Estimating city-level burden of road-traffic-collision fatalities

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Overview

- Perspective
- Data collection
  - Quality and harmonisation challenges
- Example of burden calculation
- Application

Perspective

- **Our aim is to estimate the city-level health burden of road-traffic collisions**
  - Total number of deaths
- **We are interested in how travel-pattern changes will change the burden**
  - Estimate risks at fine resolution (deaths per mode, per age, per gender, etc.)
  - Need to know who causes the burden
    - Consider two-body collisions instead of victims only
    - Collate the data as a contingency table
- **The finer the resolution, the more zeros there are**
  - We model the data to smooth over the zeros

Collision data

- Crash-level data (and not summary statistics)
- Age, gender, and mode of travel of the parties involved in the crash
- Information on victims is often known (but often hard to get)
  - Police reports (more flexibility)
  - Mortality statistics / death certificates (restricted to ICD-10 coding)
- Only fatal cases, as non-fatal cases are unreliable/biased

Who-hit-whom matrix (with ICD-10 codes)

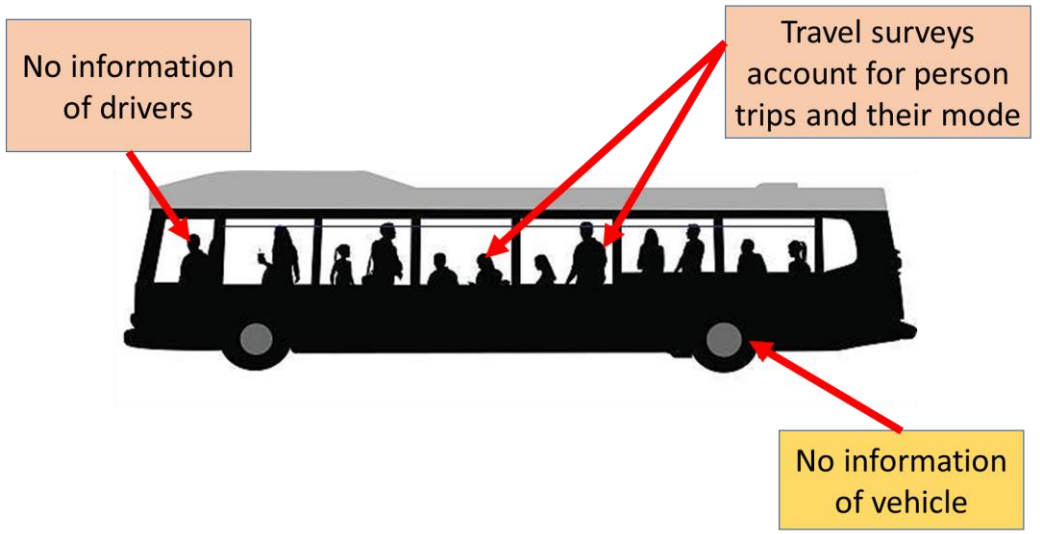
Victim types

Striking vehicle	Pedestrian	Cyclist	Motorcycle	Car	Heavy transport	Bus	Unknown / Other
No other/fixed	V00	V17	V27	V47	V67	V77	
Pedestrian		V10	V20	V40	V60	V70	
Cyclist	V01	V11	V21	V41	V61	V71	
Motorcycle	V02	V12	V22	V42	V62	V72	
Car	V03	V13	V23	V43	V63	V73	
Heavy transp. or bus	V04	V14	V24	V44	V64	V74	
Train	V05	V15	V25	V45	V65	V75	
Other	V06, V09	V16, V19	V26, V29	V46, V49	V66, V59	V76, V79	V80, V82-99

ICD-10 codes:
V: Transport injury
1: Cyclist as victim
3: Car as striker

Travel data

- Trip- or person-level data
- Age and gender
- Mode and duration / length of travel
- Potential sources: travel surveys, time use surveys and censuses



Going global

- What is the burden of road-traffic-collision fatalities across the world (particularly LMICs)?

