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Non-Powered Bicycle Injuries and Fatalities

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Executive Summary

This report provides estimates of emergency department (ED) visits to treat injuries associated with bicycles or bicycle accessories reported to CPSC as well as total counts of fatalities associated with bicycle riding, in the U.S. in 2022.[1] Findings include:

- Emergency Department Visits Associated with Bicycles or Bicycle Accessories
    - An estimated 402,300 hospital ED visits were associated with bicycles or bicycle accessories. Among these, 95% (383,700) appeared to result from bicycle riding, 4% resulted from non-riding interactions with a bicycle, and less than 1% involved a bicycle accessory or had unknown bicycle involvement.
    - Over 75% of bicycle-riding patients seen in EDs were males.
    - Most patients seen in ED-treated visits involving bicycle riding were adults, with 70% (267,200 of 383,700) of patients being over the age of 18. However, children ages 5-17 were associated with the most visits per capita, at 195 per 100,000 population.
    - The most frequently injured body parts in riding injuries seen in EDs were arms (37% of patients) and legs (30% of patients). The most common diagnoses were fractures (31%) and contusions or abrasions (30%).
    - The most common hazard patterns for bicycle-riding incidents leading to ED visits were falls (42%) and motor vehicle incidents (21%). Mountain bikes were more frequently involved in unspecified crashes, flipping over handlebars, and injuries while performing tricks or racing, compared to road bikes.[2] Road bikes were more frequently seen in falls and motor vehicle incidents than mountain bikes.
    - Motor vehicle incidents accounted for an estimated 21% (79,900 of 383,700) of ED visits associated with bicycle riding, with 80% (63,700 of 79,900) connoted in the ED report as driver error.
    - Among incidents where helmet use was known, about half of the patients were wearing a helmet when injured. Among patients who reported head injuries where helmet use was known, only about 36% (10,100 out of 28,200) were wearing helmets.
    - Alcohol or drug use was mentioned in the ED reports of about 5% of patients with bicycle-riding injuries.
    - Non-riding bicycle incidents leading to ED visits involved a variety of hazard patterns. The most common hazards were pedestrians getting struck by bicyclists (27% of estimated ED visits),

[1] At the time data analysis began, 2022 was the most recent year of complete hospital ED visit data available to CPSC.

[2] In this report, road bikes refer to bicycles reported using NEISS product code 5040 (*Bicycles or accessories, excluding mountain or all-terrain bicycles*). This includes bicycle types designed for road use, such as racing, hybrid, trekking, touring, city, utility, commuter, comfort, cruiser, recumbent, and tandem bicycles, among other bicycles intended for paved surfaces rather than rough terrain.

tripping over bicycles or falling onto bicycles (18%), carrying or lifting bicycles (13%), and repairing bicycles (12%).

- Fatalities Associated with Bicycle Riding
  - There were 1,395 fatalities associated with bicycle riding.
  - Over 87% of bicycle-riding fatalities were male.
  - Adults were victims in fatal bicycle-riding incidents more frequently than children, both in total count and per capita. Adults over the age of 45 showed the highest risk of fatal bicycle-riding incidents, accounting for 65% of riding-related fatalities.
  - Motor vehicles were associated with 38% (526 of 1,395) of bicycle-riding fatalities. This grows to 73.0% of fatalities if incidents involving other and unspecified transport accidents (which include motor vehicle-related incidents of unknown type and other accidents of unknown mechanism - these were 48.3% of the incidents) are removed.

Overview

Bicycles and bicycle accessories are among the most common classes of consumer products associated with injuries reported in hospital emergency departments.[3] During the COVID-19 pandemic, many turned to cycling as a safe way to exercise while maintaining social distance, and several metropolitan areas saw an increase in bicycle commuting.[4] In 2022, the majority of bicycle-related injuries seen in emergency departments were riding-related. Falls and motor vehicle collisions were the most common hazards. Other typical hazards include road hazards, non-powered collisions (e.g., cyclists, skateboarders, scooter riders, or pedestrians), overexertion, bicycle malfunctions, and performing tricks or participating in bicycle races. Riding-related safety factors addressed in this report include helmet usage and the involvement of alcohol or non-prescription drugs. There were also a substantial number of injuries reported by patients who were not riding bicycles, the most common of which were pedestrians struck by cyclists, people who tripped over or fell onto parked bicycles, people who injured themselves while repairing or moving bicycles, and children playing on or around bicycles. Children were more likely to be injured while riding than adults, but adults 45 or older were more likely to be fatally injured. Bicycle-riding fatalities in 2022 were most commonly caused by motor vehicle collisions and bicycle accidents of unspecified mechanism.

