



Traffic and Pedestrian Safety, Pre and Post Covid-19

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Abstract

The effects of planning initiatives aimed at increasing bicycle use have been little studied in relation to decreased auto use, injuries and pollution. As most programs promote the idea those public investments in bicycle lanes, traffic calming engineering of streets and valuing bicycling as economic and environmentally sound, this article assesses the goals and results. While bicycle use for commuting has decreased in recent years and congestion increased, focus on the effects of engineering streets for calming and bike and pedestrian use were found often to be associated with increased driving times, increased pedestrian and bicyclist injuries and increased pollution. While the economic slowdown due to Covid-19 has reduced traffic, use of existing traffic design has produced intensified conflicts which will be continuing patterns when full economic recovery takes place. The article makes use of data from a number of countries and original fieldwork.

Keywords: Traffic Calming; Bicycle; Commute; Pollution; Pedestrians; Injuries; Deaths

Introduction

The federal government, states and local agencies have investment billions in traffic changes and fees, fines and driving rules that have promoted bicycle use in America. It is appropriate, therefore, to examine the results. What effect has this work and the expenditure of public funds had on driving, pollution and traffic? Some studies have shown varied results with positive outcomes outside of cities, while injuries to pedestrians and bicyclists have varied [1]. During the Covid-19 pandemic many urban environments have seen increased use by bikes, human motive machines like wheelchairs, skateboards and mobile single passenger units like motorized skateboards and pedestrians. This increased use has brought new focus to the design of multiple use arteries both shared with motor vehicles and not. Social distancing requirements have complicated use and made for problems in local authority governance [2,3]. With only limited data available, we find driving down considerably in 2020, but fatalities have increased dramatically as have

injuries to bicycle users, while pedestrian injuries are down) [4]. While in the first half of 2020 fatalities were up per 100,000 from 1.06 to 1.25 [5]. One tentative explanation is that with less traffic drivers and bike users are ignoring street signage and driving faster. However, when things return to pre-COVID-19 conditions, current designs and street concept ideologies will have to be reconsidered. A more comprehensive and comparative analysis follows.

Commuting and Bike Use

In a recent article in the journal Wired, [6] breaks down data on biking promoted by such advocacy groups as the League of American Bicyclists. This group uses data provided from the U.S. Census Bureau's American Community Survey. Answers to questions on biking do not differentiate between a respondent's use of a bike X number of times a week or if that trip was for seasonal use or each work day or only one or two days or mixed, that is, if for work one day or partial; was it only a leg of a commute or only a part of the commute (i.e.,

home to train or bus). There is a great variation in bike use in cities, from just under 12% in some of the smaller cities to just over 3% in mostly larger ones. Weather and investments in bike friendly infrastructure are the explanations given by the League spokesmen in the article.

The Census data, therefore, tell us that commuters cycling to work dipped in 2017 by 4.7% from 2016. Less than 1% of all workers used bikes but 84% of the largest U.S. cities reported some increase in bike to work use. So one might ask, is this a cost effective result of billions of dollars invested? That is, is the expenditure associated with community goals, e.g., to reduce pollution or is it simply to support a lifestyle choice or recreational preference [7]. Bicycle advocacy groups often argue that their efforts have community goals [8].

In 2004 the Brookings Institute reported that traffic was getting worse [9]. All efforts to reduce traffic seemed to fail. The most obvious, increase in gas price, also seemed to be of little effect. City Lab published a study in 2018 [10] showing that traffic was just getting worse. Time in traffic had increased as well as miles traveled. Data from INRIX was used and is available at their website for 2018 as well (<http://inrix.com/scorecard/>).

In Seattle the cost of improvements for bicycle commuting topped \$12 million a mile [11] or a projected \$600 million for 50 miles. This may be a special case. National expenditures on bike lanes and other related “traffic calming” measures are difficult to compile as they are usually lumped in with pedestrian improvements and other street modifications. Yet it is estimated that there are now 200 miles of bike lanes in America. Another example of cost comes from Broward County Florida where a “safe streets” project was implemented for 5 complete streets with a cost of \$11.4 million. This also included pedestrian improvements. In 1984 Florida was the second state in the nation to adopt the “Complete Streets” policy and by 2018 more than 30 states and 1000 local agencies had adopted it [12]. Florida was the second state in the nation to do so. A study by Jamila MP, et al. [13] found that by 2013 the policy had reduced fatalities in pedestrians significantly, with an estimated reduction in more than 3,500 lives.