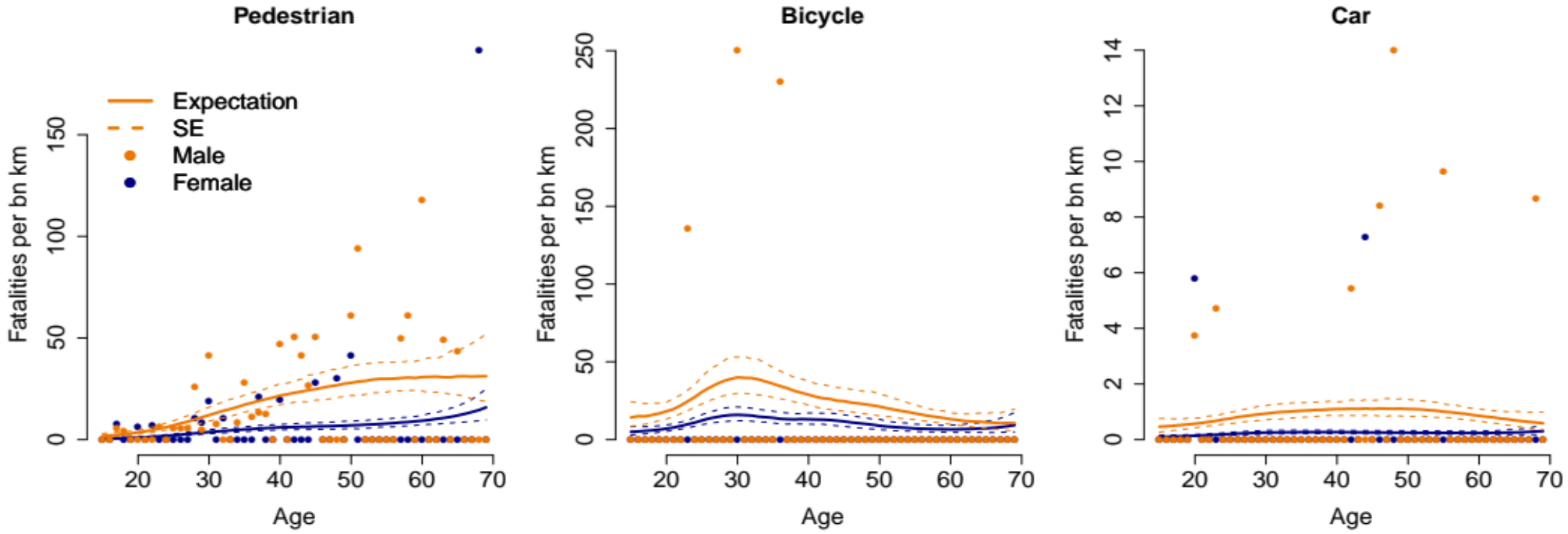
Country	Cities
India	Delhi, Bengaluru, Agra, Visakhapatnam, Amritsar, Vadodara, Bhopal, Ludhiana, Belgaum
Ghana	Accra
Brazil	Sao Paulo, Belo Horizonte, Salvador, Feira de Santana
Colombia	Bogota
Argentina	Buenos Aires
Mexico	Mexico City
Chile	Santiago, Valparaiso, Concepcion (regions)
UK	London, Manchester, Leeds, Birmingham
US	New York City, Los Angeles, Houston

Quality and harmonisation challenges

- Exposure metric: time or distance?
- Record of ‘person’ trips and not ‘vehicle’ trips
- Fleet of professional drivers not included
- Different modes of transport
- High number of ‘unknown’ striking vehicles
- Underreporting of collisions and short journeys
- Different data structures
- Different levels of data resolution
- Different data sources and triangulation methods
- Matching geographical unit and timing from different data sources

