Research In Progress:

E-Bike Safety Policy Study

Bicycle and Pedestrian Advisory Committee

City/County Association of Governments of San Mateo County

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MINETA TRANSPORTATION INSTITUTE

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The analysis presented is part of a larger study about e-bike safety policy required by CA Senate Bill 381 (Min - 2023)

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What are electric bikes?

- Bicycles with batteries and electric motors
- Two basic types:
    - Pedal assist e-bikes: the motor operates only when rider is pedaling
    - E-bikes with hand throttles: the motor can be activated without pedaling
- To be legal in the US, e-bikes must have “speed governors” that cut off the motor when the device reaches a certain top speed

Our work is guided by SB 381 (2023)

"[The study will analyze] data on injuries, crashes, emergency room visits, and deaths related to bicycles and electric bicycles and best practices for policy to promote safe use of electric bicycles."

SB 381 text: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240SB381

Today's presentation topics

1. What we know about e-bike safety
   (Preview: not a lot)
2. A review of the "Rules of the Road" for e-bike riders in the US
   (Preview: the rules are confusing and inconsistent)
3. Recommendation
   (Preview: collect better data, simplify e-bike riding rules, and tell people what the rules are)

How Dangerous Are E-Bikes?

We Know a Little, but Not Much

What we want to know about e-bike injuries

1. How many occur
2. Injuries *per exposure* (per trip or per distance traveled)

   To calculate, must know the # of trips taken and/or distance traveled
3. Factors associated with more frequent injuries, such as where they occur and the behaviors of people involved
4. Whether certain types of injuries are correlated with specific patient demographics or incident characteristics
5. How #s and types of e-bike injuries compare to similar devices (bicycles, e-scooters, etc.)

Findings from e-bike safety studies

We reviewed 197 English-language studies from around the world

The only really well-studied topic is the demographics of e-bike riders in crashes or injured (120 studies)

There are too few studies exploring whether any specific factor is associated with e-bike crashes or injuries to support strong conclusions about what factors cause e-bike crashes (e.g., no clear evidence about danger posed by certain types of street design, rules of the road, e-bike device types, etc.)

Preliminary results

E-bike injuries treated in US hospital emergency rooms: Comparatively rare, but growing (2020-2022)

Device	2020	2021	2022	% change, 2020-22
Bicycles	12,587	10,826	9,807	-22%
Skateboards	3,320	3,176	2,224	-33%
Hoverboards & powered skateboards	1,009	933	1,124	11%
Powered scooters	833	1,522	1,618	+94%
Mopeds	498	717	725	+46%
E-bikes	**115**	**286**	**526**	**+357%**

Analysis from Kevin Fang, Amelia Le, and Asha W. Agrawal of data from the National Electronic Injury Surveillance System, produced by the US Consumer Product Safety Commission

Preliminary results

Some other findings from NEISS* data, 2020-22

- Children are only 15% of e-bike patients, a far small proportion than for bicycles (44%)
- Most e-bike patients are male (74%)
- 30% of injured e-bike operators were in a vehicle collision
- Similar proportions of e-bike, bicycle, and powered-scooter patients were hospitalized (15%, 13%, 13%, respectively)

*Analysis by Kevin Fang, Amelia Le, and Asha W. Agrawal of data from the National Electronic Injury Surveillance System, produced by the US Consumer Product Safety Commission

Preliminary results

Can I Ride my E-Bike Here?
Perhaps...But Please Consult Your Lawyer

OR

A Review of E-Bike Rules for Riders in All 50 State

Research questions & methods:

Questions:

- How are e-bikes defined in state code?
- What rules govern how riders may use e-bikes?
- How do the rule for e-bikes compare to rules for similar devices (pedal bikes, etc.)

Methods

- Reviewed the vehicle code for all 50 states
- Searched for the codes from January 1 - June 1, 2024

“Please consult your lawyer…”

It’s *really* hard to know the rules for riding an e-bike

- States rarely publish a summary of rules for e-bikes, and when they do these are sometimes out of date
- Many bike advocacy groups and personal injury lawyers publish e-bike law summaries, but these often contain errors
- In the unlikely event that someone is willing to read the state code, they are unlikely to find all the needed information because:
  - Rules for pedal bicycles and/or vehicles may apply
  - Rules are scattered through the motor vehicle code
  - Complex language is hard to understand
- Laws vary substantially from state to state and often from place to place within a state

Preliminary results

The 3-class system for e-bikes

Was developed by the industry association People for Bikes (PfB), which represents bicycle manufacturers and sellers

All characteristics are the same across the 3 classes, except:

- Class 1: Motor assistance until 20 mph, but only if pedaled
- Class 2: Motor assistance until 20 mph, even if no pedaling
- Class 3: Motor assistance until 28 mph, but only if pedaled

