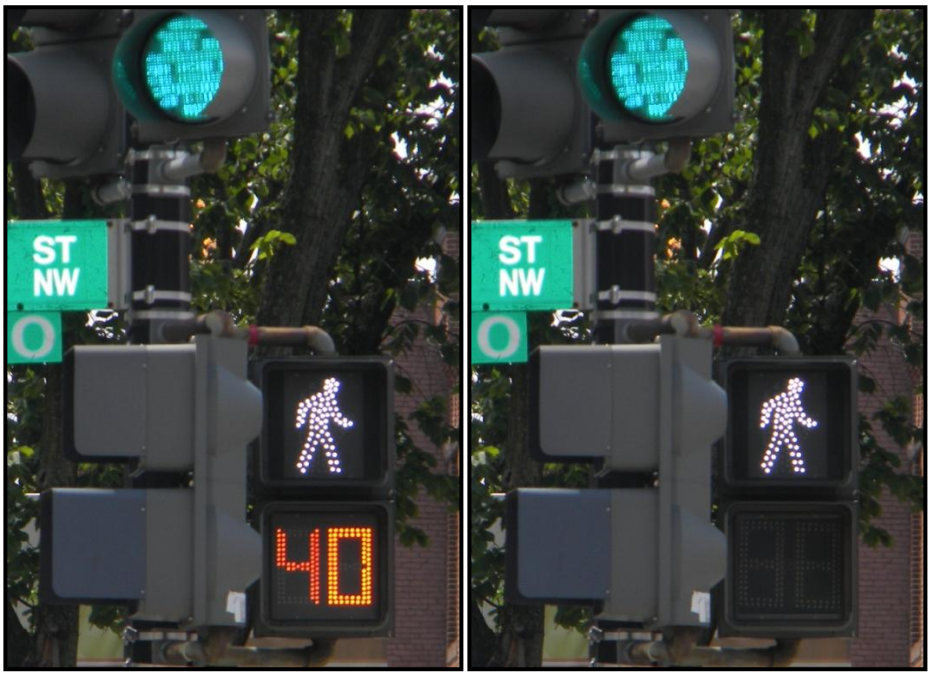
FINAL REPORT

COMPARATIVE STUDY OF COUNTDOWN PEDESTRIAN SIGNAL DISPLAYS IN THE DISTRICT OF COLUMBIA



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DISTRICT DEPARTMENT OF TRANSPORTATION

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11. Abstract

According to the Manual on Uniform Traffic Control Devices (MUTCD), Countdown Pedestrian Signals (CPS) shall only be displayed during the clearance interval (FLASHING DON'T WALK - FDW) of pedestrian signals. The primary purpose of this CPS display is to inform pedestrians of the remaining time for crossing a road controlled by the signal, to discourage them from starting, and to inform those who are already on the way of the remaining time before the beginning of the DON'T WALK (DW) interval. The general literature on CPS is conclusive that CPS is better understood than the conventional pedestrian signals. In the District of Columbia the CPS display starts at the onset of the Steady WALK (SW) interval and continues through the FDW interval. It is not certain whether this CPS display has any advantage over the standard display as prescribed by the MUTCD. In this research a comparative field study of both types of countdown displays at twenty-five (25) intersections in the District of Columbia was conducted in addition to an attitudinal survey to gauge the public's comprehension and perception of both displays. The results of the evaluation showed that at the majority of the intersections studied, there were no statistically significant differences in pedestrian crossing behaviors (using 5% significance level). The results of the analyses only apply to signalized intersections with fixed time control and show that the differences in pedestrian crossing behavior due to the two types of CPS displays are minimal. The attitudinal survey results showed that the majority of pedestrians (~86%) and drivers (~83%) prefer CPS display which starts at the onset of the SW.

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1.0 EXECUTIVE SUMMARY

Countdown pedestrian signals (CPS) are increasingly deployed as a strategy for improving safety at signalized intersections. The general literature on CPS is conclusive that CPS is better understood and preferred over the conventional pedestrian signals. There are two noted types of CPS displays of the countdown time used in jurisdictions across the United States: one where the countdown begins at the start of the Steady "WALK" (SW) interval and continues through the Flashing "DON'T WALK" (FDW), and the other that begins and ends with the Flashing "DON'T WALK" (FDW) interval. According to the 2009 Manual on Uniform Traffic Control Devices (MUTCD), CPS shall only be displayed during the clearance (FDW) interval. In the District of Columbia, the countdown display starts at the onset of the SW interval and continues through the FDW interval. This research examined whether the CPS display used by the District of Columbia has any advantage over the standard display prescribed by the MUTCD.

This research involved a comparative "before and after" field study of both types of countdown displays using surrogate safety variables to assess pedestrian crossing behaviors. The study was conducted at twenty-five (25) intersections, where the signal and traffic were videotaped. Pedestrian and driver behaviors were obtained from the video of each intersection for both types of CPS displays. The video recordings of pedestrian and vehicular traffic were made during the morning and evening peak periods. The five variables examined in this study were pedestrian completing crossing during the red interval, pedestrian beginning to cross during FDW, signal cycles with red-light running violations, pedestrian-vehicle conflicts, and signal cycles with pedestrian-vehicle conflicts. In addition, a field survey was conducted to determine the opinion of pedestrians and drivers regarding their preferred CPS display.

Statistical analyses were conducted at 95% confidence interval to determine whether the standard display as prescribed by the MUTCD has any advantage over the CPS display adopted by the District of Columbia. The results of the analysis showed that at the majority (52% -74%) of the intersections studied, there were no statistically significant differences in pedestrian crossing

behaviors at both types of CPS, at 5% level of significance. Thus, there is no discernable difference in pedestrian crossing behaviors due to the type of CPS display.

The results of the survey also showed that a majority of the pedestrians surveyed (~86%) at various intersections in the City preferred the CPS display that starts with the SW and continues through FWD. Approximately 90% of those surveyed also stated they understood the difference between the two displays. About 94% of the drivers who were surveyed at various Department of Motor Vehicles offices indicated that the magnitude of the time on the countdown display influence their driving decisions. Approximately 83% of the drivers surveyed preferred the CPS display that starts on the onset of the SW.

The results of this study show an overwhelming preference (by both drivers and pedestrians) for the CPS display that starts at the beginning of the SW interval and continues through the FDW interval. In addition, the statistical analyses show that there is no discernable advantage of using the MUTCD-prescribed display over the adopted CPS display currently practiced in the District.

2.0 INTRODUCTION

A significant development in traffic control in the United States in recent years has been the accelerated use of Countdown Pedestrians Signals (CPS) at intersections. A considerable number of signalized urban and sub-urban intersections in the United States are now equipped with CPS. The use of intersections by pedestrians and vehicles pose a potential conflict in the movement of the two traffic modes. Consequently, a pedestrian signal is used to allocate the right–of–way for the safe passage of pedestrians at signalized intersections.

Generally, *"a pedestrian signal provides a dedicated phase during which the pedestrian can enter the intersection during the steady WALK interval, and complete crossing the street during the FLASHING DON'T WALK (FDW) or STEADY DON'T WALK intervals"* [1]. A countdown pedestrian signal flashes continuously while displaying the number of seconds remaining during the pedestrian change interval, counting down to zero. The time displayed by the CPS serves as a risk mitigation mechanism used by pedestrians in resolving the crossing challenge. While the time information displayed by the signals has unanimously been accepted as a useful aid in enhancing pedestrian safety at crosswalks at signalized intersections, the type of CPS display has differed among some jurisdictions in the United States. Some jurisdictions activate their countdown display during the "STEADY WALK" (SW) interval, while others prefer to begin the countdown display during the FDW interval. The national standard on the use of CPS is provided in Section 4E-07 of the Manual on Uniform Traffic Control Devices (MUTCD) released in 2009. The MUTCD prescribes that the CPS display should begin at the onset of the FDW interval. The District of Columbia CPS display starts at the onset of the SW interval and continues through the FDW interval. This study is aimed at investigating whether the CPS display used in the District of Columbia has any advantage over the standard display prescribed by the MUTCD. The study also includes an opinion survey of pedestrians and drivers regarding their perception of the CPS display options.

3.0 PROBLEM STATEMENT

According to the MUTCD, countdown pedestrian signals shall only be displayed during the clearance interval (FDW) of pedestrian signals [1]. The primary purpose of CPS is to inform pedestrians of the remaining time for crossing a signalized intersection, to discourage them from starting, and to inform those already in the crossing process of the number of seconds remaining before the beginning of the DON'T WALK (DW) interval. The general literature on CPS is conclusive that CPS is well understood by pedestrians and motorists and has a significant advantage over conventional pedestrian signals [2, 3].

In the District of Columbia, the countdown display starts at the onset of the SW interval and continues through the FDW interval. This is contrary to the prescribed standard in the MUTCD. An earlier research study conducted in the District of Columbia that evaluated their preferred display indicated that they are well-understood by pedestrians [4]. However, it is not certain whether the SW-FWD countdown display has any advantage over the standard CPS display as prescribed by the MUTCD. In this research, a comparative field study of both types of countdown displays at 25 intersections was conducted in the District of Columbia as a "before and after" experiment. In addition, an attitudinal survey aimed at assessing pedestrian and driver understanding and preference for each type of countdown display was also conducted.

4.0 RESEARCH OBJECTIVES

The objectives of this research are as follows:

- To determine whether there are any pedestrian behavioral advantages in the SW-FWD CPS display over the standard (MUTCD) FDW CPS display, and whether any observed differences in pedestrian behavioral elements or variables are statistically significant.
- To assess pedestrian and driver opinions of the two types of countdown displays.

5.0 LITERATURE REVIEW

Pedestrian signals approved by the MUTCD consist of the illuminated words WALK (or a symbol of a person) and “DON’T WALK” (DW) (or a symbolic hand). The meanings of the indications are follows:

- The Steady WALK (SW), signified by a white silhouette of a person, “means that a pedestrian facing the signal indication is permitted to start to cross the roadway in the direction of the signal indication, possibly in conflict with turning vehicles.”
- The Flashing DON’T WALK (FDW), signified by a Portland orange flashing upraised hand, means that a pedestrian shall not start to cross in the direction of the indication, but a pedestrian who has already started, shall proceed out of the crosswalk.
- The Steady DON’T WALK (SDW), signified by a Portland orange steady upraised Hand, means that a pedestrian shall not enter the crosswalk in the direction of the indication.

The duration of each interval, depends on the geometric characteristics and the vehicular traffic at a signalized intersection. According to the 2009 edition of the MUTCD (Section 4E.07), the CPS shall display the number of seconds remaining until the termination of the pedestrian change interval. The Manual also states that the countdown display shall neither be used during the walk interval nor during the yellow change interval of a concurrent vehicular phase. In practice, the choice of the interval to start the countdown display is largely dependent on the jurisdictional preferences. For example, in Montgomery County, MD, Minneapolis, St. Paul, MN, Las Vegas, NV, and San Jose, CA, the countdown display starts with the FDW. However, in the District of Columbia, Cambridge and Boston, MA, the countdown involves the total time for the SW and the FDW intervals.

Many evaluation studies on the effectiveness of the CPS have been conducted across the United States. However, studies focusing primarily on the comparison of CPS displays are rare. Most of the studies have shown that pedestrians prefer either of the countdown displays over the conventional

pedestrian signals. The findings of selected research efforts for evaluating countdown signals are discussed below.

In 2002, Montgomery County, MD [5] conducted a pedestrian study at locations with CPS to determine the effect of the pedestrian countdown signal at five intersections. The County applied the countdown only to the FDW interval. Comparisons were made between behavioral changes of pedestrians at the same location during daylight hours and in good weather. A total of 107 pedestrians were interviewed to determine their perception of CPS. Observations of pedestrian compliance with the signal and pedestrian-vehicle conflicts were also made. A simple t-test was used to analyze the data. At 3 of the 5 intersections evaluated, there were statistically significant decreases in the number of pedestrians remaining in the crosswalk when conflicting traffic received the green indication. The majority of the pedestrians surveyed correctly explained what the countdown signal phases meant. There was also a significant reduction in the frequency of pedestrian-vehicle conflicts as a result of the installation of the CPS.

The Technical Committee of the New England Section of the Institute of Transportation Engineers conducted a study on the Countdown Pedestrian Signals that were installed at three intersections in Boston, Massachusetts [6]. The countdown display of the signals was active for the entire “WALK” and FDW intervals, similar to the practice in the District of Columbia. A “before” and “after” study was conducted. The measures of effectiveness investigated were the number of pedestrians starting on WALK, the number of pedestrians starting on FDW, the number of pedestrians finishing during the DW, the number of pedestrians running or aborting, and the number of pedestrian-vehicle conflicts. The research concluded that countdown signals did not cause any significant improvement in the mentioned variables and in some instances actually degraded pedestrian safety.

In 2001, the City of San Jose, California installed CPS at 5 intersections on trial basis [3]. The study was conducted by the San Jose State University and consisted of a “before” (installation of the countdown signals) and “after” evaluation. The countdown started at the same time as the FDW. Among the

variables studied were the proportions of pedestrians who arrived during the FDW and waited for the “WALK” before crossing, the proportion of pedestrians that entered during the “WALK”, FDW and DW intervals as well as running, baulking and hesitant pedestrians. A concurrent survey was conducted to determine how well pedestrians interpreted the meaning of the FDW indication. From the results, 59% of pedestrians gave the wrong interpretation of the FDW signals. Simple frequency analyses of the data was conducted which showed that the differences between the “before” and “after” results were not considerably significant. Although the number of motorist-pedestrian conflicts decreased, the study did not conclude that there was discernable effect due to the CPS.

In 1997, a CPS was installed and studied at the intersection of Florida State Route 535 and Hotel Plaza Boulevard in Orlando, Florida [7]. The purpose of the study was to evaluate pedestrian understanding of the CPS through field interviews. Surveys were conducted at random among local citizens and visitors. The selected crosswalk traversed eight lanes and measures about 140 feet in length. The countdown was applied to the entire WALK and FDW intervals. A total of 50 pedestrians were surveyed and the results indicated that 88% understood the functions of new countdown signals. From the responses from US residents and visitors, 91% of the former comprehended the meaning of the signals while to 81% of the visitors understood the functions of the CPS.

In 2003, the Transportation Research Center of University of Nevada evaluated of the effectiveness of countdown pedestrian signals deployed at 14 intersections in the city of Las Vegas downtown area [8]. The research methodology was one of a “treatment” and “control” type. Among the 14 intersections, 10 were treated with CPS and the remaining 4 “control” sites operated with the conventional pedestrian signals. The countdown display was applied to the FDW phase. The key variables investigated included pedestrian compliance with pedestrian signals, pedestrian–vehicle conflicts, and pedestrians who ran out of time and thus were trapped in the crosswalk. Data collection was conducted with a video recorder. The results indicated that the CPS improved pedestrian compliance with the SW, FDW and the SDW indications by 29%, 75%

and 11% respectively. There was also a substantial reduction in pedestrian-vehicle conflicts, in comparison to the “control” intersections. Field interviews were conducted to receive feedback from pedestrians with regards to their understanding of the countdown signals and the FDW symbol. The results indicated that over 90% understood the general functions of the CPS and the FDW phase. The researchers believed that the CPS had a positive effect on pedestrian crossing behavior, and by inference, countdown signals could mitigate pedestrian crashes.

The Minnesota Department of Transportation performed a before-and-after pedestrian survey in 1999 at six intersections within the metropolitan area of Minneapolis and St. Paul [9]. Pedestrians were interviewed before and after the countdown signals were installed. Field observations of pedestrian behavior were also made during the two periods. The countdown display was applied during the FDW interval. Overall, 78% of the respondents felt that the CPS was easier to understand than the conventional signal, while only 6% felt that it was more difficult to understand. The research showed that the numerical countdown, displayed during the FDW interval, was intuitively understood and used successfully by pedestrians. However, the study recommended that CPS should not become a standard signal component since the need is not always present. Situations recommended for CPS includes long pedestrian crossing distances, crossing to medians and intersections predominantly used by pedestrians with disabilities and elderly individuals.

In 2000, Huang and Zegeer [10] conducted an observational study of CPS effectiveness in Lake Buena Vista, Florida. Five intersections were observed: two with CPS and three control sites without CPS. The countdown at the two treatment sites began with the “WALK” interval. Since data was not collected at the intersections before the CPS installation, potential differences between individual sites were not fully accounted for. At each intersection, a single crosswalk was observed for the study. It was found from the analysis that significantly fewer pedestrians began crossing during the WALK signal at CPS locations (47%) than at those with the conventional signal locations (59%). Thus, pedestrians were

more likely to begin crossing during the pedestrian change interval rather than wait for the next WALK indication. In addition, contrary to expectations, slightly more pedestrians who could not complete crossing the intersection before the SDW were found at the intersections with CPS (10.5%) than at those with the conventional signals (7.7%). The report also reported fewer instances of pedestrians running at locations with CPS (3.4%) than at locations with conventional pedestrian signals (10.4%).

Studies conducted on pedestrian satisfaction and signal preferences indicate that pedestrians overwhelmingly approved of the CPS and typically prefer them to the conventional signals. Most of such studies were elements of a larger survey that included all the discussions above. For example in San Francisco [11], 78% of the pedestrians surveyed reported that CPS are “very helpful,” with only 34% for conventional signals. In the same study, 92% of the pedestrians expressed a preference for the CPS.

A study was conducted by Mahach, et al [12] in 2002 to compare pedestrian signal preference among a set of seven signals. These included a conventional pedestrian signal and a CPS which had the countdown starting at the beginning of the steady “WALK” interval. Nearly 60% of the participants selected the CPS as their favorite.

In summary, the literature suggests that the CPS provide pedestrians with additional information that help them to cross intersections more safely. The literature also suggests that pedestrians prefer CPS to conventional signals. However, most studies conducted did not focus on comparing the SW-FDW CPS display with the FDW CPS display. This study is aimed at determining whether the SW-FDW CPS has any safety advantage over the FWD CPS.

6.0 RESEARCH METHODOLOGY

A “before” and “after” study was performed to compare the two types of CPS displays. The “before” scenario is the SW-FDW CPS which starts the countdown at the beginning of the SW through the FDW interval, while the “after” scenario is the display that begins the countdown at the beginning of the FDW

interval. From playback of video recordings of traffic of both morning and evening peak periods, pedestrian and driver behaviors were observed at 25 crosswalks located at 25 selected intersections. The same observations were made at each crosswalk during the “before” and “after” scenarios. The data collected for the two scenarios were analyzed for statistical significance using a 95% confidence interval. In addition, a pedestrian and driver survey was conducted to evaluate their understanding and preferences for each of the two CPS displays. The following sections outlines the variables analyzed the description of the study intersections, the data collection process and the research hypotheses.

