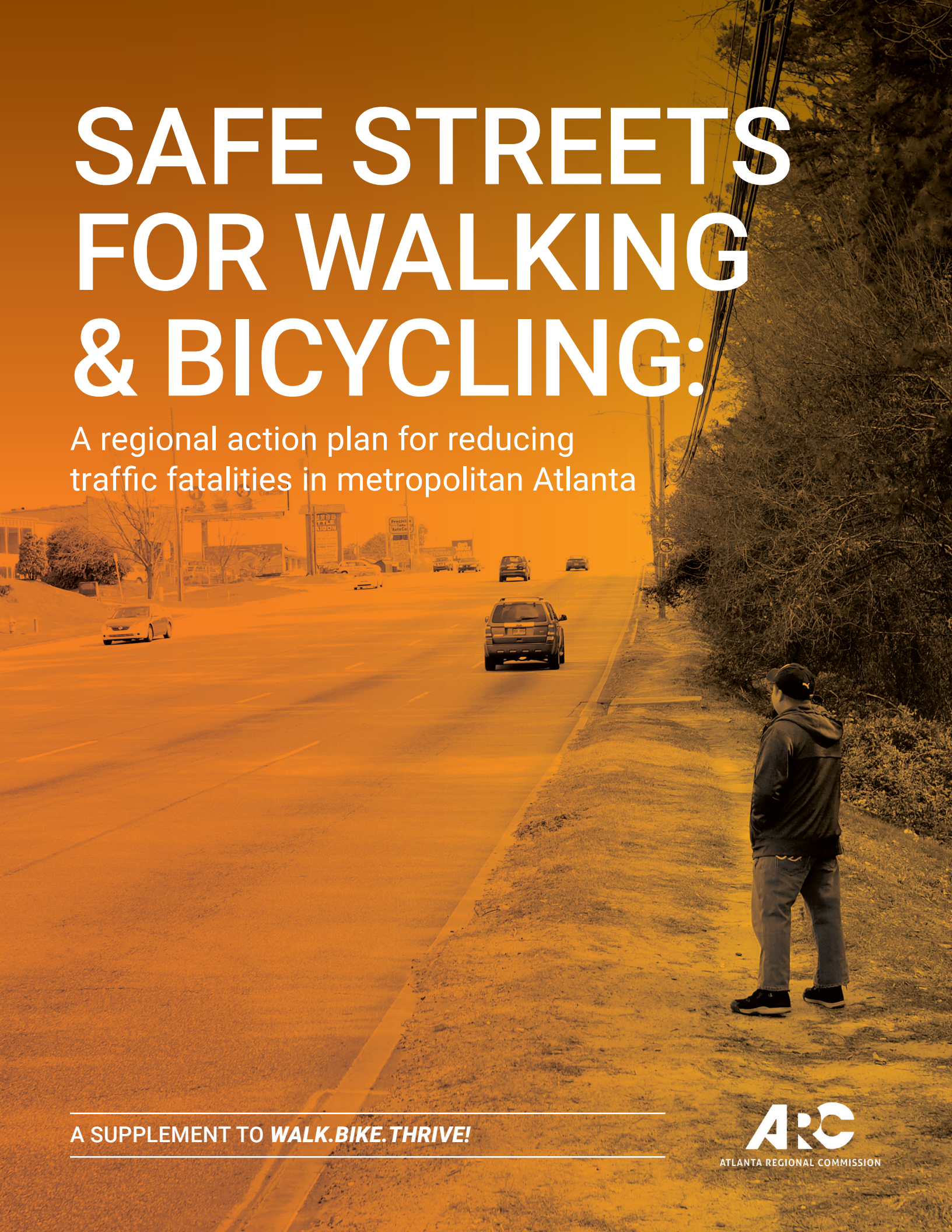
SAFE STREETS FOR WALKING & BICYCLING:

A regional action plan for reducing traffic fatalities in metropolitan Atlanta



A SUPPLEMENT TO ***WALK.BIKE.THRIVE!***

ARC
ATLANTA REGIONAL COMMISSION

"The Atlanta region will be one of the most connected and safest regions in the United States for walking and bicycling and use active transportation to improve the mobility, safety, and economic competitiveness for residents and communities."

Vision statement of ***Walk. Bike. Thrive!,*** the region's 2016 active transportation plan.

Executive Summary

The Atlanta Regional Commission's landmark 2016 active transportation strategy document, ***Walk. Bike. Thrive!*** identified "safety" as a three-fold problem. First, too many people are killed and seriously injured every year while walking or biking. Second, conditions for people having to walk and bike are frequently dangerous and unpleasant. This is a particular issue for vulnerable populations and underserved communities in the region. Third, the fear of being hit by a car or truck is a major barrier to getting more people to walk, bike, or take transit.

Safe Streets for Walking and Bicycling (Safe Streets), therefore, establishes a regional approach to eliminating fatal and serious injury crashes that is data-driven, pro-active, and aggressive. The plan recognizes that serious and fatal crashes involving pedestrians are on an upward trend and uses a "Safe System" approach to advance evidence-based countermeasures within a complete streets framework.

Safe Streets identifies several strategies for ARC:

- Short-term: ARC will focus regional transportation funding on projects that eliminate roadway designs that are dangerous for people on foot and bike.
- Medium-term: ARC will actively support the development of transportation projects by member jurisdictions that use the Safe System approach to increase traffic safety for all.
- Long-term: ARC will champion a Complete Streets approach to transportation and land use decisions that, over many years, will shift cultural norms around traffic safety and take advantage of changes in technology and demographics.

Many of these changes are societal and outside the scope of this document, so ***Safe Streets*** is a first step in recognizing that improving safety is all about choices we can start to make today.

Research has shown that increasing use and improving safety can go hand in hand—ARC's ***Safe Streets*** lays out an ambitious roadmap to achieve these twin goals.

Safe Streets is built around these critical steps:

Target and Approach

1. Set a Target: Zero Fatalities by 2030
2. Embrace a Safe System Approach

Data-driven Solutions

3. Identify Risks, Demand, and Policy Priorities
4. Use Evidence-based Countermeasures to Eliminate Risks

Strategies For Action

5. Short-term: Focus Regional Funding on Safety
6. Medium-term: Support Better Projects
7. Long-term: Champion Complete Streets Implementation

Evaluation and Research

8. Support Improved Data Collection, Crash Analysis, and Evaluation

Walking, bicycling, and taking transit are inherently safe, healthy, and positive choices; increasing active transportation improves the quality of life, economic vitality, and appeal of communities and the region.

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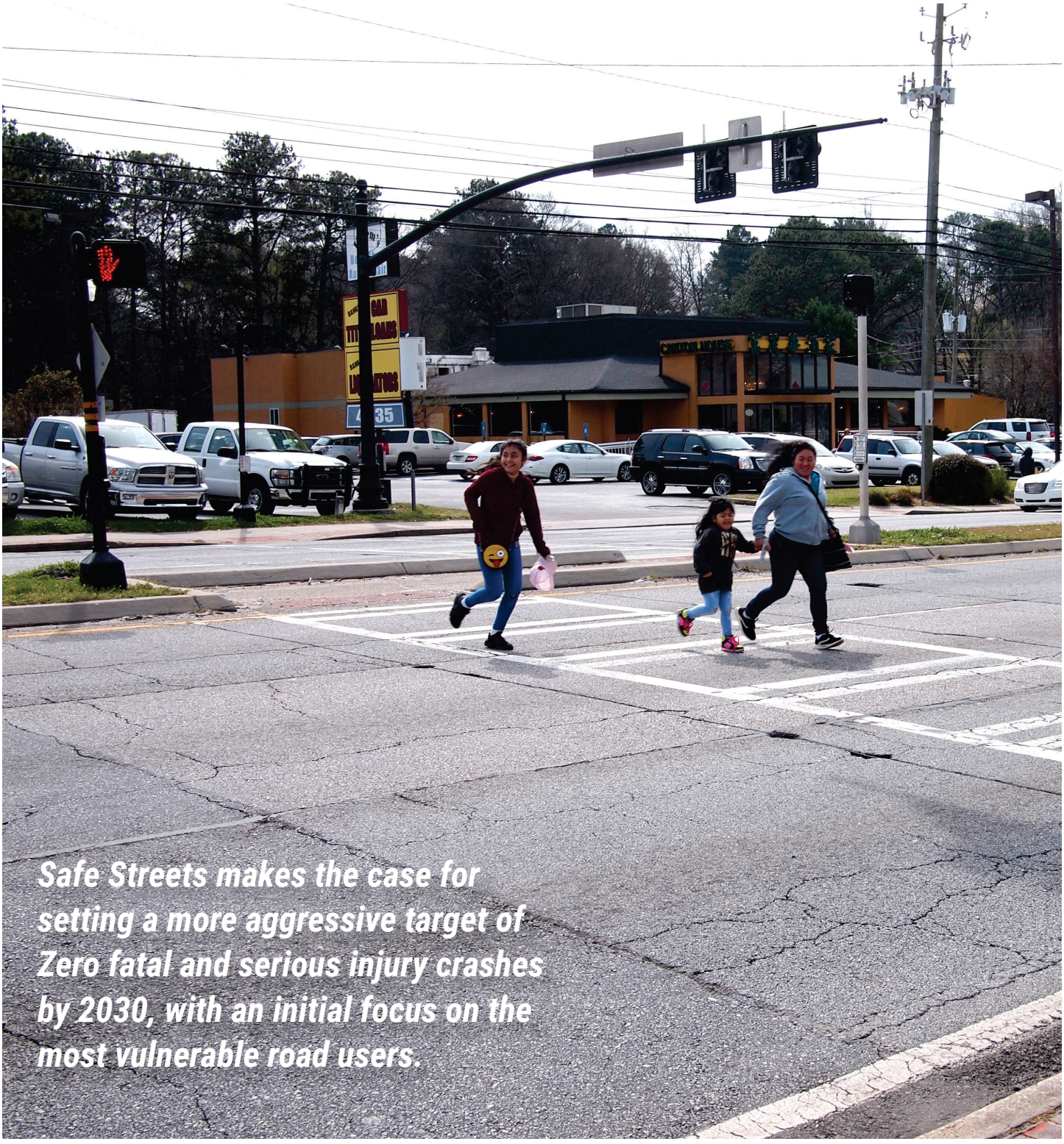
OVERVIEW



Safe Streets makes the case for setting a more aggressive target of Zero fatal and serious injury crashes by 2030, with an initial focus on the most vulnerable road users.

1. Set a Target: Zero Fatalities by 2030

Each year, an average of 90 people walking and biking lose their lives in traffic crashes in the Atlanta region; almost 300 more suffer life-threatening injuries (Figure 1). The numbers have been rising since 2010 and this trend is projected to continue.

This is unacceptable.

Safe Streets for Walking and Bicycling is the first step in a comprehensive program to eliminate fatal and serious traffic crashes in the Atlanta region within a generation. The plan is inspired by the Vision Zero initiative, which states that the only acceptable number of traffic fatalities is ZERO (Table 1).

Establishing a goal of zero is daunting. However it is critical to focusing policy decisions, prioritizing investment, and guiding the everyday decisions of transportation, health, and community development professionals across the region. ARC has an obligation to prevent loss of life and injury and to support walkable, bikeable communities which improve health, equity, and a high quality of life.

Figure 1. Average Annual Pedestrian and Bicyclist Fatalities and Serious Injuries, 2006-2015

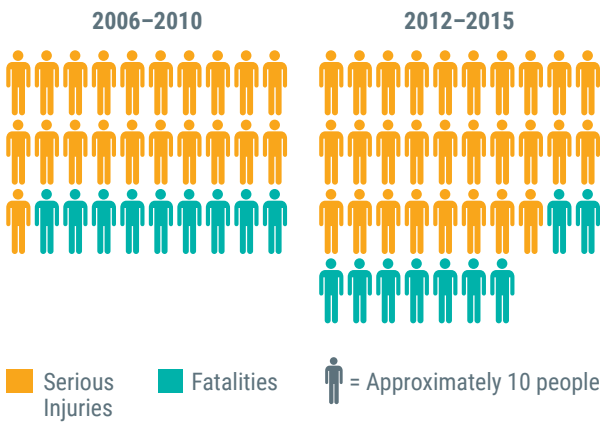


Table 1. Major differences between Vision Zero vs. traditional approach.

TRADITIONAL APPROACH	vs.	VISION ZERO
Traffic deaths are inevitable		Traffic deaths are preventable
Perfect human behavior		Integrate human failing in approach
Prevent collisions		Prevent fatal and severe crashes
Individual responsibility		Systems approach
Saving lives is expensive		Saving lives is not expensive

2. Embrace a Safe System Approach

Vision Zero is an aggressive target, based on a "Safe System" approach to traffic safety, that is fundamentally different from business as usual. (Table 2)

The Safe System approach is a holistic, systems-based strategy that: accounts for all roadway users; anticipates that humans will makes mistakes; and shares responsibility for safety between individual road users, and system designers (i.e. planners and engineers).

What this means in practice is that roadways are designed to prevent crashes from happening at speeds and in situations where the human body cannot physically survive the impact. Where pedestrians are crossing roadways, for example, motor vehicle speeds should be kept below 20-25 mph (see page 50), or controlled, signalized crossings must be provided to separate road users.

Table 2. Major differences between safe system vs. traditional approach

	TRADITIONAL APPROACH	SAFE SYSTEM APPROACH
What is the problem?	Try to prevent all crashes	Prevent crashes from resulting in fatal and serious casualties
What is the appropriate goal?	Reduce the number of fatalities and serious injuries	Zero fatalities and serious injuries
What are the major planning approaches?	• Reactive to incidents • Incremental approach to reduce the problem	• Proactively target and treat risk • Systematic approach to build a safe road system
What causes the problem?	Non-compliant road users	People make mistakes and people are physically fragile/vulnerable in crashes. Varying quality and design of infrastructure and operating speeds provides inconsistent guidance to users about what is safe use behavior.
Who is ultimately responsible?	Individual road users	Shared responsibility by individuals with system designers
How does the system work?	Is composed of isolated interventions	Different elements of a Safe System combine to produce a summary effect greater than the sum of the individual treatments, so that if one part of the system fails other parts provide protection.

Data-driven Solutions

3. Identify Risks, Demand, and Policy Priorities

A data-driven traffic safety action plan starts with an analysis of the problem: what factors make roads more dangerous for people walking and bicycling?

Risk Factors

A detailed crash analysis identified several roadway characteristics that are associated with an increased risk for fatal and serious crashes involving pedestrians and bicyclists.

Speed: Well over half of pedestrian and bike crashes occur on streets with speed limits at or above 35mph

Number of Lanes: Streets with four or more lanes have a significantly higher number of crashes per mile

Lighting: Crashes after dark disproportionately result in severe outcomes, especially for pedestrians where there is no street lighting

Crosswalks: Missing or inadequate crosswalks and sidewalks leave pedestrians vulnerable to being hit.

Roadways with high risk factors are common throughout the Atlanta region, regardless of whether or not serious or fatal crashes have occurred on these roads. Every jurisdiction within ARC has a role to play in eliminating these risky conditions.

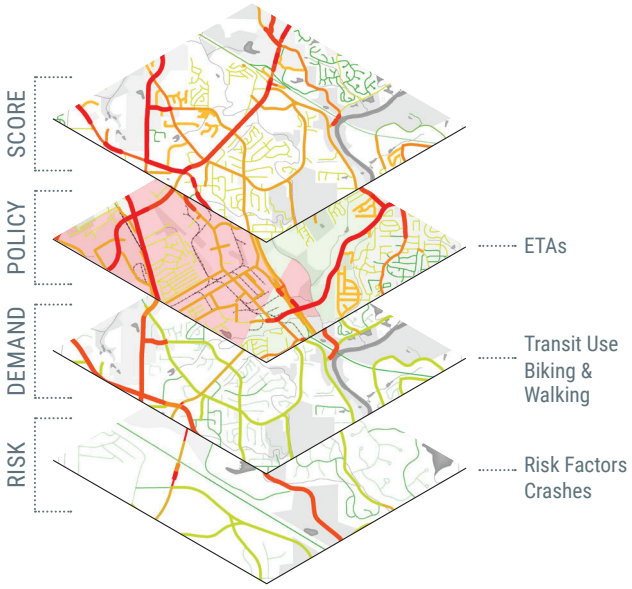
Demand

ARC's regional estimates of pedestrian and bicycle miles traveled, as well as frequency of transit service, were used to show the relative level of walking and bicycling along street segments.

Policy Priorities

Risk factors and demand were also assessed in relation to Equitable Target Areas (ETA)—defined by ARC as communities with a high percentage of people living in poverty or high minority population—as ETA's are a priority focus area for ARC's work.

Figure 2. Measuring Risk Assessment



Data-driven Solutions

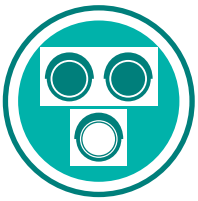
4. Use Evidence-based Countermeasures to Eliminate Risks

There are numerous proven countermeasures available to eliminate danger to people on foot and bike caused by high speed, multi-lane roads that lack crosswalks, sidewalks and protected bike infrastructure.

Safe Streets emphasizes solutions that are well documented by national agencies and organizations to address systemic design issues on roads across the region.

Many of these countermeasures are focused on pedestrian safety. However, slowing traffic down, increasing visibility, and providing better walking conditions also helps bicyclists and people accessing transit on foot.

Medians and Pedestrian Crossing Islands

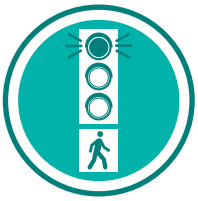


Pedestrian Hybrid Beacon

Road Diet

Sidewalks

Changing Speed Limits



Leading Pedestrian Interval

Rectangular Rapid Flashing Beacons

Crosswalk Visibility Enhancements

Street Lighting

Separated Bike Lanes

Neighborhood Greenway/ Bike Boulevard

Traffic Calming

Strategies for Action

5. Short-term: Focus Regional Funding on Safety

ARC oversees the development of the region's Long-Range Transportation Plan (LRTP) and short-term Transportation Improvement Program (TIP). The agency has direct programming authority for $100 million in federal funds and influence on other transportation funding in the region.

There are three ways in which the agency can use the MPO process to generate more and better projects that use these proven safety countermeasures to eliminate roadway risks.

