2019

Connecticut Pedestrian Safety Guide

The Connecticut Pedestrian Safety Guide was developed as a part of the 2017 Pedestrian Observational Safety Study to address pedestrian safety issues on a town level. The PSG is a statewide, data-driven safety guide for all of Connecticut's traffic safety partners. This guide is meant to serve as a safety tool for achieving Connecticut's vision of reducing pedestrian fatalities and injuries.

July 2019

Connecticut
Pedestrian Safety Guide

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16. Abstract The Connecticut Pedestrian Safety Guide (PSG) is aimed at providing a comprehensive framework for reducing pedestrian-involved collisions on all public roads. The PSG addresses state-specific pedestrian issues identified from yearlong observations and analysis of pedestrian behaviors at intersections. The PSG establishes targeted statewide goals, objectives, and key emphasis areas for improvement in the traffic safety environment.		
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ACKNOWLEDGMENTS

METRIC CONVERSION FACTORS

	APPROXIMATE CONVERSIONS TO SI UNITS			
SYMBOL	**WHEN YOU KNOW**	**MULTIPLY BY**	**TO FIND**	**SYMBOL**
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in²	square inches	645.2	square millimeters	mm²
ft²	square feet	0.093	square meters	m²
yd²	square yard	0.836	square meters	m²
ac	acres	0.405	hectares	ha
mi²	square miles	2.59	square kilometers	km²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft³	cubic feet	0.028	cubic meters	m³
yd³	cubic yards	0.765	cubic meters	m³
NOTE: volumes greater than 1000 L shall be shown in m³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m²	cd/m²
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in²	poundforce per square inch	6.89	kilopascals	kPa

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TABLE OF CONTENTS

ANALYZED SITES

PROPOSED STRATEGIES:

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LIST OF FIGURES

LIST OF TABLES

Images 4 & 5

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EXECUTIVE SUMMARY

Connecticut Pedestrian Safety Guide

The Connecticut Pedestrian Safety Guide (PSG) is aimed at providing a comprehensive framework for reducing pedestrian-involved collisions on all public roads. The PSG addresses specific pedestrian issues identified from yearlong observations and analysis of pedestrian behaviors at intersections. The PSG establishes targeted statewide goals, objectives, and key emphasis areas for improvement in the traffic safety environment.

Purpose of the PSG

Pedestrians are one of the most vulnerable road users, and their safety continues to be a priority in the State of Connecticut. The lack of available data makes it very challenging to perform meaningful analysis of these types of pedestrian crashes. The purpose of this safety guide is to better focus the state's funding and resources on the areas that have the greatest opportunity to reduce the rate of fatalities, injuries, and crashes involving pedestrians. The strategies within the PSG will provide guidance to the Pedestrian Work Group and key stakeholders concerned with improving pedestrian safety, including the Connecticut Department of Transportation (CTDOT), the Connecticut Transportation Safety Research Center (CTSRC), local law enforcement and state police, local governing agencies, and other pedestrian safety advocates. The PSG will make great strides to meet the Connecticut Strategic Highway Safety Plan's (SHSP) goal to achieve a 15% reduction in the actual number of pedestrian fatalities and serious injuries over the next five years. The PSG supplements and expands on the SHSP by providing more detailed objectives and strategies to improve pedestrian safety around the state. The CTDOT is the designated lead agency for the PSG and provides funding support.

Development of the PSG

The development of the PSG began with the 2017 Connecticut Pedestrian Observational Safety Study. The CTSRC and the CTDOT conducted an observational research study aimed at better understanding pedestrian risk-taking behavior and how it can be used to evaluate and predict vehicle-pedestrian crashes in Connecticut. Research on pedestrian behavior obtained through observational studies provide the most objective and detailed information to perform this type of analysis. The information obtained during this study was used to design this strategic plan, which addresses pedestrian safety through outreach, education, innovative engineering treatment(s) and simulated driving scenarios.

PEDESTRIAN SAFETY GUIDE

Vision

Provide a safe transportation system where people of all ages and abilities can walk, bike, utilize transit, and travel by automobile safely and comfortably on Connecticut roadways.

Mission

The State of Connecticut will use a unified, comprehensive approach to improve pedestrian safety through leadership, innovation, and strategic programs.

Performance Goal

To improve the overall safety of pedestrians, by reducing pedestrian-related crashes, injuries, and fatalities. Ensuring that all areas of Connecticut's transportation system provide safe and accessible travel options for pedestrians.

STATEWIDE PEDESTRIAN CRASH DATA (2015-2017)

The following section displays the most current three years (2015-2017) of pedestrian-involved crash data for the state. Current data on pedestrian-involved crashes in Connecticut are collected from police crash reports and uploaded nightly to an online data repository (*1*). Over 4,000 crashes involving pedestrians occurred on Connecticut roadways from 2015 to 2017. This resulted in over 160 pedestrian deaths and more than 3,900 pedestrian injuries, 698 of which were serious. A serious injury is defined as "any injury other than fatal that results in a severe laceration, broken bones, crushing injuries, significant burns, unconsciousness or paralysis" (*3*). Table 1 displays figures for pedestrian-involved crashes from 2015 to 2017. On average, about half of all crashes involved pedestrian behavior that contributed to the crash, including darting into the road or use of an electronic device.

Table 1 – Pedestrian crash data

	2015	2016	2017
Total Pedestrian-Involved Crashes	1,350	1,580	1,537
Total Fatal Pedestrian-Involved Crashes	49	61	55
Total Injury Pedestrian-Involved Crashes	1,160	1,375	1,294
N of Pedestrian Deaths	47	66	52
N of Pedestrian Deaths < 25 YO	8	12	5
N of All Injured Pedestrians	1,206	1,416	1,338
N of Seriously Injured Pedestrians	198	251	249
N of Crashes w/ Pedestrian Contributing Action	669	786	734

In 2016, Connecticut ranked 20th in the National Highway Traffic Safety Administration's (NHTSA) ranking of state's pedestrian fatality rates with a pedestrian fatality rate of 1.65 per 100,000 population (*2*). This suggests that 61% of the nation is doing a better job of preventing pedestrian motor vehicle related deaths than Connecticut, despite it being a smaller State.

(Please note: NHTSA data is compiled from the Fatal Accident Reporting System – FARS and therefore data may not match crash data from the CTCDR.)

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Figures 1-3 Proportion of Pedestrian Fatalities and Injuries, 2015-2017

Pie chart 1: Pedestrian Deaths 20%, Other MV Deaths 80%

Pie chart 2: Pedestrian Serious Injuries 16%, Other MV Serious Injuries 80%

Pie chart 3: All Pedestrian Injuries 5%, Other MV Injuries 95%
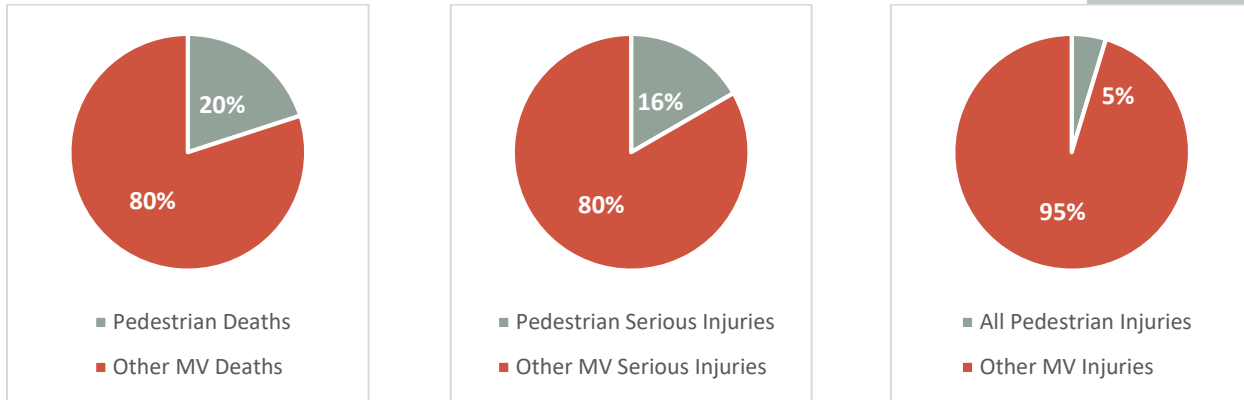
Figure 4 - Injury Status of Pedestrians by Year

2015: Fatality 48, Serious Injury 198, Minor Injury 589, Possible Injury 419, No Injury 197

2016: Fatality 68, Serious Injury 253, Minor Injury 719, Possible Injury 459, No Injury 175

2017: Fatality 47, Serious Injury 229, Minor Injury 618, Possible Injury 375, No Injury 299

Legend: Fatality, Serious Injury, Minor Injury, Possible Injury, No Injury
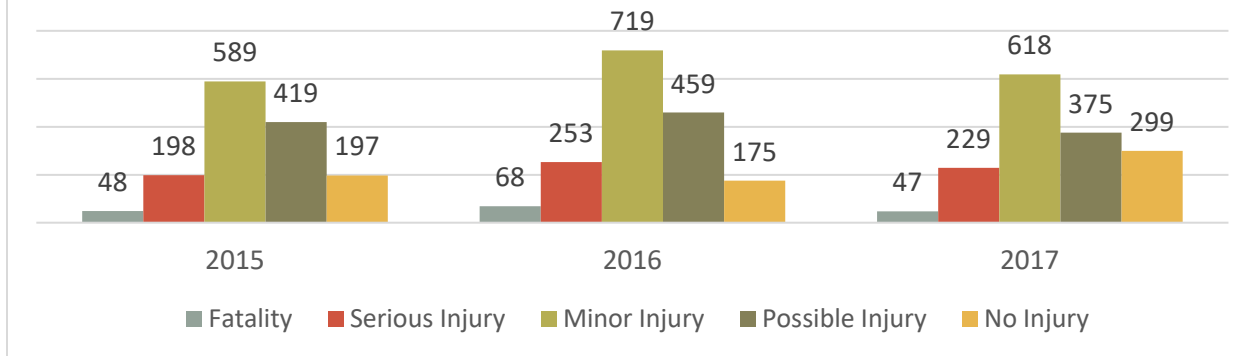
Generally, pedestrian-involved crashes are not a significant part of the motor vehicle crashes we see each year. Crashes with pedestrians represent on average less than 2% of the state's annual crash count. However, the chance of injury or fatality is greatly increased for pedestrians and during the period of 2015 to 2017, an average of over 85% of pedestrians involved in a crash incurred an injury. The most frequently sustained injury to pedestrians was a suspected minor injury as indicated in Figure 4 (*3*). Many of the pedestrians who were killed or suffered a suspected serious injury were between age 25 to 34 (Fig. 5). This trend was observed across all three years. This is unlike national traffic safety trends, where a greater proportion of fatalities are observed in either younger or older pedestrian populations (*4*).

Figure 5 - Age of Killed and Seriously Injured Pedestrians by Year

Legend: 2015, 2016, 2017

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**Figure - 6
Pedestrian Crash Locations
2015-2017**

- Intersection or Intersection-related
- Other

39.93%

60.07%
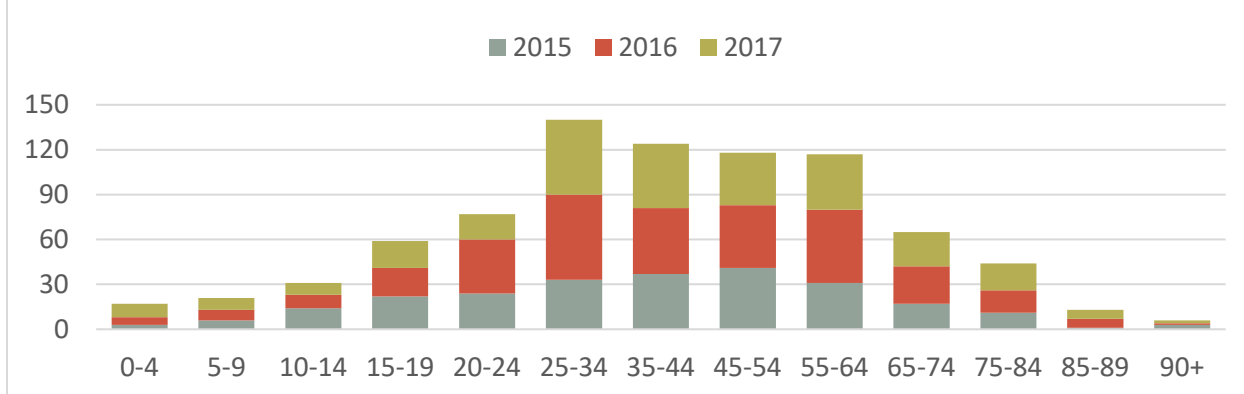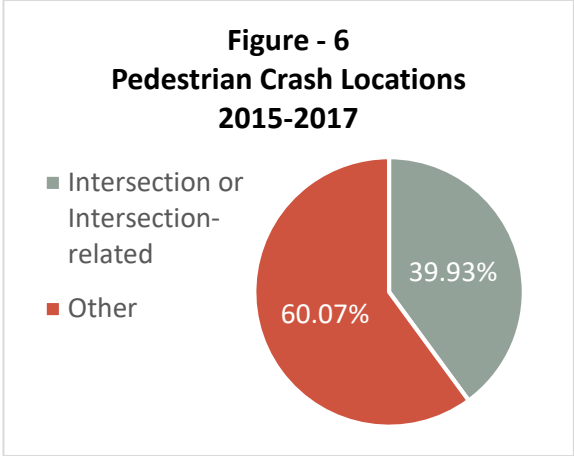
Just under 40% of pedestrian-involved crashes occurred at or near an intersection (Fig. 6). Research has shown that pedestrian-involved crashes will occur frequently in locations that are designed for pedestrian use. The European Commission reports that in the United Kingdom, one-fifth of crashes occur at or near a pedestrian crossing (*5*). This may seem ironic given that these facilities are intended to improve pedestrian safety.

However, the frequency may be partially attributed to the increased pedestrian and traffic volume at these locations. Over the last three years, despite there being a smaller number of pedestrians involved, the state's crash data has displayed a pattern of a greater proportion of more severe injuries among the pedestrian population when compared to drivers or passengers. Eighty-six percent of pedestrians were killed or injured in crashes with motor vehicles. For drivers and passengers, the exact opposite is true with 87% and 86%, respectively, incurring no injuries (Fig. 7-8).

Figure 7 - Proportion of Injuries for Each Person Type, 2015-2017

Driver	5% 8% 87%
Passenger	4% 10% 86%
Pedestrian	3% 14% 41% 27% 14%

Legend:
- Fatal (K)
- Serious (A)
- Minor (B)
- Possible (C)
- No Injury (O)

Figure 8 - Proportion of People for Each Injury Classification, 2015-2017

Fatal (K)	66% 2% 19% 13%
Serious (A)	64% 18% 14% 4%
Minor (B)	71% 22% 5% 2%
Possible (C)	70% 27% 2%
No Injury (O)	75% 25%

Legend:
- Driver
- Passenger
- Pedestrian
- Other

TOP TEN HIGH PEDESTRIAN CRASH AREAS

The top ten areas for all pedestrian-involved crashes, fatal crashes and injury crashes for Connecticut towns are shown below in Table 2. Pedestrian-involved crashes are classified as those crashes involving at least ONE pedestrian, including individuals in a wheelchair or using a skateboard. The ranking is based on the actual count of crashes, with one representing the highest count.

Table 2 Pedestrian Crashes by Town, 2015-2017			
	Total Pedestrian Crashes	**Fatal Pedestrian Crashes**	**Injury Pedestrian Crashes**
1.	Hartford (467)	Bridgeport (14)	Hartford (432)
2.	New Haven (426)	Waterbury (11)	Bridgeport (386)
3.	Bridgeport (424)	Hartford (7)	New Haven (372)
4.	Waterbury (300)	Stamford (7)	Stamford (266)
5.	Stamford (288)	East Haven (6)	Waterbury (256)
6.	New Britain (185)	East Harford (6)	New Britain (132)
7.	Danbury (127)	Greenwich (5)	Danbury (110)
8.	Norwalk (117)	Meriden (5)	Norwalk (98)
9.	Meriden (102)	New Haven (5)	Meriden (88)
10.	Meriden (98)	Norwalk (5)	Manchester (83)

PEDESTRIAN FATALITIES IN NEW ENGLAND – 2015-2017

Connecticut surpasses all other states in New England in pedestrian fatality rates. Maine has the second highest rate with 32 deaths per 1,000,000 people.