6.1 Selection of Variables

The following variables were analyzed for the comparative study of SW-FDW CPS and FDW CPS displays:

1. Pedestrians completing crossing during the red interval
2. Pedestrians beginning to cross during FDW
3. Signal cycles with red-light running violations
4. Pedestrian-vehicle conflicts
5. Signal cycles with pedestrians-vehicle conflicts

6.1.1 Pedestrians completing crossing during the red interval

This occurs when a pedestrian completes the crosswalk during the pedestrian traffic signal clearance interval (all vehicular signals turn red). In this case, the pedestrian could be exposed to conflicting vehicular traffic.

6.1.2 Pedestrians beginning to cross during FDW

This occurs when a pedestrian starts crossing during the FDW interval. Pedestrians are not supposed to start crossing during that interval.

6.1.3 Signal cycles with red-light running violations

This occurs when a vehicle failed to stop when the traffic signal regulating the vehicle’s movement turned red.

6.1.4 Pedestrians-vehicle conflicts

This occurs when either a pedestrian (or group of pedestrians) take an evasive action to avoid collision with a vehicle. This research considered only conflicts that occur between a pedestrian and a vehicle making a right-turn to/from the crosswalk.

6.2 Description of Study Intersections

The research team selected twenty-five intersections located in all eight Wards in consultation with officials of the District Department of Transportation. The primary criteria for selecting the intersections were intersections with high pedestrian activities and the representation of at least one intersection in each of the eight Wards. The research team collected data from all twenty-five intersections during the “before” scenario when the CPS display counts down from the SW through FDW intervals. Table 1 shows the selected intersections for this study. All the intersections involved in this research had asphalt pavement, sidewalks on all quadrants and were equipped with handicap ramps. The pavement conditions at the intersections were all clearly marked with stop bars and crosswalks. The lanes widths ranged between 11 to 12 feet. Two of the intersections (14th Street & K Street; Martin L. King Jr. Ave and Howard Road, and Sheridan Road) had right-turn channelization while three of the intersections (12th Street & Pennsylvania Ave; Benning Road & East Capitol Street; Benning Road & Minnesota Ave) had textured crosswalks.

Pedestrian activities were usually high during the morning peak hours (7:30 am through 9:30 am) and evening peak hours (4:30pm through 6:30pm) at the selected sites. Pedestrian activity generators in close proximity to the intersections included subway stations, bus stops restaurants, office buildings, and educational institutions.

TABLE 1: Intersections Selected for CPS Study

No.	Intersection	Wards	Recording Dates	
			Before	After
1	23rd Street & H Street, NW	2	3/17/09	5/28/09
2	13th Street & U Street, NW	1	3/27/09	5/26/09
3	12th Street & G Street, NW	2	3/23/09	6/02/09
4	Wisconsin Ave & N Street, NW	2	4/07/09	11/09/09
5	7th Street & H Street, NW	2	4/09/09	11/09/09
6	7th Street & Constitution Ave, NW	2	4/10/09	12/08/09
7	12th Street & Pennsylvania Ave, NW	2	3/20/09	6/02/09
8	14th Street & U Street, NW	1, 2	3/27/09	5/26/09
9	14th Street & K Street, NW	2	3/18/09	5/29/09
10	7th Street, Mount Vernon Square, & New York Ave, NW	2	4/01/09	6/08/09
11	21st Street & K Street, NW	2	3/18/09	5/29/09
12	Connecticut Ave & Woodly Road, NW	1, 3	3/30/09	6/01/09
13	Connecticut Ave & Nebraska Ave, NW	3	4/02/09	6/04/09
14	Connecticut Ave & Van Ness Street, NW	3	3/30/09	6/01/09
15	North Capitol & H Street	6	4/03/09	6/03/09
16	Benning Road & East Capitol Street	7	4/08/09	5/29/09
17	Benning Road & Minnesota Ave, NE	7	3/17/09	6/01/09
18	New Jersey Ave & M Street, SE	6	4/03/09	5/28/09
19	Florida Ave & North Capitol Street	5	3/18/09	12/10/09
20	New York Ave & Florida Ave, NE	5, 6	4/07/09	6/02/09
21	14th Street & Constitution Ave, NW	2	4/10/09	12/10/09
22	Independence Ave & 7th Street	2	3/19/09	6/16/09
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	8	4/09/09	6/08/09
24	Wisconsin Ave, Western Ave, & Military Road, NW	3	3/31/09	6/26/09
25	20th Street & M Street, NW	2	3/25/09	6/23/09

6.3 Data Collection and Reduction

At each intersection, a crosswalk was selected for a 2-hour videotaping of pedestrian behavior during the morning and evening peak periods. The videotaping was made for both the “before” and “after” scenarios of CPS displays. The camera was positioned strategically in order to capture the pedestrian signal display as well as the pedestrian behaviors at the crosswalk. The video recordings were done between 7:30 and 9:30am for the morning peak period, and between 4:30 and 6:30pm for the evening peak period. The data was collected on the dates presented in Table 1.

The video recordings were reviewed from which the pedestrian behavior variables were extracted. For each intersection, the total pedestrian counts, as well as the frequencies of the following variables were extracted for the morning and evening peak hours for the “before” and “after” scenarios:

Variable 1: Pedestrians completing crossing during the red interval
Variable 2: Pedestrians beginning to cross during FDW
Variable 3: Pedestrians-vehicle conflicts
Variable 4: Signal cycles with pedestrians-vehicle conflicts

Tables 2 through 5 present the raw data for all variables. From the video playback, no red light violations at the study intersections were observed, thus that variable was eliminated for the remainder of the analysis.

TABLE 2: Raw Data Frequencies during AM Peak Before Scenario (SW- FDW CPS)

No.	Intersection	Variables				Total Observed Pedestrians
		1	2	3	4	
1	23rd Street & H Street, NW	66	119	83	48	1662
2	13th Street & U Street, NW	103	91	36	28	922
3	12th Street & G Street, NW	127	67	42	18	541
4	Wisconsin Ave & N Street, NW	41	25	5	3	357
5	7th Street & H Street, NW	78	164	76	40	1502
6	7th Street & Constitution Ave, NW	33	34	42	28	206
7	12th Street & Pennsylvania Ave, NW	39	16	1	1	431
8	14th Street & U Street, NW	60	88	53	38	727
9	14th Street & K Street, NW	35	34	161	43	1186
10	7th Street, Mount Vernon Square, & New York Ave, NW	7	11	28	18	232
11	21st Street & K Street, NW	117	83	0	0	444
12	Connecticut Ave & Woodly Road, NW	8	15	41	28	196
13	Connecticut Ave & Nebraska Ave, NW	1	9	22	13	74
14	Connecticut Ave & Van Ness Street, NW	2	14	15	11	94
15	North Capitol & H Street	7	66	98	52	643
16	Benning Road & East Capitol Street	20	41	12	7	411
17	Benning Road & Minnesota Ave, NE	58	60	6	6	306
18	New Jersey Ave & M Street, SE	79	158	45	31	1437
19	Florida Ave & North Capitol Street	8	22	5	1	355
20	New York Ave & Florida Ave, NE	45	108	8	7	377
21	14th Street & Constitution Ave, NW	8	18	18	12	186
22	Independence Ave & 7th Street	4	10	42	29	180
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	21	25	6	3	223
24	Wisconsin Ave, Western Ave, & Military Road, NW	19	39	34	21	268
25	20th Street & M Street, NW	8	105	1	1	780

TABLE 3: Raw Data Frequencies during AM Peak After Scenario (FDW CPS)

No.	Intersection	Variables				Total Observed Pedestrians
		1	2	3	4	
1	23rd Street & H Street, NW	52	107	69	37	1657
2	13th Street & U Street, NW	75	169	35	25	1215
3	12th Street & G Street, NW	45	133	39	32	699
4	Wisconsin Ave & N Street, NW	33	21	9	5	346
5	7th Street & H Street, NW	70	159	62	32	1468
6	7th Street & Constitution Ave, NW	41	30	36	23	273
7	12th Street & Pennsylvania Ave, NW	49	113	38	29	596
8	14th Street & U Street, NW	43	240	44	38	776
9	14th Street & K Street, NW	43	65	73	29	1012
10	7th Street, Mount Vernon Square, & New York Ave, NW	12	24	0	0	143
11	21st Street & K Street, NW	38	69	0	0	390
12	Connecticut Ave & Woodly Road, NW	6	4	81	53	241
13	Connecticut Ave & Nebraska Ave, NW	2	6	10	5	66
14	Connecticut Ave & Van Ness Street, NW	14	74	23	19	109
15	North Capitol & H Street	41	73	79	47	597
16	Benning Road & East Capitol Street	16	36	19	12	404
17	Benning Road & Minnesota Ave, NE	21	30	2	2	358
18	New Jersey Ave & M Street, SE	119	137	37	21	1551
19	Florida Ave & North Capitol Street	7	25	4	3	383
20	New York Ave & Florida Ave, NE	54	104	5	5	390
21	14th Street & Constitution Ave, NW	10	20	15	9	203
22	Independence Ave & 7th Street	9	17	55	33	209
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	26	46	27	21	248
24	Wisconsin Ave, Western Ave, & Military Road, NW	11	17	21	19	244
25	20th Street & M Street, NW	11	135	0	0	905

TABLE 4: Raw Data Frequencies during PM Peak – Before Scenario (SW-FDW CPS)

No.	Intersection	Variables				Total Observed Pedestrians
		1	2	3	4	
1	23rd Street & H Street, NW	61	17	135	62	2013
2	13th Street & U Street, NW	134	158	80	48	1498
3	12th Street & G Street, NW	129	59	31	18	713
4	Wisconsin Ave & N Street, NW	8	16	4	4	586
5	7th Street & H Street, NW	35	193	254	66	2607
6	7th Street & Constitution Ave, NW	105	70	76	42	789
7	12th Street & Pennsylvania Ave, NW	56	26	1	1	864
8	14th Street & U Street, NW	56	48	30	18	826
9	14th Street & K Street, NW	89	93	175	47	1169
10	7th Street, Mount Vernon Square, & New York Ave, NW	23	44	32	21	500
11	21st Street & K Street, NW	79	65	0	0	597
12	Connecticut Ave & Woodly Road, NW	3	44	28	17	294
13	Connecticut Ave & Nebraska Ave, NW	4	9	27	13	84
14	Connecticut Ave & Van Ness Street, NW	16	54	64	30	222
15	North Capitol & H Street	4	67	112	53	490
16	Benning Road & East Capitol Street	26	16	12	4	556
17	Benning Road & Minnesota Ave, NE	36	70	43	20	534
18	New Jersey Ave & M Street, SE	33	61	39	23	864
19	Florida Ave & North Capitol Street	20	37	7	5	290
20	New York Ave & Florida Ave, NE	49	117	5	4	389
21	14th Street & Constitution Ave, NW	20	62	15	8	606
22	Independence Ave & 7th Street	9	26	64	37	335
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	34	112	0	0	139
24	Wisconsin Ave, Western Ave, & Military Road, NW	34	86	136	46	718
25	20th Street & M Street, NW	14	197	2	2	999

TABLE 5: Raw Data Frequencies during PM Peak - After Scenario (FDW CPS)

No.	Intersection	Variables				Total Observed Pedestrians
		1	2	3	4	
1	23rd Street & H Street, NW	43	15	117	48	1759
2	13th Street & U Street, NW	86	226	36	24	1190
3	12th Street & G Street, NW	31	158	41	34	1020
4	Wisconsin Ave & N Street, NW	16	30	2	2	612
5	7th Street & H Street, NW	27	183	241	65	2421
6	7th Street & Constitution Ave, NW	96	79	64	30	868
7	12th Street & Pennsylvania Ave, NW	106	197	31	26	831
8	14th Street & U Street, NW	46	150	44	32	1074
9	14th Street & K Street, NW	43	65	73	29	1012
10	7th Street, Mount Vernon Square, & New York Ave, NW	13	21	0	0	313
11	21st Street & K Street, NW	39	70	0	0	475
12	Connecticut Ave & Woodly Road, NW	36	51	43	32	356
13	Connecticut Ave & Nebraska Ave, NW	0	1	13	7	58
14	Connecticut Ave & Van Ness Street, NW	12	86	60	34	146
15	North Capitol & H Street	38	69	80	42	432
16	Benning Road & East Capitol Street	20	8	12	8	626
17	Benning Road & Minnesota Ave, NE	65	102	29	16	646
18	New Jersey Ave & M Street, SE	43	28	19	15	1155
19	Florida Ave & North Capitol Street	17	41	2	2	271
20	New York Ave & Florida Ave, NE	81	128	1	1	368
21	14th Street & Constitution Ave, NW	26	57	7	5	541
22	Independence Ave & 7th Street	14	69	126	45	622
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	10	13	17	15	127
24	Wisconsin Ave, Western Ave, & Military Road, NW	50	114	72	52	722
25	20th Street & M Street, NW	22	185	0	0	1167

6.4 Attitudinal Survey

Pedestrian survey was conducted at the following locations:

- 13th Street and U Street, NW
- 12th Street and G Street, NW
- 12th Street and Pennsylvania Avenue, NW
- 14th Street and U Street, NW
- 7th Street, Mount Vernon Square, and New York Avenue, NW
- 20th Street and M Street, NW
- Georgia Avenue at Barry Place

These intersections were chosen because of high pedestrian activities within their environs. The survey was conducted over seven weekdays in May 2009 and July 2009 (May 26th, 27th, 28th, and June 2nd, 3rd, 4th, and 9th) between 9:00 am and 2:00 pm under good weather conditions. The driver survey was conducted at the offices of District Department of Motor Vehicles at 1233 Brentwood Road, NE over a 3-day period in May 2009. This location was chosen due to easy access to drivers. A total of 744 pedestrians and 243 drivers were surveyed. The survey questions were posed to willing pedestrians and drivers at the various locations. The interviewers used both animated displays of the CPS on laptops as well as laminated snapshots of the CPS displays for illustration. Figures 1 and 2 show members of the research team the surveys were being conducted. Figure 3 depicts countdown signal slides that were presented to pedestrians and drivers during the surveys.

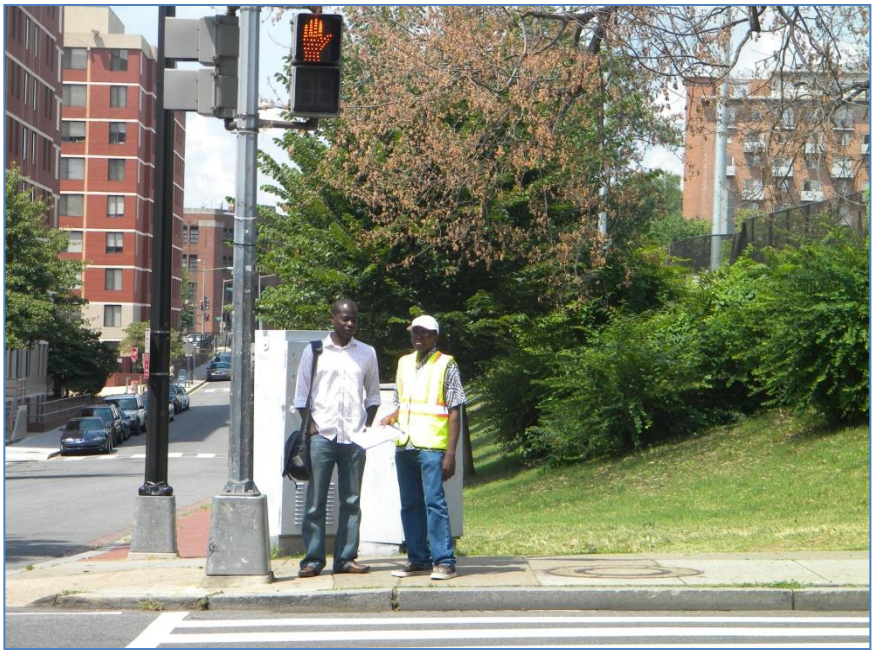

FIGURE 1: Surveying a Pedestrian in the Field

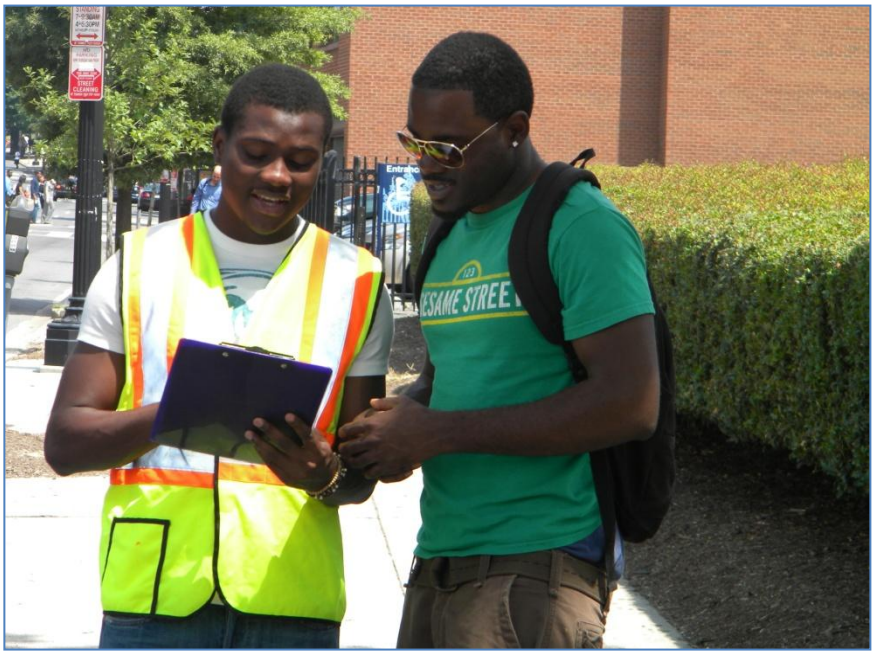

FIGURE 2: Surveying a Driver at a DMV Premise

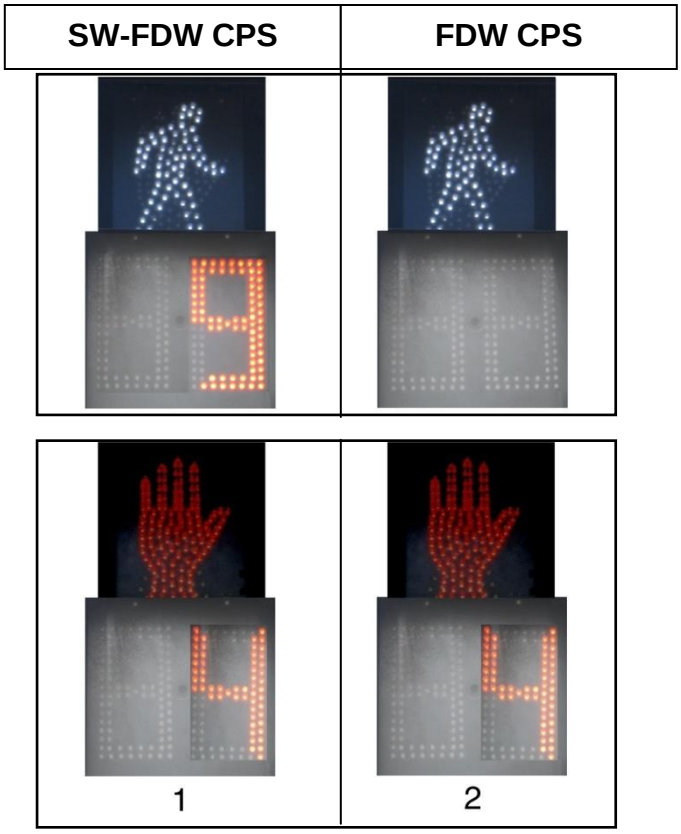

FIGURE 3: CPS Displays Showed during Field Surveys

The following survey questions were posed:

For pedestrians:

1. Do you understand the difference between the two countdown displays?
2. As a pedestrian, which display provides you with more information?
3. As a pedestrian, which display do you prefer for crossing signalized intersections?

