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DIGITAL BILLBOARD SAFTY AMONGST MOTORISTS IN LOS ANGELES



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Abstract

The paper discusses the impact of digital billboards and driver safety in Los Angeles, CA to see if a hazardous relationship exists. The Outdoor Advertising Association of America (OAAA) defines a digital billboard as “a static roadside display that rotates advertising messages every 8-10 seconds”. They do not have any video motion flashing lights, only a still poster viewed on an LCD screen; this definition is used for purposes of this paper.

For determining if a hazardous relationship exists, a review of literature, driver behavior surveys and a spatial analysis of high traffic collision intersections and digital billboard locations were examined. Although few studies proved a hazardous relationship does exist, other literature and data gathered for this study showed no relationship exists. However, they do cause greater distraction and longer eye glances than standard billboards.

Introduction

In the past five years Los Angeles has seen an uprising of a new form of outdoor advertising: the digital billboard. It has the same purpose as a regular billboard; however, multiple ads are displayed at one location usually each lasting five seconds or more with a bright LED attention grabbing appearance (Trentacoste 5). This has become a large advance in the Advertising Industry assuming motorists are more likely to glance at an advertisement with a bright screen beaming at them. The paper will examine the safety of motorists in the digital billboard environment of Los Angeles, CA to determine if there is a hazardous relationship between digital billboard placement and traffic incidents.

Although some studies mentioned in the paper may use terms such as Commercial Electronic Variable Message Signs (CEVMS), for the purposes of this paper the term 'digital billboard' will be used to cover what is defined by the Outdoor Advertising Association of America (OAAA) as "a static roadside display that rotates advertising messages every 8-10 seconds" (OAAA). They do not have any video motion flashing lights, only a still poster viewed on a screen.

While several research methods are used for studying the safety of digital billboards, it should be understood that it is very difficult and complex to measure and no one experiment or test will accurately answer all questions or make a unanimous conclusion.

First, the paper will cover the study area discussing Los Angeles's demographics, marketable profile, traffic congestion, current events regarding outdoor advertising laws, and the definition of the study area for an understanding of the environment. Next, a review of literature will encompass a variety of studies performed on the relationship

between digital billboards and traffic safety about this topic, and how it is applicable. Subsequently, survey collection data amongst motorists in Los Angeles will be analyzed. The purpose of the surveys is to understand driver behavior and knowledge of crashes while in proximity to a digital billboard. In addition, crash data of hazardous intersections was obtained to learn of any possible spatial relationship with locations of digital billboards. Last, the conclusion will discuss the study and suggest for further research to be conducted.

Hypothesis

In the in ever evolving advertising milieu of Los Angeles, digital billboards potentially have the ability to facilitate an environment in which drivers become distracted; causing hazardous driving situations by longer glances away from the road, accident avoidance behavior such as swerving, and elevated numbers of traffic accidents.

Study Area

The parameters of the study area are segments of road, usually intersections in Los Angeles, CA where a digital billboard is placed. The area of interest consists of digital billboards within the sight of a given motorist. This is also referred to as the Viewer Reaction Distance, simply meaning the distance to which a driver may be influenced by a billboard; see Figure 1 (Tantala 7). This will serve as the area in which behaviors of drivers will be examined including collisions, glancing and accident avoidance behavior. Figure 2 displays where digital billboards are located in Los Angeles along major streets.

Although approximately 80 billboards are digital as of now, there are plans for more than 800 in the near future (Gonzales).

