The Science and Politics of Red-Light Camera Enforcement

ABSTRACT

Traffic safety is a hot topic in the City of Denver. Traffic crashes are occurring at an alarming rate with a trend of fatalities and severe injuries pointing in the wrong direction. In response, the city has adopted a safety initiative called Vision Zero, a Swedish import to combat the troubled traffic situation. In the traffic safety toolbox of Vision Zero, red-light camera (RLC) enforcement is a countermeasure to mitigate the risky, collision-inducing pattern of red-light running. The catch though is that transportation policy disagreements have stymied the deployment. To use or not to use is the question pitting traffic safety proponents against critics who see the technology as a dubious enforcement practice and government overreach.

In this paper, I argue that political pressure has thwarted the adoption of an effective enforcement strategy - red-light camera technology - in a manner that exposes the tension between science and politics, and ultimately the limitations of empiricism, in developing public policy. To shed light on Denver's traffic safety debate, the paper addresses two research questions. 1) What are the traffic safety implications of red-light camera (RLC) technology particularly related to the problem of red-light running and crashes at intersections? 2) What social, economic, and political forces are in play and to what extent do they influence the policy decisions of City of Denver leadership to deploy red-light camera enforcement?

The politics of traffic safety cannot be understated. A mixed review of the academic literature and news articles shows that while the red-light camera is an effective crash mitigation device, substantive implementation in Denver has lagged behind the scientific findings. Despite the enthusiastic adoption of Vision Zero with the strong support of Mayor Michael Hancock, the political divisions in Denver have hobbled the deployment of red-light camera enforcement.

Red-light camera enforcement holds promise to improve traffic safety conditions in the City of Denver. Traffic safety is a significant issue of public health and urban livability. Denver must come to grips with the chronic problem of red-light running and the negative consequences for traffic safety in order to make progress towards the development of a safe and accessible multi-modal transportation system. Truth can and should prevail over political noise so that clear-headed empirical research can support and energize the safety policy language of the Denver Vision Zero Action Plan towards the aspiration of "safe streets for all."

Introduction

Traffic safety is a hot topic in the City of Denver. Traffic crashes are occurring at an alarming rate with a trend of fatalities and severe injuries pointing in the wrong direction. For instance, in 2019, crash statistics exposed a troubling imbalance in which traffic deaths outnumbered those by murder, 70 to 63, respectively (City of Denver, 2020). (Figure). A Denver City Council member has framed the gravity of the situation this way: "We hear daily, all over our city, real fear — it's past the point of concern — for what our traffic situation's doing" (Denver Post, 2019). The seriousness of the problem has flared to the extent that Denver Streetsblog issues a weekly "traffic violence report" listing the fatalities of pedestrians, bicyclists, motorcyclists, and

"people in cars and trucks" occurring on the streets of Denver (Denver Streetsblog, 2020). Understandably, City of Denver officials and the public are concerned about the growing human and economic costs related to vehicle crashes.

In response, the city has adopted a safety initiative called Vision Zero, a Swedish import to combat the troubled traffic situation. In Denver as well as cities across the United States including Boulder and Fort Collins in Colorado, Vision Zero aspires to do nothing less than stamp out chronically recurring vehicular crashes and provide "safe streets for all." At its introduction to Denver in 2016, Mayor Michael Hancock declared: "We need to make Denver's streets safe for everyone – no matter where they live in the city, no matter their means and no matter their choice to walk, bike, drive or take transit" (Denver Vision Zero Action Plan, 2016).

In the traffic safety toolbox of Vision Zero, red-light camera (RLC) enforcement is a countermeasure to mitigate the risky, collision-inducing pattern of red-light running. The catch though is that transportation policy disagreement has stymied its deployment in Denver. In fact, in a city of 155 square miles, just four intersections have been equipped with automated cameras (City of Denver, 2020). By contrast, eight operate in the 25 square miles of the City of Boulder (City of Boulder, 2020). To use or not to use is the question in debate pitting traffic safety proponents against critics who see the technology as a dubious enforcement practice and emblem of government overreach.

In this paper, I argue that political pressure has thwarted the adoption of an effective enforcement strategy - red-light camera technology - in a manner that exposes the tension between science and politics, and ultimately the limitations of empiricism, in developing public policy. To shed light on Denver's traffic safety debate, the paper addresses two research questions.

1. What are the traffic safety implications of red-light camera (RLC) technology particularly related to the problem of red-light running and crashes at intersections?

