Pedestrian Safety
Many Say Pedestrian Safety is a Shared Responsibility
Safety Assessments

- Begins with examination of crash reports
- At sites examine conflicts or incidents
- Examine unsafe behaviors that could be related to the crash type
Special Concerns

- Screening Crashes
  1. Dangers of midblock multilane
  2. Turning vehicles A pillar

- Failure to Scan for Pedestrians
  1. Drivers turning right
  2. Drivers turning left
  3. Speed narrows field of vision
Treatment Strategies

- Prompting
- Feedback Systems
- Increasing or Reducing Effort
- Increasing or Reducing Wait Time
- Incentive Systems
Traffic Signals

- Advance or Offset Stop Bars
- Leading Pedestrian Phase
- Hot buttons
- Buttons that confirm press
- Wide turning radius and wide lanes
- Countdown signals and signals that remind you to look
- Signs that prompt drivers of turning vehicles to look
Where do you look

All Pedestrian Crashes at Signalized Intersections

Pedestrian Crashes at Signalized Intersections Resulting in Serious Injury or Fatality
It matters which direction you cross.

Figure 3. Examples of potential conflicts involving pedestrians and turning vehicles.
Leading Pedestrian Phase
Like taking a lead in baseball
Turning Radius and Conflicts
Signaleyces
Countdown Signals and SignalEyes
Hot Button

- Vehicle Speed - Faster Vehicles More risk
- Gap Size - Shorter Gaps More Risk
- Crosswalk Length - Greater length More Risk
- Number of lanes to cross – more lanes more risk
- Directions that need to be watched. Ones Way Seems Less Risky Than Two Way Traffic
- Presence of absence of a median or pedestrian refuge island
Availability of Concurrent Behavior. Waiting is Easier When Activities are Made Available

- Something to Listen to Such as Music.
- Something to Look at. Flowers, Interesting Displays. Something to read
- Provide interesting messages
- This is why they give children crayons in restaurants. Adults work the same way
Relationship between violation and minimum green time

Pedestrians waiting for WALK at Alton Rd

Percent

30 sec.  1 min.  2 min.

Length of Vehicle Minimum Green Time
Figure 1. Miami-Dade High Pedestrian Crash Zones.
Reducing Screening Crashes

- Advance Stop Lines and Yield Markings
- Rectangular Rapid Flashing Beacons (RRFB)
- Pedestrian Hybrid Beacon (PHB)
- In-Street Signs
It is dangerous when cars stop to close
Data from 24 site study
Component Analysis

Figure 3. Percentage of total evasion conflicts during each session of Experiment 1.
In Street Signs
One vs. three signs
Evaluation of in street pedestrian crossing sign
RRFB
Data From Miami Sites

FIGURE 3  Percentage of drivers yielding for crosswalk at Northwest 67th and Main Streets during each experimental condition: (a) staged pedestrians and (b) local resident pedestrians. (Filled circles represent percentage who yielded for daytime crossing, and unfilled triangles show data for nighttime probe crossing.)
## Data From 19 Sites

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</table>
Another Example
Results

- **Trowbridge Averages**
  - No sign: 25%
  - 1 sign: 57%
  - Gateway configuration: 79%

- **Farmington Averages**
  - No sign: 25%
  - 1 sign: 57%
  - Gateway configuration: 82%
What happens if we combine them?

- Two comparisons
  - Gateway vs one in Street Sign
  - Gateway + PHB
- Two sites
- Same collection method
- Reversal design
Gateway not needed at Cass
Results

* Livernois Averages
  * No sign: 1%
  * 1 sign: 37%
  * PHB: 62%
  * PHB and 1 sign: 85%
  * Gateway configuration: 72%

* Cass Averages
  * No sign: 10%
  * PHB: 84%
  * PHB and 1 sign: 94.5%
The role of the Sign
Use of Delineators
Examine Just Edge Signs

- The use of just edge signs in the gutter pan without the sign on the lane line may have greater survival value.
- We will compare an edge side gateway with the three point gateway.
Sign Survival

