

**EMERGENCY MEDICAL SERVICES AND TRAUMA  
REGISTRIES**

**PEDAL CYCLISTS INVOLVED IN  
MOTOR VEHICLE CRASHES, TEXAS,  
2019-2021**



**TEXAS**  
Health and Human  
Services

Texas Department of State  
Health Services

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## Introduction

Motor vehicle crashes are a public health concern both in the U.S. and abroad. In the U.S., motor vehicle crashes are a leading cause of death and kill over 100 people every day. However, motor vehicle crash injuries and deaths are preventable.<sup>1</sup> There are proven strategies that can help prevent these injuries and deaths. Whether a driver, passenger, cyclist, or pedestrian, there are steps to stay safe on the road.

Bicycling for transportation or leisure has multiple health benefits associated with physical activity, such as reduced risk of cardiovascular disease, type 2 diabetes, and some cancers. Studies have found that adults who bicycle for transportation purposes are more likely to meet the weekly activity levels recommended by the Centers for Disease Control Prevention (CDC).<sup>2</sup>

However, the CDC reports that nearly 1,000 bicyclists die and over 130,000 are injured in crashes that occur on U.S. roads every year. The costs of bicycle injuries and deaths from crashes typically exceed \$23 billion in the U.S. each year. These costs include health care spending and lost work productivity as well as estimated costs for lost quality of life and lives lost.<sup>3</sup>

The Texas Department of Transportation (TxDOT) reported that bicyclist fatalities from traffic crashes are on the rise. From 2017 - 2021, 364 cyclists were killed on Texas streets and highways. In 2021 alone, there were 2,267 traffic crashes involving bicyclists in Texas, resulting in 92 deaths, a 12 percent increase in fatalities over the previous year.<sup>4</sup>

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<sup>1</sup> The Centers for Disease Control and Prevention [cdc.gov/TransportationSafety/](https://cdc.gov/TransportationSafety/), accessed April 2023.

<sup>2</sup> National Center for Biotechnology Information [pubmed.ncbi.nlm.nih.gov/19190585/](https://pubmed.ncbi.nlm.nih.gov/19190585/), accessed April 2023.

<sup>3</sup> **2019 Data: Bicyclists and Other Cyclists** / ( WISQARS (Web-based Injury Statistics Query and Reporting System) | Injury Center CDC), accessed April 2023.

<sup>4</sup> Texas Department of Transportation (TxDOT), [txdot.gov/safety/traffic-safety-campaigns/bicycle-safety.html](https://txdot.gov/safety/traffic-safety-campaigns/bicycle-safety.html), accessed April 2023.

## Objectives and Method

In this report, the Texas Department of State Health Services (DSHS) EMS and Trauma Registries (EMSTR) linked EMSTR and TXDOT data from the Texas Crash Record and Information System (CRIS) database.

EMSTR epidemiologists explored EMS, trauma, and crash variables to identify trends with pedal cyclists related to motor vehicle crashes. EMSTR ran frequencies for select variables which included but are not limited to demographics, injury severity scores, road characteristics, and helmet use.

Patients included in the linked datasets are patients involved in a crash who were assisted by EMS and who ended up in a hospital as a traumatic injury.

### Inclusion criteria

The case definitions for motor vehicle traffic-related injuries are based on guidelines established by the CDC for the annual State Injury Indicators Reports.

<b>International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) external cause-of-injury codes for Unintentional Motor Vehicle Traffic- (MVT) related Injuries (2020)</b>	<b>Description</b>
V02–V04 (.1, .9), V09.2, V09.3	MVT Pedestrian
V12-V14 (.3–.9), V19.4-V19.6, V19.9	MVT Pedal cycle
V20-V28 (.3-.9), V29.4-V29.9	MVT Motorcycle
V30–V79 (.4–.9), V83–V86 (.0-.3), V87.0–V87.8, V89.2	MVT Occupant
V80.3-V80.5, V81.1, V82.1	MVT Other

To identify pedal cyclists, EMSTR filtered using the crash variable: **Person\_Type\_Id**.

## Technical Notes

Pedal cyclists are defined by the National Highway Safety Administration as bicyclists and other cyclists including riders of two-wheeled, nonmotorized vehicles, tricycles, and unicycles.

The Texas Department of State Health Services (DSHS) Emergency Medical Services and Trauma Registries (EMSTR) data are based on passive surveillance of records submitted by Texas EMS entities and hospitals. EMSTR can only report on records received and should not be considered complete or representative of all Texas EMS entities and hospitals.

Per epidemiology best practice, EMSTR suppressed data when there were less than five records to protect identifiable data, noted with a “\*”.

## Overall 2019-2021 Linked Motor Vehicle data:

	<b>2019-2021 (n = 27,362)</b>	
<b>Person Type</b>	<b>Count</b>	<b>Percent</b>
Driver	15,817	57.81%
Passenger/Occupant	5,242	19.16%
Driver of Motorcycle Vehicle	3,879	14.18%
Pedestrian	1,617	5.91%
<b>Pedal Cyclist</b>	<b>537</b>	<b>1.96%</b>
Passenger/Occupant on Motorcycle Vehicle	208	0.76%
Other	40	0.15%
Unknown	22	0.08%