However, a study by McCann B, et al. [14], noted that Florida’s cities were at the top of injuries in the nation, though they focused their study on only 1997-8. An earlier study by Hank D, et al. [15] analyzing data from 1986 to 1995 supported the conclusions of McCann B, et al. [14] concerning injuring and dangerous street conditions. How do we reconcile these results? The source of information could be the problem [13] based its findings mainly on interviews.

It seems at first glance that the Complete Streets program reduced fatalities, but was still unable to reduce injuries. The McCann B, et al. [14]; Hank D, et al. [15] studies drew data from the United States Census or the United States National Highway Traffic Safety Administration. In 2014 the Smart Growth America and National Complete Streets Coalition team led by Geoff A, et al. [16] published a study of Florida’s streets that showed that the state still topped the nation in injuries to pedestrians with data from 2003 to 2012. Their data was from the Centers for Disease Control and other reporting agencies.

Median national costs for bikeways per mile, not hard surfaces on which motor vehicles are allowed, approach \$250,000 [17]. This varies significantly and excludes costs of property acquisition and some other regional or legal costs. Traffic calming elements run on average by type (from median islands to diverters) from \$10,000 to 25,000 each and make many per mile costs quite high. Bike overpasses run on average by type and material (wood vs. steel) \$100,000 to \$250,000. Marking symbols (typically a bike profile indicating a bike lane) run on average \$1000 per mile.

Bicycle and Pedestrian Injuries

Our next question is having these investments and traffic modifications made the streets safer? In Table 1. I have listed data on fatalities of people on bikes and also pedal powered bike-like vehicles. The use of the term “self or human propelled” implies skateboards but is unclear in many cases. This data is shown graphically in Chart 1 in blue line and the black line is the trend line for the data, slope upward to right.

Pedalcyclist Fatalities in USA		
(Non-Motorized Rider Powered by Pedals)		
2008	718	1.9% of total USA road fatalities
2009	628	1.90%
2010	623	1.90%
2011	682	2.10%
2012	734	2.20%
2013	749	2.30%
2014	729	2.20%
2015	829	2.30%
2016	852	2.30%
2017	783	2.10%

Data from the NHTSA see website at:
<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812765>

Pedestrians and Bicycle Riders Killed in the USA	
2008	5132
2009	4737
2010	4925
2011	5139
2012	5552
2013	5528
2014	5639
2015	6194
2016	6932
2017	6760

http://www.pedbikeinfo.org/factsfigures/facts_safety.efm
This data also appears to be from the National Highway Traffic Safety Administration (NHTSA).

Table 1: Pedalcyclist Fatalities in USA 2008- 2017.

The data at the top of Table 1 is the number of "Pedalcyclist" fatalities from 2008 to 2017. These are rider-powered bikes

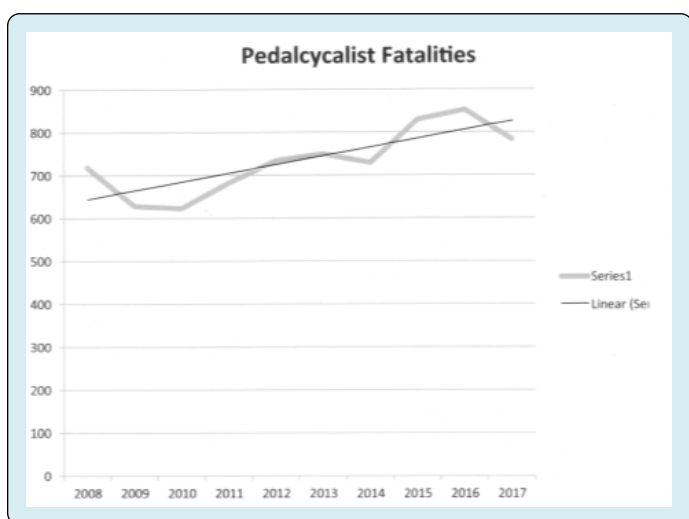


Chart 1 Pedalcyclist Fatalities Graphed with Trend line and other bike-like vehicles. The bottom list is for pedestrian and bicyclists killed on U.S. streets and trails for the same period. One can see that pedestrians have suffered far greater than bicyclists. The top list of Table 1 shows that Pedalcyclist fatalities rose from 1.9% of all roadway fatalities in 2008 to 2.1-2.3% in 2016-2017. The trend line clearly points out this increase. In the lower section we find that pedestrians and bicyclist fatalities increased by 32% from 2008 to 2017. This data is from Pedbikeinfo and is derived mainly from the NHTSA. It is also graphed as Chart 2 with a trend line that shows the increase over time.