- Operating Speed
- ADT
- Lane width
- Number of Lanes
- Protection by a delineator
- Type of installation
Combined with delineators
The Use of Treatment Packages to Produce a Culture Change

- A good package in multi faceted
- A good package is cost efficient
- A good package ties components together to generate a synergistic effect
Treatment and Generalization Sites
Prior to Beginning we Refreshed Crosswalk and Added Advance Stop/Yield Markings
Advance Stop Bar at Hawk

Ypsilanti Hawk
Hawk w/out stop bars

Hawk with stop bars
Yielding Distances

Ypsilanti Yielding Distances

- <10 ft: 5% (w/o Stop Bars), 0% (w/ Stop Bars)
- 10-20 ft: 8% (w/o Stop Bars), 1% (w/ Stop Bars)
- 20-30 ft: 17% (w/o Stop Bars), 1% (w/ Stop Bars)
- >30 ft: 71% (w/o Stop Bars), 98% (w/ Stop Bars)
## Treatment Strategy

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Community Support

* Identify community groups who can support the program
* Focus on getting support and participation from a cross section of community groups
* Once on board include groups as program sponsors
Enforcement Countermeasures

- Begin with warnings to win support
- The use of police decoy pedestrians
- The use of flyers handed to stopped drivers that documented the seriousness of the problem
- The use of a sandwich board downstream of the enforcement site to inform drivers passing through that a pedestrian operation was being conducted
- Rapid rotation between many sites
- Use of standardized procedures that have held up in court
Sandwich board signs clearly delineate what law is being enforced.
Replaced with a portable sign that is much larger
The Solution at Uncontrolled Crosswalks

- Operational definition of failure to yield and specific standardized procedure
- Use decoy pedestrians
- Warning flyers to inform about law and magnitude of the problem
Operational Definition of Not Yielding

We use the signal timing formula used to time yellow duration to calculate the dilemma zone.

If a driver can avoid running a light they can yield.

We place a cone at the location.
Standard Crossing Protocol

- Start to cross only when vehicle is close to but has not yet reached the cone.
- Begin by placing one foot off curb between crosswalk lines.
- Do not begin to cross in front of vehicle unless driver is clearly slowing to yield for you.
- If a gap appears finish crossing.
Multilane roads

* If a vehicle yields close to crosswalk do STOP AND LOOK AT LANE LINE before proceeding

* Passing a stopped vehicle at a crosswalk is an infraction. Cite people who do this.
Use of Warnings

* Warnings allow more stops
* Warning flyers help to sell the program
* Warnings allow a transition from no enforcement to enforcement of rules
You have just failed to yield to a pedestrian at a crosswalk in Gainesville.

Drivers MUST yield to pedestrians at crosswalks. It's the law!

- Florida has one of the highest rates of pedestrian injuries in the Nation.
- Each year more than 8,000 pedestrians are injured and more than 500 are killed.
- The cost to the State is estimated at approximately $300,000,000 annually.

In Gainesville, crashes involving pedestrians for 2007 and 2008 totaled 278; more than 2 per week.

The law is clear:
- Drivers must yield to pedestrians in crosswalks. This means stopping when necessary to let a pedestrian cross.
- Drivers must yield even if there are no pavement markings at the crossing.
- Drivers may not overtake other cars stopped at a marked or unmarked crosswalk to permit a pedestrian to cross.
- Turning vehicles must yield to pedestrians crossing on a green light or with the WALK signal.

We are trying to make our streets safer for everyone. Help us by cooperating and by encouraging others to do the same.

A safety message from the Gainesville Police Department, University of Florida Police Department and Alachua County Sheriff's Office

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**Drivers**: Protect pedestrians at crosswalks!

