



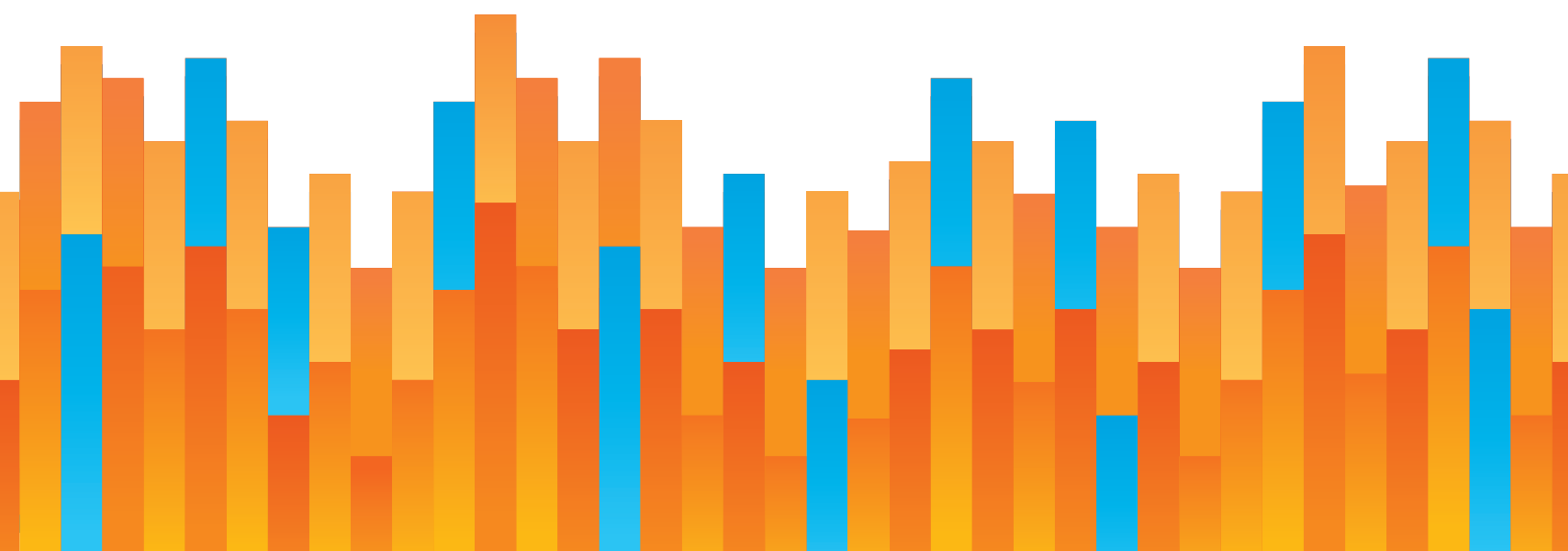
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# VISION ZERO AND COMPLETE STREETS: DO THEY MAKE ROADS SAFER?

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by Jay Derr

September 2024





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# PART 1

## INTRODUCTION

In the wake of rising traffic fatalities, municipalities around the United States have been looking for a comprehensive solution to reduce or, more optimistically, eliminate traffic fatalities. Two complementary concepts have emerged in the last few decades as possible solutions designed to improve the accessibility and safety of roads across the world: Vision Zero and Complete Streets. Both programs offer policy solutions and traffic interventions meant to improve safety, but the more heavy-handed interventions can also negatively affect the flow and speed of traffic. As is often the case in public policy, there are major tradeoffs to be considered when deciding which approach works best for safety's sake.

### 1.1

## WHAT IS VISION ZERO?

Vision Zero approaches traffic safety with the stated goal of eliminating all traffic fatalities and serious injuries. The movement gets its name from what proponents claim is the “acceptable number” of traffic fatalities: zero. Central to the concept is that human error is inevitable, so the natural policy response from a Vision Zero perspective is to design roads in a way that assumes human error is inevitable, to some degree, and then minimizes users' exposure to the conditions in which a crash is most lethal. This is typically accomplished through a mixture of traffic calming measures such as speed humps, road diets (which conventionally mean the conversion of an existing four-lane roadway to a three-lane

roadway, with two through lanes and one center two-way turn lane), and reduced speed limits to lessen the severity of injuries from automobile impacts.

According to the Vision Zero Network, Vision Zero “is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all.”<sup>1</sup> It emphasizes a holistic and multidisciplinary approach to road safety, focusing on eliminating safety risk arising from human error and creating safe road environments.

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*Vision Zero approaches traffic safety with the stated goal of eliminating all traffic fatalities and serious injuries.*

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The core principles of Vision Zero focus on safe system design through a few different means, such as:

- Engineering safer roads (typically in the construction stage—including bicycle lanes as part of a road’s plan rather than retrofitting them)
- Promoting safer speeds (this can be via lowering speed limits or by public campaigns for drivers to drive more slowly)
- Enhancing road user education and awareness (reinforcing the right of way, such as automobiles having to yield to pedestrians at marked crosswalks)
- Targeting high-risk locations on a network and implementing interventions to reduce crashes or the lethality of crashes (tightened shoulders at a high crash rate intersection, for example)

All of these factors are undertaken for the same central goal: reducing or eliminating the fatality risk from human error in road environments. In effect, Vision Zero advocates that roadways ought to be designed in a way that mitigates the impact of human error. Crashes are inevitable, so it follows that roads ought to be designed in a way to not only reduce the likelihood of a crash, but the severity of one.

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<sup>1</sup> “What is Vision Zero?” [visionzeronetwork.org](https://visionzeronetwork.org), Vision Zero Network. [visionzeronetwork.org/about/what-is-vision-zero/](https://visionzeronetwork.org/about/what-is-vision-zero/) (accessed 7 July 2023).

Vision Zero has faced challenges and criticisms along the way. Some argue that the approach is overly idealistic and unattainable, but more policy-focused criticisms examine costs and tradeoffs.<sup>2</sup> However, proponents of Vision Zero argue that it provides a clear moral framework and a long-term vision for road safety improvement.

## 1.2

## WHAT IS COMPLETE STREETS?

Complete Streets is a design framework adopted by transportation planners and engineers in many U.S. cities to create safer, more convenient street designs and city layouts for all transportation users, focusing on pedestrians, bicyclists, and transit riders. The two strategies work together to encourage more travelers to choose alternatives to traveling by automobile.



*Complete Streets offers an easy way to lower speeds, focusing (but not only) on converting existing four-lane roads to two-lane complete streets as opposed to new infrastructure, all without unnecessarily expanding the roadway.*



Complete Streets offers an easy way to lower speeds, focusing (but not only) on converting existing four-lane roads to two-lane complete streets as opposed to new infrastructure, all without unnecessarily expanding the roadway. The National Complete Streets Coalition describes Complete Streets as:

*...(A)n approach to planning, designing and building streets that enables safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. This approach also emphasizes the needs of those who have experienced systemic underinvestment, or those whose needs have not been met through a traditional transportation approach.<sup>3</sup>*

<sup>2</sup> Josh Stephens, "A Plan with 'Zero' Chance of Success," cp-dr.com, California Planning & Development Report. 22 Oct. 2015. cp-dr.com/articles/node-3815 (accessed 5 July 2023).

<sup>3</sup> "Complete Streets," smartgrowthamerica.org, Smart Growth America. <https://smartgrowthamerica.org/what-are-complete-streets/> (accessed 5 July 2023).

Smart Growth America describes it as a process, not a “product or single type of street.”<sup>4</sup> It, like Vision Zero, focuses on a multidisciplinary approach to make streets safer for users, with a priority on non-automobile users, by focusing on a few key concepts:

- Lowered speeds to reduce fatality chance when a collision occurs, especially a collision between an automobile and a pedestrian or bicyclist
- Street design with safety and multi-modal use in mind (bicycle lanes, crosswalks, protected sidewalks)
- Marked crosswalks. More crosswalks for pedestrians means more mobility for pedestrians and reduces the distance (and time necessary) to reach a marked, signalized crosswalk at an intersection.
- Transit plans. Typically, a Complete Streets approach is accompanied by a complementary transit plan. The goal of these transit plans is to shift trip-share away from what is, in most cities, an automobile-dominated environment to a more heavily transit-reliant one.

Beyond this, a core principle is Complete Streets’ attention, shared with Vision Zero, to the safety of road users regardless of mode. But Vision Zero’s focus is strictly on safety, whereas Complete Streets is split between safety and accessibility/multi-modality.

A Complete Streets approach to road design can vary. Figure 1 provides a visual depiction of one type of a complete street.

Complete Streets integrates features such as wider sidewalks, bicycle lanes, crosswalks, accessible pedestrian signals, transit stops, and traffic calming measures. Likewise, it’s also often used to convert existing four-lane streets into two-lane complete streets—though this isn’t the only type of conversion. By considering the needs of different users, Complete Streets aims to improve safety, promote active transportation, and enhance the overall quality of life in communities.

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<sup>4</sup> Ibid.

**FIGURE 1: COMPLETE STREETS DIAGRAM**

Source: “Complete Streets,” [smartgrowthamerica.org](https://smartgrowthamerica.org), [smartgrowthamerica.org/what-are-complete-streets/](https://smartgrowthamerica.org/what-are-complete-streets/) (accessed 5 July 2023).

Additionally, Complete Streets often employs quick-build projects (alternatively demonstration projects or tactical urbanism projects), which are low-cost, temporary interventions to test street design as was done in Washington State.<sup>5</sup> These low-cost interventions allow policymakers and communities to test the impact of proposed changes cheaply before committing to long-term, often more expensive implementation. Complete Streets approaches also often include complementary transit plans to boost transit ridership. These plans have done little to mitigate the decline in transit ridership nationwide and may require some rethinking for the modern traveling and commuting environment depending on the needs of each individual city.

Implementing Complete Streets often involves a range of strategies, including road redesign, retrofitting existing streets, adopting zoning regulations that support mixed-use and walkable neighborhoods, and integrating public transportation infrastructure. These efforts are typically guided by community input and data-driven decision-making.

<sup>5</sup> “Complete Streets Demonstration Projects (Washington),” [smartgrowthamerica.org](https://smartgrowthamerica.org), Smart Growth America. <https://smartgrowthamerica.org/resources/complete-streets-demonstration-projects-washington/> (accessed 29 March 2024).



## 1.3

## SYNERGIES OF VISION ZERO AND COMPLETE STREETS

Both Complete Streets and Vision Zero emphasize safety for users of all transportation modes and favor traffic calming measures and/or lane reconfiguration (by bicycle lanes or sidewalk extensions) as a means of ensuring safety. Complete Streets focuses on the assumption that fewer automobiles on the road means fewer collisions and fatalities. Many Vision Zero activists set a “complete street” as the ideal standard for an urban street because it accommodates multiple modes of transportation (such as bicycles in bicycle lanes, and pedestrians on sidewalks) and does so safely.

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*Both Complete Streets and Vision Zero emphasize safety for users of all transportation modes and favor traffic calming measures and/or lane reconfiguration (by bicycle lanes or sidewalk extensions) as a means of ensuring safety.*

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Additionally, Vision Zero and Complete Streets advocates also promote walkable neighborhoods and more development. These two goals together aid in the natural demand-growth for active transportation. The more densely developed a city is, the easier it is to justify walking from point A to point B, for example.

This brief provides a history of both movements and examines a handful of case studies of relevant city archetypes to attempt to measure the effectiveness of these policies. Most critically, it examines whether or not Vision Zero and Complete Streets policies have been effective at reducing traffic fatalities, as well as exploring some potential alternatives.

## PART 2

# HISTORY OF VISION ZERO AND COMPLETE STREETS

## 2.1

### VISION ZERO

Sweden's Parliament first introduced the Vision Zero concept in 1997, seeking to shift the emphasis from blaming individuals for accidents to designing safe road systems (there are still penalties for failure to abide by the laws of Swedish roads).<sup>6</sup> By 2020, road fatalities had dropped to less than half of what they were 14 years earlier.

Driven by the program's success in reducing fatalities across all modes at the national level in Sweden, Vision Zero principles began to gain traction in other European countries, including Norway and the Netherlands, where it became a cornerstone of road safety policies.<sup>7</sup> In the 2000s and 2010s, Vision Zero made significant progress globally, as the concept spread beyond Europe and was embraced by countries such as the U.S., Australia,

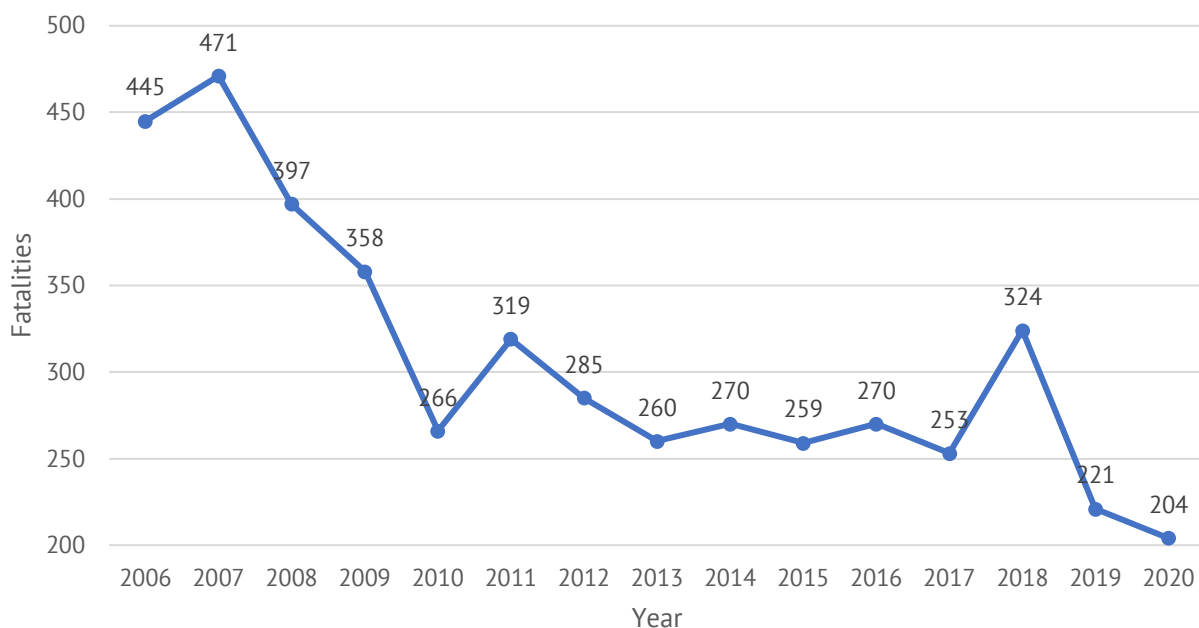
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<sup>6</sup> "Vision Zero," [roadsafetysweden.com](https://roadsafetysweden.com), Government Offices of Sweden, World Health Organization. [roadsafetysweden.com/about-the-conference/vision-zero---no-fatalities-or-serious-injuries-through-road-accidents/](https://roadsafetysweden.com/about-the-conference/vision-zero---no-fatalities-or-serious-injuries-through-road-accidents/) (Accessed 5 July 2023).

