

Digital Billboards and Traffic Safety Risks

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RESEARCH SCOPE

- Investigate links between Digital Advertising Billboards-Distraction-Traffic Safety Risk
- Multi-state and multi-facet approach
 1. State-of-Practice-Synthesis
 2. Survey of Road Users
 3. Driving Simulator Study
 4. Epidemiological Study



DIGITAL BILLBOARDS UNIQUE FEATURES

- Brightness and contrast with surroundings
- Messages changing suddenly
- Realistic imagery
- No acclimation with message
- Potential for message sequencing
- Potential for interactivity with driver



1. STATE-OF-PRACTICE SYNTHESIS Approach

- Meta-analysis studies
- Crash studies of historical trends
- Laboratory studies
- Naturalistic studies of driving behavior



STATE-OF-PRACTICE SYNTHESIS

Findings

- Overall, the state-of-practice synthesis suggests that **there is evidence** of correlation between digital advertising billboards and increased driver distraction.
- However, local conditions, experimental settings, and other factors may play a role in the **actual impact** that digital advertising billboards have on traffic safety

2. SURVEY OF ROAD USERS

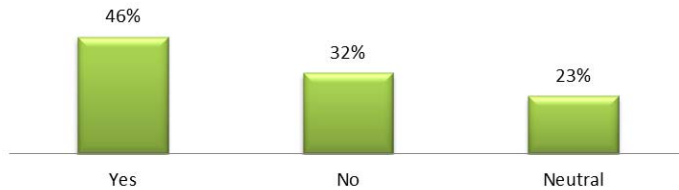
Approach

- **Goal:** Survey of driver's perceptions and attitudes toward digital advertising billboards
 - Demographics/Exposure
 - Perceived safety and efficiency
 - Regulations
- **Method:**
 - Online
- **Response:**
 - 295 AL; 429 FL

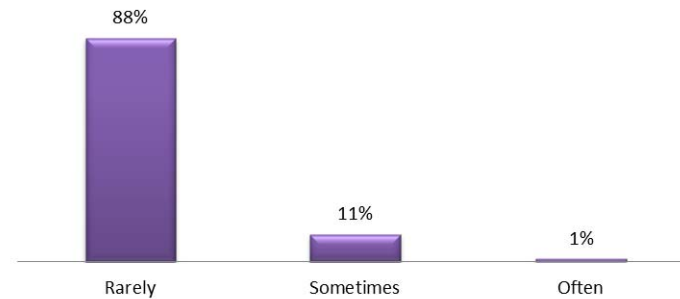
SURVEY OF ROAD USERS

Sample Findings- Alabama Drivers

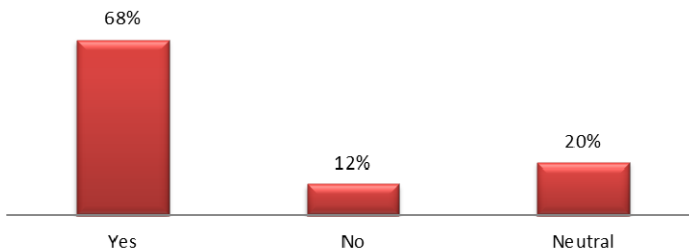
Are billboards distracting in general?



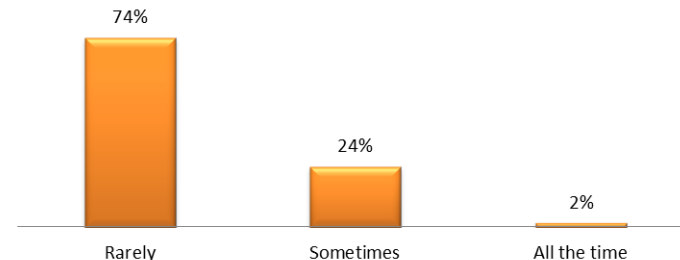
Do you slow down to read digital billboard messages?



Are digital billboards more distracting than static?