For drivers:

1. Do you often drive in the city?
2. As a driver, do you pay attention to the CPS display?
3. If yes, what does the number tell you?
4. As a driver, does the number in the CPS display help you make intersection driving decisions?
5. If not, why is the number displayed not important to you?
6. If yes, does the magnitude of the number influence your decision to stop or continue through an intersection?

7. Which of the displays do you prefer and why?

7.0 ANALYSIS

7.1 Statistical Assumptions

The four variables defined in this study were analyzed using the statistic of proportions. It was assumed that the samples collected at each intersection during the "before" and the "after" scenarios were independent and random. Based on the Central Limit Theorem [13], a sampling distribution of the difference between sample proportions is normally distributed if the sample sizes are greater than 30. Therefore, the sampling distribution of the difference in proportions considered in this study is normally distributed.

7.2 Hypothesis and Level of Significance

The null hypothesis (H_0) and the alternative hypothesis (H_1) were as follows:

$$\begin{cases} H_0 : P_b = P_a \\ H_1 : P_b \neq P_a \end{cases} \quad \text{or} \quad \begin{cases} H_0 : P_b - P_a = 0 \\ H_1 : P_b - P_a \neq 0 \end{cases}$$

where

P_b is the proportion of the variable of interest for the SW-FDW CPS

P_a is the proportion of the variable of interest for FDW CPS

The null hypothesis (*Ho*) means that the observed difference of proportions is due to chance only. A two-tailed test was chosen for this research because there is no basis for assuming that either of the two countdowns is better than the other in reducing undesirable pedestrian behavior and increasing safety. Using a two-tailed test at 5% level of significance, (H_1) would be rejected if the absolute value of z-statistic is greater than the critical value, which was determined to be 1.645.

7.3 Test Statistic

The z-statistic was calculated from the following formula:

$$z = \frac{P_b - P_a}{\sqrt{pq\left(\frac{1}{N_b} + \frac{1}{N_a}\right)}}$$

where:

$$p = \frac{N_b P_b + N_a P_a}{N_b + N_a} \quad \text{and} \quad q = 1 - p,$$

N_b is the sample size for SW-FDW CPS

N_a is the sample size for FDW CPS.

7.4 Analysis of Attitudinal Survey

A survey was conducted to obtain the opinions of pedestrians and drivers in the District of Columbia regarding their preference of the CPS displays. The opinions were tallied and tabulated (see Appendix) from which the summaries were obtained.

8. RESULTS

8.1 Hypothesis Testing

The proportion for each variable's outcome was calculated by dividing the frequency of the outcome by the sample size. The sample size is either the total number of pedestrians sampled or total number of signal cycles reviewed during the video playback. The analyses of the difference in proportions for the "before" and "after" scenarios were conducted for morning and evening peak periods. The hypotheses were evaluated at 5% level of significance. The detailed results are presented in Appendix A.

8.1.1 Pedestrians Completing Crossing during the FDW Interval

The proportion of pedestrians completing crossing during the FDW interval were computed. The results of the analysis of this variable are presented in Tables 6

and 7 for the AM and PM peak hours respectively. For the AM peak period, the proportions of pedestrians completing crossing during the FDW interval decreased

TABLE 6: Results for "Pedestrian Completing Crossing during the FDW Interval"- AM Peak

No.	Intersection	SW-FDW P_b	FDW P_a	z-statistic	p-value	Significant?
1	23rd Street & H Street, NW	0.040	0.031	1.296	0.195	**No**
2	13th Street & U Street, NW	0.112	0.062	4.142	0.000	**Yes**
3	12th Street & G Street, NW	0.235	0.064	8.608	0.000	**Yes**
4	Wisconsin Ave & N Street, NW	0.115	0.095	0.841	0.400	**No**
5	7th Street & H Street, NW	0.052	0.048	0.532	0.595	**No**
6	7th Street & Constitution Ave, NW	0.160	0.150	0.300	0.764	**No**
7	12th Street & Pennsylvania Ave, NW	0.090	0.082	0.467	0.640	**No**
8	14th Street & U Street, NW	0.083	0.055	2.080	0.038	**Yes**
9	14th Street & K Street, NW	0.030	0.042	-1.639	0.101	**No**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.030	0.084	-2.305	0.021	**Yes**
11	21st Street & K Street, NW	0.264	0.097	6.152	0.000	**Yes**
12	Connecticut Ave & Woodly Road, NW	0.041	0.025	0.940	0.347	**No**
13	Connecticut Ave & Nebraska Ave, NW	0.014	0.030	-0.685	0.493	**No**
14	Connecticut Ave & Van Ness Street, NW	0.021	0.128	-2.825	0.005	**Yes**
15	North Capitol & H Street	0.011	0.069	-5.271	0.000	**Yes**
16	Benning Road & East Capitol Street	0.049	0.040	0.629	0.529	**No**
17	Benning Road & Minnesota Ave, NE	0.190	0.061	3.574	0.000	**Yes**
18	New Jersey Ave & M Street, SE	0.055	0.077	-2.388	0.017	**Yes**
19	Florida Ave & North Capitol Street	0.023	0.018	0.410	0.682	**No**
20	New York Ave & Florida Ave, NE	0.119	0.138	-0.789	0.430	**No**
21	14th Street & Constitution Ave, NW	0.043	0.049	-0.293	0.769	**No**
22	Independence Ave & 7th Street	0.022	0.043	-1.140	0.254	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.094	0.105	-0.386	0.700	**No**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.071	0.045	1.242	0.214	**No**
25	20th Street & M Street, NW	0.010	0.012	-0.368	0.713	**No**

TABLE 7: Results for "Pedestrian Completing Crossing during the FDW Interval" – PM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.030	0.024	1.096	0.273	**No**
2	13th Street & U Street, NW	0.089	0.072	1.141	0.254	**No**
3	12th Street & G Street, NW	0.181	0.030	10.653	0.000	**Yes**
4	Wisconsin Ave & N Street, NW	0.014	0.026	-1.091	0.275	**No**
5	7th Street & H Street, NW	0.013	0.011	0.730	0.466	**No**
6	7th Street & Constitution Ave, NW	0.133	0.111	1.400	0.162	**No**
7	12th Street & Pennsylvania Ave, NW	0.065	0.128	-4.392	0.000	**Yes**
8	14th Street & U Street, NW	0.068	0.043	1.692	0.091	**No**
9	14th Street & K Street, NW	0.076	0.042	3.286	0.001	**Yes**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.046	0.042	0.301	0.763	**No**
11	21st Street & K Street, NW	0.132	0.082	2.610	0.009	**Yes**
12	Connecticut Ave & Woodly Road, NW	0.010	0.101	-4.858	0.000	**Yes**
13	Connecticut Ave & Nebraska Ave, NW	0.048	0.000	1.686	0.092	**No**
14	Connecticut Ave & Van Ness Street, NW	0.072	0.082	-0.253	0.800	**No**
15	North Capitol & H Street	0.008	0.088	-5.799	0.000	**Yes**
16	Benning Road & East Capitol Street	0.047	0.032	0.929	0.353	**No**
17	Benning Road & Minnesota Ave, NE	0.067	0.101	-2.029	0.042	**Yes**
18	New Jersey Ave & M Street, SE	0.038	0.037	0.113	0.910	**No**
19	Florida Ave & North Capitol Street	0.069	0.063	0.297	0.766	**No**
20	New York Ave & Florida Ave, NE	0.126	0.220	-3.433	0.001	**Yes**
21	14th Street & Constitution Ave, NW	0.033	0.048	-1.297	0.195	**No**
22	Independence Ave & 7th Street	0.027	0.023	0.420	0.675	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.245	0.079	3.637	0.000	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.047	0.069	-1.254	0.210	**No**
25	20th Street & M Street, NW	0.014	0.019	-0.878	0.380	**No**

at 14 intersections and increased at the remaining 11 intersections. The reductions were statistically significant at five (of the 14) intersections, and the increases were significant at four (of the 11) intersections during the AM peak period. In the PM peak period, 15 of the intersections experienced reductions in the proportions of

pedestrians completing the crossing in the FDW interval, while 10 intersections showed an increase in proportion. The reductions in proportions were statistically significant at four (of the 15) intersections, and the increases in proportions were found to be statistically significant at five (of the 10) intersections. Overall, in the AM peak periods, the alternate hypothesis H_1, that there is a difference in proportions, would be rejected at the nine intersections that produced statistically significant changes in proportions of pedestrians completing crossing during the red interval. For the PM peak hours, the hypothesis H_1 would be rejected at nine intersections.

In summary, as shown in Table 8, the results of the hypothesis test for this variable at 5% level of significance indicate in general that there is no discernable behavioral change in this pedestrian behavior due to the type of CPS display. The majority of the intersections in both the morning and evening peak periods recorded no statistically significant difference in pedestrian behavior due to the CPS displays.

TABLE 8: Summary Results for "Pedestrian Completing Crossing during the FDW Interval"

Peak Period	Percentage of intersections showing statistically significant results	
	No difference in percentage	Difference in percentage
Morning	64%	36%
Evening	64%	36%

8.1.2 Pedestrian Starting to Cross during FDW

The numbers of pedestrians that start crossing during the FDW were observed for the “before” and “after” scenarios. Tables 9 and 10 present the results of the analysis of this pedestrian behavior for the AM and PM peak periods respectively. The results for the peak period in Table 9 show that there were reductions in proportions at 12 of the 25 intersections, while the remaining intersections showed an increase in proportions.

TABLE 9: Results for "Pedestrian Beginning to Cross during FDW" – AM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.072	0.065	0.803	0.422	**No**
2	13th Street & U Street, NW	0.099	0.139	-2.829	0.005	**Yes**
3	12th Street & G Street, NW	0.124	0.190	-3.154	0.002	**Yes**
4	Wisconsin Ave & N Street, NW	0.070	0.061	0.500	0.617	**No**
5	7th Street & H Street, NW	0.109	0.108	0.077	0.939	**No**
6	7th Street & Constitution Ave, NW	0.165	0.110	1.757	0.079	**No**
7	12th Street & Pennsylvania Ave, NW	0.037	0.190	-7.276	0.000	**Yes**
8	14th Street & U Street, NW	0.121	0.309	-8.829	0.000	**Yes**
9	14th Street & K Street, NW	0.029	0.064	-4.007	0.000	**Yes**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.047	0.168	-3.894	0.000	**Yes**
11	21st Street & K Street, NW	0.187	0.177	0.374	0.709	**No**
12	Connecticut Ave & Woodly Road, NW	0.077	0.017	3.055	0.002	**Yes**
13	Connecticut Ave & Nebraska Ave, NW	0.122	0.091	0.586	0.558	**No**
14	Connecticut Ave & Van Ness Street, NW	0.149	0.679	-7.598	0.000	**Yes**
15	North Capitol & H Street	0.103	0.122	-1.095	0.274	**No**
16	Benning Road & East Capitol Street	0.100	0.089	0.520	0.603	**No**
17	Benning Road & Minnesota Ave, NE	0.196	0.084	2.979	0.003	**Yes**
18	New Jersey Ave & M Street, SE	0.110	0.088	1.980	0.048	**Yes**
19	Florida Ave & North Capitol Street	0.062	0.065	-0.184	0.854	**No**
20	New York Ave & Florida Ave, NE	0.286	0.267	0.613	0.540	**No**
21	14th Street & Constitution Ave, NW	0.097	0.099	-0.058	0.954	**No**
22	Independence Ave & 7th Street	0.056	0.081	-0.998	0.318	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.112	0.185	-2.222	0.026	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.146	0.070	2.746	0.006	**Yes**
25	20th Street & M Street, NW	0.135	0.149	-0.852	0.394	**No**

TABLE 10: Results for "Pedestrian Beginning to Cross during FDW" – PM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.008	0.009	-0.028	0.978	**No**
2	13th Street & U Street, NW	0.105	0.190	-4.394	0.000	**Yes**
3	12th Street & G Street, NW	0.083	0.155	-4.466	0.000	**Yes**
4	Wisconsin Ave & N Street, NW	0.027	0.049	-1.383	0.167	**No**
5	7th Street & H Street, NW	0.074	0.076	-0.210	0.834	**No**
6	7th Street & Constitution Ave, NW	0.089	0.091	-0.163	0.871	**No**
7	12th Street & Pennsylvania Ave, NW	0.030	0.237	-12.602	0.000	**Yes**
8	14th Street & U Street, NW	0.058	0.140	-4.078	0.000	**Yes**
9	14th Street & K Street, NW	0.080	0.064	1.377	0.169	**No**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.088	0.067	1.070	0.285	**No**
11	21st Street & K Street, NW	0.109	0.147	-1.887	0.059	**No**
12	Connecticut Ave & Woodly Road, NW	0.150	0.143	0.230	0.818	**No**
13	Connecticut Ave & Nebraska Ave, NW	0.107	0.017	2.058	0.040	**Yes**
14	Connecticut Ave & Van Ness Street, NW	0.243	0.589	-4.727	0.000	**Yes**
15	North Capitol & H Street	0.137	0.160	-0.982	0.326	**No**
16	Benning Road & East Capitol Street	0.029	0.013	1.376	0.169	**No**
17	Benning Road & Minnesota Ave, NE	0.131	0.158	-1.299	0.194	**No**
18	New Jersey Ave & M Street, SE	0.071	0.024	5.021	0.000	**Yes**
19	Florida Ave & North Capitol Street	0.128	0.151	-0.811	0.417	**No**
20	New York Ave & Florida Ave, NE	0.301	0.348	-1.383	0.167	**No**
21	14th Street & Constitution Ave, NW	0.102	0.105	-0.169	0.866	**No**
22	Independence Ave & 7th Street	0.078	0.111	-1.644	0.100	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.806	0.102	11.481	0.000	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.120	0.158	-1.479	0.139	**No**
25	20th Street & M Street, NW	0.197	0.159	2.354	0.019	**Yes**

The reductions were statistically significant at only 4 intersections, while the increases were statistically significant at eight intersections. For the PM peak period, the results indicate that 8 of the intersections had a decrease in proportions of pedestrians beginning to cross during the FDW interval, while 17 intersections had an increase in proportions. The reductions were statistically significant at four (of the 8) intersections, and the increases were statistically significant at 5 (of the 17) intersections. The reduction in proportions was statistically significant at New Jersey Ave & M Street, SE for both peak periods. The increases in proportions were statistically significant for both peak periods at the following five intersections: 13th Street & U Street; 12th Street & G Street; 12th Street & Pennsylvania Ave; 14th Street & U Street; and Connecticut Ave & Van Ness Street. For the morning peak period, the alternate hypothesis H_1 would be rejected at 12 intersections which indicate that there was no statistically significant difference in proportions of pedestrians beginning to cross during FDW. For the evening peak hours, the alternate hypothesis H_1 would be rejected at nine intersections, at 5% level of significance.

Table 11 shows the summary results of the hypothesis tests for pedestrian beginning to cross at the onset of FDW. Overall, there is no discernable behavioral change in this pedestrian behavior due to the type of CPS display, at 5% level of significance.

TABLE 11: Summary Results for "Pedestrian Starting to Cross during FDW"

Peak Period	Percentage of intersections showing statistically significant results	
	No difference in percentage	Difference in percentage
Morning	52%	48%
Evening	64%	36%

8.1.3 Pedestrian-Vehicle Conflicts

The results for the evaluation of pedestrian-vehicle conflicts are presented in Table 12 and 13 for the AM and PM peak periods respectively.

