2-650 (Ex.) – SPORTS TEAM LOGOS ON GUIDE SIGNS – DC

FINAL REPORT

Submitted to:

Ms. Greer Gillis, Chief Engineer
Mr. William P. Carr, Director, Research and Technology Development
Mr. William McGuirk, Traffic Safety Engineer, IPMA

d.
DISTRICT DEPARTMENT OF TRANSPORTATION

Prepared by:

Dr. Stephen Arhin, P.E., PTOE and Dr. Errol C. Noel, P.E.
Howard University Transportation Research Center
2366 Sixth Street, NW
Washington, DC 20059

May 26, 2010

Technical Report Documentation Page

1. Report No. DDOT-IPMA-2-650 (Ex.)	2. Report Date 05/26/2010
3. Title and Subtitle Evaluation of Sports Team Logos on Guide Signs in DC	4. Contract or Grant No. PO 292715
5. Author(s) Dr. Stephen Arhin, P.E., PTOE and Dr. Errol C. Noel, P.E.	
6. Performing Organization Name and Address Howard University Transportation Research Center 2366 Sixth Street NW, Suite 130 Washington, DC 20059	7. Type of Report and Period Covered.
8. Sponsoring Agency Name and Address District Department of Transportation 2000 14th Street NW Washington, DC 20009	
9. Supplementary Notes	

10. Abstract

The Manual on Uniform Traffic Control Devices (MUTCD) serves as the national standard for all highway traffic control devices and emphasizes uniformity in design of traffic control devices, including signs. The MUTCD does not allow the use of commercial logos on guide signs, especially on freeways. In compliance with Section 1A.10 of the MUTCD, Howard University, on behalf of the District Department of Transportation (DDOT) embarked upon a pilot evaluation of the use of a sports logo (Washington Nationals Baseball) on guide signs on freeways. The signs (with the sports logo) were installed by DDOT in March 2008 to improve the efficiency of guiding motorists to the baseball park. This report outlines the outcome of the evaluation of the signs with the sports logos that were deployed approximately 18 months prior to the conduct of the survey. The survey involved obtaining responses to a series of questions from patrons (those who attend baseball games) and non-patrons (those who do not attend baseball games).

The results showed that a significant percentage of the patrons found the existing signage (with the sports logo) to be effective in guiding them to the park and preferred signage which included a logo and word on guide signs. Similarly, the non-patrons surveyed preferred the signage with the sports team logo. The research concludes that both patrons and non-patrons were exposed by the pre-evaluation period and recommends further exploration involving unexposed subjects using a driving simulator.

11. Key Words Sports Logo Guide Signs	12. Distribution Statement

13. Security Classif.(of this report) Unclassified	14. Security Classif.(of this page) Unclassified	15. No. of Pages 44	16. Price

EXECUTIVE SUMMARY

In an effort to comply with Section 1A.10 of the Manual on Uniform Traffic Control Devices (MUTCD), the District Department of Transportation (DDOT) sought and obtained permission from the Federal Highway Administration (FHWA) to evaluate the experimental use of the logo of the Washington Nationals Baseball team on guide signs in the District of Columbia. The signs with the sports logo were erected to coincide with the opening of the Washington Nationals Baseball Park in March 2008, and their effectiveness was not previously evaluated.

This report summarizes the effort of the first part of the evaluation which involved the conduct of a survey of patrons and non-patrons of Nationals Park. It also presents the results of the survey which was conducted between August through September of 2009, approximately 18 months after the signs were erected on freeways, arterials and rail transit stations. The second part of the evaluation will be conducted by the Federal Highway Administration (FHWA) in a sign simulation laboratory. The survey questionnaire was developed by the research team at Howard University, and was reviewed by the FHWA, DDOT and the Washington Nationals Baseball team officials prior to implementation. The survey of patrons was conducted at the park. Non-patrons were surveyed at activity centers in the metropolitan area that facilitated easy access to respondents. At least 880 respondents in each target group (patrons and non-patrons) were interviewed using the approved survey questionnaire. Statistical tests of hypotheses were conducted at 5% level of significance.

The results showed that a statistically significant proportion (88%) of the patrons found the existing signage to be effective in guiding them to the stadium and prefer guide signs (69%) which include the logo and word message. More than 60% of the “non-patrons” were well aware of the logo on signs in the metropolitan area. This is probably due to the 18-month exposure before the survey. Seventy-four percent (74%) of “non-patrons” showed a significant preference for guide signs with a word message and logo. Sixty-six percent (66%) of “non-patrons” preferred the existing

signage that contains the sports logo symbol in the study area. Their preference could have been influenced by the long exposure of the signage in the area.

The findings clearly show that both patrons and non-patrons were well aware of the baseball logo and its use on guide signs on highways and metro stations in the DC metropolitan area. Thus, their responses appear to be influenced by the length of exposure (18 months) before the survey. The survey of non-patrons did not identify subjects that have not been exposed to the signage. Therefore, the survey could not objectively conclude that the signs without the logo are less ineffective. To obtain an objective assessment of alternative signage, the second part of the research (sign simulator) needs to be continued with subjects who will be screened to exclude those who have been exposed to the current signage.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 BACKGROUND

The categories, placement, graphic standards and use of traffic signs and pavement markings are legally defined in the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) [1]. The MUTCD serves as the national standard for all highway traffic control devices and emphasizes uniformity in design of traffic control devices, including signs. Traffic signs are one of the many crucial and cost-effective means of ensuring traffic safety. They are typically placed along, beside, or above a highway, roadway, pathway, or other route to guide, warn, and regulate the flow of traffic, including motor vehicles, bicycles, pedestrians, equestrians, and other travelers. The MUTCD prescribes that traffic signs must meet five fundamental requirements:

- Fulfill a need
- Command attention
- Convey a clear, simple meaning
- Command respect from travelers
- Give adequate time for proper response

Signs should be placed only where warranted by facts and engineering studies. Signs that are unwarranted or ineffective may distract road users from more important traffic control devices, may breed disrespect for all signs in the area, and are often a waste of valuable public agency and taxpayers' resources. Signs should be placed as necessary for safety and proper regulation of traffic. According to the MUTCD, the development of a signing system, especially for freeways and expressways, should be based on the premise that the signing would primarily benefit and direct road users who are not familiar with the route or area. The signing should also furnish road users with clear instructions for orderly progress to their destinations. *"Guide signs are essential to direct road users along streets and highways, to inform them of intersecting routes, to direct them to cities, towns, or other important destinations, to identify nearby rivers, streams, parks, forest, and historical sites, and generally to give such information as will help them along their way in the most simple, direct manner possible."* [1]

With minimal exception, the MUTCD states that the guide signs shall have white messages with border with a green background. The MUTCD goes on to describe other critical requirements regarding reflectivity, dimensions, lettering, etc. According to Section 2E.02 of the MUTCD, "… *road users should be guided with consistent signing on the approaches to interchanges, when they drive from one state to another, and when driving through rural or urban areas"*. The use of logos on guide signs is not recommended by the MUTCD.

The Washington Nationals Baseball Park was opened on March 30, 2008. It is located in Southeast Washington, south of the Capitol, along the Capitol riverfront adjacent to the Navy Yard. The District of Department of Transportation (DDOT), concerned about the need for efficient access to the new Washington Nationals Park, designed and installed guide signage along freeways and arterials to facilitate access to the stadium. An example of the signs erected on the City's freeways is presented in Figure 1.

Figure 1: A Guide Sign with the Baseball Team Logo

For the most part, the designs followed the requirements of the MUTCD, including legend and background. The inclusion of the logo and the name of the Washington Nationals Baseball team on the guide sign is the only critical variance. This was justified by DDOT and the Washington National's officials on the basis that the area was newly-developed and therefore needed additional signage to guide patrons to the park.

2.0 RESEARCH OBJECTIVES

This study is aimed at assessing the perception of the public regarding their knowledge and use of guide signs with the logo and name of the Washington Nationals, and at obtaining opinions on alternative signs. Field interviews of baseball and non-baseball fans (or persons who claim that they do not attend regional baseball games) were conducted for the evaluation of the directional impact and opinions of the Washington Nationals' Logo on guide signs.

3.0 LITERATURE REVIEW

The Manual on Uniform Traffic Control Devices (MUTCD) [1] governs the implementation of traffic signs in the United States. There are a range of roadway characteristics within various states that require special applications of the MUTCD, hence the reason for individual states having their own versions, none of which override the authority of the US Department of Transportation's MUTCD. Logos are defined as designs used by commercial enterprises and businesses for specific service signs, tourist-oriented directional signs, and for acknowledgement signs [1]. The use of commercial logos on freeway guide signs is not recommended by the MUTCD. However, pictographs, which are pictorial representations used to identify governmental jurisdictions, area of jurisdiction, public transport terminals, governmental agencies, or governmental approved universities or colleges, are permitted on highway guide signs.

The MUTCD was developed with the intention of standardizing road traffic signs and control devices across the United States. Standardization ensures consistency in

signage so that all drivers from any state could accurately interpret the message the respective traffic control devices.

The MUTCD, under certain circumstances, does not present clear guidelines for the design of highway guide signs and as such the guide may be considered limited and open to interpretation by respective state agencies. There is, however, an established process for official interpretations of provisions in the MUTCD. An example of the misinterpretations is the provision for signage at intersections where weaving lengths and geometric configurations may have been restricted due to right of way limitations or other factors [2].

Drivers' response to sign messages is a function of many variables, some of which include age, cognitive and driving ability, familiarity with the location, roadway design and sign design. When considering drivers that are not familiar with a particular location and their ability to quickly and accurately interpret the intended message, it is clear from previous studies [3, 4] that drivers prefer simple diagrammatic signs that show plan, graphic views of the approaching intersection over standard text signs or modified diagrammatic signs. These studies [3,4] examined only worded messages.

When logos are used on supplemental guide signs and/or post interchange guide signs a study conducted [5] suggests that a high percentage of drivers find their destinations with relative ease. This was determined to be a function of the simplicity of the respective signs and a resulting reduction in driver information overload (DIO). The survey also showed that spreading out the destination information over a distance and ample time helped most of the respondents in the way-finding process.

Conflicting messages or symbols placed on guide signs add significant time to the interpretation process that drivers undergo. For example, when symbols or text on a sign attempt to convey different messages but have similar characteristics, driver processing time increases and as such reaction time to the message is increased.

O'Leary and Turochy [6] conducted an assessment of motorists' perceptions of interstate food logo signs in Virginia. Their survey at four state welcome centers and one rest area yielded more than 500 completed surveys. The motorists' expectation of the proximity of businesses shown on the logo signs was consistent with the proximity requirement of 3 miles or less for VDOT's logo sign program.

Hawkins and Rose [7] conducted a human factors study on the effect of adding dual-logo panels to specific service signs in Texas. A timed-survey consisting of a series of photographs was used, and the subjects were asked to determine if various business logos were present. The study found that dual logos have a lower recognition level at shorter response times; however, the difference in recognition levels between single and dual logos decreased as the response time and driver familiarity with the businesses (shown in signs) increased.

Lee et al. [8] evaluated the human factors associated with the use of mixed use signs on which different types of services (e.g., food and camping) were shown on the same motherboard in Virginia. A telephone survey of motorists showed that 65 percent of the respondents were not confused by these signs, indicating a low level of confusion. There was no statistically significant difference in the number of crashes before and after the use of these signs.

Hummer and Maripalli [9] studied the human factors effects of nine-panel logo signs in North Carolina. In this laboratory survey, subjects were first shown a brand name they were asked to scan in the time-based slide show of the logo sign images that followed. The subjects were asked to determine if the brand was on the sign. The study found that the typical MUTCD-approved six-panel signs were associated with an approximately 8 percent more accurate response rate than were the nine-panel signs being tested. Because of this small difference in response rate, the study concluded that the nine-panel signs performed well and should be considered in locations with more than six businesses interested in having their logo on the signs.

The Virginia Department of Transportation (VDOT) began a pilot program in 2000 [10] in which Full Service Food logo signs were added to non-Food motherboards at seven interchanges. This program was conducted to test the safety and acceptance of logo motherboards containing more than one service type. The first hypothesis was that permitting this change would provide more information to the motorist and thus a better level of service. This was tested via a telephone survey to obtain information on the traveling public's understanding of "Full Service Food." The survey showed that most people had an understanding of the meaning of full service food. Additionally, it was hypothesized that this change will be found to be no more distracting and/or confusing

to the motorist than a motherboard having combinations of logos such as Camping/Attractions. This hypothesis was tested using a before-and-after crash database analysis for the interchanges of interest as well as for control interchanges. The results from the crash analysis showed no additional safety risk. Based on the overall survey and database analysis results, eventual changes to the Manual on Uniform Traffic Control Devices (MUTCD) were recommended to allow more than six Food logos spread over multiple motherboards. Additional research on user understanding and distraction was also recommended, using techniques such as usability testing and simulator research.

In summary, most of the evaluations on signage have resulted in providing exceptions or approval of the use of the signs under evaluation. Human factors studies based on intercept and laboratory surveys showed that the use of mixed use, dual logo, and nine-panel logo signs did not significantly increase driver confusion or distraction. Further, crash frequency was not affected by the use of such signs. There is limited information in the literature on the use of commercial logos on guide signs.

