Effects of COVID and Spatial Demography on the Reporting of Cyclists Struck by a Motor Vehicle



presented by

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- infrastructure.
- struck by motor vehicles.
- those most affected.

Why?

• Inaccurate accounting of traffic violence can lead to the misallocation of mitigating resources. • Historically disinvested communities miss out on funds to improve their car-alternative transportation

• This research is focused on people and places experiencing elevated rates of unreported cyclists

• This research provides a more complete

understanding of the community impact and what interventions are needed to improve the lives of

HOW?

- Statewide data sets of crash reports from the Illinois Department of Transportation
- Hospital discharge records from the Illinois Department of Public Health
- Customized software and probabilistic matching strategy linking crashes to corresponding hospital discharge file
- Data likely underrepresents the true scale of crashes in Illinois
- Statistical analysis shows data are proportionately representative of the population
- Many cases of cyclists seeking medical treatment after being struck by a motor vehicle remain in the hospital; data for this crash data could not be matched.
- Unmatched cases dubbed unreported.
- It is possible some unmatched cases were reported to police but the linking method failed to complete the match.
- Unreported struck cyclists are also referred to as discordant records.
- A discordance rate is calculated as the ratio of successfully linked cases to candidate cases in the hospital file and presented as a percentage.
- 2020 was treated like a natural experiment and then compared to outcomes from the previous four years.

Did onset of the COVID pandemic influence the decision of struck cyclists to report the crash?



Cyclists less likely to report being struck in 2020 relative to the prior four years. Struck pedestrians up to 20 percentage points more likely to report being hit compared to cyclists. Struck cyclists who sustained more severe injuries were more likely to report the incident to police.

Table 2 Summary

Unreported struck cyclists have on average more severe injuries relative to pedestrians.

Rates of unreported struck cyclists balloons by more than 20 percentage points as geography transitions from dense metropolitan areas to more rural areas.

2020 saw rates of unreported struck cyclists increase modestly relative to the prior four-year mean. Among Black cyclists between 2016 and 2019, the rate of unreported struck cyclists jumped 10 percentage points from metropolitan areas to micropolitan areas (areas of less density); in 2020, it increased nearly 18 percentage points.

Among White cyclists between 2016 and 2019, the rate of unreported incidents increased 11 percentage points from metropolitan to micropolitan areas; in 2020, this decreased slightly to just a 10-point difference.

More severe injury is more likely to require medical treatment and a response by emergency personnel. Cyclists with severe head injuries were nearly 20 percentage points more likely to report the crash compared to those with less severe injuries.

Unreported struck female cyclists in 2020, following the issuance of Illinois' stay at home orders generally increased across geographic types, while simultaneously decreasing among struck male cyclists.

Substance use among struck cyclists is another contributing factor.

Polysubstance use (any two or more substances) was up slightly in 2020; opioid use was up almost eight percentage points relative to the prior fouryear mean.

