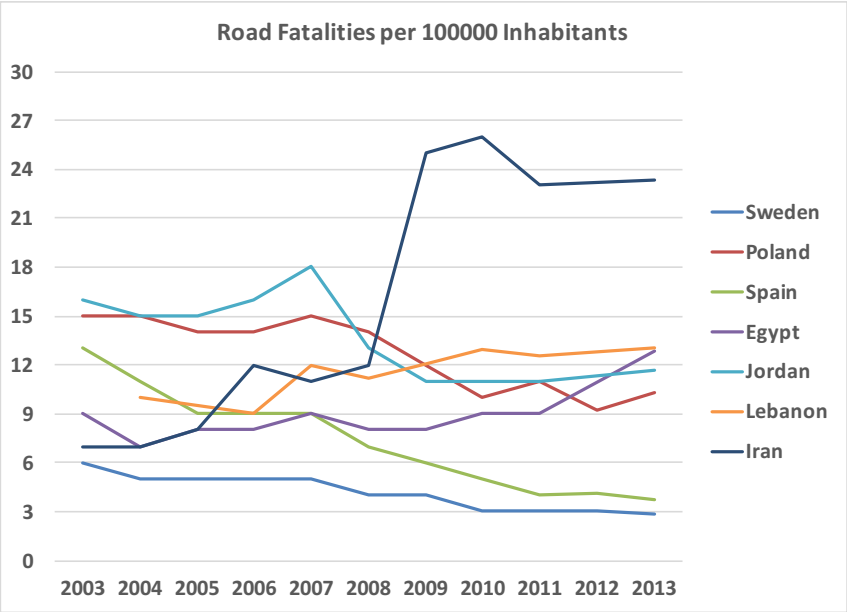


Figure 5. comparison between number of road death rates per 100 000 people

By looking at figure 5 and 6 at the same time we realize that the number of vehicles in Iran are unnecessarily high causing the road fatality rates to be decreased when normalized by hundred thousand vehicles. The same is true about Lebanon having probably more than required number of vehicles on the roads. This means that these countries need to implement a better mobility concept and improve the public transport quality. It should be mentioned that for Lebanon and Iran data of 2003 to 2009 were not available due to the nations' poor policy in act of free information.

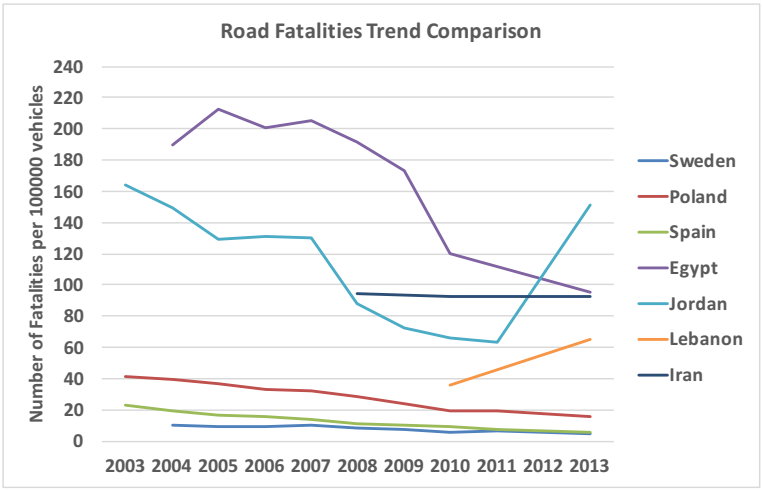


Figure 6. comparison between number of road fatality trend per 100 000 registered vehicles

Road expenditures

Figure 7 compares how Sweden, Egypt Poland and Spain have spent on improving roads and building new infrastructure to increase road safety. The intention was to also include Jordan, Lebanon and Iran in the comparison but unfortunately the data for those countries were unavailable. It is interesting to see that Spain is the one which has spent the most on improving the roads. It is now no surprise to see how successful they have been in decreasing the number of road fatalities as discussed in chapter 3.

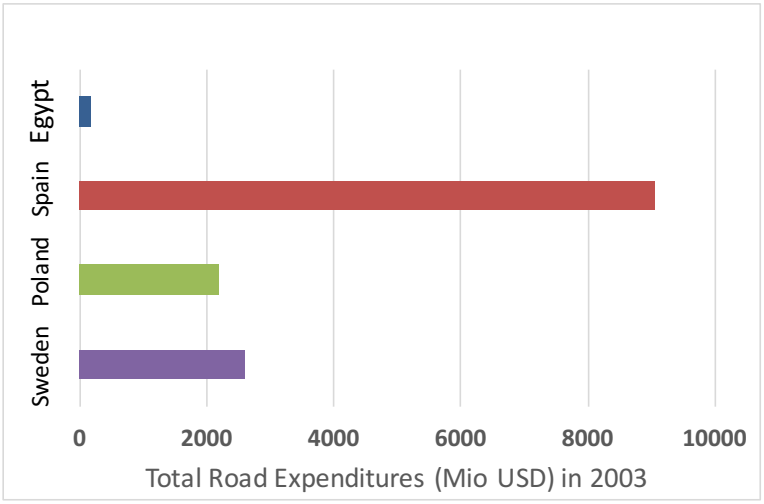


Figure 7. Comparison between the amount each country has spent on road development in 2003

Figure 8 shows that the road expenditure amount has been decreased in time in Spain. However, the country has remained successful in having low fatality rates during recent years. Although Egypt is in critical situation, it has decreased the road expenditure amount from 2007 to 2008. This is an indication for a poor policy for road safety because in the previous sections we observed how necessary it is for Egypt to improves the roads quality.

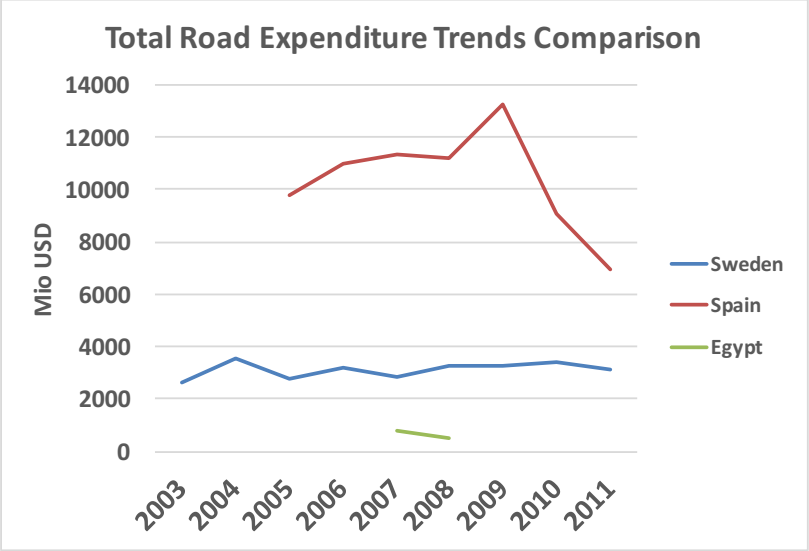


Figure 8. Comparison between the trend in road expenditure within an eight-year period

Road network density

One index to show how successful road safety policies are could be road network density. So far from the previous chapters we observed that Iran Jordan and Egypt have relatively high number of road deaths per year. Relying on IRF data of 2010, figure 9 shows how road densities in these countries are insufficient. This indicates that in these countries, the users are obliged to drive on narrow and limited paths which itself is considered as one of the main infrastructural factors increasing the risks of accidents. Figure 9 shows that infrastructural policies should be taken more seriously in Iran, Jordan and Egypt. Unfortunately, the data for Lebanon was unavailable. Therefore, it is eliminated from the graph.

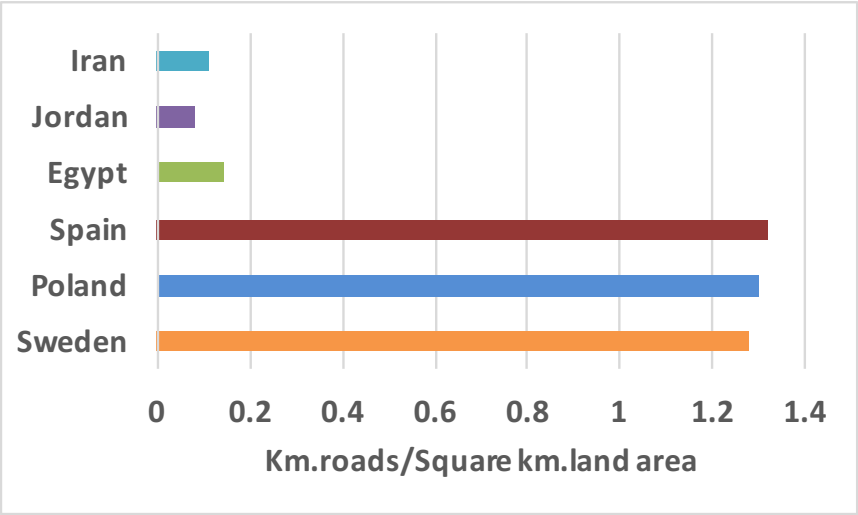


Figure 9. Road density comparison between countries od interest

3. Problem criticality measures

In section 2, some possible answers to the question "why do some countries have high road fatality rates?" were presented. Mostly poor infrastructure policies were addressed. In this section infrastructure, enforcement and vehicles safety measures are individually analyzed and based on that problem criticality level for different countries are compared.

Infrastructure

Every country has tested and implemented different infrastructural policies in their road safety vision program. However, there are some elements that have proven to be more effective in increasing road safety. This has been recognized from the outcome of those high income countries which have had the lowest road fatalities record. Sweden is a representative for such countries. Table 1 shows which policies are being considered by which countries to have safer mobility. From table 1 we see that Sweden, Spain and Poland promote walking and cycling as well as separating pedestrians and cyclists from high speed traffic. However, Iran hasn't separated vulnerable road users from high-speed traffic while at the same time they are promoting walking and cycling. It is also seen that Lebanon as one of the countries with critical road death statistics hasn't put any effort toward having safer mobility.

Table 1. Safer mobility policies comparison

	Sweden	Spain	Poland	Egypt	Lebanon	Jordan	Iran
Promote walking and cycling	Yes	Yes	Yes	No	No	Subnational	Yes
Promote investment in public transport	Yes	Yes	Yes	Yes	No	Yes	Yes
Separate vulnerable road users from high-speed traffic	Yes	Yes	Yes	No	No	Subnational	Subnational

Table 2 shows how different road auditing policies are being implemented. All of the countries audit the roads. However, in Spain, Poland and Egypt, road auditing is also being done on the existing roads which is more favorable.

Table 2. Road auditing comparison

	Sweden	Spain	Poland	Egypt	Lebanon	Jordan	Iran
On new roads	Yes	Yes	Yes	Yes	Yes	Yes	Yes
On existing roads	Partial	Yes	Yes	Yes	Partial	Partial	Partial
Conducted by an independent assessor	No	No	No	No	Yes	-	-

One of the most important measures is to evaluate how well the countries respond to an accident and how they handle injuries. Table 3 compares post crash responses of countries by evaluating 5 main factors. It is seen that unfortunately less than half of seriously injured patients are being transported by ambulance in Jordan and Egypt. This means that generally accident occurrence more likely leads to death. In Iran, the issue is more

related to lack of high quality training availability in emergency medicine. This is also true about the Spain. But Spain has been able to apply more successful infrastructure policies as compared to Iran.

Table 3. Post-Crash response comparison

	Sweden	Spain	Poland	Egypt	Lebanon	Jordan	Iran
Estimated % seriously injured patients transported by ambulance	≥75	≥75	50-74	11-49	50-74	11-49	50-74
Training in emergency medicine availability	Good	Medium	Good	Good	Good	Good	Medium
Emergency-room based injury surveillance system exists	Yes	No	Yes	Yes	No	No	Yes
Vital registration system exists	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimated % road traffic crash victims with permanent disability	6.0	2.1	25.0	-	-	-	6

Enforcement

In the introduction section, five key restrictions were pointed out to be effective in increasing road safety. Table 4, describes different enforcement levels in different countries. Among European countries, again Spain with higher amount of overall effectiveness remarks well-implemented speed and enforcement policies. One reason for Iran having relatively low effective laws is that they don't enforce speed limitations around schools which is very necessary.

Table 4. Speed laws and enforcement comparison

		Sweden	Spain	Poland	Egypt	Lebanon	Jordan	Iran
Speed limits are set		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Speed limits are modifiable		Yes	Yes	Yes	Yes	Yes	Yes	No
Maximum Speed	On urban roads (km/h)	50	50	50	60	70-90	80	50-60
	On rural roads (km/h)	80	90	90-100	60	60-70	50	-
	Around schools (km/h)	30	50	-	40	40	40	-
Effectiveness of overall enforcement (0-10)		6	7	5	4	6	8	6

Table 5, surprisingly reveals that Spain and Sweden has the highest caused-by-alcohol traffic death rates among others. Although Poland has also a high drunken driving death rate, overall effectiveness of the enforcement program is so high that we can expect this rate to be soon decreased in future.

Table 5. Drinking and driving enforcements and road traffic deaths attributed to alcohol

		Sweden	Spain	Poland	Egypt	Lebanon	Jordan	Iran
National drink-driving law		Yes	Yes	Yes	Yes	Yes	Yes	-
Drink-driving is defined by BAC		Yes	Yes	Yes	No	Yes	Yes	-
Maximum legal BAC levels	For general population (g/dl)	0.02	0.05	0.02	-	0.05	0.08	-
	For young/novice drivers (g/dl)	0.02	0.03	0.02	-	0.05	0.08	-
	For profesional drivers (g/dl)	0.02	0.03	0.02	-	0.05	0.08	-
Random test/police check points used for enforcement		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effectiveness of overal enforcement (0-10)		5.0	6.0	8.0	4.0	3.0	5.0	7.0
Proportion of road traffic deaths attributable to alcohol %		22	31.0	9.4	-	12.8	0.0	-

Vehicles

Vehicles safety standards have been recognized to be one of the main reasons to road deaths. In Chapter 2, we observed that Sweden with almost a high number of accidents rate has a very low road fatality rate. This is mostly because of suitable post crash responses and also providing safe cars to users. Poland and Spain were also so successful in having the death rates decreased within an eight-year period. Table 6 shows that European countries in general apply more restrict policies on vehicles to assure passenger safety. From the table we see that Iran with more than 20 million vehicles on roads, has unbelievably applied no strict policies about vehicles safety. This is definitely one good answer to the increasing trend in the country's road fatality rate.

Table 6. Safer vehicles policies and standards comparison

		Sweden	Spain	Poland	Egypt	Lebanon	Jordan	Iran
Number of Registered Cars		5231589	31086035	5853728	1075453	1525738	1075453	20657627
Vehicle standards	Signatory to World Forum on Harmonization of vehicle standards	Yes	Yes	Yes	-	Yes	No	No
	New cars subjected to New Car Assessment Program	Yes	No	Yes	-	No	No	No
Legislation for imported new cars	Front and rear seat-belts	Yes	Yes	Yes	No	No	Yes	Yes
	Airbags	No	No	No	No	No	No	No
	Anti-lock Braking System	No	No	Yes	No	No	Yes	No
	Electronic Stability Control	No	No	Yes	No	No	No	No
Demerit Point System in Place		No	Yes	Yes	No	No	Yes	Yes

4. Road safety data type and reliability

One of the major issues about data reliability is that some of the road crashes are not registered and stored in the database. Even fatal crashes are not completely recorded. When the injuries are less severe, the registration rate decreases. The second issue is that for those crashes that do not involve motorized vehicles the registration rate decreases further. The main consequence of underreporting of crashes is that it leads to an underestimation of the size of road safety problem.

The reason behind underreporting of crashes is mostly due to lack of clinical experience of reporters. In many countries, police are the ones who records the official information and they usually do not have sufficient training to reliably categorize injuries. On the other hand, different countries and authorities define injury severity differently. Some countries have hospitals with injury surveillance systems in place. Data recorded in such systems provide the information about the severity of the problem. Unfortunately, even in high income countries, due to high workload of the staff it is difficult to assure about the accuracy of such data. Therefore, many countries collect these data from geographic samples and the generalize results to the whole country. Thus, the ability to correctly count the number of injuries and fatalities remain a challenge.

5. Discussion and Conclusion

This work showed that the efforts to decrease road fatalities are evidently insufficient in Jordan, Egypt, Iran and Lebanon compared to Sweden, Poland and Spain. The challenge today is to achieve the same decreasing rate in the trend for middle income countries as there is now for high income countries but in a shorter time frame. The followings are suggested as a future strategic plan:

- Changing road user behavior by enforcing good laws about key risk factors as was analyzed in section 3.
- More attention should be given to pedestrians and cyclists. We know from [1] and [3] that pedestrians, cyclists and motorcyclists together make up half of all global road fatalities. It is not possible to have

safer roads unless we consider the needs of road users in all possible ways such as road building and vehicles manufacturing approaches.

- Substituting older and unsafe cars with highly standardized ones is a critical factor of saving lives. Very unfortunately, most of countries don't meet even the most basic international standards on vehicle safety.
- Utilizing special tools in cars as driving assistance such as Intelligent Speed Assistance (ISA)
- Equip the vehicles with event data recorders (black boxes) to be able to fully investigate the parameters resulting to the accident and death. These investigations will lead to better decision makings and designing safer vehicles in future.

This work also showed how Sweden and Spain have become successful in decreasing the road fatalities from 2003 to 2013. Aside from the successful strategies implemented in these countries that were briefly discussed in section three, some efficient encouraging policies were been implemented in Sweden and Spain. Safety halls in Sweden and promising practices in Spain are two remarkable actions toward road safety improvements [2]. In Sweden some safety halls were specifically built for the benefit of insight-based driver training. Many 3-D soft wares and simulating environments were used in the halls to train future drivers how to drive safe while enjoying it. In Spain promising practices in support of road crash victims were held. These practices help people mostly psychologically. If these policies get applied in middle income countries, there is no doubt that the road fatality rates in the whole world will be greatly decreased.

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Traffic Injury Prevention, 13(S1):44–56, 2012

ISSN: 1538-9588 print / 1538-957X online
DOI: 10.1080/15389588.2011.639417

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Road Traffic Injuries and Data Systems in Egypt: Addressing the Challenges

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Objective: *Road traffic injuries (RTIs) are a major cause of global mortality and morbidity, killing approximately 1.3 million people and injuring 20 to 50 million each year. The significance of this public health threat is most pronounced in low- and middle-income countries where 90 percent of the world's road traffic–related fatalities take place. Current estimates for Egypt show a road traffic fatality rate of 42 deaths per 100,000 population—one of the highest in the Eastern Mediterranean Region. RTIs are also responsible for 1.8 percent of all deaths and 2.4 percent of all disability-adjusted life years (DALYs) lost in the country. Despite this, studies surrounding this topic are scarce, and reliable data are limited. The overall goal of this article is to define the health impact of RTIs in Egypt and to identify the strengths and weaknesses of each data source for the purpose of improving the current RTI data systems.*

Methods: *A 2-pronged approach was undertaken to assess the burden of RTIs in Egypt. First, a thorough literature review was performed using PubMed, Embase, ISIS Web of Knowledge, and Scopus databases. Articles pertaining to Egypt and road traffic injuries were selected for screening. With assistance from Egyptian colleagues, a comprehensive exploration of data sources pertaining to RTIs in Egypt was undertaken and secondary data from these sources were procured for analysis.*

Results: *The literature review yielded a total of 20 studies, of which 6 were multi-country and 5 were hospital-based studies. None examined risk factors such as speeding, alcohol, or seat belt use. Secondary data sources were acquired from national hospital-based injury surveillance; a community-based health survey; pre-hospital injury surveillance; the Ministry of Transport; the General Authority for Roads, Bridges and Land Transport; death certificates; and the central agency for public motorization and statistics. Risk factor data are also limited from these sources.*

Conclusion: *The results of this article clearly highlight the significant burden that road traffic injuries pose on the health of the Egyptian population. The hospital-based injury surveillance system that has been established in the country and the use of International Classification of Diseases (ICD-10) coding brings the system very closely in line with international guidelines. There is, however, some considerable room for improvement, including the need to extend the coverage of the surveillance system, the inclusion of injury severity scores and disability indicators, and standardization of the sometimes rather disparate sources from various sectors in order to maximally capture the true burden of RTIs.*

Keywords Road traffic injuries; Egypt; Injury epidemiology

Road traffic injuries (RTIs) pose a major global public health threat that has long been neglected. According to the recently published World Health Organization (WHO) *Global Status Report on Road Safety* (GSRRS; WHO 2009a), approximately 1.3 million people die each year on the worlds' roads with between 20 and 50 million people sustaining nonfatal injuries. In 2004, 1.27 million people died as a result of RTIs, a number that is highly comparable to the number of deaths resulting from communicable diseases (Mathers et al. 2004). Though 2004 estimates place road traffic crashes as the ninth leading cause of death (responsible for 2.2% of all deaths globally), modeled projections predict that this will rise to the fifth leading cause by 2030 (3.6% of all deaths) if nothing is done to mitigate this escalating problem. Furthermore, 90 percent of road traffic fatalities occur in low- and middle-income countries (LMICs), which have only 48 percent of the world's registered vehicles (Figure 1). This translates to case-fatality rates of 21.5 and 19.5

Received 15 July 2011; accepted 7 November 2011.
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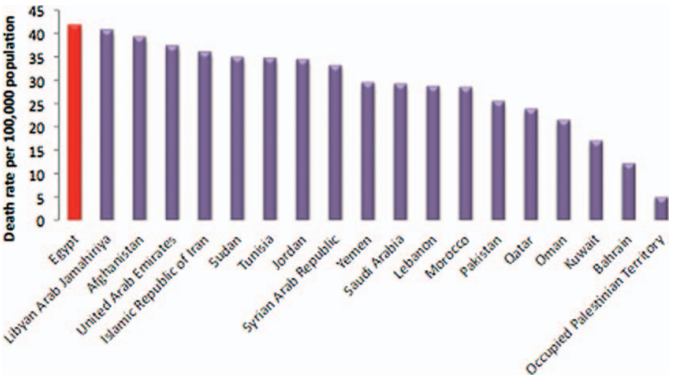

Figure 1 Modeled deaths due to road traffic injuries per 100,000 population in the Eastern Mediterranean region. Source: Global Burden of Disease Update (World Health Organization 2004) (color figure available online).

per 100,000 population for low- and middle-income countries, respectively, compared to 10.3 per 100,000 for high-income countries (WHO 2009a).

Over 50 percent of all deaths resulting from road traffic crashes occurs in the 15- to 44-year-old age group, again with higher rates being seen in LMICs (WHO 2009b). With an overall case-fatality rate of 27.6 per 100,000, RTIs affect males more than females, with the latter having a rate of 10.4 per 100,000. This gender difference is observed in all regions regardless of region or age. In addition to their fatality burden, road traffic crashes also increase the burden of nonfatal injuries (Chandran et al. 2010). In 2004, RTIs were responsible for 41,223,000 disability-adjusted life years (DALYs) lost, equivalent to 2.4 percent of the total number of DALYs lost from disease globally.

The WHO Eastern Mediterranean Region (EMR) consists of 22 countries, covering over 500 million people, with varying country levels of national income (5 are high-income, 12 are middle-income, and 5 are low-income). According to the WHO global burden of disease 2004 estimates, the overall case-fatality rate due to unintentional injuries in the region was 61.7 per 100,000 population, which is very similar to the global case-fatality rate of 61 per 100,000 population (Mathers et al. 2004). Despite its relatively small population and relatively high proportion of higher income countries, the rate of years lived with disability is highest in the EMR (1194 per 100,000 population), indicative of the nonfatal impact of injuries (Chandran et al. 2010). Although the overall number of registered vehicles per 1000 population is comparatively low (96 per 1000 population), the case-fatality rate from RTI is one of the highest in the world (WHO Regional Office for the Eastern Mediterranean 2010). Table I demonstrates some basic vehicle data for the region, demonstrating the proportion of global vehicles that are in the EMR.

In 2002, EMR's 26.4 deaths per 100,000 due to RTI was ranked second, surpassing all but the African region (WHO Regional Office for the Eastern Mediterranean 2009a). In 2004, RTIs caused 146,000 deaths and 2.8 million nonfatal injuries (Mathers et al. 2004). As a result, RTIs were ranked as the sixth leading cause of death in EMR, surpassing tuberculosis, malaria, and HIV/AIDs. Similar to global trends, RTIs in the EMR disproportionately affect individuals who are in the economically productive age group of 15 to 44. It is, for example, the leading cause of death for those between 15 and 29 and the second leading cause of death among those between 5 and 14 and 30 and 44 (WHO Regional Office for the Eastern Mediterranean 2010). Likewise, more men in the EMR die from RTIs than women (WHO Regional Office for the Eastern Mediterranean 2009b). Among children, particularly male children, RTIs are the most common form of injury. In fact, the RTI death rate (34.2 deaths per 100,000 population) among men between 15 and 29 is ranked highest in the world (WHO Regional Office for the Eastern Mediterranean 2010). RTIs also pose a tremendous economic burden; it is estimated to cost EMR a total of US$7.5 billion per year, equivalent to 1 to 1.5 percent of the gross national product of most countries in the region (Razzak 2004).

The high burden of road traffic injuries among vulnerable road users—including pedestrians, children, and bicycle/motorcycle and public transport users—is characteristic of most countries in the region. Pedestrians account for almost half of the deaths due to road traffic crashes in the region (Downing et al. 1993; Mohammadi 2009). Though a number of interventions and road safety efforts have been put into place in the region many challenges are yet to be addressed, the most substantial of which is the poor quality of data (Geziary et al. 2004). It is noted throughout the region that even if a data system is in place, there are often significant discrepancies between the figures issued by the different sectors involved in RTI monitoring.

Egypt is a low-income country located in the northeast corner of Africa. Egypt has the largest, most densely settled population among the Arab countries and has a population of 76,823,000 within a geographic area of approximately 1 million km^2, only 6 percent of which is inhabited. Basic health information has shown that Egypt has been steadily improving. For example, according to United Nations Children's Fund (UNICEF) data, the under-5 mortality rate in 1990 was 90, whereas it is now 23. Similarly, the infant mortality rate in 1990 was 66, compared with 2008 when it was 20.

Table I Characteristics of the WHO Eastern Mediterranean Region.

Countries	High income	Middle income	Low income	All
Population	33.6 million	299 million	213 million	545.6 million
% of global population	3.3	9.6	8.9	8.3
Vehicles	11.5 million	34.4. million	6.8 million	52.7 million
% of global vehicles	1.7	6.7	5.6	4

Source: *Global Status Report on Road Safety* (WHO 2009a).

Compared to other countries in the EMR, Egypt has one of the highest reported road traffic death rates per 100,000 population (Figure 1). According to the Global Status Report on Road Safety (WHO 2009a), road traffic crashes resulted in 42 deaths per 100,000 population (1.8% of all deaths from all causes in Egypt) and, as per the global burden of disease study 2004 update, 444 DALYs lost per 100,000 population (2.4% of all DALYs lost in Egypt due to all causes).

Despite the alarming increases in the burden of injuries in Egypt, there is a significant scarcity of published scientific articles surrounding the true burden of RTIs in Egypt, with the few that are available being limited to small-scale, city-based, or facility-based studies. Limited public awareness of the issue coupled with diminished emphasis on road safety policies at the national level results in reduced interest in this topic. One of the most significant constraints of policymakers is the limited yet necessary reliable data pertaining to RTIs, and it is therefore imperative that due attention be paid not only to the RTI data systems that already exist in Egypt but also to the necessity to improve these systems.

The overall goal of this article is to define the health impact of RTIs in Egypt using available data in order to gain a clearer picture of the burden of RTIs in Egypt. The primary objective is to review the secondary national data sources available in Egypt, identifying some of the strengths and weaknesses of each data source in order to identify gaps, which, if addressed, could help to improve the RTI data systems in Egypt. A secondary objective of the article is to present a summary of scientifically published studies surrounding RTI in Egypt because currently no such review of the literature is available.

METHODS

In order to assess the burden of RTIs in Egypt, a 2-pronged approach was taken: a comprehensive literature review of published articles and gray literature and an analysis of existing secondary data sources.

Electronic searches were performed (updated as of November 2010) using PubMed, Embase, ISIS Web of Knowledge, and Scopus databases with the key words: *Egypt* AND *accident*, *unintentional injury*, *road safety*, *traffic accident*, *traffic injury*, *traffic death*, *traffic fatality*, *seat belt*, *child seat*, *child restraint*, OR *speeding*. Neither publication year nor language restrictions were applied. Figure 2 represents a flowchart of how the literature review was carried out. Initial review of titles and abstracts yielded 99 articles, of which 21 were unique citations (Figure 2, Table II; Abbas 2004; Abou-Raya and ElMeguid 2009; Al-Refaie et al. 2009; Day et al. 2010; El Din 2006, 2010; El Islam 1974; El-Zawahary 1967; Hamam and El Sayed 1999; Hammam 1968; Hassan et al. 2010; Hyder 2009; Jacobs and Sayer 1982; Rady 1997; Sakr et al. 2006; Smith and Barss 1991; Wintemute 1984, 1985). Only studies pertaining to Egypt and road traffic injuries were included. Letters, opinion pieces, evaluation of medical interventions, case reports, and case series were excluded from this review. Full texts were then reviewed using the same inclusion criteria. References from the identified

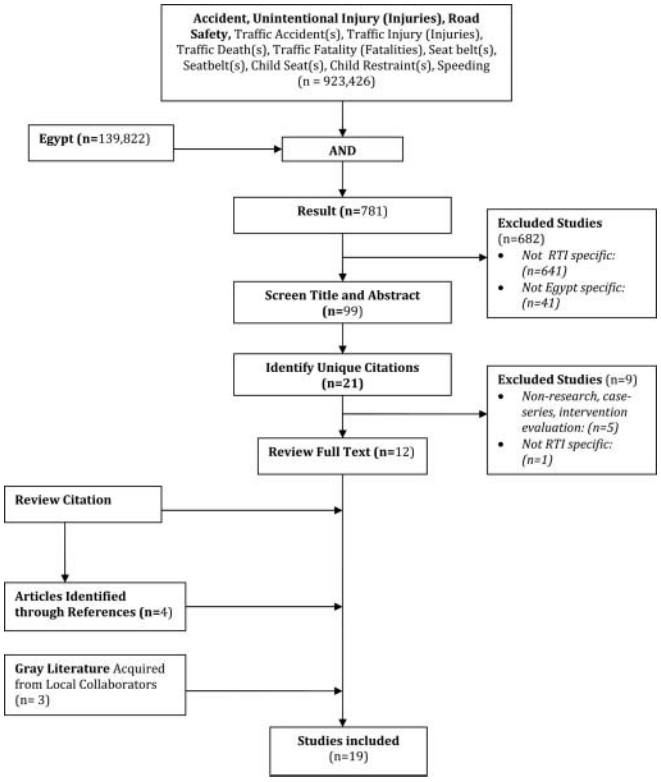

Figure 2 Flowchart summarizing literature review process for Egypt.

studies were scanned and 5 more articles were found. Gray literature acquired from local collaborators was also added.

Sources of Road Traffic Injury Data in Egypt

Data systems, where they exist, throughout the whole of the EMR and in particular in Egypt, suffer from various challenges and very rarely do the differing sources of data within a country agree with each other. Though still in their infancy, data systems for addressing the burden of injury in Egypt are in place at a national level across the various sectors. Information on the contents, methods, and quality of each identified data set was collected

Both the WHO and the Ministry of Health, through the injury surveillance and control unit, have implemented pre-hospital and hospital-based injury surveillance systems as well as community-based household surveys. The Ministry of Interior also has an active traffic department with a designated research unit; however, these data are not publicly available at present. In addition, a subsidiary of the Ministry of Transport, the General Authority for Roads, Bridges and Land Transport (GARBLT), also regularly collects crash data; however, their remit is restricted to the federal roads within Egypt.

Table III highlights the main data sources and indicators collected within each data set.

Hospital-based injury surveillance. In 1996, the Ministry of Health responded to a national recommendation for the need to implement a national hospital based injury surveillance system housed within the Injury Control Unit in the Occupational

Table II Summary of literature review

Author (date)	Type of study	Location	Study population	Results	Conclusions/ Recommendations
Behavioral/perception/attitude studies					
Day et al. (2010)	Cross-sectional	Cairo, Egypt	28 Young Egyptians (14–26 years of age) of medium to high socioeconomic status	The majority of the respondents believed that road traffic crashes are *hadthah* (accidents/out of one's control) rather than *esabah* (injuries) Education, enforcement, and engineering were recommended as intervention tactics	Young Egyptians of medium to high socioeconomic status were found to be receptive toward injury prevention programs. However, it is important to understand how these injury concepts are perceived (*hadthah* or *esabah*)
Islam et al. (1974)	Cross-sectional	Cairo, Egypt	55 Public transport drivers	Compared to normal drivers, neurotic and accident-prone drivers received a significantly higher score for neuroticism The neuroticism scores of accident-prone drivers were the highest amongst the three groups	Preemployment personality screenings were suggested
Rady (1997)	Cross-sectional	Cairo, Egypt	382 Physicians at Ain Shams University Hospital	11.2% of the participants used a seat belt regularly	Need intervention programs to reduce behavioral risk factors among physicians and laws that mandate seat belt use
Hospital-based studies					
Abou-Raya and ElMeguid (2009)	Cross-sectional	Alexandria, Egypt	258 Elderly (65 years and +) road traffic injury patients	Elderly males were at higher risk for RTIs 57% of elderly RTI victims were pedestrians, 26% were car drivers, 14% were car passengers, 2.7% were bicyclists, and 0.7% were motorcyclists	Health and transport professionals must work together to prevent RTIs in vulnerable populations Recommendations include improving motor vehicle and road designs as well as offering frequent medical screenings
Al-Refaie et al. (2009)	Retrospective	Mansoura, Egypt	46 Blunt traumatic diaphragmatic rupture patients	The main cause of blunt traumatic diaphragmatic rupture was road traffic crashes (78.3%) Of the 46 patients, 2 (4.3%) died Blunt traumatic diaphragmatic rupture was more common in men in their 40s	Blunt traumatic diaphragmatic rupture was most common in men who have been involved in road traffic crashes
Hassan et al. (2010)	Cross-sectional	Tanta, Egypt	255 Patients with craniofacial injuries	Road traffic crashes were the most common cause of craniofacial injuries (54.12%) There were a higher percentage of males involved in traffic crashes (45.88%) compared to females (7.06%)	Engineering, enforcement, and education were recommended to decrease the number of craniofacial injuries
Sakr et al. (2006)	Retrospective	Alexandria, Egypt	509 Mandibular fracture patients	The main cause of mandibular fracture was road traffic crashes (39%) Among male patients, road traffic crashes were the leading cause (42%). On the other hand, among female patients, road traffic crashes were the second leading cause (36%) Among all road traffic crash patients, individuals between 21 and 30 years were at the highest risk (39%)	Results agreed with previous research

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Table II Summary of literature review Continued.

Author (date)	Type of study	Location	Study population	Results	Conclusions/ Recommendations
Modeling					
Abbas (2004)	Statistical modeling	Rural roads in Egypt	N/A	The death per million vehicle kilometers in Egypt was 44.1. This was 34 times higher than G-7 countries and 3 times higher than other Middle Eastern countries Over the past 5 years, there has been a decrease in risk-based, causalities, and injury severity indicators but an increase in fatalities severity indicators	Recommendations included increasing the awareness of drivers regarding the importance of inspecting tires and observing speed limits. It is also necessary to implement tougher driver tests and ensure the presence of road signs and road shoulders
Secondary analysis					
Hammam (1968)	Secondary data	United Arab Republic	N/A	Of all accident-related deaths in United Arab Republic, 2.8% could be attributed to motor vehicle crashes Urban areas experienced higher rates of motor vehicle related case-fatality compared to rural regions Males were found to be at higher risks of motor vehicle related fatality than females at all ages	Accident prevention program was recommended
Hamam et al. (1999)	Secondary data	Egypt		RTIs were the leading cause of injury-related deaths RTIs were responsible for 56% and 53% of all injury related deaths in rural and urban areas, respectively Victims of RTIs included pedestrians (67%), car occupants (14%), cyclists (7%), and motorcyclists (4%).	Recommendations included improving death registration system; conducting population-based, case-control, and cohort studies; and gaining endorsements from the national committee and safety council to collect injury-related data
Surveillance					
El Din (2010)[a]	Surveillance	Cairo, Egypt	N/A	Development of a surveillance database system. During the study period, there were 594 traffic crashes, which resulted in 992 injured and 51 dead Road traffic injury rate per 100,000 population in Cairo was 52.9 and road traffic death rate per 100,000 population in Cairo was 2.7 Most victims were male (82.2%) and 40 years or younger (73.6%) 52% of the victims were pedestrians	Recommendations included standardizing data collection system, educating young drivers and child pedestrians, improving road designs, adopting safety laws, creating a national road safety council, increasing the number of ambulances during holidays, and improving EMS performance
El Din (2006)	Surveillance	Egypt	N/A	In 2007, there were 6345 accidents, of which 5403 or 85% were due to road traffic crashes Road traffic crashes contributed to 29,855 injuries and 2416 deaths Giza, Cairo, and Elbehra governorates had the highest percentages of road traffic crashes	Recommendations included increasing the number of ambulances during holidays, forming mobile or static ambulance squads, improving emergency medical service performance, introducing safety laws, and standardizing data collection systems

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Saad (2008)	Newspaper surveillance	Egypt	N/A	There were 1221 deaths, of which 48.89% were due to RTIs Among train, trucks, and car users, the latter group experienced the highest percentage of RTI deaths (51.01%) The percentage of RTI deaths compared to assault and drowning-related deaths is highest in the Red Sea governorate (92.86%)	Egypt's mortality registry can be enhanced with the use of public newspapers
Regional/global studies					
El-Zawahry (1967)	Secondary data	Multi-country (inclusive of United Arab Republic)	N/A	United Arab Republic (UAR)-specific results: The UAR experienced the highest rates of accidents in general but the lowest rate of road traffic accidents Males were at greater risks for accidents The UAR experienced high risk of accidents but the proportion of case-fatalities was low compared to all other deaths	N/A
Hyder (2009)	Cross-sectional	Multi-country (Bangladesh, Colombia, Egypt, and Pakistan)	1559 Injured children (≤12 years)	Egypt-specific information: About 32% of the 1559 child patients were from Egypt Pooled results showed that: 350 Children suffered road traffic injuries, of which 39% were pedestrians, 19% were passengers of 4-wheelers, and 13% were passengers of 2-wheelers About 5% of the children wore seat belts or helmets 20 Children needed emergency surgery and 2 died	The authors concluded that it is feasible to assess childhood injuries and use standardized injury surveillance in LMICs It was recommended that pedestrian safety be incorporated into interventions
Jacobs and Sayer (1982)	Secondary data Analysis	Multi-country (inclusive of Egypt)	N/A	Pooled results show that: RTI-related fatality rates per vehicles were higher in developing countries compared to developed countries RTIs cost about 1% of the annual gross national product of developing countries RTIs were found to be a growing health and economic problem for developing countries	Recommendations included improving education, training, and enforcement as well as implementing cost-effective interventions

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Table II Summary of literature review Continued.

Author (date)	Type of study	Location	Study population	Results	Conclusions/ Recommendations
Smith and Barss (1991)	Secondary data analysis	Multi-country (inclusive of Egypt)	N/A	Egypt-specific information: Crude case-fatality rate was 4 per 100,000 population in males and 2 per 100,000 population in females Pooled results showed that: In most of the developing world, motor vehicle crashes were the leading cause of death from unintentional injuries Males were about 5 times more likely than females to experience RTI-related deaths RTI-related fatality rates per population, vehicles, and miles traveled have increased in the developing world	Recommendations included prioritizing causal factors, using epidemiologic surveillance of injuries, ensuring accurate recording, and conducting surveys as well as population-based prospective studies
Wintemute (1984)	Secondary data analysis	Multi-country (inclusive of Egypt)	N/A	Egypt-specific information: In 1978, crude case-fatality rate per 100,000 persons was 2.1. The proportional case-fatality rate for motor vehicle–related fatality to all deaths was 0.2, and the percentage of all RTI-related deaths was 4.4 Pooled results showed that: The relationship between economic development and RTI deaths was found to be weak if not nonexistent Income distribution in low-income countries had a stronger relationship to RTI-related deaths	RTI interventions were recommended to be country-specific because the determinants of RTI-related case-fatality vary across countries
Wintemute (1985)	Secondary data analysis	Multi-country (inclusive of Egypt)	N/A	Pooled results showed that: The relationship between economic development (GNP per capita) and RTI deaths was found to be weak RTI fatality rates were increasing most quickly in low- and middle-income countries. However, this relationship was not straightforward	Future studies that focused on examining noneconomic determinants were recommended

[a]Personal communication, April 10–15, 2010, Cairo, Egypt.

Health Department of the Ministry of Health. The objectives of the system are to

1. measure the incidence of injuries;
2. assess the contribution of injuries to the overall disease burden in Egypt; and
3. measure injury characteristics including populations at risk and areas in need of intervention.

The injury surveillance questions are administered by trained registry officers to all injury cases when they visit the emergency departments. The system collects injury data from all Ministry of Health facilities, including 234 general and district hospitals, 221 specialized hospitals, 487 health integration hospitals, and 194 rural health centers and units. In 2008, educational hospitals were integrated into the system (9 hospitals) and in 2009, university and teaching hospitals were also included (17 hospitals). The total number of facilities within the system constitutes 46.9 percent of the total number of Egyptian facilities. Currently, the Egyptian health facilities that are still not included in the national surveillance system are in the health insurance sector, police hospitals, prison hospitals, railway hospitals, and private sector hospitals. This equates to 1379 hospitals (53.1% of the Egyptian facilities).

Health information system—mortality data. In Egypt, the major sources of information for injury case-fatality are hospital records, police records, and the mortality information system. In the absence of a centralized agency, data have to be compiled from different sources. All deaths in Egypt are reported to the health system and a death certificate is completed for all deaths. This information is fed into the mortality information system and analyzed at the national information center. Information is available on name, age, sex, cause, place, and time and conditions leading to death. As of December 31, 2010, the most recent mortality data accessible for this article were for 2008, reflecting inconsistencies in coverage and reporting.

Community-based household survey. A community-based survey was carried out over a period of 4 months (March–June) in 2009 with the objectives of identifying the injury burden in Egypt, defining injury patterns and characteristics, and performing a basic assessment of the impact of injuries on affected individuals. Following an initial pilot study in one governorate (Giza), the final survey was undertaken in 5 out of the 27 governorates in Egypt (2 urban: Cairo, Alexandria; and 3 rural: Assuit, Sharkia, Dakhlia), resulting in a final survey population of 11,118 households (47,797 of 77 million individuals in Egypt).

Though this survey looked at all injuries occurring at the community level, there was a specific module for RTIs that disaggregated RTI data by variables such as age, gender, activity at time of RTI, mode of transport, and striking vehicle. Importantly, it is one of the few studies that collected risk factor data such as use of seat belts and helmets. Cross-verification of details with medical records was undertaken where possible as a means of quality control and triangulation of the data with police and hospital records was carried out for additional quality control purposes.

Pre-hospital data. The pre-hospital services in Egypt have 2 types of surveillance systems in place. The first system is passive, giving a monthly count of all of the ambulance fleet missions from the 29 ambulance departments in Egypt with records of on-the-scene deaths and injuries. The second system combines passive and active systems, offering a particular focus on those that involve more than 3 victims and representing 6 percent of the total number of crashes, 23 percent of the injuries, and 48 percent of the total number of deaths resulting from RTIs in Egypt. In addition, only the cases that are reported to the emergency services will be counted under this system. Numerous victims of RTIs in Egypt will be taken to hospitals by other methods of transport, including private ambulance fleets that exist in the country, particularly in the urban cities. There is a large degree of underreporting that accompanies the pre-hospital ambulance data systems.

Central Agency for Public Motorization and Statistics. The Central Agency for Public Motorization and Statistics (CAPMAS) is the official statistical agency of Egypt that collects, processes, analyzes, and disseminates all statistical data and the census. They do not routinely collect traffic crash–related data; however they are sent data by the Ministry of the Interior. Though there is approximately a 1.5-year time lag in receiving these data, they are made available for the public in the CAPMAS Annual Statistics report. The 2008 report was made available for the purposes of this article. CAPMAS is the only source of crash data available that allows disaggregation by governorate, time of day, and vehicular damage and presents injury and case-fatality data.

RESULTS

The aforementioned search methods resulted in 19 studies (Table II): multi-country (inclusive of Egypt; $n = 6$); hospital-based ($n = 4$); behavioral, perception, and attitude ($n = 3$); surveillance methods ($n = 3$); secondary analysis ($n = 2$); and modeling ($n = 1$). The publication years ranged from 1967 to 2010. Multi-country ($n = 6$), nationwide ($n = 4$), and Cairo-based studies ($n = 4$) accounted for the majority of the literature. Similar to global trends, Egypt-specific results revealed that males and individuals from the most economically productive age range (15–44 years) had higher risks of road traffic–related injuries and fatalities compared to their counterparts. Furthermore, 3 studies found pedestrians to be the most vulnerable road users, accounting for the highest percentage of deaths (52%–87%). No studies examined risk factors such as speeding, alcohol, or seat belt use. Lastly, most recommendations included education, engineering, and enforcement:

- Standardize data collection system (Seif 2006, 2007).
- Increasing the awareness of drivers regarding the importance of inspecting tires and observing speed limits (Abbas 2004).

Table III Sources of road traffic injury data, Egypt 2001 to 2009

Data type	Responsible organization	Year(s)	Key indicators available	Comments
National hospital-based injury surveillance	Ministry of Health	1999–2009	For all injury types: Crash location Facility Demographics Place of injury External cause of injury Type of injury Diagnosis Outcome Period of admission Referrals	All national government and teaching/university hospitals.
Community-based health survey	WHO	2009	Proportion of RTI fatalities of all deaths Leading causes of death Demographics Crash location Road user categories Safety intervention use Activity at time of crash Economic data	Nationally representative sampling (PPS)—5 governorates (Alexandria, Cairo, Assuit, Sharkia, Dakhlia) 11,118 households 47,797 individuals
Pre-hospital injury surveillance	Ministry of Health	2008	Fatalities Injuries Crashes Demographics Month/day/time Crash location Vehicle involved External cause of injury Diagnosis Paramedic performance Referrals	Two types of surveillance—one active and one combined active and passive surveillance. Accessible data are from this second form of surveillance and only account for severe, multivehicle crashes
Police	Ministry of Interior		Crash location Date/time Weather/road surface Mode of transport of injured Type of vehicle Vehicle behavior Cause of crash Demographics Driver license Type of injury	Unable to access this data[a]
GARBLT			Crash location Date/time Weather/road surface Mode of transport of injured Type of vehicle Vehicle behavior Cause of crash	Looks at 10 national highways, one of which is the Cairo Ring Road. Additional roads to be added as part of RS10 will include the Alexandria roads
Death certificates			Date of death Demographics (name, age, sex, occupation) Place of death Address Cause of death Road user categories Type of vehicle	
CAPMAS/Ministry of Interior		2001–2009	Crashes Injuries Deaths Number of vehicles damaged Crash location	Data sourced from Ministry of Interior. Delays in making data publicly available. [a]

[a]As of December 31, 2010.

- Health and transport professions must work together to prevent RTIs in vulnerable populations (i.e., the elderly; Abou-Raya and ElMeguid 2009).
- Improve road design/conditions (Abbas 2004; Abou-Raya and ElMeguid 2009; Hassan et al. 2010; Seif 2006).

Estimates of the burden of RTI in Egypt have been calculated and compiled based on available data sources.

Crashes

Crash data were extracted from the CAPMAS data sets and from pre-hospital data. CAPMAS data support an estimate totaling 22,793 road traffic crashes in Egypt in 2009 and 30,666 damaged vehicles. There is a large discrepancy between the CAPMAS data and the pre-hospital surveillance data, which for the same year reported that there were 73,336 road traffic crashes in Egypt. Pre-hospital data are also subject to underreporting of less serious crashes. Respondents in the community-based survey indicated that only 23 percent of their crashes had been reported to the police.

The number of reported crashes in 2009 represents a crash rate per 1000 registered vehicles of 3.5. Crash rates per 100,000 population from 1990 to 2009 are shown in Figure 3. Disaggregating the available crash data by geographical location shows that the largest number of crashes occur on the national highways. According to these data, the total number of crashes occurring on the national highways in 2008 was 4717, which translates to an average of 12.9 crashes per day.

The community-based household survey also looked at crash location for nonfatal injuries. The results of the survey mirror the data from CAPMAS demonstrating that over half (53%) of all crashes resulting in nonfatal injuries occurred on national highways. Further disaggregation by governorate revealed that the majority of crashes occurring on the national highways occurred in Cairo (33%).

Injuries

The majority of the nonfatal road traffic injury data for this article stem from national hospital-based surveillance. Surveillance data from 2009 report an overall RTI rate of 131.91 per 100,000 population and rates of 207.36 and 52.98 per 100,000 population among males and females, respectively. Disaggregating these rates by age shows that the highest rate of RTI is among the productive age range in males with an age-specific rate of 275.12 per 100,000 for the 15- to 44-year-old group (Figure 4).

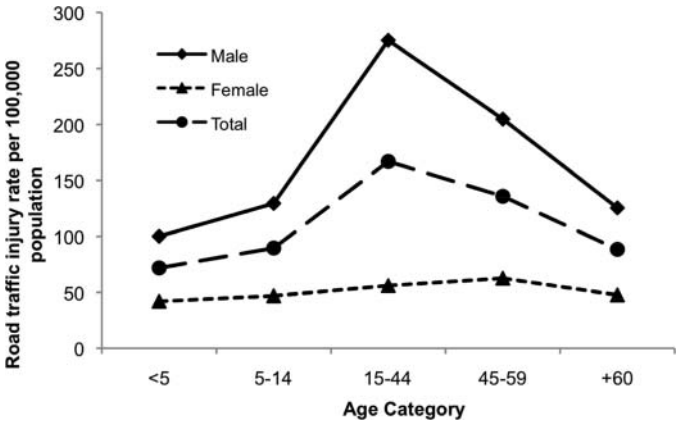

Figure 4 Rate per 100,000 population of nonfatal road traffic injuries by age and gender in Egypt. Source: hospital-based surveillance system (Ministry of Health 2009).

