Rideshare Volume and DUI Incidents in Target California Communities

Developed for National District Attorneys Association (NDAA)
by
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September 28, 2020

Introduction

Although alcohol-impaired fatalities have decreased over the last 40 years, these preventable deaths continue to account for approximately 30 percent of all motor vehicle fatalities (NCSA, 2020). Alcohol-impaired driving laws are established in each state in the U.S. where it is illegal to drive with a BAC at or above a specified level (0.05 or 0.08 depending on the state). Additionally, zero tolerance laws (e.g., for drivers under the age of 21) have been established where any measurable amount of alcohol detected when driving is illegal. Even though these laws are well known, alcohol-impaired drivers continue to get behind the wheel and alcohol-impaired driving continues to be a significant public health issue on U.S. roadways.

According to the National Highway Traffic Safety Administration (NHTSA), in 2018, 10,511 motor vehicle fatalities involved an impaired driver which represents 29 percent of all U.S. traffic fatalities (NCSA, 2020). This accounts for 29 deaths a day and one death every 50 minutes. NHTSA also reported that night and weekend alcohol-impaired driving fatalities continued to be higher than other days and times of the week as in prior years. The 2018 rate of alcohol impairment among drivers involved in fatal crashes at night was 3.4 times higher than during the day (31% versus 9%) and twice as high on weekends (14% versus 28%). In addition, the type of crashes where these fatalities most often occur involve a single vehicle (31% of fatal crashes where the driver was impaired compared to 13% in multiple vehicle fatal crashes). Specific to California, data from the Center for Disease Control and Prevention report that 9,288 people were killed in crashes involving an alcohol-impaired driver in California 2009-2018 (CDC, 2020).

The number of rides conducted by an impaired driver prior to arrest is astounding. Research conducted by Beirtel et. al found that only a small percentage of impaired drivers are detected and arrested. This was estimated at approximately 1 in 200 drivers (Beitel, Sharp, & Glauz, 2000). Another study estimated that there were 112 million alcohol-impaired driving episodes in 2010 and only one percent of drivers involved in those episodes were arrested (Bergen, Shults, & Rudd, 2011).

When considering percent contribution of annual impaired driving fatalities and the number of trips conducted by impaired drivers, rideshare platforms offer a promising countermeasure to address this harm by providing potential impaired drivers with an easily accessible alternative method of transportation. Rideshare companies such as Lyft and Uber, are companies that match passengers with drivers of vehicles for hire through websites and mobile apps. Rideshare companies are often more convenient and accessible than public transportation and often charge lower rates than taxi services, however, the idea that rideshare platforms have a direct impact on reducing impaired driving crashes and fatalities has been met with some skepticism. The research on the topic of ridesharing's impact on impaired driving is limited and varied

regarding study design and approach. Contributing to this skepticism, rideshare companies have been criticized for being confined to urban areas with limited access in rural areas. Recent research findings conducted by NHTSA regarding the prevalence of crash fatalities may provide argument for the contrary:

- Half of crash fatalities (50 percent) occur in urban areas (UAs).[1]
- Almost 80 percent of fatalities occur in UAs and the 5 surrounding miles (79 percent).
- Fifty-nine percent of rural crash fatalities occur within 5 miles of UAs (Webb, 2020).

State highway safety office (SHSO) countermeasures and strategies to reduce alcohol-impaired driving often include messaging to designate a "sober ride" home. These messages encourage those intending to "go out and drink" to designate a sober driver or to use alternative transportation including rideshare companies. For example, in 2018 during the holiday season, the Governors Highway Safety Association (GHSA), a 501(c)(3) nonprofit representing the state and territorial highway safety offices that implement federal grant programs to address behavioral highway safety issues, partnered with Lyft to combat impaired driving during this peak time of the year when impaired driving numbers tend to increase. Through this partnership, five grants were awarded to state highway safety offices in California, Illinois, Louisiana, North Dakota, and Washington to distribute Lyft ride coupons and deliver educational and awareness campaign messaging on both social media and paid media platforms (GHSA, 2019).

The California Office of Traffic Safety conducts an annual "DUI Doesn't Just Mean Booze" awareness campaign in tandem with its "Go Safely California" traffic safety effort to raise awareness of the dangers and consequences of driving under the influence of alcohol, drugs or medications. A digital promotion in Sacramento, San Francisco, Los Angeles and San Diego encourages individuals to plan a sober ride home by using the Lyft app and a special code for a discounted ride to get them home safely (GHSA, 2019). As a result, these five state agencies were effective in generating public awareness and encouraging residents to use Lyft as an alternative to driving impaired when participating in holiday festivities.