Example – Accra, Ghana

- Fatalities as a smooth function of age



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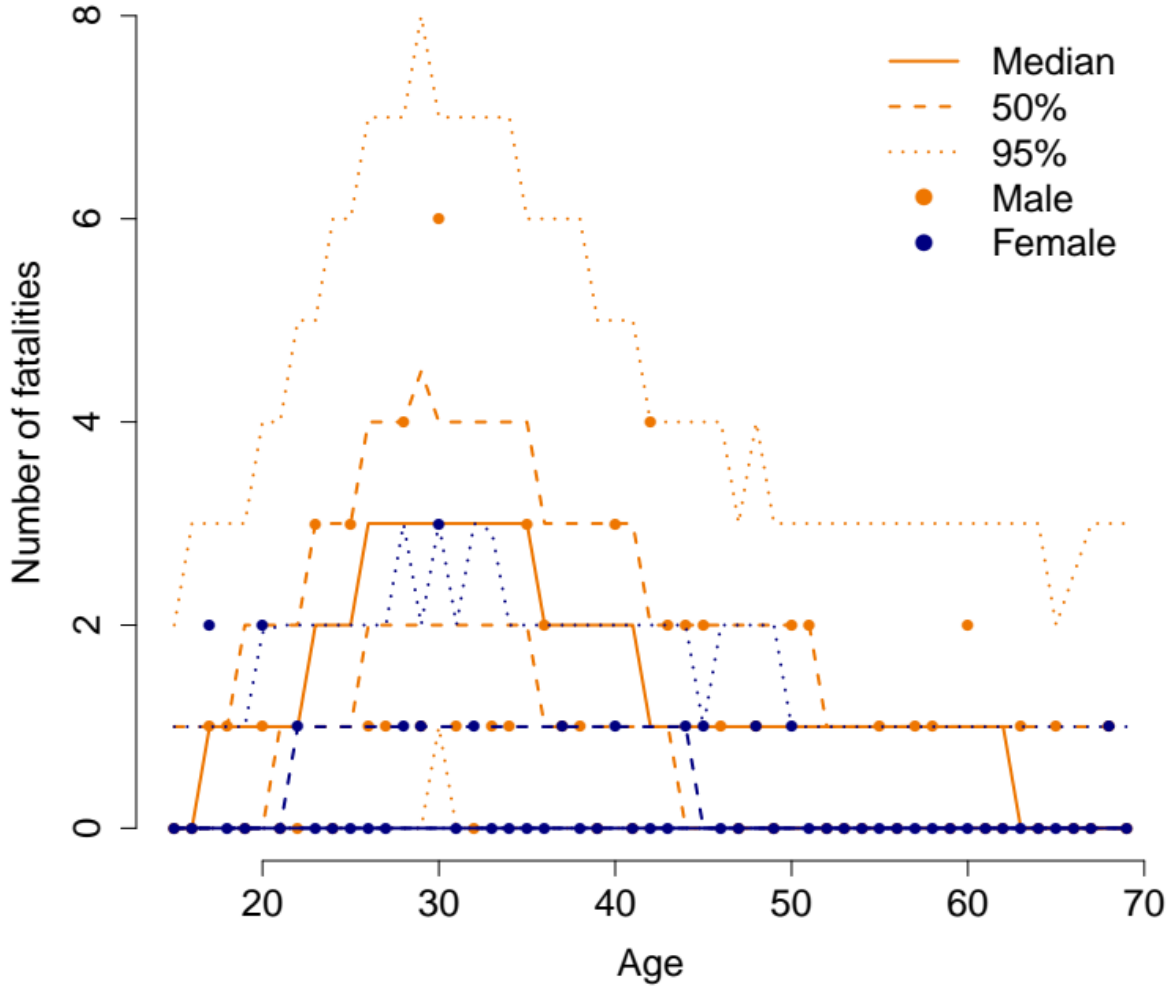