The community-based survey looked at nonfatal injuries among the survey population. The reported nonfatal injury rates due to RTIs are, for each age category, significantly lower than the reported rates from the national hospital-based surveillance. However, the age pattern observed is mirrored in the survey findings with the highest nonfatal injury rates observed in the 15- to 44-year male age group (51.4 per 100,000 population) followed by females aged 15 to 44 years (45.1 per 100,000 population).

Case Fatalities

For Ministry of Interior and CAPMAS case-fatality data, the definition of a road traffic fatality is one in which the victim dies at the scene of the crash. The follow-up of a victim to hospital or other facility to assess whether a death occurs within the standard 30 days following a crash is yet to be achieved in Egypt.

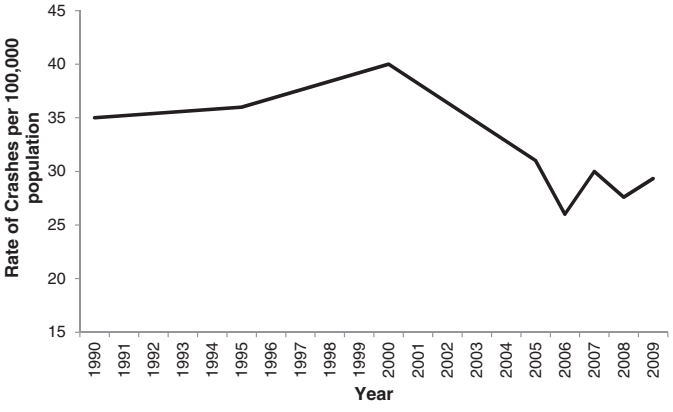

Figure 3 Rate of crashes per 100,000 population in Egypt, 1990 to 2009. Source: Central Agency for Public Motorization and Statistics (2009).

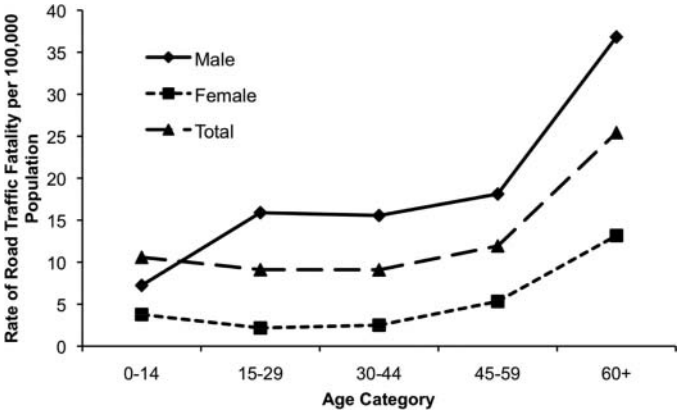

Figure 5 Rate of road traffic fatality per 100,000 population by age and gender. Source: mortality information systems (Ministry of Health 2009).

Table IV Overview of the strengths and weaknesses of select data sources for road traffic injury in Egypt, 2010

Data source	Strengths	Weaknesses
Mortality information systems	Well-established reporting system in place (CAPMAS) that all health and other injury-related authorities such as the Ministry of Interior, Ministry of Transport, and traffic police, are mandated to report deaths to	Definition of road traffic death does not include 30-day follow-up Underreporting of injury deaths due to inaccurate coding practices No formal evaluation of the data system has been carried out
Hospital-based injury surveillance	System collects all injured victims who present to emergency departments in select facilities Revised surveillance forms in keeping with international guidelines using ICD-10 coding Started including university hospitals in the national injury surveillance system in 2009	Until 2008, the coverage represented 53% of the reporting facilities (Ministry of Health faculties) Follow-up of patients for 30 days not carried out routinely No reporting for injury severity scores or degree of caused disabilities
Pre-hospital injury surveillance	Two surveillance systems in place—a passive one and a combined active/passive system The passive system accounts for all 29 ambulance fleets and gives details of all missions	Passive system not routinely used for monitoring and assessment of RTI burden The combined active/passive approach only represents 6%, 23%, and 48% of crashes, injuries, and deaths, respectively, in Egypt Looks at multivehicle crashes only
Police	Traffic police have a strong research department in place and are continuously improving their reporting systems Report some data to CAPMAS, which publish them in special report	Not all crashes and injuries are reported to police; therefore, underreporting exists
Community-based injury survey, 2009	Covered 5 governorates and used strong statistical sampling techniques Covered all injuries and included modules on risk factors and socio-economic costs	Small sample sizes of RTIs mean that survey results may not be generalizable to a national level Recall bias 21 Governorates excluded

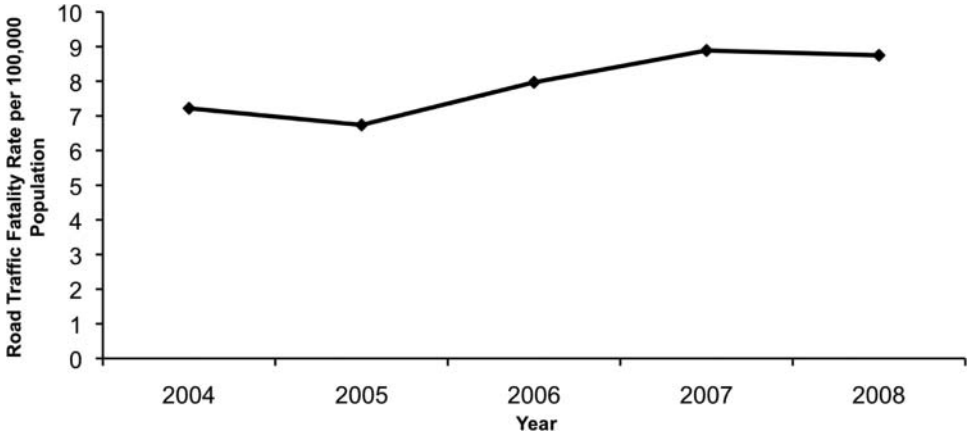

Figure 6 Road traffic fatality rate by year, 2004 to 2008. Source: CAPMAS (2009).

Region-specific data stemming from the GSRRS for the Eastern Mediterranean region (which is based on Ministry of Interior data) stated that the rate of reported deaths per 10,000 vehicles was 28.6, with a modeled death rate of 73.1 when underreporting was taken into consideration. These rates are similar to those experienced in other EMR countries such as Pakistan and Yemen (78.5 and 84.3 per 10,000 vehicles, respectively). In addition, reported vehicle occupant deaths per 10,000 vehicles was 17, and when underreporting was factored in, this resulted in a modeled rate of 43.5 per 10,000 vehicles.

Table V Comparison of data key data sources for road traffic deaths and injuries, 2007

	Data source			
Indicator	Ministry of Interior (from GSRRS)	Mortality information systems	Pre-hospital surveillance	Hospital-based surveillance
Number of road traffic fatalities, 2007	12,295	7145	4205	1657
Number of road traffic injuries, 2007	154,000	n/a	n/a	86,244

As mentioned previously, the predominant source of case-fatality data for road traffic crashes is the mortality information system in Egypt, which is fed into the WHO mortality database. These data are available at a national level disaggregated by age and gender (Figure 5). The national case-fatality rate for all ages as reported by the mortality information systems in 2008 was 10.58 per 100,000 population. The overall case-fatality rate for males for all ages is 16.41 per 100,000 population. This is compared to an overall female rate of 4.48 per 100,000 population. The trends show that case-fatality rates generally increase as age increases, reflecting the greater severity of RTI on the elderly populations.

Figure 6 is sourced from the mortality information systems report and shows a gradual increase in the road traffic fatality rate per 100,000 between 2004 and 2008.

CONCLUSION

The results of this article clearly highlight the significant burden that road traffic injuries pose on the health of the Egyptian population. There are, however, inherent gaps in the data presented due to the lack of data and limited coverage of the existing, accessible data systems. Inevitably each data source used here has its own inherent strengths and weaknesses (Table IV).

Many countries in the region, especially among the LMICs, do not have a hospital-based injury surveillance in place and therefore such an initiative is of great significance to Egypt. The use of *International Classification of Diseases* (ICD-10) coding in the hospital surveillance with several of the WHO-recommended core and optional data elements included brings the system very closely into line with international guidelines (Holder et al. 2001). There is still room for improvement, however; for example, the inclusion of injury severity scores and disability indicators that would serve to dramatically improve the quality and future applicability of the collected data. Increasing the coverage of the already existing hospital injury surveillance would be a large benefit to assessing the burden of injuries in Egypt. Many victims of road traffic crashes will go to private hospitals, which are currently not formerly included in the surveillance system.

Many of the data sources that report fatalities due to RTI do not follow the internationally recommended definition of a road traffic fatality, which includes a 30-day follow-up. This therefore results in a significant underrepresentation of the number of deaths that result from RTIs. Such data would be invaluable in obtaining a more accurate estimate of the years of potential life lost, which would, in turn, add strength to the argument that RTIs in Egypt are a significant public health problem that requires urgent attention.

The community-based household survey was one of the first surveys of its kind to be formally carried out in Egypt and therefore provides valuable and unique community-level data on RTIs in Egypt. Despite covering all causes of injury, the RTI module was comprehensive and included data that were not being collected elsewhere—specifically risk factor data on the use of safety devices. However, a more focused survey on RTIs would enable more detailed information to be drawn from the community level that would provide valuable information on disability, loss of earnings, attitudes toward road safety, etc. No such survey has been carried out in Egypt and, therefore, there is a good opportunity to involve local governmental agencies such as CAPMAS and incorporate injury modules into their regular household surveys.

As can be seen from the data in this article on Egypt, though systems are in place, there are considerable gaps that need to be addressed, and the sometimes rather disparate sources from various sectors need to come into line with each other in order to maximally capture the true burden of RTIs. However, unlike many countries in the Eastern Mediterranean region, there are existing systems in Egypt that are becoming well established as standard practice and are continuously evolving. It is clear that there is a strong awareness of the increasing burden of RTIs in Egypt and, more important, that this awareness is being acted upon through the development of the national road safety board, the establishment of the injury surveillance system, and the continuous improvements to existing data sources in the country.

The nonstandardization between data sets, particularly that between the health and transport sectors, is highlighted when road traffic fatalities and injuries are considered. For example, for the year 2007, it was reported in the *Global Status Report on Road Safety* (WHO 2009a) that there were 12,295 deaths due to RTIs. For the purposes of the GSRRS, the Ministry of Interior supplied the data. For the same year, the mortality information systems data reported that there were 7145 deaths as a result of RTIs (Table V). Similar discrepancies can be seen when road traffic injuries are considered.

Needless to say, however, it is clear from the data presented that road traffic crashes result in a considerable loss of lives in Egypt. With a modeled road traffic fatality rate of 41.6 deaths per 100,000 population, Egypt has the unfortunate distinction of suffering from the highest case-fatality rates than any other country in the EMR (Mathers et al. 2004). There is a rapid rise in the case-fatality rates in both men and women as age increases, with the highest rates seen in the 60+ age group.

Although deaths due to RTI are tragic and entirely preventable, another great impact of RTI is the morbidity and disability that accompanies nonfatal injuries. High RTI rates among men between the age of 15 to 44years demonstrate a significant burden in the most economically productive age and gender group in Egypt that needs to be addressed. The inclusion of cost data modules in the proposed data systems work will undoubtedly demonstrate the enormous economic burden that such a trend can have on a country and therefore may play an important part in convincing decision makers in Egypt to focus on this issue.

It is clear that there needs to be a strong push in Egypt to bring the various data systems in line with international guidelines and to bring them together in a standardized manner. Plans

are in place to improve the existing systems, such as the vital registration database as well as injury surveillance, police, and mortuary data, and it is envisaged that gaps in the data that are being identified will be incorporated into the improved standardized data systems; for example, risk factor data, cost information, and disabilities. Such initiatives will only serve to further improve the ability of national stakeholders to accurately examine the burden of RTIs (and injuries as a whole) in Egypt and thereby effectively target programs toward alleviating this issue.

ACKNOWLEDGMENTS

This work was conducted as part of the Road Safety in 10 Countries project funded by the Bloomberg Philanthropies.

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Cost of Road Traffic Accidents in Egypt

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***Abstract*—**The main objective of this paper is to estimate the cost of road traffic accidents in Egypt. The Human Capital (HC) approach, specifically the Gross-Loss-of-Output methodology, is adopted for estimation. Moreover, cost values obtained by previous national literature are updated using the inflation rates. The results indicate an estimated cost of road traffic accidents in Egypt of approximately 10 billion Egyptian Pounds (about $US 1.8 billion) for the year 2008. In addition, it is expected that this cost will rise in 2009 to 11.8 billion Egyptian Pounds (about $US 2.1 billion).

***Keywords*—**Cost, Gross-Loss-of-Output, Human Capital Approach, Road Traffic Accidents.

I. Introduction

ROAD traffic accidents became a growing problem that threatens the lives of many people around the world. According to [20], road traffic accidents cause the death of more than 1.2 million and the injury of between 20 and 50 million people annually worldwide with more than 90% of deaths in low and middle income countries. Besides human casualties, other aspects of losses include material damages such as the vehicles involved in these accidents or the publicly-owned properties that lie on the road and the bad physical and psychological effects on the survived victims as well as the families and friends of the casualties. Reference [9] points out that in 1997, traffic accidents cost the developing and transitional countries $US 65 billion against $US 453 billion for the highly motorized countries. Reference [2] states that traffic accidents cost the developing countries annually between 1 to 3% of their GDPs. Reference [19] points out that road traffic accidents cost the low and middle income countries annually what is more than the total aids they receive for development purposes.

The importance of estimating the cost of road traffic accidents stems from the importance of drawing attention to this problem not only as a social problem that costs a lot of people their lives but also as an economic problem that costs the society a lot of money and adds an undesirable economic burden on it. Moreover, cost estimation helps to clarify the size of this problem and the economic benefit arising from preventing such accidents. This can be done through a cost-benefit analysis that may guide policy makers, especially in developing countries with limited resources, to allocate road safety investments optimally as much as possible. For more details, see [1], [8], [10], and [19].

The Human Capital (HC) approach and the Willingness To Pay (WTP) approach are the most important and widely used approaches in estimating the cost of road traffic accidents. The HC approach estimates the cost of road traffic accidents as the lost earnings endured by casualties, whereas the WTP approach estimates this cost as the amount individuals are willing to pay for reducing the risk of experiencing a road traffic accident. Differentiation between HC and WTP depends on the objectives or priorities and data availability. If the main concern is to maximize the national output then the HC approach is the appropriate methodology to use, whereas the WTP approach is the suitable one when the main concern is to increase social welfare by reducing injuries and fatalities. On the other hand, the lack of data needed to apply the WTP approach especially in the developing countries makes the HC approach an attractive choice [8]. Several developed countries such as USA, UK, New Zealand, and Sweden adopt the WTP approach in cost estimation. A number of other developed countries uses the HC approach to estimate the cost of road traffic accidents such as Australia, Canada, Germany, Norway, Portugal, Japan, and Austria (for more details refer to [15] and [17]). On the other hand, most of the studies that estimate the cost of road traffic accidents in developing countries use the HC approach. Examples include among others: Indonesia, Bangladesh, India, Vietnam, the Philippines, and Thailand (see [1], [4], [5], [7], [11], and [18]). For Arab countries, [10] uses the HC approach to estimate the cost or traffic accidents in Jordan.

Several attempts are conducted to estimate the cost of road traffic accidents in Egypt. Reference [3] shows that the total cost of road traffic accidents in 1986 was about 54 million Egyptian Pounds with an average cost of approximately 14 thousand Egyptian Pounds per accident. Reference [12] estimates the cost of road traffic accidents in Egypt for 1993 to be $US 577 million (0.8% of GDP) with an average cost of $US 8190 per accident. Reference [14] finds that for the year 2005/2006, the average cost of a fatal or a serious accident, which causes at least one fatality or one serious injury, is 118 thousand Egyptian Pounds. For the same year, the average cost of a slight accident that causes one or more slight injuries with no fatalities or serious injuries is 13.4 thousand Egyptian Pounds. Moreover, the average cost of a property damage only accident for the year 2005/2006 is 12.8 thousand Egyptian Pounds. Reference [6] reports that the average cost of a road traffic accident is estimated to be about 8500

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Egyptian Pounds. Reference [13] claims that road traffic accidents cost Egypt 16 billion Egyptian Pounds annually.

As previously seen, there have been a limited number of attempts to estimate road traffic accidents cost in Egypt. These attempts have different limitations as some of them suffer from data deficiencies, and others lack cost components in their calculations or an adequate clear methodology for cost estimation. This study tries to estimate the cost of road traffic accidents in Egypt using an integrated methodological framework. In this regard, the study introduces a detailed and comprehensive technique for cost estimation that can be modified and updated regularly.

The rest of this paper is organized as follows: section 2 discusses the methodology employed to estimate the cost of road traffic accidents in Egypt, whereas section 3 highlights the data and assumptions used in cost estimation. Section 4 shows the estimation results. Section 5 forecasts cost in 2009. Finally, the sixth and last section summarizes the paper with some conclusions and discussions.

II. Methodology

The study adopts the HC approach to estimate the cost of road traffic accidents in Egypt. The general guidelines in estimating the cost put by [2] and [16] are followed. The HC approach equates the cost of lost life or time due to being injured in a road traffic accident to lost earnings. Among different variations of the HC approach the Gross-Loss-of-Output is the easiest and most frequently used one. It calculates the cost as the present value of the expected earnings that could have been achieved by the injured or the deceased person if not experienced the accident. The study adopts the Gross-Loss-of-Output of HC approach to estimate the cost of road traffic accidents in Egypt for the year 2008.

The study uses two different techniques of the HC approach in calculating the cost of road traffic accidents. The first technique begins by estimating the average costs of a fatality, an injury, and a damaged vehicle. These averages are then multiplied by the corresponding totals and summed together with other cost components to find the total cost of road traffic accidents for the year 2008. The cost of a fatality or an injury is calculated as the sum of lost output, family and community loss, which refers to the activities the casualty would have conducted after working hours if not experienced the accident (see [10]), medical treatment costs, lost experience of the fatality or the injured, and lost quality of life (pain, grief, and suffering). The cost of damages per vehicle is calculated by summing the average repairing costs, the average costs during the vehicle detention period, and the average cost of a deteriorating vehicle performance after repairing. Other cost components of road traffic accidents include the cost of damages in properties other than vehicles, the cost of police service, and the cost of insurance administration.

The second technique of using the HC approach depends on obtaining the average accident cost according to its severity level (fatal, serious, slight, and property damage only). Accordingly, the cost of accidents can be estimated for each severity level, and consequently, the total cost of all accidents is the sum of these of all severity levels. The cost of a fatal road traffic accident includes: the cost of fatalities, cost of injuries, cost of property damages, administrative costs, and travel delay cost. The cost of an injury (serious or slight) road traffic accident consists of the same items of a fatal accident cost except for the cost of fatalities, whereas the cost of a property-damage only road traffic accident includes: the cost of property damages, administrative costs, and travel delay cost.

In addition to the two HC techniques employed to obtain the cost of road traffic accidents in Egypt, the study also updates the estimates reported in previous national literature. To derive the corresponding figures for the year 2008 the inflation rates are applied on cost estimates indicated by these national studies. At the end, all the resulting cost estimates are compared together in order to find a sensible estimate for the cost of road traffic accidents in Egypt for the year 2008.

III. Data and Assumptions

Cost estimation requires several data items. Available raw data items in Egypt include the total numbers of road traffic accidents, fatalities, injuries, and damaged vehicles. For the unavailable data items, which have corresponding available estimates in the national literature, the study obtains their current values using the inflation rates. The other remaining required data items, which are not available whether as raw data or as estimated figures in previous national literature, are estimated using a group of assumptions recommended in previous international literature.

A. Assumptions for the First HC Technique

Applying the first technique of the HC approach in cost estimation, the following assumptions are adopted.

The lost output of a fatality is calculated using the equation in [18], which is:

$$Loss = \sum_{i=1}^{N} \frac{W(1+g)^i}{(1+r)^i}. \quad (1)$$

where: W is the average annual GDP per capita, g is the growth rate of the economy, r is the discount rate that is used to obtain the present value of future lost output, and i refers to the years of lost output that last N years. The average GDP per capita in 2007/2008 is chosen as an estimate of W, g is the average rate of the growth rates that are available from 1982/1983 until the expected rate of 2008/2009, and r is obtained as in [10] by subtracting the growth rate value from the interest rate (interest rate on treasury bills (91-day bills)) value of 2007/2008. The average age of a road traffic accident fatality is assumed to be 30 years as in [2], [7], [10], and [18]. Moreover, the age distribution of road traffic fatalities in Egypt supports this assumption. Therefore, the number of years of lost output for a fatality, which is the difference between the average age of a fatality and the

retirement age, is 30 years. For injuries, lost output is calculated using (1) assuming that the average time of lost output in this case is one month as in [18].

The family and community loss of a fatality or an injury is obtained as a percentage that is assumed to be 55% of the corresponding lost output (see [10]). The average medical treatment cost of a fatality or an injury is derived from the data of 1986 included in [3] by applying the inflation rates on the average medical treatment cost of a fatality or an injury whether at hospital or at home. The average cost of lost experience of a fatality or an injury is obtained for the year 2008 by applying the inflation rates on the corresponding figures in [3]. The cost of pain, grief, and suffering for a fatality or an injury is estimated using an average percentage, which is 28.7%, of the percentages indicated by [5] and [16] to estimate a component for the lost quality of life for fatal, serious, and slight accidents.

The average cost of damages per vehicle for the year 2008 is calculated by applying the inflation rates on the corresponding figures in [3]. The total cost of damages in public or private properties other than vehicles is also obtained for the year 2008 by the same way.

The assumptions in [16] are used to obtain the administrative costs, which include the costs of police service and insurance administration. The cost of police service is estimated as 0.6% of the noncasualty based costs, which consist of property damages and travel delay costs. Similarly, the insurance administration cost can also be estimated as 2.8% of the noncasualty based costs. The travel delay cost due to road traffic accidents is obtained by applying the inflation rates on the corresponding figure in [3].

B. Assumptions for the Second HC Technique

A classification of accidents according to severity levels (fatal, serious, slight, or property damage only) is necessary for calculating the cost of road traffic accidents in Egypt using the second technique of the HC approach. The distribution or the classification of road traffic accidents according to their severity levels is unavailable for all accidents in Egypt. However, it is partially available for accidents that only took place on the network following the General Authority for Roads, Bridges, and Land Transport in Egypt. These accidents are distributed as about 25% fatal accidents, about 75% injury accidents, and less than 1% property damage only accidents. This distribution is generalized to obtain a classification of the total road traffic accidents according to their severity levels.

Classification of the injury accidents further into serious and slight accidents uses the percentages included in [3]. Reference [3] indicates that 82% of injured individuals were hospitalized (i.e. seriously injured) due to road traffic accidents in the surveyed area, while 18% of injured individuals were medically treated and left without hospitalization (i.e. slightly injured). Therefore, serious road traffic accidents are assumed to be 82% of total injury accidents against 18% slight accidents. This assumption may be inaccurate and lead to an overestimation of the number of serious road traffic accidents. However, it is more appropriate than other assumptions adopted in the literature such as assuming that the ratio of fatal to serious to slight accidents is 1 to 13 to 72 as mentioned in [1].

To calculate the average number of casualties per accident distributed according to the casualty class (fatalities, serious injuries, and slight injuries) and the accident severity level, the averages of the corresponding numbers mentioned in [16] are adopted. These numbers are used to estimate the cost of road traffic accidents in Bangladesh, Indonesia, and Nepal. According to these figures, on average, a fatal accident results in 1.4 fatalities, 0.7 serious injuries, and 1.9 slight injuries, whereas a serious accident results in one serious injury and 1.2 slight injuries, and a slight accident results in 1.2 slight injuries.

The lost output for a fatality, a serious injury, and a slight injury, is calculated by applying (1) as in [18] with the same previously stated assumptions used for the first technique. The average lost time is assumed to be 35 days for a serious injury and 5 days for a slight injury (as in [16]). To calculate the family and community loss of a fatality or an injury (serious or slight), it is assumed to be 55% of the corresponding lost output (as in [10]). The medical treatment cost for a casualty (fatality, serious injury, and slight injury) is obtained by updating the corresponding cost included in [3] using the inflation rates and considering that the medical cost of a serious injury includes both the cost at hospital and at home, whereas the medical cost of a slight injury includes only the treatment cost at home. Similarly, the average cost of lost experience of a fatality or an injury (serious or slight) is estimated by updating the corresponding figures in [3]. The cost component for pain, grief, and suffering is estimated as 28%, 50%, and 8% of the total costs of a fatal accident, a serious accident, and a slight accident respectively as indicated by [5] and [16].

The average number of damaged vehicles per accident for each severity level is estimated by dividing the corresponding total number of damaged vehicles by the total number of accidents during 2008. The average cost of damages per vehicle is obtained by updating the corresponding average in [3]. The average cost of damaged vehicles per accident according to its severity level is obtained using the multipliers suggested by Transport Research Laboratory in the UK and indicated by [11]. These multipliers are 1.55 for a fatal accident, 1.4 for a serious accident, 1.25 for a slight accident, and 0.85 for a property damage only accident. To estimate the average costs of damages in public or private properties other than vehicles and travel delay per accident, the corresponding updated average costs in [3] are used. These averages are assumed to be the same for all severity levels of accidents. Finally, following [2], the average administrative costs are assumed to be 0.2%, 4%, 14%, and 10% of total resources costs in a fatal accident, a serious accident, a slight accident, and a property damage only accident respectively, where the resources costs include: lost output, medical treatment costs, and cost of vehicle or any other property damages.

IV. RESULTS

This section estimates the cost of road traffic accidents in Egypt for the year 2008. The two techniques of the HC approach explained in section 2 are applied using the data and assumptions presented in section 3. The cost estimates using the two techniques are presented and discussed in next subsections A and B respectively. Moreover, other cost estimates reported in the previous national literature are updated for 2008 using the inflation rates. These updated cost estimates are presented in subsection C.

A. Cost Estimates Using the First Technique of the HC Approach

The first technique of the HC approach is applied using the data and assumptions previously explained, and the results are displayed in Tables I and II. The values of cost components of road traffic accidents in Egypt for 2008 are shown in Table I. The results indicate that by using the study's first technique in applying the HC approach, the total cost of road traffic accidents in Egypt for 2008 is about 10.6 billion Egyptian Pounds. The corresponding average cost per accident is 506.9 thousand Egyptian Pounds. The biggest portion of road traffic accidents cost comes from fatalities, whose cost accounts for 67.3% of the total cost. The costs of damages in vehicles and injuries account for 6.4% and 2.9% of the total cost respectively. Damages in properties other than vehicles, travel delay, and administrative costs (the sum of police service and insurance administration costs) each represent less than 1% of the total cost. The cost component for pain, grief, and suffering is estimated to be about 2.4 billion Egyptian Pounds, which accounts for 22.3% of the total cost. To obtain cost estimates in $US, one should divide by 5.5, as the current exchange rate is $US = 5.5 Egyptian Pounds.

TABLE I
THE VALUES OF COST COMPONENTS OF ROAD TRAFFIC ACCIDENTS IN EGYPT FOR 2008

Cost component	Value (million Egyptian Pounds)	Percentage (%)
Fatalities	7141.3	67.29
Injuries	304.2	2.87
Damages in vehicles	681.2	6.42
Damages in properties other than vehicles	0.7	0.01
Travel delay	94.7	0.89
Police service	4.7	0.04
Insurance administration	21.7	0.20
Pain, grief, and suffering (lost quality of life)	2364.5	22.28
Total cost of road traffic accidents	10613.0	100

The results show that road traffic accidents fatalities during 2008 in total cost Egypt about 7.1 billion Egyptian Pounds with an average cost per fatality of 1.1 million Egyptian Pounds. In addition, road traffic injuries cost Egypt about 304.2 million Egyptian Pounds with an average cost per injury that is equal to 8.5 thousand Egyptian Pounds. Table II shows the cost of road traffic accidents fatalities and injuries in Egypt for 2008 according to their different components in Egyptian Pounds.

TABLE II
THE COST OF ROAD TRAFFIC ACCIDENTS FATALITIES AND INJURIES IN EGYPT FOR 2008

Cost component	Fatalities		Injuries	
	Per fatality (Egyptian Pounds)	Total fatalities (million Egyptian Pounds)	Per injury (Egyptian Pounds)	Total injuries (million Egyptian Pounds)
Lost output	492430.4	3251.5	998.8	35.7
Family and community loss	270836.7	1788.3	549.3	19.6
Medical costs	375.1	2.5	873.2	31.2
Lost experience	317881.8	2099.0	6094.2	217.7
Total	1081524.0	7141.3	8515.4	304.2

B. Cost Estimates Using the Second Technique of the HC Approach

The second technique of HC estimates the total cost of road traffic accidents in Egypt by 12.5 billion Egyptian Pounds. Table III shows the total cost of road traffic accidents according to severity level in Egypt for 2008. Fatal accidents represent the main bulk of all accidents total cost (85.8%).

TABLE III
THE TOTAL COST OF ROAD TRAFFIC ACCIDENTS ACCORDING TO SEVERITY LEVEL IN EGYPT FOR 2008

Accident severity level	Estimated number of accidents (accident)	Average cost per accident (Egyptian Pounds)	Total cost (million Egyptian Pounds)	Percentage of all accidents total cost (%)
Fatal	5372	1994001.8	10711.8	85.775
Serious	12758	120735.3	1540.3	12.334
Slight	2801	84200.2	235.8	1.888
Property damage only	7	55472.7	0.4	0.003
All road traffic accidents	20938	-	12488.4	100

The total average cost per a fatal accident in Egypt for 2008 is about 2 million Egyptian Pounds, while the average costs per a serious accident and per a slight accident are 120.7 thousand Egyptian Pounds and 84.2 thousand Egyptian Pounds respectively. The average cost per a property damage only accident is about 55.5 thousand Egyptian Pounds. The average accident cost figures according to accident severity level in Egypt for 2008 are displayed in Table IV.

C. Deriving Cost Estimates from Previous National Literature

This subsection updates cost estimates obtained by previous national literature to the corresponding cost figures for the year 2008 by taking into account the inflation effect.

According to [3], the average cost per a road traffic accident in Egypt for the year 1986 is about 14.2 thousand Egyptian Pounds, which reaches to about 118.5 thousand Egyptian Pounds. Multiplying the updated average cost per accident by the total number of accidents in 2008 results in a total cost of 2.5 billion Egyptian Pounds. Reference [12] estimates the total cost of road traffic accidents in Egypt for the year 1993 to be $US 577 million, which corresponds to a total cost of $US 1.6 billion or about 8.8 billion Egyptian Pounds in 2008. By applying the inflation rates on the average costs in [14] of a fatal (or a serious) accident, a slight accident, and a property damage only accident, which are 118, 13.4 and 12.8 thousand Egyptian Pounds respectively in 2005/2006 prices, the resulting average costs for 2008 are 164.4, 18.7, and 17.8 thousand Egyptian Pounds respectively. Taking the weighted average of these cost averages (based on the assumptions used for the second HC technique about the classification of accidents according to severity levels) and multiplying this value by the total number of road traffic accidents during 2008, the resulting total cost of road traffic accidents for the year 2008 is about 3 billion Egyptian Pounds. Reference [6] indicates that the average cost of a road traffic accident is about 8.5 thousand Egyptian Pounds for the year 1984. The corresponding average cost for 2008 is 98.8 thousand Egyptian Pounds with a total cost of about 2.1 billion Egyptian Pounds. Finally, according to [13], the annual cost of road traffic accidents in Egypt, and hence for 2008, is about 16 billion Egyptian Pounds. Fig. 1 is a bar chart which compares the previously mentioned estimates of the total road traffic accidents cost in Egypt for the year 2008.

TABLE IV
THE AVERAGE ACCIDENT COST FIGURES ACCORDING TO ACCIDENT SEVERITY LEVEL IN EGYPT FOR 2008 (EGYPTIAN POUNDS)

Accident severity level	Casualty related cost components (except pain, grief, and suffering)	Damages in vehicles	Damages in properties other than vehicles	Administrative costs	Travel delay	Pain, grief, and suffering	Total
Fatal	1486383.8	50426.5	178.9	1444	24857.4	430711.2	1994001.8
Serious	16317.9	45546.6	178.9	1934.9	24857.4	31899.7	120735.3
Slight	8295.8	40666.6	178.9	5819.1	24857.4	4382.5	84200.2
Property damage only	-	27653.3	178.9	2783.2	24857.4	-	55472.7

Table V shows the estimates of the average casualty related cost components (except the cost of pain, grief, and suffering) according to accident severity level in Egypt for 2008 obtained by the second technique of applying the HC approach. A fatal accident causes about 1.5 million Egyptian Pounds attributed only to the casualties without taking into consideration the cost of pain, grief, and suffering. The corresponding casualty related costs of a serious injury accident and a slight injury accident are about 16.3 thousand Egyptian Pounds and 8.3 thousand Egyptian Pounds respectively.

TABLE V
THE ESTIMATES OF THE AVERAGE CASUALTY RELATED COST COMPONENTS (EXCEPT THE COST OF PAIN, GRIEF, AND SUFFERING) ACCORDING TO ACCIDENT SEVERITY LEVEL IN EGYPT FOR 2008

Cost per casualty (Egyptian Pounds)		Accident severity level					
		Fatal		Serious		Slight	
		Assumed average number of casualties (casualty)	Total cost (Egyptian Pounds)	Assumed average number of casualties (casualty)	Total cost (Egyptian Pounds)	Assumed average number of casualties (casualty)	Total cost (Egyptian Pounds)
Fatality	1081524	1.4	1468168.9	-	-	-	-
Serious injury	8748.7	0.7	5686.7	1	5686.7	-	-
Slight injury	6772.1	1.9	12528.3	1.2	12528.3	1.2	12528.3
Total	-	4	1486383.8	2.2	16317.9	1.2	8295.8

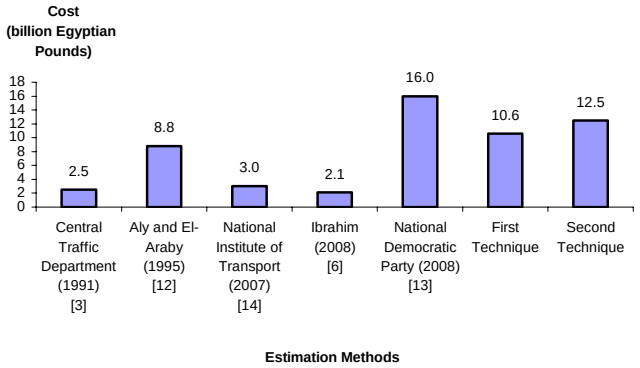

Fig. 1 The cost estimates of road traffic accidents in Egypt for the year 2008

It can be concluded that the cost of road traffic accidents in Egypt for the year 2008 is about 10 billion Egyptian Pounds. According to [2], road traffic accidents can be assumed to cost the economy annually between 1 and 2% of the GDP value. The closest estimate to the lower bound (1% of the GDP) is the estimate obtained using the first technique of the HC approach (10.6 billion Egyptian Pounds). The cost estimate obtained by the second HC technique (12.5 billion Egyptian Pounds) in addition to the estimate derived from [12] (8.8 billion Egyptian Pounds) are still reasonable compared to the remaining cost estimates which are either far below or far above 1% of GDP.

V. Forecasting Cost for 2009

Time series analysis is employed to forecast first the number of accidents and then the cost of road traffic accidents for 2009. The monthly series (y_t) of the number of road traffic accidents from 1990 to 2008 is used, where results show that an adequate model is SARIMA(1,1,1) $(0,0,1)_{12}$, which takes the form: $(1-0.38B)\Delta y_t = (1-0.86B)(1+0.27B^{12})\varepsilon_t$, where ε_t is white noise and B is the backshift operator. This model is used to forecast the monthly numbers of road traffic accidents from January 2009 until December 2009. The forecasted values as well as their lower and upper bounds for the road traffic accidents numbers during (January – December) 2009 with 95% confidence level are shown in Table VI.

TABLE VI
Forecasts of the Monthly Numbers of Road Traffic Accidents during (January – December) 2009
(accident)

Month	Lower bounds	Forecasts	Upper bounds
January	1227	1739	2252
February	1239	1765	2292
March	1238	1775	2312
April	1221	1768	2315
May	1172	1727	2283
June	1214	1778	2343
July	1172	1746	2319
August	1195	1777	2359
September	1129	1720	2310
October	1192	1791	2390
November	1145	1781	2417
December	1122	1778	2433

The forecasted number of road traffic accidents during 2009 is about 21 thousand accidents. In addition, the 95% confidence interval (C.I.) for the forecasted number of road traffic accidents in 2009 is (14, 28) thousand accidents. The average and total costs of road traffic accidents during 2009 are derived using the corresponding estimates for 2008 (obtained from the first HC technique) and the average rate of inflation rates since 1987 until 2008. Table VII shows the forecasted values as well as their lower and upper bounds of 95% C.I. for the average and total costs of road traffic accidents during 2009.

TABLE VII
The Forecasted Values as Well as Their Lower and Upper Bounds of 95% C.I. for the Average and Total Costs of Road Traffic Accidents during 2009

Average cost per accident (million Egyptian Pounds)	Forecasted number of accidents (accident)			Forecasted total cost of accidents (million Egyptian Pounds)		
	Lower bound	Forecast	Upper bound	Lower bound	Forecast	Upper bound
0.6	14266	21146	28026	7977.8	11824.9	15672.0

The results show that the average cost per road traffic accident for the year 2009 is expected to be 559.2 thousand Egyptian Pounds. The total cost of road traffic accidents for the year 2009 is expected to reach 11.8 billion Egyptian Pounds. Moreover, the 95% C.I. for the total cost of road traffic accidents for the year 2009 is (8, 15.7) billion Egyptian Pounds.

VI. Conclusion and Discussion

This study estimates the cost of road traffic accidents in Egypt for the year 2008. The estimation process is carried out using different techniques for the Gross-Loss-of-Output of HC approach and updating previous national cost estimates. The study estimates the cost of road traffic accidents in Egypt for 2008 by around 10 billion Egyptian Pounds with an average cost per accident of 500 thousand Egyptian Pounds. Moreover, costs are expected to increase during 2009 to reach 11.8 billion Egyptian Pounds with an average cost per

accident of 559.2 thousand Egyptian Pounds.

It should be mentioned that estimating the cost of road traffic accidents requires a lot of data, which may need a number of surveys in addition to continuous data quality improvement. However, the availability of at least a rough estimate about the cost of traffic accidents at the national level, even with not very accurate data, is very helpful. These estimates can be improved regularly by accounting for underreporting, surveying the casualties, and moving forward towards the WTP approach.

ACKNOWLEDGMENT

This work is funded by the Egyptian Cabinet Information and Decision Support Center (IDSC).

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Traffic Safety in Hashemite Kingdome of Jordan

According to the World Health Organization, traffic accidents are the second leading cause of death globally among children and youth people.
According to the statistics of (Jordan Traffic Institute 2014), it was found that 102,441 traffic accidents occurred during the year of 2014, which have resulted in 668 fatalities, 2,063 sever injuries and 12,727 slight injuries.

Facts about traffic accidents in Jordan

-There are dramatic increases in traffic accidents and the resulting fatalities over the past ten years. Also, traffic fatalities have grown faster than the population.
-The accident problem in Jordan, traffic accidents are very costly for a country having limited resources, where the costs of property damage only accidents are JD 267, 259 and 239 million in 2012, 2013 and 2014, respectively.
-Elderly age group over 60 years has the highest level of pedestrian risks. Elderly fatalities represented about 16% of all pedestrian fatalities. Thus, this age group should be the target for accident prevention measures. Conversely, the (51-53) age group has the lowest level of risk.
-Drivers aged (27-29) years are over- involved in traffic accidents. Also, elderly aged drivers with ages more than 60 years are the most dangerous drivers.

Main causes of traffic accidents

-The first single drivers faults involved in traffic accidents are not taking the necessary precautions while driving.
-Mirrors are the most vehicle defect involved in traffic accidents.
-Road works debris is the first single road defect that causes accidents

Recommendations may help in solving this problem

- Locate the hazardous sites on the roads and develop appropriate solutions and implementation.
-Traffic Impact Studies for the projects before implementation.
-Main street lighting and providing Traffic Calming Measures.
-Support and encourage research and scientific studies of traffic safety with participation of all the institutions concerned with traffic safety.
-Processing the causes of traffic accidents on dual transit as following:

- The length of working hours, leading to traffic accidents.
- The lack of maintenance of vehicles and dependence on annual inspection at the Department of Licensing.
- The length of the operating lifetime of the dual transit vehicles.

-Reduce use of private cars and encourage public transport use.
-develop the care provided to the injured persons from the place of the accident to the hospital or health center.

❖ Data Analysis:

Table (1) presents the growth of population, vehicle ownership, traffic accidents and fatalities between 2005 and 2014.

Year	Population (thousand)	Vehicle Ownership	No. of Accidents	Fatalities
2005	5473	679,731	83,129	790
2006	5600	755,477	98,055	899
2007	5728	841,933	110,630	992
2008	5850	905,592	101,066	740
2009	5980	994,753	122,793	676
2010	6113	1,075,453	140,014	670
2011	6249	1,147,258	142,588	694
2012	6388	1,213,882	112,817	816
2013	6530	1,263,754	107,864	768
2014	6675	1,331,563	102,441	688

Table (2) shows total road accidents, pedestrian accidents and their casualties in Jordan in 2014.

Acc. Type	Property Damage Acc.	Injury Acc.	Fatal Acc.
COLLISION	91,848	4,744	164
Pedestrian	0	3,642	197
Turn Over	834	924	88
TOTAL	92,682	9,310	449

Figure (1) shows property damage of accidents during the period of (2008-2014).

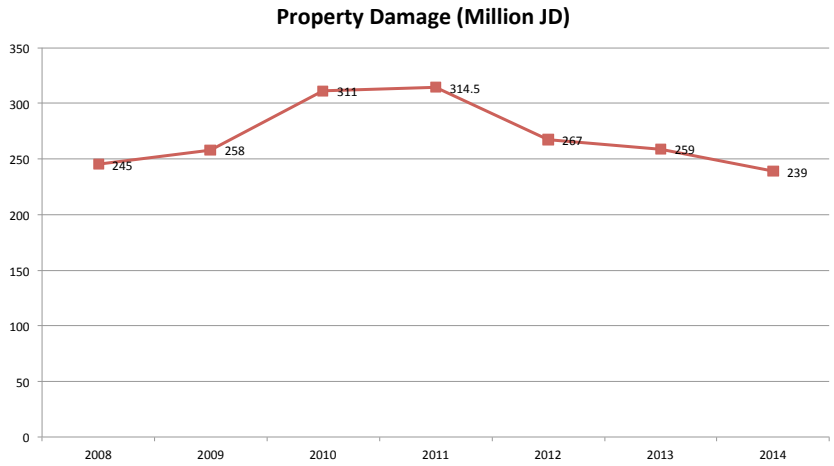


Figure (2) shows fatality risks for different developed countries.

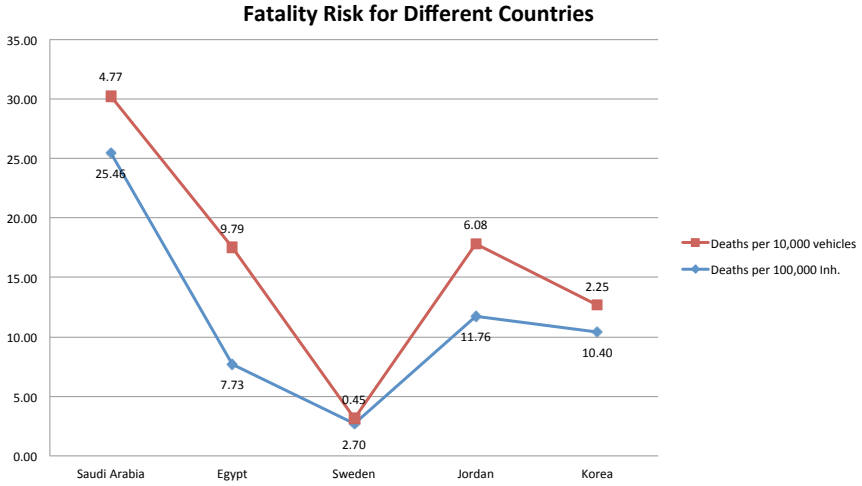


Table (3) shows Drivers faults involved in traffic accidents and its results in 2014.

Drivers Faults	No. Faults	Fatality	Slight Injury	Sever Injury
Tail Gating	22444	14	970	57
Not taking the necessary precautions while driving	28568	298	4539	861
Using Incorrect Lane	9584	227	3458	657
Priorities fals	13578	7	1474	140
Reversing Incorrect	10265	13	218	27
Failing to Comply with Obligatory sings	2207	2	201	8
Speed Limit Exceeding	1189	6	278	22
Loss of Control While Driving	1041	17	321	24
Incorrect Bending and Turning	2062	28	508	101
Disregarding A Traffic Light Signal	617	2	79	6
Driving Opposite To Traffic Direction	292	8	98	12
Wrong Overtaking	597	11	203	29
Others	13116	72	1321	226

Table (4) shows Vehicles Defects Involved In Traffic Accidents.

Vehicle Defects	No. Defects	%
Tires	26	1.22
lights	76	3.56
Windscreen wipers	28	1.31
Steering wheel	10	0.47
brake	93	4.36
Mirrors	598	28.05
Direction indicators	36	1.69
Mud pads	17	0.80
Engine failure	35	1.64
Other defects	1213	56.89
Total	2132	100.00

Table (4) shows Traffic Accidents by Road Defects.

Road Defects	No. Defects	%
Water Puddings	20	0.54
Holes,Humps	53	1.44
Defect in the traffic pillar or hidden	7	0.19
Defect barrier security	8	0.22
Defect in the the edges of the road	6	0.16
Working on the road with no signs	59	1.60
Road works debris	91	2.47
High Fountains	13	0.35
A lack of traffic controls	10	0.27
Side slope	29	0.79
Others	3394	91.98
Total	3690	100.00

Figure (3) shows the relative involvement rate for pedestrians killed or seriously injured in 2014.

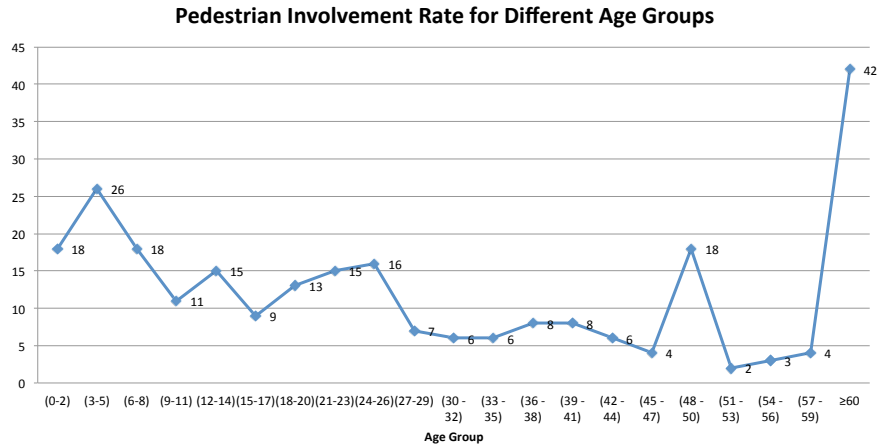


Figure (4) shows Driver Involvement Rate for Different Age Groups.

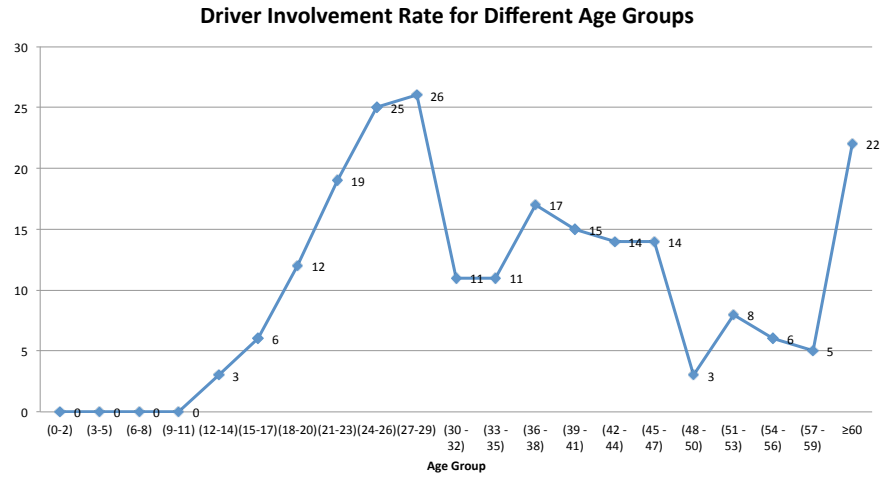


Figure (5) shows Percentage of Vehicles Involved In Traffic Accidents % in 2014.

