

A STUDY OF THE RELATIONSHIP  
BETWEEN DIGITAL BILLBOARDS  
AND TRAFFIC SAFETY  
IN ALBUQUERQUE, NM

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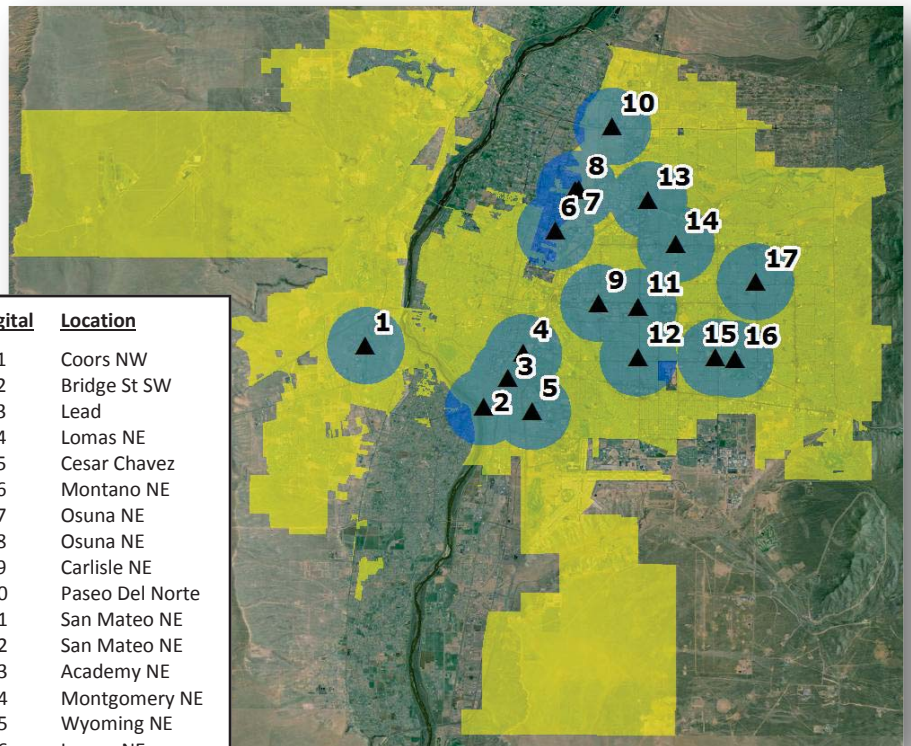
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# A STUDY OF THE RELATIONSHIP BETWEEN DIGITAL BILLBOARDS AND TRAFFIC SAFETY IN ALBUQUERQUE, NM

## KEY POINTS

- Seven years of accident data comparison
- 17 digital billboards on local roads with eight second dwell times
- Data shows no statistically significant increase in accident rates
- Driver age (young/elderly) and time of day (daytime/nighttime) are neutral factors



**Figure 1.** Digital Billboard locations in Albuquerque, NM

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*Seven years of data ...*

*... no statistically significant relationship  
with the occurrence of accidents ...*

*... age of drivers and time of day are  
neutral factors.*

## OVERVIEW

The purpose of this study is to examine **the statistical relationship between digital billboards and traffic safety in Albuquerque, New Mexico**. This study analyzed traffic and accident data along local roads near **17 existing, digital billboards** (see Figure 1) with traffic volumes on roads collectively representing approximately 240 million vehicles per year. The study uses official data as collected, compiled and recorded independently by the Police Department of the City of Albuquerque.

The study included **seven years of accident data** representing approximately 7,000 accidents near seventeen digital billboards. Ten of the seventeen billboards were converted to digital format circa August, 2006 and the remaining seven were converted circa November 2007.

Temporal (*when and how frequently*) and spatial (*where and how far*) statistics were summarized near billboards within multiple vicinity ranges from 0.2 to 1.0 miles upstream and downstream of the billboards. Additionally, subsets of daytime and nighttime accidents were analyzed for before and after comparisons.

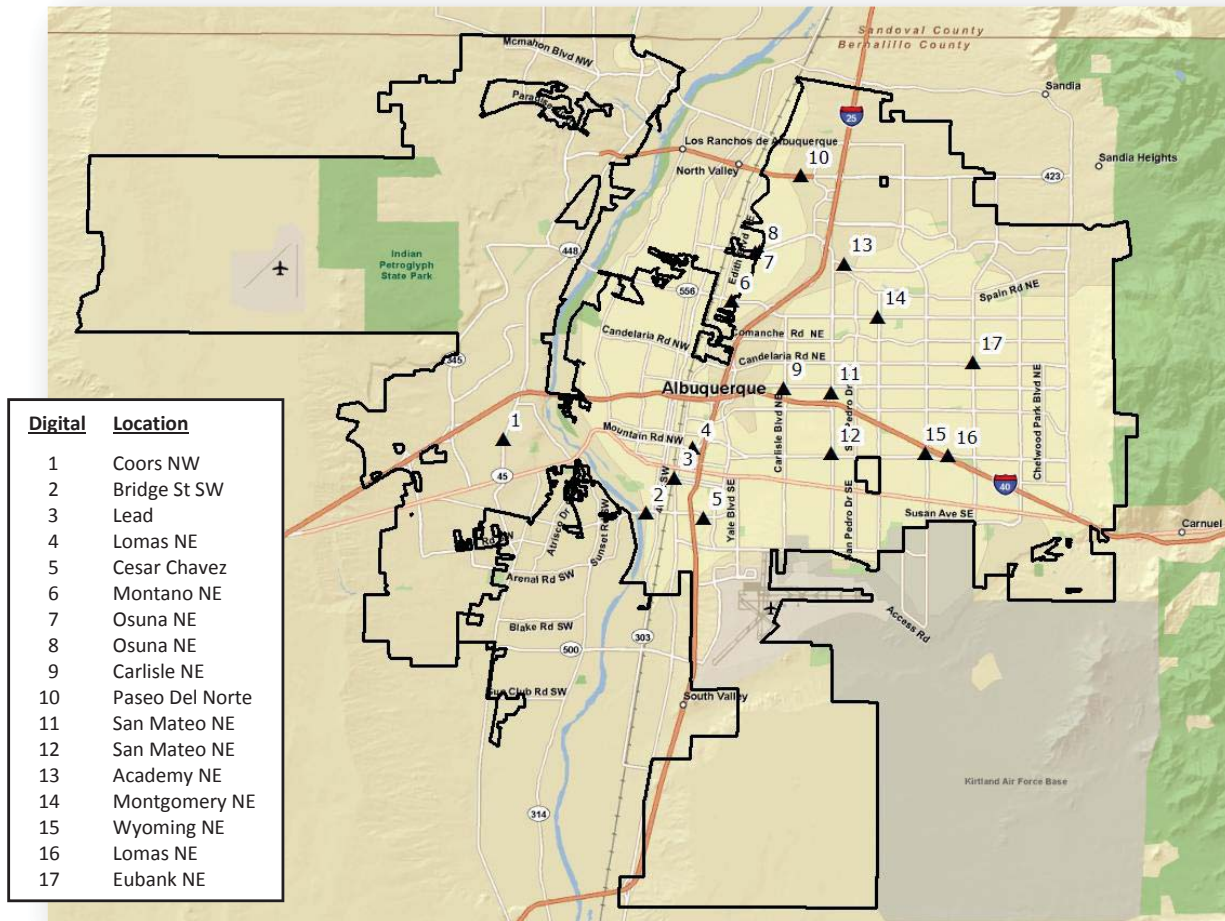
The overall conclusion of the study is that **the digital billboards in Albuquerque have no statistically significant relationship with the occurrence of accidents**. This study also finds that the age of drivers (younger/elderly) and the time of day (daytime/nighttime) are neutral factors which show no increase in accident rates near the digital billboards in Albuquerque. This conclusion is based on the Police Department's own data and an objective statistical analysis; **the data shows no increase in accident rates**.