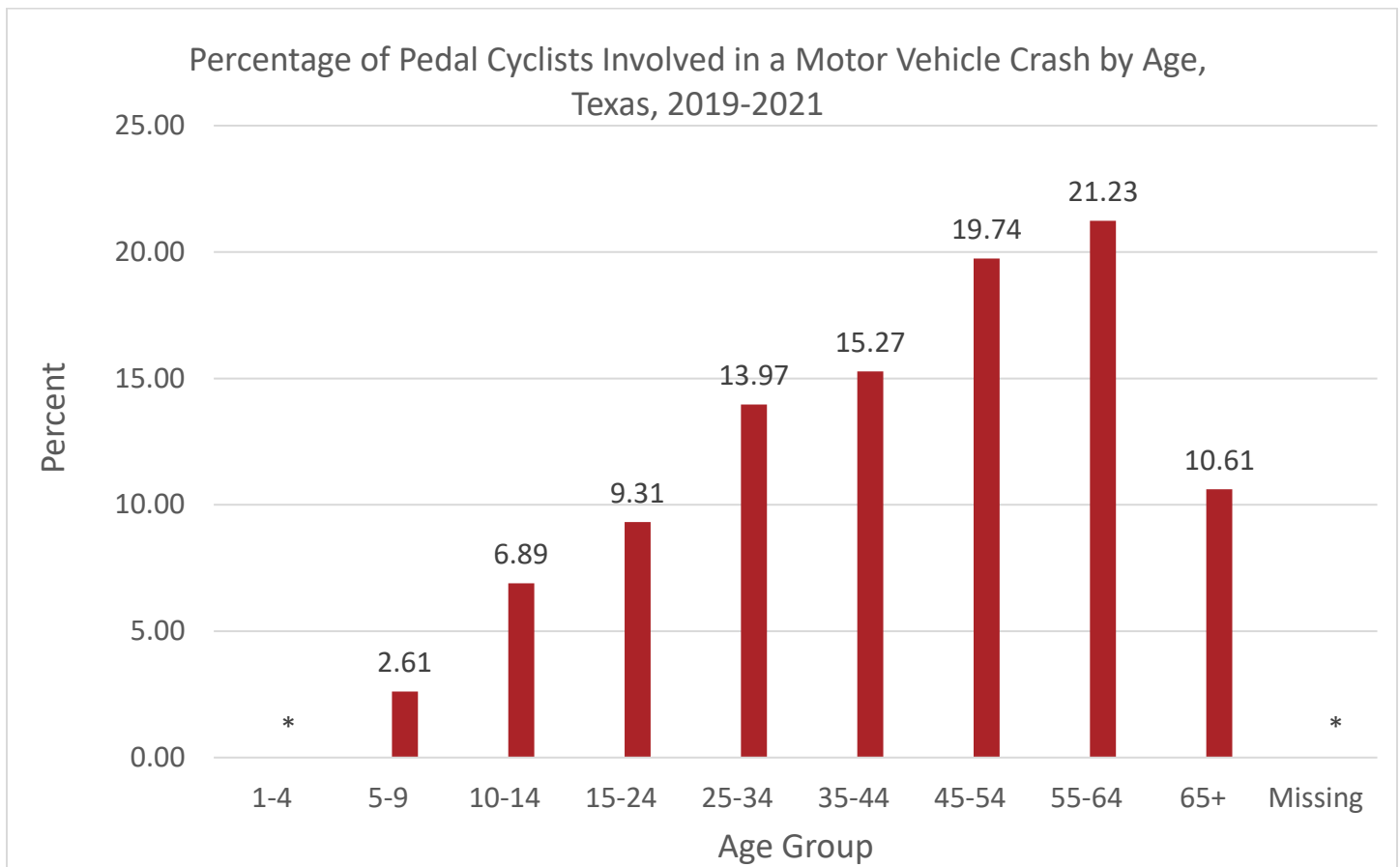
Between 2019 and 2021 there were 27,362 total unique records of motor-related vehicle injuries. Of these 27,362, 537 (1.96%) were pedal cyclists.

	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Records of Pedal Cyclists	218	201	118	537

Of the 27,362 unique motor-related vehicle injury records between 2019-2021, 537 were pedal cyclists.

