Evaluation of Effectiveness of LPI Implementations in Tampa Bay

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FDOT

UNIVERSITY of SOUTH FLORIDA

Outline

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Introduction

- **Florida ranks among the most dangerous states for pedestrians**.
- **Severe pedestrian crashes often occur at signalized intersections**, especially during conflicts with right-turning vehicles.
- **Leading Pedestrian Intervals (LPIs) offer a 3–7 second head start for pedestrians to reduce such conflicts**.
- **FDOT District 7 leads the state, having implemented LPIs at over 500 intersections**.
- This study, sponsored by **FDOT District 7**, evaluated LPI effectiveness through **crash data review, cross-sectional and before-after studies, and field observation**.

Background

- **LPIs reduce conflicts between pedestrians and right-turning vehicles**, with multiple national studies confirming their effectiveness using conflict and crash data analyses.
- **FHWA's national study found a 13% reduction in pedestrian crashes and strong Crash Modification Factors** (0.87 for total crashes, 0.86 for injury crashes), along with high benefit-cost ratios (207:1 to 517:1) (Goughnour et al., 2018; FHWA).
- **Florida has prioritized LPIs** as a pedestrian safety strategy, with a 2017 FDOT-sponsored USF study confirming their effectiveness (Lin et al., 2017).
- **The USF study emphasized site-specific assessments**—including pedestrian and vehicle volumes and intersection geometries, and developed warrants to guide their use (Lin et al., 2017).
- **The FDOT Traffic Engineering Manual (TEM) outlines LPI timing guidelines** with a typical **maximum** of **10** for intersections with actuated pedestrian phases, with typical LPIs of **4-7** seconds, and **3** seconds for those operating near capacity (FDOT, 2023).

Research Approach and Methodology

Evaluate LPIs in FDOT District 7 Using Crash Data and Surrogate Driver Behavior Data.

- **Crash Data Analysis**
  - Covered 375 intersections across five counties, with focus on incidents near corners and first travel lanes.
  - Site classification (downtown, urban, suburban, rural) enabled balanced sampling; 40 intersections were randomly selected for detailed review.
  - Supplemental review included JMT's GIS-based analysis of pedestrian fatalities at 363 LPI sites across pre/post periods.

Research Approach and Methodology (Cont'd)

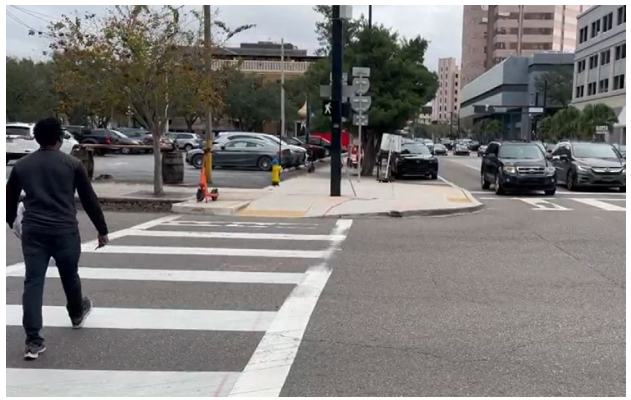
- **Driver Behavior Studies**
  - Used 3 methods
    - **Before-and-after (2 sites)**
    - **Cross-sectional (LPI vs. non-LPI site)**
    - **Yielding behavior (8 LPI sites)**
  - Observed 4 key behaviors during the first 5 seconds of "WALK" phase: **(1) *Full stop, (2) Slow & yield, (3) Fail to yield, (4) Conflicts (rare)*.**
  - Field observations captured signage, lane use, time of day, and photos; >30 observations per site ensured robust data.

Field Data Collection: LPI Study Sites

E Jefferson St. & Howell Ave

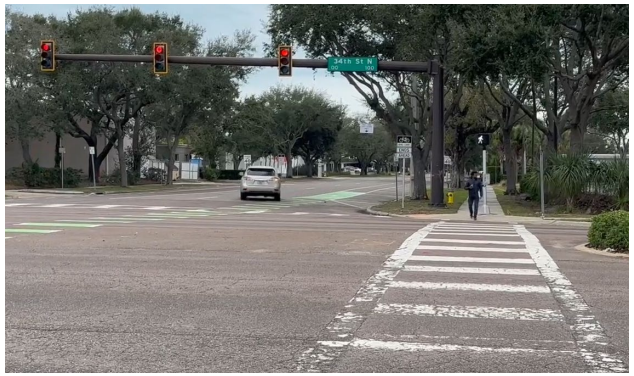
E Fowler Avenue & Bruce B Downs

Park Blvd & 49th St.



