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PubH 6078

12-17-2012

Notes Regarding Policy Brief

My Role: Staff member at the Minnesota Department of Transportation, in the Policy, Safety and Strategic Initiatives Division

My Superior: Jean Wallace, Policy Analysis, Research & Innovation

Representing: MnDOT in regards to cycling policy

Target Audience: My Supervisor, who will then present recommendations to the Division Director.

Notes: This policy proposal is designed to investigate successful cycling policies in other regions of the country and world and provide recommendations to MnDOT regarding policies MnDOT could adopt to increase cycling safety and usage. The policy recommendations focus on improving current cycling infrastructure, and integrating cycling infrastructure into future development of roadways, traffic planning, and public transportation efforts. Educational and urban planning issues are also addressed, but may be outside the influence of MnDOT.

Executive Summary

Cycling as an alternative to motor vehicle use has seen a surge in popularity in large cities in the US, but levels of cycling in the US as compared to similar European countries is low. Cyclists are also more likely to suffer injuries caused by motor vehicles in the US than in other countries, with US cyclists suffering 3 to 6 times more injuries than many European countries. A likely cause for these disparities is the gap between pro-cycling policies and infrastructure between the US and other countries. Use of bike lanes, improved intersection design, and traffic calming measures have shown promising increases in cyclist safety in some US cities and in cities in Denmark, the Netherlands and Germany. Increased cyclist and driver education in those countries has also increased road sharing between motor vehicles and cyclists. Finally, efforts to improve public transport, reduce car usage, and encourage cycling have reduce traffic and cyclist injuries in many cities in Europe. Responsible policy promoting these practices will help improve cyclist safety in Minnesota.

MnDOT should encourage three types of pro-cyclist policies. First, bike infrastructure should be updated and expanded to meet the needs of cyclists and to implement best practices found in the research literature. These updates and expansions should become part of the overall urban planning process in Minnesota. Second, MnDOT should work with public schools and driver education providers to increase education and skills training regarding road sharing. Third, MnDOT should investigate long term policies that will integrate public transport and cycling, reduce car use in congested urban areas, and begin planning for methods to actively discourage car use in areas with limited ability to further accommodate increased motor vehicle volume. Using these three approaches will provide short and long term guidance to MnDOT, legislators, and urban planners in continuing to develop the built environment in Minnesota to meet the changing needs of the road-using populace.

I. Introduction

Increased interest in cycling in the US has led a number of cities and state to investigate the safety issues surrounding cyclists and motor vehicle drivers sharing the road. Unfortunately, the US has comparatively unsafe roads for cyclists. In 2009 motor vehicles were involved in 49,000 non-fatal crashes with cyclists, and 626 fatal crashes (NHTSA, 2009). Other researchers have found that emergency room visits from motor vehicle collisions with cyclists may be much higher, near 250,000 per year (Mellion, 1991). The shared use of roads between motor vehicles and cyclists poses a safety risk to cyclists.

The most common causes of injuries due to vehicles are inappropriate driving speed of motor vehicles, head-on collisions with motor vehicles, and poor lighting of roads at night (Bil, 2010). Cyclists suffer the most severe injuries and are at fault when failing to yield the right of way. Research also tends to implicate automobile drivers as the at-fault party in most collisions (Atkinson, 1982), with one study finding 87% of collisions the fault of an automobile driver (Johnson, 2010). Policy makers should focus on reducing both vehicle and cyclists caused accidents, with a focus on those accidents caused by motorists.

Based on these findings, sensible cycling policy should focus on ways to either separate cyclists from motor vehicle drivers, or create a safer infrastructure for vehicles and cyclists to share. Multiple methods for doing this have been used in cities across the US and in many European countires. This brief will review some of the more successful methods and provide recommendations to MnDOT based on evidence from policies used elsewhere.

II. Methods to Increase Safety

Five main areas of policy and infrastructure improvement are common in the literature regarding cycling safety. These are use of bike paths and lanes, traffic calming and reduction,

intersection improvements, education and training, and urban planning and non-cycling policies. Successful examples in each of these categories will be reviewed.

1. Bike Paths and Lanes

Bike paths and bike lanes on roadways are a popular method of separating vehicles and cyclists, or providing safer road sharing infrastructure. Bike paths are completely separate routes from road ways, often parallel to roadways and separated by a curb, barrier, or other obstruction. Bike lanes are marked lanes on roadways that vehicles are not allowed to enter, or that have special rules regarding vehicle entry. In the last twenty years many cities have chosen to use one or both of these features to increase cycling safety.