4.0 RESEARCH METHODOLOGY

As noted earlier, the guide signs with the logo were installed to coincide with the opening of the ballpark in March, 2008. Thus, the signs had been exposed to the public for approximately 18 months before this evaluation. The research team at Howard University developed the two survey instruments which were used in assessing the perception of road users on the effectiveness and understanding of the guide signs with Washington Nationals' logo; one for patrons and the other for non-patrons. The survey questionnaire was finalized in August 2009 with the input from DDOT, FHWA and key personnel of the Washington Nationals. The final survey instruments are presented in Appendices 1 and 2.

To achieve statistical validity of the survey, a number of assumptions were made in determining the appropriate sample size for the survey. A population pool of 5,000 (or more) persons with a 95% confidence level, and a confidence interval of 3 units were assumed. The assumed population was based on the estimated minimum number of

patrons (from Washington Nationals officials) attending a game on any given game day. This resulted in an approximate total sample of at least 880 for patrons and same number for the non-patrons. The research team recruited and trained interviewees before the conduct of the survey. The interviewees were given the protocols for conducting the survey which included approved locations and how to approach potential respondents. The survey began on August 19, 2009 and was completed on August 31, 2009. The locations where the surveys were conducted are as follows:

(i) ***Patrons of Baseball*:**

- Washington Baseball Nationals Park, Washington, DC

(ii) ***Non- Patrons of Baseball*:**

- Washington DC Convention Center, Washington, DC
- Springfield Mall, Springfield, VA
- Prince George's Plaza, Hyattsville, MD
- Silver Spring Metro Station, Silver Spring, MD
- Van Ness Metro Station

The baseball fans (patrons) were interviewed at the park over a number of game days. DDOT and the Washington Nationals' park officials coordinated to provide the necessary logistics to enable the interviewees to conduct the survey at the entrance or exit points (and general areas) of the park. The interviewees used laminated pictures of the Washington Nationals' logo and signage to pose the questions and present illustrations (see Figures 2 and 3). In all, 941 baseball patrons and 932 non-patrons were interviewed.

Figure 2: An Interview in Progress

Figure 3: Laminated Picture of Logos Used in the Survey

5.0 DATA COMPILATION AND ANALYSIS

5.1 Frequencies and Proportions

The responses obtained from the survey were entered into a spreadsheet database (Microsoft Excel). For quality control and assurance purposes, the responses entered were checked by research assistants before finalizing the results. Using the analysis tools in Microsoft Excel, summaries and statistical analyses were conducted on the data. These included frequencies of responses, proportion of responses as well as charts and graphs of the responses.

5.2 Hypotheses

The primary statistic used in evaluating the hypotheses was that of proportions. The z-test was used to test the hypotheses at 5% level of significance for any statistically significant difference in proportions, with the assumption that the population is normally distributed. The hypotheses developed and tested for patrons and non-patrons are as follows:

5.2.1 Hypotheses for Patrons

1. The logo plus text message on freeway guide signs is preferred over the text only message. Assuming P_T and P_{LT} denote the proportions of patrons who preferred signs “with text only” and “with the logo and text” respectively, this hypothesis was tested using the following:

   H_0: $P_T \leq P_{LT}$

   H_1: $P_T > P_{LT}$

   For the signage with the logo and text message to be the preferred signage, the test should fail to reject the null hypothesis, at 5% level of significance.

2. Whether the logo plus the text message (on freeway and arterials signs) is more effective in guiding than the text only signage.

   Similarly, this will be a one-tailed test. Assuming P_T and P_{LT} denote the proportions of patrons who preferred signs “with text only” and “with the logo and text” respectively, this hypothesis can be tested using the following:

H_0: $P_T \leq P_{LT}$

H_1: $P_T > P_{LT}$

For the logo with the text message sign to be the preferred, the test should fail to reject the null hypothesis, at 5% level of significance.

3. A majority of patrons think the use of the logo is helpful in guiding them to the stadium. The test was similar to that for the previously mentioned hypotheses.
4. A majority of the patrons think the use of the word message instead of the logo would suffice. The test was similar to that for previously mentioned hypotheses.

5.2.2 Hypotheses for Non-Patrons

Using the same methodology described above, the following proportions were tested for statistical significance:

1. A majority of non-baseball patrons are aware of the use of the logo on signs.
2. A majority of the non-patrons think the use of the logo and word message instead of word message would suffice.

All the tests were conducted at 5% level of significance.

6.0 RESULTS

The results are based on the analyses of the survey data compiled. The analyses included compiling frequencies of the various responses from the survey and testing the statistical validity of the inferences from the survey. The significance of the inferences was based on a 95% confidence interval. The results are presented in two sections: frequencies (percentages) of responses and test of hypotheses for patrons and non-patrons.

6.1 Survey Results for Baseball Patrons

These results are based on the questions posed to the respondents provided in Appendices 1 for patrons.

Question 1: The objective of the first question was to identify patrons' primary states of residence or origin. The results are presented in Table 1 and displayed graphically in Figure 4.

Table 1: Patrons' State of Residence

STATE	DC	MD	VA	OTHER
FREQUENCY	227	188	302	226

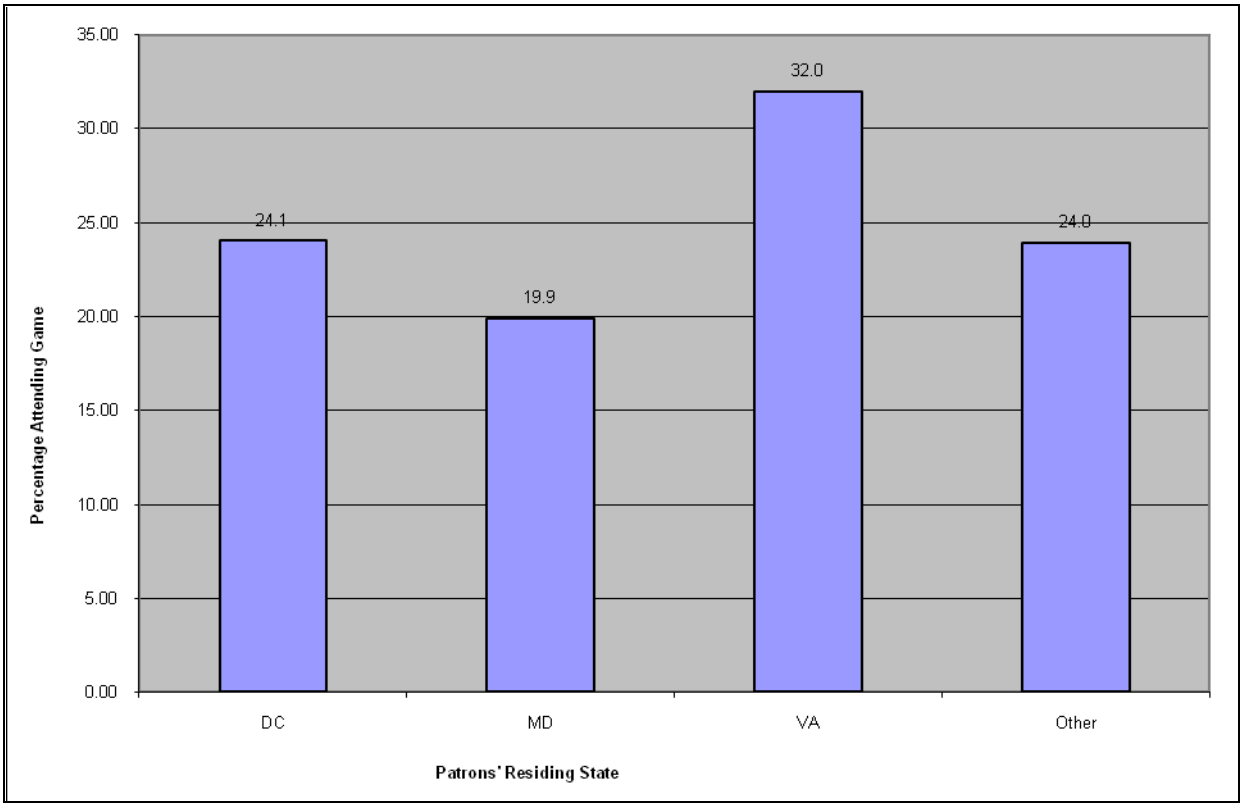

Figure 4: Distribution of Patrons' State of Residence

From the results, the majority of the patrons surveyed (approximately 32%) live in Virginia while 24.1% live in the District of Columbia. Approximately 24% of the patrons who attended the games reside in other states other than MD, DC or VA.

Question 2: In this question, the objective is to identify the predominant mode(s) of travel to the park. The respondents were asked to identify the mode of transportation

used from the options provided in Appendix 1. The results are presented in Table 2 and displayed graphically in Figure 5.

Table 2: Mode of Transportation Used by Patrons

MODE OF TRANSPORTATION	FREQUENCY
Self Drive	342
Carpool	43
Taxi	12
Metro Bus	99
Metro Rail	402
Biking	8
Walk From Home	29
Walk From Work	14

From the Table 2 and Figure 5, it is clear that the majority of the patrons (42.4%) interviewed during the survey traveled to the park by Metro rail (subway) followed by those who drove to the stadium (self drive – 36%). Approximately 10.4% of the patrons traveled to the stadium by Metro bus.

Question 3: This question asked respondents whether it was their first visit to the park. The choice of response was either "yes" or "no" and the results are presented in Table 3 and displayed in Figure 6.

Table 3: Patrons' Response to the Question on First Visit to the Park

Yes	250
No	685

The results show that a majority of the patrons surveyed (73.3%) had been to the park prior to the conduct of the survey.