Florida Avenue & Kennedy Blvd

W Bush Blvd & North Blvd



US 19 & 1st Avenue N

Tampa St & Kennedy Blvd

Kennedy Blvd / Rome

Results: CUTR's Pedestrian Fatal Crash Analysis

- Pedestrian crashes may not relate to LPI if occurring outside its active range.
- Only crashes proximity to a corners can be used to evaluate the effectiveness of LPIs, but such proximity data is often unavailable in crash reports.
- 30 intersections showed no pedestrian crashes before and after installing LPI systems.
- 10 intersections lacked sufficient pedestrian crash data to support meaningful conclusions.
- **No definitive conclusions were drawn about LPI effectiveness due to limited supporting data**.

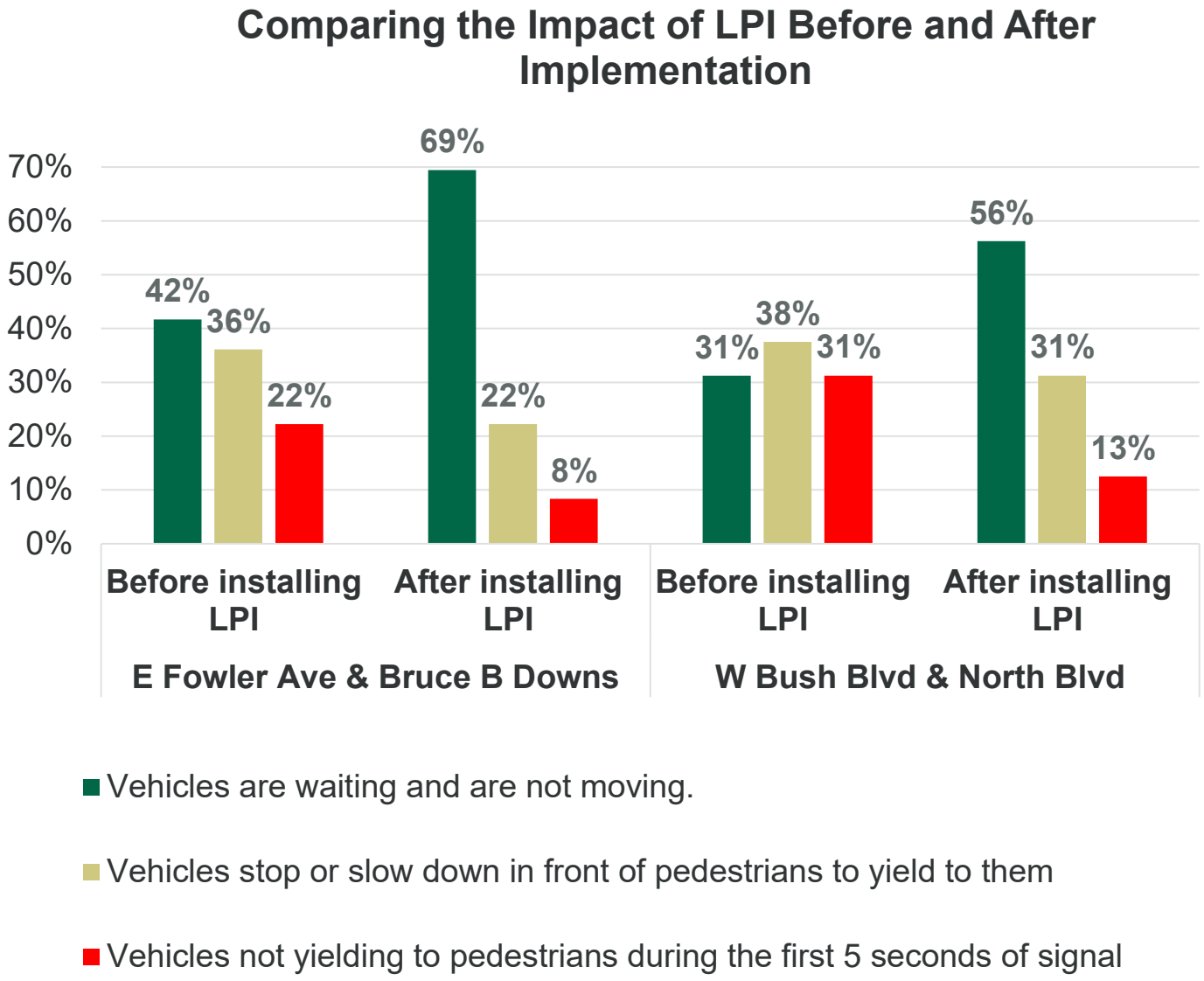
Results: JMT's Pedestrian Fatal Crash Analysis