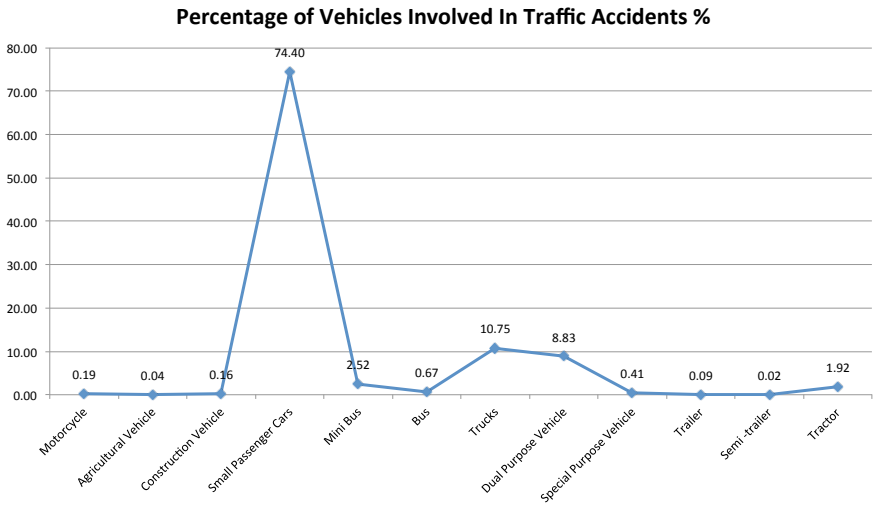
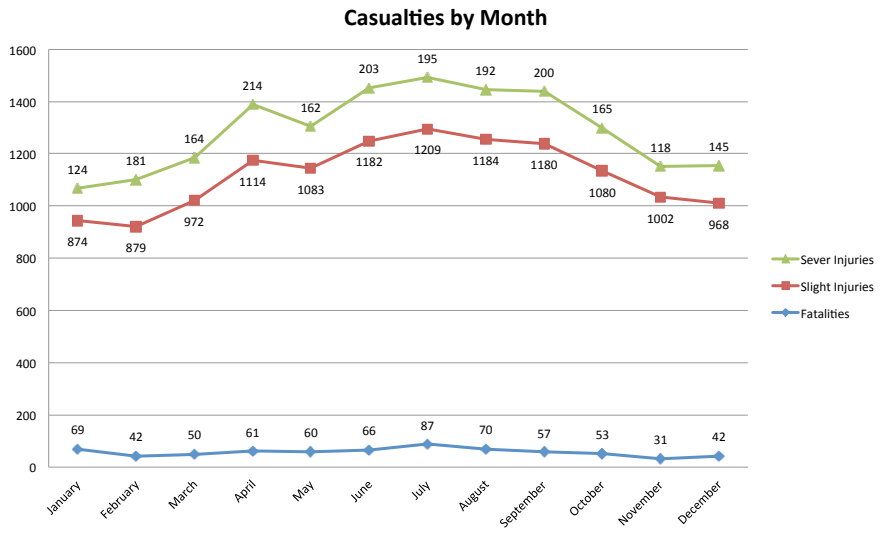


Figure (6) shows Casualties by Month in 2014.



❖ Conclusions and Results:

1. There are dramatic increases in traffic accidents and the resulting fatalities over the past ten years. Also, traffic fatalities have grown faster than the population.

2. The accident problem in Jordan, traffic accidents are very costly for a country having limited resources. Where the costs of property damage only accidents are JD 267, 259 and 239 million in 2012, 2013 and 2014, respectively.

3. Despite the fact that pedestrian accidents constitute about 4% of the total traffic accidents, they resulted in about 44% and 39%of the total traffic fatalities and injuries, respectively. This result is not unexpected because pedestrians are not given sufficient consideration in transport and urban planning.

❖ Conclusions and Results:

4. Elderly age group over 60 years have the highest level of pedestrian risks. Elderly fatalities represented about 16% of all pedestrian fatalities. Thus, this age group should be the target for accident prevention measures. Conversely, the (51-53) age group has the lowest level of risk.

5. Drivers aged (27-29) years were over- involved in traffic accidents. Also, elderly aged drivers with ages more than 60 years are the most dangerous drivers.

6. The highest involvement rates were found for small passenger cars. In general, they normally experience traveling longer distances with excessive speeds.

❖ Conclusions and Results:

7. The first single drivers faults involved in traffic accidents is not taking the necessary precautions while driving.

8. Mirrors are the most vehicle defect involved in traffic accidents.

9. Road works debris is the first single road defect that causes accidents.

10. June recorded the largest number of deaths resulting from traffic accidents and by (12.65%) of the sum of the total deaths , and the injuries and the rate of (9.49%) of the total injuries.

❖ Recommendations:

First: Roads

1. Locate the hazardous sites on the roads and develop appropriate solutions and implementation.
2. Traffic Impact Studies for the projects before implementation.
3. Main street lighting and providing Traffic Calming Measures.
4. Apply Traffic Control Devices on work zones.

❖ Recommendations:

Second : Research and traffic studies

1. Support and encourage research and scientific studies of traffic safety with participation of all the institutions concerned with traffic safety.

2. Provide the information and traffic statistics related to transport and traffic on the level of cities and regions.

❖ Recommendations:

Third: Development of the public transport sector

1. Processing the causes of traffic accidents on dual transit as following:
   - The length of working hours, leading to traffic accidents.
   - The lack of maintenance of vehicles and dependence on annual inspection at the Department of Licensing.
   - The length of the operating lifetime of the dual transit vehicles.
2. Reduce use of private cars and encourage public transport use.

❖ Recommendations:

Fourth: Rescue

1. Increase coordination with the General Directorate of Civil Defense for speed response.

2. develop the care provided to the injured persons from the place of the accident to the hospital or health center.

Traffic Accidents Statistics in Lebanon

http://kunhadi.org/kunhadi/numbers.php?lang=1

http://www.yasa.org/

https://reliefweb.int/report/lebanon/report-lebanese-red-cross-operations-october-2016

http://www.yasa.org/en/Sectiondet.aspx?id=10&id2=371

http://blogbaladi.com/lebanese-red-cross-road-accidents-statistics-for-2014-10866-accidents-14516-injuries-and-229-kills/

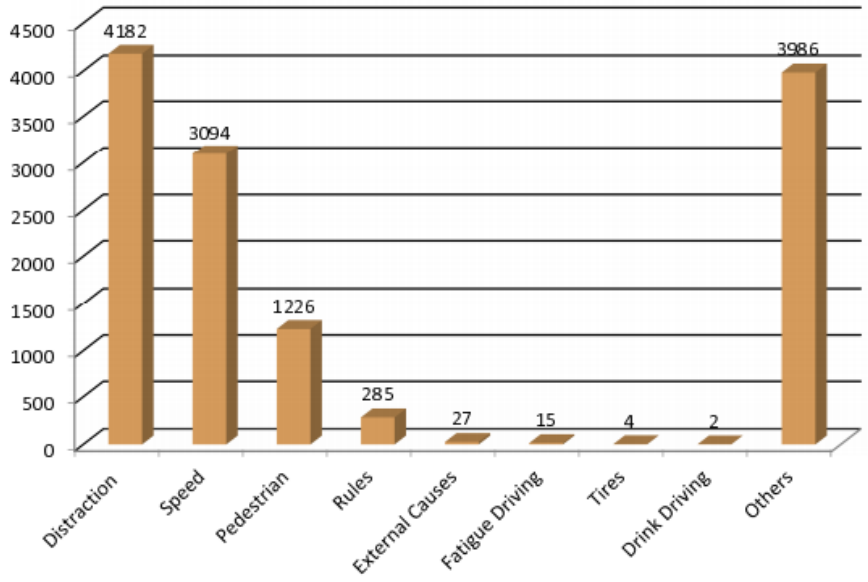


Figure 3.5 Number of crashes in Lebanon according to different causes.

Table 3.2 Number of Crashes, injuries and fatalities in Lebanon from 2007 to 2016.

Year	Number of crashes	Number of injuries	Number of fatalities
2007	4421	6266	497
2008	4770	6882	478
2009	4644	6508	513
2010	4583	6510	549
2011	4447	6040	508
2012	4804	6697	595
2013	4675	6137	649
2014	4907	6463	657
2015	4287	5458	576
2016	3277	4450	443

Table 3.3 Percentage of deaths, according to age from 2007-2015.

Age of the victim	2007	2008	2009	2010	2011	2012	2013	2014	2015
Less than 14 years	7.44	8.16	11.31	6.19	13.19	10.42	12.63	12.48	13.71
15-29 years	45.67	47.07	43.66	45.72	35.43	37.14	34.82	35.77	33.59
30-58 years	22.33	19.04	20.66	25.14	34.45	31.6	32.97	31.81	33.59
59 years and above	24.55	25.73	24.37	22.95	16.93	20.84	19.57	19.94	19.11

Table 3.4 Percentage of injuries, according to age from 2007-2015.

Age of the victim	2007	2008	2009	2010	2011	2012	2013	2014	2015
Less than 14 years	6.21	8.06	9.67	9.24	10.58	7.45	8.33	7.07	9.63
15-29 years	59.89	57.66	57.9	56.01	44.6	38.64	42.45	44.72	45.82
30-58 years	23.08	23.35	22.45	24.06	32.7	42.14	38.18	39.39	35.79
59 years and above	10.82	10.93	12.98	10.7	12.12	11.77	11.05	8.82	8.76

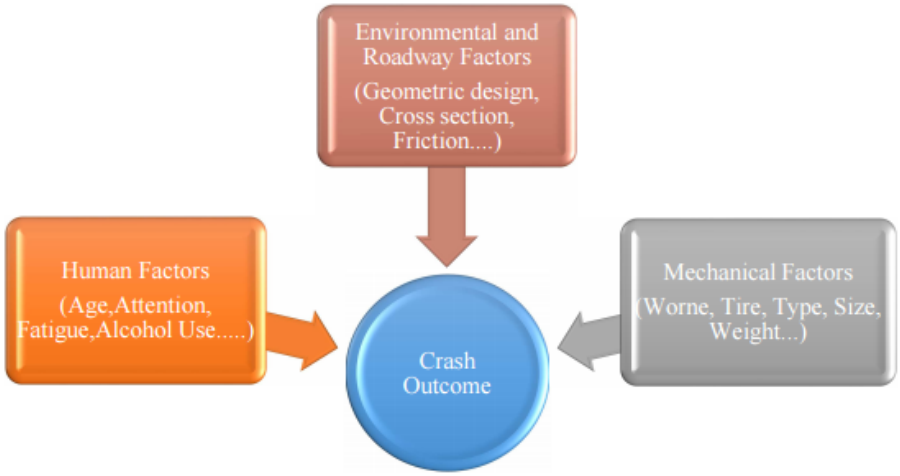


Figure 3.4 Factors leading to the occurrence of a crash.

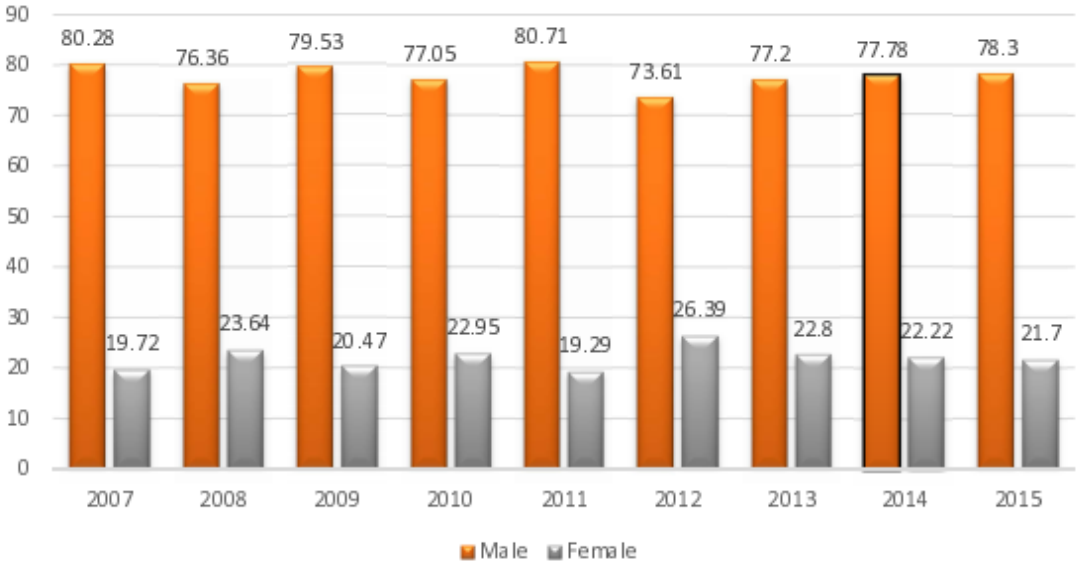


Figure 3.6 Percentage of deaths, according to gender type from 2007 to 2015.

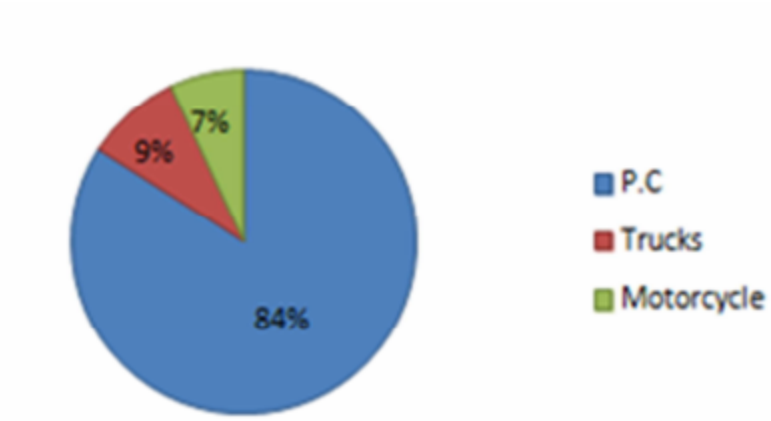


Figure 3.12 Percentage of crashes with respect to types of vehicle.

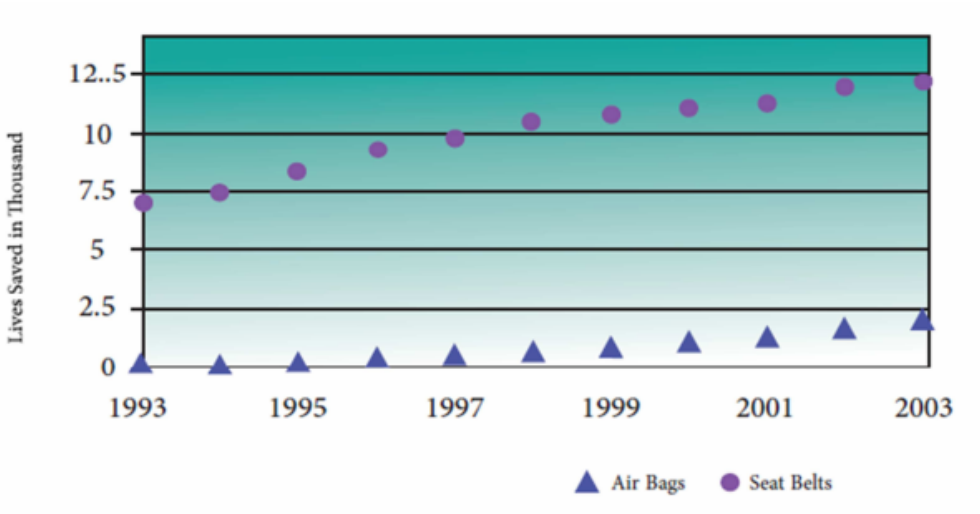


Figure 3.14 Lives saved due to seat belts and air bags from 1993 to 2003.

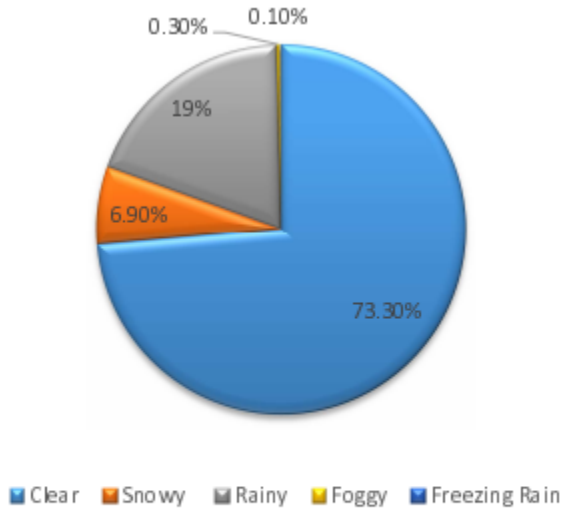


Figure 3.15 Percentage of accidents due to weather conditions.

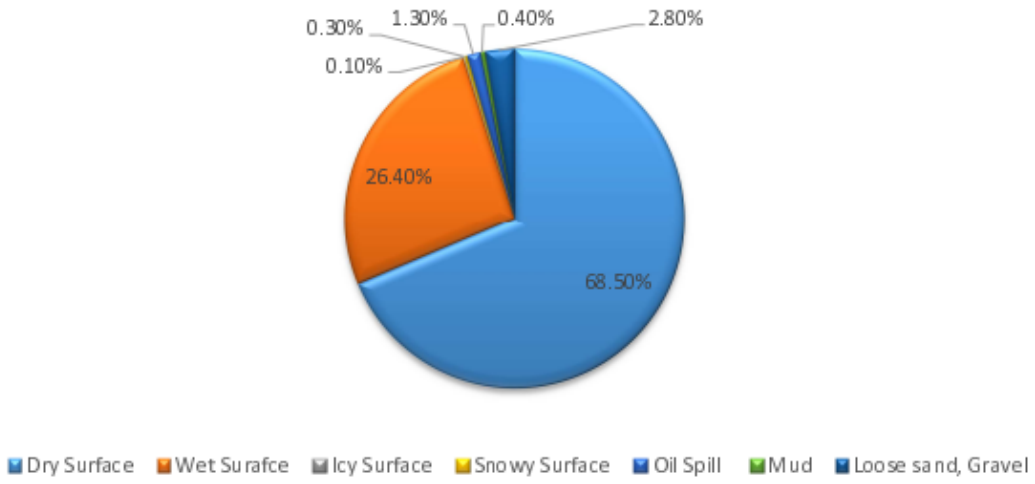


Figure 3.16 Percentage of crashes due to road and surface conditions.

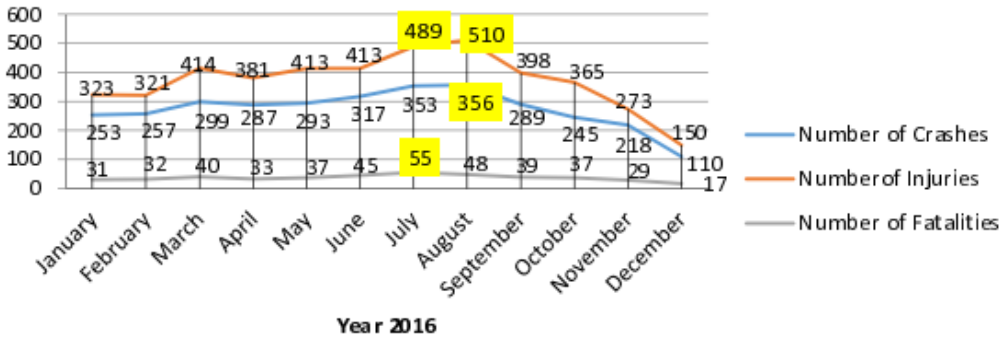


Figure 3.17 Number of crashes, injuries and fatalities for 2016 in Lebanon.

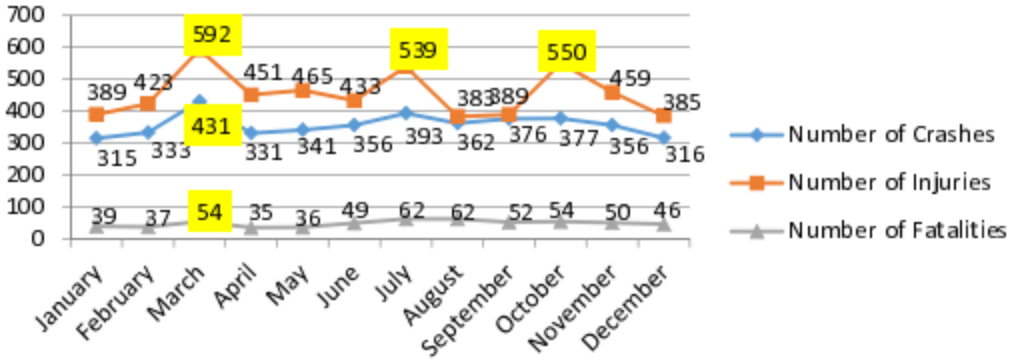


Figure 3.18 Number of crashes, injuries and fatalities for 2015 in Lebanon.

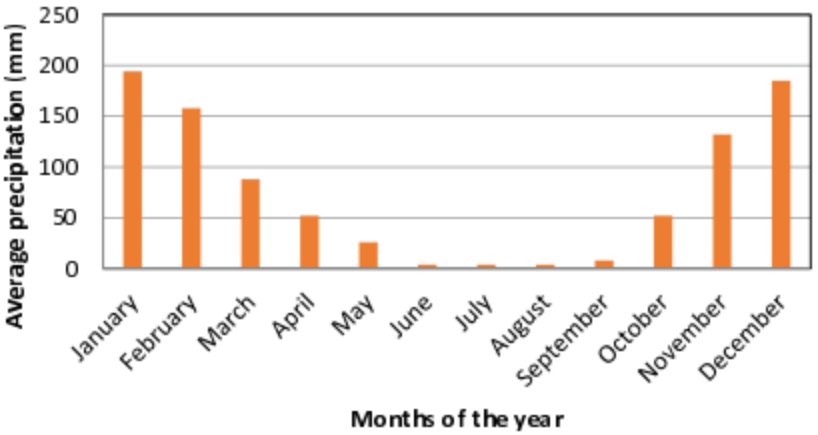


Figure 3.19 Average precipitation in Beirut, Lebanon in 2016.

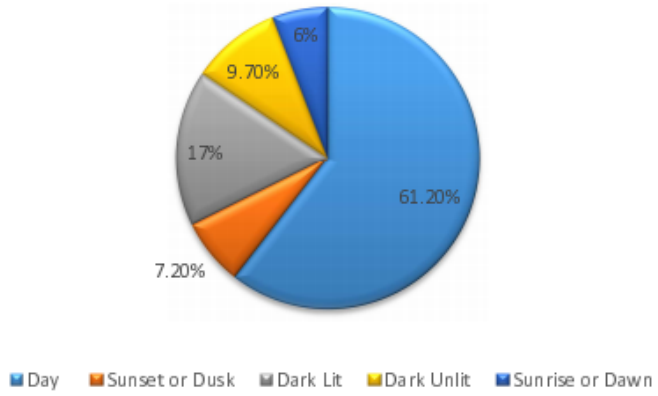


Figure 3.20 Percentage of crashes in Lebanon with respect to time conditions.

Table 4.1 Area of each Governorate of Lebanon.

Governorates-Muhafaza	Area (km^2)
Beirut	85
Mount-Lebanon	1,958
Bekaa	4,429
Nabatyeh	316,541
North	807,204
South	929.6
Akkar	788
Baalbak-Hermel	3,009

Table 4.2 Number of crashes, injuries and deaths according to each governorates in Lebanon.

Governorates	RTCs	RTIs	RTDs
Beirut	679	761	16
North	715	1013	95
Mount Lebanon	1542	1928	207
Bequaa	618	890	165
South	527	771	57
Nabatyeh	206	295	36

Table 4.3 Number of crashes, deaths and injuries before and after implementing the new Lebanese traffic law.

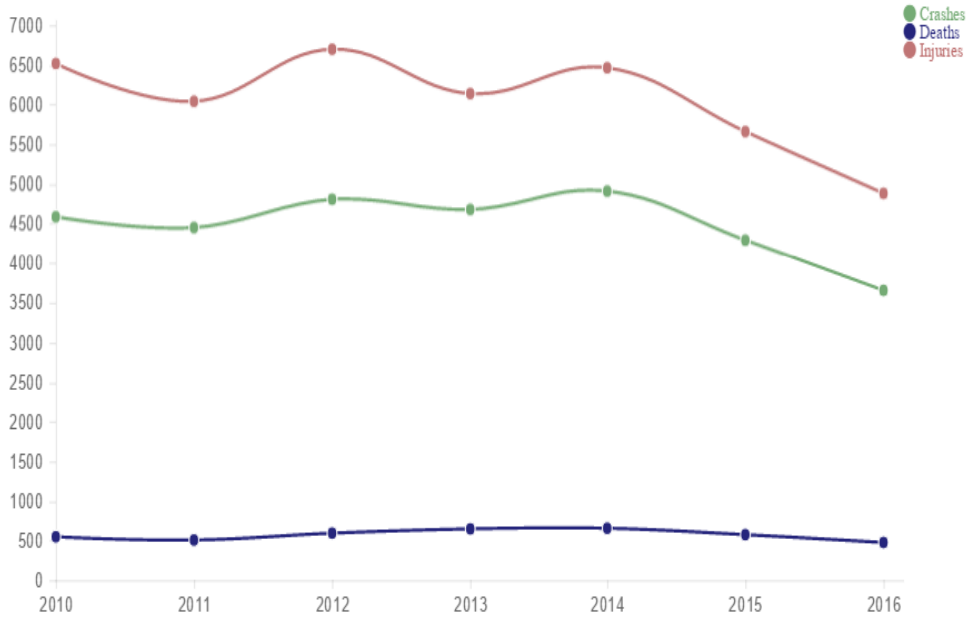
Year	Crash	Deaths	Injuries
From 22/4/2013 to 22/4/2015	9601	1305	12573
From 22/4/2015 to 22/4/2017	7437	1016	9856
Percentage of reduction	22.5%	22.1%	21.6%
Reduction of crashes	2164	289	2717

Options

2016 ▾ Crashes ▾

Governorate Map View

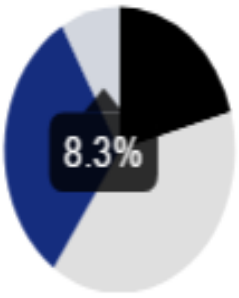
Trend



Age Bracket

Deaths

Injuries

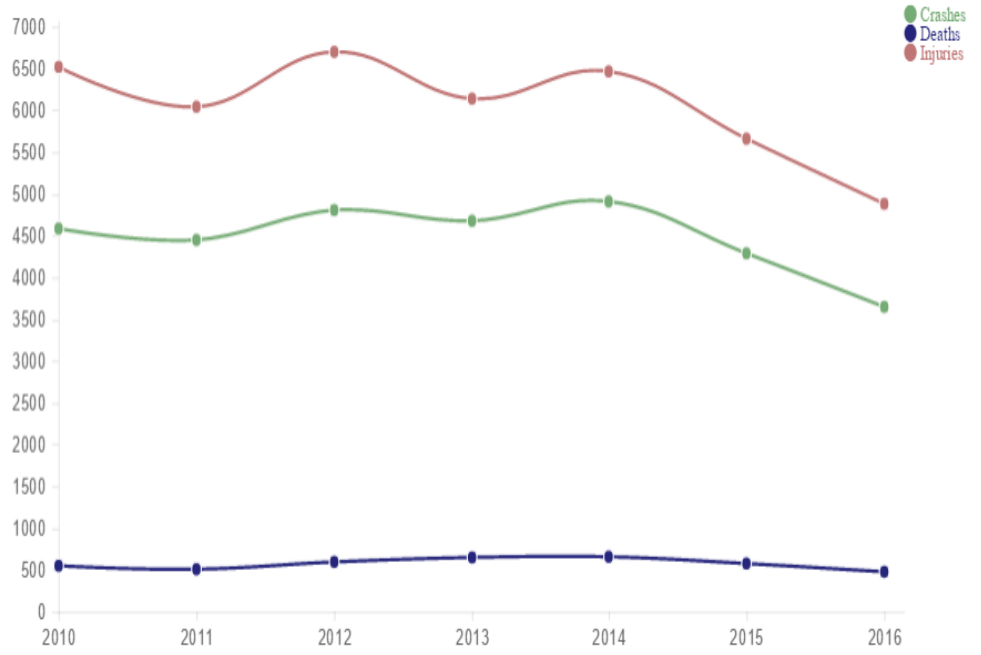


Options

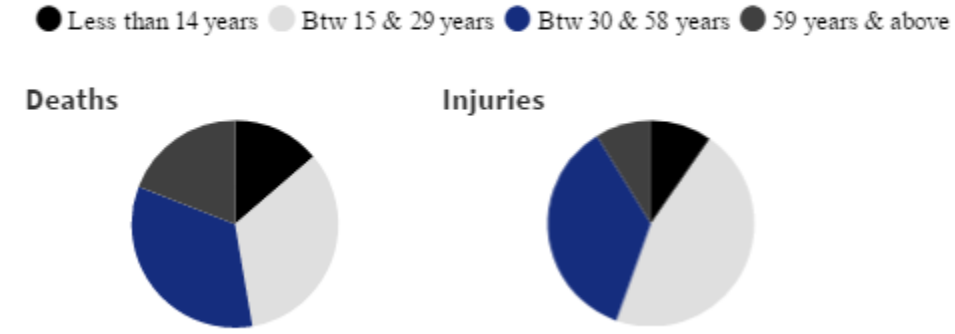
2015 ▾ Injuries ▾

Governorate Map View

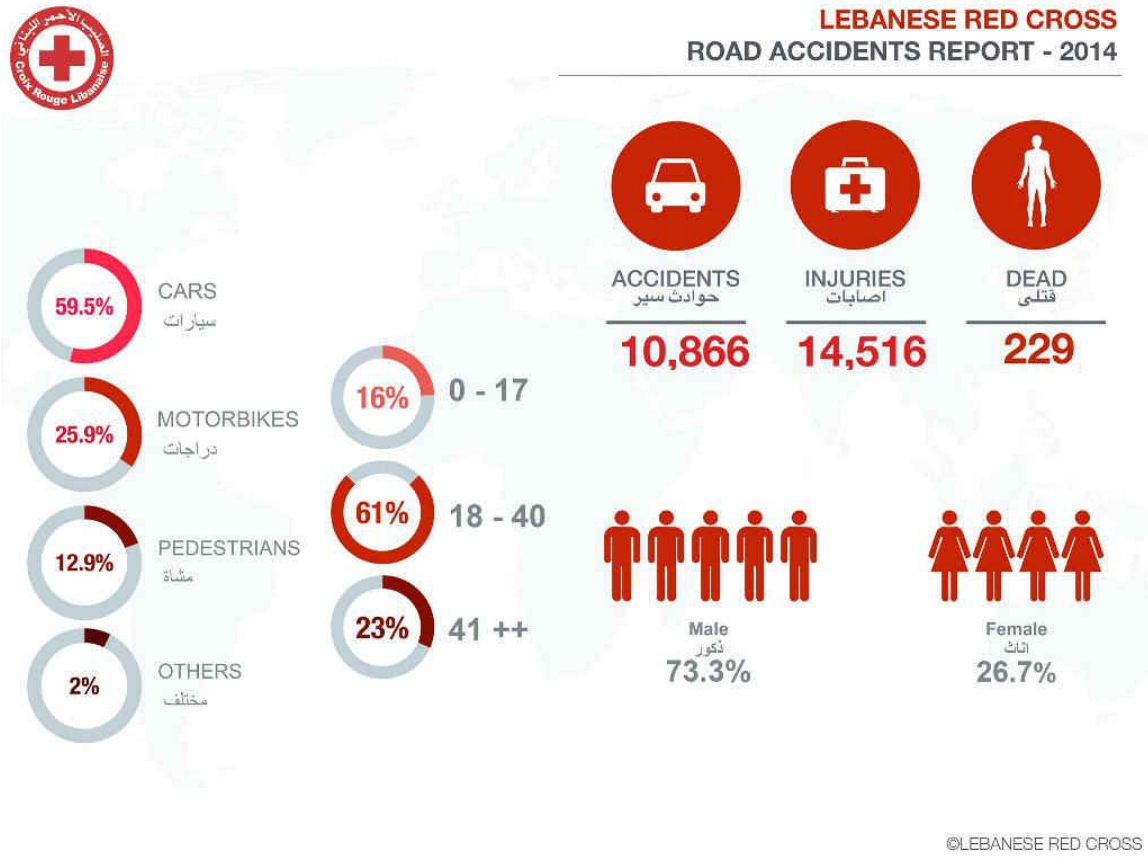
Trend



Age Bracket



LEBANESE RED CROSS STATISTICS:



YASA.ORG

Fatalities in an international comparison, 1980–2007

Country	Fatalities total (absolute)[1]				Fatalities per 1m inhabitants[1]				Fatalities per 1m inhabitants, by travel mode, 2007[1, 3]				
	1980	1990	2000	2007	1980	1990	2000	2007	Cars	Motorcycles	Bicycles	Pedestrians	Other
A	2 003	1 558	976	691	265	203	120	83	46	12	4	13	9
AUS	3 274	2 331	1 824	1 617	223	136	95	77	...	...	2	10	...
B	2 396	1 976	1 470	1 067	243	199	144	101	52	13	8	10	18
CDN	5 461	3 960	2 927	2 892[2]	227	149	95	92[2]	46	7	2	12	25
CH	1 209	925	592	384	192	139	83	51	22	11	4	11	4
CZ	1 261	1 291	1 486	1 222	122	125	145	119	64	13	11	23	7
D	15 050	11 046	7 503	4 949	193	140	91	60	32	10	5	8	5
DK	690	634	498	406	135	123	93	74	32	7	10	12	13
E	6 522	9 032	5 776	3 823	176	232	146	86	41	14	2	13	16
F	13 672	11 215	8 079	4 620	254	199	136	75	40	13	2	9	10
FIN	551	649	395	380	115	130	77	72	46	6	4	9	7
GB	6 010	5 217	3 409	2 946	110	93	59	50	24	10	2	11	3
GR	1 446	2 050	2 037	1 657[2]	150	202	193	149[2]	65	40	2	24	19
H	1 630	2 432	1 200	1 232	152	234	120	122	55	11	16	29	12
I	9 220	7 151	6 410	5 131	164	124	111	87	49	19	5	12	13
IRL	564	478	415	338	166	136	110	78	39	8	3	19	9
IS	25	24	32	15	110	94	113	49	36	10	0	3	0
J	11 388	14 595	10 403	6 639	97	118	82	52	11	5	8	17	11
KOR	6 449	14 174	10 236	6 166	172	334	218	127	30	15	6	48	28
L	98	70	76	43	270	185	175	90	59	22	0	26	2
N	362	332	341	233	89	78	76	50	34	7	1	5	3
NIRL	229	185	171	113	149	116	101	64	36	14	1	10	3
NL	1 996	1 376	1 082	709	142	92	68	43	20	4	9	5	5
NZ	597	729	462	422	189	215	121	100	73	10	3	11	4
P	2 579	2 646	1 860	974	277	283	181	92	35	13	4	15	25
PL	6 002	7 333	6 294	5 583	168	192	163	147	68	6	13	51	9
S	848	772	591	471	102	91	67	52	30	7	4	6	5
SK	...	652	628	627	...	...	116	116	...	...	...	...	...
SLO	558	517	314	293	292	259	158	145	89	20	8	16	11
TR	4 839	8 212	...	...	...	148	...	...	...	...	...	...	...
USA	51 091	44 529	41 821	41 259	225	179	152	135	54	17	2	15	46

A Austria
AUS Australia
B Belgium
CDN Canada
CH Switzerland
CZ Czech Republic
D Germany
DK Denmark
E Spain
F France
FIN Finland
GB Great Britain
GR Greece
H Hungary
I Italy
IRL Ireland
IS Iceland
J Japan
KOR Korea
L Luxembourg
N Norway
NIRL Northern Ireland
NL Netherlands
NZ New Zealand
P Portugal
PL Poland
S Sweden
SK Slovakia
SLO Slovenia
TR Turkey
USA United States of America

[1] Died within 30 days of the accident
[2] 2006
[3] 2004: Italy, Luxembourg; 2006: Canada, Greece, Portugal

Source: IRTAD, registered road traffic accidents

USV.T.24025

ROAD TRAFFIC INJURIES
A Growing National Dilemma in Lebanon
(Estimation of Deaths and Serious Injuries caused by vehicular crashes)

More than
550 Dead And 9000 Injured Every Year
At least
45 Dead AND 750 Injured Every Month
More than
1.5 Dead AND 25 Injured Every Day

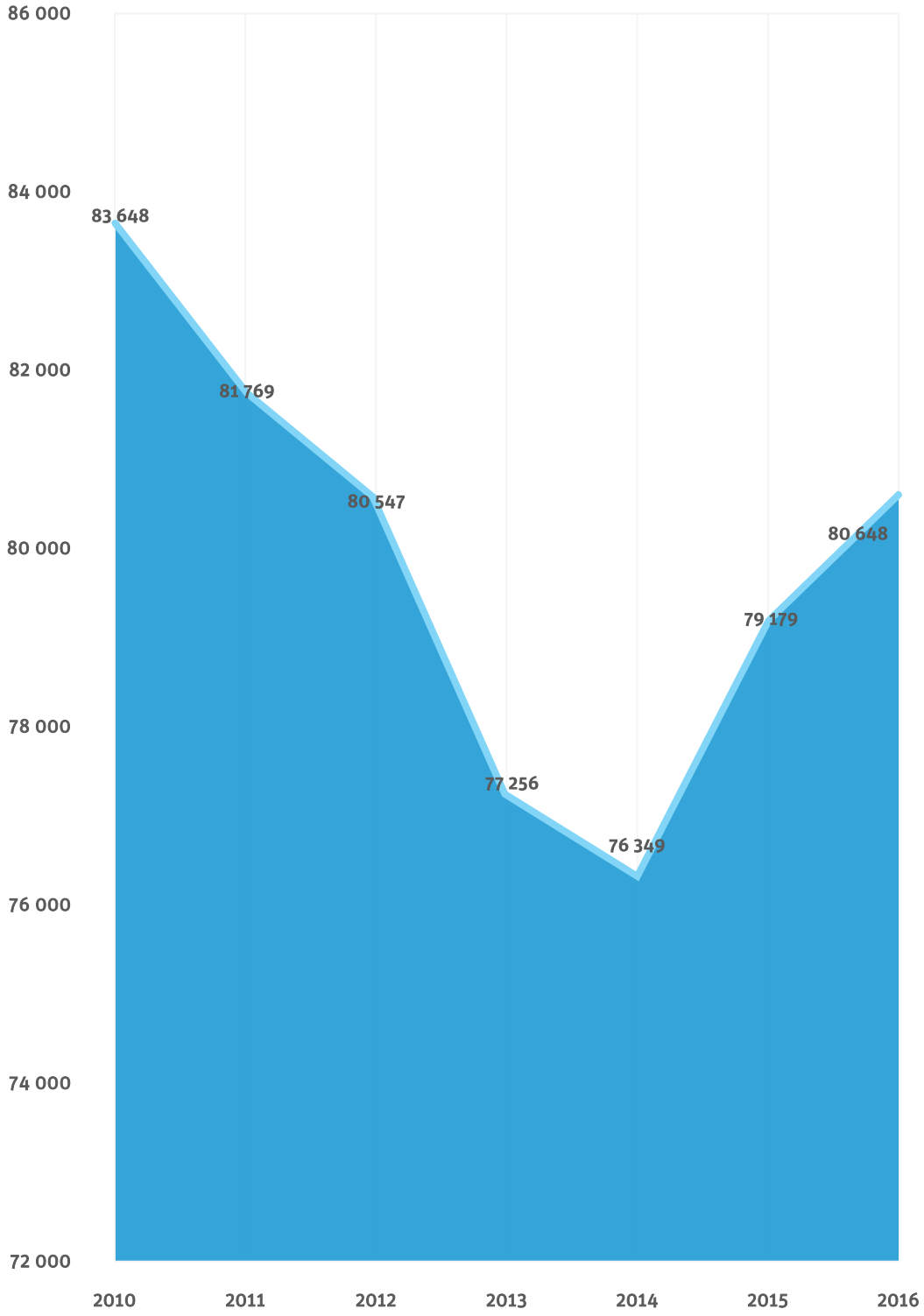
Source: YASA Lebanon, March 2004

EU
ROAD SAFETY
ANNUAL REPORT

2018

Content

Aggregate evolution in the number of road deaths 2010-2016 (32 Countries)



Data for Argentina in 2016 are an estimate.

Traffic fatalities in 2016 were down 3.6% compared to 2010.

If the United States are excluded, the reduction was nearly 15%. However, most of the improvement was achieved at the beginning of the current decade. Since 2015, progress has slowed down markedly and a number of countries have experienced a reversal. Compared to 2014, the year with the lowest traffic death toll on record for IRTAD countries in the past three decades, the death toll was 5.6% higher in 2016.

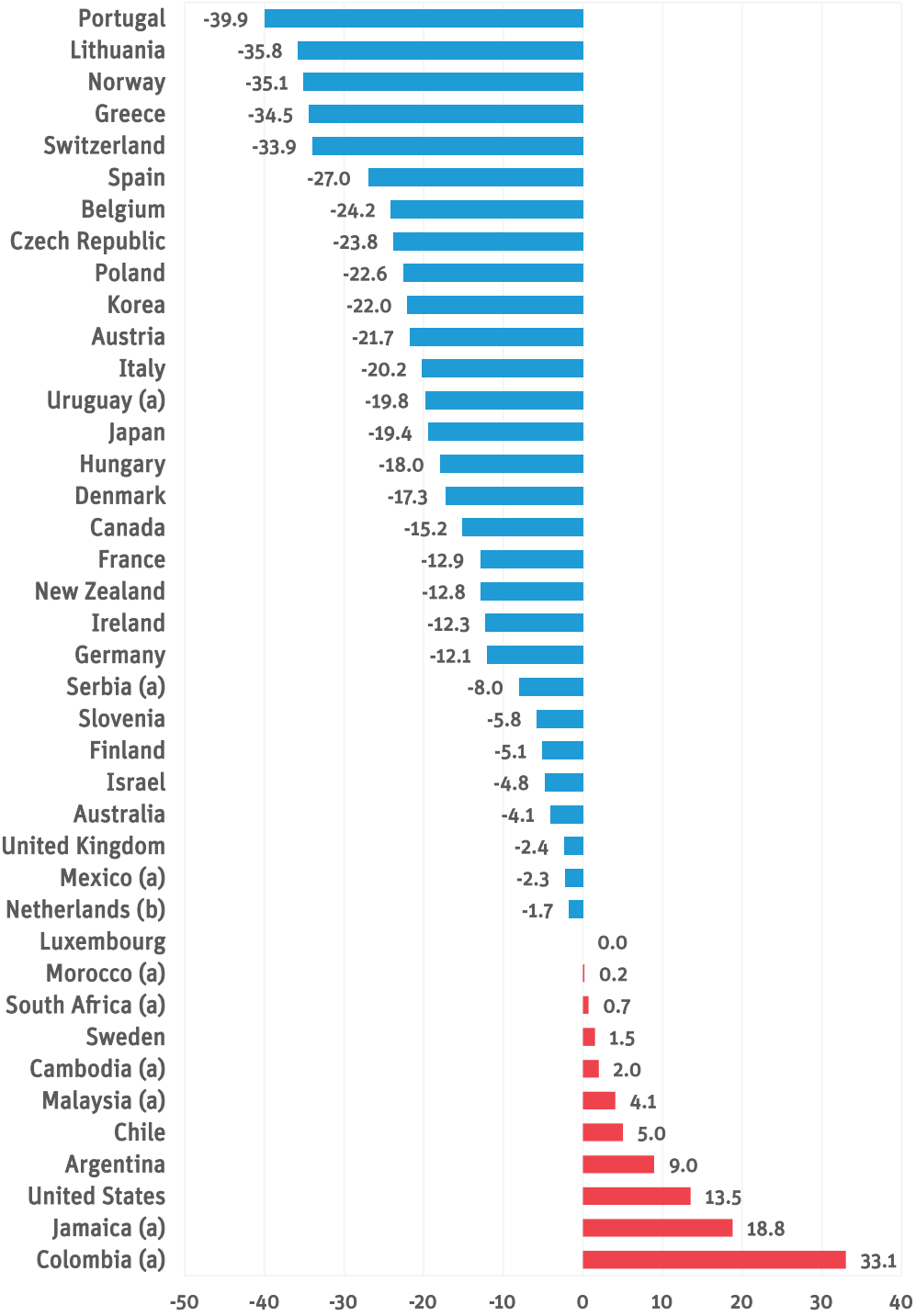
The long-term trend is positive but very far from sufficient to achieve international road safety objectives.

The United Nations Sustainable Development Goals (SDGs) set out a 50% reduction target for road deaths by 2020 compare to 2010. While five IRTAD member countries have made good progress in reducing fatalities by more than one-third since 2010 (which is about the average reduction required to halve fatalities by 2020), the majority of countries are not achieving what is needed. Indicative numbers from low- and middle-income observer countries in IRTAD suggests that in some of those countries the number of road deaths has increased. Generally, the road safety situation in low- and middle-income countries, where 90% of global road deaths occur, is much less understood than in IRTAD member countries and it is likely that road deaths in these regions are underreported, as reflected by the estimations of the WHO global status report.

Large disparities between countries' longer-term road safety performance lie behind the averages.

Benchmarked against 2010 results, the number of traffic deaths has fallen in 26 out of 32 countries in the IRTAD Group in 2016. The strongest reductions were achieved by Portugal (-39.9%), Lithuania (-35.8%) and Norway (-35.1%). The success of Norway is particularly remarkable, as the country's roads were already among the safest in the world. The United States experienced the largest increase (+13.5%) driven by a 14% increase between 2014 and 2016. The four other countries that registered more traffic deaths in 2016 than in 2010 are Argentina (+9.0%), Chile (+5.0%), Sweden (+1.5%) and Iceland (10 more deaths). The number of road deaths remained stable in Luxembourg.

Change in the number of road deaths 2010-2016 in percent

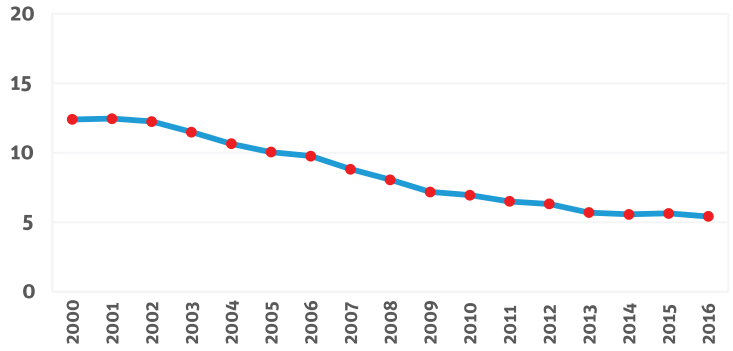


Data from Iceland are not shown because the the observations are too low to have meaningful percentage changes.
(a) Data as provided by the countries and not validated by IRTAD.
(b) Real data (actual numbers instead of reported numbers by the police).