2. What social, economic, and political forces are in play and to what extent do they influence the policy decisions of City of Denver leadership to deploy red-light camera enforcement?

I conducted a mixed review of the academic literature and popular news articles to understand both the evidence in favor of red-light camera enforcement and the cultural debate that has curbed its use in Denver. To enter the conversation of red-light camera enforcement, I made a broad sweep of subject matter around the Vision Zero traffic safety movement. I made term queries with Google Scholar and the Start My Research feature of the Auraria Library with key words such as Vision Zero, intersection safety, traffic safety, red-light camera (RLC), and crashes.

The searches led me to papers found in the health, safety, and transportation journals such as Accident Analysis and Prevention, Journal of Safety Research, Traffic Injury Prevention, and the like. Additionally, web sites managed by Federal Highway Administration (FHWA), National Highway Safety Administration (NHTSA), and the Vision Zero Network were helpful for both general and technical information. The Vision Zero Data Dashboard of the City and County of Denver too is a rich resource for the details and trends of traffic safety. Crash data available from

the Denver Open Data Catalog reveals prevalent crash types and crash locations (e.g., intersections). My cursory reading of the Bicycle and Pedestrian Crash Analysis Reports published by the City of Denver in 2016 assisted in understanding crash events related to vulnerable road users.

Thus having a general sense of the urban traffic safety landscape, I identified peer-reviewed papers and technical reports about red-light camera technology with a focus on its effectiveness to reduce crashes and injuries at intersections. From there, I turned to news reports of local media outlets of the Denver Post, Denver Streetsblog, and Denverite to find popular reports and tease out the arguments for and against photo enforcement.

A mixed review of the academic literature and news articles shows that while the red-light camera is an effective crash mitigation device with some qualifications related to the "crash migration" effect, the headwinds of political disagreement around the concept of automated enforcement have prevented substantive implementation in Denver.

The findings are arranged in three parts. The first presents a brief literature review of the effect of RLC technology on intersection safety. Next, current practices of RLC enforcement are described for a few cities in Colorado and one in Texas as representative cases of general trends in the United States. For the third part of the findings, I survey the Denver news media for accounts and opinions associated with the debate of red-light camera enforcement.

Literature Review

The consensus of four peer-reviewed studies detailed here is that the presence of a red-light camera is an effective deterrent of red-light violations and related crashes.

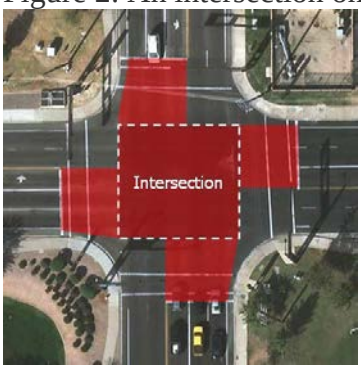
It is important to understand that urban intersections are flashpoints of traffic conflict. For instance, a citywide study of bicycle crashes in Denver found that approximately 69 percent of crashes with automobiles happen where two or more streets meet as shown in table 1. Nearly half of all crashes occurring at signal-controlled intersections with the conflicts zones outlined in red as shown in Figure 2 (Denver Bicycle Crash Analysis, 2016). Intersection design, therefore, is a paramount factor of the traffic safety calculation.

Table 1: Location of bicycle crashes at intersections and non-intersections, 2013-2020.

	UNIDENTIFIED	ALLEY RELATED	AT INTERSECTION	DRIVEWAY ACCESS RELATED	HIGHWAY INTERCHANGE	INTERSECTION RELATED	NON INTERSECTION	PARKING LOT	ROUND ABOUT	UNDER INVESTIGATION	TOTAL
Bicycle Crashes	6	106	1405	168	15	174	367	37	4	3	**2285**
Percent of Total	0.3%	4.6%	61.5%	7.4%	0.7%	7.6%	16.1%	1.6%	0.2%	0.1%	**100.0%**

Data Source: City of Denver, 2020

Figure 2: An intersection on defined by the Uniform Vehicle Code



Data Source: FHWA, 2009

In addition to design standards, the Denver Vision Zero program has given much attention to improving intersection safety with blend of strategies in the areas of engineering retrofits, education campaigns, and enforcement strategies such as red-light camera technology. The logic of RLC is to influence driving behavior with the expectation of a consequence for running a red light. As indicated previously and corroborated by several studies of this literature review, the logic is sound.