Several studies have examined the relationship between rideshare companies and other alternative transportation and the incidence of impaired driving incidents with varying results. In 2015, MADD reported that the presence of Uber's rideshare service in Oregon was associated with a 10% decrease in DUI arrests (MADD, 2015). A study conducted in 2016 by Brazil and Kirk examined the potential association between the availability of Uber's rideshare services and total, drunk-driving related, and weekend- and holiday-specific traffic fatalities in the 100 most populated metropolitan areas in the United States. This study concluded there was no association between the deployment of Uber services and the number of subsequent traffic fatalities for aggregate or specific to drunk-driving fatalities or fatalities during weekends and holidays (Brazil and Kirk, 2016). Another study conducted by Frank Martin-Buck in the

[1] To qualify as an urban area, the territory identified according to criteria must encompass at least 2,500 people, at least 1,500 of whom reside outside institutional group quarters.

same year reported that rideshare reduces fatal alcohol-related auto crashes by 10 to 11.4%, dependent upon transit usage. This study also reported that rideshare reduces DUI arrests by 8.7% to 9.2% in cities with low to moderate transit usage but has no effect in cities where transit usage is very high (Martin-Buck, 2017). A study released in 2017 conducted by the City University of New York found that in four boroughs of New York City, excluding Staten Island, there was a 25 to 35% reduction in alcohol-related car crashes since Uber launched in New York City in 2011, as compared to other places where ride-hailing company do not operate (Peck, 2017). Dills and Mulholland conducted a more recent study and found that Uber's presence in the cities examined lowered the rate of DUIs and fatal crashes (Dills & Mulholland, 2018).

A study by Moll Group, who also focused specifically on Uber, conducted a pre-post Uber launch study in 10 cities. When reviewing the California results, this study found that after Uber's launch in San Diego in June 2012, DUI arrests fell by 32%. This research also showed that arrests in San Francisco have been on a steady decline since 2010, with the exception of a slight uptick in 2011. Additionally, the Moll Group reported that Los Angeles drunk driving arrests decreased by 14% since 2012, however, the largest drop occurred between 2014 and 2016 when the number of DUIs was nearly cut in half (Moll Law Group, 2020).

A recent study by Fell et. al found that the most successful alternative transportation programs typically have social acceptance, a high level of public awareness, are low cost, have year-round availability, provide rides to and from drinking venues, have several sponsors that provide funding, and are convenient and are perceived to be safe (Fell et. al, 2020). These are also characteristics of ridesharing services.

While there are indications that rideshare services are related to a reduction in impaired driving incidents, further research is needed to document this trend and demonstrate the effectiveness of rideshare applications.

Background & Scope of Work

The National District Attorneys Association (NDAA) contracted with Casanova Powell Consulting and Dr. Ryan C. Smith to examine the relationship between rideshare volume and driving under the influence (DUI) incidents in three cities within California in support of their existing partnership with Lyft.

Founded in 1950, the National District Attorneys Association (NDAA) is a national, non-partisan non-profit membership association that provides training, technical assistance, and services to prosecutors around the country in support of the prosecution profession. As the oldest and largest association of prosecutors in the country with over 5,000 members, our mission is to be the voice of America's prosecutors and to support their efforts to protect the rights and safety of the people by providing its members with the knowledge, skills, and support they need to ensure justice is attained. NDAA, located in Arlington, VA represents state and local prosecutors' offices from both urban and rural districts, as well as large and small jurisdictions. NDAA serves as a nationwide, interdisciplinary resource center for research, training, knowledge building and accountability as it works to promote a fair and equitable administration of justice (NDAA, 2020).

Lyft was founded in 2012 by Logan Green and John Zimmer to improve people's lives with the world's best transportation and is available to 95 percent of the United States population as well as select cities in Canada. Lyft is committed to effecting positive change for our cities and making cities more livable for everyone through initiatives that bridge transportation gaps, and by promoting transportation equity through shared rides, bikeshare systems, electric scooters, and public transit partnerships (GHSA, 2020).

Objectives

This study has three main objectives:

1. Obtain and format traffic safety data related to Lyft rideshare volume and DUI incidents in target study locations (Los Angeles, San Diego, & San Francisco).
2. Determine the relationship between Lyft rideshare volume and DUI "incidents" in these locations.
3. Evaluate changes in DUI trends pre and post-Lyft introduction in these locations.

Method

The general analytic approach was to examine changes in impaired driving outcomes with the introduction of ridesharing in three California cities: The City of Los Angeles, San Diego, and San Francisco. Each of these cities provided data to Lyft in response to a Freedom of Information Act request. There was significant variability in the data provided by these locations, including format, level of aggregation, time periods covered, and DUI outcomes. Data were provided by Lyft on monthly Lyft rideshare volume in each of those locations.

