Understanding National Road Safety Performance

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What are the leading causes of health loss in India among young people (15-49 years)?

“Health loss” is measured in Disability Adjusted Life Years Lost, DALYs

DALYs from a disease =
Years of Life Lost +
Years Lived with Disability (weighted by severity)
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<tr>
<th>Health Loss 15-49 years</th>
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<tbody>
<tr>
<td>1 Road injuries</td>
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<td>2 Ischemic heart disease</td>
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Leading Causes of Health Loss (All Ages)

India

1. Neonatal disorders
2. Ischemic heart disease
3. COPD
4. Diarrheal diseases
5. Lower respiratory infect
6. Stroke
7. Tuberculosis
8. Dietary iron deficiency
9. Diabetes

Road Injuries
11. Congenital defects
12. Headache disorders
13. Self-harm
14. Other musculoskeletal
15. Falls
# Leading Causes of Health Loss

## (All Ages)

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<tr>
<th>Global</th>
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**28. Road Injuries**
Trend in Traffic Death Rates in India

Road safety in india (1971 to 2021)

Number of deaths and deaths per 100,000

Source: NCRB, MoRTH, Via R. Goel
Trend in Traffic Death Rates in USA, UK

Road Traffic Death Rate, per 100,000 population

USA

UK
### Leading Causes of Health Loss (All Ages)

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**How did death rates in rich countries get so low?**

28. Road Injuries
History of traffic death rates: UK, USA

Road Traffic Death Rate, per 100,000 population

USA

UK
History of traffic death rates: UK, USA

Road Traffic Death Rate, per 100,000 population

UK
USA

History of traffic death rates: UK, USA

Road Traffic Death Rate, per 100,000 population

- **UK**
- **USA**

Key events:
1. Event 1
2. Event 2

Time period:
- 1950
- 1960
- 1970
- 1980
- 1990
- 2000
- 2010
History of traffic death rates: UK, USA
History of traffic death rates: UK, USA

Road Traffic Death Rate, per 100,000 population


UK

USA

15 10 5 0

25 20 15 10 5 0

4
History of traffic death rates: UK, USA
History of traffic death rates: UK, USA
History of traffic death rates: UK, USA
History of traffic death rates: UK, USA

Road Traffic Death Rate, per 100 000 population

USA

UK
History of traffic death rates: OECD countries

Road Traffic Death Rate, per 100,000 population

- Australia
- Austria
- Belgium
- Canada
- Denmark
- Finland
- France
- Germany
- Iceland
- Ireland
- Italy
- Luxembourg
- Netherlands
- New Zealand
- Norway
- Spain
- Sweden
- Switzerland
- UK
- USA
History of traffic death rates: OECD countries

Something happened!
Why did road deaths rise and fall in OECD countries?

Two explanations:

1. Traditional Explanation ("economic determinism")
2. Paradigm shift & Transition to a policy era

History of traffic death rates: OECD Countries

Road Traffic Death Rate, per 100 000 population

- Australia
- Austria
- Belgium
- Canada
- Denmark
- Finland
- France
- Germany
- Iceland
- Ireland
- Italy
- Japan
- Luxembourg
- Netherlands
- New Zealand
- Norway
- Norway
- Sweden
- Spain
- Switzerland
- UK
- USA
Road Death Rates and Income

Road Traffic Death Rate, per 100,000 population

Income, Real GDP per capita (PPP)

Environmental Kuznets Curve

OECD Countries
Road Death Rates and Income

ENVIRONMENTAL KUZNETS CURVE

“As incomes rise, the demand for improvements in environmental quality will increase, as will the resources available for investment”

Beckerman (1992):
“There is clear evidence that, although economic growth usually leads to environmental degradation in the early stages of the process, in the end the best – and probably the only – way to attain a decent environment in most countries is to become rich.”

Dasgupta (2002):
“Grow first, then clean up”
Road Death Rates and Income

Road death rates will rise until 2047! (Kopits & Cropper, World Bank, 2005)
Kuznets Hypothesis: Traffic injury Literature


• McManus W. *The Economics of Road Safety: an International Perspective*. University of Michigan Transportation Research Institute, Ann Arbor, MI; 2007.


Road Death Rates and Income

Road Traffic Death Rate, per 100,000 population

Income, Real GDP per capita (PPP, $)

OECD Countries
Road Death Rates and Income

OECD Countries

India (Now)
Ecuador

Source: https://www.ecudortimes.net/around-45000-cars-per-year-come-to-guayaquil/
Ecuador: 20% of fleet is motorcycles

Cambodia: 73% of fleet is motorcycles

Which of these settings has a higher road traffic death rate?
Why did road deaths rise and fall in OECD countries?

