



A Look at e-Scooter Safety

Examining risks, reviewing responsibilities,
and prioritizing prevention

April 2019

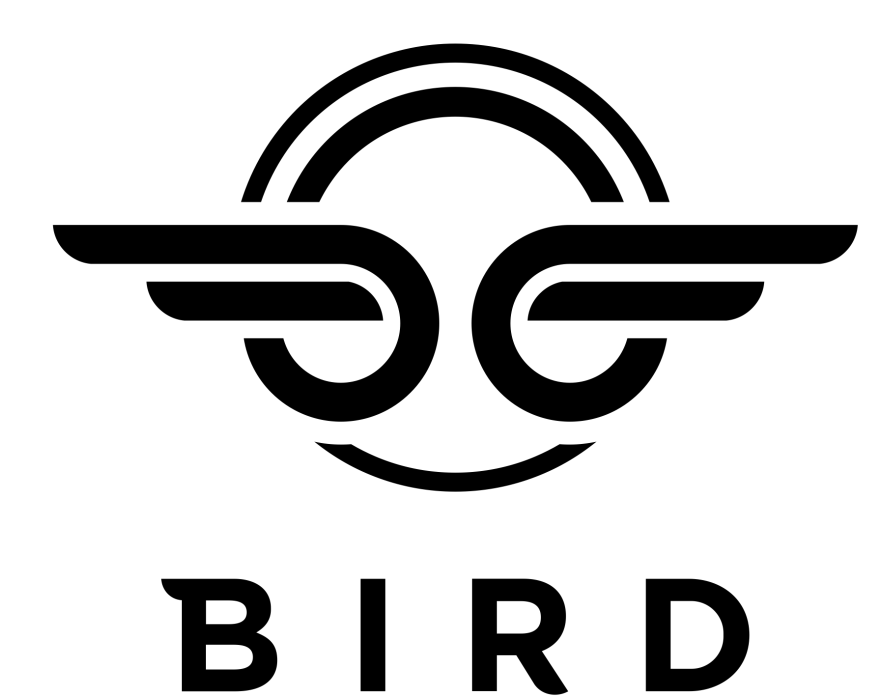


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INTRODUCTION: REPORT FROM THE GLOBAL SAFETY ADVISORY BOARD

In 2009, I was appointed by President Barack Obama to lead the National Highway Traffic Safety Administration (NHTSA). During my four-year tenure as Administrator of NHTSA, I investigated Toyota's sudden acceleration problem, advocated for ignition interlocks to prevent drunk driving, led the doubling of fuel efficiency standards, and oversaw the introduction of policy principles for self-driving cars. To help guide Bird's safety policies and products in the new field of e-scooter sharing, I joined Bird's Global Safety Advisory Board as its chair in August 2018.

This time last year, e-scooter sharing was unproven and only available in a few cities. Cities were concerned about safely integrating e-scooters into existing transportation systems, so they conducted pilot tests to measure the viability of e-scooters. These cities wanted proof that e-scooters were safe, equitable, and compatible with existing transportation systems before permitting them in the public right-of-way. A variety of city pilot programs held e-scooters to a higher standard than other modes of travel—which is often the case with innovative technologies, regardless of the potential benefits they may bring.

More than a year and tens of millions of rides later, the viability and benefits of shared e-scooters are clear. Shared e-scooters represent a cleaner, more economical and convenient transportation option that is replacing short car trips.

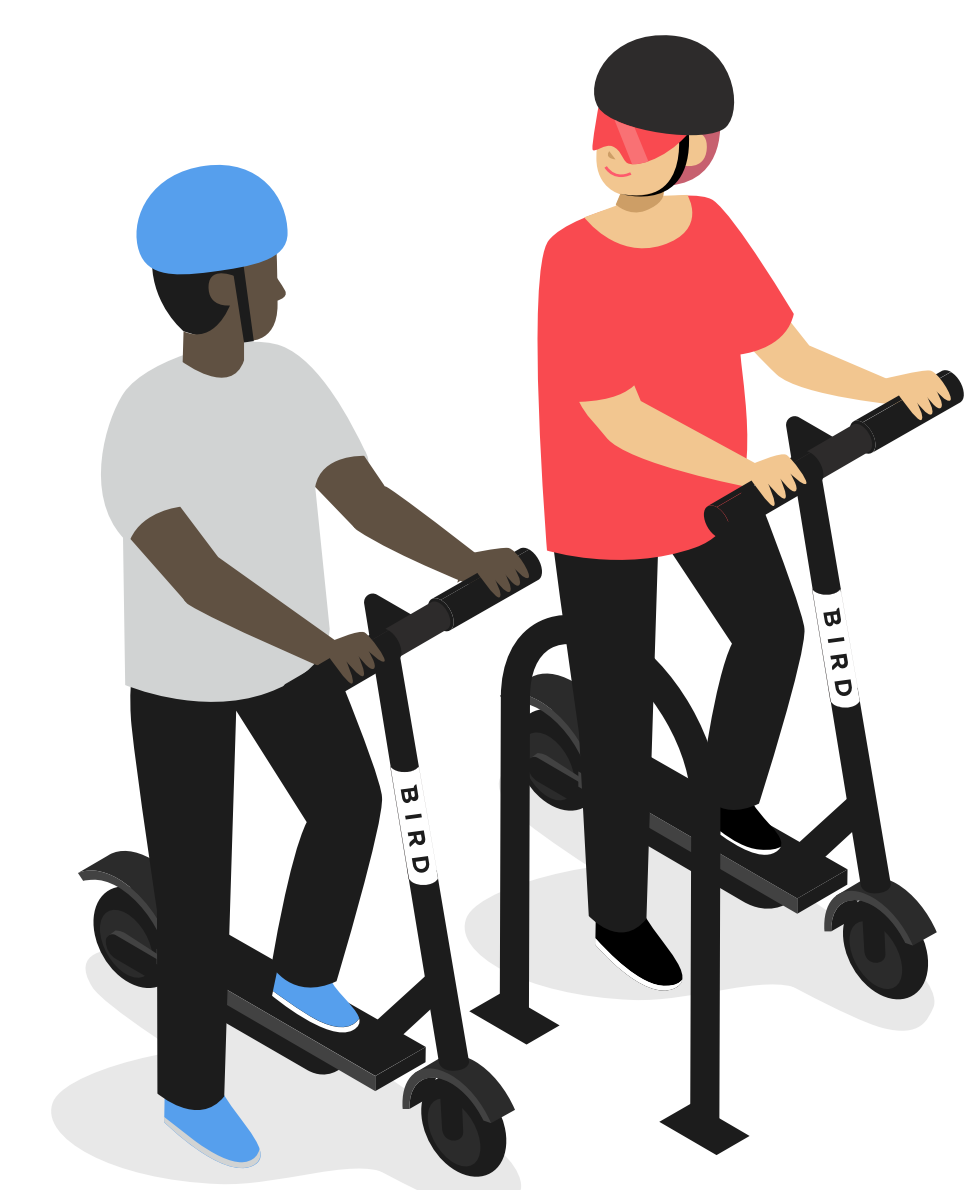
In cities where Bird operates, a number of measurable benefits have emerged. For example, city officials in Portland, Oregon released a report that revealed one out of three e-scooter trips would have otherwise been made by private car or ride-hail services.

The report “did not find a disproportionate risk” of riding e-scooters versus using other modes of travel. The report also found that e-scooters are a new, affordable transportation option for people in underserved communities.

That might seem surprising given the outsized attention e-scooter injuries have garnered in the media. But this heightened attention understandably comes with the territory of being new and exciting, whereas the story of the numerous injuries and deaths caused by cars is all too familiar. This report adds context to the safety performance of e-scooters compared to other modes of travel, and outlines the steps Bird takes to ensure its fleet operates safely.

With sensible regulation and safe operational parameters, e-scooter sharing can live up to its demonstrated ability to provide a more equitable, sustainable, and convenient way to meet the urban travel demands of today.

David Strickland is the Chair of the Global Safety Advisory Board of Bird Rides, Inc.



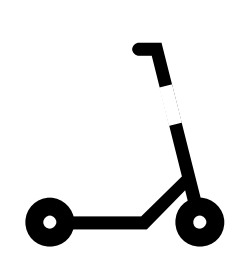


EXECUTIVE SUMMARY

The rapid emergence of e-scooters as a new form of transportation in cities across the globe has resulted in impressive progress toward people opting to travel via e-scooter in their community, in many cases to connect to transit, rather than via car. This shift has had a number of positive benefits including reduced congestion in city centers and less CO₂ emissions being generated.

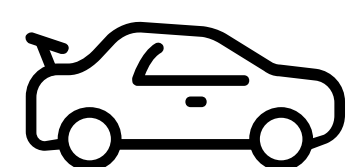
As shared e-scooters become a mainstay and reliable form of transportation in cities, it is important to explore and evaluate the safety of this transportation mode. Bird partnered with David Strickland (Chair of the Global Safety Advisory) to review Bird's internal data and information from a third party to produce an analysis of the safety of e-scooters.