Pedestrian Deaths per 1,000,000

19   34

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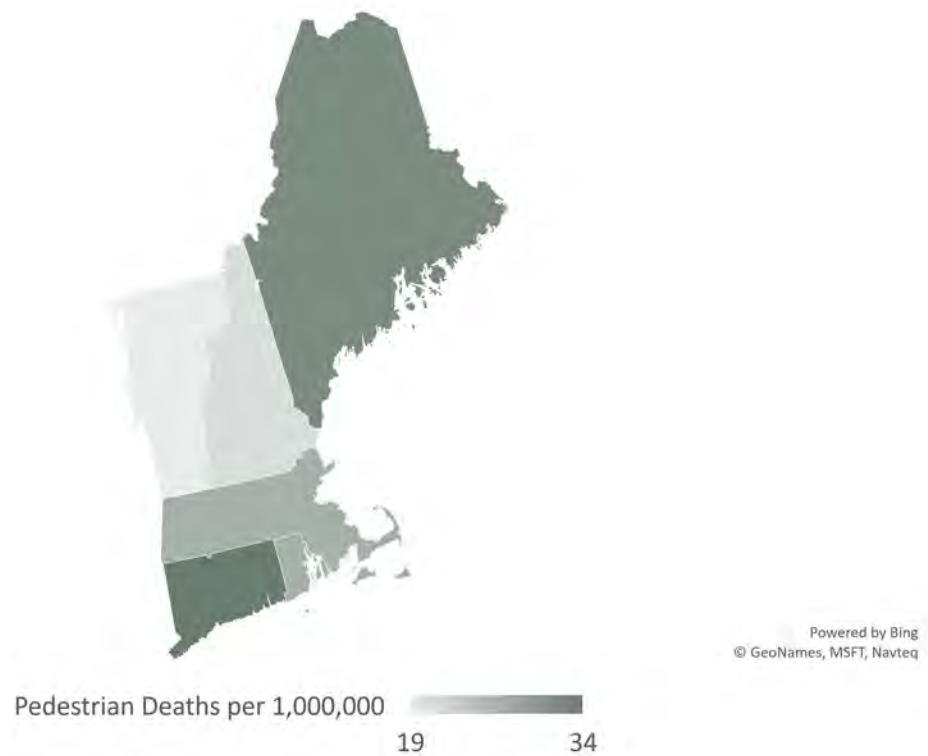
Figure 9: New England Pedestrian Fatalities per 1,000,000 (2015-2017)

Note. Data collected from the Insurance Institute for Highway Safety

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Pedestrian Deaths 2015-2017

47 — 2015

66 — 2016

52 — 2017
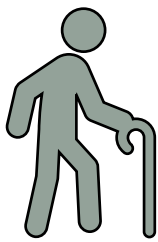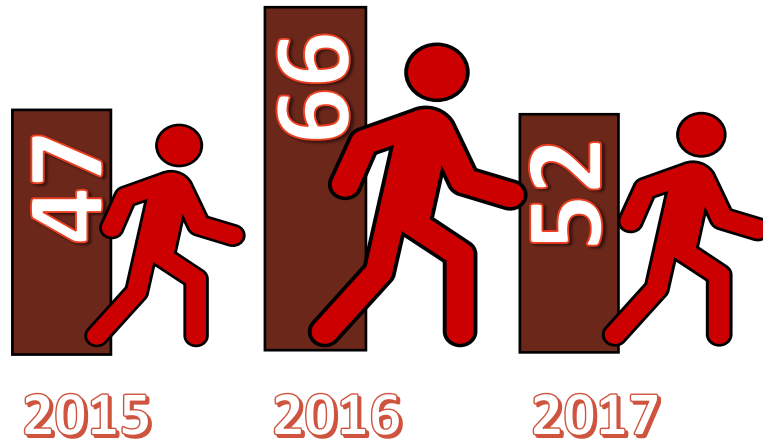
27% were 65 years of age or older
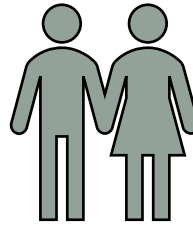
20% were under 30 years of age, of which 23% were between age 14-16

36% of fatal pedestrian crashes occurred during Dec-Feb

6-8PM time of day with the greatest number of fatal pedestrian crashes
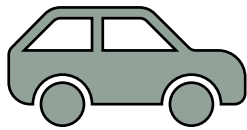
3% of motorists were under the influence of alcohol and/or drugs

13% were under the influence of alcohol and/or drugs
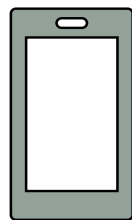
Distraction was present in **15%** of these crashes[+]

[+]Distraction data is based on the information the officer was able to obtain during his or her investigation. Information such as what the driver was distracted by may not be complete due to a lack evidence for these details.

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2017 CONNECTICUT PEDESTRIAN OBSERVATIONAL SAFETY STUDY

The inability of some data to be collected in a pedestrian-vehicle crash after death and the increased prevalence of unknown related factors have led to a gap in understanding the reason for the rise in pedestrian fatalities. It could be hypothesized that the increase in smartphone usage has led to increased distraction events that cannot be documented postmortem. Violations of crossing laws could also be the main culprit of pedestrian deaths in Connecticut. Distracted driving may play an important role in the fatality count, despite the ban on using handheld devices while operating a vehicle. The goal of the 2017 Connecticut Pedestrian Observational Study was to better understand the variables that contribute to pedestrian-vehicle conflict. There were two primary objectives of this research project:

1) To conduct a statewide pedestrian crash analysis which considers location, traffic volumes, roadway geometry and roadway classification to identify locations with high pedestrian crash rates. These locations could then be ranked, prioritized and targeted for research and evaluation.
2) To study these identified intersections, gain a better understanding of non-motorist and driver behavior, and ultimately develop a strategic safety plan to reduce risk-taking behavior and improve pedestrian safety in Connecticut.

PEDESTRIAN OBSERVATIONAL SAFETY STUDY CRASH DATA ANALYSIS

The following sections details the steps taken to locate pedestrian crash hotspots in Connecticut's state road network for the 2017 Connecticut Pedestrian Observational Safety Study.

Data Description

The study used historical pedestrian crash data from 2015 to 2017 occurring on state highways and local roads. Figure 10 shows all 4,467 pedestrian crash locations.
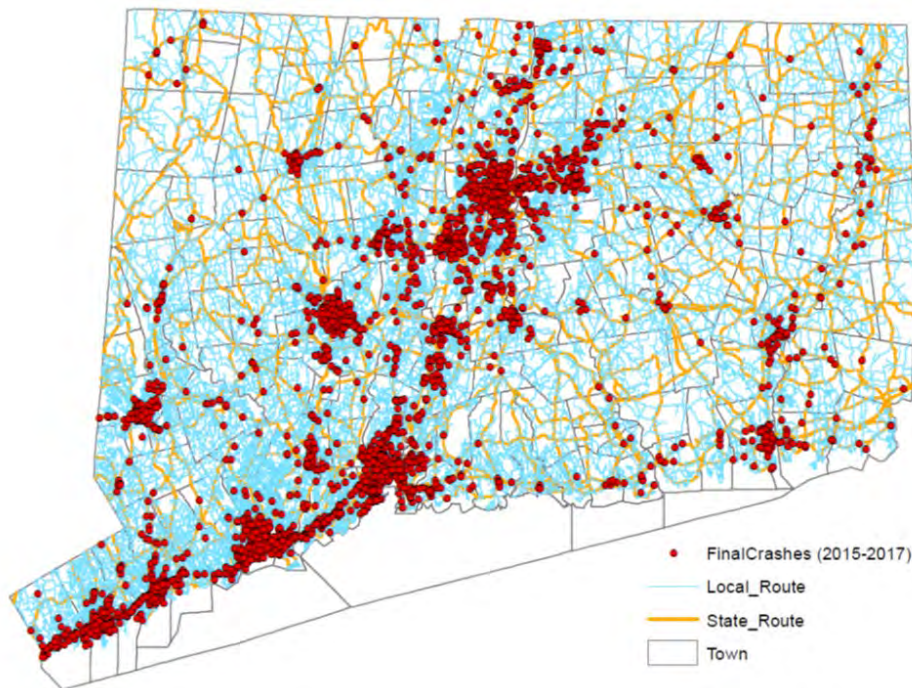

Figure 10: Pedestrian Crash Locations (2015-2017)

Geocoding of Crashes

Four different analytical methods were used to rank and identify the hotspot locations, each method utilizing different performance measures and proximity analysis techniques. A brief description of each method is presented:

Method 1: Three-year Crash Totals - No Buffer Distance

Three-year crash totals for each intersection was used as the performance measure for this method. The site with the highest frequency of crashes in the three-year period, is given the highest rank. The site with the second highest number of total crashes is ranked second, and so on. In this method, each crash was assigned to the nearest possible intersection based on planar distances, which measures the distance between two features considering the Earth as flat (i.e., does not account for curvature). As the crash and intersection locations are in close proximity to one another, planar distance is preferred over other methods such as Geodesic, which will consider curvature of the Earth and is more suitable when dealing with distances between regions or states. All 4,407 pedestrian crashes were assigned to at least one of the 73,499 possible intersections in the state. The limitations of this method include the following:

- Does not separate pedestrian crashes at the midblock crossing and treats all the crashes as intersection-related crashes.
- Does not account for crash weights/costs, treats all crashes with similar weights.

Method 2: Three-year Crash Totals – 250 Feet Buffer Distance

A buffer of 250 feet around each intersection was used to define the intersection related pedestrian crashes and to separate the midblock crossing crashes from the total crashes. A preliminary buffer of 250 feet was to match a predefined spatial analysis unit, which was used to separate roadway segment crashes from intersection crashes in Highway Safety Manual (HSM). The total number of crashes occurring within the buffer distance were counted and used to rank the intersection. If any crash was located within multiple intersection buffer areas, this crash was assigned to the nearest intersection based on planar distances between crash location and intersection locations. Using this method, a total of 1,200 out of 4,407 crashes were identified as midblock pedestrian crashes and were not assigned to an intersection. The limitations of this method include the following:

- Excludes pedestrian crashes at the midblock crossing.
- Does not account for crash weights/costs (i.e., treats all crashes with similar weights).

Method 3: Three-year Crash Totals – 500 Feet Buffer Distance

In Method 3, the buffer distance of 250 feet used in Method 2 was increased to 500 feet around each intersection to see the differences in hotspot rankings. A total of 522 out of 4,407 crashes were excluded from crash assignment to the intersection. Similar to Method 2, this method does not account for crash weights/costs.

Method 4: Equivalent Property Damage Only (EPDO) Three-year Crash Totals – 250 Feet Buffer Distance

The EPDO total 3-year crashes per intersection assigns weighting factors to crashes by severity (fatal, severe injury, non-incapacitating injury, possible injury and PDO) to develop a combined frequency and severity score per intersection. This method was used as the performance measure to address the

limitation of treating all crashes with similar weight. The weighting factors are calculated relative to PDO crash costs and the crash costs by severity are summarized yielding an EPDO value. The default values of crash costs and the EPDO weights by severity are shown below in Table 3. The monetary estimates represent Federal Highway Administration's most recent (2015) crash cost estimates and it includes direct and indirect costs (*6*). Direct costs include: ambulance service, police and fire services, property damage, or insurance. Indirect costs include the value society would place on pain and suffering or loss of life associated with the crash.

Table 3: Crash Costs and EPDO Weights

Severity Levels	Monetary Cost	EPDO Weight
Fatal Crash (K)	$5,800,000	1,450
Severe Injury Crash (A)	$402,000	100
Non-incapacitating Injury Crash (B)	$80,000	20
Possible Injury Crash (C)	$42,000	10
Property Damage Only Crash (PDO)	$4,000	1

Image 7

Results Summary

Despite the differences between the four methods of analyses, several of the same locations appeared in the results for each. The number 1 ranked location for Methods 1, 2, and 3 was 'Temple Street and Chapel Street' in New Haven. For Methods 2 and 3, the second highest ranked location was the intersection of 'Pearl Street/Central Row and Main Street' in Hartford. Only one of the top 20 ranked locations for Method 4 appeared in the results for any of the other methods. The intersection of 'Sigourney Street and Ashely Street' in Hartford was ranked second in the analysis results for Method 4, seventh in Methods 2 and 3 and tenth in Method 1.

Table 4: 3-year Crash Totals – No Buffer Distance (Method 1)

Rank	Intersection ID	Town	Road Names	PM Score
1	22834	NEW HAVEN	TEMPLE ST, CHAPEL ST	11
2	1291	STAMFORD	137-N, BROAD ST, 137-S, WEST BROAD ST	10
4	60536	HARTFORD	PEARL ST, CENTRAL ROW, MAIN ST NO 2	10
8	22806	NEW HAVEN	CHURCH ST; CHAPEL ST	7
10	61302	HARTFORD	SIGOURNEY ST; ASHLEY ST	7
12	1279	STAMFORD	ATLANTIC ST; BROAD ST; BEDFORD ST;	6

Table 5: 3-year Crash Totals – 250 feet Buffer Distance (Method 2)

Rank	Intersection ID	Town	Road Names	PM Score
1	22834	NEW HAVEN	TEMPLE ST, CHAPEL ST	10
2	60536	HARTFORD	PEARL ST, CENTRAL ROW, MAIN ST NO 2	10
3	1291	STAMFORD	137-N, BROAD ST, 137-S, WEST BROAD ST	9
7	61302	HARTFORD	SIGOURNEY ST; ASHLEY ST	7
9	22806	NEW HAVEN	CHURCH ST, CHAPEL ST	6
13	1279	STAMFORD	ATLANTIC ST, BROAD ST, BEDFORD ST	5
17	23390	NEW HAVEN	NORTON ST, WHALLEY AV	5

Table 6: 3-year Crash Totals – 500 feet Buffer Distance (Method 3)

Rank	Intersection ID	Town	Road Names	PM Score
1	22834	NEW HAVEN	TEMPLE ST, CHAPEL ST	11
2	60536	HARTFORD	PEARL ST, CENTRAL ROW, MAIN ST NO 2	10
3	1291	STAMFORD	137-N, BROAD ST, 137-S, WEST BROAD ST	10
7	61302	HARTFORD	SIGOURNEY ST; ASHLEY ST	7
9	22806	NEW HAVEN	CHURCH ST, CHAPEL ST	7
14	1279	STAMFORD	ATLANTIC ST, BROAD ST, BEDFORD ST	5
18	23390	NEW HAVEN	NORTON ST, WHALLEY AV	5

Table 7: EPDO 3-year Crash Totals – 250 feet Buffer Distance (Method 4)

Rank	Intersection ID	Town	Road Names	PM Score
2	61302	HARTFORD	SIGOURNEY ST; ASHLEY ST	1800

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SITE SELECTION

A comprehensive literature search was conducted to examine the many different methods of determining pedestrian-vehicle crash hotspots before an approach centered on crash volume was chosen. Three-year crash totals for intersections across the state were examined in order to rank the intersections by volume of crashes. Crashes that did not occur at an intersection were assigned to the closest intersection determined by planar distance. The 4,467 pedestrian-vehicle crashes that occurred from 2015 to 2017 were assigned to at least one of the 73,499 intersections in the state. In order to further rank the intersection sites, the severity of crashes was also considered. Intersections that exhibited higher cases of fatal and serious-injury crashes were weighted more heavily. Site selection for the pedestrian safety study was accomplished utilizing a combination of the results of the pedestrian crash data analysis, as well as direct input from CTDOT regarding predetermined targeted areas of interest for further research.

DATA COLLECTION

Image 8

Video footage of pedestrian behaviors was captured from October 2017 to September 2018. This footage was obtained via CTDOT issued *Leetron Vision, LLC* traffic monitoring cameras. These cameras are equipped with 'AI Count'- a portable real-time video-based traffic counting system. The cameras were mounted on two traffic light poles at opposite ends of the intersection and set to record activity for approximately two to three days in each location. CTDOT personnel were responsible for installation and collection of data from cameras. In addition, video footage provided by Western CT Council of Government (COG) was included in the observations for locations in Stamford and Danbury.

Graduate students hired and supervised by the CTSRC were responsible for viewing the collected video footage and documenting the observed behaviors of pedestrians. The following are some of the fields that were included on the data collection form: a photo of the distracted pedestrian; lighting and road conditions, pedestrian demographics (age, gender, and race), road visibility, general behaviors (walking, jogging, in a group, etc.) pedestrian distraction activity (talking, texting, eating, listening to music, etc.), intersection behaviors (use of crosswalk, use of pedestrian signal, looking for approaching vehicles, etc.) and wait time before crossing. A tally of pedestrian volume was also kept by the students.

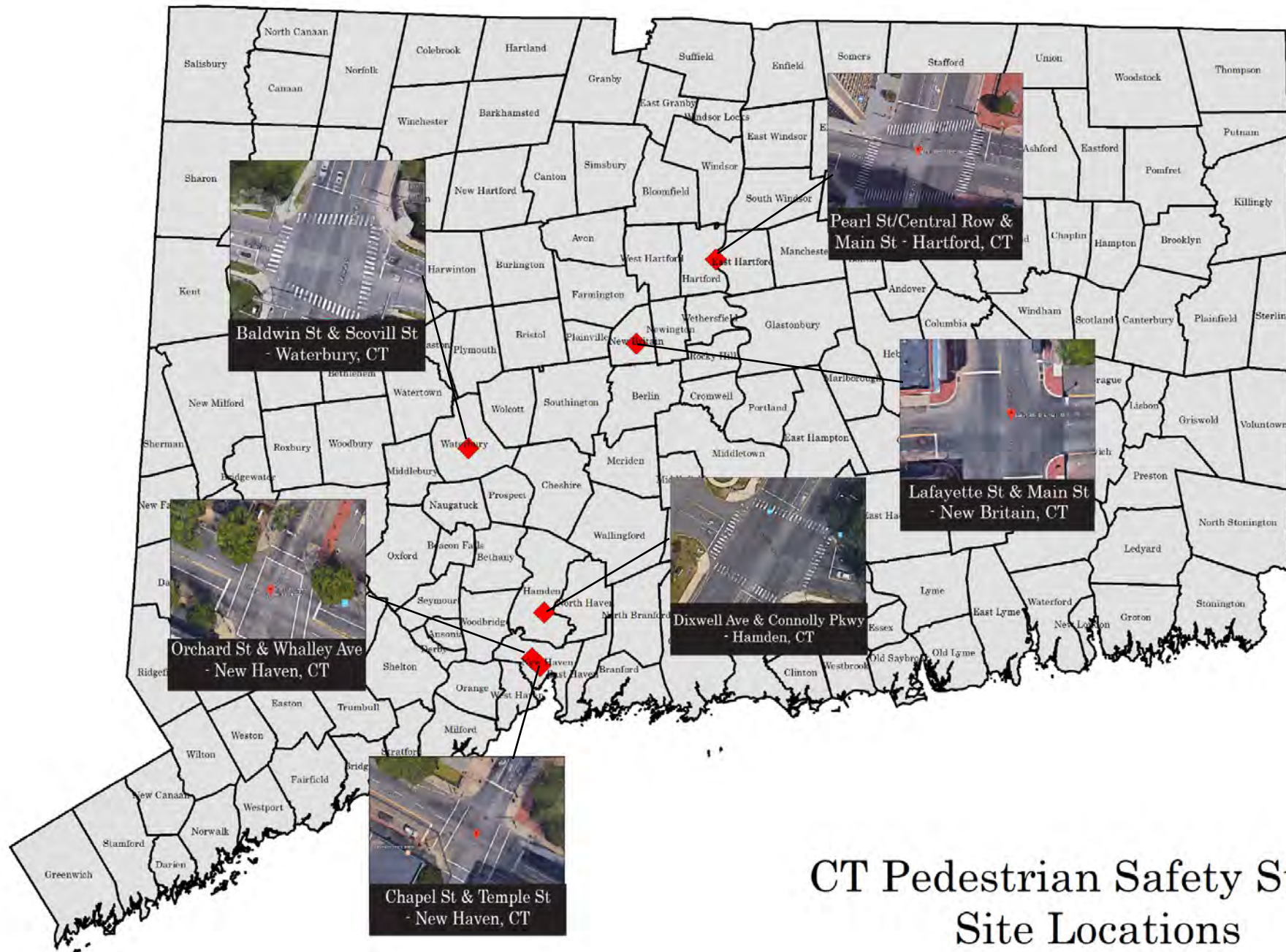CTSRC Connecticut Transportation Safety Research Center

SAFETY STUDY SITE LOCATIONS

The final six (6) locations selected for the 2017 Pedestrian Observational Safety Study are highlighted below in Table 8 as 'Analyzed Sites'. Some locations, despite falling into the top ranked intersections, were not selected as study sites because they were not suitable for camera installation. In some areas, identified in the Table 8 as 'Observed Sites', there was not an appropriate fixture to mount the camera to that would be out of sight and able to capture a good angle of pedestrian activity within the intersection. In other locations, the fixture was low enough that the cameras could have been tampered with. These sites were ultimately not included in the final analysis and results. Intersections selected for inclusion were located in the cities and towns of Hamden, New Britain, Waterbury, Hartford, and New Haven. Each of these cities were included in the top ten cities for pedestrian crashes, pedestrian injury crashes and pedestrian fatal crashes (Table 2).