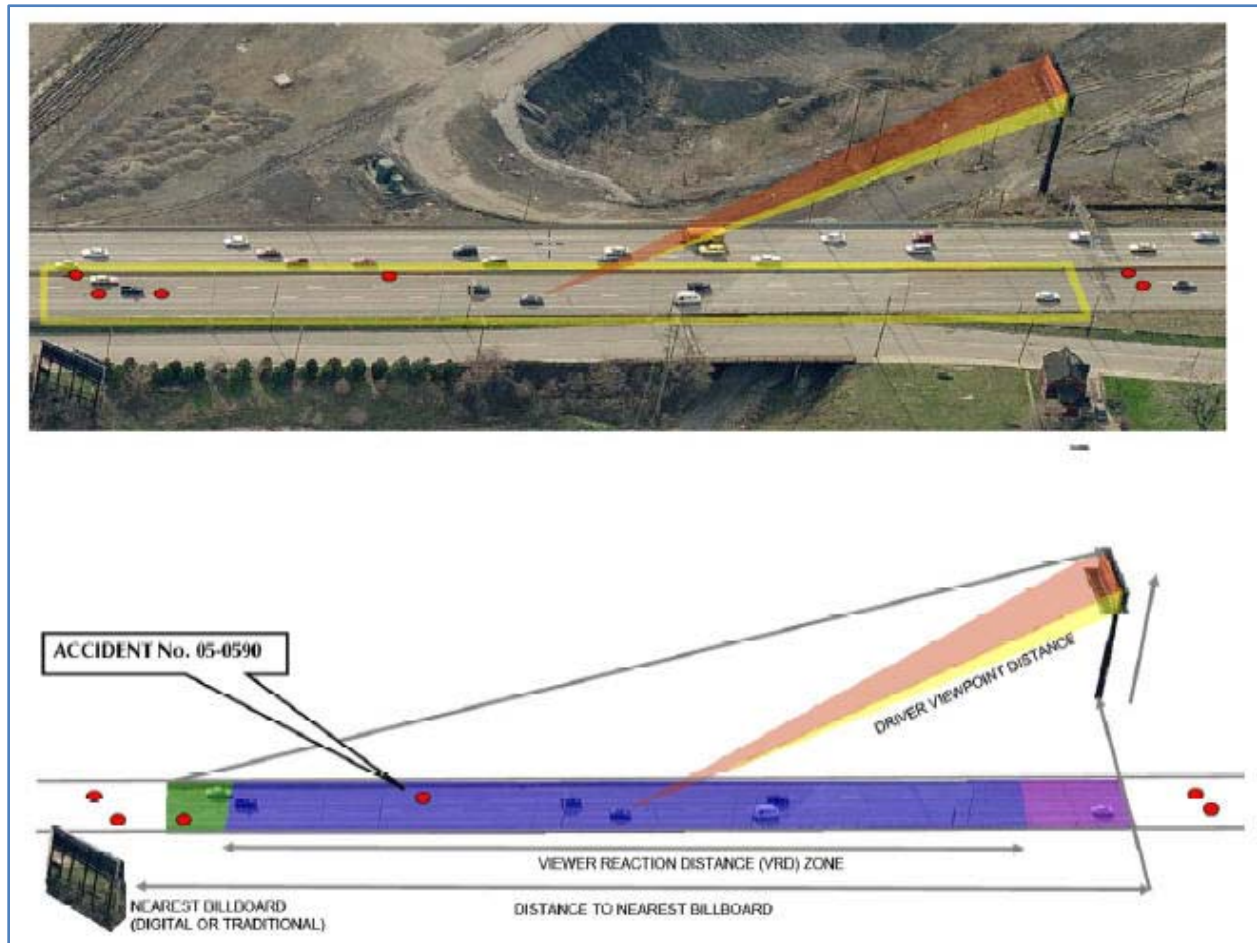