Table 2: Discordance rates by geography and demography

	[Metr	opolitan A	rea (RUCA	1-3)			Mie	cropolitan /	Area (RUCA	4-6)				Small Tow	n (RUCA 7	-9)			Rural	Area (RUC	A 10)		
Cyclist cha	aracteristic	Cases in h	ospital file	Unlinked	l hospital	Discorda	ance rate	Cases in	hospital	Unlinked	hospital	Discorda	ance rate	Cases in	hospital le	Unlinked	hospital	Discord	ance rate	Cases in	hospital	Unlinked	hospital	Discorda	ance rate
		2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016- 2019	2020	2016-	2020	2016-	2020	2016- 2019	2020
,	AII	10,475	2718	7527	2001	71.9	73.6	733	157	620	135	84.6	86.0	563	143	507	131	90.1	91.6	104	16	95	15	91.3	93.8
Age	<18	3471	929	2683	729	77.3	78.5	302	68	260	62	86.1	91.2	307	84	290	76	94.5	90.5	66	13	61	12	92.4	92.3
. 6.	18-64	6398	1589	4397	1046	68.7	65.8	401	78	337	58	84.0	74.4	230	55	195	43	84.8	78.2	32	-	29	-	90.6	-
	65+	606	200	447	133	73.8	66.5	30	11	23	-	76.7	-	26	-	22		84.6	-	-	-	-		-	-
Sex	Male	8070	2014	5748	1380	71.2	68.5	561	112	472	90	84.1	80.4	398	107	356	86	89.4	80.4	75	-	69	-	92.0	-
	Female	2403	704	1779	529	74.0	75.1	172	45	148	38	86.0	84.4	165	36	151	35	91.5	97.2	29	-	26		89.7	-
Ethnicity	Hispanic/Latino	1830	476	1263	329	69.0	69.1	26	-	23	-	88.5	-	20	-	14	-	70.0	-	-	-	-	-	-	-
	Non-Hispanic	8645	2188	6216	1580	71.9	72.2	707	151	620	125	87.7	82.8	543	140	493	119	90.8	85.0	103	16	94	15	91.3	93.8
Race	American Indian or Alaska Native	67	-	50	-	74.6		-	-	-	-	-			-	-			-	-	-	-		-	
	Asian	280	73	191	52	68.2	71.2	-	-	-	-	-			-	-	-		-	-	-	-		-	-
	Black or African American	1870	439	1293	284	69.1	64.7	82	17	65	14	79.3	82.4	15	-	13		86.7	-		-				
	Native Hawaiian																								
	or other Pacific	54	14	39	11	72.2	78.6																		
	Islander							-	-						-	-					-	-			-
	White	6158	1713	4555	1238	74.0	72.3	591	129	502	106	84.9	82.2	518	129	470	109	90.7	84.5	91	16	84	15	92.3	93.8
	Other	1931	415	1326	287	68.7	69.2	50	-	43	-	86.0	-	22	-	18	-	81.8	-	-	-	-		-	-
	Two or more	72	29	48	19	66.7	65.5	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
	Declined or Unkown	43	25	25	14	58.1	56.0								-	-			-						
Substances	Alcohol	93	37	73	29	78.5	78.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cannabis	89	26	58	17	65.2	65.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	Opioid	81	27	56	21	69.1	77.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cocaine	53	-	37	-	69.8	•	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hallucinogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stimulant	11	-	-	-	-		-	-	-	-	-			-	-		-	-		-	-		-	-
	Other Drug	38	-	31	-	81.6		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Here d Jackson	Polysubstance	55	15	40	11	72.7	73.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Head Injury	0	8080	2011	5861	1445	72.5	/1.9	584	128	500	105	85.6	82.0	447	117	403	100	90.2	85.5	78	11	71		91.0	-
Seventy	2	412	125	257	92	62.4	66.4	121	20	98	10	81.0	80.0	91	20	12	1/	91.2	85.0	22	-	20		90.9	-
	2	201	68	113	32	56.2	47.1	12	-	15	-	00.7		10	-	15		01.5	-		-	-		-	-
	4	-	-	-	-	-		-	-						-	-					-	-			_
	5	-	-	-	-	-		-							-	-		-			-				-
	6	-	-	-	-	-		-							-	-					-				-
Thorax Injury	0	9543	2444	6887	1731	72.2	70.8	654	139	561	111	85.8	79.9	508	129	461	110	90.7	85.3	94	15	88	14	93.6	93.3
Severity	1	623	151	440	105	70.6	69.5	58	14	47	13	81.0	92.9	39	11	36	-	92.3	-	-	-	-	-	-	-
	2	257	94	174	56	67.7	59.6	16	-	-	-	-		12	-	-	-		-	-	-	-	-	-	-
	3	50	30	26	17	52.0	56.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-		-	-	-	-	-		-	-	-	-		-	-	-	-	-	-	-
	6	-	-	-	-	-		-	-	-	-	-			-	-	-		-	-	-	-	-	-	-