Individual analyses of each location were conducted to account for the variability in DUI outcome measures. Initial analyses at each location focused on descriptive statistics and changes in DUI outcomes following the introduction of Lyft ridesharing in the city. Next, correlations were calculated to understand the strength of the relationship between Lyft rideshare volume and DUI outcomes. Finally, trends in DUI outcomes before and after the introduction of Lyft ridesharing were examined. Specifically, these analyses focused on whether or not trends in DUI outcomes improved in these locations following the introduction of Lyft.

Results

Los Angeles

The most detailed data were provided by the city of Los Angeles. This included incident-level DUI records from January 1st, 2010 through July 13th, 2019. Data were only provided on DUI charges (i.e., not crashes or fatalities). Specific charge details were provided including the charge code and whether it was a felony or misdemeanor. All charges were included in the analysis except for 655(B)HNC, DUI Boat or Watercraft. There was only one such charge in this dataset, and this specific charge code was not likely related to ridesharing effects.

DUI records were examined for all years with complete data (i.e., January 1st, 2010 through December 31st, 2018). Figure 1 shows the change in both DUI incidents and Lyft rideshare volume over this time period. The dotted red line demarcates the year Lyft was introduced into Los Angeles (i.e., 2013). During the period prior to rideshare from 2010 through 2013 there was a 4.1% increase in DUI incidents from 14,193 to 14,774. Following the initiation of rideshare in Los Angeles there was a 39.6% decline from the 14,774 incidents in 2013 to 8,918 incidents in 2018. The correlation between charges and rideshare volume was -.95, $p < .01$.

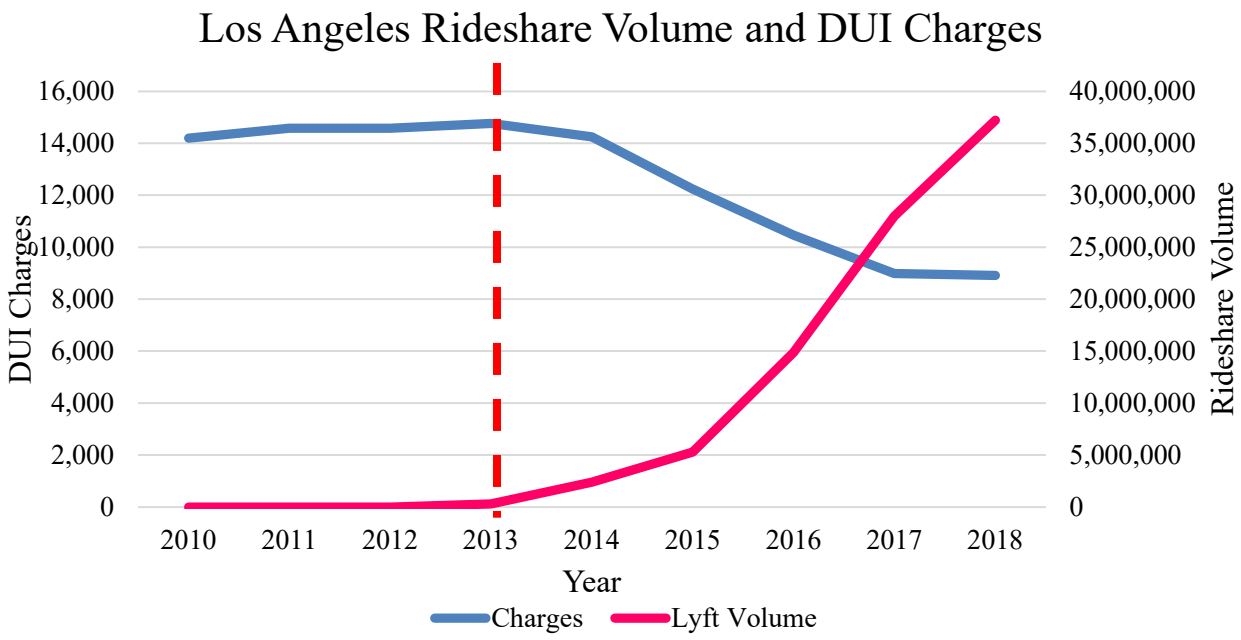


Figure 1. DUI Charges and Lyft Rideshare Volume in Los Angeles from 2010 through 2018

San Diego

San Diego provided data from 2008 through 2017. This included data on three DUI-related outcomes: arrests, collisions, and fatalities. Specific data are provided below in Table 1. Lyft ridesharing began in 2013 in San Diego.