Two explanations:

1. Traditional explanation (Economic determinism)
2. Paradigm shift & Transition to a policy era*

Road Death Rates and Income

Road Traffic Death Rate, per 100,000 population

Income, Real GDP per capita (PPP, $)
Road Death Rates and Income

Road Traffic Death Rate, per 100 000 population

Income, Real GDP per capita (PPP, $)

19 Other OECD Countries
USA
UK
Road Death Rates and Time

Road Traffic Death Rate, per 100,000 population

- 19 Other OECD Countries
- USA
- UK

Year


0  5  10  15  20  25  30  35
What happened in time?

Time-Series Cross-Sectional Analysis

\[
\ln(d_{it}) = \alpha + \beta_1 \cdot gdp_{it} + \beta_2 \cdot gdp_{it}^2 + \beta_3 \cdot urb_{it} + \beta_4 \cdot popdensity_{it} + u_i + v_t + \epsilon_{it}\]

\text{age-sex-gps}
What happened in time?

Time-Series Cross-Sectional Analysis

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Kuznets Hypothesis

- Time-Series Cross-Section Methods following Beck & Katz
- Lagged dependent variable to account for serial auto-correlation
- Validation: in-sample & out-of-sample
- 16 separate models for age- sex- groups
What happens in time?
Mortality effects: elderly people

Coefficient of Time

Female  Male
Age 80+

What happens in time?
Mortality trends in OECD countries

Road Traffic Death Rate, per 100,000 population

Something happened!
Brief history of road safety in the US

• 1900 – 1950s
  – Road safety is about “nut behind the wheel”
  – Research: primarily in driver psychology

• 1950s-1960s
  – Road safety: shifts towards biomechanical tolerance of human body
  – Research: shifts towards engineering the vehicle

• mid 1960s
  – Senator Ribicoff comes across Haddon’s book “Accident Research”
  – Nader writes “Unsafe at Any Speed”; GM’s response causes scandal

• 1970s onwards
  – Increasing regulation of roads and road users => an era of interventions!
Mortality trends in OECD countries

Road Traffic Death Rate, per 100,000 population

Paradigm Shift

Education & Behavior Change
Safe System Interventions

Australia
Belgium
Canada
Denmark
Finland
France
Germany
Iceland
Ireland
Italy
Japan
Luxembourg
Netherlands
New Zealand
Norway
Spain
Sweden
Switzerland
UK
USA
Austria
Canada
Finland
France
Germany
Ireland
Italy
Japan
Luxembourg
Netherlands
Norway
Spain
Sweden
Switzerland
UK
Mortality trends in OECD countries

Paradigm Shift

Guardrails

Chevrons

Shoulders

Road Traffic Death Rate, per 100,000 population


Australia  Austria  Belgium  Canada  Denmark  Finland  France  Germany

Paradigm Shift
Policy History: Sweden

1968: New road safety agency established
1975: Front belts and helmet use mandatory
1976: Driving tests for motorcycles
1977: Daytime running lights
1978: Moped helmets required
1979: Cycle lights required for night
1982: Signs for slow moving vehicles
1986: Reflectors on cycles

Speed fines increased: 1987
Mandatory restraints for children: 1988
BAC limits lowered, 0.05 to 0.02%: 1990
Auto speed enforcement trials: 1990

# of random breath tests doubled: 1994
Median steel wire barriers: 1995
Airbags standard in all new vehicles: 1996
Roadside steel wire barriers: 1998
1999: Winter tires mandatory in winter conditions
Policy History: UK

1970: Heavy vehicle: driving tests & limits on driving hours
1972: 16 years olds limited to riding mopeds
1974: helmets; vehicle lighting regulations
1976: Mini roundabouts introduced
1977: Helmet standards
1978: Hvy veh hours adjusted
1980: Fog lamps on new vehicles
1982: Higher stds for helmets
1983: Braking stds for heavy veh
1984: Front belt use mandatory
1987: New traffic calming regulations
1991: Speed limit lowered for buses/trucks
1992: Driving test strengthened
1993: 20 mph zones
1996: 60 mph limiters, trucks
2000: National road safety targets
2010: New road safety strategy & targets
Policy History: Netherlands

- 1971: Mandatory seat belts in new cars
- 1972: Mandatory helmets for motorcycles
- 1974: Speed limits reset; Alc 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: Moped/bike pedal reflectors
- 1983: 30 km/h zones
- 1985: Vehicle inspections required
- 1987: Moped/bike side reflectors
- 1990: Rear seatbelts fitted in new cars
- 1992: Belt use in lorries, vans, car rear seats
- 1995: Speed limiters bus & truck
Lesson: Poor countries need not wait

Paradigm Shift: Birth of institutions
Summary: History of road safety performance

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 “policy era” explanation

• In the 1960s, countries established national road safety agencies, gave them dedicated funding, authority to create and enforce road rules legislative “teeth”. Over successive years, interventions were implemented, compliance was improved, deaths came down.
Thank You!

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