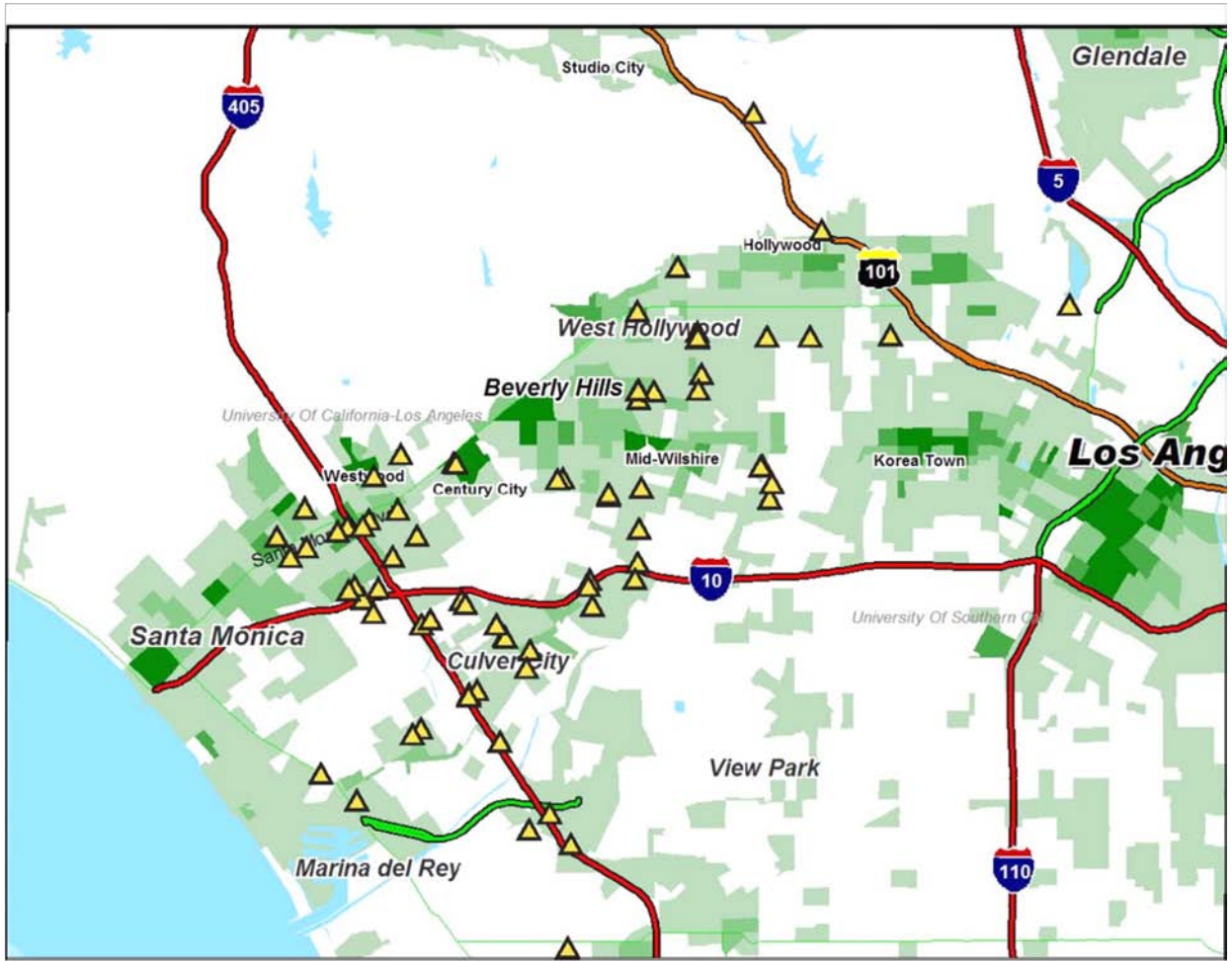


