

TITLE PAGE

“Risky Roadway Behavior during the COVID-19 Pandemic of 2020”

by

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## **Introduction**

The correlation between injury, death, vehicle speed, and traffic volume during the 2020 COVID-19 pandemic has received some much needed attention by researchers (Lee et al., 2020; Liao and Lowry, 2021; Stiles et al., 2021). Yet much remains to be learned regarding the rise in traffic violence and death on our roadways during the COVID-19 pandemic. This exploratory paper aims to build on that research and those cited below by investigating the prevalence of roadway behavior more broadly classified as risky. We use five years of linked crash and hospital data provided by the Illinois Departments of Transportation and Public Health from 2016 through 2020. Through the presentation of descriptive statistics we compare occurrences of risky behavior in the four preceding years to occurrences in 2020. Our purpose is to better understand the circumstances and contributing factors of linked crashes so they may be mitigated through action resulting in the prevention of injury and death.

## **Related literature**

### *Speeding and the unbelted*

Speeding and not wearing a seatbelt are two factors often associated with traffic related fatalities. The National Highway Traffic Safety Administration (NHTSA) found that speeding was a contributing factor in 26% of all traffic fatalities that occurred in the United States in 2019 (NHTSA, Oct. 2021). Further, NHTSA found that 47% of all individuals killed in traffic crashes in the United States were not wearing seatbelts at the time of the crash (NHTSA, 2021). Researchers find that men are more likely than women to engage in both behaviors (Liang et al., 1999). Specifically, young males and individuals under 34 are most likely to speed when compared to other age groups or demographics (Sartre Consortium, 2004). Although seat belt usage rates reached as high as 90.7% in the United States in 2019 (NHTSA, April 2020), there are a few groups of individuals who are less likely to wear a seatbelt. Seatbelts are more commonly worn in the developed world (Farooq et al., 2021). They are worn less by low-income individuals, (McCarrtt, 2004), taxi drivers (Farooq et al., 2021), and drivers from rural areas (Carter et al., 2014). Furthermore, government efforts to encourage seat belt usage, such as the “Click it or Ticket” campaign (NHTSA, May 2021) have appeared to be successful. In conjunction with seat belt laws across the United States, these campaigns have resulted in drivers penalized once to become 9.39 times more likely to wear their seatbelts (Farooq et al., 2021). Meanwhile, speeding has remained widespread, especially after the U.S federal government relinquished its power to enforce speed limits in 1995 (Friedman et al., 2009). Traffic stops are currently the primary way of enforcing speed limits in the United States, while traffic calming is a separate but growing method also being implemented (Sołowczuk, 2021).

### *Impaired driving*

Every day in the United States around 32 people, or one person every 45 minutes, dies due to an alcohol impaired driver (NHTSA, 2020). Globally, about 17% of traffic fatalities are linked to alcohol (Shield et al., 2012). These figures have led the United States to consider lowering the BAC limit for drivers to 0.05 (National Transportation Safety Board, 2013). However, research by Benjamin Hansen suggests that instead of lowering the limit, more punishments should be

implemented along the BAC distribution to help prevent repeat offenders (Hansen, 2014). Impaired driving has been a public health concern for years, but a recent study revealed that being under the influence of either alcohol and drug usage while driving has increased since the COVID-19 pandemic began (Thomas et al., 2020). Historically, men have been more likely to drive under the influence of drugs and alcohol (Lipari et al., 2016). However, research suggests that the gender gap across DUI arrests has been narrowed in recent years, with female arrests increasing (Oh, 2020). Along with this, White (Romano et al., 2010) and high-income individuals (Calling et al., 2019) are more likely to drive drunk. Going forward, police will likely continue to use breathalyzers for alcohol related incidents, with 0.08 remaining the current standard for DUIs. Testing for drugs in a traffic stop situation can be more complicated, and law enforcement is hoping to streamline the process in the future. Research is currently being conducted on the plausibility of oral fluid testing devices for drug related incidents (Bloch, 2021). Issues persist with substances like opioids, which are often permissible while driving to a certain extent. One study found that individuals under long term opioid therapy may be able to drive effectively, provided that there is not a significant impact on the central nervous system or other side effects (Dhingra et al., 2015). Although this research has merit, it is also important to note that a study conducted at the University of Michigan found that driving under the influence of opioids is most common with individuals who misuse opioids (Carter et al., 2021). These trends are likely responsible for the steady increase in opioid detection in fatal car accidents since 1999 (Li, 2019). As it stands, marijuana remains the most common drug used while driving, but nearly 20% of drivers who received a DUI in 2016 tested positive for some type of opioid (Fatality Analysis Reporting System, 2016).

### *Distracted driving*

The emergence of mobile phones has coincided with an increase in distracted driving in recent years. A study conducted in Iran found that 93% of drivers used their cell phone at least once while driving during the week, while 32.5% of drivers admitted to always using their cell phones (Kalantari et al., 2021). A study conducted by Selective Insurance, based in the United States, found that 70% of drivers had used a cellular device while driving during a 90-day period (Leondi, 2022). These numbers coincide with a study conducted by the Insurance Institute for Highway Safety, which found that cell phone usage while driving was up 57% in 2018, from the 2014 figures (Karush, 2019). The study goes on to suggest that the evolution of mobile phones to do much more than just call or text has increased usage while driving (Karush, 2019), with 15-20 year olds among the most common age of offenders (CDC, 2022). In fact, 9% of all 15–20-year olds involved in fatal crashes were distracted while driving, higher than any of the other age group (NHTSA, April 2020). Cellular phones can create visual, manual, or cognitive distractions (CDC, 2022) which inevitably leave drivers at a higher risk of being in a crash. According to a study conducted by Cambridge Mobile Telematics, 52% of all car crashes reported to their driving apps were linked to phone-related distractions (Balakrishnan, 2020). States exercise their own discretion when trying to limit phone usage while driving; 24 states ban hand-held phone usage, 48 states ban texting and driving, and 36 states ban all cell phone usage by teen drivers (Bloch, June 2021). Outside of this, rumble strips have been increasingly considered as a physical solution developed to counteract distracted driving (Federal Highway Administration,

2011). The “U Text, U Pay Campaign”, which happens every April is another way to prevent phone usage, as the police put more efforts toward cracking down on texting and driving (NHTSA, 2022).