Following are key findings and recommendations:



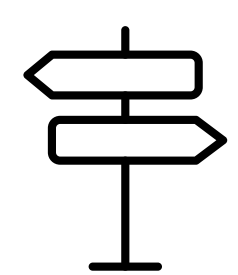
e-Scooters and bicycles have similar risks and vulnerabilities

Both Bird's internal data and independent research suggest an injury rate that is similar to bicycling. Reported injuries vary substantially between cities, and there is an association between cities with higher scores on bicycling safety as scored by People For Bikes, and fewer injuries being reported to Bird.



Replacing car trips can help increase safety for all road users

Sadly, cars killed more than 6,000 pedestrians in the U.S. in 2018 alone. Even more troubling is the trend that pedestrian fatalities rose by 27% from 2007 to 2016, while other types of traffic deaths dropped by 14%.¹ Data across cities indicate that e-scooters are replacing a significant portion of car trips—on average, 30% of Bird rides are trips that would have otherwise been taken by car. Solutions that replace car trips with safer modes of travel have the potential to contribute to a safer environment. Options like Bird that help connect riders to transit can help displace long car trips as well.



Operators and cities alike must act to improve safety

Bird and other operators have a responsibility to safety that must be fulfilled. Cities can improve safety for e-scooter riders by maintaining smoother streets, managing car and truck speeds, reducing car trips, and achieving safety in numbers. Above all, cities must design for safety. Bird's rider surveys uncover a strong demand for protected bike lanes and better maintained streets. Experience from several cities show that bike lanes and other Vision Zero-related infrastructure investments effectively reduce crash risk for all road users.²

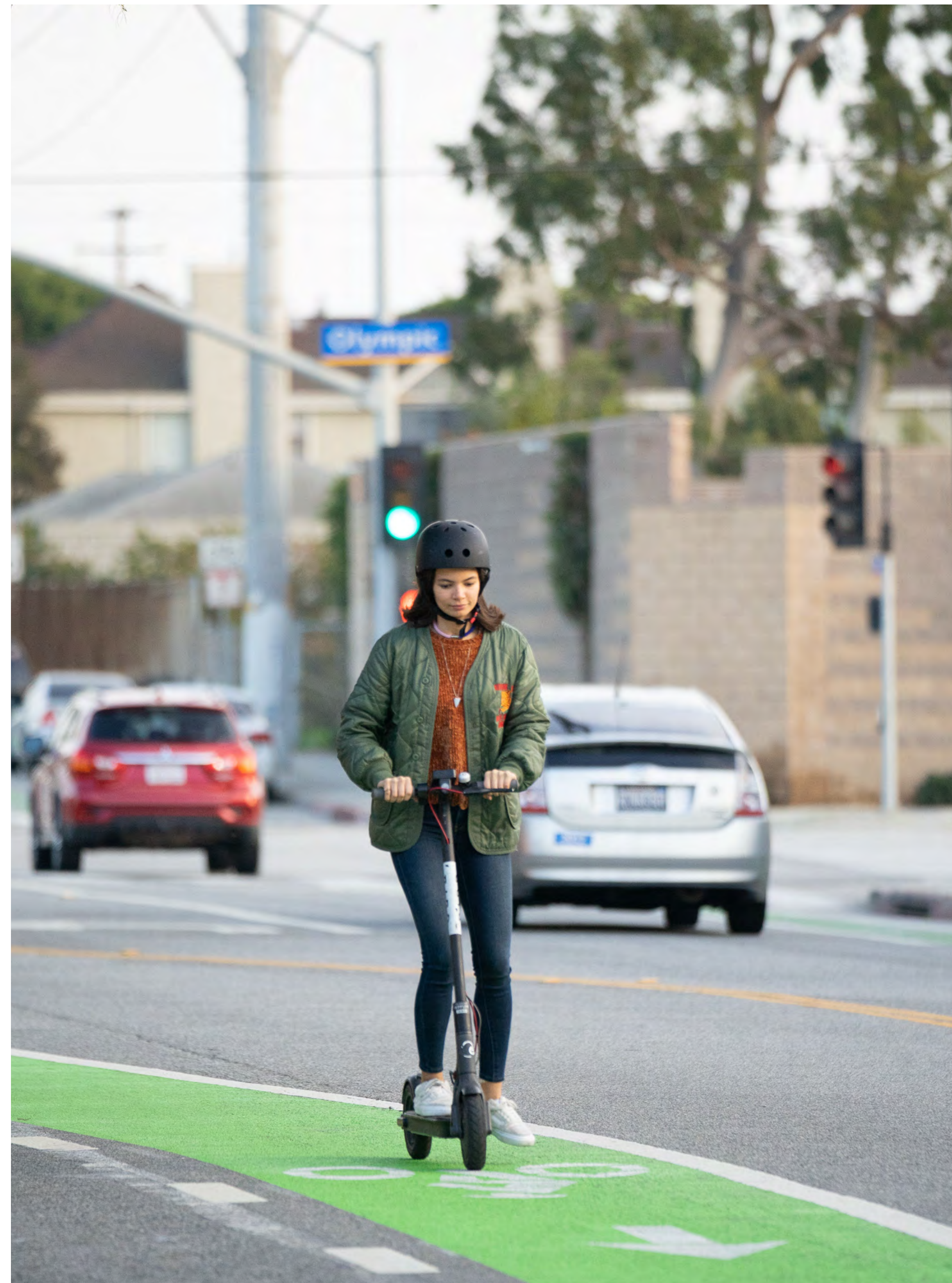
¹ See <https://www.ghsa.org/sites/default/files/2018-02/pedestrians18.pdf>

² "Marshall W, Farenchak N, Janson B. "Why are Bike-Friendly Cities Safer for All Road Users?" <https://www.ugpti.org/resources/reports/downloads/mpc18-351.pdf>



FINDINGS

e-Scooters and Bicycles Have Similar Risks and Vulnerabilities



On average, Bird riders reported one incident resulting in any kind of injury for every 27,000 miles ridden (or in less than 0.01% of trips).³

Calculated on either a per trip or per miles traveled basis, riding a Bird is as safe as, or safer than, bicycling.

In 2015, there were 467,000 reported injuries associated with bicycling.⁴ In 2014, 902 cyclists died and 35,206 cyclists were seriously injured (requiring hospitalization).⁵ The all-age severe injury rate for cycling across the United States according to Buehler and Pucher (2017) is 3.3 hospital admissions per million miles cycled.⁶ Using the methodology in that paper, the national emergency department rate for bicycles is 58.9 emergency department visits per million miles cycled, or one emergency department visit per 16,885 miles cycled.

Bird collects and analyzes reports from its riders on injuries they sustain while riding a Bird. Bird provides a number of ways for riders to report incidents including by email (Hello@bird.co), through an in-app messaging feature, and by phone.

Bird's reported injury rate is 37.2 injuries per million miles, or one per 26,881 miles ridden. This is a different measure from the national bicycling emergency department rate referenced above, because it captures all degrees of injuries reported to Bird—even if they did not result in an emergency department visit, and omits those emergency department visits not reported to Bird.

³ Bird's own internal data. Disclaimer: The injury rate was determined by incidents reported directly to Bird and does not take into account other e-scooter providers or privately owned scooters. The overwhelming majority of these incidents are minor in nature, resulting only in abrasions or minor contusions

⁴ See <https://www.cdc.gov/motorvehiclesafety/bicycle/index.html>

⁵ Pucher J, Buehler R. "Safer Cycling Through Improved Infrastructure". Am J Public Health. 2016;106(12):2089-2091.

⁶ Buehler and Pucher, "Trends in Walking and Cycling Safety: Recent Evidence From High-Income Countries, With a Focus on the United States and Germany", February 2017, Vol 107, No. 2 AJPH








Bike-Friendly Cities = Fewer e-Scooter Injuries



Reported injury rates can vary quite substantially across cities (See Figure 1), a fact that is also true for bicycling injury rates. Indeed, as shown in Figure 1, this early evidence is suggestive of an association between cities with higher scores on bicycling safety as scored by the advocacy group, People For Bikes, and fewer injuries being reported to Bird.⁷

Figure 1 - Fewer e-Scooter Injuries in Bike-Friendly Cities

	TOTAL BIRD REPORTED INJURIES PER MILLION MILES	"PEOPLE FOR BIKES" SAFETY SCORE
 San Diego	32.4	3.0
 Austin	32.8	3.0
 Phoenix Area	37.3	1.5
 Dallas	38.7	1.5
 San Antonio	51.2	1.0

Safety Score: 5=most bike-friendly; 0= least bike-friendly

A number of recently released and ongoing independent and collaborative studies are augmenting the understanding of injury risk associated with shared e-scooters. Consistent with Bird’s internal data, these independent studies also point to parity with bicycling when it comes to measures of safety.