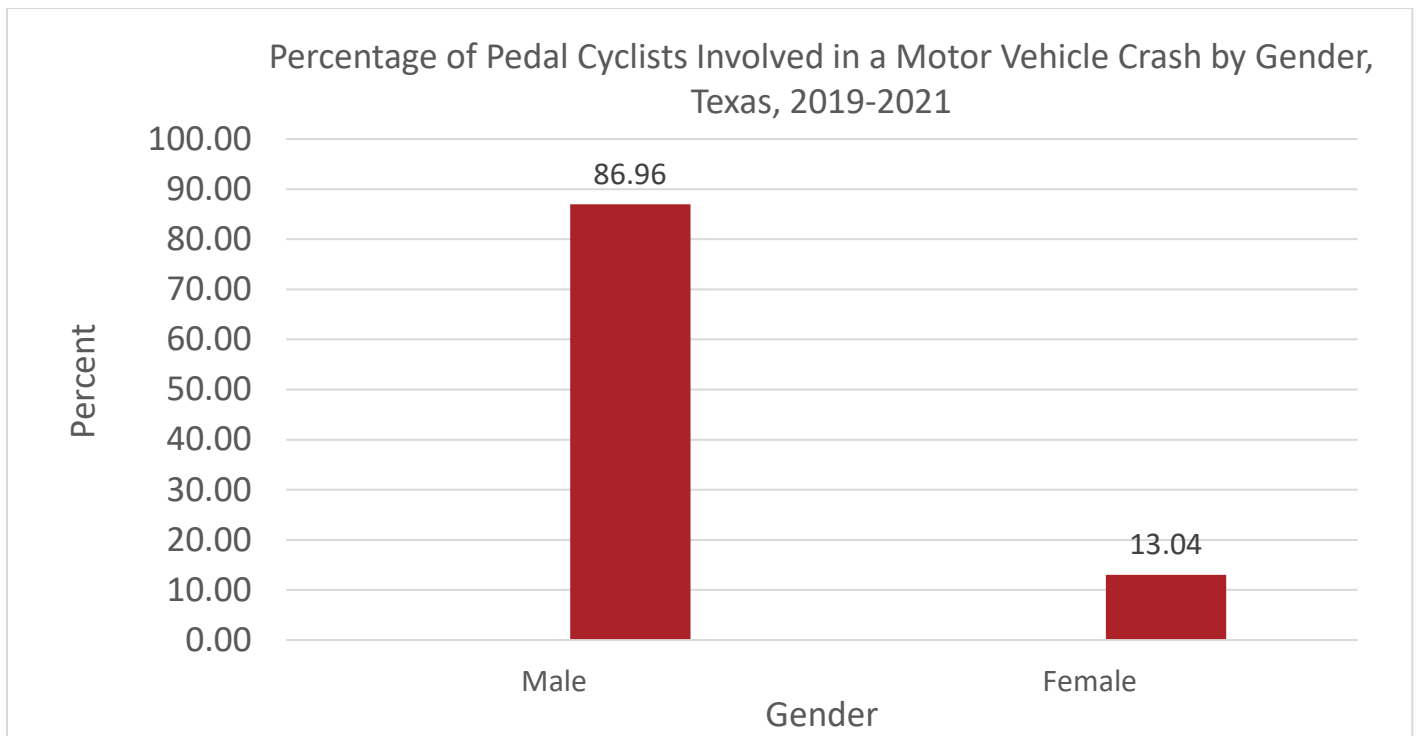
## Demographics

### Age Group



Between 2019 and 2021, bicyclists in all age groups were involved in crashes. Those with the highest percentages were represented by age groups 45 to 54 and 55 to 64 respectively, with an average of 20 percent and 21 percent followed by age groups 25 to 34 and 35 to 44 respectively, with an average of 14 percent and 15 percent.

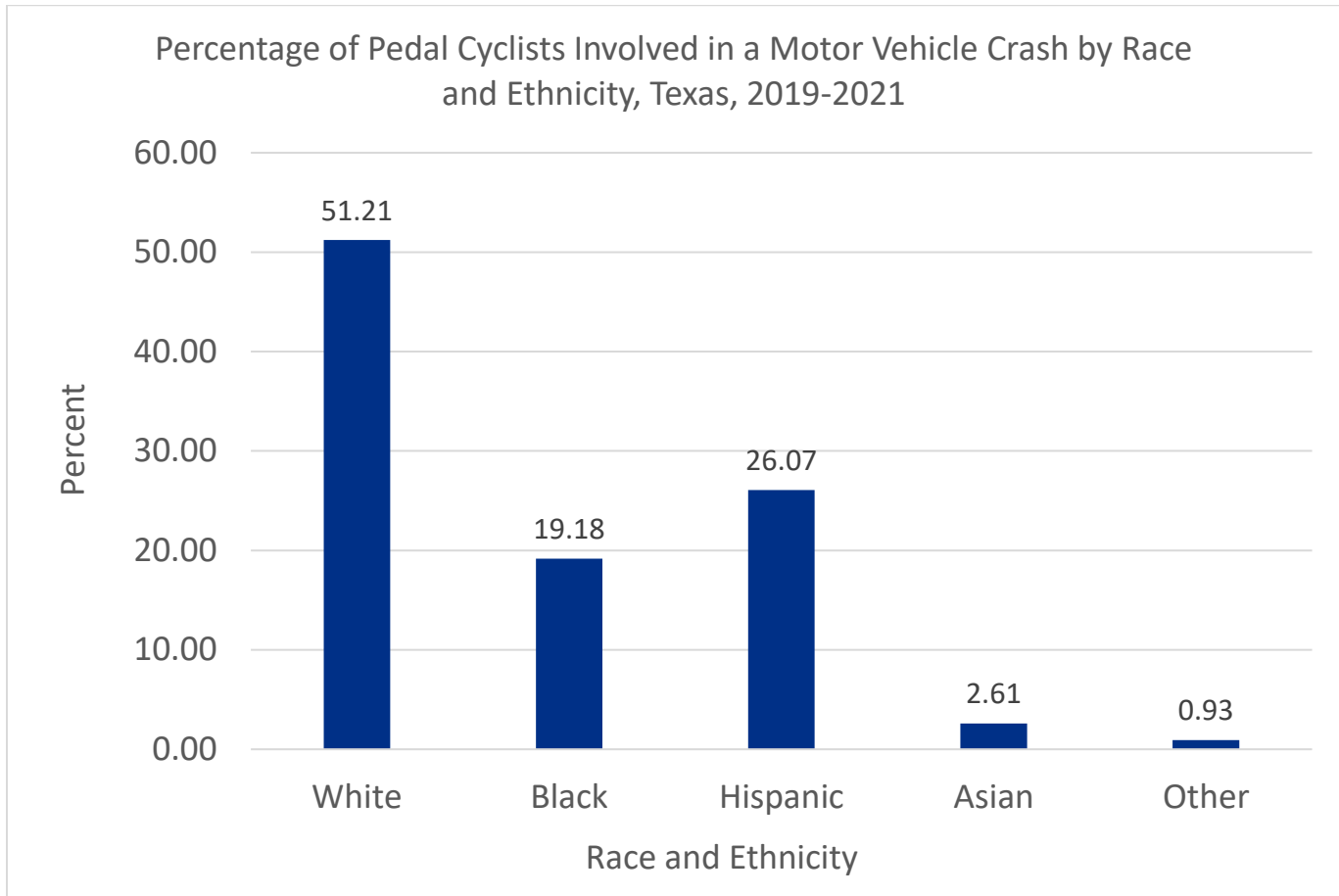
## Gender



Within the 2019-2021 dataset, most cyclists (86.96 percent) were male.



