Session 6: Safer Vehicles

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Outline

- Vehicle Related Road Crash Fatalities and Injuries.
- Key Issues in Vehicle Safety
- Vehicle safety technology
- Policy levers available
- Risks to manage
Vehicle Related Road Crash Fatalities and Injuries

- There is a disproportionate distribution of population, road crash fatalities, and registered motor vehicles by country income categories.
- The motorization rate in 2015 as reported by OICA, was an average of 182 vehicles per 1,000 population, which was an increase of 27% from 2005. The most substantial increments are observed in developing regions, 141% in Asia; 60% in Latin America and 35% in Africa. Even though motorization in LMICs are low, their motorization increases are very high.

Comparison of distribution of Population, Road Crash Fatalities and Motor Vehicles between High, Middle and Low income countries.

Data from 2018 WHO Global Status Report on Road Safety
Key Issues in Vehicle Safety

• Human capacities and frailties:
  ➢ Approach to vehicle safety needs to be based on Safe System

• Vehicle Occupants:
  ➢ Comprise over of 45% of LMICs total road crash fatalities. Vehicle to vehicle crashes are the most common crash type - frontal impacts followed by side impacts.
  ➢ Factors influencing crash severity include speed of travel, seat-belt use, vehicle mass and the vehicle level of crash protection.
Key Issues in Vehicle Safety

• **Pedestrians, cyclists, and Motorcyclists:**
  - Comprise 50% of LMICs total road crash fatalities (under-estimate)
  - Majority pedestrian fatalities are due to collisions with vehicle fronts.
  - Reduction of pedestrian crash risk depends upon their separation from the high speeds of motor vehicles or, where shared use is common sufficiently low vehicle impact speed to prevent severe crash injury and provision of crash protective car fronts addressing the vulnerabilities of the high-risk user groups.

• **Motorcyclists:**
  - Comprise over of 12% of LMICs total road crash fatalities. Much higher in some LMIC’s. (again, under-estimated)
  - Majority of road crash fatalities are due to head injuries. Other injuries include lower limb injuries from direct contact with impacting vehicle, ground or objects (due to off road impacts)
Role of Vehicle Safety in Road Safety Improvement

Vehicle safety addresses the safety of all road users and comprises measures to help:

1. Avoid a crash (crash avoidance)
2. Mitigate the severity of a crash before it occurs through slowing the vehicle through intelligent speed management or advanced braking (crash mitigation)
3. Reduce injury in the event of a crash (crash protection)
4. Reduce the consequences of injury (post-crash response)
Technology – Active Vehicle Safety Features

• Active Safety systems help prevent crashes (through hazard detection, avoidance and mitigation), they control the dynamics of the vehicle.

• Examples of active safety systems include:
  ➢ **Typical examples:** Anti-lock Braking System (ABS); Traction Control System (TCS); Stability Control System (ESP)
  ➢ ‘Emerging’ technologies: Cruise control (ACC); Road sign detection; Intelligent Speed Assistance (ISA) [Note: EU requirement from 2021]; Blind spot detection; Lane departure warning; Pedestrian detection and vision enhancement (night/automated vision, adaptive headlights), Autonomous Emergency Braking (AEB)
Technology – Passive Vehicle Safety Features

• Passive Safety systems help mitigate the consequences of crashes. They protect vehicle occupants and vulnerable road users involved in the crash.

• Examples of passive safety systems include:
  
  ➢ **Typical examples:** Seatbelts, airbags, body structure with programmed deformation, retractable steering column, head restraints, fuel cut-off.

  ➢ **Emerging technologies:** Automatic emergency call (eCall)
Technology – Active and Passive Technology Advancement

- Passive safety (red): Reduced personal injury in event of an accident
- Active safety (blue): Avoiding an accident

Key Technologies:
- Side impact protection
- Air bag
- Active seat belts
- Deformation elements
- Compound glass
- Seat belt
- Safety cell
- Underfloor concept
- Automatic emergency call
- Precrash action
- Smart adaptive controls
- Autonomous driving
- Collision avoidance
- Platooning
- Highway copilot
- Co-pilot
- Over-ride
- Driver assistance
- Pilot

Timeline:
- 1960: ABS, ETC
- 1970: ABS, ETC
- 1980: ABS, ETC, EBD
- 1990: ABS, ETC, EBD, ESP
- 2000: ABS, ETC, EBD, ESP, ACC
- 2010: ABS, ETC, EBD, ESP, ACC, ABS
- 2020: ABS, ETC, EBD, ESP, ACC, ABS, BAS, BbW

Legend:
- ABC: Active body control
- ABS: Antilock brake system
- ACC: Adaptive cruise control
- BAS: Brake assist system
- BbW: Brake by wire
- CA: Collision avoidance
- DbW: Drive by wire
- EBD: Electronic brakeforce distribution
- EMB: Electromechanical brakes
- EMS: Electromechanical steering
- ESP: Electronic stability program
- ETC: Electronic traction control
- SbW: Steer by wire

Notes:
- (wb) with mechanical backup
Vehicle Standards and New Car Assessment Programmes

• Most new vehicles are now tested for to see how well they protect occupants, and other vulnerable road users, in a crash.