Table 1. Annual DUI Outcomes for San Diego

Year	Arrests	Collisions	Fatalities
2008	4159	888	22
2009	4069	783	21
2010	4156	714	14
2011	3705	713	8
2012	3770	831	2
2013	3680	801	12
2014	3391	732	3
2015	2587	727	10
2016	2369	669	29
2017	2772	651	11

The relationship between these DUI outcome variables and ridesharing volume were calculated using bivariate correlations. The correlation matrix is provided in Table 2. As can be seen, rideshare volume is significantly negatively correlated with both arrests and collisions. There was also a significant positive correlation between arrests and collisions which indicates that both variables are related metrics of impaired driving outcomes in San Diego. Fatalities were not significantly correlated with any of the variables. This is likely due to the small sample size and, relatedly, the variance in this outcome. The relationship between rideshare volume, arrests, and collisions are further examined below.

Table 2. Means, Standard Deviations, and Correlations between Study Variables in San Diego

Variable	*M*	*SD*	1	2	3
1. Volume	1,523,540	2,645,260.7			
2. Arrests	3,466	665.0	-.77*		
3. Collisions	751	73.9	-.69*	.67*	
4. Fatalities	13	8.6	.19	-.11	-.02

*$p < .05$

**$p < .01$

Figure 2 shows the annual number of arrests from 2008 through 2017. The dashed line indicates when ridesharing was introduced. As can be seen in the figure, there was a general reduction in the number of arrests in San Diego over this time period, with the exception of a slight uptick in arrests from 2016 to 2017. Arrests decreased a total of 24.7% following the introduction of Lyft (i.e., from 2013 – 2017). This is compared to a 11.5% decrease in the years preceding ridesharing from 2008 to 2013.

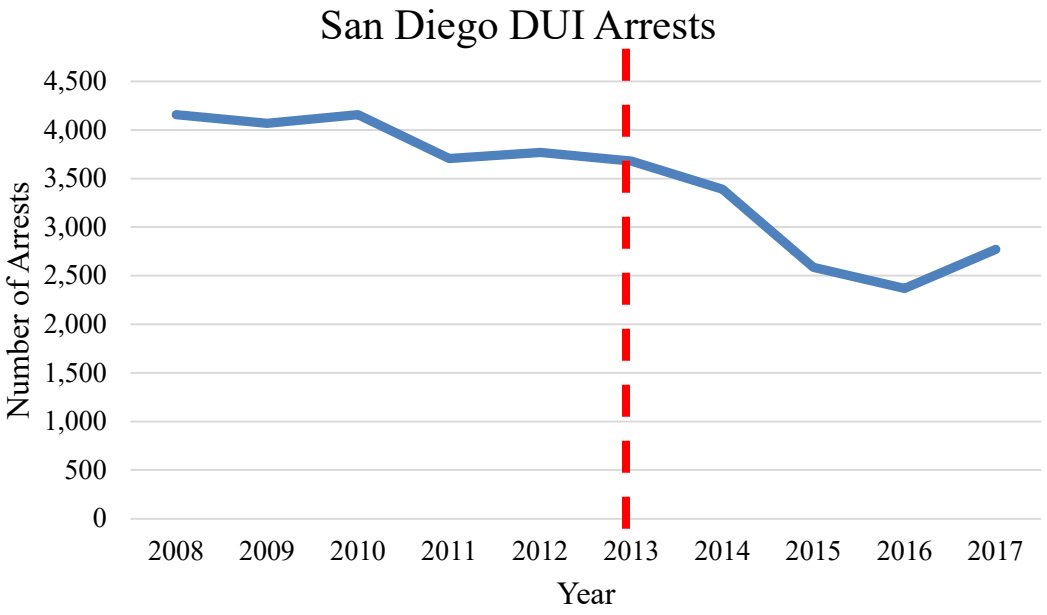


Figure 2. Annual DUI Arrests in San Diego from 2008 to 2017

Figure 3 shows the annual number of collisions from 2008 through 2017. Again, the dashed line indicates when ridesharing was introduced. Collisions decreased a total of 18.7% following the introduction of Lyft from 2013 to 2017. This is compared to a 9.8% reduction in the years proceeding introduction from 2008 to 2013. Thus, the general decrease in impaired driving collisions nearly doubled during the same time period Lyft was introduced as compared to the previous six years. This was similar to the results observed for DUI arrests.