<sup>7</sup> "Vision Zero – A History," [actionvisionzero.org](https://actionvisionzero.org), Action Vision Zero. [actionvisionzero.org/resources/vision-zero-a-brief-history/](https://actionvisionzero.org/resources/vision-zero-a-brief-history/) (accessed 7 July 2023).

and New Zealand.<sup>8</sup> City governments, particularly in urban areas with high traffic volumes, started adopting Vision Zero as a framework for reducing traffic fatalities and severe injuries.

**FIGURE 2: YEARLY FATALITIES IN SWEDEN**



Source: Adapted from “Number of road traffic fatalities in Sweden from 2006 to 2020,” [statista.com](https://www.statista.com/statistics/438009/number-of-road-deaths-in-sweden/), Statista, Oct. 12 2021. [www.statista.com/statistics/438009/number-of-road-deaths-in-sweden/](https://www.statista.com/statistics/438009/number-of-road-deaths-in-sweden/) (accessed 5 July 2023) and “Development of Road Safety in Sweden,” [unece.org](https://unece.org/fileadmin/DAM/trans/doc/2012/wp1/NatDev-2012_SWEDEN.pdf), United Nations Economic Commission for Europe. [unece.org/fileadmin/DAM/trans/doc/2012/wp1/NatDev-2012\\_SWEDEN.pdf](https://unece.org/fileadmin/DAM/trans/doc/2012/wp1/NatDev-2012_SWEDEN.pdf) (accessed 5 July 2023).

As Vision Zero has gained momentum globally, numerous cities in the U.S. have adopted Vision Zero targets and implemented strategies to reduce traffic fatalities.<sup>9</sup> These strategies often combine infrastructure improvement, enhanced enforcement, and public education campaigns.

Achieving the ultimate goal of zero fatalities has remained difficult, given how challenging it is to eliminate traffic fatalities in any major city. However, Vision Zero has inspired a paradigm shift in how societies approach traffic safety, emphasizing a holistic, multidisciplinary approach to roadway design and safety.

<sup>8</sup> Ibid.

<sup>9</sup> “Vision Zero Communities,” [visionzeronetwork.org](https://visionzeronetwork.org), Vision Zero Network. [visionzeronetwork.org/resources/vision-zero-communities/](https://visionzeronetwork.org/resources/vision-zero-communities/) (accessed 5 July 2023).

## 2.2

## COMPLETE STREETS

The idea of Complete Streets, developed by Barbara McCann and David Goldberg of Smart Growth America, emerged in the United States in the early 2000s.<sup>10</sup> It gained prominence as a result of growing concerns about safety, public health, and the desire to create more livable communities across the U.S. Most specifically, it was propagated as a policy initiative by America Bicycles looking to make roads across the country safer for cyclists.



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*Albuquerque, Boston, Charlotte, New York, and San Francisco are just a few examples of cities that have incorporated Complete Streets.*

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In recent years, Complete Streets policies have been adopted in various cities and metro areas across the U.S. Many states and municipalities have implemented specific policies that require or encourage considering Complete Streets principles in the planning, design, construction, and operation of transportation projects. Albuquerque, Boston, Charlotte, New York, and San Francisco are just a few examples of cities that have incorporated Complete Streets.<sup>11</sup> Likewise, at the federal level, Complete Streets has been endorsed by the Federal Highway Administration and funded through U.S. Department of Transportation grant programs such as the Safe Streets and Roads for All (SS4A) discretionary grant program.<sup>12</sup>

The ideals of Complete Streets and Vision Zero may sound promising, especially for pedestrians and cyclists. Still, it's important to examine the policies that derive from these concepts and their effect on transportation as a whole. While their goals differ, Vision Zero and Complete Streets share many of the same policy reforms, as discussed in Part 3.

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<sup>10</sup> Barbara McCann, "Happy Anniversary, Complete Streets!" smartgrowthamerica.org, Smart Growth America. 3 Dec. 2010. smartgrowthamerica.org/happy-anniversary-complete-streets/ (accessed 5 July 2023).

<sup>11</sup> "Complete Streets Policies," smartgrowthamerica.org, Smart Growth America. smartgrowthamerica.org/program/national-complete-streets-coalition/policy-atlas/ (accessed 5 July 2023).

<sup>12</sup> "Safe Streets and Roads for All (SS4A) Grant Program," United States Department of Transportation, transportation.gov. <https://www.transportation.gov/grants/SS4A> (12 August 2023).

## PART 3

# VISION ZERO AND COMPLETE STREETS POLICIES

### 3.1

## SPEED AND INFRASTRUCTURE

As Smart Growth America (one of the organizations credited with creating Complete Streets and being a major proponent of Vision Zero in the United States) says on its website, speed is a major factor in how fatal a vehicle-on-pedestrian collision will be.<sup>13</sup> As such, many of the design changes Vision Zero and Complete Streets call for are measures that reduce the speed of automobile traffic. Advocates for lower speed limits have often said that the status quo prioritizes efficiency over safety. Their main call is for a paradigm shift in the opposite direction, with safety first far above speed.<sup>14</sup> One core finding is that when cars are traveling 23 mph, only 10% of pedestrians struck by a vehicle will die. This number increases to 46% when pedestrians are being hit by vehicles traveling at 40 mph.<sup>15</sup>

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<sup>13</sup> “Complete Streets,” [smartgrowthamerica.org](https://smartgrowthamerica.org/what-are-complete-streets/), [smartgrowthamerica.org/what-are-complete-streets/](https://smartgrowthamerica.org/what-are-complete-streets/) (accessed 5 July 2023).

<sup>14</sup> “Safety Over Speed,” [visionzeronetwork.org](https://visionzeronetwork.org/resources/safety-over-speed/), Vision Zero Network. [visionzeronetwork.org/resources/safety-over-speed/](https://visionzeronetwork.org/resources/safety-over-speed/) (accessed 5 July 2023).

<sup>15</sup> Brian Tefft, “Impact Speed and a Pedestrian’s Risk of Severe Injury or Death,” Foundation for Traffic Safety, 2011. [aaafoundation.org/impact-speed-pedestrians-risk-severe-injury-death/](https://aaafoundation.org/impact-speed-pedestrians-risk-severe-injury-death/) (accessed 5 July 2023).

As a result, Vision Zero advocates a comprehensive reimagining of speed limits via the redesigning of streets (especially urban arterials, which could be converted into complete streets). Traditionally, speed limits are based on the 85<sup>th</sup> percentile of driver speeds, ergo the speed at which or below which 85% percent of drivers travel.<sup>16</sup> A wide-open street will often encourage faster driving; in general, the posted speed limit will be higher. Therefore, roads with narrower and fewer lanes should reduce automobile speeds. In this way, lowering speed is achieved through infrastructure changes to the roadway.

A complete street exerts this approach, especially when it's implemented as a four-lane conversion. Narrowing lanes and reducing four lanes to two, plus adding infrastructure for pedestrians and bicyclists, lead to slower traffic overall. Table 1 shows a set of proposed speed limits in a Vision Zero plan.

**TABLE 1: PROPOSED SPEED LIMITS**

Type of Infrastructure and Traffic	Suggested Travel Speed
Locations with possible conflicts between pedestrians and cars	19 mph
Intersections with possible side impacts between cars	31 mph
Roads with possible frontal impacts between cars	44 mph
Roads with no possibility of a side impact or frontal impact (only impact with the infrastructure)	62+ mph

Source: Adapted from Claes Tingvall and Narelle Haworth, "Vision Zero—An ethical approach to safety and mobility," 6th ITE International Conference Road Safety & Traffic Enforcement, September 1999, Melbourne, Australia. Monash University Accident Research Centre, Melbourne (accessed 2023).

When Vision Zero was first introduced in Sweden, it was implemented as a street design primer. The background paper the Swedish government wrote for Vision Zero said "... the speed limits within the road transport system should be determined by the technical standard of vehicles and roads so as not to exceed the level of violence that the human body can tolerate. The safer the roads and vehicles, the higher the speed that can be accepted."<sup>17</sup> That is the basis for many of these speed limit suggestions in Table 1. As such, any areas where there is a conflict of mode (cars driving on streets with crosswalks) or a conflict of direction (a four-way intersection with no crosswalks) should have lower speed

<sup>16</sup> "Speed Information," Federal Highway Administration, [safety.fhwa.gov](https://safety.fhwa.dot.gov/uslimits/notes/speed_info.htm). [https://safety.fhwa.dot.gov/uslimits/notes/speed\\_info.htm](https://safety.fhwa.dot.gov/uslimits/notes/speed_info.htm) (25 March 2024).

<sup>17</sup> Claes Tingvall and Narelle Haworth, "Vision Zero—An ethical approach to safety and mobility," 6th ITE International Conference Road Safety & Traffic Enforcement, September 1999, Melbourne, Australia. Monash University Accident Research Centre, Melbourne (accessed 2023).

limits. These changes are further complemented by Complete Streets policies as well, with tighter lanes and diversified modal choice.

In principle, this concept makes sense. Automobiles can go faster in areas where there's less risk to others, and there's less risk to others where there's less modal or directional conflict. The main focus of Vision Zero is often major arterials. These arterials can have crosswalks, especially in the hearts of cities.

## 3.2

### MEASURING EFFECTIVENESS

Because safety is a key metric for both Complete Streets and Vision Zero advocates, that is the chosen measure to gauge these policies' levels of success in cities where they have been implemented. Both also share characteristics beyond their desired street designs, such as prioritizing safety and multi-modal access. As a means of achieving their goals, both approaches also call for safety-focused data collection practices.<sup>18</sup>

When looking at the numbers-driven components of Vision Zero and Complete Streets, both rely on data-driven analysis and support, including, but not limited to:

- **Crash information collection:** Details such as the vehicle type involved in a crash, location, contributing factors, and the severity of injuries.
- **Fatality and injury data:** Vision Zero programs track traffic-related fatalities and injuries, which helps establish a High Injury Network (HIN). Core to the Vision Zero approach, a High Injury Network maps where the majority of traffic fatalities and injuries occur. This provides insight both to policymakers to enact change where it would have the highest impact and to individuals looking to make informed decisions.
- **Data integration and analysis:** This could take the form of inter-agency databases, or a hospital sharing limited details of records to the body in charge of implementing Vision Zero and combining that data set with police reports on crashes.

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<sup>18</sup> Joshua Pluguez, "Plan and Analyze Complete Streets," United States Department of Transportation, Federal Highway Administration, [highways.dot.gov/complete-streets/plan-and-analyze-complete-streets](https://highways.dot.gov/complete-streets/plan-and-analyze-complete-streets) (accessed 5 July 2023).

- **Benchmarking and performance indicators:** Rigorous data collection practices make it easier to lay out and monitor the performance of the entity responsible for implementing traffic safety fixes. While it's nearly impossible to reach zero fatalities in a given year, this helps identify more-realistic standards.
- **Public input and reporting:** Vision Zero and Complete Streets both call for policymakers to engage interested parties and the public at large to consult on changes that they would like to see. This is often used to supplement data from the aforementioned programs.
- **Evaluation of interventions:** Vision Zero calls for any proposed infrastructure changes (be they new bicycle lanes, roundabouts, or other traffic calming measures) to be evaluated for impact.

## 3.3

## ARE THESE PRACTICES LIKELY TO LOWER FATALITIES IN THE U.S.?

What made this program work so effectively in Sweden, and could it translate to the U.S.? An article in the *American Journal of Public Health*, seeking keys to Sweden's success for American policymakers to emulate, compared the differences between Sweden's approach and culture that existed before and after Vision Zero to the United States' and its programs thus far.<sup>19</sup>

First, the authors noted that at least some of the disparity between Sweden's implementation and attempts to mirror it in the U.S. is due to liability. For example, Sweden, alongside some other EU countries, has strict liability for driver-on-pedestrian or bicyclist collisions, meaning the driver of the automobile is held responsible in any collision where drivers and cyclists share the roadway.<sup>20</sup> In contrast, in the U.S. liability can still vary from case to case.<sup>21</sup> Uniform Vehicle Code section 11-1202, adopted by 48 of 50 states, says: "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 vehicle." This

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<sup>19</sup> Matthew Cushing et al., "Vision Zero in the United States Versus Sweden: Infrastructure Improvement for Cycling Safety," *American Journal of Public Health*, Volume 106, National Library of Medicine, National Center for Biotechnology Information, ncbi.nlm.nih.gov. (December 2016).

<sup>20</sup> "How European Countries Handle Bicycle & Pedestrian Insurance and Liability Issues," *mobikefed.org*, Missouri Bicycle and Pedestrian Federation. <https://mobikefed.org/2015/01/how-european-countries-handle-bicycle-pedestrian-insurance-and-liability-issues> (accessed 6 May 2024).

<sup>21</sup> "Are Bicyclists Ever At Fault for Traffic Accidents?," *nolo.com*. Nolo.com. <https://www.nolo.com/legal-encyclopedia/are-bicyclists-ever-liable-for-traffic-accidents.html> (accessed 6 May 2024).



uniform vehicle code means that bicyclists must also follow the rules of the road similar to cars.

In Sweden, bicycles have more dedicated off-roadway bicycle infrastructure, and in places without such infrastructure, where bicycle and vehicle traffic must share a space, speed limits were lowered. But cyclists also have to yield to car drivers where bicycle routes intersect roadways.<sup>22</sup> Effectively, fewer bicycles sharing infrastructure with automobiles, and reducing speeds where cyclists and drivers must share the roadway, make crashes less fatal. Additionally, reducing confusion by having clearly defined right-of-way laws at intermodal intersections lessens the likelihood and severity of a collision. In this way, Sweden's clearer legal liability framework contributes to its improved safety record.



*In Sweden, bicycles have more dedicated off-roadway bicycle infrastructure, and in places without such infrastructure, where bicycle and vehicle traffic must share a space, speed limits were lowered.*



The journal article sums up the most important takeaway:

*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. This suggests that the context in which infrastructure is built is especially important.<sup>23</sup>*

The authors concluded that large-scale bicycle infrastructure projects across the U.S. such as bicycle lanes and shared lane markings would be ideal, but are likely cost-prohibitive to pursue as a means of completely eliminating serious injury and death.

<sup>22</sup> "Pedestrian crossings, bicycle crossings & bicycle path," korkortonline.se, Korkort Online.se. <https://korkortonline.se/en/theory/crossings/> (accessed 18 November 2023).

<sup>23</sup> Cushing et al., "Vision Zero in the United States Versus Sweden."