Hospital Emergency Department Visits Associated with Bicycles or Bicycle Accessories, 2022

In 2022, an estimated 402,300 hospital emergency department visits were associated with bicycles or bicycle accessories. This estimate is based on the 10,088 cases reported by sample hospitals to the National Electronic Injury Surveillance System (NEISS)[5] using product codes 5033 (*Mountain or all-terrain bicycles or accessories*) or 5040 (*Bicycles or accessories, excluding mountain or all-terrain bicycles*). These numbers do not match the values reported in the 2022 NEISS Data Highlights[6] because CPSC staff excluded 86 cases reported with these codes which did not directly involve a bicycle or bicycle accessory. For example, incidents that only involved scooters, children's toy vehicles, e-bikes, motorcycles, or other motorized vehicles, or where it was unclear whether the bicycle was motorized or not, were considered miscoded and therefore out of scope for this report. Incidents involving a driver of a car or motorcycle who hit a bicycle were also considered out of scope if the patient was not the cyclist. Finally, cases in which the patient rode a bike earlier in the day but was seen in the emergency department for an injury unrelated to a bicycle or bicycle accessories were considered out of scope and are not included in this report. Table 1 presents the number of remaining NEISS cases and the estimated number of ED visits they represent for 2022.

[3] 2022 NEISS Data Highlights (cpsc.gov)
[4] *Surge in Demand Prompts Bicycle Shortages, Higher Prices*, Earlene K.P. Dowell and Andrew W. Hait, United States Census Bureau, June 03, 2021.
[5] NEISS is a statistically valid, nationally representative probability sample of hospitals with emergency departments. See the Appendix for more details.
[6] 2022 NEISS Data Highlights (cpsc.gov)

Table 1: Estimated Emergency Department Visits Associated with Bicycles or Accessories, 2022

Year	Cases	Estimate[α]	C.V.[7]
2022	10,088	402,300	0.13

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.

Bicycle Involvement

Table 2 presents the extent of bicycle involvement in the cases presented in Table 1. There are four categories of bicycle involvement: bicycle accessory only or bicycle involvement unknown, non-riding incident, riding incident, and presumed riding incident.

There were 37 reported cases resulting in an estimated 1,600 ED visits which did not directly involve a bicycle or where bicycle involvement was unknown. Incidents were placed in this category if, for example, a person was found lying on the ground near a bicycle and no details were reported of the incident. Also included in this category are bicycle accessory-related incidents, such as those involving bicycle racks, pumps, or helmets, but no bicycle.

There were an estimated 17,000 non-riding ED visits based on 473 cases reported to the NEISS database. An injury was counted as non-riding if the patient was a pedestrian struck by a bicycle or was injured while interacting with a parked bicycle.

The remaining 9,578 reported cases were categorized as either Riding incidents or Presumed Riding incidents, with an estimate of 284,200 ED visits. A case was classified as "Riding" if the hospital report explicitly stated that the patient was "riding" or otherwise clearly implied that the patient was riding (e.g., "going downhill on a bike" or "crashed bike into a tree"). Incidents in which the patient was sitting on their bicycle but not moving, such as those stopped at a traffic light or mounting/dismounting their bicycle, were also categorized as riding incidents. If, for example, the narrative stated the patient "was involved in a bicycle accident," "fell off bike," "fell on bike," "flipped over handlebars," or "got their leg stuck in a bike," and little to no other information was provided, then the incident was *presumed* to be riding-related.

Table 2: Estimated ED Visits Associated with Bicycles or Accessories by Bicycle Involvement, 2022

Type of Incident	Cases	Estimate[α]	Percent	C.V.
Bicycle Accessory or Bicycle Involvement Unknown	37	1,600	<1%	0.22
Bicycle, Non-Riding	473	17,000	4%	0.12
Bicycle, Riding	6,945	284,200	71%	0.14
Bicycle, Presumed Riding	2,633	99,500	25%	0.13
Total	***10,088***	***402,300***	***100%***	***0.13***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.