## Race and Ethnicity



More than half (51 percent) of the bicyclists in the linked dataset were non-Hispanic White. Hispanics accounted for 26 percent of the cyclists, 19 percent were Black, 3 percent were identified as Asian, and 1 percent were other.

## EMS and Trauma Variables

**Chief Complaint of the Anatomical Location:** The table below provides the primary anatomic location of the chief complaint as identified by EMS personnel (from the National EMS Information System/NEMESIS 3.3.4 Data dictionary).

Chief Complaint And Location	2019-2021 (N=537)	
	Count	Percent
General Global	147	27.37%
Extremity Lower	51	9.50%
Head	44	8.19%
Extremity Upper	16	2.98%
Back	12	2.23%
Neck	*	*
Abdomen	*	*
Chest	*	*
Not Recorded	260	48.42%

\*Less than 5 cases

The three top patient anatomical complaints were general complaints, in the lower extremities, and the head.

**Injury Severity Score (ISS):** ISS is an established medical score to assess trauma severity. It assesses the combined effects of patients with multiple injuries and is based on an anatomical injury severity classification: the Abbreviated Injury Scale (AIS). AIS is an anatomically based injury severity scoring system that classifies each injury by body region on a six-point scale developed by the Association for the Advancement of Automotive Medicine.<sup>5</sup>

Injury Severity Score	2019 (n = 218)		2020 (n = 201)		2021 (n = 118)	
	Counts	Percent	Counts	Percent	Counts	Percent
1-8 (Less Severe)	87	39.91%	75	37.31%	50	42.37%
9-15	85	38.99%	64	31.84%	40	33.90%
16-24 (Severe)	34	15.60%	35	17.41%	14	11.86%
>=25 (Most Severe)	10	4.59%	26	12.94%	14	11.86%
Missing	*	*	*	*	0	0.00%

<sup>5</sup> Association for the Advancement of Automotive Medicine [aaam.org/abbreviated-injury-scale-ais/](http://aaam.org/abbreviated-injury-scale-ais/).

\*Less than 5 cases

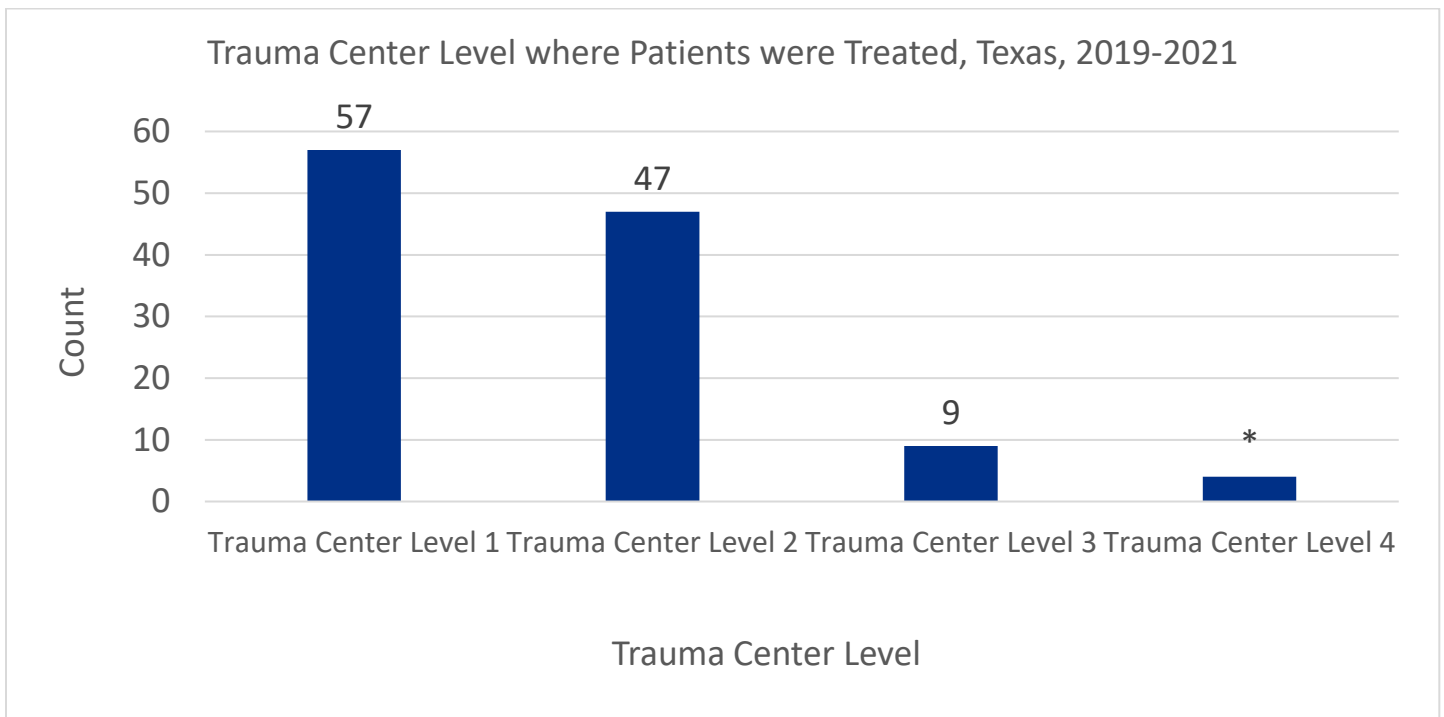
Between 2019 and 2021, approximately a quarter of the injured patients (133/537 = 24.77 percent) were assigned an ISS greater than 15.