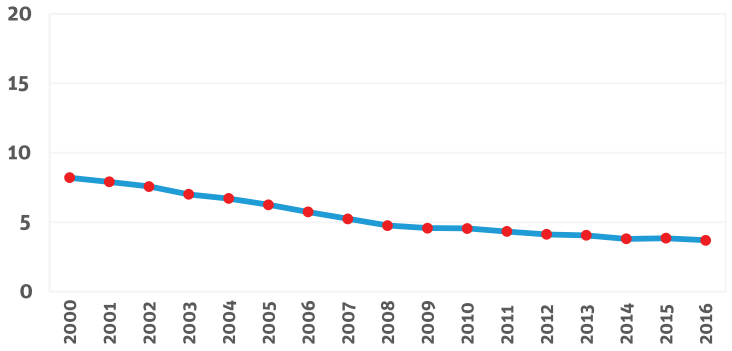
Evolution of road fatalities

2000-2016 per 100 000 inhabitants

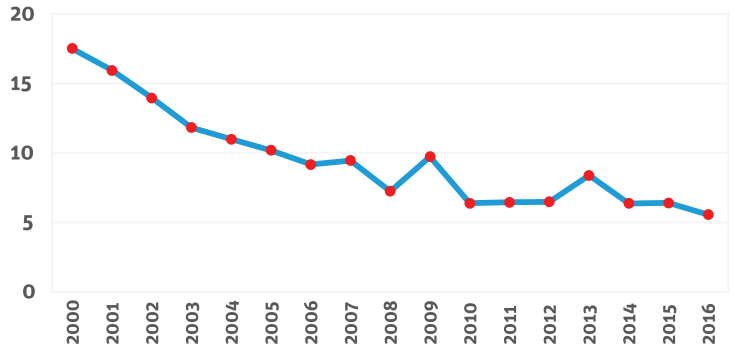
ITALY



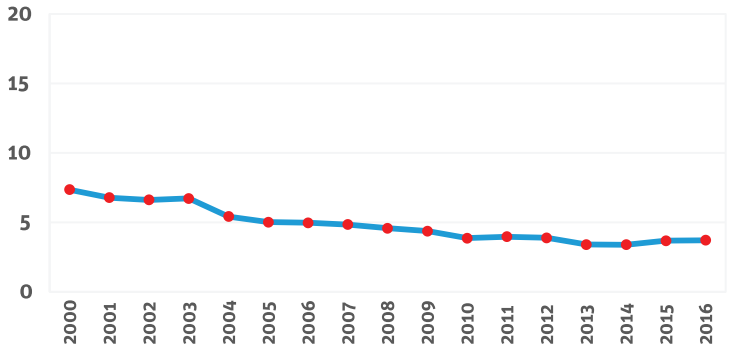
JAPAN



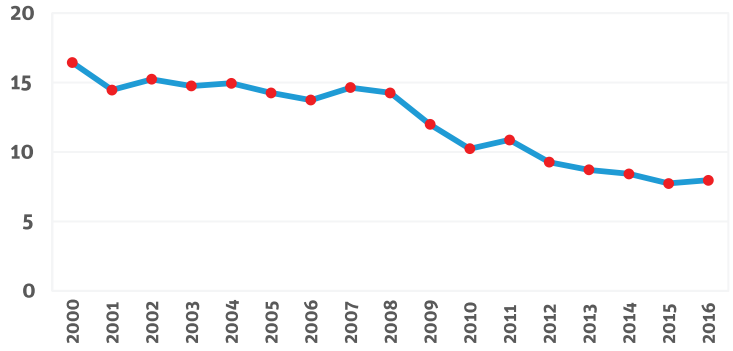
LUXEMBOURG



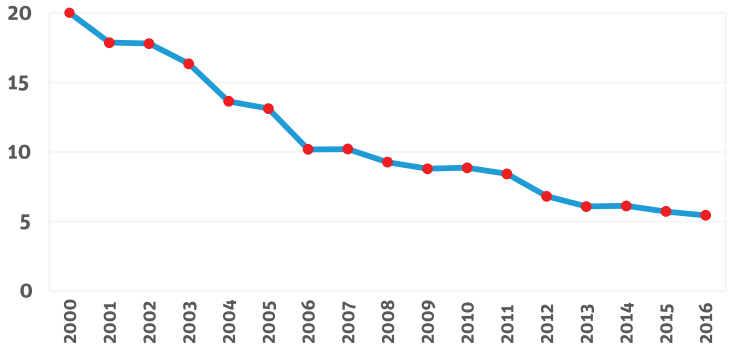
NETHERLANDS [a]



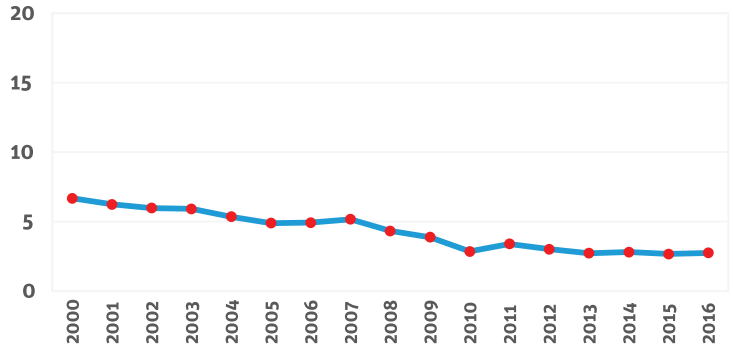
POLAND



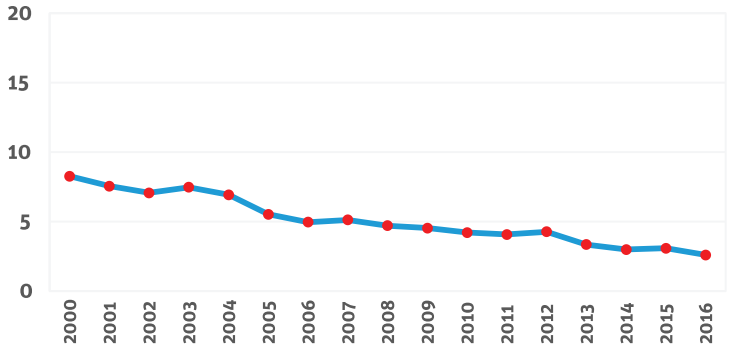
PORTUGAL



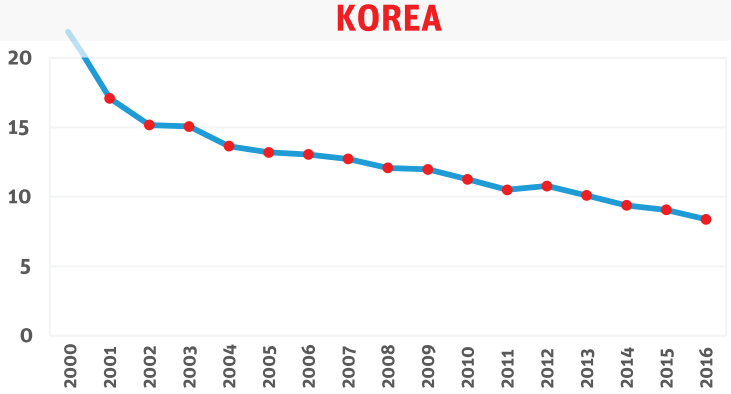
SWEDEN



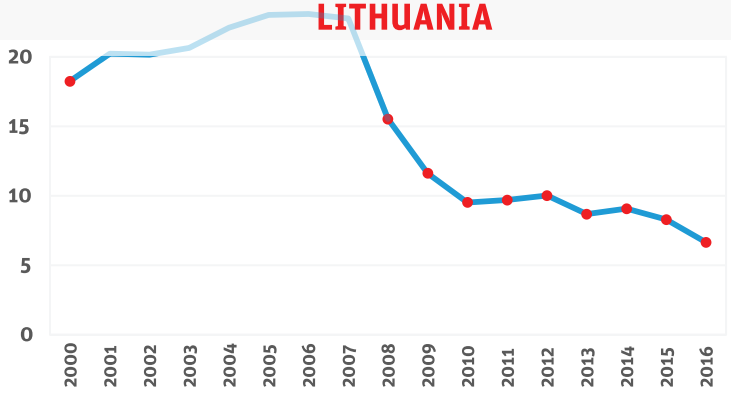
SWITZERLAND



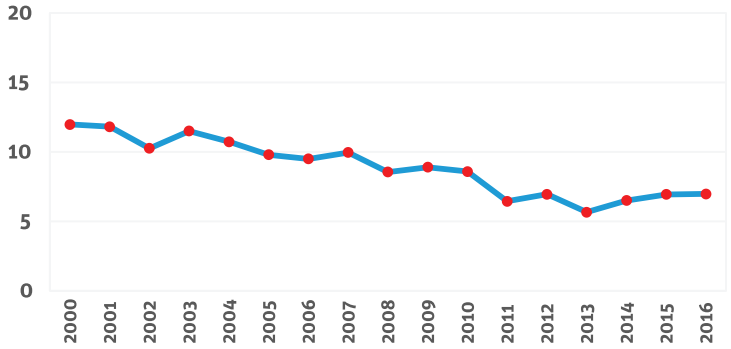
KOREA



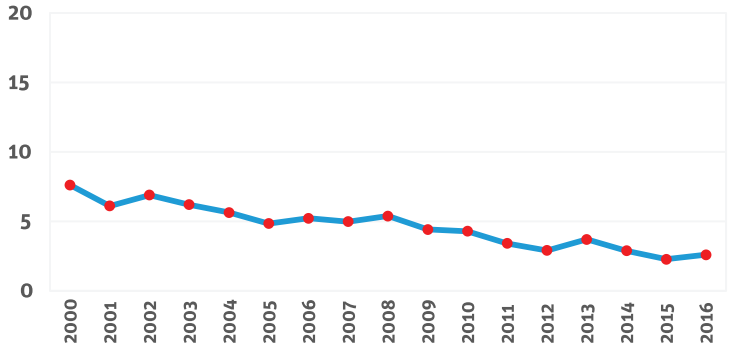
LITHUANIA



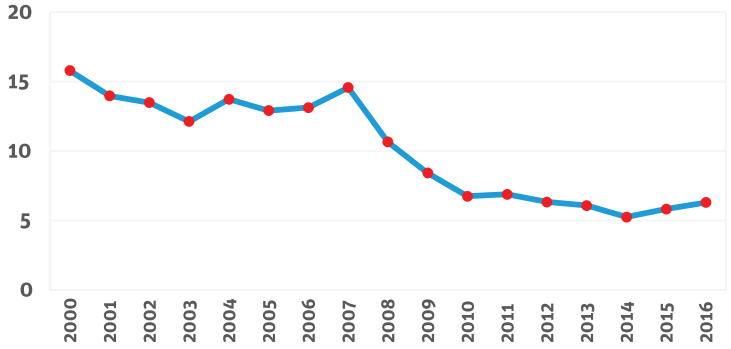
NEW ZEALAND



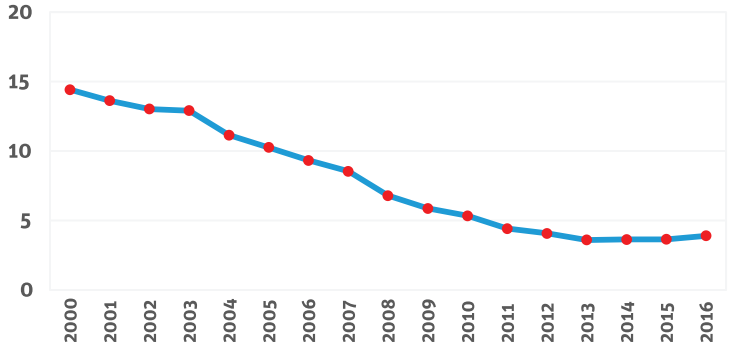
NORWAY



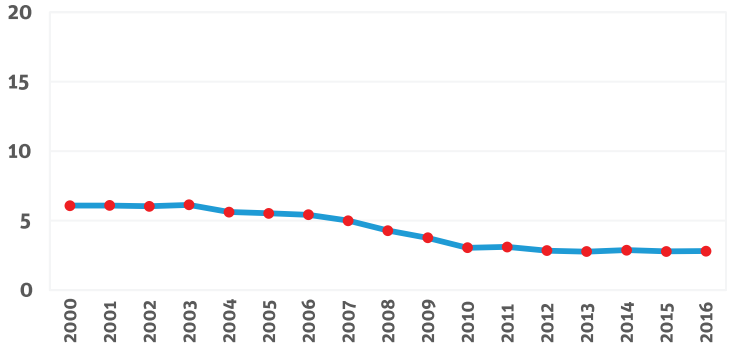
SLOVENIA



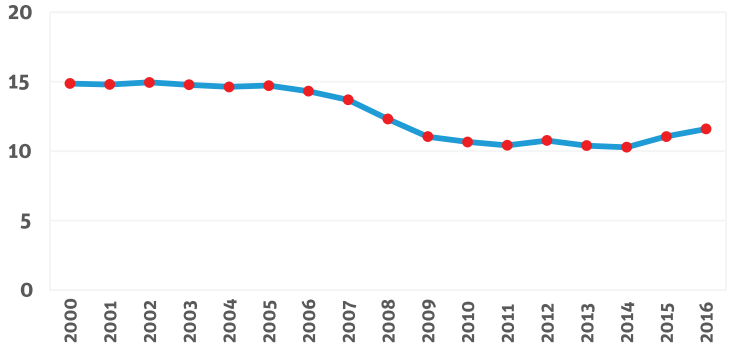
SPAIN



UNITED KINGDOM



UNITED STATES



(a) Real data (Actual numbers instead of reported numbers by the police).

Lead indicators

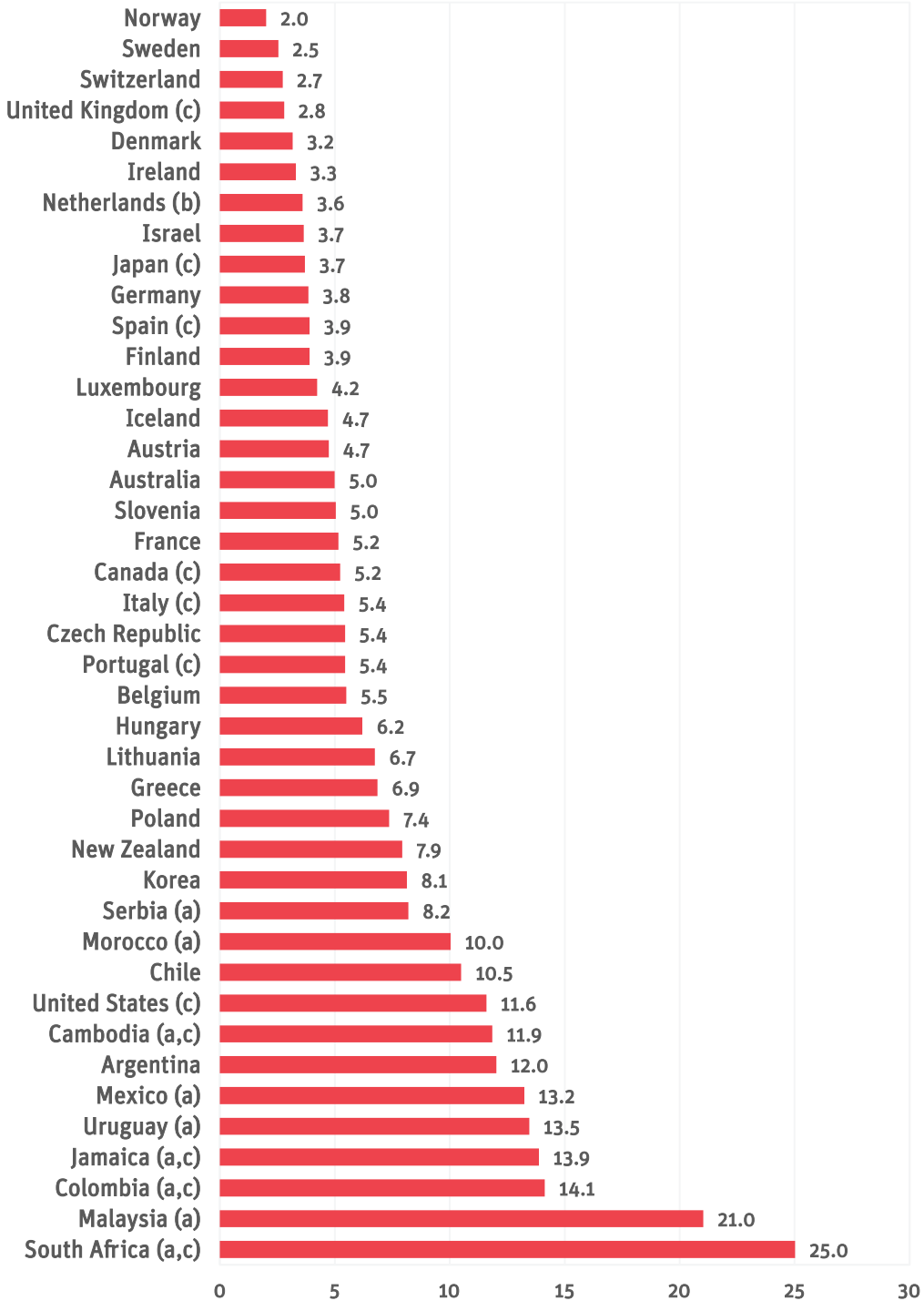
Traffic-related mortality rates differ widely but are narrowing.

Four countries recorded fewer than three fatalities per 100 000 inhabitants in 2016: Norway, Switzerland, Sweden and the United Kingdom. In 2010, only two countries had achieved this level. In 2000, the lowest rate of traffic-related mortality among IRTAD countries had been 6.1 deaths per 100 000 inhabitants in the United Kingdom. Thirteen countries formed a group of relatively well-performing countries with mortality rates of five or less - a rate that not a single country had achieved in 2000. The United States stands out with a relatively high traffic mortality rate of 11.6 in 2016, together with the Latin American IRTAD countries, all of which registered more than 12 road deaths per 100 000 inhabitants.

With 2.6 fatalities per 100 000 inhabitants, Norway achieved one-fifth of Argentina's traffic mortality rate of 12.7. Despite these significant disparities, traffic-related mortality rates in all IRTAD member countries are far below the high rates in many low- and middle-income countries. For example, South Africa, an IRTAD observer country, reported more than 25 deaths per 100 000 population for 2016. With a marked reduction in the number of road deaths, Norway achieved a mortality rate of two deaths per 100 000 inhabitants in 2017 and therefore a historic first since the systematic collection of road safety data began.

The mortality rate is useful for comparing the road safety level of countries with similar levels of motorisation and traffic. Comparing the number of road fatalities in relation to the total distance travelled provides an indicator for assessing the risk of travelling on a given road network. The number of traffic deaths in relation to the number of vehicles on the road serves as an approximation of crash risk exposure in the absence of data on distance travelled.

Road fatalities per 100 000 inhabitants 2017 or latest available



Data for 2017 is provisional.

(a) Data as provided by the countries and not validated by IRTAD.

(b) Real data (actual numbers instead of reported numbers by the police).

(c) 2016 data.

Lead indicators

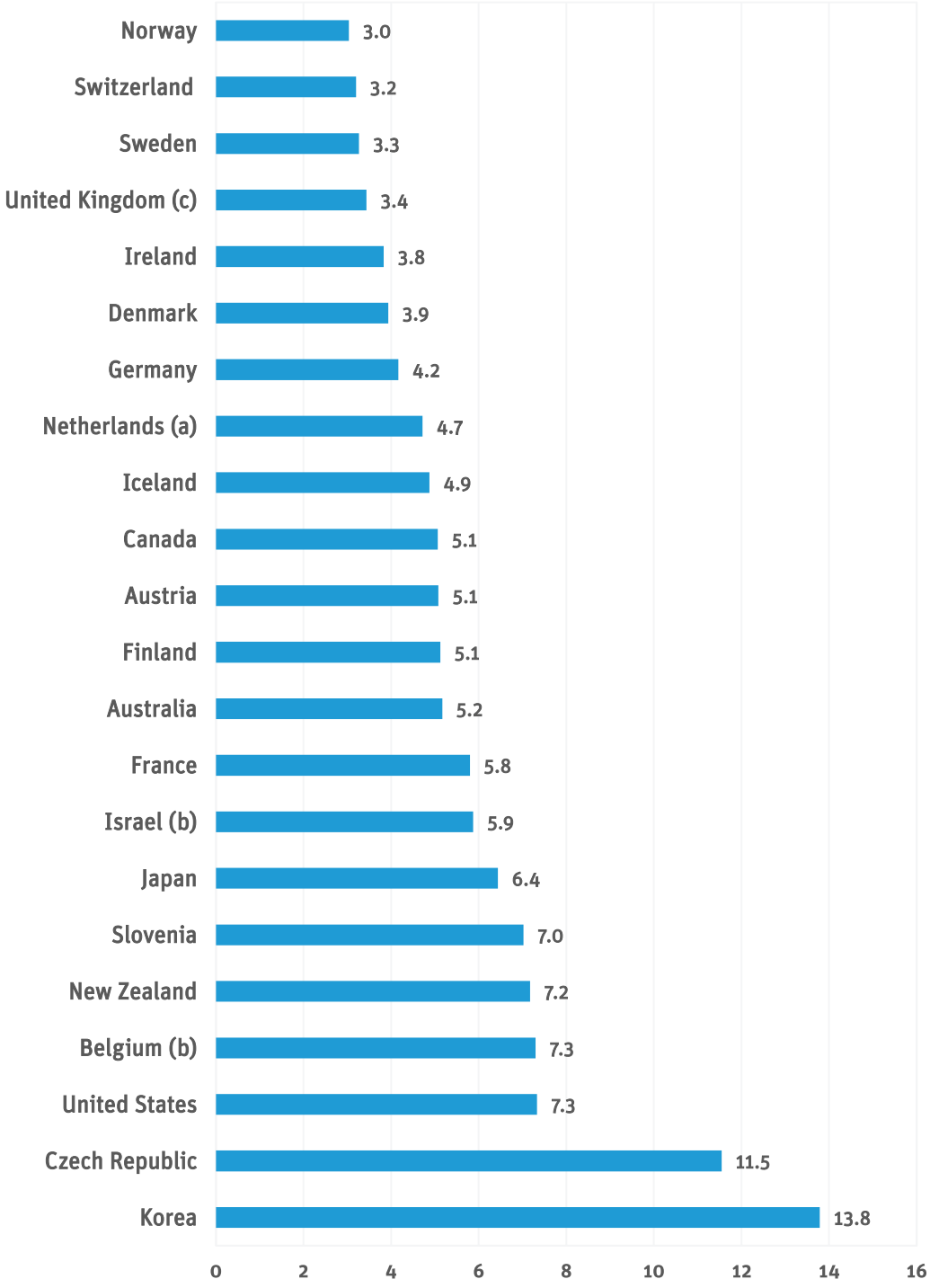
Travel risk measured by distance travelled has decreased since 2010.

The one exception are the United States (see Table 3). Iceland also shows an increase, but the very low number of road deaths there, typically between 4 and 12 per year, means very small changes in the number of absolute road deaths cause large statistical fluctuations. Six countries recorded fewer than four deaths per billion vehicle-kilometres travelled in 2016: Norway, Switzerland, Sweden, the United Kingdom (without Northern Ireland), Ireland and Denmark. These are three more than in 2010. Data on vehicle-kilometres travelled is regularly collected in 22 of the 32 IRTAD countries; it is usually not available for the less-developed countries.

The same countries are among the best performers when considering the fatality rate per 10 000 registered motor vehicles. In 2016, Norway, Switzerland, Sweden and the United Kingdom registered fatality rates below 0.5 deaths per 10 000 registered motor vehicles. In 2000, the four best-performing countries had fatality rates of 1.2. Thus, the fatality risk in these countries has more than halved in the past 16 years. Among countries for which validated data exists, the fatality risk was highest in Chile, which had 4.5 road deaths per 10 000 motorised vehicles or 15 times the rate of top-performing Norway. Importantly, other countries exceed the risk level of Chile, but not based on validated data.

Road deaths per distance travelled 2016

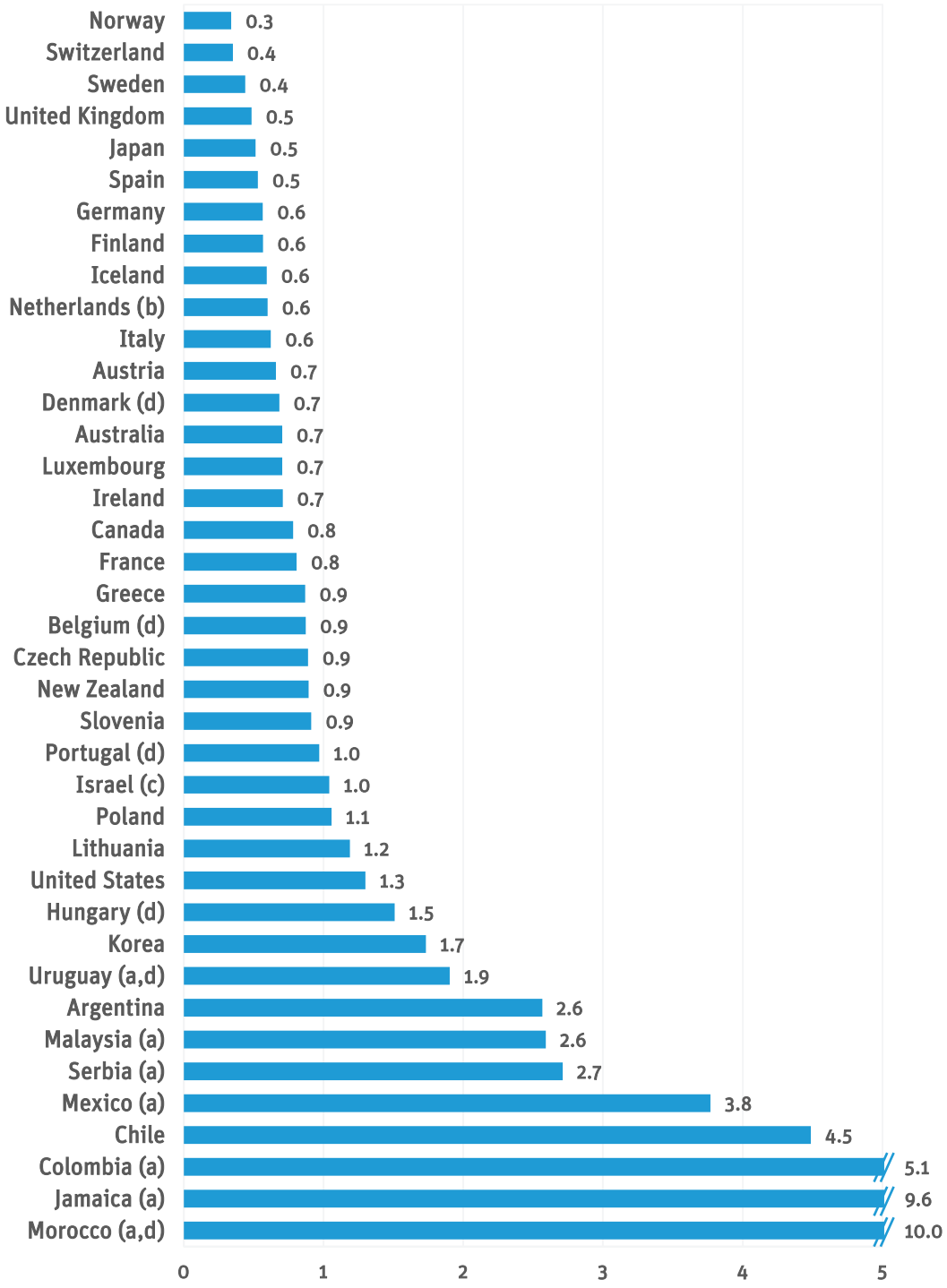
billion vehicle-kilometres



Data from Argentina, Cambodia, Chile, Greece, Hungary, Italy, Jamaica, Lithuania, Luxembourg, Malaysia, Morocco, Poland, Portugal, Serbia, Spain and Uruguay are not available.
Data from Colombia and Mexico are not shown.
(a) Real data (actual numbers instead of reported numbers by the police).
(b) 2015 data.
(c) Data for Great Britain only.

Road deaths per 10 000 vehicles 2016

registered vehicles



Data from Cambodia are not available.

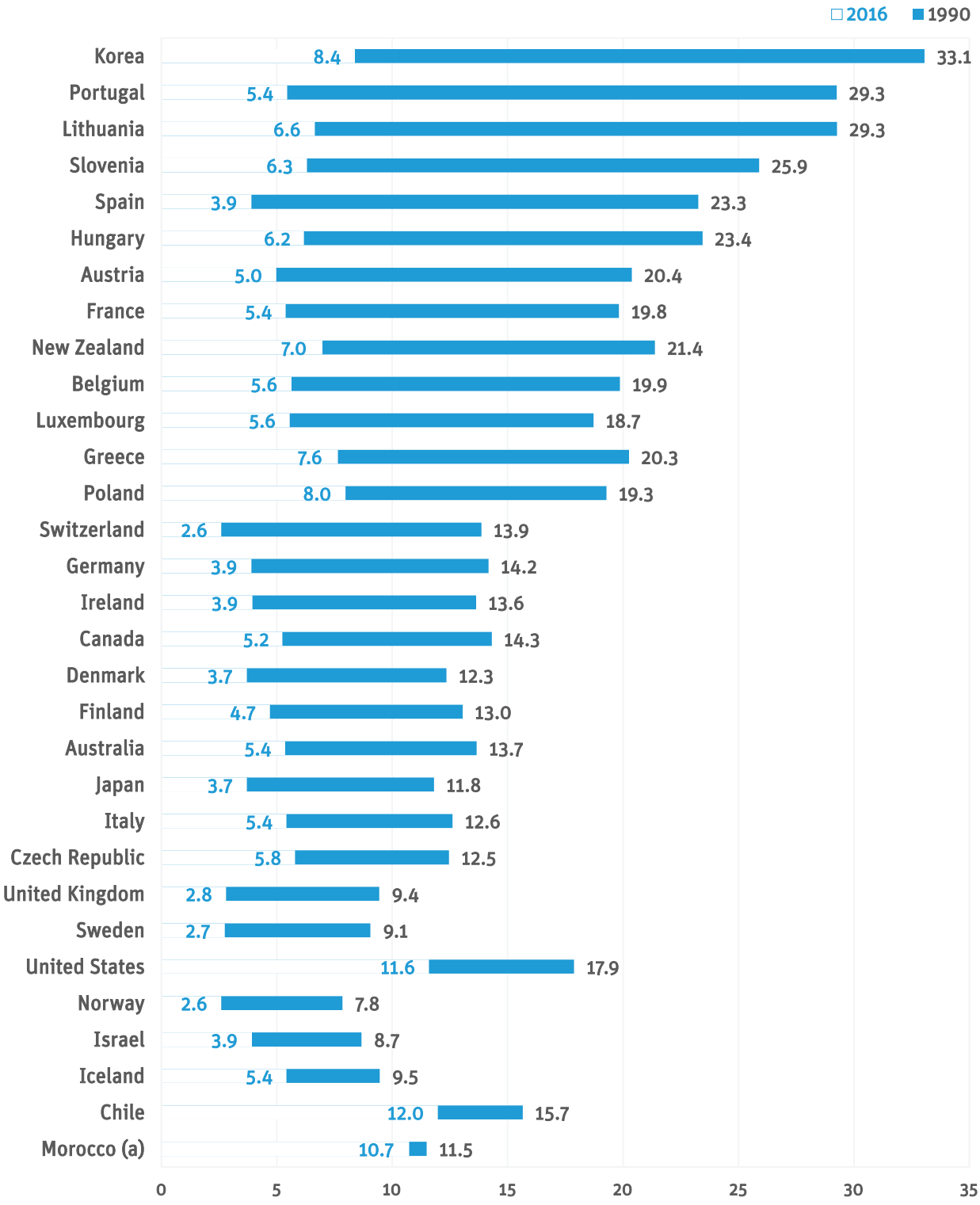
(a) Data as provided by the countries and not validated by IRTAD.

(b) Real data (actual numbers instead of reported numbers by the police).

(c) 2015 data.

(d) Mopeds are not included in the registered vehicles.

Progress in reducing mortality rates 1990, 2016 per 100 000 inhabitants



Data from Argentina, Cambodia, Colombia, Jamaica, Malaysia, Mexico, Netherlands, Serbia and Uruguay are missing.
(a) Data as provided by countries and not validated by IRTAD.

Road user groups

Car occupants continue to benefit most from road safety improvements.

In 2016, car passengers represented 40% of all road deaths; in 2000, their share had been nearly 50%. Since 2010, the number of car occupants killed in crashes has decreased in all countries except Chile (+25%) and the United States (+7%). The addition of safer vehicles to the fleets, equipped with technologies that prevent crashes (such as Electronic Stability Control) or mitigate their consequences (e.g. airbags) contribute to this improvement.

The number of vulnerable road users killed in traffic increased in many countries.

In 2016, pedestrians, cyclists and riders of powered two-wheelers represented more than half of the total number of road deaths. The respective share of all traffic fatalities rose from 15% in 2000 to 18% in 2016 for motorcyclists, from 22% to 24% for pedestrians, and from 6% to 8% for cyclists. In 8 out of the 30 countries for which data are available and validated, more pedestrians died in crashes in 2016 than in 2010. For cyclists, this was the case in 12 countries, and in 11 countries for motorcyclists.

Whether more fatalities among a specific group of road users reflect an increase in risk or is the result of broader factors, (such as more kilometres travelled by that group) is impossible to ascertain without information on the exposure to risk of the different road user categories. Car occupants have benefitted from safer vehicles with better protection. Cycling may have seen more fatalities as a result of increased numbers of cyclists because of the promotion of active transport which is not always accompanied by the development of safe cycling infrastructure.

The relationship between road safety and economic performance

The number of road deaths significantly declined in several countries between 2008 and 2010. The IRTAD report Why Does Road Safety Improve When Economic Times Are Hard? (ITF, 2015) showed that during the period 2008-2010 two thirds of the reduction in road deaths in 14 countries could actually be attributed to the recession. While economic activity is recovering in several countries, a forthcoming update of the 2015 study by Rune Elvik examines whether the deteriorating performance in road safety was related to it.
The main conclusions are:

- Economic recession is associated with a larger reduction of the number of traffic fatalities than would be expected based on long-term trends. In a few countries there is evidence that when economic growth resumes and unemployment falls, the decline in the number of traffic fatalities slows down significantly or even reverses. However, the decline in the number of traffic fatalities that was evident before 2010 has continued after 2010 in most of the countries included in the study.

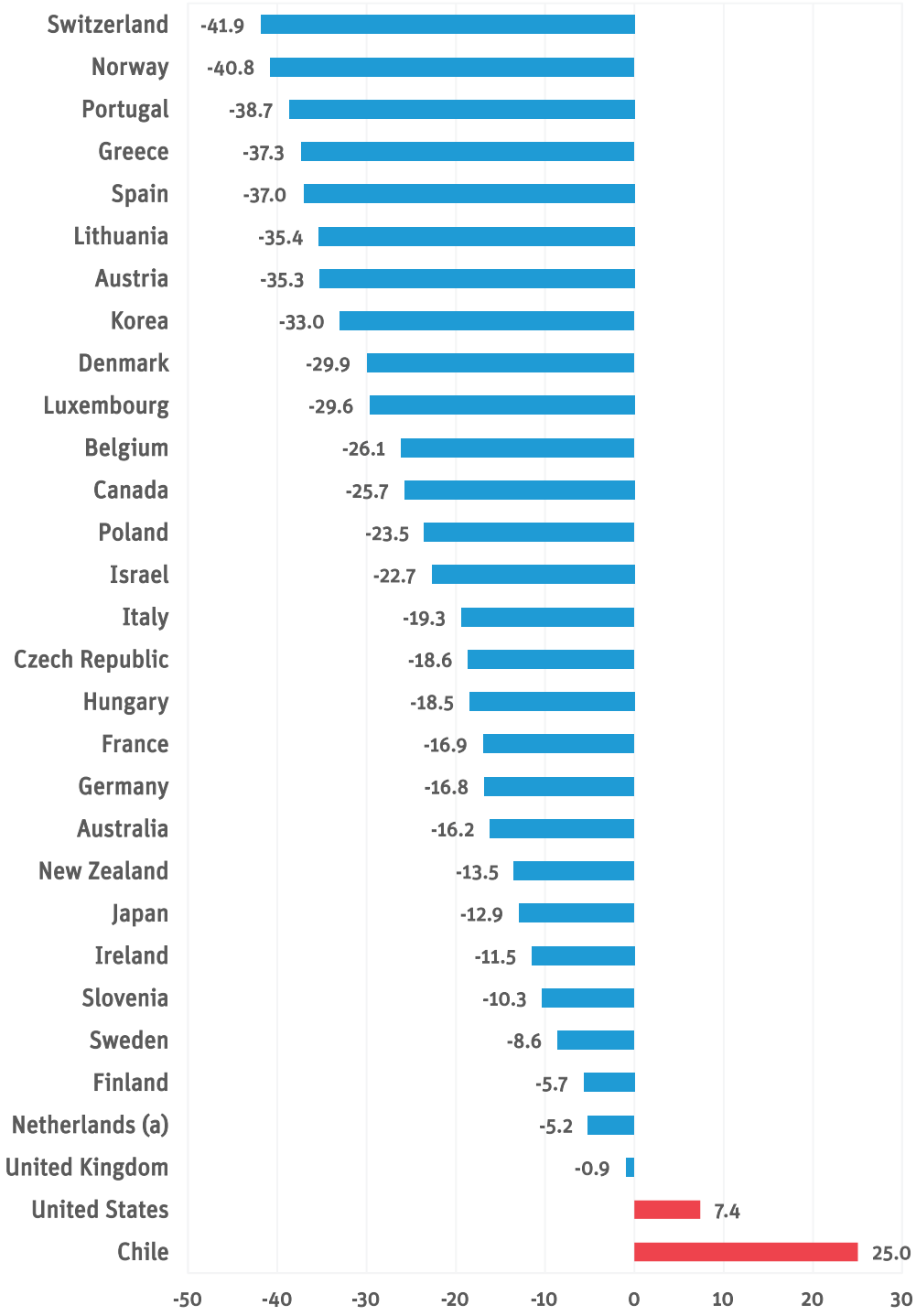
- Considerable differences between countries exist with respect to how sensitive the number of traffic fatalities is to changes in unemployment. In some countries changes in unemployment were associated with large changes in the number of fatalities, for instance in Sweden and in the United States. In other countries, like France and Japan, fluctuations in unemployment hardly affected the long-term declining trend in the number of fatalities.

- Why is the relationship strong in some countries and weak in others? The answer to this question probably lies in two policy areas. On the one hand, if road safety policy is effective, i.e. it succeeds in bringing about a sustained reduction in the number of traffic fatalities year after year, it may be more resilient to the impacts of other factors like unemployment than where road safety policies have been less effective. On the other hand, labour market policies may be more impactful in some countries than in others. An effective labour market policy limits the rise of unemployment and keeps its fluctuations over time within a narrow range – potentially so much so, that unemployment will not have a large influence on the number of traffic fatalities.

Source: Why Does Road Safety Improve When Economic Times Are Hard? (ITF, 2015)

Car occupant deaths 2010-2016

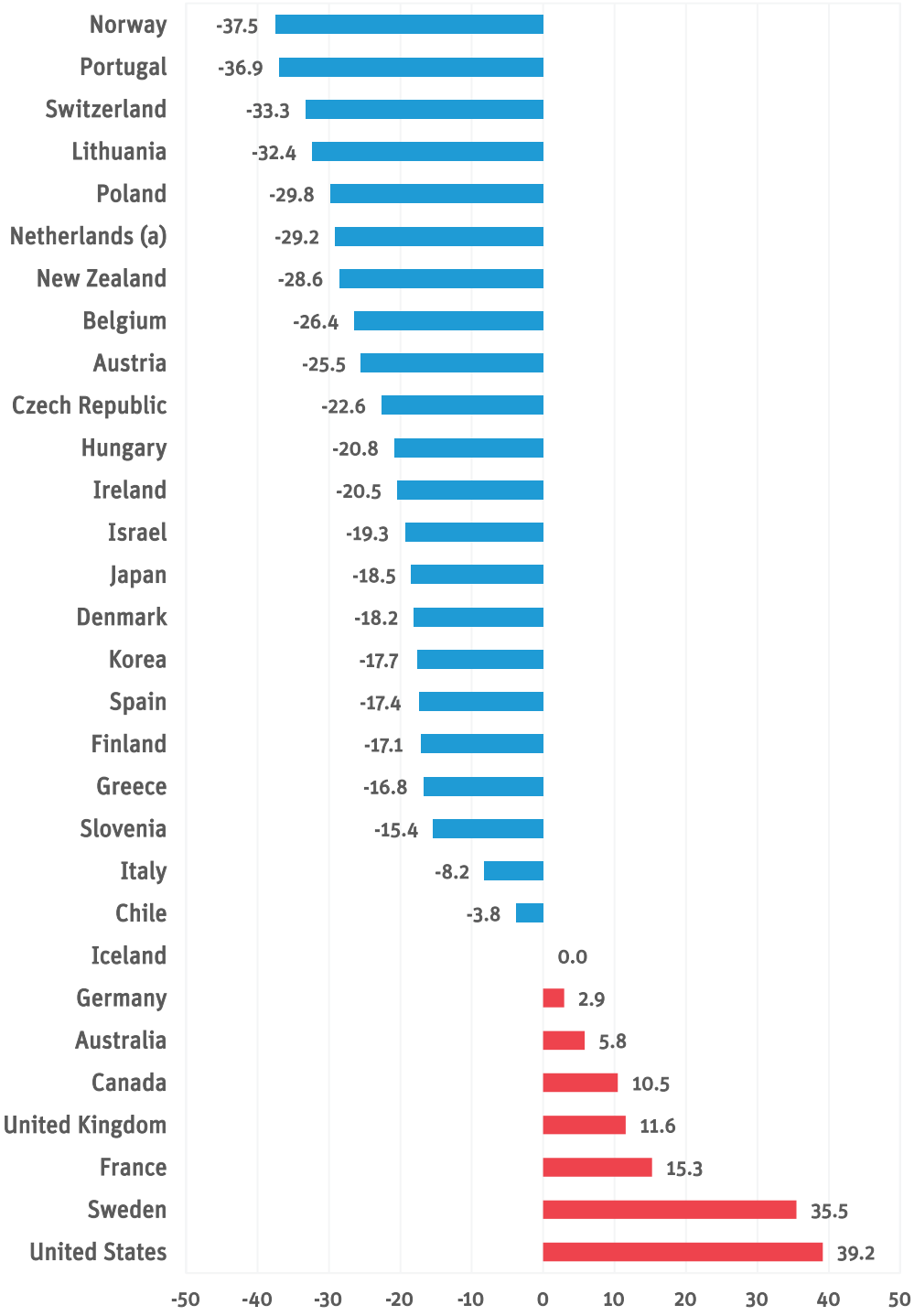
Percentage change



Data from Argentina are not available.
Data from Iceland are not shown since observations are too low to have meaningful percentage changes.
(a) Real data (actual numbers instead of reported numbers by the police).

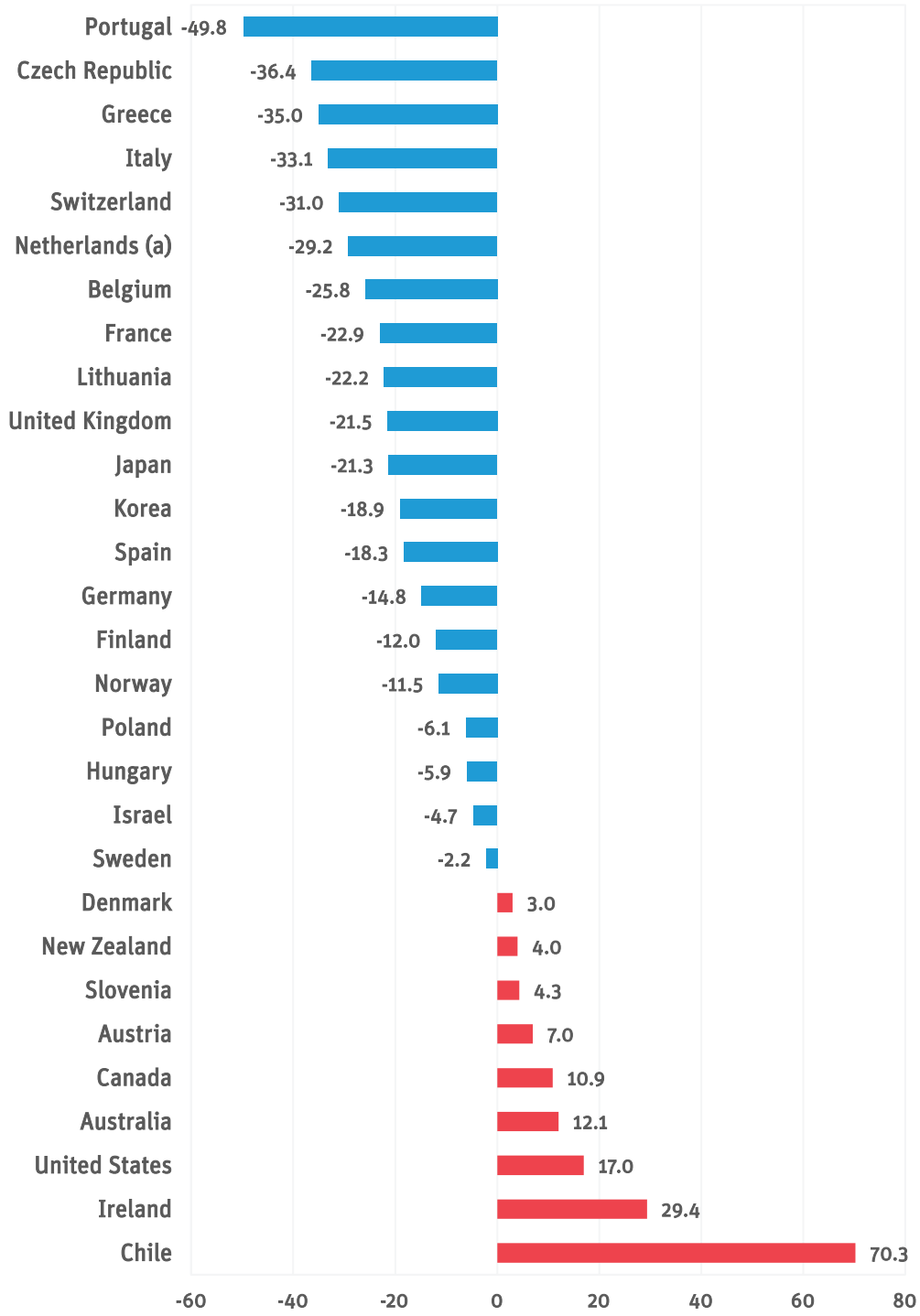
Pedestrian deaths 2010-2016

Percentage change



Data from Argentina are not available.
Data from Luxembourg are not shown since observations are too low to have meaningful percentage changes.
(a) Real data (actual numbers instead of reported numbers by the police).

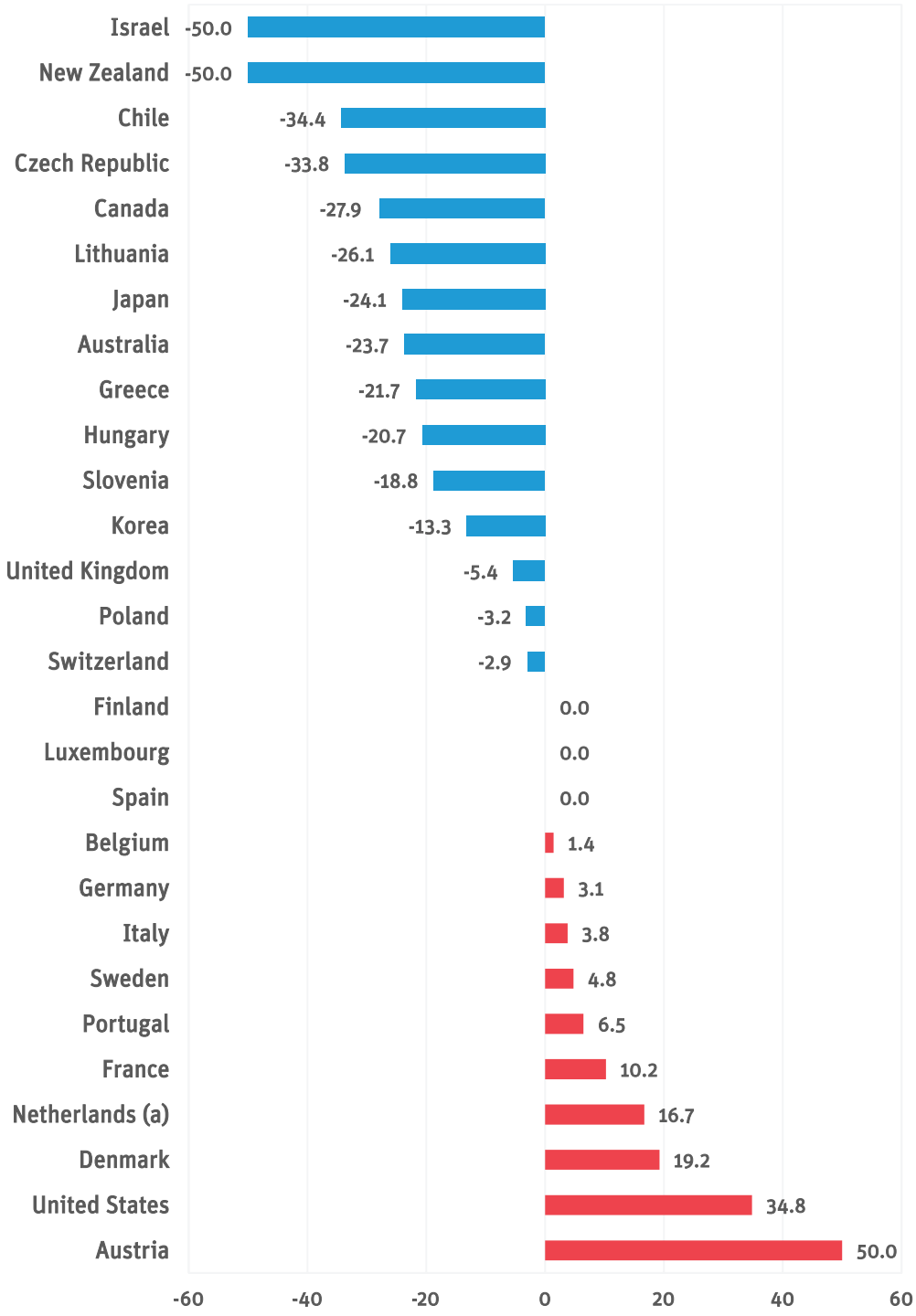
Riders of powered two-wheelers killed 2010-16 Percentage change



Data from Argentina are not available.
Data from Iceland and Luxembourg are not shown since observations are too low to have meaningful percentage changes.
(a) Real data (actual numbers instead of reported numbers by the police).

Cyclist deaths 2010-2016

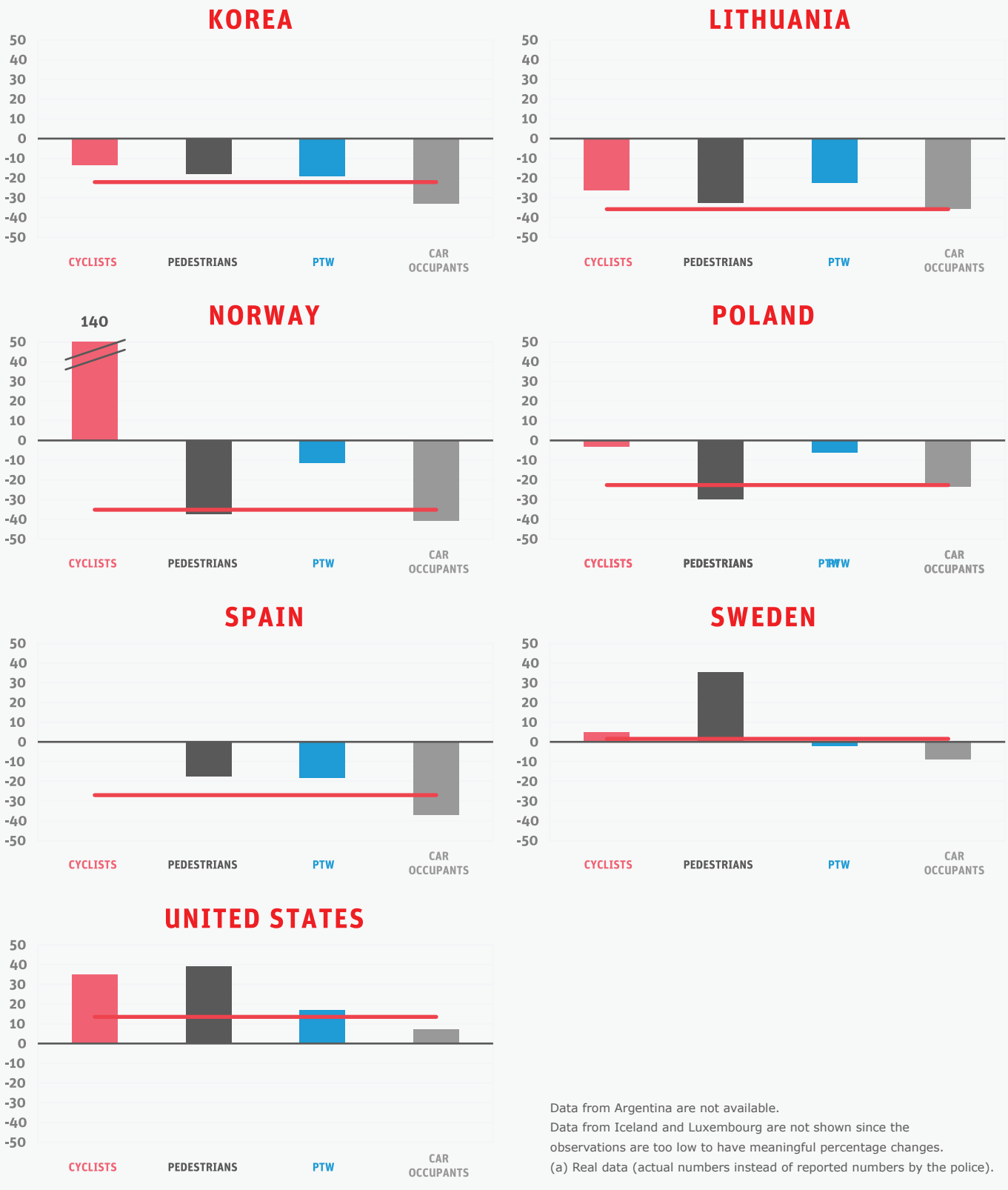
Percentage change



Data from Argentina are not available.
Data from Iceland, Ireland and Norway are not shown since observations are too low to have meaningful percentage changes.
(a) Real data (actual numbers instead of reported numbers by the police).