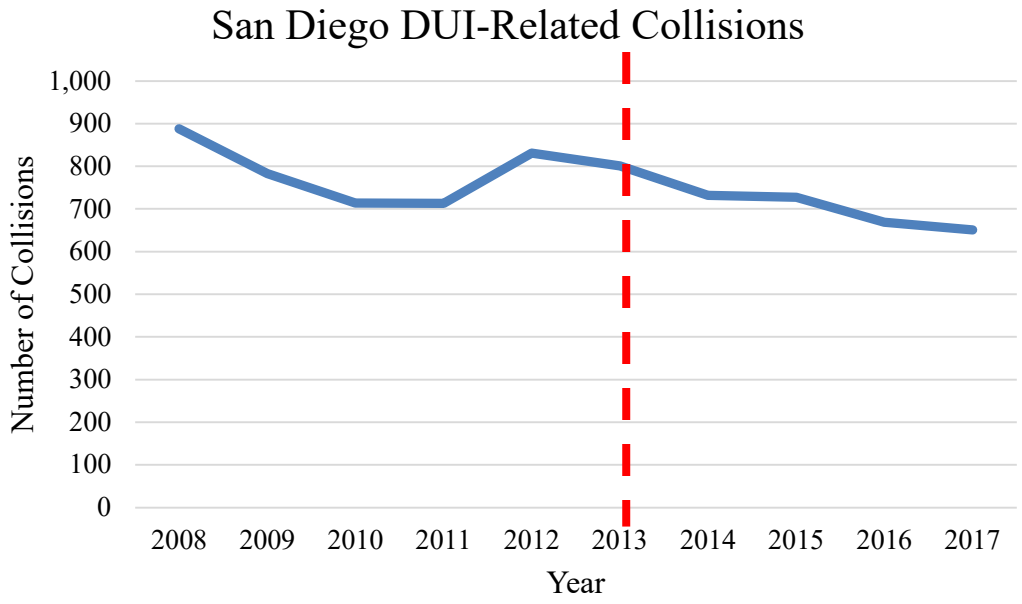


Figure 3. Annual DUI-Related Collisions in San Diego from 2008 to 2017

San Francisco

The San Francisco Police Department provided 10 complete years of data on DUI outcomes from 2008 through 2017. This included the annual totals for:

- Arrests and Citations for DUI/DWI/stoned driving;
- DUI/DWI/Stoned driving involved crashes; and
- DUI/DWI/Stoned driving involved injuries and fatalities that took place in the City and County of San Francisco.

Data were provided from a search of the Crime Data Warehouse via Business Intelligence Tools for Incidents reported with various DUI-related codes (e.g., driving under the influence of alcohol, gross vehicular manslaughter while intoxicated, and driving under the influence of alcohol with injury). The data provided via Freedom of Information Act request are shown below in Table 3.

Table 3. Annual DUI Data from San Francisco from 2012 to 2017

Year	Incidents	Bookings*	Crashes	Injuries
2012	255	255	16	19
2013	423	423	21	23
2014	335	333	15	16
2015	402	390	22	23
2016	364	359	36	36
2017	292	289	29	29

*Not arrests

As can be seen above in Table 3, the number of DUI-related events is significantly smaller than the other two cities. This is especially true for crashes and injuries where the numbers ranged from a low of 15 to a high of 36. The low sample sizes for these variables limits the strength of these data for the analysis. Additionally, data were only available for one year prior to the launch of Lyft in San Francisco which limits the ability to examine pre-rideshare trends DUI outcomes.

The correlations and descriptive statistics for San Francisco are provided below in Table 4. The only significant correlations were for incidents and booking and crashes and injuries, indicating that those variables are almost perfectly correlated. Indeed, an examination of Table 3, shows there are only slight variances in the reported numbers between those sets of variables. There was not a significant correlation between Lyft rideshare volume and any of the DUI-related measures. This is likely because 2012, the year prior to the launch of Lyft, had the lowest number of reported incidents and bookings. Again, data going back prior to 2012 would be necessary to fully capture the trend in these outcomes prior to the implementation of Lyft in San Francisco.

Table 4. Means, Standard Deviations, and Correlations between Study Variables in San Francisco

Variable	*M*	*SD*	1	2	3	4
1. Volume	9,623,841.0	9,491,958.0				
2. Incidents	345.0	64.3	-.09			
3. Bookings	342.0	62.6	-.12	1.00**		
4. Crashes	23.2	8.0	.79	.17	.15	
5. Injuries	24.3	7.2	.74	.15	.14	.99**

*$p < .05$

**$p < .01$

Figure 4 shows the number of DUI incidents and bookings from 2012 through 2017. The dashed line shows when Lyft was launched in San Francisco (Spring 2013). From the time of launch in 2013 to 2017, DUI incidents decreased a total of 31.0% and DUI booking decreased by 31.7%. Immediately prior to the first full year of launch (i.e., 2012 to 2013) incidents and bookings both increased by 65.9%. However, data going back prior to 2012 would be necessary to provide a more stable analysis of DUI trends prior to the implementation of Lyft.