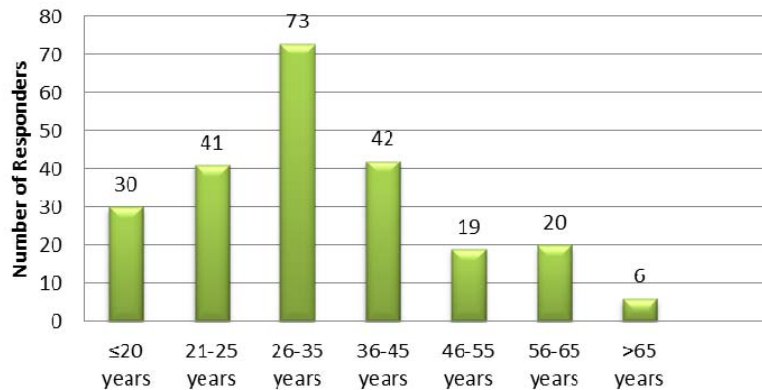
How often do you use info from digital billboard messages?



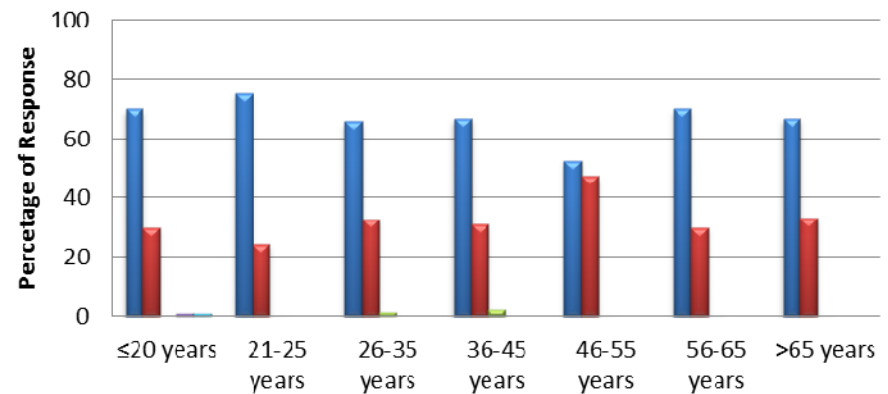
SURVEY OF ROAD USERS

Sample Findings- Alabama Drivers

Number of Responders by Age

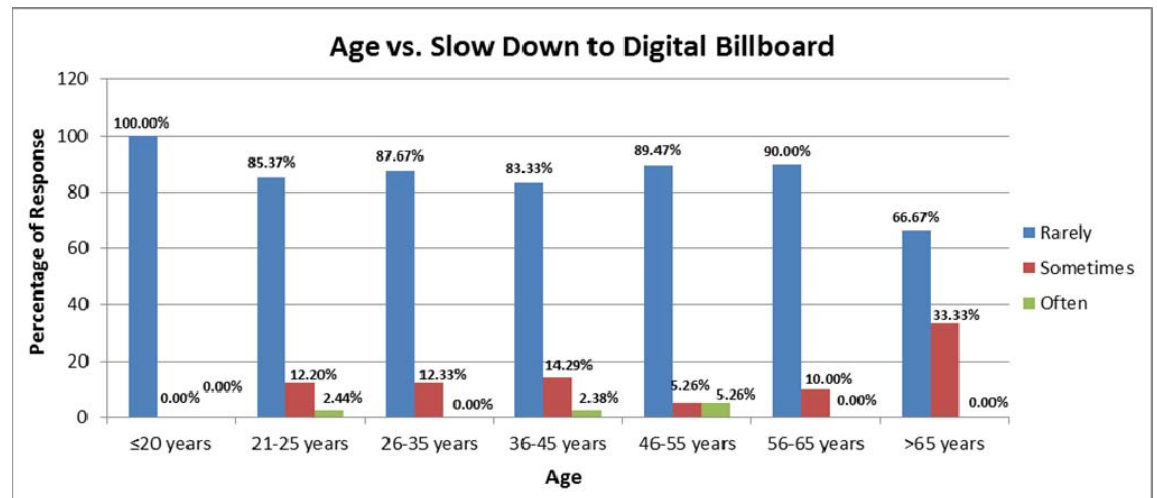
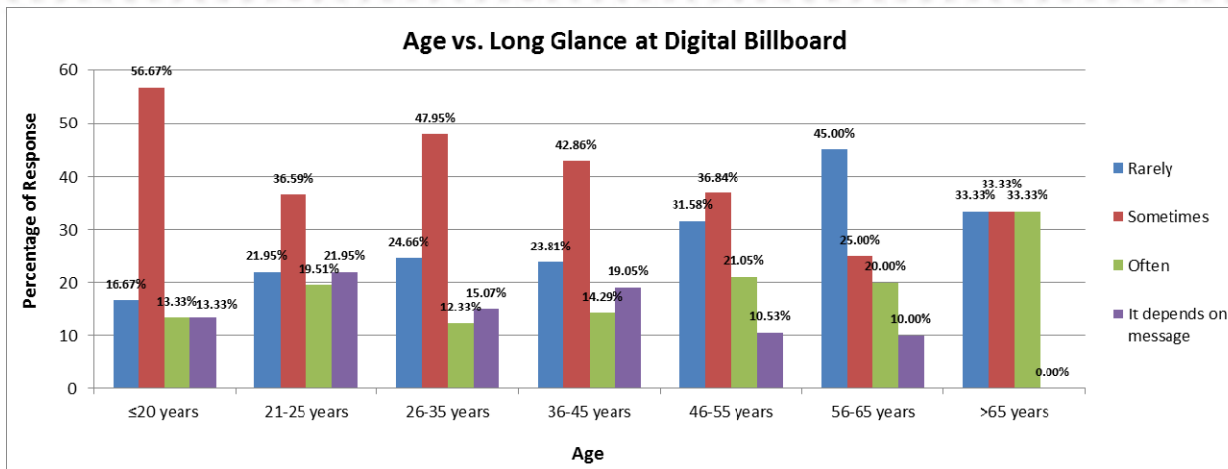