Road fatalities by different road users

2010-2016 Percentage change



Data from Argentina are not available.
Data from Iceland and Luxembourg are not shown since the observations are too low to have meaningful percentage changes.
(a) Real data (actual numbers instead of reported numbers by the police).

Age groups

Ensuring road safety for seniors is a key challenge for ageing societies.

The number of people aged 65 years or older has almost doubled between 1994 and 2015 and their share is expected to reach 16% of the world population by 2050 (1994: 6%). More fragile and vulnerable than younger age groups, senior citizens have nonetheless become more mobile than in the past and thus more exposed to traffic risks.

Older road users are particularly at risk in traffic.

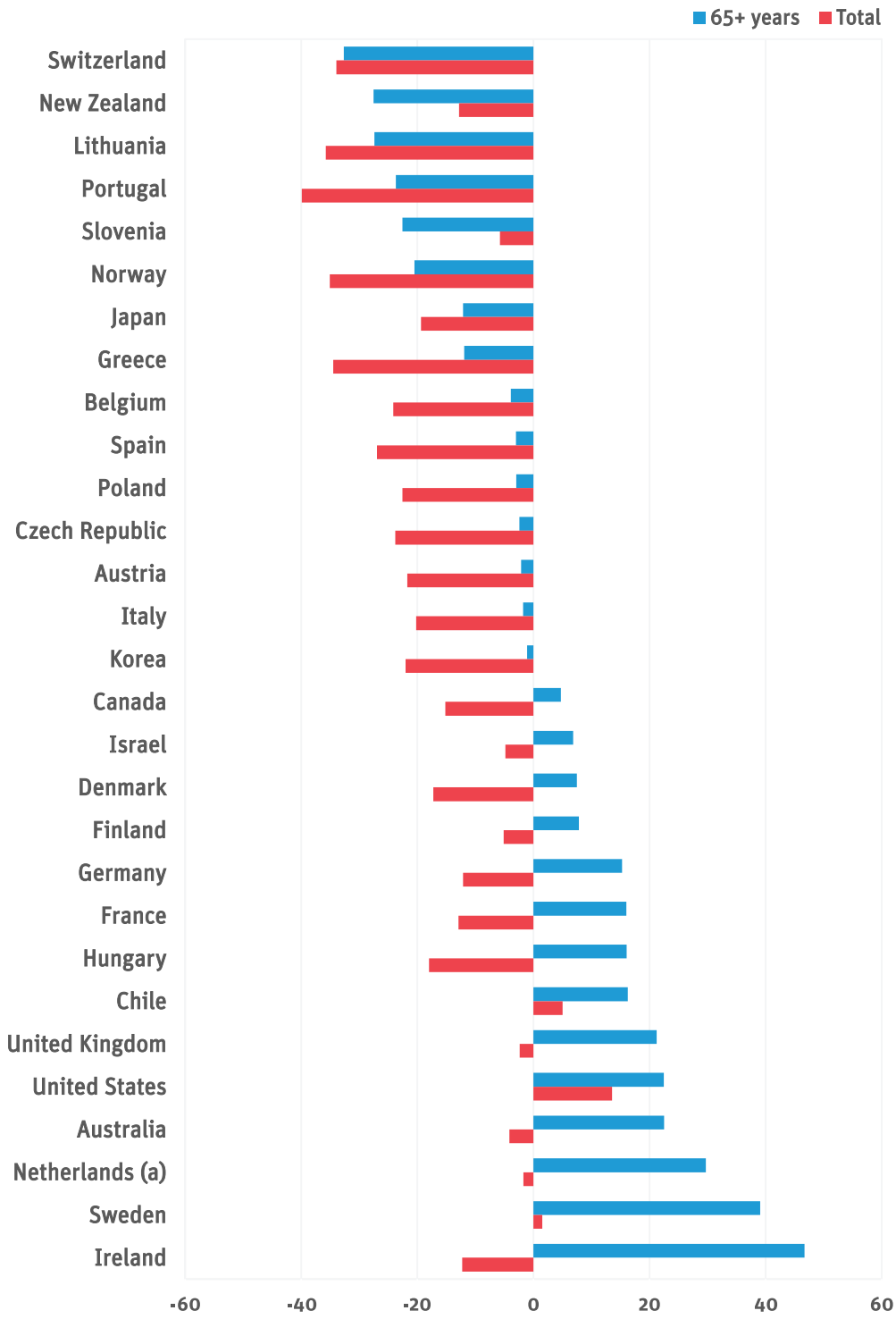
Traffic-related deaths among senior citizens aged 65 or above increased by 6.9% between 2010 and 2016, against the overall decline of road deaths by 3.6%. This is partly due to their increased population share, although this does not explain the phenomenon fully. Fourteen out of 31 IRTAD countries with available data recorded a rise in the number of road deaths among their elderly citizens aged 65 or older. In ten countries, the elderly have the highest mortality rate in traffic of all age groups. In Korea, for instance, seniors had 25.6 road fatalities per 100 000 population, while the national average was 8.4. The risk to die in traffic increases substantially with age. For the 75+ age group, traffic-related mortality rate is much higher than for the 65-74 age group. In Japan, for example, the mortality rate of those aged above 75 is twice that of seniors aged 65-74. In more than half of IRTAD countries, the senior citizens above 75 years are the age group the most at risk in traffic.

Young road users continue to be particularly vulnerable in traffic.

Traffic crashes are the single greatest killer of 15-24 year olds. In most countries, 18-20 year olds have the highest or second-highest traffic related mortality of all age groups. Their risk to die in a road crash is typically twice as high as for the population average. The high crash rates of young drivers in particular can be explained by high-risk behaviour, lack of experience, and lifestyle associated with their age. Males still run higher risks than females, especially in this age group. Typically young males aged 18 to 24 have a mortality rate two to three times higher than young females.

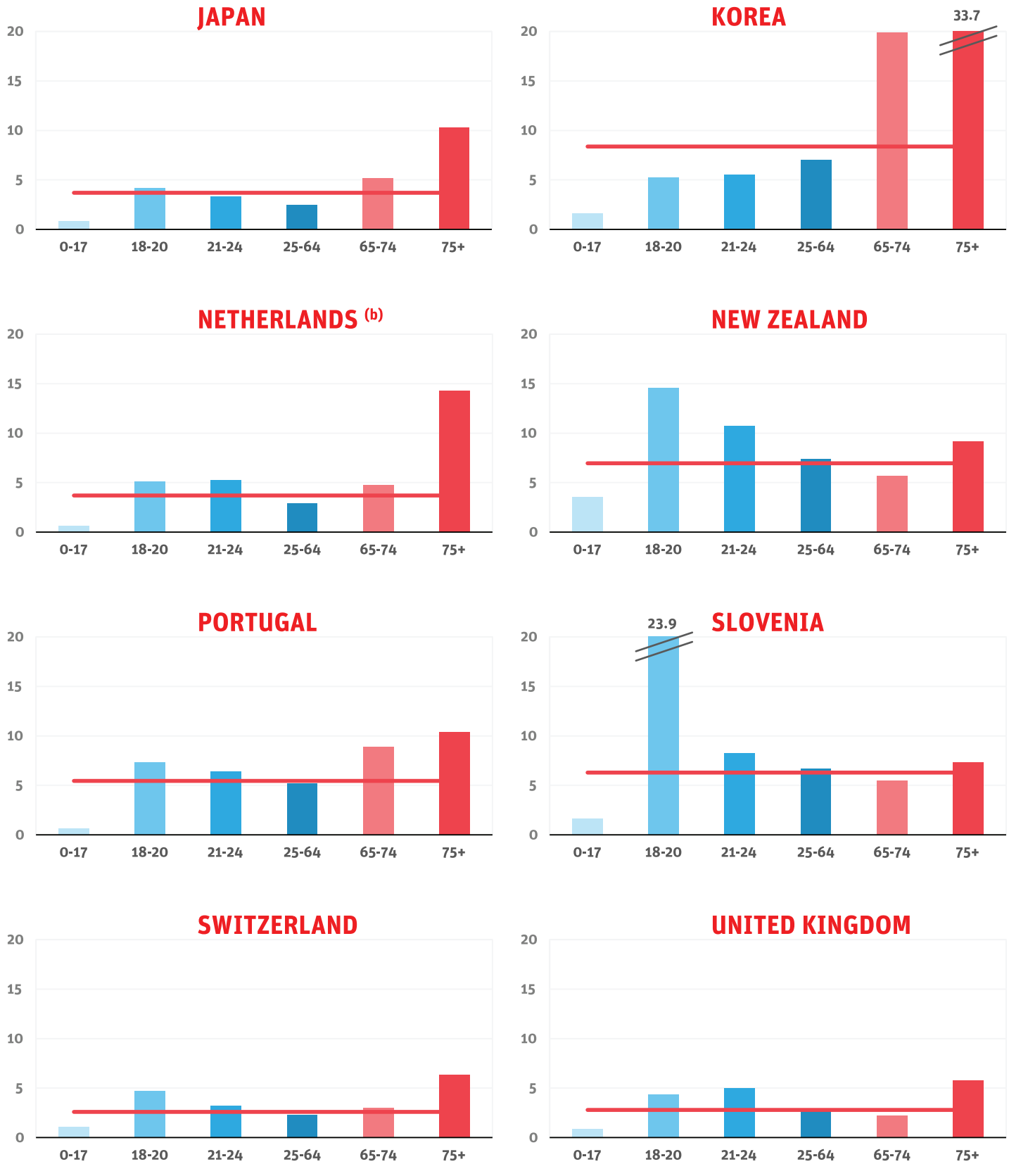
Seniors killed compared to all road users 2010-2016

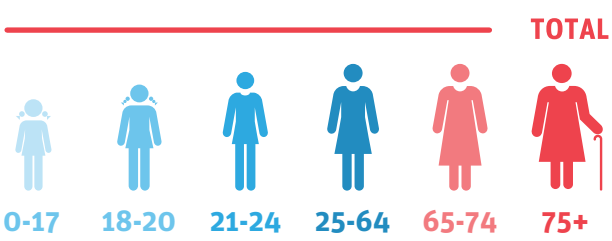
65+ years, percentage change



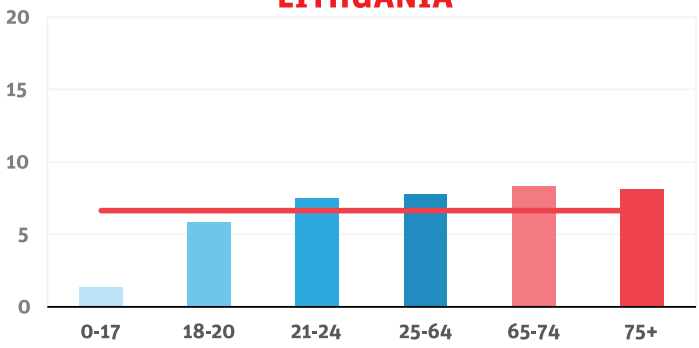
Data from Argentina are not available.
Data from Iceland and Luxembourg are not shown since observations are too low to have meaningful percentage changes.
(a) Real data (actual numbers instead of reported numbers by the police).

Mortality rate by age group 2016

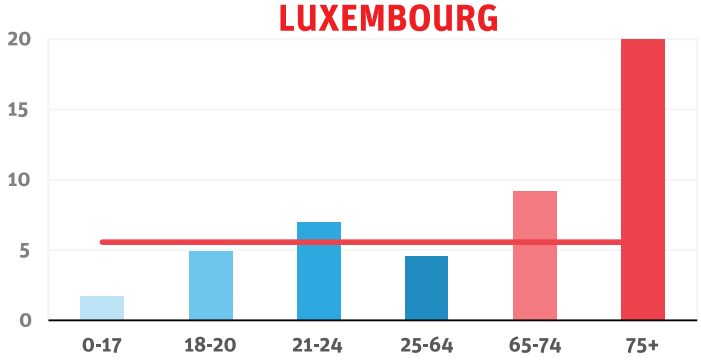




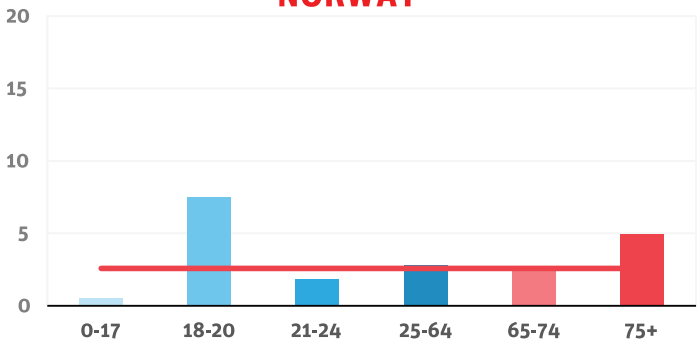
LITHUANIA



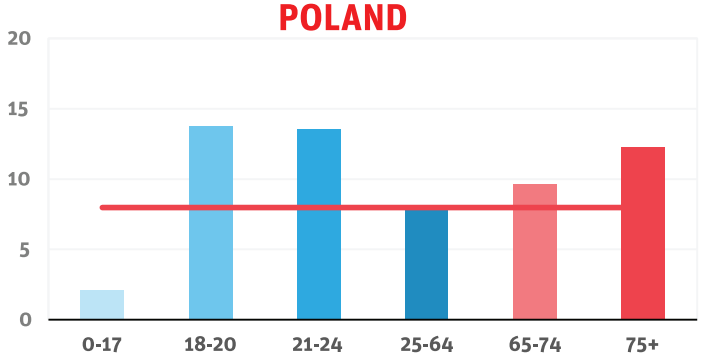
LUXEMBOURG



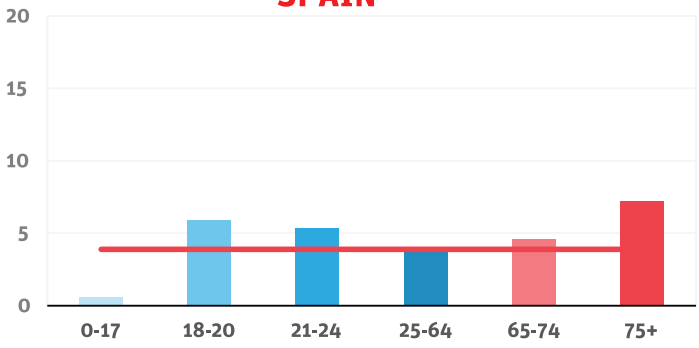
NORWAY



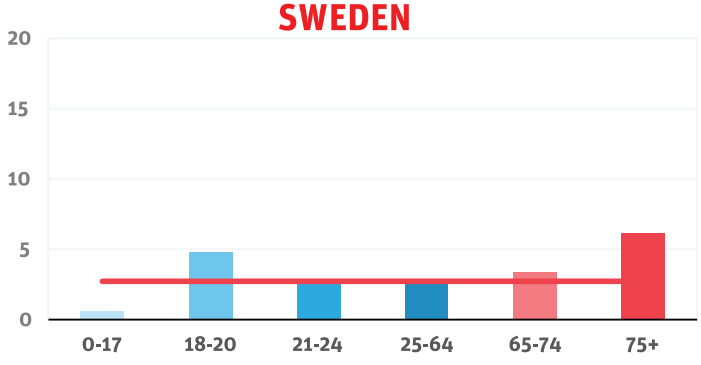
POLAND



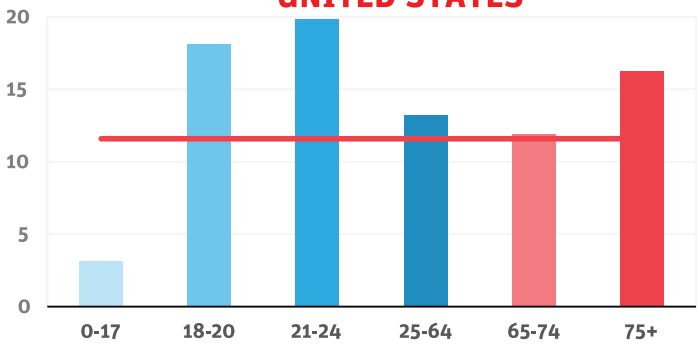
SPAIN



SWEDEN



UNITED STATES



Data from Argentina are not available.
(a) 2015 data.
(b) Real data (actual numbers instead of reported numbers by the police).

Road type

Most traffic fatalities occur on rural roads.

Inappropriate and relatively high speeds, the lack of physical separation as well as poor roadsides increase the occurrence and severity of road crashes. In 2016, road fatalities on rural roads represented between almost 40% (in Portugal) and 76% (in New Zealand) of all road deaths. However, it is worth mentioning that in most countries the majority of non-fatal severe crashes occur in urban areas.

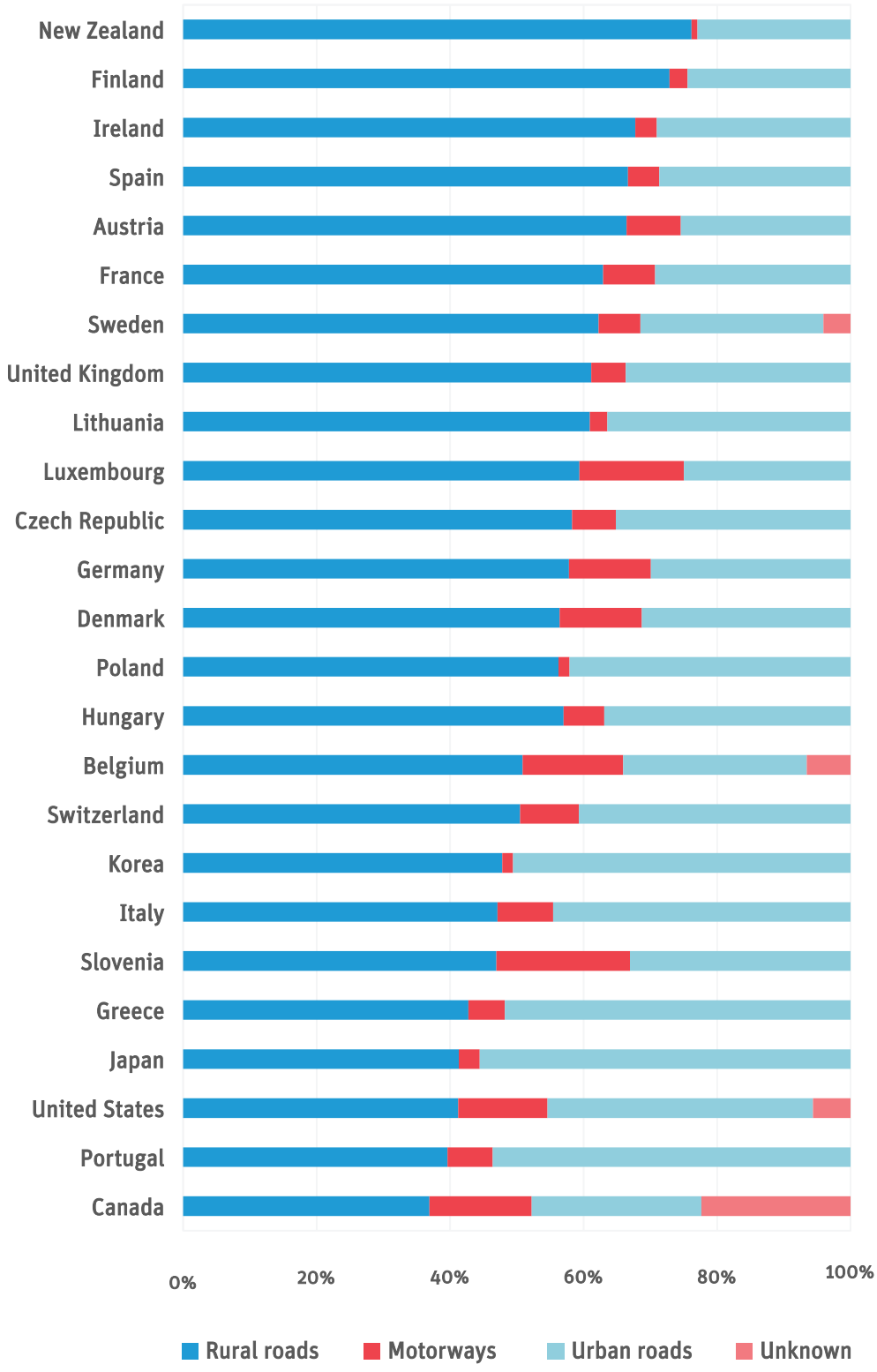
Fatal crashes in urban areas are increasing.

Since 2000, the share of fatalities that occur on city roads has increased in more than half of the IRTAD countries. This trend is particularly prevalent in Greece, Korea and Portugal. In Korea, road deaths in urban areas represented 32% of all fatalities in 2000, rising to 42% in 2010 and 51% in 2016. In Greece, the percentage of urban traffic fatalities rose from 34% in 2010 to 52% in 2016, and in Portugal from 39% to 54%.

Motorways are the safest roads.

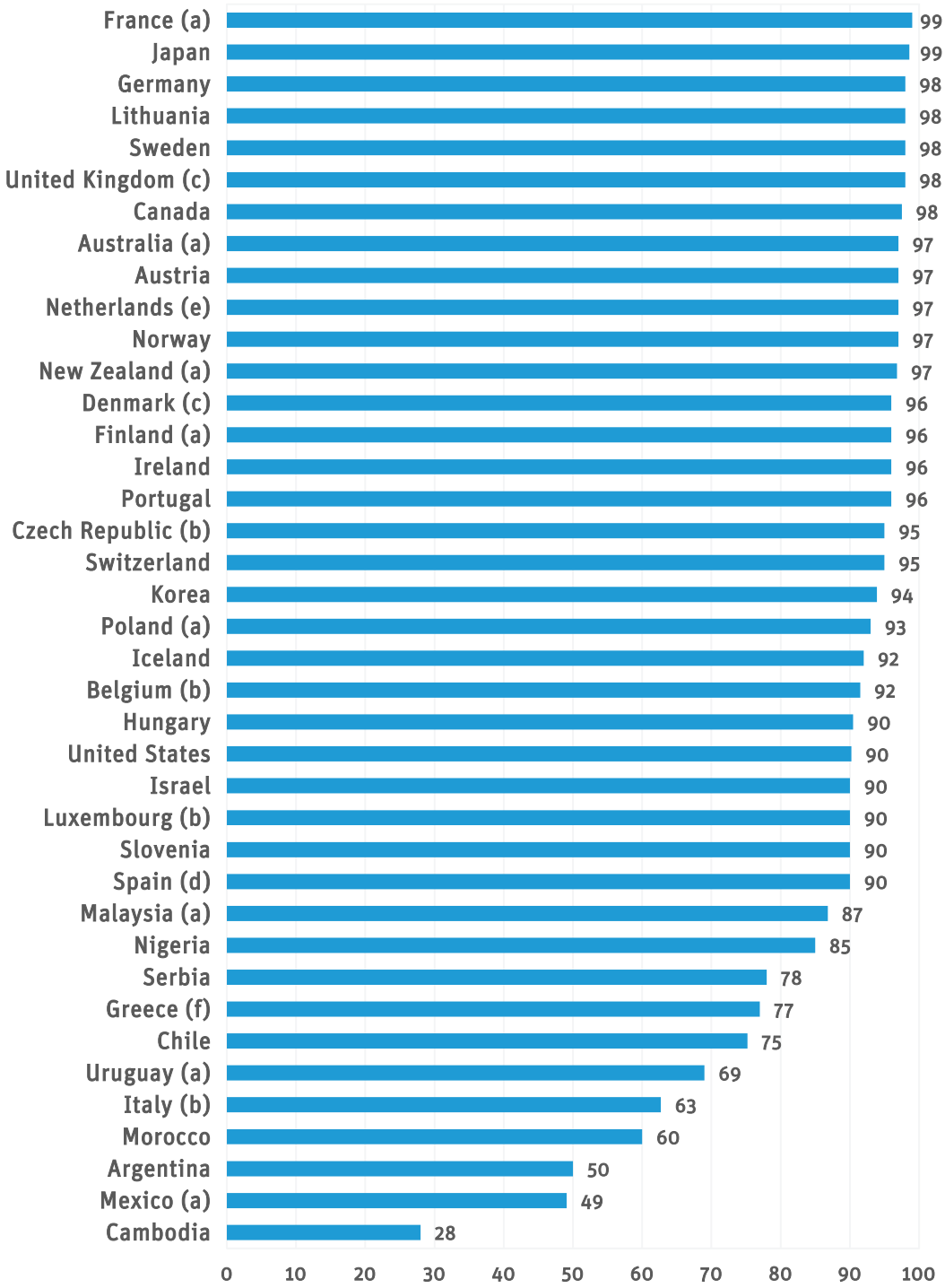
In countries for which kilometrage data and fatality data are available by type of road, the risk of dying on motorways is between two to six times smaller than on the whole network.

Traffic deaths by road type
2016



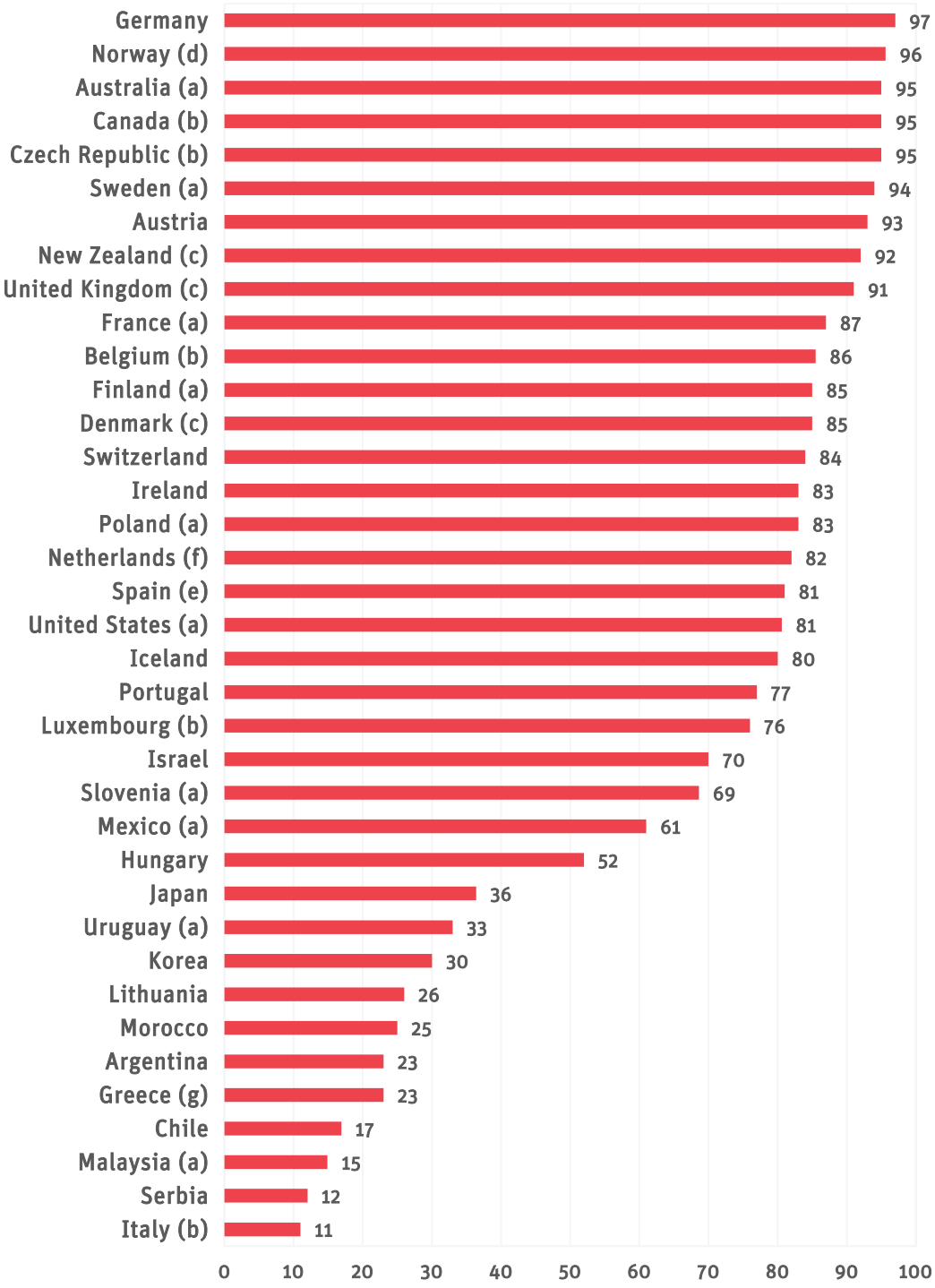
Data from Argentina, Australia, Chile, Iceland, Israel, Netherlands and Norway are not available.

Seatbelt wearing rates in front seats 2017 or latest available year



Data based on national surveys and not on a common international methodology.
Data for Colombia and Jamaica are not available.
(a) 2016 data.
(b) 2015 data.
(c) 2014 data.
(d) 2012 data.
(e) 2010 data.
(f) 2009 data.

Seatbelt wearing rates rear seats 2017 or latest available year



Data based on national surveys and not on a common international methodology.
Data for Cambodia, Colombia and Jamaica are not available.
(a) 2016 data.
(b) 2015 data.
(c) 2014 data.
(d) 2013 data.
(e) 2012 data.
(f) 2010 data.
(g) 2009 data.

Table 1. **Road fatality data** 2017 compared to 2016

Country	2017 road deaths	Data status	2016 road deaths	% change
Countries with validated data				
Argentina	5 300	provisional	5 530	-4.2
Australia	1 227	provisional	1 296	-5.3
Austria	413	provisional	427 (a)	-3.3
Belgium	620	estimate	637	-2.7
Canada	..	..	1 898	..
Chile	1 928	final	2 178	-11.5
Czech Republic	577	final	611	-5.6
Denmark	183	provisional	211	-13.3
Finland	212	provisional	258	-17.8
France	3 456	provisional	3 477	-0.6
Germany	3 177	provisional	3 206	-0.9
Greece	739	provisional	824	-10.3
Hungary	624	final	607	2.8
Iceland	16	final	18	-11.1
Ireland	158	provisional	186	-15.1
Israel	321	final	335	-4.2
Italy	1 623	provisional for Jan-Jun	1 510	7.5
Japan	4 431	final	4 698	-5.7
Korea	4 182	provisional	4 292	-2.6
Lithuania	192	final	192	0.0
Luxembourg	25	final	32	-21.9
Netherlands (c)	613	final	629	-2.5
New Zealand	380	final	327	16.2
Norway	106	provisional	135	-21.5
Poland	2 831	final	3 026	-6.4
Portugal	592	provisional	563	5.2
Slovenia	104	final	130	-20.0
Spain	..	provisional for fatalities with 24 hours	..	3.0
Sweden	254	provisional	270	-5.9
Switzerland	230	final	216	6.5
United Kingdom	1 286	provisional for Jan-Sep	1 372	-6.3
United States	37 150	estimation	37 461	-0.8
Observers and accession countries (b)				
Cambodia	..	..	1 852	..
Colombia	6 479	provisional	6 806 (a)	0.0
Jamaica	321	final	379	-15.3
Malaysia	6 740	final	7 152	-5.8
Mexico	..	..	16 185	..
Morocco	3 499	provisional	3 593 (a)	-2.6
Serbia	579	provisional	607	-4.6
South Africa	14 050	final	14 071	-0.1
Uruguay	470	final	446	5.4

(a) 2016 provisional data for comparative purposes with 2017 data. These data can differ from the 2016 final data shown in the other tables and graphs.
(b) Data as provided by the countries and not validated by IRTAD.
(c) Real data (actual numbers instead of reported numbers by the police).

Table 2. **Overview: Road fatality trends** 2010-2016

Country	Road fatalities							2016 % change from		Annual average change
	2016	2015	2014	2013	2012	2011	2010	2015	2010	2016-10
Countries with validated data										
Argentina	5 550	..	5 279	5 209	5 074	5 040	5 094	..	9.0	1.4
Australia	1 296	1 206	1 151	1 185	1 299	1 277	1 352	7.5	-4.1	-0.7
Austria	432	479	430	455	531	523	552	-9.8	-21.7	-4.0
Belgium	637	732	727	724	770	861	840	-13.0	-24.2	-4.5
Canada	1 898	1 870	1 846	1 951	2 075	2 023	2 238	1.5	-15.2	-2.7
Chile	2 178	2 140	2 119	2 110	1 980	2 045	2 074	1.8	5.0	0.8
Czech Republic	611	737	688	654	742	773	802	-17.1	-23.8	-4.4
Denmark	211	178	182	191	167	220	255	18.5	-17.3	-3.1
Finland	258	270	229	258	255	292	272	-4.4	-5.1	-0.9
France	3 477	3 461	3 384	3 268	3 653	3 963	3 992	0.5	-12.9	-2.3
Germany	3 206	3 459	3 377	3 339	3 600	4 009	3 648	-7.3	-12.1	-2.1
Greece	824	793	795	879	988	1 141	1 258	3.9	-34.5	-6.8
Hungary	607	644	626	591	605	638	740	-5.7	-18.0	-3.2
Iceland	18	16	4	15	9	12	8	12.5	125.0	14.5
Ireland	186	162	193	188	163	186	212	14.8	-12.3	-2.2
Israel	335	322	279	277	263	341	352	4.0	-4.8	-0.8
Italy	3 283	3 428	3 381	3 401	3 753	3 860	4 114	-4.2	-20.2	-3.7
Japan	4 698	4 885	4 838	5 165	5 261	5 535	5 828	-3.8	-19.4	-3.5
Korea	4 292	4 621	4 762	5 092	5 392	5 229	5 505	-7.1	-22.0	-4.1
Lithuania	192	242	267	258	301	296	299	-20.7	-35.8	-7.1
Luxembourg	32	36	35	45	34	33	32	-11.1	0.0	0.0
Netherlands (a)	629	621	570	570	650	661	640	1.3	-1.7	-0.3
New Zealand	327	319	293	253	308	284	375	2.5	-12.8	-2.3
Norway	135	117	147	187	145	168	208	15.4	-35.1	-7.0
Poland	3 026	2 938	3 202	3 357	3 571	4 189	3 908	3.0	-22.6	-4.2
Portugal	563	593	638	637	718	891	937	-5.1	-39.9	-8.1
Slovenia	130	120	108	125	130	141	138	8.3	-5.8	-1.0
Spain	1 810	1 689	1 688	1 680	1 903	2 060	2 478	7.2	-27.0	-5.1
Sweden	270	259	270	260	285	319	266	4.2	1.5	0.2
Switzerland	216	253	243	269	339	320	327	-14.6	-33.9	-6.7
United Kingdom	1 860	1 804	1 854	1 770	1 802	1 960	1 905	3.1	-2.4	-0.4
United States	37 461	35 485	32 744	32 893	33 782	32 479	32 999	5.6	13.5	2.1
Observers and accession countries (b)										
Cambodia	1 852	2 231	2 226	1 950	1 966	1 905	1 816	-17.0	2.0	0.3
Colombia	7 158	6 831	6 352	6 211	6 131	5 773	5 670	4.8	26.0	4.0
Costa Rica	..	..	662	625	655	576	574	..	..	..
Jamaica	379	382	331	307	260	308	319	-0.8	18.8	2.9
Malaysia	7 152	6 706	6 674	6 915	6 917	6 877	6 872	6.7	4.1	0.7
Mexico	16 185	16 039	15 886	15 853	17 102	16 615	16 559	0.9	-2.3	-0.4
Morocco	3 785	3 776	3 489	3 832	4 167	4 222	3 778	0.2	0.2	0.0
Serbia	607	599	536	650	688	731	660	1.3	-8.0	-1.4
South Africa	14 071	12 944	12 702	11 844	12 211	13 954	13 967	8.7	0.7	0.1
Uruguay	446	506	538	567	510	572	556	-11.9	-19.8	-3.6

(a) Real data (actual numbers instead of reported numbers by the police).
(b) Data as provided by the countries and not validated by IRTAD.

Table 3. **Overview: Road fatalities since 1990**

per 100 000 inhabitants, per billion vehicle-km and per 10 000 registered motor vehicles

	Road fatalities per 100 000 inhabitants				Road fatalities per billion VKT				Road fatalities per 10 000 registered vehicles			
	1990	2000	2010	2016	1990	2000	2010	2016	1990	2000	2010	2016
Countries with validated data												
Argentina	..	..	12.6	12.7	..	..	..	..	..	..	2.9	2.6
Australia	13.7	9.5	6.1	5.4	..	9.8	5.9	5.2	2.3	..	0.8	0.7
Austria	20.4	12.2	6.6	5.0	32.0	15.0	7.3	5.1	3.7	1.8	0.9	0.7
Belgium (c)	19.9	14.4	7.7	5.6	28.1	16.3	8.5	7.3	4.3	2.6	1.3	0.9
Canada	14.3	9.5	6.6	5.2	..	9.3	6.7	5.1	2.3	1.6	1.0	0.8
Chile	..	..	12.1	12.0	..	..	..	..	..	10.6	6.3	4.5
Czech Republic	12.5	14.5	7.7	5.8	48.3	36.7	16.2	11.5	3.3	3.2	1.3	0.9
Denmark (c)	12.3	9.3	4.6	3.7	17.3	10.7	5.6	3.9	3.1	2.1	0.9	0.7
Finland	13.0	7.7	5.1	4.7	16.3	8.5	5.1	5.1	2.8	1.5	0.7	0.6
France	19.8	13.7	6.4	5.4	26.7	15.6	7.1	5.8	3.6	2.3	1.0	0.8
Germany	14.2 (d)	9.1	4.5	3.9	19.7(d)	11.3	5.2	4.2	2.5 (d)	1.4	0.7	0.6
Greece	20.3	18.7	11.2	7.6	..	..	..	..	..	3.1	1.3	0.9
Hungary (c)	23.4	11.7	7.4	6.2	..	..	..	..	11.2	4.4	2.0	1.5
Iceland	9.5	11.5	2.5	5.4	14.9	13.8	2.5	4.9	..	1.8	0.3	0.6
Ireland	13.6	11.0	4.7	3.9	19.2	11.5	4.5	3.8	4.5	2.5	0.9	0.7
Israel	8.7	7.1	4.6	3.9	22.4	12.4	7.1	5.9 (b)	4.1	2.5	1.4	1.0 (e)
Italy	12.6	12.4	7.0	5.4	..	..	..	..	2.1	1.6	0.8	0.6
Japan	11.8	8.2	4.6	3.7	23.2	13.4	8.0	6.4	1.9	1.2	0.6	0.5
Korea	33.1	21.8	11.3	8.4	..	49.5	18.7	13.8	..	..	..	1.7
Lithuania	29.3	18.3	9.5	6.6	..	..	..	..	12.7	5.0	1.4	1.2
Luxembourg	18.7	17.5	6.4	5.6	..	..	..	..	3.3	2.4	0.8	0.7
Netherlands (b)	..	7.3	3.9	3.8	..	9.2	5.1	4.7	..	1.4	0.7	0.6
New Zealand	21.4	12.0	8.6	7.0	..	13.6	9.4	7.2	3.3	1.8	1.2	0.9
Norway	7.8	7.6	4.3	2.6	12.0	10.5	4.9	3.0	1.4	1.2	0.6	0.3
Poland (c)	19.3	16.4	10.2	8.0	..	..	..	..	8.1	4.5	1.8	1.1
Portugal (c)	29.3	20.0	8.9	5.4	..	..	..	..	13.4	4.3	1.6	1.0
Slovenia	25.9	15.8	6.7	6.3	65.1	26.7	7.7	7.0	..	..	1.0	0.9
Spain	23.3	14.4	5.3	3.9	..	..	..	..	5.1	2.2	0.7	0.5
Sweden	9.1	6.7	2.8	2.7	12.0	8.5	3.5	3.3	1.7	1.2	0.5	0.4
Switzerland	13.9	8.3	4.2	2.6	18.6	11.2	5.4	3.2	2.2	1.2	0.6	0.4
United Kingdom	9.4	6.1	3.0	2.8	..	7.4	3.8	..	2.1	1.2	0.5	0.5
United States	17.9	14.9	10.7	11.6	12.9	9.5	6.9	7.3	2.4	1.9	1.3	1.3
Countries with validated data (a)												
Cambodia	..	..	12.7	11.9	..	..	..	..	..	..	..	..
Colombia	..	..	11.4	14.1	..	..	..	..	..	..	6.7	5.1
Costa Rica	..	..	12.7	..	..	..	..	..	..	..	..	..
Jamaica	..	..	..	13.9	..	..	..	..	..	..	9.4	9.6
Malaysia	..	25.9	24.0	22.9	..	..	16.2	..	..	5.7	3.4	2.6
Mexico	..	13.9	14.5	13.2	..	..	..	27.5	..	9.0	5.2	3.8
Morocco (c)	11.5	12.7	11.8	10.7	..	..	..	..	29.0	21.7	13.5	10.0
Serbia	..	13.9	9.0	8.6	..	..	..	..	..	..	3.6	2.7
South Africa	..	..	27.9	25.0	..	..	..	..	..	..	..	..
Uruguay (c)	..	..	16.6	12.8	..	..	..	..	..	..	3.4	1.9

(a) Data as provided by the countries and not validated by IRTAD.
(b) Real data (actual numbers instead of reported numbers by the police).
(c) Mopeds are not included in the registered vehicles.
(d) 1991 data.
(e) 2015 data.

Eastern Mediterranean status report on road safety

Call for action

World Health Organization
Regional Office for the Eastern Mediterranean

1 Introduction

1.1 Road traffic injuries: a global public health problem

Road traffic injuries are one of the leading causes of death worldwide resulting in more than 1.27 million deaths in 2004; almost equal to the number of deaths caused by HIV/AIDS, tuberculosis and malaria combined [1]. In addition, road traffic crashes are estimated to cause about 20 and 50 million non-fatal injuries every year [2]. Death and disability due to road traffic injuries affect all age groups but the most affected are those in the 5–44 years age group [1]. It is estimated that road traffic injuries will move up in the ranking of leading causes of deaths from tenth in 2004 to fifth in 2030, largely affecting the low- and middle-income countries [1,3].

For a given country, the economic cost of road traffic injuries is roughly estimated to be 1%–2% of its gross national product [2]. Direct economic costs of road traffic injuries in low- and middle-income countries were estimated to be US$ 65 billion per year in 1999, more than the total development assistance received by these countries each year [4]. Furthermore, road traffic injuries lead to indirect costs such as productivity

loss caused by the disabled population and their care providers and loss of property [2].

1.2 Road safety in the Eastern Mediterranean Region

Eastern Mediterranean Region

The Eastern Mediterranean Region of the World Health Organization comprises 22 countries (Figure 1) and is home to 546 million people. Five countries of the Region are high-income, 12 are middle-income, while five are low-income countries. The level of motorization is relatively low in the Eastern Mediterranean Region compared to other parts of the world. Only 4% of the world's motorized vehicles (or 52.7 million) are registered in the Region, which is home to 8.3% of the world's population (Table 1). Overall 96 vehicles are registered per 1000 population in the Region; however wide variations are observed. For instance, the level of motorization is 721 vehicles per 1000 population in Qatar compared to 20 in the occupied Palestinian territory (West Bank and Gaza Strip). Many of the countries of the Region, such as Islamic Republic of Iran and Pakistan, have seen a significant increase in motorization levels from 2000 onwards. Currently, five high-income countries—Saudi Arabia (299), United Arab Emirates (401), Kuwait (479), Bahrain (509), Qatar (721)—and four middle-income countries—Islamic Republic of Iran (238), Jordan (142), Lebanon (296), Tunisia (122)—have higher than average motorization levels compared to the rest of the countries in their income groups worldwide.

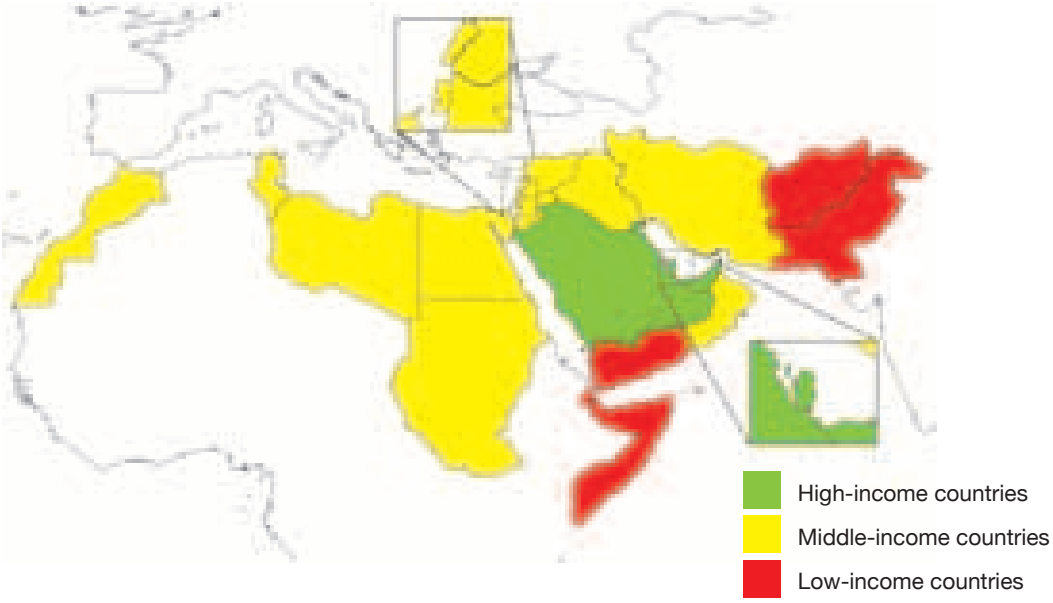


Figure 1. WHO Eastern Mediterranean Region

Table 1. Characteristics of the WHO Eastern Mediterranean Region

Countries	High-income	Middle-income	Low-income	All
Population	33.6 million	299 million	213 million	545.6 million
% of global population	3.3	9.6	8.9	8.3
Vehicles	11.5 million	34.4 million	6.8 million	52.7 million
% of global vehicles	1.7	6.7	5.6	4.0

Source: Global Status report on road safety 2009

Health burden of road traffic injuries in the Eastern Mediterranean Region

In 2004, road traffic injury was the sixth leading cause of death in the Eastern Mediterranean Region (Table 2). It caused an estimated 146 000 deaths and 2.8 million non-fatal injuries—a disturbingly high figure of 17 deaths and 320 injuries every hour. Most of the victims are young, productive members of society. For those between the ages of 15 and 29, road traffic injury is the leading cause of death. It is the second-leading cause of death among the 5–14 and 30–44 year age groups (Table 2). The road traffic injury death rate in the Region among men of between 15 and 29 years is highest in the world (34.2 deaths per 100 000 inhabitants). Among children, particularly male children, road traffic injuries are the most common form of injury [5,6,7]. Overall, the number of deaths due to road traffic injury is greater than that of deaths caused by diseases such as tuberculosis, HIV and malaria (Figure 2).

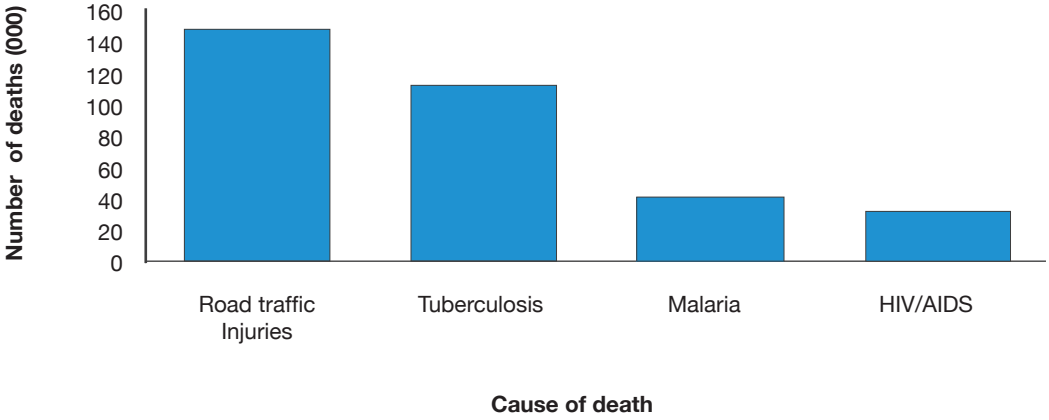


Figure 2. Road traffic injury deaths compared to deaths due to tuberculosis, malaria and HIV/AIDS, Eastern Mediterranean Region estimates for 2004, both sexes

Source: WHO (2008). Global burden of disease: 2004 update

Table 2. Leading causes of death, Eastern Mediterranean Region, both sexes by age group, 2004

Rank	0–4	5–14	15–29	30–44	45–69	70+	Total
1.	Perinatal causes	Lower respiratory infections	Road traffic injuries	Ischaemic heart disease	Ischaemic heart disease	Ischaemic heart disease	Ischaemic heart disease
2.	Lower respiratory infections	Road traffic injuries	War and conflict	Road traffic injuries	Cerebrovascular disease	Cerebrovascular disease	Perinatal causes
3.	Diarrhoeal diseases	War and conflict	Tuberculosis	War and conflict	Chronic obstructive pulmonary disorder	Lower respiratory infections	Lower respiratory infections
4.	Congenital anomalies	Malaria	Self-inflicted injuries	Tuberculosis	Tuberculosis	Hypertensive heart disease	Diarrhoeal diseases
5.	Measles	Drowning	Lower respiratory infections	Drug use disorders	Hypertensive heart disease	Chronic obstructive pulmonary disorder	Cerebrovascular disease
6.	Malaria	Measles	Violence	Lower respiratory infections	Cirrhosis of the liver	Nephritis and nephrosis	Road traffic injuries
7.	Whooping cough	Tuberculosis	Drowning	HIV/AIDS	Lower respiratory infections	Diabetes mellitus	Tuberculosis
8.	Meningitis	Cerebrovascular disease	Fires	Self-inflicted injuries	Nephritis and nephrosis	Cirrhosis of the liver	Hypertensive heart disease
9.	Tetanus	Congenital anomalies	Ischaemic heart disease	Maternal haemorrhage	Road traffic injuries	Diarrhoeal diseases	War and conflict
10.	Protein-energy malnutrition	Meningitis	Maternal haemorrhage	Cerebrovascular disease	Diabetes mellitus	Inflammatory heart diseases	Chronic obstructive pulmonary disorder
11.	Syphilis	Fires	Cerebrovascular disease	Diarrhoeal diseases	Trachea, bronchus, lung cancers	Alzheimer disease and other dementias	Nephritis and nephrosis
12.	Road traffic injuries	Falls	Leukaemia	Asthma	War and conflict	Tuberculosis	Congenital anomalies
13.	Tuberculosis	Protein-energy malnutrition	Drug use disorders	Violence	Breast cancer	Trachea, bronchus, lung cancers	Cirrhosis of the liver
14.	Drowning	Leukaemia	HIV/AIDS	Nephritis and nephrosis	Diarrhoeal diseases	Road traffic injuries	Diabetes mellitus
15.	Fires	Lymphoma, multiple myeloma	Rheumatic heart disease	Breast cancer	Drug use disorders	Bladder cancer	Malaria
16.	Upper respiratory infections	Rheumatic heart disease	Lymphoma, multiple myeloma	Fires	Oesophageal cancer	Endocrine disorders	Measles
17.	Cerebrovascular disease	Epilepsy	Poisonings	Lymphoma, multiple myeloma	Mouth and oropharyngeal cancers	Stomach cancer	Self-inflicted injuries
18.	Endocrine disorders	Nephritis and nephrosis	Abortion	Rheumatic heart disease	Inflammatory heart diseases	Oesophagus cancer	Drug use disorders
19.	Iron deficiency anaemia	Cirrhosis of the liver	Nephritis and nephrosis	Cirrhosis of the liver	Endocrine disorders	Mouth and oropharyngeal cancers	Inflammatory heart diseases
20.	HIV/AIDS	Leishmaniasis	Hypertensive disorders	Hypertensive heart disease	Stomach cancer	Breast cancer	Tracheal, bronchus, lung cancers

Source: WHO (2008). Global burden of disease: 2004 update

Economic burden of road traffic injuries in the Eastern Mediterranean Region

The direct cost of road deaths for Eastern Mediterranean Region countries is estimated to be US$ 7.5 billion annually [8]. A study from the Islamic Republic of Iran showed that the cost of road traffic injuries only on rural roads was approximately US$ 1.2 billion in the years 1997–98, which is equivalent to 1.9% of Islamic Republic of Iran's gross national product (Box 1) [10]. In Jordan the cost of road traffic injuries was estimated to be equal to 2% of gross national product (Box 2) [11]. Despite the evidence that preventing road traffic injuries can lead to significant gains in terms of economy, public spending on road safety in the countries of the Region is very low [12]. For instance, Pakistan spends as little as US$ 0.07 per capita on road safety, which is 1% of its public spending on health and 0.2% of its military budget [13].

