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Exploring Electric Bicycle Safety Performance Data and Policy Options for California

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The recent emergence of electric bicycles has generated both excitement over their potential as affordable, climate-friendly transportation and concerns about their safety for riders and bystanders.This study, conducted as directed by California Senate Bill 381 (2023), assembled data and expert insights to help policymakers develop effective laws and policy that will support the twin goals of expanding electric bicycle use and protecting public safety.

What is an "electric bicycle"?

Under California law, as in most states, electric bicycles must have 2 or 3 wheels, operable pedals, and an electric motor that produces no more than 750 watts of power. Further, California segments legal bicycles into three classes on the basis of the top motor-assisted speed (20 or 28 mph) and method of activating motor assistance (by pedaling and/or via a hand throttle).

Complicating any discussion of electric bicycle safety, many devices that people perceive to be "electric bicycles" are actually not legal electric bicycles because they have motor power in excess of 750 watts and/or assist speeds above the 20 or 28 mph limit. Adding to the confusion, some devices sold and shipped as meeting power and speed limits for electric bicycles are easily modified to higher power outputs and speeds.

Rules for riding electric bicycles

The California Vehicle Code states that "an electric bicycle is a bicycle," thereby granting electric bicycles most of the rights and responsibilities of conventional bicycles.

There are just a few extra restrictions on electric bicycles, such as age minimums and adult helmet requirements for some types of electric bicycles.

What we do—and don't—know about safety

A major stumbling block to understanding electric bicycle safety risk is the fact that some proportion of crashes, injuries, and fatalities attributed to "electric bicycles" involve higher-power devices that are not legal electric bicycles. Counts of electric two-wheelers parked at a dozen northern California middle and high schools suggest that, at least for young riders in those communities, as few as 12% of the devices may be legal electric bicycles.

Keeping this major data quality limitation in mind, some patterns about electric bicycles emerged from our original analysis of crash, injury, and fatality data, plus a review of over 200 published electric bicycle safety studies:

- The number of incidents attributed to electric bicycles has risen sharply in recent years. That finding in and of itself is not surprising, though, since electric bicycle popularity has also climbed rapidly.
- Despite a rapid increase in incidents, electric bicycle crashes, injuries, and fatalities are, on the whole, far less common than incidents involving conventional bicycles.

- When injuries do occur, electric bicycle riders have somewhat more severe outcomes than conventional bicycles, on average, with more serious medical diagnoses and/or higher hospitalization rates.
- Most electric bicycle *injuries* appear to result from solo crashes, but vehicle crashes appear to be involved in a majority of *fatalities*.
- Nationwide, people injured and killed on electric bicycles tend to be older than those in incidents with conventional bicycles. That said, emergency rooms in communities where electric bicycles are popular among teenagers report numerous young people injured.

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Policy options

The State of California can most effectively support safe electric bicycle riding with a package of complementary actions that include educating all road users about electric bicycle rights and responsibilities, building safe biking infrastructure, re-considering how the California Vehicle Code defines and regulates use of electric bicycles, and improving data collection and analysis of electric bicycle related incidents to inform policy changes. Specific actions recommended in the report include:

- Building high-quality bicycle infrastructure on state facilities and supporting local government efforts to do the same
- Adopting strict disclosure requirements on retailers, so that buyers understand whether the device is a legal electric bicycle under statute, which class of device it is, and state rules on who may ride the device
- Publishing a handbook of Rules of the Road for riders of electric bicycles, conventional bicycles, and other micromobility devices that presents the full set of rules for these modes as defined in the California Motor Vehicle Code
- Specifying that the 750 watt maximum motor power refers to peak power, not continuous power for legal electric bicycles
- Revising the procedures that medical staff and police officers use to report incidents involving two-wheeled electric devices so that only those incidents involving legal electric bicycles are classified as such

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To Learn More

For more details about the study, download the full report at transweb.sjsu.edu/project/2423.html

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