## STUDY REGION

The City of Albuquerque was chosen as a study region, because it has multiple digital billboards in close proximity that were in service for extended periods of time. The roads adjacent to these billboards are heavily traveled (approximately 665 thousand vehicles traveled per day on the sections of road near the digital billboards).

The City of Albuquerque is the largest City in the State of New Mexico, is situated in the central part of the State straddling the Rio Grande, and had a population of 522 thousand people and 183 thousand households. Albuquerque is ranked as the 34th largest City and the 6th fastest growing in America. In 2008, there were some 439 thousand licensed drivers in Albuquerque (approximately 84% of the population).

Albuquerque is geographically divided into four quadrants. They are NE (northeast), NW (northwest), SE (southeast), and SW (southwest). The north-south division line is Central Avenue (the path that Route 66 took through the city) and the east-west division line is the Burlington Northern and Santa Fe (BNSF) Railway track line. The City is generally bisected by the Pan American Freeway (also known as Interstate 25) in the north-south direction and the Coronado Freeway (also known as Interstate 40).



**Figure 2.**  
Digital Billboard locations and streets  
in Albuquerque, NM

*The static display on each of these digital billboards has a "dwell time" of eight seconds.*

#### **BILLBOARD CHARACTERISTICS**

Digital billboards display static messages which, when viewed, resemble conventional painted or printed billboards. With digital technology, a static copy “dwells” and includes no animation, flashing lights, scrolling, or full-motion video. The static display on each of these digital billboards has a "dwell time" of eight seconds.

The digital billboards were designed and manufactured by *Daktronics*, and use red, green, and blue light-emitting-diode (LED) technology to present text and graphics. The digital billboards compensate for varying light levels, including day and night viewing, by automatically monitoring and adjusting overall display brightness and gamma levels. A photocell is mounted on each of the digital billboards to measure ambient light. The seventeen digital billboards that were studied are owned and operated by *Clear Channel Outdoor, Inc.*

The digital billboards are numbered 1 to 17 and are located along various local roads throughout the City. The locations of the seventeen billboards in Albuquerque are shown in Figures 2 and 3 which summarize direction, configuration and other sign characteristics. The digital boards and their surroundings were observed during day and night conditions. Each of the seventeen digital billboards is a freestanding, single-pole, structure with one digital face. Figure 4 summarizes the conversion dates. Ten of the seventeen billboards were converted to digital format circa August, 2006 and the remaining seven were converted circa November 2007. This allows for before/after comparisons of up to 4.3 years (or 52 months) and 7 years (or 84 months) respectively. Additional billboard-location photos, aeriels, and map references for each billboard number are also included within this report as Figures 5 to 21.

Billboard No.	Location	Digital Facing	Face Size	Configuration	Reader Side	Install / Live Date
1	<b>Coors NW</b> 510 ft south of Los Volcanes	N	11x22	Freestanding, Vee, Flag	Right Hand	11/19/2007
2	<b>Bridge SW</b> 115 ft west of 8th	E	11x22	Freestanding, Vee, Flag	Cross	11/27/2007
3	<b>Lead SE</b> 90 ft west of Broadway	E	11x22	Freestanding, Center-mount	Cross	8/14/2006
4	<b>Lomas NE</b> 444 ft east of Edith	E	11x22	Freestanding, Center-mount	Right Hand	8/14/2006
5	<b>Avenida Cesar Chavez SE</b> 0.2 mi west of University	W	11x22	Freestanding, Center-mount	Right Hand	10/4/2006
6	<b>Montano NE</b> 0.15 mi east of Edith	E	11x22	Freestanding, Superflag, Vee	Cross	8/31/2006
7	<b>Osuna NE</b> 0.38 mi east of Edith	W	11x22	Freestanding, Center-mount, Vee	Cross	11/19/2007
8	<b>Osuna NE</b> 0.47 mi east of Edith	E	11x22	Freestanding, Center-mount	Right Hand	8/29/2006
9	<b>Carlisle NE</b> 115 ft south of Menaul	S	11x22	Freestanding, Vee, Flag with Eccentric Upright	Cross	11/13/2007
10	<b>Paseo Del Norte NE</b> 0.25 mi west of Jefferson	E	14x28	Freestanding, Center-mount, Vee	Right Hand	11/21/2007
11	<b>San Mateo NE</b> 100 ft north of Prospect	N	11x22	Freestanding, Flag	Cross	8/29/2006
12	<b>San Mateo NE</b> 174 ft north of Lomas	N	11x22	Freestanding, Vee, Center-mount with Eccentric Upright	Right Hand	11/13/2007
13	<b>Academy NE</b> 364 ft west of McKinney	W	11x22	Freestanding, Flag with Eccentric Upright	Cross, Center	8/31/2006
14	<b>Montgomery NE</b> 135 ft west of Louisiana	E	11x22	Freestanding, Center-mount with Eccentric Upright	Right Hand	8/17/2006
15	<b>Wyoming NE</b> 422 ft north of Lomas	N	11x22	Freestanding, Center-mount	Right Hand	8/30/2006
16	<b>Lomas NE</b> 725 ft west of Easterday	E	11x22	Freestanding, Vee, Flag	Right Hand	11/14/2007
17	<b>Eubank NE</b> 235 ft north of Candelaria	N	11x22	Freestanding, Flag	Cross	8/17/2006

**Figure 3.**  
Digital Billboard direction, sizes and other sign characteristics



Digital No.	Install / Live Date	7 years of comparison						
		2003	2004	2005	2006	2007	2008	2009
1	11/19/2007				prior to conversion		digital	
2	11/27/2007				prior to conversion		digital	
3	8/14/2006	prior to conversion					digital	
4	8/14/2006	prior to conversion					digital	
5	10/4/2006		prior to conversion				digital	
6	8/31/2006	prior to conversion					digital	
7	11/19/2007				prior to conversion		digital	
8	8/29/2006	prior to conversion					digital	
9	11/13/2007				prior to conversion		digital	
10	11/21/2007				prior to conversion		digital	
11	8/29/2006	prior to conversion					digital	
12	11/13/2007				prior to conversion		digital	
13	8/31/2006	prior to conversion					digital	
14	8/17/2006	prior to conversion					digital	
15	8/30/2006	prior to conversion					digital	
16	11/14/2007				prior to conversion		digital	
17	8/17/2006	prior to conversion					digital	

**Figure 4.**  
Digital billboard conversion dates

Digital Billboard No. 1 advertises to southbound traffic on Coors Boulevard NW south of Los Volcanes Road NW. Digital Billboard No. 1 is a right-hand reader and a free-standing, vee, flag configuration. Figure 5a is a photo of the digital face. Figure 5b shows the location in an oblique aerial. The digital face was converted from a conventional face on 19Nov07 using the existing structure.