⁷ Ratings are described at <https://cityratings.peopleforbikes.org/methodology/>



Portland, Oregon. In a recently completed study by the Portland Bureau of Transportation (PBOT), which examined e-scooter-related emergency department visits from urgent care centers and hospitals, as well as bike-related visits from those same facilities, a total of 176 e-scooter visits were counted in comparison to 429 bike visits.

“

We did not find a disproportionate risk that would discourage the city from allowing a scooter ride-share pilot.

Multnomah County Environmental Health Director, Jae Douglas, Ph.D.

”

Kansas City, Missouri. Similarly, Kansas City reviewed 100,000 EMS records between July and October 2018 and found only 19 calls related to e-scooter injuries, a period during which hundreds of thousands of e-scooter trips were completed.

By The Numbers

KANSAS CITY, MISSOURI

Four months of EMS records show less than five e-scooter injuries per month

A manual review of nearly 100,000 EMS records logged between July 2018 through October 2018 shows only 19 accidents involving electric scooters, according to the Kansas City Fire Department.



96,850

CALLS RECEIVED IN 4 MONTHS

19

CALLS FROM E-SCOOTER INJURIES

0

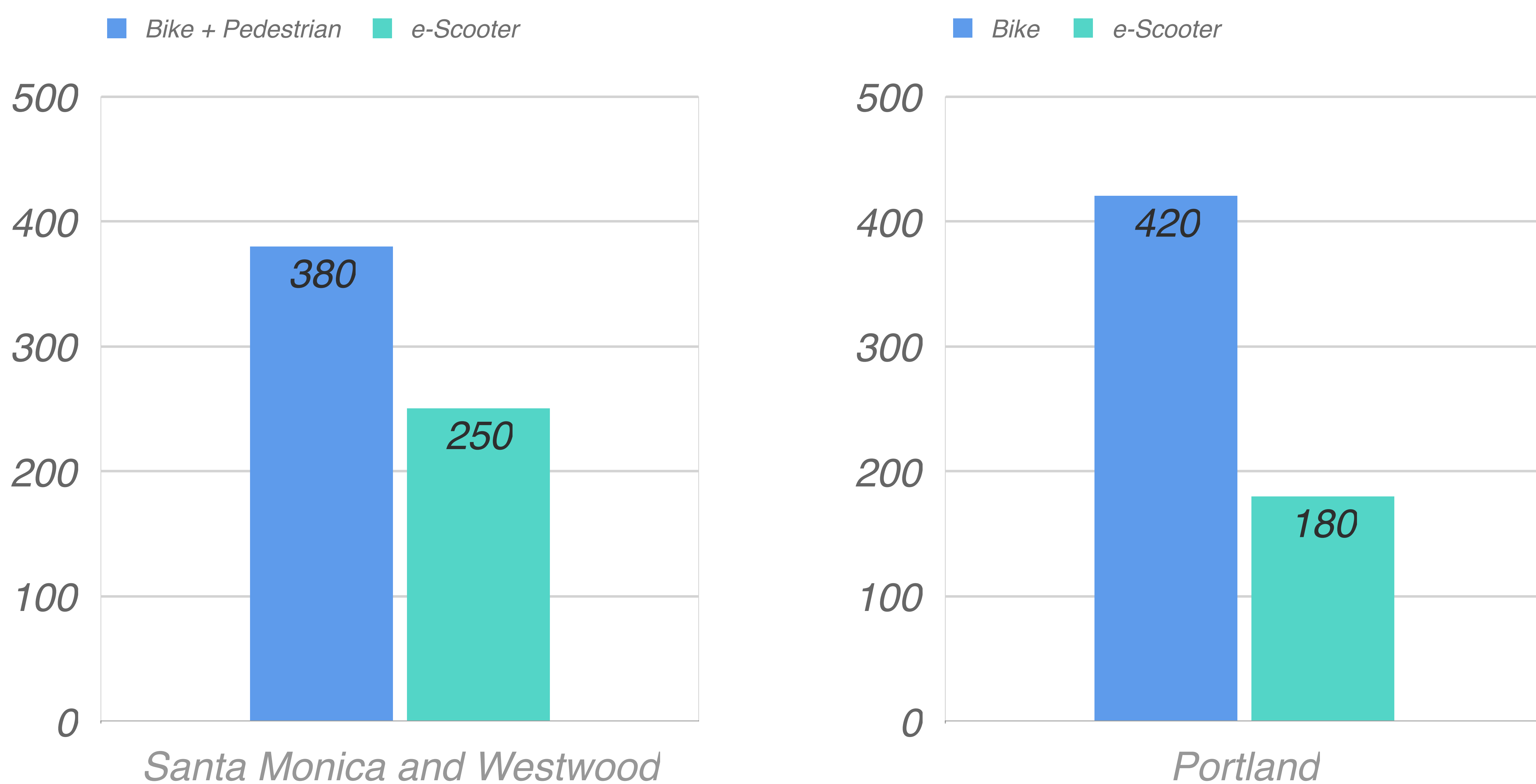
LIFE-THREATENING CALLS



Santa Monica and Westwood, California. A study of 249 reported e-scooter visits at two medical centers in Santa Monica and Westwood published in the JAMA Network Open journal, also identified 376 visits for bicyclist and pedestrian injuries during the same time period at the two emergency departments under study. (See Figure 2)

To put these figures in context, Bird alone completed hundreds of thousands of e-scooter trips in Portland, and millions of miles of trips in Santa Monica and Westwood, during the time period covered by those two reports. Assuming that other e-scooter operators and private operators in Santa Monica and Westwood completed approximately as many trips as Bird, the total number of trip miles would suggest an emergency department visit rate and overall hospitalization rate similar to that of bicycling.⁸

Figure 2 - Bicycle, Pedestrian and e-Scooter Emergency Department Visits (Third Party Data)⁹



Unfortunately, the data currently available to everyone is incomplete—the description of those bicyclists injuries is cursory, and there is no benchmark to the total miles travelled or the severity of the injuries. Nonetheless, it seems that the studies taken together suggest that e-scooter safety is comparable to cycling safety, and that safety can be improved by improving safe bicycling infrastructure in cities.

Cities can help create a more hospitable environment for e-scooter riders and bicyclists by partnering with transportation operators and community organizations to better educate all road users about safety. This includes educating automobile drivers about their obligation to share the road with vulnerable road users as well as educating bicyclists and e-scooter riders about their responsibilities and the benefits of wearing helmets. For example, in Santa Monica, Bird partnered with the city on a public service campaign which included: exterior ads on buses, and light rail trains reminding motorists to check their blind spots, and encouraging e-scooter riders to wear helmets.

⁸ Comparisons are difficult. Buehler and Pucher (2017) report an all age national average, whereas the Trivedi et al (2019) paper is a count of visits in two hospitals in the greater Los Angeles region. In addition, Bird only possesses trip data for one of the e-scooter operators, and no records for private e-scooters. Furthermore, injury definitions can differ importantly across facilities and studies. Thus, any conclusions are tentative.

⁹ PBOT, "2018 E-Scooter Findings Report," available at <https://www.portlandoregon.gov/transportation/article/70971>; Trivedi TK, Liu C, Antonio ALM, et al. Injuries Associated With Standing Electric Scooter Use. JAMA Network Open. 2019;2(1):e187381. doi:10.1001/jamanetworkopen.2018.7381



Bird's Responsibility to Safety

By prioritizing safe infrastructure design and traffic enforcement, cities have the most power to reduce injury and fatality rates for all road users. As cities reorient their own transportation policies around Vision Zero principles to better control motor vehicle speeds and safeguard vulnerable road users to better prioritize safety, Bird is focusing on ways it can help contribute to achieving the Vision Zero goal of zero fatalities and serious injuries.

Bird's industry-leading safety policies and practices include:

- Ceasing operations after midnight, when risk to all road users increases. To our knowledge, Bird is the only e-scooter operator to implement this practice across all of its markets.¹⁰
- Requiring riders to confirm they are 18 or older.
- Instituting responsible speed limits in consultation with city officials.
- Enabling direct reporting of irresponsible parking behavior through the in-app Community Mode feature.

Operating Parameters

At its inception, Bird made an early operating decision to cease operations overnight, in recognition of the traffic safety literature that finds a disproportionately high crash risk in the late night and early morning hours.¹¹ Indeed, with three of the four known shared e-scooter fatalities in the U.S. having taken place between 1 a.m. and 5 a.m., this was a prescient decision.¹²

Another example of Bird's safe and responsible operating policies is its restriction on underage riding, informed by the strong body of research indicating that children are more likely to be involved in crashes. In a 2017 study by Siman-Tov et al,¹³ the authors document a total of 795 e-bike and e-scooter injuries—51% of injured motorized scooter riders were age 14 or younger.