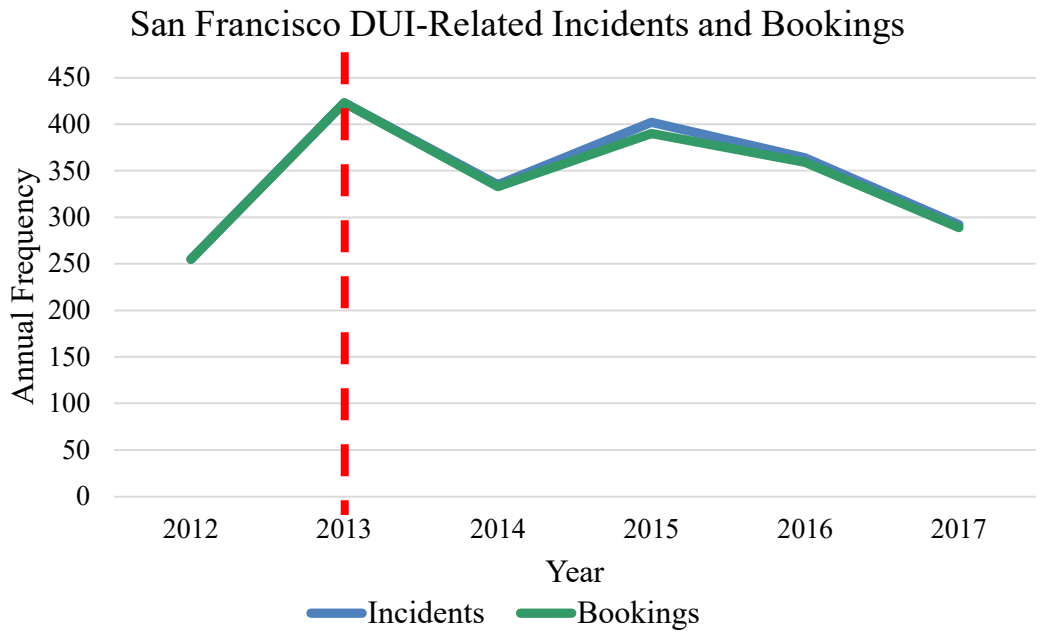


Figure 4. San Francisco DUI Incidents and Booking 2012 to 2017

As noted above, DUI crashes and injuries were very low in frequency for San Francisco. This creates a lot of variability in the data and makes it more difficult to assess trends. Figure 5 depicts both of these outcomes from 2012 to 2017. From 2012, both crashes and injuries increased relative to 2017. The relative number of these events remained relatively unchanged with 21 crashes in 2013 compared to 29 crashes in 2017 and 23 injury events in 2013 compared to 29 injury events in 2017.