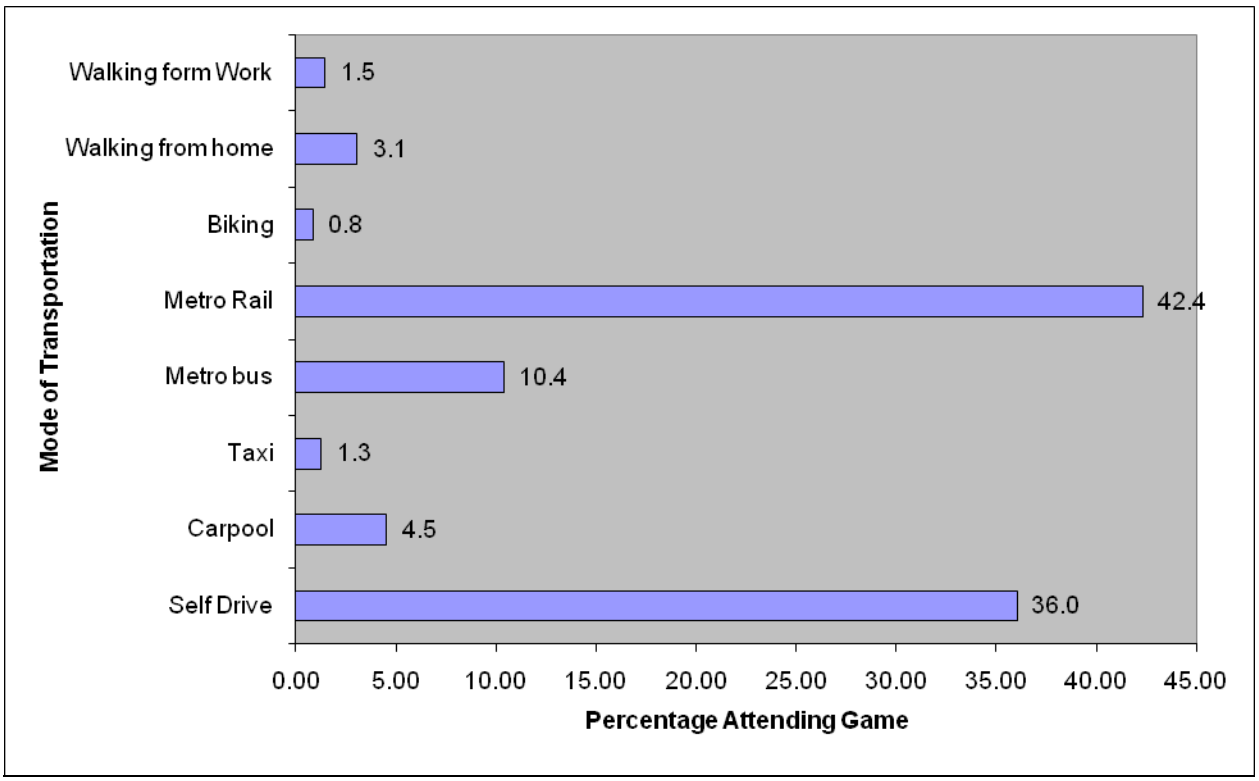

Figure 5: Mode of Travel Used by Patrons in Attending Games

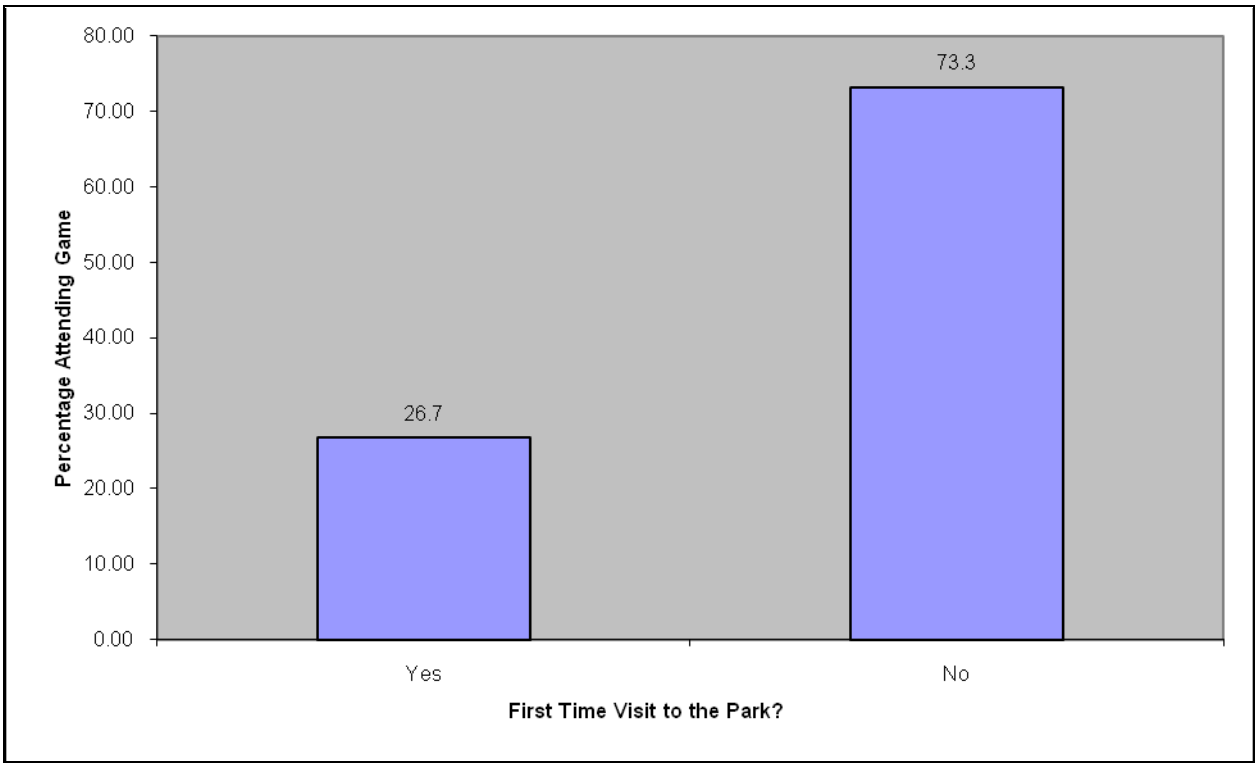

Figure 6: Patrons' Responses to Question on First Visit to the Park

Question 4: The objective of this question is to determine whether the patrons who used the Metro rail system have noticed the use of the Washington Nationals' logo on signs at stations. The results are presented in Table 4 and displayed in Figure 7.

Table 4: Patrons' Responses to Notice of Logo Signs on Metro Rail

Yes	265
No	294

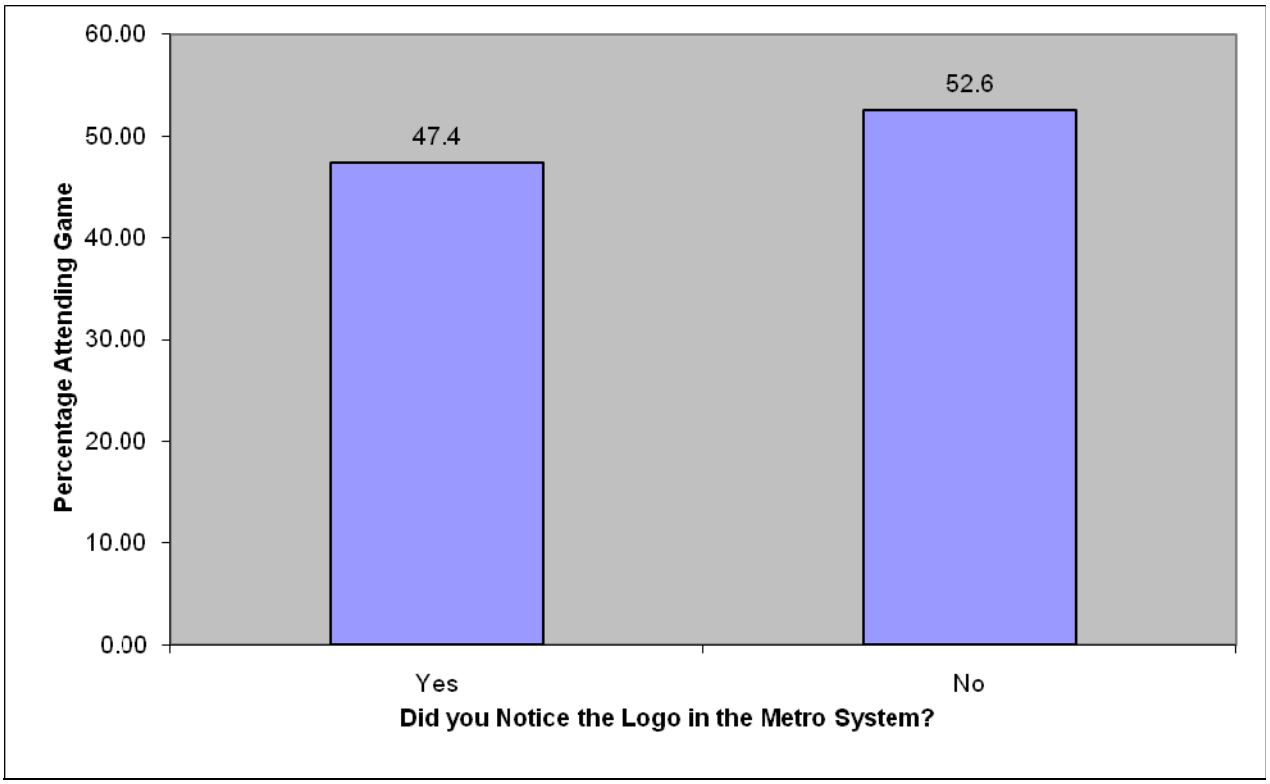

Figure 7: Patrons' Responses Regarding Notice of Signs in Metro Rail System

As shown in the table and figure above, approximately 53% of the patrons surveyed who used the metro rail system indicated that they did not notice the use of the Washington Nationals' Logo in the Metro rail system while the remainder did.

Question 5a: This question was posed to seek the opinion of the patrons who drove to the park whether the logo together with the word message helped in guiding them to the park. The responses are presented in Table 5 and displayed in Figure 8.

Table 5: Driving Patrons' Responses to the Helpfulness of Current Signage

Yes (Helpful)	376
No (Not Helpful)	156

Current Sign: Word Message with Logo

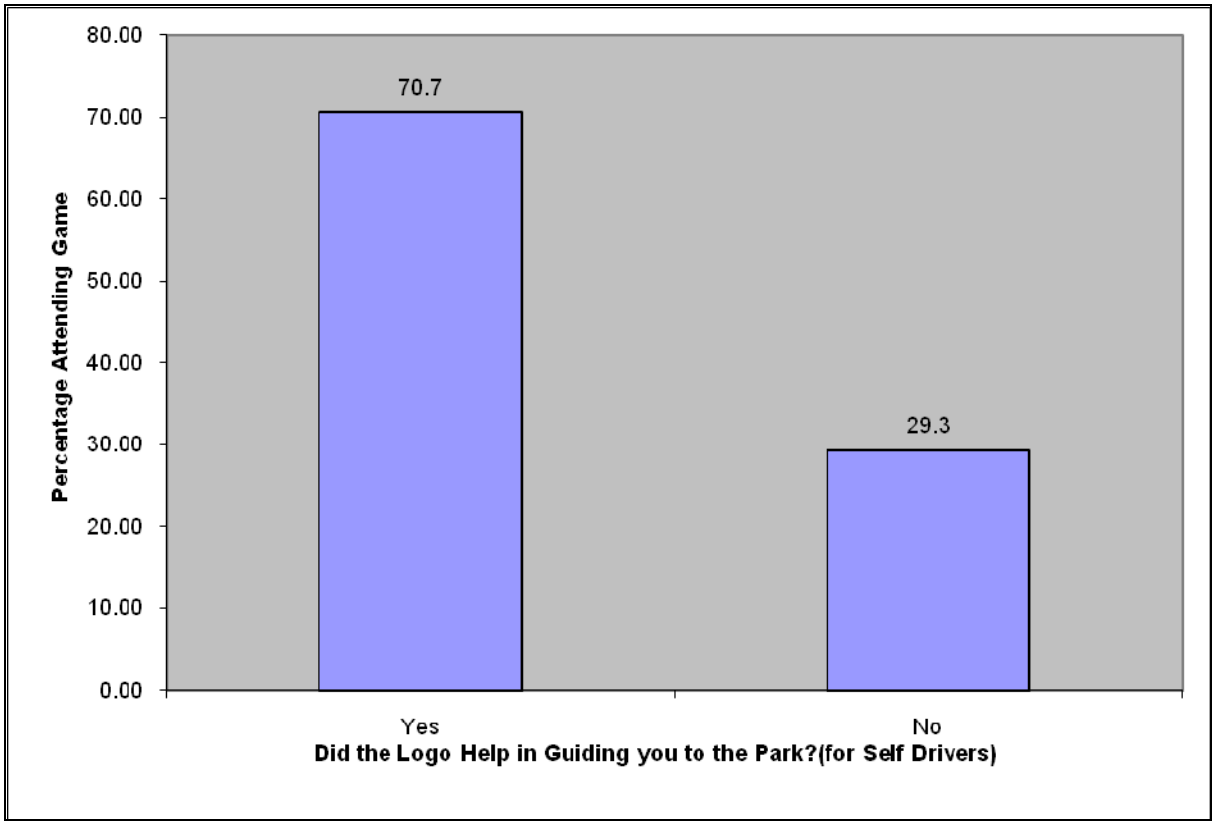

Figure 8: Driving Patrons' Responses to the Helpfulness of Current Signage

The results presented in Table 5 and Figure 8 show that the majority of the patrons (~71%) surveyed who drove thought that the logo and word message on guide signs helped in guiding them to the park.

Question 5b: In this question, the intent was to determine whether the patrons actually followed the logo as a guide (for both self drive and metro rail riders) to the park. The results are presented in Table 6 and graphically in Figure 8.

Table 6: Patrons' Responses to Following the Logo as a Guide to the Park

Yes (Followed)	364
No (Not Followed)	325

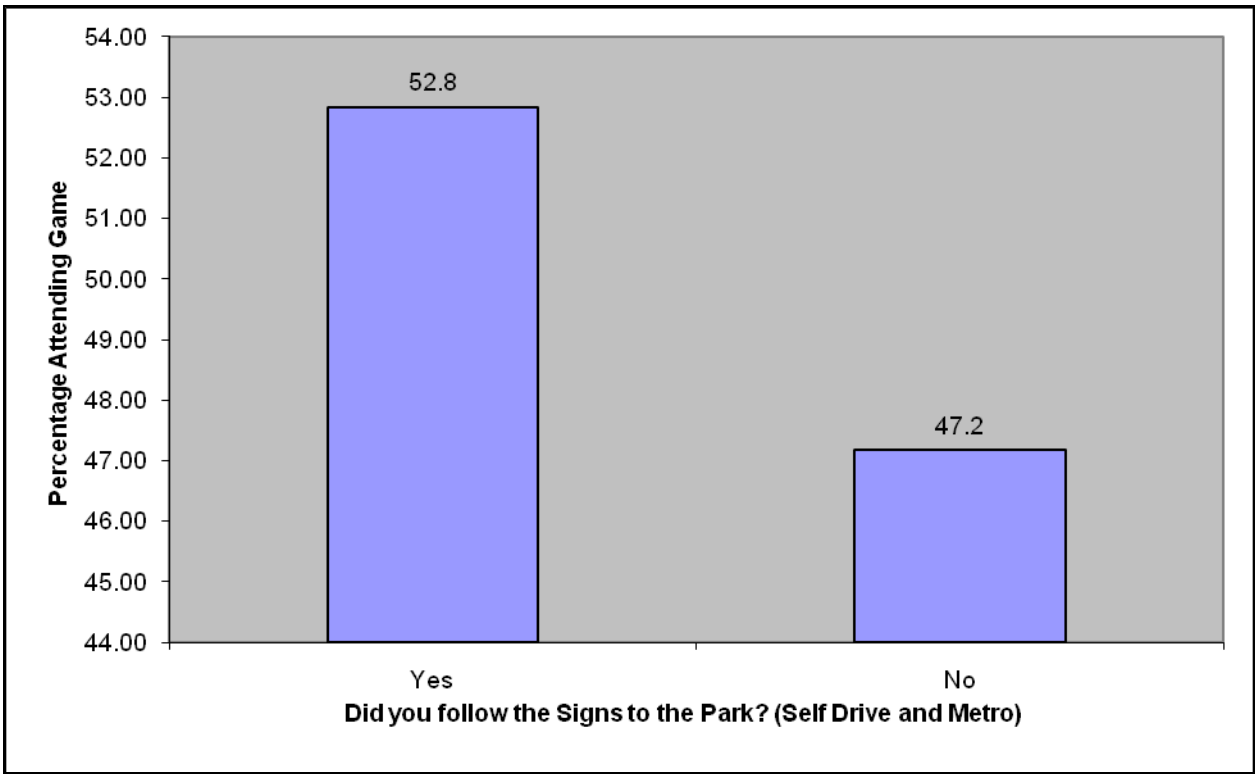

Figure 9: Patrons' Responses to Following the Logo as a Guide to the Park

From the results (Figure 9), the majority of the patrons (53%) indicated that they actually followed the signs with the logo as guide to get them to the park.

Question 6: This question was posed to seek the opinion of the patrons on the meaning of the sample of the logo presented to them. In this question, choices were not provided. A review of the responses indicated that an overwhelming majority (98%) of

the patrons rightly noted that the logo represents that of the Washington Nationals baseball team.