### *Motorcycle helmets*

The dangers of riding a motorcycle, particularly without a helmet, are evident based on existing research. Recent data trends point to the government’s decision in 1976 to repeal the 1966 Highway Safety Act, which had required all motorcyclists to wear helmets (Herlander, 2021). From 1999-2019, states with universal helmet laws had 33% less head-related fatality rates than states with loose or no helmet laws (Herlander, 2021). More generally, wearing a helmet has been found to reduce the risk of a severe head injury by almost 50% (Khor et al., 2017). However, as it stands, only 18 states and Washington D.C have universal helmet laws, while 29 states have laws that are directed toward young drivers (Insurance Institute for Highway Safety, 2022). Laws for young drivers are incredibly difficult to enforce though, as it is a complete judgment call of law enforcement to try and estimate the age of a rider (Insurance Institute for Highway Safety, 2022). Research suggests that helmet laws are very efficient in increasing helmet usage rates. In fact, in 2021, 95.9% of motorcyclists wore helmets in states with laws that required helmets (National Center for Statistics and Analysis, 2022). An important aspect of this statistic is whether or not these helmets were compliant with Department of Transportation standards. In taking this into account, 86.1% of motorcyclists wore the proper DOT approved helmet when their state required it (National Center for Statistics and Analysis, 2022). On the other hand, only 56.9% of motorcyclists wore helmets in states where they weren’t required (National Center for Statistics and Analysis, 2022). Some 53.4% of motorcyclists in those states wore the correct DOT approved helmet (National Center for Statistics and Analysis, 2022). Among those most likely to not wear a helmet are individuals under the age of 29 and over the age of 50 (Insurance Institute for Highway Safety, 2020). These two groups alone made up around 62% of total motorcycle fatalities in 2020 (Insurance Institute for Highway Safety, 2020). Along with this, 92% of the motorcycle deaths in 2020 were men (Insurance Institute for Highway Safety, 2020). While these demographics do account for many of the fatalities, to some extent, the likelihood of death while riding a motorcycle can also be attributed to the type of bike. When evaluating the death rate per 10,000 motorcyclists, those who rode super sport motorcycles were 4 times more likely to die than those who rode standard or cruiser motorcyclists (Teoh et al., 2010). Super sport models tend to be lower in weight, which could be linked to riders being unable to control them in a collision situation.

### **Sources and methods**

#### *Crash and hospital data*

Funded by a grant from the Illinois Department of Public Health in collaboration with the Illinois Department of Transportation and the University of Illinois at Springfield, Illinois crash and hospital records for the years 2016 through 2020 were successfully linked. The linkage was accomplished using the software LinkSolv – consisting of probabilistic methods developed in the National Highway Traffic Safety Administration’s Crash Outcome Data Evaluation System

program (McGlinchy, 2021). A combination of data fields common to both files were identified as those with the highest success rate of linking the crash and hospital files: county, victim age, crash date, victim date of birth, and victim sex. Geographical tolerances are permitted for nearby counties since the crash may have occurred in a county adjacent to the hospital location. Crash date tolerances are also permitted one day into the future to allow for the striking of midnight before a crash victim reaches the hospital for treatment. Cook County, home to Chicago, is where some 40% of the Illinois population resides, effectively making county a relatively indiscriminate match field – which is a factor controlled for in the LinkSolv software. These linked files are critical in our understanding of the effects of motor vehicles on the lives of the citizens of Illinois. Such an investigation as presented here would not be possible without the successful linkage of the disparate crash and hospital files. Still, linked cases represent only about 60,000 crashes annually out of the more than 300,000 annual crashes contained in the file.

The hospital files include rich (yet not personally identifying) individual patient data who were admitted under urgent, emergency, and trauma admission types. Individual patient race, ethnicity, sex, and age are included as fields in the hospital files, among many others. A diagnosis of the presence of intoxicating substances conducted at the hospital is also included as a data field and investigated as it relates to contributing crash factors. To better understand the distribution of hospital charges among crash victim characteristics and contributing factors, total charges are investigated. Patient home zip code is also a field included in the files which permits the study of socioeconomic factors inferred by 2019 5-Year ACS estimates. All references to zip codes throughout the manuscript are made to the patient home zip code.

### *Interrupted time series*

As successfully done elsewhere (Doucette et al., 2021), 2020 received treatment group designation in recognition of the natural experiment that transpired following the imposition of stay at home orders. As is common with natural experiments, an interrupted times series analysis is applied to the linked Illinois crash and hospital data for the five years of 2016 through 2020 (Bernal et al., 2016; Craig et al., 2017). Data for the years 2016 through 2020 are limited to the timeframe around when the stay at home order took effect (March 21, 2020) and continue through to December 31 for each year of the study period. For example, for 2016 the data range from March 21, 2016 through December 31, 2016. The analysis conducted here also contains just those data from crashes that were successfully linked to a corresponding hospital file, so the numbers may be an undercount.