TABLE 12: Results for "Pedestrian-Vehicle Conflicts" - AM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.050	0.042	1.143	0.253	**No**
2	13th Street & U Street, NW	0.039	0.029	1.308	0.191	**No**
3	12th Street & G Street, NW	0.078	0.056	1.544	0.123	**No**
4	Wisconsin Ave & N Street, NW	0.014	0.026	-1.139	0.255	**No**
5	7th Street & H Street, NW	0.051	0.042	1.083	0.279	**No**
6	7th Street & Constitution Ave, NW	0.204	0.132	2.113	0.035	**Yes**
7	12th Street & Pennsylvania Ave, NW	0.002	0.064	-5.084	0.000	**Yes**
8	14th Street & U Street, NW	0.073	0.057	1.277	0.201	**No**
9	14th Street & K Street, NW	0.136	0.072	4.820	0.000	**Yes**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.121	0.000	4.319	0.000	**Yes**
11	21st Street & K Street, NW	0.000	0.000	0.000	1.000	**No**
12	Connecticut Ave & Woodly Road, NW	0.209	0.336	-2.941	0.003	**Yes**
13	Connecticut Ave & Nebraska Ave, NW	0.297	0.152	2.051	0.040	**Yes**
14	Connecticut Ave & Van Ness Street, NW	0.160	0.211	-0.937	0.349	**No**
15	North Capitol & H Street	0.152	0.132	1.010	0.312	**No**
16	Benning Road & East Capitol Street	0.029	0.047	-1.331	0.183	**No**
17	Benning Road & Minnesota Ave, NE	0.020	0.006	1.167	0.243	**No**
18	New Jersey Ave & M Street, SE	0.031	0.024	1.247	0.212	**No**
19	Florida Ave & North Capitol Street	0.014	0.010	0.450	0.653	**No**
20	New York Ave & Florida Ave, NE	0.021	0.013	0.901	0.368	**No**
21	14th Street & Constitution Ave, NW	0.097	0.074	0.809	0.418	**No**
22	Independence Ave & 7th Street	0.233	0.263	-0.678	0.498	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.027	0.109	-3.480	0.001	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.127	0.086	1.489	0.136	**No**
25	20th Street & M Street, NW	0.001	0.000	1.077	0.281	**No**

TABLE 13: Results for "Pedestrian-Vehicle Conflicts" - PM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.067	0.067	0.067	0.946	**No**
2	13th Street & U Street, NW	0.053	0.030	2.075	0.038	**Yes**
3	12th Street & G Street, NW	0.043	0.040	0.337	0.736	**No**
4	Wisconsin Ave & N Street, NW	0.007	0.003	0.617	0.537	**No**
5	7th Street & H Street, NW	0.097	0.100	-0.252	0.801	**No**
6	7th Street & Constitution Ave, NW	0.096	0.074	1.651	0.099	**No**
7	12th Street & Pennsylvania Ave, NW	0.001	0.037	-5.466	0.000	**Yes**
8	14th Street & U Street, NW	0.036	0.041	-0.367	0.714	**No**
9	14th Street & K Street, NW	0.150	0.072	5.691	0.000	**Yes**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.064	0.000	4.566	0.000	**Yes**
11	21st Street & K Street, NW	0.000	0.000	0.000	1.000	**No**
12	Connecticut Ave & Woodly Road, NW	0.095	0.121	-1.039	0.299	**No**
13	Connecticut Ave & Nebraska Ave, NW	0.321	0.224	1.267	0.205	**No**
14	Connecticut Ave & Van Ness Street, NW	0.288	0.411	-1.722	0.085	**No**
15	North Capitol & H Street	0.229	0.185	1.619	0.105	**No**
16	Benning Road & East Capitol Street	0.022	0.019	0.208	0.836	**No**
17	Benning Road & Minnesota Ave, NE	0.081	0.045	2.545	0.011	**Yes**
18	New Jersey Ave & M Street, SE	0.045	0.016	3.818	0.000	**Yes**
19	Florida Ave & North Capitol Street	0.024	0.007	1.579	0.114	**No**
20	New York Ave & Florida Ave, NE	0.013	0.003	1.572	0.116	**No**
21	14th Street & Constitution Ave, NW	0.025	0.013	1.456	0.145	**No**
22	Independence Ave & 7th Street	0.191	0.203	-0.426	0.670	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.000	0.134	-4.458	0.000	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.189	0.100	3.423	0.001	**Yes**
25	20th Street & M Street, NW	0.002	0.000	1.529	0.126	**No**

The results indicate that there were both reductions and increases in the proportions of pedestrian-vehicle conflicts during both morning and evening periods. For the morning peak period, four of the 18 reductions were statistically significant, while three of the seven increases were statistically significant. For the PM peak period, 18 of the intersections had reduced percentages of pedestrian-vehicle conflicts, one intersection showing no difference in proportion, while the remaining six showed an increase in proportion. In the evening peak period, seven of the reductions in proportions were statistically significant, while two of the increases were found to be also statistically significant. The reductions in proportions were significant for both morning and evening peak periods at 7th Street, Mount Vernon Square, & New York Ave, NW, and 14th Street & K Street, NW. The increases in proportions were significant for both morning and evening peak periods at 12th Street & Pennsylvania Ave, and Martin L. King Jr. Ave, Howard Road, & Sheridan Road.

In summary, as shown in Table 14, the results of the hypothesis tests for this variable indicate in general that there is no discernable behavioral change in pedestrian-vehicle conflicts due to the type of CPS display.

TABLE 14: Summary Results for "Pedestrian-Vehicle Conflicts"

Peak Period	Percentage of intersections showing statistically significant results	
	No difference in percentage	Difference in percentage
Morning	72%	28%
Evening	68%	32%

8.1.4 Number of Cycles with Pedestrian-Vehicle conflicts

The number of signal cycles with pedestrian-vehicle conflicts was recorded. The summary results of this variable are presented in Tables 15 and 16 for the morning and evening peak hours respectively. The results for morning peak hours indicate that 3 of the 16 reductions in proportions were statistically significant, while 4 of the 9 increases in proportions were statistically significant. For the evening peak

TABLE 15: Results for "Number of Cycles with Pedestrian-Vehicle Conflicts" -AM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.667	0.514	1.864	0.062	**No**
2	13th Street & U Street, NW	0.389	0.347	0.518	0.604	**No**
3	12th Street & G Street, NW	0.250	0.444	-2.451	0.014	**Yes**
4	Wisconsin Ave & N Street, NW	0.042	0.069	-0.728	0.467	**No**
5	7th Street & H Street, NW	0.556	0.444	1.333	0.182	**No**
6	7th Street & Constitution Ave, NW	0.389	0.319	0.871	0.384	**No**
7	12th Street & Pennsylvania Ave, NW	0.014	0.403	-5.745	0.000	**Yes**
8	14th Street & U Street, NW	0.528	0.528	0.000	1.000	**No**
9	14th Street & K Street, NW	0.597	0.403	2.333	0.020	**Yes**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.250	0.000	4.536	0.000	**Yes**
11	21st Street & K Street, NW	0.000	0.000	0.000	1.000	**No**
12	Connecticut Ave & Woodly Road, NW	0.389	0.736	-4.200	0.000	**Yes**
13	Connecticut Ave & Nebraska Ave, NW	0.181	0.069	2.016	0.044	**Yes**
14	Connecticut Ave & Van Ness Street, NW	0.153	0.264	-1.642	0.101	**No**
15	North Capitol & H Street	0.722	0.653	0.899	0.369	**No**
16	Benning Road & East Capitol Street	0.117	0.200	-1.250	0.211	**No**
17	Benning Road & Minnesota Ave, NE	0.100	0.033	1.035	0.301	**No**
18	New Jersey Ave & M Street, SE	0.517	0.350	1.842	0.065	**No**
19	Florida Ave & North Capitol Street	0.014	0.042	-1.014	0.310	**No**
20	New York Ave & Florida Ave, NE	0.097	0.069	0.603	0.546	**No**
21	14th Street & Constitution Ave, NW	0.167	0.125	0.708	0.479	**No**
22	Independence Ave & 7th Street	0.403	0.458	-0.673	0.501	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.050	0.350	-4.108	0.000	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.292	0.264	0.372	0.710	**No**
25	20th Street & M Street, NW	0.014	0.000	1.003	0.316	**No**

TABLE 16: Results for "Number of Cycles with Pedestrian-Vehicle Conflicts" -PM Peak

No.	Intersection	SW-FDW	FDW	z-statistic	p-value	Significant?
		P_b	P_a			
1	23rd Street & H Street, NW	0.861	0.667	2.747	0.006	**Yes**
2	13th Street & U Street, NW	0.667	0.333	2.828	0.005	**Yes**
3	12th Street & G Street, NW	0.250	0.472	-2.776	0.006	**Yes**
4	Wisconsin Ave & N Street, NW	0.056	0.028	0.590	0.555	**No**
5	7th Street & H Street, NW	0.917	0.903	0.291	0.771	**No**
6	7th Street & Constitution Ave, NW	0.583	0.417	2.000	0.046	**Yes**
7	12th Street & Pennsylvania Ave, NW	0.014	0.361	-5.338	0.000	**Yes**
8	14th Street & U Street, NW	0.250	0.444	-1.733	0.083	**No**
9	14th Street & K Street, NW	0.653	0.403	3.005	0.003	**Yes**
10	7th Street, Mount Vernon Square, & New York Ave, NW	0.292	0.000	4.958	0.000	**Yes**
11	21st Street & K Street, NW	0.000	0.000	0.000	1.000	**No**
12	Connecticut Ave & Woodly Road, NW	0.236	0.444	-2.638	0.008	**Yes**
13	Connecticut Ave & Nebraska Ave, NW	0.181	0.097	1.446	0.148	**No**
14	Connecticut Ave & Van Ness Street, NW	0.417	0.472	-0.474	0.635	**No**
15	North Capitol & H Street	0.736	0.583	1.935	0.053	**No**
16	Benning Road & East Capitol Street	0.067	0.133	-0.861	0.389	**No**
17	Benning Road & Minnesota Ave, NE	0.333	0.267	0.797	0.426	**No**
18	New Jersey Ave & M Street, SE	0.383	0.250	1.570	0.116	**No**
19	Florida Ave & North Capitol Street	0.069	0.028	1.163	0.245	**No**
20	New York Ave & Florida Ave, NE	0.056	0.014	1.366	0.172	**No**
21	14th Street & Constitution Ave, NW	0.111	0.069	0.872	0.383	**No**
22	Independence Ave & 7th Street	0.514	0.625	-1.346	0.178	**No**
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0.000	0.250	-4.140	0.000	**Yes**
24	Wisconsin Ave, Western Ave, & Military Road, NW	0.639	0.722	-0.758	0.448	**No**
25	20th Street & M Street, NW	0.028	0.000	1.424	0.154	**No**

period, five of the 16 reductions in proportions were found to be statistically significant, while four of the nine increases in proportions were found to be statistically significant.

In summary, as shown in Table 17, the results of the hypothesis tests for this variable indicate in general that there is no discernable change in number of signal cycles with pedestrian-vehicle conflicts due to the type of CPS display.

TABLE 17: Summary Results for "Number of Cycles with Pedestrian-Vehicle conflicts"

Peak Period	Percentage of intersections showing statistically significant results	
	No difference in percentage	Difference in percentage
Morning	72%	28%
Evening	64%	36%

9.0 ATTITUDINAL SURVEY

9.1 Pedestrian Survey

A survey, designed to gather information from pedestrians regarding their understanding and preference for the two types of CPS, was conducted at five intersections where SW-FDW countdown display was changed to FDW countdown display. Pedestrian involved in crossing events at the intersection were selected at random. The total number of respondents was 744. The survey form and detailed responses from the pedestrians are presented in Appendix B.

9.1.1 Results for Question 1

The summary of the responses to the question *"Do you understand the difference between the two countdown displays?"* is presented in Figure 4. The results indicate that the majority of the respondents (90%) indicated that they knew the difference between the two CPS displays. This is an indication that a majority of pedestrians in the City are aware of the two types of CPS displays.

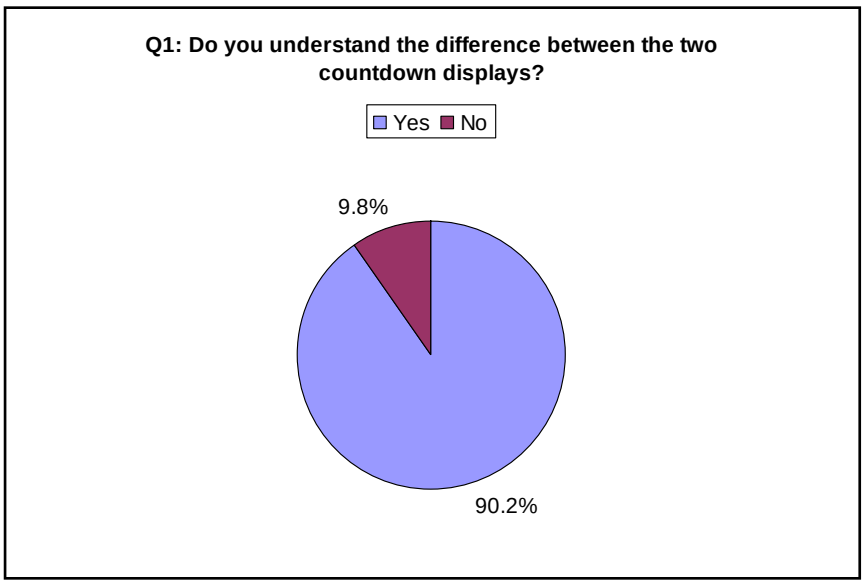

FIGURE 4: Responses to Question 1 of Pedestrian Survey

9.1.2 Results for Question 2

The summary of the responses to the question *"As a pedestrian, which display provides you with more information?"* is presented in Figure 5.

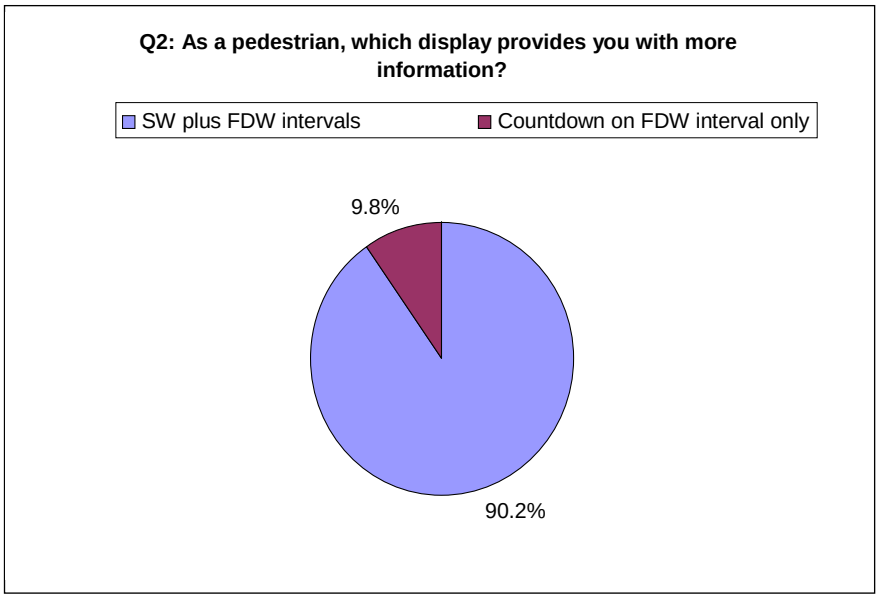

FIGURE 5: Responses to Question 2 of Pedestrian Survey

The results indicate that approximately 90% of the pedestrians surveyed chose the SW-FDW countdown which corresponds to the "before". The responses suggest

that pedestrians believe that displaying the time during the SW interval help them make more educated crossing decisions.

9.1.3 Results for Question 3

Finally, pedestrian were asked to indicate which of the two types of CPS displays they would prefer for signalized intersections in the City. The summary of the responses to that question is presented in Figure 6. Approximately 86% of the respondents said that they would prefer the SW-FDW countdown display to be used at signalized intersection in the City.

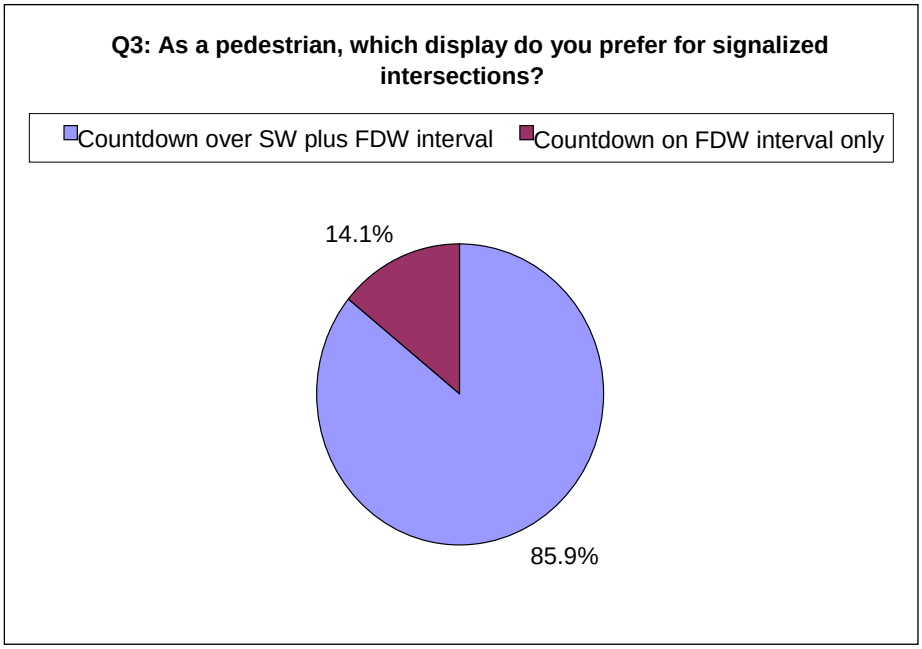

FIGURE 6: Responses to Question 3 of Pedestrian Survey

Some of the pedestrians surveyed made a number of comments about the FDW countdown display. The WALK interval for FDW display is usually displayed with a SW without the countdown time. Some respondents contended that when there is no countdown time below the SW, it appears to them that the pedestrian signal is malfunctioning, in which case, they remain confused until the FDW interval is displayed before proceeding to cross.

9.2 Driver Survey

A survey was conducted to assess driver's attitudes about the countdown displays. A total of 243 drivers were surveyed. The following questions were posed:

1. Do you often drive in the city?
2. As a driver, do you pay attention to the CPS display?
3. If yes, what does the number tell you?
4. As a driver, does the number in the CPS display help you make intersection driving decisions?
5. If not, why is the number displayed not important to you?
6. If yes, does the magnitude of the number influence your decision to stop or continue through an intersection?
7. Which of the displays do you prefer and why?

Table 18 and Figures 7 through 11 show the results of the survey. Among respondents who drive in the City, approximately 69% indicated that they pay attention to CPS display. Nearly all drivers that admitted paying attention also agreed that the CPS help them make driving decisions. About 94% of these respondents said that CPS display influences their decisions as to stop or continue through an intersection. In addition, the majority (84%) of drivers surveyed prefer SW-FDW display because they indicated it gives them more information than the FDW display.