Age vs. Perception on More Distraction of Digital Billboard



SURVEY OF ROAD USERS

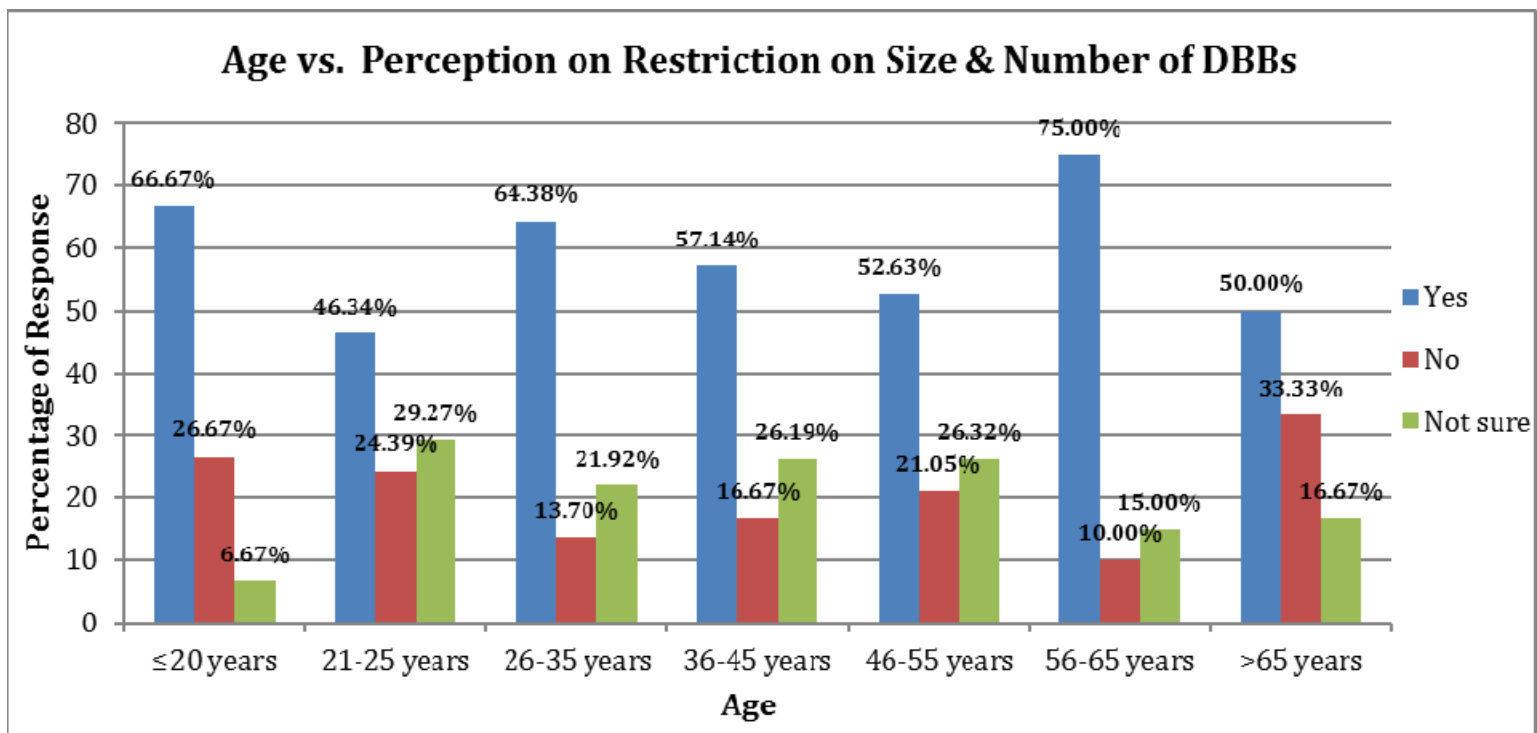
Sample Findings- Alabama Drivers



SURVEY OF ROAD USERS

Sample Findings- Alabama Drivers

Q: Should there be restrictions on the size and number of digital billboards for traffic safety?



SURVEY OF ROAD USERS

Findings Summary- Alabama Drivers

- Road users perceive **digital billboards as more dangerous than static**
- **Younger drivers** admit staring at digital billboards longer without adjusting their speeds
- Responders overwhelmingly agree on the **need for stricter regulations** of billboards (related to the location of billboards, size and number of DBBs)