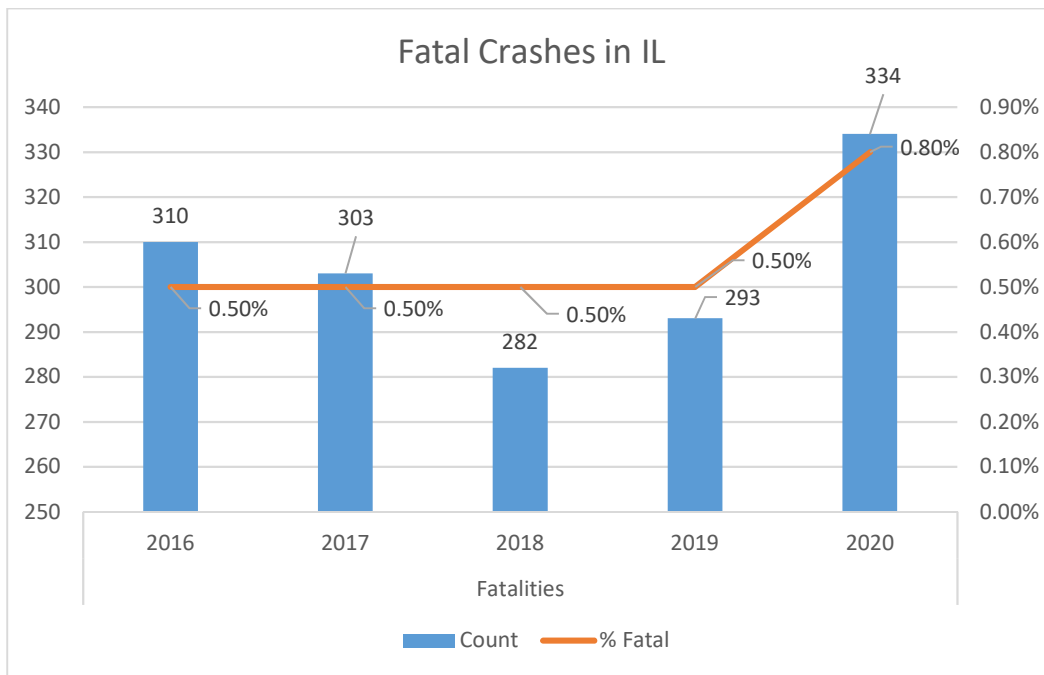
### **Findings**

Unless otherwise stated, proportions are calculated as a percentage of all linked files as a way to foster clarity throughout the analysis. A more nuanced analysis may benefit from calculating proportions strictly using the sample rather than the population. For example, calculating the proportion of un-helmeted motorcyclists of just crashes involving a motorcycle, rather than of all crashes, provides clarity on the share of helmeted motorcyclists. Still, there is analytical merit in both methods.

### Fatal crashes

The analysis begins by examining the distribution of linked fatal motor vehicle crashes across the five study years. **Figure 1** shows there were 37 more fatal crashes than the previous four year mean in 2020, despite there being nearly 14,000 fewer crashes than is typical – implying a significant increase in fatal crashes. The share of fatal crashes was also up to 0.8% of linked crashes, up from the consistent share of 0.5% of the previous four years. So the number and proportion of fatal crashes were both up significantly in 2020; the following sections investigate the prevalence of common contributing factors.

*Figure 1: Incidence counts and percentages of fatal crashes among all linked Illinois crashes for 2016 through 2020*



### Injury severity

This section examines the distribution of injury severity among those involved in motor vehicle crashes across the five study years (Table 1). Following the March 21<sup>st</sup> stay at home order in Illinois, there were nearly 14,000 fewer crashes in 2020 than the average of the previous four years. Yet, the crashes that did occur were of a more serious nature. The proportion of minor injuries (MAIS of 1) in 2020 was almost seven percentage points lower than the previous four year average – implying the prevalence of more severe injuries. The share of moderate and serious injuries (MAIS of 2 and 3, respectively) in 2020 were also up. Moderate injuries were up more than three percentage points, and serious injuries were up 1.5 percentage points following four years of little variation. Severe and critical injuries (MAIS of 4 and 5, respectively) were up in both the number of cases (despite fewer crashes overall) and their share. The number of severe injuries sustained resulting from linked crashes reached 91 cases in 2020, nearly double the prior

four year mean. Those 91 severe injuries were also more than double the share of a typical year. The number of critical injuries sustained in 2020 reached 174, some 57 more cases than the previous four year mean. The share of linked critical crash injuries in Illinois also doubled to 0.4%, or about 1 out of 250 injuries – up from 1 out of 500 in previous years.

*Table 1: Maximum Abbreviated Injury Scale (MAIS) score of motor vehicle crash victims in Illinois by year\**

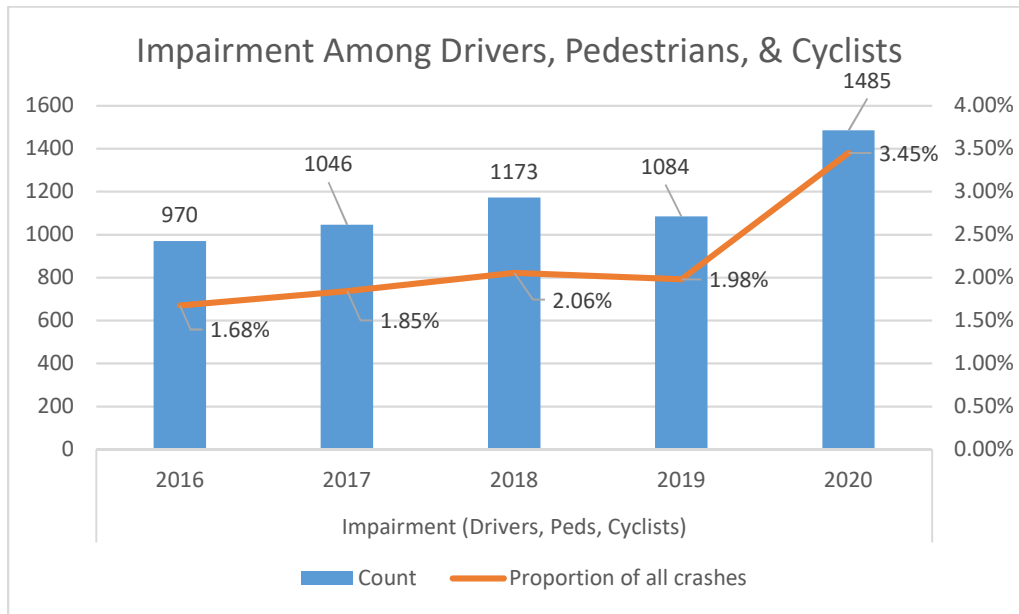
MAIS	2016		2017		2018		2019		2020	
0	17,538	30.3%	17,676	31.2%	18,568	32.5%	18,594	34%	14,375	33%
1	33,245	57.4%	31,869	56.2%	31,684	55.5%	29,460	53.8%	21,256	49%
2	5,675	9.8%	5,721	10.1%	5,440	9.5%	5,302	9.7%	5,568	13%
3	1,263	2.2%	1,264	2.20%	1,195	2.10%	1,230	2.2%	1,572	3.7%
4	48	0.10%	43	0.10%	54	0.10%	45	0.10%	91	0.21%
5	110	0.20%	113	0.20%	125	0.20%	121	0.20%	174	0.40%
Total	57,879		56,686		57,066		54,752		43,036	