Table 18: Summary of Driver Survey

Question	Responses	Cases	Percentage	Total Responses
1	Yes	225	90.7%	243
	No	18	7.3%	
2	Yes	155	69.2%	224
	No	69	30.8%	
4	Yes	154	99.4%	155
	No	1	0.6%	
6	Yes	145	93.5%	155
	No	10	6.5%	
7	Yes	128	82.6%	155
	No	27	17.4%	

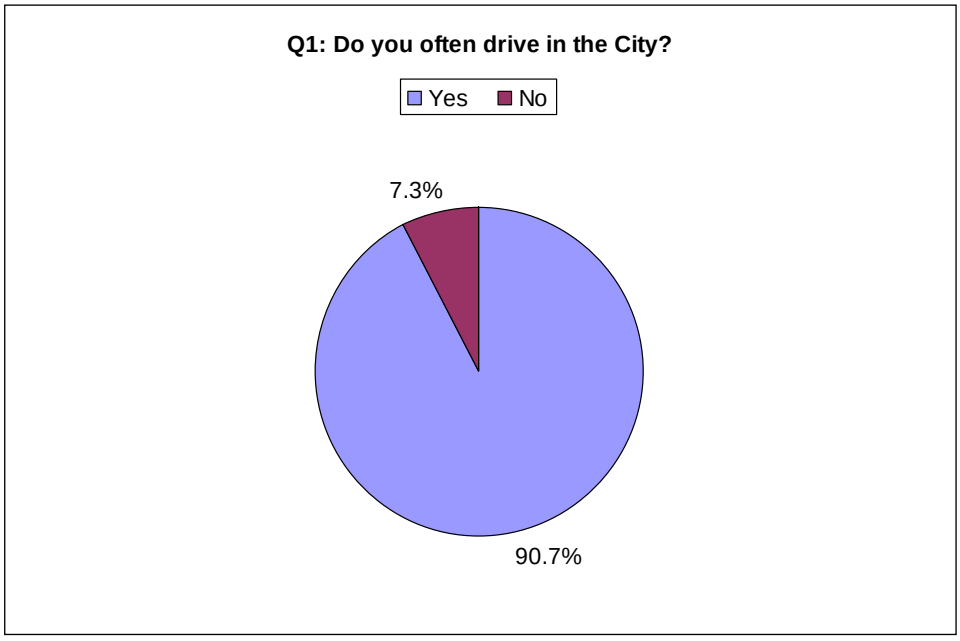

FIGURE 7: Responses to Question 1 of Driver Survey

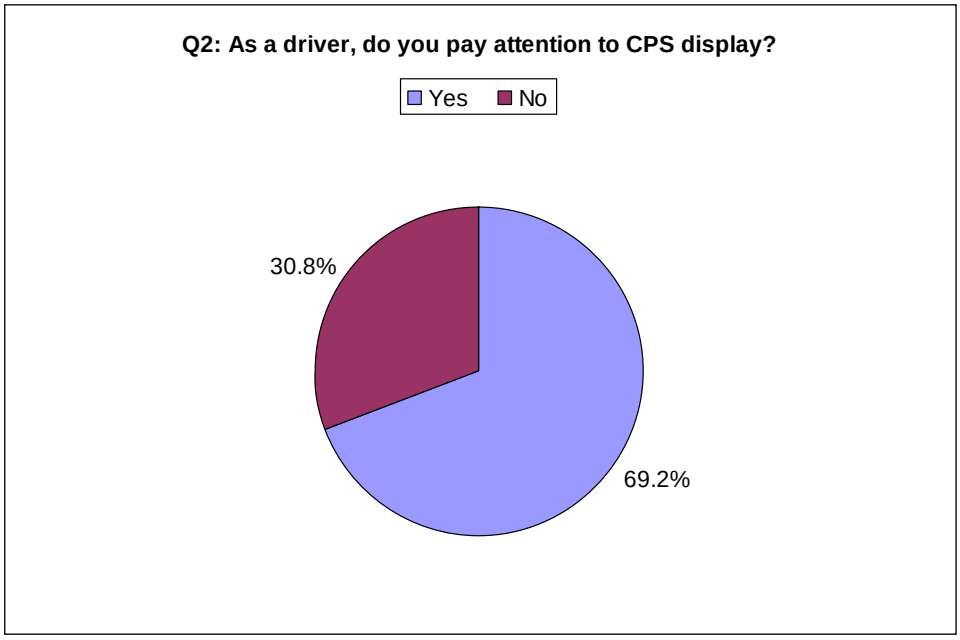

FIGURE 8: Responses to Question 2 of Driver Survey

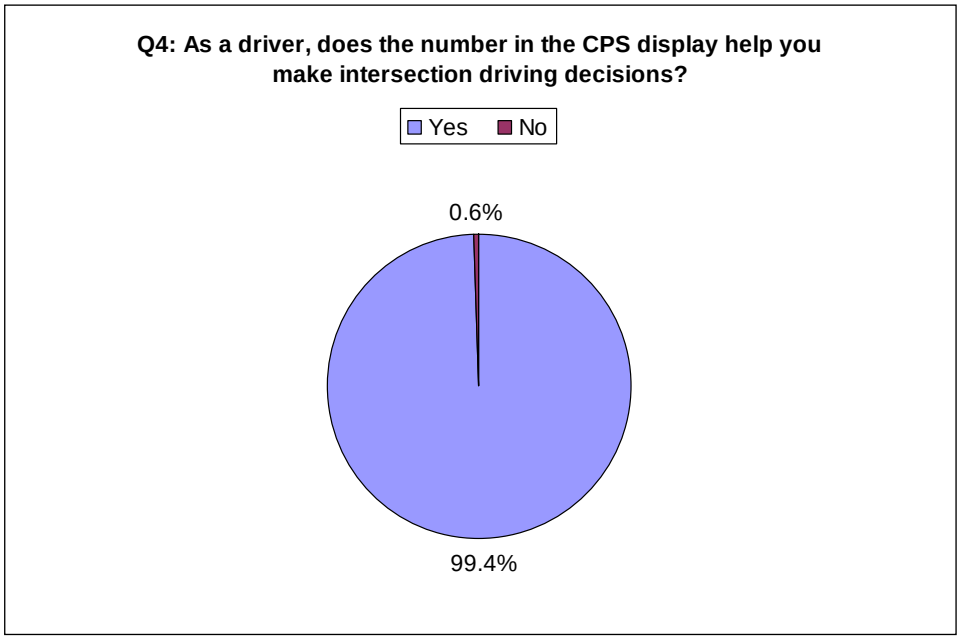

FIGURE 9: Responses to Question 4 of Driver Survey

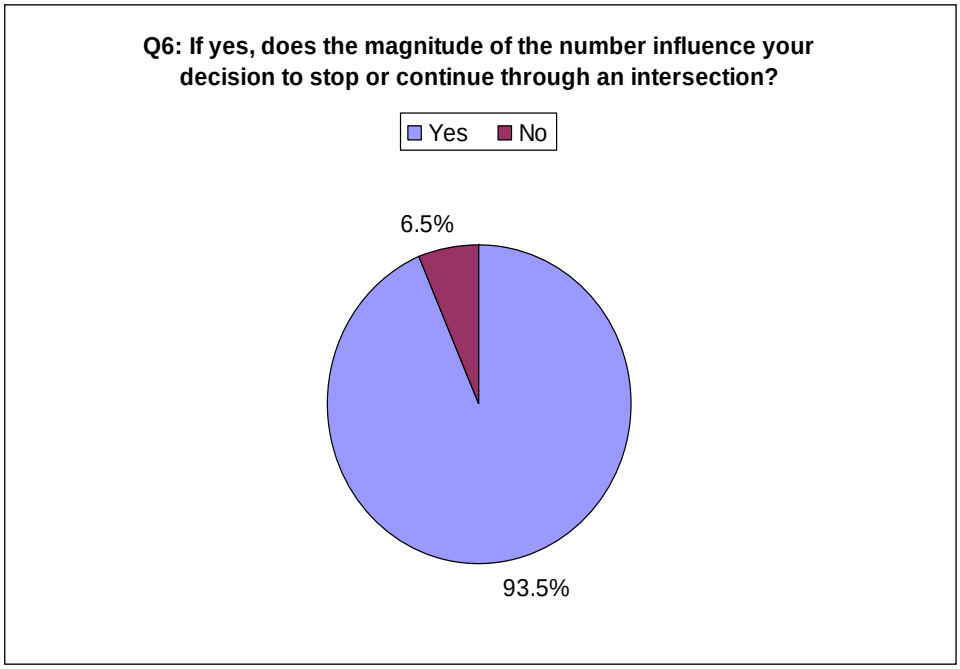

FIGURE 10: Responses to Question 6 of Driver Survey

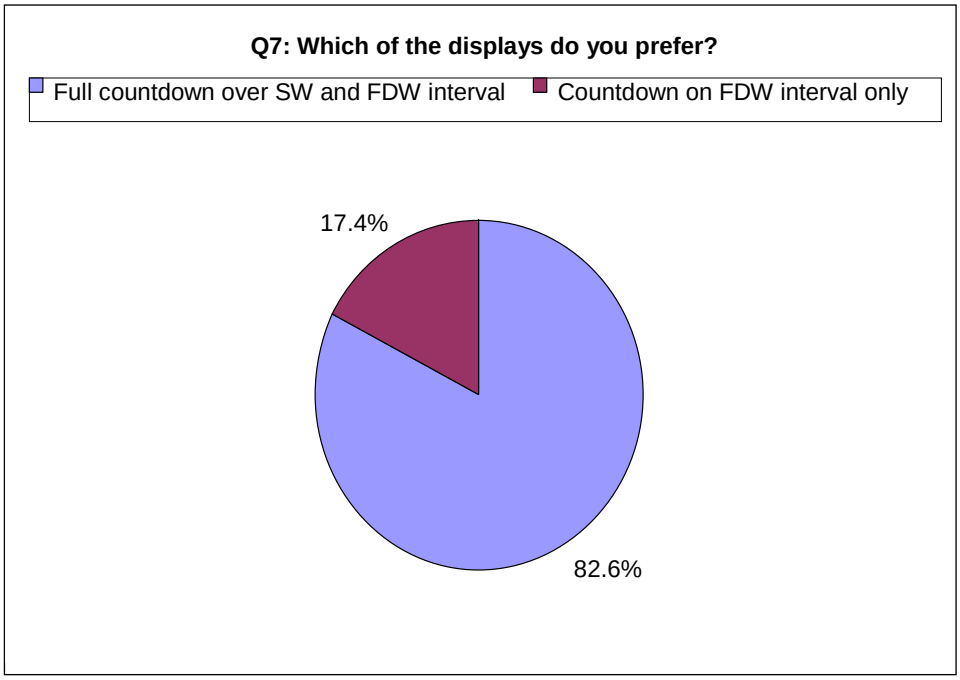

FIGURE 11: Responses to Question 7 of Driver Survey

Drivers were also asked the meaning of the number displayed on the CPS. Some of the response to that question included *"Time remaining before traffic lights change", "How many seconds left for the traffic light to turn red"*, *"How much time available for pedestrian to cross"*. The actual responses and comments from drivers were compiled and are presented in Appendix C.

10.0 DISCUSSION

This research focused on surrogate variables that influence pedestrian safety issues at crosswalks at signalized intersections. The variables of interest used in this comparative study were the following:

1. Pedestrian Completing Crossing during the Red Interval
2. Pedestrian Beginning to Cross during FDW
3. Pedestrian-Vehicle Conflicts
4. Cycles with Pedestrian-Vehicle Conflicts

From the results, 36% of the intersections showed statistically significant changes in proportions (reductions or increases) of pedestrians who completed their crossing during the red interval in the AM peak period. In the PM peak, also

36% of the intersections recorded statistically significant changes in proportions. Overall, there is no discernable behavioral change in this pedestrian behavior due to the type of CPS display.

The evaluation of pedestrians beginning to cross during FDW showed statistically significant difference in proportions at 48% of the intersections during the AM peak hours. The PM peak period had 36% of the intersections had a statistically significant increase or decrease in proportion. These results suggest that there is no behavioral change in this pedestrian behavior due to the type of CPS display.

The results indicate that 28% of the intersections recorded statistically significant difference in proportions of pedestrians who had conflicts with vehicles in the AM peak period. During the PM peak hours, intersections that had significant changes in proportions related to this behavior represented 32%. Overall, only one intersection showed a decrease in proportions for both AM and PM peak periods. The increases in proportions were constantly significant at two of the 25 intersections. In summary, there is no clear pattern of change in pedestrian-vehicle conflicts due to the type of CPS display.

The changes in proportion of the number of cycles where pedestrian-vehicle conflicts occurred was statistically significant at 28% of the intersections in the AM peak hours, and 36 % of the intersections during the PM peak period.

The pedestrian survey showed that the majority of respondents understand the difference between the two types of CPS displays evaluated in this research. The results also suggest that pedestrians prefer the full countdown display (SW-FDW CPS) over the FDW CPS. These results imply that pedestrian believe that the time displayed during the WALK interval of the SW-FDW CPS help them make better crossing decisions.

The driver survey indicated that most of the drivers paid attention to CPS displays and used the countdown to make driving decisions at intersections (99%). Approximately 95% of these drivers indicated that CPS display influences their decision to stop or continue through the intersection. The majority of the surveyed

drivers indicated that they prefer SW-FDW CPS because the displayed time is their focus in making driving decisions at signalized intersections.

11.0 CONCLUSIONS

This study found that both drivers and pedestrians understand the difference between the two countdown types. In addition, they showed an overwhelming preference for the CPS display that starts at the SW interval which they believe provides more time information for driving and crossing decisions. In comparing pedestrian crossing behaviors at the intersections, the results showed that there is no advantage of using one type of display over the other. The results of the analyses only apply to signalized intersections with fixed time control and show that the differences in pedestrian crossing behavior due to the two types of CPS displays are minimal.

With pedestrians' and drivers' overwhelming preference for the CPS display which starts at the beginning of the SW interval, coupled with the fact that there is no clear advantage of using one display over the other, the District Department of Transportation could seek an exemption from FHWA for the continued use of the SW-FDW CPS display.

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APPENDICES

A: Statistical Analyses

B: Pedestrian Survey Results

C: Driver Survey Results

APPENDIX A

Statistical Analyses

Results for "Pedestrian Completing Crossing during the Red Interval" - A.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	66	52	1662	1657	0.040	0.031	0.036	0.964	0.006	1.296	0.195
2	13th Street & U Street, NW	103	75	922	1215	0.112	0.062	0.083	0.917	0.012	4.142	0.000
3	12th Street & G Street, NW	127	45	541	699	0.235	0.064	0.139	0.861	0.020	8.608	0.000
4	Wisconsin Ave & N Street, NW	41	33	357	346	0.115	0.095	0.105	0.895	0.023	0.841	0.400
5	7th Street & H Street, NW	78	70	1502	1468	0.052	0.048	0.050	0.950	0.008	0.532	0.595
6	7th Street & Constitution Ave, NW	33	41	206	273	0.160	0.150	0.154	0.846	0.033	0.300	0.764
7	12th Street & Pennsylvania Ave, NW	39	49	431	596	0.090	0.082	0.086	0.914	0.018	0.467	0.640
8	14th Street & U Street, NW	60	43	727	776	0.083	0.055	0.069	0.931	0.013	2.080	0.038
9	14th Street & K Street, NW	35	43	1186	1012	0.030	0.042	0.035	0.965	0.008	-1.639	0.101
10	7th Street, Mount Vernon Square, & New York Ave, NW	7	12	232	143	0.030	0.084	0.051	0.949	0.023	-2.305	0.021
11	21st Street & K Street, NW	117	38	444	390	0.264	0.097	0.186	0.814	0.027	6.152	0.000
12	Connecticut Ave & Woodly Road, NW	8	6	196	241	0.041	0.025	0.032	0.968	0.017	0.940	0.347
13	Connecticut Ave & Nebraska Ave, NW	1	2	74	66	0.014	0.030	0.021	0.979	0.025	-0.685	0.493
14	Connecticut Ave & Van Ness Street, NW	2	14	94	109	0.021	0.128	0.079	0.921	0.038	-2.825	0.005
15	North Capitol & H Street	7	41	643	597	0.011	0.069	0.039	0.961	0.011	-5.271	0.000
16	Benning Road & East Capitol Street	20	16	411	404	0.049	0.040	0.044	0.956	0.014	0.629	0.529
17	Benning Road & Minnesota Ave, NE	58	21	306	358	0.190	0.061	0.120	0.880	0.036	3.574	0.000
18	New Jersey Ave & M Street, SE	79	119	1437	1551	0.055	0.077	0.066	0.934	0.009	-2.388	0.017
19	Florida Ave & North Capitol Street	8	7	355	383	0.023	0.018	0.020	0.980	0.010	0.410	0.682
20	New York Ave & Florida Ave, NE	45	54	377	390	0.119	0.138	0.129	0.871	0.024	-0.789	0.430
21	14th Street & Constitution Ave, NW	8	10	186	203	0.043	0.049	0.046	0.954	0.021	-0.293	0.769
22	Independence Ave & 7th Street	4	9	180	209	0.022	0.043	0.033	0.967	0.018	-1.140	0.254

23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	21	26	223	248	0.094	0.105	0.100	0.900	0.028	-0.386	0.700
24	Wisconsin Ave, Western Ave, & Military Road, NW	19	11	268	244	0.071	0.045	0.059	0.941	0.021	1.242	0.214
25	20th Street & M Street, NW	8	11	780	905	0.010	0.012	0.011	0.989	0.005	-0.368	0.713