Table 8: Selected Study Observation Sites

				Analyzed Sites	Observed Sites
Rank	Intersection ID	Town	Road Names		Score
1	23274	NEW HAVEN	ORCHARD ST, WHALLEY AV		10
2	22835	NEW HAVEN	TEMPLE ST, CHAPEL ST		9
4	25236	HAMDEN	CONNOLLY PKWY, 10-N		8
5	40086	WATERBURY	BALDWIN ST NO 1, SCOVILL ST, MILL ST NO 3		7
11	60537	HARTFORD	PEARL ST, CENTRAL ROW, MAIN ST NO 2		7
13	46810	NEW BRITAIN	LAFAYETTE ST, MAIN ST NO 1		6
6	9677	BRIDGEPORT	CAPITOL AV, MAIN ST NO 2		7
RANK WAS NOT CONSIDERED	PILOT DOT SITES	WETHERSFIELD	ROUTE 99 & WELLS ROAD		N/A
		WETHERSFIELD	ROUTE 99 AND CHURCH ST		N/A
	WESTCOG	STAMFORD	BROAD ST & WASHINGTON BLVD		N/A
		STAMFORD	PROSPECT ST & FOREST ST		N/A
		STAMFORD	BROAD ST & ATLANTIC ST		N/A
		DANBURY	MAIN ST & NORTH ST		N/A
		DANBURY	MAIN ST & WEST ST		N/A

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ANALYZED SITES

CT Pedestrian Safety Study
Site Locations

Fig. 11

Baldwin St & Scovill St - Waterbury, CT

Pearl St/Central Row & Main St - Hartford, CT

Lafayette St & Main St - New Britain, CT

Orchard St & Whalley Ave - New Haven, CT

Dixwell Ave & Connolly Pkwy - Hamden, CT

Chapel St & Temple St - New Haven, CT

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TIMELINE OF RESEARCH STUDY

The study was conducted over a period of 14 months following the approval of the University of Connecticut's Institutional Review Board in April of 2017. Pedestrian behavior data was collected from October 2017 to September 2018. Driver distraction data was collected from April 2018 to July 2018. Data Entry Specialists compiled the data beginning in April 2018.

Figure 12: Detailed Timeline of Research Study
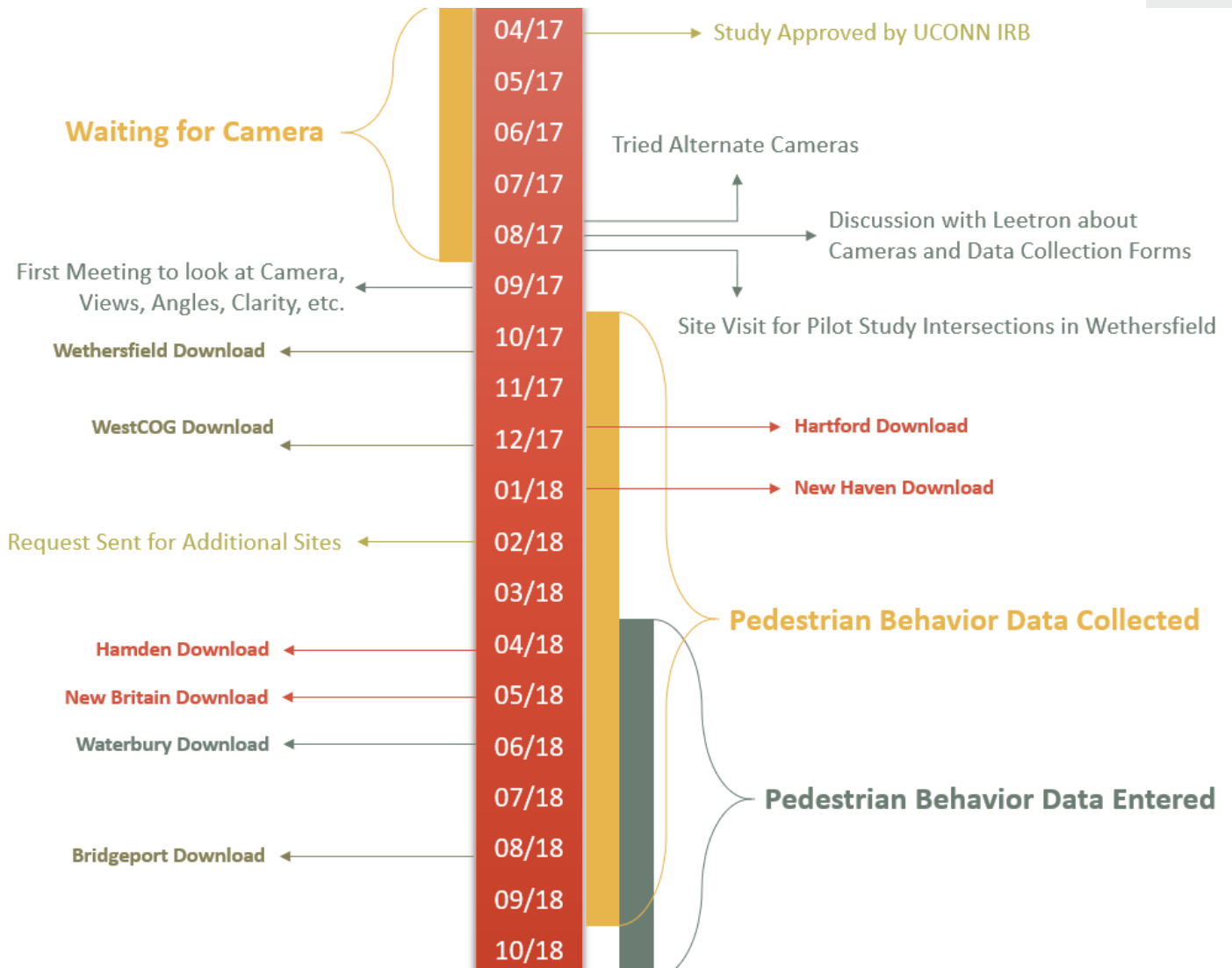
PEDESTRIAN BEHAVIOR DATA COLLECTION

The following pages summarize the findings of the 2017 Connecticut Pedestrian Observational Safety Study analysis by study site. Data from a total of six intersections in the towns of Hartford, Hamden, New Haven, New Britain, and Waterbury were analyzed using the statistical analysis software SAS v9.4. Data entry specialists at the University of Connecticut viewed the video footage and recorded their observations in Microsoft Access forms (*Appendix A*). The data collected focused on pedestrian characteristics, misuse events, distraction events, behavior in cases of conflict, and environmental variables. For the purpose of this study, ideal pedestrian behavior was considered to mean the following: '*pedestrian crosses road using designated crosswalk, pedestrian waits for pedestrian 'walk' signal before crossing, pedestrian looked both ways for vehicles before crossing and pedestrian is not distracted while crossing'*. If any one of the above conditions is not met by the pedestrian while crossing, then it is considered as **atypical/ risky behavior** and that information was then collected and entered in our database. For pedestrians exhibiting risky behavior, data was collected for the following items –

- **Site Conditions:** intersection, start time, end time, age, race, gender, visibility on road, road conditions, light conditions. was pedestrian clearly visible, reasons for pedestrian obscurity

- **Pedestrian Actions:** pedestrian looked for vehicles/waited before crossing, misuse of crosswalk, whether pedestrian was distracted or not, possibility of conflict with vehicle, pedestrian actions in case of conflict, pedestrian used of crosswalk, ramp, island or signal, eating, grooming, jay-walking, jogging, listening to music, looking at electronics, using wheelchair, pushing wheelchair/stroller, running, smoking, talking on phone, talking with a person, texting, walking a pet.
- **Presence in crosswalk** – bicycle, jogger, vehicle, wheelchair, blind person, disabled person, scooter, skateboard, rollerblade, Segway, baby stroller, crossing guard.

From this list, the study team decided to focus on the analysis of four main classifications of risky pedestrian behavior:

1. **Did pedestrian look for vehicles;**
2. **Did the pedestrian wait before crossing;**
3. **Was the pedestrian distracted or not (listening to music, looking at electronics, talking on the phone or texting); and,**
4. **Pedestrian use of crosswalk, ramp, island or signal.**

Table 9: Characteristics of Study Intersections

Table 9 below provides some roadway characteristics for each of the six sites selected for observation (*7*). A more detailed description of each intersection, including census data for the town in which the intersection is located, can be found in Appendix B.

Intersection	New Haven *Temple St x Chapel St*	New Haven *Whalley Ave x Orchard St*	Hamden *Connolly Pkwy x Dixwell Ave*	New Britain *Lafayette St x Main St*	Hartford *Pearl St /Central Row x Main St*	Waterbury *Baldwin St x Scoville St*
# of legs	4	4	4	4	4	4
Pedestrian signal	Yes	Yes	Yes	No	Yes (exclusive)	Yes
Sidewalk	Yes	Yes	Yes	Yes	Yes	Yes
Unmarked/ marked crosswalk	Unmarked	Unmarked	Marked	Marked	Marked	Marked
# of exclusive turn lanes	2	1	4	0	2	3
Pedestrian ramp	Yes	Yes	Yes	Yes	Yes	Yes
Max # of lanes crossable	4	4	6	3	5	5
Intersection lighting	Yes	Yes	Yes	Yes	Yes	Yes
Signalized	Yes	Yes	Yes	No – All way stop	Yes	Yes
Protection /prohibitions	RTOR prohibited at all times; permitted left turn	RTOR prohibited at all times; protected-permitted left turn	RTOR prohibited at all times; protected left turn	N/A	RTOR prohibited at all times; protected-permitted left turn	N/A
Nearby Landmarks	Bus stops, Yale Univ, Shubert Theater, park	Superior court, Correctional center, bus stops, liquor store	Hamden HS, bus stop, shopping plaza	nail salon, tobacco vape and smoke shop, psychic reader	Yoga studio, Old State House, coffee shop, downtown businesses	St. Mary's Hospital; shopping plaza, restaurants

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GENERAL OBSERVATIONS BY INTERSECTION

A total of 9,769 pedestrians were found to exhibit some form of risky behavior out of a total pedestrian volume of 38,768 (25%) observed during this study. Pedestrian crossing behaviors were observed at the following intersections: Chapel Street at Temple Street in New Haven, Whalley Avenue at Orchard Street in New Haven, Connolly Parkway at Dixwell Avenue in Hamden, Baldwin Street at Scoville Street in Waterbury, Pearl Street/Central Row at Main Street in Hartford, and Lafayette Street at Main Street in New Britain. **Analysis is focused on the 9,769 pedestrians who exhibited risky behaviors at these intersections.**

General findings suggest that risky behavior is more prevalent than distraction among pedestrian populations. Distraction was present in 31.13% of the pedestrians who were exhibiting risky behaviors but in only 5.24% of the overall study population. The greatest proportion of distraction observed among the risky behaviors was highest at Hamden, at 50.4% and lowest at New Haven – Chapel Street, at 6.86%. Study locations with a high percentage of observed pedestrians exhibiting risky behavior usually also had a greater proportion of distracted pedestrians. The exception to this was the New Haven location of Chapel Street at Temple Street. Observations at this intersection revealed the highest percentage of pedestrians exhibiting risky behaviors (33.72%) but the lowest rate of distracted pedestrians (5.89%). The study results showed that more than 86% of the pedestrians did not wait for the appropriate pedestrian signal to cross. Pedestrians either did not utilize the available signal at all or did not wait for the signal to change before they started walking across the intersection. There were no substantial findings in terms of age, gender or race cohorts.

As shown in Table 10, New Haven is the town with the highest overall population, and the intersection at The Chapel Street and Temple Street intersection showed the highest percent of pedestrians exhibiting risky behaviors of all six intersections analyzed. Although New Haven's other intersection, Whalley Ave, had a significantly lower number of pedestrians recorded, it still ranked second in percentage of risky behaviors. Hartford displayed the highest percent pedestrian count against the total recorded population of the city, but the lowest percent of pedestrians exhibiting risky behaviors. The Hamden intersection had the lowest town population, lowest pedestrian volume, lowest percent of pedestrians recorded against town population, lowest volume of pedestrians exhibiting risky behavior, and yet the Hamden intersection had the third highest percent of pedestrians exhibiting risky behaviors.

Table 10: Population, Pedestrian Volume, and Risky Behavior Percentage by Intersection

Town	Intersection Street	Town Population	Pedestrian Volume	Percent Pedestrians	Risky Behavior Volume	Percentage of Risky Behaviors
New Haven	Chapel St	129,779	11,726	9.04%	3,954	33.72%
New Haven	Whalley Ave	129,779	3,561	2.74%	1006	28.25%
Hamden	Conolly Pwky	60,960	599	0.98%	164	27.38%
Waterbury	Baldwin St	110,366	1,785	1.62%	486	27.23%
New Britain	Lafayette St	73,206	1,873	2.56%	487	26.00%
Hartford	Pearl St	124,775	19,224	15.41%	3,672	19.10%

Note. Town populations from the Connecticut Department of Health, 2018.

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As shown in Figure 13, the five most common displays of risky behaviors were not waiting for the signal before crossing the street, not looking for oncoming traffic before crossing the street, misuse of the crosswalk, jaywalking, and distracted walking. Almost 86% of pedestrians exhibiting risky behaviors did not wait before crossing the road and approximately 76% did not look for oncoming traffic.

Figure 13: Percentages of Pedestrians in Violation of Roadway Safety Behaviors
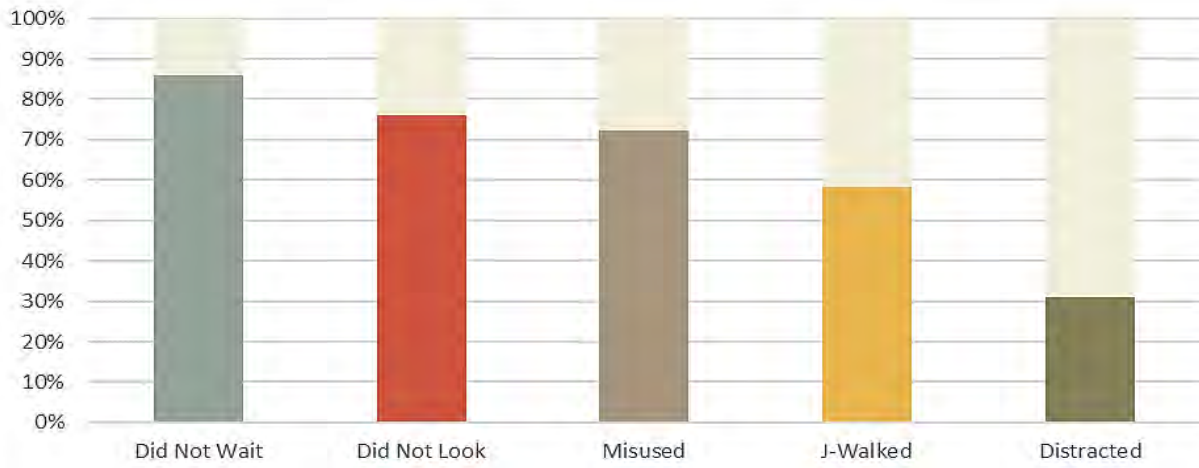
The risky behavior events were not mutually exclusive, but certain overlaps showed more signs of correlation than others. As shown in Figure 14, 94% of those who did not look before crossing the road also did not wait. Around 18% of those who misused the crosswalk also engaged in distracted walking. The highest event correlated to distraction was not waiting before crossing the road, with 76% of distracted pedestrians not waiting.

Figure 14: Overlap of Risky Behaviors

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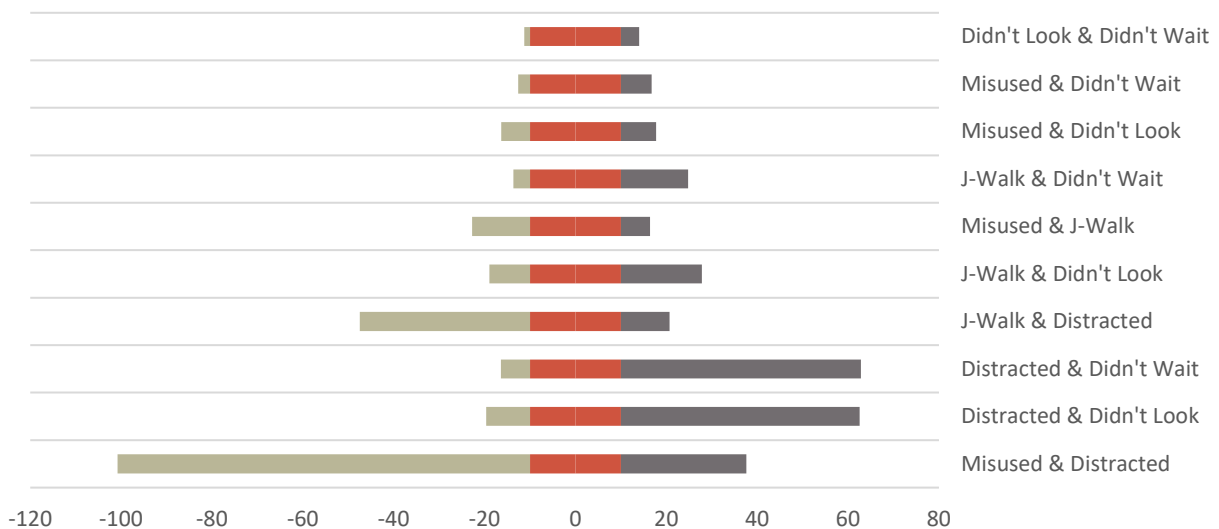
Distraction events occurred in 31.13% of the cases where pedestrians exhibited risky behaviors. Although this is a smaller portion than the roadway system violation cases account for, those who were engaged in a distracted event were found to be almost three times as likely to be involved in a situation with potential for conflict. The main types of known distraction events exhibited were talking to another person, talking on the phone, listening to music, using other electronics, and texting. As shown in Figure 15, talking to another person made up 31% of the known distraction events. Pedestrians talking to other pedestrians were found to be 2.2 times as likely to be in a situation with potential for conflict.