### Trauma Center Levels by ISS

Trauma center levels are assigned through two processes – a designation process and a verification process. The different levels refer to the kinds of resources available in a trauma center and the patient numbers admitted yearly. These categories define national standards for trauma care in hospitals. Categorization is unique to both Adult and Pediatric facilities.

A Level 1 trauma center is a health care facility with the capacity to provide total care for every aspect of injury – from prevention through rehabilitation.<sup>6</sup>

### Trauma Center Levels



\*Less than 5 cases

Data indicates that injured pedal cyclists were most likely to be treated at Level 1 and Level 2 trauma centers.

<sup>6</sup> American Trauma Society [amtrauma.org/page/traumalevels](https://amtrauma.org/page/traumalevels)).

## Trauma Center Levels when the ISS is greater than 15

<b>Trauma Center Levels - when ISS &gt; 15 (severe)</b>	<b>Average Percent 2019-2021</b>
Level 1 Trauma Center	58.73%
Level 2 Trauma Center	17.46%
Level 3 Trauma Center	19.05%
Level 4 Trauma Center	*

\*Less than 5 cases

When EMSTR analyzed trauma center level usage by ISS, data indicated that 58 percent of the patients with a severe ISS of 15 or higher were treated at a trauma center level 1.

## Crash Variables

### Road Characteristics and Outside Conditions:

Road Classification	Percentage 2019 - 2021
City Street	63.61%
U.S. and State Highways	14.90%
County Road	7.81%
Farm To Market	6.90%
Interstate	3.67%
Non Trafficway	2.83%
Other Roads	0.28%
<b>Road Surfaces</b>	
Dry	93.10%
Wet	6.46%
Sand, Mud, Dirt	*
Other	*
<b>Intersection Information</b>	
Non-Intersection	36.93%
Intersection	32.35%
Intersection Related	23.63%
Driveway Access	7.09%
<b>Weather Conditions</b>	
Clear	81.40%
Cloudy	14.25%
Rain	3.91%
Fog	0.44%
<b>Lighting Conditions</b>	
Daylight	60.85%
Dark, Lighted	21.25%
Dark, Not Lighted	13.50%
Dusk	*
Dark, Unknown Lighting	*
Dawn	*

## Crash Variables Results:

**Road Classification:** Between 2019 and 2021, most pedal cyclist crashes occurred on city streets, with an average of 63 percent and 14 percent occurring on U.S. and State Highways.

**Road surfaces:** The data indicates that the surface of the roads was dry in 93 percent of crashes.

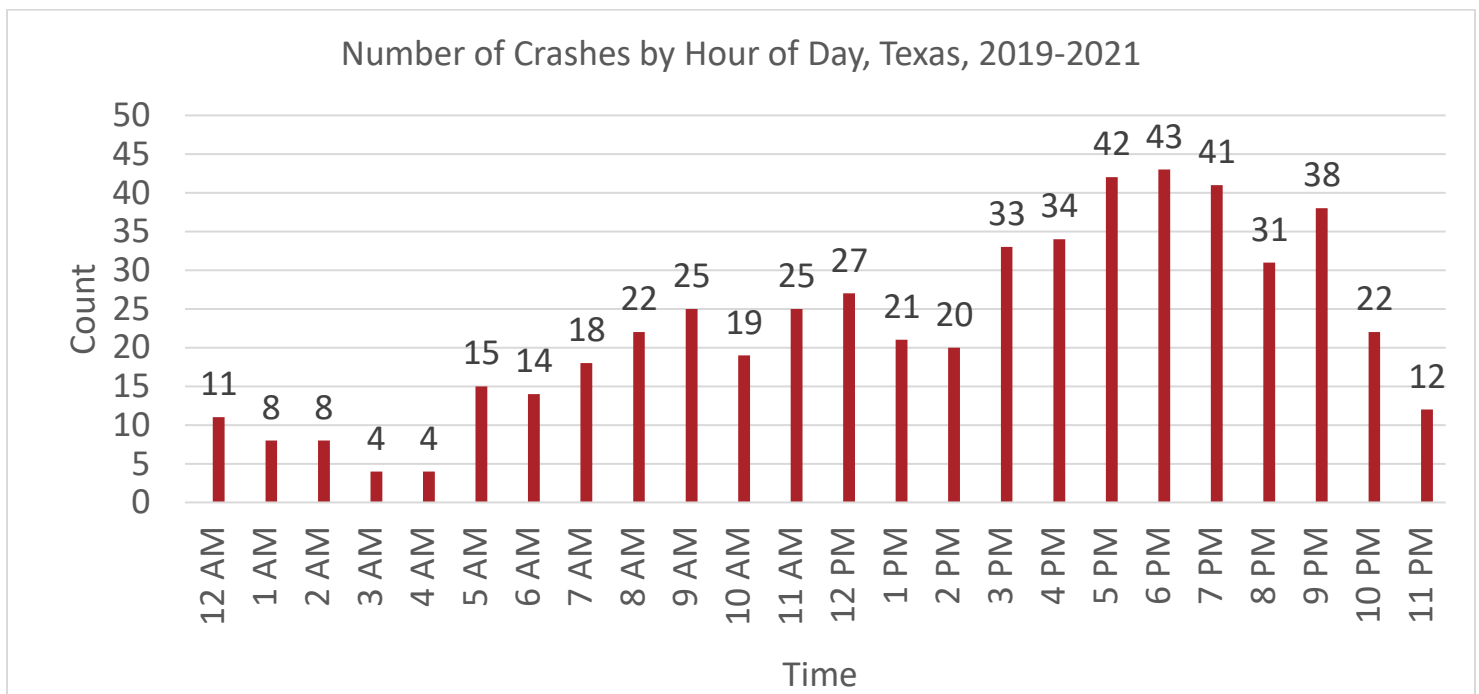
**Intersections:** According to the data, over 32 percent of the crashes occurred in an intersection.