Figure 1: This diagram taken from the study in Cleveland, Ohio represents a segment of road where drivers are able to view and interpret a billboard, or the Viewer Reaction Distance (Tantala 46).

The study area is truly unique in that it contains the most motorists and traffic congestion in a single city in the United States (Digital Los Angeles 1). The Census approximates that 87% of the inhabitants in Los Angeles use an automobile on a daily basis (1). Although the city is known as a common tourist destination, it is also infamous for traffic jams. This makes this market is ideal for outdoor advertising. Digital billboards

allow for advertising that doesn't require manual labor when an ad is changed, only a remote computer operator (1). Although, at what point does it become too much advertising?

In order to understand attitudes of digital billboards in the city of Los Angeles, current events and legislation are examined. Currently regulation of outdoor media is being considered. For example, the city of Los Angeles Planning Commission voted to re-map districts allowing for digital billboards and supergraphics, which are large posters draped alongside of buildings creating a giant advertisement (Willon 1). The new proposal will ban digital billboards in the city except for certain restrictive zones, and create new districts such as Nan Nuys, Westwood, Koreatown, and Encino (Zahniser 1). The intent of this proposal is to reduce billboard congestion in certain areas, and allow for others to be in areas perceived by the city as being better suited for outdoor advertising (Willon 1). This is in response to a 2002 city billboard ban, which was overturned in court after advertising companies sued (1).



**Blockgroups
by daywork/lasm**

Dark Green	40,000 to 1,150,000
Medium-Dark Green	30,000 to 40,000
Medium-Light Green	15,000 to 30,000
Light Green	5,000 to 15,000
White	0 to 5,000

Figure 2: Shows the daytime population density per square mile in 2007 of the area where digital billboards are represented by yellow triangles in Los Angeles (data: Caritas 2007; map: Sites USA 2008; billboard locations: Clear Channel 2009 and CBS Outdoor 2009).

Literature Review

Several studies have been conducted to examine the relationship between digital media and traffic safety. From a report by the U.S. Department of Transportation, three methods of analysis were used in the literature review study on *The Possible Effects of Commercial Electronic Variable Message Signs (CEVMS) on Driving Safety* including 1) an increase in traffic accidents in the surrounding area of a digital billboard, 2) if there is an increase in near-collisions, and 3) increase in eye glances away from the road and on to a CEVMS (2). All are important approaches for analysis assuming that all of these factors are caused by distraction which can lead to an accident. All will be taken into consideration by examining the literature on the topic.

The Outdoor Advertising Association of America (OAAA) piloted two studies regarding driver safety and digital billboards. The first took place in Cuyahoga County, Ohio, which includes the metropolitan area of Cleveland. The study area included seven locations with one digital billboard along a given stretch of interstate highway. Researchers examined these locations 12 months prior to the installation and 12 months after to monitor change. The study focused on two criteria of analysis: the occurrence of accidents before and after the digital billboards and statistical correlation coefficients between traffic collisions and the location of the digital billboards. All seven billboards were free-standing on a single pole with a 672 square feet screen (10). They all fit the definition of a digital billboard, containing no animation or motion (22). They found no change in accident patterns before and after the conversion of the billboards and no statistical relationship between the two variables.

Based on the study's findings, the authors conclude that digital billboards do not have a negative effect on drivers (48); however, it lacks other factors that could influence a different outcome. Another study completed by the National Highway Traffic Safety Administration titled the *100-Car Naturalistic Driving* found in their study that 83% of accidents were not reported to police (Trentacoste 7) and all of the accident data in the Ohio study relied on police report. Therefore it is inconclusive for the authors to be aware of all traffic collisions around the digital billboards. They also warned of the importance of taking into account near-crashes because "the kinematics of crashes and near-crashes are similar" (7). A comparable study to the one in Ohio performed by the Wisconsin Department of Transportation investigated by-directional flows of traffic on freeways in their state near electronic billboards. They found a 36 percent increase over a three year period before and after a digital billboard was installed (5).

The second study supported by the OAAA was completed by the Virginia Tech Transportation Institute: *Driving Performance and Digital Billboards*. It covers the cities of Cleveland, OH and Pittsburg, PA. In Pittsburg the billboards of study were placed around a hill or curve and not at intersections (Lee 19). In Los Angeles, all digital billboards as reported by Clear Channel and CBS are located at intersections. While in Cleveland, the billboards were located off to the side of a straight roadway (19). Billboards in this study were located on interstate routes 85 percent of the time (21). Contrary, the majority of digital billboards in Los Angeles are on major streets, not interstates.

