Outline of the Presentation

- Definition of some general terms related to road traffic accidents and injuries;

- 100 years of road safety;

- Global magnitude and trends of road traffic fatalities;

- Story of HICs.

An accident

- An accident is a specific, unpredictable, unusual and unintended external action which occurs in a particular time and place, with no apparent and deliberate cause but with marked effects.

- It implies a generally negative outcome which may have been avoided or prevented had circumstances leading up to the accident been recognized, and acted upon, prior to its occurrence.

- Experts in the field of injury prevention avoid use of the term 'accident' to describe events that cause injury in an attempt to highlight the predictable and preventable nature of most injuries.

- Such incidents are viewed from the perspective of epidemiology - predictable and preventable.

- Preferred words are more descriptive of the event itself, rather than of its unintended nature (e.g., Crash, collision, drowning, fall, etc.)
Traffic collision

- A traffic collision, also known as a traffic accident, motor vehicle collision, motor vehicle accident, car accident, automobile accident, Road Traffic Collision (RTC) or car crash, occurs when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole. Traffic collisions may result in injury, death and property damage.

Accident Severity

Fatal Accident
Grievous Accident
Simple Injury Accident
Property Damage Only

Road Accident

- Collision occurring on a public road and involving at least one moving vehicle.

Fatal – An accident in which one or more persons are killed outright on the spot or within 30 days of the accident is called a fatal accident.

Grievous – An accident in which a person has received injuries, such as fractures, concussions, internal lesions, crushing, severe cuts and lacerations and severe general shock, requiring medical treatment and detention in hospital.

Simple – An accident in which a person sustained injuries but need not be admitted to hospital. It can also include an accident victim who sustained injuries and was treated in hospital but not detained overnight.
- Property damage – A property damage type accident is when motor vehicles hit a pedestrian, another vehicle in traffic, a parked vehicle, an animal, a fixed object, etc. but no fatalities or injuries has been occurred.

Collision Type

1. Head on
2. Rear end
3. Right Angle
4. Side Swipe
5. Overturn
6. Hit object on Road
7. Hit object off Road
8. Hit Parked Vehicle
9. Hit Pedestrian
10. Hit Animal
11. Others

Collision Type

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11. Others
Accident Rate

- Number of accidents that have occurred over a given period of time, divided by the value of another variable selected in view of the question raised
  - km of roads,
  - km driven,
  - Population,
  - Number of vehicles on the road, etc.

- Accident rates are mostly used for comparisons between different geographical areas or periods of time.
The History of Road Safety

Classical Times: Romans had one way streets, parking laws, crossing places (stepping stones), pavements, and possible roundabouts. There are occasional references to accidents.

1800's
- 1875 there were 1,589 fatalities, mostly involving horse conveyance.
- Highway Act of 1835 prohibited riding on a footpath, and has regulations on the control and driving of carts and carriages.
- Licensing Act of 1872.
- The Locomotive (Red Flag) Act of 1865 with its speed limit of 4 mph in open country and 2 mph in towns is well known.

1916: LONDON “SAFETY FIRST” COUNCIL.
It aimed to reduce accidents by providing training for drivers in industry and public transport; street safety measures; and public campaigns.

1918: MOTOR LEGISLATION COMMITTEE.
Traffic lights: The first three colour traffic lights were installed in New York and were manually operated by the police. Automatic signals were introduced in the UK by the mid twenties.

1919: LEAGUE OF NATIONS.
A number of scientific and technical committees, one of which dealt with road traffic.

1922: US School Patrol system started.

1923: ARM SIGNALS CODIFIED.

1928: AGRICULTURAL MACHINERY (SAFETY) ACT.

1929: ALNESS COMMITTEE.
This was the Select Committee of the House of Lords set up to look at road accidents.

1930: THE HIGHWAY CODE.

1931: ROYAL COMMISSION ON TRANSPORT.

1933: DEPARTMENTAL COMMITTEE ON TRAFFIC SIGNS.
The committee decided on the size, colour and type of signs, and laid down fundamental principles for a signing system.

1939: THE ROYAL COMMISSION ON ROAD SAFETY.
It examined the highway problems in the U.K.

