

## Introduction

- Distracted driving and speeding are two major traffic safety concerns in the United States.
- 14,400 people died in USA from distraction and speeding related crashes in 2020 (NHTSA, 2022).

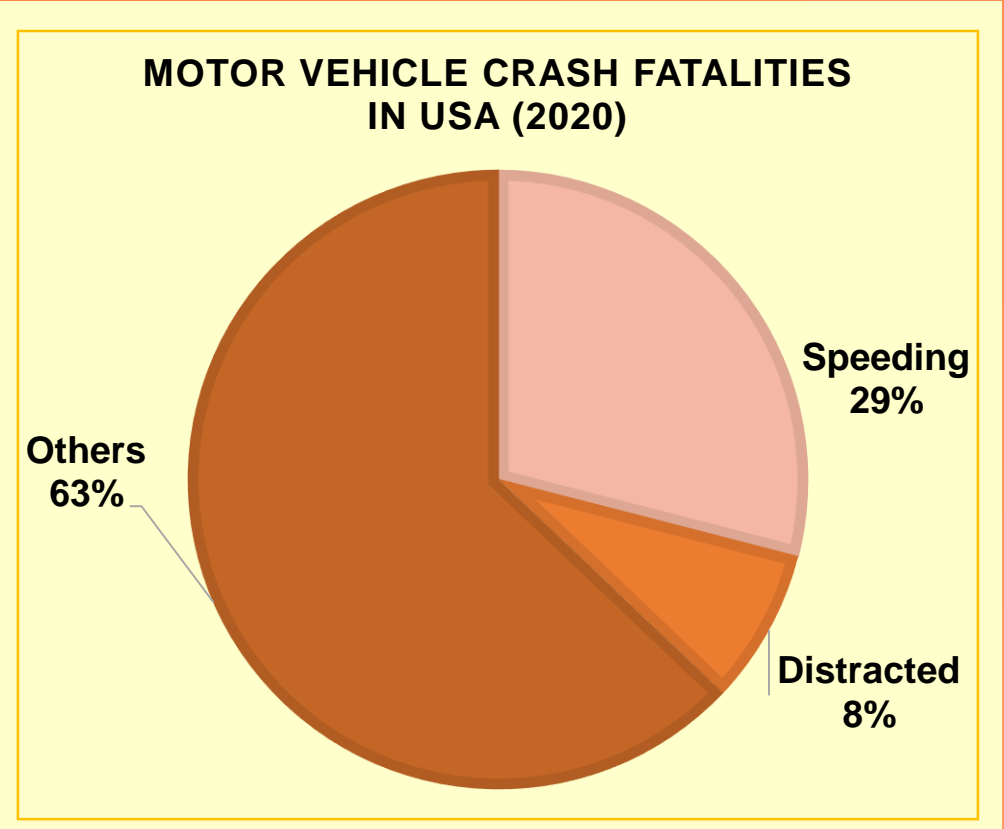


Figure 1: Motor Vehicle Crash Fatalities in USA

## Objective

- To analyze the impact of distracted driving on speeding behavior of the drivers in the selected high crash corridors in the state of New Jersey.

## Data Collection

- Test vehicle: Ford Truck of Rowan University
- Selected corridors: US1, US9, NJ18, NJ55, US22, I80, I95, US130, I295, and Garden State Parkway
- Duration: March 2021- August 2021
- Data Collector: Crew member in front passenger seat
- Data Archiving: iOS Tally Counter App, GPS tracker
- Data Recording: Go Pro Hero 9 Camera



Figure 2: Test Vehicle, GPS Tracker and Counter App

## Methodology

- Three classes of speeding are considered: 0-5, 5-10, and 10+ mph above the posted speed limit.
- Two non-parametric significance tests (Mann–Whitney U test and Kruskal–Wallis test) were performed.

Equations for Mann-Whitney test-

$$U_1 = R_1 - \frac{n_1(n_1+1)}{2} \quad (1)$$

$$U_2 = R_2 - \frac{n_2(n_2+1)}{2} \quad (2)$$

$U_1, U_2 =$  Mann Whitney Value  
 $n_1, n_2 =$  sample size  
 $R_1, R_2 =$  sum of ranks

Equations for Kruskal Wallis test-

$$H = \left[ \frac{12}{n(n+1)} \sum \frac{R_i^2}{n_i} \right] - 3(n+1) \quad (3)$$

$H =$  H-stat  
 $n =$  sample size  
 $R =$  sum of ranks

## Data Description

- 65% of the drivers were speeding while they were distracted.
- Almost two-fifth (39%) drivers did at high level (10+ mph over PSL).

