E-bike Safety Research

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TRB Bicycle and Pedestrian Safety Analysis
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Outline

- E-bike research at TRB
- Quick review of e-bike safety research
  - China
  - Europe
- Our US-based safety behavior study
Transportation Research Board (TRB) Activities

- Joint subcommittee revived in 2011 under TRB’s Bicycling committee (chaired by J. Dill)
- Current co-chairs C. Cherry and G. Rose
- Active in developing calls for papers, research need statements, conference sessions etc.
- TRB is the single largest venue of publishing LEV research
E-bikes in the mainstream: Reviewing a decade of research

- Elliot Fishman (Utrecht U. in Netherlands) and Chris Cherry (UT-Knoxville)
- In Review in “Transport Reviews” journal
Safety Research

- Not much out there: little data, qualitative
- China: Hospital and crash data, video conflicts
- North America: Some GPS studies, qualitative
- Europe: Two recent studies using hospital/crash data.
Behavioral Research: Asia

- China
Safety Research

- Perceptions and Behavior
  - Some riders perceive e-bikes are safer, esp. at intersections (North America and China)
  - In China, e-bike riders with at-fault crash history generally have lower safety attitudes and lower risk perception.
  - Better e-bike performance makes users state they behave better (Popovich) contrary to Langford observations.

Safety Research: China

- Crash and Hospitalization Data
  - Crash burden increasing
  - Going up nearly as fast as e-bike numbers rising
  - E-bike rider injuries more severe than bicyclist injuries
  - Motor vehicle collisions are most serious
  - Head injuries highest proportion of injuries requiring hospitalization—recommend helmets

Safety Research: China

- Safety Behavior at Intersections
  - Recent trend in video intersection safety behavior
  - E-bike riders tend to run red lights more than bikes
  - E-bike riders tend to wait less time at red lights
  - E-bike riders generally behave badly at high rates (along with bicyclists).
  - The only worse offender in intersection conflicts are cars.

Safety Research: China

- **E-bike Speed**
  - Three studies investigated cruising speed of e-bike riders
  - All three found ~+40% speed differential with bicycles
  - Main holes in literature is related to fault, vulnerability, and conflict modes

E-bikes unsafe or vulnerable?

- Recent studies on e-bikes find:
  - e-bike riders behave poorly
  - e-bike fatalities up a little less than e-bike growth
Safety Research: Europe

- Two new studies investigate hospitalization data
  - 23 hospitalizations in Switzerland. Head and upper extremity.
    - Not as severe as China (helmet use and single-vehicle crashes)
  - 294 e-bike crashes in Netherlands
    - Very little difference between bikes
    - E-bikes that displace cars would have positive safety benefits

Safety Research

- North America
  - E-bike riders act almost exactly like bicyclists
  - Violate traffic control devices or wrong-way ride at about same rate
  - Travel speeds are not detrimental to e-bikes

Safety Research

Conclude

- E-bikes in NA and Europe about the same as bicycles (so far as we can tell)
- Pure safety research usually needs more and detailed data
  - possible but not available in China and not necessarily transferable elsewhere
  - Safety behavior is best proxy we have
  - Big gaps in cause/fault analysis
- Big data and telematics can help
- Behavioral data is key to all questions about impacts on the transportation/health system. How do people use e-bikes and what modes do they displace