Issue At A Glance:

Improving Bicycle Infrastructure for Injury Prevention

Bicycle crashes and injuries are a significant public health concern since they are preventable but continue to occur in substantial numbers each year, leading to hospitalizations and deaths. Bicycle riders are "vulnerable road users" due to the difference in mass, speed, and physical protection compared to motor vehicles. This brief explores how road design and policy can improve safety for people on bikes.

Introduction

Bicycles offer much more than an outlet for exercise or leisure. With proper infrastructure, bicycles can serve as a form of transportation that is enjoyable, sustainable, and highly efficient for people of all ages. In 2021, just over 50% of all trips taken in the United States (counting automobile, rail, transit, and air) were less than three miles, and 28% of trips were less than one mile.[1] Many short car trips can be made by foot or bike instead. Replacing car trips with walking and cycling can improve air quality; boost mood; promote physical activity and weight loss; and reduce the risk of heart disease, diabetes, and certain cancers.[2]

However, the built environment in most of the United States, including in urban areas, is often not conducive to pedestrians and bicyclists, making walking and cycling more dangerous than car travel on a per-trip and per-mile basis.[3] Investing in safer facilities such as traffic calming and protected bike lanes can make cycling a more appealing option to people of all ages, thus increasing physical activity levels. As a type of active transportation, bicycling can be transformative in reducing obesity rates, reducing vehicle traffic, lowering carbon emissions, improving air quality, and boosting public health.

Key Concepts

Active transportation refers to human-powered mobility via biking, walking, or rolling (via scooters, skateboards, wheelchairs, etc.).

Vehicle miles traveled (VMT) is a measure used in transportation planning as the sum of miles that a vehicle will travel over a given time period, usually one year.

Vision Zero is an approach to traffic safety that aims to eliminate all traffic fatalities and severe injuries. It was first adopted in Sweden in the 1990s and has spread internationally.

Complete Streets are streets that are designed to facilitate safe use and mobility for all users, including drivers, pedestrians, bicyclists, and public transit riders.

Traffic calming uses physical design measures to reduce speeding and improve safety for road users.

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Importance of Safer Biking Infrastructure

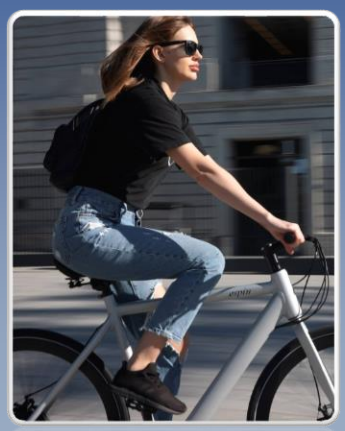
Traffic violence is a major public health concern: Compared to occupants of passenger vehicles, bicyclists and pedestrians in the U.S. are, respectively, 2.3 and 1.5 times more likely to be killed in any given trip.[3] As vulnerable road users, people on bicycles contend with the stark differences in mass, speed, and physical protection compared to passengers of motor vehicles. In a 2013 study analyzing the burden of hospitalizations in the U.S. for bicycling injuries caused by motor vehicle crashes (MVC), MVC-related bicycling injuries were associated with longer hospital stays and higher costs than non-MVC bicycle injuries. Around 7,000 MVC-related bicycle injury hospitalizations occur annually, resulting in $425 million in hospital costs.[4] A report by the U.S. Consumer Product Safety Commission (CPSC) found that emergency department visits related to e-scooters, e-bikes, and hoverboards more than doubled from 34,000 in 2017 to 77,200 in 2021.[5] Many of the same principles for safe infrastructure apply to both e-bikes and regular bikes.

Fatal and nonfatal injury rates for walking and cycling are higher in the U.S. versus Germany or the Netherlands, revealing that differences in the built environment play a major role in safety.[6] There are many factors for these differences: Car ownership is incentivized in the U.S. via free parking, low gasoline taxes, and relatively lower vehicle prices compared to Europe. In contrast, the land-use pattern in European cities is much more compact with many car-free avenues, wide sidewalks, raised crosswalks, and grade-separated cycling facilities. Connectivity is a major component as well: Bike paths are fragmented and sparse in the U.S., making it difficult for people to choose to bike for transport. German and Dutch bikeways use coordinated networks in rural and urban areas that serve as practical and safe alternatives for daily use.[6]

Road safety for bicyclists is also an equity concern. An analysis of the National Household Travel Survey (NHTS) and Fatality Analysis Reporting System (FARS) found that Black Americans had the highest fatality rate per mile traveled via walking or cycling, followed by Hispanics, then Whites, and Asian Americans.[7] Study authors expressed that the findings provide evidence for structural racism in transportation in part related to lack of investment in pedestrian and cycling infrastructure in communities of color. Proper biking infrastructure is critical for safety and equity for people of all ages, abilities, and backgrounds.