Box 1. Successful interventions can reduce road traffic injuries; an example from the Islamic Republic of Iran

The Islamic Republic of Iran initiated a programme of comprehensive road safety interventions in 2005. Three enforcement-based interventions—seatbelt law, motorcycle helmet law and general traffic law enforcement (e.g. use of speed cameras, patrolling)—and mass media educational campaigns on national radio and television (e.g. broadcasts of animated movies for children, expert panels and educational programmes on road safety) were implemented in all 28 provinces of the country. Motorization level (registered vehicles per 1000 inhabitants) increased from 157 in 2004 to 230 in 2007. Fatalities per 100 000 inhabitants decreased 38.2 in 2004 to 31.8 in 2007 (odds ratio [OR] = 0.83, 95% confidence interval [95%CI] = 0.82–0.85) whereas fatalities per 10 000 vehicles decreased from 24.2 in 2004 to 13.4 in 2007 (OR = 0.56, 95%CI = 0.55–0.57). Similarly, road traffic injuries per 100 000 inhabitants decreased from 361.4 in 2004 to 345.7 in 2007 (OR = 0.97, 95%CI = 0.96–0.98) and road traffic injuries per 10 000 vehicles decreased from 227.6 in 2004 to 155.6 in 2007 (OR = 0.68, 95%CI = 0.67–0.68) (Figure 3) [9].

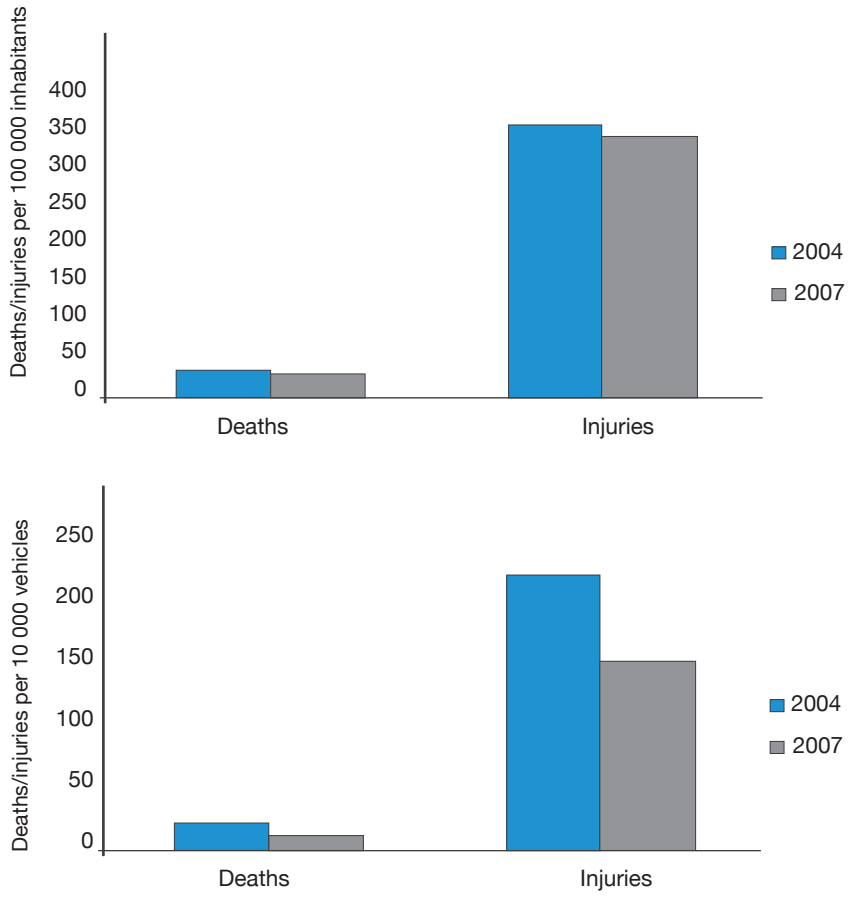


Figure 3. Impact of road safety intervention on road mortality and injury rates in the Islamic Republic of Iran

Box 2. The economic cost of road traffic injuries: an example from Jordan

To assess the magnitude of road traffic injuries to the Jordanian economy in a given year, an estimate was made for 1996. Unit cost of death, injury, property damage, and police and insurance activities were assessed and overall economic costs to the country were estimated. The unit cost per traffic fatality was 46 520 Jordanian dinars (US$ 56 941) of which 59% was attributed to loss of productivity. Overall road traffic injuries resulted in a JD 103 million (US$ 146 million) loss to the economy, equivalent to 2% of gross national product (GNP). Fatal crashes, which were 1.3% of all crashes, accounted for 28% of total cost whereas property damage crashes, which were 69% of all crashes, accounted for 32% of total cost (Figure 4).

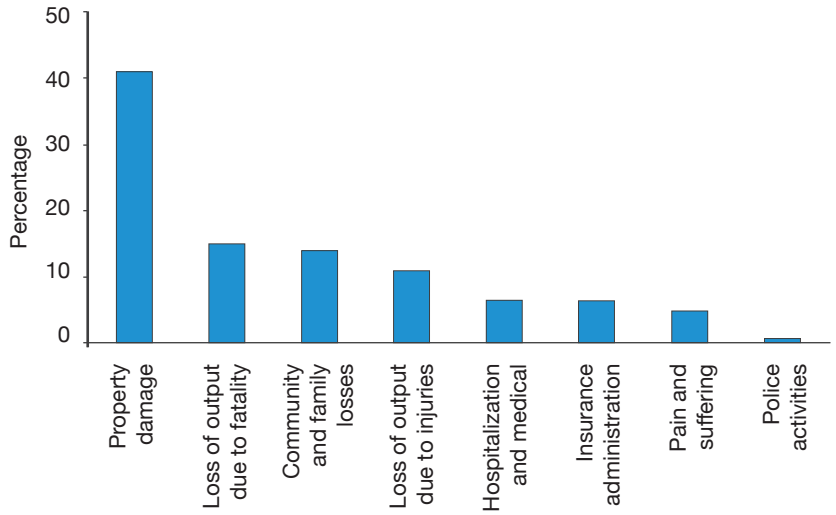


Figure 4. Elements of traffic crash cost in Jordan

Box 3. Specific road traffic injury prevention and control recommendations from *World report on road traffic injury prevention*

1. Identify a lead agency in government to guide the national road traffic safety effort.
2. Assess the problem, policies and institutional settings relating to road traffic injury and the capacity for road traffic injury prevention in each country.
3. Prepare a national road safety strategy and plan of action.
4. Allocate financial and human resources to address the problem.
5. Implement specific actions to prevent road traffic crashes to minimize injuries and their consequences and evaluate the impact of these actions. These actions include measures to reduce excessive and inappropriate speed; to reduce drink-driving; and to increase the use of motorcycle helmets, seatbelts and child restraints.
6. Support the development of national capacity and international cooperation.

1.3 Purpose and scope of the regional status report on road safety

Prevention of road traffic injuries has been on the United Nations agenda for the past 60 years. These efforts gained further strength with the establishment of the Division of Violence and Injury Prevention at the World Health Organization during the past decade. Subsequently, the *World report on road traffic injury prevention*, published by the World Health Organization and World Bank in 2004, led to international focus and agreement on a way forward. The report made six specific recommendations to the member states for prevention and control of road traffic injuries (Box 3). Several countries, including many countries of the Region, have reported adoption of UN resolutions and its road safety agenda over the past five years, setting their national or subnational priorities and working on the prevention of road traffic injuries at different levels.

Comprehensive information on various aspects of road traffic injury prevention was not available from most countries of the Region. In order to define future priorities, it is crucial to evaluate and quantify initiatives taken by the countries. This assessment was particularly important for the Eastern Mediterranean Region for many reasons as follows.

1. Road traffic injuries are known to contribute significantly to the burden of disease in the Region. The Region had the highest road mortality rate for men in the age group 15–29 years.
2. In the Eastern Mediterranean Region the distribution of road traffic injuries was different from other regions. The road mortality rates in high-income countries in the Region were higher than low- and middle-income countries of the Region and high-income countries of other regions [14].
3. Research on road traffic injury prevention and control is rudimentary in most countries of the Region.
4. Data on important contributing factors to road traffic crashes were never reported, possibly due to the involvement of multiple agencies in overall transportation in any country and no structure to support multisectoral collaboration in many countries.

The *Global status report on road safety* was commissioned with the following objectives:

- To assess the status of road safety in all WHO Member States using a core set of road safety indicators and a standardized methodology.
- To indicate the gaps in road safety.
- To help countries identify the key priorities for intervention and to stimulate road safety activities at a national level.

2 Methods

2.1 Data collection strategy

In August 2007, WHO began to work on the *Global status report on road safety* (GSSRS). As a first step, a self-administered questionnaire was developed. A complete questionnaire, including Arabic translation, is available at: www.who.int/violence_injury_prevention/road_safety_status/2009.

In each participating country, a national data coordinator was nominated and trained. The coordinator facilitated a consensus meeting involving six to eight road safety experts from different backgrounds: health, transport, police (ministry of interior), nongovernmental organizations, academics and other road safety practitioners. In contrast to questionnaires in other regions, the questionnaires in the Eastern Mediterranean Region countries were completed by face-to-face interviews with the participants (Figure 5).

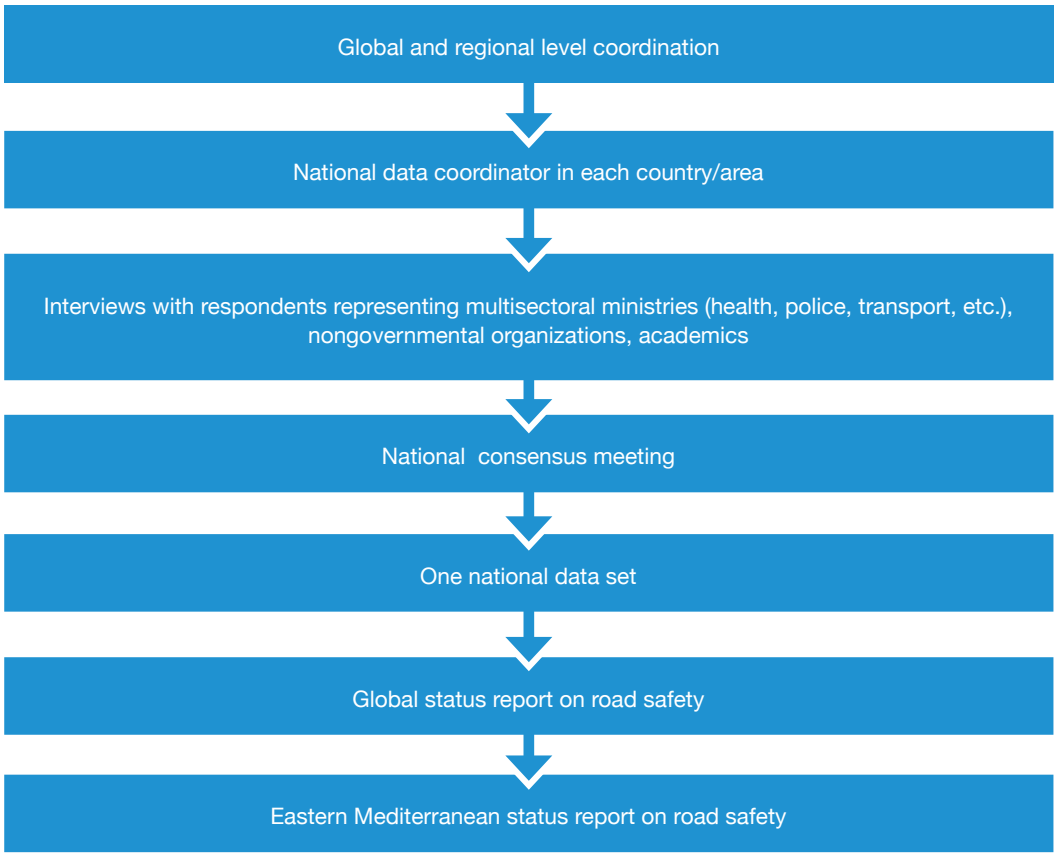


Figure 5. Data collection strategy

Table 3. Sectors represented in the survey

Sector	Number of countries with participation of sector	%
Lead agency	11	58
Transport	5	26
Health	17	89
Traffic police/interior	8	42
Educational/research institution	6	32
Other governmental	12	63
Others/nongovernmental organizations	8	42

In the Eastern Mediterranean Region, 19 out of the 21 Member States and the occupied Palestinian territory participated in the survey. Djibouti and Somalia, representing 1.7% of the Region's population, were the only two countries which did not participate.

An attempt was made to include all the relevant stakeholders and sectors in the survey. Table 3 summarizes the sectors involved. Of the 19 countries reporting details of the survey respondents, 17 (89%) had a representative of the health sector while only 5 (26%) had a representative of the transport sector.

2.2 Data processing and analysis

Data were entered into an online database, and each response was examined for accuracy, consistency and validity.

Only three countries were found to have vital registration completeness greater than or equal to 85% and external causes of death coded to undetermined intent less than 30%. Estimates of road traffic deaths for other countries were made based on a negative binomial regression model. Details of the methodology are available at www.who.int/injury_violence_prevention/road_safety_status/2009.

Data were extracted from the tables presented in the global report. For data not presented in the global report, the questionnaires from all participating countries of the Region were obtained, and the data were reanalysed. Key informants and WHO country focal persons for injury were contacted to obtain further information. For questions regarding enforcement of laws, a score of 7 or more out of 10 was classified as effective enforcement. A data search was carried out for road traffic injury related publications from the Region and included as references where required. Other WHO reports were also searched and included in the discussion (more details on data available in the statistical annex).

3 Results

3.1 Magnitude of road traffic injuries

Overview

Based on the modelled estimates[1], high-income and middle-income countries of the Eastern Mediterranean Region have the highest road traffic injury fatality rates (per 100 000 population) in the world. With the African Region, the Eastern Mediterranean Region has the unfortunate distinction of the highest overall road traffic injuries fatality rate (of 32 per 100 000 population) in the world (Table 4).

Pakistan contributes to 24% of all deaths in the Region. Consistent with population share, Pakistan, Islamic Republic of Iran and Egypt are responsible for almost 60% of all road traffic injuries deaths in the Region.

High-income countries of the Region have the highest fatality rates from road traffic injuries compared to any other region of the world. The estimated fatality rate of 28.5 per 100 000 population is more than double the next highest, the Region of the Americas, and four times that of the European and Western Pacific regions (Figure 6). Despite having only 3.3% of the world's high-income countries' population and only 1.7% of world high-income countries' vehicles, the Region is responsible for 9.1% of all deaths in high-income countries worldwide. The Eastern Mediterranean Region is the only region where fatality rates are higher in high-income countries than in low-income countries. Three of the five high-income countries with the highest fatality rates are from the Eastern Mediterranean Region (United Arab Emirates, Saudi Arabia and

Table 4. Eastern Mediterranean Region road traffic injury fatality rates (per 100 000 population) compared to global estimates

	High-income		Middle-income		Low-income		Total	
	Eastern Mediterranean Region	Global	Eastern Mediterranean Region	Global	Eastern Mediterranean Region	Global	Eastern Mediterranean Region	Global
Modelled fatality rates	29	10	36	20	28	22	32	19

[1] Modelling was done to adjust for underreporting of data between countries, lack of standard definitions for road traffic deaths, use of different data sources and varying quality of the reporting systems.

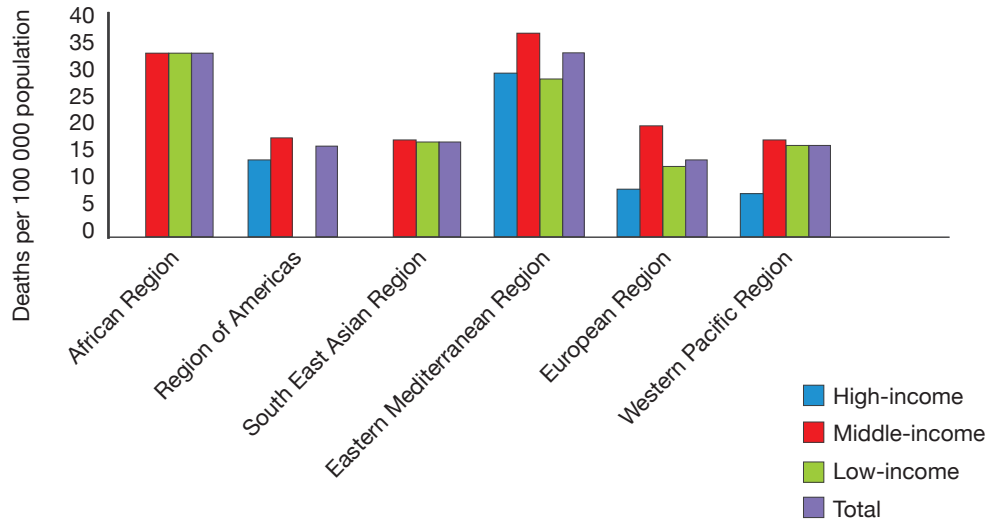


Figure 6. Modelled road traffic injury fatality rates (per 100 000 population) by WHO Region

Qatar). This relationship between income and road safety highlights the rapid and relatively recent increase in income of many countries where rapid infrastructure development has overtaken the growth in safety systems.

The middle-income countries of the Region, with 9.6% of the world's middle-income countries' population, account for 17.6% of global deaths in these countries. The fatality rate of 35.8 per 100 000 population is again the highest in the world. Egypt, a middle-income country, has one of the highest fatality rates in the world (Figure 7).

In the Eastern Mediterranean Region about 80% of road deaths are among males (Figure 8). One possible reason is lower exposure to road risks for females as they tend to drive less compared to men in the Region compared to other regions.

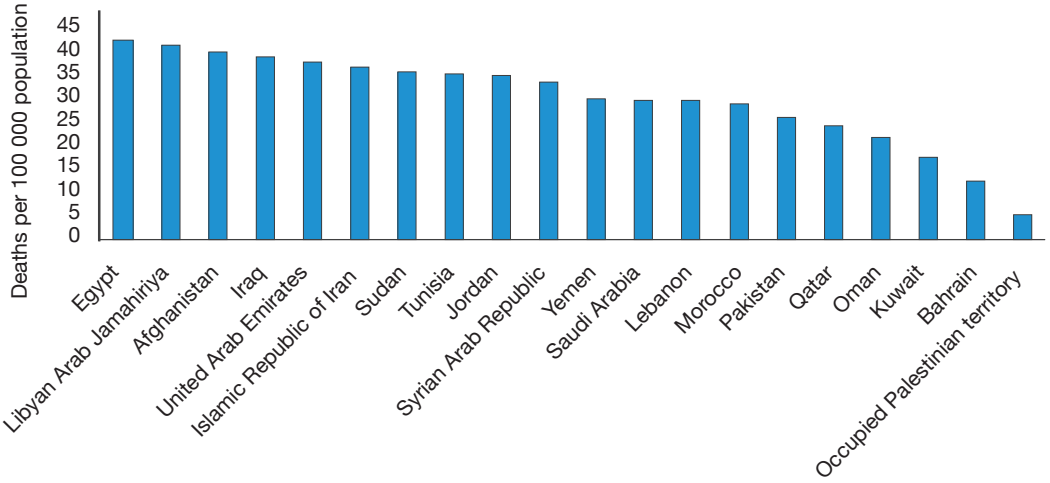


Figure 7. Modelled road traffic injury fatality rates (per 100 000 population) in the Eastern Mediterranean Region

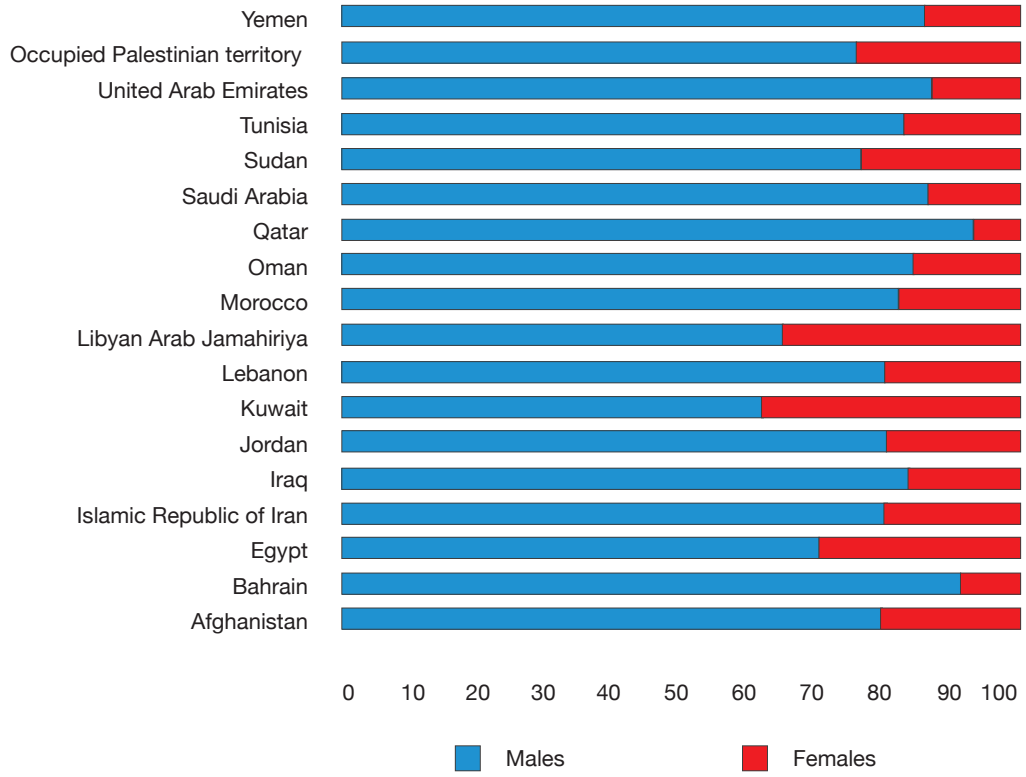


Figure 8. Proportion of road traffic deaths among males and females

Road traffic fatalities by road user groups

What is already known about the issue?

Vulnerable road users (pedestrians, cyclists and users of motorized and non-motorized two- and three-wheelers) constitute 46% of overall global traffic deaths and up to 80% of deaths in certain groups. In many countries the vulnerable road users face risks because of poor planning and construction of roads [15]. Effective interventions such as enforcement of helmet use by cyclists can prevent 60% of head injuries [16].

What does the survey reveal?

Based on data from only 10 countries, 56% of all fatalities were among the occupants of four-wheeled motorized vehicles (Figure 9). This proportion is higher in high-income countries where almost 66% of fatalities are seen in this group. Vulnerable road users account for around 32% of all fatalities with pedestrians, occupants of motorized two- or three-wheelers and cyclists contributing to 22%, 5% and 5% of road traffic deaths respectively (Table 5).

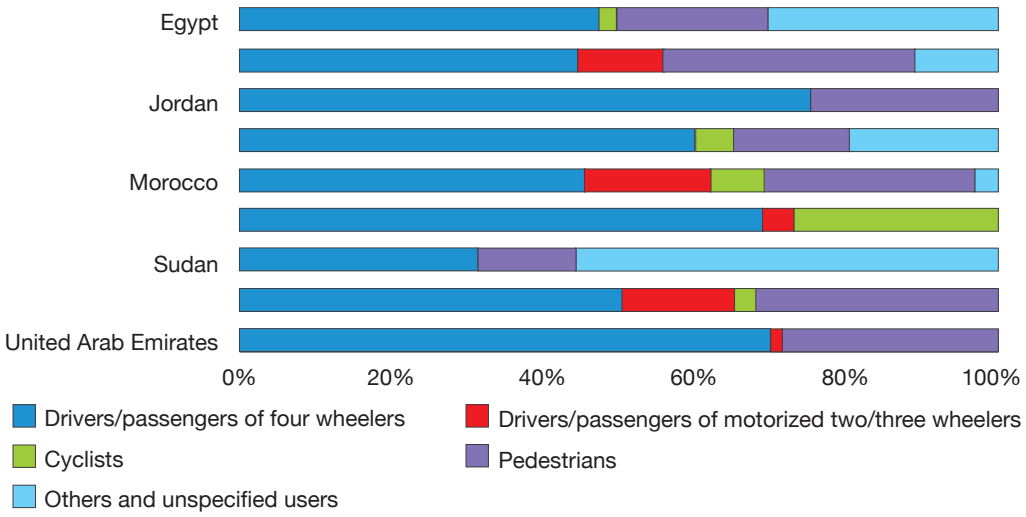


Figure 9. Proportion of modelled deaths by road users (%)

Table 5. Percentage distribution of fatalities by road user type in the Eastern Mediterranean Region*

	All	High-income	Middle-income
Occupants of four-wheeled vehicles	56	66	51
Occupants of motorized two- or three-wheelers	5	4	6
Cyclists	5	11	2
Pedestrian	22	19	24
Other/unspecified	12	0	17

* *No data available for low-income countries.*

The absence of data from low-income countries such as Pakistan, Afghanistan and Yemen needs special mention. These three countries contribute 33% to the total burden of road traffic deaths in the Region.

The distribution of vehicles and thus the exposure vary considerably by the economic status of the country. While motorized two- and three-wheelers constitute almost half of all vehicles in low-income countries, their numbers are less than 1% among high-income countries of the Eastern Mediterranean Region (Table 6). Availability of data from low-income countries is therefore likely to add to the total number of injuries of two- and three-wheelers and pedestrians in the region because of the higher number of small and unprotected vehicles and poor road management in these countries.

Table 6. Percentage distribution of vehicles in the Eastern Mediterranean Region

Vehicle type	Low-income	Middle-income	High-income
Four-wheeled motorized vehicles	31.2	54.4	73.8
Motorized two- and three-wheelers	46.8	22.3	0.8
Minibus/pick up/van/ jeep	12.2	7.5	15.9
Trucks	4.1	8.9	6.3
Buses	5.7	1.4	1.8
Non-motorized vehicles	0.0	0.4	0.0
Other	0.0	5.2	1.5

What action is needed?

Occupants of cars and pedestrians are two high-risk groups in the Region. Interventions focused on these groups such as speed control, use of seatbelts and child restraints, and separating pedestrians from vehicles need to be considered. It is important to collect data from low-income countries in the Region to ascertain the role of motorized two- and three-wheelers in these settings.

3.2 Level of road safety legislation enforcement

Speed control

What is known about this issue?

- High speed is associated with higher risk of crash. For instance a study showed that an average increase in speed of 1 km/h was associated with a 3% higher risk of a crash involving an injury [17].
- The probability of a pedestrian being killed rises by a factor of 8 as the impact speed of the car increases from 30 km/h to 50 km/h [18].
- GSRRS recommended that the speed limits on urban roads should not exceed 50 km/h. It is also important that local authorities further reduce these limits based on local use patterns.

What does the survey reveal?

Only 40% (*n* = 8) of Eastern Mediterranean Region countries had urban speed limits of 50 km/h or less. Four countries (Iraq, Lebanon, Oman and Qatar) reported their urban speed limits higher than 90 km/h.

Speed limits on rural roads[2] in most of the countries of the Region varied from 45 to 90 km/h; in Jordan, Morocco and Oman, this limit is set at above 90 km/h. Only half (11 of 20) of the countries allow modification in the speed limits at the local rather than on national level (Table 7).

Only two of the 21 countries reported perceived effectiveness of overall speed enforcement at 7 or above 7 on a scale of 0 to 10.

Table 7. Countries with urban speed limit of 50 km/h or less

Country/area	Maximum speed	
	On urban roads (km/h)	On rural roads (km/h)
Afghanistan	50	90
Bahrain	50	80
Islamic Republic of Iran	50	60
Kuwait	45	80
Libyan Arab Jamahiriya	50	70
Sudan	50	–
Tunisia	50	50
Occupied Palestinian territory	50	80

[2] Countries may have different definitions for rural roads. However, the United Nations Economic and Social Commission for Asia and the Pacific study defines the connections from villages to markets or to the nearest road of a higher category as rural roads and also those which directly serve farms.

Box 4. Seatbelt use reduces road traffic injuries—evidence from the Region

A study done in United Arab Emirates in 1992 on 706 drivers admitted to the emergency department with road traffic injuries showed that the rate of 10.5% of drivers "always" used seatbelt while 5.8% of drivers used seatbelts "frequently". This retrospective, interview based study showed a reduction in the number of road traffic injuries due to use of seatbelts. Those drivers who were not wearing seatbelts were at risk twice as often as drivers who were restrained by belts. A majority of the patients stated that seatbelts were the best protective measure against all injuries (62.1%) and severe injuries (29.1%) from road traffic accidents. Also, there was strong support for the mandatory use of seatbelts (56%) [22].

What action is needed?

- Member countries should adopt speed limits consistent with known safety standards at the national and local levels taking into consideration the state of the road infrastructure.
- Rapid road infrastructure development in many of the countries of the Region needs to be linked to incorporation of safety features in road design.
- Enforcement of speed limits through the use of speed enforcement detection devices needs to be carried out.
- Local or provincial administrations need to be given the authority, resources and political support to implement measures to reduce speed limits to levels consistent with local safety requirements.
- Legislation and enforcement can be made more effective through targeted public awareness and education campaigns on the adverse effects of speeding and the reasons for enforcing speed limits.

Seatbelts

What is known about this issue?

- Seatbelt use is one of the most effective measures for reducing fatal and nonfatal road traffic injuries [Box 4].
- Seatbelt use reduces crash death risk by 40%–65%, moderate and severe injuries by 43%–65% and all injuries by 40%–50%.
- Wearing a vehicle safety belt reduces the risk of being killed or seriously injured in a road crash by about 40%–50% for front seat and 25%–75% among rear seat passengers [19,20,21].

What does the survey reveal?

All countries of the Region except Afghanistan and Yemen have a national seatbelt law. However, there are only six countries (30%) where the national law on seatbelts applies to all car occupants.

Seatbelt wearing rates were available from 11 countries. For front seat (drivers or passenger) the seatbelt wearing rates vary from 5% in Libyan Arab Jamahiriya to 95% in Oman. There were only two countries with rear passenger seatbelt use rate, with Oman reporting wearing rate of 1% and Morocco reporting 19%. In only one country in the Region did seatbelt wearing rates exceed 90% (Table 8).

The effectiveness of the seatbelt wearing law enforcement is poor in most of the countries of the Region. Half of the countries have law enforcement effectiveness scores of less than 7 on a scale of 0 to 10.

Table 8. Seatbelt wearing rates for drivers and front seat passengers in Eastern Mediterranean Region

Country	National seatbelt wearing rate
Bahrain	22%
Egypt	70% driver only
Islamic Republic of Iran	75%–80%
Jordan	65% drivers; 10% front passenger
Lebanon	15%
Libyan Arab Jamahiriya	5%
Morocco	75% front seats; 19% rear seats
Oman	95% front seats; 1% rear seats
Qatar	50% front seats
Syrian Arab Republic	81% front seats
United Arab Emirates	61% front seats

What action is needed?

- Almost half of road traffic fatalities in the Eastern Mediterranean Region are the occupants of motorized four-wheelers (all four-wheelers as indicated in GSRRS). Mandatory seatbelt use laws for both front and rear seats and strict enforcement could save up to 50% of these fatalities.
- All countries should enact laws that require car occupants to use seatbelts in both front and rear seats.
- Countries should strengthen enforcement of such laws.

Use of child restraints

What is known about this issue?

- Road traffic injuries are the second leading cause of death among children aged 5–14 years of age (Table 9). Children are killed at a rate of 18.3 and 17.4 per 100 000 in high-income countries and low- and middle-income countries of the Region respectively every year. Road traffic injuries bring indirect psychological trauma to children when they are injured or lose a parent to injury.
- Correct use of child restraints can reduce deaths among infants by 70% and small children by 80% [18].
- Unrestrained children were three times more likely to be hospitalized due to road traffic injuries as compared to restrained children [23].
- Enforcement of mandatory child restraint laws can increase the use of child restraints

What does the survey reveal?

According to the survey, only two of the 20 countries surveyed have child restraint laws (Figure 10) compared to about half of countries globally. In these two countries the laws were considered ineffective: in the case of Saudi Arabia the effectiveness was rated less than 3 on a score of 0 to 10 by all the respondents whereas in the case of the occupied Palestinian territory only two of the eight respondents rated it more than 7.

What action is needed?

- All countries should enact laws mandating use of child restraints.
- In countries where such laws exist, better enforcement by police and education of parents will enhance compliance.
- Research is needed in most countries of the Region to establish baseline evidence on the frequency of road traffic injuries among children and the use of restraints, so that the impact of legislation and education can be measured.

Motorcycle helmet use

What is known about the issue?

- Use of helmets is one of the most successful approaches for preventing injury among motorized two-wheeler riders [2].
- Use of helmets when riding a motorcycle can cut the fatality and severe injury rates by almost 40% and 70% respectively [25].
- Effective enforcement of helmet wearing laws can improve helmet wearing rates almost up to 100% [19].
- After the repeal of mandatory helmet

Table 9. Estimated mortality due to road traffic injuries (rate per 100 000 population), age group and income level (both sexes), 2004, Eastern Mediterranean Region

Income level	<1 year	1–4 years	5–9 years	10–14 years	15–19 years	< 20 years
All	27.7	16.3	19.6	11.7	19.8	17.4
High-income	116.6	9.8	9.0	8.8	22.9	18.3
Low- and middle-income	22.6	16.6	20.2	11.9	19.7	17.4

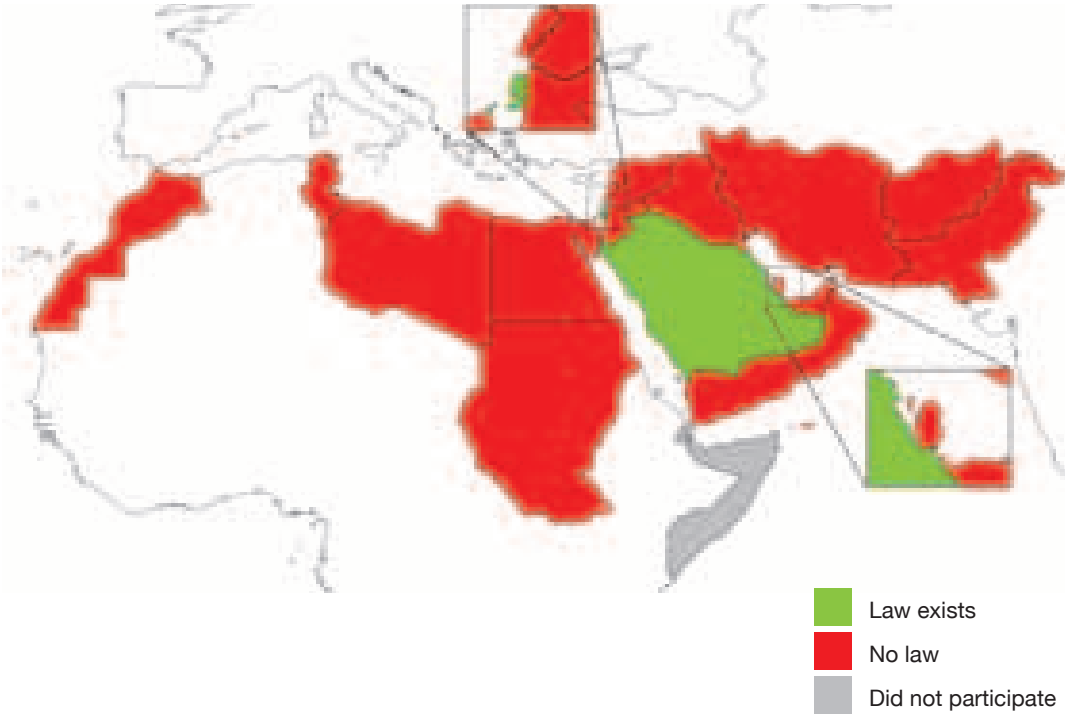


Figure 10. Child restraint laws by country in the Eastern Mediterranean Region

laws, the deaths from motorcycle accidents in two states[3] in the United States of America increased by 50% and 100% respectively [26].

What does the survey reveal?

Results of the survey showed that only four countries out of the 20 surveyed have a mandatory helmet law as well as a helmet standard. Thirteen countries have a law but no standard (Figure 11). Only four countries shared their helmet wearing rates, which ranged from 90% in Qatar to 13% in Islamic Republic of Iran (Table 10). Only the United Arab Emirates rated the effectiveness of its overall enforcement regime above 7.

What action is needed?

- In countries where injuries to motorcyclists are common, laws are needed requiring helmet wearing for both rider and pillion passenger.
- Laws should also define a standard motorcycle helmet, in order to ensure availability and use of the most effective motorcycle helmets.
- In countries with high motorcycle use, helmet wearing rates should be measured as a performance indicator for traffic law enforcement.

[3] Motorcycle helmet laws were repealed in Kentucky and Louisiana.

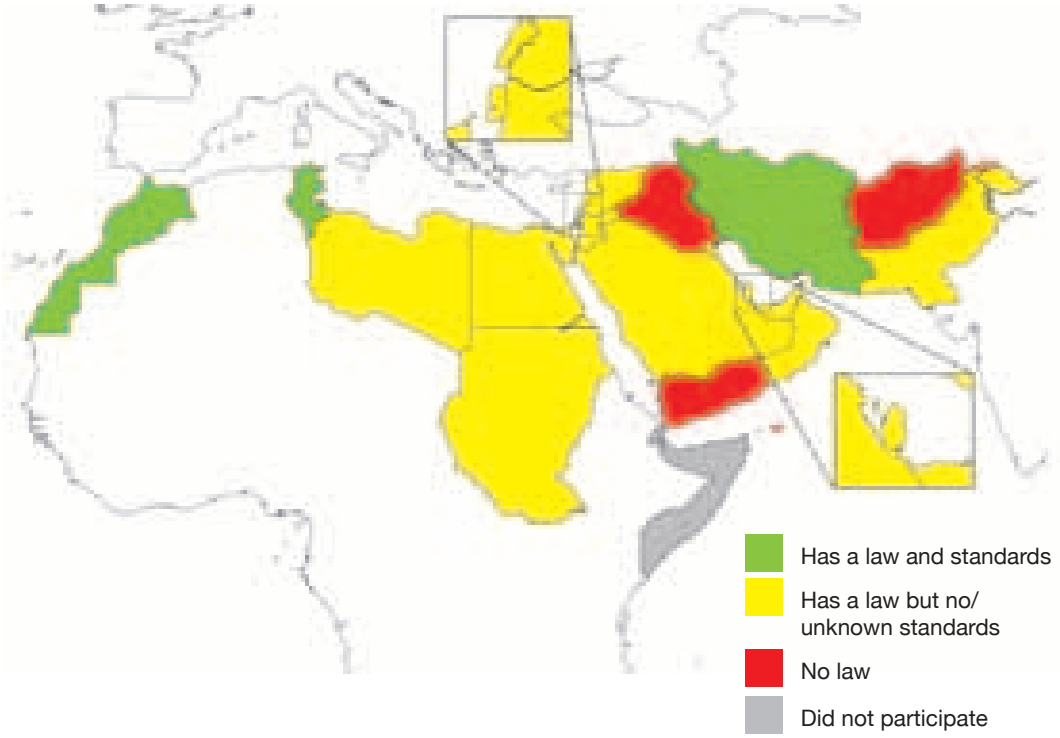


Figure 11. Motorcycle helmet laws and standards by country in the Eastern Mediterranean Region

Table 10. Levels of motorcycle helmet wearing in the Eastern Mediterranean Region

Country	Estimated national helmet wearing rate (%)	National helmet law	Helmet standards
Egypt	70	Yes	No
Islamic Republic of Iran	13–15	Yes	Yes
Morocco	67[a]	Yes	Yes
Qatar	90	Yes	No

[a] *Drivers only*

Alcohol use and road safety in the Eastern Mediterranean Region

What is known about the issue?

- Drivers and motorcyclists with blood alcohol concentration greater than zero are at higher risk of a crash than those whose blood alcohol concentration is zero [27,28].
- The risk of involvement in a fatal crash doubles with each 0.02% increase in blood alcohol concentration [29].
- If a blood alcohol concentration limit is fixed at 0.10 g/dl, this will result in three times the risk of a crash that exists with the most common limit in high-income countries of 0.05 g/dl. If the legal limit stands at 0.08 g/dl, there will still be twice the risk that there would be with a limit of 0.05 g/dl [2].
- Upper limits of 0.05 g/dl for the general driving population and 0.02 g/dl for young drivers and motorcycle riders are generally considered to be the best practice at this time [2].

What does the survey reveal?

The survey found that 19 out the 20 countries surveyed have a law against drinking and driving. Morocco is the only country where such a law does not exist

but alcohol consumption is prohibited. The data showed that nine of the 20 countries of the Region had completely prohibited alcohol use for the general population. Four had a blood alcohol concentration limit of 0.05 g/dl and three had a blood alcohol concentration limit of 0.08 g/dl for the general population (Figure 12). United Arab Emirates is the only country in the Region with a blood alcohol concentration limit of 0.1 g/dl. None of the countries of the Region has defined a lower limit for young or novice drivers as recommended in the *World report on road traffic injury.* Only eight countries reported a system of random breath testing or police check points used for enforcement.

Data on alcohol's role in road traffic injuries were not available for most countries of the Region. Of the 20 countries surveyed, only four provided data on deaths attributable to drink-driving. Bahrain had the highest proportion of road deaths attributed to alcohol (7.7%) followed by Morocco, Libyan Arab Jamahiriya and Tunisia (Table 11). Five out the 20 countries surveyed stated that they considered the enforcement level above 7 on a scale of 0 to 10. Three countries ranked enforcement effectiveness at the level of 1.

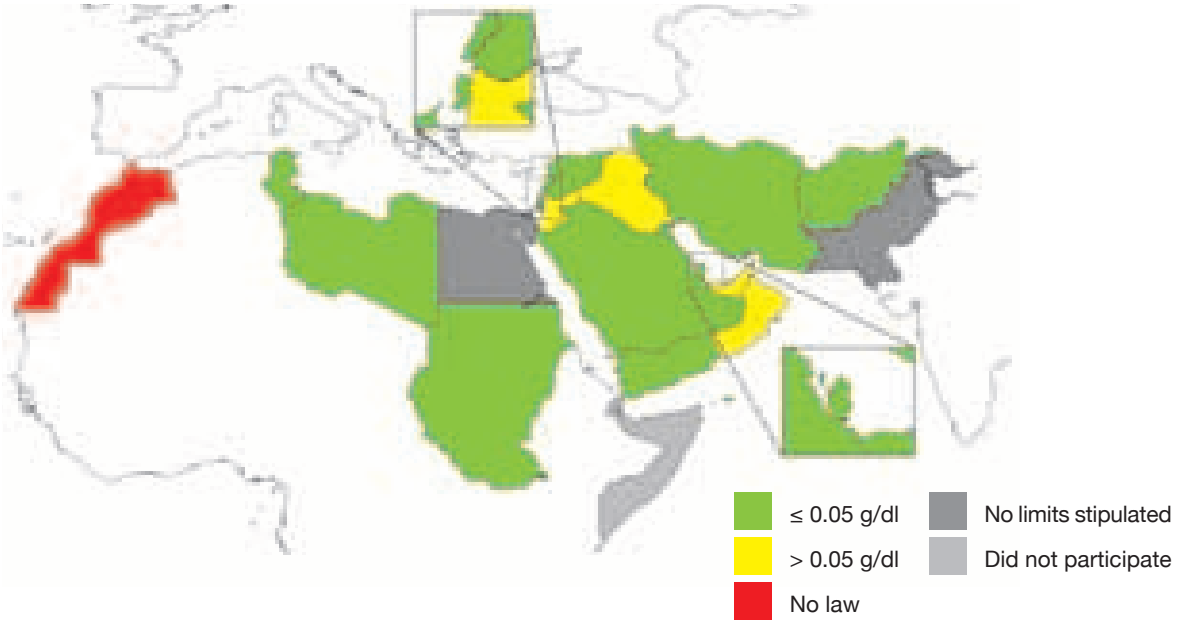


Figure 12. Blood alcohol concentration (g/dl) by country in the Eastern Mediterranean Region

Table 11. Proportion of alcohol-related fatal crashes in the Eastern Mediterranean Region

Country	Fatalities attributable to alcohol (%)
Bahrain	7.7
Morocco	2.97
Libyan Arab Jamahiriya	2
Tunisia	0.7
Afghanistan, Egypt, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Pakistan, occupied Palestinian territory, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, United Arab Emirates, Yemen	No data

What action is needed?

- The system of random checks on drivers and availability of data related to this needs to be strengthened to assess the true contribution of alcohol consumption towards road traffic injuries in the Region.
- Countries permitting alcohol use need to define a lower blood alcohol concentration limit for younger and novice drivers, ideally at the level of 0.02 g/dl or less.
- Behaviour change strategies focusing especially youth to discourage alcohol consumption can reduce the injuries resulting from drunk driving among them.
- More research needs to be carried out on the role of other drugs of abuse such as khat, marijuana, narcotics and benzodiazepines in the incidence of road traffic injuries in the Region.

3.3 Institutions and policies

Institutional framework for road safety in the Eastern Mediterranean Region

Why is an institutional framework important for road safety?

Experience worldwide has shown that the prevention of road traffic injuries cannot be achieved by one single sector, be it transport, police or health. It often requires multidisciplinary, multilevel involvement of governments, businesses and civil society. The effort of coordinating these activities would require a lead agency with an appropriate amount of resources and a clear legislative mandate. Without funding the agency is not likely to be effective. One of the roles of the lead agency or group is to produce a national strategic document for road safety. Countries with a history of success have set of achievable targets to ensure serious consistent efforts.

What are the best practices for an institutional framework?

The first recommendation of the World report on road traffic injury was to "identify a lead agency in government to guide the national road traffic safety effort". The lead agency, with funding and a government mandate, defines a coherent national strategy. A set of targets is then defined to ensure consistent focused interventions [2].

What does the survey reveal?

Fourteen of the 20 countries of the Region identified a lead agency responsible for road safety although only eight of these agencies had funding allocated in the national budget for agency's activities. Of these, seven (50%) had an agency at the interministerial level. Countries without a lead agency included high-income countries such as Kuwait and Qatar, and middle-income countries such as Lebanon, Libyan Arab Jamahiriya, Sudan, Tunisia and the occupied Palestinian territory. All three low-income countries had identified a lead agency.

Only Egypt, Jordan, Lebanon, Morocco, Tunisia and United Arab Emirates had a single national road safety strategy. Nine countries had either subnational plans or multiple road safety strategic plans.

Of those with a national strategy, only half had measureable targets in their strategies (Table 12). Morocco, Tunisia and United Arab Emirates are the only countries in the Region with measurable road safety targets backed by funding to achieve these targets.

What action is needed?

- Countries need to establish lead agencies with funding defined in the national budget and legislative mandate as the primary requirement for further action in road safety.
- Each country needs to develop a national road safety strategy through a national consultative process.
- Each country needs to define measureable indicators and set targets which are formally endorsed by the government and supported by specific budgetary allocations.

Table 12. Road safety institutional framework in the Eastern Mediterranean Region

Lead agency	Number of countries	Percentage of total countries
No	6	30
Yes	14	70
Lead agency is funded (of the 14 countries with a lead agency)		
No	6	43
Yes	8	57
National road safety strategy		
No	5	25
Yes	6	30
Subnational	3	15
Multiple strategies	6	30
Strategy includes measureable national targets (of the six countries with national strategy)		
No	1	17
Yes	3	50
Not formally endorsed	2	33

National policies on alternative transportation

What is already known about this issue?
It is well known that travel by a well regulated public transportation system, such as buses or trains, is safer than any other mode of road travel. According to the *World report on road traffic injury prevention*, countries should encourage the use of public transportation and their combination with cycling and walking [2].