Follow these four rules:

1. Never stop directly at or too near a crosswalk. Stop 30 feet back so pedestrians can see cars in other lanes.

2. Wait until pedestrians have crossed at least one lane beyond yours before proceeding.

3. Be alert for children. They may dart out into traffic without warning. Adults may also do the same.

4. Use special care when turning at intersections. Pedestrians are more vulnerable to turning vehicles and must look over their shoulder to see them.
Common Excuses

* I did not see the pedestrian
Didn’t know I had to yield
They don’t even yield to a blind pedestrian
Educational Elements

* Warnings distributed to residents just prior to the beginning of the first wave (warnings) and second wave (citations)
* Earned media
* Large highway feedback signs
* Partnerships between city agencies, and community partners
NOTICE

We are sending you this notice to alert you that the Gainesville Police Department, Alachua County Sheriff’s Department, and University of Florida Police Department will begin an intensive program of stopping and ticketing drivers that do not yield to pedestrians in crosswalks starting this coming week.

We need your help to make Gainesville safer for pedestrians of all ages.

You can help by:

1. **Looking for pedestrians in crosswalks**
2. **Yielding by stopping or slowing for the pedestrian** as the law requires
3. **Encouraging others to do the same**

**Be a Good Model. Yield, avoid a ticket, and help keep pedestrians safe**

*A safety message from the Gainesville Police Department*
Pedestrians:
Make crosswalks work for you!

Follow these rules:
1. Wait for the walk signal.
2. At crosswalks without traffic signals, place only one foot off the curb in the street.
3. Wait for the cars to stop.
4. NEVER, NEVER STEP IN FRONT OF A MOVING VEHICLE!
5. Keep looking for oncoming vehicles as you cross each lane.
6. Keep looking from side to side and over your shoulder for turning vehicles as you cross.
7. Thank drivers with a friendly wave.

Crosswalk markings and traffic lights don’t stop cars. Make sure you KEEP LOOKING!

After dark, drivers cannot see pedestrians in dark clothing until it is too late. Even if their head lights blind you, they still cannot see you. Wear retro-reflective materials or carry a light flash light to make yourself more visible.

The Crosswalk Safety Program is a joint initiative of the Gainesville Police Department, the University of Florida Police Department and the Alachua Sheriff’s Office.

The program is endorsed by the following organizations:

CROSSTALK SAFETY

In Gainesville, an average of 140 pedestrians are injured each year.

Prepared by CERS
www.cers-safety.com
Drivers MUST yield to pedestrians.

It's the law.

Florida has one of the highest rates of pedestrian injuries in the nation.

Each year more than 8,000 pedestrians are injured and 500 are killed.

In Gainesville, an average of 140 pedestrians are injured each year.

The Law in Florida is CLEAR:

- Drivers must yield to pedestrians in crosswalks. This means stopping when necessary to let a pedestrian cross.
- Drivers may not overtake other drivers stopped at a crosswalk.
- Drivers must yield even if there are no pavement markings at the crossing.
- Turning vehicles must yield to pedestrians crossing on a green light or with the WALK signal.

WE ARE TRYING TO MAKE OUR STREETS SAFER FOR EVERYONE. HELP US BY COOPERATING AND BY ENCOURAGING OTHERS TO DO THE SAME.

Drivers:

Protect pedestrians at crosswalks!

Follow these four rules:

1. Never stop directly at or too near a crosswalk. Stop 30 feet back so pedestrians can see cars in other lanes.
2. Wait until pedestrians have crossed at least one lane beyond yours before proceeding.
3. Be alert for children. They may dart out into traffic without warning. Adults may also do the same.
4. Use special care when turning at intersections. Pedestrians are more vulnerable to turning vehicles and must look over their shoulder to see them.
# Earned Media

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<tr>
<td>December</td>
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</tr>
</tbody>
</table>
We used this idea for speeding, seatbelt use and yielding to pedestrians
Speeding

Drivers not speeding yesterday 94%

Best record 94%
Stringent vs. Lenient Speed Criteria

VARIABLES INFLUENCING DRIVER SPEED

PLEASANT ST.