Table 1: Descriptive Statistics of the drivers distraction and speeding behavior

Parameter	Within PSL	0 to 5 mph above PSL	5 to 10 mph above PSL	10+ mph above PSL
Mean	0.352	0.120	0.135	0.393
Standard Error	0.005	0.004	0.004	0.006
Standard Deviation	0.478	0.325	0.342	0.488
Sample Variance	0.228	0.106	0.117	0.239
Count	2752	940	1056	3075
Confidence Level (95.0%)	0.011	0.007	0.008	0.011

\*PSL = Posted Speed Limit

## Results

Table 2: Mann-Whitney U test for comparing temporal and roadway features

Feature	Mean Rank (X <sub>1</sub> )	Mean Rank (X <sub>2</sub> )	Delta Mean Rank	Mann-Whitney U	Z-score	p-value
<b>Day of week (X<sub>1</sub>= Weekday, X<sub>2</sub>= Weekend)</b>						
0-5 mph above PSL	469.23	472.97	-3.74	98410.00	-0.200	0.841
5-10 mph above PSL	522.25	542.63	-20.38	114007.50	-1.001	0.317
10+ mph above PSL	1370.17	1716.76	-346.59	914596.00	-10.819	<0.001*
<b>Type of roadway (X<sub>1</sub>= Signalized, X<sub>2</sub>= Unsignalized)</b>						
0-5 mph above PSL	444.70	488.55	-43.85	97022.00	-2.437	0.015*
5-10 mph above PSL	488.84	550.16	-61.32	112587.50	-3.123	0.002*
10+ mph above PSL	1411.95	1572.05	-160.10	709228.50	-4.092	<0.001*
<b>Toll/No-toll road (X<sub>1</sub>= toll, X<sub>2</sub>= no toll)</b>						
0-5 mph above PSL	475.26	467.76	7.50	100752.50	-0.408	0.684
5-10 mph above PSL	552.06	512.32	39.74	124459.50	-2.080	.037*
10+ mph above PSL	1599.40	1467.19	132.21	1074837.50	-4.118	<.001*
<b>Hour of day (X<sub>1</sub>= Congestion, X<sub>2</sub>= No congestion)</b>						
0-5 mph above PSL	466.43	473.76	-7.33	107396.00	-0.411	.681
5-10 mph above PSL	546.29	510.51	35.78	129941.50	-1.906	.057*
10+ mph above PSL	1595.54	1453.99	141.55	1035607.50	-4.343	<0.001*

\*Statistically significant at 95% confidence level

Table 3: Kruskal Wallis test for comparing geometric roadway properties

Feature	H value	p-value	Mean Rank Values			Direction of Effect (↑for increase, ↓for decrease)		
			X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>1</sub> vs. X <sub>2</sub>	X <sub>1</sub> vs. X <sub>3</sub>	X <sub>2</sub> vs. X <sub>3</sub>
<b>Median Type (X<sub>1</sub>= Unprotected, X<sub>2</sub>= Curbed, X<sub>3</sub>= Positive)</b>								
0-5 mph above PSL	3.09	0.21	436.30	440.90	477.80	-	-	-
5-10 mph above PSL	2.27	0.32	496.20	556.65	532.88	-	-	-
10+ mph above PSL	9.08	0.01*	1418.99	1475.28	1559.12	-	-	↑
<b>Number of Lanes (X<sub>1</sub>= 2 lanes, X<sub>2</sub>= 3 lanes, X<sub>3</sub>= 4 or more lanes)</b>								
0-5 mph above PSL	7.33	0.03*	435.96	489.75	455.14	↑	-	-
5-10 mph above PSL	0.68	0.71	535.80	529.81	510.36	-	-	-
10+ mph above PSL	4.30	0.12	1498.86	1566.76	1500.38	-	-	-
<b>Median Width (X<sub>1</sub>= 0-12', X<sub>2</sub>= 13'-24', X<sub>3</sub>= 25' or more)</b>								
0-5 mph above PSL	0.52	0.77	467.44	483.12	467.01	-	-	-
5-10 mph above PSL	1.50	0.47	526.30	513.38	544.82	-	-	-
10+ mph above PSL	8.89	0.01*	1479.18	1571.50	1580.68	-	↑	-
<b>Shoulder Width (X<sub>1</sub>= 0-4', X<sub>2</sub>= 5'-8', X<sub>3</sub>= 9' or more)</b>								
0-5 mph above PSL	0.20	0.90	479.82	460.06	470.25	-	-	-
5-10 mph above PSL	0.45	0.79	521.32	508.05	531.04	-	-	-
10+ mph above PSL	13.15	<0.01*	1632.17	1282.56	1542.36	↓	-	↑

\*Statistically significant, PSL= Posted Speed Limit

## Conclusions

- Most drivers speeded 10+ mph over PSL while getting distracted.
- Speeding while distracted were significantly affected by the time of day and the geometric design features of the roadway.
- While distracted, most drivers did speeding during the weekends, on unsignalized roads, and road segments with wider medians and shoulders.
- Policymakers could help reduce distractions by enforcing speeding, as most distracted drivers also involve in speeding.

## Acknowledgement

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