*\*MAIS: 0 = No injury, 1 = Minor, 2 = Moderate, 3 = Serious, 4 = Severe, 5 = Critical, 6 = Maximum; MAIS scores of 6 were 10 or fewer cases for each year, per the governing data use agreement these cases have not been reported*

The linked hospital file contains patient test results for the presence of six common intoxicating substances, along with an “other drug” classification for substances that fall outside of normal reporting. Those six substances include: alcohol, cannabis, opioid, cocaine, hallucinogens, and stimulants. This section classifies a positive test result of any of the six named substances, including the “other drug” classification, as impaired. This classification applies to the following road users: drivers, pedestrians, and cyclists. Passengers are excluded from this particular analysis since impairment among this quasi-autonomous group is unlikely to cause a crash with injury.

Crashes involving impairment were up significantly in 2020 following four years of relatively modest growth in occurrences. **Figure 2** shows linked crashes for which impairment was determined, with incidents aggregated among drivers, pedestrians, and cyclists for the five years of 2016 through 2020. Beginning at the imposition of the COVID-19 stay at home order, there were 417 more impaired crashes in 2020 compared to the prior four year mean. This increase in impaired cases occurred despite there being nearly 14,000 fewer total linked crashes in 2020 relative to the previous four year mean. Impaired crashes in 2020 represented nearly 3.5% of all linked cases, which is more than double the rate of 2016 and up by a factor of 1.8 compared to the prior four year average.

Figure 2: Incidence counts and percentages of impaired drivers, pedestrians, and cyclists among all linked Illinois crashes for 2016 through 2020



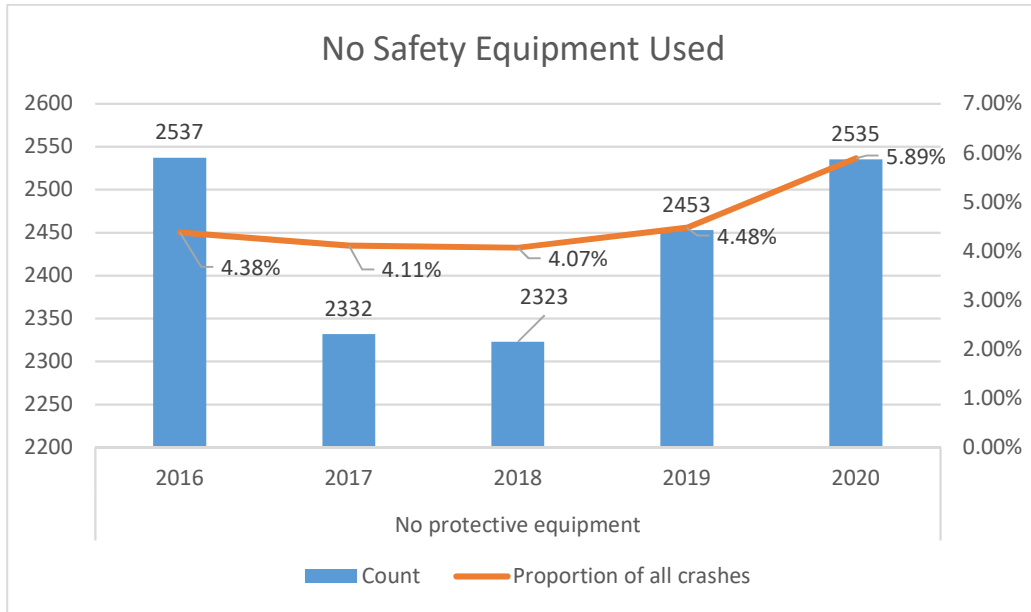
### All safety features

A useful measure of risky driving behavior is the broad use, or lack of use, of safety equipment across road users. This section examines the following cases in which no safety equipment was used: drivers or passengers who did not wear a seat belt, children who had either no car seat or the car seat was used improperly, drivers or passengers of motorcycles without a helmet, and pedal-cyclists without a helmet. Beginning in 2019 a field named “not DOT compliant helmet” was added to the crash data. This field was not included in the figures for 2019 and 2020, so these years could actually be an undercounting of the true number.

Crashes in which no safety equipment was used was at its highest rate in five years in 2020. **Figure 3** shows that for people involved in linked crashes in 2020, close to 6% of them did not use, or were not provided in the case of children, safety equipment. Again, despite 2020 witnessing nearly 14,000 fewer linked crashes on average, the count of no safety equipment used (2,535) is essentially the same as the worst year in the study, that of 2016 (2,537). It should be noted that motorcyclists without helmets constitute over 1,000 of these cases alone. Motorcyclists are examined in a succeeding section.