1. Direct more funding to high-risk corridors and communities.
2. Ensure that all funding supports safer designs by incorporating evidence-based countermeasures.
3. Promote better local project development, design, and implementation.

Safe access to transit, for people of all abilities, is a regional priority supported by ARC's funding process

Strategies for Action

6. Medium-term: Support Better Projects

Safe Streets focuses on the ways in which ARC can most effectively use its role as a regional convener to support local projects that increase safety.

ARC will provide technical assistance to its member jurisdictions and:

1. Help local agencies take advantage of new tools, policies and programs that can systematically eliminate known risks for pedestrians and bicyclists on area roadways.
2. Provide technical assistance to help member jurisdictions develop transportation projects that have a strong safety element.
3. Share case studies showing how local agencies can use outreach and engagement strategies to go beyond the crash data.
4. Provide guidance on the applicability and availability of proven countermeasures to eliminate roadway risks.
5. Provide examples of effective Vision Zero and Complete Streets policies and action plans.
6. Identify funding sources and strategies for safety projects at the Federal, state and local level.

Pedestrian Risk Assessment map showing the relative risk of area roads based on roadway design elements, crash history, demand factors, and policy priorities.

Strategies for Action

7. Long-term: Champion Complete Streets Implementation

Every year, hundreds of miles of roads in the Atlanta region are resurfaced, repaired and/or reconstructed. Each project provides an opportunity to use proven countermeasures to eliminate roadway designs that increase risk for people walking, bicycling, and driving.

Safe Streets recommends ARC champion a Complete Streets approach to planning and building roadways. This means ARC will actively support agencies in the region who design and operate roads for safe use by people on foot and bike as well as those in motor vehicles.

To support this long-term strategy, ARC will:

1. Champion its own Complete Streets policies and approach.
2. Promote and provide a comprehensive set of examples and recommended approaches to systematically eliminate risk factors from area roads that are contributing to serious and fatal traffic crashes.
3. Actively support safer street designs and complete streets policies of member jurisdictions.
4. Offer technical training for ARC staff, local agency engineers and planners, and consultants on Complete Streets designs, policies and programs.
5. Support coordinated land use and transportation planning via the LCI program, funding and technical assistance.

Table 3. A new approach to roadway design.

	TRADITIONAL APPROACH	COMPLETE STREETS APPROACH
Roads are:	built for the free-flowing, high-speed movement of cars and trucks, with minimal interruptions	designed with safe access for people walking, biking and driving, including people with disabilities
Streets are:	designed for the perspective of people traveling at 55 mph (or more)	sensitive to the context of adjacent land uses, street classification, and multi-modal systems
The network:	rewards long distance, single-occupant travel	rewards short trips and transit use
The system:	funnels vehicles onto a limited number of high-capacity roadways with minimal access and no realistic alternatives	supports a more connected network that offers more choice
The result:	divides and overwhelms communities in favor of mobility	responds to and is respectful of community engagement

Evaluation and Research

8. Support Improved Data Collection, Crash Analysis, and Evaluation

Safe Streets for Walking and Bicycling is based on a data-driven, safe system approach to traffic safety. However, there are significant limitations in the available data and ARC recommends future research and analysis that will assist regional efforts to eliminate fatal and serious traffic crashes. These include:

1. More definitive and complete information on the cause or contributing causes of crashes.
2. The inclusion of information on non-auto crashes, near misses, and the perception of safety.
3. Further research into the traffic safety impact of the development patterns and built environment fostered by the Livable Centers Initiative.
4. Developing a better understanding of the intersectionality of race, poverty, housing, access to jobs, health, and traffic safety.

Evaluation

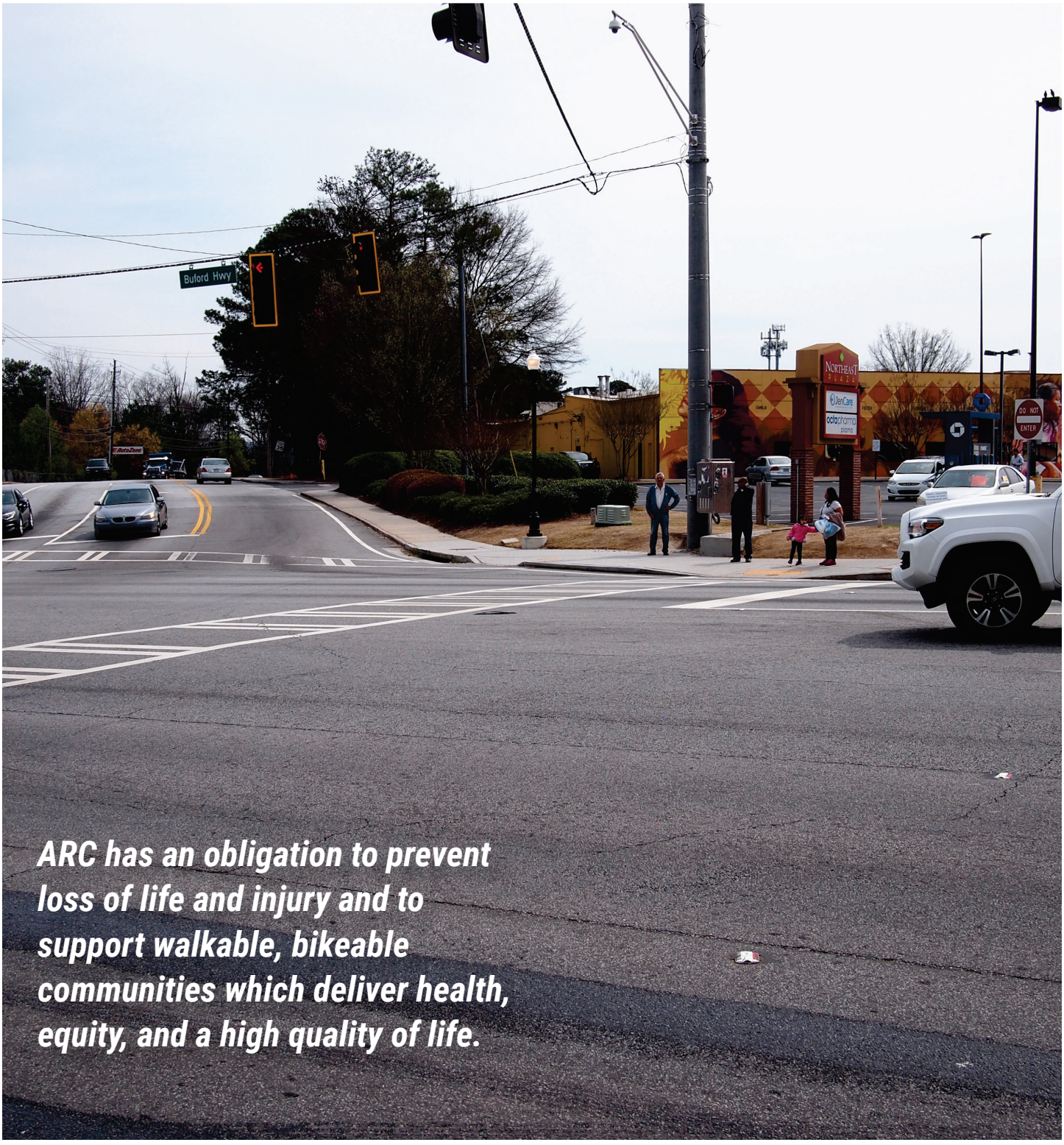
Tracking non-motorized fatalities and serious injuries will help determine whether the region is moving towards zero traffic fatalities and will support the future establishment of more aggressive targets.

Need to make a slight change so the sentence says "ARC will formally track regional performance measures via the Regional Transportation Plan using metrics including:

1. Number of non-motorized fatalities and non-motorized serious injuries.
2. Anticipated effect of the Transportation Improvement Program (TIP) toward achieving adopted targets.

Tech Parkway safely connects Georgia Tech's downtown campuses for people on foot and bicycle.

TARGET AND APPROACH



ARC has an obligation to prevent loss of life and injury and to support walkable, bikeable communities which deliver health, equity, and a high quality of life.

1. Set a Target: Zero Fatalities by 2030

Current Trends

Between 2006 and 2015, the total number of crashes in the Atlanta region involving pedestrians and bicyclists steadily increased from an annual combined average of 1,685 to 2,581, an increase of 53% (Figure 3). Most of this increase was due to a dramatic rise in pedestrian crashes (from 1,408 in 2006 up to 2,510 in 2015). The number of people killed or seriously injured also increased by 26% from 2012-2105 compared to the earlier years of 2006-2010.

This increase in pedestrian and bicyclist crashes, fatalities and serious injuries can only be partly explained by population growth—there was an increase of 9.5% in the number of pedestrian and bicyclist fatalities and serious injuries per 100,000 population (Figure 4). The only bright spot in current trends is that the percentage of pedestrian crashes resulting in a fatality or serious injury has declined from 20% to 15% (Figure 5).

Figure 3. Total Pedestrian and Bike Crashes in ARC Region, 2006-2015*

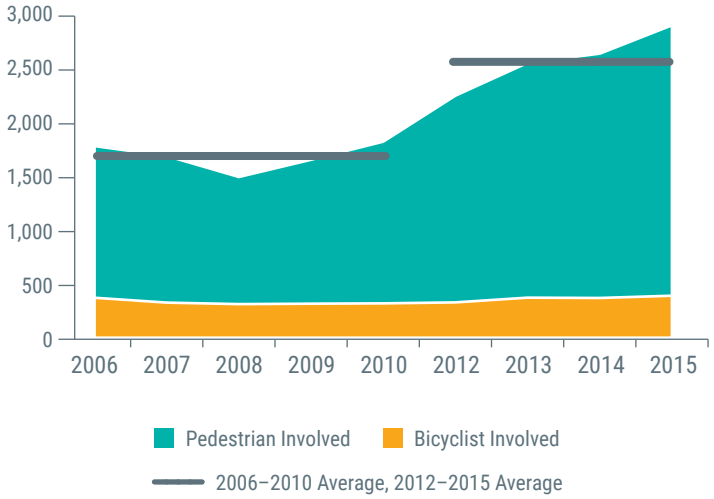


Figure 4. Pedestrian and Bicyclist Fatalities and Serious Injuries per 100,000 Population, 2006-2015*

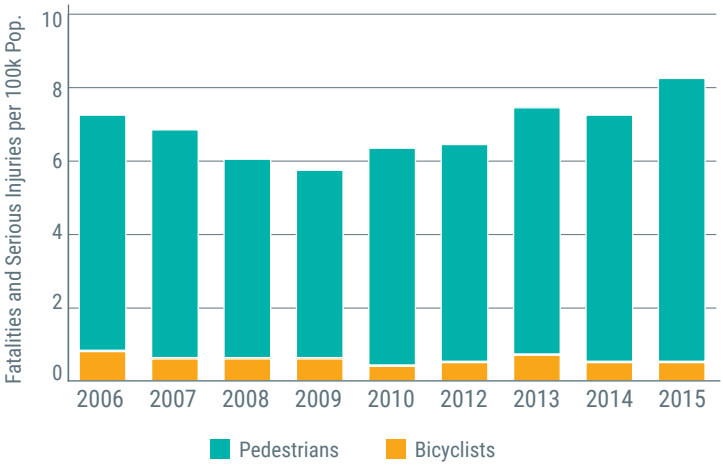
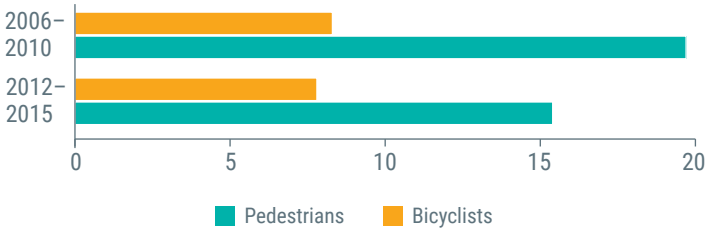


Figure 5. Pedestrian and Bicyclist Fatalities and Serious Injuries as a Percentage of Total Crashes, 2006-2015*



*2011 data omitted due to inconsistencies in reporting.

Establishing Performance Measures

In 2016, the Federal Highway Administration established a requirement for State Departments of Transportation and Metropolitan Planning Organizations (of which ARC is one) to establish targets for overall traffic safety and for the number of nonmotorized fatalities and serious injuries. Since roughly half of Georgia's pedestrian and bicycle fatalities occur in the Atlanta region, the State and MPO targets are inextricably linked—and in February 2018 the ARC board approved adoption of the statewide targets for nonmotorized fatalities and serious injuries in the region.

Unfortunately, because of the forecasted significant increase in nonmotorized fatalities and serious injuries in 2017 and 2018—from 1,002 statewide in 2016 to 1,231 in 2018—the "target" of 1,027 for 2018 represents an actual increase in the number of fatalities and serious injuries statewide. In a resolution adopting these targets ARC, "recognizes the challenges of setting statewide targets and believes it can best assist GDOT in reversing recent upward trends in overall fatalities and injuries by identifying the causes and locations of the most critical safety issues in the Atlanta Region and focusing ARC's efforts and resources on those issues." ARC is also committed to the "long term goal of slowing and eventually reversing recent trends."

GEORGIA'S STRATEGIC HIGHWAY SAFETY PLAN

Every State Department of Transportation is required to develop a Strategic Highway Safety Plan (SHSP) to focus and coordinate traffic safety initiatives across different statewide agencies. The Georgia Department of Transportation adopted its current SHSP in 2015 and is scheduled to update the plan in 2018. The document, Towards Zero Deaths, consolidates the highway safety plans of the DOT, the Governor's Office of Highway Safety, the Department of Public Safety and the 15 Metropolitan Planning Organizations that encompass 65% of the state's population.

Since 2016, the SHSP is also expected to contain the Federally-mandated Safety Performance Measures developed by the GDOT in consultation with its partners. For 2018, these statewide performance measures and targets are:

- Number of fatalities: 1,662 annually
- Rate of fatalities: 1.33 per 100 million vehicles miles traveled (VMT)
- Number of serious injuries: 19,643 annually
- Rate of serious injuries: 16.32 per 100 million VMT
- Number of non-motorized fatalities and non-motorized serious injuries: 1,027 annually

ARC currently programs projects to help ensure statewide targets are met. As the Atlanta region accounts for almost half of all traffic fatalities in the state, the goal of Safe Streets is for the region to exceed these targets and inspire a more aggressive timeline to the elimination of fatalities on Georgia's roads.

Figure 6. Projected Non-motorized Fatalities and Serious Injuries

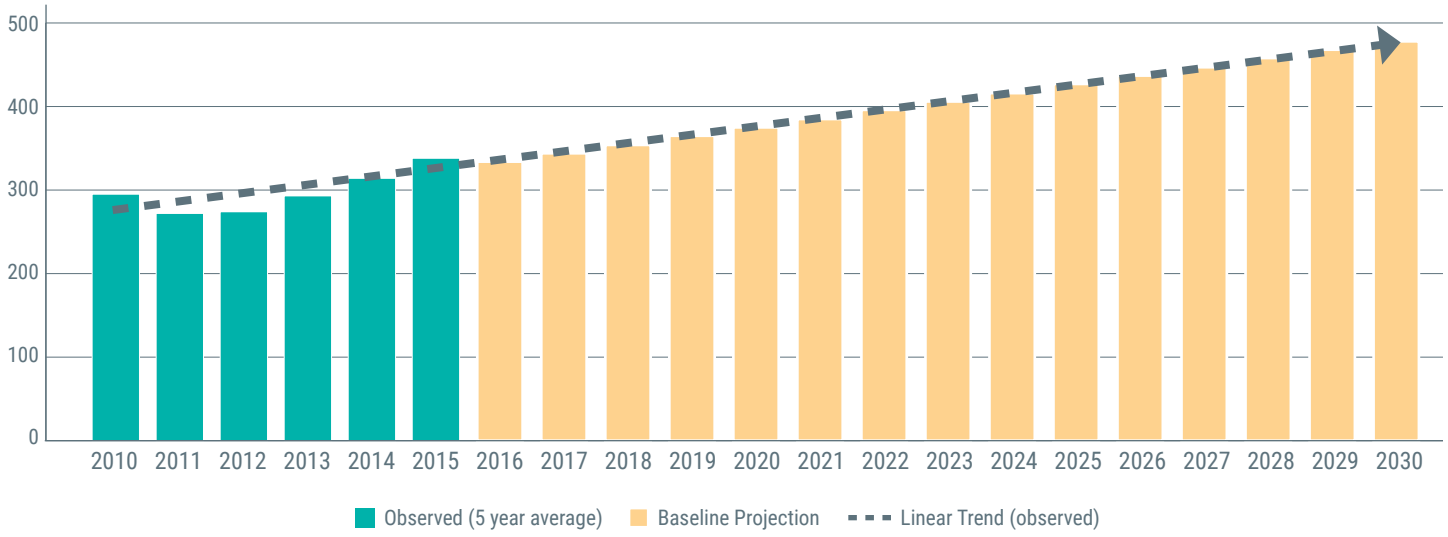
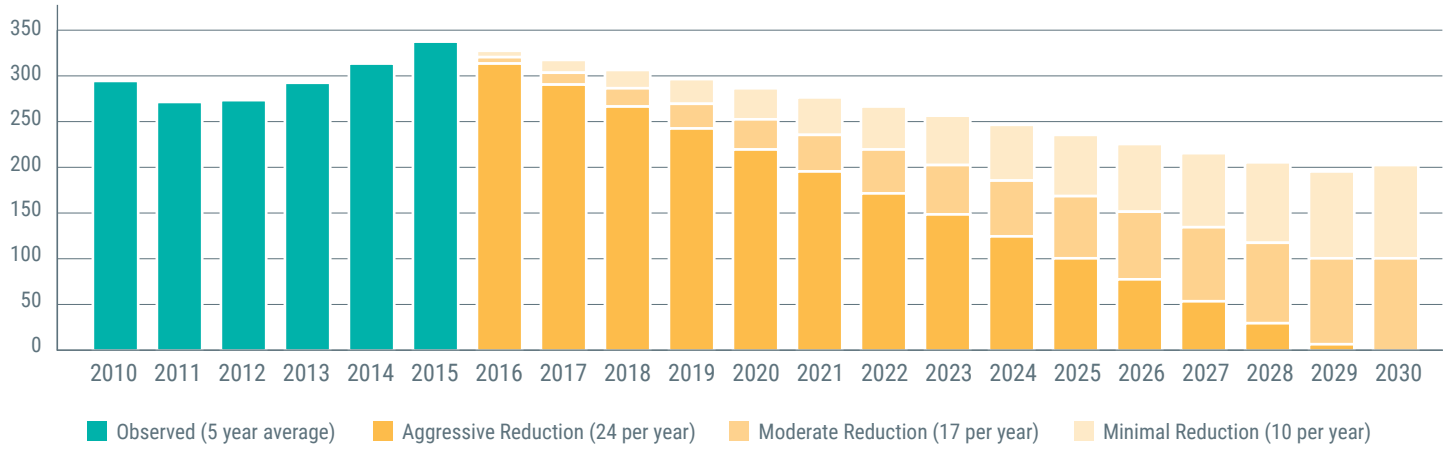


Figure 7. Non-motorized Fatalities and Serious Injuries Target Options



The statewide and regional targets were based on five-year rolling averages of pedestrian and bicyclist fatalities and serious injuries. The observed trend for the region since 2011 is alarmingly upward and if realized would result in 150 additional fatalities and serious injuries in 2030 over 2016 (Figure 6). This projection strengthens the case for taking bold action to reduce pedestrian and bicyclist crashes.