Even though both studies by the OAAA found that there is no correlation between traffic accidents and being distracted by the digital billboards, it is hard to measure because when traffic accidents are reported the extent to which they cite the cause of the accident,

the accident report doesn't declare what the driver was distracted by (Trentacoste 5); and drivers may not be aware they are distracted (17), as it is stated in a study by the U.S. Dept of Transportation. They also failed to note that not all accidents are reported to police (6).

In regards to the critique of the sponsored studies by the OAAA, mixed reviews are shared by stakeholders. OAAA Spokesperson Jeff Golimowski states that, "[they] do not represent a distraction towards drivers" (Gonzales). This cannot be since the purpose of the billboards requires attention of the driver to glance at it. Industry expert Jerry Wachtel who has worked both for and against the industry disapproves of the two studies by the OAAA. In a television report by Los Angeles's KCET news, when Wachtel is observing the intersection of Santa Monica Blvd. and Westwood Blvd. containing three digital billboards he states, "The more digital billboards that occur, I believe, more distraction will take place. The more distraction that takes place, the more traffic back-ups and slowdowns there are going to be. I don't see a very bright future for intersects like this under those conditions" (Gonzales).

He believes there was an effort on the part of the OAAA to show results in favor of the industry (Gonzales). In a report prepared for the Maryland State Highway Administration Wachtel states, "...acceptance of these reports as valid is inappropriate and unsupported by scientific data, and that ordinance or code changes based on their findings is ill advised" (15). He believes digital billboards are a distraction to drivers because they are the brightest objects in the landscape, are the 'dominant visual element', messages can take five seconds to digest, images rotate up to every eight seconds cause gazing to see what is next (5).

The non-profit organization dedicated to “preserving and enhancing the scenic character of America’s communities...” Scenic America published an article with similar arguments supporting Wachtel’s (McCafferty 8). The author points out although the LED (light-emitting diode) screens are substantially profitable for the advertising industry, “some studies have shown a link between traffic problems and digital billboards” because peoples’ eyes are drawn to them as opposed to regular billboards (3). Not only are they more distracting but they can also be seen from greater distances (3). Though the author took into account that there are some empirical studies that show inconclusive or safety neutral results, she reiterated the Wisconsin study which stated crashes went up 35 percent (3). As far as age is concerned with attention, younger drivers are more likely to become distracted by forms of electronic media and older drivers are known to have longer viewing times to interpret the ad (3).

Examining the Virginia Tech study, McCarthy also points out the bias and lack of credibility to the study. The study is commonly referenced by the Advertising Industry to support their claims of having a neutral impact to driving behavior (Gonzales). In the court case of *Nichols Media Group vs. The Towns of Babylon and Islip*, the court threw the study out when the plaintiff attempted to use it in support of their argument because it, “is so infected by industry bias as to lack credibility and reliability,” because the study was funded by outdoor advertising stakeholders, the OAAA was involved in the demeanor of the study, and lacked peer review (4).

Methods

Methods of this study include primary research encompassing a spatial analysis of the top five percent of hazardous intersections of California in Los Angeles in relation to digital billboards and driver behavior surveys.

The spatial analysis will examine which intersections were determined the most hazardous in Los Angeles by the *California 2008 Five Percent Report* which identifies the top five percent of hazardous intersections in California. To determine if any spatial correlation exists between digital billboards and traffic collisions, the intersections from the report will be geocoded and overlaid with the geocoded addresses of the digital billboards, see Figure 3. If an intersection is apparent in both datasets, then a digital billboard may be deemed unsafe for motorists, assuming there are no other external factors.