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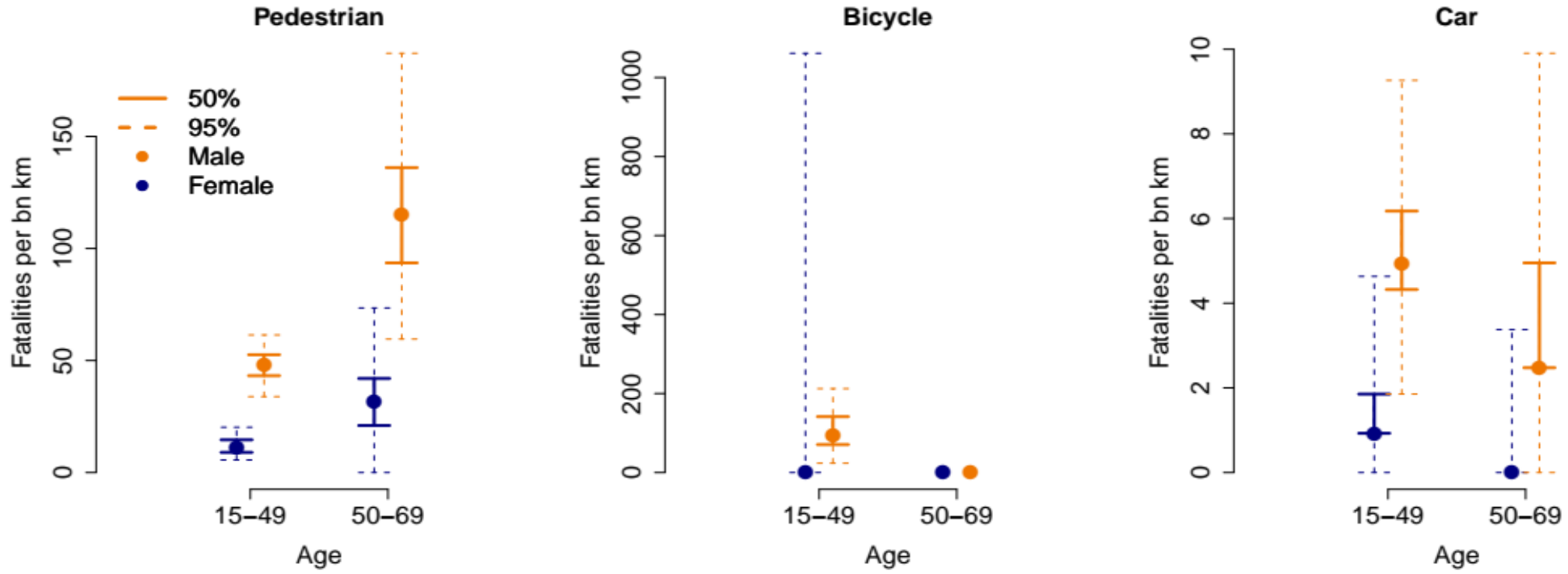
- Fatalities grouped by age