Struck Cyclists and Zip Codes

- Dense, urban areas saw most incidents of unreported struck cyclists for 2016 2019 and 2020.
- Based on zip code population, rural communities stand out as being disproportionately affected.
- Carlinville in southwestern Illinois had the highest rate per capita for the years 2016 through 2019.
- Robinson in southeastern Illinois had the highest rate in 2020.
- Demographic shift of typical unreported struck cyclist occurred in 2020 with stay-at-home orders.
- Average poverty rate of an unreported struck cyclist in 2020 was nearly 3 percentage points lower than the prior four-year mean.
- 2020 average carless household rate was 2.2 percentage points lower relative to previous 4 years.
- Increased use of cycles during the worst of pandemic lockdowns among the wealthier could imply an effort to avoid contact on public transit.
- Typical unreported struck cyclists in 2016-2019 and 2020 lived in zip codes with 3 and 2.6 times, respectively, the rate of carless households compared to the Illinois state average.
- Compared to average Illinois poverty rate, crashes occurred among residents of zip codes with an average rate nearly 7 points higher in 2016-2019, and just under 4 percentage points higher in 2020.
- While there was a bit of an adjustment in 2020, this still disproportionately affected the socioeconomically disadvantaged.







Table 3

Descriptive statistics of discordant struck cyclists measured at the zip code level*



Cohort	Mean	Median
2016-19 Carless Household Rate	17.3%	14.5%
2016-19 Poverty Rate	18.5%	17.6%
2020 Carless Household Rate	15.1%	11.6%
2020 Poverty Rate	15.6%	13.5%

*2019 5-Year American Community Survey estimates









Standard Deviation
10.6%
9.10%
10.7%
9.01%





Poverty vs. Carlessness

- Among pedestrians, without exception, zip codes with the highest discordant rates are among members of communities with poverty and carlessness rates far above the Illinois average.
- Among cyclists, the zip codes with the highest discordant rates cuts a much wider swath, and are much more evenly distributed across communities of both high and low rates of poverty and carlessness.
- Distribution of unreported struck cyclists is more likely to be below and to the left of the Illinois average – implying poverty and carlessness rates below the average.
- Existing especially among the treatment group (2020) are high discordant rate zip codes with high, and very high, rates of carlessness but below average poverty rates.
- This implies that rather than being forced into alternative transport modes like cycling because of an inability to afford a car – the car-less, some unreported strikes may be among the relatively better off who are simply in pursuit of a car-free lifestyle.



Figure 1



 2016-19 Unreported 2020 Unreported

*2019 5-year American Community Survey estimates

UNREPORTED CYCLIST CRASHES

Characteristics of Struck Cyclists

- For the first time, 2020 saw a statistically significant and negative relationship between car ownership and unreported struck cyclists.
- For the first time, living in a zip code with higher carlessness was associated with a greater likelihood of not reporting being struck on a cycle.
- Prior to 2020, the reverse was true.

Table 4

Unreported struck cyclist characteristics association with high incidence per capita: results of segmented binary logistic regression model

Variable	Coefficient (2016-2019)	Odds Ratio (2016-2019)	Coefficient (2020)	Odds Ratio (2020)	
Built Environment	0.315*	1.37*	0.391*	1.48*	
Carless Household Rate	5.63*	278*	-4.77*	0.008*	
Poverty Rate	6.90*	988*	7.32*	1515*	
Child Poverty Rate	-3.40**	0.033**	-0.430	0.651	
Hispanic	-0.122	0.886	-0.657*	0.518*	
White	-0.181	0.834	0.414	1.51	
Black	-0.521*	0.594*	-0.167	0.846	
Asian	-0.888*	0.412*	-0.311	0.732	
Other (race)	-0.152	0.859	0.823***	2.28***	
Median Household Income	0.00*	1.00*	0.00*	1.00*	

*Significant at 1%; **Significant at 5%; ***Significant at 10%

Conclusion

- Access to these data and when examined in this manner, they can be useful to policymakers, transportation planners and engineers, and community members when conducting road safety assessments.
- More accurate information can result in a more equitable distribution of mitigation funding and efforts within the communities that need it the most - so that investments can be made in car-alternative transport infrastructure and decrease the risk exposure for those outside of cars.
- Future studies should focus on investigating the dynamics underlying the factors outlined here specifically in a manner that permits community outreach to encourage the reporting of all crashes.