The Path to Zero

Safe Streets lays out three scenarios for reducing the actual numbers of fatal and serious injury crashes to zero (Figure 7). Each of the scenarios is a significant departure from the baseline projections (which may mean that progress is not immediate) and will require a very different approach to tackling traffic safety from what has gone before.

Taking the initial steps to adopting a target of Zero traffic fatalities and serious injuries within a generation is a bold move, but not without precedent. Across the United States, communities are adopting Vision Zero goals, policies, and action plans based on the simple belief that no loss of life is acceptable in our transportation system—we don't accept anything other than zero in the aviation, railroad and shipping sectors, or on building sites and manufacturing plants.

Achieving the goals of the Vision Zero initiative is predicated on the commitment to creating a "Safe System" where fatal and serious injury crashes are methodically engineered out of the transportation system and not accepted as inevitable.

2. Embrace a Safe System Approach

Traffic safety is a constant concern and a primary focus of every transportation and public works department in the region. Significant investments of time, money and creative work go into public information and education campaigns, as well as enforcement and engineering projects to reduce the number of people killed and injured on our roads. Despite that, the number of crashes and victims remains stubbornly high. So, what is different about Vision Zero and a Safe System approach?

The Vision Zero Network, a national network of cities committed to eliminating traffic fatalities by a set date, identifies six key elements that sets Vision Zero apart from traditional road safety efforts.

i. **Traffic deaths are preventable.** Zero is upheld as the only acceptable number of traffic fatalities and the word "accident" is eliminated from the traffic safety vocabulary. Serious and fatal crashes are entirely preventable; they are not accidents and they are not inevitable.

ii. **System failure is the problem.** In the Vision Zero framework, individuals are not the problem. It is flaws in the system—from planning through design, construction and maintenance—that allow roads to have no safe crossings or which set up conflicts between high-speed motor vehicles and pedestrians and bicyclists. Ticketing pedestrians for jaywalking where there are no crosswalks or sidewalks is not going to solve the issue or change people's behavior.

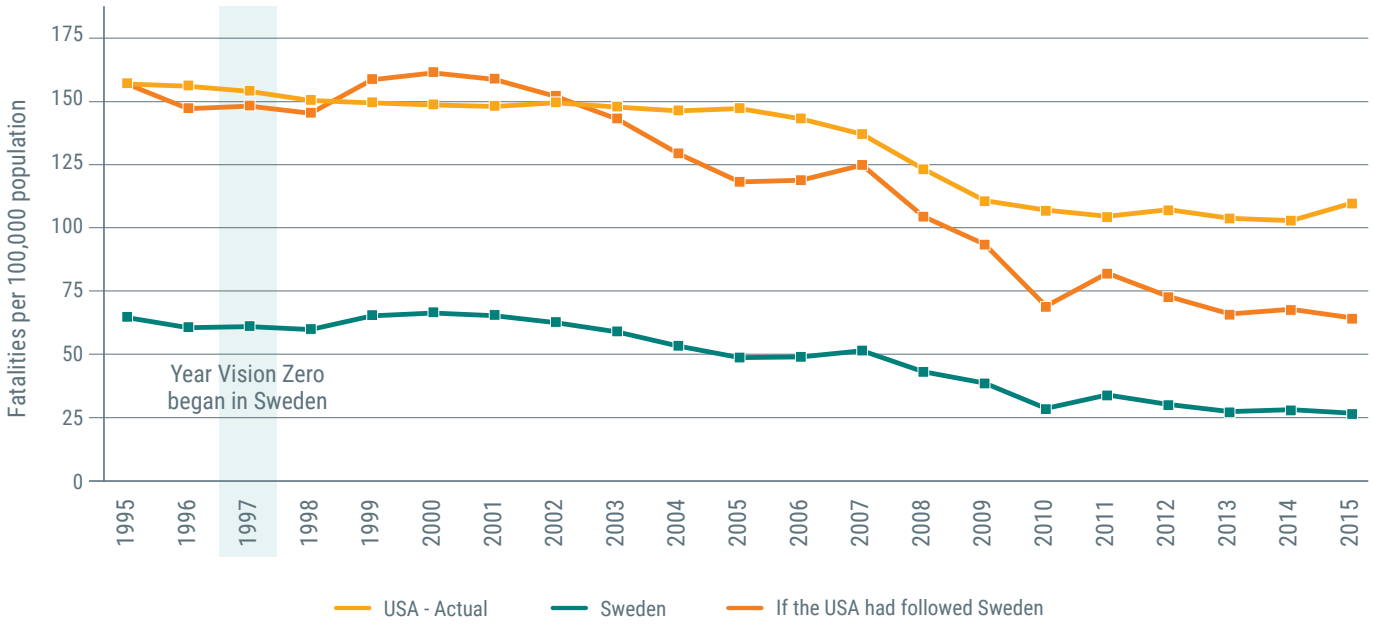
iii. **Road safety is a public health issue.** While traditional approaches to transportation safety have prioritized reducing or preventing collisions, Vision Zero focuses on preventing injuries and fatalities. Engineers are challenged to eliminate the circumstances in which a human body may be exposed to crash forces it cannot survive.

iv. **The Safe System approach is holistic.** Roadway design is a part of the issue, but so are land use and development decisions, school siting choices, housing policies, and a host of factors that affect our transportation options and choices. The tension between speed and safety in the Atlanta region is as much to do with land use as it is road design.

v. **Data drives decisions.** Vision Zero demands a relentless focus on eliminating fatalities and serious injuries first. Preventing red light running and speeding through automated enforcement, for example, may increase rear-end collisions…but reduces fatal and serious injury crashes.

vi. **Social equity is a key goal and component of Vision Zero.** Traffic crashes in the ARC region disproportionately affect vulnerable populations, particularly among those who do not have access to a motor vehicle and who are more likely to be dependent on walking, biking and transit. Communities of concern must be meaningfully engaged in addressing the safety, personal security, accessibility, and larger cultural and societal issues around road safety and community development.

Figure 8. Traffic Safety in the United States and Sweden, 1995-2015



Shifting to Systemic Safety Analysis

Effective data analysis must account for the unique characteristics of different crash types. Pedestrian and bicycle crashes are often widely distributed across a road network and occur with lower frequency compared to more common but less severe crashes. Traditional road safety programs use crash mapping to identify hotspots where a high concentration of crashes have occurred previously. A safe systems approach requires looking broadly and proactively at the underlying factors that contribute to high-risk roadways.

Hotspots often represent high concentrations but only a small portion of all crashes. Georgia DOT defines pedestrian safety hotspots as locations having 10 or more crashes per half-mile of roadway. In an analysis of crash locations in the ARC region, the hotspot approach was found to address only 13% of pedestrian and 8% of bicycle crashes resulting in death or serious injury (Table 4)—the clear majority of pedestrian and bicycle crashes happen in a very dispersed pattern throughout the region. Hotspot analysis of all crashes (not just by mode) also bias towards high-frequency crashes, the majority of which are property-only crashes and tend to be less severe, and countermeasures that may reduce crashes but do not address the safety of other road users.

Systemic analysis is a complementary analysis technique increasingly used to assess crash types that are either widely distributed or low-frequency. The Federal Highway Administration (FHWA) states: "A systemic approach to safety involves widely implemented improvements based on high-risk roadway features correlated with specific severe crash types. The approach helps agencies broaden their traffic safety efforts at little extra cost."[1]

Safe Streets uses systemic analysis techniques to:

- Assess crash and roadway data in combination to identify high-risk roadway features
- Focus on the risks for severe crashes that do not have high frequencies or concentrations
- Account for widely dispersed crashes where location fluctuates over time
- Support proven countermeasures in wider but targeted, data-driven locations

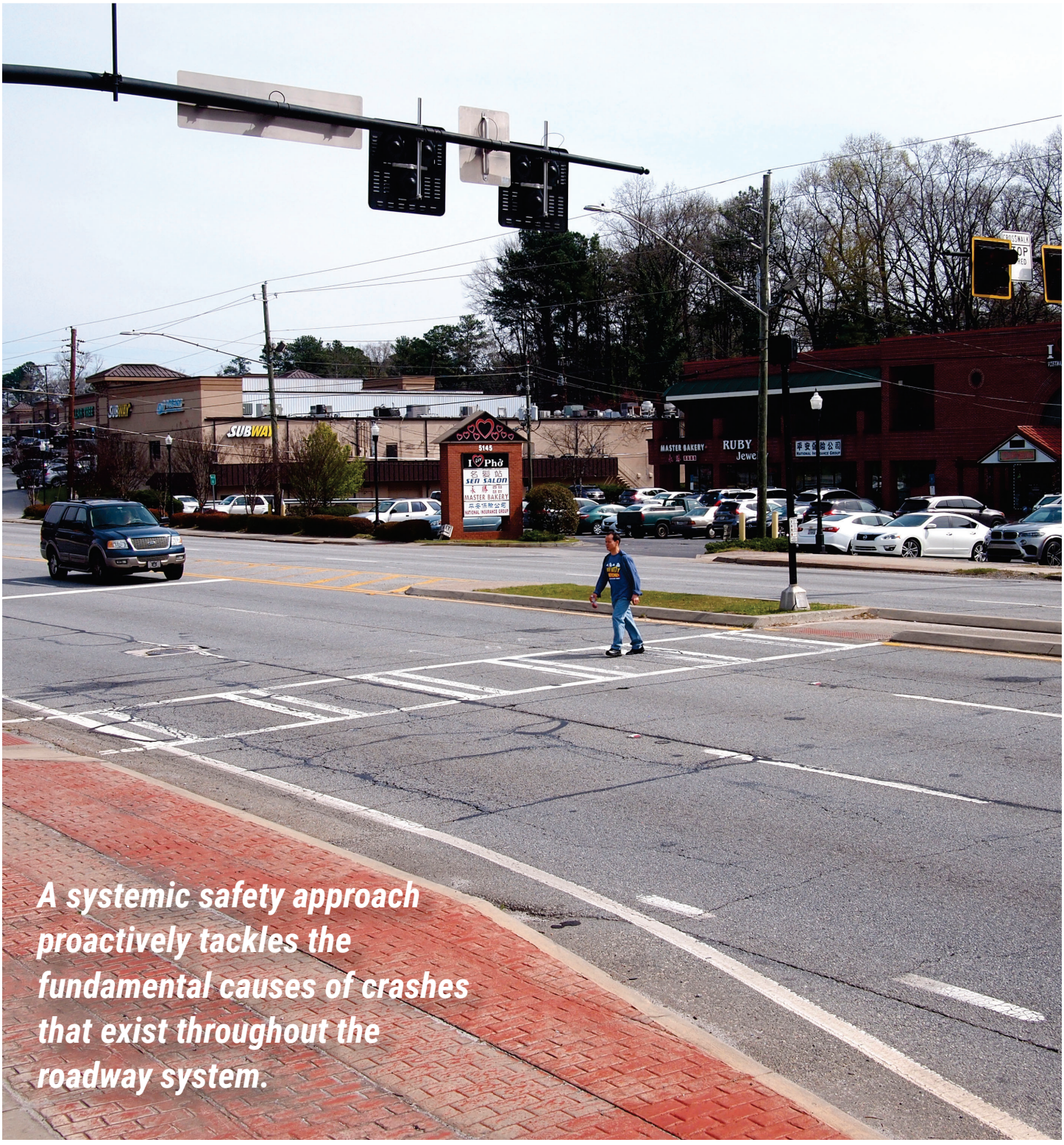
Focusing on hotspots misses most serious and fatal crashes and dramatically limits the probability of ever getting to zero serious injuries and fatalities. A systemic safety approach proactively tackles the fundamental causes of crashes that exist throughout the roadway system and prevents dangerous roadway designs from being replicated.

Table 4. Crashes inside and outside hotspots

	PEDESTRIAN CRASHES			
	Hotspot threshold: 10 crashes per 1/2 mile		Hotspot threshold: 2 crashes per 1/2 mile	
	Crashes	Percentage	Crashes	Percentage
Total crashes within hotspots	1,559	21%	5,329	70%
Total crashes outside hotspots	6,008	79%	2,238	30%
Total crashes	**7,567**	**100%**	**7,567**	**100%**
KSI crashes within hotspots	160	13%	787	64%
KSI crashes outside hotspots	1,076	87%	449	36%
Total KSI crashes	**1,236**	**100%**	**1,236**	**100%**

	BICYCLE CRASHES			
	Hotspot threshold: 10 crashes per 1/2 mile		Hotspot threshold: 2 crashes per 1/2 mile	
	Crashes	Percentage	Crashes	Percentage
Total crashes within hotspots	193	15%	678	51%
Total crashes outside hotspots	1,129	85%	644	49%
Total crashes	**1,322**	**100%**	**1,322**	**100%**
KSI crashes within hotspots	9	8%	46	41%
KSI crashes outside hotspots	103	92%	66	59%
Total KSI crashes	**112**	**100%**	**112**	**100%**

DATA-DRIVEN SOLUTIONS



A systemic safety approach proactively tackles the fundamental causes of crashes that exist throughout the roadway system.

3. Identify Risks, Demand, and Policy Priorities

Understanding the basic patterns, contributing factors and crash types that occur in the 20-county metro-Atlanta area is essential to identifying specific risk factors and the appropriate countermeasures to reduce or eliminate them from the system.

The four most recent available years of crash reports (2012-2015) were analyzed in detail to perform a risk assessment. The term "KSI Crash" is used in this analysis to refer to a crash in which a person was killed or seriously injured.

Where contributing factors were listed, "failure to yield" and "inattention" were the most common for motor vehicles, pedestrians, and bicyclists—bicyclists also had "riding on the wrong side of the road" as a common factor.

Roadway and Environmental Risk Factors

Several roadway and environmental risk factors were studied to determine how they might influence pedestrian and bicyclist crash risk. The characteristics shown to be most strongly associated with crash frequency and severity were lighting conditions, the functional class of the roadway, the number of lanes and the speed limit on the road.

Figure 9. Percentage of Total and KSI Crashes by LIGHTING CONDITIONS

Crashes in dark conditions (i.e. at night) disproportionately result in severe outcomes, particularly for pedestrians. The effect is most profound in dark, unlit conditions (compared to dark, lit conditions).

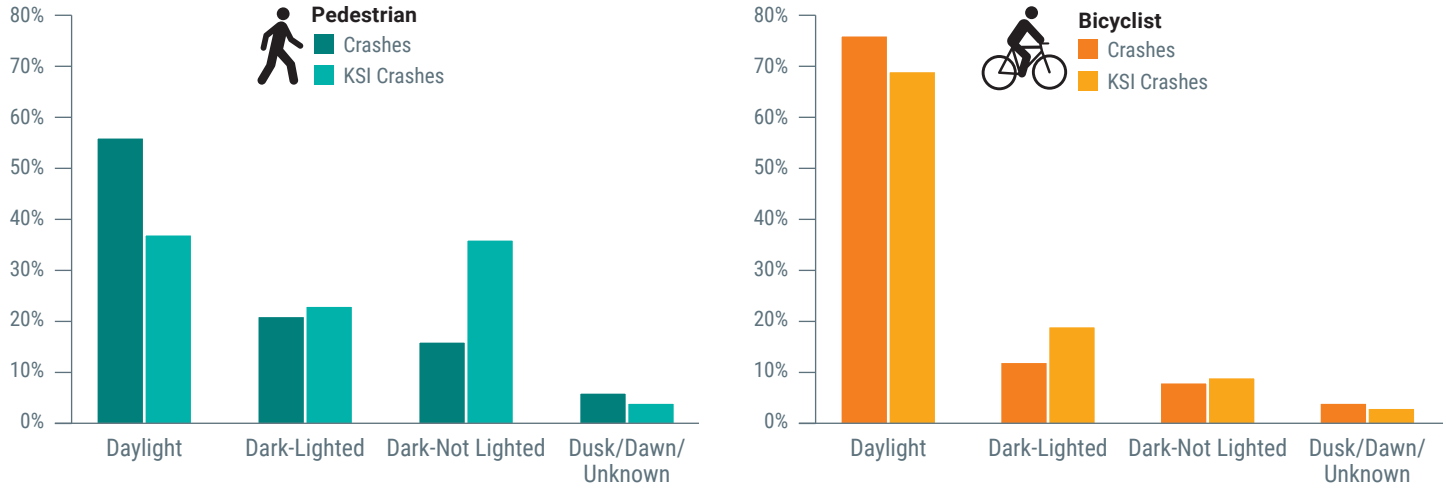


Figure 10. Distribution of Pedestrian and Bicycle Crashes by POSTED SPEED LIMIT

Considerably more than half of pedestrian and bicyclists crashes occur on streets with speed limits at or above 35 miles per hour. Crashes are more severe on higher speed streets.