For the remainder of the analysis in this report, the Riding and Presumed Riding categories in Table 2 were grouped together and referred to as incidents associated with bicycle riding. Riding and non-riding

[7] C.V. stands for Coefficient of Variation, the ratio of the standard error of the estimate (i.e., variability) to the estimate itself. See the Appendix for more details.

cases were subsequently reviewed for more detailed hazard descriptions, and riding cases were further reviewed for demographics, injury types, helmet use, and alcohol or drug involvement.

Estimated Emergency Department Visits Associated with Bicycle Riding, 2022

As bicycle riding injuries are the primary concern when discussing bicycle safety, below are more detailed analyses of demographics, injury types, hazards, and safety factors associated with bicycle riding incidents reported to emergency departments in 2022.

Gender

Seventy-five percent (289,100 of 383,700) of ED patients associated with bicycle riding in 2022 were male, as shown in Table 3. Similar gender disparity was also seen in roadway bicycle accidents in 2021, where 81% of those injured were male, according to the National Highway Traffic Safety Administration (NHTSA).[8]

Table 3: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Gender, 2022

Gender	Cases	Estimate[α]	Percent	C.V.
Male	7,303	289,100	75%	.12
Female	2,271	94,400	25%	.15
Non-Binary/Other	4	*	<1%	0.61
Total	***9,578***	***383,700***	***100%***	***.13***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.
**Does not meet criteria for publishing NEISS estimate of C.V. ≤ 0.33, estimate ≥ 1,200, and n ≥ 20.*

Age

Table 4 presents the estimates of emergency department visits associated with bicycle riding by age. The majority of estimated visits involved adults. However, when compared to the 2022 U.S. population, bicycle riding-related ED visits among children ages 5-17 were more common per capita than any adult population.

Table 4: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Age, 2022

Age	Cases	Estimate[α]	Percent	2022 U.S. Pop.[β]	Est. Injuries per 100K Pop.	C.V.
<5	361	9,900	3%	18,657,742	53	0.22
5-17	3,258	106,700	28%	54,567,582	195	0.16
18-44	2,923	120,400	31%	119,740,789	101	0.11
45-64	2,059	94,200	25%	82,835,114	114	0.13
65+	977	52,600	14%	57,470,184	91	0.27
Total	***9,578***	***383,700***	***100%***	***333,271,411***	***115***	***0.13***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.
[6]Estimates of the Components of Resident Population Change by Race and Hispanic Origin for the United States: April 1, 2020 to July 1, 2023 (NC-EST2023-COMPN)

[8] Bicycle Safety (nhsta.gov), 2023.

Race and Ethnicity

Table 5 presents the race and ethnicity demographics among hospital emergency department visits associated with bicycle riding in 2022. Black patients were seen disproportionately often, accounting for 16% of estimated ED visits (where race or ethnicity were known) but only 14% of the population. Conversely, Hispanic patients of all races and Asian patients of all ethnicities were both seen at much lower rates than their respective population percentages (10% versus 19%, and 2% versus 6%, respectively).

Table 5: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Race and Ethnicity, 2022