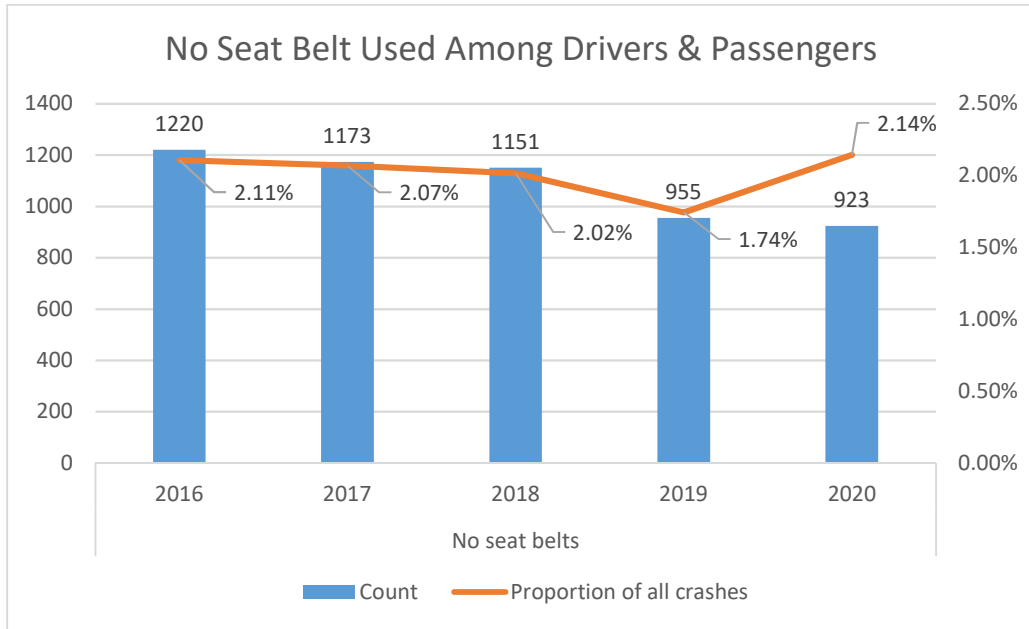
Figure 3: Incidence counts and percentages for crashes in which no safety equipment was used among all linked Illinois crashes for 2016 through 2020



### Seatbelts

Despite three years of modest decline, the rate of no seatbelt used among drivers and passengers in crashes was at its highest rate in 2020 across the study period (**Figure 4**). Though the count of linked cases identified as not properly buckled-up was at its lowest level of all study years, since the total of all crashes was lower in 2020, proportionately 2020 had the highest rate dating to 2016. The differences between years among the unbuckled are relatively slight and could simply be the result of anomalies in the data. Still, higher rates of crashes involving the unbuckled is a part of the larger story of 2020 on Illinois roadways and as reported on here in other analysis sections.

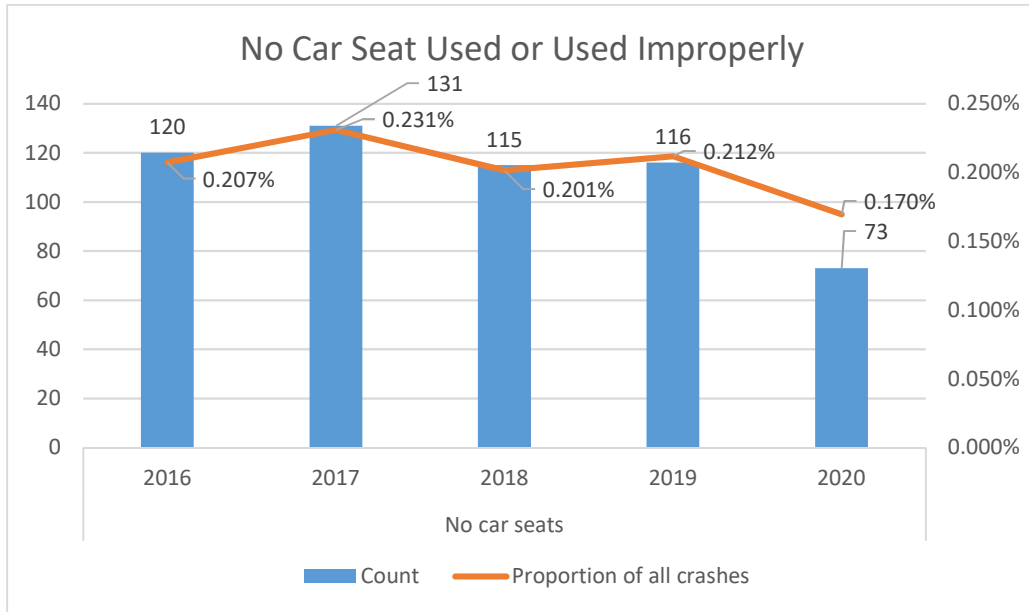
Figure 4: Incidence counts and percentages for crashes in which seatbelts were not used among all linked Illinois crashes for 2016 through 2020



### Car seats

The rate of children involved in crashes with either no car seat, or the car seat was improperly used, was down in 2020 relative to previous years (**Figure 5**). This may be a positive externality derived from schools, daycares, and other closures – many children had nowhere to go and staying home appears to have kept them out of crashes.