Question 7: The objective of this question was to gauge the opinion of patrons who drove (or carpooled) on the effectiveness of the use of the Nationals' logo on signs for guidance to the park. Presented in Table 7 and graphically in Figure 10 is the summary of the responses.

Table 7: Patrons' Opinion on the Effectiveness of the Logo in Guidance to Park

RESPONSES	FREQUENCY	PERCENTAGE
Effective	251	37.9
Somewhat Effective	186	28.1
Neutral	115	17.4
Somewhat Ineffective	34	5.1
Ineffective	76	11.5

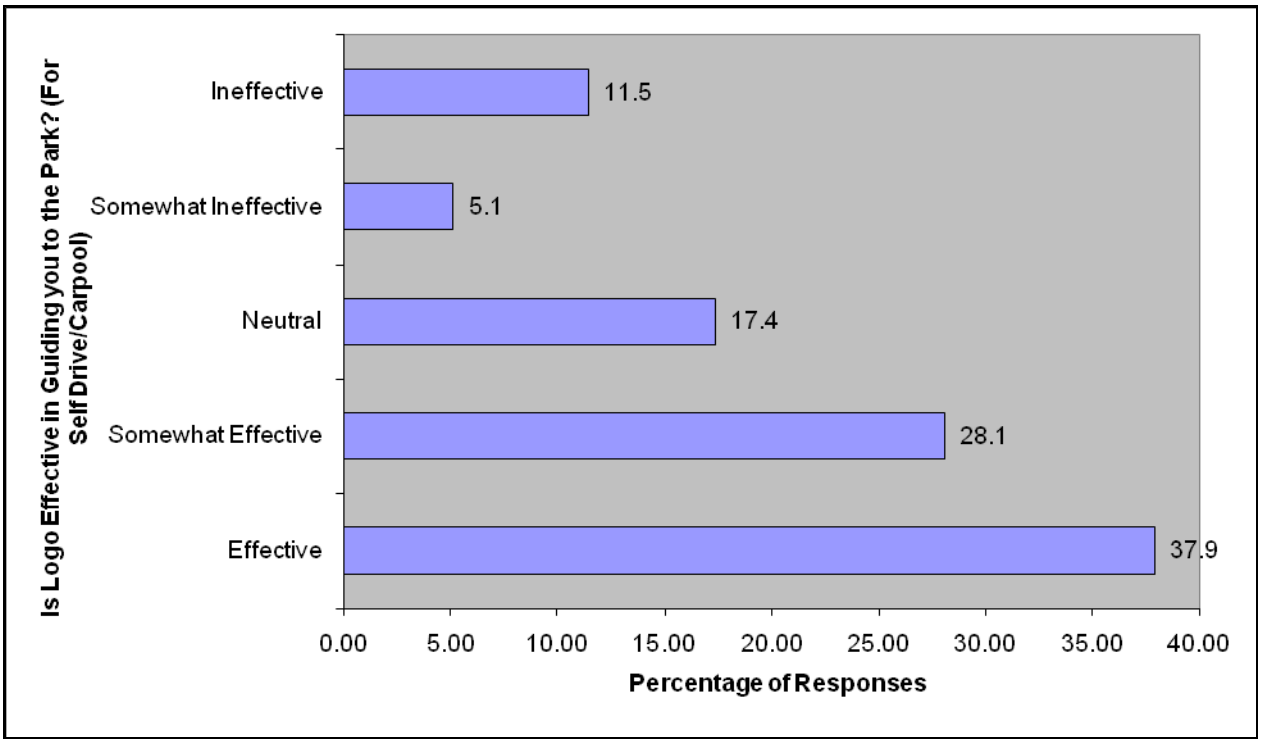

Figure 10: Patrons' Opinion on the Effectiveness of the Logo in Guidance to Park

The results show that approximately 66% of the patrons think the logo is effective and somewhat effective in guiding them to the park, while about 11.5% think it is ineffective. Thirty-four percent (34%) of the interviewees were either neutral or found the National Logo on the signs to be ineffective.

Question 8: This question was used to gauge the opinion of the patrons whether they think it would suffice to use a purely worded message (only), instead of the worded message with the logo. The summary of the responses is presented in Table 8 and graphically in Figure 11. The results show that the majority of the patrons (~70%) think it would not suffice to have only a worded message on the guide signs for directing them to the park.

Table 8: Patrons' Responses for Word-Only Message

RESPONSES	FREQUENCY
Yes	190
No	647
Don't Know	89

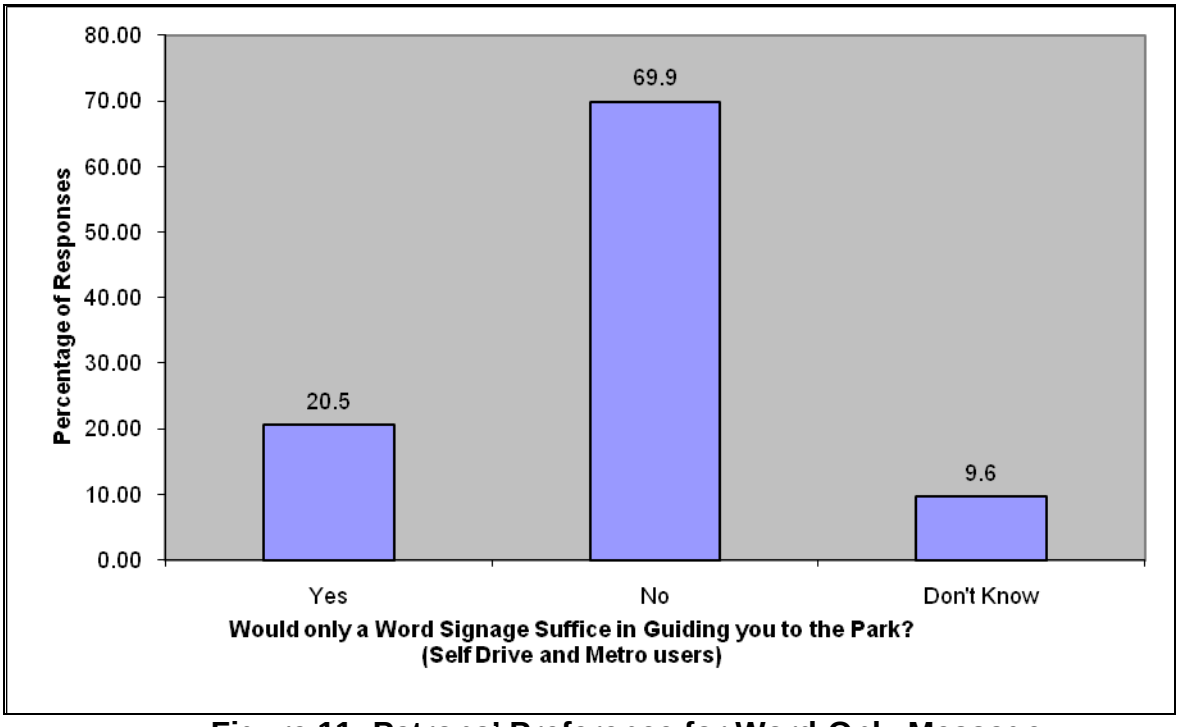

Figure 11: Patrons' Preference for Word-Only Message

Question 9a: The opinion of those patrons who drove was sought in this question regarding their recommended or preferred signage format which would be most useful in guiding them to the park. The summary of the responses is presented in Table 9 and in Figure 12. The results show that the majority of the driving patrons (88%) recommend the use of the logo and word message on guide signs for directions to the park.

Table 9: Driving Patrons' Preference on Signage Format

SIGNAGE FORMAT	FREQUENCY	PERCENTAGE
Word Only	26	2.9
Logo and Word	784	88.2
Don't Know	79	8.9

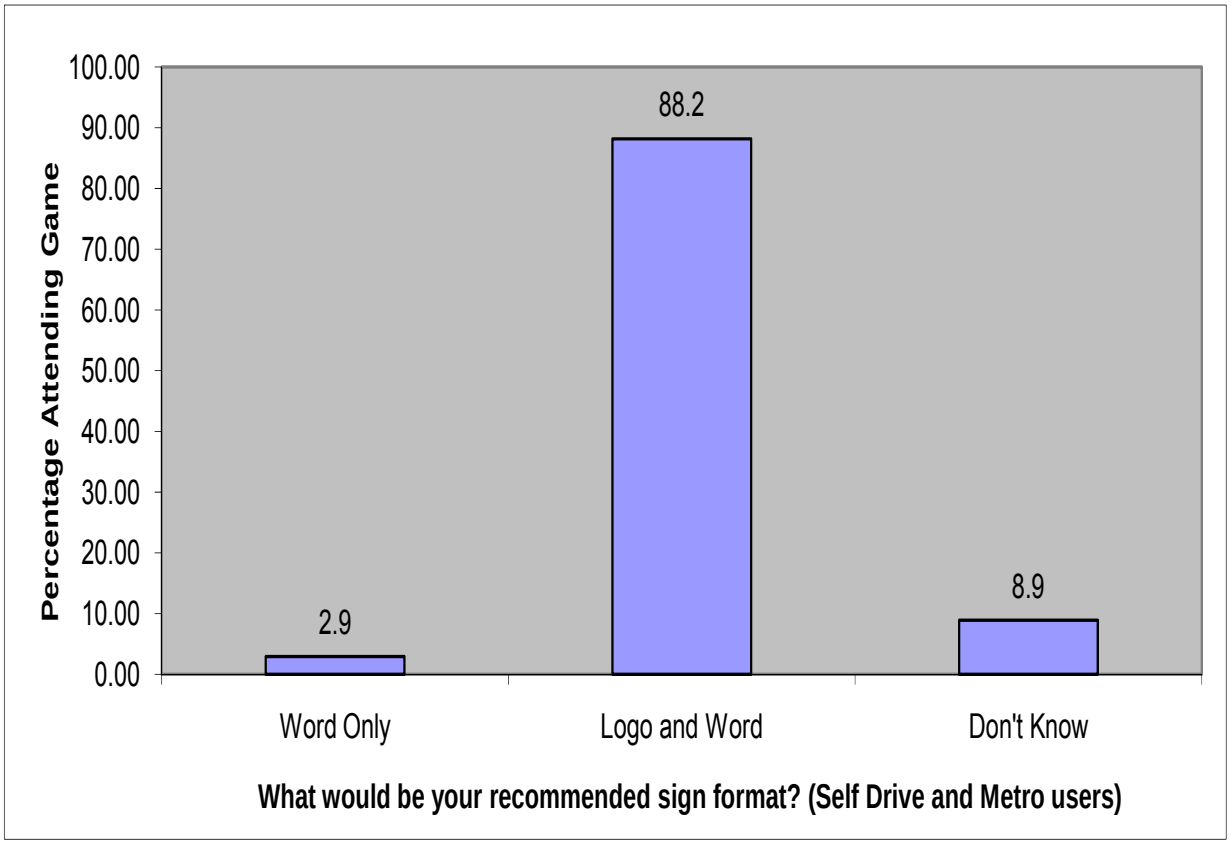

Figure 12: Driving Patrons' Preference on Signage Format

Question 9b: The preferred combination of either the logo and/or word message on signs (and vice versa) was sought from the patrons in the question posed. The summary of the responses is presented in Table 10 and in Figure 13.

Table 10: Patrons' Preference for Sign Messages

SIGNAGE	FREQUENCY
Baseball Park	2
Nationals Park	590
Washington Nationals Park	17
Ballpark	135
Baseball Park	85
Baseball Park	2
Nationals Park	5
Nationals Ballpark	15
Ballpark	2

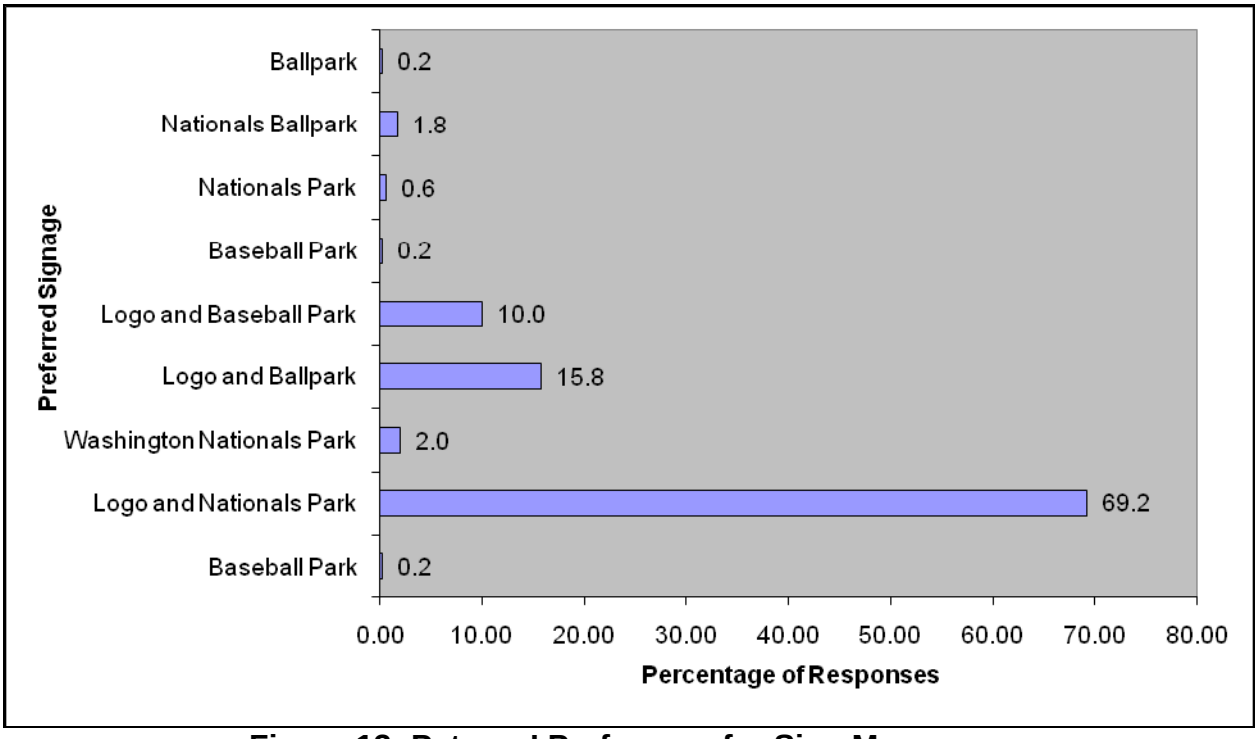

Figure 13: Patrons' Preference for Sign Messages

The results show that the majority of the patrons (69%) surveyed recommended the use of the logo and "*Nationals Park"* on guide signs to direct them to the park. The next two preferred or recommended signage chosen were: logo and "*Ballpark*", and logo and "*Baseball Park*".

