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Are E-bikes Unsafe? A review of European and North American Studies

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1. Introduction:

Electric bikes (e-bikes) are emerging in the United States as an important complement to conventional bicycles and have already made major inroads into Europe's active transportation systems. E-bikes operate much like conventional bicycles but have a small electric motor to assist the rider, with a few different types of control systems. Most bicycle manufacturers (OEMs) have developed e-bike lines in the past couple of years. In the United States, e-bikes are governed for sale by the Consumer Product Safety Commission, but are regulated by use at local and state levels (e.g., how they are regulated on shared use paths) [1]. The primary concern regarding an e-bike's place in the transportation system is safety. Many state and local governments are grappling with development of regulations, in the absence of an evidence-base. In recent years, an evidence-base has begun to emerge from European, Australian, and North American empirical studies of naturalistic behavior, crash records, hospitalization records, and qualitative safety perception research. This presentation will review and synthesize the recent and emerging research on e-bike safety with two primary questions: 1) to what extent does the existing safety evidence show differences in e-bike safety outcomes compared to bicycles, such that differential regulations should exist and 2) what are e-bike substitution patterns in Europe and North America to assist in policy development surrounding e-bikes – can mode substitution imply directions of safety shifts.

2. Results:

Some of the main findings from existing research indicate that e-bike riders tend to behave similarly to bicyclists when considering speed and compliance with traffic control devices. E-bike riders tend to ride 2-5 mph faster, on average [2-7]. Riders tend to ride at higher speeds on uphill segments, but not flat or downhill segments.

A few studies have scrutinized crash or hospitalization data. Older riders tend to have slightly higher injury rates, but mostly related to balance while dismounting the heavier bike. E-bike riders tend to have slightly higher perceived rates of safety critical events with other road users, however, they tend to make riders feel safer. Despite some evidence of higher hospitalization and injury rates, the average injury severity is about the same as cyclists' injury [8-10].

One of the key factors when determining net safety impacts is exploring the behavioral shifts related to e-bikes. Most e-bike riders in North America ride farther and more often than conventional bicycling counterparts. E-bike

riders also tend to use the e-bike for more utilitarian trips and replace more car trips than conventional bicyclists [11-15].

3. Conclusion:

The research on e-bike safety has not found deifinitive negative or positive safety impacts. E-bikes tend to be a little faster on average, but top speeds don't tend to be faster. Much of the speed advantage occurs on uphill sections. Reduced travel time is an appealing factor of e-bikes but speed increases exacerbates some conflicts and perhaps creates expectation problems with other road users. Some of the increases in injury burden have occurred among a particularly vulnerable user group, older riders. E-bikes are more likely to be involved in single-vehicle crashes (e.g., dismounting). As e-bikes become more ubiquitous in North America, injury burden will naturally increase, but likely accompanied by a decline in other vulnerable and non-vulnerable road user injuries. Regulations should be tailored to assure e-bike vehicle design, infrastructure design, and operations maintain safety of all road users and promote innovation.

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