¹⁰ Weinberg, C., "Scooters Grapple With Safety After Dark," The Information, January 29, 2019. <https://www.theinformation.com/articles/scooters-grapple-with-safety-after-dark>

¹¹ Folkard, S. 1997. "Black times: Temporal determinants of transport safety," Accident Analysis & Prevention, 29 (4), pp. 417-430

¹² As of March 1, 2019. Tsiaperas, T. "Dallas man, 24, dies a day after apparent electric scooter accident," Dallas News, September 3, 2018, available at <https://www.dallasnews.com/news/dallas/2018/09/03/dallas-man-24-dies-day-after-apparent-electric-scooter-accident>; Lazo, L., and P. Hermann "Scooter rider fatally struck by SUV in Dupont Circle, officials say," Washington Post, September 21, 2018, available at https://www.washingtonpost.com/local/public-safety/emergency-workers-try-to-rescue-pedestrian-trapped-under-suv-in-dupont-circle/2018/09/21/aec71252-bdaa-11e8-be70-52bd11fe18af_story.html?hpid=hp_hp-top-table-main-scoped-out-scooter%3Ahomepage%2Fstory&hpid=hp_hp-top-table-main-scoped-out-scooter%3Ahomepage%2Fstory; Winkley, L., "Bird electric scooter rules should have prevented death in Chula Vista," San Diego Union Tribune, December 26, 2018, available at <https://www.sandiegouniontribune.com/news/public-safety/sd-me-scooter-death-bird-rules-20181226-story.html>; Holley, P., "Amid a wave of injuries, Irish exchange student is latest person killed in e-scooter accident," Washington Post, February 5, 2019, available at <https://www.washingtonpost.com/technology/2019/02/05/amid-wave-severe-injuries-irish-exchange-student-becomes-latest-person-killed-electric-scooter-accident/>

¹³ Siman-Tov M, Radomislensky I; Israel Trauma Group, Peleg K, "The casualties from electric bike and motorized scooter road accidents.," Traffic Inj Prev. 2017 Apr 3;18(3):318-323. Epub 2016 Nov 14.



Vehicles

Bird dedicates significant energy and resources to the continual advancement and improvement of its fleet. As the most experienced e-scooter operator, Bird has evaluated the data from millions of rides taken on its fleet of vehicles to design new e-scooters to include features such as:

- Durable brakes that are designed for consistent braking.
- Reinforced hardware to prevent failure even during heavy use.
- Requiring kick-start before throttle can be engaged (to avoid unintentional or jerky acceleration).
- Non-slip standing surfaces and durable grips for secure riding.
- Clear and prominent labeling to reinforce responsible ridership rules (helmet recommended, no double riding, etc).
- Always-on front light (clear) and rear light (red) coupled with reflectors for extra visibility.
- Front and rear lights configured to remain illuminated for at least 90 seconds after the rider has stopped.
- Manual bells on newer models that can be used to alert other users on the road.
- Vehicles capable of being capped at specific speeds as necessary.

Bird Zero, the newest vehicle in the Bird fleet, is purpose designed and engineered specifically for long-lasting daily shared use. It meets the demands of cities with varying climates and street terrains by providing riders with superior battery life for longer range, enhanced lighting for increased visibility, stability, and improved durability for a longer life-span.

Additionally, Bird's GPS technology allows it to monitor where Birds are located at all times, to create customized zones that regulate speed based on a Bird's physical location, and to send push notifications regarding relevant geo-specific regulations.

BIRD ZERO SPECS	
Braking	Drum Brake + Regenerative Brake
Lights	Headlight + tail light

Mechanical brakes
enable riders to safely stop and slow down as needed

Integrated digital display
lets riders easily check their speed and the battery level of their Bird

The latest wireless and bluetooth technologies
improves communication between a Bird and the app

Longer lasting battery
extends the range of a Bird

Solid tires
withstand a variety of ground surfaces

Low center of gravity
provides a smoother riding experience

Wide riding deck
allows for a more comfortable ride

Large brake lights
increase vehicle visibility to help keep riders safe

Five Safety Steps for Cities: Protecting the Most Vulnerable



Traditional traffic safety policy that focused on improving safety for drivers and passengers is rapidly being supplanted by Safe Systems,¹⁴ Sustainable Safety, and Vision Zero approaches that prioritize the safety of Vulnerable Road Users as a means of eliminating traffic deaths and serious injuries.¹⁵ Radjou and Kumar (2018) define Vulnerable Road Users (VRUs) as, “having small mass relative to other road users with little or no external protective devices that would absorb the energy of a collision. They include pedestrians, cyclists, and motorized two-wheelers.”¹⁶

More than 45 U.S. cities have officially adopted Vision Zero.¹⁷ Among leading U.S. transportation planners and engineers, 97.3% were recently found to be aware of Vision Zero, and most of these professionals now work in cities that have adopted some aspect of Vision Zero as best practice traffic safety policy.¹⁸

The centrality of VRUs in Vision Zero is in part due to their over-representation in traffic injuries and fatalities,¹⁹ but is also informed by the strong body of evidence that improving safety for VRUs is the most effective way of reducing injuries and fatalities for all road users.²⁰ After the adoption of VRU-focused Vision Zero policies in New York City and San Francisco, traffic casualties among VRUs and motorists alike were reduced 28% and 41% respectively,²¹ bucking the national trend of increasing traffic casualties.

More than just a general focus on VRUs, successful Vision Zero programs have several specific interventions in common.

¹⁴ <https://www.roadsafety.unc.edu/about/safesystems/>

¹⁵ Kim E, Muennig P, Zohn, R. Vision zero: a toolkit for road safety in the modern era. 2017 Dec; 4: 1. *Injury Epidemiology* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5219975/>

¹⁶ Constant A, Lagarde E (2010) Protecting Vulnerable Road Users from Injury. *PLoS Med* 7(3): e1000228. <https://doi.org/10.1371/journal.pmed.1000228>

¹⁷ Vision Zero Network, Vision Zero Cities Map. <https://visionzeronetwork.org/resources/vision-zero-cities/>

¹⁸ Evenson KR, LaJeunesse S, Heiny S. Awareness of Vision Zero among United States' road safety professionals. *Injury Epidemiology*. 2018 May 8;5(1):21. doi: 10.1186/s40621-018-0151-1. <https://www.ncbi.nlm.nih.gov/pubmed/29736881>

¹⁹ Constant A, Lagarde E (2010) Protecting Vulnerable Road Users from Injury. *PLoS Med* 7(3): e1000228. <https://doi.org/10.1371/journal.pmed.1000228>

²⁰ Ibid

²¹ Ferrier, K. “Vision Zero Buoyed by Progress in Longest Running Cities,” Vision Zero Network <https://visionzeronetwork.org/vision-zero-buoyed-by-progress/>



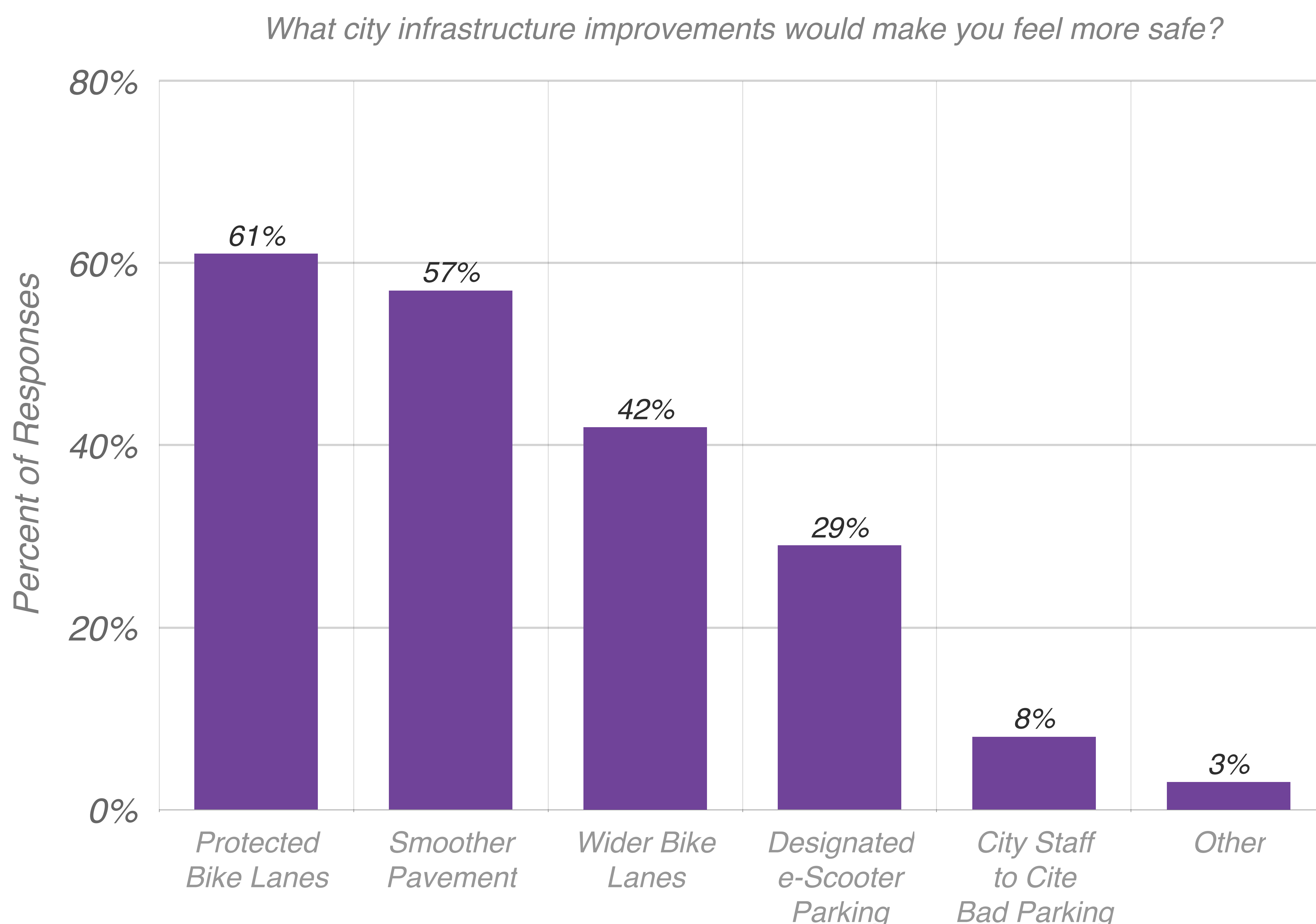
Based on the evidence supporting the efficacy of these common interventions, following are five city actions that hold the most promise for improving safety for e-scooter riders and other road users alike:

1. Design safer streets

The majority of fatalities and severe injuries sustained by VRUs are caused by motor vehicle impacts.²² A large body of independent research has demonstrated that for VRUs, protective road design and infrastructure are likely to be the most important factors in limiting serious injuries.²³ ‘Complete Street’ infrastructure that provides VRUs dedicated space and physical protection, such as protected bike lanes, have been proven to reduce traffic casualties by up to 90%.²⁴ In New York City, protected bike lanes and pedestrian refuge islands that were installed on major avenues in Manhattan reduced traffic injuries to all road users by 37 - 58%.²⁵

This evidence for real safety is consistent with riders’ perception of what will make them feel more safe. In Bird’s surveys, riders identified the following top four improvements in infrastructure that cities can make to improve their sense of safety: protected bike lanes (61%), smoother pavements (57%), wider bike lanes (42%), and designated e-scooter parking (29%) (See Figure 3). Similarly, in Portland’s recent study of e-scooter use during its four month pilot, individuals ranked bike lanes and low car speed streets as their most preferred road types, with sidewalks ranked last (p.6).

Figure 3 - Desired Infrastructure Improvements (Bird Rider Survey)²⁶



²² Cripton P, Shen H, Brubacher J, Chipman M, Friedman S, Harris M, Winters M, Reynolds C, Musimano M, Babul S, Teschke K. Severity of urban cycling injuries and the relationship with personal, trip, route and crash characteristics: analyses using four severity metrics. *BMJ Open*. 2015; 5(1): e006654. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4289714/>

²³ Pucher J, Buehler R. Safer Cycling Through Improved Infrastructure. *Am J Public Health*. 2016;106(12):2089-2091.

²⁴ Teschke K, Harris M, Reynolds C, Winters M, Babul S, Chipman M, Cusimano M. Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study. December 2012. *American Journal of Public Health (AJPH)* <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2012.300762>

²⁵ BNYC DOT. “Measuring the Street: New Metrics for 21st Century Streets” 2012. <http://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf>

²⁶ Survey of 2,045 Bird riders, January 2019.



Encouraged by the evidence these types of design increase both real and perceived safety, several cities are working to reduce traffic injuries through the implementation of safe design. Following are some illustrative examples:



Santa Monica, CA. The city where Bird first launched, Santa Monica, has planned the construction of 19 miles of new green bike lanes to support the remarkable growth in e-scooter riding.²⁷ Providing spaces where e-scooter riders feel safe has helped to facilitate the explosive growth in ridership there and to prove that micromobility is a viable option for cities.



New York City. Between 2000 and 2017, New York reduced the rate of Bicyclists Killed or Severely Injured (KSI) per Ten Million Cycling Trips steadily from 83.7 to 21.7, a 74% reduction.²⁸ It is not the case that bikes got 400% safer in that time period, or that cars got any less dangerous. However, over this time period, the city did invest in expanding its bike lane network by 381% with an additional 800 miles of bike lanes.²⁹ With the city's prioritization to improve safety infrastructure, New York City's streets have become much more friendly to all drivers, cyclists, and pedestrians.



Kansas City. Some organizations have begun to recognize that infrastructure protected from car traffic served more than just bikes, as micromobility continues to grow. In Kansas City, BikeWalkKC created a pop-up mobility lane they labeled for both bikes and e-scooters.³⁰



St. Louis. Bird is currently working with city and hospital safety researchers in several cities to identify streets where safe infrastructure investments would yield the greatest safety benefit. In St. Louis, for example, Bird is working within the newly created Scooter Safety Task Force to identify high-demand, high-crash corridors where protected bike lanes could reduce risk and increase ridership.

²⁷ Cagle, K., "City invests millions of dollars in greener commute," Santa Monica Daily Press, July 30, 2018

²⁸ NYC DOT, "New York City Cycling Risk Changes in cyclist safety relative to bicycle use in New York City 2000 - 2016," available at <http://www.nyc.gov/html/dot/downloads/pdf/nyc-cycling-risk.pdf>

²⁹ Pucher J, Buehler R. Safer Cycling Through Improved Infrastructure. Am J Public Health. 2016;106(12):2089-2091.

³⁰ Schmitt, A., "Local Bike Advocates: E-Scooters Are Game-Changing," Streetsblog, Jan 14, 2019, <https://usa.streetsblog.org/2019/01/14/local-bike-advocates-e-scooters-are-game-changing/>

2. Maintain safe street conditions

Street conditions play a key role in crash prevention. While severe injuries and fatalities are more likely to involve motor vehicle collisions, minor cyclist injuries are more likely to be caused by “rider only” crashes that do not involve direct collisions with cars but rather are caused by the rider veering to avoid a motor vehicle, cyclist error, poor visibility or unsafe pavement conditions.³¹ Potholes, uneven surfaces and other pavement irregularities are a leading cause of bicycle crashes,³² and it is likely the same will prove true for e-scooters.

Already there is a strong perception among e-scooter riders that road conditions are an important safety factor: “smoother pavements” was second only to “protected bike lanes” as a safety measure desired by Bird riders. (See Figure 3, page 12)



3. Reduce car and truck speeds

Vehicular speeding is a leading cause of death and injury on urban streets. According to Injury Epidemiology, “Vision Zero: a toolkit for road safety in the modern era”:

Vulnerable road users, such as pedestrians or cyclists, should not be exposed to vehicles at speeds over 30 km/h (18.6 mph). If separation is not possible, then reduce the vehicle speed to 30 km/h.³³

Cities that have adopted 25 mph or lower speed limits and enforced with safe street design and automated enforcement have reduced vehicular speeding and pedestrian injuries. In New York City, speeding was reduced by 63% and pedestrian injuries by 23%.³⁴

³¹ Schepers P, Agerholm N, Amoros E, et al An international review of the frequency of single-bicycle crashes (SBCs) and their relation to bicycle modal share Injury Prevention 2015;21:e138–e143. <https://injuryprevention.bmj.com/content/21/e1/e138>

³² Munster, D., Koorey, G., Walton, D. 2001. Role of road features in cycle-only crashes in New Zealand. Transit New Zealand Research Report No. 211. 48 pp. <https://can.org.nz/system/files/Transfund-report-211-Cycle-Crashes.pdf>

³³ Kim E, Muennig P, Zohn R. Vision zero: a toolkit for road safety in the modern era. Inj Epidemiol. 2017 Dec; 4: 1. Published online 2017 Jan 9. doi: 10.1186/s40621-016-0098-z <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5219975/>