Bike lanes provide a useful solution in places where bike paths are difficult or impossible to build. In the US, a study comparing Davis, California and Santa Barbara, California found that after Davis implemented bike lanes, there was a 31% reduction in all accidents involving cyclists, and a 53% reduction in accidents influenced by bike lanes (Lott, 1976). A test of colored bike lanes at intersections in Portland, Oregon found both motorists and cyclists obeyed the bike lanes and yielded properly more often (Hunter, 2007).

Separate bike paths that prohibit vehicular traffic obviously have very low numbers of accidents involving motor vehicles on the pathway themselves. However, intersections with roadways appear to pose a greater risk to cyclists, and will be discussed in the Intersection Improvements section. Based on these findings, improved bike lane marking and infrastructure is a promising way to improve safety.

2. Traffic Calming and Reduction

Traffic calming and reduction are methods that slow down or reduce motor vehicle traffic, often promoting pedestrian, bicycle, or public transport options as an alternative. The forms traffic calming

takes are varied, from reduced speed limits, road narrowing, zig zag patterns, speed bumps, use of one way streets, mid-block closures, and other creative methods to reduce motor vehicle speed and access (Pucher J. B., 2008). Traffic calming efforts in Dutch cities has reduced injuries by 20% to 70% (Kraay, 1989). Calming efforts in German cities resulted in a reduction of injuries by 35% to 56% (Hass-Klaus, 1992). No studies were found that implicated traffic calming efforts could increase injury or accident rates.

Efforts to use traffic calming have benefits beyond cycling injuries. A systematic review of 16 controlled before and after studies found in studies reporting fatalities, the rate ratio of fatalities in traffic calmed regions was 0.63 that of non-calmed regions. In studies reporting injuries, the rate ratio of traffic calming regions was 0.89 compared to regions without traffic calming (Bunn, 2003). Traffic calming efforts have also reduced child pedestrian injuries (Jones, 2005). Traffic calming, then, is effective at increasing safety for all non-motor vehicle traffic. These methods of traffic control should be investigated by MnDOT to determine if traffic calming could be used in suitable areas in Minnesota to increase safety on the roadways.

3. Intersection Improvements

Most interactions and conflicts between cyclists and motor vehicles occur at intersections where roadways and bike lanes and paths meet. Cyclists are at risk for injuries at intersections of any cycling route and motor vehicle roadways (Bil, 2010) (Atkinson, 1982). Common injuries involve vehicles making right turns and colliding with cyclists, cyclists attempting to cross lanes to make left turns, and issues related to the motor vehicle oriented design of most roadways. A variety of methods have been developed to try and reduce conflict between motor vehicles and cyclists.

The simplest method to control intersections is extending bike lane markings through an intersection. This approach is most effective on roadways with bike lanes on only one side of the road

(Jensen, 2007). It may not be suitable for roads with multiple bike lanes. A second method is marking bike lanes with colored markings before an intersection (Weigand, 2008). Tests of this method in Portland were positive, with both drivers and cyclists displaying better road behavior (Hunter W. , 2000). A third approach involves "bike boxes" or advance stop lines. These markings place a stop line for motor vehicles further back from the intersection and allow cyclists to move in front on vehicles at the intersection, reducing the chance of vehicles to turn right into cyclists. Multiple studies have investigated this approach and found it effective, but noted that vehicles tend to encroach on the "bike box" (Allen, 2005) (Wall, 2003) (Wheeler, 1995).

Other, infrequently investigated or untested methods have been proposed. Cyclist activated signals, or scramble signals for cyclists only at intersections have been proposed (Pucher J. B., 2008) (Wheeler, 1995). Turn restrictions for vehicles while permitting all turns for cyclists has been suggested. Traffic signals for cyclists have seen some success in trials in Davis, California, reducing vehicle and cyclist conflicts (Korve, 2002).

Bike paths at intersections deserve special attention. Research has found that bike paths crossing intersection actually increase the risk of injury to cyclists from motor vehicles (Balsiger, 1992). This is due to the phenomenon that when cars and bikes see each other, they are more aware of each other. Separated bike lanes remove this awareness. This is especially true if the bike path is not visible from the roadway. Because of this, non-recreational bike paths should be avoided in favor of bike lanes where appropriate.

4. Training and Education

A large problem facing cyclists and drivers in the US is a lack of formal education regarding how the two groups should interact on the roadways. European countries with cycling policies have developed more comprehensive training programs for both drivers and cyclists that require both groups

to be aware of the requirements to share the roadways (Pucher J. B., 2008). Some of these countries also have corresponding legal requirements and penalties related to road sharing. These policies may explain the reduced levels of cycling injuries due to motor vehicles, despite much lower helmet usage in Europe.