Pedestrian Fatal Crashes One Year Before and After LPI Implementations

Pedestrian Fatal Crashes Before/After LPI 363 LPI Locations		
	Before LPI *April 18, 2020 to April 18, 2021 (12 months)*	After LPI *February 13, 2022 to February 13, 2023 (12 months)*
Citrus	0	0
Hernando	0	0
Hillsborough	1	1
Pasco	3	4
Pinellas	8	0
Total	12	5 (-58%)

Pedestrian Fatal Crashes Two Years Before and About Two Years After LPI Implementations

Pedestrian Fatal Crashes Before/After LPI 363 LPI Locations		
	Before LPI *April 18, 2019 to April 18, 2021 (24 months)*	After LPI *February 13, 2022 to January 26, 2024 (23 months and 13 days)*
Citrus	0	0
Hernando	0	0
Hillsborough	1	2
Pasco	3	5
Pinellas	12	3
Total	16	10 (-38%)



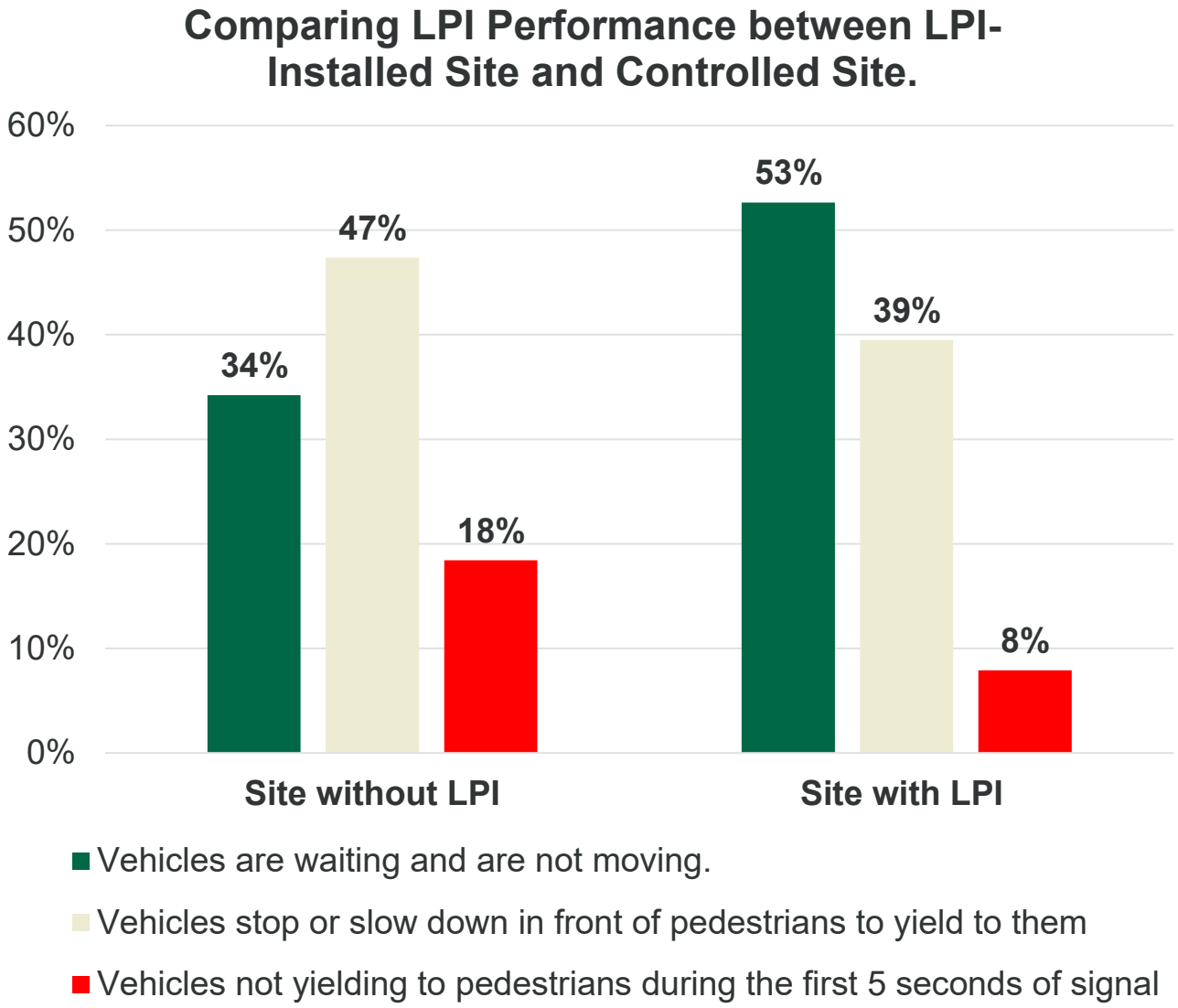
Results: Before LPI vs After LPI

Overall Impact

26% — 71% improvement

-10%

-16% — 61% improvement

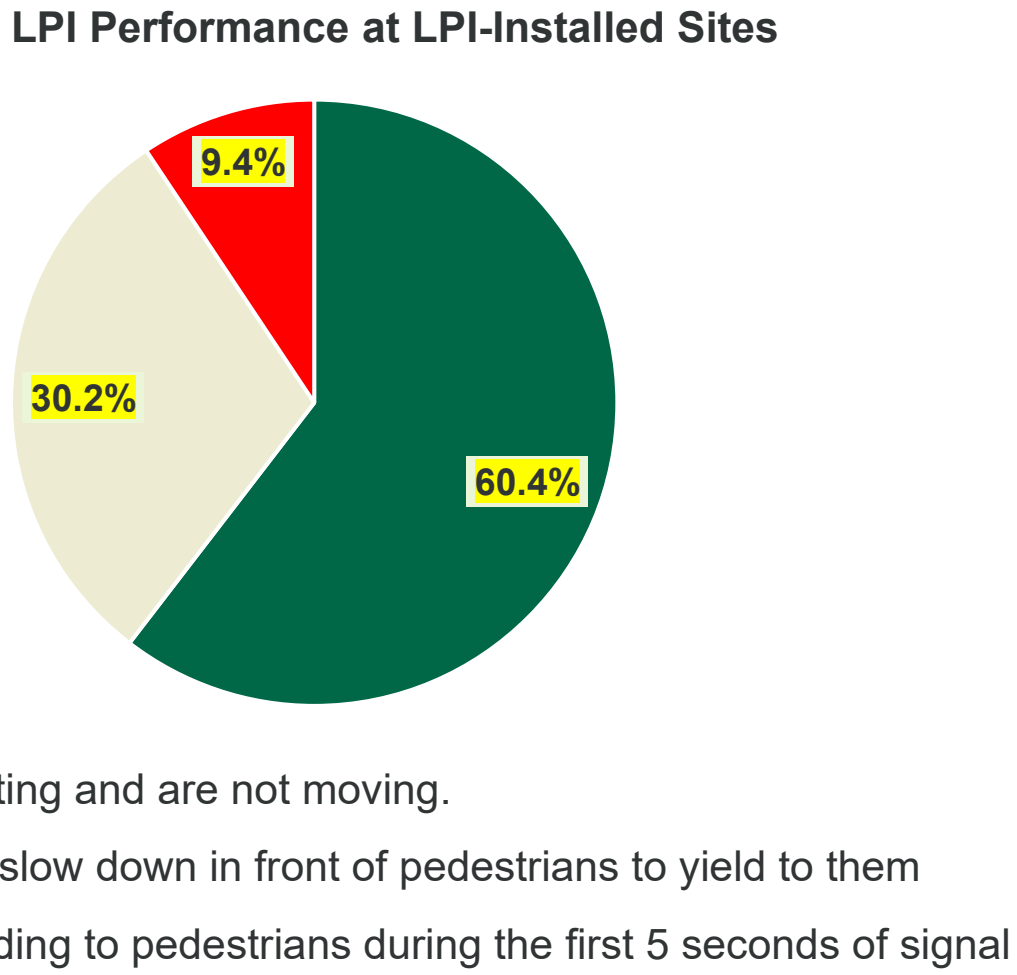