PERCENT DRIVING AT OR OVER

60 km/h

50

40

30

20

10

0

SESSIONS

5 10 15 20 25 30 35 40 45

Baseline 1

Posting Stringent Criterion

Posting Lenient Criterion

Baseline 2

Posting Stringent Criterion

Posting Lenient Criterion

Posting Stringent Criterion
Warning flyers gave reasons why drivers should not speed.

Featured that two children had been struck.

Asked them to be good models.

IT DOESN'T MAKE SENSE TO SPEED ON MOUNT EDWARD ROAD

THERE WERE 20 TRAFFIC ACCIDENTS ON MOUNT EDWARD ROAD LAST YEAR

2 children were struck by vehicles
1 vehicle was struck from behind
2 vehicles lost control while turning
4 vehicles were struck while turning in front of other vehicles
3 vehicles were struck while entering from side streets
3 vehicles were struck while passing other vehicles
2 vehicles were struck while parked on the street
3 miscellaneous

DAMAGE TO VEHICLES WAS WORTH OVER $14,175.

THE TWO PEDESTRIANS INJURED ON MOUNT EDWARD ROAD LAST YEAR WERE CHILDREN

There are six schools in this area with a total enrollment of 4,607 students. Every morning, noon hour and afternoon, the sidewalks and crosswalks along Mount Edward Road are full of children on their way to and from school. Yet - at these same times, drivers on Mount Edward Road have been clocked as high as 80 km/hr. THINK AGAIN. AT YOUR SPEED YOU MIGHT NOT HAVE BEEN ABLE TO STOP IF AN INATTENTIVE CHILD HAD RUN OUT IN FRONT OF YOU.

AT THE SPEED YOU WERE GOING

You might not have been able to stop if an unpredictable driver tried to turn left in front of you. You might not have been able to stop if a car in front of you stopped suddenly. You might not have been able to stop if a car emerged suddenly from a side street.

SO FAR, NONE OF THE CHILDREN WALKING NEAR MOUNT EDWARD ROAD HAS BEEN KILLED

IF DRIVERS DON'T SLOW DOWN, IT WILL PROBABLY BE JUST A MATTER OF TIME BEFORE ONE IS

WE ARE TRYING TO MAKE YOUR STREETS SAFER FOR YOU. PLEASE CO-OPERATE

SLOW DOWN

Dartmouth Police Force
Warning Program
* Speed reductions for a 1 week program with large numbers of stops produced effects that persisted for a year

* Combining the program with posted feedback produced very large reductions
Replicated in Israel

2. Mean percentage of drivers traveling at or over 60 km/hr and 70 km/hr during each session of Experiment E typical errors. Horizontal dashed lines represent the initial baseline averages.
Paid Radio Ads

- The city of Gainesville prepared 3 radio ads for play on radio stations during the third phase.
- All other TV radio, and printed media spots were the result of earned media.
Protect pedestrians at crosswalks!
Follow these four rules:
1. Never stop directly at or too far from a crosswalk. Stop 30 feet back, so pedestrians can see cars in other lanes.
2. Wait until pedestrians have crossed at least one lane beyond yours before proceeding.
3. Be alert for children. They may dart out into traffic without warning. Adults may also do the same.
4. Use special care when turning at intersections. Pedestrians are more vulnerable to turning vehicles and must look over their shoulders to see them.

What’s a legal crosswalk?
All sides of every intersection are legal crosswalks, regardless of whether or not there is signage, painted lines or a paved sidewalk.

You have just failed to yield to a pedestrian at a crosswalk in Orlando.
Drivers MUST yield to pedestrians at crosswalks.
It’s the law!
- Florida has the highest rate of pedestrian injuries in the Nation.
- Each year more than 8,000 pedestrians are injured and more than 500 are killed.
- The cost to the State is estimated at approximately $300,000,000 annually.

Metro Orlando ranks as the Nation’s most dangerous for pedestrians. An average of more than two pedestrians are injured each day and one is killed each week.