First, Llau and Ahmed aggregated the results of nine studies measuring the effectiveness of RLC and found a positive correlation to reduced red light violations and crash severity. Four of the nine studies completed between 1999 and 2010 showed remarkable reductions of red light running ranging from 40 to 94 percent. In addition, the research indicated a positive spillover effect of a 26-50 percent drop in violation in intersections *without* cameras (Llau, 20103)

Second, a meta-analysis of 18 American studies of the effectiveness of red-light cameras for intersection safety indicated generally positive safety outcomes. A caveat is the crash migration effect that explains the consequence of an intervention that in this case reduces right-angle crashes but produces more rear-end crashes at street intersections. Safety experts can tolerate the trade-off because rear-end crashes tend to cause less bodily damage and fewer fatalities compared to a collision of two vehicles right angles known as a “T-bone” crash. The meta-analysis found that intersections with RLC had a 12 percent fewer number of crashes and reduced right-angle crashes by 24 percent. However, the analysis too found a 32 percent increase in rear-end crashes that follows a principle of “crash migration.” Crash migration occurs when an intervention succeeds towards a primary objective (e.g., reduce conflicts of intersections) but shifts the safety problem to another location (e.g., higher rate of rear-end crashes at the approach of intersections). Despite the mixed traffic safety outcomes, the study concluded that RLC enforcement on balance “tends to have a strong overall net safety effect” particularly in dense urban environments (Goldenbeld, 2017).

Third, by comparing aggregate crash rates of 57 large cities using RLC technology to 33 control cities without it, researchers Hu and Cicchino with the Insurance Institute for Highway Safety found that camera enforcement dampened the number of fatal crashes at intersections. Further, the research revealed a safety bonus of a reduction of fatal crashes at nearby *non-camera* intersections. The key finding, based on 23 years of data, was a 14 percent reduction of fatal crashes at signalized intersections and a 21 percent reduction of fatal red-light running crashes

compared to the predicted number of fatalities. Also significant, the removal of red-light camera had a negative consequence. Upon removal of a RLC, both red-light running and the general rate of fatal crashes at intersections increased by 30 percent and 14 percent respectively over a study period of 2010 to 2014 (Hu, 2017).

Fourth, a study of 27 intersections in Maryland using a before-and-after design found clear traffic safety benefits of RLC deployment. The analysis of multi-year crash data showed a significant decrease in side-impact crashes albeit with mixed results on the number of rear-end crashes. As previously noted in the Hu study, RLC deployment delivered a safety spillover bonus. That is, the intersection following the subject RLC intersection benefited from a "halo effect" for safety. Drivers tended to approach the downstream intersections at slower speeds and with a greater tendency to stop at the sight of a yellow signal at the intersection. The empirical evidence shows a net benefit of using RLC in reducing RLR and "T-Bone" crashes despite the undesirable consequence of more rear-end crashes (Park, 2019).

For its part, the City of Denver Police Department supports automated enforcement as a behavioral tool demonstrated by this statement from its web site: "Photo enforcement is an important tool that changes driver behavior to improve safety" (City of Denver, 2020). The Denver Police web site refers to national research that shows RLC technology can reduce fatalities by 21 percent an overall reduction of right-angle crashes at intersections (FHWA, 2005).

Current Practices in Three Cities

A sampling of two Colorado municipalities coupled with its legislative demise in Austin, Texas demonstrates the flux of red-light camera activity in the U.S.

Since 1995, the City of Boulder has employed RLC and recently expanded coverage to eight intersections, twice that of Denver. Boulder justifies the purpose of its automated enforcement program with traffic safety: "Speeding and red-light-running are two of the most common causes of traffic crashes in Boulder. . . photo enforcement devices . . . improve traffic safety, prevent crashes, and save lives." The Boulder web site provides contextual and even myth- busting information. For example, the myth that "The city uses red light cameras to make money" is countered with a statement that, "The city uses the cameras to prevent speeding and protect road users – not to generate revenue - . . . in line with our community's Vision Zero goals" (City of Boulder, 2020).

"Red light cameras save lives" reads the headline of the web page of the City of Colorado Springs that maintains RLC technology at four intersections, the same number as in Denver. The city promotes public safety and the positive influence of RLC on driving behavior. As evidence, the web page refers to results of a 72 percent decrease in red light running violations over the first year of implementation (City of Colorado Springs, 2020).