Results for "Pedestrian Completing Crossing during the Red Interval" - P.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	61	43	2013	1759	0.030	0.024	0.028	0.972	0.005	1.096	0.273
2	13th Street & U Street, NW	134	86	1498	1190	0.089	0.072	0.082	0.918	0.015	1.141	0.254
3	12th Street & G Street, NW	129	31	713	1020	0.181	0.030	0.092	0.908	0.014	10.653	0.000
4	Wisconsin Ave & N Street, NW	8	16	586	612	0.014	0.026	0.020	0.980	0.011	-1.091	0.275
5	7th Street & H Street, NW	35	27	2607	2421	0.013	0.011	0.012	0.988	0.003	0.730	0.466
6	7th Street & Constitution Ave, NW	105	96	789	868	0.133	0.111	0.121	0.879	0.016	1.400	0.162
7	12th Street & Pennsylvania Ave, NW	56	106	864	831	0.065	0.128	0.096	0.904	0.014	-4.392	0.000
8	14th Street & U Street, NW	56	46	826	1074	0.068	0.043	0.054	0.946	0.015	1.692	0.091
9	14th Street & K Street, NW	89	43	1169	1012	0.076	0.042	0.061	0.939	0.010	3.286	0.001
10	7th Street, Mount Vernon Square, & New York Ave, NW	23	13	500	313	0.046	0.042	0.044	0.956	0.015	0.301	0.763
11	21st Street & K Street, NW	79	39	597	475	0.132	0.082	0.110	0.890	0.019	2.610	0.009
12	Connecticut Ave & Woodly Road, NW	3	36	294	356	0.010	0.101	0.060	0.940	0.019	-4.858	0.000
13	Connecticut Ave & Nebraska Ave, NW	4	0	84	58	0.048	0.000	0.028	0.972	0.028	1.686	0.092
14	Connecticut Ave & Van Ness Street, NW	16	12	222	146	0.072	0.082	0.076	0.924	0.040	-0.253	0.800
15	North Capitol & H Street	4	38	490	432	0.008	0.088	0.046	0.954	0.014	-5.799	0.000
16	Benning Road & East Capitol Street	26	20	556	626	0.047	0.032	0.039	0.961	0.016	0.929	0.353
17	Benning Road & Minnesota Ave, NE	36	65	534	646	0.067	0.101	0.086	0.914	0.016	-2.029	0.042
18	New Jersey Ave & M Street, SE	33	43	864	1155	0.038	0.037	0.038	0.962	0.009	0.113	0.910
19	Florida Ave & North Capitol Street	20	17	290	271	0.069	0.063	0.066	0.934	0.021	0.297	0.766

20	New York Ave & Florida Ave, NE	49	81	389	368	0.126	0.220	0.172	0.828	0.027	-3.433	0.001
21	14th Street & Constitution Ave, NW	20	26	606	541	0.033	0.048	0.040	0.960	0.012	-1.297	0.195
22	Independence Ave & 7th Street	9	14	335	622	0.027	0.023	0.024	0.976	0.010	0.420	0.675
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	34	10	139	127	0.245	0.079	0.165	0.835	0.046	3.637	0.000
24	Wisconsin Ave, Western Ave, & Military Road, NW	34	50	718	722	0.047	0.069	0.058	0.942	0.017	-1.254	0.210
25	20th Street & M Street, NW	14	22	999	1167	0.014	0.019	0.017	0.983	0.006	-0.878	0.380

Results for "Pedestrian Beginning to Cross during FDW" - A.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	119	107	1662	1657	0.072	0.065	0.068	0.932	0.009	0.803	0.422
2	13th Street & U Street, NW	91	169	922	1215	0.099	0.139	0.122	0.878	0.014	-2.829	0.005
3	12th Street & G Street, NW	67	133	541	699	0.124	0.190	0.161	0.839	0.021	-3.154	0.002
4	Wisconsin Ave & N Street, NW	25	21	357	346	0.070	0.061	0.065	0.935	0.019	0.500	0.617
5	7th Street & H Street, NW	164	159	1502	1468	0.109	0.108	0.109	0.891	0.011	0.077	0.939
6	7th Street & Constitution Ave, NW	34	30	206	273	0.165	0.110	0.134	0.866	0.031	1.757	0.079
7	12th Street & Pennsylvania Ave, NW	16	113	431	596	0.037	0.190	0.126	0.874	0.021	-7.276	0.000
8	14th Street & U Street, NW	88	240	727	776	0.121	0.309	0.218	0.782	0.021	-8.829	0.000
9	14th Street & K Street, NW	34	65	1186	1012	0.029	0.064	0.045	0.955	0.009	-4.007	0.000
10	7th Street, Mount Vernon Square, & New York Ave, NW	11	24	232	143	0.047	0.168	0.093	0.907	0.031	-3.894	0.000
11	21st Street & K Street, NW	83	69	444	390	0.187	0.177	0.182	0.818	0.027	0.374	0.709
12	Connecticut Ave & Woodly Road, NW	15	4	196	241	0.077	0.017	0.043	0.957	0.020	3.055	0.002
13	Connecticut Ave & Nebraska Ave, NW	9	6	74	66	0.122	0.091	0.107	0.893	0.052	0.586	0.558
14	Connecticut Ave & Van Ness Street, NW	14	74	94	109	0.149	0.679	0.433	0.567	0.070	-7.598	0.000
15	North Capitol & H Street	66	73	643	597	0.103	0.122	0.112	0.888	0.018	-1.095	0.274
16	Benning Road & East Capitol Street	41	36	411	404	0.100	0.089	0.094	0.906	0.020	0.520	0.603

17	Benning Road & Minnesota Ave, NE	60	30	306	358	0.196	0.084	0.136	0.864	0.038	2.979	0.003
18	New Jersey Ave & M Street, SE	158	137	1437	1551	0.110	0.088	0.099	0.901	0.011	1.980	0.048
19	Florida Ave & North Capitol Street	22	25	355	383	0.062	0.065	0.064	0.936	0.018	-0.184	0.854
20	New York Ave & Florida Ave, NE	108	104	377	390	0.286	0.267	0.276	0.724	0.032	0.613	0.540
21	14th Street & Constitution Ave, NW	18	20	186	203	0.097	0.099	0.098	0.902	0.030	-0.058	0.954
22	Independence Ave & 7th Street	10	17	180	209	0.056	0.081	0.069	0.931	0.026	-0.998	0.318
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	25	46	223	248	0.112	0.185	0.151	0.849	0.033	-2.222	0.026
24	Wisconsin Ave, Western Ave, & Military Road, NW	39	17	268	244	0.146	0.070	0.109	0.891	0.028	2.746	0.006
25	20th Street & M Street, NW	105	135	780	905	0.135	0.149	0.142	0.858	0.017	-0.852	0.394

Results for "Pedestrian Beginning to Cross during FDW" - P.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	17	15	2013	1759	0.008	0.009	0.008	0.992	0.003	-0.028	0.978
2	13th Street & U Street, NW	158	226	1498	1190	0.105	0.190	0.143	0.857	0.019	-4.394	0.000
3	12th Street & G Street, NW	59	158	713	1020	0.083	0.155	0.125	0.875	0.016	-4.466	0.000
4	Wisconsin Ave & N Street, NW	16	30	586	612	0.027	0.049	0.038	0.962	0.016	-1.383	0.167
5	7th Street & H Street, NW	193	183	2607	2421	0.074	0.076	0.075	0.925	0.007	-0.210	0.834
6	7th Street & Constitution Ave, NW	70	79	789	868	0.089	0.091	0.090	0.910	0.014	-0.163	0.871
7	12th Street & Pennsylvania Ave, NW	26	197	864	831	0.030	0.237	0.132	0.868	0.016	-12.602	0.000
8	14th Street & U Street, NW	48	150	826	1074	0.058	0.140	0.104	0.896	0.020	-4.078	0.000
9	14th Street & K Street, NW	93	65	1169	1012	0.080	0.064	0.072	0.928	0.011	1.377	0.169
10	7th Street, Mount Vernon Square, & New York Ave, NW	44	21	500	313	0.088	0.067	0.080	0.920	0.020	1.070	0.285
11	21st Street & K Street, NW	65	70	597	475	0.109	0.147	0.126	0.874	0.020	-1.887	0.059
12	Connecticut Ave & Woodly Road, NW	44	51	294	356	0.150	0.143	0.146	0.854	0.028	0.230	0.818
13	Connecticut Ave & Nebraska Ave, NW	9	1	84	58	0.107	0.017	0.070	0.930	0.044	2.058	0.040

14	Connecticut Ave & Van Ness Street, NW	54	86	222	146	0.243	0.589	0.380	0.620	0.073	-4.727	0.000
15	North Capitol & H Street	67	69	490	432	0.137	0.160	0.148	0.852	0.023	-0.982	0.326
16	Benning Road & East Capitol Street	16	8	556	626	0.029	0.013	0.020	0.980	0.012	1.376	0.169
17	Benning Road & Minnesota Ave, NE	70	102	534	646	0.131	0.158	0.146	0.854	0.021	-1.299	0.194
18	New Jersey Ave & M Street, SE	61	28	864	1155	0.071	0.024	0.044	0.956	0.009	5.021	0.000
19	Florida Ave & North Capitol Street	37	41	290	271	0.128	0.151	0.139	0.861	0.029	-0.811	0.417
20	New York Ave & Florida Ave, NE	117	128	389	368	0.301	0.348	0.324	0.676	0.034	-1.383	0.167
21	14th Street & Constitution Ave, NW	62	57	606	541	0.102	0.105	0.104	0.896	0.018	-0.169	0.866
22	Independence Ave & 7th Street	26	69	335	622	0.078	0.111	0.099	0.901	0.020	-1.644	0.100
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	112	13	139	127	0.806	0.102	0.470	0.530	0.061	11.481	0.000
24	Wisconsin Ave, Western Ave, & Military Road, NW	86	114	718	722	0.120	0.158	0.139	0.861	0.026	-1.479	0.139
25	20th Street & M Street, NW	197	185	999	1167	0.197	0.159	0.176	0.824	0.016	2.354	0.019

Results for "Pedestrian-Vehicle Conflicts" - A.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	83	69	1662	1657	0.050	0.042	0.046	0.954	0.007	1.143	0.253
2	13th Street & U Street, NW	36	35	922	1215	0.039	0.029	0.033	0.967	0.008	1.308	0.191
3	12th Street & G Street, NW	42	39	541	699	0.078	0.056	0.065	0.935	0.014	1.544	0.123
4	Wisconsin Ave & N Street, NW	5	9	357	346	0.014	0.026	0.020	0.980	0.011	-1.139	0.255
5	7th Street & H Street, NW	76	62	1502	1468	0.051	0.042	0.046	0.954	0.008	1.083	0.279
6	7th Street & Constitution Ave, NW	42	36	206	273	0.204	0.132	0.163	0.837	0.034	2.113	0.035
7	12th Street & Pennsylvania Ave, NW	1	38	431	596	0.002	0.064	0.038	0.962	0.012	-5.084	0.000
8	14th Street & U Street, NW	53	44	727	776	0.073	0.057	0.065	0.935	0.013	1.277	0.201
9	14th Street & K Street, NW	161	73	1186	1012	0.136	0.072	0.106	0.894	0.013	4.820	0.000
10	7th Street, Mount Vernon Square, & New York Ave, NW	28	0	232	143	0.121	0.000	0.075	0.925	0.028	4.319	0.000
11	21st Street & K Street, NW	0	0	444	390	0.000	0.000	0.000	1.000	0.000	0.000	1.000

12	Connecticut Ave & Woodly Road, NW	41	81	196	241	0.209	0.336	0.279	0.721	0.043	-2.941	0.003
13	Connecticut Ave & Nebraska Ave, NW	22	10	74	66	0.297	0.152	0.229	0.771	0.071	2.051	0.040
14	Connecticut Ave & Van Ness Street, NW	15	23	94	109	0.160	0.211	0.187	0.813	0.055	-0.937	0.349
15	North Capitol & H Street	98	79	643	597	0.152	0.132	0.143	0.857	0.020	1.010	0.312
16	Benning Road & East Capitol Street	12	19	411	404	0.029	0.047	0.038	0.962	0.013	-1.331	0.183
17	Benning Road & Minnesota Ave, NE	6	2	306	358	0.020	0.006	0.012	0.988	0.012	1.167	0.243
18	New Jersey Ave & M Street, SE	45	37	1437	1551	0.031	0.024	0.027	0.973	0.006	1.247	0.212
19	Florida Ave & North Capitol Street	5	4	355	383	0.014	0.010	0.012	0.988	0.008	0.450	0.653
20	New York Ave & Florida Ave, NE	8	5	377	390	0.021	0.013	0.017	0.983	0.009	0.901	0.368
21	14th Street & Constitution Ave, NW	18	15	186	203	0.097	0.074	0.085	0.915	0.028	0.809	0.418
22	Independence Ave & 7th Street	42	55	180	209	0.233	0.263	0.249	0.751	0.044	-0.678	0.498
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	6	27	223	248	0.027	0.109	0.070	0.930	0.024	-3.480	0.001
24	Wisconsin Ave, Western Ave, & Military Road, NW	34	21	268	244	0.127	0.086	0.107	0.893	0.027	1.489	0.136
25	20th Street & M Street, NW	1	0	780	905	0.001	0.000	0.001	0.999	0.001	1.077	0.281

Results for "Pedestrian-Vehicle Conflicts" - P.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	135	117	2013	1759	0.067	0.067	0.067	0.933	0.008	0.067	0.946
2	13th Street & U Street, NW	80	36	1498	1190	0.053	0.030	0.043	0.957	0.011	2.075	0.038
3	12th Street & G Street, NW	31	41	713	1020	0.043	0.040	0.042	0.958	0.010	0.337	0.736
4	Wisconsin Ave & N Street, NW	4	2	586	612	0.007	0.003	0.005	0.995	0.006	0.617	0.537
5	7th Street & H Street, NW	254	241	2607	2421	0.097	0.100	0.098	0.902	0.008	-0.252	0.801
6	7th Street & Constitution Ave, NW	76	64	789	868	0.096	0.074	0.084	0.916	0.014	1.651	0.099
7	12th Street & Pennsylvania Ave, NW	1	31	864	831	0.001	0.037	0.019	0.981	0.007	-5.466	0.000
8	14th Street & U Street, NW	30	44	826	1074	0.036	0.041	0.039	0.961	0.013	-0.367	0.714
9	14th Street & K Street, NW	175	73	1169	1012	0.150	0.072	0.114	0.886	0.014	5.691	0.000

10	7th Street, Mount Vernon Square, & New York Ave, NW	32	0	500	313	0.064	0.000	0.039	0.961	0.014	4.566	0.000
11	21st Street & K Street, NW	0	0	597	475	0.000	0.000	0.000	1.000	0.000	0.000	1.000
12	Connecticut Ave & Woodly Road, NW	28	43	294	356	0.095	0.121	0.109	0.891	0.025	-1.039	0.299
13	Connecticut Ave & Nebraska Ave, NW	27	13	84	58	0.321	0.224	0.282	0.718	0.077	1.267	0.205
14	Connecticut Ave & Van Ness Street, NW	64	60	222	146	0.288	0.411	0.337	0.663	0.071	-1.722	0.085
15	North Capitol & H Street	112	80	490	432	0.229	0.185	0.208	0.792	0.027	1.619	0.105
16	Benning Road & East Capitol Street	12	12	556	626	0.022	0.019	0.020	0.980	0.012	0.208	0.836
17	Benning Road & Minnesota Ave, NE	43	29	534	646	0.081	0.045	0.061	0.939	0.014	2.545	0.011
18	New Jersey Ave & M Street, SE	39	19	864	1155	0.045	0.016	0.029	0.971	0.008	3.818	0.000
19	Florida Ave & North Capitol Street	7	2	290	271	0.024	0.007	0.016	0.984	0.011	1.579	0.114
20	New York Ave & Florida Ave, NE	5	1	389	368	0.013	0.003	0.008	0.992	0.006	1.572	0.116
21	14th Street & Constitution Ave, NW	15	7	606	541	0.025	0.013	0.019	0.981	0.008	1.456	0.145
22	Independence Ave & 7th Street	64	126	335	622	0.191	0.203	0.199	0.801	0.027	-0.426	0.670
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0	17	139	127	0.000	0.134	0.064	0.936	0.030	-4.458	0.000
24	Wisconsin Ave, Western Ave, & Military Road, NW	136	72	718	722	0.189	0.100	0.144	0.856	0.026	3.423	0.001
25	20th Street & M Street, NW	2	0	999	1167	0.002	0.000	0.001	0.999	0.001	1.529	0.126

Results for "Number of Cycles with Pedestrian-Vehicle Conflicts" - A.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	48	37	72	72	0.667	0.514	0.590	0.410	0.082	1.864	0.062
2	13th Street & U Street, NW	28	25	72	72	0.389	0.347	0.368	0.632	0.080	0.518	0.604
3	12th Street & G Street, NW	18	32	72	72	0.250	0.444	0.347	0.653	0.079	-2.451	0.014
4	Wisconsin Ave & N Street, NW	3	5	72	72	0.042	0.069	0.056	0.944	0.038	-0.728	0.467
5	7th Street & H Street, NW	40	32	72	72	0.556	0.444	0.500	0.500	0.083	1.333	0.182
6	7th Street & Constitution Ave, NW	28	23	72	72	0.389	0.319	0.354	0.646	0.080	0.871	0.384
7	12th Street & Pennsylvania Ave, NW	1	29	72	72	0.014	0.403	0.208	0.792	0.068	-5.745	0.000

8	14th Street & U Street, NW	38	38	72	72	0.528	0.528	0.528	0.472	0.083	0.000	1.000
9	14th Street & K Street, NW	43	29	72	72	0.597	0.403	0.500	0.500	0.083	2.333	0.020
10	7th Street, Mount Vernon Square, & New York Ave, NW	18	0	72	72	0.250	0.000	0.125	0.875	0.055	4.536	0.000
11	21st Street & K Street, NW	0	0	72	72	0.000	0.000	0.000	1.000	0.000	0.000	1.000
12	Connecticut Ave & Woodly Road, NW	28	53	72	72	0.389	0.736	0.563	0.438	0.083	-4.200	0.000
13	Connecticut Ave & Nebraska Ave, NW	13	5	72	72	0.181	0.069	0.125	0.875	0.055	2.016	0.044
14	Connecticut Ave & Van Ness Street, NW	11	19	72	72	0.153	0.264	0.208	0.792	0.068	-1.642	0.101
15	North Capitol & H Street	52	47	72	72	0.722	0.653	0.688	0.313	0.077	0.899	0.369
16	Benning Road & East Capitol Street	7	12	60	60	0.117	0.200	0.158	0.842	0.067	-1.250	0.211
17	Benning Road & Minnesota Ave, NE	6	2	60	60	0.100	0.033	0.067	0.933	0.064	1.035	0.301
18	New Jersey Ave & M Street, SE	31	21	60	60	0.517	0.350	0.433	0.567	0.090	1.842	0.065
19	Florida Ave & North Capitol Street	1	3	72	72	0.014	0.042	0.028	0.972	0.027	-1.014	0.310
20	New York Ave & Florida Ave, NE	7	5	72	72	0.097	0.069	0.083	0.917	0.046	0.603	0.546
21	14th Street & Constitution Ave, NW	12	9	72	72	0.167	0.125	0.146	0.854	0.059	0.708	0.479
22	Independence Ave & 7th Street	29	33	72	72	0.403	0.458	0.431	0.569	0.083	-0.673	0.501
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	3	21	60	60	0.050	0.350	0.200	0.800	0.073	-4.108	0.000
24	Wisconsin Ave, Western Ave, & Military Road, NW	21	19	72	72	0.292	0.264	0.278	0.722	0.075	0.372	0.710
25	20th Street & M Street, NW	1	0	72	72	0.014	0.000	0.007	0.993	0.014	1.003	0.316