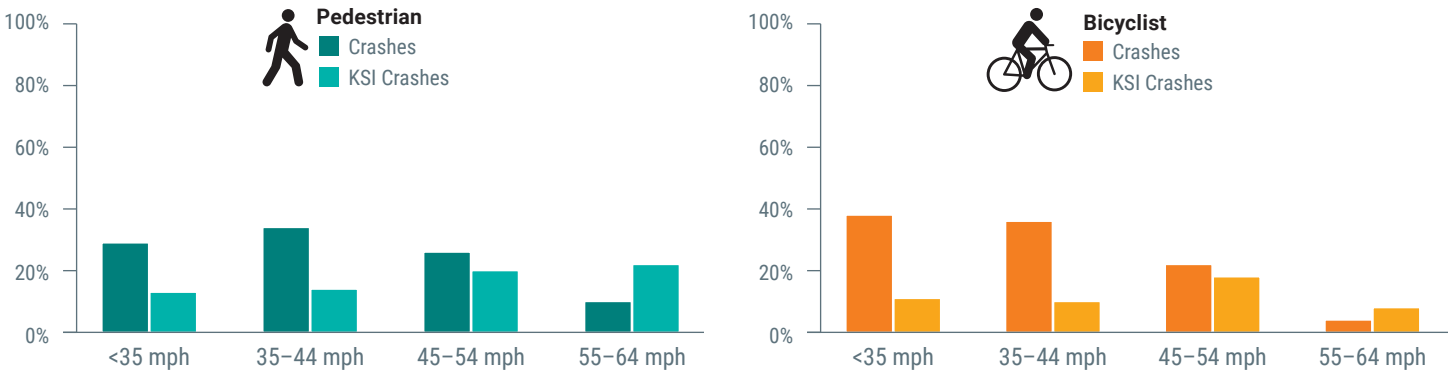


Figure 11. Annual Non-KSI and KSI Pedestrian Crashes per 100 Miles by ROADWAY FUNCTIONAL CLASS

Arterial and collector streets have the highest number of pedestrian and bicyclist crashes per mile, although local streets also account for a high number of crash locations.

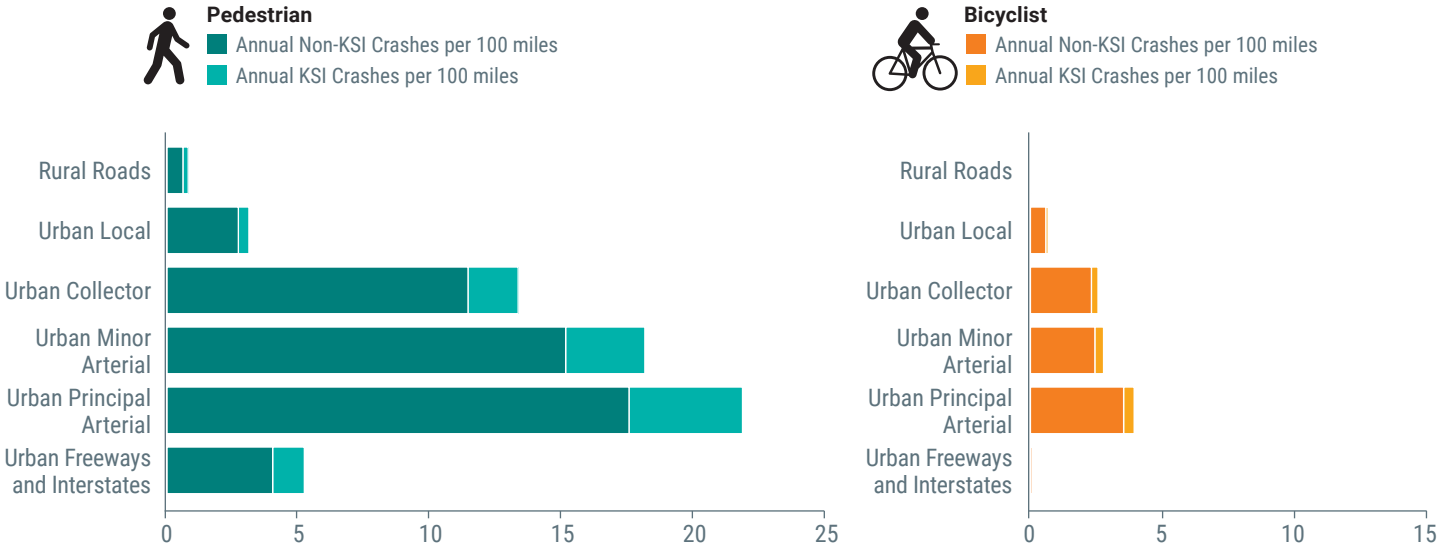
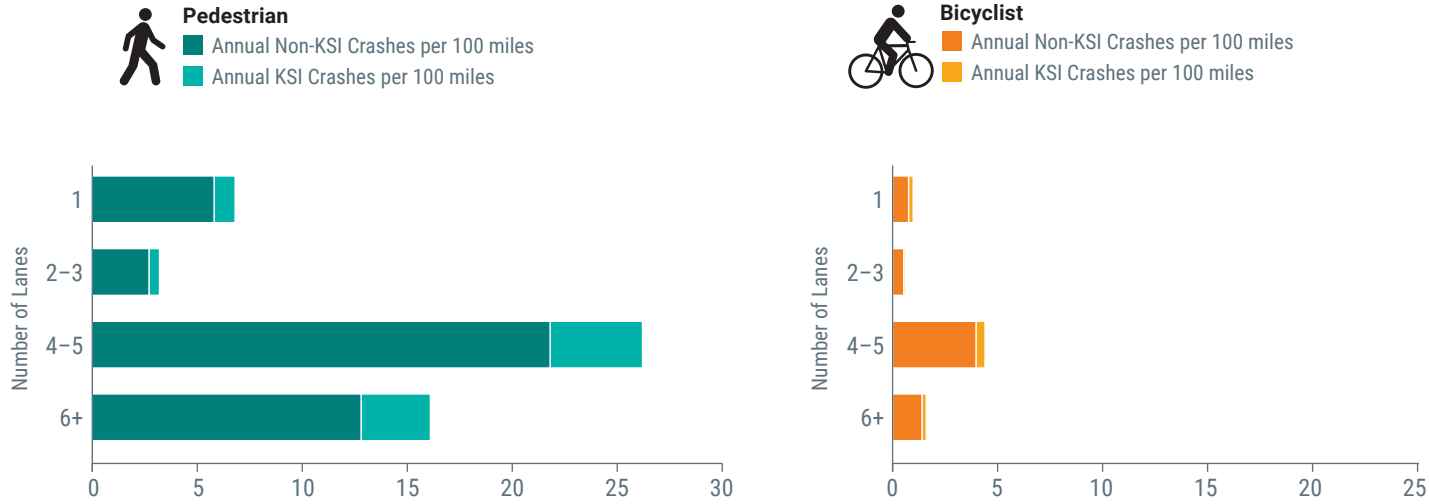


Figure 12. Annual Non-KSI and KSI Crashes per 100 Miles by NUMBER OF LANES

Streets with four or more lanes have significantly higher numbers of crashes per mile compared to streets with fewer than four lanes.



Reviewing Crash Scenarios

Understanding the types of crashes that occur at a given location or along a corridor is also essential to deploying effective countermeasures. Crash reports provide information on the vehicle, pedestrian, and bicycle maneuvers leading to the crash (Tables 5 and 6). Although this data does not provide as nuanced of an understanding as a review of crash narratives, reviewing the data at this level is a cost-effective and efficient way to begin to identify common crash patterns.

- A roughly equal number of pedestrians are hit while crossing in a crosswalk versus those hit while crossing outside of a crosswalk.
- Vehicles turning into pedestrians in the crosswalk are among the most common pedestrian crash scenarios.
- Right-turning vehicles contribute to more bicycle crashes than vehicles turning left, but crashes in which the driver was heading straight are the most likely overall.
- Crash severity for pedestrians and bicyclists is influenced by vehicle speed, with the worst crashes occurring when vehicles are operating at full speed.
- Crashes away from crosswalks and where pedestrians are walking along roads (presumably without sidewalks) result in more severe crashes than other scenarios.

The analysis of GDOT crash data highlights the continuing need to improve the quality and reliability of information that is available to local agencies. The extensive amount of missing information on contributing factors to crashes, for example, significantly hampers the ability to understand what is really happening when crashes occur.

The Georgia Department of Transportation (GDOT) crash reports include valuable information on behavioral contributing factors for each "unit" (bicycle, car, truck etc.) and for each person involved in a crash. Unfortunately, in more than 80% of cases no contributing factors were listed for pedestrians, or the report simply said "other" factors were involved without specifying anything. This was also true for 59% of vehicles in pedestrian crashes, half of all bicycles, and two-thirds of vehicles in bicycle crashes.

This highlights the continuing need to improve the quality and reliability of information that is available to local agencies. The extensive amount of missing information on contributing factors to crashes, for example, significantly hampers the ability to understand what is really happening when crashes occur.

Table 5. Number and Percentage of PEDESTRIAN CRASHES by Top Vehicle and Pedestrian Maneuvers

PEDESTRIAN MANEUVER	VEHICLE MANEUVER		
	Straight	Turning Left	Turning Right
Crossing at Crosswalk	419	531	399
Crossing, Not At Crosswalk	1,094	186	98
Darting into Traffic	659	29	18
Off Roadway	269	54	29
Walking with Traffic	308	12	5

Table 6. Number of BICYCLE CRASHES by Top Vehicle and Bicycle Maneuvers

BICYCLE MANEUVER	VEHICLE MANEUVER			
	Stopped	Straight	Turning Left	Turning Right
Straight	49	443	184	263
Turning Left	4	42	12	4
Turning Right	1	15	5	2

Identifying High Risk Corridors

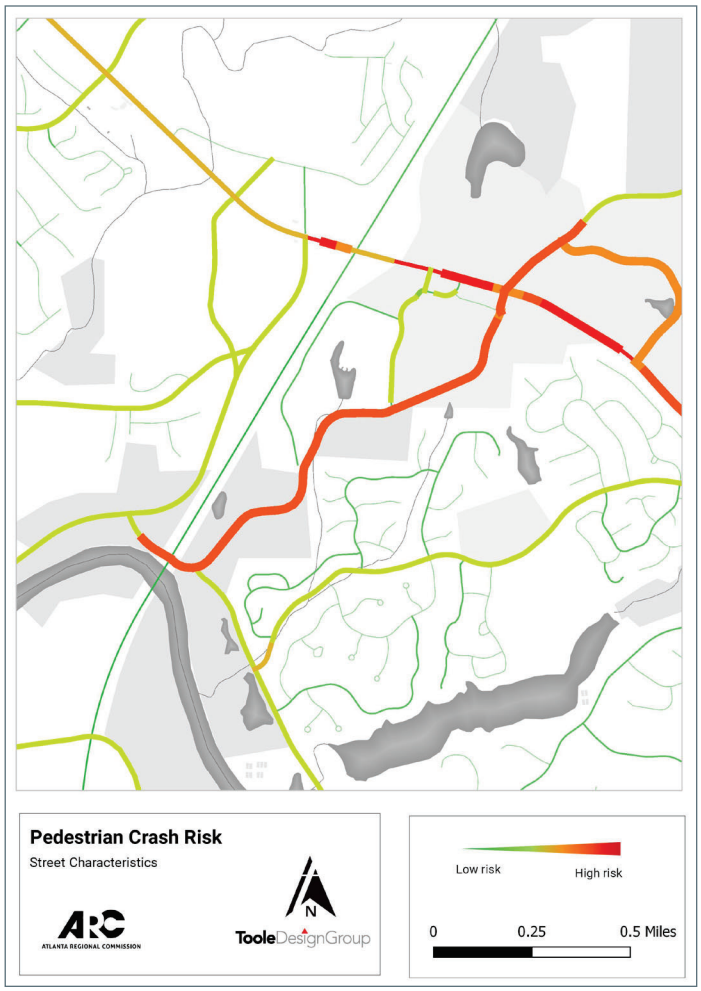
The ***Safe Streets*** analysis confirms that a number of roadway design elements and street characteristics are associated with higher crash rates and/or more serious outcomes. Separate pedestrian and bicycle crash risk scores were calculated for each roadway segment in the region. These crash risk scores were weighted by severity (fatal and serious injury crashes were weighted three times other crashes) and include a weighted crash rate per 10 miles of roadway (Table 7). The resulting crash risk scores were then transferred onto a road map to show the presence (or absence) of risk factors for every road in the region. Significantly, some high-risk segments of roadway may not have a documented history of crashes, but the presence of risk factors suggests it may just be a matter of time before a crash occurs.

Table 7. Pedestrian and Bicycle CRASH RISK SCORES for Number of Lanes

PEDESTRIANS			
Number of Lanes	Weighted Crashes	Weighted Crash Rate per 10 miles	Crash Risk Score
1	227	4.9	0
2	7,856	2.5	0
3	720	23.3	3
4	4,976	22.8	3
5	603	58.3	5
6+	1,540	17.1	3

BICYCLES			
Number of Lanes	Weighted Crashes	Weighted Crash Rate per 10 miles	Crash Risk Score
1	51	1.1	0
2	2,007	0.7	0
3	119	3.8	3
4	902	4.1	3
5	85	8.2	5
6+	145	1.6	2

Pedestrian Crash Risk Map



Looking Beyond the Numbers

The Safe Streets plan is data-driven and goes beyond the traditional approach of identifying crash hotspots to singling out those elements of roadway design that cause risk, wherever they occur. However, even this approach lacks the insight of people on the ground with a personal experience of what happens on the street every day. As part of the planning process, three representative corridors in the region were visited and studied in more detail. These corridors effectively illustrate the critical lessons learned from the data analysis and provide the opportunity to look beyond the numbers into perceptions of safety, to observe actual behavior in the roadway environment, and to gather qualitative feedback on ways in which the roadway environment affects behavior. This was also an opportunity to learn about unreported crashes and near misses.

Corridor #1: Crash hotspots do not tell the whole safety story.

This suburban arterial serves as a regional thoroughfare while also providing access to services, schools, and a community college. The corridor is served by bus routes with signed bus stops and occasional bus shelters. Retail (including restaurants and convenience stores) along the corridor serves adjacent neighborhoods. There are infrequent and poorly lit signalized crosswalks at major intersections; there are long sections of high-speed roadway with no controlled crossings and multiple lanes to cross without a median.

A traditional crash analysis would identify the southern section of this corridor as the "hotspot," due to tight clustering of several crashes, and recommend localized countermeasures. The safe system approach acknowledges that high risk factors exist along the entire corridor and most fatal and serious injury crashes do not happen in a single hotspot. Given the adjacent land uses and demand factors, fatal and serious injury crashes are likely to occur anywhere along this corridor unless countermeasures are applied broadly.

Further north, there are four travel lanes and a center turn lane, speeds remain high, there is inadequate lighting and infrequent (i.e. no) crosswalks despite the presence of transit stops.

Occasional bicycle use is predominantly wrong way riding on the sidewalk, two of the highest risk factors for bicycle/motor vehicle crashes nationwide

The south end of corridor #1 has multiple risk factors (45 mph speed limit, 6+ travel lanes, inadequate street lighting, moderate demand).

Walking & Bicycling Demand and Exposure

Completing the high-risk corridor assessment has to account for a measure of exposure. A high number of pedestrian crashes in a particular location might be a concern per se, but might also be partially explained by a high level of pedestrian activity and high transit use, both of which ARC seeks to promote as important elements of the region's transportation vision.

ARC's travel demand model estimates pedestrian and bicycle miles traveled (PMT and BMT) for residents of each traffic analysis zone in the region. Although street-level exposure estimates (i.e., multimodal traffic volumes) are not available, these area-level estimates provide an overall indication of the level of pedestrian and bicycle activity in a given area.

To work with this data, PMT and BMT estimates were first normalized by geographic area resulting in pedestrian and bicycle "activity density" measures (pedestrian and bicycle activity per unit area), which were organized into categories ranging from 1 (low activity level) to 5 (high activity level). Street segments were then analyzed to determine whether crashes occur more or less frequently with respect to the density of pedestrian and bicycle travel in the area around the segment. Weighted crash rates were found to rise with increasing activity levels, which matches expectations, up to the point when high volumes of walking and biking increase awareness and change the behavior of drivers. Pedestrian and bicycle priority scores were assigned as shown in Table 8.

Table 8. Pedestrian and Bicycle Priority Scores for PEDESTRIAN AND BICYCLE ACTIVITY Variable

PEDESTRIANS			
Pedestrian and Bicycle Activity	Weighted Crashes	Weighted Crash Rate per 10 miles	Priority Score
1	794	1.1	0
2	1,602	2.3	1
3	3,025	4.3	2
4	7,029	10.1	4
5	3,347	27.9	5

BICYCLES			
Pedestrian and Bicycle Activity	Weighted Crashes	Weighted Crash Rate per 10 miles	Priority Score
1	171	0.2	0
2	430	0.6	1
3	669	1.0	2
4	1,343	1.9	4
5	691	5.8	5

Transit Demand

Transit frequency is also included in the high-risk corridor identification methodology. Transit service has a few implications for pedestrian and bicycle safety. For example, people walk—and to a lesser extent bike—to transit stops and are therefore exposed to traffic when accessing transit. While the area-level pedestrian and bicycle activity data discussed above provides an indication of the overall level of expected pedestrian and bicycle use in an area, transit service provides a more nuanced indication of exposure at the street level.

To incorporate transit into the risk methodology, each street segment was assigned a score based on the highest frequency route. Scores were assigned based on transit frequencies in the ranges shown in Table 9. Transit is weighted more heavily in the pedestrian risk score than for bicyclists, as walking is more commonly used to access transit.

Table 9. Pedestrian and Bicycle Priority Scores by TRANSIT FREQUENCY

Transit Frequency	PEDESTRIANS	BICYCLES
15 minutes or less	5	2
16–30 minutes	3	1
31–60 minutes	1	0
NA	0	0

Corridor #2. The most dangerous roads combine numerous risk factors and high demand.

This busy suburban corridor traverses several communities and serves numerous apartment complexes, multi-family homes, long-stay hotels and motels, grocery, retail, and fast food businesses as well as carrying frequent bus service. Well-defined paths on the grass edges of the road demonstrate that there is considerable demand for walking and biking despite minimal infrastructure for people walking or biking.

The combination of high demand and multiple risk factors—high-speed; multi-lane; suburban arterial; missing sidewalks and crosswalks; no street lighting; etc—make the acute crash history on this roadway very predictable. Safety countermeasures along this corridor need to be widespread and redundant to address the many risk factors along the corridor.

Frequent transit service generates a consistent level of pedestrian activity and a need to cross the road.

Pedestrian demand is shown by well-worn paths in the grass. Incomplete and hazardous crosswalks discourage compliance.