3. DRIVING SIMULATION STUDY Approach

- **Goal:** Evaluate the distractive effects of roadside billboards through the use of the UAB driving simulator
- **Approach:**
 - Developed driving simulator data collection protocol
 - Developed driving simulator scenarios
 - 16 mile simulated highway driving scenario, with a mixture of digital and static billboards
 - Recruit participants (57)
 - Data collection and analysis



DRIVING SIMULATION STUDY

Analysis

- Length of Eye Gaze

Percent of time participants spent looking at billboards while driving

- Memory Recall and Recognition

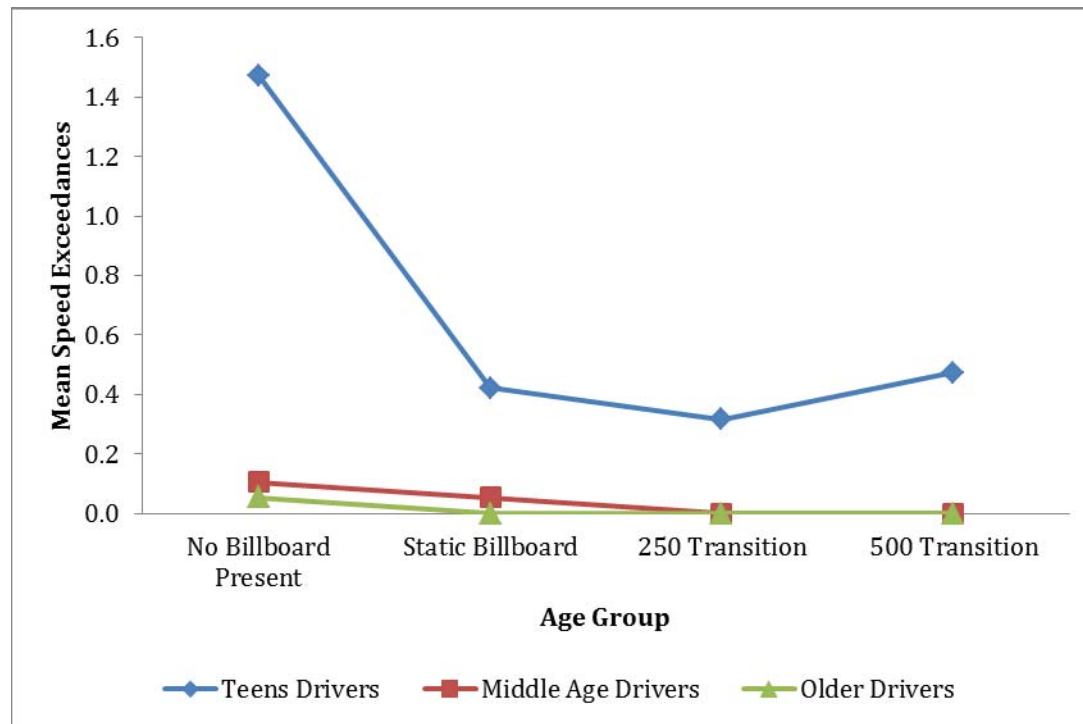
Post-drive memory recall of information presented on billboards.