**Figure 5.** Digital No. 1 (a, left) View on Coors Boulevard NW, (b, right) Oblique Aerial of location

Digital Billboard No. 2 advertises to westbound traffic on Bridge Street SW west of 8<sup>th</sup> Street SW. Digital Billboard No. 2 is a cross reader and a free-standing, vee, flag configuration. Figure 6a is a photo of the digital face. Figure 6b shows the location in an oblique aerial. The digital face was a new location that was installed and activated on 27Nov07.

**Figure 6.** Digital No. 2 (a, left) View on Bridge Street SW, (b, right) Oblique Aerial of location

Digital Billboard No. 3 advertises to westbound traffic on Lead Avenue SE west of Broadway Boulevard SE. Digital Billboard No. 3 is a single-faced, cross reader and a free-standing, center-mount configuration. Figure 7a is a photo of the digital face. Figure 7b shows the location in an oblique aerial. The digital face was converted from a conventional face on 14Aug06 using the existing structure.

**Figure 7.** Digital No. 3 (a, left) View on Lead Avenue SE, (b, right) Oblique Aerial of location

Digital Billboard No. 4 advertises to westbound traffic on Lomas Boulevard NE east of Edith Boulevard NE. Digital Billboard No. 4 is a right-hand reader and a free-standing, center-mount configuration. Figure 8a is a photo of the digital face. Figure 8b shows the location in an oblique aerial. The digital face was converted from a conventional face on 14Aug06 using the existing structure.

**Figure 8.** Digital No. 4 (a, left) View on Lomas Boulevard NE, (b, right) Oblique Aerial of location

Digital Billboard No. 5 advertises to westbound traffic on Avenida Cesar Chavez SE west of University Boulevard SE. Digital Billboard No. 5 is a right-hand reader and a free-standing, center-mount configuration. Figure 9a is a photo of the digital face. Figure 9b shows the location in an oblique aerial. The digital face was converted from a conventional face on 4Oct06 using the existing structure.

**Figure 9.** Digital No. 5 (a, left) View on Avenida Cesar Chavez SE, (b, right) Oblique Aerial of location





Digital Billboard No. 6 advertises to westbound traffic on Montano Road NE east of Edith Boulevard NE. Billboard No. 6 is a cross reader and a free-standing, vee, superflag configuration. Figure 10a is a photo of the digital face. Figure 10b shows the location in an oblique aerial. The digital face was converted from a tri-vision face on 31Aug06 using the existing structure.

**Figure 10.** Digital No. 6 (a, left) View on Montano Road NE, (b, right) Oblique Aerial of location

Digital Billboard No. 7 advertises to eastbound traffic on Osuna Road NE east of Edith Boulevard NE. Digital Billboard No. 7 is a cross reader and a free-standing, vee, center-mount configuration. Figure 11a is a photo of the digital face. Figure 11b shows the location in an oblique aerial. The digital face was converted from a conventional face on 19Nov07 using the existing structure.

**Figure 11.** Digital No. 7 (a, left) View on Osuna Road NE, (b, right) Oblique Aerial of location

Digital Billboard No. 8 advertises to westbound traffic on Osuna Road NE east of Edith Boulevard NE. Digital Billboard No. 8 is a right-hand reader and a free-standing, center-mount configuration. Figure 12a is a photo of the digital face. Figure 12b shows the location in an oblique aerial. The digital face was converted from a conventional face on 29Aug06 using the existing structure.

**Figure 12.** Digital No. 8 (a, left) View on Osuna Road NE, (b, right) Oblique Aerial of location

Digital Billboard No. 9 advertises to northbound traffic on Carlisle Boulevard NE south of Menaul Boulevard NE. Digital Billboard No. 9 is a cross reader and a free-standing, flag configuration with an eccentric upright. Figure 13a is a photo of the digital face. Figure 13b shows the location in an oblique aerial. The digital face was converted from a conventional face on 13Nov07 using the existing structure.

**Figure 13.** Digital No. 9 (a, left) View on Carlisle Boulevard NE, (b, right) Oblique Aerial of location

Digital Billboard No. 10 advertises to westbound traffic on Paseo Del Norte Road NE west of Jefferson Street NE. Digital Billboard No. 10 is a right-hand reader and a free-standing, center-mount, vee configuration. Figure 14a is a photo of the digital face. Figure 14b shows the location in an oblique aerial. The digital face was converted from a larger, 14x48 conventional face on 21Nov07 using the existing structure.

**Figure 14.** Digital No. 10 (a, left) View on Paseo Del Norte Road NE, (b, right) Oblique Aerial of location



Digital Billboard No. 11 advertises to southbound traffic on San Mateo Boulevard NE north of Prospect Avenue NE. Digital Billboard No. 11 is a cross reader and a free-standing, flag configuration. Figure 15a is a photo of the digital face. Figure 15b shows the location in an oblique aerial. The digital face was converted from a conventional face on 29Aug06 using the existing structure.

**Figure 15.** Digital No. 11  
(a, left) View on San Mateo Boulevard NE, (b, right) Oblique Aerial of location

Digital Billboard No. 12 advertises to southbound traffic on San Mateo Boulevard NE north of Lomas Boulevard NE. Digital Billboard No. 12 is a right-hand reader and a free-standing, center-mount, vee configuration with an eccentric upright. Figure 16a is a photo of the digital face. Figure 16b shows the location in an oblique aerial. The digital face was converted from a conventional face on 13Nov07 using the existing structure.

**Figure 16.** Digital No. 12  
(a, left) View on San Mateo Boulevard NE, (b, right) Oblique Aerial of location

Digital Billboard No. 13 advertises to eastbound traffic on Academy Road NE west of McKinney Drive NE. Digital Billboard No. 13 is a cross and center reader and a free-standing, flag configuration with an eccentric upright. Figure 17a is a photo of the digital face. Figure 17b shows the location in an oblique aerial. The digital face was converted from a conventional face on 31Aug06 using the existing structure.

**Figure 17.** Digital No. 13  
(a, left) View on Academy Road NE, (b, right) Oblique Aerial of location

Digital Billboard No. 14 advertises to westbound traffic on Montgomery Boulevard NE west of Louisiana Boulevard NE. Digital Billboard No. 14 is a right-hand reader and a free-standing, center-mount configuration with an eccentric upright. Figure 18a is a photo of the digital face. Figure 18b shows the location in an oblique aerial. The digital face was converted from a tri-vision face on 17Aug06 using the existing structure.