6.2 Survey Results for Non-Patrons

These results presented in this section are based on the questions posed to the respondents provided in Appendices 2 for patrons.

Question 1a: The objective of this question is to establish non-patrons' primary states of residence or origin. The summary of the responses is presented in Table 11 and displayed graphically in Figure 14. In all, 911 non-patrons responded to this question.

Table 11: State of Residence of Non-Patrons

STATE	DC	MD	VA	OTHER
FREQUENCY	418	361	77	55

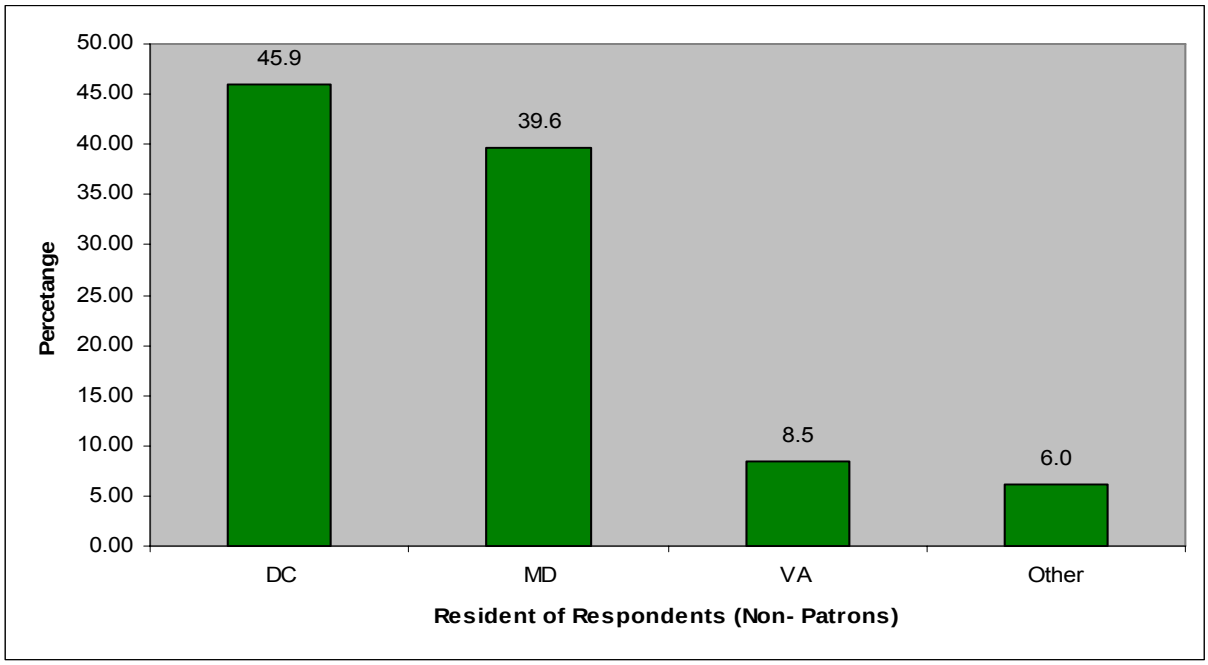

Figure 14: Non-Patrons' State of Residence

Approximately 46% of the non-patrons interviewed resided in the District of Columbia, with 39.6% from Maryland, 8.5% from Virginia and 6% from other states.

Question 1b: The intent of this question is to identify non-patrons' familiarity with the District of Columbia by asking how often they travel to the city. The summary of the responses is presented in Table 12 and displayed graphically in Figure 15.

Table 12: Non-Patrons' Frequency of Travel to the District

TRAVEL	DAILY	WEEKLY	MONTHLY
FREQUENCY	335	139	102

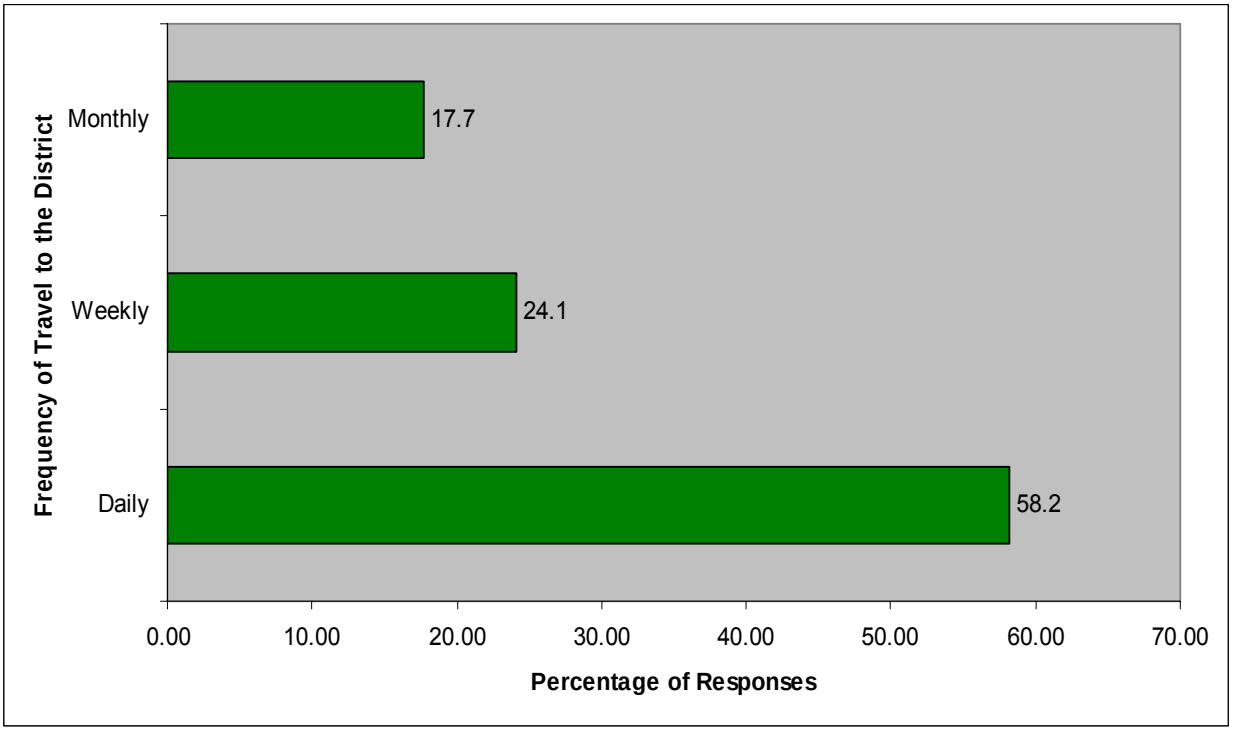

Figure 15: Non-Patrons' Frequency of Travel to the District

Of the 574 non-patrons who responded to this question, approximately 58% of them travel daily, 24% travel monthly and about 18% travel monthly to the District (see Figure 15).

Question 1c: The intent of this question is to determine the primary reason for traveling to the District. The summary of the responses is presented in Table 13 and displayed graphically in Figure 16.

Table 13: Non-Patrons' Reason for Travel to the District

Employment	312
Pleasure	262

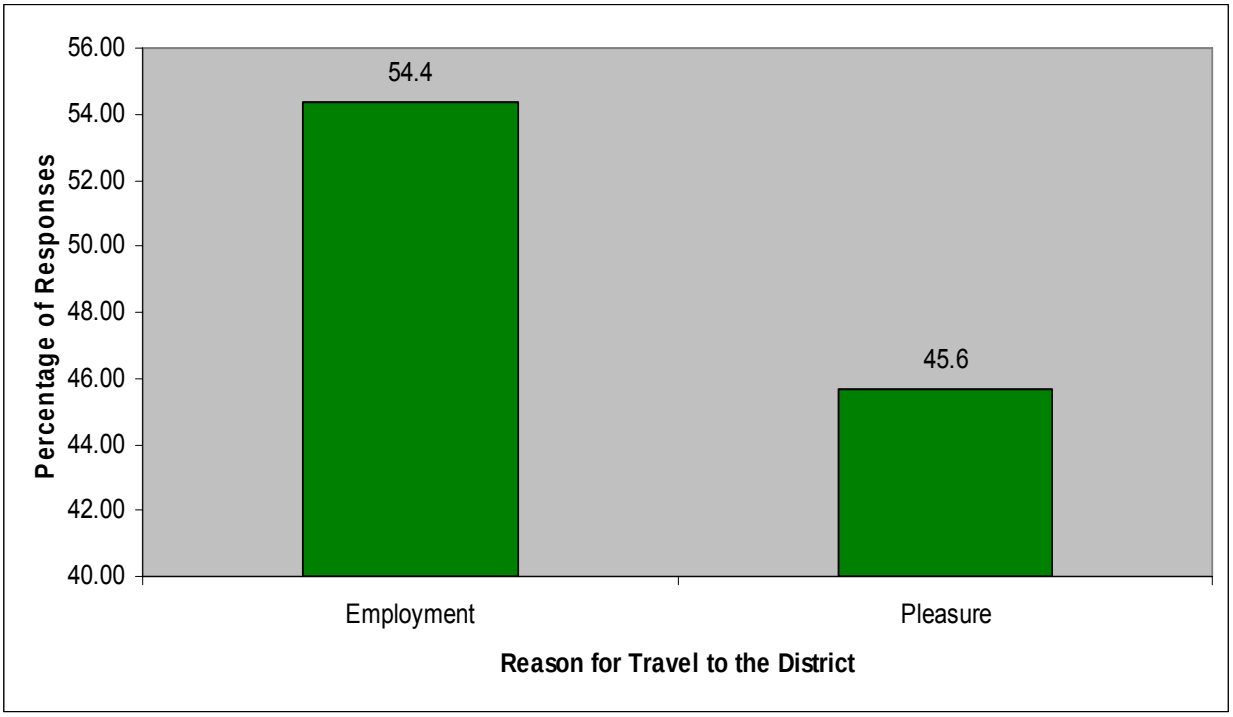

Figure 16: Non-Patrons' Reason for Travel to the District

Of the 574 non-patrons who responded to this question, approximately 54% of them travel to the District for employment reasons while approximately 46% travel to the District for pleasure.

Question 2: In this question, the objective is to identify the predominant mode(s) of travel to the District. The respondents were asked to identify the mode of transportation used from the options provided in Appendix 2. The results are presented in Table 14 and displayed graphically in Figure 17.