The National Highway Traffic Safety Administration’s (NHTSA) data support the importance of where infrastructure is built as well. NHTSA data show that “nearly three-quarters of all bicyclist deaths occur in urban areas.”<sup>24</sup> Because the majority of cycling occurs in urban areas, implementation might be best focused there. Lighting is also a major factor, with 29% of cyclist fatalities occurring at intersections, and 52% of those fatalities occurring at night.<sup>25</sup> Nationally, the FARS (Fatality Analysis Reporting System) database also shows a trend of rising pedalcyclist (defined by NHTSA as bicyclists or other cyclists riding two-wheeled, nonmotorized vehicles, tricycles, and unicycles) fatalities, rising from 806 in 2016 to 966 in 2021, which shows why there has been a renewed focus on cyclist safety even if only a small percentage of people use bicycles as their preferred mode of travel.<sup>26</sup>

The prevalence of bicycle-only infrastructure means the impact of this kind of change would be to a smaller percentage of road users relative to other, more automobile-centric countries such as the U.S. In these more automobile-oriented cities, that would be harder to accomplish, and interventions of that level may be cost-prohibitive to implement due to the existing design of streets. Lowered speed limits impact more people in the U.S. due to a larger share of U.S. travelers using automobiles. However, that does not mean there is no means of accommodating both. Grade separations, which take pedestrian and bicycle traffic over or under competing automobile traffic, works to keep the speed of traffic high while putting pedestrians and cyclists out of harm’s way—but still, this is an expensive, permanent piece of infrastructure that only makes sense in areas where there’s high cyclist traffic midblock.

Traffic calming measures, by design, impact the speed of traffic and lower roadway efficiency. Widening the roadways to build new bicycle lanes is an expensive endeavor, and the lack of bicycle-specific infrastructure throughout the U.S. means any traffic calming measures, such as lowered speed limits, would likely impact drivers. Likewise, conversion of existing lanes to bicycle lanes would increase congestion, while tightening the existing lanes to make room for bicycle lanes would reduce speeds. Both approaches come with tangible tradeoffs.

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<sup>24</sup> “Bicycle Safety,” National Highway Traffic Safety Administration, [nhtsa.gov. https://www.nhtsa.gov/road-safety/bicycle-safety](https://www.nhtsa.gov/road-safety/bicycle-safety) (11 December 2023).

<sup>25</sup> “Pedalcyclist Fatalities, by Crash Characteristics,” United States Department of Transportation, [explore.dot.gov. https://explore.dot.gov/views/DV\\_FARS\\_PC/CrashCharacteristics?%3Aiid=3&%3AisGuestRedirectFromVizportal=y&%3Aembed=y](https://explore.dot.gov/views/DV_FARS_PC/CrashCharacteristics?%3Aiid=3&%3AisGuestRedirectFromVizportal=y&%3Aembed=y) (11 December 2023).

<sup>26</sup> “National Statistics,” National Highway Traffic Safety Administration, [nhtsa.gov. https://www-fars.nhtsa.dot.gov/Main/index.aspx](https://www-fars.nhtsa.dot.gov/Main/index.aspx) (29 March 2024).



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*Widening the roadways to build new bicycle lanes is an expensive endeavor, and the lack of bicycle-specific infrastructure throughout the U.S. means any traffic calming measures, such as lowered speed limits, would likely impact drivers.*

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Narrowing roadways, reducing lanes, and lowering speeds of important arterials through cities may have adverse effects for motorists and for movement of goods. Critics of Complete Streets argue that prioritizing non-automotive modes of transportation can lead to increased congestion, reduced parking availability, and expensive multi-modal streets that fail to adequately consider the needs of motorists.<sup>27</sup> This model was more easily adopted in Europe, due to European cities having lower average speed limits and shorter travel distances than comparable U.S. cities, where many drivers, especially in major U.S. cities, experience significant traffic congestion and long commutes. Decreasing traffic speeds further in some of the country’s most congested cities like Chicago, Dallas, Phoenix, and Philadelphia may be ill-advised.

However, proponents argue that the benefits of Complete Streets—such as improved safety, health, and livability—outweigh these costs.<sup>28</sup> Accordingly, many U.S. cities have adopted Vision Zero and Complete Streets policies. But how effective have they been at reducing fatalities? Part 4 analyzes four case studies to determine effectiveness.

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<sup>27</sup> Diana Diamond, “Are city officials cluttering up our streets?” paloaltoonline.com, Palo Alto Online. 28 Aug. 2018. paloaltoonline.com/blogs/p/2018/08/28/are-city-officials-cluttering-up-our-streets (accessed 5 July 2023).

<sup>28</sup> “Busting the Myths About Complete Streets,” activetrans.org, Active Transportation Alliance. activetrans.org/sites/files/cs.pdf (accessed 5 July 2023).

## PART 4

# CASE STUDIES

Vision Zero and Complete Streets seem to offer comprehensive solutions for any municipality looking to address traffic fatalities. But have these programs delivered on their promises in U.S. cities? Have Vision Zero programs led to drastically reduced traffic fatalities in any area they have been implemented? Have complete streets led to a safer, more equitable experience for users of all modes? The answer is complicated. Of these two movements, Vision Zero has a much broader, more easily assessed goal: zero fatalities. Complete Streets is more complicated, but a mode isn't safe or equitable for all users if it hasn't led to a decrease in fatalities. For this report, since Vision Zero's entire focus is safety and Complete Streets prioritizes it as well, traffic fatalities are the best benchmark to examine.

But no two cities are the same. Accordingly, this report examines four general archetypes of cities and looks for a common thread.

**Legacy Transit Cities:** These cities were developed largely around pedestrians, horses, and streetcars in the 19<sup>th</sup> and early 20<sup>th</sup> centuries. Often times these cities have higher population densities and are built around central business districts conducive to rail transit services. Cities such as Chicago and San Francisco fall under this category.

**Post-World War II Cities:** These types of cities were built during the post-World War II automobile boom when access to automobiles was cheap and easy. While Post-World War II cities have similar populations to legacy transit cities, these cities have lower population densities, wider roadways, and easier accessibility for automobiles. Cities such as Los Angeles, although it's a unique case, and Charlotte fall under this category.

**Mid-Sized Cities:** Not all cities are as big as Los Angeles or Chicago. The core criterion for this category is lower population size and lower population density. Cities such as Albuquerque, New Mexico, and Louisville, Kentucky fall under this category.

**College Cities:** Colleges and universities are at the center of some cities. In these places transit options that take students to and from campus are a central feature. Boulder, Colorado, and Gainesville, Florida fall under this category.

## 4.1

# LEGACY TRANSIT CITIES

## CASE STUDY ONE: SAN FRANCISCO, CALIFORNIA

### Measures Adopted

San Francisco may be one of the best-case scenarios for both Vision Zero and Complete Streets adoption. Even as one of the best-case scenarios, the city's approach still has some room for improvement. Similar to Los Angeles, the city adopted Complete Streets in response to AB 1358, implementing its Vision Zero program in 2014. The initial two-year action plan included guidelines and steps the city would take to begin properly tracking and measuring traffic fatalities to see if its new strategy would reduce fatalities. Paired with yearly updates, the Vision Zero approach that San Francisco took was transparent and thorough. San Francisco did not have a traffic fatality rate as high as Los Angeles, but it did make efforts to lower it further.

San Francisco's efforts began with its High-Injury Network map. It made the methodology public, allowing for greater transparency.<sup>29</sup> This transparent, data-driven approach provides metrics such as data selection, the methodology by which the city gathered the data, as well as important disclaimers about the intended use of the map. The city's Department of Public Health also provided an interactive web tool with which to examine the High-Injury Network and publicize its findings.<sup>30</sup>

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<sup>29</sup> "Vision Zero High Injury Network: 2022 Update," Vision Zero San Francisco, [visionzerosf.org](https://visionzerosf.org), November 2022. [www.visionzerosf.org/wp-content/uploads/2023/03/2022\\_Vision\\_Zero\\_Network\\_Update\\_Methodology.pdf](https://www.visionzerosf.org/wp-content/uploads/2023/03/2022_Vision_Zero_Network_Update_Methodology.pdf) (accessed 5 July 2023).

<sup>30</sup> "Vision Zero High Injury Network: 2022," San Francisco Department of Public Health, [sfgov.maps.arcgis.com](https://sfgov.maps.arcgis.com). <https://sfgov.maps.arcgis.com/apps/webappviewer/index.html?id=b2743a3fc0b14dd9814cf6668fc34773> (accessed 5 July 2023).

Then, the city moved to take action. San Francisco took the idea of benefit-cost analysis and made it core to its action plan, summarized in the Vision Zero Action Strategy for 2021-2024.<sup>31</sup> Of all the city’s fiscally sound moves, this was the most important. It also provided a (very simplified) chart of the costs and effectiveness of suggested countermeasures for the public in the Action Strategy, shown in Tables 2 and 3.

**TABLE 2: TOOLS FOR SLOWING SPEED IN SAN FRANCISCO**

Tool	Cost	Effectiveness*
Signal Progression Speeds	<\$10,000	Moderate
Speed Limit Reductions	\$10,000-\$50,000	Moderate
Speed Humps	\$10,000-\$50,000	Moderate
Speed Radar Signs	\$50,000-\$250,000	Minimal
Speed Cameras	\$50,000-\$250,000	Significant
Quick-Build Road Diets	\$250,000+	Significant

\*Effectiveness as evaluated by San Francisco’s Vision Zero program, which was determined by the impact on driving speed.

Source: Adapted from “2021 Vision Zero SF Action Strategy,” Vision Zero San Francisco, [visionzerosf.org](http://visionzerosf.org). [www.visionzerosf.org/wp-content/uploads/2021/11/VZSF\\_AS\\_111021\\_spreads-FINAL.pdf](http://www.visionzerosf.org/wp-content/uploads/2021/11/VZSF_AS_111021_spreads-FINAL.pdf) (accessed 5 July 2023).

**TABLE 3: TOOLS FOR SAFER CROSSING IN SAN FRANCISCO**

Tool	Cost	Effectiveness*
Daylighting	<\$10,000	Moderate
Continental Crosswalks**	<\$10,000	Moderate
Painted Safety Zones	\$10,000-\$50,000	Significant
Walk Speed 3.0***	\$10,000-\$50,000	Significant
Leading Pedestrian Intervals	\$10,000-\$50,000	Significant
Rapid Flashing Beacons	\$50,000-\$250,000	Moderate
Bicycle Traffic Signals	\$50,000-\$250,000	Moderate
New Signal Mast Arms & Signal Heads	\$50,000-\$250,000	Significant
Red Light Cameras	\$250,000+	Moderate
New Traffic Signals	\$250,000+	Significant
Quick Build Program	\$250,000+	Significant

\*Effectiveness as evaluated by San Francisco’s Vision Zero program, which is determined by the impact on driving speed and/or crash reduction.

\*\*Continental Crosswalks refer to crosswalks with longitudinal high-visibility paint strips to designate where motorists and cyclists can anticipate pedestrian traffic crossings.

\*\*\*Walk Speed 3.0 refers to San Francisco’s intersection crossing time change from 3.5 ft/second to 3.0 ft/second.

Source: Adapted from “2021 Vision Zero SF Action Strategy,” Vision Zero San Francisco, [visionzerosf.org](http://visionzerosf.org). [www.visionzerosf.org/wp-content/uploads/2021/11/VZSF\\_AS\\_111021\\_spreads-FINAL.pdf](http://www.visionzerosf.org/wp-content/uploads/2021/11/VZSF_AS_111021_spreads-FINAL.pdf) (accessed 5 July 2023).

<sup>31</sup> “2021 Vision Zero SF Action Strategy,” Vision Zero San Francisco, [visionzerosf.org](http://visionzerosf.org). [www.visionzerosf.org/wp-content/uploads/2021/11/VZSF\\_AS\\_111021\\_spreads-FINAL.pdf](http://www.visionzerosf.org/wp-content/uploads/2021/11/VZSF_AS_111021_spreads-FINAL.pdf) (accessed 5 July 2023). 26.

The city also took an innovative approach to infrastructure design. San Francisco's Vision Zero Quick-Build Program delivered easily modified and cheap infrastructure changes to the High-Injury Network in San Francisco.<sup>32</sup> These projects were sometimes constructed as an interim solution instead of long-term infrastructure changes to monitor their impacts. For example, constructing a sidewalk extension takes many months to install. A short-term solution would be repainting the street and extending the sidewalk into the street, with barriers erected between pedestrians and automobile traffic. An ultra-low cost example would use traffic cones deployed to shift traffic behavior in statistically significant areas, and to monitor fatality rates in that area after the fact.

During the time that a short-term solution was in place, the San Francisco Municipal Transportation Agency, through its Vision Zero Safe Streets Evaluation Program, would compare pre- and post-implementation statistics of any program and publicize the findings within 24 months. These evaluations would be used either to justify a longer-term solution or, if the changes had no impact or a negative impact, they could be used to cancel long-term plans for an area.

For example, the Embarcadero Quick-Build project introduced a two-way protected bicycleway along the waterfront to connect to ferry transit.<sup>33</sup> This was accomplished by converting a traffic lane into a protected bicycle lane, adding bicycle signals, adding no-turn-on-red restrictions, and additional pedestrian signal time.<sup>34</sup>

## Results

But are these changes working to reduce fatalities? Figure 3 shows San Francisco's traffic fatalities year by year, with both an initial decline and a troubling reversal.

As shown in Figure 3, the majority of San Francisco's traffic fatalities come from those who are using active transportation (cycling or walking). They are far more vulnerable than those in automobiles. A pedestrian hit by a car is at far higher risk of bodily harm than someone in a vehicle.

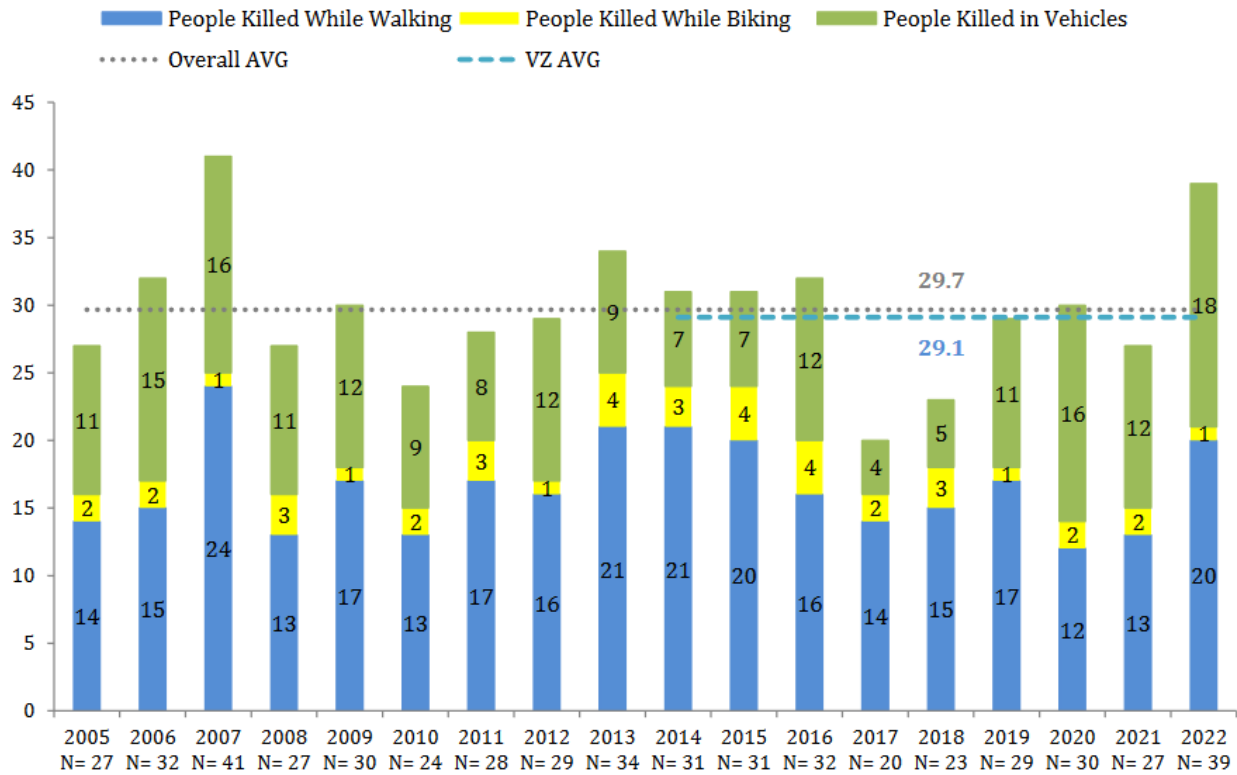
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<sup>32</sup> "Vision Zero Quick Build," San Francisco Municipal Transportation Agency, [sfmta.com. www.sfmta.com/vision-zero-quick-build-projects](https://www.sfmta.com/vision-zero-quick-build-projects) (accessed 5 July 2023).