**Figure 18.** Digital No. 14  
(a, left) View on Montgomery Boulevard NE, (b, right) Oblique Aerial of location

Digital Billboard No. 15 advertises to southbound traffic on Wyoming Boulevard NE north of Lomas Boulevard NE. Digital Billboard No. 15 is a right-hand reader and a free-standing, center-mount configuration. Figure 19a is a photo of the digital face. Figure 19b shows the location in an oblique aerial. The digital face was converted from a conventional face on 30Aug06 using the existing structure.

**Figure 19.** Digital No. 15  
(a, left) View on Wyoming Boulevard NE, (b, right) Oblique Aerial of location



Digital Billboard No. 16 advertises to westbound traffic on Lomas Boulevard NE west of Easterday Drive NE. Digital Billboard No. 16 is a right-hand reader and a free-standing, vee, flag configuration. Figure 20a is a photo of the digital face. Figure 20b shows the location in an oblique aerial. The digital face was converted from a conventional face on 14Nov07 using the existing structure.

**Figure 20.** Digital No. 16 (a, left) View on Lomas Boulevard NE, (b, right) Oblique Aerial of location

Digital Billboard No. 17 advertises to southbound traffic on Eubank Boulevard NE north of Candelaria Road NE. Digital Billboard No. 17 is a cross reader and a free-standing, flag configuration. Figure 21a is a photo of the digital face. Figure 21b shows the location in an oblique aerial. The digital face was converted from a conventional face on 17Aug06 using the existing structure.

**Figure 21.** Digital No. 17 (a, left) View on Eubank Boulevard NE, (b, right) Oblique Aerial of location



20a



20b



21a



21b

*AADT ranges individually near the seventeen billboards from 14 to 80 thousand vehicles per day, or equivalently 5 to 29 million vehicles per year.*

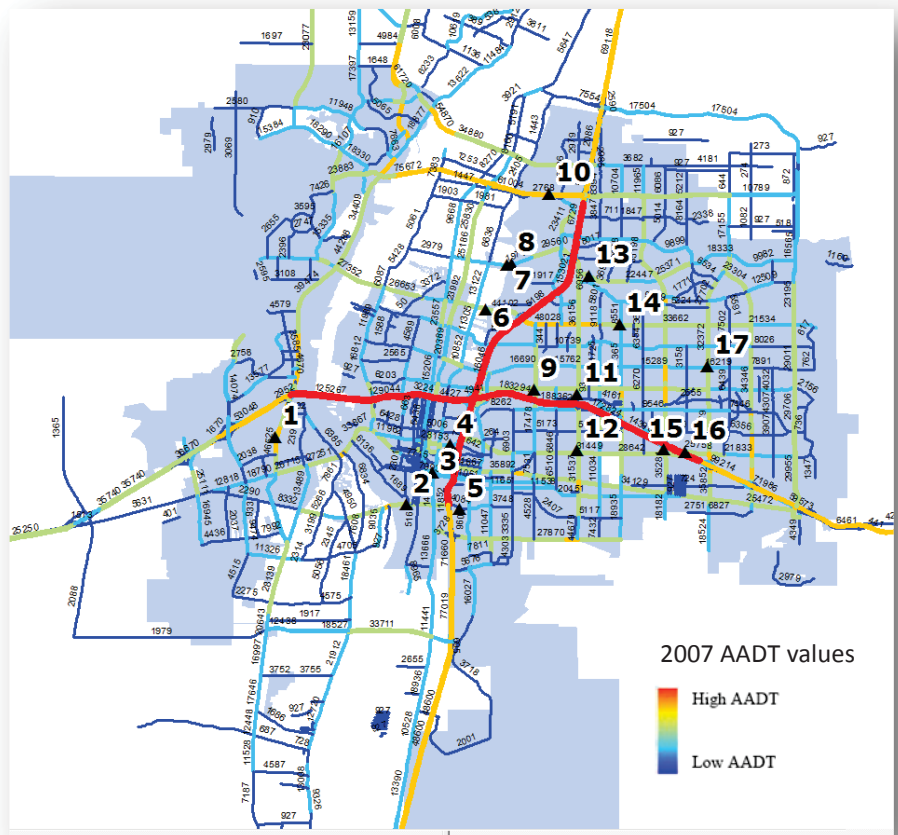
### TRAFFIC VOLUME DATA

Traffic volume data for the City of Albuquerque was obtained from the New Mexico Department of Transportation (NMDOT) and included the annual average daily traffic (AADT), which is the average of 24-hour counts collected throughout the year. The AADT volumes were recorded in Albuquerque between 2002 and 2008.

The AADT values are summarized in Figure 22. AADT ranges individually near the seventeen digital billboards from 14 to 80 thousand vehicles per day, or equivalently 5 to 29 million vehicles per year. For all seventeen billboards, this collectively represents approximately 665 thousand vehicles per day or 240 million vehicles per year.

AADT Traffic Volumes (thousands per day) near digital billboard locations

Digital	2008	2007	2006	2005	2004	2003	2002
1	52.7	46.5	46.2	45.9	44.9	35.8	36.1
2	48.2	37.9	40.1	37.4	39.9	33.4	38.2
3	14.6	21.7	21.0	19.6	19.2	18.7	19.8
4	28.6	22.1	21.8	21.6	21.2	20.6	20.3
5	18.6	18.7	16.6	16.8	16.2	15.9	16.3
6	38.0	29.1	28.7	28.5	27.9	27.2	26.9
7	25.7	19.7	19.4	19.3	18.9	18.4	18.5
8	25.7	19.7	19.4	19.3	18.9	18.6	18.5
9	29.3	28.9	32.9	29.7	28.2	57.5	26.9
10	79.5	65.4	64.5	64.1	59.0	37.8	36.4
11	51.8	39.7	39.2	38.9	38.8	40.8	37.1
12	50.9	39.0	39.3	40.9	40.6	26.5	41.6
13	32.9	35.3	33.0	33.3	33.6	41.5	26.7
14	45.5	44.5	43.8	43.6	42.6	35.8	43.2
15	45.5	35.2	33.5	36.5	36.7	20.9	33.7
16	33.5	25.7	25.4	24.6	24.6	29.1	20.5
17	44.1	33.3	33.3	32.4	32.4	29.0	28.5