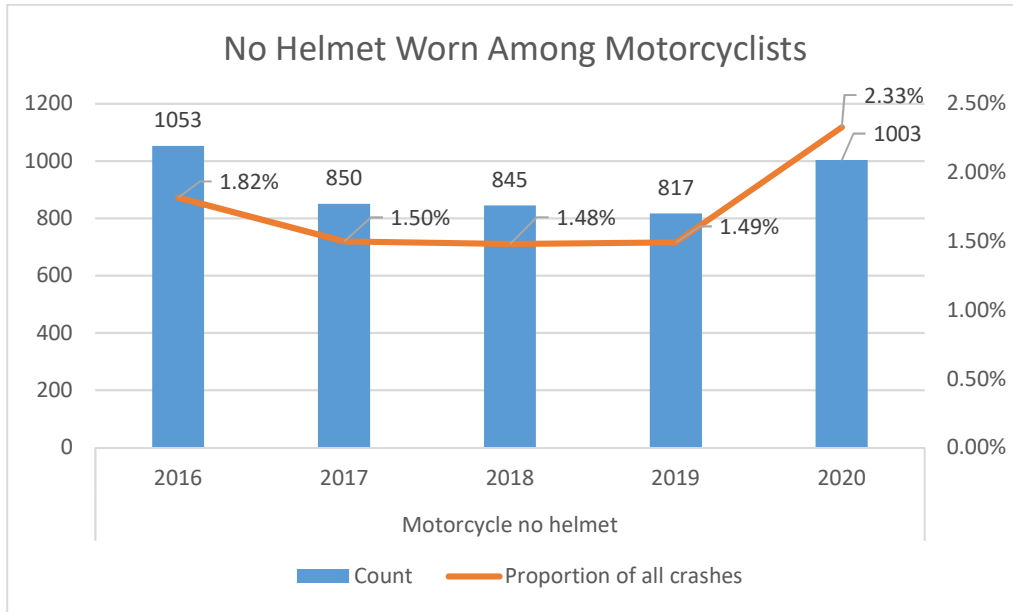
Figure 5: Incidence counts and percentages for crashes in which children were not properly buckled in a car seat among all linked Illinois crashes for 2016 through 2020



### Motorcycle helmets

In 2020, the rate of linked crashes involving motorcycles in which either the driver or passenger was not wearing a helmet was at its highest level in five years (**Figure 6**). In this case, the denominator in the rate calculation is all linked crashes by year. But results show that the count of all linked motorcycle crashes in 2020 was actually higher than the prior four year mean (1,606 in 2020 compared to the four year mean of 1,439), despite other vehicle crash counts being down. The implication is that motorcyclists either maintained previous levels of riding, or they actually increased their amount of riding following the stay at home order. The reason for this outcome is not fully known. Perhaps since riding a motorcycle is considered by many an inherently dangerous activity, riders had a higher predilection of doing so during a public health emergency. Another contributing factor could be that with more women staying home due to increased domestic responsibilities, men, who disproportionately ride motorcycles (Insurance Institute for Highway Safety, 2020), had a disproportionate exposure to crashes. A third factor could be increased aggressive driving behavior by motorcyclists.

Figure 6: Incidence counts and percentages for crashes in which motorcycle drivers and passengers were not properly helmeted among all linked Illinois crashes for 2016 through 2020



### Speeding

Figure 7 shows that the frequency of crashes in which speeding was involved as reported by police did not really change much in 2020. For the five years of the study period, including 2020, the proportion of crashes involving speed remained steadily just below the 40% mark. However, as shown in Figure 8, in 2020 there was an inversion of the share of fatal crashes involving speed. Figure 8 also shows the trend of increasing shares of fatal crashes involving speed began in 2017, but really took off in 2020. In fact, 2020 realized a nearly nine percentage point jump in the share of fatal crashes involving speed. So while even though the share of all crashes involving speed held steady, or was even down slightly, speeding apparently became more dangerous. Finally, as discussed above, there were 334 linked fatal crashes in 2020 from the beginning of the stay at home order – 24 more than the second highest year of 2016, and 37 more than the prior four year mean. So 2020 had significantly more fatal crashes, both proportionately and in total, despite there being some 14,000 fewer linked crashes on average overall.

Figure 7: Incidence counts and percentages for crashes in which speeding was involved among all linked Illinois crashes for 2016 through 2020

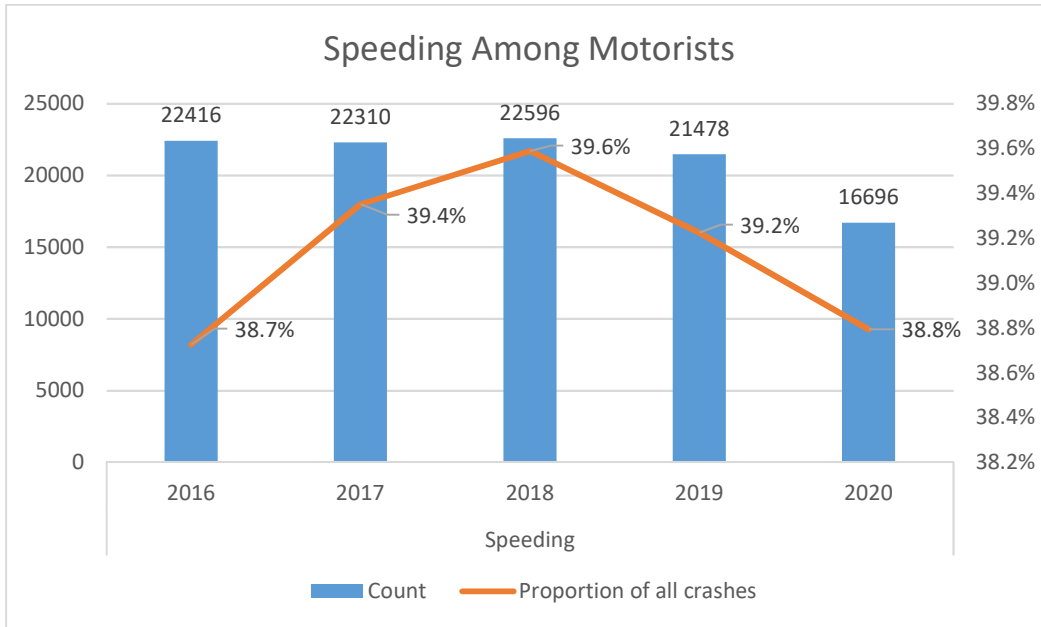
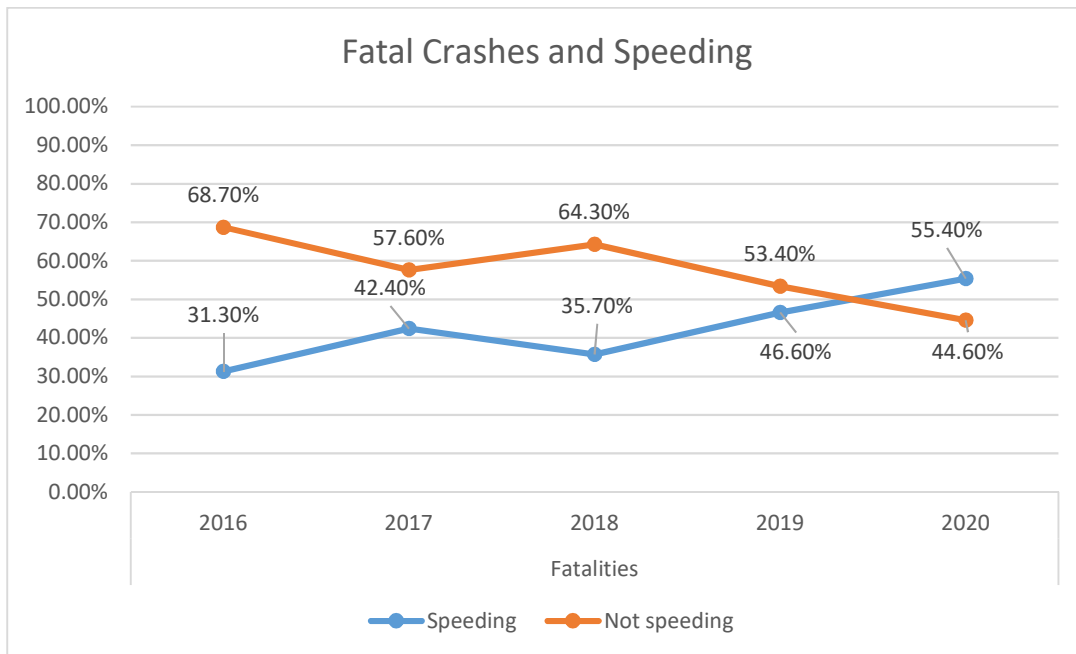