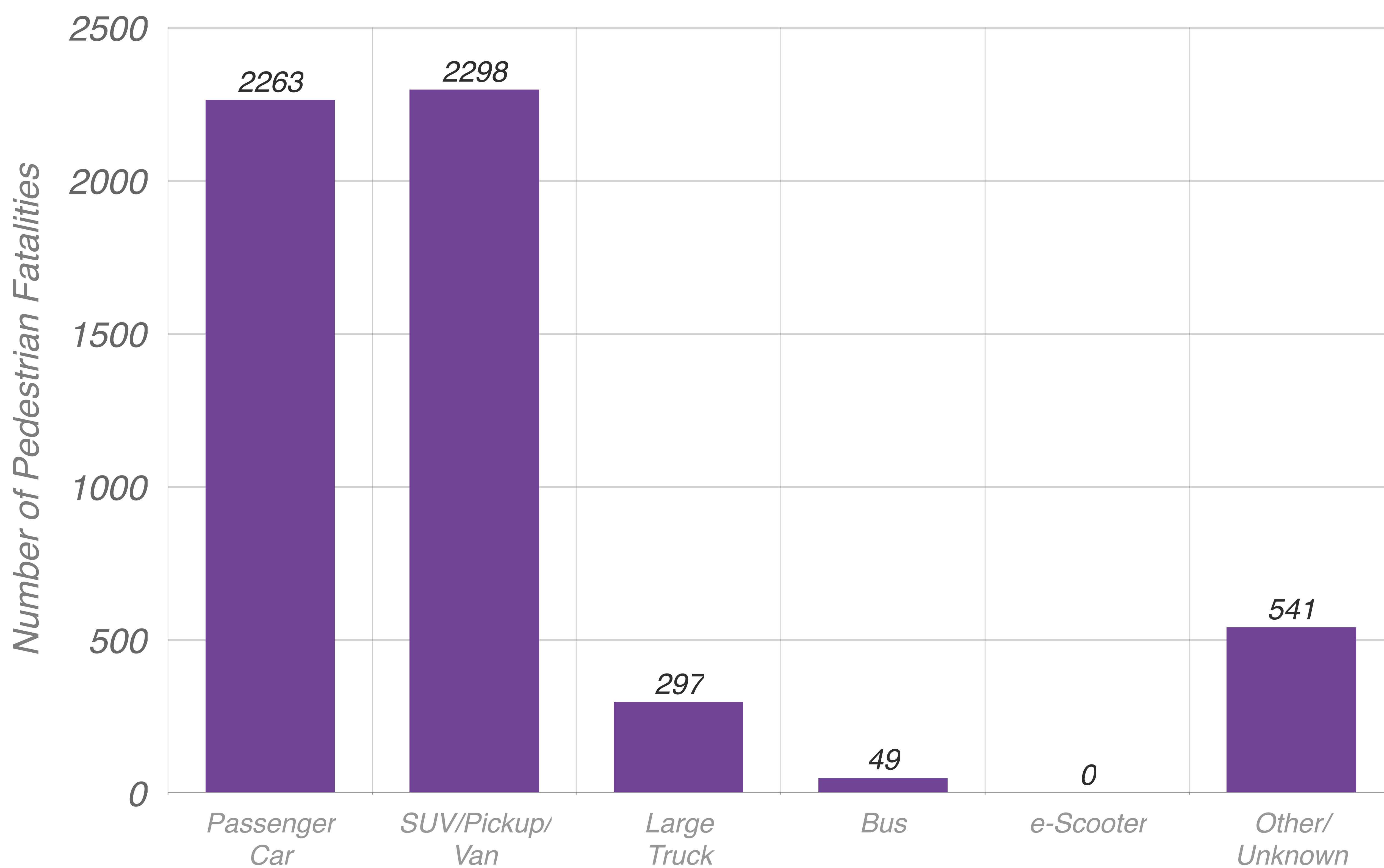
³⁴ NYC DOT Speed Camera Report. 2017. <http://www.nyc.gov/html/dot/downloads/pdf/speed-camera-report-june2017.pdf>

4. Reduce car trips

The biggest threat, by far, to pedestrians and other VRUs comes from cars and trucks (See Figure 4). In 2017, around 6,000 pedestrians were killed by cars in the U.S., or 2 people every 3 hours.³⁵ Additionally, another 100,000 more were sent to emergency departments.³⁶ The risk to pedestrians involved in car crashes of being killed is 150% greater than that to the vehicle occupants.³⁷

It is well established that fatalities and casualties to all road users thus rises or falls in relation to the number of car and truck vehicle miles traveled (VMT)³⁸, and that cities with fewer driving trips and more public transit trips have fewer traffic deaths.³⁹ Conversely, after tens of millions of shared e-scooter trips in the U.S., there have been no reports of e-scooters causing the death of pedestrians, bicyclists, or other vulnerable road users. In the studies conducted to date, even the rate of pedestrian injuries resulting from e-scooters was extremely low: After 700,000 trips in Portland, only 2 pedestrian injuries were reported. And after millions of trips in Westwood and Santa Monica, the JAMA Network Open study documented only 11 cases of non-riders being hit by scooters, none of which resulted in serious injury.

Figure 4 - Number of Pedestrian Fatalities by Mode (NHTSA Data)⁴⁰



³⁵ NHTSA, "2017 Fatal Motor Vehicle Crashes: Overview," October 2018, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812603>

³⁶ CDC, "Pedestrian Safety," available at https://www.cdc.gov/motorvehiclesafety/pedestrian_safety/index.html

³⁷ CDC, "Pedestrian Safety," available at https://www.cdc.gov/motorvehiclesafety/pedestrian_safety/index.html

³⁸ 2. Ahangari, H., et. al. (2017). Automobile-dependency as a barrier to vision zero, evidence from the states in the USA. Accident Analysis and Prevention, 107(77-85).