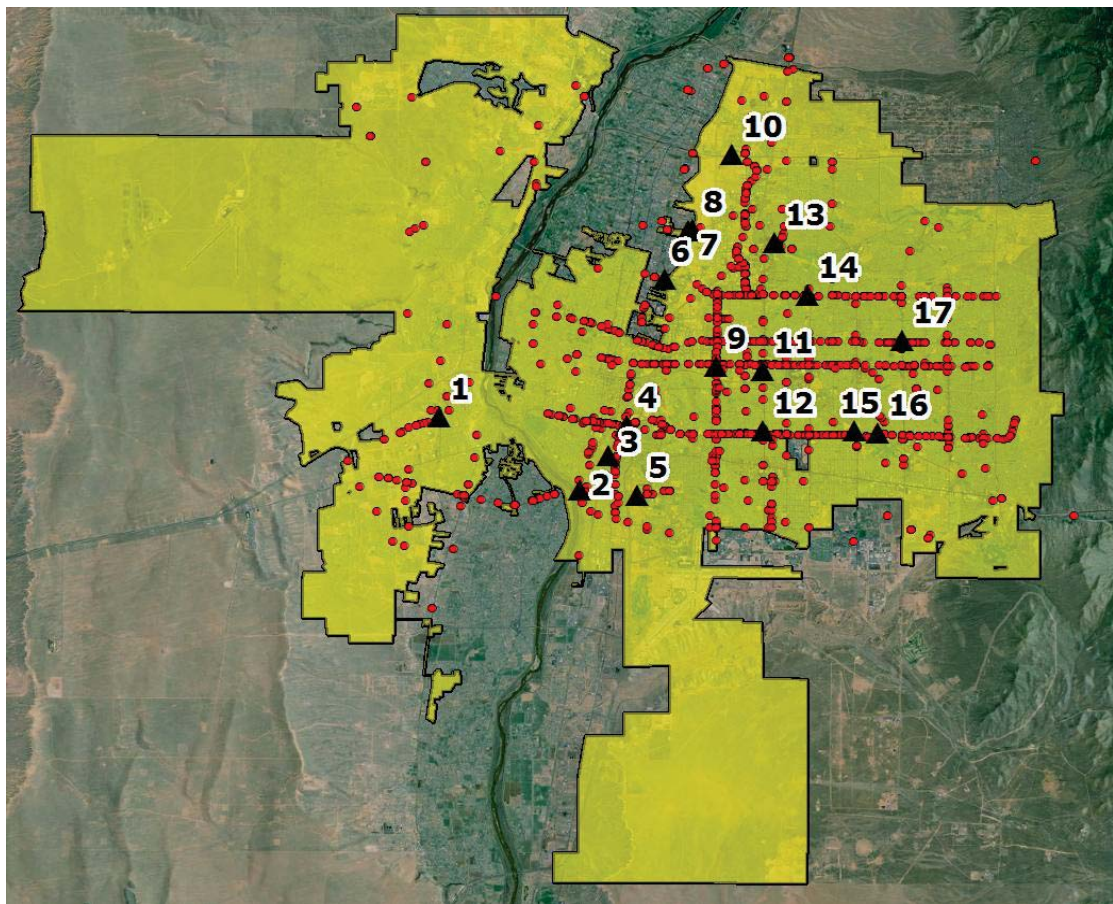
**Figure 22.** AADT Volume Data near digital billboard locations in Albuquerque, NM summarized in a table from 2002 to 2008 (left) and thematically mapped for 2007 (right)



## ACCIDENT DATA

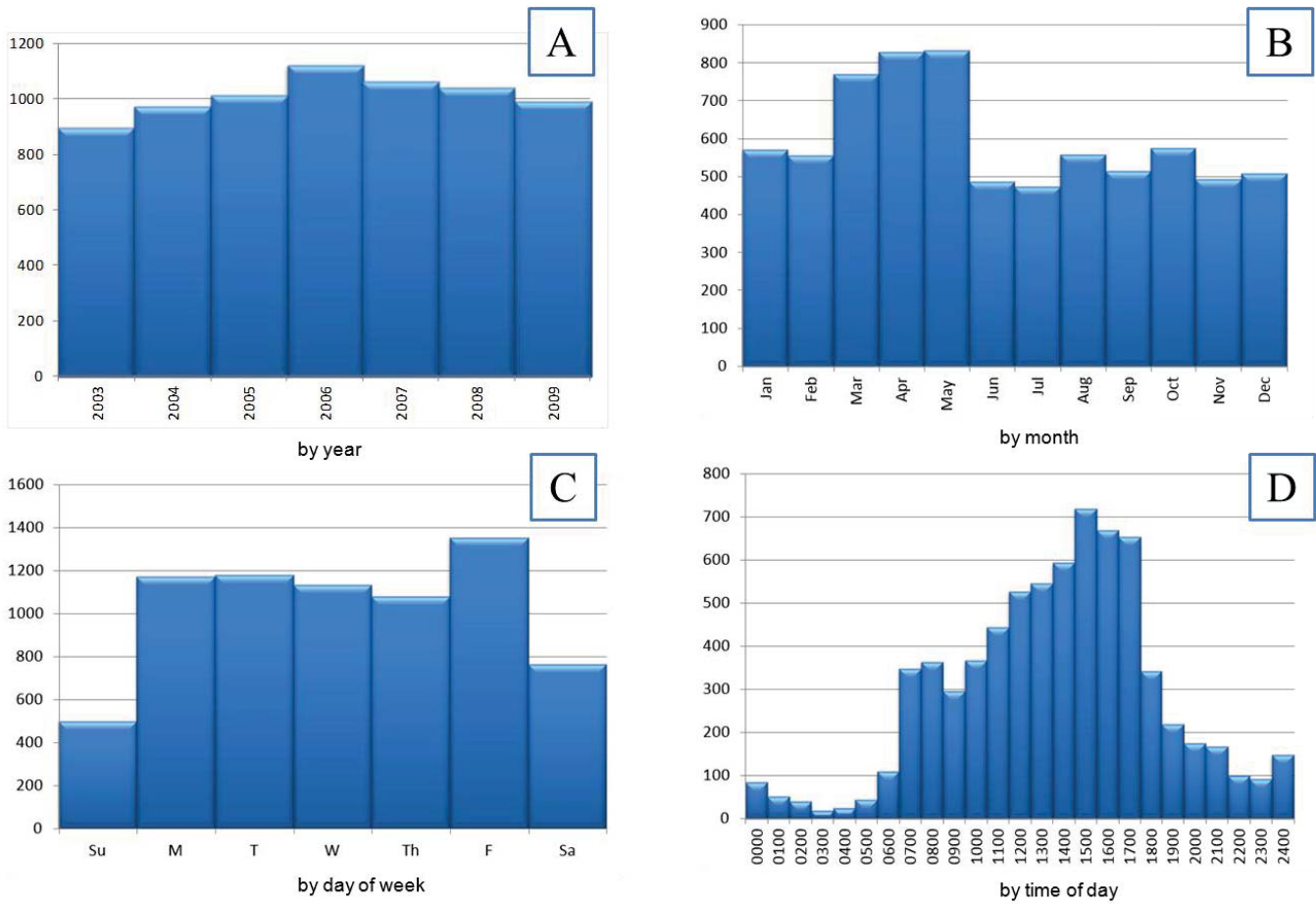
In Albuquerque, the majority of accident reports are investigated and recorded by the City of Albuquerque Police Department. Data is maintained by the Police Department. Law enforcement officials are required to submit reports on crashes they investigate that meet reporting thresholds provided by statute, which is five hundred dollars or more in property damage, or that anyone was injured, or killed in the crash. Data generally conforms to the American National Standards Institute (ANSI) Standard D16.1 – 1996, Manual on Classification of Motor Vehicle Traffic Accidents.