<sup>33</sup> "Embarcadero Quick-Build Projects," San Francisco Municipal Transportation Agency, [sfmta.com. https://www.sfmta.com/projects/embarcadero-2020-quick-build-projects](https://www.sfmta.com/projects/embarcadero-2020-quick-build-projects) (accessed 5 July 2023).

<sup>34</sup> Ibid.

**FIGURE 3: SAN FRANCISCO TRAFFIC FATALITIES FROM 2005 TO 2022**



Source: “Vision Zero Traffic Fatalities: 2022 End of Year Report,” Vision Zero San Francisco, [visionzerosf.org](https://www.visionzerosf.org), May 2023. [www.visionzerosf.org/wp-content/uploads/2023/05/Vision-Zero-2022-End-of-Year-Traffic-Fatality-Report-FINAL-PUBLIC.pdf](https://www.visionzerosf.org/wp-content/uploads/2023/05/Vision-Zero-2022-End-of-Year-Traffic-Fatality-Report-FINAL-PUBLIC.pdf) (accessed 5 July 2023).

What went wrong? On paper, San Francisco seems to be the ideal city for a Vision Zero program. The city has a much higher split of non-automobile modes (walking, cycling, public transit) than more automobile-centric cities such as Los Angeles. Only 31.5% of San Francisco’s population commute to work via automobile, and 11.3% commute via transit.<sup>35</sup>

But people travel for reasons other than just commuting. Per the 2021 San Francisco Municipal Transportation Authority’s (SFMTA) Travel Decisions Survey, 62% of people chose to travel via their privately owned vehicles.<sup>36</sup> The remaining 38% used San Francisco’s “priority modes,” such as transit, walking, or bicycling.<sup>37</sup> When respondents were asked

<sup>35</sup> “Means of Transportation to Work by Selected Characteristics,” United States Census Bureau, [data.census.gov](https://data.census.gov). <https://data.census.gov/table?q=commute+in+San+Francisco+city,+California&tid=ACST1Y2021.S0802> (accessed 5 July 2023).

<sup>36</sup> “Travel Decisions Survey 2021,” San Francisco Municipal Transportation Agency (SFMTA), [sfmta.com](https://www.sfmta.com). [https://www.sfmta.com/sites/default/files/reports-and-documents/2022/04/sfmta\\_td2021\\_rpt\\_v2.pdf](https://www.sfmta.com/sites/default/files/reports-and-documents/2022/04/sfmta_td2021_rpt_v2.pdf) (15 August 2023).

<sup>37</sup> Ibid.



whether the pandemic had changed their travel mode choice, there was a 10% shift toward automobiles for commuting.<sup>38</sup>

So, is San Francisco focused on the right goals? The metric of effectiveness that San Francisco uses for Table 2 above is the impact an intervention has on driving speed and crash reduction. While the latter is useful information, the former seems to give mixed results. Regardless, the city's Vision Zero program touts that the 6<sup>th</sup> Street Pedestrian Safety Quick-Build project resulted in a 21% decrease in 85<sup>th</sup> percentile speeds, but makes no mention of any reduction in crashes.<sup>39</sup>

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*But speed seems to be the wrong metric. Even after speeds decreased across the city, fatalities continued to rise.*

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But speed seems to be the wrong metric. Even after speeds decreased across the city, fatalities continued to rise. Fatalities started to climb again in 2022 with a 44% one-year increase, which was San Francisco's worst year for road deaths since the start of its Vision Zero program.<sup>40</sup> Despite average speeds being lowered from 29 miles per hour in 2021 to 23 miles per hour in 2022 during peak, and off-peak speeds dropping from 40 miles per hour in 2021 to 37 miles per hour in 2022, San Francisco's fatalities increased.<sup>41</sup>

With city officials targeting speed as their preferred measurement, it makes driving in the city even more challenging. San Francisco is already ranked as the seventh most congested city in the United States. Residents of the city were already paying a high cost of

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<sup>38</sup> Ibid.

<sup>39</sup> “2021 Vision Zero SF Action Strategy,” Vision Zero San Francisco, visionzerosf.org. [www.visionzerosf.org/wp-content/uploads/2021/11/VZSF\\_AS\\_111021\\_spreads-FINAL.pdf](http://www.visionzerosf.org/wp-content/uploads/2021/11/VZSF_AS_111021_spreads-FINAL.pdf) (accessed 5 July 2023).

<sup>40</sup> Garrett Leahy, Liz Lindqwister, “SF Just Had Its Worst Year for Road Deaths Since Plan To End Them Began,” *The San Francisco Standard*, 30 Jan. 2023. [sfstandard.com/transportation/sf-just-had-its-worst-year-for-road-deaths-since-plan-to-end-them-began/](https://sfstandard.com/transportation/sf-just-had-its-worst-year-for-road-deaths-since-plan-to-end-them-began/) (5 July 2023).

“Vision Zero Traffic Fatalities: 2022 End of Year Report,” Vision Zero San Francisco, visionzerosf.org, May 2023. [www.visionzerosf.org/wp-content/uploads/2023/05/Vision-Zero-2022-End-of-Year-Traffic-Fatality-Report-FINAL-PUBLIC.pdf](http://www.visionzerosf.org/wp-content/uploads/2023/05/Vision-Zero-2022-End-of-Year-Traffic-Fatality-Report-FINAL-PUBLIC.pdf) (accessed 5 July 2023).

<sup>41</sup> “San Francisco CA,” inrix.com, Inrix. [inrix.com/scorecard-city-2022/?city=San%20Francisco%20CA&index=15](https://inrix.com/scorecard-city-2022/?city=San%20Francisco%20CA&index=15) (accessed 5 July 2023).

congestion at \$1,642 per year.<sup>42</sup> Road redesigns and interventions to lower speed shouldn't necessarily be the goal, especially when the relative direct and indirect costs of such interventions are so high. The most critical performance metric for a Vision Zero program ought to be fatalities reduced, not impact on driving speed. While lowered speeds can lead to reduced fatalities (and the two are correlated), San Francisco may not have focused these speed changes in the areas where they make the most sense.

Context is critical in determining where interventions ought to be focused, and whether they brought positive change or not. NHTSA's FARS database shows that there were 181 fatalities in San Francisco from 2016 to 2021 (in contrast to the city's Vision Zero report stating there were 161).<sup>43</sup> Of the 92 fatalities involving a pedestrian, 56 occurred at an intersection. Only 89 fatalities not involving a pedestrian occurred during the 2016-2021 period, with 42 occurring at an intersection.<sup>44</sup>

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*San Francisco's intersections seem to be statistically significant—they are especially dangerous for pedestrians.*

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San Francisco's intersections are statistically significant, especially when evaluating their danger for pedestrians.<sup>45</sup> The good news is that fatalities at intersections have gone down year by year since 2019, though this could be skewed given it's a small sample size, and 2020 marked the beginning of COVID-19. Between 2016 and 2021, however, roadways away from intersections have gotten less safe. Fatalities away from intersections plateau at 13 per year starting in 2016, then increase to 14 fatalities in 2019, then increase further to 17 in 2021.<sup>46</sup> Again, more years of data will likely be necessary to draw any conclusion, but it seems the city ought to focus some of its traffic safety resources away from intersections as well.

<sup>42</sup> Ibid.

<sup>43</sup> “Fatality Analysis Reporting System (FARS),” National Highway Traffic Safety Administration, [nhtsa.gov. https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars](https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars) (accessed 8 March 2024).

<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

While San Francisco's leap in fatalities doesn't correspond to any sizable increase in vehicle-miles traveled (which is still lower than pre-COVID numbers for California at large), it may just have been little more than a bad year following the COVID-19 pandemic. With so few traffic fatalities overall in San Francisco, a few more accidents alone can contribute a disproportionate amount to the overall percent increase. It's hard to draw a concrete conclusion based on one year.

Overall, San Francisco's policy toolkit is a mixed bag. One example of a good practice (in terms of implementation speed and cost reduction) from the city's Vision Zero implementation is the Quick-Build program. This innovative approach to implementing Vision Zero at a lower cost ought to be a model going forward for cities looking to implement Vision Zero. But additional approaches may be necessary. The city ought to place a renewed focus on intersection signaling, given the prevalence of fatalities at intersections.

Leading Pedestrian Interval (LPI) signaling is a low-cost method of increasing pedestrian safety at crosswalks.<sup>47</sup> In simpler terms, when a pedestrian push button is pressed and the crosswalk signal for pedestrians to cross is lit up, no drivers will have a green light for the first few seconds of the pedestrian signal. San Francisco already started implementing LPI to some extent as part of its Vision Zero campaign, but it alone may not be enough to stem the city's fatalities.<sup>48</sup> This change, paired with other light interventions like right-on-red restrictions (disallowing motorists from turning right on red) at pedestrian crosswalks, could help rein in fatalities and injuries at four-way intersections especially.<sup>49</sup>

This, paired with an evaluation of city-wide crosswalk lighting and signaling, ought to help bring fatalities lower. Lighting changes especially could benefit drivers equally. Education for pedestrians and cyclists alike on their rights outside of crosswalks could also be beneficial, given fatalities were relatively high both at and away from intersections, while drivers could stand to be reminded of their obligation to yield to foot traffic in marked areas. In any case, solutions seem like they will need to be more complex than lowering speeds across the city.

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<sup>47</sup> "Signs and Signals 41. Upgrade/Modify Pedestrian Signal Timing," Federal Highway Administration, [safety.fhwa.gov](https://safety.fhwa.gov). <https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/41.htm> (accessed 27 March 2024).

<sup>48</sup> "Giving Pedestrians a Head Start," San Francisco Municipal Transportation Authority, [sfmta.com](https://www.sfmta.com). <https://www.sfmta.com/blog/giving-pedestrians-head-start>. (Accessed 26 March 2024).

<sup>49</sup> "Signs and Signals 44. Right Turn on Red Restrictions," Federal Highway Administration, [safety.fhwa.gov](https://safety.fhwa.gov). <https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/44.htm> (accessed 27 March 2024).

Whether 2022 was an anomalous year by chance or is indicative of greater problems with San Francisco’s Vision Zero and Complete Streets approach, only time will tell. But as it stands, San Francisco’s Vision Zero program looked to be the most successful of the case studies until 2021.

## 4.2

# POST-WORLD WAR II CITIES

## CASE STUDY ONE: LOS ANGELES, CALIFORNIA

### Measures Adopted

Los Angeles adopted a Complete Streets policy in response to a 2008 bill in the California State Legislature.<sup>50</sup> AB 1358, the Complete Streets Act, requires local jurisdictions in California to “plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context.”<sup>51</sup>

In 2015, Los Angeles adopted a Vision Zero program.<sup>52</sup> Just one year later in 2016, Los Angeles had a pedestrian death rate that was double that of San Francisco, Chicago, and New York, and four times that of Seattle.<sup>53</sup> As discussed earlier, one core feature of a Vision Zero and Complete Streets approach is data collection. This culminated in Los Angeles’ Priority Corridors (corridors where the need for safety improvements should be a priority) and a High-Injury Network (HIN) map, which is shown in Figure 4.

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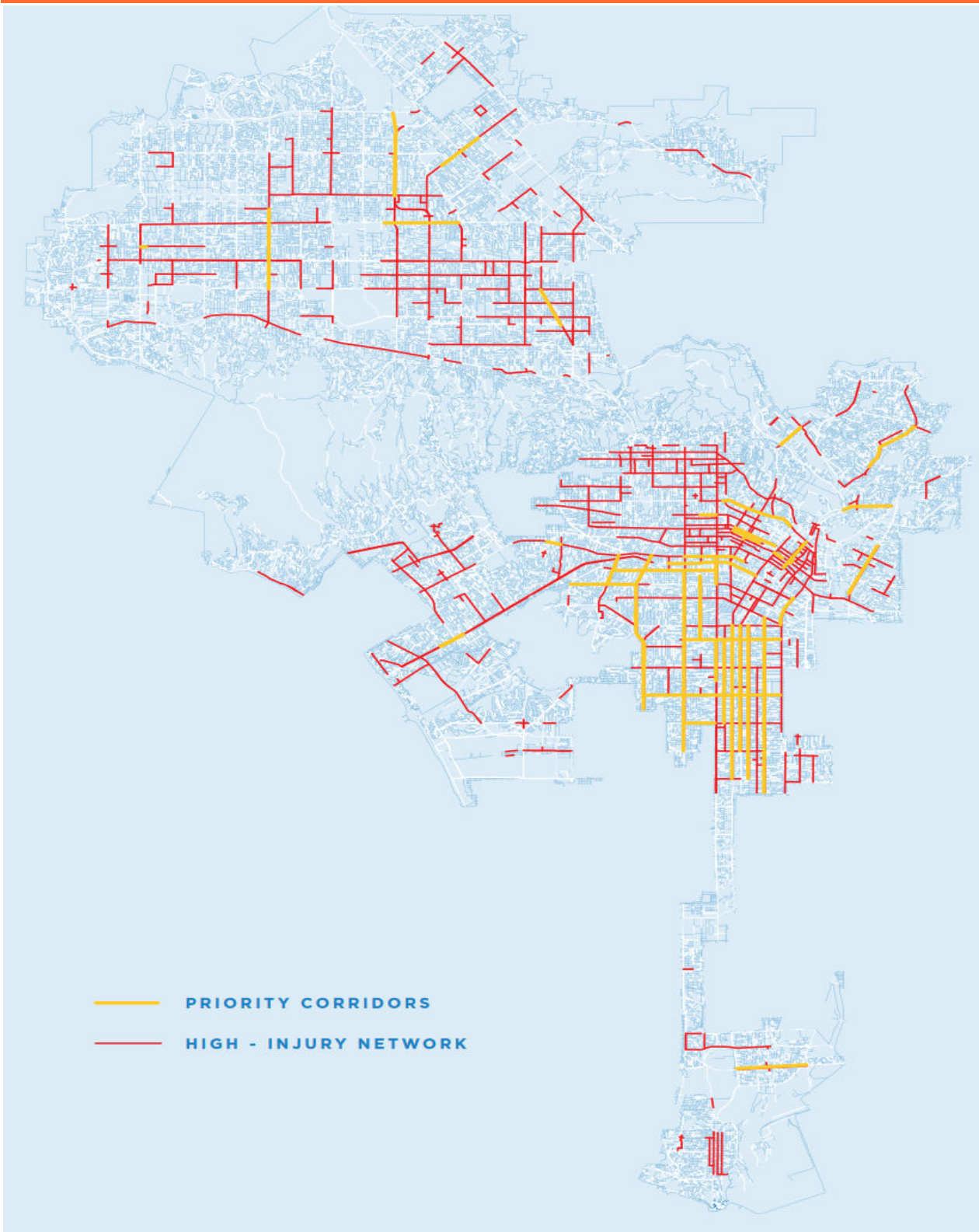
<sup>50</sup> “Mobility Plan 2035,” Los Angeles Department of City Planning, [planning.lacity.org](http://planning.lacity.org), February 2014. [www.planning.lacity.org/eir/mobilityPlan/DEIR/assets/appendix\\_b.2\\_final\\_mobility\\_plan\\_2035.pdf](http://www.planning.lacity.org/eir/mobilityPlan/DEIR/assets/appendix_b.2_final_mobility_plan_2035.pdf) (date accessed 5 July 2023).

