Vision Zero in the United States Versus Sweden: Infrastructure Improvement for Cycling Safety

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Inspired by Swedish legislation, Vision Zero policies are being adopted in the United States with increasing frequency. Although some view the goal of eliminating serious injury and death on the road system as impractical, Sweden's lower rates of road-related injury and death provide compelling evidence that more can be done to improve US cycling safety. We examine existing Vision Zero and cycling-related literature to highlight the central components of the Swedish policy, with the goal of providing evidence-based recommendations for successful implementation of similar policies in the United States. Ultimately, infrastructure design should remain central in US Vision Zero plans, but supplemental initiatives promoting a cycling and safety culture also can be incorporated. (*Am J Public Health.* 2016;106:2178–2180. doi:10.2105/AJPH.2016.303466)

See also Pucher, p. 2089.

Regarded as a leader in road safety,[1] Sweden's Vision Zero policies view serious injury and death on the road system as morally unacceptable and aim to eliminate them entirely. The success of these policies in Sweden has made them an inspiration for US road safety initiatives.[2] Contrary to the commonly cited statistic that 90% of crashes result from human error, Vision Zero legislation places responsibility for collisions on road planners.[3] However, rather than aiming to eliminate human error or collisions, successful Vision Zero plans anticipate these problems through infrastructure that reduces collision severity by using the body's biological tolerance against external forces as a guiding mechanism.[4] This approach aims to minimize the effect of all potential collisions, whether induced by human error, the influence of alcohol, or another cause. This is achieved by separating traffic modalities at high speeds, managing speed for integrated traffic flow, and reducing angles of conflict at potential collision points.[5]

POSITIVE CHANGE AS A RESULT OF IDEAL POLICIES

Implementing large-scale bicycle infrastructure projects across the United States, such as bicycle lanes, cycle tracks, and shared-lane markings, would be ideal; however, the cost for eliminating serious injury and death through infrastructure alone likely would be prohibitive. Indeed, cities implementing Vision Zero policies in the United States often combine infrastructure projects with law enforcement, education, and cycling encouragement initiatives.[6–9] However, positive change can occur as the result of ideal policies with large-scale, symbolic goals, as long as these goals are achievement inducing.[10]

In order for US Vision Zero plans to succeed, it is important to combine a long-term vision for achieving minimized rates of injury and death with interim targets for qualified improvement along the way,[11] building from the current US cycling paradigm.

US CYCLING PARADIGM

The cycling environment differs across the United States, and legislation varies by state, but similarities also are seen. Vehicular cycling, following the notion that "cyclists fare better when they act and are treated as drivers of vehicles,"[12] is featured prominently in bicycle safety education curriculums and traffic legislation across the United States. Uniform Vehicle Code section 11–1202, which 48 of 50 states have adopted in some form,[13] explains that "Every person propelling a vehicle by human power or riding a bicycle shall have all of the rights and all of the duties applicable to the driver of any other vehicle."[14] This is important, because it enables cyclists to ride off of sidewalks, which can be much more dangerous for cyclists than riding on the street.[15]

However, the safety successes of countries like Sweden, the Netherlands, and Germany, which are known for their ample cycling infrastructure,[16] imply that the United States has room for improvement. Specifically, these successes suggest that improving cycling infrastructure is key to increasing cycling safety in the United States.

BICYCLE INFRASTRUCTURE AND SAFER CYCLING

No conclusive findings have shown that riding on bicycle infrastructure is significantly safer than riding on the street. Studies often show that injury rates are generally reduced on bicycle infrastructure, but danger is often increased at intersections.[15] This suggests that the context in which infrastructure is built is especially important. Although cycling on the street can, at times, lessen the chance of injury at intersections,

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on-street collisions are more often fatal.[17] Therefore, cycling infrastructure is required to improve cycling safety, especially to address cycling fatalities.

In addition, the safety benefits of cycling infrastructure are not all physical. As the average distance cycled per capita increases, and driver attitudes and awareness toward cyclists change, the rates of injury and death while cycling decrease.[18] This is especially important in the United States, where the cycling culture is dominated by men, and rates of cycling are low in youths and elderly populations.[19] Considering that women and the American elderly[20] are more likely to cycle when off-road bicycle paths or separate cycling facilities are available, creating more cycling infrastructure can improve safety through cycling encouragement and increased awareness rather than physical protection alone.

RECOMMENDATIONS FOR IMPROVEMENT

To improve bicycle infrastructure, the United States should separate traffic flow on high-speed roads and aim to decrease chances of serious injury at intersections and on lower-speed roads.