The law is clear:
- Drivers must yield to pedestrians in crosswalks. This means stopping when necessary to let a pedestrian cross.
- Drivers must yield even if there are no pavement markings at the crossing.
- Drivers may not overtake other cars stopped at a marked or unmarked crosswalk to permit a pedestrian to cross.
- Turning vehicles must yield to pedestrians crossing on a green light or with the WALK signal.

We are trying to make our streets safer for everyone. Help us by cooperating and by encouraging others to do the same.
A safety message from the Orlando Police Dept.
Bus wrap

Stop for me...

or, stop for me.

iYield4peds.org
Pedestrian Prompt Signs

AT CROSSWALKS
1 RAISE HAND TO ALERT DRIVERS
2 PLACE ONE FOOT ON STREET
3 WAIT UNTIL CARS STOP
4 THANK DRIVERS

NEVER STEP IN FRONT OF A MOVING VEHICLE
Engineering

- No passing from dilemma zone to the crosswalk
- Use of advance yield markings
- Use of in-street signs to remind drivers that yielding to pedestrians is State Law
In-street signs
Combined with delineators
Yielding Results

* **Treated Sites.** Yielding for staged crossings at treated sites averaged 31.5% during baseline and 62.0% by the end of the study. Yielding for unstaged crossing averaged 45.4% during baseline and 82.7% at the end of the study.

* **Untreated Generalization Sites.** Yielding for staged crossings at untreated generalization sites averaged 36.7% during baseline and 58.5% by the end of the study. Yielding for unstaged crossing at these sites averaged 49.6% during baseline and 72.9% percent at the end of the study.
Weekly yielding at treatment sites

Averages Across All 6 Enforcement Sites

Percent Yielding

Week
## Enforcement Sites

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<th>Baseline</th>
<th>Enforcement</th>
<th>Enforcement &amp; Ticketing</th>
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<tr>
<td>SE 15th Street at SE 11th Avenue</td>
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<td>59.5</td>
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<td>56.3</td>
<td>91.7</td>
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<tr>
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<td>100.0</td>
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<td>52.1</td>
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<tr>
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<td>No Data</td>
<td>No Data</td>
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<td>45.4</td>
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<td>76.3</td>
<td>64.6</td>
<td>82.7</td>
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</table>
Weekly yielding at generalization sites

Averages Across All 6 Generalization Sites

- Baseline
- Enforcement
- Enforcement & Ticketing
- Citations & Ads
- Enforcement & Signs