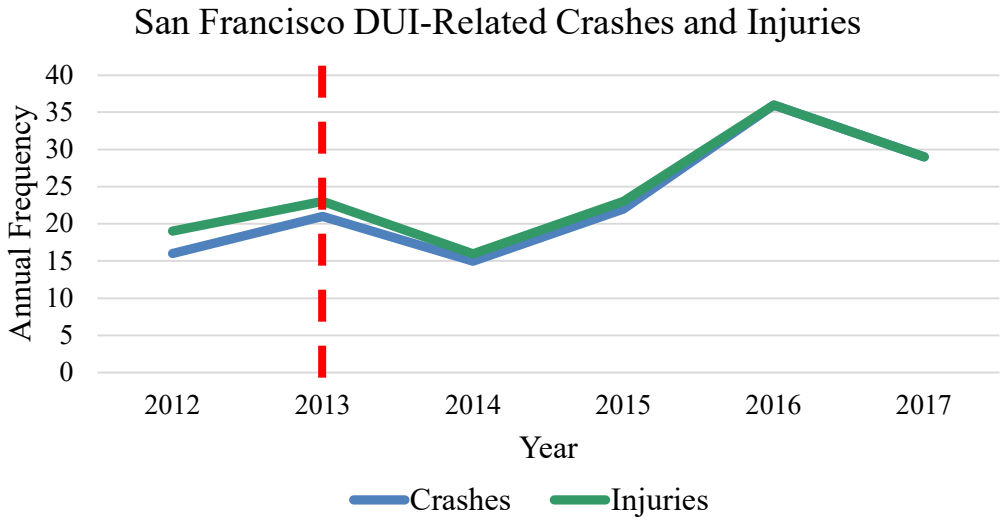


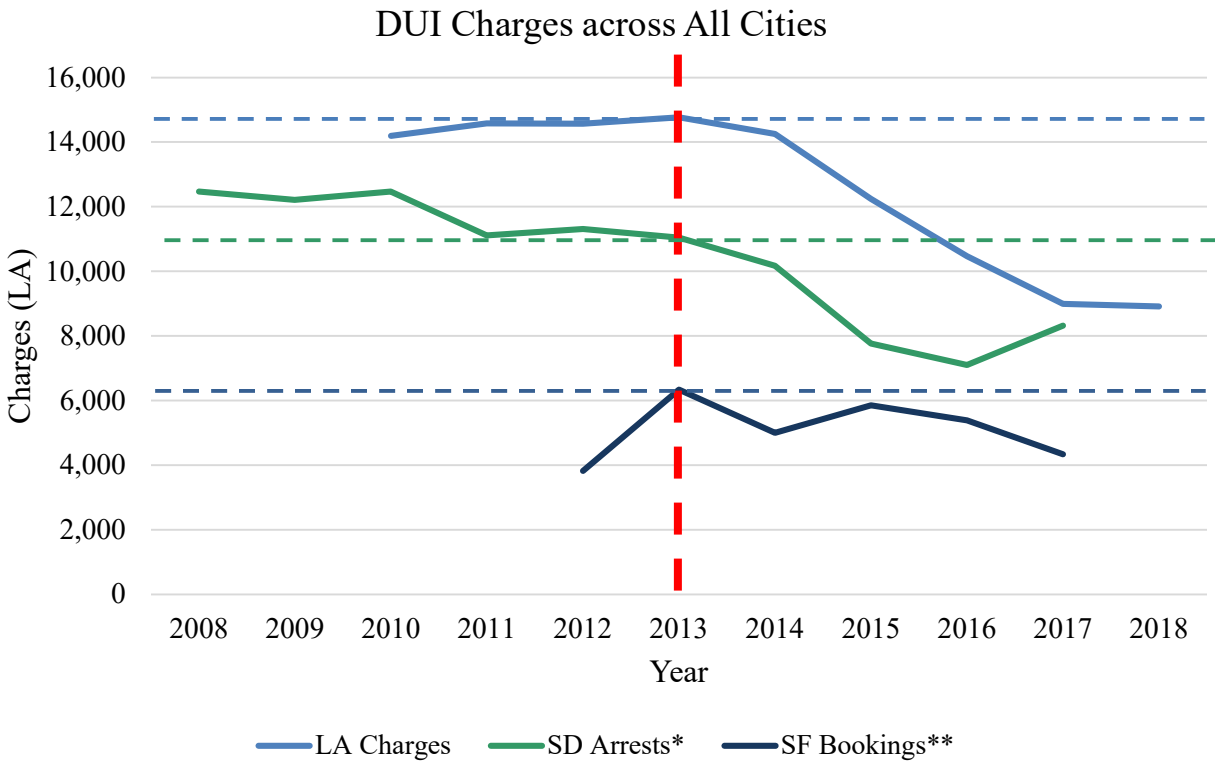
Figure 5. San Francisco DUI Crashes and Injuries 2012 to 2017

The crash and injury data should be interpreted with caution due to the relatively low frequency of behaviors and only marginal increase in the number of events over this time period.

Overall Results and Summary

While each of the cities in this study provided a different set of DUI outcome variables and years of data, some comparisons are possible across locations. The most comparable variable across all locations was “charges” for Los Angeles, “arrests” for San Diego, and “bookings” for San Francisco.

Figure 6 shows the change of these related outcome measures across all three cities over the periods where data were available. This allows for an examination of general trends related to the introduction of ridesharing. The dotted red line shows the year of Lyft rideshare introduction across all three cities. The solid lines show changes in DUI charges, arrests, and bookings (with scaling for San Diego and San Francisco to show trends on the same graph). The dashed lines of the same color correspond to the number of DUI charges for the year Lyft was introduced. This allows easier interpretation of pre- and post-introduction changes in DUI outcomes. This figure shows significant decreases in these DUI outcomes following the introduction of Lyft and marked improvements as compared to the years prior to this introduction.



*3-1 Scale
**15-1 Scale
Figure 6. DUI Charges Pre- and Post- Lyft Launch

Discussion

Importance of rideshare

In addition to driver impairment by alcohol consumption, drug-impaired driving has evolved to be more than just driving under the influence of illicit drugs and has also become a significant concern on our roadways. With the recent legalization and decriminalization of recreational and medical cannabis by several states, as well as, the growing abuse of prescription drugs including the opioid crisis, driving under the influence of drugs is a continuing public safety threat that gives rise to increasing risk on U.S roadways.

It is clear that given the option to have a sober ride rather than driving impaired, rideshare offers an affordable, convenient, and accessible alternative. However, the option lies within the driver to do so. In this regard, an annual economic survey conducted by Lyft, found that 71% of riders reported they are less likely to drive substance-impaired due to the availability of Lyft. As previously mentioned, NHTSA has documented that most alcohol impaired driving fatalities occur on nights and weekends, this information aligns with the frequency of Lyft's reported ride use where the majority of Lyft rides take place outside of commute hours, such as nights and weekends. In addition, according to a recent analysis by Lyft, more Lyft pick-ups and drop-offs occur in areas where entertainment and nightlife establishments occur and during the evening

(Hutchinson, 2020). It is evident that Lyft has positioned itself as an accessible alternative to driving impaired especially during the days, times, and locations most needed.