Aside from accidents, driver behavior needs to be observed through commuter surveys. Learning from the literature, relying simply on accident data isn't sufficient for the study of the topic. It can exclude unreported accidents (Trentacoste 7), leave out accident preventative behavior, and does not take into account eye glancing away from the road. The importance of studying these actions is necessary because it is the distraction that inhibits a driver from looking at billboard as opposed to the road. By knowing where the digital billboards are located, the surveyed population was geographically segmented to people who live by or commute near a digital billboard's location. It is not sufficient to only consider where people reside because it is excluding the daytime population (i.e. population densities of where people are during the day time such as place of work), see Figure 2.

The surveys were gathered for the topic because they easily collect information on attitudes and behavior of motorists while in proximity of a digital billboard. These surveys were distributed electronically by geographically segmenting people via an online social network site, Facebook and email contact groups. Participants were only selected from the Los Angeles network, or were screened to ensure the surveyed population is regularly exposed to digital billboards in Los Angeles.

Data

From the report of the top five percent of hazardous intersections in California, the data overlay is shown in Figure 3. Of the 76 mapped intersections with digital billboards, only three intersections, about four percent, matched ones in the report for the top 5% of hazardous intersections. Those intersections are Melrose Ave at La Brea Ave, Pico Blvd. at Sepulveda Blvd., and Santa Monica Blvd at La Cienega Blvd. This does not suggest that in these intersections, digital billboards cause accidents here. It only advocates that of these hazardous intersections, a digital billboard(s) is present. In addition, with their distractive behavior, any elements in these places that would have the potential to defer a driver's attention shouldn't be present.