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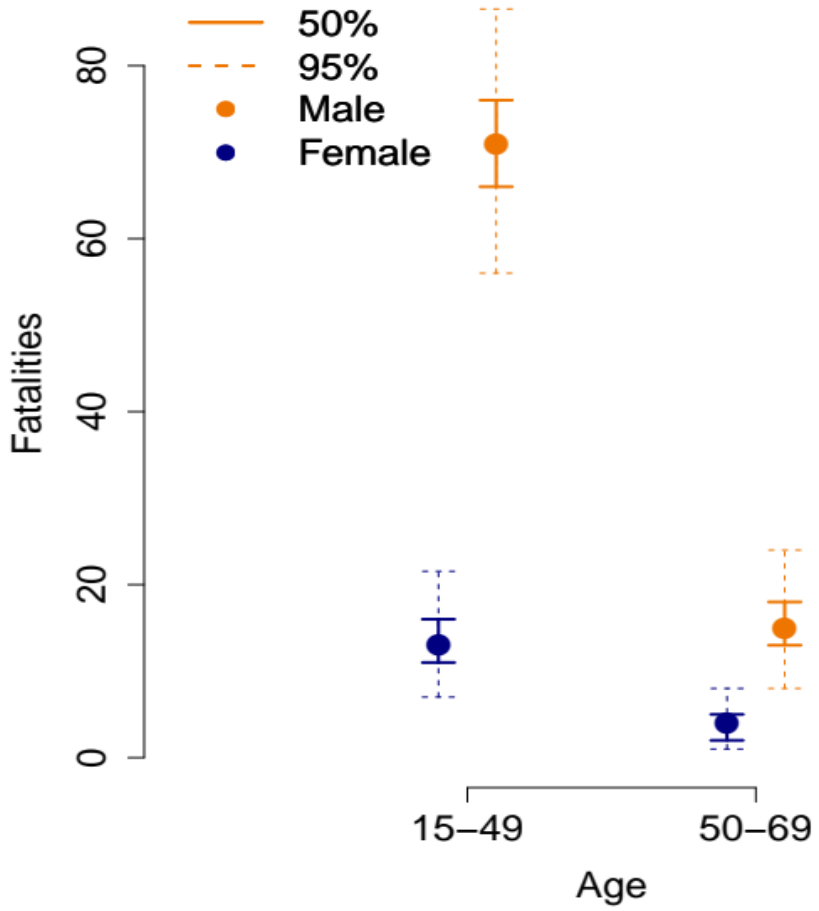
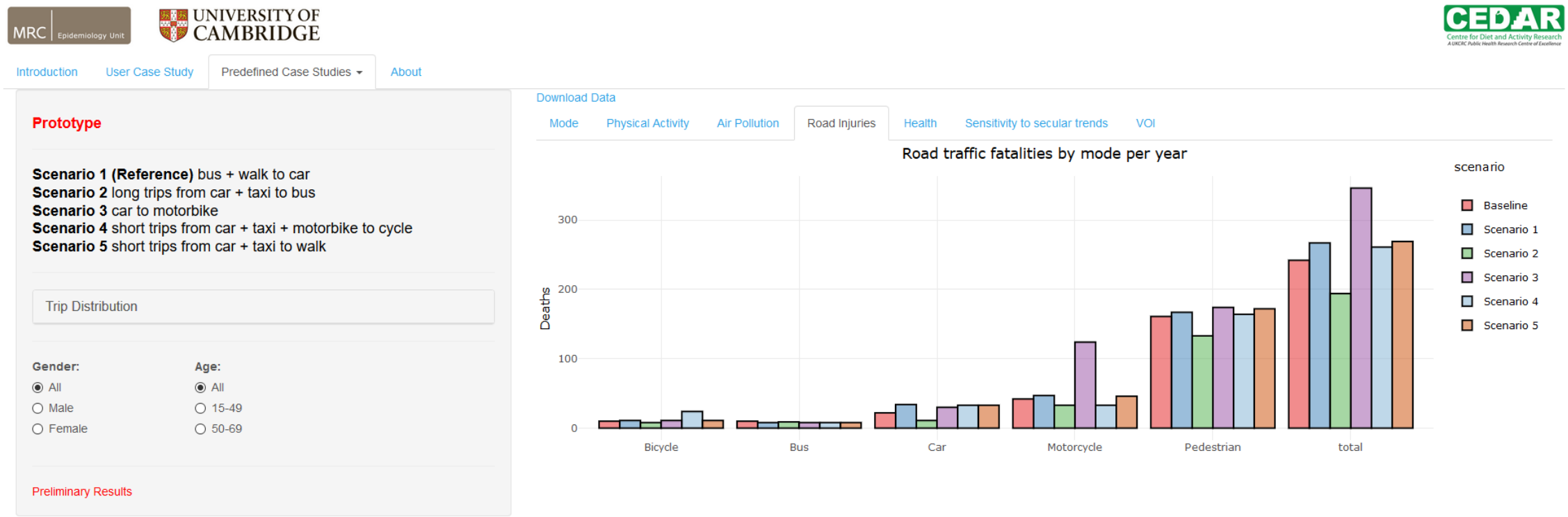


Applications – Integrated Transport and Health Impact Modelling Tool (ITHIM)