Results for "Number of Cycles with Pedestrian-Vehicle Conflicts" - P.M. Peak

No.	Intersection	n_b	n_a	N_b	N_a	P_b	P_a	p	q	S.E.	z-statistic	p-value
1	23rd Street & H Street, NW	62	48	72	72	0.861	0.667	0.764	0.236	0.071	2.747	0.006
2	13th Street & U Street, NW	48	24	72	72	0.667	0.333	0.500	0.500	0.118	2.828	0.005
3	12th Street & G Street, NW	18	34	72	72	0.250	0.472	0.361	0.639	0.080	-2.776	0.006
4	Wisconsin Ave & N Street, NW	4	2	72	72	0.056	0.028	0.042	0.958	0.047	0.590	0.555
5	7th Street & H Street, NW	66	65	72	72	0.917	0.903	0.910	0.090	0.048	0.291	0.771
6	7th Street & Constitution Ave, NW	42	30	72	72	0.583	0.417	0.500	0.500	0.083	2.000	0.046

7	12th Street & Pennsylvania Ave, NW	1	26	72	72	0.014	0.361	0.188	0.813	0.065	-5.338	0.000
8	14th Street & U Street, NW	18	32	72	72	0.250	0.444	0.347	0.653	0.112	-1.733	0.083
9	14th Street & K Street, NW	47	29	72	72	0.653	0.403	0.528	0.472	0.083	3.005	0.003
10	7th Street, Mount Vernon Square, & New York Ave, NW	21	0	72	72	0.292	0.000	0.146	0.854	0.059	4.958	0.000
11	21st Street & K Street, NW	0	0	72	72	0.000	0.000	0.000	1.000	0.000	0.000	1.000
12	Connecticut Ave & Woodly Road, NW	17	32	72	72	0.236	0.444	0.340	0.660	0.079	-2.638	0.008
13	Connecticut Ave & Nebraska Ave, NW	13	7	72	72	0.181	0.097	0.139	0.861	0.058	1.446	0.148
14	Connecticut Ave & Van Ness Street, NW	30	34	72	72	0.417	0.472	0.444	0.556	0.117	-0.474	0.635
15	North Capitol & H Street	53	42	72	72	0.736	0.583	0.660	0.340	0.079	1.935	0.053
16	Benning Road & East Capitol Street	4	8	60	60	0.067	0.133	0.100	0.900	0.077	-0.861	0.389
17	Benning Road & Minnesota Ave, NE	20	16	60	60	0.333	0.267	0.300	0.700	0.084	0.797	0.426
18	New Jersey Ave & M Street, SE	23	15	60	60	0.383	0.250	0.317	0.683	0.085	1.570	0.116
19	Florida Ave & North Capitol Street	5	2	72	72	0.069	0.028	0.049	0.951	0.036	1.163	0.245
20	New York Ave & Florida Ave, NE	4	1	72	72	0.056	0.014	0.035	0.965	0.031	1.366	0.172
21	14th Street & Constitution Ave, NW	8	5	72	72	0.111	0.069	0.090	0.910	0.048	0.872	0.383
22	Independence Ave & 7th Street	37	45	72	72	0.514	0.625	0.569	0.431	0.083	-1.346	0.178
23	Martin L. King Jr. Ave, Howard Road, & Sheridan Road, SE	0	15	60	60	0.000	0.250	0.125	0.875	0.060	-4.140	0.000
24	Wisconsin Ave, Western Ave, & Military Road, NW	46	52	72	72	0.639	0.722	0.681	0.319	0.110	-0.758	0.448
25	20th Street & M Street, NW	2	0	72	72	0.028	0.000	0.014	0.986	0.020	1.424	0.154

APPENDIX B

Pedestrian Survey Results

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
1		1	1		1	
2	1		1		1	
3	1		1		1	
4	1		1		1	
5	1		1		1	
6	1		1		1	
7	1		1		1	
8	1		1		1	
9	1		1		1	
10	1		1		1	
11	1		1		1	
12	1		1		1	
13	1		1		1	
14	1		1		1	
15	1		1		1	
16	1			1		1
17	1			1		1
18	1		1			1
19	1		1		1	
20	1		1			1
21	1		1		1	
22	1		1		1	
23	1		1		1	
24	1		1		1	
25	1		1		1	
26	1		1		1	
27	1		1		1	
28	1		1		1	
29	1		1		1	
30	1		1		1	
31	1		1		1	
32	1		1		1	
33	1		1		1	
34	1		1		1	
35	1		1		1	
36	1		1		1	
37	1		1			1
38	1		1		1	
39		1	1		1	
40		1	1		1	
41	1			1		1
42		1	1		1	
43	1		1			1
44	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
45	1		1		1	
46	1		1		1	
47		1	1		1	
48	1		1		1	
49	1		1		1	
50	1		1		1	
51	1		1		1	
52		1	1		1	
53	1		1		1	
54	1		1		1	
55	1		1		1	
56		1	1			1
57	1		1		1	
58	1		1		1	
59	1			1		1
60		1	1		1	
61	1		1		1	
62	1		1		1	
63	1		1		1	
64		1	1		1	
65	1		1		1	
66		1	1		1	
67	1		1		1	
68	1		1		1	
69	1		1		1	
70	1		1		1	
71	1		1		1	
72		1	1		1	
73	1		1		1	
74		1	1		1	
75	1		1		1	
76	1		1		1	
77	1		1		1	
78	1		1		1	
79	1		1		1	
80	1		1		1	
81	1		1		1	
82	1		1		1	
83	1		1		1	
84	1		1		1	
85	1		1		1	
86	1		1		1	
87	1		1		1	
88	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
89	1		1		1	
90	1		1		1	
91	1		1		1	
92	1		1		1	
93	1		1		1	
94	1		1		1	
95	1		1		1	
96	1		1		1	
97	1		1		1	
98	1		1		1	
99	1		1		1	
100	1		1		1	
101	1		1		1	
102	1		1		1	
103	1		1		1	
104	1		1		1	
105	1		1		1	
106	1		1		1	
107	1		1		1	
108	1		1		1	
109		1	1			1
110	1		1		1	
111		1	1		1	
112	1		1		1	
113	1		1		1	
114	1		1		1	
115		1	1		1	
116		1	1		1	
117		1	1		1	
118		1	1		1	
119	1		1		1	
120	1		1		1	
121	1		1		1	
122	1		1		1	
123	1		1		1	
124	1		1		1	
125	1		1		1	
126	1		1		1	
127	1			1		1
128	1		1		1	
129	1			1		1
130	1		1		1	
131	1		1		1	
132	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
133	1			1		1
134	1		1		1	
135	1			1		1
136	1		1		1	
137	1		1		1	
138	1		1		1	
139	1		1		1	
140	1		1		1	
141	1		1		1	
142	1		1		1	
143	1		1		1	
144	1		1		1	
145	1		1		1	
146		1	1		1	
147	1		1		1	
148		1	1		1	
149	1		1		1	
150	1		1		1	
151	1		1		1	
152	1		1		1	
153	1		1		1	
154	1		1		1	
155	1		1			1
156	1		1		1	
157	1		1		1	
158	1		1		1	
159	1		1		1	
160	1		1		1	
161	1		1		1	
162	1		1		1	
163	1		1		1	
164	1		1		1	
165	1		1		1	
166	1		1		1	
167	1		1		1	
168	1			1		1
169	1			1		1
170	1		1		1	
171	1		1		1	
172		1	1		1	
173	1		1		1	
174	1		1		1	
175	1		1		1	
176	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
177	1		1		1	
178	1		1		1	
179	1		1		1	
180	1		1		1	
181	1		1		1	
182	1		1		1	
183	1		1		1	
184	1		1		1	
185	1			1		1
186	1		1		1	
187	1		1		1	
188	1		1		1	
189	1		1		1	
190	1		1		1	
191	1		1		1	
192	1		1		1	
193	1			1		1
194	1		1		1	
195	1		1		1	
196	1		1		1	
197	1		1		1	
198	1		1		1	
199	1		1		1	
200	1		1		1	
201		1	1		1	
202	1		1		1	
203	1		1		1	
204	1		1		1	
205	1			1		1
206	1		1		1	
207	1			1		1
208	1			1		1
209	1		1		1	
210	1		1		1	
211	1		1		1	
212	1		1		1	
213	1			1		1
214	1		1		1	
215	1		1		1	
216	1		1		1	
217	1		1		1	1
218	1		1		1	
219	1		1		1	
220	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
221		1	1		1	
222	1		1		1	
223	1		1		1	
224	1		1		1	
225	1			1		1
226	1		1		1	
227	1		1		1	
228	1		1		1	
229	1		1		1	
230	1			1		1
231	1			1		1
232	1			1		1
233	1		1		1	
234	1			1		1
235	1		1		1	
236	1		1		1	
237	1		1		1	
238	1		1		1	
239	1			1		1
240	1			1		1
241	1			1		1
242	1			1		1
243	1		1		1	
244	1		1		1	
245	1		1		1	
246	1		1		1	
247	1		1		1	
248	1		1		1	
249	1		1		1	
250	1		1		1	
251	1		1		1	
252	1		1		1	
253	1			1		1
254	1			1		1
255	1		1		1	
256	1			1		1
257	1			1		1
258	1		1		1	
259	1		1		1	
260	1		1		1	
261	1		1		1	
262		1	1		1	
263	1		1		1	
264	1			1		1

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
265	1		1		1	
266		1	1		1	
267	1			1		1
268	1		1		1	
269	1			1		1
270	1		1		1	
271	1		1		1	
272		1		1		1
273	1		1			1
274	1		1			1
275	1		1			1
276	1		1		1	
277	1		1		1	
278	1		1		1	
279	1			1		1
280	1			1		1
281		1	1		1	
282	1		1			1
283		1	1		1	
284	1		1			1
285	1		1			1
286	1		1			1
287	1		1			1
288		1		1		1
289	1		1		1	
290	1		1		1	
291	1		1		1	
292		1	1		1	
293	1		1		1	
294	1		1		1	
295	1		1		1	
296	1		1		1	
297	1	0	1	0	1	0
298	1	0	1	0	1	0
299	1	0	1	0	1	0
300	1	0	1	0	1	0
301	1	0	1	0	1	0
302	1	0	1	0	1	0
303	1	0	1	0	1	0
304	1	0	1	0	1	0
305	1	0	1	0	1	0
306	0	1	1	0	1	0
307	1	0	1	0	1	0
308	1	0	1	0	1	0

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
309	1	0	1	0	1	0
310	1	0	1	0	1	0
311	1	0	1	0	1	0
312	1	0	1	0	1	0
313	1	0	1	0	1	0
314	1	0	1	0	1	0
315	1	0	1	0	1	0
316	1	0	1	0	0	1
317	1	0	1	0	1	0
318	1	0	1	0	1	0
319	1	0	1	0	1	0
320	1	0	1	0	1	0
321	1	0	1	0	1	0
322	1	0	1	0	1	0
323	1	0	1	0	1	0
324	1	0	1	0	1	0
325	1	0	1	0	1	0
326	1	0	1	0	1	0
327	1	0	1	0	1	0
328	1	0	1	0	1	0
329	1	0	1	0	1	0
330	0	1	1	0	1	0
331	1	0	1	0	1	0
332	1	0	1	0	1	0
333	1	0	1	0	1	0
334	0	1	1	0	1	0
335	0	1	1	0	1	0
336	1	0	1	0	1	0
337	1	0	1	0	1	0
338	1	0	1	0	1	0
339	0	1	1	0	1	0
340	1	0	1	0	1	0
341	1	0	1	0	1	0
342	1	0	1	0	1	0
343	1	0	1	0	1	0
344	1	0	1	0	1	0
345	1	0	1	0	1	0
346	1	0	1	0	1	0
347	1	0	1	0	1	0
348	1	0	1	0	1	0
349	1	0	1	0	1	0
350	1	0	1	0	1	0
351	1	0	1	0	1	0
352	1	0	1	0	0	1

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
353	1	0	1	0	0	1
354	1	0	1	0	0	1
355	1	0	1	0	1	0
356	1	0	1	0	1	0
357	1	0	1	0	1	0
358	1	0	1	0	1	0
359	1	0	1	0	1	0
360	1	0	1	0	1	0
361	1	0	1	0	1	0
362	0	1	1	0	1	0
363	1	0	1	0	1	0
364	1	0	1	0	1	0
365	1	0	1	0	1	0
366	1	0	1	0	1	0
367	1	0	1	0	1	0
368	1	0	1	0	1	0
369	1	0	1	0	1	0
370	1	0	1	0	1	0
371	1	0	1	0	1	0
372	1	0	1	0	1	0
373	1	0	1	0	1	0
374	1	0	1	0	1	0
375	0	1	1	0	1	0
376	1	0	1	0	0	1
377	0	1	1	0	1	0
378	0	1	1	0	0	1
379	1	0	1	0	1	0
380	1	0	1	0	1	0
381	1	0	1	0	1	0
382	1	0	1	0	1	0
383	1	0	1	0	1	0
384	0	1	1	0	1	0
385	0	1	1	0	1	0
386	1	0	1	0	1	0
387	1	0	1	0	1	0
388	1	0	1	0	1	0
389	1	0	1	0	1	0
390	1	0	1	0	1	0
391	1	0	1	0	1	0
392	1	0	1	0	0	1
393	1	0	1	0	1	0
394	1	0	1	0	1	0
395	1	0	1	0	1	0
396	1	0	1	0	1	0

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
397	1	0	1	0	1	0
398	1	0	1	0	1	0
399	1	0	1	0	1	0
400	1	0	1	0	1	0
401	1	0	1	0	1	0
402	1	0	1	0	1	0
403	1	0	1	0	1	0
404	1	0	1	0	1	0
405	1	0	1	0	1	0
406	1	0	1	0	1	0
407	1	0	1	0	1	0
408	1	0	1	0	1	0
409	1	0	1	0	1	0
410	1	0	1	0	1	0
411	1	0	1	0	1	0
412	1	0	1	0	1	0
413	1	0	1	0	1	0
414	1	0	1	0	1	0
415	1	0	1	0	1	0
416	0	1	1	0	1	0
417	1	0	1	0	1	0
418	1	0	1	0	1	0
419	1	0	1	0	1	0
420	1	0	1	0	1	0
421	0	1	1	0	1	0
422	1	0	1	0	1	0
423	1	0	1	0	1	0
424	1	0	1	0	1	0
425	1	0	1	0	1	0
426	1	0	1	0	1	0
427	1	0	1	0	1	0
428	0	1	1	0	1	0
429	0	1	1	0	1	0
430	0	1	1	0	1	0
431	1	0	1	0	1	0
432	0	1	1	0	1	0
433	1	0	1	0	1	0
434	1	0	1	0	1	0
435	1	0	1	0	1	0
436	1	0	1	0	1	0
437	1	0	1	0	1	0
438	1	0	1	0	1	0
439	1	0	1	0	0	1
440	1	0	1	0	1	0

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
441	1	0	1	0	1	0
442	1	0	1	0	1	0
443	0	1	1	0	1	0
444	0	1	1	0	1	0
445	0	1	1	0	1	0
446		1	1		1	
447		1	1		1	
448	1		1		1	
449	1		1		1	
450	1		1		1	
451	1		1		1	
452	1		1		1	
453	1		1		1	
454	1		1		1	
455	1		1		1	
456	1		1		1	
457	1		1		1	
458	1		1		1	
459	1		1		1	
460	1		1		1	
461	1		1		1	
462	1		1		1	
463	1		1		1	
464	1		1		1	
465		1	1		1	
466	1		1		1	
467	1		1		1	
468	1		1		1	
469	1		1		1	
470	1		1		1	
471	1		1		1	
472	1		1		1	
473	1		1		1	
474	1		1		1	
475	1		1		1	
476	1		1		1	
477	1		1		1	
478	1		1		1	
479	1		1			1
480	1		1		1	
481	1		1		1	
482	1		1		1	
483	1		1		1	
484	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
485	1		1		1	
486	1		1		1	
487		1	1		1	
488		1	1		1	
489	1		1		1	
490	1		1		1	
491	1		1		1	
492	1		1			
493		1	1		1	
494	1		1		1	
495	1		1		1	
496	1		1		1	
497	1		1		1	
498	1		1		1	
499	1		1		1	
500	1		1		1	
501	1		1		1	
502	1		1		1	
503	1		1		1	
504	1		1		1	
505	1		1		1	
506	1		1		1	
507	1		1		1	
508	1		1		1	
509	1		1		1	
510	1		1		1	
511	1		1		1	
512	1		1			1
513	1		1		1	
514	1		1		1	
515	1		1		1	
516	1		1		1	
517	1		1		1	
518	1		1		1	
519	1		1		1	
520	1		1		1	
521	1		1		1	
522	1		1		1	
523	1		1		1	
524	1		1		1	
525	1			1		1
526	1		1		1	
527	1		1		1	
528	1			1		1

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
529	1			1		1
530	1			1		1
531	1		1		1	
532	1		1		1	
533	1		1		1	
534	1		1		1	
535	1		1		1	
536	1		1		1	
537	1			1		1
538	1			1		1
539	1			1		1
540	1			1		1
541	1			1		1
542	1			1		1
543	1			1		1
544	1		1		1	
545	1		1		1	
546	1		1		1	
547	1		1		1	
548	1		1		1	
549	1		1		1	
550	1		1		1	
551	1		1		1	
552	1		1		1	
553	1		1		1	
554	1		1		1	
555	1		1		1	
556	1		1		1	
557		1		1		1
558	1		1		1	
559	1		1		1	
560	1		1		1	
561		1	1		1	
562	1		1		1	
563	1			1	1	
564	1			1	1	
565	1		1		1	
566	1			1		1
567	1		1		1	
568	1		1			1
569		1		1		1
570	1		1		1	
571	1		1		1	
572	1		1		1	