1942: KERB DRILL (Child road safety Program)

1943: ROYAL COMMISSION ON TRANSPORT.

1943: ROYAL COMMISSION ON ROAD SAFETY.
This was commissioned by the Minister of War Transport to examine road safety.

1945: DEPARTMENTAL COMMITTEE ON TRAFFIC SIGNS.

1946: The first of a series of Presidential Highway Safety Conferences held in the U.S.A.

1947: final report of the Committee on road safety

1954: THE ROYAL COMMISSION ON ROAD SAFETY.

1957: THE ROYAL COMMISSION ON ROAD SAFETY.

1963: THE ROYAL COMMISSION ON ROAD SAFETY.

1970: THE ROYAL COMMISSION ON ROAD SAFETY.

1973: THE ROYAL COMMISSION ON ROAD SAFETY.

1977: THE ROYAL COMMISSION ON ROAD SAFETY.

1981: THE ROYAL COMMISSION ON ROAD SAFETY.

1985: THE ROYAL COMMISSION ON ROAD SAFETY.

1990: THE ROYAL COMMISSION ON ROAD SAFETY.

1995: THE ROYAL COMMISSION ON ROAD SAFETY.

2000: THE ROYAL COMMISSION ON ROAD SAFETY.

2005: THE ROYAL COMMISSION ON ROAD SAFETY.

2010: THE ROYAL COMMISSION ON ROAD SAFETY.

2015: THE ROYAL COMMISSION ON ROAD SAFETY.
The History of Road Safety

1949: UN CONFERENCE ON ROAD AND MOTOR TRAFFIC
1951: ZEBRA CROSSINGS
   New zebra crossing was introduced.
1956: ROAD TRAFFIC ACT
   Introduce penalty
1955: THE SLOUGH EXPERIMENT
   This was a two year experiment to see if accidents could be reduced by intensive three E's work.
1961: TUFTY CLUB
1963: THE BUCHANAN REPORT
1965: "UNSAFE AT ANY SPEED"

The History of Road Safety

1963: Grove Hill, London, on 25th February 1900

The European Road Safety Federation was formed.

The History of Road Safety

1974: The first motor - car
1975: LEAGUE OF SAFE DRIVERS:
   The UK government launched its New Driver Safety Programme
1989: CHILDREN AND ROADS-A SAFER WAY
1994: Grove Hill, Harrow

The History of Road Safety

1997: ROAD SAFETY: THE NEXT STEPS
   An Interdepartmental review which set the one-third casualty reduction target and assessed how effective various measures
   PRINCE MICHAEL ROAD SAFETY AWARDS
1998: COMMITTEE OF PUBLIC ACCOUNTS
   THE NORTH REPORT:
   THE "TRINCA" REPORT:
   EDUCATION REFORM ACT: National Curriculum
1999: CHILDREN AND ROADS-A SAFER WAY
1990: CODE OF PRACTICE
   CHILDREN'S TRAFFIC CLUB
1993: THE EUROPEAN TRANSPORT SAFETY COUNCIL

The History of Road Safety

1994: The European Road Safety Federation was formed.
   The UK government launched its New Driver Safety Programme
   The Order of the Road was relaunched
   1994 was also the UN's International 'Year of the Family and some work was done under its heading.
   CRSOA and AMIDSO merged to form LARSOA.
1995: European Year of the Young Driver
   And so on ................
   UN Road safety week
   Safe system Approach
   Decade of Action

The History of Road Safety

1967: ROAD SAFETY ACT
   ROAD SAFETY: A FRESH APPROACH: This was a White Paper which had a significant impact at the time.
1968: "CHILDREN IN TRAFFIC"
   UN CONFERENCE ON ROAD TRAFFIC
   THE "ELECTRIC ROAD" DISPLAY
1970: INTERNATIONAL DRIVERS BEHAVIOUR RESEARCH ASSOCIATION
1971: INSTITUTE OF ROAD SAFETY OFFICERS.
   GREEN CROSS CODE
1974: ROAD TRAFFIC ACT
   Section 8 of this Act made road safety a statutory duty of local authorities.
1975: COUNTY ROAD SAFETY OFFICERS ASSOCIATION.