Numerous convenience and grocery stores attract pedestrians from nearby housing units and neighborhoods.

Reflecting Regional Policy Priorities

The risk assessment is based on observed crash patterns as well as roadway design and behavior. However, there are also important regional policy priorities that can be overlaid onto the resulting maps to help focus and prioritize investment decisions.

For example, The Atlanta Regional Commission is careful to ensure that its policies and activities do not disproportionately negatively impact members of the community who are classified as children, low income, minority, elderly or disabled. ARC uses Equitable Target Areas (ETAs) to identify areas in the region with greater social needs. Census data is used to identify low-income and minority communities, and these variables are combined into an ETA index for the entire ARC region. The ETA index is used as input for project prioritization and evaluation, monitoring resource allocation, and assisting in decision-making.

This equity perspective is important to traffic safety, as disadvantaged groups experience disproportionate traffic safety burdens due to the fact that they are more likely to use transit, biking, and walking and live in areas without safe infrastructure. Analysis conducted for ***Walk Bike Thrive!*** found that 22 percent of residents in the Atlanta region live in an ETA, but 37 percent of bicycle crashes and 42 percent of pedestrian crashes occur in these areas.

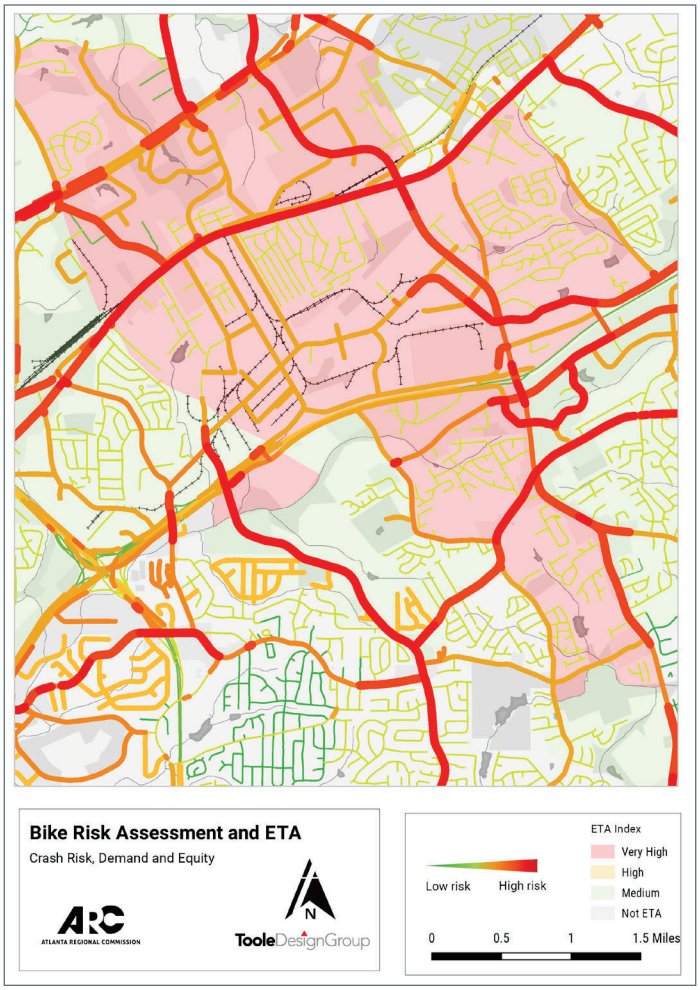
For ARC, therefore, ETAs are factored into the project selection and prioritization process for bicycle and pedestrian safety projects. For the regional high-risk corridor identification process, street segments were assigned an ETA score based on the adjoining area, as shown in Table 10.

Local jurisdictions using this document should overlay their own policy priorities onto the regional risk assessment maps and undertake their own qualitative outreach process to gather local input into problem identification and project development.

Table 10. Pedestrian and Bicycle Priority Scores for EQUITABLE TARGET AREAS

ETA INDEX	PEDESTRIAN AND BICYCLE PRIORITY SCORE
Very High	5
High	3
Medium	1
Not ETA	0

Bike Risk Assessment with ETA



Corridor #3. Equitable Target Areas frequently overlap with high risk, high demand roadways.

This urban arterial street traverses a predominantly low-income, minority community identified as an Equitable Target Area. Car-ownership and access to a car is lower than average and dependence on walking, biking, and transit is higher than average. There is a transit station at the southern end of the corridor and the street serves a college campus, social service buildings, and numerous convenience stores along the length of the corridor.

High crash locations and roads with high risk factors frequently overlap with communities in which there has been underinvestment and where poverty levels are high. Countermeasures need to address corridor risk factors but also be developed in close coordination with the adjacent community and residents.

This lane configuration leaves no room for people on bicycles.

Limited pedestrian crossing opportunities are poorly marked and controlled.

The entrance to a major transit station with no direct pedestrian crossing.

Safety and Equity

Safe transportation is fundamental to building an equitable region. Lack of safe access to jobs, education, and services is disproportionately affecting already vulnerable populations—minorities, people of color, low-income households, children, older adults, and people with disabilities. People should be able to travel safely regardless of age, race, wealth, or ability and no matter where they are in the Atlanta region.

This plan uses Equitable Target Areas (ETAs) as a data tool to identify areas with higher concentrations of vulnerable populations. A safe system must also account for the histories of communities, the lives of individuals, and current social disparities when prioritizing funding and engaging with communities around the region.

Transit users waiting at a bus stop with no sidewalk, crosswalk, seating or shelter.

Safety is a human rights issue.

Travel throughout metro Atlanta is dangerous, regardless of transportation mode. Georgia statewide traffic fatalities (per 100k population) in 2016 were 20% higher than the national average (15.1 vs. 12.5).[2] Travel is particularly dangerous for people walking and bicycling as fatality rates have risen steadily over the past several years and the Atlanta region's Pedestrian Danger Index is roughly twice that of the national average (107.2 vs. 53.8).[3] Transportation should be safe for everyone and roadway designs should benefit everyone.

Safety is an issue tied to race.

Transportation risk is disproportionate for minority communities and people of color. Nationally, black and Hispanic men are second and third, respectively, (behind Native Americans) in highest rates of pedestrian fatalities.[4] Statewide in Georgia, black pedestrians are significantly over-represented in fatality data and nearly 1.68 times more likely to be killed than white pedestrians.[5] Safe infrastructure is critical, but social bias is important also as studies indicate that drivers are significantly less likely to yield to people of color trying to cross the street.[6]

Safety is an issue of income.

Transportation risk particularly burdens individuals dependent upon walking, bicycling, and transit. Low-income households rely significantly more on walking for trips and ride transit at higher rates than other groups.[7] National research shows that the poorest third of neighborhoods are twice as likely to suffer pedestrian fatalities.[8] In the Atlanta region, ETAs suffer nearly twice the rate of pedestrian collisions as non-ETAs.[9]

Safety is an issue of displacement.

As communities change, many low-income and low-car households move to neighborhoods with less transit access or adjacent to busier roads thus increasing their risk while walking, making travel longer or logistics more difficult, and requiring a car or making transportation more expensive.[10]

Safe infrastructure is a civil rights issue.

While risk is higher, safe infrastructure is less likely to be present in minority and low-income communities. National data indicates that streets with safer features—pedestrian-scale lighting and/or traffic calming features—are significantly less common in middle- or low-income communities than high-income areas.[11] Lack of safe infrastructure also requires people to make riskier choices and facilitates increased enforcement, leading to both higher risk and over-policing.[12]

Safety is a children and families issue.

Communities that lack safe infrastructure are particularly dangerous for children and families. Motor vehicle crashes are the number one cause of death for children under 18.[13] Children are more vulnerable to collisions and require safer streets and infrastructure to navigate their communities and, as with other benefits, traffic calming is significantly less common in low-income areas.[14] The benefits of a safe and active childhood are innumerable: better physical and mental health; reduced social isolation and more freedom; fewer burdens on families and schedules; and many more.[15]

Safety is a critical issue for people with mobility impairments.

Roadway risks are amplified for people who have mobility impairments or rely on assistive devices. Pedestrians with disabilities and older adults face additional barriers to travel along sidewalks and to cross fast, busy roads. Lack of mobility reduces independence, limits job opportunities, and increases health risks for people with disabilities.[16] Older adults often outlive their ability to drive safely by 7-10 years, reducing their independence and increasing the risk of depression.[17] Building safer streets and applying universal access design standards to transportation projects especially benefit those underserved populations.

Safety is an economic opportunity issue.

Lack of safe infrastructure inhibits transportation mobility and damages the region's economic vibrancy. The Atlanta region currently struggles with maximizing economic opportunity due to issues of transportation mobility, neighborhood segregation, and access to jobs.[18] For people who rely on walking, bicycling, or public transit unsafe conditions reduce travel choices and constrain economic opportunities for both individuals and the region as a whole.[19] "Walkable urban places" increasingly drive regional growth while providing many benefits for local travel, but are often associated with lower measures of social equity and are not distributed evenly throughout the region.[20]

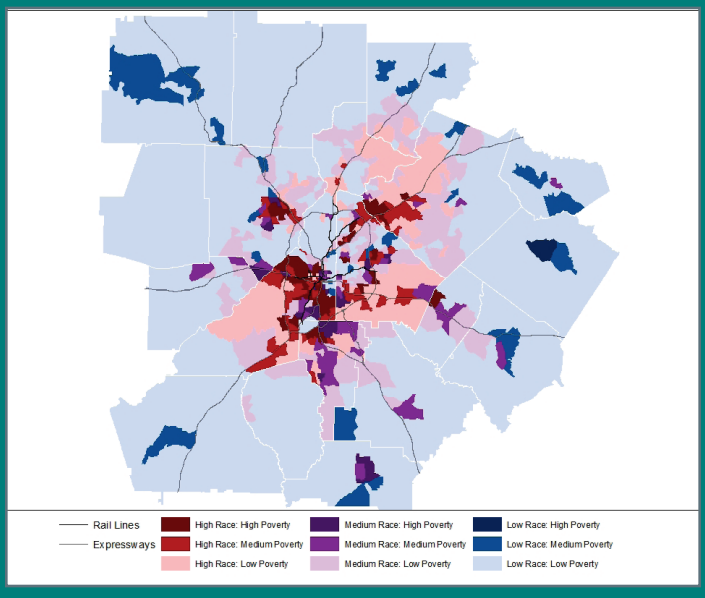
The research is clear that equity, opportunity, safety, and transportation are vitally linked. Complete streets can improve safety outcomes and this plan promotes widespread, systemic infrastructure improvements that are ever-present and user-neutral. To make this happen, planners must incorporate the needs of individuals and communities in ensuring more equitable outcomes.

Agencies should listen and be responsive to the needs of people to ensure equitable priorities and outcomes. A safe system understands that people encounter public spaces differently depending on their own experiences and personal attributes. An equitable process must incorporate the diverse perspective of individuals.

Funding prioritization must account for communities and individuals that lack the political or financial capital to press for safer streets. Safer infrastructure provides benefits to all individuals but risks and benefits are not distributed evenly. The provision of safety infrastructure is a civil rights issue and agencies must be active supporters of communities that have been traditionally under-represented and overlooked.

Planners must work with communities to first understand their needs and desires and then identify infrastructure, tools, and resources to improve safety. Safety from traffic collisions is critical, but a community may have other related concerns including personal security, housing or transportation costs, displacement, transit access, or everyday travel schedules.

Disaggregated Race and Poverty Map



ARC has mapped the intersections of race and poverty in the region. The areas of overlap with high risk corridors for people on foot and bike can help further focus investment decisions.

Interpreting Limited Crash Data

The Safe Streets crash analysis identified limitations in the available data. In addition to informing the "further research" recommendations at the end of the report, this highlighted two critical issues. First, some of the "best" data is the least useful in identifying specific countermeasures. Second, there are gaps in the definition of what constitutes a crash that are significant.

1. Using Temporal Data Wisely

Among the most reliable and consistent data points in traditional crash analyses are the month, day, and time of day at which crashes occur. In the Atlanta region:

- A higher number of pedestrian and bicycle crashes occur from 6am to 6pm, but severe crashes occur disproportionately between 6pm and 6am (Figure 13).
- Pedestrian crashes increase from October through December, while the months of May through August have the highest number of bicycle crashes (Figure 14).
- Fridays see the highest percentage of pedestrian crashes; Wednesday is the highest for bicyclists.

This information is interesting and can be useful in organizing outreach initiatives, however, it is not realistic to use it to tell people not to walk, bike or take transit after dark or to limit their bicycling exposure on Wednesdays, for example. Education and enforcement campaigns using this data may inappropriately target the behavior of pedestrians and bicyclists; blaming the victim, by suggesting that he or she should not have been there in the first place (e.g. riding a bicycle after dark). More importantly, solutions based on temporal data such as this ignore the fact that people walking and biking need a safe environment at all times. Engineering solutions offer that permanence.

2. Recognizing Data Gaps

The crash data are also limited in several important respects:

- although a very high percentage of fatal and serious injury crashes are captured in the police data, minor injury and property damage only collisions are significantly under-reported, especially when pedestrians and bicyclists are involved
- crash reports are not collected unless a motor vehicle is involved and the collision occurs on a public road; this excludes falls caused by broken or missing sidewalks and potholes, as well as crashes in parking lots and on private roads and driveways
- by definition, crash reports do not shed any light on near misses and on locations so dangerous and unpleasant to walk or ride that they are avoided

Figure 13. Distribution of Total and KSI Bicycle Crashes by TIME OF DAY

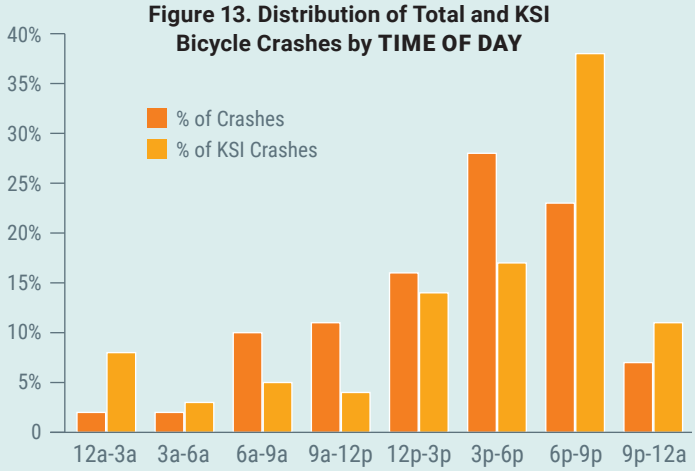
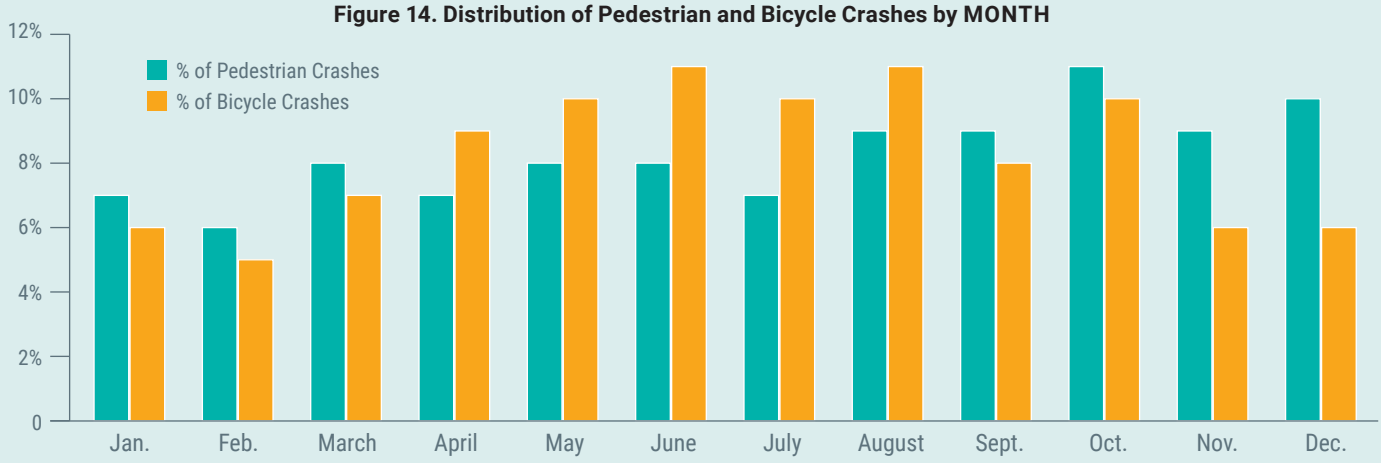


Figure 14. Distribution of Pedestrian and Bicycle Crashes by MONTH

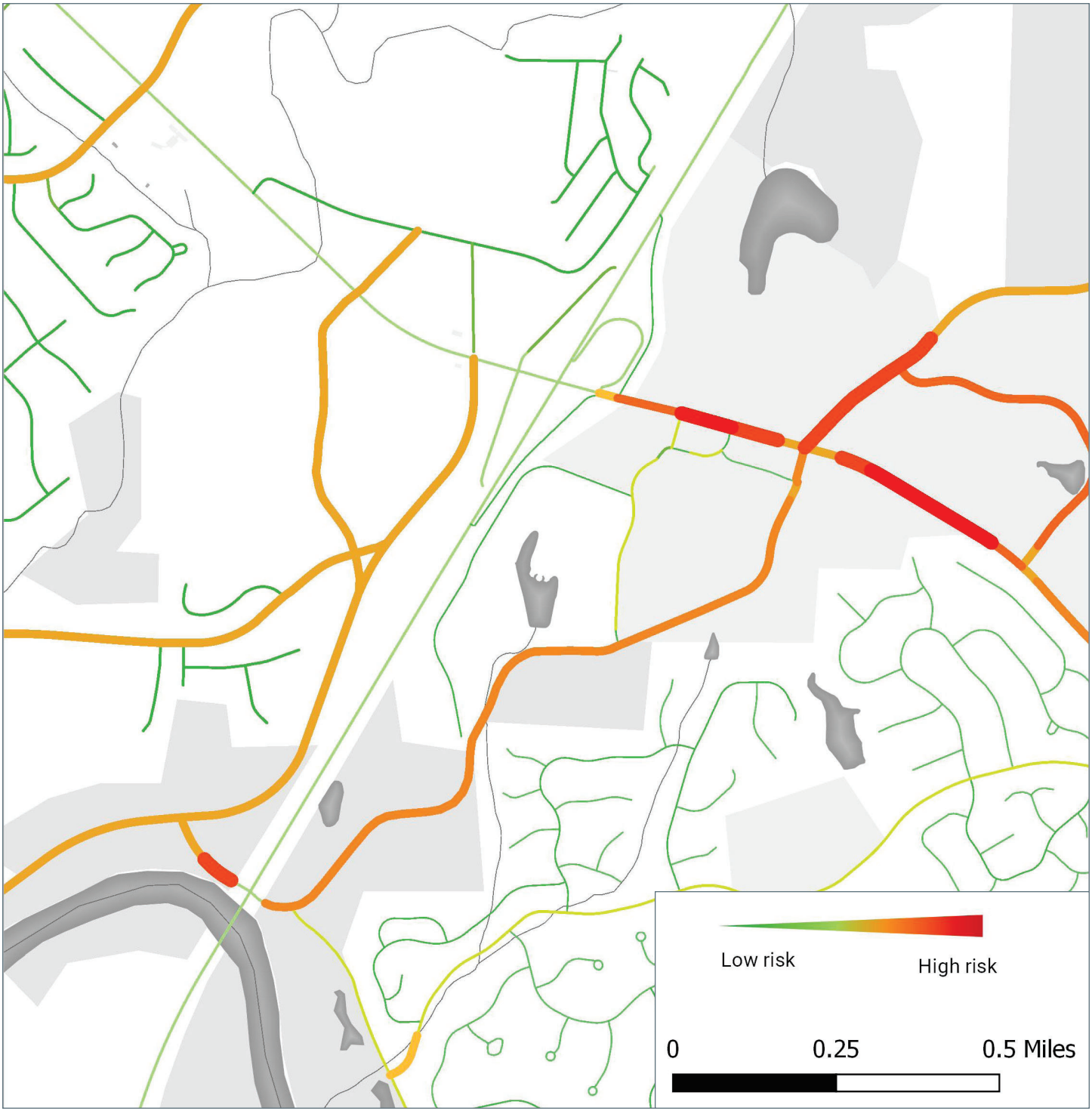


Creating A Risk Assessment Map for the Region

The result of the ***Safe Streets*** crash analysis is a powerful tool to assist ARC member jurisdictions eliminate fatal and serious injury crashes involving people on foot and bike by 2030. The layers of data showing crash risk, demand for active travel, and policy priorities such as equity, are combined into one high-risk corridor map. These maps clearly show the relative risk for pedestrian or bicyclist crashes on every segment of roadway in the ARC region.