- Driving Performance

- a) the number of speed limit exceedances, $v > 69$ (mph)
- b) the number of road edge excursions, and
- c) the total number of motor vehicle collisions

DRIVING SIMULATION STUDY

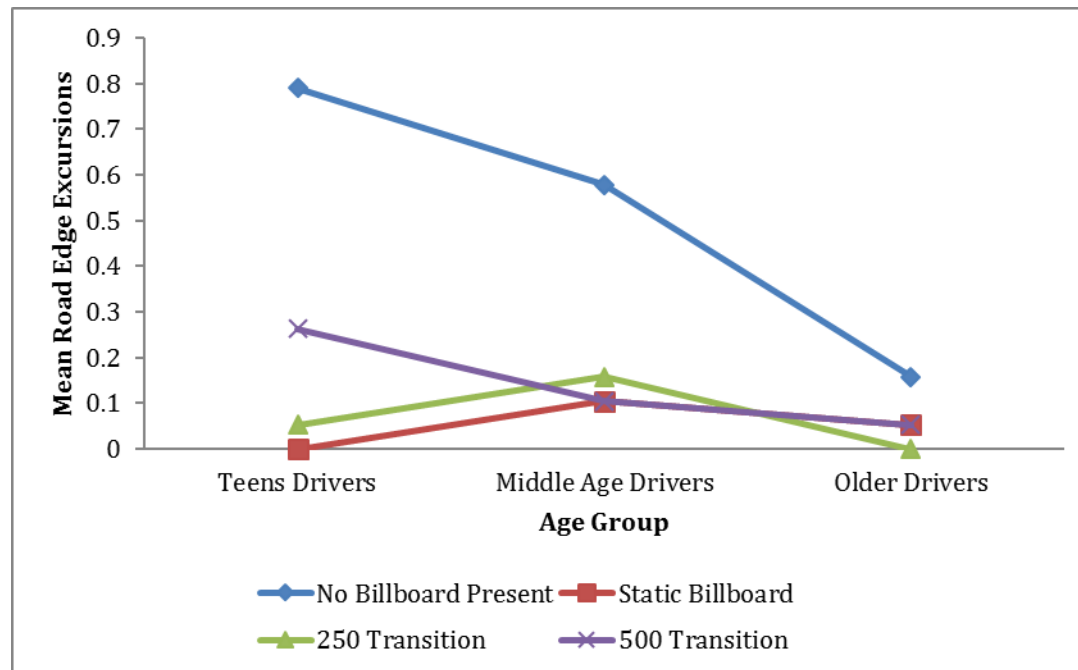
Sample Findings



- Participants had fewer speed exceedances when there was a billboard present
- Teens, as expected, had more speed exceedances than middle aged and older drivers

DRIVING SIMULATION STUDY

Sample Findings



DRIVING SIMULATION STUDY

Conclusions

- Significant main effects of age group and billboard type were found
- Billboards drew the visual attention of teen drivers significantly more than that of drivers in the other age groups
- Digital billboards, particularly those transitioning at 500 ft, evoked significantly more attention than static billboards
- Teens had more speed exceedances than middle aged and older drivers
- Older drivers had poorer performance in the recognition and recall tests compared to middle aged drivers

4. CRASH ANALYSIS

Approach

- **Goal:** Analysis of historical crash records in the vicinity of digital billboards
- **Approach:**
 - Identification of digital billboards
 - Select study segments (0.5 mile u/s + 0.02 mile d/s of DBBs) and control segments (farther d/s from DBBs)
 - Obtain historical crash data from reliable sources
 - Perform spatial analysis of crash data (where and how far from DBBs) to find statistical relationships between crash rate and digital billboard presence.