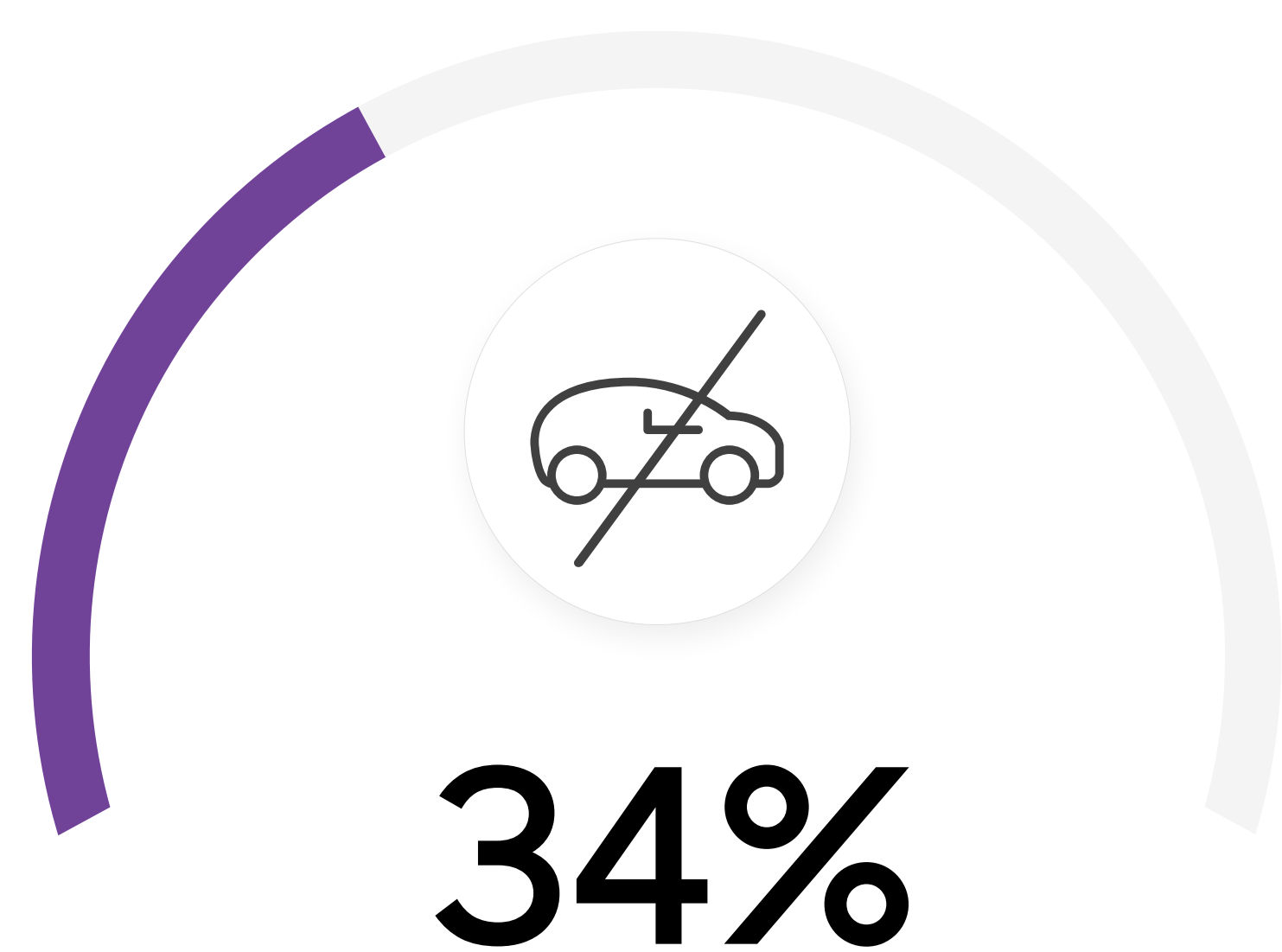
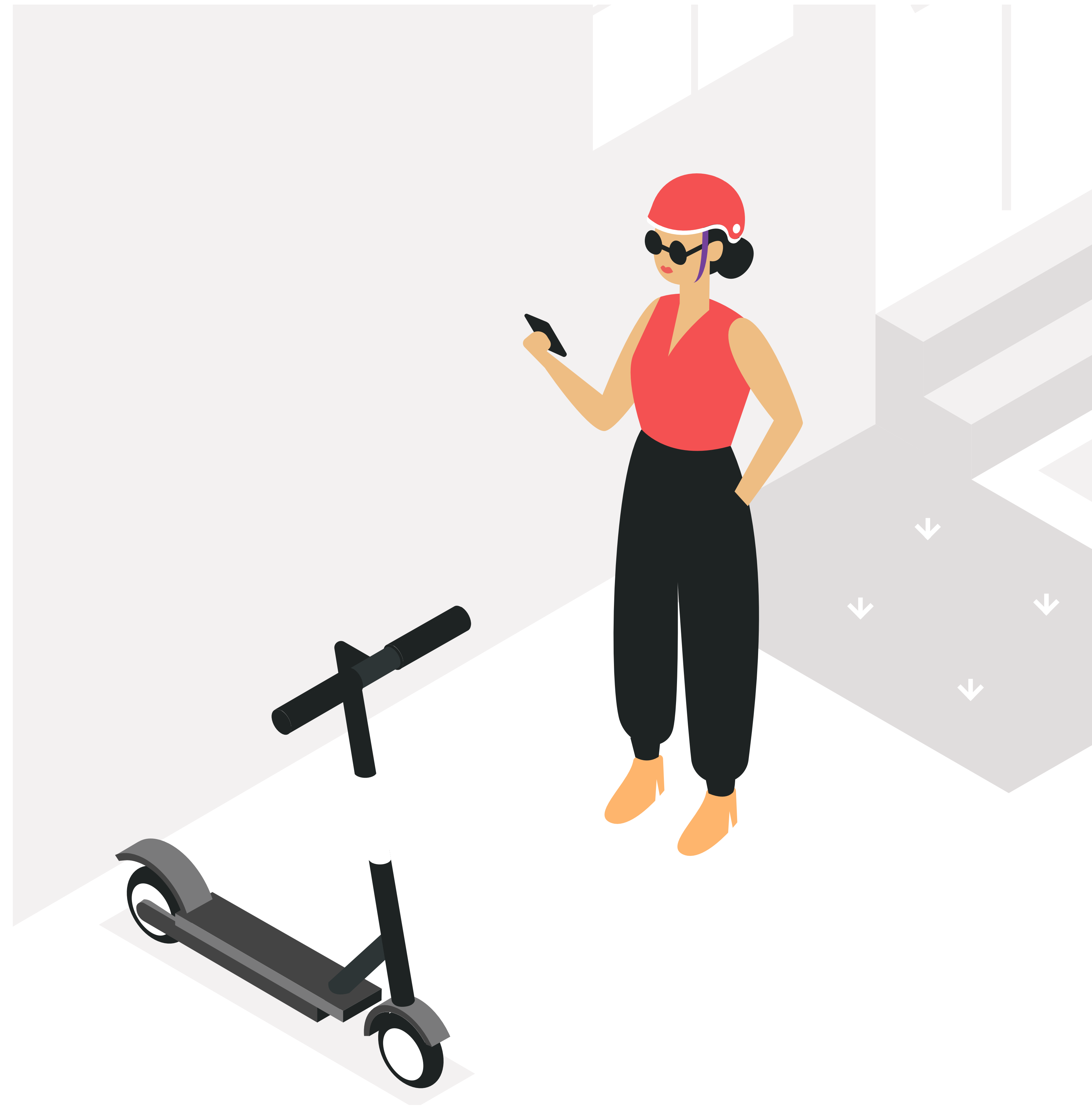
³⁹ Dickens M, Shaum L. "Public Transit Is Key Strategy in Advancing Vision Zero, Eliminating Traffic Fatalities" American Public Transit Association, 2018. <https://www.apta.com/resources/hottopics/Documents/APTA%20VZN%20Transit%20Safety%20Brief%208.2018.pdf>

⁴⁰ Based on single-vehicle crash data from 2016 from NHTSA. <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812493> Scooter data is from 2018.

The strongest variables connected to traffic fatality rates are the number of automobile vehicle miles traveled and vehicles per capita.

To improve safety, cities should adopt policies that induce a shift from car trips to safer, smaller-scale modes of travel or transit. Riding a Bird not only replaces short car trips, but by helping riders connect to transit, Bird rides have the potential to displace even more, and longer, car trips.

Indeed, in the same exhaustive report that found shared e-scooters pose “no disproportionate risk,” the Portland Bureau of Transportation pointed to a significant safety upside of more widespread shared e-scooter use:



With 34 percent of Portland scooter riders stating they replaced car trips with e-scooter trips, an increase in e-scooter use has the potential to contribute to a reduction in serious injuries and fatalities.



This potential safety benefit is not just relevant to Portland, but any city that is considering the safety benefits of more widespread ridership of shared e-scooters. Indeed, other cities like Denver are conducting surveys and finding similar evidence of significant car trip replacement by shared e-scooters.

Bird's own surveys confirmed these broad patterns. In a survey of 1,148 riders across Atlanta, Austin, Phoenix, and Los Angeles, Bird riders reported mode-switching behavior similar to that found in city-administered surveys in Denver and Portland (see Figure 5).