Ethnicity	Race	Cases	Estimate[α]	Percent	Percent of 2022 U.S. Population[β]	C.V.
Hispanic	White	399	*	5%	17%	0.36
	Black	25	*	<1%	1%	0.46
	Asian	2	*	<1%	<1%	0.92
	American Indian/Alaska Native	6	*	<1%	1%	0.53
	Native Hawaiian/Pacific Islander	2	*	<1%	<1%	0.46
	Other/Multiple	172	*	2%	1%	0.48
	Not Stated	278	7800	3%	-	0.23
	Total	***884***	***26,100***	***10%***	***19%***	***0.27***
Non-Hispanic	White	3,681	165,900	61%	59%	0.14
	Black	1,032	28,800	11%	13%	0.17
	Asian	201	5,000	2%	6%	0.22
	American Indian/Alaska Native	27	1,400	1%	1%	0.27
	Native Hawaiian/Pacific Islander	13	*	<1%	<1%	0.38
	Other/Multiple	98	2,800	1%	2%	0.25
	Not Stated	173	*	2%	-	0.39
	Total	***5,225***	***211,000***	***77%***	***81%***	***0.12***
Ethnicity Unknown	White	641	*	7%	-	0.44
	Black	289	*	5%	-	0.75
	Asian	93	*	1%	-	0.83
	American Indian/Alaska Native	4	*	<1%	-	0.78
	Native Hawaiian/Pacific Islander	1	*	<1%	-	1.00
	Other/Multiple	130	*	1%	-	0.81
	Total	***1,158***	*******	***13%***	***-***	***0.49***
Total (Race/Ethnicity Known)	White	4,714	198,000	73%	76%	0.12
	Black	1,346	42,200	15%	14%	0.23
	Asian	296	6,700	2%	6%	0.24
	American Indian/Alaska Native	37	1,700	1%	1%	0.24
	Native Hawaiian/Pacific Islander	16	*	<1%	<1%	0.37
	Other/Multiple	400	*	4%	3%	0.36
	Total	***7,267***	***273,700***	***100%***	***100%***	***0.11***

Neither Race nor Ethnicity Known/Stated	2,311	*	-	-	0.40

Source: NEISS Database, March 2024

[α]Estimates are rounded to the nearest 100.

[6]Source: Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States: April 1, 2020 to July 1, 2023 (NC-EST2023-SR11H), U.S. Census Bureau, Population Division, June 2024

**Does not meet criteria for publishing NEISS estimate of C.V. ≤ 0.33, estimate ≥ 1,200, and n ≥ 20*

Body Parts Injured

Table 6 presents the estimated ED visits associated with bicycle riding by body part injured. In October 2018, CPSC upgraded the NEISS system, allowing ED visits to contain up to two codes for the body part injured and the diagnosis. For ED visits that involved two distinct body parts injured, staff counted both. The most common body parts injured were the arms, hands, and shoulders, which were involved in 37% of estimated ED visits (142,800 of 383,700).

Table 6: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Body Part Injured, 2022

Body Part Injured	Cases[α]	Estimate[β]	% of Total Est.	C.V.
Head	1,806	75,600	20%	0.17
Face/Ear	1,678	63,000	16%	0.10
Arm/Hand/Shoulder	3,586	142,800	37%	0.12
Torso	1,865	81,700	21%	0.16
Leg/Foot	2,657	106,900	28%	0.13
All/Other	604	24,900	7%	0.15
Neither Body Part Specified	74	2,500	1%	0.23
Total ED Visits[γ]	***9,578***	***383,700***	***100%***	***0.13***

Source: NEISS Database, March 2024

[α]In October 2018, CPSC upgraded the NEISS system. As a result of this upgrade, an emergency-department visit is allowed to contain up to two codes for the body part injured. If either of the two codes listed a specific body part, staff counted both of them for the purpose of these data analyses.

[6]Estimates are rounded to the nearest 100.

[γ]Totals represent raw cases and estimated ED visits; columns do not add to totals because cases can have multiple body parts injured.

Diagnosis

Table 7 presents the estimated injuries associated with bicycle riding by diagnosis. As in Table 6, if there were two distinct diagnoses associated with an ED visit, staff counted both.

Table 7: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Diagnosis, 2022

Diagnosis	Cases[α]	Estimate[β]	% of Total Est.	C.V.
Fracture	2,936	119,300	31%	0.16
Contusion/Abrasion	2,757	113,400	30%	0.12
Laceration	1,704	67,300	18%	0.12
Internal Organ Injury	1,375	58,700	15%	0.21
Strain/Sprain	711	31,900	8%	0.17
Concussion	314	11,400	3%	0.16
Other (Specific)[γ]	910	36,000	9%	0.10
Unspecified	513	20,600	5%	0.14
Both Diagnoses Unspecified/Unknown	1385	52,500	14%	0.13
Total ED Visits[δ]	***9,578***	***383,700***	***100%***	***0.13***

Source: NEISS Database, March 2024

[α]In October 2018, CPSC upgraded the NEISS system. As a result of this upgrade, an emergency-department visit is allowed to contain up to two codes for the diagnosis. If either of the two codes listed a specific diagnosis, staff counted both of them for the purpose of these data analyses.