Strategies are needed to: improve mass transit systems and taxi services (including improvements to routes covered and ticketing procedures, shorter distances between stops, and greater comfort and safety of both the vehicle and the waiting areas); better coordinate between different modes of travel; create secure shelters for bicycles and "park and ride" facilities, where users can park their cars near public transport stops; and raise fuel taxes and instigate other pricing reforms that discourage private car use in favour of public transport.

What does the survey reveal?
Eleven out of the 20 countries surveyed in the Region had national policies encouraging investment in public transportation. All of the three low-income countries (Afghanistan, Pakistan and Yemen), some of the middle-income countries (Sudan, Oman, Lebanon and occupied Palestinian territory) and one high-income country (Kuwait) did not have policies that support public transportation development. Libyan Arab Jamahiriya had no national policy, although there were subnational policies. The most common way of supporting public transportation was through subsidizing its pricing and improving access and frequency of public transport service (Table 13).

Only two countries (Islamic Republic of Iran and United Arab Emirates) had policies encouraging walking and cycling. Both of the countries increased investment in bicycle lanes and footpaths as well as instituted traffic calming measures to decrease speed in areas used by cyclists and pedestrians.

Table 13. National policies to support public transport

Country	Subsidized pricing of public transport	Improved service of public transport	Disincentives for private car use
Bahrain	Yes	No	No
Egypt	Yes	Yes	Yes
Iraq	Yes	Yes	Yes
Islamic Republic of Iran	Yes	Yes	Yes
Jordan	No	Yes	No
Morocco	Yes	Yes	No
Qatar	Yes	Yes	No
Saudi Arabia	No	Yes	No
Syrian Arab Republic	Yes	Yes	No
Tunisia	Yes	Yes	No

Note. Libyan Arab Jamahiriya reported subnational policies. Other countries in the Region did not report policies. Yes denotes presence of policy; No denotes no mention of policy.

What action is needed?

- It is critical that countries develop policies to encourage investment in public transport.
- In many countries public transport is run by private transport groups with a focus on profit-making; the additional cost of ensuring safety may not be thought of as good investment. Public transport should be either owned by government or tightly regulated by government to ensure safety.
- Each country in the Region needs to develop policies to encourage walking and/or cycling as an alternative to car travel.
- As about 90% of the countries had no policies for the promotion of walking and cycling and only about half of the countries had national policies for investment in public transport, measures need be taken to provide alternative modes of transport such as walking or cycling which will not only ensure gains in terms of road safety but also help reduce air pollution and improve opportunities for physical activity and exercise, hence reducing the burden of obesity and other chronic illnesses.

Systems to ensure safe roads and safe vehicles

What is already known about the issue?

- Vehicle safety standards—improvements in vehicle design, occupant protection and vehicle maintenance—have reduced road crashes significantly in developed countries.
- Periodic vehicle inspection in addition to frequent random checking of vehicles on the road is practised in many countries.
- Road safety audits should be included during the design, construction and maintenance phases of any new road construction projects.
- Road maintenance includes fixing potholes, cleaning drainage facilities, replacing missing traffic signs, guard-rails, road markings and other safety measures.

What does the survey reveal?

Most of the countries had a standard system of assessment/test for new drivers of cars to undergo in order to obtain a driving licence and almost all of the countries required the drivers to take a theoretical assessment/test (e.g. written exam, computer test) and practical assessment (i.e. in a car).

Eleven countries had a mandatory system that ensured the designs of new major road construction projects be submitted for a road safety audit, and 13 countries reported that the road safety audits (or inspections) of existing road infrastructure were conducted on a regular basis. Most of these audits were performed either by the transport or works department/ministry of these countries.

Thirteen countries did not manufacture vehicles, and there was no national legislation that required the car importers in these countries to adhere to standards of fuel consumption and seatbelt installation in front and rear seats; only three countries had all three standards in place. Periodic vehicle inspection was performed in 16 countries (Table 14).

What action is needed?

- Countries should implement mandatory road safety audits for new road construction projects as well as for existing road infrastructure.
- Countries need to implement a system of periodic vehicle inspection to ensure compliance with the basic safety standards.
- Each country needs to define safety standards for all cars, both locally manufactured and imported. No car should be allowed on the road without seatbelts installed in the front and back seats.

Table 14. Infrastructure and vehicle standards

	Number of countries	Percentage of total countries
Type of test for driving licence (theoretical and practical)		
Both	18	90
Practical only	2	10
Designs of road construction submitted for a formal road safety audit		
Yes	11	55
No	4	20
Informal checks	5	25
Regular road safety audits of existing roads		
Yes	13	65
No	7	35
Periodic vehicle inspection process		
All vehicles	16	80
Except motorized two-wheelers	4	20

3.4 Data quality

What does the survey reveal?

Data are one of the primary drivers of policy. In the Eastern Mediterranean Region, the data on road traffic injuries have three major shortcomings: the underreporting of road fatalities and non-fatal injuries; lack of data on risk factors; and differences in the definition of road traffic injury death, making regional comparison difficult.

All the participating countries reported that they had some mechanism of collecting national data on road traffic deaths on a regular basis. However, when estimates of underreporting were done, the Region was found to have one of the highest levels of underreporting in the world.

Only two countries, Iraq and Pakistan, identified underreporting as an issue during the survey. In Iraq, deaths at the scene of injury were not reported while in Pakistan, the main data source was police reporting and did not include other deaths that occur, for instance, in hospital.

In the case of Afghanistan the deaths reported were from the General Directorate of Road Care, which collects data only from the traffic highways. Hence the data from smaller roadways and data from the hospitals were missing.

Also, data on important risk factors were found to be missing. In particular, data were not available for many countries on seatbelt and helmet use rates and alcohol-related fatal injuries. Data on road traffic deaths by road users were missing in many countries. The standard definition[4] of road mortality is a road death occurring within 30 days of a road crash. Only half of the countries follow this definition. Others have different definitions, as shown in Annex 1.

What action is needed?

- Accurate data collection would require improved data linkages between various stakeholders, increased resources to undertake data collection and processing and involvement of health sector to facilitate road traffic injury surveillance.
- Countries need to use the 30-day definition of road traffic deaths for harmonization across data sources.
- Countries need to establish a system to collect data on rates of seatbelt use, helmet wearing and child restraint use.
- Data need to be gathered on deaths attributable to alcohol.

[4] United Nations Economic Commission for Europe (2003) definition of 30 days to define road fatality.

3.5 Pre-hospital care system

Why is pre-hospital care important in road traffic injuries?

- An effective and efficient chain of interventions is required for timely and appropriate care of trauma patients. This chain of intervention is now called a trauma system.
- Well organized trauma systems have decreased mortality among all treated trauma patients by 15%–20% and decreased medically preventable deaths by 50% [30,31].
- An important component of trauma systems is care before reaching the hospital. There is evidence to support improvement in outcomes through improvements in the pre-hospital care system. For details of development of pre-hospital and trauma care, visit: http://www.who.int/violence_injury_prevention/publications/services/guidelines_traumacare/en/index.html.
- A well established pre-hospital care system means lifesaving and immediate care with the activation of emergency response system through a single well disseminated universal access phone number and lifesaving interventions in the field, provision of efficient and safe transportation to hospital and immediate attention by hospital staff trained in trauma care.

What does the survey reveal?

The survey showed that a formal pre-hospital care system did not exist in three of the countries of the Region surveyed and was present only in certain parts of Pakistan. Most of the countries of the Region have a universal access phone number for pre-hospital care—a single nationwide emergency telephone number. However the effectiveness and reliance of the system is unknown.

What action is needed?

- The pre-hospital care system in each country needs to be integrated into an effective trauma care system at local and regional levels.
- Countries should study the utilization of pre-hospital services and their quality. Quality standards need to be adopted, where they do not exist.

4 Conclusions and recommendations

4.1 Conclusions

The main strength of the report is that the data were collected on a standard questionnaire from all the countries surveyed, and a homogenous methodology was adopted in the processing of data. Weakness was due to paucity of data on certain themes such as proportion of alcohol-related fatal crashes, road traffic deaths by road users, seatbelt use for nine countries and motorcycle helmet wearing rates. Data were absent for nine of the countries surveyed for the variable on seatbelt wearing rates; therefore the analysis was only possible for 11 countries.

While significant variation exists between countries in the Region, the following are some of the important facts that apply generically to most if not all countries of the Region (Annex 3).

1. Road traffic injury is a major threat to the health and development of the Eastern Mediterranean Region

The report clearly shows the health and to some extent economic burden of road traffic injuries in the Region. The average regional road fatality rate is one of the highest (32.2 per 100 000 inhabitants) in the world, resulting in 176 000 deaths every year. Regional high-income countries have the highest road fatality and injury rates compared to countries with similar socioeconomic status elsewhere. For the economically productive age groups of 15–44 years, road traffic injuries are the leading cause of death and disease burden. Considering reported deaths, the Islamic Republic of Iran has one of the highest road traffic injuries fatality and injury rates in the world, and if estimates are adjusted for the 30-day definition of road fatality then Pakistan has one of leading road fatality

counts in the world. Costing studies for burden of injuries and deaths due to road traffic injury were performed in half of the countries of the Region.

2. No institutional frameworks exist in many countries of the Region

There was no lead agency for road safety in six out the 20 countries surveyed. Only six countries had a single national road safety strategy, and only three countries had measurable road safety targets for future. About 90% of the countries of the Region do not have national policies for promotion of cycling and walking and only half of the countries of the Region have policies to invest in public transport.

3. Legislation and enforcement of key road safety interventions need to be strengthened in many countries of the Region

Only 40% of the countries surveyed have set optimum urban speed limits (≤ 50 km/h) on the roads. No law exists in Afghanistan, Iraq and Yemen obliging motorcyclists to wear helmets. Data on helmet wearing rates were available for four countries only. Seatbelt wearing rates above 90% were reported from only one country out of the 11 which reported the use rate. Only two places; Saudi Arabia and the occupied Palestinian territory had child restraint laws. However, enforcement of these laws was rated very poor (≤ 2). Overall, there was poor enforcement of these laws in the Region.

4. Adherence to vehicle and road design safety standards is low in the Eastern Mediterranean Region

In seven countries of the Region, no regular audits for existing road infrastructure were conducted whereas in two other countries no formal audits were required for new road construction projects. Vehicles were manufactured in six countries of the Region, four of which reported that they implemented standards on fuel consumption and seatbelt installation.

5. Some important data are non-existent or incomplete

A number of problems were identified in the regional road traffic data. Only nine countries followed the United Nations Economic Commission for Europe (2003) definition of 30 days to define road fatality. The breakdown of road deaths by road user was available for only 10 countries in which a large proportion of involved vehicle type was not specified for Sudan (56%), Egypt (30%) and Islamic Republic of Iran (11%). Road fatality trend was available for 12 countries only.

4.2 Recommendations

Following is the summary of the recommendations based on the findings of the survey. Some of these recommendations apply more to some countries than others.

1. *Establish and strengthen lead agencies and manage performance through target setting*. A government-funded lead road safety agency should be established in each member country. The status of this agency should be interministerial and have a well defined budget in the national budget. This agency should take the lead in data collection, inviting all stakeholder institutions to a central location at least once a year to discuss nationwide road safety problems in the light of international recommendations and national priorities. It should announce measurable road safety targets for the next five years with the help of prominent political/governmental figures to assert the political will for achieving these targets.

2. *Make safe, healthy, environment-friendly transport choices; design transport around walking, cycling and public transport*. Unlike other regions, the Region completely lacks any policies to promote safe walking, cycling and public transport. This should be inculcated in all future transport policies in member countries.

3. *Focus on implementing the five most effective interventions to reduce chances of injury during a crash.*
   a. *Control speed*. Speed limits on urban and rural roads and motorways should be set by defining each road type in the countries of the Region. Speed enforcement should be done by fixed and mobile speed cameras. Moreover, engineering interventions should be evaluated in the Region so that other member countries can benefit from these interventions being tested with similar settings.
   b. *Implement seatbelt laws*. Seatbelt laws should apply to all vehicle occupants; and these laws should be better enforced.
   c. *Promote child restraint in cars.* Child restraint laws need to be developed in most of the countries of the Region. Moreover, enforcement should be improved in those countries where these laws exist.
   d. *Enforce use of standard motorcycle helmets.* Motorcycle helmet law should include pillion riders, and a standard needs to be defined for these helmets in the countries of the Region. More efforts are required to measure helmet wearing rates in the countries of the Region.
   e. *Ascertain the role of alcohol in road crashes and control it, if found to be a problem.* Drink driving should be measured in the countries of the Region using standard devices. Moreover, it is possible that other illicit drugs/substances are used before or while driving. Laws should include all these substances, and measurement devices should be made available to the local traffic police.

4. *Allow only safe vehicles on the roads.* Vehicle manufacturing and import standards should be evaluated in the Region to ensure that only vehicles that follow international safety standards, such as those of the European Union, are allowed to be on the market. Safety features should not be treated as “optional” but rather as essential features of a car in the Region.

5. *Ensure safe road design through safety audits at all stages of road construction and maintenance.* Road safety audits should be conducted by national, regional and local road authorities to implement preventive measures on the roads under their jurisdiction.

6. *Improve trauma care.* A pre-hospital care system of ambulances connected through a universal access number is an important but just one component of a comprehensive trauma system. The quality of emergency and trauma care needs to be studied in the Region, and benchmarks for outcomes need to be defined.

7. *Define data needs; harmonize definitions and data collection methodology.* Costing studies should be performed using standard methods in all member countries in order to advocate the need for road safety targets.

8. *Enhance institutional capacity for data gathering, analysis and dissemination.* The Region needs to agree on the data needs, harmonize definitions and data collection methodology. Collaborative relationships between health, police and traffic authorities will need to be established for setting up surveillance systems. Countries of the Region need to foster institutional development on injury prevention. This can be achieved through governmental stewardship of various institutes working on injury research and prevention.

Estimation method

The third stage used data from Group 1 countries to develop a statistical model to predict road traffic deaths (point estimates) for Group 2 countries including 90% confidence limits. The framework used to predict road traffic mortality was constructed using selected variables (identified through a literature review) which have direct relationship to the outcome variable (road traffic death). These variables were later grouped into three categories: exposure factors (Ej), risk or preventive factors (Rj), and mitigating factors (Mj). Gross national income (Ij) has an influence on the first two categories (Figure 1).

In this framework, the road traffic mortality outcome (Yj) is a function of a set of independent variables described as exposure factors (Ej), risk or preventive factors (Rj), mitigating factors (Mj) and gross national income (Ij). This can be expressed as follows: Yj= f (Rj, Mj, Ij, Ej).

The relationship between the outcome and the independent variables is a nonlinear function. The number of deaths (Yj) is a non-negative integer count data; thus the standard approach (*11*) to be used is the Poisson regression or another form of regression based on the Poisson. The most commonly used regression model for count data treats the response Y as a Poisson variable. In the Poisson regression model, the mean equals the variance, conditional on explanatory variables. In practice, however, this assumption was not satisfied. For this reason, a negative binomial regression model was chosen where the assumption for the dependent variance and Poisson's particular case of negative binomial model are adequately satisfied.

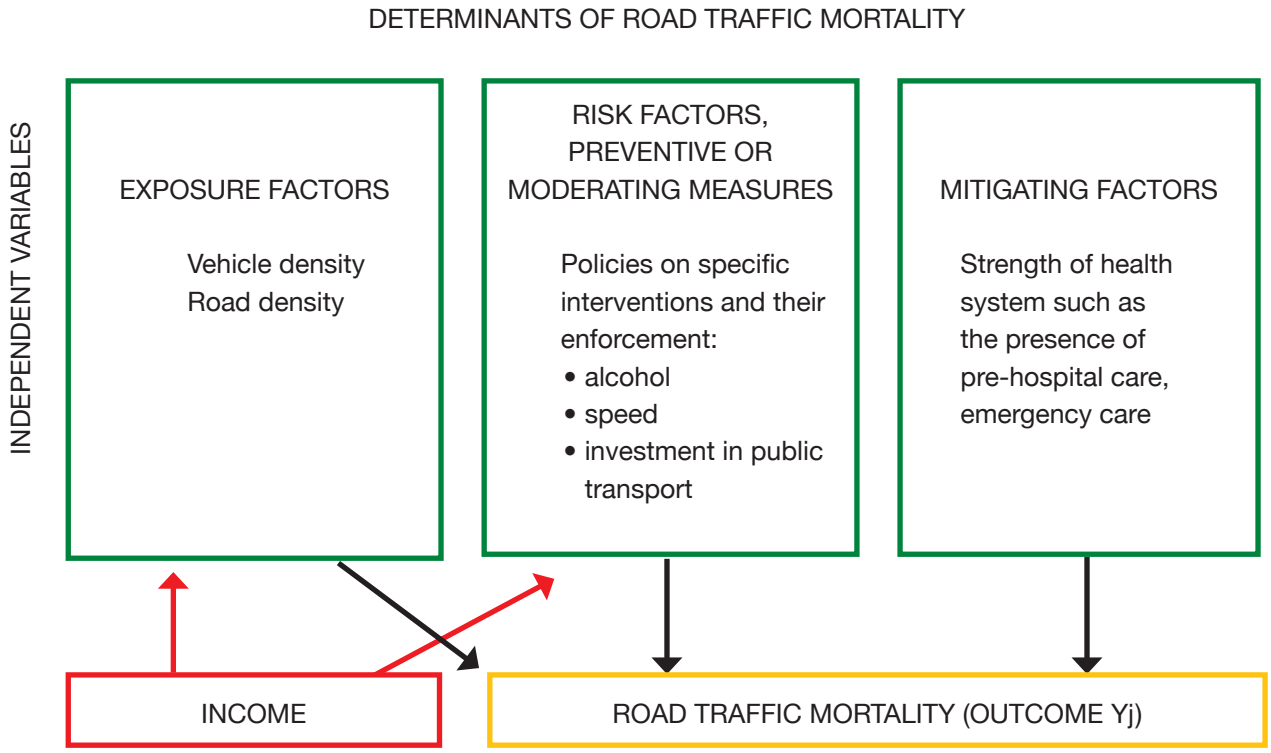


Figure 1. Framework for determinants of road traffic mortality

At the end, a negative binomial regression modelling technique using STATA software (*2*) was used to predict the number of road traffic fatalities with population size as an exposure facture. The model was constructed on the basis of reported data from Group 1 countries.

The full in-depth description of the methodology and formulas for the modelling process are available at the following website www.who.int/violence_injury_prevention/road_traffic/road_safety_status/2009.

Annex 1. Definition of road fatality in countries of the Eastern Mediterranean Region

Country	At scene	Within 24 hours	Within 7 days	Within 30 days	Within 1 year
Afghanistan	√	√	√	√	√
Bahrain	NA	NA	NA	NA	NA
Egypt	√	NA	NA	NA	NA
Iran, Islamic Republic of	NA	NA	NA	√	NA
Iraq	√	√	√		NA
Jordan	NA	NA	NA	√	NA
Kuwait	NA	NA	NA	√	NA
Lebanon	NA	NA	√	NA	NA
Libyan Arab Jamahiriya	NA	NA	NA	√	NA
Morocco	NA	NA	NA	√	NA
Occupied Palestinian territory	NA	NA	NA	√	NA
Oman	NA	NA	NA	√	
Pakistan	NA	NA	NA	NA	NA
Qatar	NA	NA	NA	√	NA
Saudi Arabia	NA	NA	NA	√	NA
Sudan	NA	NA	NA	NA	NA
Syrian Arab Republic	√	NA	NA	NA	NA
Tunisia	NA	NA	NA	√	NA
United Arab Emirates	NA	NA	NA	√	NA
Yemen	√	√	√	NA	NA

Annex 2. Deaths per 10 000 registered vehicles in countries of the Eastern Mediterranean Region

Country	Reported deaths per 10 000 vehicles	Reported vehicle occupant deaths per 10 000 vehicles	Modelled deaths per 10 000 vehicles	Modelled vehicle occupant deaths per 10 000 vehicles
Afghanistan	2.5		14.5	
Bahrain	2.4	1.5	2.4	1.5
Egypt	28.6	17.0	73.1	43.5
Iran, Islamic Republic of	13.5	11.2	15.0	12.4
Iraq	8.0		49.3	
Jordan	11.8	9.1	24.1	18.6
Kuwait	3.5		3.5	
Lebanon	3.6		8.4	
Libyan Arab Jamahiriya	11.7	7.2	13.7	8.4
Morocco	16.8	7.8	38.7	18.0
Occupied Palestinian territory	23.9		110.5	
Oman	12.7		8.8	
Pakistan	10.5		78.5	
Qatar	3.3		3.3	
Saudi Arabia	8.6		9.7	
Sudan	18.6	6.4	111.4	38.4
Syrian Arab Republic	20.3		47.2	
Tunisia	12.0	6.8	28.7	16.2
United Arab Emirates	6.0	4.4	9.3	6.9
Yemen	35.8		84.3	

Annex 3. Overview of status of major recommendations in the Eastern Mediterranean Region

Country	Lead agency	Urban speed ≤ 50 km/h	Blood alcohol concentration ≤ 0.05 g/dl	Helmet law	Seat-belt law	Child restraint law
Afghanistan	√	√	√	x	x	x
Bahrain	√	√	√	√	√[a]	x
Egypt	√	√	x	√[a]	√[a]	x
Iran, Islamic Republic of	√	√	√	√	√	x
Iraq	√	x	x		√	x
Jordan	√	√*	x	√	√[a]	x
Kuwait	x	√	√	√	√[a]	x
Lebanon	x	x	√	√	√[a]	x
Libyan Arab Jamahiriya	x	√	√	√[a]	√	x
Morocco	√	x	x	√[a]	√	x
Occupied Palestinian territory	x	√	√	√	√	√
Oman	√	x	x	√	√[a]	x
Pakistan	√	x	√	√[a]	√[a]	x
Qatar	x	x	√	√	√[a]	x
Saudi Arabia	√	x	√	√[a]	√	√
Sudan	x	√	√	√	√[a]	x
Syrian Arab Republic	√	√*	√	√	√[a]	x
Tunisia	√	√	√	√	√[a]	x
United Arab Emirates	√	x	x	√	√[a]	x
Yemen	√	x	√	x	x	x

√ *Meets the defined standard*

x *Does not meet the defined standard*

* *Speed limits may exceed 50 km/h in some settings*

[a] *Not applied to all occupants/riders*

Table A.2: Vehicles, road traffic deaths and proportion of road users

Country	General information			Vehicles	
	Population numbers[a] for 2007	GNI per capita[b] for 2007 in US dollars	Income level[c]	Number of registered vehicles	Reported number of road traffic deaths[d]
Afghanistan	27 145 275	319[f]	Low	731 607	1 779
Bahrain	752 648	20 610[f]	High	382 977	91
Egypt	75 497 913	1 580	Middle	4 300 000	15 983
Iran (Islamic Republic of)	71 208 384	3 470	Middle	17 000 000	22 918
Iraq	28 993 374	1 646[f]	Middle	2 242 269	1 932
Jordan	5 924 245	2 850	Middle	841 933	992
Kuwait	2 851 144	40 114[f]	High	1 364 790	482
Lebanon	4 099 115	5 770	Middle	1 400 000	536
Libyan Arab Jamahiriya	6 160 483	9 010	Middle	1 826 533	2 138
Morocco	31 224 137	2 250	Middle	2 284 060	3 838
Oman	2 595 133	11 275[f]	Middle	629 670	798
Pakistan	163 902 405	870	Low	5 287 152	7 234
Qatar	840 635	66 063[f]	High	605 699	199
Saudi Arabia	24 734 533	15 440	High	7 398 600	6 358
Sudan	38 560 488	960	Middle	1 200 000	2 227
Syrian Arab Republic	19 928 516	1 760	Middle	1 389 346	3 663
Tunisia	10 327 285	3 200	Middle	1 244 918	1 497
United Arab Emirates	4 380 439	41 082[f]	High	1 754 420	1 056
West Bank and Gaza Strip	4 018 000[f]	1 422[f]	Middle	78 609	188
Yemen	22 389 169	870	Low	777 734	3 003

Road traffic deaths			Road user deaths (%)				
Modelled number of road traffic deaths[e]		Estimated road traffic death rate per 100 000 population[e]	Drivers/ passengers of 4-wheeled vehicles	Drivers/ passengers of motorized 2- or 3-wheelers	Cyclists	Pedestrians	Other or unspecified users
Point estimate	90% Confidence Interval						
10 593	6 234–22 894	39.0					
91		12.1	59.4	5.5	6.6	28.6	
31 439	19 411–47 668	41.6	47.5	0.1	1.9	20.1	30.4
25 491	18 726–34 337	35.8	44.9	11.4		33.3	11.0
11 059	6 933–21 500	38.1					
2 027	1 407–3 188	34.2	64.0[g]			36.0	
482		16.9					
1 170	837–1 625	28.5					
2 497	1 518–3 760	40.5	60.0		5.0	15.0	20.0
8 850	6 273–12 783	28.3	45.7	16.3	7.1	27.9	3.0
553	347–920	21.3					
41 494	28 379–76 695	25.3					
199		23.7	69.0[g]	4.0	27.0[h]		
7 166	5 535–9 544	29.0					
13 362	8 820–19 143	34.7	31.5			12.7	55.8
6 552	5 024–8 684	32.9					
3 568	2 555–4 948	34.5	50.8	14.4	2.6	32.0	0.3
1 626	912–2 570	37.1	70.0	1.5		28.5	
896	627–1 287	4.9					
6 553	4 021–15 797	29.3					

[a] Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2007). World population Prospects: The 2006 Revision, Highlights. New York: United Nations.

[b] Gross National Income (GNI) per capita is the dollar value of a country's final income in a year divided by its population using Atlas methodology. Data from World Development Indicators database, World Bank, revised 17 October 2008.

[c] World Development Indicators database: Low income is $935 or less, middle income is $936 to $11 455, high income is $11 456 or more.

[d] Adjusted for 30-day definition of a road traffic death.

[e] Modelled using negative binomial regression. Data from countries with good vital registration and countries with a population of less than 100 000 were not included in the model.

[f] 2007 data not available. Latest available used from http://data.un.org/.

[g] Passengers and drivers of any motorized vehicle; includes category "unspecified".

[h] Cyclists and pedestrians.

Table A.3: Drinking and driving laws, enforcement and road traffic deaths attributed to alcohol

Country	National drink–driving law	How drink–driving is defined		
		Blood alcohol concentration (BAC) level	Physician certificate	Breath content
Afghanistan	Yes[a]	Yes	Yes	Yes
Bahrain	Yes[a]	Yes	…	Yes
Egypt	Yes[b]	…	…	…
Iran (Islamic Republic of)	Yes[a]	Yes	Yes	Yes
Iraq	Yes	Yes	…	…
Jordan	Yes	Yes	Yes	Yes
Kuwait	Yes[a]	Yes	Yes	…
Lebanon	Yes	Yes	…	…
Libyan Arab Jamahiriya	Yes[a]	Yes	…	…
Morocco	No[a]	n/a	n/a	n/a
Oman	Yes	Yes	Yes	Yes
Pakistan	Yes[a]	…	Yes	…
Qatar	Yes	Yes	…	…
Saudi Arabia	Yes	Yes	Yes	…
Sudan	Yes[a]	…	Yes	Yes
Syrian Arab Republic	Yes	Yes	…	Yes
Tunisia	Yes	Yes	…	…
United Arab Emirates	Yes	Yes	Yes	…
West Bank and Gaza Strip	Yes	Yes	Yes	…
Yemen	Yes[a]	…	Yes	…

Random breath testing or police check points used for enforcement	Effectiveness of overall enforcement (respondent consensus) (scale 0–10)	National maximum legal BAC levels			Proportion of road traffic deaths that are attributable to alcohol (%)
		For the general population (g/dl)	For young or novice drivers (g/dl)	For professional or commercial drivers (g/dl)	
Yes	10	0.00	0.00	0.00	…
No	4	0.00	0.00	0.00	7.7
No	4	...	...	...	…
Yes	1	0.00	0.00	0.00	…
No	5	0.08	0.08	0.08	…
…	3	0.08	0.08	0.08	…
…	9	0.00	0.00	0.00	…
Yes	1	0.05	0.05	0.05	…
No	5	0.00	0.00	0.00	2.0
…	n/a	n/a	n/a	n/a	3.0
Yes	4	0.08	0.08	0.08	…
Yes	4	0.00	0.00	0.00	…
No	6	0.00	0.00	0.00	…
No	7	0.00	0.00	0.00	…
No	10	0.00	0.00	0.00	…
No	8	0.05	0.05	0.05	…
Yes	3	0.05	0.05	0.05	0.7
Yes	8	0.10	0.10	0.10	…
No	1	0.05	0.05	0.05	…
…	…	0.00	0.00	0.00	…

[a] Alcohol is prohibited.

[b] Not defined by BAC or no standardized definition.

… Data not available.

n/a Data not applicable.

Table A.4: Seat-belt and child restraint laws, enforcement and wearing rates

Country	Seat-belts	
	There is a national seat-belt law	The law applies to all occupants
Afghanistan	No	n/a
Bahrain	Yes	No
Egypt	Yes	No
Iran (Islamic Republic of)	Yes	Yes
Iraq	Yes	Yes
Jordan	Yes	No
Kuwait	Yes	No
Lebanon	Yes	No
Libyan Arab Jamahiriya	Yes	Yes
Morocco	Yes	Yes
Oman	Yes	No
Pakistan	Yes	No
Qatar	Yes	No
Saudi Arabia	Yes	Yes
Sudan	Yes	No
Syrian Arab Republic	Yes	No
Tunisia	Yes	No
United Arab Emirates	Yes	No
West Bank and Gaza Strip	Yes	Yes
Yemen	No	n/a

Seat-belts			Child restraints	
Enforcement is applied to the following occupants	Effectiveness of seat-belt law enforcement (respondent consensus) (scale 0–10)	National seat-belt wearing rate	There is a national child restraint law	Effectiveness of child restraint law enforcement (respondent consensus) (scale 0–10)
n/a	n/a	…	No	n/a
Front seat occupants only	4	22%	No	n/a
Front seat occupants only	7	70% driver only	No	n/a
Front seat occupants only	8	75%–80%	No	n/a
Front seat occupants only	8	…	No	n/a
Front seat occupants only	5	65% drivers; 10% front passenger	No	n/a
Front seat occupants only	3	…	No	n/a
Front seat occupants only	4	15%	No	n/a
All occupants	4	5%	No	n/a
Driver only	8	75% front seats; 19% rear seats	No	n/a
Front seat occupants only	9	95% front seats; 1% rear seats	No	n/a
Driver only	3	…	No	n/a
Front seat occupants only	7	50% front seats	No	n/a
All occupants	5	…	Yes	2
Front seat occupants only	7	…	No	n/a
Front seat occupants only	9	81% front seats	No	n/a
Front seat occupants only	2	…	No	n/a
Front seat occupants only	7	61% front seats	No	n/a
All occupants	3	…	Yes	1
n/a	n/a	…	No	n/a

… Data not available.
n/a Data not applicable.

Table A.5: Speed laws and enforcement

Country	Speed limits are set at a national level	Speed limits are modifiable at a local level
Afghanistan	Yes	Yes
Bahrain	Yes	No
Egypt	Yes	No
Iran (Islamic Republic of)	Yes	No
Iraq	Yes	No
Jordan	Yes	Yes
Kuwait	Yes	Yes
Lebanon	Yes	Yes
Libyan Arab Jamahiriya	Yes	No
Morocco	Yes	Yes
Oman	Yes	No
Pakistan	Yes	Yes
Qatar	Yes	No
Saudi Arabia	Yes	No
Sudan	Yes	Yes
Syrian Arab Republic	Yes	Yes
Tunisia	Yes	Yes
United Arab Emirates	Yes	Yes
West Bank and Gaza Strip	Yes	No
Yemen	Yes	Yes

Legislation differs by vehicle type	Maximum speed		Effectiveness of overall enforcement (respondent consensus) (scale 0–10)
	On urban roads (km/h)	On rural roads (km/h)	
Yes	50	90	10
Yes	50	80	4
Yes	60	60	7
Yes	50	60	6
Yes	100	…	5
Yes	50–80	80–120	6
Yes	45	80	6
Yes	100	60	4
Yes	50	70	3
Yes	60	100	5
Yes	120	120	6
Yes	70	…	4
No	100	60	7
No	80	…	5
Yes	50	…	7
Yes	45–60	45–60	8
Yes	50	50	5
Yes	60	40	7
Yes	50	80	3
Yes			3

… Data not available.

Table A.6: Helmet laws, enforcement and wearing rates

Country	There is a national helmet law	The law applies to the following road users		
		Drivers	Adult passengers	Child passengers
Afghanistan	No	n/a	n/a	n/a
Bahrain	Yes	Yes	Yes	Yes
Egypt	Yes	Yes	No	No
Iran (Islamic Republic of)	Yes	Yes	Yes	Yes
Iraq	No	n/a	n/a	n/a
Jordan	Yes	Yes	Yes	Yes
Kuwait	Yes	Yes	Yes	Yes
Lebanon	Yes	Yes	Yes	Yes
Libyan Arab Jamahiriya	Yes	Yes	…	…
Morocco	Yes	Yes	Yes	No
Oman	Yes	Yes	Yes	Yes
Pakistan	Yes	Yes	Yes	No
Qatar	Yes	Yes	Yes	Yes
Saudi Arabia	Yes	Yes	No	No
Sudan	Yes	Yes	Yes	Yes
Syrian Arab Republic	Yes	Yes	Yes	Yes
Tunisia	Yes	Yes	Yes	Yes
United Arab Emirates	Yes	Yes	Yes	Yes
West Bank and Gaza Strip	Yes	Yes	Yes	Yes
Yemen	No	n/a	n/a	n/a

Exceptions to law			Effectiveness of overall enforcement (respondent consensus) (scale 0–10)	There are helmet standards	Estimated national helmet wearing rate (%)
There are exceptions to the helmet law	The helmet law applies to all road types	The helmet law applies to all engine types			
n/a	n/a	n/a	n/a	n/a	…
No	Yes	Yes	5	No	…
Yes	Yes	Yes	6	No	70
No	Yes	Yes	6	Yes	13–15
n/a	n/a	n/a	n/a	n/a	…
No	Yes	Yes	4	No	…
No	Yes	Yes	3	No	…
No	Yes	Yes	2	No	…
Yes	Yes	No	7	No	…
Yes	Yes	Yes	4	Yes	67[a]
No	Yes	Yes	7	No	…
Yes	Yes	Yes	4	No	…
No	Yes	Yes	5	No	90
Yes	Yes	Yes	2	No	…
No	Yes	Yes	7	Yes	…
No	Yes	Yes	4	No	…
No	Yes	Yes	5	Yes	…
No	Yes	Yes	8	No	…
Yes	No	No	3	No	…
n/a	n/a	n/a	n/a	n/a	…

[a] Drivers only.

… Data not available.

n/a Data not applicable.

Table A.7: Road safety management, strategies and policies

Country	Lead agency			Strategies		
	A lead agency is present	Lead agency status	The lead agency is funded	There is a national road safety strategy	The strategy includes measurable national targets	The strategy is funded
Afghanistan	Yes	Governmental	Yes	No	n/a	n/a
Bahrain	Yes	Governmental	Yes	Multiple strategies	n/a	n/a
Egypt	Yes	Interministerial	Yes	Yes	No	No
Iran (Islamic Republic of)	Yes	Other	Yes	Multiple strategies	n/a	n/a
Iraq	Yes	Governmental	No	Subnational	n/a	n/a
Jordan	Yes	Interministerial	No	Yes[a]	n/a	n/a
Kuwait	No	n/a	n/a	No	n/a	n/a
Lebanon	No	n/a	n/a	Yes[a]	n/a	n/a
Libyan Arab Jamahiriya	No	n/a	n/a	No	n/a	n/a
Morocco	Yes	Interministerial	No	Yes	Yes	Yes
Oman	Yes	Interministerial	Yes	No	n/a	n/a
Pakistan	Yes	Governmental	No	Multiple strategies	n/a	n/a
Qatar	No	n/a	n/a	No	n/a	n/a
Saudi Arabia	Yes	Interministerial	Yes	Multiple strategies	n/a	n/a
Sudan	No	n/a	n/a	Subnational	n/a	n/a
Syrian Arab Republic	Yes	Interministerial	No	Multiple strategies	n/a	n/a
Tunisia	Yes	Governmental	Yes	Yes	Yes	Yes
United Arab Emirates	Yes	Governmental	Yes	Yes	Yes	Yes
West Bank and Gaza Strip	No	n/a	n/a	Subnational	n/a	n/a
Yemen	Yes	Interministerial	No	Multiple strategies	n/a	n/a

Policies		Audits		Driving tests			Vehicle insurance required
There are policies to promote walking and cycling	There are policies to promote investment in public transportation	Formal audits on new roads	Regular audits on existing roads	Written	Practical	Medical	
No	No	Yes	Yes	Yes	Yes	…	No
No	Yes	Yes	Yes	…	Yes	…	Yes
No	Yes	Yes	Yes	Yes	Yes	…	Yes
Yes	Yes	Yes	Yes	Yes	Yes	…	Yes
No	Yes	No	No	Yes	Yes	…	Yes
No	Yes	No	No	Yes	Yes	…	Yes
No	No	No	No	Yes	Yes	Yes	Yes
No	No	Yes	No	Yes	Yes	…	Yes
No	Subnational	No	No	…	Yes	…	Yes
No	Yes	No	Yes	Yes	Yes	…	Yes
No	No	Yes	Yes	Yes	Yes	…	Yes
No	No	No	No	Yes	Yes	…	Yes
No	Yes	Yes	Yes	Yes	Yes	…	Yes
No	Yes	Yes	Yes	Yes	Yes	…	Yes
No	No	Yes	Yes	Yes	Yes	…	Yes
No	Yes	Yes	Yes	Yes	Yes	…	Yes
No	Yes	No	Yes	Yes	Yes	…	Yes
Yes	Yes	Yes	Yes	Yes	Yes	…	Yes
No	No	No	No	Yes	Yes	Yes	Yes
No	No	No	Yes	Yes	Yes	…	Yes

[a] Not formally endorsed by government.

… Data not available.

n/a Data not applicable.

Table A.8: Pre-hospital care systems

Country	Formal pre-hospital care system	Universal access telephone number		Telephone number(s)
		National	Regional	
Afghanistan	No	n/a	n/a	…
Bahrain	Yes	Yes	…	999
Egypt	Yes	Yes	…	123
Iran (Islamic Republic of)	Yes	Yes	…	115
Iraq	Yes	Yes	…	122
Jordan	Yes	Yes	…	199
Kuwait	Yes	Yes	…	777
Lebanon	No	n/a	…	…
Libyan Arab Jamahiriya	Yes	No	Yes	151,191,193
Morocco	Yes	Yes	…	115
Oman	Yes	Yes	…	9999
Pakistan	Yes	Yes	…	15
Qatar	Yes	Yes	…	999
Saudi Arabia	Yes	Yes	…	997
Sudan	No	n/a	n/a	n/a
Syrian Arab Republic	Yes	Yes	…	110
Tunisia	Yes	Yes	…	198
United Arab Emirates	Yes	Yes	…	999
West Bank and Gaza Strip	Yes	Yes	…	101
Yemen	Yes	Yes	Yes	195

… Data not available.

n/a Data not applicable.

INVESTIGATION OF FATAL CRASH TRENDS IN THE ARAB WORLD COMPARED WITH EU

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ABSTRACT

Over three decades, vehicular and fatality related data are analysed and modelled for the Arab world and compared with 27 EU countries. The data comparison and modelling include vehicle development, death frequencies and death rates per inhabitants and vehicles. The modelling is based on least-squares regression fit considering around two-third of a million gathered data points for 45 considered countries. The gathered Arab countries' data, as a whole, are thought to be presented for the first time; since no such data are yet observed in the literature. It is expected that an extra 117 million vehicles will be pumped into the global road network in a decade time from the earlier two regions. This sums to around 15% of the current global vehicle population. While such an increase looks very encouraging for the vehicles' manufacturers, its environmental consequences and power consumption needs are surely not. While crash deaths in EU countries dropped from 74,876 during 1980 to 30,170 during 2011, that in the Arab countries increased from 22,145 victims to 37,736. The death record in the Arab countries is expected to further escalate to 54 thousand by the year 2022 based on mathematical models developed here. This represents around 45% increase since 2011. That for 27 EU countries is expected to be within 10 and 20 thousand deaths, which is less than half of the 2011 record. The crash death rates in the EU countries decreased continuously during the past three decades and will continue doing so during the coming decade. That in the Arab world will also continue dropping gently during the coming decade. Currently, the overall rates for the EU countries is half that of the average Arab countries. The gap between the two will increase with the time if no proper counter action is considered. The rates in the Arab countries is quite misleading because of the clear difference in the vehicle ownership rate and average vehicle-miles travelled between Arab and EU countries. While the deaths rates per population in the 15 EU countries are heading towards zero in a decade time; the rate in the Arab countries are expected to increase by 16%. Many factors contribute to such high rates of traffic deaths in the Arab countries, as lack of measurable long-term safety plans, inconsistent handling of traffic safety strategies, poor research involvement and limited post-accident rehabilitation centres.

Keywords: Arab countries, crash death, death per vehicle, EU, fatality per population, roadway fatalities, traffic safety.

1 INTRODUCTION

Traffic crash data and database are well established in the developed countries. They are widely available and easily accessible for the researchers. This is not the case in most of the Arab and Asian countries. In fact, there is no single data base or reference covering the vehicular and traffic safety records for the past three decades. The case becomes more difficult to investigate when accidents involving vulnerable road users, as pedestrians, children, cyclists and motorcyclists to be considered as such data are not available except for few countries as Bahrain, Qatar, UAE, Jordan and Tunisia. Therefore, it was not possible to be considered in the comparison process. Nevertheless, this study tries to put together such data and compare their trends with European Union (EU) countries.

Arab world consists of 22 countries; 7 Arabian Peninsula ones, namely Saudi Arabia, Kuwait, Qatar, United Arab Emirates (UAE), Oman, Bahrain and Yemen; 5 Western Arabian ones, namely Mauretania, Morocco, Algeria, Tunisia and Libya; 4 Sham countries, namely Jordan, Syria, Lebanon and Palestine; 5 Middle Arabian Countries, namely Egypt, Iraq, Sudan, Somalia and Djibouti; and one East Country, namely Comoros. The population of the 22 countries is around 369 millions, as per 2011 data. The population growth is quite high as compared with 15 and 27 European Council

ISSN: 1743-7601 (paper format), ISSN: 1743-761X (online), http://www.witpress.com/journals
DOI: 10.2495/SDP-V10-N2-245-257

Countries. The population of 15 EU countries, consisting of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom, is 355 millions considering 2011 data. This is very close to the population of the 22 Arab World countries. The 27 EU countries consist of the earlier 15 ones beside Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia. The total population of the 27 countries is around 499 millions.

The importance of this study lies in the limited traffic safety-related literature and scarce historical data related to the Arab Countries; especially when compared with the developed ones.

2 OBJECTIVES AND STUDY APPROACH

This study aims to analyse and model vehicular development, traffic deaths and death rates during the past three decades in the Arab countries and compare the current and future trends with EU countries.

The data simply consist of population, which is the easy part, vehicle fleet and traffic death records, which are the difficult and problematic part in the Arab countries. In fact, the study covers the 22 Arab countries along with the earlier mentioned 15 and 27 EU countries. The data for each country are gathered from official reports and web sites, well-known international databases, research literature and direct contacts. The data for the Arab countries required special attention since the published data, other than population details, are scarce. Therefore, some are obtained through official contacts with the researchers and various Traffic Directorates. The historical vehicle fleets, death frequencies and death rates in the Arab countries along with their future predictions are compared with those for 15 and 27 EU countries using scattered diagrams and regression models. The death rates considered here are per population and per registered vehicles. The rates per vehicle-miles are not considered here due to lack of necessary data in most of the Arab world for the past 30 years. This is also true for data for other vulnerable users. Future predictions are based on best least-squares regression fit. Sophisticated modelling techniques such as multivariate analysis and artificial intelligence such as neural network and fuzzy system [1], are yet not necessary for such a quantitative or deterministic singular predictor data with years. The simplest form of many of these techniques minimizes the error square as in least-squares error method. In fact, the artificial intelligence techniques have received much attention in the area of traffic forecasting because of the ability to approximate any degree of complexity and work without prior knowledge of problem solving [2]; which is not the case here. The models tested here include, among many others, linear, exponential, quadratic, cubical, polynomial, power, inverse, compound, S-curve, growth and logarithmic. The data from different sources are cross checked, since the data for 1980s, from past official literature, do not always match those published more recently. Ambiguous and contradicting ones, as in the case of sudden change in successive years, are double checked from more than one source. Least rationale and logical ones are excluded.

3 DATA

The majority of the data are gathered from official publications and web sources, as for Bahrain, Qatar, Saudi Arabia, Kuwait, Oman, UAE, Algeria, Yemen, Morocco and Tunisia, and from several well-known data bases like International Road Federation, as IRF World Road Statistics [3], EU Road Federation, as European Road Statistics [4], Economic Commission for Europe, as Statistics of Road Traffic Accidents in Europe [5], International Traffic Safety Data and Analysis, as IRTAD Group [6], World Health Organization, as the International Status Report on Road Safety Call for Action [7,8] and UK Department of Transport, as Transport Statistics for Great Britain [9]. Several Annual fact books were also used to gather thedata published through official bodies, as General

Directorate of Traffic in Bahrain [10], Oman [11] and Dubai [12], Public Security in Saudi Arabia [13] and Ministries of Planning. Europe data are well established and are widely available in several European data bases. The casualty and vehicle data for most of the Gulf Cooperation Council (GCC) countries are gathered through official contacts involving Bahrain Directorate of Traffic with various corresponding directorates. It took over 8 months to compile the necessary data for 18 Arab countries, out of the 22, together. The data for Somalia, Djibouti, Comoros and Mauritania are not available except rough estimates for few recent years. However, the influence of the data from these countries on the overall analysis is minimal since the vehicle and death data from these countries, based on the most recent available data, account for only 2.4% and 1.8%, respectively, of the total 22 Arab countries. As a result, the overall data are adjusted to account for the missing data points as per their available recent percentages. This might not be the best assumption since the percentages of these countries 20 or 30 years back might not be as the current ones. However, due to lack of any data, this might give a just assumption.

The gathered historical crash death data for over three decades, along with vehicle fleets and death rates, are probably presented for the first time in the literature.

While missing fatality data for the 27 EU countries were less than 5% for the considered period (1978–2011), mostly being from the Eastern European countries; those in the 18 Arab countries were around 20%. The missing vehicular data were as much as 26%. However, around 1520 data points were processed for each of the 45 considered countries; which totals to around two-third of a million data points for the all the considered countries. Many data points are yet to be completed. Any missing vehicle or population data points are replaced with either an interpolated value in case it falls between two known values; or a predicted one if otherwise. The latter are based on average growth rates for the closest 8–10 years data points. The data for Czech and Slovak Republics prior to 1992 are jointly considered since no records are found for each country individually during the former Czechoslovakia time. The data for Saudi Arabia are based on Arabic calendar year, which is about 3.2% lesser than the Gregorian calendar.

It is worth mentioning that underreporting of the official registered records is not considered here, since such data are not available for almost all the Arab countries except for the last couple of years for very few Arab countries. Though several official records are fairly accurate, as in Bahrain, Qatar, Kuwait, Oman, Jordan, Tunisia and UAE; others are not as accurate as should be like in Sudan, Egypt, Algeria and Libya [14].

4 MAIN RESULTS

4.1 Vehicular development

The vehicle population in the 22 Arab countries, after being adjusted for the missing countries, has increased from just around 8 millions in 1980 to 48 millions in 2011 (Table 1). It has multiplied six times in 32 years time. That in 15 and 27 EU countries increased by 70% and 85%, respectively; since 1980, which is less than double. The current vehicle population in the Arab countries represents only 5% of the worldwide vehicle population. That in 27 EU countries represents over 30% of the worldwide count. The vehicular development since 1980 is regressed against the years using the earlier mentioned techniques. The models best fitted the data for Arab and EU countries are presented in Table 2. The predicted vehicle fleet for a decade time, based on the regressed models with high R^2 values of at least 0.98, shows significant increase in the vehicle fleets. The vehicle population in the Arab countries will approach 73 million by the year 2022 (Table 2, exponential model). That in the 27 EU countries is 356 million vehicles based on an S-curve model. This is 23% greater

Table 1: Registered vehicle fleet in the Arab and EU countries (in millions).

Year	22 Arab countries	15 EU countries	27 EU countries	Year	22 Arab countries	15 EU countries	27 EU countries
1980	8.25	135.95	149.25	1998	21.88	193.92	221.25
1982	10.44	144.11	158.91	2000	24.85	202.91	232.74
1984	12.53	152.27	168.60	2002	26.45	215.13	247.56
1986	14.00	159.99	177.35	2004	28.99	219.27	254.35
1988	15.22	164.87	183.51	2006	32.69	221.70	258.36
1990	16.73	167.73	188.79	2008	36.90	226.85	269.07
1992	18.36	168.00	193.21	2010	44.65	231.17	275.43
1994	19.61	175.80	197.87	2011	47.83	NA	NA
1996	20.45	183.48	208.29				

Table 2: Best-fit models for vehicle fleet prediction in Arab and EU countries (data 1978 to 2011 for Arab countries and 1980 to 2010 for EU ones).

Countries	Vehicles (2010 data)	Type	Model	R^2	F	Prediction for 2022
Arab	44,651,001	Linear	1,047,775.5482x – 2,068,188,762	0.919	341	50,063,581
		Compound	6.91008e – 38 * 1.052641^x	0.967	636	77,717,305
		Exponential	9.6076 – E35* exp(0.0477*x)	0.980	1507	72,708,480
27 EU	275,426,578	Linear	4234370.2484*x – 8236238674	0.984	1765	325,657,968
		S curve	exp(59.48355 – 80458.89/x)	0.987	2287	356,489,198
		Growth	exp(–21.17784756951474 + 0.020216 * x)	0.987	2272	358,806,168

than the 2011 vehicle population. This means that around 28 million extra vehicles in the Arab countries will be added to the current 45 million's record, as per 2010 records. That in 27 EU countries is 81 million vehicles. This means that an extra 109 million vehicles will be pumped into the global road network by the year 2022 from just these two regions. This is almost 13% of the current global 850 million vehicles from just Arab and EU Countries.