Table 14: Mode of Travel Used by Non-Patrons in Metropolitan Area

MODE OF TRAVEL	FREQUENCY
Self Drive	354
Carpool	17
Taxi	18
Metro Rail/Bus	528
Biking	14
Walk	23

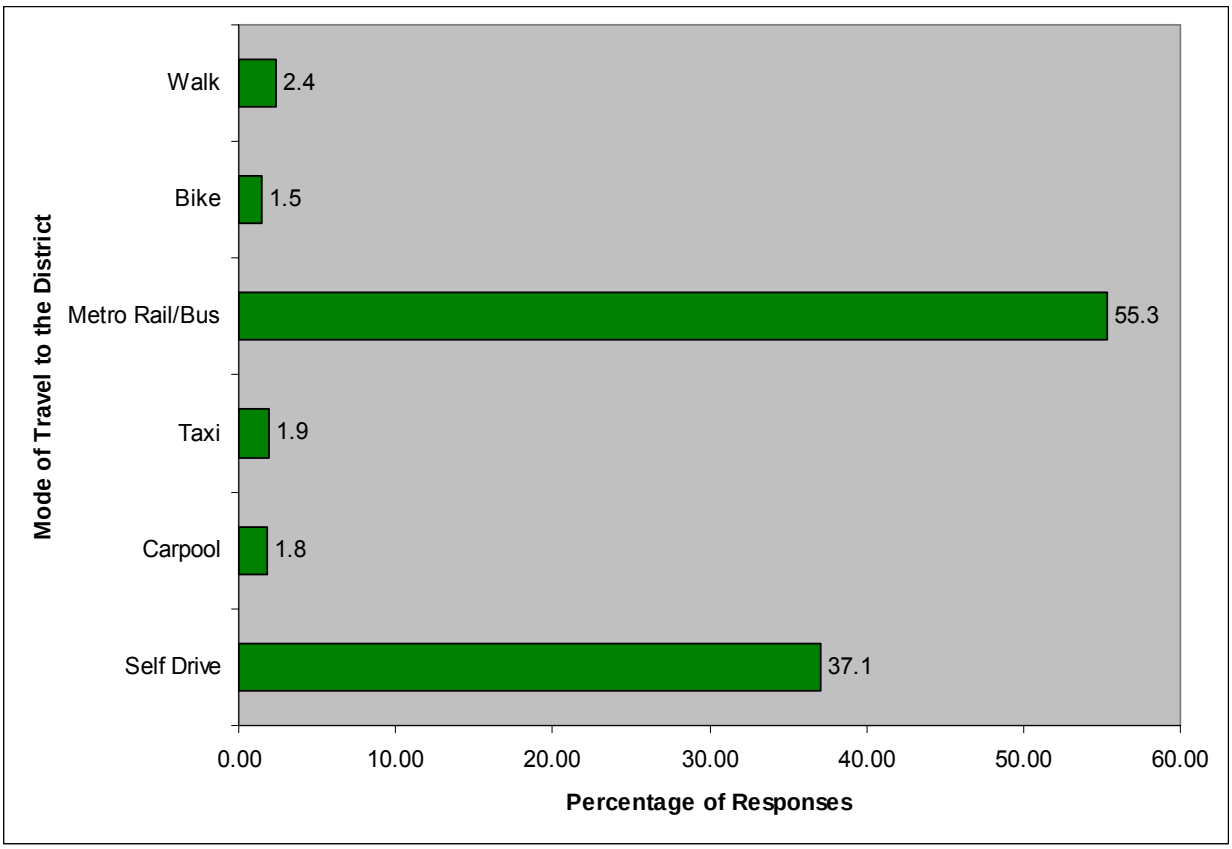

Figure 17: Mode of Travel Used by Non-Patrons in Metropolitan Area

From the Figure 17, it is clear that the majority of the non-patrons (55.3%) interviewed travel to the District by Metro rail (subway) or bus followed by those who self-drive to the District (37%).

Question 3: This question was posed to seek the opinion of non-patrons on the meaning of the sample of the logo presented to them. In this question, choices were not provided. A review if the responses indicated that the majority (53%) of the non-patrons rightly recognize that the logo represents the Washington Nationals baseball team.

Question 4: The intent of the question posed was to determine whether non-patrons are aware that the Washington Nationals is a baseball team with a park in DC. The summary of the responses are presented in Table 15 and in Figure 18. The results show that approximately 76% of the 901 non-patrons who responded to this question are aware that the Washington Nationals is a baseball team with a park in DC.

Table 15: Non-Patrons' Awareness of Washington Nationals in DC

Yes	687
No	214

Question 5: This question was posed to determine whether non-patrons are interested in baseball since it probes the intent of non-patrons in attending a Nationals' game. In all, 881 of those surveyed responded to this question and the summary of the results is presented in Table 16 and Figure 19.

Table 16: Non-Patrons who considered attending a Nationals' Game

Considered (Yes)	427
Did Not Consider (No)	462

About 52% of the 881 non-patrons interviewed claimed they have not considered attending a game of the Washington Nationals while the 48% of them have.

Question 6: The objective of this question is to determine whether the non-patrons noticed the use of the Washington Nationals' logo on signs in the Metro rail and highway systems. The results are presented in Table 17 and displayed in Figure 20.

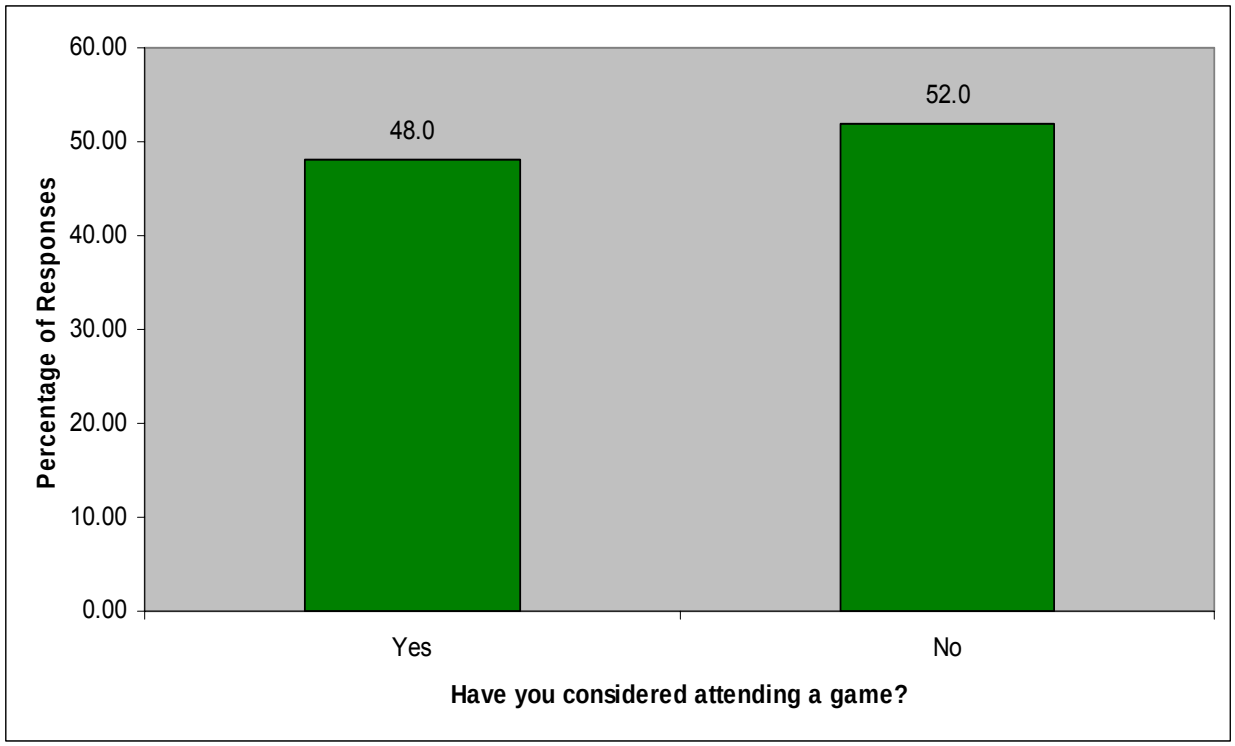

Figure 18: Non-Patrons Who Consider Attending a Nationals Game

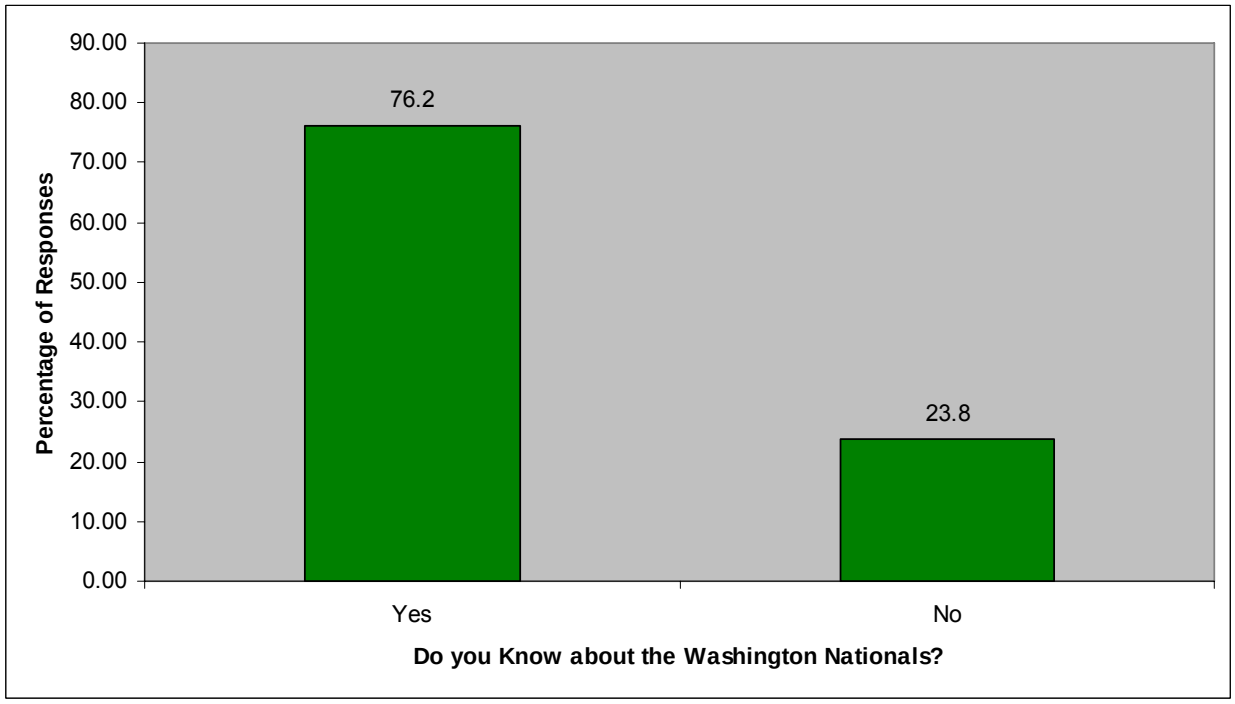

Figure 19: Non-Patrons' Awareness of Washington Nationals in DC

Table 17: Non-Patrons' Notice of the Baseball Logo in the Metro Area

Yes	533
No	354

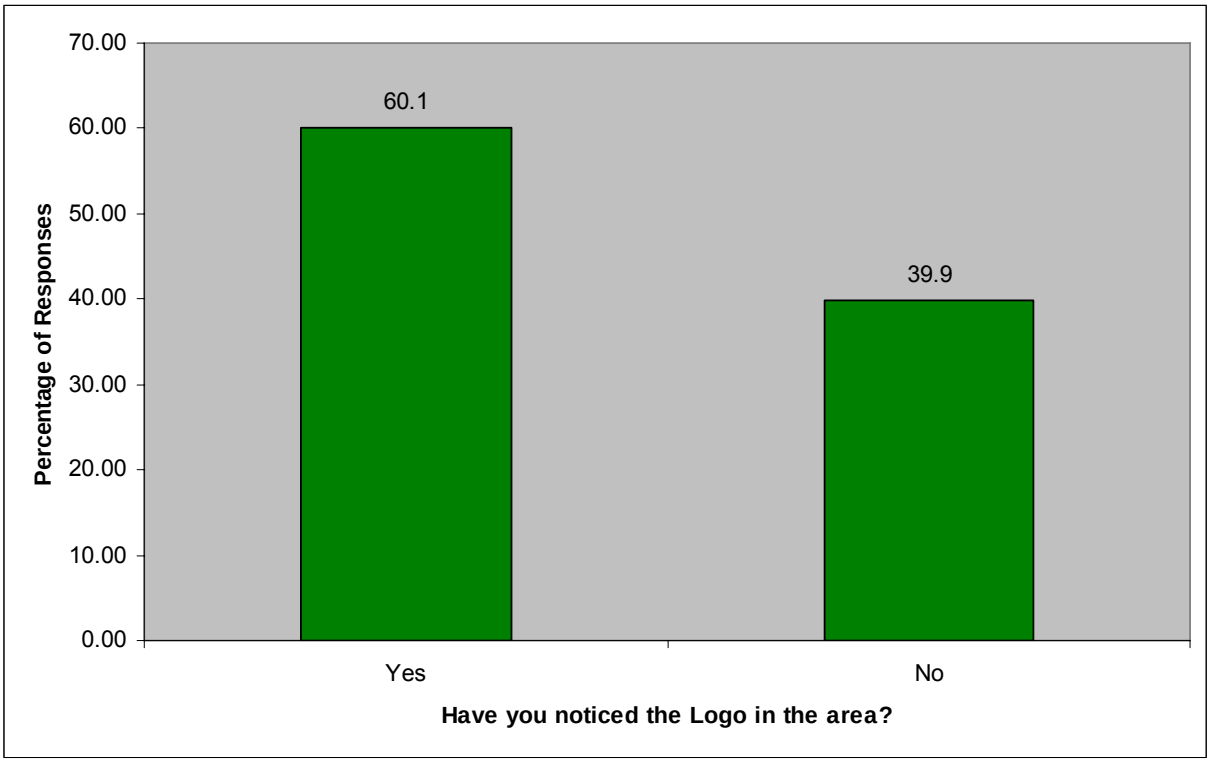

Figure 20: Non-Patron's Notice of Baseball Logo in the Metro Area

As shown in the figure above, approximately 60% of the 887 non-patrons surveyed indicated that they notice the use of the Washington Nationals' Logo in the Metro area while the remainder did not.

Question 7: In this question, the non-patrons were asked to recall locations where they have noticed the use of the logos. Options of responses were not provided. Approximately 64% of the non-patrons indicated that they have noticed the use of the signs on highways, train stations and on Washington Nationals memorabilia. The frequencies of responses by type are presented in Figure 21.