Historical Background of Accident

- The first road traffic accident - In 1771 the first accident involving a motor vehicle took place in Paris when a steam tractor hit a low wall in the grounds of the Paris arsenal.
- First fatal car accident - The first motor - car accident in Britain resulting in the death of the driver occurred in Grove Hill, Harrow - on-the Hill, London, on 25th February 1900.
• **First road traffic death** - The first road traffic death occurred on a terrace in the grounds of **Crystal Palace in London** on 17th August 1896. The victim was **Bridget Driscoll**, a 44 year old mother with two children who had come to London with her teenage daughter and a friend to watch advancing display.

The Crystal Palace at Penge (1854)

- The first recorded road traffic death (to a pedestrian) occurred in **London 1896**, the coroner committed that such an event should never been allowed to happen again.

- Since then **around 30 millions** lives have been lost to road traffic accident and many more millions people have been injured and crippled.

GLOBAL MAGNITUDE AND PATTERN

- **Road traffic injuries: the facts**
  - 1.24 million road traffic deaths occur every year
  - #1 cause of death among those aged 15-29 years
  - 3 out of 4 road deaths are pedestrian

- The number of injury could be as high as **50 million** - the combined population of five of the world’s large cities.

- Every day, more than **3,500 people are killed** (one person in about every 25 seconds) in road crashes worldwide; 137,000 more are injured or disabled.

At present:
- 8th leading cause of death overtaking tuberculosis and malaria as causes
- leading cause of death for young people aged 15-29 years
- leading cause of death for children aged 5-14 years
- leading cause of serious health loss for men aged 15-49 years
- 2nd leading cause of death for those aged 15-49 years
Distribution of Global Injury Mortality by Cause

Road traffic deaths accounted for 23% of all injury deaths worldwide.

Low-income and middle-income countries have the highest burden and road traffic death rates:
- Most (92%) of the world’s fatalities on the roads occur in low-income and middle-income countries,
- which have only 53% of the world’s registered vehicles where 84% of the world’s population live,
- Approximately, 62% of reported road traffic deaths occur in 10 countries.

Accident death rates in developing countries are much higher (at least 50 times) than in developed countries.

The African region has the highest road traffic death rate.

Traffic Fatality rates per 100,000 persons in 116 countries. Bangladesh is represented by red circle and Iraq is represented by the red square.
Deaths by violent causes Vs. RTA

- Even when deaths by various violent causes are considered, road traffic accident is found to be the leading cause accounting for 33 percent, 36 percent and 56 percent of the deaths in developed, developing and Middle-Eastern countries respectively.

Deaths by natural disasters Vs. RTA

- The road safety problem appears to be much more severe compared with other natural disasters such as earthquake, cyclone, tsunami etc.

- In last 35 years, there were ten major natural disasters which claimed about 1.4 million lives with an average 140,000 deaths per disaster while road traffic accidents alone account for 1.3 million deaths each year of which nearly 50 percent are in the Asia Pacific region with a clear sign of rapid increasing trends.

Characteristics of RTA problem: Global and Regional

- More than half of all global road traffic deaths occur among young adults between 15 and 44 years of age.

- Around 73% of all global road traffic fatalities are males.

- Vulnerable road users – pedestrians, cyclists and motorcyclists – account for a much greater proportion of road traffic collisions in low-income and middle-income countries than in high income countries.
Pedestrian, cyclists and user of motorized two-wheelers—collectively known as Vulnerable Road Users—this proportion is higher in the poorer economies of the world.

• According to WHO estimates for 2002, there were 180,500 children killed as a result of road crashes. Some 97% of these child road deaths occurred in low-income and middle-income countries.

• More boys are injured than girls, and children from poorer families have higher rates of injury. Even in high-income countries, research has shown that children from poorer families and ethnic minority groups have higher rates of unintentional injury, particularly in the case of child pedestrians.

Global estimates of costs of road traffic crashes:

• US$ 518 billion globally;

• US$ 65 billion in low-income and middle-income countries, exceeding the total amount received in development assistance;

• between 1% and 1.5% of gross national product in low-income and middle-income countries; and

• 2% of gross national product in high-income countries.

