Vehicle Design for Road Safety: What are the Gaps in Evidence?

Kavi Bhalla, PhD
Associate Professor
Public Health Sciences, University of Chicago
kavibhalla@gmail.com

Launch of the Road Safety Evidence Gap Map, Sept 2022, TRIP C, IIT Delhi

Department of Public Health Sciences

Key Messages

1. Global road traffic deaths are not falling
2. But US/Europe have successfully reduced deaths
   - Vehicle technologies have been very important
   - Especially technologies for protecting car occupants
3. In India, most victims are motorcyclists and pedestrians. They’re killed by trucks and motorcycles.
4. The EGM shows:
   a) There are very few evaluations from LMICs
   b) Robust study designs for evaluating vehicle safety (e.g. case-control) are not commonly seen in studies from LMICs
   c) Very few evaluations of vehicle technologies relevant to LMICs
   d) There are no evaluations of indigenous vehicles

... despite extensive global advocacy for road safety

But US/Europe have successfully reduced deaths. How?

How did high-income countries get safety technologies in all vehicles?

1. Minimum design standards
   - Legal requirements (government & legislation)
   - Sets minimum standards for what can be sold
   - E.g. Federal Motor Vehicle Safety Standards
2. Creating market competition (NCAPs)
   - Using New Car Assessment Programs (NCAPs)
   - Usually run by NGOs (e.g. Insurance Institute for Highway Safety)
   - Star rating of cars based on testing; more stringent than regulations
   - Goal is to provide consumers with information
Elisa R. Braver

Generation: A Matched-Pair Cohort Study
Using Head-on Collisions to Compare Risk of Driver Death by Frontal Air Bag

Original Contribution

Abbreviations: FARS, Fatality Analysis Reporting System; NHTSA, National Highway Traffic Safety Administration; SUV, sport utility vehicle.

Received for publication June 26, 2007; accepted for publication October 23, 2007.

Here is what we found ....
4. The EGM shows:
   a) There are very few impact evaluations of vehicle technologies done in LMICs

   - No studies from low income countries
   - Only 1 study from a lower-middle income country (Cambodia on helmets)

   ![Graph showing number of studies by income level]

4. The EGM shows:
   d. Robust study designs for evaluating vehicle (e.g. case-control) are not commonly seen in studies from LMICs

   ![Graph showing number of studies by study design]

What Technologies Have been Evaluated?

Bicycle Technologies:
- All studies are on helmets except conspicuity (1 study)

Motorcycle Technologies:
- All studies are on effect of helmets except ABS (2 studies), Conspicuity (1), and Daytime lights (2)

Bus & Truck Technologies:
- Daytime lights (1); General safety (2); Conspicuity (1)

Car technologies (for safety of non-occupants):
- Daytime lights (3), Vehicle front-end (1), General regulations (1), Automatic Braking (1), Antilock brakes (1), Electronic Stability Control (1)

Safer Bus/Truck Fronts

- Researchers have been showing feasibility for 30 years!
- Have still not been field tested
- Are receiving no attention in current policy & regulatory discussion

What vehicles kill pedestrians?

- Proposed UN Regulations only target cars
- But, in LMICs, most pedestrians are not killed by cars

![Graph showing percentage of pedestrians killed by vehicle type]
Researchers have been showing feasibility for 25 years!

Technologies have still not been field tested

Are receiving no attention in current policy & regulatory discussion

Wide spectrum of poorly understood issues

- Pedestrian safety in crashes with motorcycles
- Transport of people on agricultural tractor trailers
- Agriculture tractors being struck from the rear
- Flowing garments (e.g., saris) on motorcycles
- Kids on motorcycles

Need for Research in LMICs

- Epidemiological investigations to identify key risks
- Engineering research to develop countermeasures
- Evaluation of field performance
- Scale up through regulation, consumer information, & other means

Effect of autorickshaw design modifications

Design modifications include rearward facing passenger seat, driver seatbelt, interior padding, and front-end design [Source: Mohan et al., 1997]

Conclusions

- There are many tried & tested technologies that focus on car occupants. These should be put in all cars. (via regulations & NCAP)
- However most victims in India (and LMICs) are not car occupants. We especially need technologies focused on trucks, motorcycles, agricultural tractors.
- EGM shows: no research in LMICs to address the many LMIC-specific concerns