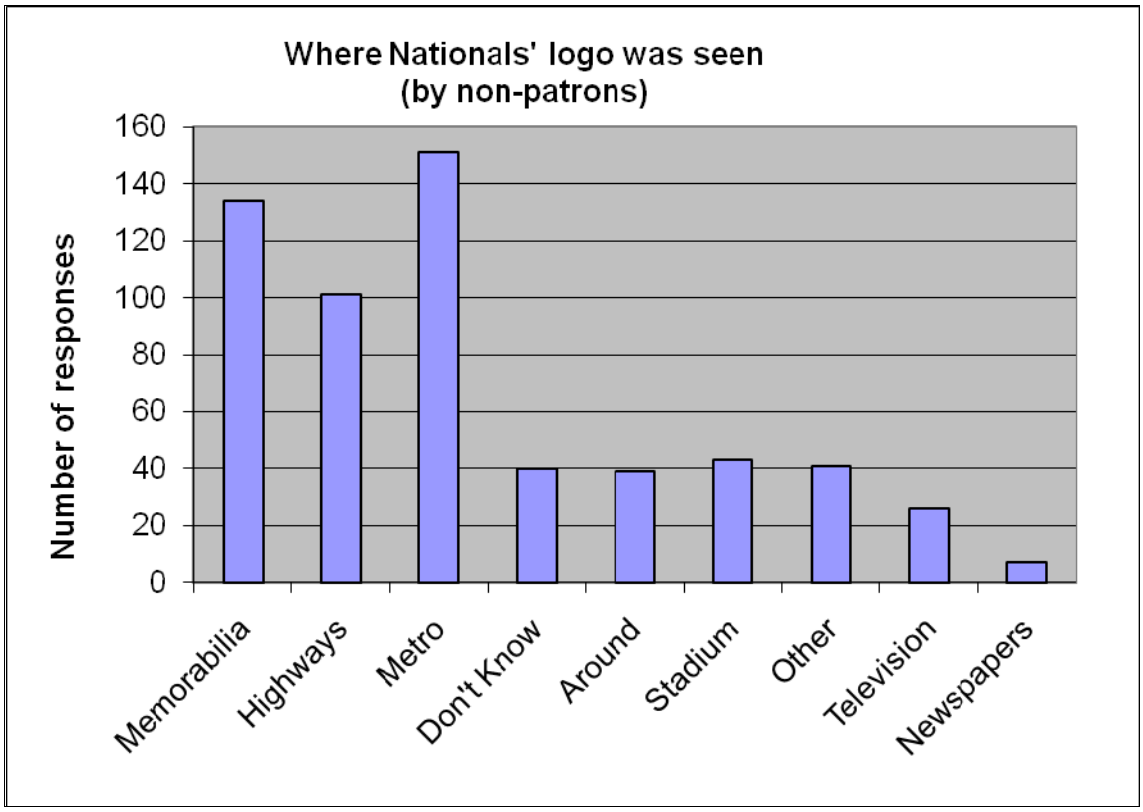

Figure 21: Non-Patron's Notice of Baseball Logo at Locations

Question 8a: The opinion of the non-patrons was sought regarding their recommended or preferred signage format. The summary of the responses is presented in Table 18 and in Figure 22. The results show that the majority of the patrons (~75%) recommend the use of the logo and word message on guide signs for directions to the park.

Table 18: Non-Patrons' Preference for Signage Format

SIGNAGE FORMAT	FREQUENCY
Name of Park Only	47
Name of Park and Logo	650
Don't Know	174

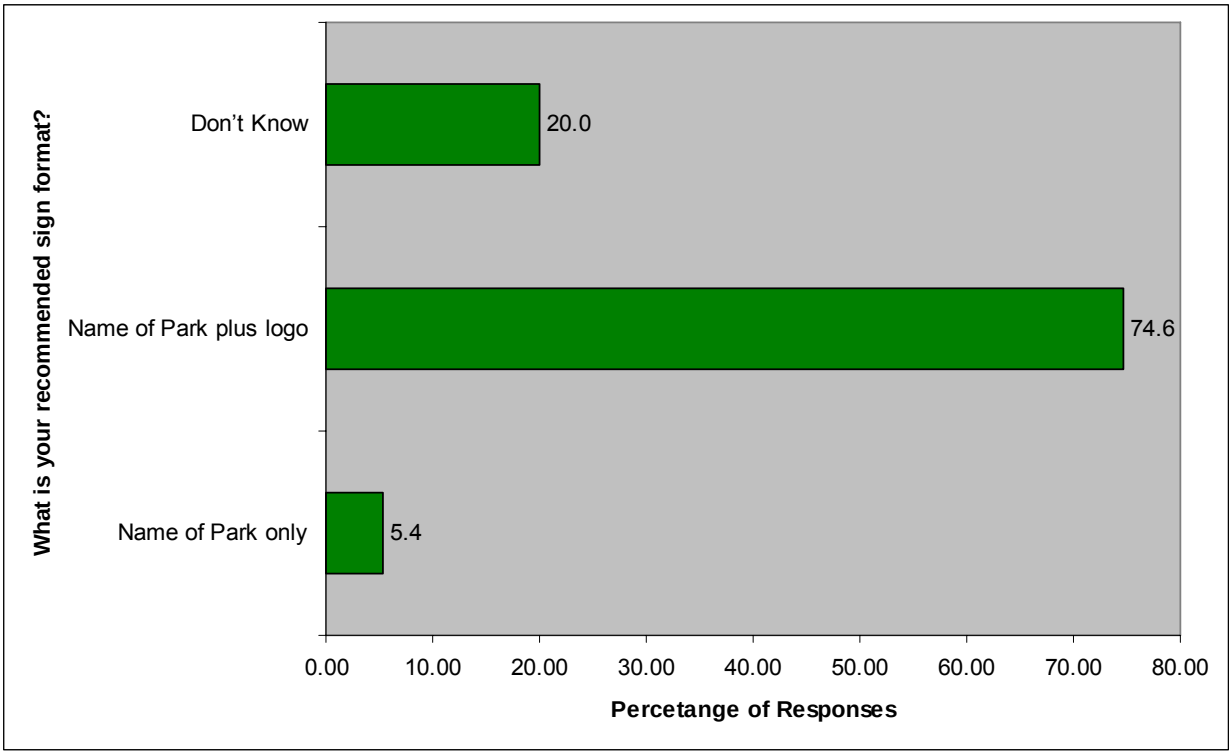

Figure 22: Non-Patrons' Preference for Signage Format

Question 8b: The preferred combination of either the logo and/or word message on signs (and vice versa) was sought from the non-patrons in the question. The summary of the responses is presented in Table 19 and in Figure 23.

Table 19: Non-Patrons' Preference for Guide Sign Message

SIGNAGE	FREQUENCY
Baseball Park	20
Nationals Park	557
Washington Nationals Park	70
Ballpark	55
Baseball Park	125
Nationals Park	2
Nationals Ballpark	11
Ballpark	4

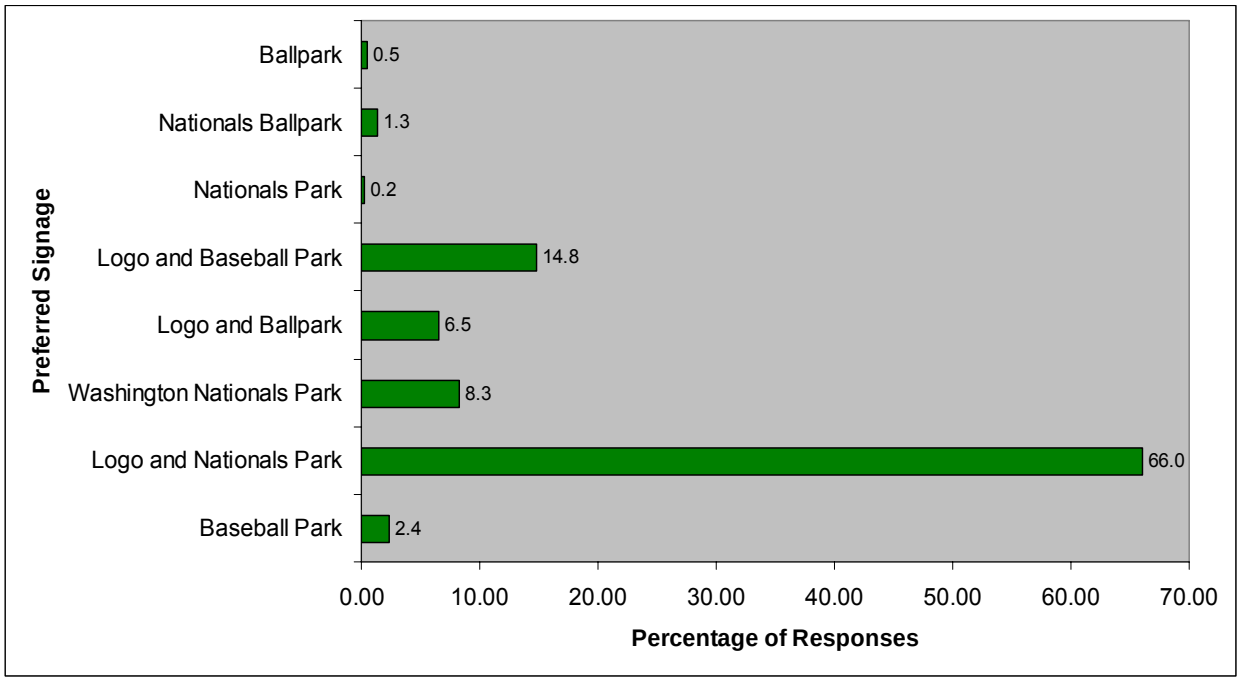

Figure 23: Non-Patrons' Preference for Guide Sign Message

The results show that the majority of the non-patrons (66%) surveyed recommended the use of the logo and "*Nationals Park"* on guide signs to direct them to the park. The next preferred or recommended signage chosen was logo and "*Baseball Park*.

6.3 Results of Hypothesis Tests for Patrons

The following hypotheses were tested at 5% level of significance.

Hypothesis 1: The logo plus text message on guide signs is preferred over the text only. Assuming P_T and P_{LT} denote the proportions of patrons who preferred signs with "text only" and with the "logo and text" respectively, this hypothesis was tested using the following:

H_0: $P_T \leq P_{LT}$

H_1: $P_T > P_{LT}$

The results are presented in Table 20.

Table 20: Results of Patrons' Hypothesis 1

P_T	0.032098765
P_{LT}	0.967901235
s	5.016515932
Z– value	-0.186544303

The proportion of the patrons surveyed who preferred the "logo and text" was 0.96 which was greater than those who preferred the "text only" (0.03). Since the z-value is less than the critical z-value at 5% level of significance (1.96), the null hypothesis cannot be rejected. Thus, a statistically significant proportion of the patrons preferred the logo plus text message on guide signs is preferred over the text only.

Hypothesis 2: This hypothesis tests whether the patrons think the logo plus the text message (on signs on freeways and arterials) is more effective in guiding than the text only sign. Assuming P_T and P_{LT} denote the proportions of patrons who selected signs "with text only" and "with the logo and text" respectively, this hypothesis can be tested using the following formulation:

H_0: $P_T \leq P_{LT}$

H_1: $P_T > P_{LT}$

The results are presented in Table 21.

Table 21: Results of Patrons' Hypothesis 2

P_T	0.201096892
P_{LT}	0.798903108
s	9.374398213
Z– value	-0.06377009

The proportion of the patrons surveyed who thought the "logo and text" helped in guiding them to the park was 0.799 which was greater than those who thought the "text only" (0.20) was better. Since the z-value is less than the critical z-value at 5% level of significance (1.96), the null hypothesis cannot be rejected. Thus, a statistically significant proportion of the patrons think the logo plus text message on guide signs is more effective in guiding them to the park than the text only.

Hypothesis 3: This hypothesis tests whether the majority of patrons think the use of the logo in general is helpful in guidance. Assuming P_H and P_{NH} denote the proportions of patrons who thought the use of the logo was "helpful" and "not helpful" respectively, this hypothesis can be tested using the following equation:

H_0: $P_{NH} \leq P_H$

H_1: $P_{NH} > P_H$

The results are presented in Table 22.

Table 22: Results of Patrons' Hypothesis 3

P_H	0.706766917
P_{NH}	0.293233083
s	10.50026853
Z– value	-0.039383168

The proportion of the patrons surveyed who thought the logo was "helpful" in guidance was 0.707 which was greater than those who thought its use is "not helpful" (0.293) was better. Since the z-value is less than the critical z-value at 5% level of significance (1.96), the null hypothesis cannot be rejected. Thus the hypothesis that a majority of patrons think the use of the logo is helpful in guiding them to the park is valid and statistically significant at the 95% confidence level.

Hypothesis 4: This hypothesis tests whether the majority of the patrons think the use of the word message instead of the logo would suffice. Assuming P_S and P_{NS} denote the proportions of patrons who thought the word message instead of the logo would "suffice" and "not suffice" respectively, this hypothesis can be tested using the following equation:

H_0: $P_S \leq P_{NS}$

H_1: $P_S > P_{NS}$

The results are presented in Table 23.

Table 23: Results of Patrons' Hypothesis 4

P_S	0.227001195
P_{NS}	0.772998805
s	12.11898399
Z– value	-0.045053085

The proportion of the patrons surveyed who thought the word message instead of the logo would "suffice" was 0.227 which was less than those who thought it would "not suffice" (0.773). Since the z-value is less than the critical z-value at 5% level of significance (1.96), the null hypothesis cannot be rejected. Thus, the hypothesis that the majority of patrons think the use of the word message instead of the logo would suffice is not valid. It can be concluded at 5% level of significance that the majority of the patrons think it is not sufficient to use word message only on signs.