Cyclists share responsibilities to understand their vehicles and the rules of the road. Research in Toronto has linked increased cyclist injury rates to lower levels of experience, implicating that proper knowledge of cycling is an important factor in increasing safety (Aultman-Hall, 1999). The European example is again informative. Many European countries have mandatory or strongly encouraged cycling training programs that are delivered to young children to ensure they have the skills needed to engage in safe cycling (Pucher J. B., 2008). Integrating such programs into school physical education programs should be promoted by MnDOT

5. Policy and Urban Planning

Local and national policies have a strong influence on the desirability of motor vehicle transport as compared to other methods. The Netherlands, Germany and Denmark all have focused on cycling as an alternative to motor vehicles, and all three have comparatively high cycling rates, from 10% to 27% of all trips occurring via bicycle, as compared to about 1% in the US (Pucher J. B., 2007). Pro-cycling policies have been wide ranging, including increasing bike parking, working to combat theft, and increased education regarding cycling for cyclists and drivers. Policies to reduce motor vehicle usage have included traffic calming, increasing the number of bike paths and lanes, and integrating public transport and biking in a variety of ways. Other factors also influence motor vehicle usage.

Car ownership, licensing and registration are generally a much more expensive option in Europe as compared to the US. These costs come from higher taxes, tariffs, registration, licensing and parking fees (Pucher J. B., 2008). The cost of fuel also plays a role in car usage. Using prices available as of this

writing, the average cost per gallon of automotive fuel in the US is $3.35, while in Western European countries the same amount of fuel ranges from $7.46 to $9.46 per gallon, at mid-December 2012 prices and conversion rates. This price differential has existed for quite some time. Many of these costs come from policies designed to reduce car ownership and usage in Europe. Furthermore, zoning and land use policies in Europe favor centralized cities and transportation alternatives to motor vehicles, as compared of the "urban sprawl" found in much of the US (Nivola, 1999).

Finally, building bike infrastructure itself increases usage of that infrastructure. In a study of 43 large cities across the US, researchers have found that building cycling infrastructure increases the number of commuters who use bicycles as a means of transportation (Dill, 2007). MnDOT should consider adopting or adapting policies that have been successful in reducing motor vehicle use in other cities, as increasing the real or perceived cost of car usage will put positive pressure on other forms of transportation.

III. Counter Arguments

A review of scholarly sources finds few reasoned arguments against policies promoting cycling or various aspects of pro-cycling policy. Most counter arguments appear in the press or on the internet in the form of editorial columns or blog posts. Some of the major arguments against bike lanes are examined here.

"Bikes should be kept on separate paths to avoid conflicts with vehicles."

This stance argues that integrated bike lanes on roadways presents a danger to both cars and cyclists, and that only bike paths should be promoted. While this line of thought holds true outside intersections, two other factors are important. The first factor consists of the legal and political ramifications of separating traffic, specifically that some municipalities then fail to police, protect, or

maintain bike paths. In some cities, like Los Angeles, separation also removes government liability for those activities (Box, 2010). The second factor is that bike paths, as opposed to bike lanes, may increase cyclist risk of injury due to the nature of bike path and intersection designs (Balsiger, 1992). Bike paths can also lack proper exits and entrances to allow commuter and local traffic to access destinations, reducing effectiveness of these tools. Without significant reworking of urban development,, bike paths should only be used as a recreational or secondary option.

"Creating bike lanes reduces parking and increases car traffic."

While this may be true in some cases, one of the goals of increasing cycling infrastructure is to specifically demotivate automotive traffic. If cycling infrastructure is well implemented, it should remove some vehicles from the road, and provide specific pressure on drivers to leave their vehicles in order avoid the traffic and parking issues that this argument cites.

"Cyclists do not follow the laws, so why should we promote cycling?"

This argument is understandable, as some cyclists show high rates of flaunting traffic laws. However, research noted previously has found that providing increased biking infrastructure actually increases the rates at which cyclists obey laws, especially at intersections. This argument also could be used against drivers of motor vehicles, who also regularly disregard traffic laws. Many cycling injuries are due to this sort of behavior. However, just as roads have not been abandoned because some motorists speed, cycling infrastructure should not be abandoned because some cyclists break the rules of the road. More aggressive education and enforcement towards drivers and cyclists may improve behavior.

"Building cycling infrastructure costs more than it's worth."

