How to integrate mobility and safety data

Best practices and smart estimates

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Mobility data for road safety studies

Exposure is a primary factor concerning road accidents

Used as statistical measure to compare events (accidents, injuries, deaths) in standardized parameters.
Mobility data for road safety studies

2 sets of data:

- **exposure by mode**

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Mode of travel</th>
<th>2006CC</th>
<th>2007CC</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger kilometres</td>
<td>All transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger kilometres</td>
<td>Non road-based transport</td>
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<tr>
<td>Passenger kilometres</td>
<td>Road transport</td>
<td></td>
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<tr>
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<td>Number of trips</td>
<td>Road transport</td>
<td></td>
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</tbody>
</table>

- **exposure by vehicle**

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Mode of travel</th>
<th>2006CC</th>
<th>2007CC</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles</td>
<td>Vehicle on 2-3 wheels</td>
<td></td>
<td></td>
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<tr>
<td>Vehicles</td>
<td>Passenger car</td>
<td></td>
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<td></td>
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<tr>
<td>Vehicles</td>
<td>Light goods road vehicle</td>
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<tr>
<td>Vehicle kilometres</td>
<td>Road transport</td>
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<td>Vehicle kilometres</td>
<td>Passenger car</td>
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<tr>
<td>Vehicle kilometres</td>
<td>Goods road vehicle</td>
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<tr>
<td>Vehicle kilometres</td>
<td>Light goods road vehicle</td>
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<tr>
<td>Vehicle kilometres</td>
<td>Bus or coach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle kilometres</td>
<td>Tram</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle kilometres</td>
<td>Other road transport</td>
<td></td>
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</tr>
</tbody>
</table>
Mobility data for road safety studies

(4) Exposure standards

- **Exposure by mode**
  - # trips
  - (x) Avg distance per trip
  - Passenger km

- **Exposure by vehicle**
  - # vehicles
  - (x) Avg distance per year
  - Vehicle km

(x) Occupation
“State of the Art”: Home-based OD surveys

Travel patterns in a given area (city) for strategical planning

“State of the Art”: Home-based OD surveys

¿How to obtain risk exposure measures through OD surveys?

- # trips
- # vehicles
  - (x) Avg distance
  - (*)

Passenger km → Vehicle km

- # Vehicles: # vehicles/household (sample) * # households (census)
- # Trips: # generation rates (sample) * # homes (census) * days/year (+ weekend adj.)

Avg. Distance: Origin & Destination from sample + road network (* trips/year)
“State of the Art”: Home-based OD surveys

- Reliable & Precise
- Flexible (time series)
- Expensive (cost & time)
- Needs active involvement (non-passive)

- Used mainly for strategical analysis in large cities (12 in Argentina, pop > 300,000)

- What could be done in small towns/jurisdictions (under resourced, no tech)

  “do-minimum” approach (better than “do-nothing”!)
  focus on aggregate data
Smart estimates: a “second-best” approach

- # trips
- # vehicles

(x) Avg distance
(*)

- Passenger km
- Vehicle km

- ¿How to obtain each one of these...?
Smart estimates: a “second-best” approach

Number of vehicles

- Vehicle registrations (overestimates > 30%)
- Use survey data from other cities (correction factor to registrations)
- Insurance data (potential underestimates, ex. motorcycles)
- Econometric models / regressions (national data + per capita GDP)
- Local: * Traffic counts
  * Camera records (LPR)

Buenosaires.gob.ar
Smart estimates: a “second-best” approach

Avg distance per year (Veh.km)

- Fuel use models;
- Economic and GDP models;
- Traffic counts;
- Original Equipment Manufacturers maintenance data;
- Phone surveys;
- Panel survey methods;
- Onboard vehicle telemetry;
- Cell phone apps/telemetry;
- GPS data (limited to commercial vehicles);
- Odometer readings (registrations/renewals);
- Insurance-based data.

* Vehicle sales data
* Vehicle inspections

Canadian Council of Motor Transport Administrators (2017)
### Smart estimates: a “second-best” approach

**Number of trips per vehicle & Average distance per trip**

<table>
<thead>
<tr>
<th>Public (fixed-route)</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>“easy”</td>
<td>“difficult”</td>
</tr>
<tr>
<td>- Timetables (vehicle trips/year) * average occupation (field surveys)</td>
<td>- Occupation (field surveys) * vehicle trips/year</td>
</tr>
<tr>
<td>- Distance per trip from demand profiles</td>
<td>- Vehicle trips/year = Vehicle distance/year / Avg. distance/trip (surveys, mathematical models (1/3 L), trip distribution functions)</td>
</tr>
</tbody>
</table>
Final thought

“Information is not knowledge”

A. Einstein

“Knowledge is power”

F. Bacon

Knowledge ≠ POWER
Knowledge + Action = POWER

Boxtheorygold.com
Thank you!!