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
573	1		1			1
574	1		1		1	
575	1		1		1	
576	1		1		1	
577	1		1		1	
578	1		1		1	
579	1		1		1	
580	1		1			1
581	1		1		1	
582	1		1		1	
583	1		1			1
584	1		1		1	
585	1		1		1	
586	1		1		1	
587	1		1			1
588	1		1		1	
589	1		1		1	
590	1			1		1
591	1		1		1	
592	1			1		1
593		1	1		1	
594	1		1			1
595	1	0	1	0	1	0
596	1	0	0	1	0	1
597	1	0	1	0	1	0
598	1	0	1	0	1	0
599	1	0	1	0	1	0
600	1	0	1	0	0	1
601	0	1	1	0	1	0
602	0	1	1	0	1	0
603	1	0	1	0	0	1
604	1	0	1	0	1	0
605	1	0	0	1	0	1
606	1	0	1	0	1	0
607	0	1	1	0	1	0
608	1	0	1	0	1	0
609	1	0	1	0	1	0
610	1	0	1	0	1	0
611	1	0	1	0	1	0
612	1	0	1	0	1	0
613	1	0	1	0	1	0
614	1	0	1	0	1	0
615	1	0	1	0	1	0
616	1	0	1	0	1	0

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
617	1	0	1	0	1	0
618	1	0	1	0	1	0
619	1	0	1	0	1	0
620	0	1	1	0	1	0
621	1	0	1	0	1	0
622	1	0	1	0	1	0
623	1	0	1	0	1	0
624	1	0	1	0	1	0
625	1	0	1	0	1	0
626	1	0	1	0	1	0
627	1	0	1	0	1	0
628	1	0	1	0	1	0
629	1	0	1	0	1	0
630	1	0	1	0	1	0
631	1	0	1	0	1	0
632	1	0	1	0	1	0
633	1	0	1	0	1	0
634	1	0	1	0	1	0
635	1	0	1	0	1	0
636	1	0	1	0	1	0
637	1	0	1	0	1	0
638	1	0	1	0	1	0
639	1	0	1	0	1	0
640	1	0	1	0	1	0
641	1	0	1	0	1	0
642	1	0	1	0	1	0
643	1	0	1	0	1	0
644	1	0	0	1	0	1
645	0	1	1	0	1	0
646	1	0	1	0	1	0
647	1	0	0	1	0	1
648	1	0	0	1	0	1
649	1	0	0	1	0	1
650	1	0	1	0	1	0
651	1	0	1	0	1	0
652	1	0	1	0	1	0
653	1	0	1	0	1	0
654	1	0	0	1	0	1
655	1	0	1	0	1	0
656	1	0	1	0	1	0
657	1	0	1	0	1	0
658	1	0	1	0	1	0
659	1	0	1	0	1	0
660	1	0	1	0	1	0

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
661	1	0	1	0	1	0
662	1	0	1	0	1	0
663	1	0	1	0	1	0
664	1	0	0	1	0	1
665	1	0	1	0	1	0
666	1	0	1	0	1	0
667	1	0	1	0	1	0
668	1	0	1	0	1	0
669	1	0	1	0	1	0
670	1	0	1	0	1	0
671	1	0	1	0	1	0
672	1	0	1	0	1	0
673	1	0	1	0	1	0
674	1	0	0	1	0	1
675	1	0	1	0	1	0
676	1	0	1	0	1	0
677	1	0	1	0	1	0
678	0	1	0	1	0	1
679	1	0	1	0	1	0
680	1	0	1	0	1	0
681	1	0	1	0	1	0
682	1	0	1	0	1	0
683	1	0	1	0	1	0
684	0	1	1	0	1	0
685	1	0	1	0	1	0
686	1	0	1	0	1	0
687	1	0	0	1	1	0
688	1	0	0	1	0	1
689	1	0	1	0	1	0
690	0	1	1	0	0	1
691	1	0	1	0	1	0
692	1	0	1	0	1	0
693	1	0	1	0	1	0
694	1	0	1	0	1	0
695	1	0	1	0	1	0
696	1	0	1	0	1	0
697	1	0	1	0	1	0
698	1	0	1	0	1	0
699	1	0	1	0	1	0
700	1	0	1	0	1	0
701	1	0	1	0	1	0
702	1	0	1	0	1	0
703	1	0	1	0	1	0
704	1	0	1	0	1	0

	Do you understand the difference between the two countdown displays?		As a pedestrian, which display provides you with more information?		As a pedestrian, which display do you prefer for crossing signalized intersections?	
ID	**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**	**SW-FDW CPS**	**FDW CPS**
705	1	0	1	0	1	0
706	1	0	1	0	1	0
707	1	0	1	0	1	0
708	1	0	1	0	1	0
709	1	0	1	0	1	0
710	1	0	1	0	1	0
711	1	0	1	0	1	0
712	1	0	1	0	1	0
713	1	0	1	0	1	0
714	0	1	1	0	1	0
715	1	0	1	0	0	1
716	1	0	1	0	1	0
717	0	1	0	1	0	1
718	0	1	0	1	0	1
719	0	1	1	0	1	0
720	0	1	0	1	0	1
721	1	0	1	0	1	0
722	1	0	1	0	1	0
723	1	0	1	0	1	0
724	1	0	1	0	1	0
725	1	0	1	0	1	0
726	1	0	1	0	1	0
727	1	0	1	0	1	0
728	1	0	1	0	1	0
729	1	0	1	0	1	0
730	1	0	1	0	1	0
731	1	0	1	0	1	0
732	1	0	1	0	1	0
733	1	0	1	0	1	0
734	1	0	1	0	1	0
735	1	0	0	1	0	1
736	1	0	1	0	1	0
737	1	0	0	1	0	1
738	1	0	1	0	1	0
739	1	0	1	0	1	0
740	1	0	1	0	1	0
741	1	0	1	0	1	0
742	1	0	1	0	1	0
743	1	0	0	1	1	0
744	1	0	0	1	0	1

APPENDIX C

Driver Survey Results

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
1	1			1		1			1			1
2			1		Help to know when the lights going to turn red or green	1				1		1
3			1		To know when the light changes	1			1			1
4	1		1		Tells when the light is about to change	1			1			1
5	1			1			1	don't pay attention to it				1
6	1		1			1				1		1
7	1			1			1	Because I don't pay attention to it			1	
8	1		1		Seconds left before the light changes	1				1	1	
9	1		1		Amount of second left	1			1			1
10	1		1		Waiting time for pedestrians to cross	1			1		1	
11	1		1									
12	1		1		The time remaining for the red light	1			1		1	
13	1			1			1				1	
14	1		1		Second left for the light	1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
15	1		1			1			1		1	
16	1		1		Tells me to pay attention to the countdown	1			1		1	
17	1		1		Caution for people crossing	1			1		1	
18	1			1		1			1			1
19	1		1		Gives me good information	1			1		1	
20	1		1		Pedestrians have the right of way	1			1		1	
21	1		1		Take caution	1			1		1	
22	1		1		How long before you stop	1			1		1	
23	1			1			1	don't pay attention to it			1	
24	1			1		1			1			1
25	1		1		Time to go	1			1		1	
26		1	1		When people should be walking	1				1		1
27		1		1		1			1		1	
28		1		1			1	Not walking, I am driving			1	
29		1		1			1	It doesn't concern driver				1
30	1		1		When people are walking	1			1			1
31	1			1		1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
32	1		1		How many seconds for people to cross	1			1		1	
33	1		1		How many seconds need for people to cross	1			1		1	
34	1		1		Duration to cross			No preference		1	1	
35	1		1		Seconds need to walk	1			1		1	
36	1		1		Seconds need to walk	1			1			1
37	1		1		Shows safety when driving	1			1		1	
38	1		1		Shows when to stop	1			1		1	
39	1		1		Seconds for peds to cross	1			1		1	
40	1		1		Duration to cross	1			1		1	
41	1		1		Duration to cross	1			1		1	
42	1		1		Time remaining for peds to cross	1			1		1	
43	1		1		Time for peds to cross	1			1		1	
44	1		1		Provides information when to stop or drive	1			1		1	
45	1		1		Slow down	1			1		1	
46	1			1		1			1		1	
47	1		1				1	It just is not		1		1
48		1		1		1				1		1
49	1			1		1				1	1	
50	1			1		1				1	1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
51	1		1		time to go	1			1		1	
52	1			1		1		before light changes	1		1	
53	1		1		number of seconds left to go		1	because if pedestrians in walk ways, it does not matter	1		1	
54	1		1		time before red light		1				1	
55	1		1		when the light is going to turn		1	does not sometimes look	1		1	
56	1		1		when the lights is going to turn		1	does not sometimes look at the lights	1		1	
57	1		1		seconds left before the time changes	1			1			1
58	1		1		time remaining before the light changes	1			1		1	
59	1		1		time to cross	1			1		1	
60	1		1		Pedestrians time		1	For Pedestrians				
61	1		1		How much time to cross	1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
62	1		1		push more gas	1			1		1	
63	1		1		caution	1			1		1	
64	1		1		slow down	1			1		1	
65	1		1		walking time	1			1		1	
66	1		1		time to go before light changes	1			1		1	
67	1		1		lights about to changes	1			1		1	
68	1		1		The lights is about to change	1			1		1	
69	1		1		time to go before light changes	1			1		1	
70	1			1		1			1		1	
71	1		1		watch out	1			1		1	
72	1		1		to know when to stop	1			1		1	
73	1	1	1		how many seconds left for the lines to turn red	1			1		1	
74			1		when people should be crossing the street	1			1			1
75	1			1		1			1		1	
76	1			1			1	It doesn't mean anything to them	1		1	
77	1			1		1			1			1
78		1		1			1	I don't drive in				1

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
								the city often				
79	1			1			1	It just doesn't			1	
80	1		1		it let me know when my traffic light is about to be green, so I know I can drive	1			1		1	
81	1		1		tells the duration of the light or CPS	1			1		1	
82	1		1		it shows the amount of seconds for the pedestrians to cross	1			1		1	
83	1		1		shows the timing of the red or green light	1			1		1	
84	1		1		when to step or go	1			1		1	
85	1		1			1			1		1	
86	1		1		To know when the light is going to change	1			1			1
87	1		1		when to stop at the light		1			1	1	
88	1		1		Amount of time left to walk	1			1			1
89	1		1		how many seconds left before the lights changes	1			1	1	1	
90	1		1		information on the red light	1		when to slow down		1	1	
91	1		1		pay attention to the	1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
					countdown							
92	1		1		when to expect pedestrians walking	1			1		1	
93	1		1		numbers are important	1			1		1	
94		1		1		1			1			1
95		1		1		1				1	1	
96		1		1		1			1		1	
97	1		1		very important	1			1		1	
98	1		1		pay attention to the lights	1			1		1	
99	1			1		1			1		1	
100	1		1		how long I have	1			1			
101	1		1		to know when the light is about to change	1			1		1	
102	1		1		it shows something bright that less visible pedestrians can see	1					1	
103	1		1			1			1		1	
104	1			1			1	does not pay attention to the display				1
105	1		1			1			1		1	
106	1		1		amount of time left	1			1		1	
107	1		1		when to stop by the yellow light	1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
108	1		1			1			1		1	
109			1		how long the light is about to change	1			1		1	
110	1		1		how long you have till the light turns red	1			1		1	
111	1		1		how to drive and when to slow down	1			1		1	
112	1		1		when to stop	1		doesn't want a ticket	1		1	
113				1								
114	1		1		you know when the lights going to change	1			1			1
115	1		1		helps you decide	1			1		1	
116	1			1		1			1		1	
117	1			1		1			1		1	
118	1			1			1	just watch the lights	1		1	
119	1		1		tells me if am about to knock somebody	1			1		1	
120	1			1		1			1			1
121	1			1			1	Not important because peds do not respect it			1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
122	1			1			1	Just the color of the light			1	
123	1		1		How to the light change		1	Not relevant to the traffic around			1	
124	1		1		Caution	1			1		1	
125	1			1		1			1		1	
126	1		1		when the light is going to change to green or red	1			1		1	
127	1			1		1			1		1	
128	1		1		Important to decide	1			1		1	
129	1		1		tells me to stop or move	1			1		1	
130	1		1		Helps to decide	1			1		1	
131	1			1		1			1		1	
132	1			1				Don’t care				
133	1			1		1			1			1
134	1		1		Good indicator to proceed or stop	1			1		1	
135	1		1		Slow down	1			1		1	
136	1		1		Tells me a lot	1			1		1	
137	1		1		Prompts me	1			1		1	
138	1		1		Yield to peds	1			1		1	
139	1		1		Whether to slow down or	1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
					not							
140	1		1		Allows peds to walk	1			1			1
141	1		1		Caution	1			1			1
142	1			1		1			1		1	
143	1		1		Prompts you to decide	1			1		1	
144	1		1		Tells when the green light is coming up	1			1			1
145	1		1		Tells how long pedestrian need to cross		1	Because people don't pay attention to it, so one need to look before driving	1		1	
146	1		1		How people have to cross	1			1		1	
147	1		1		Tells when to move	1			1		1	
148	1			1		1			1		1	
149	1		1		When people are walking		1	Because I am not walking				1
150	1			1		1			1			1
151	1			1		1				1	1	
152		1	1		Nothing really		1	Because I am driving	1			1
153		1		1		1			1		1	
154	1		1			1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
155	1		1		How long people can walk							
156	1		1		When light stop or light about to change	1				1	1	
157	1		1			1			1		1	
158	1			1			1					1
159		1	1		If I can make a right turn before people stop/start walking	1			1		1	
160	1		1		Time you have to go	1				1	1	
161	1		1		Must be ready to stop or continue	1			1		1	
162	1		1		Time for people to cross	1			1		1	
163	1			1				Don’t pay attention to it while driving				
164	1		1		Go or not go	1			1		1	
165	1		1		Time for the light to turn red	1			1		1	
166	1			1				I always focus on green or red light				
167	1		1		Pedestrian crossing time	1			1		1	
168	1			1				Focus on driving			1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
169	1			1				Do not have time				
170	1		1			1			1		1	
171	1		1		I got the green light	1			1		1	
172	1		1		Does not tell much	1			1		1	
173	1		1		Green light to go	1			1		1	
174	1			1		1			1		1	
175	1		1		Green light time	1			1		1	
176	1		1			1			1		1	
177	1		1			1			1		1	
178	1		1		Time left to cross	1			1			1
179		1										
180		1										
181	1		1		Time for peds to cross	1			1		1	
182	1		1		Time left until light changes	1			1		1	
183	1		1		Time to go before light changes	1			1		1	
184	1			1			1				1	
185	1		1		How much time is left	1			1		1	
186			1			1			1		1	
187	1		1		Pedestrians are allowed to cross	1				1	1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
188	1		1		When to cross	1			1		1	
189	1		1		When to use the road	1			1		1	
190	1		1		When to cross	1			1			1
191	1		1		Tells me when to use the intersection	1			1		1	
192	1		1		Puts one order in the system	1			1			1
193	1		1		Prevents confusion	1			1		1	
194	1		1			1			1			1
195	1		1		Usual traffic information	1			1			1
196	1		1				1	Do not use it	1		1	
197	1		1				1	Good for pedestrians not for drivers		1		1
198	1		1		Tells me how much time is left to cross	1			1		1	
199	1		1		Tells me either to speed up or slow down	1			1		1	
200	1		1		Tells me a lot	1			1		1	
201	1		1		Gives lot of time information	1			1		1	
202	1		1		Gives more information	1			1		1	
203	1			1			1	Does not pay attention to it			1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
204	1			1			1	Does not pay attention to it			1	
205	1		1		When the light is about to change	1			1		1	
206	1		1		Amount of time left before the green comes on	1			1		1	
207	1		1		Time left before the light changes	1			1			1
208		1										
209		1										
210	1		1		Time left before the light changes	1			1		1	
211	1			1			1	Do not pay attention				1
212		1										
213	1		1		Time left for the light to change	1			1		1	
214	1		1		To know when the light going to turn red or green	1			1			1
215	1			1			1	Do not pay attention		1	1	
216	1		1		Seconds before light changes	1			1		1	
217	1		1		Seconds for light to turn	1			1		1	

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
218	1		1		Seconds for light to turn red	1			1		1	
219	1		1		Seconds left for the light to turn green	1			1		1	
220	1		1		Seconds you have to cross	1			1		1	
221	1		1		The light is about to turn	1			1		1	
222	1		1		Do not know	1				1	1	
223	1		1		Time for the people		1		1		1	
224	1		1		Time for pedestrian to cross	1			1		1	
225	1		1		How much time is left	1			1		1	
226	1		1		Information for pedestrians	1			1		1	
227	1			1		1			1		1	
228	1			1		1			1		1	
229	1		1		Helps to prevent accident	1			1			1
230	1			1		1			1			1
231	1		1		Stop or speed up	1			1			1
232	1			1		1			1			1
233	1			1		1			1			1
234	1		1		Depends on what the display tells me, whether to yield or speed up	1			1			1

	Do you often drive in the City?		As a driver, do you pay attention to the CPS display?		If yes, what does the number tell you?	As a driver, does the number in the CPS display help you make intersection driving decisions?		If not, why is the number displayed not important to you?	If yes, does the magnitude of the number influence your decision to stop or continue through the intersection?		Which of the display do you prefer?	
ID	**YES**	**NO**	**YES**	**NO**		**YES**	**NO**		**YES**	**NO**	**SW-FDW CPS**	**FDW CPS**
235	1			1		1			1		1	
236	1			1		1			1		1	
237	1			1		1			1		1	
238	1			1		1			1		1	
239	1		1		Tells me to slow down or keep going	1			1		1	
240	1			1		1			1		1	
241	1			1		1			1			1
242	1			1		1			1			1
243	1		1		Tells to pay attention	1			1		1	
244	1			1		1			1		1	
245	1			1		1			1			1
246	1		1		Time to walk		1				1	
247	1		1		Time to cross	1			1		1	
248	1		1		Time to go	1			1		1	