In most settings, this opinion is simply untrue. When the costs of road wear, reduced vehicle emissions, health benefits and other factors are included in the cost to benefit analysis of adding cycling infrastructure, studies have found positive ratios ranging from 3:1 to 34:1 in terms of benefits gained compared to money spent (Davis, 2010). An Australian study found even high ratios, in the range of 5:1 to 54:1 over 30 years (Yi, 2011). Cycling infrastructure more than pays back initial investments.

IV. Policy Approaches

Based on the research and arguments listed above, a variety of policy approaches have been effective at increasing cyclist safety. At the city level, all of the following approaches have seen some success:

- Increasing the number of on-road bike lanes.
- Limiting bike lanes to one side of the roadway.
- Using colored bike lane markings at intersections and preceding intersections.
- Providing “bike boxes” at intersections.
- Reducing motor vehicle numbers and speed.
- Installing intersection signals for cyclists only.
- Providing advance signals at intersections for cyclists.
- Formalizing training for both cyclists and drivers to increase awareness of how the two groups interact.
- Increasing integration of public transportation and cycling through “park and ride” systems that allow geographically distant commuters to safely park bikes at transit hubs.
- Implementing “anti-car” policies that increase the cost of car ownership at a variety of levels, or by reducing the attractiveness of operating a vehicle in areas of traffic congestion.

V. Policy Recommendations

The US has a strong car culture. Many European cities have instituted car free zones that would be untenable in the US, and in the Twin Cities and Minnesota at large, due to cultural habits and the current infrastructure. Cycling safety policy enacted by MnDOT should therefore attempt to refine the existing infrastructure, take cycling infrastructure into account when developing new roadways and maintaining existing roadways, and focus on non-infrastructure policies to increase safety.

Improving existing infrastructure should focus on improving signage and bike lane markings and redesigning how intersections handle bike traffic. The East and West Mississippi River Trails are a prime example of this. Bike pathways frequently mix with pedestrian traffic, and are funneled into pedestrian crosswalks. In some locations, these paths are adjacent to roads with bike lanes, with no clear indication of which should be used when. Effective policy would move bike pathway traffic to the roadways before intersections and provide consistent signage and usage rules. Development should also focus on the more cost effective use of bike lanes as opposed to bike pathways, as bike lanes often require pavement markings and adaptation of existing intersections as opposed to new construction and maintenance efforts for pathways. High volume bike lanes at intersections would benefit from bike boxes to reduce conflicts between cars and cyclists, and would also benefit from clear markings in intersections of where bike traffic and vehicle traffic is allowed.

Future roadway construction and maintenance should take into account current bike lanes and evaluate if lanes should be added to new streets or moved to more effectively channel vehicle and cyclist traffic. This should be considered especially in areas where high speed limit roads contain bike lanes when adjacent streets may be more suited to sharing bike and vehicle traffic. Road resurfacing and repainting should also take into account bike lane markings and coloring to ensure that all shared roads are adequately marked. Given that Minnesota often has harsh winters which obscure road markings, signage and lighting regarding shared road use should also be considered.

Non-infrastructure policies should also be supported such as increased driver and cyclist education programs. Elementary schools would do well to learn from European child cycling education programs. MnDOT should advise legislators to add cycling education curriculums to physical education activities in public schools and promote the importance of cyclists following the rules of the road to prevent injury. Driver education courses and exams should also increase the attention given to road sharing and the rights and capabilities of cyclists sharing the road with motor vehicles.

Beyond educational programs, MnDOT should work with public transit operators to promote cycling to feeder stations for us and light rail in commuter communities, primarily by providing ample secure parking for bicycles. This will both reduce car use in city centers and increase available parking at transit hubs and in congested areas by reducing overall car traffic. Another policy to investigate is increasing parking fees in congested areas that also have cycling and public transit infrastructure in place to accommodate a shift from automobile traffic to other forms of transportation. Minnesota has no toll roads at this time, so increased tolls or congestion taxes would likely be politically difficult to implement. If alternative transportation modes are further developed, this approach may be worth considering in the future.

Finally, MnDOT should consider working with law enforcement officials to increase awareness and enforcement of proper road usage by both motor vehicle drivers and cyclists. While motor vehicles are responsible for most cycling related accidents on roadways, cyclists must also bear some responsibility. Increasing enforcement for running red lights and improperly following signage would help deter inappropriate behaviors, and perhaps more importantly let drivers know that the road is not being given to cyclists, but shared by both groups. Improved enforcement may also send a signal to those who perceived cycling as dangerous that conditions are improving, and increase use of cycling infrastructure, further increasing the benefits of increasing spending on cycling infrastructure and reducing traffic.

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