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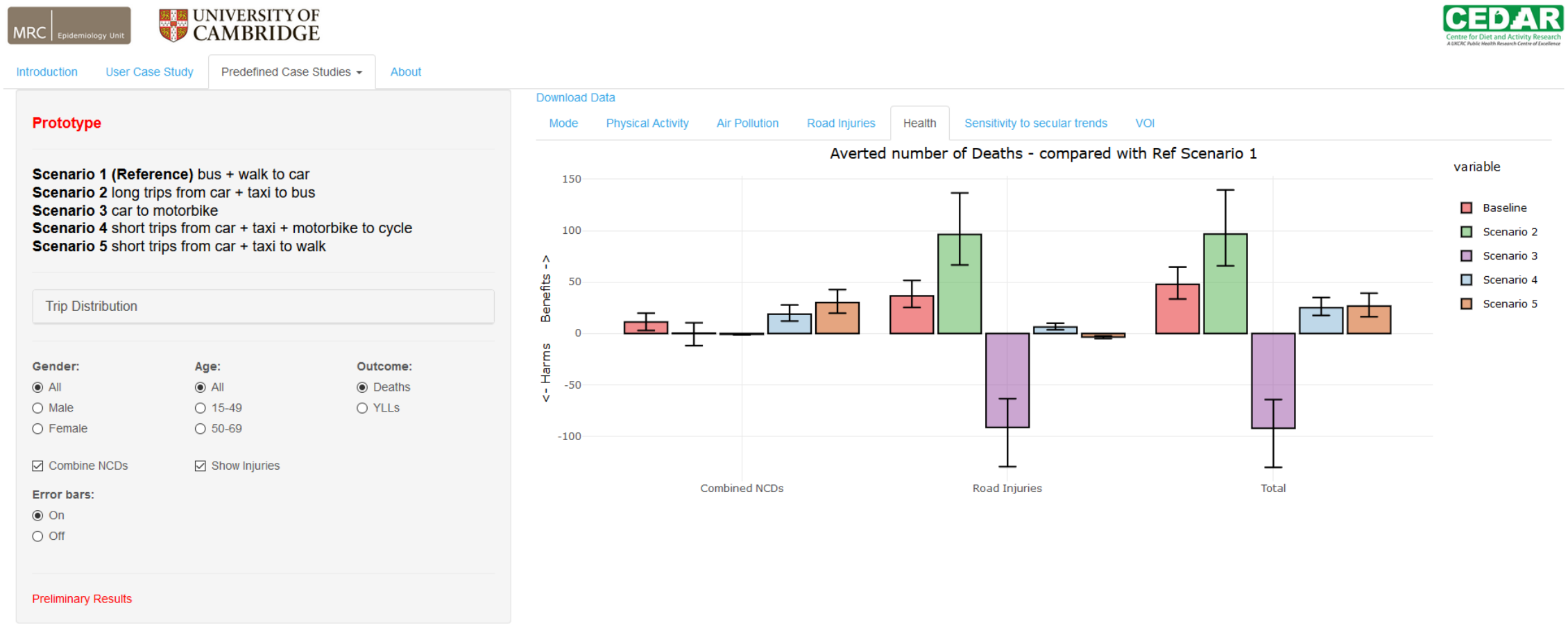

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Global assessment of national-level mortality statistics for assessing injury burden