**Weather conditions:** Most crashes (81 percent) happened when the weather was clear.

**Lighting conditions:** Based on the data, 60 percent of crashes occurred in daylight.

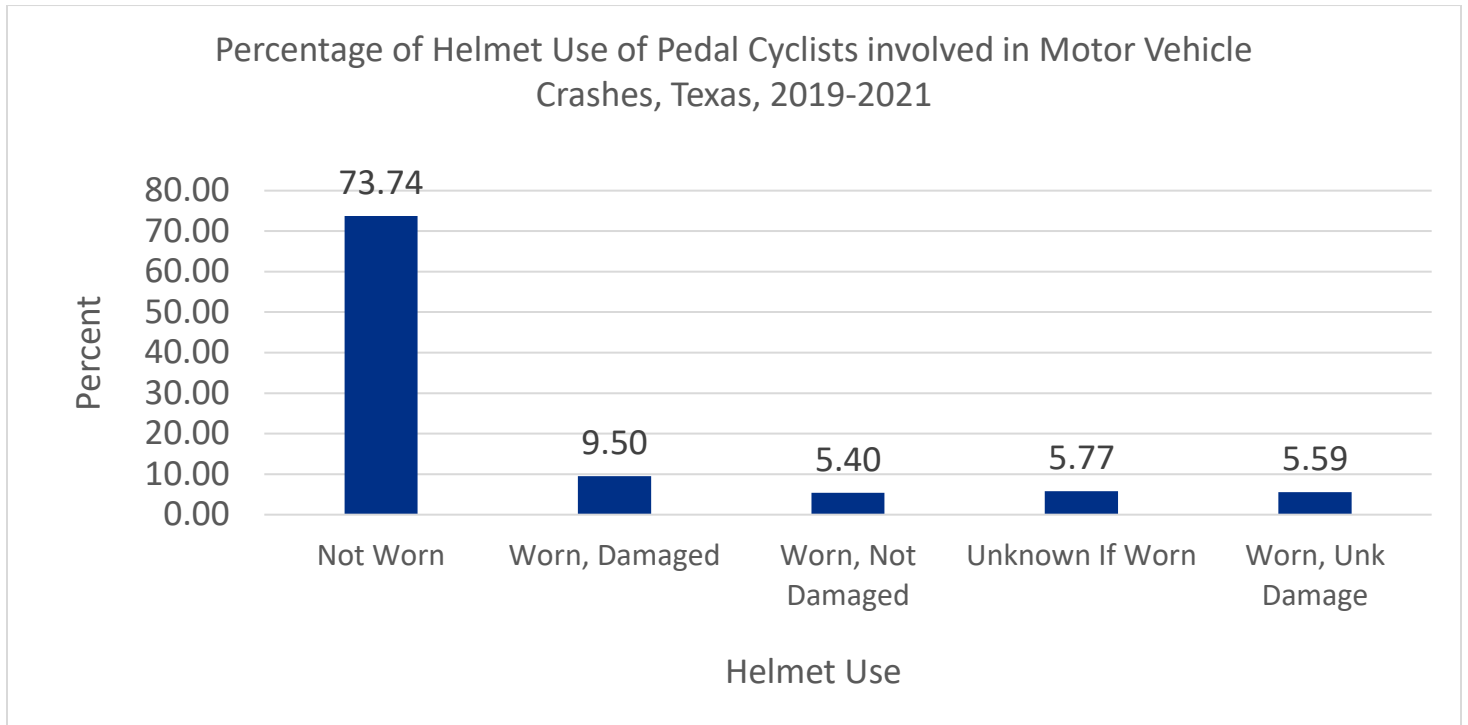
## Time of Crash

EMSTR used variable **Crash\_time** to explore time the crashes occurred.



Pedal Cyclist crashes occurred throughout the day. There are a few minor peaks, with the highest peak occurring at 6 pm with 43 crashes.