The value of the risk assessment map is twofold. First, the maps are adaptable to each jurisdiction. In addition to having layers of data to separate pedestrian and bicyclist risk factors, the GIS-based map also allows local agencies to overlay their own policy priority areas onto the roadway safety assessment.

Pedestrian Crash Risk Map

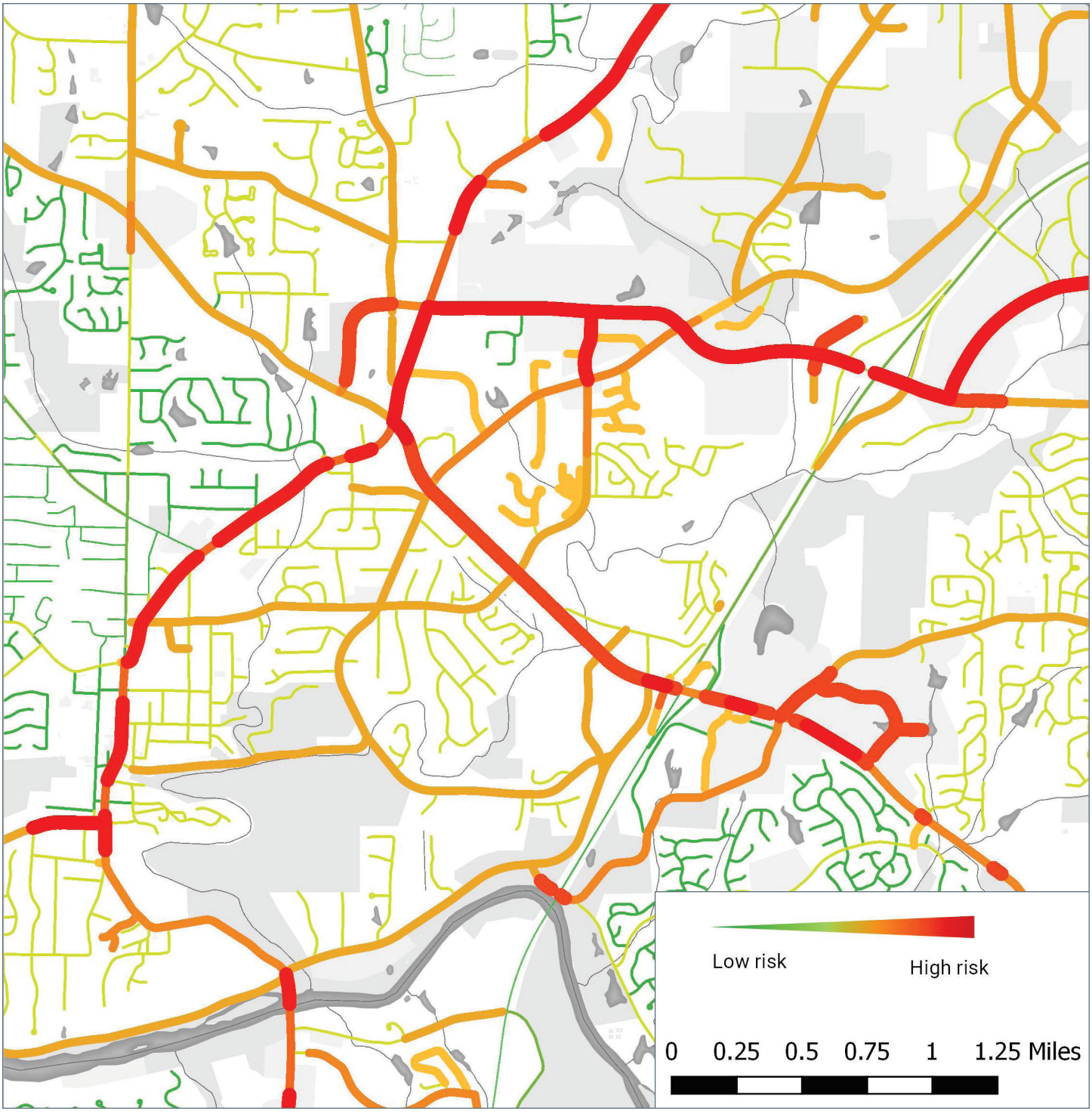


Second, the risk assessment map identifies the highest priority (highest risk) corridors in each jurisdiction—not just the crash hotspots but the systemic roadway design problems that need to be addressed in the short and the longer term.

The maps suggest an approach to identifying and implementing countermeasures that is deliberate, proactive, and different from past approaches to traffic safety that aren't working today.

On the following pages, the ***Safe Streets*** plan identifies a number of proven countermeasures that address the greatest risks to people on foot and bike, coupled with an approach to implementing these projects that can achieve the goal of zero fatal and serious injury crashes by 2030.

Bike Crash Risk Map



4. Use Evidence-based Countermeasures to Eliminate Risks

The findings of ***Safe Streets*** support the need for a new approach to the design and operation of roads in the Atlanta region, and in particular the need to prioritize pedestrian and bicyclist safety and mobility.

High-speed, multi-lane roads account for a high percentage of crashes in the region, especially those resulting in fatalities or serious injuries. Where these arterials intersect with land uses and transit activity that generate high levels of walking and bicycling, the crash risk is high. Reversing the crash trend and achieving ARC's and Georgia's long-term safety goals will only be possible with a commitment to implementing proven countermeasures as part of an overall complete streets approach that changes conditions for people walking and bicycling on major streets throughout the region.

Fortunately, many of the tools necessary to eliminate the risk factors on the region's roads already exist and have been well researched, tried and tested by Federal, state and local governments. This plan recognizes that dispersed crashes require widespread intervention and puts a particular emphasis on countermeasures that provide systemic or corridor-level safety.

The best safety solutions layer different treatments (i.e. crosswalks plus lighting) and ensure that multiple countermeasures provide redundant benefits and are mutually supportive of safer outcomes. The countermeasures in ***Safe Streets*** have been based on national research or drawn from national guidance, however planning and engineering judgement will be required to ensure that countermeasures are appropriate for their location.

	RISK FACTORS							
COUNTERMEASURES	**Poor Lighting**	**Arterials**	**4+ lanes**	**35mph+**	**No Crosswalks**	**Unprotected turns**	**Unsafe passing**	**No sidewalks**
Medians & Pedestrian Crossing Islands		✓	✓	✓	✓	✓		
Pedestrian Hybrid Beacons (PHB)			✓		✓			
Road diet		✓	✓	✓				
Lane diet		✓	✓	✓				
Sidewalks		✓	✓	✓				✓
Crosswalks					✓			
Changing Speed Limits		✓	✓	✓			✓	
Leading Pedestrian Intervals (LPI)		✓				✓		
Rectangular Rapid Flashing Beacons (RRFB)					✓			
Crosswalk Visibility Enhancements	✓				✓			
Street lighting	✓					✓		
Separated bike lanes		✓		✓			✓	
Traffic calming				✓		✓		✓

Medians and Pedestrian Crossing Islands

A median is the area between opposing lanes of traffic and may be created by pavement markings, raised medians or islands (often with landscaping). Typically installed along the length of a multi-lane suburban or urban street, medians can reduce head-on motor vehicle collisions and can provide a valuable refuge for pedestrians crossing a road in multiple stages. Wide medians can also be used to create a pedestrian crossing island.

Pedestrian Crossing Islands reduce crossing distances and provide a protected refuge and waiting area at intersections or midblock crossings. Pedestrian crossing islands should be at least 6' wide and are often accentuated with high visibility signs, crosswalk markings, and signals.

New medians on Buford Highway provide a refuge for pedestrians

Boulder, CO

Risk Factor and Behavior Addressed

Medians and pedestrians crossing islands address risk factors created by multi-lane roads (4 or more lanes) and higher speeds (35mph and above). They can be particularly effective on roads where there are long distances between intersections and controlled crossings; especially on roads served by transit.

Benefits

- Raised medians cut pedestrian crashes by 46%
- Crossing islands can reduce pedestrian crashes by 56%

Costs

Average $15,000 depending on the size and construction materials.

Examples in ARC region

- 10th Street at Midtown MARTA station, Atlanta, GA
- East Ponce de Leon Avenue, Decatur, GA
- Dekalb Avenue at King Memorial MARTA station, Atlanta, GA

REFERENCES

National Highway Traffic Safety Administration, Traffic Safety Facts - 2015 Data - Pedestrians. Report DOT HS 812 375, (Washington, DC: 2017).

Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11

Pedestrian Hybrid Beacon

A pedestrian hybrid beacon (PHB) is a pedestrian-activated signal that uses flashing and solid lights to improve roadway crossing safety. When activated, the signal immediately flashes yellow to alert drivers before changing to a red stop light. When vehicles are stopped, pedestrians are given a Walk signal. PHBs are used where traditional traffic signals may not be needed, but pedestrians need to cross where vehicle speeds or volumes are high, especially at schools, shared-use paths, parks and other high-pedestrian volume areas. The PHB is sometimes referred to as a HAWK (High-intensity Activated crossWalK beacon) signal.

The PHB offers more control than a flashing beacon as it assigns right of way and provides positive stop control, however it isn't a full pedestrian signal and even allows motorists to proceed once the pedestrian has cleared their side of the roadway.

Risk Factor and Behavior Addressed

Nationally, more than 75% of pedestrian fatalities occur at non-intersection locations. In the ARC region, high risk factors for pedestrians include high-speed, multi-lane roads with limited crossing opportunities.

Benefits

- PHB's reduce pedestrian crashes by 69% and all crashes by 29%; they reduce fatal and serious injury crashes by 15%
- PHBs only operate when activated by a pedestrian. Motor vehicle traffic is not delayed if there are no pedestrians waiting to cross.

Costs

PHBs average $60,00 per crossing

Examples in ARC region

- Buford Highway (US 23/GA 13), Atlanta, Brookhaven, Chamblee, & Doraville, GA
- Ponce de Leon Avenue (US 23/GA 8), Atlanta, GA
- Candler Road (GA 155), Dekalb County, GA

REFERENCES

CMF Clearinghouse, CMF IDs: 2911, 2917, 2922.

National Highway Traffic Safety Administration, Traffic Safety Facts - 2015 Data - Pedestrians. Report DOT HS 812 375, (Washington, DC: 2017).

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Street Design Guide (2013)

Manual on Uniform Traffic Control Devices (2009)

Road Diet

Road diets or roadway reconfigurations changes defined travel lanes typically with new pavement markings. While leaving the width of the roadway unchanged, a lane diet creates safer travel conditions by remarking three or four-lane roadways to a two-lane roadway, with bike lanes, defined parking and a center two-way left turn lane (TWLTL). Road diets are applied where average daily traffic is less than 25,000 vehicles.

Before and after images of Nickerson Street in Seattle, which was reduced from a four-lane street to two travel lanes, a turning lane, and a bike lane on each side.

Risk Factor and Behavior Addressed

Road diets address many risk factors in the ARC region including high-speed urban arterials and collectors that have no dedicated space for people on bikes. Road diets also increase the opportunities for pedestrians to cross streets safely.

Benefits

- Total crash rates are reduced by between 19% and 47%
- Improve pedestrian conditions by reducing crossing distances, adding medians and pedestrian crossing islands; bike lanes also provide a buffer between pedestrians and cars.
- Improve conditions for bicycles by creating space for bike lanes or buffered bike lanes.
- Improve conditions for motor traffic by reducing travel speeds and weaving, and by increasing the opportunity to turn without blocking moving traffic.
- Can be achieved with simple restriping and minimal construction (e.g. raised median, buffered bike lane)

Costs

Road diets vary in cost with the width and length of the roadway. Per mile, road diets vary between $25,000 and $40,000. Road diets incorporating curb extensions or median islands can increase costs to $100,000 per mile.

Examples in ARC region

- Ponce de Leon Avenue (US 23/GA 8), Atlanta, GA
- Church Street, Decatur, GA
- Decatur St. at Georgia State University, Atlanta, GA
- Wylie Street, Atlanta, GA
- Dogwood Drive, Hapeville, GA

REFERENCES

Evaluation of Lane Reduction "Road Diet" Measures on Crashes, FHWA-HRT-10-053.

FHWA Road Diet Informational Guide

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Street Design Guide (2013)

Sidewalks

Sidewalks, or walkways, are spaces reserved for those travelling by foot or wheelchair including sidewalks, shared-use paths and roadway shoulders. Accessibility is a required element of good sidewalk planning and design.

Risk Factor and Behavior Addressed

The absence of sidewalks leaves people to walk in the roadway where they come into conflict with motor vehicles. This is particularly dangerous on high speed roadways. In the ARC region, many roads served by transit don't have sidewalks or crosswalks.

Benefits

Walkways provide safe places for people to walk and reduce crash rates by 65% - 89%. Paved shoulders reduce crash rates by 71%. Walkways and sidewalks greatly improve mobility options and safety for those in wheelchairs and other mobility-assist devices.

Costs

Sidewalks vary in cost depending on construction materials and width. Sidewalks average $2 per square foot, therefore a 5-foot side, 100-foot long sidewalk will cost approximately $1,000.

Examples in ARC region

- Buford Highway (US 23/GA 13), Atlanta, Brookhaven, Chamblee, & Doraville, GA
- 2nd Ave at Charles Drew Charter School, Atlanta, GA
- Fowler Street and 10th Street (GT Campus), Atlanta, GA

REFERENCES

Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, Table 11.

National Highway Traffic Safety Administration, Traffic Safety Facts - 2015 Data - Pedestrians. Report DOT HS 812 375, (Washington, DC: 2017).

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Street Design Guide (2013)

Changing Speed Limits

Speed limits are typically posted based on observed motor vehicle speeds (usually the 85th percentile speed), which in turn is a function of roadway design. This frequently leads to speed limits (and actual speeds) that are higher than appropriate for the surrounding land use and mix of users. USLIMITS2 is a web-based design tool which helps evaluate and assign consistent speed limits along a roadway, considering several factors including traffic speeds, volumes, setting, crash data and roadway user types such as truck, pedestrian and bicycle.

Risk Factor and Behavior Addressed

Increasing motor vehicle speeds are associated with a greater frequency of crashes and more severe crashes. In the ARC region, roads with posted speeds of 35mph and higher have a significantly higher incidence of fatal and serious crashes, especially those involving people on foot and on bike.

Benefits

USLIMITS2 is a web-based tool designed to help practitioners set reasonable, safe and consistent speed limits for specific segments of roads (excluding school zones and constructions zones).

Costs

Use of the software is free. If speed limits are changed, there is a cost associated with replacing signs and enforcement of the new limits. Reducing speed limits may also be done in conjunction with other countermeasures such as neighborhood traffic calming.

Examples in ARC region

- City of Alpharetta, GA (35mph to 25 mph)
- Ball Mill Road (35mph to 25 mph), Sandy Springs, GA

Special Note

Automated speed enforcement is an essential element of changing speed limits and managing speed. Georgia state law currently (as of 2018) allows automated enforcement within school zones. This is an important tool for communities to increase the safety of children, families, and communities. Automated enforcement can also reduce over-policing when cameras are located based on data-driven analysis and equitably distributed.

REFERENCES

FHWA

Leading Pedestrian Intervals

A Leading Pedestrian Interval (LPI) is an adjustment to traffic signal timing which provides pedestrians the opportunity to begin crossing an intersection prior to motor vehicle traffic being given the green signal to proceed. LPIs typically provide pedestrians 3–7 seconds of crossing time to establish right-of-way in the intersection and become more visible to motorists.

Risk Factor and Behavior Addressed

Conflicts with turning traffic are among the most common contributing causes to crashes between motorists and people on foot and bike in the ARC region. Even when crossing with the light, pedestrians have to contend with left- and right-turning traffic that often fails to yield. By giving pedestrians a head start, LPIs improve the visibility of crossing pedestrians and increase the chances of motorists yielding to them.

LPIs improve safety for pedestrians who may be slower to proceed into the intersection such as senior citizens and those in wheelchairs.