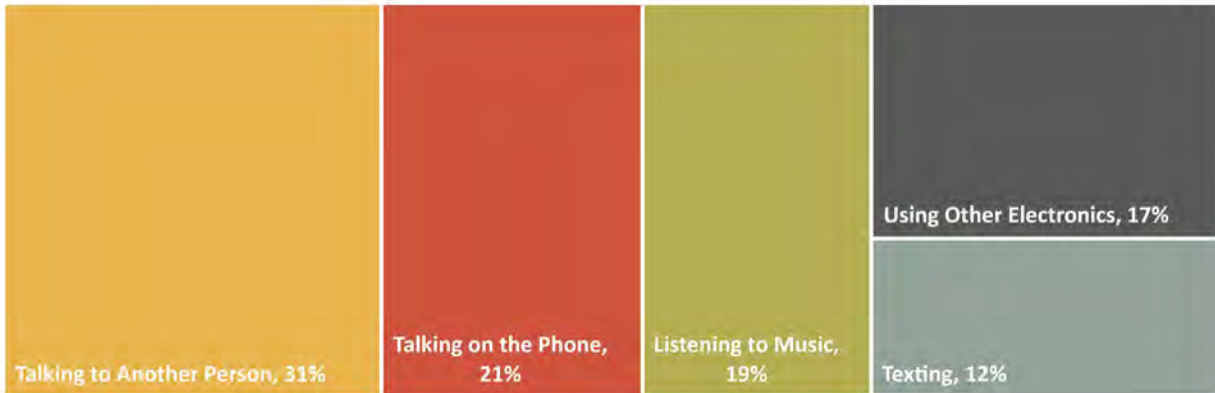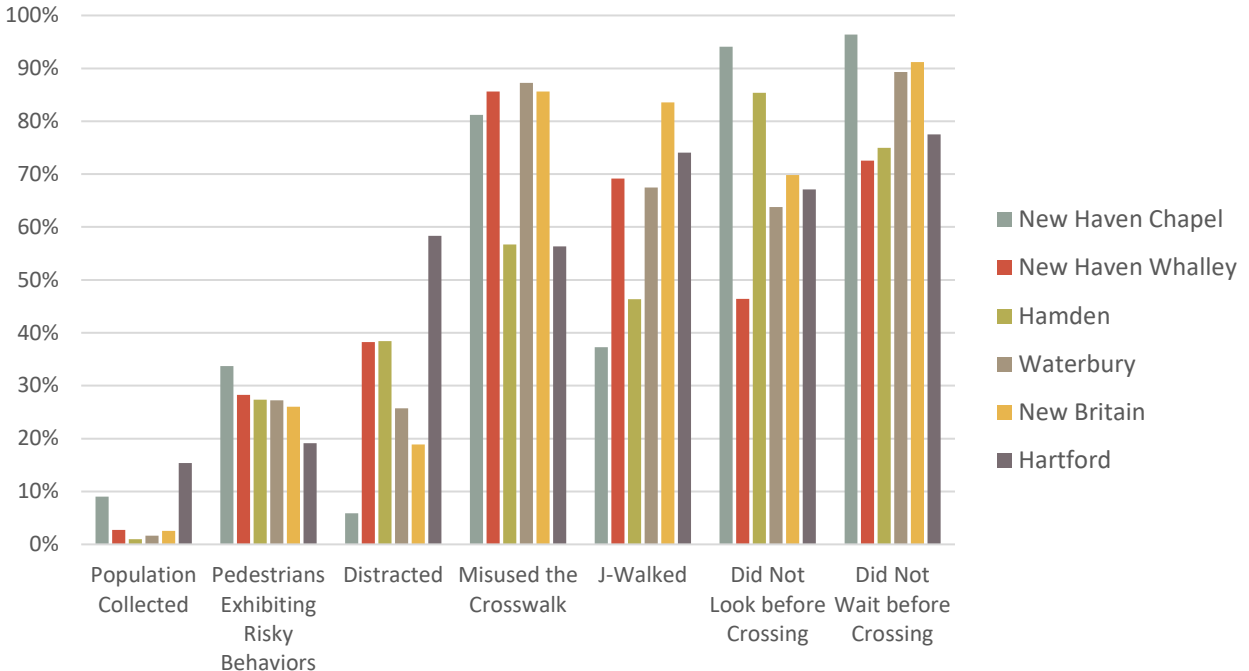**Figure 15: Distracted Events Across All Intersections**

Figure 16: Findings Distributed by Intersection

Study Site #1: Hartford – Pearl Street/Central Row at Main Street

SUMMARY OF SITE-SPECIFIC FINDINGS:

Pedestrians observed at the Hartford intersection of **Main Street and Central Row/Pearl Street** made up the largest portion of the study population. A volume of more than 19,000 pedestrians traveled through this intersection during the observation period. Although Hartford had the largest amount of pedestrian volume, pedestrians at this location exhibited the lowest frequency of risky behavior at 19.10%. The Hartford intersection is the only intersection where there were more instances of distraction than misuse of the crosswalk. The highest rate of distraction among risky behaving pedestrians was observed at this location (58.36%). A significantly greater proportion of pedestrians were at risk

Image 9

for a conflict with a vehicle than at other study sites (52.7% vs < 10%). A breakdown of gender and age cohorts shows a population that is predominately adult (96.06%) and male (64.14%). However, these demographics are very similar to those of pedestrians at the other study intersections as most pedestrians observed were identified as White (36.34%) and Male (65.66%).
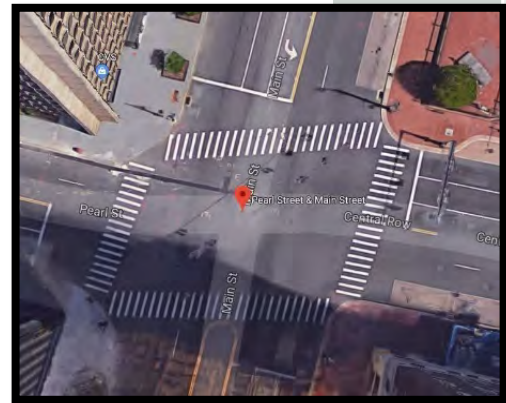
Results pertaining to the four main classifications of risky pedestrian behavior:

Many of the pedestrians using the crosswalk at the intersection of Main Street at Central Row/Pearl Street were observed crossing the roadway without scanning for approaching vehicles before (67.10%). This area is heavily trafficked by both vehicles and pedestrians and is the only location of the study that is equipped with an exclusive pedestrian countdown signal. Perhaps, pedestrians who frequent the area have grown accustom to the exclusive signal phase and therefore are less likely to scan for approaching vehicles. However, most pedestrians crossing without scanning the roadway were also not crossing when the exclusive signal was active. In addition, a large number of pedestrians did not wait before crossing the road either (77.51%). Nearly 60% of pedestrians misused the crosswalk but in contrast, the spread between the percent of pedestrians who did and who did not misuse the crosswalk was the lowest at this intersection (56%). A larger spread was noted amongst pedestrians observed at the other study sites, with anywhere from 74% to 92% of the pedestrians misusing the crosswalk.

Figure 17: Findings for Hartford

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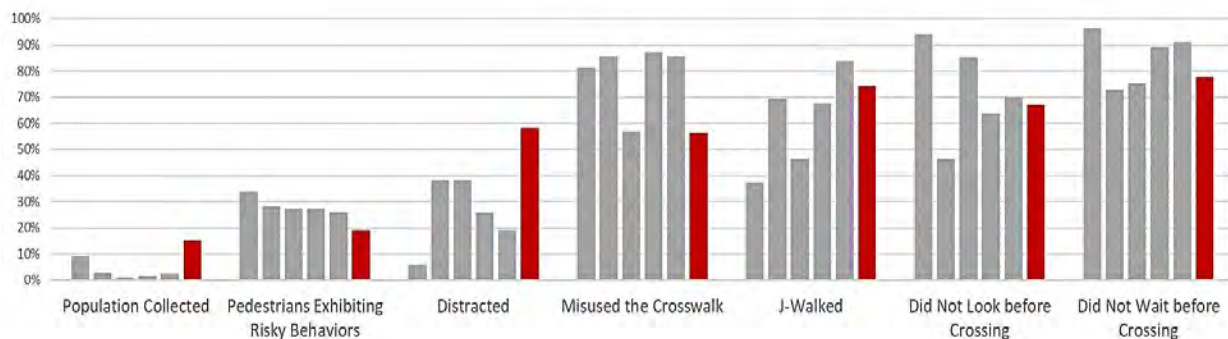
Study Site #2: Hamden – Connolly Parkway at Dixwell Avenue

SUMMARY OF SITE-SPECIFIC FINDINGS:

The Hamden intersection of **Connolly Parkway at Dixwell Avenue (Route 10-N)** had the smallest pedestrian volume of all the analyzed study observation sites, with a total of 505 observed. Nearly a quarter (24.75%) of pedestrians were engaged in some form of risky crossing behavior at this intersection. Just over half of risky crossing pedestrians were also distracted walking (50.4%). Race of pedestrians in this location was hard to identify via the collected video footage. For almost half (46.4%) of Hamden's risky crossing pedestrians, race could not be determined. A breakdown of gender and age cohorts reveals a predominately adult (87.2%) and male (64.8%) population, very similar to

Image 10

observations for all locations. Only 8% of pedestrians were at risk of conflict with a vehicle. Some commonly observed activities of the risky behavior subgroup included listening to music (23%), looking at electronics (21%) and talking with another person (13.6%). This is not surprising considering that this pedestrian crossing location is in front of a high school and these are behaviors that are found to be common among teenagers and young adults.
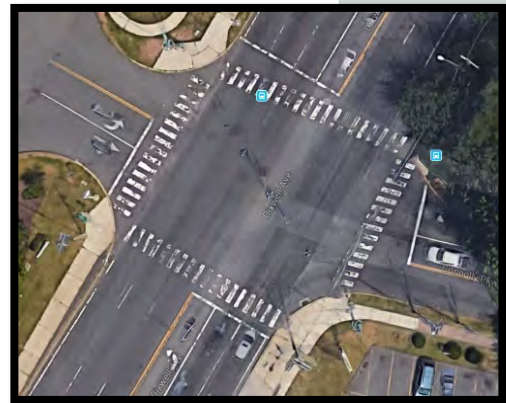
Results pertaining to the four main classifications of risky pedestrian behavior:

A small number of pedestrians stopped to look for approaching vehicles at this location (15%). This is the second lowest rate of compliance for this variable compared to other locations. Pedestrians crossing here did have a higher rate of compliance when waiting to cross the road (25%). In fact, pedestrians' rate of compliance when waiting to cross is higher in Hamden than for all other locations as well as the study overall (25% vs 13.31%). Hamden also showed the second lowest prevalence of misuse of the crosswalk (56.71%) and jaywalking (46.34%). Just over 72% of the total number of risky crossing pedestrians for all locations misused the crosswalk and less than two percent (1.31%) of these observations were in Hamden. In contrast, this intersection had one of the highest proportions of distracted walking of all the observation sites, whether looking at total pedestrian volume at this location (38.41%) or just the pedestrians who exhibited risky behaviors (50.4%). The most common distraction type at this location was listening to music (46%).

Figure 18: Findings for Hamden
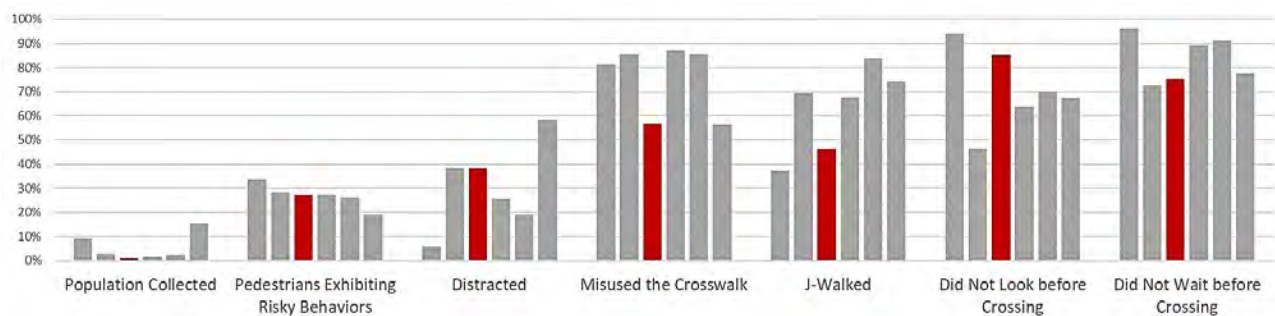
Study Site #3: New Haven - Chapel Street and Temple Street

SUMMARY OF SITE-SPECIFIC FINDINGS:

The total pedestrian volume observed at the New Haven intersection of **Chapel Street at Temple Street** was 11,726, the second highest volume of all the sites besides Hartford. The findings from this intersection differed the most from the other intersections, including the other New Haven site, in terms of distracted walking and the correlation between distraction and misuse behaviors. Just under 6% of those pedestrians engaged in risky crossing behavior were also distracted walking. This is the lowest proportion of this variable for all pedestrian populations observed in the study. This fact is even more interesting when considering that the greatest proportion of pedestrians exhibiting risky behavior

Image 11

was observed at this intersection. Nearly 34% of pedestrians observed at this intersection exhibited risky crossing behavior, representing 10.2% of the total study population. This finding is in stark contrast to the results of the other locations, in which a higher occurrence of distraction was typically observed with a higher occurrence of risky behaviors. It may suggest that pedestrians are aware and educated enough to not engage in distracted walking but that there is still a need to educate pedestrians on conspicuity and right-of-way laws.
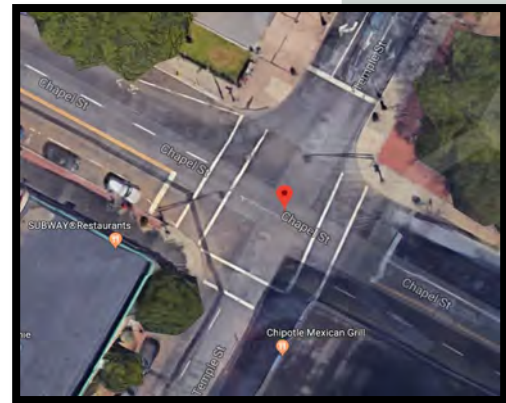
Results pertaining to the four main classifications of risky pedestrian behavior:

A great deal of pedestrians at this location did not look for approaching vehicles before crossing the road (94.06%). This area incurs a lot of pedestrian foot traffic and the infrastructure has been designed to accommodate this so perhaps the culture has adapted to this more so than in other locations. A very small number of pedestrians waited to cross the road (3.59%) and crosswalk misuse among pedestrians at this location was very high (81%), providing further evidence that there is a different crossing culture in this location that may be influenced by the college-aged population. This location is within proximity to the Yale University campus and a common cultural element of college campuses is to yield to pedestrian traffic, as most everyone is walking to and from classes at any given time. This ideology could partially explain the absence of safe pedestrian crossing behaviors at this location. However, the fact that pedestrian-involved crashes are high in this location suggests that drivers of this area may not have necessarily adopted the same philosophies about sharing the road with pedestrians and as a result pedestrian-vehicle conflict is a common occurrence.

Figure 19: Findings for New Haven – Chapel St
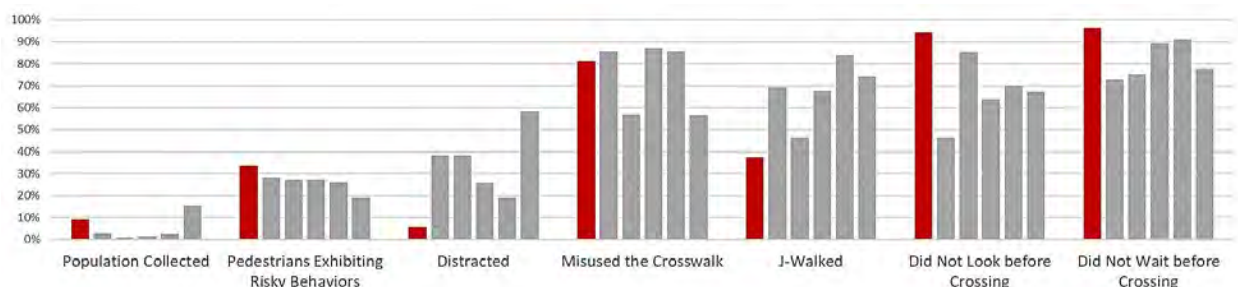
Study Site #4: New Haven – Whalley Avenue at Orchard Street

SUMMARY OF SITE-SPECIFIC FINDINGS:

Total pedestrian volume captured at the New Haven intersection of **Whalley Avenue at Orchard Street** was 3,561. Just under 30% of pedestrians were observed exhibiting risky behavior while crossing. Unlike the other New Haven intersection, 38.27% of risky crossing pedestrians at this location were also distracted while crossing. More than 75% of the observed pedestrian population were identified as male. This location had the largest spread between the proportion of males and females. Racial demographics for the study population in New Haven also differs from the predominately white study population, with 53% of observed pedestrians in this location identified as African American.

Image 12

Only 10.34% of pedestrians were identified as White, the lowest proportion of all study locations. This location also had the highest proportion of pedestrians who were running versus walking at the time of observation (11.43%).
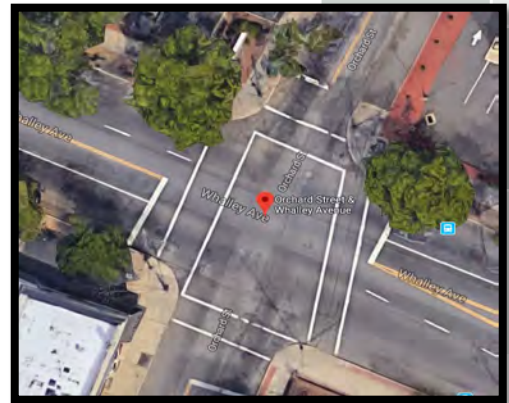
Results pertaining to the four main classifications of risky pedestrian behavior:

Just over 46% of risky behaving pedestrians in this location did not look for approaching vehicles prior to traveling through the intersection. Despite the fact that this is nearly half, this percentage is the lowest of all observation sites. The same thing is true for observations of pedestrians waiting for the pedestrian signal before crossing. More than 72% of pedestrians at this intersection did not wait prior to crossing, however this represents the highest rate of compliance across all study sites. Crosswalk misuse was the most common risky crossing behavior among pedestrians at this location (85.59%). Of the 1,006 pedestrians exhibiting risky crossing behaviors, 385 or 38.27% were also distracted.