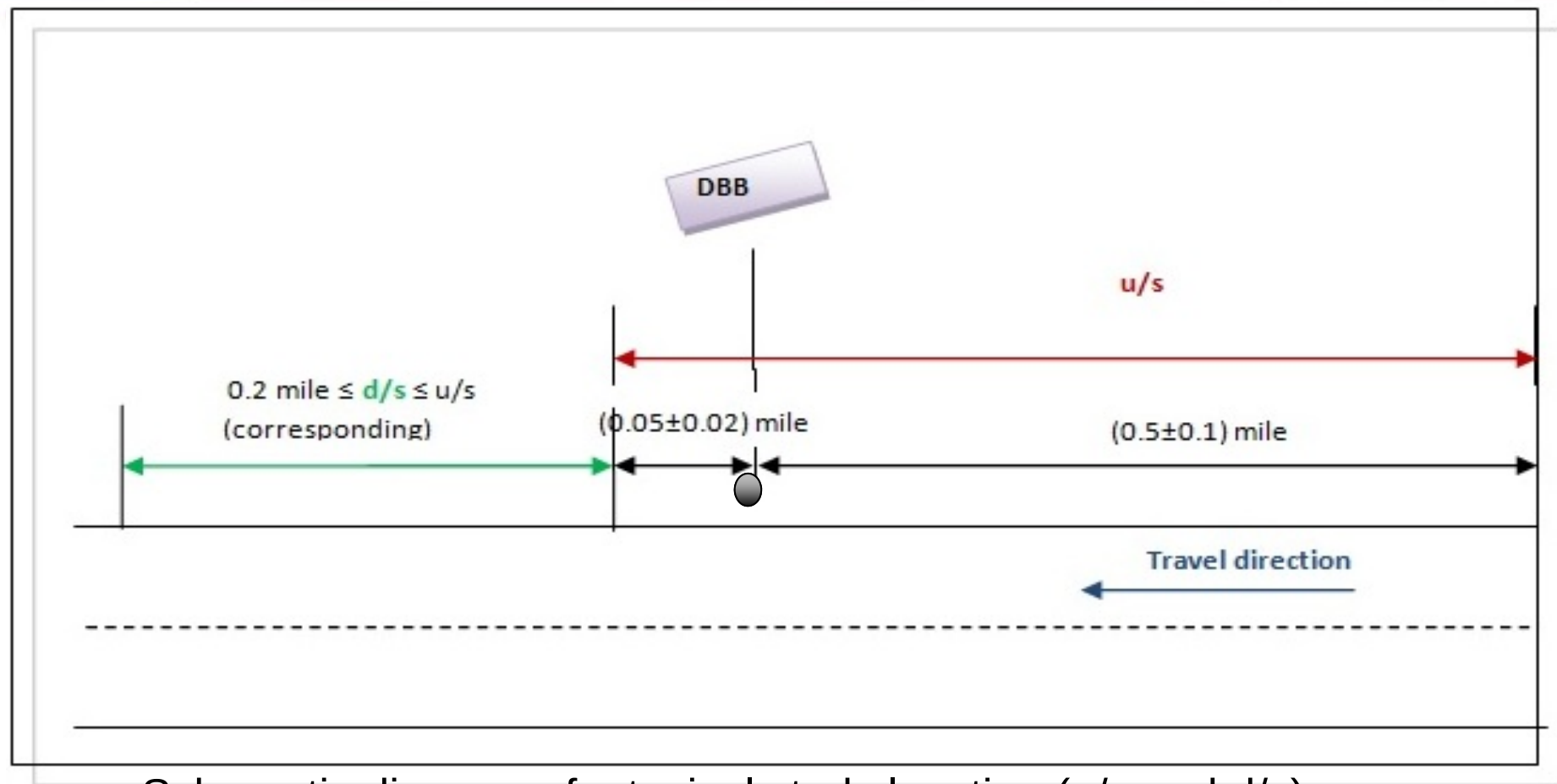
CRASH ANALYSIS

Study site selection criteria

- Long, straight section of road
- No billboard inside the influence and non-influence zones
- Good visibility
- Uniform traffic flow (AADT)
- Similar roadway geometry (e.g. lane number, lane width etc.)