In comparing lists of most bike friendly cities (with the most modifications for bike use and safety) with the cities with the worst traffic and most hours lost in traffic we find a remarkable contradiction (Table 2). Some of the most bike friendly cities have the worse traffic. So we ask are these modifications to promote bike use causing more traffic delays?.

Cities with the Worst Traffic	Most Bike Friendly Cities
Boston	Seattle
Washington, D.C. (8)	San Francisco
Chicago [3]	Fort Collin, Co.
New York (14) [1] (10)	Minneapolis
Los Angeles (3) [2] (1)	Portland Oregon
Seattle	Chicago
Pittsburgh	Eugene, Oregon
San Francisco (8)	Madison, Wis.
Philadelphia [8]	New York
Portland Oregon (11)	Cambridge, Mass
Atlanta (15)	Washington, D.C.
Atlanta (15)	Boulder, Co
Houston [4] (9)	Austin, Tx
Austin, Tx	Denver, Co (12)
Baltimore (9)	Tempe, Az

Table 2: Data for Traffic from INRIX and Bike Friendly People for Cities and Bikes () = accidents; = population rank; *Italics* = pollution rank.

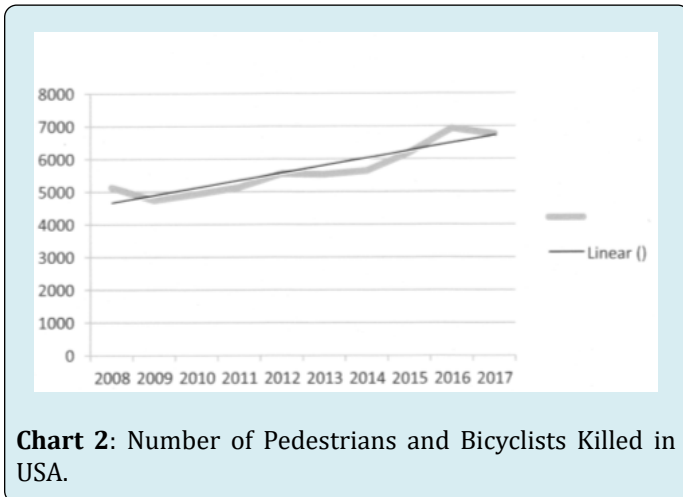
We find some cities in both columns, that is, worst traffic and most bike-friendly. However, the data for bike friendly cities includes cities with very small populations so comparing the left column of large cities does not provide a per capita relation between the two columns. Ranking for number of accidents appears in the left column in parentheses. If we add the population rank to the list in brackets we see that some of the cities with the highest population also have high rates of accidents and appear high in the right column. Only one city turned up on the top 20 cities for most dangerous for pedestrians that were Miami.

A meta-analysis of 33 studies of traffic calming projects found that traffic calming, when combined with widening adjacent streets to carry heavier traffic loads, could reduce accidents by up to 15% [18].

Pollution

Our next concern is the effect of cars or bikes on pollution. We should expect to find that those cities with the most bike use would have less pollution. Rankings for this are in the columns in italics in Table 2.

Transit and Road Use Ideology



Not one of the cities listed by People for Bikes as most bike friendly was in the top 15 cities in the USA with the cleanest air, according to data provided by the American Lung Association (<https://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/cleanest-cities.html>).

Discussion and Conclusion

What we find from our Table 2 is that 5 of the cities touted for bike friendly modifications of their roads have either some of the worst traffic or are quite dangerous for both pedestrians and bikes as well as have high rates of accidents. Vehicle registrations from 2008 to 2017 have increased by 16,468,240 according to Census data. The Federal Highway Administration reports that Americans are driving more, up 2.8% in 2015. Data on ride-sharing indicates that more than 95 million people used Uber or Lift or one of the other companies in 2018 (<https://www.statista.com/statistics/833743/us-users-ride-sharing-services/>). It is also clear these services are contributing to congestion [19].