Socioeconomic and health effects of road traffic injuries:

<table>
<thead>
<tr>
<th>Region</th>
<th>GHP, 1997 (US$ billion)</th>
<th>Estimated annual injuries</th>
<th>As percentage of GHP</th>
<th>Gross (US$ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>670</td>
<td>1</td>
<td>0.7</td>
<td>518</td>
</tr>
<tr>
<td>Asia</td>
<td>7,626</td>
<td>1</td>
<td>76.1</td>
<td>656</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>1,000</td>
<td>1</td>
<td>10.9</td>
<td>109</td>
</tr>
<tr>
<td>Middle East</td>
<td>439</td>
<td>1.5</td>
<td>7.4</td>
<td>499</td>
</tr>
<tr>
<td>Central and West Asia</td>
<td>439</td>
<td>1.5</td>
<td>9.9</td>
<td>499</td>
</tr>
<tr>
<td>South Asia</td>
<td>1,625</td>
<td>6.2%</td>
<td>64.1</td>
<td>1,625</td>
</tr>
<tr>
<td>Highly industrial countries</td>
<td>22,605</td>
<td>3</td>
<td>453.9</td>
<td>22,605</td>
</tr>
<tr>
<td>Total</td>
<td>23,230</td>
<td></td>
<td></td>
<td>23,230</td>
</tr>
</tbody>
</table>

Note: Gross national product

Trends in road traffic injuries: global and regional trends:

Trends in prereitirement years of life lost annually and federal research expenditures for major causes of death in the United States.
• According to WHO data, road traffic deaths
  – 0.9 million in 1990
  – 1.2 million in 2004
  – 1.24 million in 2013

• Low-income and middle-income countries account for the majority of this increase.

• Since the 1960s and 1970s, there has been a decrease in the numbers and rates of fatalities in high-income countries.

• At the same time, there has been a pronounced rise in numbers and rates in many low-income and middle-income countries.
**Trends in US**

*Road Safety* Continues to improve.

In 2009 the US had the lowest Level of traffic Fatalities. Since 1954 and this is the 18th Consecutive year the fatality rates have fallen.

2009 - 33,963 (drop of 8.9%) as compared to 2008 - 37,261 deaths.

The fatality rate for 2009 declined to the lowest on record to 2008 - 1.16 fatalities / 160 million vehicle km traveled (VKT) down from 2008 - 1.25 fatalities / 160 million VKT.

**Global Projections and Predictions**

- Currently, there are two main models for predicting future trends in road traffic fatalities. These two models are:
  - the WHO Global Burden of Disease (GBD) project, using health data;
  - the World Bank’s Traffic Fatalities and Economic Growth (TFEG) project, using transport, population and economic data.

- Both predict a substantial increase in road traffic deaths if present policies and actions in road safety continue and no additional road safety counter-measures are put into place.

- The model predicts the following scenario for 2020 compared with 1990:

\[
\text{Fatal injury accidents (Dutch)}
\]

![Fatal injury accidents (Dutch)](image)

It is extremely significant that fatality rates are now lower than in 1954, when average speeds were lower.

Some of this can be attributed to:
- laws against drink driving,
- seatbelts and
- improved car design with crumple zones and ABS brakes.

However US transportation secretary Ray LaHood cautioned. “There are still far too many people dying in traffic accidents. Drivers need to keep their hands on the steering wheel and their focus on the road in order to stay safe.”
Global Projections and Predictions...

- Road traffic deaths are predicted to increase by 83% in low-income and middle-income countries (if no major action is taken), and to decrease by 27% in high-income countries. The overall global increase is predicted to be 67% by 2020 if no major action is taken.

- South Asia will record the largest growth in road traffic deaths, with a dramatic increase of 144% between 2000 and 2020. If the low-income and middle-income countries follow the general trend of the high-income countries, their fatality rates will begin to decline in the future, but not before costing many lives.

Projected Ranking

- Road traffic injuries will rise in rank to fifth place as a major cause of death worldwide.