LPIs improve safety at intersections where left-turning vehicles are allowed to turn after yielding to on-coming or pedestrian traffic.

Benefits

LPIs reduce pedestrian-vehicle crashes by 60%

Costs

LPIs have essentially no cost as they are programmed into existing or new signals.

Examples in ARC region

- City of Atlanta, GA
- Memorial Drive at East Lake Boulevard, Atlanta, GA

REFERENCES

FHWA's Handbook for Designing Roadways for the Aging Population

Manual on Uniform Traffic Control Devices (2009)

Rectangular Rapid Flashing Beacons (RRFB)

Rectangular rapid-flashing beacons (RRFB) are pedestrian-activated signals, installed in conjunction with a marked crosswalk, which alert motorists to yield to crossing pedestrians. They are typically used in locations where a full traffic signal may not be warranted. RRFBs use an irregular flashing sequence which attracts motorists' attention to pedestrians crossing and allow pedestrians to safely cross.

Risk Factor and Behavior Addressed

The ARC region has a lot of roadways where there are no marked or signalized crossings for pedestrians, even though there is a clear demand for people to get across the road. The absence of safe places to cross the road is a major risk factor for pedestrians in the region. RRFBs are particularly useful for establishing visible marked crosswalks on roads with posted speeds up to 35mph and where high vehicle volumes create challenging pedestrian crossing conditions.

RRFBs can be used in conjunction with pedestrian crossing islands and road diets as part of a package of measures to enable people to more safely navigate multi-lane roadways with high crash risks.

Benefits

RRFBs increase motorist yield rates by up to 80%*

Costs

RRFBs cost an average of $22,000 per crossing location.

Examples in ARC region

- 10th Street at Midtown MARTA station, Atlanta, GA
- Dekalb Avenue at King Memorial MARTA station, Atlanta, GA
- College Avenue (GA 10) at Agnes Scott College, Decatur, GA

REFERENCES

NACTO Urban Street Design Guide (2013)

Manual on Uniform Traffic Control Devices (2009)

CDOT Roadway Design Guide, Chapter 14 (2015)

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations (2005)

** Efficacy of Rectangular-shaped Rapid Flash LED Beacons*

Crosswalk Visibility Enhancements

Crosswalk visibility enhancements include a variety of treatments which make pedestrian crossings more obvious to approaching motorists, including advanced warning signs and markings, overhead lighting and curb extensions. Enhancements may also include parking restrictions on crosswalk approaches, in-street stop or yield signs and ladder and continental striped crosswalks.

Risk Factor and Behavior Addressed

Motorist failure to stop and/or yield to pedestrians in a crosswalk is both a significant contributing cause of fatal and serious crashes in the ARC region as well as behavior that degrades the pedestrian experience on area roads. More prominent crosswalks, especially in combination with speed management, encourage yielding behavior. In addition, higher quality and more visible crosswalks encourage pedestrians to use these crossing locations rather than mid-block or away from a crosswalk.

Benefits

Crosswalk visibility enhancements can reduce crashes by 23%–48%

Costs

Crosswalk visibility enhancements vary in cost depending on the treatment applied. Average costs include:

- High-visibility crosswalks (pavement markings): $2,500 per crossing
- Curb extensions: $15,000 per each corner
- High visibility and advanced warning signs: $300 per sign
- In-street stop or yield signs: $250 each

Examples in ARC region

- Ponce de Leon Avenue, Decatur GA
- Edgewood Avenue at Park Place, Atlanta, GA
- Boulevard (Grant Park area), Atlanta, GA
- Mitchell Street, Atlanta, GA

REFERENCES

NACTO Urban Street Design Guide (2013)

ADA Accessibility Guidelines (2004)

Manual on Uniform Traffic Control Devices (2009)

Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) (2011)

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines (2005)

Bushell, M., Poole, B., Zegeer, C., & Rodriguez, D. (2013). Costs for Pedestrian and Bicyclist Infrastructure Improvements: A Resource for Researchers, Engineers, Planners, and the General Public. Pedestrian and Bicycle Information Center.

Street Lighting

Street lighting improves safety for all roadway users by illuminating otherwise dark locations on both roadway and sidewalk areas, depending on the type of lighting provided. Street level lighting is situated over 20-feet high and illuminates the roadway, primarily for the benefit of motorists. Pedestrian scale lighting is typically 10 to 18-feet high along sidewalks or shared-use paths.

Risk Factor and Behavior Addressed

There is a dramatic increase in the frequency and severity of crashes involving pedestrians in low light conditions where there is no or little street lighting.

Benefits

Street lighting increases the visibility of all roadway users and illuminates the path of travel, which is especially important for pedestrian and bicycle travel in the hours of darkness when surface defects, signs and markings can become invisible.

Lighting can be used to highlight areas of particular concern, such as crosswalks and intersections where pedestrians are likely to be present.

Costs

The cost of street lighting varies depending on the area covered.

- Crosswalk: $11,000 - $42,000
- Block: $600,000 for 1/3 mile of pedestrian level lighting
- Operating costs should be considered which average $700 annually per intersection

Examples in ARC region

- The Beltline (ped-scale lighting), Atlanta, GA
- Edgewood Avenue between Cornelia and Krog Street, Atlanta, GA

REFERENCES

APBP Lighting Webinar

Vision Zero Network Webinar

Separated Bike Lanes

Separated bike lanes, also known as protected bike lanes or cycle tracks, are exclusive bikeway facility that are physically separated from motor vehicle traffic and sidewalks. The added separation protects bicyclists from motor vehicle traffic creating a safer space for bicyclists of all ages and abilities. Separation varies in the form of flexible delineator posts, on-street parking or raised buffers and medians.

Risk Factor and Behavior Addressed

The largest number of bicycle and motor vehicle crashes in the ARC region occur with both the bicyclist and motorist going straight ahead. This suggests that both bicyclists and motorists will benefit from more physical separation, especially on busier roadways.

Riding the wrong way (i.e. against traffic) on the sidewalk remains a major contributing cause of bicyclist crashes nationwide, as well as in the ARC region. Bicyclists choose to ride on the sidewalk because busy, high speed roads with no bicycling infrastructure are not comfortable and do not feel safe.

Benefits

- Separated bike lanes reduce crash rates by 90%*
- Separated bike lanes increase bicycle traffic by creating conditions that attract bicyclists of all ages and abilities.
- Pedestrian safety is also improved by separating bicycle traffic from pedestrian space and providing additional separation from motor vehicle traffic.
- Bicyclists are much less likely to ride on the sidewalk when facilities are provided on the roadway.

Costs

Separated bike lanes cost varies depending on the separation used and if they are created in conjunction with other projects. General cost per one-way mile for separated bike lane elements include:

- Pavement markings - $50,000
- Buffers
  - Striped with pavement markings: $15,000
  - Flexible delineator posts: $22,000
  - Parking stops: $30,000
  - Parked vehicles: $12,000 (pavement markings and signs)
  - Planters: $120,000
  - Precast curb: $500,000
  - Cast in place curb: $45,000

Examples in ARC region

- North McDonough Street, Decatur, GA
- Tech Parkway, Atlanta, GA
- Peachtree Center Avenue, Atlanta, GA
- John Portman Blvd, Atlanta, GA
- Park Place, Atlanta, GA (one-way)

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Bikeway Design Guide (2014)

MassDOT Separated Bike Lane Planning and Design Guide (2015)

FHWA Separated Bike Lane Planning and Design Guide (2015)

People for Bikes, "Protected Bike Lanes Do Not Need to Cost $1 million per mile" Michael Anderson, May 16, 2017

"Safety impacts of bicycle infrastructure: A critical review." DiGioia, Jonathan, Kari Edison Watkins, et al. Journal of Safety Research, 61 (2017) 105–119.

Neighborhood Greenways/Bicycle Boulevards

Neighborhood greenways, also known as bicycle boulevards, are low volume, low speed roadways that incorporate traffic calming treatments to discourage through motor vehicle traffic and encourage bicycle traffic. They often run parallel to busy major roadways or travel corridors.

Typically identified as residential roadways, neighborhood greenways employ a variety of traffic calming including traffic diverters, speed humps and chicanes to limit motor vehicle traffic access and speed. Neighborhood greenway improvements should be applied to roadways with less than 3,000 vehicles per day and target motor vehicle speeds of 20 mph or less.

High-quality crossings of major roads or barriers are key to the success of neighborhood greenways.

Risk Factor and Behavior Addressed

Neighborhood greenways attract bicyclists away from busy, high-speed and high-volume parallel roads where much greater risk factors are present.

Neighborhood greenways also improve conditions for bicyclists and area residents by applying measures which reduce motor vehicle traffic speeds and discourage cut-through traffic.

Benefits

Neighborhood greenways benefit bicyclists by reducing the amount and speed of motor vehicle traffic along the corridor.

Property values generally increase along neighborhood greenways due to the improve conditions.

Costs

Costs of neighborhood greenways vary depending on the traffic calming elements applied. Average costs of traffic calming features include

- Speed humps: $4,000
- Speed humps (bicycle-friendly): $5,000
- Speed tables: $12,000
- Traffic diverters: $20,000
- Shared-lane markings: $300 each or $11,000 per mile or two-way roadway

Neighborhood greenway intersections with major roadways may require pedestrian hybrid beacons (PHB) or rectangular rapid flashing beacons (RRFB)

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Bikeway Design Guide (2012)

Manual on Uniform Traffic Control Devices (2009)

Fundamentals of Bicycle Boulevard Planning & Design (2009)

"Safety impacts of bicycle infrastructure: A critical review." DiGioia, Jonathan, Kari Edison Watkins, et al. Journal of Safety Research, 61 (2017) 105–119.

Traffic Calming

Traffic calming includes a variety of horizontal and vertical street treatments that reduce the speed and volume of motor vehicle traffic. Traffic calming is typically applied to residential, collector and minor arterial streets. Safety is improved because of slower speeds which improves driver awareness, and shortens stopping distances. Traffic calming treatments include speed humps, speed tables, chicanes, raised crosswalks and raised intersections.

Risk Factor and Behavior Addressed

Speeding and failure to yield, even on relatively minor roads, continue to increase the frequency and severity of crashes involving pedestrians and bicyclists in the ARC region.

Benefits

Traffic calming improves safety and comfort for all roadway users by reducing crash rates, injuries and fatalities. Area-wide implementation of traffic calming measures helps to avoid shifting problems from one location to a nearby or neighboring street.

Pedestrians have a 13% likelihood of fatality or severe injury in collisions with vehicles travelling 20 mph or less but 75% likelihood in collisions with vehicles travelling 40 mph.

Costs

Costs of traffic calming elements applied may vary. Average costs of traffic calming features include

- Speed humps: $4,000
- Speed humps (bicycle-friendly): $5,000
- Speed tables: $12,000
- Traffic diverters: $20,000
- Raised crosswalks: $12,000
- Raised intersections: $25,000–$70,000 depending on size of intersections
- Chicanes: $10,000
- Curb Extensions: $13,000

Examples in ARC region

- Bulb outs: Ponce de Leon Avenue, Decatur, GA
- Curb Extensions: McLendon Avenue, Atlanta, GA
- Speed humps: Second Ave, Decatur, GA
- Speed humps: Sisson Ave, Atlanta, GA
- Traffic circle: Park Plaza, Alpharetta, GA
- Speed table: Beltline (Old Fourth Ward), Atlanta, GA
- Speed tables: E. Lake Boulevard, Atlanta, GA
- Two-lane slow point: N. Park Drive, Tucker, GA
- Traffic circle: Ashford Crossing, Dunwoody, GA
- Roundabout: Grady Avenue and Beauregard Boulevard, Fayetteville, GA
- Curb extensions: Sycamore Street, Decatur, GA
- Speed tables: Cherokee Avenue at Milledge Avenue, Atlanta, GA

REFERENCES

FHWA The Effects of Traffic Calming Measures on Pedestrian and Motorist Behavior (2001)

ITE Traffic Calming Web site

NACTO Urban Street Design Guide (2013)

Traffic Calming Device Implementation Guidebook, City of Atlanta

Tefft, Brian C. Impact speed and a pedestrian's risk of severe injury or death. Accident Analysis & Prevention. 50. 2013.

STRATEGIES FOR ACTION

Roadways with high risk factors are common throughout the Atlanta region. Every jurisdiction within ARC has a role to play in eliminating these risky conditions.

5. Short Term: Focus Regional Funding on Safety

The Atlanta Regional Commission programs millions of dollars of transportation funds each year through the Transportation Improvement Program (TIP) process. These dollars represent a significant percentage of overall transportation spending in the region and play a catalytic role in local project development and funding decisions.

In the context of traffic safety, ARC can use its process to:

- direct more funding to high-risk corridors and communities
- ensure that all funding supports safer designs by incorporating proven safety countermeasures
- promote better local project development, design, and implementation.

ARC's project evaluation framework (the "TIP Cookbook") is used to develop the TIP based on a three-step Key Decision Point (KDP) process that supports the agency's commitment to performance-based planning and decision-making.

There is an opportunity to build the goals of ***Safe Streets*** into each of the three KDP's, so that eliminating fatal and serious injury crashes on the region's roads becomes an integral part of every project in the TIP.

KDP 1 ensures that all projects in the TIP support regional policy goals. ***Safe Streets*** recommends that the current list of Roadway Capacity Filters, which are used to evaluate roadway projects submitted for funding, be expanded to emphasize "safety countermeasures that contribute to reducing fatal and serious injury traffic crashes".

KDP 2 establishes a complex matrix of performance criteria to ensure each project is evaluated and scored against all relevant metrics. Criteria scores are then weighted to reflect policy priorities.

Active Transportation Projects: Bicycling- and pedestrian-specific projects can address specific safety issues or support increased travel within or between communities. Project safety scores should assess:

- the crash risk factors on the existing road segment; and
- the countermeasures proposed by the project to address specific risk factors.

Bicycling and walking projects along higher-risk roads, those that integrate proven countermeasures, those that fill existing network gaps, and those that reinforce safe community design should become priorities for funding. ***Safe Streets*** recommends that project assessment should assess projects for high-risk factors (see pages 20-21) and crash risk scores developed as part of this plan (see page 23); and award

points for the specific evidence-based countermeasures identified in this document (see page 34).[21]

Documentation of project-level crash risks and proposed countermeasures will be important to helping ARC assess the long-term effect of the region's TIP towards achieving federal and state performance targets (see page 57). ARC will monitor regional crash numbers and trends to assess long-term outcomes.

Roadway Expansion Projects: Roadway projects form the foundation of the region's transportation network and have enormous implications for walking, bicycling, and safety. These projects can provide new opportunities to walk or bike, address a current network gap, or mitigate potential negative impacts through complete street elements. The project safety score for roadway expansion projects is made up of two elements:

a) the rate of crashes on the existing road segment (serious injury and fatality crash rate per 100 million VMT); and

b) countermeasures proposed.

Speed Versus Safety

In a landmark 2017 report, the National Transportation Safety Board (NTSB) identified speeding as one of the most common factors in motor vehicle crashes in the United States and concluded that "the current level of emphasis on speeding as a national traffic safety issue is lower than warranted."

The findings of the study confirm that speed increases both the likelihood of serious and fatal crash involvement as well as increasing the severity of a crash. More than 31% of crashes in the United States identify speed as a factor, a number that is underestimated in the view of the NTSB.

The report singles out automated speed enforcement as an effective but hugely underutilized countermeasure to reduce speeding-related crashes, fatalities and injuries, noting that many states have laws that prohibit or restrict the use automated speed enforcement. After reviewing current techniques for setting and enforcing speed limits (including the 85th percentile rule), the NTSB concludes that "the Safe System approach to setting speed limits in urban areas is an improvement over conventional approaches because it considers the vulnerability of all road users".

The NTSB is concerned that the current level of emphasis on speeding as a national traffic safety issue is lower than warranted, and that is certainly evident in the Atlanta region. One potential reason for this is that speed is often equated with free-flowing traffic and a lack of congestion—there is a perceived conflict between safety and speed. As a result, speed reduction measures are rejected for fear of causing congestion and delay. Not only does this ignore research that slower speeds can improve traffic flow and efficiency (e.g. with dynamic or variable speed control systems) but frequently pits the temporary convenience of motorists against the safety and accessibility needs of neighborhoods, especially those more reliant on walking, bicycling, and transit.

ARC's own policies reflect this unresolved tension. On the one hand, regional transportation priorities and local community concerns are dominated by discussion of congestion relief and the cost of congestion; on the other hand, the agency expressly notes in the regional transportation plan that "ensuring people arrive at their destination safely must be given as much consideration as reducing congestion and motorist travel times…".

Safety risks for each mode should be incorporated into roadway expansion projects. Countermeasures for roadway expansion projects should include bicycling and pedestrian treatments. It should also be possible to award negative points for projects that include design elements known to increase safety risks for people on foot and on bicycle, for example projects that add lanes and increase motor vehicle speeds without any appropriate countermeasures.

Criteria Weighting: The project safety scores are weighted to reflect the relative importance of safety versus other policy criteria (e.g. network connectivity, social equity, and mobility & congestion). This weight can be adjusted to increase the prominence of safety as factor for prioritization, especially for project types that have disproportionate, negative impacts on pedestrian and bicycling safety. Weights should be balanced between advancing safer outcomes and supporting increased mobility in high-demand areas.

Other Criteria: All projects are also assessed on a range of other policy priorities:

- Multimodalism assesses complete streets elements included to accommodate other modes than the primary project purpose. Complete street elements support safety but where projects detract from safety they should be assessed and scored accordingly.
- Social equity assesses the impact of projects on ensuring a fair and equitable transportation system. This question should specifically account for safety outcomes to ensuring safe and dignified access to regional transportation.

KDP 2 also assesses projects by several program- and outcome-specific measures.

- Projects considered for Livable Centers Initiative (LCI) funding are scored on whether a project: creates a complete street, promotes walkability, provides access to transit, supports economic outcomes (ladders of opportunity), or promotes social equity. This section can be updated with additional safety countermeasures.
- All projects are assessed by project deliverability criteria to ensure they are feasible and can be built on time and budget. This section can help anticipate how safety features may affect implementation (for example by requiring a variance or exception) and ensure they are not excluded later in the life of the project.