Discussion of study findings

Trends in DUI outcomes with the introduction of Lyft ridesharing were examined in three California locations: Los Angeles, San Diego, and San Francisco. All three locations experienced significant declines in outcomes related to impaired driving charges, arrests, and bookings following the introduction of Lyft. This included a 39.6% reduction in DUI charges in Los Angeles, a 31% reduction in DUI bookings in San Francisco, and a 24.7% reduction in arrests in San Diego. Furthermore, results showed that increases in ridesharing volume were significantly associated with decreases in these DUI outcomes. Indeed, there were strong significant negative correlations between rideshare volume and DUI incidents in Los Angeles (r = -.95, p <.05) and San Diego (r = -.77, p < .05). There were also negative correlations between rideshare volume and both DUI incidents and bookings in San Francisco, but these correlations failed to reach statistical significance. In general, San Francisco reported substantially fewer DUI incidents than any other location, which makes it more difficult to reach statistically significant results at this location.

It is important to note that national trends have also shown decreases in alcohol impaired driving. Specifically, alcohol impaired-driving fatalities in the past 10 years have declined by 2 percent from 10,759 in 2009 to 10,511 in 2018 (NCSA, 2018). Across the U.S., alcohol-impaired drivers involved in single-vehicle, nighttime crashes dropped from 49% in 2009 to 40% in 2018 (9% difference; NCSA, 2018). Thus, an important aspect of this study was to investigate if reductions in DUI outcomes with the introduction of Lyft simply captured this national trend or if greater improvements in DUI outcomes were experienced following rideshare introduction. This was the primary goal of conducting pre-post analyses in this study.

The result of the pre-post analysis provided further support for the introduction of ridesharing. While DUI charges dropped significantly in all three cities following the introduction of Lyft, two of the three cities in this study were actually exhibiting increases in this outcome in the preceding years. In San Diego, the one study city where DUI arrests were already decreasing before Lyft was introduced, this decline more than doubled following the launch of Lyft from an average of 11.5% to 24.7%.

Due to the lack of true experimental control and the large number of variables that impact traffic outcomes, a causal attribution cannot be given to the role of ridesharing in directly producing the improvements in DUI outcomes that were observed across all three study cities. However, the results are consistent with research hypotheses that ridesharing would be associated with traffic safety improvements. The results provide early support for the safety benefits of ridesharing and should encourage further research in this area.

Limitations

Certain limitations of this study and approach should be acknowledged. The purpose of this study was to examine the correlational relationship between impaired driving incidents and the presence of Lyft in these cities. This study is not intended to identify a causal relationship between the use of Lyft's rideshare services and the frequency of impaired driving outcomes. There are several factors that were not examined for the purposes of this study that can

influence the number of impaired driving incidents. Some of these factors include vehicle miles traveled (VMTs), law enforcement engagement, countermeasures and messaging that may have been conducted during these times, socioeconomic influences, sex, age, and other demographics.

Data were only provided for Los Angeles, San Diego, and San Francisco. Control cities were not used for pre-post comparison purposes. Data obtained for this study did not include individual Lyft usage and related DUI events since it is not possible to solely examine Lyft's relationship with traffic outcomes at the individual level.

While information on arrests, crashes, and fatalities was provided for several cities, the number of these events was relatively small. This makes these data largely unsuitable for an examination of trends or other conclusions related to these data. Thus, while these data were reported in this study for full transparency, caution should be applied when interpreting results where data were limited. This limited data often did not fit the overall patterns of other results, such as DUI arrest data. For example, crashes and injuries in San Francisco actually increased over study years (i.e., 2012 – 2017). Larger amounts of data would be necessary to more fully understand the impact of ridesharing on these outcomes.

Despite these limitations, this study adds to the limited empirical knowledge about the association of rideshare services with traffic outcomes. Future research should investigate these relationships to further expand our understanding of rideshare services.

Recommendations

Several studies shown that rideshare platforms are related to reductions in impaired driving arrests, fatalities, and crashes, while other studies show no effect. This study adds to that body of literature and is a crucial early step in understanding the potential value of ridesharing in reducing DUI harm. Although reductions in DUI incidents were observed with the introduction of Lyft in all three cities, the correlational results cannot be used to determine a causal relationship. It is possible and likely that other factors may have influenced these reductions. It is recommended that further research is conducted using additional data which, at a minimum, includes vehicle miles traveled, law enforcement engagement, and economic factors.

The research team applauds Lyft's dedication to improving public safety and providing their rideshare data in an effort to promote and support this research. The research team encourages all rideshare programs to engage in similar data sharing to allow for greater understanding of rideshare benefits and to conduct more robust studies to identify the impact of rideshare platforms on impaired driving incidents.

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