Figure 20: Findings for New Haven – Whalley Ave

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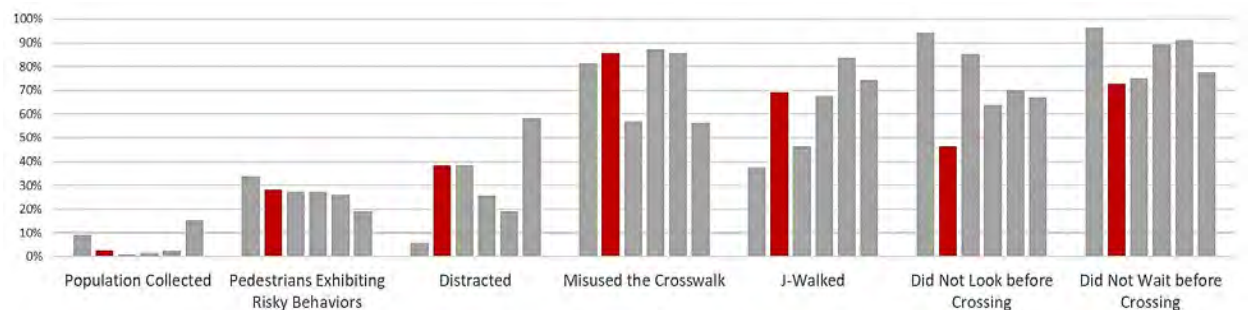
Study Site #5: Waterbury – Baldwin Street at Scovill Street/Mill Street

SUMMARY OF SITE-SPECIFIC FINDINGS:

The Waterbury intersection of **Baldwin Street No 1 at Scovill Street/Mill Street No 3** had the second smallest pedestrian volume during the observation period, with only 1,785**.** Just over 7% of the total observation population at this location were walking while distracted by something. However, when looking at pedestrians found to be exhibiting risky crossing behaviors, the proportion of distraction behavior increases to 25.72%. Risky crossing behavior was exhibited by 27.23% of the total pedestrian volume. In terms of pedestrian demographics, race could not be reliably determined for 42.12% of observed pedestrians. Jaywalking was frequently document among the risky behavior subgroup (85.14%)**.**

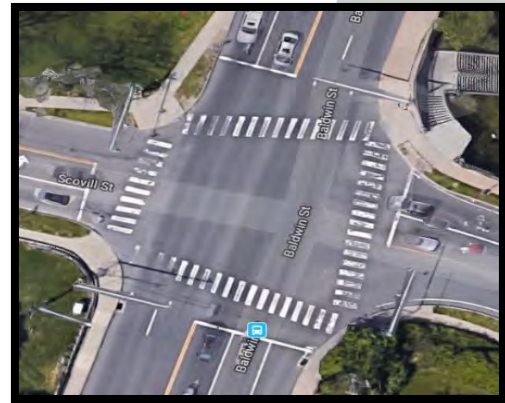*Image 13*

Results pertaining to the four main classifications of risky pedestrian behavior:

The Waterbury intersection had the highest proportion of pedestrians who looked for oncoming traffic before making their way across the roadway (50.29%). Pedestrians here appear to be at least somewhat aware of the importance of scanning the roadway prior to entering it when compared to the other study locations. In contrast, very few pedestrians were observed waiting for the pedestrian signal before crossing through the intersection (10.7%), suggesting that pedestrians will opt for a quick visual scan of the road to determine a safe crossing time rather than wait for the time designated by the signal. Results for this variable were like those observed at the New Britain and New Haven – Chapel St study sites. These locations also have a similar proportion of pedestrians exhibiting risky behaviors as the Waterbury site. Crosswalk misuse was high at 87%. While distraction was not a significant finding of the study population as a whole, distraction among the risky behavior group at this location was much higher. One-fourth of pedestrians were found to be distracted while crossing through this intersection. In comparison to the other study sites, Waterbury has the second lowest instances of observed distracted walking.

Figure 21: Findings for Waterbury

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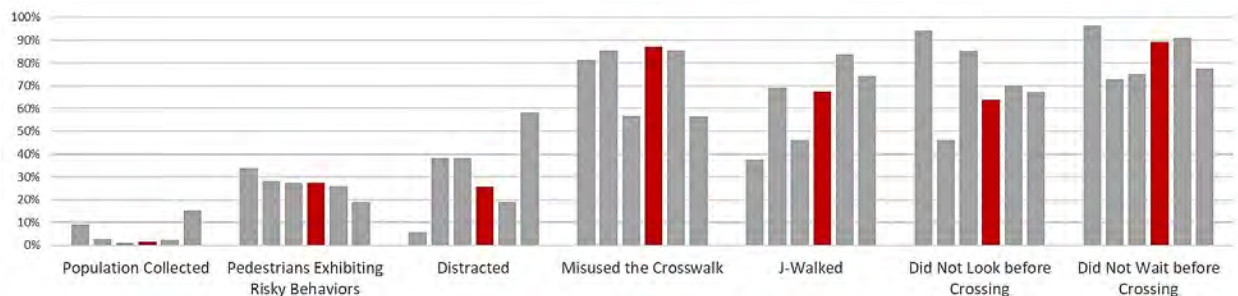
Study Site #6: New Britain – Lafayette Street at Main Street No 1

SUMMARY OF SITE-SPECIFIC FINDINGS:

Twenty six percent of pedestrians observed at the crossing of **Lafayette Street at Main Street No 1** in New Britain exhibited risky behaviors and another 4.48% of pedestrians were distracted. Around 19% of pedestrians were observed distracted walking while also exhibiting other risky crossing behaviors, such as crossing against the signal or outside of the marked crosswalk. This is the only one of the analyzed sites that is not controlled by a traffic signal or equipped with a pedestrian walking signal. Total pedestrian volume at this location was 1,873. The New Britain study site had the smallest spread between proportion of genders, with 47.03% identified as females and 52.97% identified as males.


Image 14

Just under 20% of the risky behavior subgroup at this location was distracted by another pedestrian accompanying them.

Results pertaining to the four main classifications of risky pedestrian behavior:

The proportion of crosswalk misuse among pedestrians was highest at Lafayette Street at Main Street No 1. Around 87% of pedestrians misused the designated crosswalk. Because there is no pedestrian walk signal present at this location, observations most likely consisted of those pedestrians who crossed outside of the marked crosswalk space. Distracted walking was not observed to be a significant problem at this location. Only 4.91% of the total pedestrian volume were distracted while crossing. However, when examining only those who exhibited risky behaviors, the proportion of distracted pedestrians increases to 18.89%. Despite this, a much smaller proportion of distracted and risky behaving pedestrians were observed at this location compared to the others (Fig. 22). Of the 18.89% distracted pedestrians, 8.74% were distracted by looking at an electronic device, 5.38% were looking at their cell phone specifically, 2.24% were listening to music and only one pedestrian was documented as texting while crossing, representing less than half a percent. Most distractions involved talking with another person.

Figure 22: Findings for New Britain
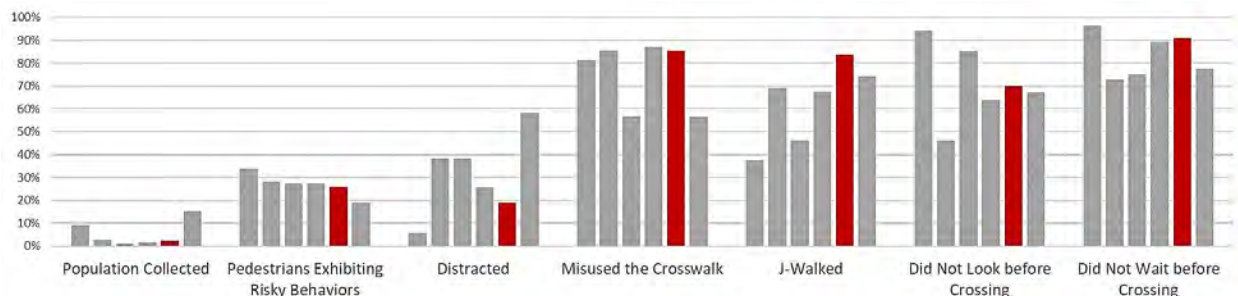
A little more than two-thirds (69.82%) of pedestrians at this location were observed not looking for approaching vehicles, prior to crossing through the intersection. Less than 10% of pedestrians waited before crossing through the intersection. This is not surprising given that there is no pedestrian signal at

this location and that the motor vehicle traffic is controlled by a 4-way stop sign. So perhaps, although many pedestrians did not wait before crossing, it was because they could clearly see that there was not another vehicle approaching at the time of their crossing. Regardless, this intersection is still one of the top 20 intersections in the state with a high volume of pedestrian-involved crashes. According to available crash data for the city of New Britain, at least 18 crashes have occurred in or around the intersection of Lafayette Street and Main Street No 1, since 2015 (*1*). Image 15 shows how this intersection compares to others in the New Britain area. This may indicate that while pedestrians may feel that they can cross safely through the crosswalk, in reality it is not always safe to do so and that more needs to be done to protect this vulnerable population.
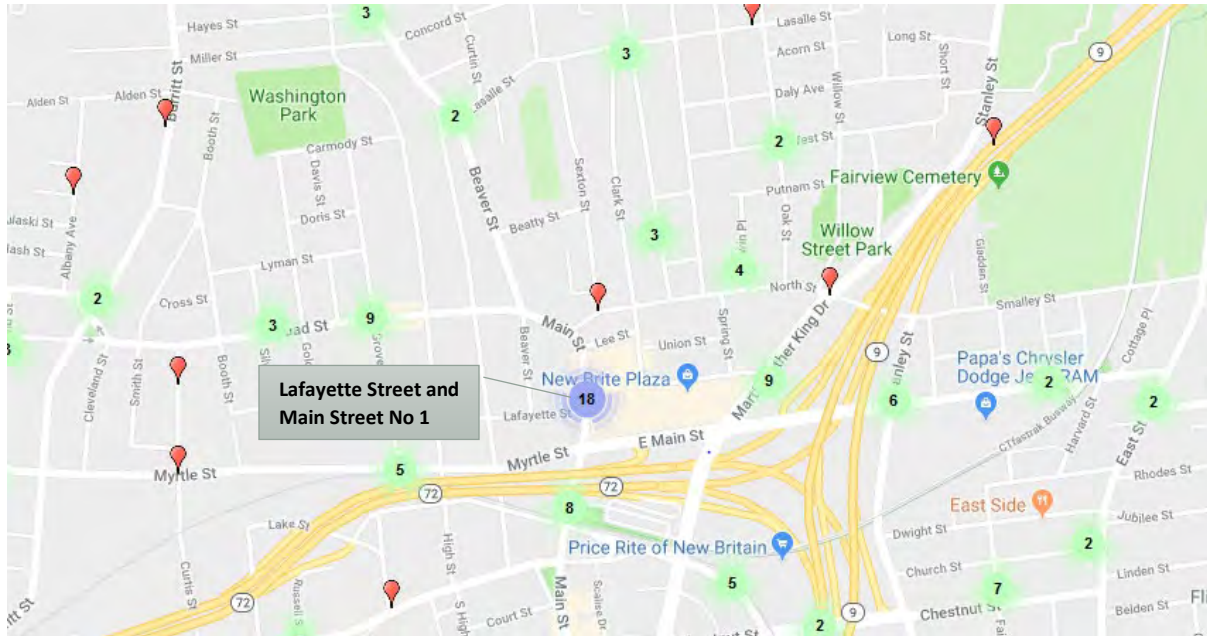

Image 15 – Map of pedestrian-involved crashes in New Britain, CT, 2015-2018

STUDY VALIDATION

The analysis for site identification in this observational study used state crash data from 2015 to 2017. Recently, 2018 crash data has been verified and released, and we used the 2018 crash data to evaluate the validity of results and findings of pedestrian behaviors from the initial analysis. Data for 2018 pedestrian crashes were extracted and assigned to all intersections across the State. The intersections were then compared and ranked based upon the total pedestrian crash frequencies, and the top 100 intersections from the list were summarized for the following analysis.

Figure 23: Summary Statistics of 2018 Pedestrian Crashes

Pedestrian Crash Hot Spots by Town, 2018
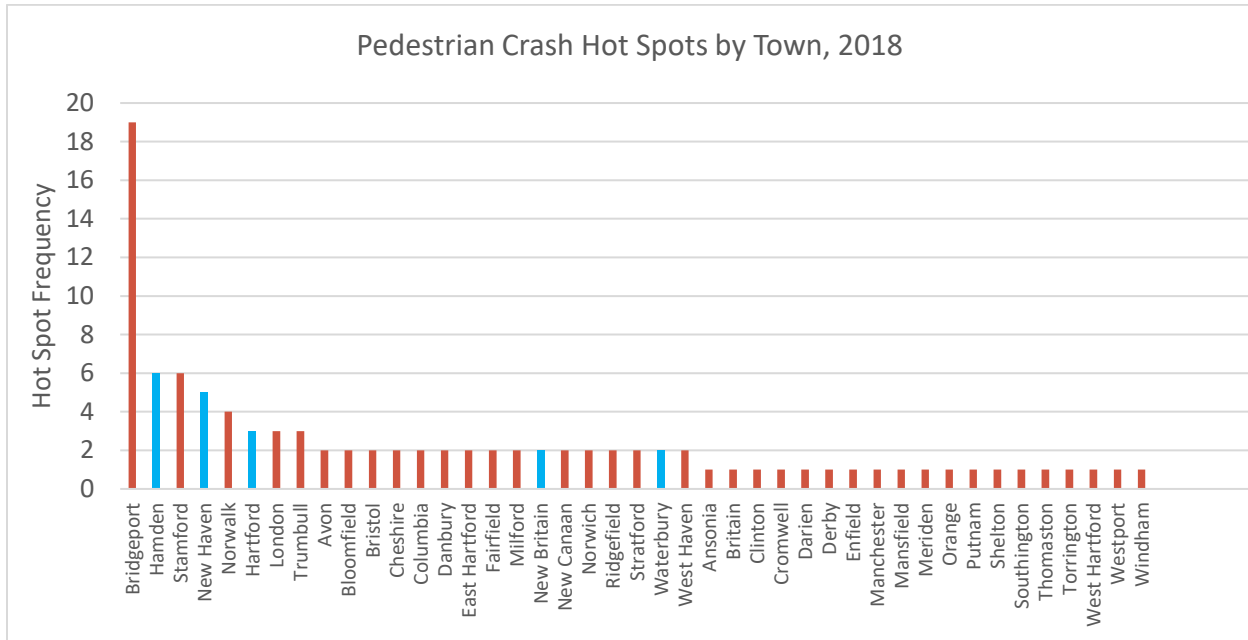
Observational Study Towns

Figure 23 demonstrates the number of intersections included in the top 100 site list for each town. Bridgeport surpassed all towns with a total of 19 intersections that were included in the list of 100 intersections with a high pedestrian crash frequency during 2018. Although the number of pedestrian crashes for a specific intersection within only one year is very small, the total number of intersections by town may offer additional insight about the potential risky pedestrian behaviors for each area and verify if the sites previously selected for the analysis are representative.

The five towns where the six observation sites are located, (i.e. Hamden, New Haven, Hartford, New Britain and Waterbury) have a higher number of intersections from the top 100 list, especially Hamden, New Haven and Hartford. This indicates that these five towns consistently experienced pedestrian safety issues in 2018. In addition, the intersection ranked at No. 1 on list for 2018 pedestrian-involved crashes is Connolly Parkway at Dixwell Avenue (Route 10 N) in Hamden, one of the six study sites. Overall, we firmly conclude that the locations used for the pedestrian observational study are effectively representative for identifying risky pedestrian crossing behaviors in the State of Connecticut, and the findings and conclusions generated from this study are supported by the analysis of 2018 data.

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CONCLUSIONS

The Connecticut Transportation Safety Research Center and the Connecticut Department of Transportation conducted this observational research study with the goal of better understanding the factors that have led to the increase in pedestrian deaths. The study has highlighted the factors that increase risk for pedestrians in the roadways. The study revealed that in an observed sample of pedestrians in the capital city of Hartford, well over half of the pedestrians who were engaged in risky behaviors were distracted. Overall, violations of the roadway system were the most commonly exhibited risky behavior, led by failure to wait for the walk signal. There was potential for correlation observed 94% of those who did not look for oncoming traffic, also did not wait for the walk signal.

The site variations in the study show that the most populated city of New Haven exhibited the highest percentage of pedestrians exhibiting risky behaviors. The capital city of Hartford exhibited the highest percentage of distracted pedestrians. The site with a high school, Hamden, did have lower percentages of jaywalking and misusing the crosswalk, but had an alarmingly high percentage of pedestrians engaged in risky behaviors who did not look for oncoming traffic before crossing the street.

The percentage of roadway system violations exhibited could be a result of a lack of education on pedestrian safety. Implementation of an education program aimed at teaching the rules, risks, and results of following and violating the roadway system or walking while distracted could have the potential to lead to a decline in the number of pedestrians who put themselves in situations of high risk.

The CTSRC and CTDOT plan to continue research of pedestrian crash risks with the use of a full-scale driving simulator. The simulator allows for the testing of pedestrian-involved scenarios that would be impossible to carry out in the field. Scenarios can be developed to mimic pedestrians darting into the road, jaywalking, or even wearing dark clothing. The full-scale setup can test distracted driving as well as interaction with simulated pedestrians. With the use of sensors and monitors, a study could be developed to measure everything from seconds before braking, rate of eye movement, and brain activity in cases of conflict.

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PROPOSED STRATEGIES

PROPOSED STRATEGIES AND SAFETY IMPROVEMENTS

Decreasing the number of pedestrian fatalities and serious injuries can be achieved through a multidisciplinary approach that incorporates strategies from engineering, education, and enforcement. More holistic approaches are often needed to tackle a comprehensive issue such as pedestrian safety. Often pedestrian's socioeconomic status and physical environment are directly related to their limited knowledge of traffic safety and as a result, their risk-taking behavior on the road. Cultural norms and individual experiences can also greatly affect travel behavior and compliance with traffic safety laws. Education and enforcement can be employed to improve compliance with pedestrian right-of-way laws and traffic signal compliance. Engineering treatments to intersections can greatly enhance pedestrian mobility and lower their crash exposure.

How to Use Proposed Strategies

This safety guide is intended to serve those working towards the state Department of Transportation's (CTDOT) goal of **zero traffic-related deaths**. Transportation engineers, law enforcement, town and regional planners, injury prevention specialists and others are encouraged to read through the findings of the pedestrian study for each location and determine if the site-specific countermeasures could be applied to traffic safety issues in their target areas. The recently released Transportation Research Board's Pedestrian Safety Analysis report states that countermeasures should be specific to the identified risks and be appropriate for that condition (*8*). This guide is unique in that it ties together the industry's current best practices and the results of naturalistic observation to attack pedestrian specific traffic safety issues in targeted areas. Another rare component of this safety guide is that it focuses **exclusively** on countermeasures to change the behavior of pedestrians. Countless other national and state released safety guides understandably focus heavily on motorists' actions behind the wheel to try and diminish pedestrian-vehicle collisions. The purpose of the observational study, however, was to try a different approach of examining pedestrian behaviors in a naturalistic environment and determine how those observations could serve to combat this population's risky behaviors.