Source: https://peopleforbikes.cdn.prismic.io/peopleforbikes/3686d20b-5695-47c1-b0c7-ffe06402be55_Model-eBike-Legislation-Jan2020.pdf

E-bike class system isn’t applied consistently across states

- 36 states use the PfB definition without modification
- 1 state uses PfB but modifies Class 2 top speed to 25 mph
- 3 states use PfB but require a speedometer
- 2 states use a 2-class system
- 7 states do not use a class system at all

Includes California

Preliminary results

Age minimum to operate for different devices

E-bike	18 states have no minimum 5 states have a minimum of 15 or 16 years for any kind of e-bike 27 states set age minimum for only certain e-bike classes, usually Class 3, with the age requirement ranging from 12 to 16*
Pedal bike	No states have an age minimum
E-scooter	37 states have no minimum 13 states have a minimum, which ranges from 12 to 16 years 1 state waives the minimum with adult supervision

* California has no limit to ride Class 1 and 2 e-bikes, but the legislature just passed AB 2034, allowing a few cities to pilot a minimum age of 12 years for any e-bike class

Preliminary results

Helmet rules for different device types

	E-bikes	Pedal bike	E-scooters
No requirement	22*	30	37
Required for certain ages (and for e-bikes, that may vary by class)	28	20	13

Preliminary results

Helmet rules for e-bikes

- 21 states have no requirement
- 11 states require helmets for all e-bike classes, though usually only for children
- 11 states require helmets only for Class 3 e-bikes, though some limit this to children
- 6 states vary rules by e-bike class

  California: Class 3: everyone wears a helmet
  Class 1 and 2: under 18 wear a helmet

- We couldn't tell for one state

Preliminary results

Sidewalk riding allowed for e-bikes?

No rules in 20 states. Rules elsewhere vary:

- Always allowed
- Always prohibited
- Allowed unless prohibited by a local authority
- Prohibited unless expressly allowed by a local authority
- Not stated, though sometimes can be inferred through rules for pedal bicycles, vehicles, pedal bicycle operators, and/or vehicle operators*

Complications include:

- 5 states allow sidewalk riding outside business districts, but not within them
- 3 state vary rules by age
- 2 states vary rules by e-bike class
- 1 state allows only if motor is off

* California: No direct statement. The word “sidewalk” is not mentioned in any bicycle or e-bike rules about where to ride. However, as best we can tell, the code implies that e-bikes are allowed on sidewalks unless prohibited by local ordinance.

Preliminary results

Other rules on e-bikes in some states include:

- Whether e-bikes can be ridden on bike paths, bike trails, and multi-use paths
- How many passengers are allowed
- Age limits for e-bike passengers
- Prohibitions on earbuds or listening devices
- Requirements that riders must ride in single file
- Number of hands required to be on the handlebars
- Whether towing trailers or children seated in trailers is permitted

Conclusion: State e-bike rules leave a LOT to be desired

Goal for effective regulation	Performance
Appropriately balance safety with accessibility for all road users	Unclear
Easy to find	Poor
Easy to understand ○ Simple – little complexity or nuance ○ Intuitive – e.g., the same as rules for similar devices ○ The language is easy to understand	Poor
Enforceable	Ok to poor
“Fair” in the sense of treating like travel modes alike	Ok to poor

Preliminary results

Suggested actions for San Mateo Cities & County

Advocate for better Rules of the Road in CA

Make the Rules of the Road for e-bikes easier to understand and remember.

- Move towards a simpler class system, like the one used in many European countries:
  - Pedelecs: max speed of 15 mph, and rules mirror pedal bike rules (including helmet requirements, etc.)
  - Speed pedelecs: higher max speed, and rules mirror moped rules (including age minimums, helmets built to higher standard, etc.)
- Don't change e-bike rules in isolation; consider standardized rules for all small, wheeled devices (bikes, e-bikes, e-scooters, e-skateboards, etc.)
- Set rules at the state level, with only very minor options for local variation, such as perhaps certain locations with additional restrictions

Teach people the e-bike rules

- Advocate that the state publish a collection of state e-bike rules written in plain language, similar to the “driver handbooks” prepared for motor vehicle operators
- Educate the community about e-bike rules of the road, including through schools
- Ensure plentiful signage to communicate any local rules that deviate from state standards, such as locations where sidewalk riding is prohibited in a business district

Collect better e-bike data

Work with medical professionals and police to better document crashes and injuries for e-bikes (and other small devices)

- Look at medical records beyond ER injuries
- Collect detailed data on the transportation factors surrounding crashes: type of infrastructure where the crash occured, what the e-bike rider was doing, what other road users were doing, etc.
- Document the device type with precision (i.e., e-bike class)

Collect “exposure” data (how much e-bikes are used in the community)

Contact information

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