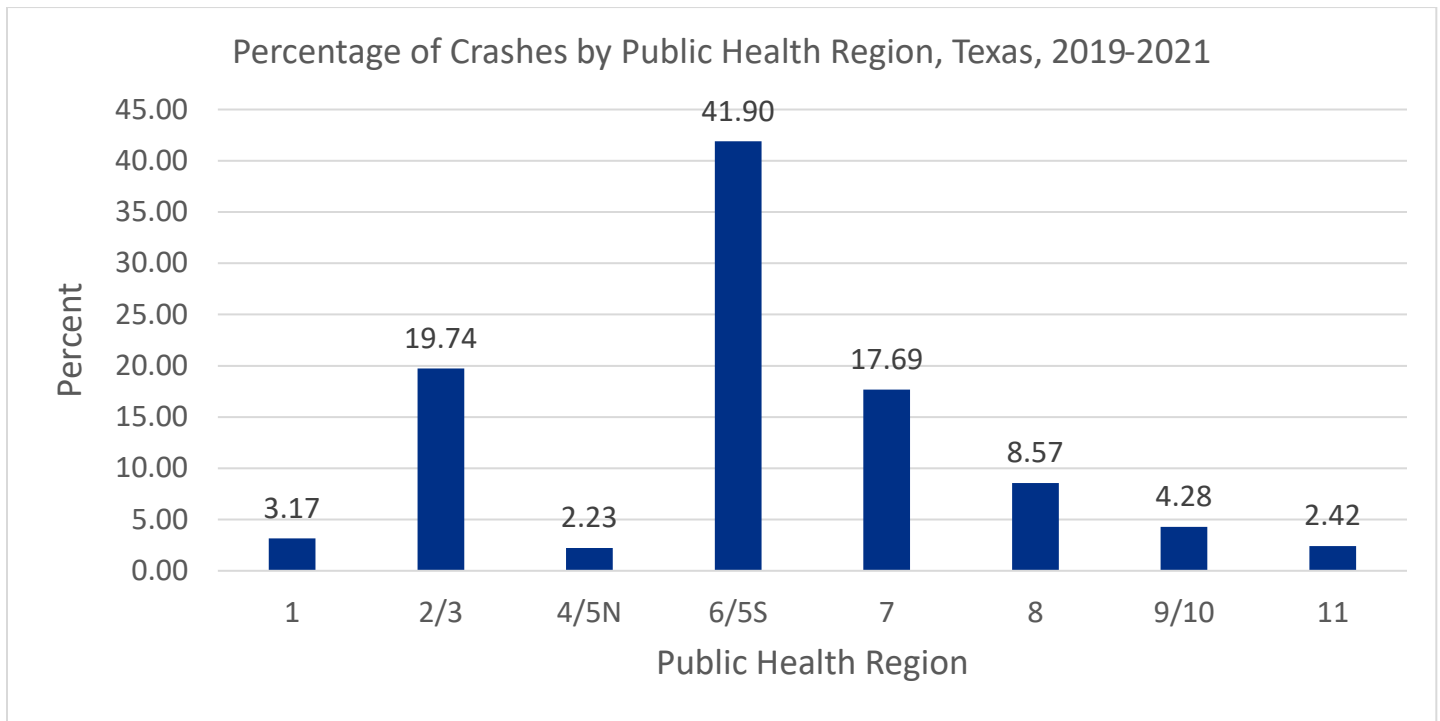
## Helmet Use



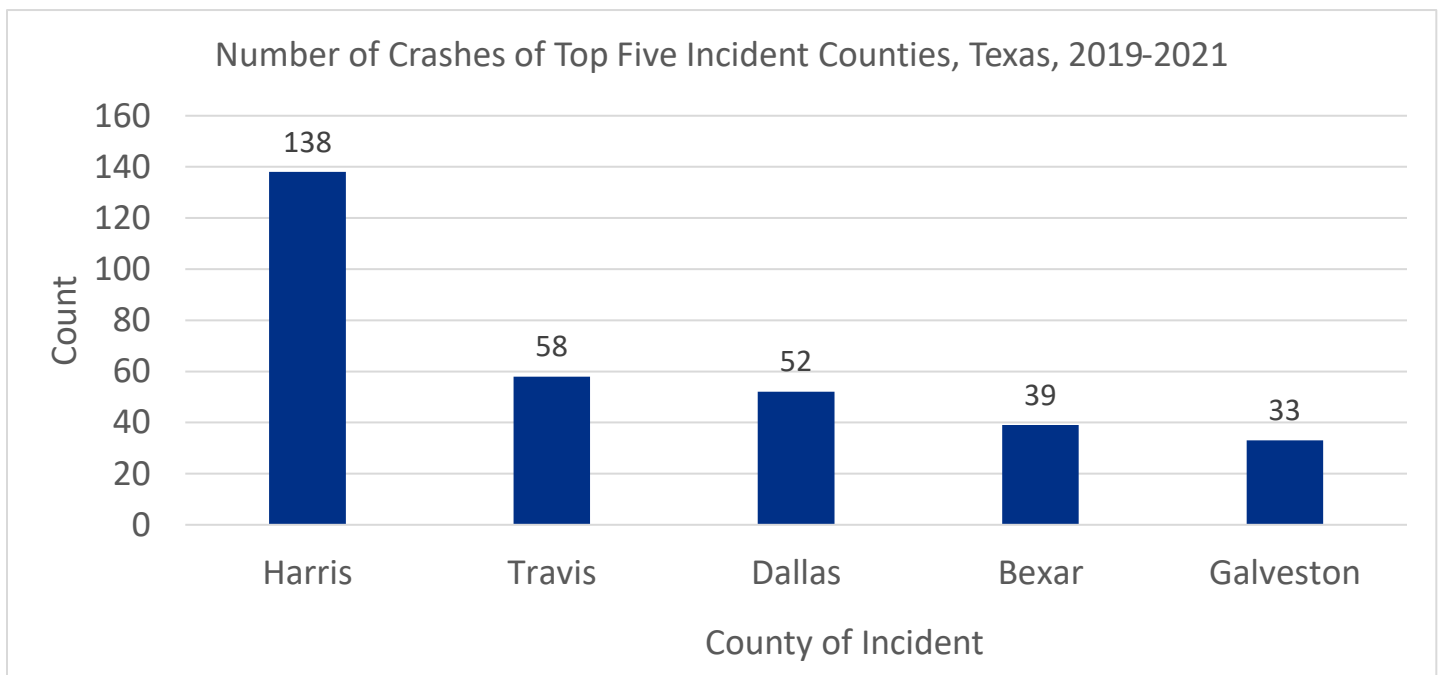
Out of the 537 pedal cyclists, 74 percent were not wearing a helmet.