Users of the PSG should look to the strategies provided in the following sections as a starting point for changing pedestrian behavior in their communities. No one strategy alone will fully eradicate risky pedestrian behavior, so use of multiple strategies on a recurring basis is encouraged. The PSG contains explanations of how each of the countermeasures evoke change in certain risky behaviors. Links to outside resources with proven track records of success in implementing some of these strategies are included.

Table 11 – Countermeasure Cost Chart

Much of the provided cost data was obtained from the Pedestrian and Bicycle Information Center (*13*). Prices can vary from state to state. Price brackets are to be used as estimates only.

$	$$	$$$	$$$$	$$$$$
$0-$10,000	$10,000-$50,000	$50,000-$100,000	$100,000-$250,000	$250,000+

Disclaimers: The information in this safety guide is highly subjective and is provided as a summary compiled from multiple, sometimes-conflicting sources. All suggestions, statements, judgments, and possible errors or omissions are solely the responsibility of the authors. Users of the Pedestrian Safety Guide who disagree with any statement within or who wish to add information or key references are invited to send their comments and suggestions to the Connecticut Department of Transportation.

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$	$$	$$$	$$$$	$$$$$
$0-$10,000	$10,000-$50,000	$50,000-$100,000	$100,000-$250,000	$250,000+

Education-based crash reduction approaches are needed to achieve a balanced and comprehensive traffic safety policy. Education promotes cooperation among road users and encourages them to adapt to one another in the traffic safety environment. Although other methods for reducing traffic crashes, such as high-visibility enforcement and the installation of pedestrian HAWK signals, have proven to be effective, these methods can only penetrate so far due to limited resources and public acceptance. High-visibility enforcement cannot be conducted year-round and engineering improvements can only be completed if the necessary space and funds are available. A study published in the Journal of Transport & Health surveyed members and residents of an academic healthcare community. More than half of respondents (56%) reported that campaigns centered on educating pedestrians and drivers about how to stay safe "would be effective or very effective in improving pedestrian safety" (*9*). Education is the catalyst that makes way for the understanding and social acceptability of other strategies that are implemented.

Road Safety Education Program $-$$

There are many state resources out there that pertain to pedestrian safety education but few that focus on changing the behavior of the pedestrian outside of elementary school curriculum. Road Safety Education (RSE) places importance on combining emotional experiences with traffic experiences and changing behaviors and misperceptions through effective social norms marketing.

Recently published transportation research indicates three main objectives to RSE and each of these objectives speak directly to changing the behaviors observed throughout the pedestrian study (*10*). They include the following:

1. Improvement of skills through training and experience,
2. Promotion of knowledge and understanding of traffic rules and situations,
3. Strengthening and/or changing attitudes towards risk awareness, personal safety and the safety of other road users.

- **RSE action must be based on knowledge of the target.** It is important to ensure your intended target audience and the program of your choice match one another. Adapting educational material to cultural and sociodemographic predictors of crash involvement will maximize effectiveness. The Pedestrian and Bicycle Information Center emphasizes the importance of tailoring a program to relate to the specific population needs and interests of college students. This age group tends to be preoccupied with their friends, establishing their independence and are strongly opposed to delays in gratification. Taking these and other factors into consideration when developing educational programs will help engage students in understanding why pedestrian safety is important and how it affects them directly (*11*).

Image 15

Also, take advantage of the access to college events and on-campus activities for promotion or participation recruitment for safety education programs.

- **Multifaceted approach.** Because the risky behavior of young adolescents extends beyond just the road and into other aspects of their life, a more integrated approach may be needed when tailoring a program to this audience. A study evaluating the effectiveness of five different RSE programs, discussed two programs that involved a variety of learning approaches to raise awareness of risky behavior. One program targeted at 12 and 13-year old adolescents involved a day's worth of educational exercising including observing the conspicuity of non-motorists in the dark who are not wearing reflective clothing, wearing goggles to simulate the effects of alcohol impairment and "watching a traffic situation from another person's perspective". This program saw a 17.2% improvement in participant attitudes. The second program was developed for individuals age 15 to 25 years and included more of an emotional component. Survivors of motor vehicle crashes who were still suffering the physical and emotional effects of that crash were asked to speak about their experiences. Participants were then asked to write a reaction to what had been shared with them and later were asked to move through obstacle courses blindfolded and using a wheelchair to simulate living with a physical handicap (*12*). The percentage of improved attitudes for this activity are not as high as the first program, but there was still a positive change from pre- to post-survey. A more integrated approach might also lead to more effective prevention programs.

- **Explicitly explain the responsibilities of a pedestrian as a road user.** Many individuals are unaware of their rights and responsibilities as a pedestrian. For instance, it may not be very well known that pedestrians are required to yield to motor vehicles and bicyclist when they are not at a crosswalk or intersection. Unfortunately, there is no required training associated with safe pedestrian activity and most people do not generally seek this knowledge out on their own. However, 78.6% of pedestrians observed in our study were found to have misused the crosswalk in some way, whether that be crossing outside of the crosswalk, crossing against the pedestrian signal or not using the signal all together.

- **Continue RSE throughout secondary education and college.** Road safety education is much more in depth and common practice in curriculum for primary schools than for secondary schools, possibly because as an individual gets older, their behavior can become less amenable to education and training. However, 15 to 25-year olds, the predominate age group of secondary education and college, is also the predominate group at risk for traffic fatalities. In addition, college-aged adults are more likely to walk or bike to their destinations for multiple reasons including the expense of owning a vehicle or because of paring restrictions on campus. It would

be neglectful to not expand this education to older age groups on the platform of an academic setting. The Family, Career, and Community Leaders of America (FCCLA) has two RSE programs they utilize for older teens and young adults. The first, Traffic Informers, is geared towards 15 to 25 year olds and includes testimony from peers who have sustained injuries in a crash and what it is like to live in the aftermath of that crash. Each participant is

Image 16 – Participants of FCCLA's Teen Road Safety Assessment

asked to write a reaction to the shared stories. They also take part in a obstacle course that they complete blindfolded and riding in a wheel chair to simulate the feeling of trying to complete daily tasks with physical handicaps. Victim Aid is the second RSE program for young adults age 15 to 18. The focus of the program is similar, educating pedestrians about the potential long-term concequences of unsafe road behavior. Curriuclum included pictures and videos from crashes and the victims and their families.

Measurement of Program Effectiveness: Pre- and post-survey of residents' knowledge of safe crossing behavior and road responsibilities of pedestrians.

Educational Campaign $$-$$$

Educational campaigns, much like road safety education, focus on changing human behavior through messaging. Both countermeasures aim to strengthen awareness of crash risk, understanding of traffic laws and to educate the public on how to be safe road users. However, educational campaigns differ from RSE programs in two major ways. These campaigns generally do not involve much individual participation in skills training and the also extended beyond a multi-day workshop or afternoon seminar. Educational campaigns are developed to reach many people who fall into the specific target group of the campaign. The Pedestrian and Bicycle Information Center, run by the University of North Carolina Highway Safety Research Center, discusses the three specific types of educational campaigns – public awareness, targeted campaigns, and individual campaigns (*13*).

Public awareness campaigns. Public awareness campaigns are a great resource for garnering public support and buy in for an educational message. The momentum from an effective awareness campaign can increase the probability of success with pedestrian safety initiatives introduced later. Messaging is distributed to a broad audience via highway message board or commercial and radio advertisement.

Targeted campaigns. Targeted campaigns are specific to a certain group and changing the behavior of that group. These types of campaigns typically repeat at certain intervals in an effort to maintain long-term results. This would be an ideal campaign type to target pedestrian crosswalk misuse behaviors.

Individual campaigns. Individual campaigns differ from the other campaigns types because intervention is conducted at the individual level, typically through an intermediary, in the form of safety guards, doctors and other authority figures.

Long-term changes in attitude and behavior are more likely if these different methods for campaigns are used in collaboration with one another. A well-respected European study of a meta-analysis of RSE programs in 14 different countries reported that in general, safety campaigns reduced speeding and the number of crashes while also increasing seatbelt use and motorists' yielding behavior by a significant percent (*14*). Van Houton (2011) explains in his research that several rules go into making prompts, or message, that is effective at changing behavior. He states that the prompts should be in a place where they will be seen or heard by pedestrians (*15*). This presents an opportunity for developers of a pedestrian awareness campaign to be creative with when and where they advertise their message.

- **Extensive and heavily saturated awareness campaign.** Depending upon who your target audience is, the time period for awareness campaigns can vary. To help address their pedestrian fatality problem in 2011, the Chicago Department of Transportation launched a year-long

advertising campaign calling on drivers and pedestrians to pay better attention and followed that up with their first pedestrian safety plan.

- **Include messaging that evokes positive emotions and a high degree of personal relevance (*16*).** Peer-to-peer education. Cultivate innovative partnerships through the healthcare industry to utilize those relationships to implement pedestrian awareness programs targeting pedestrian visibility.

- **Challenge myth that low speed crashes are not dangerous** by highlighting the susceptibility of pedestrians to sustain serious injuries or fatalities in these crashes. The Chicago DOT campaign incorporated the installation of 32 mannequins in a high pedestrian crash area to represent the same number of pedestrians killed on Chicago streets. Awareness messaging was distributed on buses and trash receptacles (*17*).

Image 17

- **Challenge myths about crash prevalence and crash risks.** Over 75% of pedestrians observed misusing the crosswalk in our study did not look for approaching vehicles before crossing the road. In Hartford, the observation site with the greatest pedestrian volume, over 58% of pedestrians engaging in risky crossing behaviors were also distracted. Emphasize the increase in crash risk for pedestrians who engage in these behaviors**.**

- **Deliver using mass media.** Television and radio broadcasts are both great tools to help reach a wide-range audience in a short amount of time. In the current age of technology, it is now easier than ever to promote a campaign message to a massive audience. Multiple messages can be crafted for target audiences or platforms and released simultaneously via social media and television programming. Add a clever phrase to capture the attention of the audience and make the message easier to remember (ex. Click-It-Or-Ticket; Subtract the Distraction).

- **Conduct a follow up campaign.** Campaign longevity and persistence have a positive effect on changing behavior. A popular behavior change theory, the Transtheoretical Model of Change, suggests that there are five different stages of change that people must go through prior to the behavior change becoming permanent. The five stages, pre-contemplation, contemplation, preparation, action and maintenance, are fluid and a person may revert to an earlier stage more than once before completing all five (*17*). Therefore, behavior change methods must be implemented on a reoccurring basis to achieve maximum effectiveness. Permanent behavior is difficult, but it can be achieved with the reinforcement of messaging and subsequent shift in perspective and social norms.

Measurement of Program Effectiveness: Analysis of pedestrian crash data in the Connecticut Crash Data Repository for specific location after program implementation.

$	$$	$$$	$$$$	$$$$$
$0-$10,000	$10,000-$50,000	$50,000-$100,000	$100,000-$250,000	$250,000+

One crucial component of improving pedestrian safety is the implementation of highly structured effective police enforcement operations. Classical deterrence theory explains that deviant or unwanted behavior can be reduced by introducing severe, immediate and swift punishments associated with that behavior (*18*). A person's willingness to engage in a behavior will be partially based on the perceived positive gains or negative repercussions as a direct result of that behavior.

In his study evaluating the effectiveness of speeding and DUI enforcement campaigns in Australia, researcher Richard Tay found that the number of breath tests performed each month and the percentage of drivers arrested were associated with a statistically significant reduction in the number of serious crashes per month. To be truly effective in changing behavior, however, the threat of punishment alone is not enough. An individual's behavior is more likely to change, when they can associate personal and/or vicarious experiences with that behavior. This is the case for deterrence of a behavior as well as reinforcement.

Coffee with a Cop $

Image 18

Coffee with a Cop is a program centered around meet-and-greet events between law enforcement and the community members they serve (*19*). Originally established by the Hawthorne Police Department in California, this program is viewed as one of the most successful community-oriented policing programs and is now utilized by 650 departments across the country including right here at home by the University of Connecticut's police department. This program gives residents of a community a chance to bring any concerns or issues up in an environment that is not distracted by an emergency or other type of crisis. For officers, they get the opportunity to build rapport and trust in their communities, which in turn helps them do their job more efficiently. Many of our study sites were in densely populated urban areas and the officers who work in these cities are charged with investigating not only a high volume of traffic collisions but also of other reported serious crimes. Officers who serve in rural, more sparsely populated areas may have already established strong ties in their community if for no other reason than the fact that the population is smaller and closer knit. With the Coffee with a Cop program, a dialogue of open communication between officers in urban areas and their community members can be developed in a relaxed and non-confrontational environment. Officers can make individualized personal connections to really make a lasting impact when discussing pedestrian safety.

- **Foster positive community relationships.** An individual's interactions and experiences with law enforcement may conjure negative feelings and connotations. Usually an officer is involved when someone is in crisis either because of something they did or because of something that was done to them. Unfortunately, this can result in a sense of distrust and resentment of law enforcement among community members. When law enforcement can interact with individuals outside of a tense situation that involves the potential for punishment, this can make way for a more amicable relationship between officers and the community they serve.

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- **Change the attitudes and beliefs about enforcement.** Community policing has a long and established history of breaking down the barriers of communication and trust between the police and citizens. Community members who participate in these talks with their local law enforcement may develop a greater sense of appreciation for what it is that the police do to help keep them safe and the dangers that they are faced with on a daily basis. Communication has the potential change incorrect assumptions about several matters such as enforcement periods, why they are done, and who the intended "targets" of that enforcement are.

- **Create greater acceptance and comradery.** Former FBI Director, James Comey, was quoted at a 2016 conference saying that "it's hard to hate up close…it's hard to hate somebody you know, somebody whose life you understand" (*20*). He was specifically addressing the relationship between the Birmingham Police Department and their community. The sentiment behind this statement is that when people of different backgrounds and life experiences can come together and break bread, they realize how much common ground there is between them and their differences are minimized. A sense of comradery is found between both parties and there is less animosity and misunderstanding. This same sentiment can be tied to the Coffee with a Cop program. Utilize this program as a tool to bridge the gaps between law enforcement officers and their community members.

Image 19

- **Use creativity and innovation.** Departments are encouraged to invite some creativity and brainstorming into the Coffee with a Cop program and make it their own. The program can evolve to something beyond just coffee. UConn PD introduced the program on campus and in the surrounding area of Mansfield in 2015, and they have seen program attendance grow each year. In response to the popularity of the program, the department decided to launch the first community outreach facility dog. Their facility dog, Tildy, has been a part of their Coffee with a Cop program since April 2018, and she has been instrumental in engaging with students on campus, being intimately involved with various community events, and providing invaluable safety education programs.

Measurement of Program Effectiveness: Pre- and post-survey of residents' opinions and attitudes towards law enforcement.

Public Intoxication Outreach $$

Under Connecticut General Statutes, it is not illegal to be intoxicated in public. Currently, the laws regarding public intoxication (CGS 17a-683) state that an officer who happens upon an individual drunk in a public place or incapacitated by alcohol may take the person into protective custody and transfer them to a medical facility, hospital or something similar. Protective custody under this statute does not signify an arrest. In fact, the statute explicitly states that "no entry or other record shall be made to indicate that the person has been arrested or charged with a crime" (*21*).

From a traffic safety perspective, however, public intoxication is a very important issue related to reducing pedestrian-vehicle collisions. Pedestrians who are walking in areas with vehicle traffic while under the influence of alcohol and/or drugs are at a greater risk of being struck by a moving vehicle. Alcohol consumption at a restaurant or bar typically occurs in the evening into the early morning hours, when visibility is worse due to lighting conditions. Pedestrians who are under the influence may also have slower reaction times to on coming vehicles and be in danger of drunkenly staggering or falling on to the roadway.

A recent study conducted by researchers at the University of Tennessee supports these statements. The study examined statewide pedestrian-involved collisions from 2011-2016 and found that 22% of pedestrians who died in these crashes had alcohol in their systems and that they were frequently being struck by vehicles at night (*22*).

- **Support drafting and disbursement of educational material on public intoxication.** Transportation professionals who work to draft educational material on the risks associated with public intoxication would benefit from the support of law enforcement. Police officers are dealing firsthand with publicly intoxicated individuals or worse, the aftermath of a fatal crash involving an inebriated pedestrian. It is important for officers to not only advocate for the push towards greater pedestrian safety awareness but also to provide input and guidance to those individuals charged with developing material to combat this issue. Many behavior modification theories support sanctions as an effective means of changing unwanted behavior (*23-25*). The incorporation of public intoxication legislation that required attendance of a pedestrian safety course or warnings to be issued to offenders would go a long way towards changing the culture.
- **Participate in community safety education.** Some law enforcement agencies engage in community outreach by handing out safety lights to cyclists in place of ticketing them for incorrect riding behavior. This action can be adopted to help encourage safe pedestrian crossing behaviors. Officers can set up posts at intersections with heavy pedestrian foot traffic during evening hours to hand out reflective vests to enhance pedestrian conspicuity. Pamphlets detailing the responsibilities of pedestrians as road users and how they can protect themselves on the road can also be crafted for distribution. Police departments can also coordinate with local business to set up community outreach efforts during the day when customer traffic is higher.

Measurement of Program Effectiveness: Analysis of pedestrian crash and toxicology data for specific location after program implementation.

Distracted Walking Outreach $$

Smartphones, more so than other electronic devices such as tablets or MP3 players, are an ingrained part of everyday life for most people. They are a critical component of modern-day communication and can be a large source of information for a variety of topics. As a result, it is becoming more difficult for people to separate themselves from these devices and this behavior cuts across gender, age, and racial cohorts. Extensive research has explored the cognitive and physiological responses to notifications and phone calls when examining distracted driving and the difficulty some motorists have in resisting these behaviors. The argument against distracted walking coheres with the same points made for distracted driving. Motor vehicle crashes that involve distraction are difficult to investigate because it may be hard for the officer to prove that the driver was distracted at the time of the crash. Distracted walking may be easier to combat from a law enforcement perspective. Distracted pedestrians are more visible to officers than a distracted motorist and therefore officers can more easily identify distraction behaviors.