The accident data set provided by the Police Department of the City of Albuquerque includes 7,000 accidents over seven years between 2003 and 2009 and near digital billboard locations. Most of the data is specified by addresses and intersections. Figure 23 shows the geocoded accident locations generally near digital billboards in the City of Albuquerque.



**Figure 23.** Traffic Accidents (red dots) near digital billboard locations in Albuquerque, NM, from 2003 to 2009

Figure 24 summarizes the traffic accident data for the past seven years generally within one mile of the digital billboard locations in the City of Albuquerque and shows the distribution of accidents by year, month, day of week and time of day. This represents a consistent pattern of data and illustrates that more accidents occur on weekdays and at rush hour (before and after work).



**Figure 24.** Histogram of traffic accident data of the past seven years near digital billboards in the City of Albuquerque and by (A) year, (B) month, (C) day of week digital and (D) time of day

*The analysis of this robust data involves an engineering-statistics based approach and uses a widely accepted method to show what happened when these seventeen digital billboards were installed in Albuquerque.*

## **ANALYSIS**

The analysis of this robust data involves an engineering-statistics based approach and uses a widely accepted method to show what happened when these seventeen digital billboards were installed in Albuquerque. The analysis has two parts.

The first part is a temporal analysis. The incidence of traffic accidents near the digital billboards is examined for an equal length of time before and after the digital billboards were installed and activated. This part is for the purpose of establishing if traffic accidents occurred more or less frequently in the presence of these digital billboards. With information collected from police accident reports, the temporal analysis also uses metrics such as traffic volumes, the accident-rate values, the maximum number of accidents during any given month, etc.

For comparison, accident statistics were summarized near the digital billboards within multiple vicinity ranges of 0.2, 0.4, 0.6, 0.8, and 1.0 miles both upstream and downstream of the billboard. These vicinity ranges also sampled data to include: (1) accidents along the principal roads to which the digitals directly advertise, (2) accidents recorded as occurring within the intersection of the primary road and any cross roads, and (3) for crossroad accidents within a reasonable distance from the primary road to include drivers turning onto or leaving the primary road. Accident data for roads to which the digitals do not advertise or are not connected were excluded, even if they were within the specified vicinity range.

The second part is a spatial analysis. This establishes statistical correlation coefficients between the digital billboards and accidents. Correlation coefficients are statistical measures of the “association” between two sets of data. The results are analyzed for various scenarios accounting for accident density and billboard proximity.

Additionally, subsets of accident data for age of driver and for daytime and nighttime accidents were analyzed for before and after comparisons. For a more lengthy discussion of analysis methods, please refer to previous studies (see References 6 and 7).

*The number of accidents and rates of accidents near the seventeen digital billboards remained consistent within all vicinity ranges.*

## RESULTS

Figure 25 shows a comparison of the accident metrics before and after the conversion near all seventeen digital billboards studied in Albuquerque. The statistics are summarized for vicinity ranges of 0.2, 0.4, 0.6, 0.8 and 1.0 miles of the billboard. The metrics include the total number of accidents, the average number of accidents in any given month, the peak number of accidents in any given month, etc. Other metrics, including rates and vehicle-miles traveled, were also analyzed.

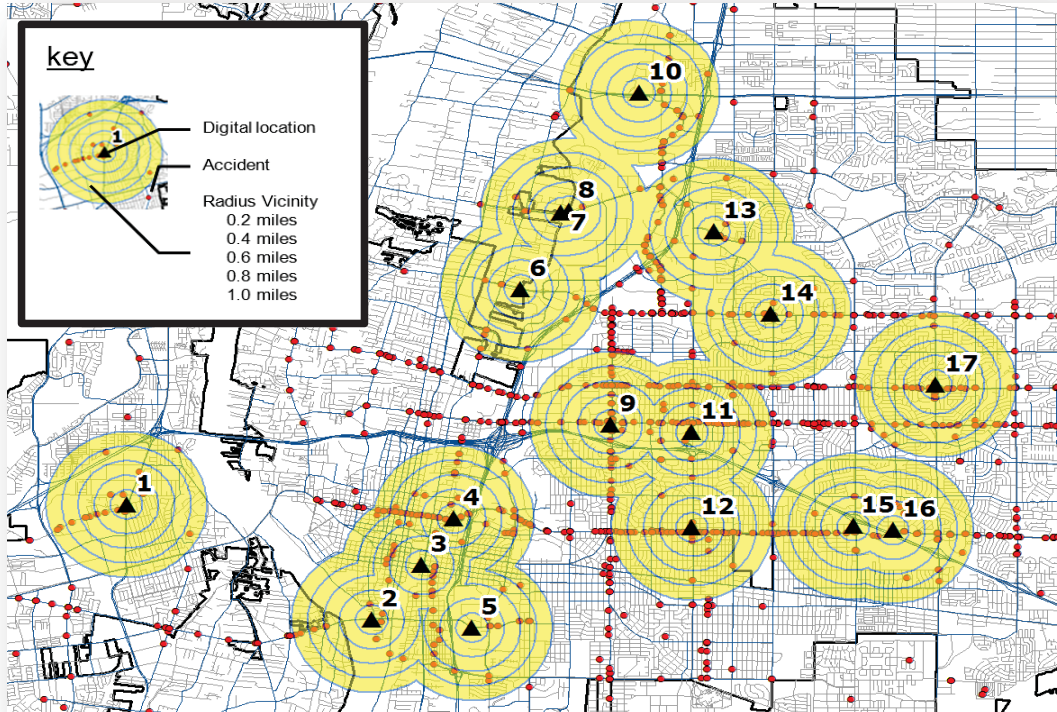
The number of accidents and rates of accidents near the seventeen digital billboards decreased in all vicinity ranges, except in 1.0 miles. The benchmark 0.6 mile vicinity experienced a 3.3% decrease in accidents over the average seven year span for all signs; this includes 1.6 fewer accidents per month after conversion. Figure 26 shows the locations of accidents for each of the seventeen signs and within vicinity ranges within 0.2, 0.4, 0.6, 0.8 and 1.0 miles of the billboards. Figure 27 shows the distributions of the number of accidents per month near digital billboards between 2003 and 2009 within vicinity ranges with radii of 0.2, 0.4, 0.6, 0.8 and 1.0 miles and in Albuquerque, NM. Each blue line shows the approximate conversion date of the first ten and second seven digitals; the dashed rectangles show equal time periods for months before and after the conversion dates. Within the 0.6 mile vicinity, the average number of accidents in any given month decreased from 48.5 to 46.9 collectively for these seventeen signs; similarly the peak number of accidents in any given month decreased from 88 to 79. Similar decreases and trends in both averages and peaks were observed for both smaller and larger vicinity ranges.