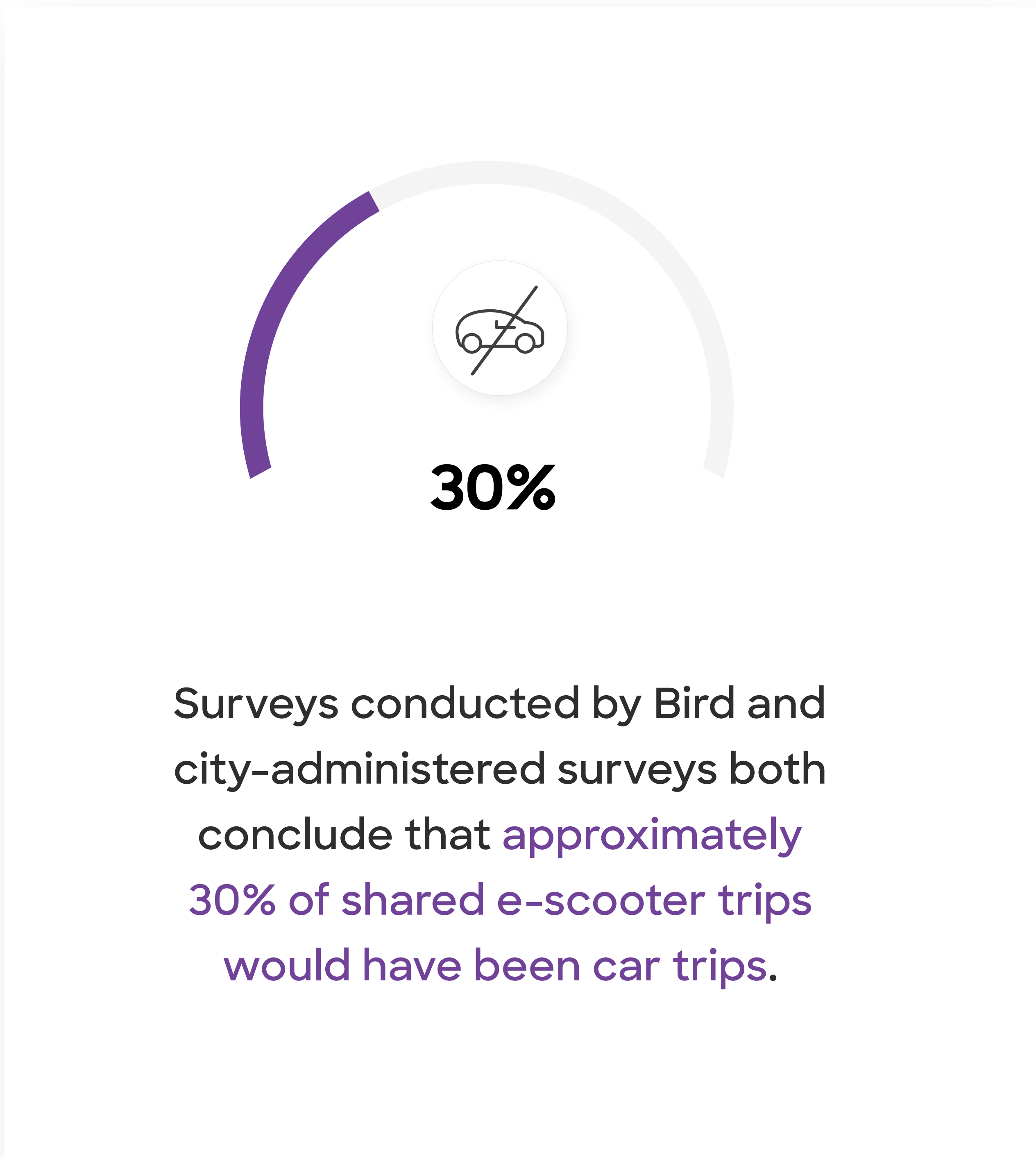
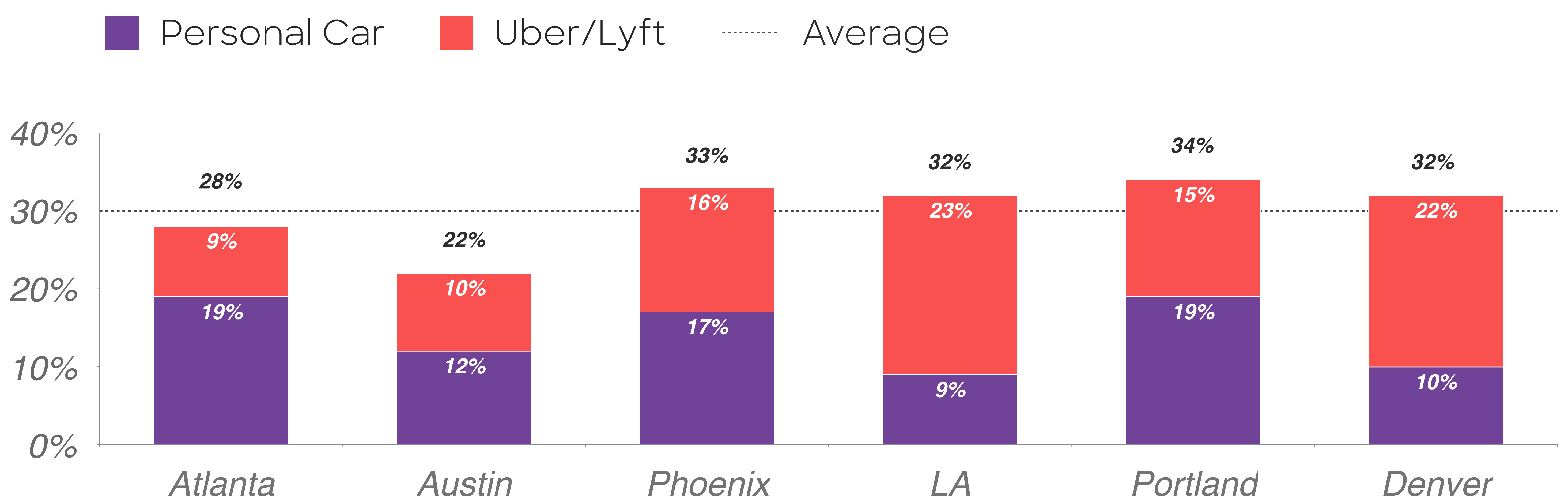


Figure 5 - Percentage of e-Scooter Trips Replacing Car Trips (Bird and City Surveys)⁴¹



⁴¹ The Bird survey asked riders to think about their last trip taken using Bird and asked "If Bird didn't exist, how would you have gotten to your destination?" Responses included the following: Walk; Personal bike; Bike share; Public transit; Personal car; Lyft/Uber; I would not have taken trip."



5. Unlock safety in numbers and the ‘Virtuous Cycle’ of safety

Peter Jacobsen coined the term “safety in numbers” in research published in 2003,⁴² which documented, “the likelihood that a given person walking or bicycling will be struck by a motorist varies inversely with the amount of walking or bicycling.” The force behind “safety in numbers,” according to Jacobsen, is motorists’ expectation of encountering cyclists and pedestrians, which rises with increased prevalence of cyclists and pedestrians.

Safety in numbers is a part of leading municipal Vision Zero policies. As the City of Philadelphia has stated in its own Vision Zero policy, “Successful Vision Zero programs recognize that there is safety in numbers, that increasing numbers of people walking and biking make these activities safer, as well as improve the health of a city.”⁴³ New York City, which adopted and implemented Vision Zero several years before Philadelphia, stated in its 2018 Vision Zero year four Report: “As the number of regular bicyclists has increased cycling has gotten dramatically safer, potentially showing a safety in numbers effect.”⁴⁴

The implication is clear: Policies that increase the number of pedestrians or cyclists increase the individual safety of walking and bicycling, while policies that suppress ridership increase danger. Jacobsen has stated the same effects are likely to hold true for e-scooter riders.⁴⁵

As shared e-scooters gain more mode share from more dangerous and polluting cars and SUVs, crashes, injuries, and fatalities should fall. The safety benefit of e-scooters’ proven car trip replacement potential will be further accelerated as cities build more protected lanes that benefit e-scooter riders, bicyclists and pedestrians alike. In so doing, cities have the power to instigate a ‘virtuous cycle’ of increasing micromobility ridership, decreasing car use, and creating safer streets.



⁴² Jacobsen PL, “[Safety in numbers: more walkers and bicyclists, safer walking and bicycling](#),” Injury Prevention 2003;9:205-209.

⁴³ City of Philadelphia, About Vision Zero, 2017. <http://visionzerophl.com/about>

⁴⁴ City of New York, Vision Zero year 4 report. March, 2018. <https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-4-report.pdf>

⁴⁵ Jacobsen, P. and J. Jacobsen, “Tiny Vehicles and the New Safety in Numbers,” Streetsblog, October 9, 2018, <https://usa.streetsblog.org/2018/10/09/tiny-vehicles-and-the-new-safety-in-numbers/>



CONCLUSIONS AND RECOMMENDATIONS

While the safety data individual companies and cities have regarding e-scooters is undoubtedly incomplete, some preliminary findings are emerging:

- Injury rates for e-scooters are comparable to those for bikes, and when operators act responsibly and cities invest in safe streets, injury rates are lower for all vulnerable road users.
- Data across cities indicate that e-scooters are replacing a significant portion of car trips. As the Portland Bureau of Transportation indicated in its study, this is a favorable finding that may hold future systemic safety benefits as overall crashes do rise and fall with car usage. Further study, however, is needed to better understand and maximize the potential safety benefits of wider scale replacement of car trips with shared e-scooter trips.
- The most important contributing variable is the investment cities choose to make in safe infrastructure such as well maintained streets and connected networks of protected bike lanes and intersections.

Operators and riders alike must put safety first, above expediency and above other operating considerations. Bird is proud of its leadership role, and will continue to lead the industry in the fulfillment of our responsibility to safety. Cities have an equal and even greater responsibility, due to their power to shape streets and set and enforce safe laws regulations for all road users. All crashes are preventable. Best practice evidence shows the way forward: By providing protected lane space, maintaining streets, managing car and truck speeds, replacing car trips, and achieving safety in numbers, cities can dramatically improve safety for all road users.

To further our understanding of crash risk relative to other modes, future e-scooter safety research should situate e-scooter injuries in the broader context of 40,000 annual motor vehicle deaths, or the 4.6 million annual motor vehicle injuries.⁴⁶ Taking the numbers reported by Consumer Reports of 1,545 e-scooter injuries over the past year, **more people are injured by motor vehicles in three hours in the United States than are injured by e-scooters in a year.**

Benchmarking injuries across travel modes is difficult for a variety of reasons. Little is known about the vehicle miles traveled for different modes, injury definitions and the understanding of severity differ across institutions and jurisdictions, and road infrastructure differs dramatically from city to city. New York cycling injury rates have improved 400% over the last 15 years, a much larger difference than the difference between cycling and e-scooter injury rates which look more or less similar.

The aforementioned limitations of the studies to date are acknowledged by e-scooter companies, safety experts, and public health researchers alike. Dr. Tarak Trivedi of UCLA Medical Center, Dr. Lawrence Lewis of Washington University (in St. Louis, MO), and Prof. Chris Cherry of the University of Tennessee are all preparing proposals for more comprehensive studies that will include more in-depth data gathering and analysis necessary to identify causal factors, risk exposure, and comparative risk across modes.

These and other critical research collaborations will yield a more complete understanding of crash risk. This deeper understanding is essential as Bird continues to improve and expand crash prevention policies and practices.



⁴⁶ National Safety Council, "Motor vehicle: Preliminary Estimates," available at <https://injuryfacts.nsc.org/motor-vehicle/overview/preliminary-estimates/>