- **Increase police presence at intersections.** When someone is crossing the road, he or she is no longer just a pedestrian, they are a shared road user which means that they have a responsibility to behave in such a way that does not invite unnecessary harm to other road users. The National Highway Traffic Safety Administration states that law enforcement should be looking for the following violations at intersection crosswalks: pedestrians crossing diagonally and those

attempting to cross when they do not have a walk signal and otherwise interfering with traffic (*26*). This type of behavior was documented frequently in the pedestrian observational study, in particularly at the Hartford intersection of Pearl Street/Central Row and Main Street.

- **Support drafting and disbursement of educational material on distracted walking.** Much like the ideology behind public intoxication enforcement, law enforcement participation in creating distracted walking educational material is vitally important. Officers are typically the audience that views the end result of distracted walking in the form of a collision resulting all too often in serious and fatal injuries for the pedestrian involved. A push towards distracted walking legislation has already begun in Stamford and is currently in effect in other U.S. cities like Honolulu and Montclair. In July 2017, Honolulu enacted the first ever distracted walking law in the U.S. The law states that any

Image 20

  pedestrian crossing the street or highway while viewing an electronic device is subject to a $35 fine (*27*). In Montclair, California, the fine for a first offense is $100 (*28*).

- **Incentivized Enforcement.** Issue rewards for demonstrated good behavior. Recommendations for types of rewards include gift cards or coupons to nearby retailers. Too often the focus is on deterring deviant behavior, as this can sometimes be more effective. However, more emphasis should be placed on highlighting good crossing behavior and encourage pedestrians to continue making those choices.

Measurement of Program Effectiveness: Analysis of pedestrian crash and toxicology data for specific location after program implementation.

Progressive Ticketing $$

The concept of progressive ticketing entails a "ramp up" process of enforcement in three stages: Education, Warning, and finally Ticketing (*29*). This form of enforcement is useful when trying to change unsafe behaviors like the frequent crosswalk misuse observed in the pedestrian study. High visibility can be accomplished through extensive media coverage and the program should be completed at regular intervals.

- **Educating** — Awareness of upcoming police enforcement can help to foster public acceptance of pedestrian safety efforts and sometimes even encourage changes in behavior. The public needs to understand pedestrian crossing laws, the responsibilities of pedestrians and drivers and the consequences of risky crossing behaviors on pedestrian safety.

- **Warning** — Announcing what action will be taken by law enforcement and why, gives the public time to change their behaviors before the ticketing phase starts. A notification of enforcement prior to citations being issued is important especially in areas that do not have a history of enforcement. This provides law enforcement with the opportunity to educate the public about the value and added benefit of enforcement efforts. Police visibility in the community increases and officers can interact with the very offenders whose behaviors they are working to change. In addition to verbal warnings, notification can also be provided in the form of community fliers, signs, local media coverage or press conferences, and social media. This phase could be

particularly useful in combatting distracted walking since there is currently no statute that forbids it.

- **Ticketing** — After the warning period is over, police should hold a press conference to announce the beginning of the ticketing enforcement period and include when and where the police operations will occur. The press conference serves two purposes: to assure the public that law enforcement will follow up on their commitment to pedestrian safety and to weed out the serious, habitual offenders from the rest of the population. If pedestrians continue their unsafe behaviors, officers issue tickets for road crossing.

Measurement of Program Effectiveness: Analysis of pedestrian crash data available in the Connecticut Crash Data Repository after program implementation.

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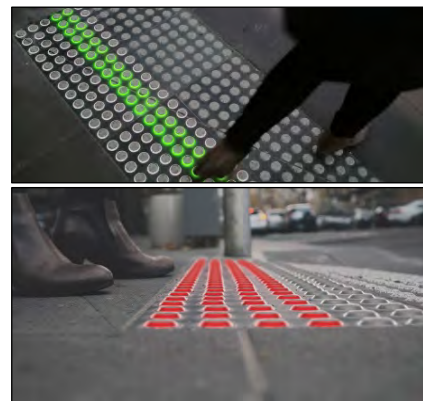| $	$$	$$$	$$$$	$$$$$
$0-$10,000	$10,000-$50,000	$50,000-$100,000	$100,000-$250,000	$250,000+

Engineering modifications have proven to be a complimentary addition to enforcement and educational strategies for changing human behavior. Savolainen, Gates and Datta (2011) discuss the findings of an evaluation of two pilot enforcement programs aimed at reducing the incidents of pedestrian traffic violations in Detroit, Michigan. The authors determined that while targeted enforcement proved to be an effective method for improving pedestrian safety, that infrastructure-based countermeasures enhanced the effectiveness of the enforcement programs (*29*).

Pedestrians misuse of the crosswalk was a risky behavior that was frequently recorded in our observational study. Research suggests that crash reduction and improving pedestrian compliance can be accomplished by reducing the amount of time that pedestrians must wait to cross at intersections. All the intersections selected for the pedestrian observational study, with the exception of one, were equipped with marked crosswalks, signalized traffic controls and pedestrian crossing signals. However, these locations are still seeing some of the highest volumes of pedestrian collisions at intersections in the state. This means, there is room to improve upon the existing treatments to reduce pedestrian crossing fatalities and injuries.

Implement or Update Sidewalks and Marked Crosswalk Areas $-$$$

Implementing or administering upgrades to pedestrian facilities at intersections is an obvious course of action to increase pedestrian safety. Greater visibility of and accessibility to pedestrian facilities will encourage pedestrian use. Sidewalks are the pedestrian lanes of the roadway and proper maintenance and upkeep of these areas is just as important as fixing a pothole or uneven pavement on the road.

- **In-ground traffic lights (*30*).** The engineering improvement was introduced to combat distracted walking from smartphone use and the popularity of Pokémon GO. In-ground traffic lights will flash red or green to correspond with the changing traffic signals and catch the eye of pedestrians looking down at their electronic devices. This engineering treatment could prove to be particularly effective among millennials, a generation who has come to be reliant on their smartphones for everyday life.

Images 21-22 - In-ground traffic lights

- **Pedestrian switch pads.** These pressure sensitive pads act as a pedestrian signal call button for those waiting to cross. Easily adherable to existing ramps, the pads signal is cancelled if the pedestrians vacates the pad, allowing traffic to continually flow.
- **Low cost curb extension.** Bulb outs or neckdowns, alternative names for curb extensions, are an effective tool for increasing pedestrian safety and visibility, slowing motorists' speeds during turns at intersections and reducing pedestrian wait time in the street. This treatment works to change the behavior of both drivers and pedestrians. Pedestrians have a shorter distance to cross

the road and are more visible to motorists, allowing them increased stopping time at the intersection.

- **Sidewalk repairs.** Cracking, settling of sidewalks or overgrown shrubbery on an intersection corner can greatly impact the accessibility of safe pedestrian routes in an area. Town planners can conduct a citywide sidewalk condition assessment to inventory conditions that are impeding pedestrian mobility. Grade-separated asphalt pathways are a great, cost effective alternative to traditional sidewalk improvements

- **Community crosswalk program (32).** Specially designed crosswalks that are painted or otherwise showcase art can be an effective way to encourage community involvement in pedestrian safety issues and to promote safe crosswalk behaviors. Neighborhoods can collaborate to design a unique crosswalk that represents the best parts of that community and clearly highlights a safe pedestrian walking path. Ideal locations for this treatment would be areas where there is already a marked crosswalk and preferably shorter width streets with lower traffic volume to preserve the life of the design. However,

Images 23-24 - Specially painted crosswalks

please note that these types of decorative crosswalks are not compliant with the Manual on Uniform Traffic Control Devices (MUTCD) and generally are not supported by the Federal Highway Administration (FHWA). While they may bring attention to the crosswalk and make pedestrians more aware of educational or enforcement programs, if not designed properly they may negatively impact safety (*33*).

Measurement of Program Effectiveness: Post-treatment opinion and attitude survey of residents; in person observation period at specific location.

Update/Implement Pedestrian Crossing Signal $-$$$$

Current pedestrian crossing signals are designed for a community looking ahead of them, not down at their electronic devices. Evolving the current infrastructure to keep pace with social behavioral changes is crucial to continued pedestrian safety. Pedestrians' impatience and subsequent diminished waiting times can be curbed with entertaining and interactive traffic signals while in-ground traffic lights can help to lessen distracted walking and pedestrian-involved collisions.

- **Interactive pedestrian crossing signal (34).** Install interactive pedestrian signals that 'dance' using "motion capture technology" (*35*). The countries and cities who have implemented this behavioral change have cited the desire of pedestrians to "watch and wait rather than walk through the red light" (*34-35*). Lisbon, the pilot city for these signals saw an 81% increase in pedestrian wait times at the red pedestrian signal because they were engaged by the dancing signal.

Images 25-26 – Interactive Dancing Traffic Light

- **Increase timing of pedestrian signal phasing.** Optimize signal operations with automated pedestrian detection phasing, timing, coordination and clearance intervals. Research has found a reduced number of signal violations by pedestrians at locations with a countdown signal (*36*). Split or concurrent signal phasing can reduce pedestrian-vehicle conflict and illegal road crossings. Automated pedestrian detection provides more timely pedestrian indications and ensures that pedestrians have enough time to safely cross the roadway. Wait time decreases at successive road crossings (*37*).

- **Install HAWK Pedestrian Beacons.** These signal beacons can provide a safer crossing environment for pedestrians than traditional crosswalks (*38*). Because the beacons are only activated when a pedestrian is present, there is minimal to no increase to driver wait times. These high-tech pedestrian safety beacons have already been introduced in the state in the city of Stamford. This engineering treatment may be a good consideration for the New Britain study site of Lafayette Street at Main Street No 1. There is no pedestrian crossing signal despite its proximity to a large shopping plaza**.

Measurement of Program Effectiveness: In person observation period at specific location; analysis of pedestrian crash data post treatment period.

Support Technological Advances $$$$-$$$$$

It takes a human driver, who is not distracted, a full two seconds to acknowledge a potentially hazardous driving situation and to step on the brake pedal. If a vehicle is traveling at 30 miles per hour, slightly above the general posted speed limit in most residential areas, in that two seconds the vehicle would travel 357

feet or over half a mile. For a computer, i.e. a vehicle equipped with an intelligent transportation system, this time is reduced to 0.3 seconds, over six and a half times faster than a human driver. Although, the focus of this safety guide is pedestrian education and behavior change, one should not underestimate what can be achieved to reduce pedestrian crash risk through vehicle and infrastructure improvements and technology advancements such as driver assisted technology, vehicle to vehicle (V2V) and vehicle to pedestrian (V2P) communications.

Image 27

- **Intelligent Transportation Systems (ITS).** Research in the automotive engineering industry calls for innovation and creativity in the creation of intelligent transportation systems built for

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pedestrian detection. A 2014 research study proposes a two-stage pedestrian detection system and compares the method against a single-stage system. The result of the comparison indicated that the proposed two-stage pedestrian detection method was superior in performance, both in detecting pedestrians that are further away and also by achieving a pedestrian detection rate of about 80% compared to 64% with the single-stage method (*39*). Many new model vehicles now include some ITS features such as advance driver warning systems and automatic braking. Pedestrian detectors, switch pads and GPS systems are just a few examples of ITS equipment meant specifically for pedestrian users (*40*).

- **Connected Vehicles.** Autonomous and connected vehicle technology is still in its infancy and the same can be said of research of these vehicular advancements. There is, however, an abundance of traffic psychology research that suggests human error is the number one causal factor attributable to collisions, by over 90%. If for only this reason, it would be advantageous for traffic safety professionals outside of this field to partner together with those researching and developing this type of technology. V2V and V2P communications are an especially important component of future vehicle design, chiefly because current transportation infrastructure is built to accommodate motorists, not pedestrians. Technology can be designed to continually process new information and incorporate it into the vehicle communication system, something that is difficult to accomplish on a human level.

SUMMARY OF COUNTERMEASURES

The 2017 Pedestrian Observational Safety Study included several variables of data that produced results that could be generalized across all study sites. The first variable pertained to whether or not the pedestrians at a given location were scanning the roadway for oncoming vehicles prior to stepping into or crossing through the intersection. Although individually, the observation location of Baldwin Street No 1, Scovill Street/Mill Street No 3 in Waterbury, had the highest proportion of pedestrians scanning for approaching vehicles among those observed, only 24.3% of the entire study population demonstrated this same behavior. This indicates that this may be a general issue among pedestrians in Connecticut. The second variable involved pedestrian wait times prior to crossing the road, and they were virtually non-existent in the study population. This was the predominate type of misuse observed. An overwhelming 86.69% of all pedestrians observed in the study did not wait before crossing the road. Lastly, distracted walking and other risky crossing behaviors appeared to be positively correlated at all but two of the study sites (New Haven – Chapel St and New Britain). The CTSRC's proposed general and site-specific strategies, to improve pedestrian safety are provided in summary form in Tables 12 and 13. These recommended countermeasures are based on the analyzed results from the 2017 Pedestrian Observational Safety Study and gathered from the current best practices in pedestrian safety. General, as well as location-specific countermeasures are summarized in Tables 12 and 13.

Table 12: Summary of General Strategies

General	
	Work with community business and restaurants interested in the promotion of pedestrian safety education and corresponding safety resources.
	Create an effective targeted and/or public educational campaign specific to the pedestrian population. Increase awareness about safe crossing habits and pedestrian road users' rules and regulations.
	Develop multiple road safety education programs targeted towards different age cohorts.
	Foster strong relationships within the community to encourage support for enforcement efforts. Raise awareness of pedestrian safety issues and risks for injury and death.
	Enforce traffic safety laws that pertain to both pedestrians AND drivers. Pedestrians and motorists can be misinformed regarding traffic laws, which may lead to risky or reckless behavior.
	Implement progressive ticketing approach to enforce pedestrian traffic violations.

	Support the development and adoption of technological advancements to road infrastructure and automotive engineering to reduce risk of pedestrian-vehicle collisions.
	Increase funding for pedestrian safety infrastructure projects such as raised pedestrian crossings, sidewalk repair, and pedestrian signal improvements.
	Optimize signal operations with automated pedestrian detection phasing, timing, coordination and clearance intervals. Automated pedestrian detection provides more timely pedestrian indications and ensures that pedestrians have enough time to safely cross the roadway.
	Expand effective enforcement and education of all roadway users to improve pedestrian safety based on known risk factors and data trends. Incorporate injury data and mapping of dangerous routes or high pedestrian-crash areas into educational material.
	Incorporate engineering improvements in the form of automated enforcement systems. For maximum effectiveness, implementation should coincide with a strong educational effort to inform the public about the benefits of the equipment and the intention to improve motorist and pedestrian safety.
	Draft and support legislative revisions for traffic safety enforcement, improvements and education. In addition, draft and support new educational initiatives to deter distracted walking and public intoxication.

Table 13: Summary of Site-Specific Strategies

		Location Specific
HARTFORD	**Pearl St/Central Row at Main St** **Issues: Distracted walking; pedestrian wait time** 	- Pedestrian fencing - Concurrent or split pedestrian signal phasing - In-ground traffic lights - Educational campaign (Targeted and Public) - Distracted walking outreach - Progressive ticketing - Increased police presence at intersection
HAMDEN	**Connolly Pkwy at Dixwell Ave** **Issues: Distracted walking; crosswalk misuse** 	- Community Crosswalk Program - RSE (secondary education and multifaceted) - Distracted walking outreach - Educational campaign (Public) - Progressive ticketing - Pedestrian switch pads

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	Intersection	Countermeasures
NEW HAVEN	**Chapel St at Temple St** **Issues: Pedestrian wait time; pedestrians not looking for vehicles; crosswalk misuse** 	- In-ground traffic lights - Educational campaign (Targeted, Public and Individual) - RSE (multifaceted) - Public intoxication outreach - Increased police presence at intersection - Interactive pedestrian crossing signal
	Whalley Ave at Orchard St **Issues: Pedestrian wait time; pedestrians not looking for vehicles** 	- Incentivized enforcement - In-ground traffic lights - Educational campaign (Public)
WATERBURY	Baldwin St No 1 at Scovill St Issues: **Crosswalk misuse; pedestrian wait times** 	- Educational Campaign - Concurrent or split pedestrian signal phasing - Coffee with a Cop
NEW BRITAIN	**Lafayette St at Main St No 1** **Issues: Pedestrian wait time; pedestrians not looking for vehicles; crosswalk misuse** 	- HAWK Pedestrian Beacon - RSE - Educational Campaign (Targeted and Public) - Pedestrian switch pads

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APPENDIX A
Pedestrian Data Collection Form

ID	24	PA Talking over phone	☐
Photo		PA Texting	☐
Road condition	Dry	PA Looking at an electronic device	☐
Light condition	Dark. Lighted	PA Eating	☐
Start Time	8:44:42 PM	PA Smoking	☐
End Time	8:44:54 PM	PA Pushing stroller/wheelchair	☐
IF snow, are the roads covered?	☐	PA On a wheelchair	☐
Visibility on road	Poor	PA Walking a pet	☐
Age group	Adult	PA Listening to music	☐
Gender	Male	PA Grooming	☐
Race	White	Possibility of conflict	☐
Ped used crosswalk	☑	Ped acitivities in case of conflict	
Ped used ramp	☑	PIC Bicycle	☐
Ped used island	☐	PIC Jogger	☐
Ped used signal	☐	PIC Vehicle	☐
Ped part of group?	☐	PIC Wheelchair	☐
If yes, then # of people in group	0	PIC Blind person	☐
Did ped wait before crossing?	☐	PIC Disabled person	☐
If yes, then how long?		PIC Scooter	☐
Did ped look for approaching vehicles?	☑	PIC Skateboard	☐
If yes, then how many instances?	1	PIC Rollerblade	☐
Misuse?	☑	PIC Segway	☐
Distracted?	☐	PIC Baby stroller	☐
PA Standing	☐	PIC Crossing guard	☐
PA Walking	☑	Was pedestrian clearly visible?	☐
PA Running	☐	Reasons for pedestrian obscurity	
PA J-walking	☐	Additional notes	
PA Jogging	☐		
PA Talking to a person	☐		

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Location Characteristics

Hartford

Hartford Demographics[+]:

County: Hartford

Council of Government: Capital Region

Population:
- 2012-2016: 124,320
- 2020 Projected: 126,443
- '16 - '20 Growth/Yr: 0.4%
- Land Area (sq. miles): 17
- Pop/Sq. Mile (2011-2015): 7,153
- Median Age (2011-2015): 31
- Households (2011-2015): 45,845
- Med. HH Inc. (2011-2015) $32,095
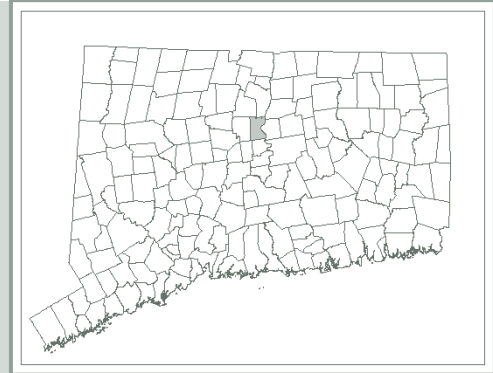
Age Distribution (2011-2015):

0-4		5-14		15-24		25-44		45-64		65+	
8,874	7%	17,135	13%	25,537	21%	34,666	28%	27,098	22%	12,310	10%

Poverty Rate (2012-2016): 31.9%

Unemployment Rate: 9.4%

Education Attainment (2012-2016):
- High School Graduate: 22,833 (31%)
- Associates Degree: 4,303 (6%)
- Bachelors or Higher: 12,373 (17%)

[+]*Information in this section was obtained from the 2018 Connecticut Economic Resource Center town profiles, located at:* https://www.cerc.com/resources/town-profiles/

Table 1 - 2015-2017 Pedestrian Crash Data for Hartford				
	Total Crashes	Fatal Crashes	Injury Crashes	Pedestrian Fatalities	Pedestrian Injuries
2015	135	3	120	3	120
2016	176	2	164	2	168
2017	166	2	158	2	158

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Study Site #1: Pearl Street/Central Row at Main Street

- Type of intersection:
  - o Roadway/roadway (not interchange related)
- Intersection traffic control:
  - o Signalized (with exclusive pedestrian signal)
- Left or right turn prohibitions or protections
  - o Right-turn-on red prohibition (all times)
  - o Protected-permitted left turn (all times, except for West leg)
- Intersection geometry:
  - o Cross intersection (four legs)
  - o Conventional left turn lanes
  - o Two-way directional flow
- Crosswalk presence or type:
  - o Marked crosswalk with no island
- Max number of lanes crossable: 5
- Number of exclusive left turn lanes: 2
- Intersection lighting: Yes

Image 9

LOCATION CHARACTERISTICS:

Hartford is the third most populated city in Connecticut and is the capital of the state. The intersection of **Main Street at Central Row/Pearl Street** is one of the busiest intersections in the city of Harford and is located right downtown, surrounded by skyscraping business centers and Connecticut's Old State House. The intersection is signalized four ways and all four crosswalks have a walk signal. There are at least five bus stops within a half-block radius from the intersection. This is a heavily trafficked downtown area scattered with several corporate offices and restaurants nearby. Within walking distance of the location are business such as Webster Bank, the Harford Business Journal, Trumbull Kitchen and Hartford Sweat, a yoga and fitness studio. With nearby parking garages and on street parking available from 9am to 3pm and again after 6pm, this area is burdened by heavy vehicle traffic at all hours of the day.