A statistical t-test was used to compare whether the average difference between the two, time periods is really significant or if it is due to random difference. Using a 95% confidence interval, there is no statistically significant difference in the accident statistics evaluated between conventional and digital billboards near these digital locations.

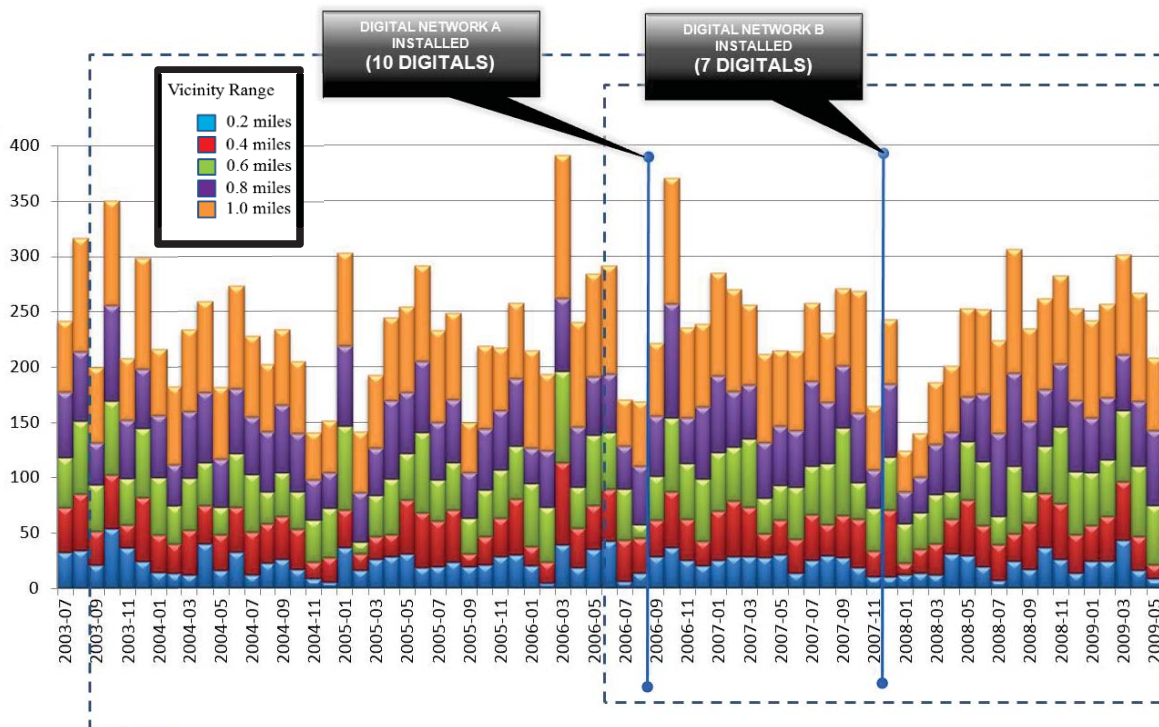
Consistent results were obtained for before and after comparisons of the older set of ten digital conversions, and for the later set of seven digital conversions, respectively. Additionally, consistent results were obtained for driver-age comparisons. Low correlation coefficients were calculated for the spatial analysis. Correlation coefficients were calculated and indicated a very strong correlation of accident patterns near digital billboards when compared with the accident patterns prior to conversion.

		DISTANCE RANGE FROM BILLBOARD (MILES)				
		0.2	0.4	0.6	0.8	1.0
Prior to Installation	Total Accidents as Conventional Billboard	805	1228	1650	1931	2569
	Average Number of Accidents in a Month	23.7	36.1	48.5	56.8	75.6
	Standard Deviation	11.2	15.2	15.8	15.0	18.7
	Peak Number of Accidents in Any Given Month	54	74	88	93	129
	Minimum Number of Accidents in Any Given Month	4	12	25	32	42
Digital Billboard	Total Accidents as Digital Billboard	752	1181	1595	1858	2578
	Average Number of Accidents in a Month	21.5	34.7	46.9	54.6	75.8
	Standard Deviation	9.2	10.6	14.7	12.1	16.9
	Peak Number of Accidents in Any Given Month	43	53	79	83	112
	Minimum Number of Accidents in Any Given Month	7	10	12	29	37
% Change	Total Accidents, % Change	-6.6%	-3.8%	-3.3%	-3.8%	0.4%
	Change in Average Number of Accidents in a Month	-2.2	-1.4	-1.6	-2.1	0.3

**Figure 25.** Summary accident statistics during seven years within vicinity ranges of 0.2, 0.4, 0.6, 0.8 and 1.0 miles near seventeen digital billboards locations in Albuquerque, NM



**Figure 26.** Accident location near digital billboards between 2003 and 2009 within vicinity ranges with radii of 0.2, 0.4, 0.6, 0.8 and 1.0 miles and in Albuquerque, NM.



**Figure 27.** Stacked distributions of the number of accidents per month near digital billboards between 2003 and 2009 within vicinity ranges with radii of 0.2, 0.4, 0.6, 0.8 and 1.0 miles and in Albuquerque, NM. Each blue line shows the approximate conversion date of the first ten and second seven digitals; the dashed rectangles show equal time periods for months before and after the conversion dates.

Figure 28 summarizes the accident rates that account for variations in traffic volumes for all digital locations within vicinity ranges. The 0.6 mile benchmark vicinity experienced a decrease in accident rates over the seven-year span; the change in accident rates decreased 0.04 accidents per 100,000 vehicles per year. Similar decreases and trends were observed for both smaller and larger vicinity ranges.

		DISTANCE RANGE FROM BILLBOARD (MILES)				
		0.2	0.4	0.6	0.8	1.0
Prior to Installation	Average Accident Rate per 100,000 vehicles average per year prior to installation	0.14	0.21	0.28	0.33	0.44
Digital Billboard	Average Accident Rate per 100,000 vehicles average per year after installation	0.12	0.18	0.24	0.28	0.40
Change	Change in Average Accident Rate per volume per 100,000 vehicles average per year after installation	-0.02	-0.03	-0.04	-0.04	-0.04

**Figure 28.** Summary accident rates during seven years within vicinity ranges of 0.2, 0.4, 0.6, 0.8 and 1.0 miles near seventeen digital billboards locations in Albuquerque, NM

## COMPARISON OF ACCIDENTS BY AGE OF DRIVER

The accident statistics were also analyzed to determine if the age of the drivers involved in the accidents near digital billboards was a factor. The data was specially studied to determine if there are increases in the accident rates of young drivers (under 21) or elderly drivers (65 and older). Figure 29 shows the distribution of accidents by age of driver for all accidents, by age of female drivers, and by age of male drivers.