Separating Traffic Flow on High-Speed Roads

Because most cycling fatalities occur at nonintersections, and speed is a main contributor to cycling deaths,[21] separated cycling infrastructure should be prioritized along high-speed roads. The chance of cyclist fatality doubles at vehicle speeds of 30 miles per hour (48.3 km/h), increases by a factor of 11 at 40 miles per hour (64.4 km/h), and increases by a factor of 16 at 50 miles per hour (80.5 km/h)[22]; thus, many argue for 20 miles per hour (30 km/h) restrictions in areas where vulnerable road cyclists are integrated with general traffic flow.[5] As an example, advocates in cities such as New York City and San Antonio, Texas, have already argued for 25 miles per hour speed targets on certain roads, emphasizing that speed reduction accommodating vulnerable road users is essential to improving safety.[7,9] New York City's "slow zones" can serve as a model for other cities seeking effective speed reduction strategies.

Although political and funding concerns in each municipality will likely determine the speed at which traffic separation occurs, setting incrementally ambitious targets that lead to eventual separation at greater than 20 miles per hour is advisable.

Adding Lanes and Intersection Modifications

Intersection modifications can help decrease the severity of potential collisions. For example, the increased intersection risk on cycle tracks can be mitigated by routing the cycle track closer to the road when approaching intersections, similar to a bicycle lane, to improve cyclist visibility.[23] Additionally, when a bicycle lane crosses through a turn lane, adding yield markings for cars entering the mixing zone, installing posts to limit the number of access points to the lane, and colorizing the pavement can all improve cyclist safety.[24]

Furthermore, because bicycle lanes have been shown to change cyclist riding position[25] and, in many cases, driver passing position,[26] they are an ideal solution for reducing serious injury on lower-speed roads. However, bicycle lanes only lessen the chance of fatal rear or sideswipe collisions, whereas cycle tracks effectively eliminate this risk, making bicycle lanes on high-speed roads acceptable only as an interim step toward separate infrastructure.

FUTURE CONSIDERATIONS

Considering the relatively high cost of infrastructure improvements, and the fact that enforcement, education, and encouragement activities also can improve cycling safety, several initiatives can be implemented alongside meaningful infrastructure improvement in a Vision Zero plan. Further research is needed to determine the most effective noninfrastructure improvements, but they will likely fall in the categories of incentivizing cycling, promoting a road safety culture, and, when a transportation mode shift is desired, disincentivizing automobile use.

Although these noninfrastructure initiatives can serve as meaningful interim Vision Zero targets when substantial infrastructure change is difficult to implement, infrastructure should never become a secondary element of US Vision Zero policies. Improved safety and cycling cultures can help to prevent collisions but cannot change the body's biological tolerances when a collision does occur. Without a mechanism for decreasing collision severity, a Vision Zero plan's long-term goal of eliminating death and serious injury is no longer approachable, rendering the policy ineffective. AJPH

CONTRIBUTORS

M. Cushing completed the literature review, structured the argument, wrote the article, and revised drafts of the article. J. Hooshmand conceptualized the initial research question, supervised the research project, and provided critical revisions on drafts of the article. B. Pomares provided critical revisions on drafts of the article. G. Hotz supervised the research project and reviewed drafts of the article.

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HUMAN PARTICIPANT PROTECTION

Institutional review board approval was not needed because no participants, whether human or animal, were involved in the research project.

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Variation in Vaccination Data Available at School Entry Across the United States

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Objectives. To compile substate-level data on US school-age children's vaccination rates.

Methods. For states that did not have suitable data online, in 2015 we submitted information requests to the state health department and followed up with the state's Freedom of Information Act when necessary.

Results. The accessibility, scale, and types of vaccination data varied considerably. Whereas 26 states provided data online, 14 released data only after a Freedom of Information Act request. School or school-district data were available for 24 states, 19 at the county level, 2 at the health department level, and 6 provided no substate-level data.

Conclusions. Effective vaccination policy requires a robust understanding of vaccination behavior. Some states make it difficult to access data or provide low-resolution data of limited value for identifying vaccination behavior. (*Am J Public Health*. 2016;106: 2180–2182. doi:10.2105/AJPH.2016.303455)

The relationships among vaccination recommendations and policies, vaccine uptake, and the rates of exemptions from school-entry vaccination requirements are of great interest to public health officials. This information is especially valuable when it allows the identification of specific communities where vaccination coverage rates are below recommended thresholds and populations may be more vulnerable to outbreaks.

State-level data are helpful for identifying national trends in kindergarten vaccination and exemption rates,[1] but they do not allow examinations of within-state differences in vaccination coverage. Vaccination-related behavior has proven to be highly spatially variable within states or larger regions.[2–4] Communities with very low vaccination rates are often located in close proximity to communities with much higher vaccination rates. State-level data, or even county-level data, on vaccination coverage and exemption rates may not allow the identification of the most at-risk communities. Our ability to improve scientific knowledge about of the links between vaccination coverage rates and infectious disease outbreaks is dependent on having access to data at a fine spatial resolution. The challenges associated with accessing spatial data about immunization have been described for some individual states,[4,5] but the availability of data has not been systematically examined across the country.

METHODS

As part of our ongoing research about vaccination behavior in the United States, we attempted to collect substate-level school vaccination or exemption data for all 50 states and the District of Columbia. Our data collection process began in July 2015, and we concluded our efforts in September 2015. We began by accessing all official data available

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