Percent Yielding

Week
# Generalization Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Baseline</th>
<th>Enforcement</th>
<th>Enforcement &amp; Ticketing</th>
<th>Citations &amp; Ads</th>
<th>Enforcement &amp; Signs</th>
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<tbody>
<tr>
<td><strong>Staged</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>University of Florida Museum Road</td>
<td>82.9</td>
<td>74.6</td>
<td>83.0</td>
<td>84.8</td>
<td>84.5</td>
</tr>
<tr>
<td>NE 16&lt;sup&gt;th&lt;/sup&gt; Avenue at NE 12&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>13.6</td>
<td>39.2</td>
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<td>32.8</td>
<td>47.1</td>
</tr>
<tr>
<td>NW 16&lt;sup&gt;th&lt;/sup&gt; Street at Gainesville Police Dept.</td>
<td>7.2</td>
<td>11.8</td>
<td>13.1</td>
<td>13.0</td>
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<tr>
<td>NW 41&lt;sup&gt;st&lt;/sup&gt; Street at Shopping Center</td>
<td>41.2</td>
<td>56.0</td>
<td>49.7</td>
<td>46.7</td>
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<tr>
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<td>37.3</td>
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<td>70.0</td>
<td>72.7</td>
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</tr>
<tr>
<td>SW 2&lt;sup&gt;nd&lt;/sup&gt; Avenue at SW 1&lt;sup&gt;st&lt;/sup&gt; Street Courthouse</td>
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<td>86.0</td>
</tr>
<tr>
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<td>0.0</td>
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<td>No Data</td>
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<tr>
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<td>100.0</td>
<td>77.8</td>
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<td>No Data</td>
</tr>
<tr>
<td>SE 2&lt;sup&gt;nd&lt;/sup&gt; Avenue at Sweetwater Park</td>
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<td>54.9</td>
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<td>55.6</td>
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<tr>
<td>SW 2&lt;sup&gt;nd&lt;/sup&gt; Avenue at SW 1&lt;sup&gt;st&lt;/sup&gt; Street Courthouse</td>
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<td>95.0</td>
<td>62.0</td>
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<td>87.5</td>
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<tr>
<td><strong>MEAN</strong></td>
<td>49.6</td>
<td>60.5</td>
<td>64.4</td>
<td>67.7</td>
<td>72.9</td>
</tr>
</tbody>
</table>
Individual site results
## Time Series Results Enforcement Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>$LC_1$</th>
<th>$p$-value</th>
<th>$SC_1$</th>
<th>$p$-value</th>
<th>Baseline Level</th>
<th>Level at end of study</th>
<th>End level minus baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average of all six Enforcement sites</td>
<td>11.97</td>
<td>&lt;.001</td>
<td>.484</td>
<td>&lt;.001</td>
<td>30.63</td>
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<td>.912</td>
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<td>E5</td>
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<td>.500</td>
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<td>30.55</td>
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<td>.002</td>
<td>.79</td>
<td>17.52</td>
<td>49.29</td>
<td>31.77</td>
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</tbody>
</table>
## Time series results generalization sites

<table>
<thead>
<tr>
<th>Site</th>
<th>$LC_1$</th>
<th>$p$-value</th>
<th>$SC_1$</th>
<th>$p$-value</th>
<th>Baseline Level</th>
<th>Level at end of study</th>
<th>End level minus baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average of all generalization sites</td>
<td>10.80</td>
<td>.010</td>
<td>.158</td>
<td>.044</td>
<td>37.48</td>
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<td>18.82</td>
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<td>2.64</td>
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<td>70.59</td>
<td>33.56</td>
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</table>
Regression Test Results

- Significant results for enforcement and generalization sites
- Significant diffusion effect
- No significant difference between staged and unstaged crossing results.
- The enforcement group slope (.484) is approximately three times the value of the generalization group slope (.157).
- A test on the difference (enforcement versus generalization) between the overall rate of increase for the two groups of sites is statistically significant ($p < .001$).
- It is clear from these analyses that as a whole, there were large increases in yielding behavior for both groups of sites, but the enforcement group was associated with much larger increases.
Results – Knowledge, Attitudes and Awareness

★ The objective was to increase proper yielding behavior among drivers

★ The program produced a robust increase in awareness associated with the behavioral change in driver behavior.

★ Following the introduction of treatment there was a statistically significant increase in the percentage of people who
  ★ thought they knew the law;
  ★ had seen or heard publicity about the program;
  ★ had read about the program in a newspaper;
  ★ and had seen a road sign showing yielding data.
Whether they had recently seen a road sign containing yielding data after each wave?

<table>
<thead>
<tr>
<th>Jan 10</th>
<th>Apr 10</th>
<th>Sep 10</th>
<th>Jan 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>13%</td>
<td>53%</td>
<td>75%</td>
<td>78%</td>
</tr>
</tbody>
</table>
This Study Produced 5 Interesting Results

1. High-visibility enforcement led steady increase in the percentage of drivers yielding right-of-way to pedestrians over the course of the year.

2. The program produced a marked increase in yielding behavior best described as a sustained change in driving culture.

3. The program produced higher levels of yielding to natural pedestrian crossings than to staged crossings and the changes in both were highly correlated.
4  The effects of the program generalized to crosswalks that were not targeted for enforcement and the amount of generalization to was inversely proportional to the distance from sites that received enforcement.

5  The program produced a large change in driver perception of crosswalk enforcement over the course of the year.
The End