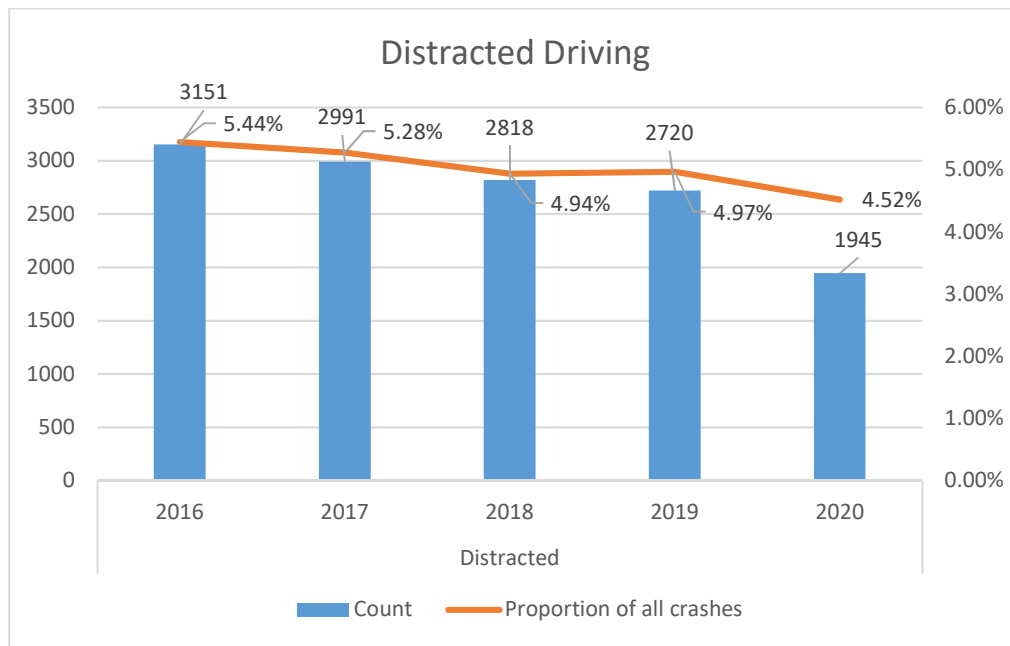
Figure 8: Percentages of fatal crashes in which speeding was involved among all linked Illinois crashes for 2016 through 2020



### *Distracted*

**Figure 9** shows that linked crashes in which distracted driving was involved have been on a steady decline dating back to 2016. In fact, the proportion of cases involving distracted driving and crashes in 2020 was the lowest of the study period. Upon examining fatalities among crashes involving distracted driving, no clear trends stand out there either. About 3.7% of fatal crashes involved a distracted driver in 2020, which is just about at parity with the prior four year mean of 3.6%.

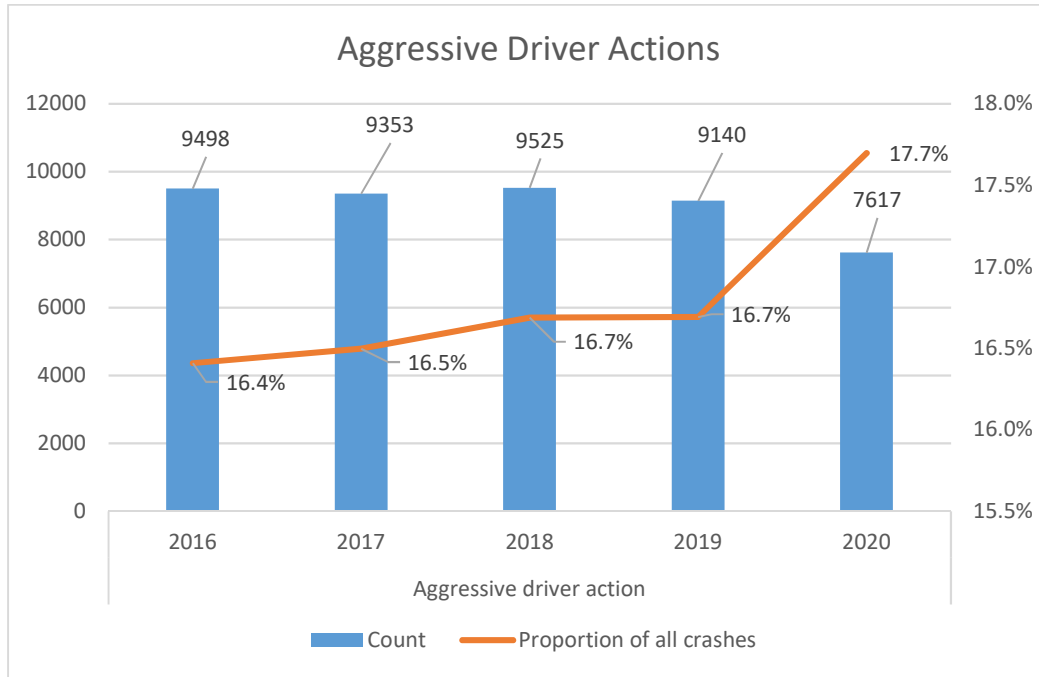
*Figure 9: Incidence counts and percentages for crashes in which distracted driving was involved among all linked Illinois crashes for 2016 through 2020*