KDP 3 accounts for less tangible and more subjective project selection factors such as regional balance, cost-effectiveness and deliverability that may come into play once an objectively prioritized list of projects has been developed. At this stage, ARC staff and stakeholders should be asked to consider how the project list will contribute to achieving the goals of the State's Strategic Highway Safety Plan. Projects can also be re-distributed to ensure that funding is fairly allocated to vulnerable or underserved communities.

Vehicle and Pedestrian Collision Speed and Survival Percentage

When a vehicle is traveling at...

20 MPH

30 MPH

40 MPH

this is the driver's field of vision.

It takes...

45' TO STOP

85' TO STOP

145' TO STOP

and pedestrians hit at this speed have a...

13% Likelihood of fatality or severe injury

40% Likelihood of fatality or severe injury

73% Likelihood of fatality or severe injury

6. Medium-term: Support Better Projects

People walk, ride bikes and take transit across the metropolitan area and regional traffic patterns are heavily influenced by local trips and available travel options on local streets. As a result, regional coordination and leadership is required, in addition to funding, to build a safer regional transportation system.

The ARC and each of its member jurisdictions and partner agencies has a mandate and a responsibility to build a safer transportation system for all.

- The U.S. Department of Transportation states that "every transportation agency…has the responsibility to improve conditions and opportunities for walking and bicycling".
- Federal mandates require metropolitan transportation planning agencies to "provide for consideration of projects and strategies that will…increase the safety of the transportation system for motorized and nonmotorized users".
- The ARC board directs staff to "conduct investigations into the causes and location of fatalities and injuries within the Atlanta region and recommend an appropriate course of action for the agency to follow in improving safety outcomes on our transportation system for all users…"

As a result, ARC is committed to helping local agencies develop and implement better transportation projects that increase safety for all users.

In addition to promoting the use of proven countermeasures as part of the TIP process (see previous section), ARC will:

1. Help local agencies take advantage of tools, policies, and programs that can systematically eliminate known risks for pedestrians and bicyclists on area roadways.

2. Provide technical assistance to help member jurisdictions develop transportation plans and projects that have a strong safety element. For example, the risk assessment maps developed for Safe Streets are available to help prioritize corridors with the highest risk for serious or fatal pedestrian and bicycle crashes in the future.

3. Share techniques or case studies for how local agencies can use outreach and engagement strategies to go beyond the crash data.

4. Provide guidance on the availability of proven countermeasures to eliminate roadway risks. This enables agencies and consultants to identify appropriate solutions to eliminate risk as part of larger projects or as stand-alone projects and programs.

5. Provide examples of effective Vision Zero and Complete Streets policies and action plans for local jurisdictions to use as models and templates.

6. Identify funding sources and strategies for safety projects at the federal, state and local level. This enables agencies to implement projects faster and more efficiently.

In this way, ARC will begin to fulfill the promise of ***Walk. Bike. Thrive!*** in "leading the region on moving towards Vision Zero policies for all roadways and encourage incorporation of safety elements into both roadway design and marketing efforts."

WHAT IS A HIGH INJURY NETWORK?

Several US cities have analyzed their crash data to determine whether there are particular roadways and corridors where fatal and serious injury crashes are concentrated. The City of Atlanta, for example, discovered that 72% of fatal and 42% of injury crashes occur on just 6% of the city's roadways. This helps to prioritize corridor improvements as well as highlight the types of roadways and roadway design elements that are contributing to serious traffic safety problems. The Vision Zero Network recommends creating a HIN as "this approach is helping city staff focus limited resources on the most problematic areas, while also building greater public and political buy-in for changes."

https://visionzeronetwork.org/hin-for-the-win/

http://transportationplan.atlantaga.gov/docs/ATP_Final_Report.pdf

Example of a High Injury Network in Denver, CO.

7. Long-term: Champion Complete Streets Implementation

Much of the Atlanta region has been planned and built around the automobile. In common with most metropolitan areas in the United States, land use planning and growth in the second half of the 20th Century was focused almost exclusively on a dispersed, suburban development pattern. This was predicated upon a transportation system almost exclusively designed for motor vehicles that could travel long distances at relatively high speed.

More recently, the well-documented downsides of this over-reliance on the car (e.g. pollution, obesity, physical inactivity, sprawl, and huge road safety issues) have inspired change. People are moving back into more urban and city-center locations; transit options have improved; projects such as the Beltline have transformed neighborhoods; and the Livable Centers Initiative has enabled more sustainable growth in the region.

In many communities around the United States, similar changes are being complemented by a "Complete Streets" approach to roadway design and operation. This has emerged as an effective, long-term strategy to systematically and proactively address existing roadway designs that have increased risk for pedestrians, bicyclists and motorists.

Basic Principles

For the Atlanta region, the basic principles of a Complete Streets approach mean that over time, all streets should be planned, designed and operated to provide a basic level of safe access for people using all elements of the transportation system, regardless of whether they are walking, taking transit, driving or riding a bike.

This doesn't mean that every street looks the same. Each roadway is unique and should be designed in response to its community context – that includes adjacent land uses, the function of the street within the overall transportation system (e.g. local road versus major arterial), and the role of the corridor in creating connected networks and routes for the different modes. A critical transit corridor will look and feel different from a rural road; the presence of a major bike route will heavily influence the design and operation of a roadway. The Florida Department of Transportation's recent Context Classifications for Complete Streets is a useful illustration of this point (Figure 16).

A complete streets approach provides the flexibility to enable roadway designs to achieve policy priorities and goals. In the more urbanized areas of the region, ARC seeks to encourage short trips, active transportation, and transit

WHAT ARE COMPLETE STREETS?

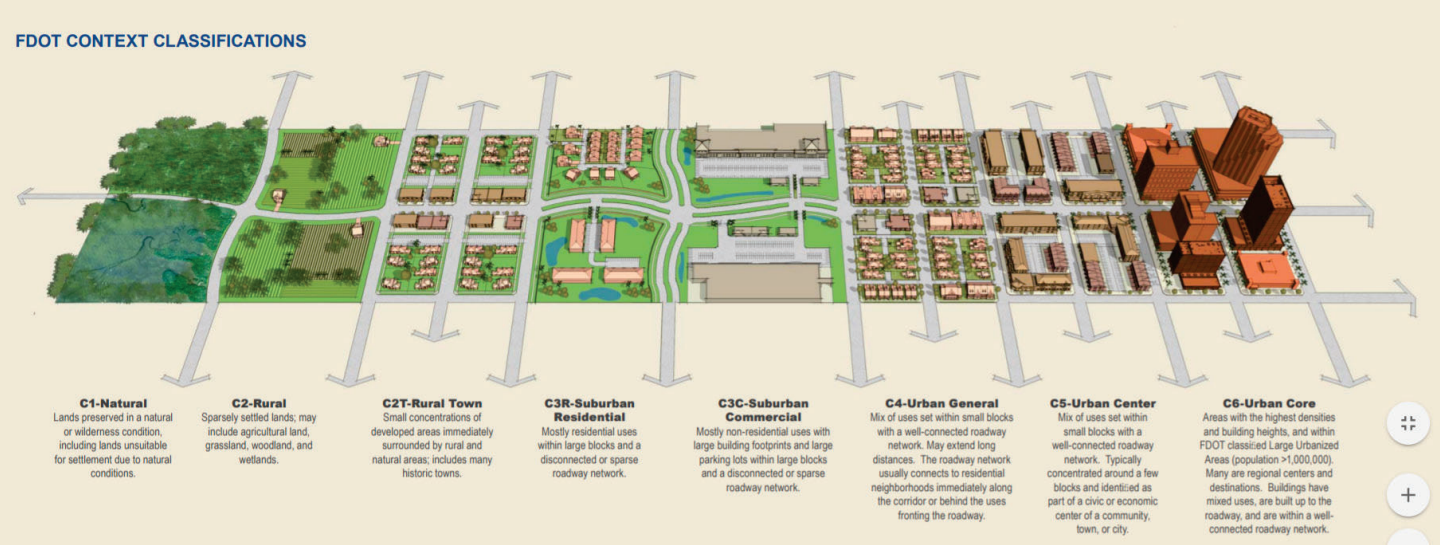
"Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete Streets make it easy to cross the street, walk to shops, and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from train stations.

Creating Complete Streets means transportation agencies must change their approach to community roads. By adopting a Complete Streets policy, communities direct their transportation planners and engineers to **routinely design and operate the entire right of way to enable safe access for all users**, regardless of age, ability, or mode of transportation. This means that every transportation project will make the street network better and safer for drivers, transit users, pedestrians, and bicyclists—making your town a better place to live."

Source: National Complete Streets Coalition

Before and after, Complete Street example in downtown Denison, Texas.

Figure 15. Florida DOT's Context Classifications for Complete Streets.



use; complete streets designs can emphasize walking, biking and transit access in those areas. Safety is a regional goal that is heavily influenced by roadway design and a complete streets approach ensures a range of appropriate proven safety countermeasures is available regardless of whether a road is urban, suburban or rural.

ARC's Role in Implementing Complete Streets

Each year, hundreds of miles of roads in the 20-county region are resurfaced, repaired, or reconstructed by State and local agencies. New miles of roadway are added in an attempt to reduce congestion. Every one of these projects is an opportunity to implement proven safety countermeasures to prevent and eliminate fatal and serious injury crashes among all road users.

ARC does not implement these projects directly; that is the role of GDOT and city, county, and other local public works or transportation agencies. As the designated Metropolitan Planning Organization for the region, ARC plays an important role in coordinating and approving projects that use Federal transportation funds. In this capacity, the agency has the ability to establish funding guidelines and scoring processes that support regional policy goals such as safety. (See earlier section)

In addition, ARC provides sample policies, guidance, and technical assistance in a range of areas in support of regional policy goals.

ARC will support local agency Complete Streets implementation by:

1. Championing complete streets principles and supporting regional, state, and local complete streets implementation.
2. Promoting safer street designs and providing a comprehensive set of design element examples to systematically eliminate risk factors from the region's roads.
3. Actively supporting complete streets policies of member jurisdictions and providing examples or case studies to support new policies.
4. Offering technical training for ARC staff, local agency engineers and planners, and consultants on implementing complete streets, including policy development, programs, and design standards.
5. Supporting coordinated land use and transportation planning via the LCI program, funding, and technical assistance to develop local plans, zoning codes, development regulations, and street design guidelines to achieve complete streets.

A Spectrum of Complete Streets Project Implementation

The individual elements of a "complete street" vary based on context and range from the straightforward (marking a crosswalk) to the complex (changing adjacent land uses). There is no sequence in which these design elements and changes should occur and the transformation of a corridor into a Complete Street does not have to happen in one fell swoop. Some design elements, such as those related to universal design and accessibility, might be implemented as a stand-alone program across numerous locations; other techniques such as road diets require a more comprehensive, site-specific project.

Basic sidewalk infrastructure on major road

Separated bike lane installed on busy arterial road

Delivering Dignity and Basic Safety

There are hundreds of miles of high-speed, high-volume suburban roads in the Atlanta region that may never be considered attractive destinations for a pleasant stroll. Nonetheless, they should provide an environment where people [who may have no choice] can walk or ride with dignity and safety, i.e. not in the gutter or on goat paths worn into the grass.

- **Accessible Streets:** the installation of curb ramps and detectable warnings at every location where sidewalks transition to the roadway is a straightforward and immediate need; it is also the foundation of a complete street.
- **Filling Gaps:** missing sidewalks, crosswalks and short-cut connections should be identified and filled, especially in proximity to transit service and activity generators (such as shopping centers, medical and social service facilities, recreation areas, apartment complexes, and major employment centers).
- **Safe Transit Stations and Stops:** every train station and bus stop should be accessible, safe and convenient for people on foot and bike. Stations and stops in mid-block locations or away from the traffic controlled environment of a signalized intersection should have safe, marked and controlled crosswalks, medians and lighting.

Connecting People and Communities

Connectivity and convenience go hand in hand with creating a safe and accessible transportation system that gets people where they want to go. Pedestrians benefit from a minimum grid of safe streets and crosswalks; bicycling increases dramatically with access to a low-stress network of trails, local streets, and busier roads with protected bicycling infrastructure.

- **Controlled crossings:** as vehicle speeds and volumes increase, people need more frequent safe places to cross the road, sometimes in midblock locations. Signalized crosswalks, leading pedestrian intervals, protected turns, and HAWK signals are all available to create a minimum grid of safe, accessible streets.
- **Neighborhood Greenways:** there are a lot of local roads that are suitable for bicycling but they aren't connected and there are no safe crossings of the busier roads that separate them. Neighborhood greenways make these connections and focus on creating safe crossings; they can also provide better connectivity for pedestrians without limiting motor vehicle access.
- **Separated bike infrastructure:** most of the population doesn't feel safe riding on busy roads without physical separation from motor vehicle traffic. Protected or separated bike lanes, together with careful intersection design, can create a safer, more attractive bicycling environment. Regional trails offer a similar comfortable biking experience.

Neighborhood traffic calming

Infill development served by a regional trail

Transformational Projects

Many of the risk factors for pedestrian and bicyclist crashes—as well as motor vehicle collisions—exist because roads haven't been designed with the needs of people on foot, bike or transit in mind. More complex and transformational projects can correct this by introducing area-wide traffic calming solutions, high capacity transit corridors, and by reducing the number of lanes and lane widths to better manage traffic flow for all users.

- **Right-sizing roads:** opportunities exist across the metro Atlanta region to transform streets and neighborhoods by reconfiguring roads where lane capacity is underutilized due to relatively low vehicle volumes. Sometimes called road diets, these projects add separation and safe crossings for pedestrians, and create safer turning maneuvers and improved flow for motorists.
- **Priority Transit Corridors:** dedicated bus lanes, priority turns, and even Bus Rapid Transit projects can increase the overall capacity of a roadway and better serve adjacent neighborhoods, making more effective use of the existing right of way. In the long term, transit can be used as a tool to support community planning and building more walkable, safer communities.
- **Area-wide traffic calming:** thousands of miles of low volume roads and neighborhood streets exist throughout the ARC region that could be much safer places to walk, bike and drive if motor vehicle speeds were kept to 20-30 mph or lower. Area-wide traffic calming programs can affect change over entire neighborhoods, not just one street or location.

Achieving Long Term Change

Ultimately, complete streets are just one part of a larger, long term shift in development patterns and attitudes towards a more sustainable, safe, people- and community-centered region. During the course of the next 20 years, the Atlanta region will undergo significant change and rebuilding as the population grows and dramatic shifts in demographics, the retail environment, housing patterns and technology take hold. Choices and policy decisions we make today are essential to ensuring these changes result in a safe, sustainable and people-centered region.

- **Changing land use patterns:** the Livable Centers Initiative has set the precedent for focusing development in ways that encourage active transportation, transit and safe, connected communities rather than continuing to allow sprawling, unsustainable development that is narrowly-focused on single-occupancy car travel.
- **Embracing technology:** the exciting opportunities presented by the development of autonomous and connected vehicles must be harnessed to deliver the promise of significantly reduced car ownership, use and storage (i.e. parking), as well as a dramatically safer traffic environment. Policy should lead technology on this journey.
- **Creating a safety culture:** establishing a goal of Zero fatalities and serious injuries within a generation is going to take a commitment on the part of every single user of the transportation system, as well as policymakers, traffic engineers and community planners. That commitment exists in the world of aviation, shipping, rail, and workplace safety and must be extended to our highways and communities.

EVALUATION AND RESEARCH

ARC recommends future research and analysis into new areas of inquiry that will assist regional efforts to eliminate fatal and serious traffic crashes.

8. Support Improved Data Collection, Crash Analysis, and Evaluation

Consistent and compete data is foundational to a safe system approach to traffic safety. Throughout the ***Safe Streets*** development, limitations to data have highlighted areas that need further exploration and more detailed analysis. ARC recommends future research and analysis into new areas of inquiry that will assist regional efforts to eliminate fatal and serious traffic crashes.

Improved Data Collection and Analysis

A number of further research needs and issues were identified during the development of the Safe Streets plan including:

1. more definitive and complete information is needed on the cause or contributing causes of crashes.
2. the inclusion of information on non-auto crashes, near misses, and the perception of safety would add to the overall crash picture
3. multi-dimensional crash analyses would offer more objective assessments of safety. For example, there are increased numbers of pedestrian crashes near transit stops—but no analysis of whether crash victims were using transit or were at that location for other reasons.
4. further research is needed into the traffic safety impact of the development patterns and built environment fostered by the Livable Centers Initiative
5. a better understanding of the intersectionality of race, poverty, housing, access to jobs, health, and traffic safety is essential to improving traffic safety in an equitable manner.

ARC will support research initiatives to help answer these questions by participating in research efforts, writing letters of support for regional priorities, providing technical or material support in research efforts, hosting or fostering students and academics, and identifying future funding efforts for research and analysis.

Evaluation

Tracking non-motorized fatalities and serious injuries will help determine whether the region is moving towards zero traffic fatalities and will support the future establishment of more aggressive targets. The current Federal performance measures establish a clear framework for evaluating regional progress:

PRINCIPLES FOR AUTONOMOUS VEHICLES AND SHARED MOBILITY

The World Resources Institute recently facilitated the development of "The 10 Shared Mobility Principles for Livable Cities", produced by a consortium of international transport experts from seven organizations. The principles are designed to guide urban decision-makers and stakeholders toward the best outcomes for all in ongoing changes to transport technology, operational systems, and ownership and business models. The principles:

1. Plan cities and their mobility together.
2. Prioritize people over vehicles.
3. Support the shared and efficient use of vehicles, lanes, curbs and land.
4. Engage with stakeholders.
5. Promote equity.
6. Lead the transition towards a zero-emission future and renewable energy.
7. Support fair user fees across all modes.
8. Aim for public benefits via open data.
9. Work towards integration and seamless connectivity.
10. Support that autonomous vehicles in dense urban areas should be operated only in shared fleets.

http://www.wrirosscities.org/our-work/project-city/shared-mobility-principles-livable-cities

1. Number of non-motorized fatalities and non-motorized serious injuries.
2. Anticipated effect of the Transportation Improvement Program (TIP) toward achieving adopted targets.

A robust evaluation program is complimentary to a data-driven project selection process. The effectiveness of ARC's TIP in reducing long-term fatality and serious injury risks will depend on data available and documented during the project prioritization process (see page 48-49), as well as data collected and assessed before and after project implementation. ARC will formally track regional performance measures via the Regional Transportation Plan.

Endnotes

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ATLANTA REGIONAL COMMISSION