<sup>51</sup> “Assembly Bill No. 1358,” Official California Legislative Information, [leginfo.ca.gov](http://leginfo.ca.gov). [www.leginfo.ca.gov/pub/07-08/bill/asm/ab\\_1351-1400/ab\\_1358\\_bill\\_20080930\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_1351-1400/ab_1358_bill_20080930_chaptered.pdf) (date accessed 5 July 2023).

<sup>52</sup> Scott Beyer, “Los Angeles Launches ‘Vision Zero’ Initiative To End Traffic Deaths,” *Forbes*, 28 Aug. 2015. *Forbes.com*. [www.forbes.com/sites/scottbeyer/2015/08/28/los-angeles-launches-vision-zero-initiative-to-end-traffic-deaths/?sh=6a53e88721d7](http://www.forbes.com/sites/scottbeyer/2015/08/28/los-angeles-launches-vision-zero-initiative-to-end-traffic-deaths/?sh=6a53e88721d7) (5 July 2023).

<sup>53</sup> Laura Bliss, et al, “What Happens When a City Tries to End Traffic Deaths,” *Bloomberg.com*. [www.bloomberg.com/news/articles/2019-11-21/vision-zero-are-cities-reducing-traffic-deaths](http://www.bloomberg.com/news/articles/2019-11-21/vision-zero-are-cities-reducing-traffic-deaths) (accessed 5 July 2023).

**FIGURE 4: LOS ANGELES PRIORITY CORRIDOR AND HIGH-INJURY NETWORK MAP**



Source: “2018 Action Plan + Progress Report,” Los Angeles Department of Transportation, Los Angeles Vision Zero. [ladotlivablestreets-cms.org/uploads/d704aa3913e440d5ab4cb91930e902d4.pdf](https://ladotlivablestreets-cms.org/uploads/d704aa3913e440d5ab4cb91930e902d4.pdf) (accessed 5 July 2023).

The data gathered were robust, helping narrow down where fatalities occurred within city limits to a total of only 6% of the road-miles in Los Angeles. The HIN accounted for 70% of pedestrian fatalities, despite only making up 6% of city streets.<sup>54</sup>

In order to reduce fatalities, the city implemented exclusive pedestrian traffic signal phases called “pedestrian scrambles” (where pedestrians can cross intersections both perpendicularly and diagonally) that halt all vehicular traffic for some time to lower fatalities.<sup>55</sup> Los Angeles’ 2018 Action Plan included plans to deliver 100 signal improvements at locations with a demonstrated need.<sup>56</sup>



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*In order to reduce fatalities, the city implemented exclusive pedestrian traffic signal phases called “pedestrian scrambles” (where pedestrians can cross intersections both perpendicularly and diagonally) that halt all vehicular traffic for some time to lower fatalities.*

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The city made additional improvements including curb extensions, curb ramps, speed humps, intersection tightening (adding bollards and/or paint to expand sidewalks further into an intersection and lower speeds), and sidewalk repairs.<sup>57</sup>

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<sup>54</sup> “Maps,” Los Angeles Department of Transportation, Los Angeles Vision Zero. [ladotlivablestreets.org/programs/vision-zero/maps](https://ladotlivablestreets.org/programs/vision-zero/maps) (accessed 5 July 2023).

<sup>55</sup> “DESIGN ELEMENT: Exclusive Pedestrian Phase,” Los Angeles Department of Transportation Complete Streets Committee, [ladot.lacity.org](https://ladot.lacity.org/sites/default/files/2022-08/exclusive-pedestrian-phase-policy-design-guide-final-2017.pdf), January 2017. [ladot.lacity.org/sites/default/files/2022-08/exclusive-pedestrian-phase-policy-design-guide-final-2017.pdf](https://ladot.lacity.org/sites/default/files/2022-08/exclusive-pedestrian-phase-policy-design-guide-final-2017.pdf) (accessed 5 July 2023).

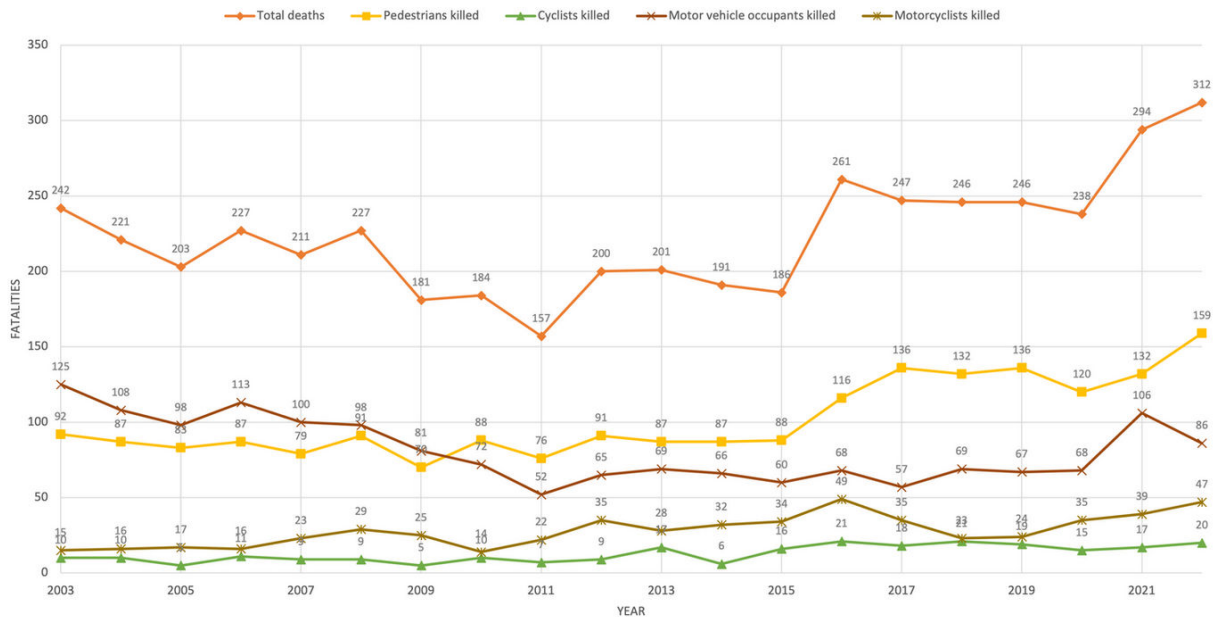
<sup>56</sup> “2018 Action Plan + Progress Report,” Los Angeles Department of Transportation, Los Angeles Vision Zero. [ladotlivablestreets-cms.org/uploads/d704aa3913e440d5ab4cb91930e902d4.pdf](https://ladotlivablestreets-cms.org/uploads/d704aa3913e440d5ab4cb91930e902d4.pdf) (accessed 5 July 2023).

<sup>57</sup> “Maps,” Los Angeles Department of Transportation, Los Angeles Vision Zero. [ladotlivablestreets.org/programs/vision-zero/maps](https://ladotlivablestreets.org/programs/vision-zero/maps) (accessed 5 July 2023).

**Results**

Despite these traffic-slowing measures pedestrian fatalities are still increasing as shown in Figure 5.

**FIGURE 5: FATALITIES FROM TRAFFIC COLLISIONS, LOS ANGELES**



Source: “Traffic Collision Data from 2010 to Present,” data.lacity.org, Los Angeles Open Data, 8 June 2017. <https://data.lacity.org/Public-Safety/Traffic-Collision-Data-from-2010-to-Present/d5tf-ez2w> (accessed 5 July 2023).

As shown in Figure 5, other than one trough forming during 2020, the year where COVID-19’s effects were the most pronounced, Los Angeles’ fatalities climbed steadily from 157 in 2011 to 312 in 2022. Worse still, the increase has been most noteworthy among pedestrians.

The early, positive trends of lower fatalities coincided with Complete Streets implementation in 2008, but much of the positive headway seems to have been erased in the years following Vision Zero’s implementation. While pedestrian fatalities dropped then stagnated between 2009-2015, they have been increasing sharply for the past nine years. The interventions pursued by the city appear to have made driving even more challenging and worsened congestion.<sup>58</sup> Los Angeles is the sixth most congested city in the United States. Congestion costs residents \$1,601 per driver each year. Los Angeles has increased

<sup>58</sup> “Los Angeles CA,” inrix.com, Inrix. [inrix.com/scorecard-city-2022/?city=Los%20Angeles%20CA&index=14](https://inrix.com/scorecard-city-2022/?city=Los%20Angeles%20CA&index=14) (accessed 5 July 2023).

traffic congestion for little tangible gain.<sup>59</sup> These costs likely affect a huge portion of Los Angeles' population. Nearly 69% of the city's population commutes via automobile.<sup>60</sup> Since it doesn't appear that L.A.'s traffic-slowing measures have saved pedestrian lives, L.A. ought to either look for Vision Zero and Complete Streets interventions that move the needle or work to lower congestion.

NHTSA's Fatality Analysis Reporting System (FARS) shows that 1,721 fatal motor vehicle crashes occurred between 2016 and 2021 in Los Angeles. The data from these crashes also show the time and place of these accidents matter and can have an impact on the frequency of crashes. Only 696 fatal crashes occurred at intersections, while 1,025 were midblock or away from intersections.<sup>61</sup> Nighttime was more dangerous than the daytime, with 1,162 of the fatal crashes occurring at night.<sup>62</sup> The most dangerous type of intersection from 2016 to 2021 was four-way intersections, which had 493 of the 696 fatalities at intersections.<sup>63</sup>

The majority of fatalities throughout the period evaluated occurred at night on lighted stretches of road.<sup>64</sup> Sixty-eight percent occurred on a mix of Interstates, other expressways, and principal arterials throughout the city. Of those fatalities, 1,353 occurred on other arterials, local roads, and collector streets.<sup>65</sup>

Overall, the picture seems clearer: intersections are dangerous, but most fatal crashes occur midblock. Additionally, arterials seem to be the most dangerous. But who is most impacted by fatal crashes? Of the 1,721 fatal crashes, 794 involved pedestrians and 97 involved cyclists.

These findings seem to suggest that traffic fatalities could be largely mitigated by reducing intermodal access, or implementing grade separations where the costs could be justified by the positive safety impacts on pedestrian traffic combined with the positive impact of removing modal conflict from automobile traffic flow. If cyclists and pedestrians are at such

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<sup>59</sup> Ibid.

<sup>60</sup> "Commuting Characteristics by Sex," United States Census Bureau, data.census.gov. <https://data.census.gov/table/ACSST1Y2022.S0801?q=S0801&g=160XX00US0644000> (accessed 3 October 2023).

<sup>61</sup> "Fatality Analysis Reporting System (FARS)," National Highway Traffic Safety Administration, nhtsa.gov. <https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars> (accessed 7 March 2024).

<sup>62</sup> Ibid.

<sup>63</sup> Ibid.

<sup>64</sup> Ibid.

<sup>65</sup> Ibid.



a high risk on Los Angeles' roadways outside of intersections, the city ought to look to find ways to shift cyclists and pedestrian traffic out of the way of automobile traffic. Even if solutions such as lowered speeds throughout the roadways of the city were implemented, bad driving and driving under the influence would limit their effectiveness. Solutions could include options such as bicycle boulevards, which are streets or bicycleways designed for bicycle traffic.

Alternatively, enforcement campaigns for drivers to remember their obligation to yield at pedestrian crosswalks, especially those mid-street away from intersections could prove helpful given the city's challenges with fatalities away from intersections. Crosswalk visibility enhancements like high-visibility markings on the street and side of the road, overhead lightings, and in-street yield signs to catch the attention of motorists, paired with curb extensions at the highest fatality crossings could prove critical in lowering fatality rates at crosswalks.<sup>66</sup> The FHWA found these interventions could reduce crashes by 23%-48%.<sup>67</sup>

Policymakers in L.A. ought to learn from the city's Vision Zero program failures. Vision Zero doesn't seem to have made fatalities worse, but it doesn't seem to be doing much to help either. So far, the implemented solutions have done little to actively mitigate the problem they set out to solve, and the city's interventions ought to have their performance measured annually.