• Several **New Car Assessment Programmes (NCAP)** have been developed (for example LatinNCAP, AseanNCAP for Latin America and South East Asia resp.) to evaluate new automobile designs for safety performance and provide the information to consumers.

• The **Global New Car Assessment Programme (Global NCAP)** serves as a platform for co-operation among NCAPs worldwide and promotes the universal adoption of the UN motor vehicle safety standards worldwide.

= First 5 star car in India.
Vehicle Standards and New Car Assessment Programmes

- A comparison video between a Nissan Versa (cheapest sedan in USA) and the Nissan Tsuru (cheapest sedan in Mexico).
- Mexico doesn’t have strong crash test standards; the Versa has airbags but the Tsuru does not.
- Nissan decided to discontinue the Tsuru.

#NoZeroStarCars

Video Link: https://www.youtube.com/watch?v=85OysZ_4lp0
Vehicle Roadworthiness Inspections

- Research in developed countries suggests that vehicle defects cause about 3% to 5% of crashes.
- It is likely that the figures are higher in low and middle income countries: older, and less well maintained fleets.
- This is especially true of heavy vehicles

Unroadworthy Public Service Vehicles involved in road crashes
Used Vehicles Importation

- Used vehicles make up a large proportion of the vehicle fleet in developing countries.
- It is estimated that at least **8 out of 10 imported vehicles are used vehicles**.

- Only 12% of countries have banned used vehicles imports.
- 18% have reasonable restrictions - allowing import of vehicles under 5 years only.
- 40% have weak regulations – allowing import of vehicles under 10 years only.
- 30% have no used vehicle import regulations.
Used Vehicles Importation

Vehicle age matters!

- Newer vehicles are less likely to be involved in fatal crashes, due to continual improvements in crash protection features.
- The risk of dying in a crash is 71% higher in a vehicle that is 18 years old or more compared to a vehicle three years old or less.
- The higher the mean vehicle fleet age, the higher the probability of fatal road crashes.
Used Vehicles Importation and Roadworthiness - Solutions

1. Scrapping and banning of all zero-star NCAP rated vehicles;
2. Banning export or import of vehicles with a history of crashes that affected the structural integrity of the vehicle;
3. Ensuring good function of key vehicle safety features (both passive and active safety features);
4. Ensuring intact vehicle identifiers.

• Co-benefits for sustainability: better fuel efficiency, lower GHGs and other emissions.
Vehicles Inspection Schemes

- A successful pilot study was conducted in Togo in 2017 by GRSF and CITA, where the current vehicle inspection system was analyzed and improvement recommendations were proposed in three categories:
  1. **Requirements for vehicles entering the country**;
  2. **Capacity building for the department in charge of the scheme**;
  3. **Upgrading of the existing inspection stations, including the size of the network**.
Safer Vehicles – Available Policy Levers

• National, regional and international authorities should work together to ensure vehicle safety through various actions:

1. Mandatory key safety standards for new vehicles
2. Vehicle inspection schemes at import and periodically
3. Improve the availability and quality of vehicle safety information (for example from NCAP programmes) to consumers.
4. Incentivize scrapping old vehicles and purchase of safe vehicles
5. Assist (or require) vehicle dealers to publicize safety information at the point of sale.
6. Work with fleet buyers, importers and operators to encourage and incentivize safer vehicle purchasing decisions (for example through workplace safety laws).
7. Investigate the earlier adoption of international vehicle safety standard.
8. Set up the technology platform for future uptake of vehicle safety technology: Infrastructure – vehicle communication.
Safer Vehicles – Risks to manage

1. Corruption issues with imports and inspections

2. Waiting on Autonomous Driving:
   a. Long way off for LMICs
   b. Risks with the Road Infrastructure: lane lines, dust, maintenance…

3. Making standards too strong in LMICs = risk of increased expense
   a. Keep existing cars even longer
   b. Move to motorcycles (far more dangerous than the zero star cars)

4. Post-crash alerts have questionable value:
   a. Often ignored (too many false alarms)
   b. Other elements of emergency response are much weaker link in the chain in many LICs

5. Risk homeostasis: History shows too much faith in (active) technologies which drivers detect readily

6. Vehicle industry is not as concerned with safety as is claimed (fought the EU requirements for ISA, seeking a long delay)
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THANK YOU

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