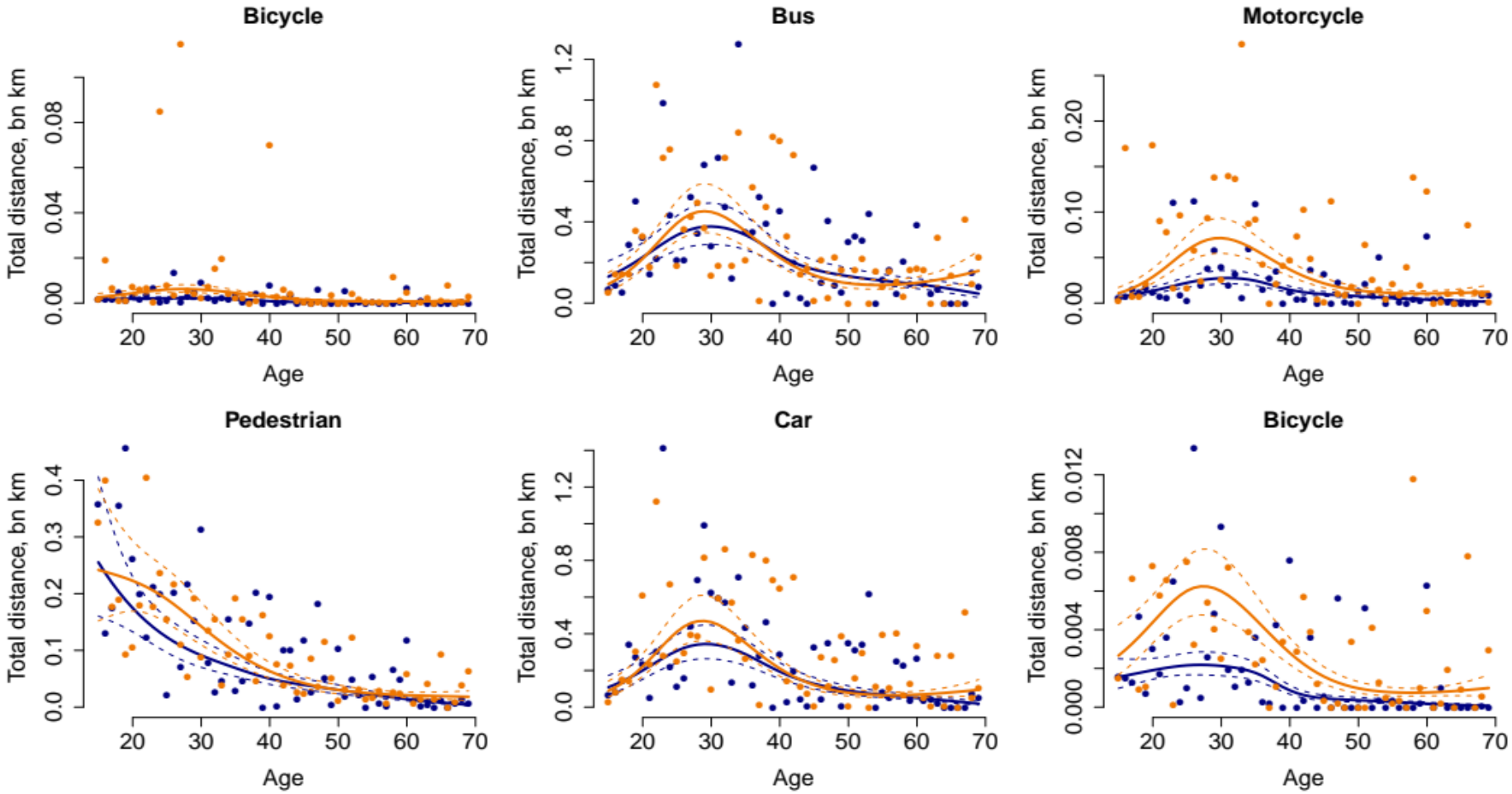
Region[b]	Country		
	Reliable estimates of deaths due to all external causes of injury ($n=20$)	Reliable estimates of deaths due to road injury ($n=47$)	Reliable estimates of deaths due to suicide or homicide ($n=60$)
Asia Pacific, high-income countries	Japan, Republic of Korea	Japan, Republic of Korea	Japan, Republic of Korea
Central Asia	Uzbekistan	Kyrgyzstan, Uzbekistan	Kyrgyzstan, Uzbekistan
East Asia	China, Hong Kong SAR	China, Hong Kong SAR	China, Hong Kong SAR
South-East Asia		Mauritius	Mauritius
Australasia	Australia, New Zealand	Australia, New Zealand	Australia, New Zealand
Caribbean	Barbados, Trinidad and Tobago	Bahamas, Barbados, Belize, Cuba, Guyana, Saint Lucia, Trinidad and Tobago	Bahamas, Barbados, Belize, Cuba, Guyana, Martinique, Saint Lucia, Trinidad and Tobago
Central Europe	Hungary, Poland, Slovakia, Slovenia	Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia	Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia
Eastern Europe	Estonia, Lithuania	Estonia, Latvia, Lithuania, the Republic of Moldova	Estonia, Latvia, Lithuania, the Republic of Moldova
Western Europe	Finland, Iceland, Ireland, Luxembourg, Malta	Austria, Finland, Germany, Greece, Iceland, Ireland, Luxembourg, Malta, Portugal, Spain	Austria, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom
Latin America – Andean countries			Ecuador
Central Latin America	Panama	Colombia, Costa Rica, El Salvador, Mexico, Panama	Colombia, Costa Rica, El Salvador, Mexico, Panama
Southern Latin America		Chile	Argentina, Chile, Uruguay
Tropical Latin America		Brazil, Paraguay	Brazil, Paraguay
North Africa and the Middle East		Kuwait	Kuwait
North America, high-income countries		Canada, United States of America	Canada, United States of America