### *Driver actions*

Though acts of speeding appear to be down yet more deadly, and acts of distraction also appear to be down, what of aggressive driving behavior? There is no field in the data which explicitly flags aggressive driving, but there are descriptions of driver behavior that can be reasonably interpreted as aggressive. This section interprets the following driver actions to be aggressive: evading police, disregard control device, failed to yield, followed too closely, improper passing, too fast for conditions, and wrong way. Looking at the data in this way reveals those cases were up in 2020 by a modest 1 percentage point, following four years of very little variation – in the 1/10<sup>th</sup> of a percentage point range (**Figure 10**). So while the increase in aggressive actions is slight, it is about 5-10 times higher than the regular variation.

Figure 10: Incidence counts and percentages for crashes in which an aggressive driver action was involved among all linked Illinois crashes for 2016 through 2020



### Hospital charges

As demonstrated throughout this text, risk taking and injury severity were at unprecedented high levels in 2020. An examination of the corresponding hospital charges to treat those more severe injuries also reveals unprecedented high levels (**Table 2**). Total hospital charges for linked crashes in Illinois reached nearly \$740 million in 2020, up 14.6% from 2019 or 5.4 times the typical year over year change, and about \$120 million over the prior four year mean. The average patient charge in 2020 was about six and a half thousand dollars over normal, and the median charge was about \$1,400 more than normal. The unpredictability and occurrence of extreme hospital charges is also evident in the inflated standard deviation of charges in 2020. The standard deviation for hospital charges to treat those injured in motor vehicle crashes in 2020 was over \$55K, or up about \$20K from prior years.

Table 2: Hospital charges of motor vehicle crash victims in Illinois from 2016 through 2020

	2016	2017	2018	2019	2020
Average	\$ 10,022.00	\$ 10,547.00	\$ 10,854.00	\$ 11,511.00	\$ 17,154.00
Median	\$ 3,459.00	\$ 3,771.00	\$ 3,886.00	\$ 4,102.00	\$ 5,294.00
Total	\$580,140,999.00	\$597,931,587.00	\$619,485,665.00	\$630,323,296.00	\$738,269,179.00
YoY Total Change	-	2.98%	3.48%	1.72%	14.6%

\*Color scales relate values by rows; green indicates relatively small numbers, red indicates relatively large numbers

## Discussion

Roadway behavior in Illinois typically classified as being of a risky nature appears to have been endemic in 2020. Though the data reveal it is not always as simple as counting the number or share of crashes involving any particular contributing crash factor. Crashes involving speed, for example, were down both in numbers and share. But a cross-tabulation of speed and fatal crashes reveals the share of fatalities involving speeding as a factor jumped nine percentage points in 2020 to over 55% of fatal crashes. So while occurrences of speeding and crashes were down, those that did occur had more severe consequences. Perhaps an increase of incidents of extreme speeding explains this, but the data fall short of providing supporting evidence.

Though to be sure, some outcomes of 2020 *really are* as simple as just counting numbers and shares. Impairment among drivers, pedestrians, and cyclists was up by 417 cases compared to the previous four year mean, despite there being almost 14,000 fewer linked crashes in 2020. Impaired road users in 2020 represented nearly 3.5% of all linked cases, which is more than double the rate of 2016 and up by a factor of 1.8 compared to the prior four year average. The presence of alcohol showed up in 602 cases, 510 of which were at or above the legal limit of 0.08%. Cannabis was involved in 511 cases and opioids another 441 – with some crossover impairment occurring.

There were 37 more fatal crashes than the previous four year mean in 2020, again despite there being nearly 14,000 fewer crashes than is typical. The share of fatal crashes was also up to 0.8% of linked crashes, up from the consistent share of 0.5% of the previous four years. Other injuries were also up in 2020 as measured using the MAIS. The number of severe injuries sustained reached 91 cases in 2020, nearly double the prior four year mean and double the share of a typical year. The number of critical injuries sustained in 2020 reached 174, some 57 more cases than the previous four year mean and double the typical share to 0.4% of crashes.

## Conclusion

Much more research ideally utilizing diversified sets of data is required to better learn of the full extent of risky behavior that occurred on Illinois roadways in 2020. As well, more research is needed to better understand what caused such behavior. In the meantime, it is not entirely clear what would mitigate the damage being caused. A combination of lower speed limits and increased enforcement has been shown effective at reducing injuries and fatalities (Tiwari, 2020). Though the issue of impaired drivers, pedestrians, and cyclists is more complex. Enforcement and targeted campaigns could nab more impaired drivers and prevent some injuries from occurring, but what of pedestrians and cyclists? Investments in our transportation infrastructure, especially among car-alternative modes of transportation, would go a long way in keeping motor vehicles away from those on foot or cycle, impaired or not, but we leave answers to future research.



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