- Road traffic injuries will rise to become the third leading cause of Disability Adjusted Life Years (DALYs) lost.

- Road traffic injuries will become the second leading cause of DALYs lost for low-income and middle-income countries.

- Road traffic deaths will increase worldwide, from 0.99 million to 2.34 million (representing 3.4% of all deaths).

- DALYs lost will increase worldwide from 34.3 million to 71.2 million (representing 5.1% of the global burden of disease).
ALYS in low and middle income countries
(children age 5-14)

Leading Causes of Death, 2004 and 2030 compared

Why Rise and Fall in HICs??

Overview
- History of RTI death counts in high income countries. Three stories:
  - Story 1: Role of income growth
  - Story 2: Role of vehicle mix
  - Story 3: Role of road safety policies

- RTI death counts in low income countries
  - What will be the story here?

Why did road traffic deaths first rise and then fall in rich countries?

Story 1: Income growth

Income growth and RTI

India: RTI peaks in 2047 ($8,000 income)
Explaining the history of rich countries:

The Income Story

- RISING ROAD TRAFFIC DEATHS
  - Countries become richer in time
  - Wealth leads to more cars and more travel
  - More cars/travel kill more people
  - Road deaths initially rise with income

- FALLING ROAD TRAFFIC DEATHS
  - At some income level countries begin to worry and implement safety policies
  - Road deaths fall with income

- Implications for low income countries: Rising death toll for decades

Why did road traffic deaths first rise and then fall in rich countries?

Story 2: Motorization leads to shifting risks vulnerable road users to car occupants

Imagine a motorizing society ...

Increasing car ownership implies fewer pedestrians

Risk Reduction: Pedestrian → Car Occupant

assumptions:
- Each car imposes a risk, r, on each pedestrian
- For simplicity assume occupants have zero risk

Comparison: Model versus Historic data

Dealing with mixed-mode transport growth

Need to think about:
- Pair-wise risks:
  - scooters are at risk from cars, pedestrians, buses, other scooters
  - Include environment as a risk factor (i.e. single vehicle crashes)
- Need suitable models for motor vehicle fleet growth
Estimating RTI in mixed-mode motorization

Number of RTI deaths = (Number of crashes) * (risk of death in crash)

Number of car-scooter crashes = (number of cars)(number of scooters)

Risk of death in a crash

<table>
<thead>
<tr>
<th>Risk of death</th>
<th>Pedestrian</th>
<th>Scooters</th>
<th>Cars</th>
<th>Bus</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.040</td>
<td>0.090</td>
<td>0.105</td>
<td>0</td>
<td>N/A</td>
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<tr>
<td>0.090</td>
<td>0.040</td>
<td>0.090</td>
<td>0.105</td>
<td>0</td>
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</tbody>
</table>

* Derived from review of real-world crash data from US and EU data (scooters)

Now consider a few different motorization scenarios

1. Car based motorization in rich countries (already described)
2. Car based motorization in developing countries
   - 80% travel by bus + high car use (can outnumber scooters by 10 times)
3. Scooter based motorization in developing countries
   - 40% travel by bus + high scooter use (scooters)

Why did road traffic deaths first rise and then fall in rich countries?

Story 3: Road safety “policy era”

Effect of Income on RTI Death Rates

Income, Real GDP per Capita, PPP

Effect of Time on RTI Death Rates

Year

USA

UK

AUS, AUT, BEL, CAN, CHE, DEU, DKK, FIN, FRA, UK, RUL, ITA, ESP, NLD, NOR, SWE, USA
Why did death rates decline in rich countries?

(even after accounting for the role of rising income ...)