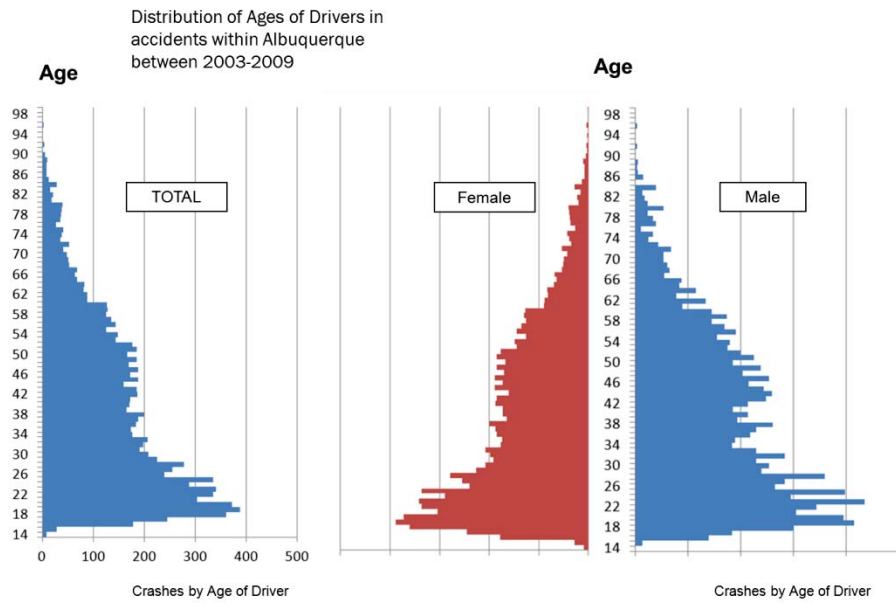
Figure 30 shows the distributions of ages of driver for all accidents within a one mile vicinity before digital conversions (top, left), after digital conversion (top, right) and the correlation between before and after conversions for the number of accidents for each age (bottom). Individual accidents may have multiple cars and drivers involved, which is reflected in the analysis. In comparing the histograms in Figure 30, note the typical distribution type (shape) and typical average values. The average driver age for accidents prior to digital conversion is 38.2 years; the average drive age after conversions is 38.4 years.

Correlation coefficients were calculated and indicated a very strong correlation of accident patterns for age-of-driver factors. Figure 33 shows a 0.980 (98.0%) correlation coefficient when comparing accidents before conversion with those after conversion.

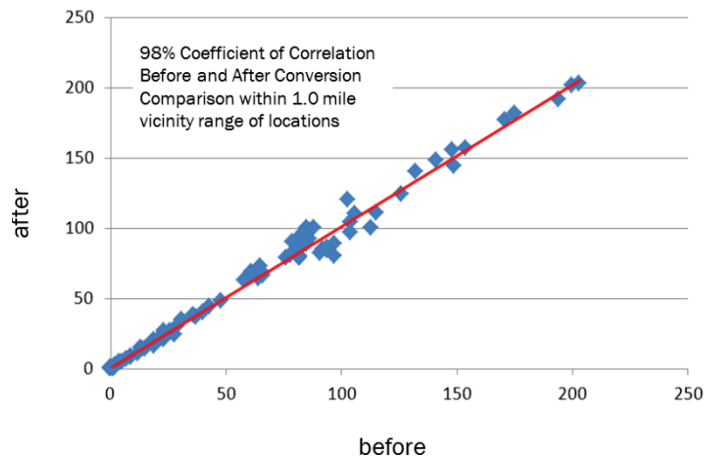
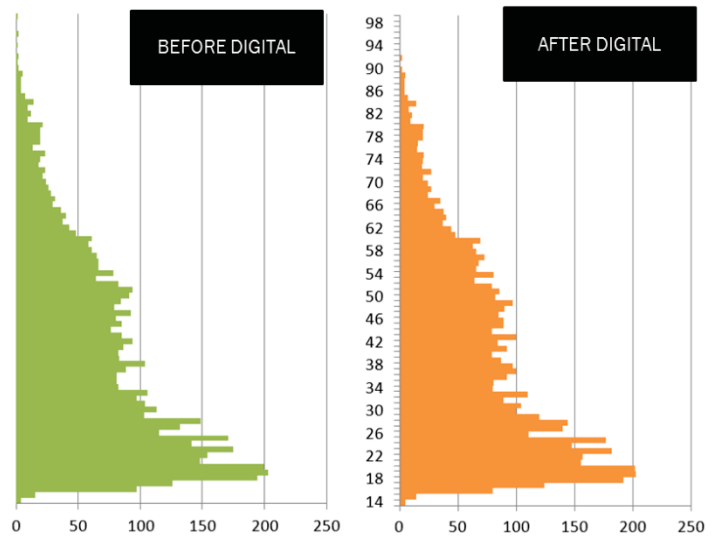
Additionally, the accident statistics were also analyzed to determine if the time of day of accidents near digital billboards was a factor. The data was specially studied to determine if there are increases in the accident rates during dawn, daylight, dusk and dark/nighttime conditions near these digital billboards. Correlation coefficients were calculated and indicated a very strong correlation of accident patterns for time-of-day factors. There is a 0.976 (97.6%) correlation coefficient when comparing accidents before conversion with those after conversion.



## COMPARISON OF ACCIDENTS BY AGE OF DRIVER



**Figure 29.** Distributions of age of driver for all accidents, by age of female drivers and by age of male drivers and for accidents within one mile of digital billboards in Albuquerque



**Figure 30.** Distributions of age of driver for all accidents before digital conversion (top, left green histogram), after digital conversion (top, right orange histogram) and the correlation between before and after of number of accidents for each age (bottom).

*Simply stated, the data shows no increase of accident rates near these billboards.*

## FINDINGS

Albuquerque, New Mexico, was a unique opportunity for this study about the statistical associations between digital billboards and traffic safety using robust data sets and analyzing multiple locations for periods of as much as seven years. The overall conclusion is that the digital billboards in Albuquerque have no statistically significant relationship with the occurrence of accidents. This conclusion is based on the City of Albuquerque's own data and an objective statistical analysis; the data shows no increase in accident rates. This study also finds that the **age of drivers (younger, older) and the time of day (nighttime, daytime) are neutral factors** which show no increase in accident rates near digital billboards along the local roads in Albuquerque.

The specific conclusions of this study of Albuquerque indicate the following.

- **The number and rates of accidents near the seventeen digital billboards show a 3.3% decrease** within 0.6 miles of all digital billboards over an average seven years. Similar decreases and trends in both averages and peaks were observed for both smaller and larger vicinity ranges.
- **The accident statistics and metrics remain consistent**, exhibiting statistically insignificant variations at each of the digital billboards. The metrics include the total number of accidents in any given month, the average number of accidents over the 52- to 84-month periods, the peak number of accidents in any given month, and the number of accident-free months. These conclusions account for variations in traffic-volume and other metrics.
- **Consistent results were obtained for comparisons of daytime and nighttime accidents and for young and elderly drivers in accidents.** Correlation coefficients were calculated and indicated a very strong correlation of accident patterns near digital billboards when compared with the accident patterns near the former, conventional-face billboards.

Simply stated, **the data shows no increase of accident rates near these billboards.**

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