Ten red-light camera operated in Austin, Texas until 2019 when a conservative state legislature spurred by a "firebrand" state senator passed House Bill 1631 that effectively declawed local government including the City of Austin from collecting fines generated by red-light cameras. During the comment period of HB 1631 law, a Republican state senator evoked a legal complication that, "Red light cameras violate the right to due process by creating a presumption that the registered owner of the car committed a violation." The statement represents the

concerns of critics of RLC about privacy violations, municipal "cash grab," and a "new form of speed trap" (Statesman, 2019).

The Politics of Traffic Safety

As the case in Austin exemplifies, the politics of traffic safety cannot be understated. Despite the enthusiastic adoption of Vision Zero with the strong support of Mayor Michael Hancock, the political divisions in Denver have hobbled the deployment of red-light camera enforcement.

Politics is a complicated and multi-layered game that defies facile explanation of motives, however, for the sake of argument; the major political disagreements are distilled into a "safety" versus "liberty" dynamic. Whereas the "safety" proponents stand by the operational efficiency and enforcement results of RLC, opponents of RLC, the "liberty" faction, express concerns about an intrusive enforcement technique and underhanded municipal revenue generation. In a review of the politics of traffic safety that follows, the opinions and policy positions pulled from in the local news articles might be thought of as points along the line of a safety - liberty continuum.

As an ardent proponent of RLC, Jill Lacantore, who leads the WalkDenver advocacy organization, has expressed the policy debate in terms of lost opportunities. "So our biggest focus, policy-wise, has been fending off the attempts by the state legislature to ban automated enforcement. In the way that it is now, it's not allowed in the places where it's needed most" (Denver Post, 2019).

Another proponent of RLC, Denver council member Wayne New, said, "It's just a mystery why it's not justifiable. It seems political, not practical" in reaction to the decision by the Colorado Department of Transportation (CDOT) to reject the Denver funding of automated enforcement at selected intersections of arterial boulevards with poor safety records. His disbelief that the two agencies could not coordinate sensible safety enforcement measures was justified in that CDOT shares an interest in traffic safety and is a partner to the City of Denver in the implementation of the Vision Zero Action Plan (Denver Post, 2019).

A third representative of the safety side of the debate is Andrew Bernstein, a writer with Bicycling Magazine in Boulder, who was nearly killed on his bicycle by a pickup truck driver in 2019. His concerns are those of a vulnerable road user with a desire for stepped-up enforcement: "I believe the focus should be on making driving safer. Cyclists are vulnerable, and when we get hit like I got hit, the injuries can be catastrophic, or we can die . . . the key is to greatly increase enforcement of restrictions on cell phones, on speeding, on drinking and driving." In the same interview, Bernstein's brother added a thought about the social contract of people for mutually assured traffic safety: "I think there are a lot of drivers out there who do not drive with any sort of concern in their hearts for the people around them, and that's very scary" (Roberts, 2019).

Moving to the "liberty" side of the debate, Denver City Councilor Kevin Flynn, an outspoken opponent of RLC, argues that simple adjustments to traffic signals such as increasing yellow phase would be a more productive strategy than the use of cameras to stamp out red-light running (Denver Post, 2019). Moreover, when asked about the safety effective of red-light cameras, Flynn responded, "I don't know that they have, because fatalities are so few and far between that it's hard to tell what's statistically significant. But I do know that setting the yellow time saves lives and reduces red-light running" (Denverite, 2019).

In the same conversation, Flynn referred to the decision of policy makers in 2010 to wind down RLC in Loma Linda, California because as the Mayor of the town said, "I believe these red light cameras are ways for city governments to legally extort money from their citizens. Issues were raised about the hefty amount of unpaid violations and the unsavory profit motive of Redflex, a private management company (Eyewitness News, 2010).

In 2011, when additional RLC equipment was installed in Boulder, a resident when asked her opinion about automated enforcement, expressed skepticism about governmental greed and underhanded tactics: “Frankly, I’m not a huge fan of them. I personally think the reason the city uses them is not so much safety, but to make money” (Urie, 2011).

In a third and final example of opinions based on “liberty” , State Auditor Dennis Gallagher doubted government’s motivation of the use of RLC during testimony to Colorado state legislature : “Because these programs were sold as public safety enhancements but are widely viewed as a ‘cash grab’ by the public, it undermines public trust” (Kaminsky, 2015).