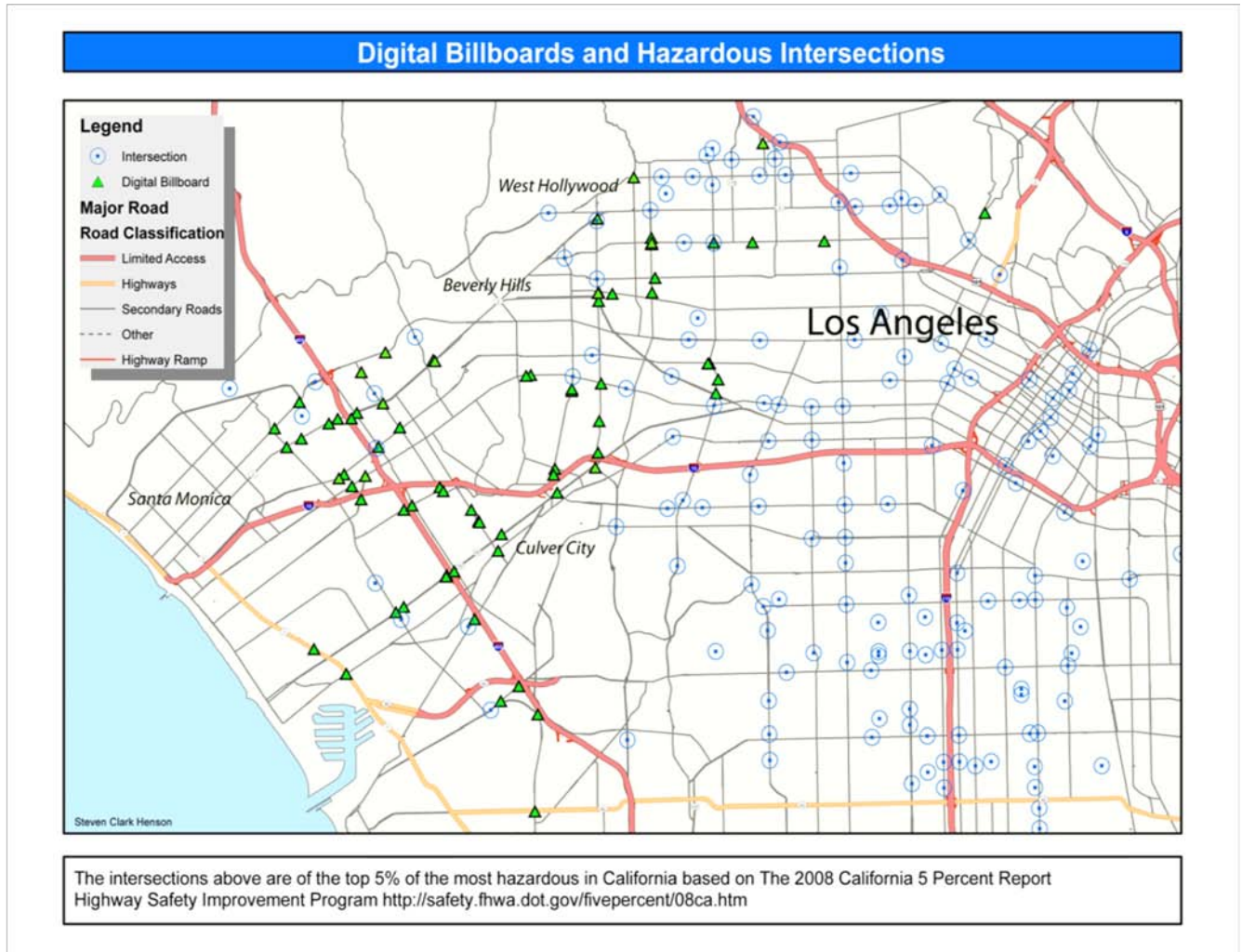


Figure 3: The map above represents intersections of the top 5% of the most hazardous in California based on The 2008 California 5 Percent Report by the Highway Safety Improvement Program <http://safety.fhwa.dot.gov/fivepercent/08ca.htm>

Digital Billboard Driver Safety Survey

Purpose: To examine the safety of motorists in a digital billboard environment of Los Angeles, CA to determine if there is a hazardous relationship between digital billboard placement and traffic incidents.

Definition: A Digital Billboard is defined as static roadside displays that rotate an advertising message every 8-10 seconds (oaaa.org). They are usually operated by a giant LED screen and do not feature motion, only bright still images.

Please answer to the best of your ability.

1. Age:
2. Gender:
3. How often on a weekly basis do you see a digital billboard?
4. Are you always driving when you see one?
5. Can you remember what ads you saw? If so which ones (name up to three)?
6. Can you remember WHERE you saw the digital billboard(s)?
7. Do you believe you are more likely to glance at a digital billboard as opposed to a normal billboard with no LED screen while your car is in motion?
8. If so, how long would you say you glance at one while your car is in motion?
9. Are you more likely to glance at a digital billboard while (choose one):
 - a.) Stopped at a red light or traffic
 - b.) While car is moving
 - c.) All of the above
10. How long would you say your glances are?
11. Do you feel glancing inhibits yours or other motorists driving ability from concentrating on the road?
12. Have you ever been in, witnessed, or know someone who has had an accident because of distraction by a digital billboard?
13. Have you ever had to apply swift breaking, swerving, or other actions to avoid a traffic collision or any other moving traffic violations because you were distracted by a digital billboard?

Figure 4: Driver Behavior Survey

The survey gathered data supporting the spatial analysis and was similar most literature in regards to number of accident occurrences. Twenty-one people were surveyed between the ages of 20 and 38. Eighty percent said they were more likely to glance at a

digital billboard as opposed to a standard billboard. All but two respondents were able to remember a product category, such as movies or TV shows or specific product they saw. Sixty-two percent of the population said they were more likely to glance at a digital billboard while stopped at an intersection, and the remaining 38 percent said both while the car is in motion and stopped at a light. One person stated they were, “more likely to glance... longer [at a digital billboard] if they change.” When asked, ‘Do you feel glancing inhibits yours or other motorists driving ability from concentrating on the road?’ 42.8% agreed, 19% disagreed, and one third said it depends on other factors, such as the type of driver. The next question, ‘Have you ever been in, witnessed, or know someone who has had an accident because of distraction by a digital billboard?’ 95 percent responded no, and when asked, “Have you ever had to apply swift breaking, swerving, or other actions to avoid a traffic collision or any other moving traffic violations because you were distracted by a digital billboard?”, 90 percent said no.