6.4 Results of Hypothesis Tests for Non-Patrons

Hypothesis 1: This hypothesis tests whether the majority of non-baseball patrons are aware of the use of the logo on signs in the metropolitan area. Assuming P_A and P_{NA} denote the proportions of patrons who are "aware" and "not aware" respectively of the use of the logo on signs, this hypothesis can be tested using the following equation:

H_0: $P_{NA} \leq P_A$

H_1: $P_{NA} > P_A$

The results are presented in Table 23.

Table 24: Results of Non-Patrons' Hypothesis 1

P_A	0.600901917
P_{NA}	0.399098083
s	14.58489899
Z– value	0.013836492

The proportion of the patrons surveyed who responded that they are "aware" of the use of logo in the metropolitan area is 0.6 which is more than those who were "not aware" (0.4). Since the z-value is less than the critical z-value at 5% level of significance (1.96), the null hypothesis cannot be rejected. Thus, the hypothesis that majority of non-baseball patrons are aware of the use of the logo on signs is statistically significant.

Hypothesis 2: This hypothesis tests whether the non-patrons recommend the logo plus the text message (on signs on freeways and arterials) to be more effective in guiding than the text only sign. Assuming P_T and P_{LT} denote the proportions of non-patrons who

selected signs "with text only" and "with the logo and text" respectively, this hypothesis can be tested using the following formulation:

H_0: $P_T \leq P_{LT}$

H_1: $P_T > P_{LT}$

The results are presented in Table 25.

Table 25: Results of Non-Patrons' Hypothesis 2

P_T	0.067431851
P_{LT}	0.932568149
s	6.620476041
Z– value	0.130675845

The proportion of the non-patrons surveyed who thought the "logo and text" would be better to be used on guide signs was 0.93 which was greater than those who thought the "text only" (0.07) was better. Since the z-value is less than the critical z-value at 5% level of significance (1.96), the null hypothesis cannot be rejected. Thus, a statistically significant proportion of the non-patrons recommended the logo plus text message on guide signs rather than the text only.

7.0 DISCUSSION OF RESULTS

The general emphasis of the survey was to gauge the perception of motorists regarding guide signs that exhibit the name and logo of the Washington Nationals Baseball team. The target subjects were categorized into two broad groups: those who attend baseball games (patrons) and those who do not attend baseball games (non-patrons). The system of guide signs for providing direction to the baseball park was installed on freeways, arterials and train stations eighteen months before the survey.

A majority of the patrons surveyed were found to be residents of VA (32%). In all, only 24% of the patrons surveyed live in the District. Also, the patrons predominantly used the Metro rail as the mode of travel to the park, although a substantial percentage of those surveyed also drove to the ballpark. It is therefore important to have an effective signage for users of the two modes of transportation. It is also worth noting that about 76% of the patrons surveyed had been to the park on more than one occasion and were somewhat familiar with how to get there. Signage providing guidance to the

park will therefore predominately benefit the patrons who are attending a game for the first time.

The responses also showed that only 53% of the patrons who used the Metro rail as their mode of travel to the park noticed the use of the logo on signs in the Metro system. This may be due to the fact that some of those patrons were familiar with the Metro system and as such do not need to follow the signs to guide them.

For the patrons who drove to the park, approximately 71% of them indicated that the signage with the logo and word message helped in guiding them to the stadium. In addition, the hypothesis that a majority of the patrons thought the logo and word message on the signs helped in guiding them to the park was found to be statistically valid. Fifty-three percent (53%) of patrons who drove indicated that they followed the signs with the logo while traveling to the park.

Almost all of the patrons surveyed identified the logo as that of the Washington Nationals baseball team, indicating familiarity with the logo. In addition, the majority of the patrons (66%) surveyed indicated that the use of the logo and word message on the guide signs was effective. This majority was found to be statistically significant at 95% confidence interval. A statistically significant proportion of the patrons (70%) also indicated that a word only message on the guide signs would not be enough in directing people to the park.

Finally, when the patrons were asked to recommend a format for signage, a statistically significant proportion of those surveyed preferred a logo with word message. This was also evident in their response to identifying their preferred signage on guide signs since approximately 70% of those surveyed selected the logo with “Nationals Park” (as it currently exist).

The non-patrons surveyed were predominately from the District and MD. For those who lived outside of the District, their travel to the District was predominantly by train (Metro – 55.3%), followed by self-drive (37.1%). Most of their travel to the District was primarily for employment reasons (54.4%). A statistically significant proportion of the non-patrons (76.2%) were aware of the Washington Nationals baseball team and approximately 60% of them have considered attending a baseball game. When probed to recommend a signage format on guide signs, a statistically significant proportion of

the non-patrons surveyed (75%) recommended the use of the logo and name of baseball team with 66% of them preferring the logo and Nationals Park.

8.0 CONCLUSIONS AND RECOMMENDATIONS

It should be noted that the survey was conducted about 18 months after the signs were installed on streets, freeways and transit systems thus, the signs, as they are, were well exposed to the public who had no exposure to alternative signing options. The majority of the subjects, including the “non-patrons” were familiar with the current signage. Based on the sustained exposure of the subjects to the current signage, familiarity was probably well established.

It must also be stated that due to some legal constraints encountered during the development of the survey, actual variations of potential alternative sign messages were not designed and presented to the interviewees. The responses to questions related to sign message alternatives would have been different from those presented. A substantial proportion of the patrons surveyed do follow the signage to the park, even though they are familiar with the area. The survey revealed that a statistically significant proportion of both patrons and non-patrons prefer signage that has a combination of a worded message and a logo. In conclusion, the current signage on guide signs in the City for way-finding purposes to the park seemed to be helpful to both patrons and acceptable to non-patrons.

A simulation study should be conducted to determine whether the drivers comprehend effectively with the logo and word message. This will provide empirical basis to support the effectiveness of the current (or proposed) navigation signage while not distracting drivers from the effectiveness of signing for other destinations. The simulation study needs to be continued with focus on a sample of non-patrons, who are not familiar with the subject, and where the driver behavior, not influenced by previous knowledge of the subject, could be objectively observed and measured in an environment where a selection of options are sequentially introduced.

9.0 REFERENCES

1. Federal Highway Administration. *Manual on Uniform Traffic Control Devices.* Washington, D.C., 2004. http://mutcd.fhwa.dot.gov/kno-2003r1.htm. Accessed March 16, 2009.
2. Chrysler, S.T., Williams, A.A., Funkhouser, D., Holick, A. J., Brewer, M.J., 2006. *Guidelines for use of Diagrammatic Guide Signs and Their Alternatives (Summary).* Project 0-5147. Austin, TX: Texas Department of Transportation, Research and Technology Implementation Office.
3. Chrysler, S.T., Williams, A.A., Funkhouser, D., Holick, A. J., Brewer, M.J., 2007. *Driver Comprehension of Diagrammatic Freeway Guide Signs.* FHWA/TX-07/0-5147-1. Austin, TX: Texas Department of Transportation, Research and Technology Implementation Office. PP 3-29, 129-133.
4. Barrett, M. L., Pigman, J. G., Langley, R. E., 2002. *Evaluation of Post-Interchange Guide Signs.* KTC-02-23/U12-02-1F. Lexington, KY: Kentucky Transportation Center.
5. Lerner, N.D., Llaneras, R.E., McGee, H.W., Alexander, G., 2003. *Additional Investigations on Driver Information Overload.* Transportation Research Board NCHRP Report 488. Washington, DC.
6. O'Leary, A., and Turochy, R. *An Assessment of Motorists' Perceptions of Food Logo Signs*. Virginia Transportation Research Council, Charlottesville, 1999. http://www.virginiadot.org/vtrc/main/online_reports/pdf/99-TAR9.pdf. Accessed March 9, 2009.
7. Hawkins, H.G., and Rose, E.R. Effects of Adding Dual-Logo Panels to Specific Service Signs. In *Transportation Research Record, Journal of the Transportation Research Board, No. 1918.* Transportation Research Board, Washington, D.C., 2005, pp. 108-115.
8. Lee, S.E., Sudweeks, J.D., and Willis-Walton, S. *Specific Service Signs: Full Service Food Logo Panel MUTCD Experiment*. Virginia Tech Transportation Institute, Blacksburg, 2005.

9. Hummer, J., and Maripalli, U. The Human Factors Effects of Nine-Panel Logo Signs. In *TRB 87th Annual Meeting Compendium of Papers*. Transportation Research Board, Washington D.C., 2008.
10. Virginia Logos. Specific Service Signs. http://www.virginialogos.com/DesktopDefault.aspx?tabid=22. Accessed March 16, 2009.
11. Mace, D.J. Sign Legibility and Conspicuity. In *Transportation in n Aging Society: Improving Mobility and Safety for Older Persons.* TRB Special Report 218. Transportation Research Board, Washington, D.C., 1988, pp. 270-293.
12. Federal Highway Administration. MUTCD: Interim Approval for Use of Clearview Font for Positive Contrast Legends on Guide Signs. Washington, D.C., 2004. http://mutcd.fhwa.dot.gov/res-ia_clearview_font.htm. Accessed October 27, 2008.
13. Maripalli, U. *The Human Factors Effects of Nine-Panel Logo Signs.* Master's thesis. North Carolina State University, Raleigh, 2007.
14. H. Gene Hawkins, Jr., Susan T. Chrysler, and Garry L. Ford. Urban Freeway Guide Signing: Final Report, Texas Department of Transportation, 2003.
15. Shepard, F.D., 1974. *The Effect of Diagrammatic Signing At High Speed Interchanges.* VHRC 73-R53, Charlottesville, VA: Virginia Highway Research Council.
16. Whitaker, L.A., 1985. *Drivers' Unconscious Errors in the Processing of Traffic Signs.* HS-040 071. Research Record 1027, Washington, DC: Transportation Research Board, National Research Council (Driver Information Needs and Transportation Research Board. PP 42-45.
17. Jacobs, R.J., et al., 1975. *The Visibility of Alphabetic and Symbolic Traffic Signs.* Journal of the Australian Road Research Board, Vol. 5, No. 7: Australian Road Research. pp 68-86.

APPENDIX 1
SURVEY QUESTIONNAIRE FOR PATRONS

1. Participant is a resident of which state/jurisdiction:
   - ☐ District of Columbia
   - ☐ Maryland
   - ☐ Virginia
   - ☐ Other
2. What mode of travel do you often use when attending baseball games (select one)?
   - ☐ Self Drive
   - ☐ Carpool
   - ☐ Taxi
   - ☐ Metro bus
   - ☐ Metro rail
   - ☐ Biking
   - ☐ Walking from home
   - ☐ Walking from office
3. Is this your first visit to the Park?
   - ☐ Yes
   - ☐ No
4. If you used Metro, did you notice the logo  being used within the metro rail system?
   ☐ Yes ☐ No
5. a) If you drove to the Park, did you think that the logo  used alongside the word message on the highway signs helped in guiding you to the Park?
   ☐ Yes ☐ No

   b) Do you generally follow the  signs on the highway (or metro) in finding your way to the Park?
   ☐ Yes ☐ No
6. What does the logo sign  mean to you?

   _____

   _____
7. (<u>For self drive/carpool patrons</u>): How effective is the logo in guiding you to the Park:
   - ☐ Effective
   - ☐ Somewhat Effective
   - ☐ Neutral
   - ☐ Somewhat Ineffective
   - ☐ Ineffective
8. In your opinion, instead of the word with the logo, would a purely worded message (only) on the signs suffice?
   - ☐ Yes
   - ☐ No
   - ☐ Don't Know
9. a) Which of the following sign formats would you recommend to be most useful to you in driving to the Park?
   - ☐ Word Only
   - ☐ Logo and Word
   - ☐ Don't Know

   b) Which of the following sign messages would you prefer for a road sign for guiding you to the Nationals Park?
   - ☐ Baseball Park
   - ☐  Nationals Park
   - ☐ Washington Nationals Park
   - ☐  Ballpark
   - ☐  Baseball Park
   - ☐ Baseball Park
   - ☐ Nationals Park
   - ☐ Nationals Ballpark
   - ☐ Ballpark

APPENDIX 2
SURVEY QUESTIONNAIRE FOR NON-PATRONS

1. a. Participant is a resident of which state/jurisdiction:
   - ☐ District of Columbia
   - ☐ Maryland
   - ☐ Virginia
   - ☐ Other

   b. How often do you travel to the District?
   - ☐ Daily
   - ☐ Weekly
   - ☐ Monthly

   c. Your travel to the District is primarily for:
   - ☐ Employment
   - ☐ Pleasure

2. What mode of travel do you often use in the metropolitan area?
   - ☐ Self Drive
   - ☐ Carpool
   - ☐ Taxi
   - ☐ Metro Rail/Bus
   - ☐ Bike
   - ☐ Walk

3. What does the logo sign  mean to you?

   _____
   _____
   _____

4. Do you know that the Washington Nationals is a baseball team with a Park in DC?

   ☐ Yes ☐ No

5. Have you ever considered attending a Nationals game in person?

   ☐ Yes ☐ No

6. Have you noticed the symbol  on signs in the DC Metropolitan area?

   ☐ Yes ☐ No

7. If yes, where have you noticed the signs?

   _____
   _____

8. a) Which of the following sign formats would you recommend?

   ☐ Name of Park only
   ☐ Name of Park plus logo
   ☐ Don't Know

   b) Which of the following messages would you prefer for a road sign for guiding you to the Nationals Park?

   ☐ Baseball Park

   ☐  Nationals Park

   ☐ Washington Nationals Park

   ☐  Ballpark

   ☐  Baseball Park

   ☐ Baseball Park

   ☐ Nationals Park

   ☐ Nationals Ballpark

   ☐ Ballpark