What About E-Bikes?

Electric bicycles have become increasingly popular in recent years and have the capacity to replace car trips more easily by providing electric motor assist to the work of pedaling. However, e-bikes may pose a higher risk of internal injury and concussion due to faster travel speeds. E-bike defects can include battery fires, brake failures, and other malfunctions.[8]



There are 3 broadly recognized classes of e-bikes:

- **Class 1**: Maximum speed of 20 mph. Electric motor works only when the rider is pedaling.
- **Class 2**: Maximum speed of 20 mph. Includes a throttle to power the motor when not pedaling.
- **Class 3**: Maximum speed of 28 mph. May include a throttle. May not be allowed in typical bike paths. Riders must be at least 16 years old.

Bicycle Safety Initiatives & Policies

City-Level Initiatives

Barriers for safer streets in the U.S. include unsafe road designs that place vulnerable bicyclists on high-speed roads, lax enforcement of traffic regulations, and a lack of political will or funding for street improvements. On the flip side, visionary city leadership can go a long way towards improving bicycle and road safety.

City councils and transportation departments can implement safer street design such as:

- **traffic calming** features to slow down cars such as lane narrowing, bulb-outs or corner extensions, raised intersections, roundabouts, and speed bumps;
- **protected bike lanes** that utilize concrete bollards or curbs to physically separate cars from bikes;
- **pedestrian- and bike-only streets** that induce active transportation mobility;
- **two-way cycle tracks** that allow bicycles to travel in two directions in a separated lane next to cars or on fully separated, quiet routes.

City-wide initiatives can unite advocates and planners in improving single streets or networks. **Bicycle Master Plans** outline networks of bikeways in a city or county for implementation and undergo community input and approvals. Locally, San Bernardino County published its **Active Transportation Plan** in July 2022,[9] and the **City of Redlands Bicycle Master Plan** was published in January 2015.[10] While the City of Loma Linda does not have a bicycle master plan, Loma Linda University Health released a **Wholeness in Transportation** proposal in December 2015 which provides recommendations to encourage active transportation around the campus.[11]

Vision Zero initiatives to eliminate traffic-related fatalities have been implemented in jurisdictions around the country, though many cities are failing to meet their benchmark goals.[12]

State-Level Policies

The California Department of Transportation (Caltrans) has committed to a **Complete Streets** policy stating that all transportation projects funded or overseen by Caltrans will include complete streets facilities for people walking, biking, and taking transit.[13]

In 2022, the **OmniBike Bill** (AB 1909) was signed into law which modifies vehicle code to facilitate safety for people on bikes.[14] The bill requires drivers to change lanes when passing a bicyclist, prohibits cities and counties from enforcing bicycle licensing requirements which have historically been used to harass youth and bike riders of color, opens most bikeways to e-bikes, and allows bikes to cross streets using pedestrian walk signs.

In addition, the California State Legislature considers bike safety-related bills each year. For example, the bill to study the connection between vehicle weight and pedestrian and cyclist injury (AB 251, Ward) was passed by the Legislature and signed by the Governor on October 7, 2023.[15]

Conclusion

Safe street design is essential to promoting bicycles for active transportation and reducing bicycle-related injuries and fatalities in California and the United States. Mobility improvements can take many forms such as Complete Streets, protected bike lane networks, and traffic calming but require political will and city leadership in implementing roadway changes.

Some European governments seized an opportunity during the COVID-19 pandemic to roll out pop-up bike lanes and incentivize cycling for transport to reduce disease transmission. A study of 20 European countries found that this infrastructure, if maintained, will generate $2.2-6.9 billion per year in health benefits, based on a previous finding that every kilometer cycled generates $0.45 in health benefits.[16] A cross-sectional study of walking and cycling rates found that U.S. adults who walked and cycled to work were more likely to achieve recommended levels of physical activity and less likely to have obesity or diabetes.[17] In addition to such health benefits, facilitating cycling for transportation has the added benefit of reducing vehicle emissions and car traffic. We have a public health imperative to build safer bicycling infrastructure to build a healthier, greener future.

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Did you know?

California is rolling out a $10 million statewide e-bicycle incentive. The pilot program is projected to launch towards the end of 2023. Vouchers start at $1,000 with additional incentives of $750 for cargo or adaptive bikes, and $250 for people below 250% of the federal poverty line or living in a disadvantaged census tract. [18]

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