CRASH ANALYSIS

Typical layout of study location



Schematic diagram of a typical study location (u/s and d/s)

CRASH ANALYSIS

Approach- Specifics-1

- ✓ Identification of sites
 - o AL: I-65; I-20/59, I-459; I-565; I-85; I-10
 - o FL: SR 826, SR 408, and SR 528. I-95, I-395, and I-4
- ✓ The impact of digital advertising billboard on traffic safety has been analyzed at 8 and 10 DBB locations on limited access facilities in AL and FL respectively
- ✓ 377 crashes in FL and 77 crashes in AL were used for analysis
- ✓ Crash data analysis

$$CR = \frac{\text{Crash Count} * 10^6}{0.5 * AADT * 365 * L * N}$$

Example of study site; Location ID 19 on I-4 WB in Tampa



4. CRASH ANALYSIS

Crash Rates by Location– Alabama Sites

Summary Crash Statistics at the AL Digital Billboard Locations

Loc	City	DBB Influence Zone (U/S)				DBB Non-Influence Zone (D/S)				% Change in Crash Rate
		Len. (mi)	Total Crash Count	AADT	Crash Rate*	Len. (mi)	Total Crash Count	AADT	Crash Rate*	
1	Mobile	0.453	6	368990	0.197	0.453	7	368990	0.229	16.67
2	Mobile	0.467	15	470500	0.374	0.237	9	470500	0.442	18.23
3	Mont- gomery	0.396	5	228640	0.303	0.396	2	228640	0.121	-60.00
4	Madison	0.373	4	291580	0.202	0.373	1	291580	0.050	-75.00
5	Huntsville	0.353	3	453160	0.103	0.353	4	453160	0.137	33.33
6	Huntsville	0.486	3	453160	0.075	0.207	0	453160	0.000	-100.00
7	Bessemer	0.505	4	249850	0.174	0.505	5	249850	0.217	25.00
8	Bessemer	0.497	9	248480	0.399	0.497	0	248480	0.000	-100.00
Total crashes		3.53	49	344489	0.221	3.021	28	324859	0.156	-29.19

4. CRASH ANALYSIS

Crash Rates by Location– Florida Sites

Summary Crash Statistics at the FL Digital Billboard Locations

Loc.	City	DBB Influence Zone (U/S)				DBB Non-Influence Zone (D/S)				% Change in Crash Rate
		Len. (mi)	Total Crash Count	AADT	Crash Rate*	Len. (mi)	Total Crash Count	AADT	Crash Rate*	
1	Delray Beach	0.23	1	195,000	0.041	0.54	14	193,250	0.245	501.70
2	Miami	0.39	13	123,808	0.492	0.21	9	143,333	0.546	11.06
3	Doral	0.40	21	210,000	0.457	0.35	36	211,667	0.888	94.38
4	Miami	0.20	15	162,900	0.841	0.20	41	160,720	2.330	177.04
5	Miami	0.19	97	245,000	3.806	0.26	35	251,543	0.977	-74.32
6	Hallandale Beach	0.28	54	232,389	1.516	0.24	15	238,253	0.479	-68.39
7	Eatonville	0.40	3	160,000	0.086	0.40	3	151,500	0.090	5.61
8	Orlovista	0.36	1	60,000	0.085	0.17	2	60,000	0.358	323.53
9	Orlando	0.40	2	42,750	0.214	0.17	0	---	0.000	-100.00
10	Tampa	0.40	8	153,750	0.238	0.34	7	153,929	0.244	2.82
Total Crashes		3.25	215	---	0.809	2.88	162	---	0.608	-24.79