## 4.3

### SMALLER CITIES AND TOWNS

#### CASE STUDY 3: ALBUQUERQUE, NEW MEXICO

##### Measures Adopted

Albuquerque embraced Vision Zero in 2018. The most recent 2021 Action Plan lauds Complete Streets policies, citing its use across the country as a landmark form of street

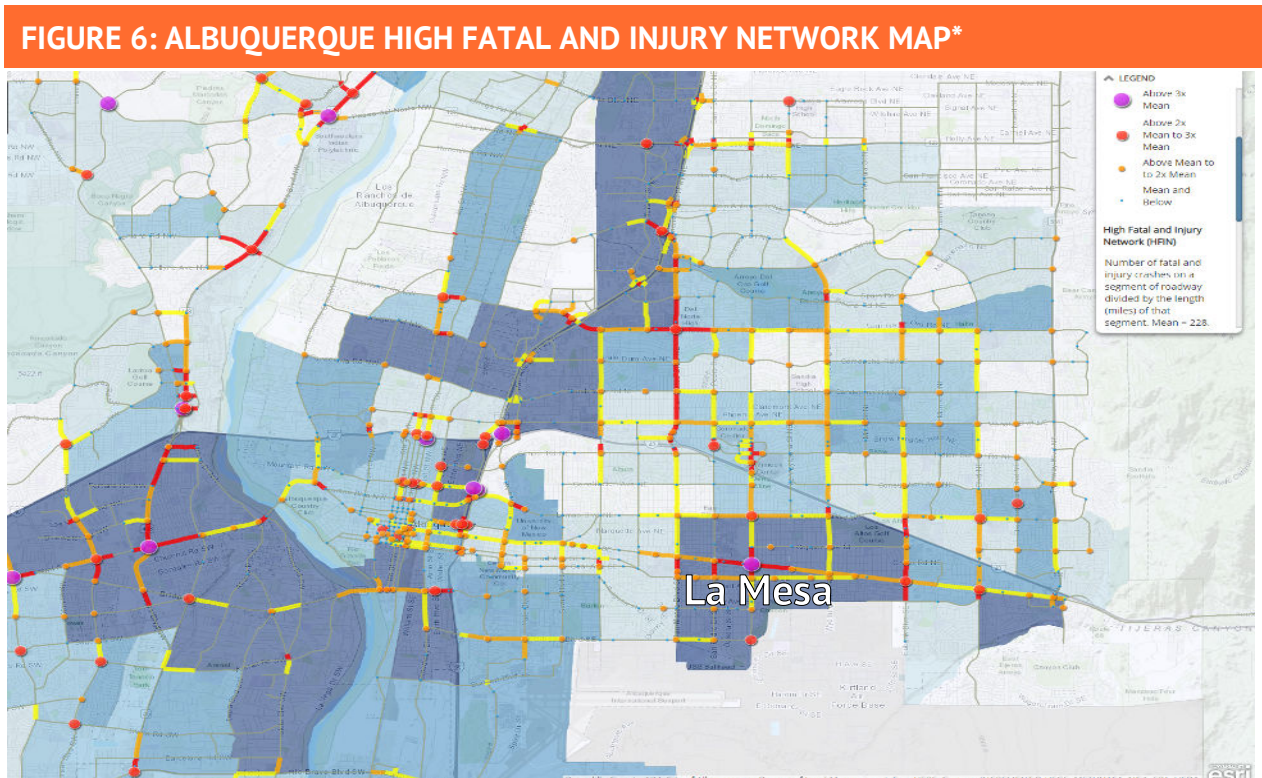
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<sup>66</sup> "Crosswalk Visibility Enhancements," Federal Highway Administration, [safety.fhwa.gov](https://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_VizEnhancemt_508compliant.pdf). [https://safety.fhwa.dot.gov/ped\\_bike/step/docs/TechSheet\\_VizEnhancemt\\_508compliant.pdf](https://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_VizEnhancemt_508compliant.pdf) (accessed 23 March 2024).

<sup>67</sup> Ibid.

design to “make medium and high traffic areas more inclusive of all forms of urban transportation,” among other goals.<sup>68</sup>

Shortly after the introduction, the plan segues into the data on how many fatalities the city saw in the last year. The Action Plan data, supplemented with data from the New Mexico Department of Transportation’s (NMDOT) annual community reports, paint a clear picture of where fatalities happen, and what communities are most impacted. Albuquerque’s High Fatal and Injury Network, also shown in the report, shows that the majority of fatalities happen in the La Mesa area, just east-southeast of the I-25 and I-40 interchange, as shown in Figure 6.



**\*Purple dots on the map indicate areas and intersections with several fatal and injury crashes three times above the mean, red dots indicate intersections and areas with two to three times the mean, and yellow dots indicate a range above the mean upward to two times the mean.**  
**Source:** Based on “Albuquerque Area High Fatal and Injury Network (HFIN),” Mid-Region Metropolitan Planning Organization, [mrmmpo.maps.arcgis.com](http://mrmmpo.maps.arcgis.com). [mrmmpo.maps.arcgis.com/apps/MapSeries/index.html?appid=6c1be2820174460f96e5b64cd39aac4a](http://mrmmpo.maps.arcgis.com/apps/MapSeries/index.html?appid=6c1be2820174460f96e5b64cd39aac4a) (3 October 2023).

<sup>68</sup> “The Action Plan,” One Albuquerque, City of Albuquerque, [cabq.gov](http://cabq.gov). [www.cabq.gov/vision-zero/documents/abq-vzactionplan-2021-final.pdf](http://www.cabq.gov/vision-zero/documents/abq-vzactionplan-2021-final.pdf) (5 July 2023).

To meet Albuquerque’s goal of zero fatalities, the city needs to determine which factors lead to collisions.

First, the city’s data show that the top factor in any fatal collision is sobriety, with 59.9% of fatal crashes involving drugs or alcohol.<sup>69</sup> Perplexingly, drugs and alcohol make up a relatively small 3.9% of total crashes in Albuquerque.<sup>70</sup> Effectively, drug and alcohol involvement increases the fatality risk of a crash more than any other factor. A total of 24.4% of all crashes in the city are due to driver inattention, which results in the second most injuries, eighth most fatalities, and the highest number of property-damage-only collisions.<sup>71</sup>



*The second, and highest crash-involved factor, is what Albuquerque defines as “high-risk driving,” which comprises many subcategories.<sup>72</sup> Most notably, it includes disregarding traffic signals, driver inattention, excessive speed, failure to yield, and ignoring stop signs.*



The second, and highest crash-involved factor, is what Albuquerque defines as “high-risk driving,” which comprises many subcategories.<sup>73</sup> Most notably, it includes disregarding traffic signals, driver inattention, excessive speed, failure to yield, and ignoring stop signs.<sup>74</sup> This mixed criteria constitutes 18% of fatal collisions, 47% of collisions resulting in injury, 26% of property-damage-only collisions, and 29% of total collisions.<sup>75</sup> One of the Action Plan’s responses to these data is a safe speeds initiative, which the city started by establishing a Downtown Safety Zone with a speed limit of 20 mph and signal timing adjustments on other High Fatal and Injury Network streets.<sup>76</sup> Likewise, the city added “sharrows” (shared arrows marking a lane for mixed-use between automobiles and bicycles) on a few stretches of road. The problem with this approach is that it fails to acknowledge

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<sup>69</sup> “The Action Plan,” One Albuquerque, City of Albuquerque, cabq.gov. [www.cabq.gov/vision-zero/documents/abq-vzactionplan-2021-final.pdf](http://www.cabq.gov/vision-zero/documents/abq-vzactionplan-2021-final.pdf) (3 October 2023).

<sup>70</sup> Ibid.

<sup>71</sup> Ibid.

<sup>72</sup> Ibid.

<sup>73</sup> Ibid.

<sup>74</sup> Ibid.

<sup>75</sup> Ibid.

<sup>76</sup> Ibid.

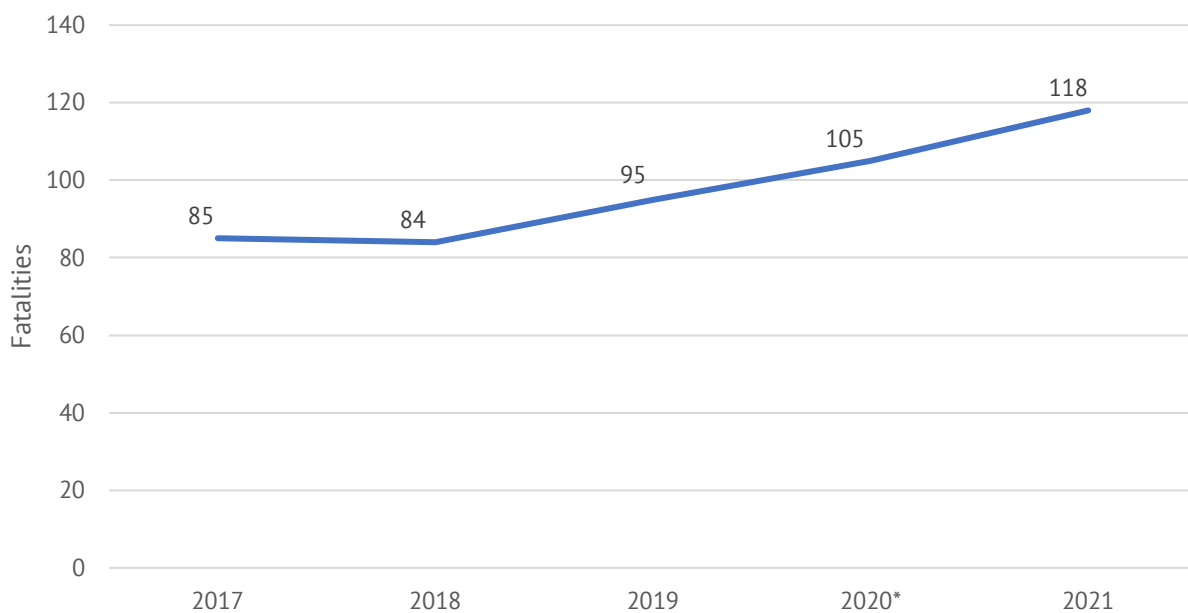
that these drunk and/or drugged drivers are less likely to abide by posted speed limits anyway. Further, “high-risk” drivers already avoid posted speed limits and constitute 29% of total collisions on their own.<sup>77</sup>

The program’s costs are a mixed bag. Albuquerque has, through its Vision Zero initiative, sought ways to replicate a program akin to San Francisco’s Quick-Build Program. Its main goal is to find quick and cheap infrastructure solutions to help reduce fatalities where they’re most necessary on the city’s High Fatal and Injury Network. That is a fact-based approach. However, it’s offset by the fact that Albuquerque has taken other actions that have nothing to do with Vision Zero or Complete Streets. For example, one of the action items in the Vision Zero Action Plan is eliminating transit fares for youth and older adults. On the other hand, moves to make sidewalks Americans with Disabilities Act-compliant for disabled individuals make sense.

**Results**

But those changes have not done much to mitigate fatalities in the city, as shown in Figure 7.

**FIGURE 7: FATALITIES IN ALBUQUERQUE BY YEAR**



\*Data from 2020 may be an outlier due to the impact of COVID-19.

<sup>77</sup> Ibid.

Source: Adapted from years 2017-2021 New Mexico Traffic Crash Annual Reports, Table 103. “New Mexico Traffic Crash Annual Report,” New Mexico Department of Transportation, [gps.unm.edu](https://gps.unm.edu), 2017. [gps.unm.edu/gps\\_assets/tru\\_data/Crash-Reports/Annual-Reports/annual-report-2017.pdf](https://gps.unm.edu/gps_assets/tru_data/Crash-Reports/Annual-Reports/annual-report-2017.pdf) (5 July 2023).

As it stands, it’s clear that the city of Albuquerque needs a different approach to reducing traffic fatalities. The city’s targeted interventions have done little to mitigate the rise in fatalities. Since 2018 fatalities have steadily risen in Albuquerque. In a city where 80% of commuters rely on automobiles, interventions ought to be targeted in areas of statistical significance like La Mesa as Albuquerque’s were, but they also need to be adjusted when it is clear they are not having the intended effect.<sup>78</sup>

“

*The city’s targeted interventions have done little to mitigate the rise in fatalities. Since 2018 fatalities have steadily risen in Albuquerque.*

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NHTSA’s FARS database can help reveal some of the deeper problems underlying Albuquerque’s fatality problem. In contrast to other case studies, Albuquerque has a statistically significant number of fatalities in the nighttime versus the daytime, which warrants deeper evaluation. Of the 570 fatalities recorded by FARS, 333 occurred at night.<sup>79</sup> The daytime in Albuquerque is much safer for pedestrians, but far less safe for drivers comparatively.<sup>80</sup> The majority of pedestrian fatalities occur away from intersections in the dark, indicating a lack of lighting at crosswalks or pedestrians crossing the street at night away from lighting systems.<sup>81</sup>

In its action plan, the city admits that policing and enforcement are critical for its goals, but it also acknowledges law enforcement’s historical role in discrimination. It cites automated enforcement as a possible solution, but notes this would only help after the fact in proving blame, not in mitigating the accidents. An education campaign alongside groups in their community may work best to mitigate these accidents before they happen, or posting lower

<sup>78</sup> “Commuting Characteristics by Sex,” United States Census Bureau, [data.census.gov](https://data.census.gov). <https://data.census.gov/table/ACSST1Y2022.S0801?q=S0801&g=160XX00US3502000> (accessed 21 November 2023).

<sup>79</sup> “Fatality Analysis Reporting System (FARS),” National Highway Traffic Safety Administration, [nhtsa.gov](https://www.nhtsa.gov). <https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars> (accessed 12 March 2024).

<sup>80</sup> Ibid.

<sup>81</sup> Ibid.

speed limits that many motorists do not follow. Additionally, these interventions are less costly compared to infrastructure overhauls and changes.

Additionally, mid-street crosswalks ought to be evaluated. With so many pedestrian fatalities away from intersections, it raises the question of what is going wrong at night for pedestrians. The FARS database is limited in its answers to this problem. Albuquerque must rely on law enforcement and community groups for on-the-ground data collection to get a better idea of what is going wrong, where, and why.

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*With so many pedestrian fatalities away from intersections, it raises the question of what is going wrong at night for pedestrians.*

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## 4.4

### COLLEGE TOWNS

#### CASE STUDY 4: BOULDER, COLORADO

##### Measures Adopted

Boulder adopted Vision Zero in 2014 as part of the city’s Transportation Master Plan.<sup>82</sup> The city adopted Complete Streets as a guiding principle as well, showing up in project studies such as The 30<sup>th</sup> and Colorado Corridor Study.<sup>83</sup> Thanks to its relatively early adoption, Boulder has plenty of data. But Boulder is unique in that the number of transportation fatalities is very low. Since 2017 (the earliest those data are available from the city of Boulder’s Crash Data website), there have only been 13 traffic fatalities within Boulder’s city limits.<sup>84</sup> With only three fatalities in 2018, two in 2019, three in 2021, and one in 2022, the need for such a comprehensive overhaul is a bit unclear.

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<sup>82</sup> “Transportation Master Plan,” City of Boulder Public Works – Transportation & Mobility Department, [bouldercolorado.gov. bouldercolorado.gov/projects/transportation-master-plan](https://bouldercolorado.gov/projects/transportation-master-plan) (5 July 2023).

<sup>83</sup> “30<sup>th</sup> and Colorado Corridors Study,” City of Boulder Public Works, [bouldercolorado.gov. bouldercolorado.gov/projects/30th-and-colorado-corridors-study](https://bouldercolorado.gov/projects/30th-and-colorado-corridors-study) (5 July 2023).

<sup>84</sup> “City of Boulder Crash Data,” [boulder.maps.arcgis.com. boulder.maps.arcgis.com/apps/dashboards/095b1408ece3466fa2e15a4b3a8f36c1](https://boulder.maps.arcgis.com/boulder.maps.arcgis.com/apps/dashboards/095b1408ece3466fa2e15a4b3a8f36c1) (5 July 2023).