Traffic calming initiatives can cause controversy in neighborhoods and cities where they affect travel or “trip” times by a busy populace. A New York Times story in July of 2008 is characteristic of the theory of traffic calming and the effects it has on actual lives of people Linda FB, et al. [20]. In many cities in the world the issue of traffic and safety bring up the issue of traffic calming as a means of

creating safe streets and reduce noise and pollution caused by auto and truck traffic [21]. The basic idea has evolved as a means of protecting or creating urban environments that are quiet and safe. A means of protecting residents’ use with that of motorists and bike users as well as pedestrians is also a goal [22]. Sany ZR, et al. [23] found an average reduction in accidents of about 40% in the Vancouver area and a reduction of accident claim costs between 10 and 57%. However, a meta-analysis of a number of studies from a wide geographic area found only an 11% reduction in accidents [24]. Another study Bunn F, et al. [25] questioned whether road conditions, including paving type and street lighting, were missing factors in some studies and recommends an “area wide approach.” This concern is supported in a later study by Beyer FR, et al. [26]. A few studies reporting significant reductions in injuries are projections for small studies or based on assumptions from estimated reductions in speed and probable injury [27]

Ideas and experiments in creating a combination of uses by attempting to redesign urban streets arose in Scandinavia, the Netherlands and Germany in the 1960s and 70s [28]. Traffic calming measures have been found to reduce injuries and accidents in the areas where they are employed but result in traffic diversion around them, increasing congestion and accidents in adjacent areas [27]. The generally supported concept is the value of reducing speeds and thereby reducing the severity of impacts and damage/injury [29]. A comprehensive study of the effectiveness of traffic calming techniques of different kinds found that the greatest benefit was in speed reduction in the local area of application, while accident frequency was only reduced in about half the cases depending on type of technique employed [30].

While traffic calming creates conflict among residents and motorists, and especially police and emergency vehicle personnel, the benefits seem to accrue to local residents most in improvements in general perceptions of quality of life. It has also been shown to slow emergency vehicles and endanger lives [31]. Overall, reduction of speed seems to be the main mechanism but often only shifts traffic and speed to adjacent roads resulting in more accidents and injuries in those areas and negative quality of life impacts there.

In San Francisco traffic fatalities have varied dramatically since 2010, from less than 5 to 11 in just the first 6 months of 2019 (<https://sfgov.org/scorecards/transportation/traffic-fatalities>). Pedestrians suffer the greatest number of fatalities (https://www.visionzerosf.org/wp-content/uploads/2019/07/06.2019Fatalities_JuneSummaryMemo.pdf). While bike fatalities are low for 2019 thus far, they increased in 2016. Overall comparisons nationally show San Francisco having a general upward trend in bicycle

accidents and injuries where other cities have demonstrated either no change or slight reductions (<https://www.giel.com/california-bicycle-accident-lawyers/bicycle-accident-statistics-us-bay-area.html>). This data appears to include injuries and is drawn from claims and hospital records. When checked against a partial database made available by the San Francisco Municipal Transportation Agency for January 2019 it showed general similarity in pattern [32]. In fact, recent figures have supported the idea that traffic-calming measures have decreased injuries to bicyclists, but increased those to pedestrians. And San Francisco officials have claimed this association [33] but see also: Gafni M, et al. [34]. With cyclist injuries or death at less than 10% of those of pedestrians what we are seeing is a transfer of social good to one group at the expense of another; to the danger of a majority to benefit a minority.

The causes of the increase in pedestrian deaths and injuries in San Francisco have been explained recently by officials Rachel S, et al. [35] as due to:

- An increase in population and jobs
- Increased homelessness
- An aging population
- More vehicles on the road

Comparing the increase in fatalities in auto accidents in San Jose Emily D, et al. [36] to that in San Francisco, these might be valid causes. Both pedestrians in general are suffering fatalities and injuries at comparable rates to those in San Francisco, the elderly and homeless are a significant element in this rise. On the other hand, San Jose has also embarked on a program of traffic calming defined as basic and comprehensive (Anonymous, n.d., see: <http://www.sanjoseca.gov/DocumentCenter/Home/View/235>; and 2001, sees: <https://www.ca-ilg.org/sites/main/files/file-attachments/toolkit.pdf>).