Nearby landmarks: Old State House, Blue State Coffee shop, People's United Bank, Dunkin Donuts, CVS, Dhaba Wala Indian Kitchen, Travelers, Ancient Burial Ground, Downtown YMCA, Burger King, Wells Fargo Bank.

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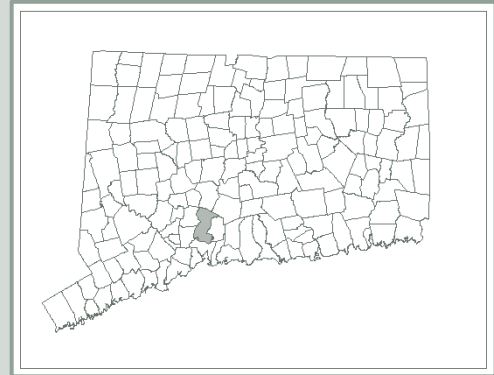CTSRC

Hamden

Hamden Demographics⁺:

County: New Haven

Council of Government: South Central Region

Population:
- 2012-2016: 61,476
- 2020 Projected: 65,545
- '16 - '20 Growth/Yr: 0.4%
- Land Area (sq. miles): 33
- Pop/Sq. Mile (2012-2016): 1,883
- Median Age (2012-2016): 38
- Households (2012-2016): 23,356
- Med. HH Inc. (2012-2016) $71,665

Age Distribution (2012-2016):

0-4		5-14		15-24		25-44		45-64		65+	
3,068	5%	5,856	10%	12,442	20%	14,754	24%	16,466	27%	9,070	15%

Poverty Rate (2012-2016): 8.4%

Unemployment Rate: 4.6%

Education Attainment (2012-2016):
- High School Graduate: 9,176 (23%)
- Associates Degree: 2,689 (7%)
- Bachelors or Higher: 18,274 (46%)

⁺*Information in this section was obtained from the 2018 Connecticut Economic Resource Center town profiles, located at:* https://www.cerc.com/resources/town-profiles/

Table 2 - 2015-2017 pedestrian crash data for Hamden					
	Total Crashes	Fatal Crashes	Injury Crashes	Pedestrian Fatalities	Pedestrian Injuries
2015	19	0	18	0	18
2016	25	1	23	1	25
2017	22	0	17	0	16

Study Site #2: Connolly Parkway at Route 10-N

- Type of intersection:
  - Roadway/roadway (not interchange related)
- Intersection traffic control:
  - Signalized (with pedestrian signal)
- Left or right turn prohibitions or protections
  - Right-turn-on red prohibition (all times)
  - Protected left turn (into Hamden HS)
- Intersection geometry:
  - Cross intersection (four legs)
  - Conventional left turn lanes
  - Two-way directional flow
- Crosswalk presence or type:
  - Marked crosswalk with no island
- Max number of lanes crossable: 6
- Number of exclusive left turn lanes: 4
- Intersection lighting: Yes
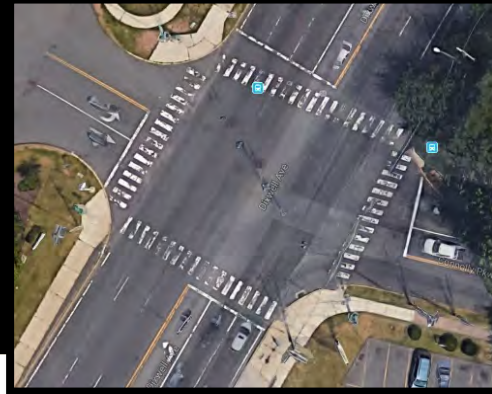
Image 10

LOCATION CHARACTERISTICS:

The intersection of **Connolly Parkway at Route 10-N (Dixwell Ave)** is located in a main shopping area of Hamden, with several restaurants and stores to the North and South, along Route 10. One leg of this intersection is the major driveway to Hamden High School, the main high school in the area. On the opposite side of the street is a strip mall containing a Chinese restaurant, car wash and laundromat. A CVS and Bed Bath & Beyond are in a parking lot adjacent to this. Despite the intersection being equipped with a pedestrian countdown signal and a clearly marked crosswalk on all four legs, this is a high traffic area that requires a pedestrian to cross up to six travel lanes to get across.

Nearby landmarks: Hamden High School, CVS, Chinese Chef restaurant, Splash Car Wash, Bed Bath & Beyond, Shop Rite, Panera Bread.

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New Haven

New Haven Demographics[+]:

County: New Haven

Council of Government: South Central Region

Population
- 2012-2016: 130,612
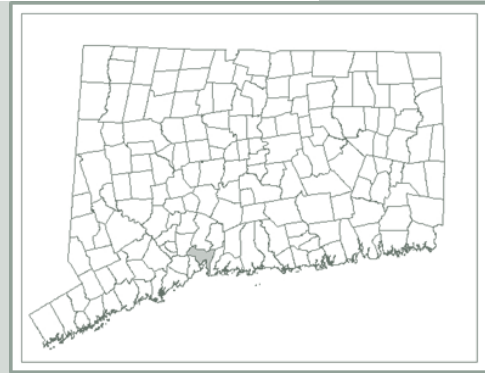- 2020 Projected: 135,379
- '16 - '20 Growth/Yr: 0.7%
- Land Area (sq. miles): 19
- Pop./Sq. Mile (2012-2016): 6,992
- Median Age (2012-2016): 30
- Households (2012-2016): 49,771
- Med. HH Inc. (2012-2016) $37,192

Age Distribution (2012-2016)

0-4		5-14		15-24		25-44		45-64		65+	
7,792	6%	16,577	13%	24,805	19%	41,728	32%	25,822	20%	13,681	10%

Poverty Rate (2012-2016): 26.1%

Unemployment Rate: 6.6%

- *Education Attainment (2012-2016)*
- High School Graduate: 24,450 (30%)
- Associates Degree: 3,523 (4%)
- Bachelors or Higher: 27,810 (34%)

[+]Information in this section was obtained from the 2018 Connecticut Economic Resource Center town profiles, located at: https://www.cerc.com/resources/town-profiles/

Table 14 - 2015-2017 Pedestrian Crash Data for New Haven

	Total Crashes	Fatal Crashes	Injury Crashes	Pedestrian Fatalities	Pedestrian Injuries
2015	136	0	117	0	126
2016	177	3	158	3	165
2017	177	2	150	2	153

Study Site #3: Whalley Avenue and Orchard Street
- Type of intersection:
    - Roadway/roadway (not interchange related)
- Intersection geometry:
    - Cross intersection (four legs)
    - Conventional left turn lanes
    - Two-way directional traffic flow
- Left or right turn prohibitions or protections
    - Right-turn-on red prohibition (all times)
    - Protected-permitted left turn
- Intersection traffic control:
    - Signalized (with pedestrian signal)
- Crosswalk presence or type:
    - Marked crosswalk with no island
- Max number of lanes crossable: 4
- Number of exclusive left turn lanes: 1
- Intersection Lighting: Yes

Image 11

LOCATION CHARACTERISTICS:

Whalley Avenue and Orchard Street experiences a good amount of pedestrian traffic through any given day. This particular area of New Haven is unusual because there is a mixture of local business chains and residential homes very nearby to one another, some even sharing one side of the street. A person sitting on the front steps of their homes could be seen as a loiterer if they moved 100 feet to their left, so pedestrians are often in and around this area. There are two strip malls along two of the approaches of this intersection that pedestrians may walk to. Each contain businesses such as Subway, a check cashing place, a Boost Mobile, Whalley Chiropractic and a beauty supply store. A few fast food chains and a CVS are within walking distance to this intersection. A liquor store sits at the half-way point between this location and the intersection to the west, Whalley Avenue at County Street.

Nearby landmarks: Public transit stops, Subway, CVS, Superior Court for Juvenile Matters, New Haven Correctional Center, Burger King, liquor store, Stop & Shop.

Study Site #4: Chapel Street and Temple Street
- Type of intersection:
    - Roadway/roadway (not interchange related)
- Intersection geometry:
    - Cross intersection (four legs)
    - Conventional left turn lanes
    - Two-way directional traffic flow (East and West/Chapel St)
    - One-way directional traffic flow (North to South/Temple St)
- Left or right turn prohibitions or protections
    - Right-turn-on red prohibition (all times)
    - permitted left turn
- Intersection traffic control:
    - Signalized (with pedestrian signal)
- Crosswalk presence or type:
    - Marked crosswalk with no island
- Max number of lanes crossable: 4
- Number of exclusive left turn lanes: 1
- Number of exclusive right turn lanes: 1
- Intersection lighting: Yes

Image 12

LOCATION CHARACTERISTICS:

New Haven is the second most populated city in Connecticut and the highest populated city in the study. **Chapel Street and Temple Street** intersect in a popular downtown area in New Haven. Located just blocks away from several higher education institutions such as Yale University and Gateway Community College, this location is filled with several business that are attractive to college students. This intersection is right in front of the New Haven Green, a large park area where several pedestrians can hangout, walk their pet or ride bicycles. Three bus stops are located at this intersection as well as more than six restaurants and other businesses. Although lighting exists along Temple Street to the north, there is no lighting within the intersection. A tequila bar, and a wine and liquor store, are also within proximity increasing the probability for intoxicated pedestrians in the area.

Nearby landmarks: Shubert Theater, Yale University, Yale Law School, bus stops, church, park.

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Waterbury

Waterbury Demographics[+]:

County: New Haven

Council of Government: Naugatuck Valley

Population:
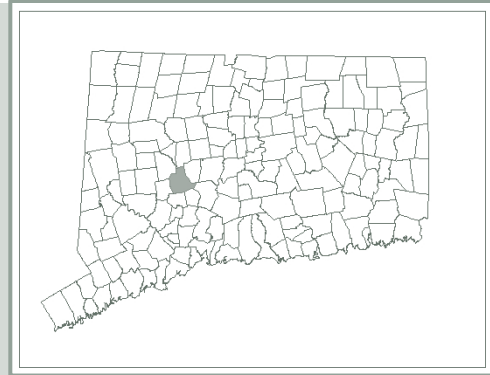2012-2016: 109,211
2020 Projected: 112,571
'16 - '20 Growth/Yr: 0.7%
Land Area (sq. miles): 29
Pop/Sq. Mile (2012-2016): 3,829
Median Age (2012-2016): 35
Households (2012-2016): 39,735
Med. HH Inc. (2012-2016) $39,681

Age Distribution (2012-2016):

0-4		5-14		15-24		25-44		45-64		65+	
7,901	7%	15,517	14%	16,275	15%	29,737	27%	26,472	24%	13,309	12%

Poverty Rate (2012-2016): 25.4%

Unemployment Rate: 8.1%

Education Attainment (2012-2016):
High School Graduate: 25,112 (36%)
Associates Degree: 5,294 (8%)
Bachelors or Higher: 10,477 (15%)

[+]Information in this section was obtained from the 2018 Connecticut Economic Resource Center town profiles, located at: https://www.cerc.com/resources/town-profiles/

Table 15 - 2015-2017 Pedestrian Crash Data for Waterbury					
	Total Crashes	Fatal Crashes	Injury Crashes	Pedestrian Fatalities	Pedestrian Injuries
2015	98	3	86	3	90
2016	90	3	76	3	76
2017	120	7	98	7	108

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INTERSECTION DESCRIPTION:

Study Site #7: Baldwin Street No 1 at Scovill Street/Mill Street No 3

- Type of intersection:
    - Roadway/roadway (not interchange related)
- Intersection geometry:
    - Cross intersection (four legs)
    - Conventional left turn lanes
    - Two-way directional traffic flow
- Left or right turn prohibitions or protections
    - Permitted left turns
- Intersection traffic control:
    - Signalized (with pedestrian signal)
- Crosswalk presence or type:
    - Marked crosswalk with no island
- Max number of lanes crossable: 5
- Number of exclusive left turn lanes: 2
- Number of exclusive right turn lanes: 1
- Intersection lighting: Yes

Image 13

LOCATION CHARACTERISTICS:

The southern approach of Baldwin Street is an overpass that runs over I-84. Along this part of the street there are sidewalks on either side of the bridge for pedestrians to walk on that lead towards this intersection. Two bus stops are located on Baldwin Street at opposite corners of the intersection. The corner of Mill Street and Baldwin Street faces a sidewalk path designated for patrons of the nearby retail stores and restaurants. Pedestrian crosswalks are clearly marked and there are two light sources for the intersection, but they are placed on opposites sides from one another on the same approach. This means that only one half of the intersection may be well lit for pedestrian foot traffic in dark conditions.

Nearby Landmarks: St. Mary's Hospital, St. Mary's Grammar Schoo, T.J. Maxx, Petco, Chili's Grill & Bar restaurant, Barnes & Noble, Save-A-Lot, Five Below, Michaels, Buffalo Wild Wings, Petco.

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New Britain

Hartford Demographics[+]:

County: Hartford

Council of Government: Capital Region

Population:
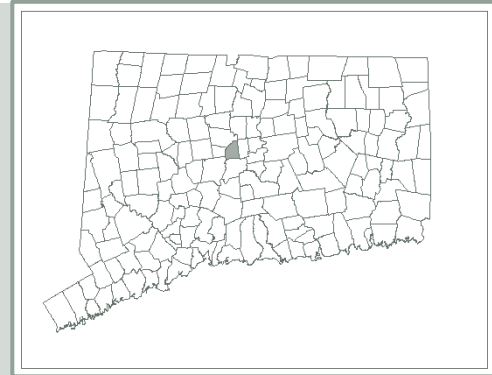2012-2016: 72,876
2020 Projected: 75,277
'15 - '20 Growth/Yr: 0.8%
Land Area (sq. miles): 13
Pop/Sq. Mile (2012-2016): 5,443
Median Age (2012-2016): 34
Households (2012-2016): 28,118
Med. HH Inc. (2012-2016) $41,844

Age Distribution (2012-2016):

0-4		5-14		15-24		25-44		45-64		65+	
4,535	6%	9,703	13%	11,853	16%	20,349	28%	17,550	24%	8,886	12%

Poverty Rate (2012-2016): 22.9%

Unemployment Rate: 7.2%

Education Attainment (2012-2016):
High School Graduate: 17,897 (38%)
Associates Degree: 3,316 (7%)
Bachelors or Higher: 8,475 (18%)

[+]Information in this section was obtained from the 2018 Connecticut Economic Resource Center town profiles, located at: https://www.cerc.com/resources/town-profiles/

Table 16 - 2015-2017 Pedestrian Crash Data for New Britain

	Total Crashes	Fatal Crashes	Injury Crashes	Pedestrian Fatalities	Pedestrian Injuries
2015	58	1	49	1	120
2016	49	2	34	2	168
2017	82	0	50	0	158

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INTERSECTION DESCRIPTION:

Study Site #9: Lafayette Street at Main Street No 1
- Type of intersection:
  - o Roadway/roadway (not interchange related)
- Intersection geometry:
  - o Cross intersection (four legs)
  - o Two-way directional traffic flow
- Intersection traffic control:
  - o Unsignalized (no pedestrian signal)
  - o Stop-signed controlled (all-way)
- Crosswalk presence or type:
  - o Marked crosswalk with no island
- Max number of lanes crossable: 3
- Intersection lighting: Yes

Image 14

LOCATION CHARACTERISTICS:

Recent improvements have been conducted at the intersection of **Lafayette Street at Main Street No 1** in New Britain. Within the last five years, marked crosswalks were painted on all four approaches of this crossing. Designated bike lanes and on-street parking spots have been identified running north and south on Main Street as well. Despite the previously mentioned engineering improvements, the location was not equipped with a pedestrian walk signal. This may be due to the fact that there is no signalized traffic light at this crossing. Traffic from all four approaches are stop sign controlled.

There is also one bus stop at this intersection, but the status of use is unknown as there are designated on street parking spaces in front it. The eastern approach leg is one of the entrances and exits to a shopping plaza with an Ocean State Job Lot and Marshalls. A package store is located less than 100 feet away from this intersection.

Nearby Landmarks: nail salon, tobacco vape and smoke shop, psychic reader, Ocean State Job Lot, Marshalls, Taco Bell, Webster Bank, EbLens.

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