The city's actions mirrored that of many other Vision Zero approaches. Boulder began with establishing a High Risk Network, its term for a High Injury Network. The city's High Risk Network accounted for only 7% of city streets, but 48% of fatal and serious injury crashes, 56% of all bicycle-involved crashes, and 57% of all pedestrian-involved crashes.<sup>85</sup> In Boulder's data collection, it also narrowed down which types of crashes accounted for 62% of fatal and serious injury crashes:

- Red light running crashes;
- Left-turn crashes;
- Right-turn slip-lane crashes;
- Right-turn on red crashes;
- Right-turn crashes;
- Multi-use path crossing crashes; and
- Pedestrian crashes while crossing the street.<sup>86</sup>

## Results

With Boulder's different goal of reducing crashes instead of reducing fatalities, it's worth looking at overall crash numbers as well as just fatalities. One bad year could completely skew the trend in a city where there is typically only one fatality a year. Boulder's crash data are outlined in Figure 8.

Based on the data in Figure 8, Boulder has made progress in preventing accidents damaging only property. However, since the number of traffic fatalities was already low, the numerical improvement is small. Boulder's goal, as stated by the city in its action plan, is to "reduce the number of traffic-related fatalities and serious injuries to zero."<sup>87</sup> Boulder's progress in pursuit of this goal plateaued in recent years. Both incapacitating and non-incapacitating injuries per year have increased slightly since 2021. Likewise, one fatality per year may be as low as the city can get. However, fewer instances of property damage incurred by vehicle crashes are occurring by a large margin. That is a win, but the current approach is not reducing fatalities and injuries.

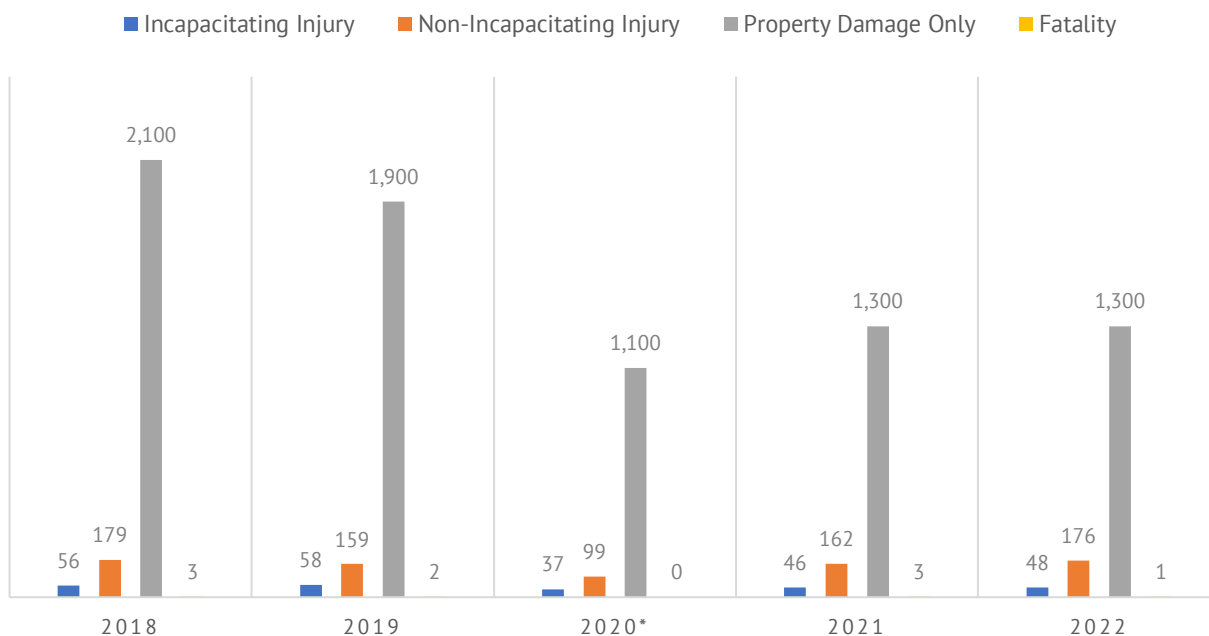
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<sup>85</sup> "Boulder Vision Zero Action Plan," City of Boulder, [bouldercolorado.gov](https://bouldercolorado.gov). <https://bouldercolorado.gov/media/11606/download?inline> (2 August 2023).

<sup>86</sup> Ibid.

<sup>87</sup> "Vision Zero Action Plan," [bouldercolorado.gov](https://bouldercolorado.gov/projects/vision-zero-action-plan). <https://bouldercolorado.gov/projects/vision-zero-action-plan> (15 November 2023).

FIGURE 8: TYPES OF CRASHES BY YEAR



\*Data from 2020 may be an outlier due to the impact of COVID-19.

Source: Adapted from “City of Boulder Crash Data,” [boulder.maps.arcgis.com](https://boulder.maps.arcgis.com).

[boulder.maps.arcgis.com/apps/dashboards/095b1408ece3466fa2e15a4b3a8f36c1](https://boulder.maps.arcgis.com/apps/dashboards/095b1408ece3466fa2e15a4b3a8f36c1) (5 July 2023).

Regardless, Boulder has continued its efforts to lower the number of crashes. It tailored its response appropriately on its High Risk Network to statistically significant intersections, as outlined in its Action Plan.<sup>88</sup> Changes ranged from making it illegal to make right turns on red at six intersections to green pavement markings highlighting bicycle lanes in conflict zones between modes.<sup>89</sup> Its Action Plan’s biggest section examines what low-cost solutions the city can implement, which is a promising sign. These low-cost solutions involve updating and implementing policies and practices for setting speed limits, as well as securing future funding sources for more Vision Zero projects.

Auto-averse policies commonly found in Complete Streets and Vision Zero, and parts of Boulder’s response, are often politically infeasible. Part of Boulder’s easy adoption of Vision Zero may be due to its sizable population that travels via non-automobile modes. A city-sponsored travel survey in Boulder found that, from 1990 to 2018, bicycle and transit use

<sup>88</sup> “Boulder Vision Zero Action Plan,” City of Boulder, [boulder.colorado.gov](https://boulder.colorado.gov/media/11606/download?inline). <https://boulder.colorado.gov/media/11606/download?inline> (2 August 2023).

<sup>89</sup> Ibid.



had grown the most (7.9% and 3.4% growth respectively) as the mode of choice for trips.<sup>90</sup> Likewise, single-occupancy vehicles and multi-occupancy vehicles decreased by 7.5% and 5.0% respectively.<sup>91</sup> The percentage of pedestrians fluctuated throughout the survey years.<sup>92</sup> A relatively small, when compared to other city case studies, 40.4% of Boulder’s population commutes via automobile.<sup>93</sup>



*Part of Boulder’s easy adoption of Vision Zero may be due to its sizable population that travels via non-automobile modes.*



However, 91.2% of households in Boulder do have access to a vehicle.<sup>94</sup> These numbers are echoed by the American Community Survey. Per the Census Bureau’s American Community Survey, 43.1% of Boulder’s population drives a car, truck, or van to work (or carpools in one).<sup>95</sup> Active transportation users made up a smaller portion of the population (but a substantial one, especially compared with other case studies), with 10.1% of the population walking to work, and 8.8% bicycling.<sup>96</sup> Only 4.4% of the population used public transportation options in the city, and 1.0% used taxicabs or motorcycles.<sup>97</sup> Drivers are the largest portion of commuters in the city still, but 32.5% of the city’s population works from home.<sup>98</sup>

<sup>90</sup> “Modal Shift in the Boulder Valley,” National Research Center, City of Boulder Transportation Division, bouldercolorado.gov. <https://bouldercolorado.gov/media/4806/download?inline> (15 August 2023).

<sup>91</sup> Ibid.

<sup>92</sup> Ibid.

<sup>93</sup> “Means of Transportation to Work by Selected Characteristics,” United States Census Bureau, data.census.gov. [data.census.gov. data.census.gov/table?q=commute+in+Boulder+city;+Colorado&tid=ACSST1Y2021.S0802](https://data.census.gov/table?q=commute+in+Boulder+city;+Colorado&tid=ACSST1Y2021.S0802) (5 July 2023).

<sup>94</sup> “Vehicles Available,” United States Census Bureau, census.gov. <https://www.census.gov/acs/www/about/why-we-ask-each-question/vehicles/> (5 August 2023).

<sup>95</sup> “Commuting Characteristics by Sex,” United States Census Bureau, data.census.gov. <https://data.census.gov/table/ACSST1Y2022.S0801?q=S0801:+Commuting+Characteristics+by+Sex&g=160XX00US0807850> (1 October 2023).

<sup>96</sup> Ibid.

<sup>97</sup> Ibid.

<sup>98</sup> Ibid.

Additionally, Boulder's light-handed approach to mitigating traffic fatalities and lowering collisions may serve the city well in the long run. Of the plan's proposed changes and interventions, few are as restrictive and costly as road dieting. Changes to right-on-reds at intersections of note, protected left turns, and red light cameras (if used for safety and not for revenue generation) are some ways to lower collisions. But many changes are still auto-averse, with a large movement to lower speed limits to 20 mph throughout the city.



*Changes to right-on-reds at intersections of note, protected left turns, and red light cameras (if used for safety and not for revenue generation) are some ways to lower collisions.*



NHTSA's FARS data, while used in other case studies, are not very useful for a look at Boulder's fatality data. The FARS database only has tables available for specific cities and NHTSA regions for fatalities, not for crashes at large or property-damage-only crashes.

Boulder has had one of the smartest approaches, and it has been successful in lowering crashes. Crashes have been trending down in Boulder since 2001, but as noted, severe crashes have remained steady.<sup>99</sup>

## 4.5

### SUMMARY OF CASE STUDIES

In effect, we have four different cities struggling to find effective countermeasures for traffic fatalities and injuries. All four cities have different problems to address, with some common findings.

First, crosswalks, especially mid-street, have proven to be dangerous in more than one city. Both Los Angeles and Albuquerque have statistically significant midblock fatality rates. Second, interventions outside of intersections typically involve costlier curb extensions to be effective in the worst of cases, whereas minor (and cheaper) signal improvements at intersections can remedy most problems.

<sup>99</sup> "Boulder Vision Zero Action Plan," City of Boulder, [bouldercolorado.gov](https://bouldercolorado.gov), May 2023. [bouldercolorado.gov/media/11606/download?inline](https://bouldercolorado.gov/media/11606/download?inline) (5 July 2023).

Beyond that, the case studies prove that the context of these interventions does matter. The areas of statistical significance in each case study varies enough that no one intervention (or type of intervention) would remedy the problems each and all of the case studies face. For example, would road diets really help with Albuquerque's danger at night? Likewise, would improved (and more widespread) lighting systems help with San Francisco's fatalities at intersections?



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*The areas of statistical significance in each case study varies enough that no one intervention (or type of intervention) would remedy the problems each and all of the case studies face.*

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Of the studies evaluated, San Francisco's Vision Zero program was the most promising until its most recent report. That said, that year may be an outlier and the city may be back on track next report.

Los Angeles' approach seems to have had the worst impact. Whether those fatalities are a result of Vision Zero/Complete Streets interventions or otherwise is not entirely clear from the data, but the trend in the city has not been what policymakers envisioned and ought to be re-examined.

Albuquerque, likewise, has experienced a surge in fatalities over the years since Vision Zero/Complete Streets implementation. Much of it seems to stem from a surge of fatalities in the nighttime, however. While nighttime is more dangerous than daytime due to lower visibility (and other compounding factors including drowsiness), Albuquerque's leap in fatalities in the night is worth deeper examination by policymakers.

But Boulder may be the most unique case. Without much FARS data to speak of (given it only provides data for fatalities, not all collisions), we're left with an incomplete picture. Interventions made have coincided with lowered overall collisions regardless, but fatalities have remained low throughout the Vision Zero and Complete Streets programs' lifespans in Boulder.

But all this raises the question: what policies should be implemented to counter rising fatalities in cities such as these?

## 4.6 EFFECTIVE MEASURES OTHER CITIES HAVE TRIED

The first question cities ought to ask is: What actions have been more effective at reducing fatalities? The National Highway Traffic Safety Administration’s “Countermeasures That Work” is a Highway Safety Guide that provides some case studies and examples of targeted interventions that have yielded success in different parts of the country.

In Orlando, Florida, drivers failed to yield to pedestrians at crosswalks. Based on rounds of warnings and enforcement, authorities determined that yield signage was too close to the crosswalks. By engaging with the community, policymakers made an informed decision at a low price—moving the yield signs 30 feet and adding medians and refuge islands increased driver yield rates from 5% to 28%.<sup>100</sup> Likewise, a small study in Qatar found that light-emitting diode (LED) lights and advance variable message signs (similar to the orange-text signs seen across the U.S.) contributed to higher yield rates, increasing from 88.71% to 98.39%.<sup>101</sup>

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“  
*By engaging with the community, policymakers made an informed decision at a low price—moving the yield signs 30 feet and adding medians and refuge islands increased driver yield rates from 5% to 28%.*  
”

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Another topical example is Washington, D.C.’s Street Smart safety campaign from 2005-2011, which was a short-run, limited-scope traffic safety campaign. Law enforcement officials worked with the District Department of Transportation (DDOT) to enforce statutes requiring drivers to yield at pedestrian crossings. The cost of this operation was funded through federal grant money for regional safety campaigns and contributions from local jurisdictions, but the remainder was within both agencies’ normal operating budgets. This was an awareness campaign to make sure drivers knew their obligations at a pedestrian

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<sup>100</sup> “Pedestrian Safety Enforcement Operations: A How-To Guide”, National Highway Traffic Safety Administration, [nhtsa.gov. nhtsa.gov/sites/nhtsa.gov/files/812059-pedestriansafetyenforceoperahowto-guide.pdf](https://www.nhtsa.gov/sites/nhtsa.gov/files/812059-pedestriansafetyenforceoperahowto-guide.pdf) (5 July 2023).

<sup>101</sup> Qinaat Hussain, et al, “Do detection-based warning strategies improve vehicle yielding behavior at uncontrolled midblock crosswalks?” *Accident Analysis & Prevention* 157 (July 2021). [www.sciencedirect.com/science/article/pii/S0001457521001974](https://www.sciencedirect.com/science/article/pii/S0001457521001974) (5 July 2023).

crosswalk. Social media and in-person enforcement were leveraged to spread the message. Surveys sent out before and after the awareness campaign found “statistically significant increases in awareness among the general public” and saw a corresponding drop in traffic fatalities for vehicle occupants and pedestrians, both in line with Vision Zero’s and Complete Street’s goals.<sup>102</sup>

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*Some other interventions that have a proven track record are Rectangular Rapid Flashing Beacons (RRFBs).*

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Some other interventions that have a proven track record are Rectangular Rapid Flashing Beacons (RRFBs). RRFBs are two rectangular-shaped yellow indicators with LED arrays, typically placed mid-block (as opposed to at an intersection) to help motorists spot crosswalks and pedestrians.<sup>103</sup> RRFBs were the subject of a Texas A&M Transportation Institute report in 2016. This report studied a few different sites, and yield rate increases varied.<sup>104</sup> For example, in Calgary in 2013, before RRFBs were implemented there were yield rates of 83%.<sup>105</sup> Afterward, yield rates rose to 98%.<sup>106</sup> In Florida in 2009, the FHWA evaluated two sites in Miami during the daytime and nighttime.<sup>107</sup> Yield rates varied before RRFB implementation at 2%-4% at night and 4% during the day.<sup>108</sup> After RRFB implementation, yield rates were 72%-96%.<sup>109</sup>

<sup>102</sup> “Pedestrian Safety Enforcement Operations: A How-To Guide”, National Highway Traffic Safety Administration, [nhtsa.gov. nhtsa.gov/sites/nhtsa.gov/files/812059-pedestriansafetyenforceoperahowto-guide.pdf](https://nhtsa.gov/sites/nhtsa.gov/files/812059-pedestriansafetyenforceoperahowto-guide.pdf) (5 July 2023).