Even though 19 percent of the respondents thought that the digital billboards do not inhibit their driving ability, all but two respondents said their glances are or longer than 2 seconds which is deemed unsafe by the *100-Car Naturalistic Driving Study* stating that “a driver looking away from the forward roadway for greater than 2s... the odds of a crash or near-crash are nearly twice those than when a driver attends to the forward roadway” (Trentacoste 7).

Although the surveys did capture an understanding of influences by digital billboards, it was noticed after the data collection that the surveys lacked some strengths. First, the majority of those surveyed were under the age of 30. This generation was exposed to more digitally visual vehicles from young childhood developmental years such

as computers and video games, and could possibly have influence as to how they respond at an older age to outdoor digital media. Older generations such as baby boomers and Generation X could perhaps have different responses.

Some questions appeared to be problematic in syntax. Question ten was thrown out of the data because it closely resembled question eight, was not specific and confused the respondents, most claiming it was the same as number eight, see Figure 4. It was intended to encompass all answers to question nine (those being a. stopped at a red light or traffic; b. while car is moving; c. all of the above). Question eight was only intended to understand drivers' glances while a car is in motion. Although, it was problematic, those who assumed it was regarding question nine gave answers that showed they glance at a digital billboard roughly twice as long while stopped at a traffic light rather than while driving.

Further Research

If more research were to be conducted, people in older age ranges would be surveyed because they could have different driving behavior. For example one respondent, age 38, was the only person surveyed who was able to remember three specific products in ads and where he saw them. Although one respondent is not conclusive, it could suggest further research to determine if people over 30 have a better short term memory, or if they are more likely to digest an ads message and thus be able to recall it.

Due to the numerous components involved in the presence of digital billboards, one study is not significant enough to accurately and ultimately determine whether their placement in view of drivers positively correlates with traffic collisions. For example, the two OAAA published studies saw no change or correlation between vehicular accidents

during the time before and after the billboard. However, this is hard to measure because when traffic accidents are reported the extent to which they cite the cause of the accident doesn't say what they were distracted by as it is stated in a study by the U.S. Dept of transportation (6). Spokesperson of the OAAA Jeff Moeloski states that, "[they] are not a distraction towards drivers" (Gonzales). However, this cannot be a factual statement from examining data from driver surveys and examining literature in the field. Also, the results of the studies may be interpreted as biased because they may have produced a result that OAAA wanted to see in their favor since it was possibly funded and engineered by their stakeholders, allowing for ethical proof that there is no harmful effect (McCafferty 3).

Of the research done on digital billboards on effecting accidents, none consider the clutter of an urban vs. rural landscape. In an urban and visually dense serenity such as Santa Monica Boulevard in Los Angeles, several billboards both static and digital along with several businesses line the area intersecting Interstate 405. With a cluttered urban landscape, are drivers less likely to observe digital billboards? Comparatively, are drivers more likely to observe a digital billboard in a remote section of road?

Conclusion

Although evidence of several studies makes claims showing that there is no correlation between traffic collisions in environments with a digital billboard, most notably the two by the OAAA, there are others that prove legitimate increases in accidents, such as the WisDOT study. Therefore, this study cannot say with complete confidence whether digital billboards contribute to the accident rate in any given area. As it was found in this study as well, what can be inferred is that drivers are more likely to glance at a digital

billboards as opposed to a standard billboard (Lee, McElheny, and Gibbons 7); and the odds of a vehicular accident or near accident are twice as likely when a driver turns away from looking forward on the road for more than two seconds (Trentacoste 7). Although some studies show no correlation or are inconclusive between digital billboards and hazardous driving conditions, it is not sufficient to say that they are not detrimental to drivers because they do distract drivers and it should not rule out that they could cause a traffic accident. Nevertheless, no study has yet to show them to be safe. Just like cellular phones and navigational systems, digital billboards simply add to driver distraction environment.

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