Policy conflicts can stem from overlapping jurisdictional oversight of the transportation network. In 2018, for example, the Denver City Council ran into this obstacle related to several arterial streets that overlap as designated state highways managed by the Colorado Department of Transportation (CDOT). Having allocated some $1.4 million in street safety funding from the city budget for red-light cameras and mobile speed enforcement related to four hazardous intersections in Denver, CDOT staff declined to accept the funding in spite of a spokeswoman’s statement that “number one thing we do is safety” (Denver Post, 2019).

Discussion

The literature review, admittedly limited in scope, presents strong evidence that red-light cameras work as intended. Their presence at intersections dampens red-light running, abates crashes, and reduces fatalities and serious injuries caused by hazardous broadside crashes. The traffic safety benefits of RLC are particularly important even if some studies indicate that crash migration is occurring as indicated by an increase in rear-end crashes at the approach to intersections.

Looking at the current practices of Boulder and Colorado Springs, despite their widely separated political leanings, the power of the safety-first message and the political cover it provides are noteworthy indicators of successful and sustainable automated enforcement. The take-away lesson here is that an appeal to public health and safety can preempt the legal and technical attacks that subverted RLC in Austin and in Texas generally. Without clearly communicating the public safety benefits afforded by RLC, local government might lack the influence to block statewide attempts to constrain or eliminate RLC programs.

A sampling of the news media accounts about the politics of traffic safety uncovers the forces in a policy tug-of-war. There are tremendous opposing forces of “safety” and “liberty to return to the metaphor used previously. Proponents of RLC demand enforcement based on a safety-first prerogative to meet what they consider is a public health crisis of traffic deaths and injuries. For this side, red-light cameras translate to safety. There is a general trust in the ability of government to act for the public good.

In contrast, opponents of RLC stand strong for selective, “fair” enforcement with a freedom-first premise and a wish to maintain a smaller role of government. On this side of the debate, red-light camera enforcement means interference. There is a general sense of distrust of the motives of government and distaste for enforcement overreach that limits individual rights. Whereas the “safety” side implies that government has a responsibility to protect the public, the “liberty” side prefers to leave the responsibility of driving behavior to the individual. Accordingly, those who favor liberty do not want to be caught red-handed by “ticket traps” and instead suggest extending the yellow-phase of a signal as a technical solution that allows for individual compliance at intersections.

In sum, the policy debate provides rich perspectives and opinions that reflect the cultural divisions of our time. RLC supporters urge greater use of the technology as a significant tool to achieve Denver Vision Zero goals. Safety advocates point to a public health crisis and demand that the City of Denver take greater action to blunt the number of fatalities and serious injuries (Denver Streetstblog, 2019). On the other hand, RLC critics express concerns of a municipal “cash grab” of enforcement citations and “Big Brother” surveillance that upset individual rights and expectations of privacy.

The policy debate hovers around the role of government in traffic safety and enforcement. Herein lies an inherent conflict of interest that viewed through the conceptual lens of political economy explains how the political tug-of-war can result in sub-optimal public policy. In the case of automated enforcement, public safety as the ultimate policy goal of Vision Zero is diminished by a powerful desire to maintain individual responsibility for driving behavior.

The deeply held positions call for a planning process that recognize the concerns, fears, and hopes of the constituents. Transportation planners and engineers would be advised to describe the benefits and drawbacks of the use of photo enforcement in a way that acknowledges the differences of perspectives and opinions, and too forges ahead with policy guidance that stays true to a responsibility to protect the health, welfare, and safety of the public. The role of the planning process here is to understand the will of the public and present factual data in order to meet the needs of real traffic safety improvements. Planners need a solid basis of fact from which to make recommendations and shape traffic safety policy.

Conclusion

Red-light camera enforcement holds promise to improve traffic safety conditions in the City of Denver. Traffic safety is a significant issue of public health and urban livability. For this reason, Denver must come to grips with the chronic problem of red-light running and the negative consequences for traffic safety so that progress may continue towards the development of a safe and accessible multi-modal transportation system.

However, Vision Zero has yet to deliver on the promise of substantially reducing crashes and the human and economic costs of collateral damage. The generally accepted value of the safety objectives of Vision Zero is not in question. However, the lagging results raise questions about the efficacy of Vision Zero and the ability of the City of Denver to operationalize its strong policy language of the goal of zero deaths by 2030.

A public debate about traffic safety has exposed the tension between science and politics in developing and implementing public policy. The policy debate reflects the competing influences of science and politics in current political climate in which the legitimacy and authority of government are under attack. Truth should prevail over political opinion in that clear-headed and rigorous empirical research can support and energize the safety policy language of the Vision Zero Action Plan.

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