<sup>103</sup> “Rectangular Rapid Flashing Beacons (RRFB),” Federal Highway Administration, [highways.dot.gov. https://highways.dot.gov/safety/proven-safety-countermeasures/rectangular-rapid-flashing-beacons-rrfb](https://highways.dot.gov/safety/proven-safety-countermeasures/rectangular-rapid-flashing-beacons-rrfb) (Accessed 25 March 2024).

<sup>104</sup> Kay Fitzpatrick, et al, “Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon,” Texas A&M Transportation Institute, 2016. <https://static.tti.tamu.edu/tti.tamu.edu/documents/TTI-CTS-0010.pdf> (28 March 2024).

<sup>105</sup> Ibid.

<sup>106</sup> Ibid.

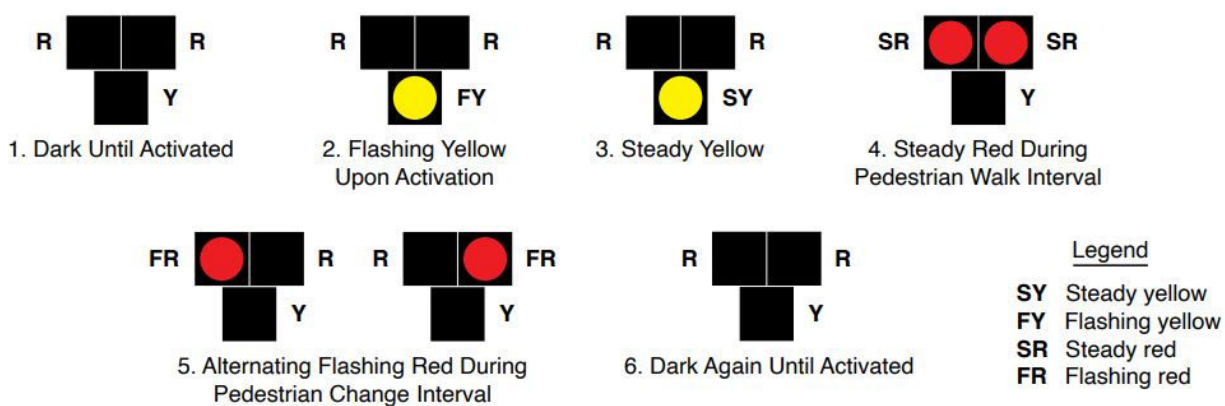
<sup>107</sup> Ibid.

<sup>108</sup> Ibid.

<sup>109</sup> Ibid.

Additionally, cities can look to Pedestrian Hybrid Beacons (PHBs) as another light intervention to lower fatalities and injury rates. PHBs are traffic lights that consist of two red lenses above a singular yellow lens, pictured below in Figure 9.

**FIGURE 9: PEDESTRIAN HYBRID BEACON**



Source: “Pedestrian Hybrid Beacons,” Federal Highway Administration, [highways.dot.gov](https://highways.dot.gov).

<https://highways.dot.gov/safety/proven-safety-countermeasures/pedestrian-hybrid-beacons> (accessed 28 March 2024).

PHBs were found to reduce pedestrian crashes by up to 55%, reduce total crashes by up to 29%, and reduce serious injuries and fatal crashes by up to 15%.<sup>110</sup>

The FHWA has also evaluated grade separations as a possible intervention for particularly troublesome crossings. These can vary in level, from basic pedestrian islands between lanes to overpasses and underpasses, where conflict is completely removed between competing modes. An example of a pedestrian overpass is shown in Figure 10 on the next page.

Despite the safety benefits an overpass can bring, the FHWA cautions against extensive use of grade-separated crossings as well, noting that “[g]rade-separated crossings can be beneficial to pedestrians under certain circumstances but are very costly and may not be used by pedestrians if not planned properly”.<sup>111</sup>

<sup>110</sup> “Pedestrian Hybrid Beacons,” Federal Highway Administration, [highways.dot.gov](https://highways.dot.gov). <https://highways.dot.gov/safety/proven-safety-countermeasures/pedestrian-hybrid-beacons> (accessed 28 March 2024).

<sup>111</sup> “Pedestrian Hybrid Beacons,” Federal Highway Administration, [highways.dot.gov](https://highways.dot.gov). <https://highways.dot.gov/safety/proven-safety-countermeasures/pedestrian-hybrid-beacons> (accessed 28 March 2024).

**FIGURE 10: PEDESTRIAN OVERPASS**

Source: SW Andover St Pedestrian and Bicycle Bridge, <https://www.seattle.gov/transportation/projects-and-programs/programs/bridges-stairs-and-other-structures/bridges/sw-andover-st-bridge>, 13 August 2024.

Municipalities looking to engage in heavy use of onerous traffic calming measures, especially to save lives, ought to keep in mind that those same traffic calming measures can slow emergency response times. A policy analysis of Austin, Texas found that, with even a 30-second increase in emergency service response time, Austin would lose an additional 37 lives per year from cardiac arrest, though this analysis is very dated.<sup>112</sup> If Vision Zero’s goal is truly zero fatalities, first responders’ needs must be considered. The negative impact on response times is most pronounced with vertical displacement measures (like speed humps and raised intersections), per the Federal Highway Administration.<sup>113</sup> Raised intersections are a form of intervention where the entirety of an intersection is raised—effectively a speed hump for an entire intersection—to slow traffic.<sup>114</sup>

<sup>112</sup> Leslie Bunte Jr., “Traffic Calming Measures & Emergency Response: A Competition of Two Public Goods,” MA, The University of Texas at Austin, 2000. [https://nacto.org/docs/usdg/traffic\\_calming\\_programs\\_and\\_emergency\\_response\\_bunte.pdf](https://nacto.org/docs/usdg/traffic_calming_programs_and_emergency_response_bunte.pdf) (10 August 2023).

<sup>113</sup> “Traffic Calming ePrimer - Module 5,” Federal Highway Administration, [safety.fhwa.dot.gov](https://safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module5.cfm#:~:text=Measures%20with%20Vertical%20Deflection,results%20in%20longer%20response%20time). [https://safety.fhwa.dot.gov/speedmgt/ePrimer\\_modules/module5.cfm#:~:text=Measures%20with%20Vertical%20Deflection,results%20in%20longer%20response%20time](https://safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module5.cfm#:~:text=Measures%20with%20Vertical%20Deflection,results%20in%20longer%20response%20time) (2 August 2023).

<sup>114</sup> “Traffic calming 29. Raised Intersection; 30. Raised Pedestrian Crossing,” Federal Highway Administration, [safety.fhwa.gov](https://safety.fhwa.gov). <https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/29-30.htm> (28 March 2024).

Overall, the existing literature covering traffic safety interventions is rich and ever-expanding. Policymakers ought to familiarize themselves with NHTSA's suggestions before deciding what interventions to pursue.



## PART 5

# BEST PRACTICES, CONCLUSIONS, AND RECOMMENDATIONS

### 5.1

## BEST PRACTICES

A running theme throughout the case studies examined in the report is that solutions in one area or city archetype may or may not work in another. Even for two cities that fall within the same archetype, success is not as simple as direct emulation. One thing is clear: policymakers who choose to pursue a Vision Zero and Complete Streets approach to curb traffic fatalities ought to keep a close eye on the performance of those programs in the years following implementation.

As such, policymakers should practice key lessons from other cities' Vision Zero and Complete Streets implementations when looking for solutions. First, and most critically, incremental change is worth pursuing. It's unrealistic to quash all instances of traffic fatalities in 30 years, let alone five. Lowering the number in a year by a percentage each year is still an accomplishment, despite what the ambitious goal of Vision Zero may be.

Further, data-driven support is essential. To both Vision Zero and Complete Streets' credit, they suggest that tailoring solutions based on rigorous data analysis is the best path.

Analyzing crash and fatality trends is the best first step a municipality can take, regardless of its size or shape. For example, Boulder, Colorado officials discovered that many crashes were due to motorists making right turns on red. By barring these turns from selected intersections along its High Risk Network, officials mitigated the problem and collisions fell.

When evaluating solutions for mid-block fatalities, officials ought to consider intermodal traffic. Are bicyclists and pedestrians crossing the street midblock? If so, is there sufficient lighting and advance warning for motorists? If there's a bicycle trail or avenue that crosses the road there, could a more permanent grade separation alleviate safety concerns for cyclists and pedestrians while keeping automobile traffic moving smoothly? These are questions officials ought to ask. Fewer, safer lanes for cyclists is preferable to more unsafe lanes.



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*Solutions should be evaluated by projected positive impact and by what modes could be negatively affected by proposed changes.*

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Solutions should be evaluated by projected positive impact and by what modes could be negatively affected by proposed changes. Effectively, proposals should consider looking at a municipality's modal split as part of a sketch-level benefit-cost analysis. In a city such as San Francisco, where only 31.5% of people commute via automobile, traffic calming measures will have less negative overall impact.<sup>115</sup> Benefits will be more widespread, as more of the city uses alternative modes of transportation. For a city like Los Angeles, with a higher reliance on automobiles, to take the same approach would be shortsighted. For auto-reliant cities like Los Angeles, it's worth first evaluating options other than traffic-calming.

Policymakers need to ask the following questions: What is leading to so many fatalities at a specific intersection? Is it a failure to yield to pedestrians? Is it automobiles making right turns on red at an intersection with low visibility? The answers should be key when

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<sup>115</sup> "Means of Transportation to Work by Selected Characteristics," United States Census Bureau, data.census.gov. <https://data.census.gov/table?q=commute+in+San+Francisco+city;+California&tid=ACST1Y2021.S0802> (accessed 5 July 2023).

deciding what solutions to use. While a complete street may make sense as a catch-all to solve these challenges, they make the most sense in lower traffic collector roads—especially if there’s a proven need for safety improvements, but not every road should be turned into a complete street. Arterials, which are typically designed to transport a large number of vehicles a long distance, are not good candidates for Complete Streets. But neighboring streets with less traffic, which tend to be more local in nature, could be better candidates for conversion to a complete street.

A consistent problem that cities encounter is driver error and/or misbehavior, which is involved in nearly all crashes. Unfortunately, rather than look for a cost-effective solution, the cities examined seem to be taking the most expensive, most onerous route to address these problems by redesigning streets.

Many of the tried-and-tested methods to address most problems with traffic safety can be found in NHTSA’s “Countermeasures That Work” and should serve as the first line of defense, especially for urban arterials and highways. But even beyond those two types of infrastructure,” it’s worth noting that the main case studies cited in “Countermeasures That Work” are targeted interventions—and that ought to be mirrored in a Vision Zero or Complete Streets approach. These can range from an enforcement campaign targeting failure-to-yield at a few crosswalks in a city to city-wide education campaigns on the responsibilities of a driver when approaching a crosswalk. Both can have a positive impact, but they must be targeted well and applied correctly.

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*... policymakers ought to embrace a granular approach to traffic safety and evaluate problems intersection-by-intersection and street-by-street.*

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In short, policymakers ought to embrace a granular approach to traffic safety and evaluate problems intersection-by-intersection and street-by-street. There is no one answer to all of any city’s traffic fatalities, but some solutions can help. Look to the specific solutions Vision Zero and Complete Streets can offer for a specific intervention, not the all-or-nothing approach advocates often call for.

Overall, solutions will vary depending on the needs of the municipality. A realistic approach to traffic safety ought to keep in mind that a solution working elsewhere does not guarantee its success everywhere.

## 5.2

## CONCLUSIONS

Vision Zero and Complete Streets both offer a conclusive but unrealistic set of goals for traffic safety. Implementing individual Vision Zero and Complete Streets policies can offer the most effective solution. For example, data collection practices are worth the time and effort to tailor future solutions to the right areas, and most critically the right problems. However, the policies are only as useful as the data used to design them. A municipality looking to tackle rising traffic fatalities ought to use Vision Zero's data collection and integration as a benchmark but set more realistic performance indicators. Municipalities also ought to consider the tradeoffs of major traffic interventions like road diets on a case-by-case basis. Limiting and/or lowering the flow of automobiles in a city may improve safety, but the same goal may be attainable in a less intrusive way.

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*Low-cost infrastructure such as traffic cones and signage can work as temporary fixes or case studies before longer-term capital projects are built.*

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Oftentimes, the tools to lower fatalities lie within the city's existing traffic safety toolbox. They just need to be deployed efficiently. Low-cost infrastructure such as traffic cones and signage can work as temporary fixes or case studies before longer-term capital projects are built. Low-cost infrastructure can be moved after fatalities at one problem location are lowered to a different problem location. When driving and commuting patterns change, infrastructure can be moved to change patterns elsewhere.

One key solution that Vision Zero advocates frequently call for is community engagement. Orlando's successful community engagement, resulting in new data and tailored solutions based on the perspective of those seeing the problems firsthand, shows that engagement can be a powerful tool.

Leveraging existing agencies' (such as law enforcement or community groups) expertise on the streets to get the best evaluation of which problems are prevalent on any stretch of road should be core to any problem-solving approach. Infrastructure changes ought to be made, and informed, from the bottom up, based on community feedback and assessment of needs.

Cities ought to be examining the unique needs of their communities, and localizing problem areas down to the intersection to minimize negative impacts on traffic. But that is often just the first step to addressing traffic fatalities. Existing resources and communities, like law enforcement, already have boots-on-the-ground experience, and that experience ought to be leveraged in making decisions about how to solve each problem.

## 5.3

### RECOMMENDATIONS

In short, cities ought to look to do a few things.

- Evaluate problems intersection by intersection and street by street.
- Build a comprehensive database of traffic fatalities, collisions, and areas of statistical importance to draw on.
- Work with community groups and law enforcement to understand community needs and areas of concern.
- Implement changes only once they have been tested—whether via quick-build programs or otherwise.
- Evaluate data on interventions to decide whether the proposed benefits justify the costs.
- Review existing countermeasure suggestions, and evaluate their projected impacts against the projected costs, including those that would negatively impact traffic congestion.

# ABOUT THE AUTHOR

**Jay Derr** is a transportation policy associate at Reason Foundation. A Louisiana native, Derr attended Louisiana State University where he received his undergraduate degree with a major in political science and a minor in history. Prior to joining Reason, Derr began his career at the Pelican Institute for Public Policy.