Bhalla K et al. Availability and quality of cause-of-death data for estimating the global burden of injuries. Bull World Health Organ. 2010;88(11):831-838C.

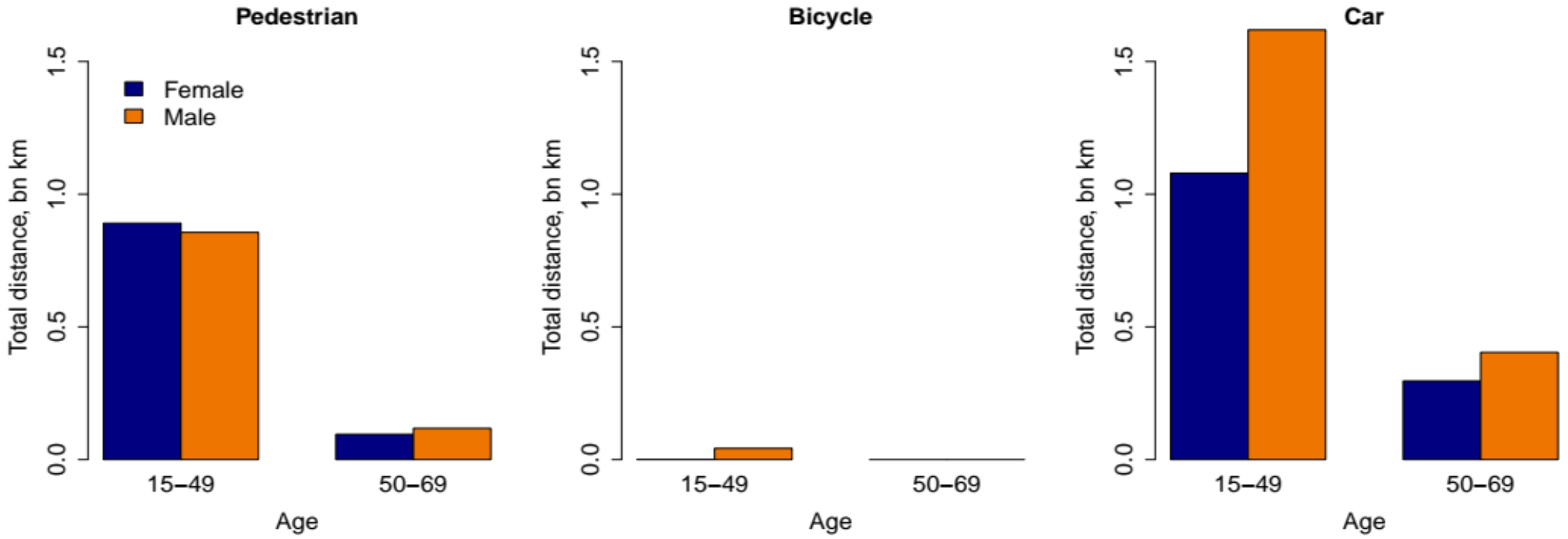
Quality assessment parameters in data-poor settings

	Likelihood of…			
Main sources of traffic injury data	**Underreporting of deaths**	**Unspecified mechanism of injury**	**Proportion of unspecified victim mode**	**Proportion of unspecified striking vehicle**
Police	High	None to Low	Low	High
Mortality statistics	Low	High	Low to high	High

Smoothed distances travelled (Accra, Ghana)



Grouped distances (Accra, Ghana)



Fatalities per bn km, both as striker and casualty (England)