Theoretical arguments for slowing city traffic and reducing auto use via amenity reduction (i.e., fewer parking spaces) is not linked to investments in mass transit or other means of travel that would rationally produce choices for city residents and commuters [37]. Planners appear to believe that by creating worsening traffic and parking conditions people will chose to walk, bike or use public transportation even when no provision is made to increase public transit options [38]. In fact, city planners are ignoring or downplaying residents' desire for parking. Surveys both in the USA and Europe have shown that people make trip choices based on availability of parking and transit. Businesses, especially small businesses find that current reductions of parking options (even when park lets

reduce parking and are conceived to promote foot traffic for shopping) reduce commerce [39]. Removal of parking has been often considered a means to add traffic lanes and reduce congestion; however, recent trends have been to use removal of parking to produce bike lanes or traffic calming [40]. Some removals have resulted in massive traffic jams lasting hours see images from San Francisco's China Basin area (Figures 1-8).



Figure 1: Seventh Street in China Basin San Francisco. What were previously 4 lanes in two directions is transformed into two lanes. A bike lane can be seen to the far right. Cars are parked to the left shielding the bike lane on the left.



Figure 2: Opposite view from Figure 1 showing parking lane with bike lane to right. Opposite direction bike lane can be seen on left with oncoming traffic. Right hand lane is bifurcated and parking faded out towards 16th Street in distance. Dashes indicate left turn lane onto 16th Street.



Figure 3: View of 7th Street from one block before area shown in Figures 1 & 2. Previous 4 lane configuration now 2 lanes. Continuation of bike lane on right and left. 7th Street is funneled from 4 lanes to 2 lanes prior to this intersection creating continuous traffic jams during most of the day.

At the end of this block toward the over pass is a left turn lane to cross railroad tracks. Drivers in the direction toward 16th can be prevented from passing waiting traffic to cross the tracks for over 10 minutes at a time. Drivers on the opposite side of the rail tracks are often backed up blocking a roundabout and lanes exiting it that lead to 4th Street and 16th creating a considerable traffic jam.



Figure 4: View of bike lane designed to prevent car door opening to injure or impede bicyclists. Parking spaces are now in what was a traffic lane with traffic moving passed parked cars in only lane left.



Figure 5: View of 7th Street farther north of previous images showing loss of parking and bike lanes. Street has been engineered to remove as much parking as possible and provide space for “safe” lanes for bikes. Traffic is squeezed into one lane in each direction. Design creates an opportunity for drivers to enter the bike lane to attempt to pass stopped traffic creating dangerous conditions.



Figure 6: View of 7th Street showing cars parked in former curb lane and increased danger for drivers to exit their autos.

It seems obvious that the current traffic calming theory is failing due to a lack of association of key elements. When cities and planners can attempt to reduce car use, the lack of alternative transit and trip possibilities is critical. Attempts to reduce parking and auto use without an increase public investments in mass transit have resulted in citizen anger and in some cases removal of calming devices and restoration of parking (removal of parklets) [30]. Another related issue is the lack of affordable housing, which is increasing driving times for commuters and creating more dependence on autos, especially as single driver trips [41].

Note on Methods and Research

This research was conducted from May of 2014 to August of 2019. Fieldwork was concentrated in San Francisco, Oakland and Marin County. Interviews, measurements and photographs were taken by the author.

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Figure 7: View of intersection with stop sign where drivers' view of oncoming traffic is blocked by parked cars in former curb lane.



Figure 8: View of same intersection as in Figure 7 showing not only blocked view of oncoming traffic on 7th but also how traffic on oncoming lane cannot see bicycle riders in lane hidden by cars.

The principles of transportation development and housing needs have been known for more than a century [42], though even many ancient cities developed systematic approaches to increased population and flow of populace and commerce [43,44]. More emphasis is needed on designing affordable housing and transportation. Current theory of planning seems to believe that creating dysfunctional conditions will lead to adaptation. This may be true, but history also provides us with stark examples of citizen anger at policies that undermine the quality of life [45].

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