CRASH ANALYSIS SUMMARY FINDINGS

Crash rates by location

- From the analysis on crash rates by location it is found that:
 - Crash rate is 29% higher at DBB influence zones in Alabama, compared to non-influence zones
 - Crash rate is 25% higher at DBB influence zones in Florida, compared to non-influence zones

CRASH ANALYSIS

Crash type– Alabama Sites

Summary Statistics by Crash Type- AL

Crash Type	Upstream		Downstream		%Change in Crash Rate
	Crash Count	Crash Rate ¹	Crash Count	Crash Rate ¹	
Non-collision	1	0.005	0	0	-100.00
Single Vehicle Crash	7	0.032	8	0.045	40.63
Angle (front to side) Same Direction	1	0.005	0	0	-100.00
Rear End	11	0.050	7	0.039	-22.00
Side Impact (90 degrees)	1	0.005	0	0	-100.00
Sideswipe – Same Direction	6	0.027	0	0	-100.00
Record from Paper System	22	0.099	13	0.072	-27.27
Total Crashes	49	0.221	28	0.156	-29.19

CRASH ANALYSIS

Crash Type– Florida Sites

Summary Statistics by Crash Type- FL

Crash Type	Upstream		Downstream		Percent Change in Crash Rate
	Crash Count	Crash Rate ²	Crash Count	Crash Rate ²	
Rear-end	82	0.373	99	0.373	-0.12
Sideswipe	88	0.346	40	0.187	-45.74
Collision with Fixed Objects ¹	43	0.222	21	0.098	-55.84
Median Crossover	1	0.041	2	0.063	54.27
Tractor/Trailer Jackknifed	1	0.028	0	0.000	-100.00
Total Crashes	215	0.809	162	0.608	-24.79

CRASH ANALYSIS SUMMARY FINDINGS

Crash rates by location

- From the analysis on crash type it is found that:
 - In Alabama, out of 7 crash types, the number of crashes for all crash types except single vehicle crashes is higher at DBB influence zones
 - In Florida, out of 5 crash types, all crash types except median crossover type are over-represented at DBB influence zones

CRASH ANALYSIS

Crash severity– Alabama Sites

Summary Statistics by Crash Severity- AL

Crash Severity	Upstream		Downstream		Percent Change in Crash Rate
	Crash Count	Crash Rate ¹	Crash Count	Crash Rate ¹	
Fatal Injury	2	0.009	1	0.006	-33.33
Incapacitating Injury	6	0.027	1	0.006	-77.78
Non-incapacitating Injury	0	0	2	0.011	---
Possible Injury	4	0.018	1	0.006	-66.67
Property Damage Only (PDO)	35	0.158	22	0.123	-22.15
Unknown	2	0.009	1	0.006	-33.33
Total Crashes	49	0.221	28	0.156	-29.19

CRASH ANALYSIS

Crash severity– Florida Sites

Summary Statistics by Crash Severity- FL

Crash Severity	Upstream		Downstream		Percent Change in Crash Rate
	Crash Count	Crash Rate ¹	Crash Count	Crash Rate ¹	
Fatal	0	0.000	1	0.026	---
Injury	98	0.478	72	0.274	-42.63
Property Damage Only (PDO)	117	0.476	89	0.328	-31.03
Total Crashes	215	0.809	162	0.608	-24.79

CRASH ANALYSIS SUMMARY FINDINGS

Crash severity

- The analysis on crash injury severity reveals:
 - Higher number of more severe crashes at DBB influence zones in Alabama and Florida, although the overall number of severe accidents is small
 - Property damage only (PDO) type crashes comprises a large portion of all crashes occurred in both Alabama and Florida

CRASH ANALYSIS DISCUSSION

- Summary conclusions:
 - While variations were observed from site to site, the overall results were consistent between the two states and showed higher crash rates at DBB influence study sites.
- Recommendations:
 - It is recommended to validate the results using more sites, longer study segments and larger sample of crash data
 - Future study may incorporate the comparison of findings from AL and FL with other states
 - Study of the impact of DBB placement (right vs. left side of the road; on premises and off premises digital billboards) is also recommended
 - Study of the driver distraction level based on type of message and delivery method

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