In fact, the annual growth rate of the vehicle development during the past 15 years reflects a much higher estimate than that predicted from the models. This is because the trend in the vehicle development during the past 15 years looks steeper than that for the period between 1978 and 1995 (Table 1). The other way round is true for the EU countries; in which the recent trend looks flatter. This is quite logical since the EU countries have developed their sustainable mass transit system long back. That in many Arab countries are still to be developed. As a result, the rider share of the public modes in the EU countries is far greater than that in the Arab countries. To consider such fluctuations and to reduce the cumulative effect of the error square of the earlier models, the data are regressed once again for

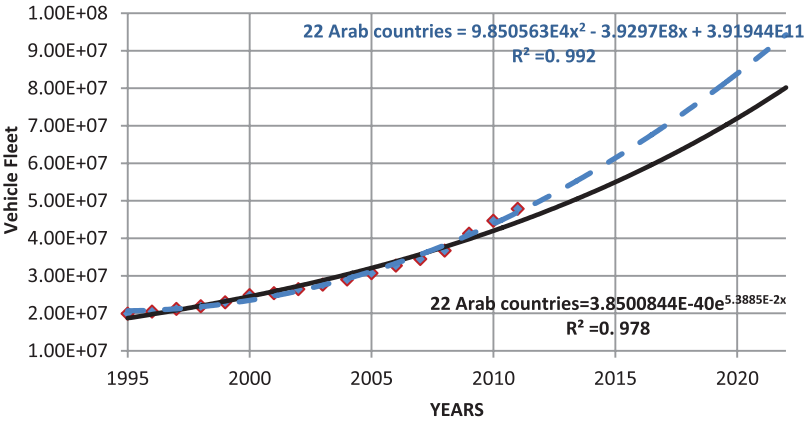

Figure 1: Vehicle development and best-fitted models for the total 22 Arab countries (1995–2011).

the period from 1995 to 2010/2011 so as to have a closer and more reasonable fit the data for the recent years. The best fits along with the predicted values are presented in Fig. 1. As can be seen from the figure, the data for the Arab countries are bound between an upper limit through a quadratic model and a lower one through a power model. The latter shows an estimate of 80 million vehicles for the year 2022 and the former shows 97 millions. Both are greater than the earlier estimates. These indicate, on average, an increase of around 100% compared with 2010 record. This means an extra 44 million vehicles by the year 2022. Similarly, the data for the 27 EU countries are bound between a lower limit, considering a linear fit, and a higher one considering an exponential fit. The prediction for the year 2022, on average, shows an increase of 16% since 2010; which is around 73 million extra vehicles. The increase by the year 2022 from the two regions approaches 117 million vehicles. This is around 15% of the current global vehicle population.

While such an increase looks very encouraging for vehicles' manufacturers; its environmental consequences are not. According to the EU commissions, the renewed sustainable transport in Europe must meet economic, social and environmental conditions [15]. Currently, none are applied in most of the Arab countries. However, such conditions, placed by EU commissions, will force manufacturers to innovate a more sustainable personal mobility.

It is worth mentioning that the average annual growth rate in the vehicle fleet during the past three decades in the Arab countries is 7.8% compared with 1.2% in 27 EU countries. There is, yet, no clear plan to encourage travellers to shift towards safer and more sustainable mode of transport in most of the Arab countries, though congestion in major cities is a serious problem. In exception to many Arab cities; Dubai and Cairo have succeeded to provide an efficient Mass Transit System (MTS) to their busy networks. MTS is necessary to control users exposure to accidents by shifting some of the car users towards other safer modes of transport. Murray Mackay [16] considers the latter among the important pillars of any Traffic Safety Strategies.

4.2 Fatality trends

The total crash deaths in the 22 Arab countries, after being adjusted for the missing countries' data, increased from 22,328 victims during 1980 to 37,952 during 2011 (Fig. 2). Such drastic increase in death records is in total contradiction with the direction of the death trends in the EU countries. The crash deaths in 15 and 27 EU countries dropped from 59,879 and 74,876, in respective order, during

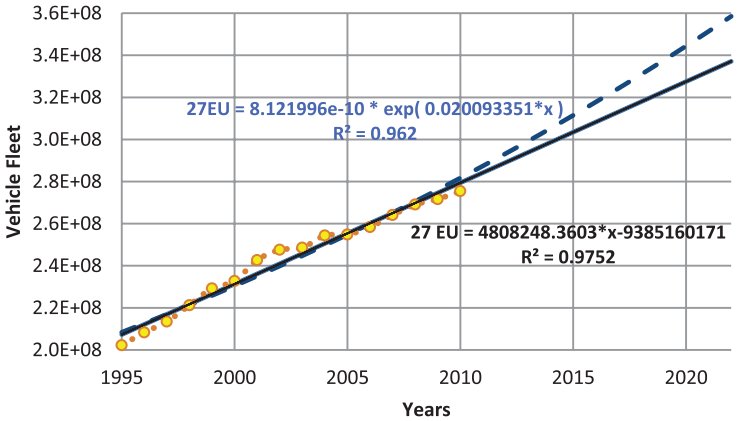

Figure 2: Vehicle development and best-fitted models for the total 27 EU countries (1995–2011).

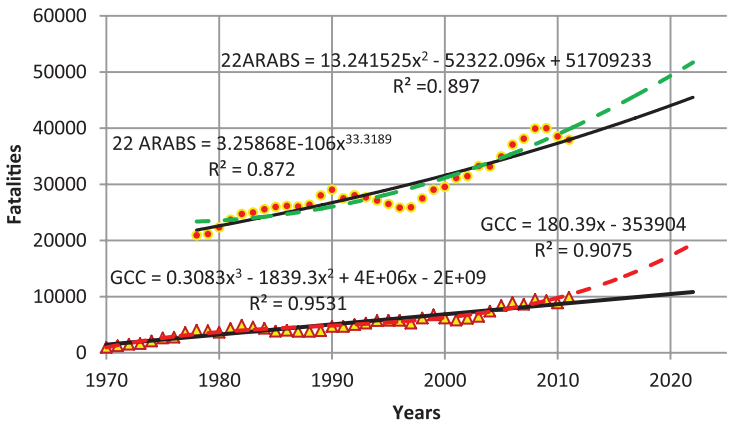

Figure 3: Fatality trends in GCC and Arab countries and their corresponding best fits since 1970/1978.

1980 to 20,764 and 30,170, respectively, during 2011 (Fig. 3). While these are about one-third and two-fifth of the 1980 records in 15 and 27 EU countries, respectively; that in the Arab world is just under twice that of the 1980 records. Such high increasing trend in the Arab countries raises serious questions regarding the counteract safety plans and the effectiveness of the official efforts towards such serious public health problem.

According to various tested regression models, such an increasing trend in the Arab world will continue during the coming decade. The predicted traffic death in the Arab countries for the year 2022, considering data since 1978 (Fig. 3), is expected to be within an envelope of 46–52 thousand deaths. That in 27 EU countries, as per cubical and exponential regression models shown in Fig. 4, drops to a lower bound of 26 thousand deaths and an upper bound of 32 thousand deaths by the same year. In fact, this is even lesser than that for the six GCC countries, which represent only 11% of the total Arab population, though the population and vehicle fleet in the GCC countries are as little as

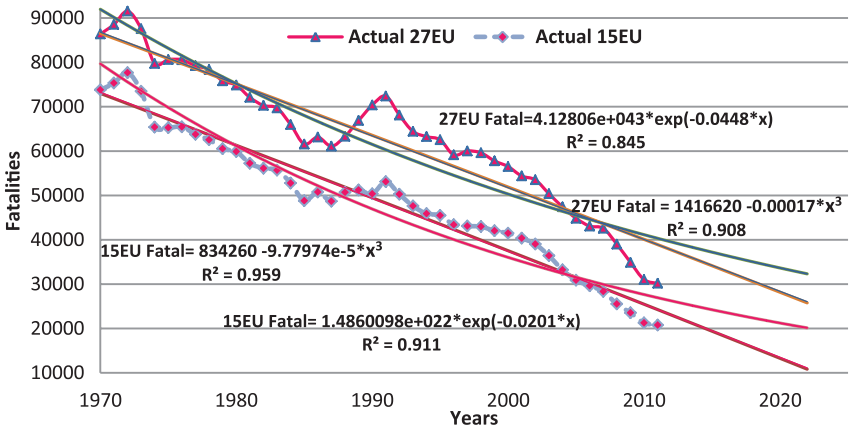

Figure 4: Traffic death trends in 15 and 27 EU countries and their corresponding best fits since 1970.

8% and 5%, respectively, of that in the 27 EU countries. The predicted traffic death in 15 EU countries is between 11 and 20 thousands deaths by the year 2022.

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The earlier crash deaths for the year 2022 in the Arab countries are in excess of just about 20% of the 2011. This is quite unrealistic; since the annual growth rate in the death records and their general trends during the past 15 years reflect a much higher estimate. In fact, the death record is expected to reach four times the earlier estimate as per average annual growth rate in roadway deaths; considering the past 15 years' data. The other way round was true for the EU countries. To adjust such estimates and to reduce the cumulative error square effect of the earlier models; the death records are regressed once again using the data for the period from 1995 to 2011. This will lead to a closer and more reasonable fit to the data for the recent years. As a result, the best fits along with their corresponding predicted values are presented in Table 3. The upper and lower limits for the year 2022 based on linear and power models are within 51–57 thousand deaths. These are substantially higher than the earlier estimates. The previous range for the year 2022, on average, represents around 45% increase since 2011. All the other tested models followed very similar trends of the earlier two models.

The crash death prediction for 27 EU countries is within 9400, as per cubical fit, and 20,300 deaths, as per exponential fit. Logarithmic and inverse fits showed similar estimates to the former cubical model, with slightly lower R^2 values. Power, growth and S-curve fits presented similar fits to the latter exponential model. The earlier range, on average, represents less than half the current record. The expected range for the predicted traffic deaths for the year 2022 for the 15 EU is 3–13 thousands deaths (Table 3).

Table 3: Best-fitted models for traffic deaths for Arab and EU countries (based on data for the period from 1995 to 2011).

Countries	Current deaths (year 2011)	Developed models	R^2	F-test	Predicted deaths (year 2022)
Arab	37,952	968.8352*x–1907640	0.943	249	51,345
		$8.1166684E–194x^{59.849}$	0.945	259	57,316
GCC	9901	288.5777x–570646	0.859	92	12,857
		$10.431351x^2$–41499.416x + 41279778	0.881	92	16,370
15 EU	20,764	7.186001e + 48 * exp (–0.05096*x)	0.931	217	12,709
		$1135402–0.000136988*x^3$	0.964	398	2937
27 EU	30,170	4.1280655e + 43 * exp (–0.04476*x)	0.928	194	20,272
		$1416620–0.000170 * x^3$	0.963	394	9357

Once again, such trends in the Arab countries show serious traffic safety concerns, since the fatality trends in the developing countries show continuous dropping patterns and will continue dropping during the coming decade; and the trends in the Arab countries show continuous increasing patterns and will continue doing so during the coming seen future.

Though many factors lead to the earlier high number of crash deaths in the Arab World and require careful attention, urban planning of the infrastructure in most of the Arab countries is not a forgiving one. They do not support Traffic Safety Plans; especially that related to exposure control towards accidents. Another sector requiring intensive improvement is human behaviour development, since generally over half of crash fatalities in many Arab countries are related to speed, red light crossing and not obeying the rules. It is quite important to mention that while the western drivers comprehend over 74% of the posted signs; GCC drivers understand only 51.8% of them [17,18]. The comprehension of other Arab drivers of posted signs is 56.4% [19].

4.3 Fatality rates

The average crash fatality rates per 100,000 population in the Arab countries showed a fairly decreasing pattern during the years from 1980 to 1996 (Fig. 5). In fact, the rates showed to be far lesser than that in EU countries. However, this should not wrongly be interpreted that these countries were doing quite well or better than EU in traffic safety. The rates in the Arab countries are quite misleading because of the clear difference in the vehicle ownership rate and average vehicle-miles travelled. While the former in the EU countries is one vehicle per 1.8 population, that in the Arab countries is one per 7.4 population. The vehicle-miles travelled in the Arab countries though are not yet easy to be estimated, it is surely lesser than that in the EU countries. As the vehicle ownership is expected to increase, as discussed earlier, along with the vehicle-miles travelled; the crash deaths are also expected to escalate if no clear traffic safety plans are imposed. The fatality rates showed an increasing trend afterword. The overall fatality rates for the 15 and 27 EU countries were in the range of 14–17 deaths per 100,000 population during early 1980s; as been said which were clearly higher than that of the Arab countries. The rates in the EU countries decreased continuously during the past three decades. The rates will continue doing so during the coming decade according to the models developed here and are shown in Fig. 4. That in the Arab world is not as clear as in EU countries, since the rates in the Arab countries showed a clear dropping trend until 1997, then started escalating

Table 4: Developed models for fatalities per 100,000 population based on data 1995 to 2011.

Countries	Fatality /100,000 pop (year 2011)	Developed models	R^2	F-test	Predicted rate (year 2022)
Arab	10.23	$165 - 309326 * x^{-1}$	0.496	5	11.88
15 EU	5.24	$323 - 3.902781848436275E - 8 * x^3$	0.970	86	0.07
27 EU	6.04	$- 0.45042 * x + 912$	0.970	78	1.46

till 2009. The rates dropped slightly afterward. Nevertheless, they are expected to continue dropping gently during the coming decade. Currently, the overall rates for the EU countries is in the range of 5–6 deaths per 100,000 inhabitants, which is half that of the average Arab countries. However, the gap between them is also expected to continuously increase with the time, as per developed models, if no proper counter action is considered.

The fatality rates in EU and Arab countries for the period after 1995 follow slightly different trend than that prior to 1995. To improve the models presented in Fig. 4, as done for the fatalities; the data since 1995 are regressed once again. The models are shown in Table 4.

While cubical model, with very high R^2 value of 0.97, shows that fatality rates per 100,000 population in 15 EU countries will asymptotically tend to approach zero in just over a decade time; an inverse model for the Arab countries, with R^2 value of 0.50, shows that the annual death rate will be close to 12 deaths per 100,000 population. That for the 27 EU countries will be close to 1.5. In other words, while the death rates per population in the various EU countries drop drastically towards zero, or at least will be heading towards it, by the year 2022; the rate in the Arab countries will increase by 16% considering the data since 1995.

The traffic crash death rate per 10,000 vehicles in 15 and 27 EU countries, once again, will asymptotically tend to close to zero, or at least it will be heading towards it, in about a decade time (Fig. 5) as per linear, logarithmic, inverse and cubical models with R^2 greater than 0.955. The trend is expected to go closer and closer to zero with time; but will not reach the absolute zero in the foreseeing future with the current transport facilities. Such trends remind us with the effectiveness of Swedish 'Vision Zero' strategies [21]. Honestly, most of the researchers during early 1990s thought that such plans were unachievable. The historical data showed that such a vision is not an imaginary one. However, the earlier finding is further confirmed, with R^2 of greater than 0.995, when the models are further refined for the data since 1995. However, exponential and compound models showed an upper limit of death rates per 10,000 vehicles of 0.46 and 0.60 in a decade time for 15 and 27 EU countries, respectively (Table 5). These are about half the rates of the year 2011.

Contrary to the EU countries, the trends in the Arab countries do not follow such clear descending trends. Nevertheless, unlike the death rate trend per 100,000 population in the Arab countries; the trend of death per 10,000 vehicles in the Arab countries showed a clear decreasing pattern from an average 27 deaths per 10,000 vehicles during 1980 to 8 in 2011. The latter in the 27 EU countries dropped from 5.02 to 1.13, respectively (Fig. 5). According to a regressed exponential model, which best fitted the data with R^2 value of 0.94, the rate is expected to further drop during the coming decade (Fig. 6). It is quite important to mention that the death rates during the period from 1996 to 2008 were in the range of 11–12.5. The death rate per 10,000 vehicle for the year 2022 using the past 15 years data is expected to drop slightly by the year 2022. According to best regressed model shown in Table 5, the death rate will drop to 6.8 by the year 2022. This is around 10% lesser than the current

Table 5: Developed models for fatalities per 10,000 vehicles based on data since 1995.

Countries	Fatality/10,000 vehicles (year 2010\2011)	Developed models	R^2	F-test	Predicted rate (year 2022)
Arab	7.90	–468+960413.952 * x^{-1}	0.778	73	6.82
15 EU	0.92	3.406458158E+57 * 0.9362x	0.978	35	0.46
27 EU	1.13	4.05083889E+54 * 0.9395x	0.978	34	0.60

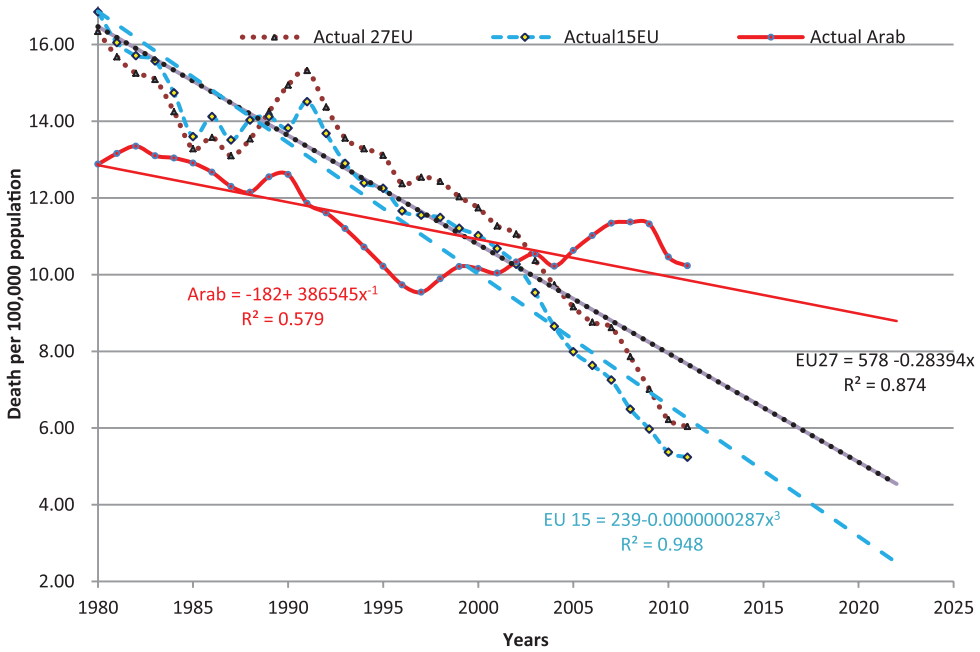

Figure 5: Trend in the traffic deaths rates in the Arab, 15 EU and 27 EU countries (1980–2011).

7.9 rate. The current death rate per vehicles is at least 7 times that of the EU countries. That predicted for the year 2022 is over 11 times EU rates.

Once again, such poor safety records in the Arab World require careful reading, proper interpretation of the results and extensive research since many contributing factors lead to such high rates of traffic deaths. These include, among many others, lack of measurable long-term traffic safety plans, inconsistent handling of traffic safety strategies, poor involvement of Non-Governmental Organization (NGO) in traffic safety problem, poor coordination between various stake holders, poor research involvement in the traffic safety crises and limited post-accident rehabilitation centres. However, the earlier weaknesses do not mean exclusion of successful programs. For example, Riyadh, capital of Saudi Arabia, Dubai, in UAE, Bahrain, and several other cities have involved lots of efforts, especially in human behaviour and enforcements, to reduce traffic fatalities.

Many EU countries sat long-term national safety plans since the 1970s and 1980s for the traffic casualty reduction. In 1987, a target was set in UK, for example, to reduce road casualties by one-third

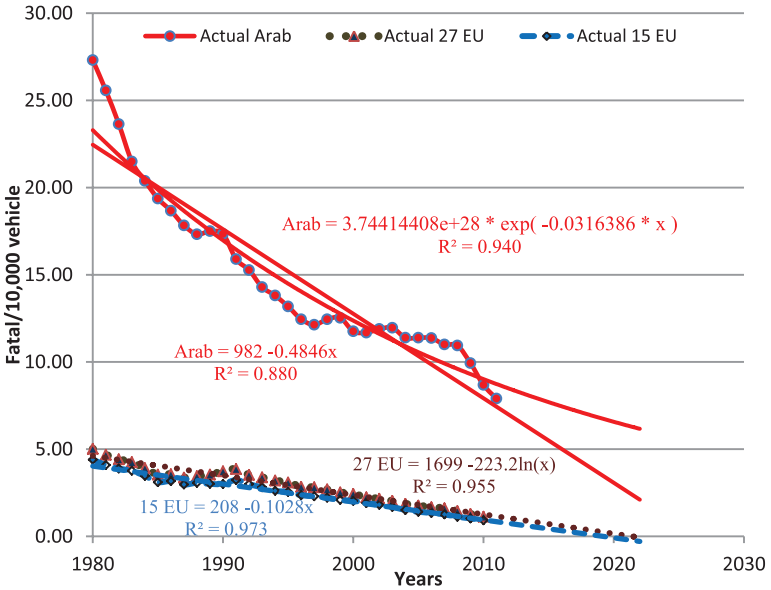

Figure 6: Fitted models for Arab and EU countries using data since 1980.

by the year 2000 [20]. As a result, road death has fallen by 39% and serious injuries by 45%. The target was successfully met. In 2000, the officials sat a plan to further reduce crash deaths and severe injuries by 40% by the year 2010. They have fairly succeeded in approaching the sat target [21]. There are many other similar successful stories throughout the 15 EU countries to improve the current plans and follow them up. The Swedish National Road Administration employed their 'Vision Zero – From Conceptual to Action' plan [21]. The Danish Road Safety Commission employed 'Every Accident is One Too Many' targeting 40% deaths reduction [22].

There are great opportunities to transfer such experience to the Arab countries through the various involved bodies such as consulting offices, research institutions and contractors. Some, as TRL and Sewe-Road, are already involved in developing traffic safety plans and procedures for casualty reductions in the region. Manufacturers may also involve better vehicle high-tech to suite the regional problems since over 32 million extra vehicles are expected to be added to the current 48 million vehicles by the year 2022. Supporting traffic safety through ITS and administering the traffic more efficiently are also sectors requiring further investigation in the region.

5 CONCLUSIONS AND RECOMMENDATIONS

Over three decades, roadway vehicular data, death records and death rates per population and per vehicles are presented for the Arab countries. The rate per vehicle-miles was not possible to be considered here due to lack of necessary historical data concerning average annual mileage in the Arab countries. Such data are thought to be presented for the first time in the literature. The data are analysed, modelled and compared with 15 and 27 EU countries. In total, around two thirds of a million data points are processed for the considered 45 Arab and EU countries. The vehicular predictions for the year 2022 show an increase of 100% in the Arab countries and 16% in the EU ones compared with 2010/2011. These mean extra 44 million and 73 million vehicles, in respective order. The sum of the two accounts for around 16% of the current global vehicle population. While such an increase

looks very encouraging for vehicle manufacturers, its environmental consequences and power conservation are not.

Traffic crash records in 22 Arab countries summed up to 22,320 fatalities during 1980. Those in 15 and 27 EU countries were 59,879 and 74,876 deaths, respectively. Since then, the death records in the Arab countries escalated by over 70% to reach 37,952 during 2011. Contrary to this, traffic death in EU countries showed a substantial drop with the time. The crash deaths records in 15 and 27 EU countries showed 20,764 and 30,170 deaths in 2011, respectively. These are about one-third and two-fifth, in respective order, of the 1980 records. The fatality trend in the Arab countries during the past three decades was far above the international norms.

The upper and lower death limits for the year 2022 based on linear and compound models are within 51–57 thousand deaths. The average represents an increase of around 45% since 2011. The predicted limit for 27 EU countries is within 9400 deaths, as per cubical fit, and 20,300, as per exponential fit. The average represents less than half of the current record. The expected range for the 15 EU countries is 3–13 thousands deaths. On average, the latter represents <39% of the current record.

The crash death rates showed a continuous descending trend in the EU countries during the past three decades and will continue doing so during the coming decade. That in the Arab world will also continue dropping gently during the coming decade. The gap between Arab and EU countries is continuously increasing with time and is expected to do so during the coming decade unless proper counteractions are considered. Furthermore, the rates in the Arab countries are quite misleading because of the clear difference in the vehicle ownership rate and average vehicle-miles travelled between the Arab countries and EU ones. The fatality rates per 100,000 population and per 10,000 vehicles in 15 EU countries will asymptotically head towards zero in about a decade time. That in the Arab countries is not so. An inverse model shows that the annual death rate will be close to 12 deaths per 100,000 population in a decade time. That for the 27 EU countries will be close to 1.5. In other words, while deaths rates per population in EU countries drop drastically by the year 2022, the rate in the Arab countries will increase by 16%. The rate per 10,000 vehicles will drop by 10%.

Such poor safety records in the Arab countries require careful reading, proper interpretation of the results and extensive research since there are many factors leading to such high rates in traffic deaths.

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Our Shared Vision
A world free of road crash death and injury

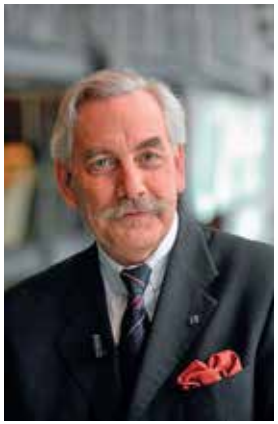
Our Shared Mission
The sustainable reduction of road crash death and injury with a priority on low- and middle-income countries

The Global Road Safety Partnership wishes to thank all involved in the production of the 2014 Annual Report.

Statistics and infographics supplied by Bloomberg Philanthropies and from the World Health Organization Global Status Report on Road Safety 2013.

TABLE OF contents

FROM THE chair



Dr Jean-Yves Le Coz,
Expert Leader
'Road Safety',
Renault SAS and
GRSP Chairman

The year 2014 was a strong one for the Global Road Safety Partnership, consolidating upon the growth experienced in 2013 and firming our position as a key actor in the development and implementation of global road safety good practice.

The year was also significant from a global perspective within the Decade of Action for Road Safety, 2011-2020. The publication last year of the Global Status Report on Road Safety 2013 reinforced the need for a united global effort and provided the road safety community with the data required to better target actions. Conversations and negotiations regarding the inclusion of specific road safety oriented language within the post-2015 Sustainable Development Goals took on heightened importance – and rewardingly, current drafts indicate a level of success to the campaign. Recognition of the road safety cause on this stage has the potential to encourage a significant increase in global investment, and with it, provide the Decade with much needed impetus towards its goals.

In a continued effort to raise the profile of road safety on the agenda of our host organization, the International Federation of Red Cross and Red Crescent Societies, GRSP undertook a number of initiatives designed to build on the interest generated through our workshops within the 2013 General Assembly. A key element within this campaign was the mapping, and subsequent publication, of the road safety interests and competencies of 142 National Societies. Strengthening road safety actions within the 189 National Societies and network of 17 million active volunteers gives GRSP a truly unique platform for global impact.

Our many programmes and initiatives contributed to an impressive body of work on which the Global Road Safety Partnership reported. Whether implementing multi-sector projects in communities in Asia, building the capacity of city level road safety stakeholders in South America, advocating for policies to improve road safety in countries across Africa, or contributing to the road safety knowledge base on a global level, the partnership model on which GRSP was founded remains core to our success.

I wish also to stress that our strength as an organization, and most importantly our ability to contribute to improving global road safety, is directly tied to the support, expertise and collaborative generosity of our members and partners; I hereby take this opportunity to thank you.

To conclude, I remind one and all that the road safety community is relatively small in relation to the scale of the challenges we face. Yet with the commitment of those involved, the application of proven good practice, and a continued drive to position road safety on the global agenda, we can and will move towards our shared vision.

Dr Jean-Yves Le Coz
Chairman
Global Road Safety Partnership

GLOBAL ROAD SAFETY

Partnership

The Global Road Safety Partnership (GRSP) is a dynamic, professional, non-profit organization working globally through a proven 'public– private– civil society' partnership model to contribute to the United Nations Decade of Action for Road Safety through *a sustainable reduction of road crash death and injury with a priority on low- and middle-income countries.*

- The GRSP was **founded in 1999** as an initiative of the World Bank, the Department for International Development (DFID) and the International Federation of Red Cross and Red Crescent Societies (IFRC) in response to global recognition of road safety as a human-made disaster.
- The GRSP is a **hosted programme of the International Federation of Red Cross and Red Crescent Societies** giving the organization a unique auxiliary to government status and access to 189 National Societies and 17 million active volunteers.
- The GRSP is a membership organization with a growing list of active members representing leading global **private enterprise**, multilateral **development agencies**, **civil society** and **government** bodies.
- A **proven and cost-effective partnership model** underpins all GRSP field projects bringing together the multiple voices, experiences and expertise of the private sector, public sector and civil society with singular purpose.
- In 2014, GRSP has been active in road safety partnership projects encompassing **capacity building**, **advocating for policies** impacting on road safety and **knowledge development** in **43 countries**.
- GRSP is **actively advocating for safer road use** within the United Nations Road Safety Collaboration (UNRSC) as Chair of the 4th Pillar of the Decade of Action, 'Safer Road Users'.

A global crisis requires a global effort

The true scope of road crash death and injury is well documented on both social and economic levels. It is estimated that 1.24 million people are killed each year taking an immeasurable toll on families and communities. Up to 50 million people suffer serious, life-altering injuries which, in many low- and middle-income countries, directly contribute to the poverty cycle.

It has been recognized by the United Nations General Assembly in the resolution for the Decade of Action for Road Safety that 'The solution to the global road safety crisis can only be implemented through multi-sector collaboration and partnership'. Building and sustaining such partnerships is where the power of the Global Road Safety Partnership truly lies.

1.24 million
road traffic deaths every year.

As many as
50 million
are injured each year.

8th

leading cause
of death globally

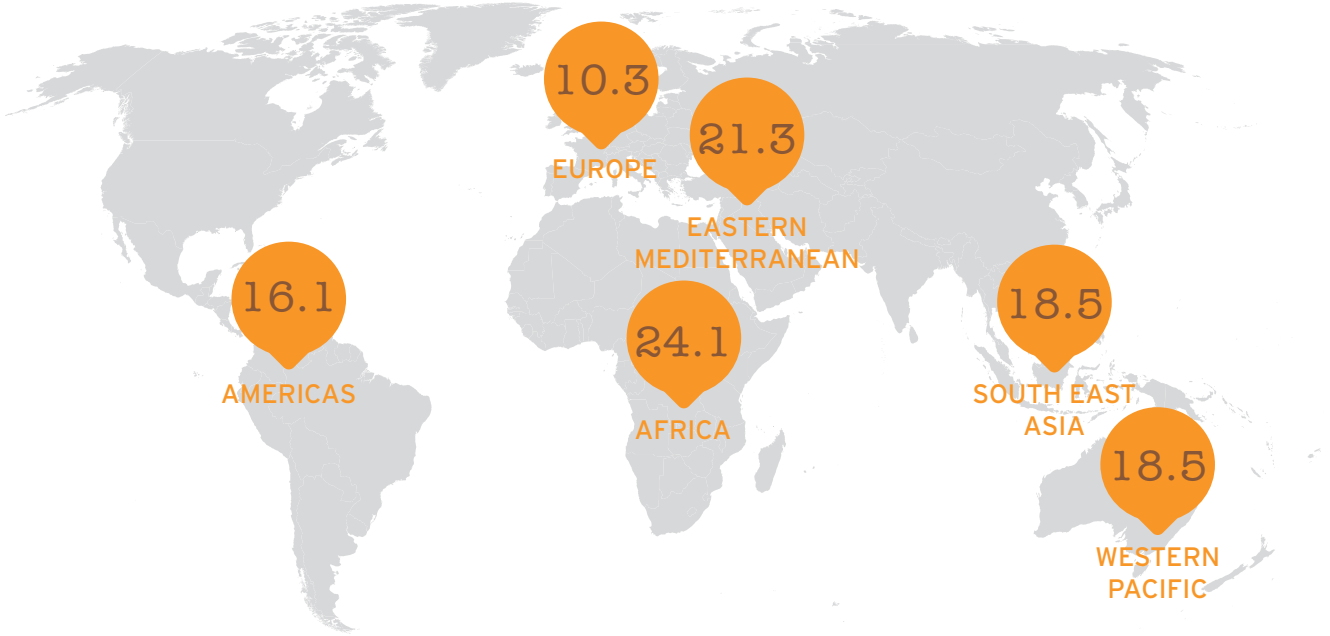
Leading cause of death
for those aged

15-29 years

50%

of all road traffic deaths are among pedestrians, cyclists or motorcycle riders

HOW SAFE YOU ARE DEPENDS ON WHERE YOU ARE: ROAD FATALITIES PER 100,000 POPULATION



OUR Programmes

Through a range of specific programmes, initiatives and partnerships, GRSP has a unique global footprint achieved through the cumulative expertise of our team and partners working for improved road safety outcomes in 43 countries across five regions.

Bloomberg Philanthropies Global Road Safety Programme

The 2010-2014 125-million-USD programme saw a consortium of partners including the Global Road Safety Partnership, World Health Organization, Johns Hopkins International School of Public Health, World Bank Global Road Safety Facility, Association of Safe International Road Travel and the World Resources Institute (EMBARQ) collaborate to reduce death and serious injury on the roads across 10 low-and middle-income countries, in: Brazil, Cambodia, China, Egypt, India, Kenya, Mexico, Russian Federation, Turkey and Vietnam.

Throughout 2014, the Global Road Safety Partnership strengthened its role as a global leader in the provision of city and national-based capacity building work, particularly in the areas of:

- **risk factor enforcement training** for traffic police and road safety stakeholders;
- developing and supporting a **road safety advocacy programme** with selected civil society organizations and Red Cross and Red Crescent National Societies; and
- managing the growing the **road safety grants programme**.

In September 2014, Bloomberg Philanthropies announced a new phase of the Initiative, committing 125 million US dollars to a further 5 years (2015-2019) see page 13.

Road Safety Grants Programme

The Road Safety Grants Programme was initiated in 2012 as part of the Bloomberg Philanthropies Global Road Safety Programme and is managed and administered by GRSP. Its purpose is to strengthen the capacity of NGOs to advocate for improvements in road safety policy and actions in order to reduce deaths and serious injuries as a result of road crashes. During 2014, the programme supported 20 active grantees working in seven countries.

For more detailed information see www.grsproadsafety.org/grants-programme

Global Road Safety Initiative

The Global Road Safety Initiative is a proven collaboration harnessing the road safety expertise of globally respected private sector organizations to develop and implement community- and city-based interventions designed to contribute to reducing deaths and injuries on the road which are data led, rigorously evaluated, cross-sectorally engaging and ultimately sustainable.

Administered by GRSP, the GRSI is funded by **Michelin**, **Renault**, **Shell**, **Total** and **Toyota**.

For more detailed information see www.grsproadsafety.org/what-we-do/global-road-safety-initiative

EuroMed Transport Programme

The 'EuroMed Transport: Support to the MENA Road Safety Programme' aims to provide capacity building and technical assistance to road safety officials in 8 beneficiary countries in the MENA region, namely Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Palestine and Tunisia. The multi-sector, evidence based and result oriented in-country pilot projects form an important component of the programme funded by the European Union.

For more detailed information see www.grsproadsafety.org/what-we-do/eu-mena

TRACECA Road Safety II

TRACECA (**Tr**ansport **C**orridor **E**urope-**C**aucasus-**A**sia) is an international transport programme involving the European Union and member states of the Eastern European, Caucasian and Central Asian region, namely: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

Working with partners including Eastern Alliance for Safe and Sustainable Transport (EASST), the Red Cross Global First Aid Reference Centre (GFARC), automobile clubs and Red Cross Red Crescent National Societies, the programme aims to help build both government and civil society stakeholder capacity, promote long-term and sustainable partnership and knowledge sharing, and increase collaboration and cooperation within the region with a focus on safer road users and improved post-crash care.

By Region

AFRICA

Africa is home to a mere 4%* of the world's registered motor vehicles, yet globally the continent experiences the highest rate of road traffic fatalities. Rapid increases in motorization in the many fast-growing African economies poses an enormous threat in coming years. Our work across the region focuses on interventions around identified key risk factors, such as seat-belts, speed, and drinking and driving. Taking momentum from our successes, we continue to work collaboratively and to strengthen local partnerships, addressing risky road behaviour and building a stronger culture of road safety across Africa.

In 2014, GRSP contributed towards:

- Improving road safety in Zambia through engineering interventions and the introduction of 'Safe to School – Safe to Home' methodology in Lusaka city.
- Advocating to strengthen school transport safety standards in Kenya and to reduce vehicle speed around schools.
- Leading 'Safe Roads 4 Youth' programme in South Africa, which has provided actionable insights into effective approaches to drinking and driving prevention.
- Facilitating knowledge sharing between road safety stakeholders from 30 countries through the 3rd GRSP African Road Safety Regional Seminar.

**Global Status Report on Road Safety 2013, WHO*

AMERICAS

Whilst globally the Americas as a region has the second lowest rate of road traffic fatalities worldwide with 16.1* deaths per 100,000 habitants, the disparity between north and south is alarming.

Our work in the Americas has focused on the development and application of a replicable enforcement 'Train the Trainer' programme in both Brazil and Mexico. GRSP was also the driving force behind the development of the Proactive Partnership Strategy (PPS), a process for planning and implementing road safety interventions based on reliable data from multiple sources.

Some of the highlights of our achievements include:

- **Ensuring more than 6,500 police in Mexico are trained in the safe efficient set-up of alcohol checkpoints and seat-belt wearing enforcement.**
- **Delivering Train the Trainer workshops in Brazil, with more than 1,300 road safety stakeholders in attendance with the majority being road police.**
- **Securing the adoption of the PPS across Brazil, for implementation in all 27 state capital cities and in Brasilia.**

Global Status Report on Road Safety 2013, WHO

ASIA PACIFIC

In Asia Pacific, the majority of people killed annually in road crashes are vulnerable road users – pedestrians, cyclists and motorcycle riders. In fact, vulnerable road users account for 50% of all road traffic deaths in the region.

As a result, GRSP has developed and implemented innovative strategies toward making cities safer across the region, in particular for these vulnerable road users. All our programmes are designed to target and address the locally identified road safety risks, such as helmet-wearing, child pedestrian safety and speed.

Regional highlights include:

- Building the capacity of every road police person in Cambodia through training, mentoring and coaching programmes.
- Working with local transport companies in Vietnam to put into place drink drive policies and initiatives.
- The replication and expansion of the 'Safe to School – Safe to Home' programme in Vietnam and China reaching more than 12,000 students.
- Engineering improvements and slower speed zones around schools participating in the 'Safe to School – Safe to Home' programme.
- Supporting the passage of the Road Traffic Law in Cambodia, which includes motorcycle passenger helmet requirements.
- Guiding the development of strategic plans for drinking and driving enforcement in India, and training police in strategic and targeted enforcement.

Our efforts demonstrate that inexpensive public health interventions and community-based projects can make a real and sustainable difference.

EUROPE AND CENTRAL ASIA

Europe and Central Asia is a region of disparity. While a number of western European countries enjoy the lowest road crash fatality rates anywhere in the world, many of the fast developing but poorer economies suffer some of the highest fatality rates amid rapid increases in motorization.

Despite many notable improvements in vehicle safety, drink-driving and speed continue to be critical contributing factors in road traffic crashes. As a consequence, our work in the region is focused on addressing these road safety risks and others, such as seat-belts and child restraints.

Highlights of our progress in the region include:

- Road safety situational assessments undertaken and multi-disciplinary national level working groups constituted in 10 countries.
- Drafting and delivering a report on pedestrian safety to the Russian government with recommendations for improving the situation.
- Certification of Master Trainers (Training of Trainers) in first aid for road crash response – resulting in more than 400 people being trained.
- Progressing the adoption of child restraint standards in Russia.
- Building the capacity of road police in Russia to enforce seat-belt wearing and to manage travel speeds.
- Working with the Turkish Red Crescent Society to advocate for improvements to Turkish seat-belt legislation.

MIDDLE EAST AND NORTH AFRICA (MENA)

Globally, the Middle East and North Africa (MENA) region has the second highest road fatality rate, with 21.3* deaths per 100,000 population. Although authorities and some national organizations have taken targeted action towards increasing road safety, for example adopting national speed limits, many strategies remain poorly implemented or enforced.

Through enhanced training techniques and supporting the implementation of good practice interventions, GRSP is building the capacity of road safety stakeholders to address risk factors impacting road safety in the region.

Achievements include:

- Developing and delivering a French language Road Safety Audit course in collaboration with ARRB used to train 20 national road safety stakeholders in Morocco.
- Developing and testing a contextualised Defensive Driving Training (DDT) curriculum suitable for the road environment in Jordan.
- Enhanced road safety management practices at a public transport company in the city of Sfax, Tunisia has paved the way towards the amendment of road safety guidelines within the Ministry of Transport.

GLOBAL

Highlights

GRSP welcomed two new members who joined the partnership in 2014, Stars Foundation and MAPFRE Foundation (Fundacion MAPFRE).

Founded in 2001 by Al-Dabbagh Group and based in London, Stars Foundation invests in organizations and ideas that transform the lives of disadvantaged children and their communities globally. Stars is committed to reaching 20 million people by 2020 through a range of programmes all underpinned by a set of core principles:

- A focus on improving the wellbeing of children.
- A belief in unlocking the power of local organizations.
- A commitment to sharing examples of effective practice.
- Accelerated progress through partnerships.

MAPFRE Foundation was established on 5 November 1975 and is an institution sponsored by the Spanish insurance group MAPFRE. The foundation's aim is to contribute to achieving objectives of general interest to society, including:

- Promoting the safety of people and their assets, focussing particularly on road safety, medicine and health.
- Enhancing quality of life and of the environment.
- Contributing to improving the economic, social and cultural conditions of the more disadvantaged people and sectors within society.

Both organizations bring a wealth of experience to the partnership and GRSP looks forward to working closely with each.

2014 International Road Safety Executive Dinner

October 30 saw GRSP host the 2014 International Road Safety Executive Dinner at the President Wilson Hotel in Geneva.

It was a distinguished gathering comprising thought leaders, advocates and innovators in the field of road safety. Guests were honoured to have on the evening as special guest and speaker, His Excellency Amr Al Dabbagh, Founding Chairman of new GRSP member, Stars Foundation, who spoke eloquently on the principles of 'Giving, Earning and Sustaining'.

142 National Societies provide feedback on road safety work

In 2014 GRSP conducted a mapping project involving 142 National Societies of Red Cross and Red Crescent to assess the capacity of National Societies to engage in road safety. The report arising from this project provides a comprehensive overview of the scope of work currently being undertaken in this field through the National Society and volunteer networks. It also serves as both a guide to the potential work that could be instigated, and a conduit for enhanced sharing and communication on matters of road safety between National Societies themselves, and with the Global Road Safety Partnership.

Amongst other findings, the report shows that whilst **70% of National Societies** do carry out road safety interventions, **82% of National Societies** expect to play an increasing role in road safety in the future. The report also documents funding sources for National Society road safety work, details private sector partnerships, shares case studies of good practice and more.

Introducing the Bloomberg Philanthropies Initiative for Global Road Safety

Building on the success of phase 1 of the Bloomberg Philanthropies Initiative for Global Road Safety, the year 2015 marks the beginning of the second five-year phase of the Bloomberg Philanthropies' programme aiming to reduce fatalities and injuries from road traffic crashes. For the second phase, with a new commitment of US$125 million over five years from Bloomberg Philanthropies, ten cities and five countries have been selected as official participants in the Bloomberg Initiative for Global Road Safety (BIGRS). A total of 20 cities were invited to submit proposals to compete for funding and technical support to implement good practice road safety and to save lives. Ten were selected to progress. With assistance from the world's leading experts in road safety, the chosen cities will establish an elite network of visionary municipal leaders who commit to implementing bold, new efforts to save lives and protect their citizens from road traffic injuries. The BIGRS will also work with five countries at a national level to strengthen road safety legislation. The Road Safety Grants Programme managed by GRSP will also be expanded.

Safe to School - Safe to Home

The year saw replication and expansion for one of GRSP's flagship programmes, 'Safe to School - Safe to Home'. The lead implementation in Vietnam expanded into new schools, reach expanded in China, and a commitment for funding has been secured for replication in Dong Nai province through Shell Vietnam. Work is also underway with a number of Shell affiliates in the region to introduce the programme in their countries of operation. Further, the methodology has been introduced in the 10 countries of the TRACECA programme.

Developed by GRSP through the Global Road Safety Initiative, the programme in 2014 also saw the addition of a specialized 'school road safety assessment tool' developed in collaboration with ARRB.

GRSP 2014 Asia and Africa Seminars focus on Child Safety

500 children die on the roads each day. Thousands more are seriously injured.

With these figures driving the theme for the Third UN Global Road Safety Week 2015 (4 – 10 May 2015), 2014 saw GRSP host the 7th annual Asia regional event and the 3rd African event, both with a focus on strengthening child road safety in the regions. Since the first Asia regional seminar held in 2007, GRSP regional seminars and workshops have cemented themselves as key events on the global road safety calendar.

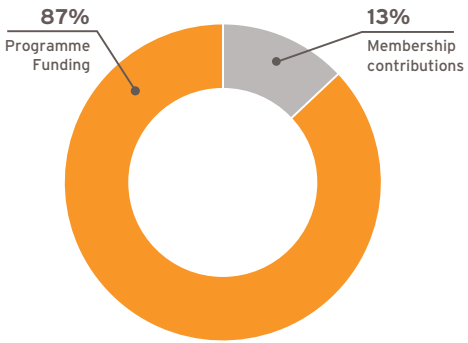
In total, over 430 road safety experts, practitioners, business representatives and senior government officials from all over the world shared ideas, initiatives and best practices to help reduce road deaths and injuries amongst vulnerable road users and stimulated support and action around the United Nations Decade of Action for Road Safety 2011-2020.

The events are made possible with the support of our members Michelin, Renault, Shell, Total and Toyota.

Financials

Income

Total = CHF 6.84M (USD 7.47M)

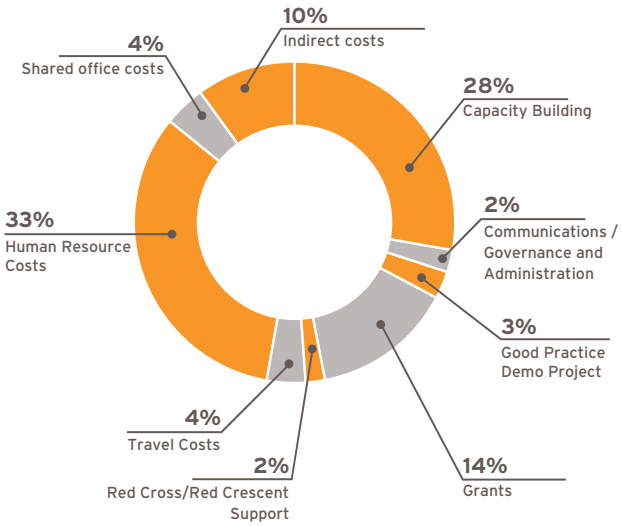


Main sources of Programme Funding

Bloomberg Philanthropies
European Union
Global Road Safety Initiative - 2
Miscellaneous

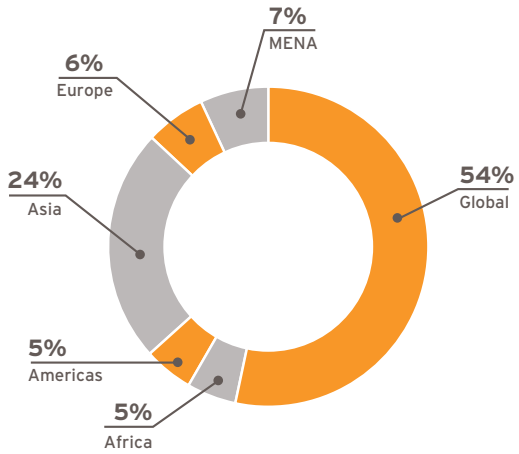
Expenditure by activity area

Total = CHF 6.35M (USD 6.94M)



Expenditure by region

Total = CHF 6.35M (USD 6.94M)



Business Partners

Bridgestone
BP
Chevron Corporation*
Honda
Michelin*
Nestlé*
Renault SAS*
Shell*
Total*
Toyota
Zurich Insurance*

Multilateral Partners

African Development Bank
Asian Development Bank
Inter-American Development Bank
UNECA
UNESCAP
UNECE
UNESCWA
World Health Organization*
The World Bank*

Civil Society Partners

ARRB Group Ltd*
FIA Foundation for the Automobile and Society
ICAP
International Federation of Red Cross and Red Crescent Societies*
International SOS Foundation*
Mapfre Foundation
Stars Foundation
World Rescue Organisation*

Government Partners

DFID*
Mexico MoH
NHTSA

Donors

Bloomberg Philanthropies

*Executive Committee members

Join the Partnership

It is widely acknowledged that partnership is key to creating a real and sustainable impact on road safety. The Global Road Safety Partnership is a demonstrated leader in building partnerships, designing and implementing evidence-based road safety interventions, and is a respected contributor to the field of road safety good practice both within private organizations and at a global level. Members access and enjoy:

- The **Capacity** of our global team of experts and extensive network of experienced partners.
- The **Reputation** of being a member of a world-class global network of business, government and civil society.
- The **Opportunity** to leverage the complementary efforts, expertise and energy of other members to make a sustainable contribution to road safety within your organization, community and beyond.

For further information on joining Global Road Safety Partnership, refer to our website at www.grsproadsafety.org

While there, why not look at the growing list of organizations that have signed the Global Road Safety Commitment, a pledge to work towards zero death and injury within individual organizations.

We commit

www.grsproadsafety.org

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The Global Road Safety Partnership is hosted by:

International Federation
of Red Cross and Red Crescent Societies

GLOBAL
ROAD SAFETY
PARTNERSHIP

MENASAFE

Co-funded by the
Erasmus+ Programme
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Master Curriculum, Capacity Building and Network Development in Traffic Safety in Egypt, Jordan and Lebanon
AGREEMENT NUMBER – 2015–3172/001-001
Project reference number – 561768-EPP-1-2015-1-PL-EPPKA2-CBHE-JP