## Geographical Locations

### Public Health Region (PHR)



### Incident County



The highest record numbers occurred in Harris County, where Houston is located. Harris County is located in PHR 6/5 South.

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### Motor Vehicle Crashes with Cyclists



## Discussion

In this report, EMSTR explored roadway characteristics, weather, lighting conditions, and bicyclists' behavior to try to understand possible contributors of pedal cyclists involved in motor vehicle crashes between 2019-2021 using linked data.

The findings in this analysis show that surface of the roads (93 percent dry), weather conditions (81 percent clear), and lighting conditions (60 percent daylight) were interesting factors in understanding the crash circumstances.

However, it is important to note that the analysis also showed that 55 percent of crashes occurred in an intersection and 74 percent of the cyclists were not wearing a helmet during the crash.

## Conclusion

Using a helmet is considered the single most effective way to prevent head and brain injuries. Results from a meta-analysis found that using bicycle helmets reduces serious head injuries by 60 percent, traumatic brain injuries by 53 percent and serious injuries and deaths by 34 percent.<sup>7</sup>

Bicycle helmet laws are effective for increasing helmet use and reducing crash-related injuries and deaths when they are combined with education campaigns. Texas has no state-wide law requiring cyclists of any age to wear a helmet.<sup>8</sup>

## Limitation

By including only individuals identified in the linked dataset, EMSTR may have excluded cyclists who were involved in a crash but:

- Were not injured;
- Had minor injuries and drove themselves to a hospital;
- Died on the scene; or
- Were taken to another facility for observation or to the Intensive Care Unit.

In addition, it is possible that during the linkage process, EMST may have excluded individuals with missing identifiers such as date of birth or social security numbers.

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<sup>7</sup> Cleveland Clinic [health.clevelandclinic.org/bicycle-helmet-safety/](https://health.clevelandclinic.org/bicycle-helmet-safety/)

<sup>8</sup> McCraw Law Group [mccrawlawgroup.com/blog/bicycle-helmet-laws-in-texas/](https://mccrawlawgroup.com/blog/bicycle-helmet-laws-in-texas/)

## References

[cdc.gov/TransportationSafety/](https://cdc.gov/TransportationSafety/)

**2019 Data: Bicyclists and Other Cyclists**

**WISQARS (Web-based Injury Statistics Query and Reporting System) | Injury Center CDC**

[txdot.gov/safety/traffic-safety-campaigns/bicycle-safety.html](https://txdot.gov/safety/traffic-safety-campaigns/bicycle-safety.html)

[health.clevelandclinic.org/bicycle-helmet-safety/](https://health.clevelandclinic.org/bicycle-helmet-safety/)

[aaam.org/abbreviated-injury-scale-ais/](https://aaam.org/abbreviated-injury-scale-ais/)

[mccrawlawgroup.com/blog/bicycle-helmet-laws-in-texas/](https://mccrawlawgroup.com/blog/bicycle-helmet-laws-in-texas/)

**World Health Organization (WHO)**

[amtrauma.org/page/traumalevels](https://amtrauma.org/page/traumalevels)

The National EMS Information System (NEMSIS): [nemsis.org/technical-resources/version-3/version-3-data-dictionaries/](https://nemsis.org/technical-resources/version-3/version-3-data-dictionaries/)

The National Trauma Data Bank (NTDB): [facs.org/quality-programs/trauma/tqp/center-programs/ntdb/ntds](https://facs.org/quality-programs/trauma/tqp/center-programs/ntdb/ntds)

**Injury Indicators Case Definitions:** Thomas KE, Johnson RL. State injury indicators report: Instructions for preparing 2019 data. Atlanta (GA): CDC, National Center for Injury Prevention and Control; 2021.

# General Informational Page

## General Information

The Emergency Medical Services and Trauma Registries (EMSTR) is comprised of four registries: the EMS Registry; the acute Traumatic Injury Registry; the Traumatic Brain Injury Registry / Spinal Cord Injury Registry; and the Submersion Registry. EMSTR is a statewide passive surveillance system that collects reportable event data from EMS providers, hospitals, justices of the peace, medical examiners, and rehabilitation facilities. Texas is home to one of the largest EMS registries in the U.S. with more than 4 million records submitted annually.



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## Our Goals

- Provide a robust registry reporting framework for recording reportable traumas.
- Reduce the burden of injury to the public resulting from preventable occurrences using trend analysis.
- Provide data as close to real-time as possible for local, state, and national leadership use.

## Our Mission

Improve Texans' health, safety, and well-being through good stewardship of public resources with a focus on core public health functions.

The Injury Prevention Unit works to understand how injuries impact Texans. By providing injury and violence data and education, we can help you lead the way on injury prevention in homes, workplaces, and communities.

## Contact Information

### Emergency Medical Services and Trauma Registries

Texas Department of State Health Services  
1100 West 49<sup>th</sup> Street  
Mail Code 1922  
Austin, Texas 78756

For program inquires:  
[Injury.web@dshs.texas.gov](mailto:Injury.web@dshs.texas.gov)

For data requests:  
[Injury.epi@dshs.texas.gov](mailto:Injury.epi@dshs.texas.gov)

[dshs.texas.gov/injury-prevention](https://dshs.texas.gov/injury-prevention)

Texas EMS and Trauma Registries

[\*dshs.texas.gov/injury-  
prevention/ems-trauma-registries\*](https://dshs.texas.gov/injury-prevention/ems-trauma-registries)

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