Policy history - Sweden

- 1967 (September): Sweden shifts from left to right hand driving
- 1968: Sweden established a new authority, the Road Safety Agency
- 1979: Front seat belts become mandatory
- 1975: Helmet law for motorcyclists
- 1976: Driving test for motorcycle
- 1977: Daytime running lights
- 1978: Moped helmet
- 1979: Cycle light in nighttime
- 1982: All slow moving vehicles shall have a warning sign
- 1986: Reflector on cycles (front, back and wheels)
- 1987: Speed limit increased
- 1990: Blood Alcohol Content limit lowered from 0.05 to 0.02%; Start trials with automatic speed enforcement
- 1994: Limit for serious intoxicated 0.1%; Number of random breath tests doubled; Speed limit enforcement by laser
- 1995: Mandatory seat belts for all new cars
- 1996: Car seat belt sign in all new cars
- 1997: Vision Zero is taken by Parliament
- 1998: Roadside steel wire barriers
- 1999: Seat belt law expanded (tax drivers, bory) mandatory in winter conditions

Sweden

Policy History - UK

- 1977: Heavy vehicle driving tests; limits on heavy vehicle driving hours
- 1977: Compulsory helmets, 50 mph speed limit due to traffic calming
- 1977: Traffic calming introduced
- 1978: New standards for braking; Mandatory rear fog lights on new vehicles
- 1986: New standards for crash test fences; Institution of Highways & Transportation produces guidelines on accident reduction
- 1992: Front seat belt use mandatory
- 1994: Speed limiting devices required to be fitted on lorries and tractors
- 1996: National target to reduce deaths by 50% by 2000; Amber flashing light mandatory on all vehicles
- 1997: Close proximity and wide angle rear view mirrors mandatory on new heavy vehicles
- 1998: All new heavy goods vehicles must have 60 mph limit; speed cameras
- 1999: New Traffic Calming Regulations result in wide range of implementations
- 1999: Speed limits lowered for buses and trucks
- 1996: Driving lessons strengthened
- 2000: Government issues a new road safety strategy
United Kingdom

Policy History - UK

1970: Heavy vehicles driving tests; limits on alcohol
1972: Bus and coach drivers must pass road safety tests
1973/74: Compulsory helmets, 50 mph speed regulations
1975: New standards for helmets, guards on bonnets introduced
1976: Heavy vehicles introduced; new side window requirements
1977: New front seat safety belts required in cars
1978: Front seat safety belts required for buses and trucks
1985: Single round headlights required
1986: Front four-wheeler standard introduced
1989: New road sign standard introduced
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1995: New road sign standard introduced
1996: Speed limits lowered for buses and trucks
1996: Tail lamps strengthened
2000: Government issues a new road safety strategy

Policy History: Netherlands

1971: Mandatory seat belts in new cars
1972: Mandatory helmets for motorcycles
1974: Speed limits reset; Alcohol limit set to 0.05%
1975: Mandatory helmets for mopeds
1976: Rules for children in cars (e.g. forbidden on laps in front)
1977: Heavy vehicles, trailers must have reflective markings
1979: Mopeds and bicycle reflectors on pedals
1983: 30 km/h zones introduced
1985: Periodic vehicle inspection tests required
1987: Mopeds, bicycles require side reflectors
1990: Rear seat safety belts required in new cars
1992: Mandatory use of seat belts in lorries and vans, and in car rear seats.

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Summary: Rise-fall of deaths in rich countries

The “income” explanation
- More cars kill more people ➔ road deaths initially rise with income
- At some income level countries begin to care about the rising death toll and implement policies ➔ Road deaths later fall with income

The “mode shift” explanation
- As people move from being pedestrians to car occupant, total societal risks rises initially due to threat from cars and later falls as pedestrians are eliminated from the system.

The “policy era” explanation
- Starting in the 1960s, countries established national road safety agencies, gave them legislative teeth. Over successive years, interventions were implemented, compliance was improved, deaths came down.
SUNflower: common themes

• All three countries:
  – Sustained efforts: Policies have developed over several decades
  – Integrated plan: Road safety plan integrated within the road transport plan
  – Targeted Policies: e.g. speeding, VRUs, infrastructure, drinking and driving
    • Netherlands and Sweden have explicit visions that focus on reshaping the road transport system to be inherently safe
  – Target setting: Set quantitative targets, which are important for keeping traffic safety on the political agenda

Road traffic injuries in low and middle income countries

• Limits to what can be learnt from high income countries:
  LIC are dramatically different from HIC in the past
• Existing sources about deaths and injuries in LIC are of poor quality

Thank you all
Ensure Safety for All