Results: LPI Site vs Controlled Site

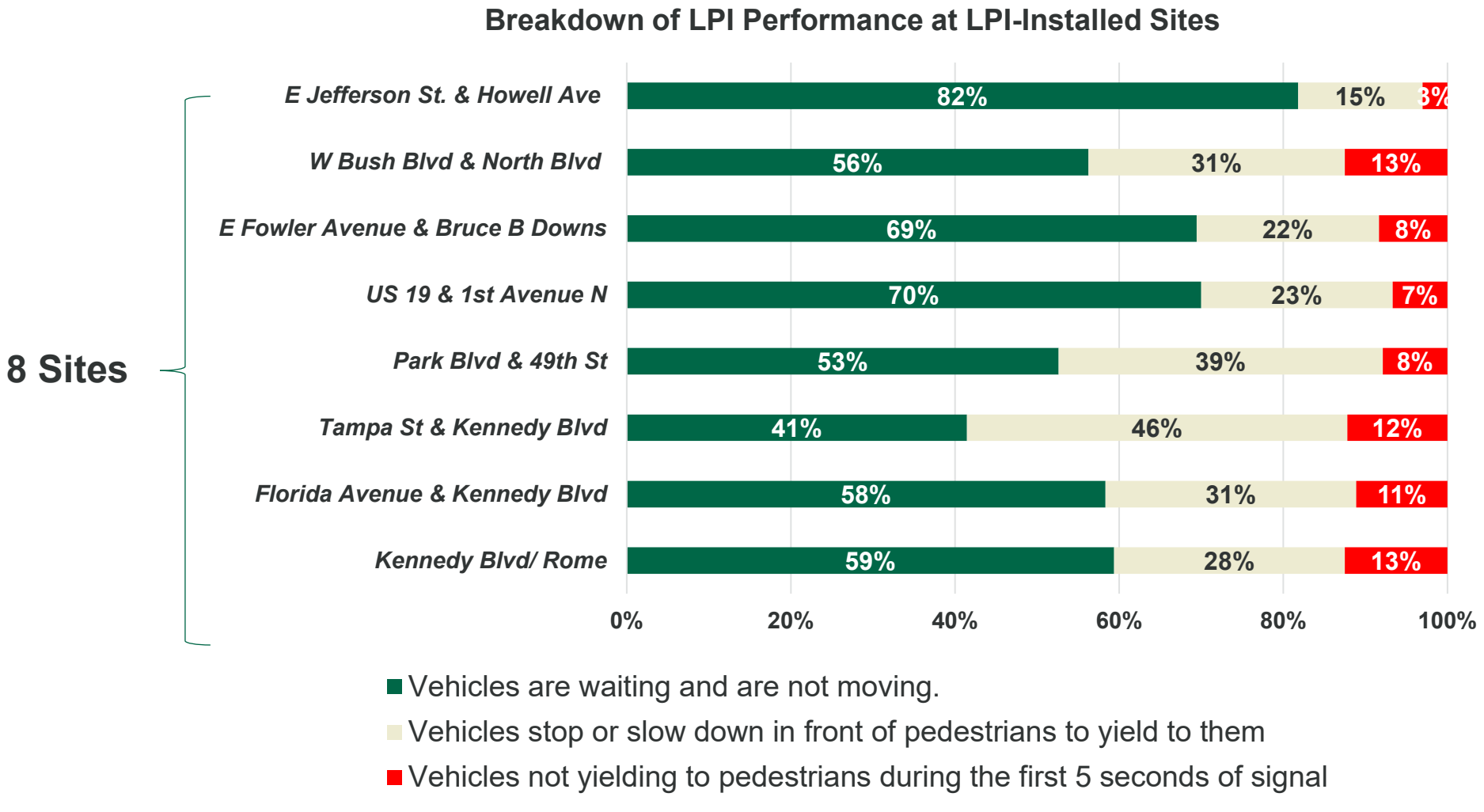
Overall Impact

19%	↑	56% improvement
-8%	↓	
-11%	↓	56% improvement

Results: Performance of LPI Sites



Results: Performance of LPI Sites (Cont'd)



Findings and Main Takeaways

Findings:

- **Although crash analysis showed a 58% drop in pedestrian fatalities at the intersections** one-year post-LPI, and a **38%** drop over two years, **results varied significantly by county, and the conclusion of LPI's effectiveness by county was totally different.**
- **Before-and-after field studies showed a 26% rise in safe driver behaviors** (waiting during WALK) and a **16% drop in unsafe actions**.
- **Cross-sectional study found 19% higher compliance at LPI sites** versus non-LPI sites, and an **11% decrease in failure to yield**.
- **At 8 LPI-equipped sites, 91% of drivers stopped or yielded,** with only 9% failing to yield during the WALK phase.
- **Individual site compliance ranged from 87% to 97%, confirming LPIs' effectiveness in varied urban settings.**

Findings and Main Takeaways (Cont'd)

Key Takeaways:

- **LPIs significantly improve pedestrian safety by increasing driver compliance** and foster safer interactions between pedestrians and right-turning vehicles.
- LPIs not only improve compliance but also create a predictable and safer environment for pedestrian crossings.
- **LPIs offer a low-cost, high-impact strategy to reduce pedestrian-vehicle conflicts.**
- Before-after crash analysis for an entire intersection cannot be used to accurately evaluate LPI's effectiveness.
- Field studies are crucial for evaluating behavioral impacts beyond crash data.
- **Combining LPIs with blank-out signs could strengthen driver awareness and boost pedestrian protection.**

Thank you!

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