[β]Estimates are rounded to the nearest 100.

[γ]This "Other" category includes the following diagnoses: Amputation, Anoxia, Avulsion, Burns, Crushing, Dental Injury, Dermatitis, Dislocation, Foreign Body, Hematoma, Hemorrhage, Ingestion of Foreign Object, Nerve Damage, Poison, Puncture.

[δ]Totals represent raw cases and estimated ED visits; columns do not add to totals because cases can have multiple injuries.

Disposition

Table 8 presents the dispositions of ED visits associated with bicycle-riding incidents. Among patients with riding injuries seen in hospital EDs, 82% were either treated and released or examined and released without treatment. Sixteen fatalities seen in EDs were reported to the NEISS database. Twelve of the 16 fatal incidents involved motor vehicle accidents.

Table 8: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Disposition, 2022

Disposition	Cases	Estimate[α]	Percent	C.V.
Left without being seen or left against medical advice	355	14,100	4%	0.20
Treated and released	7,935	315,500	82%	0.13
Treated and admitted for hospitalization	1,103	45,100	12%	0.27
Treated and transferred to another hospital	100	5,900	2%	0.17
Held for observation	69	2,400	1%	0.32
Fatality	16	*	<1%	0.35
Total	***9,578***	***383,700***	***100%***	***0.13***

Source: NEISS Database, March 2024

[α]Estimates are rounded to the nearest 100.

**Does not meet criteria for publishing NEISS estimate of C.V. ≤ 0.33, estimate ≥ 1,200, and n ≥ 20*

Hazard Patterns

Table 9 presents the hazard patterns associated with ED visits by bicycle riders. Detailed descriptions of the hazard categories are as follows:

1. **Bike Malfunction:** The incident was due to a bike malfunction such as the bicycle chain breaking off, the brakes failing, a flat tire, or other parts coming loose. This also includes incidents where the patient was riding a custom-built bicycle that did not yet have brakes installed and subsequently crashed.

2. **Tricks/Racing:** The rider was attempting to perform tricks or was participating in a bicycle race. Incident reports where the rider was listed as crashing at a skate park or on a specialty off-road track are included here. This also includes incidents where the rider was "riding with no hands on the handlebars" or "jumping the curb."

3. **Road Hazard:** Road hazards here include potholes, small objects in the road, railroad tracks, manhole covers, bumps of any kind, slippery surfaces, loose gravel, etc. This category also includes incidents where the exact hazard is not listed but the bicycle wheel "caught" on something causing the rider to crash, or where the bicycle "slipped out" from under the rider.

4. **Swerve/Brake:** Cyclists swerved or braked quickly to avoid a collision with a pedestrian, animal, or other cyclist and subsequently crashed, fell, or otherwise injured themselves as a result. This does not include swerving or stopping to avoid a motor vehicle; those incidents are included in the "Motor Vehicle Involved" category.

5. **Motor Vehicle Involved:** The rider was hit by a motor vehicle, the rider hit a motor vehicle, the rider swerved to avoid a vehicle that pulled out, or there was a bike-versus-vehicle collision where the fault was unknown. Motor vehicles here include cars, trucks, buses, trains, motorcycles, and powered bikes and scooters. See Table 11 for a more detailed breakdown of this category.

6. **Collision, Non-Powered:** The cyclist collided with another person who was either on a non-powered bike, skateboard, or scooter, or was on foot.

7. **Hit Stationary Object:** The cyclist collided with a stationary object such as a tree, telephone pole, fence, wall, curb, or guard rail.

8. **Environmental Encounter:** This includes animal encounters such as bee stings, insect bites, dog bites and attacks, and other wild animal encounters while riding, as well as environmental hazards such as tree branches hitting the rider in the face or a strong gust of wind knocking the rider over. This does not include swerving to avoid wildlife ("Swerve/Brake") nor crashing into a tree or bush ("Hit Stationary Object").

9. **Other Interference:** This includes any other form of external interference with the rider, such as a child kicking or pulling on the bike, a pet pulling on a leash attached to the bike, a foreign object such as headphone cords or a leash getting tangled in the bike spokes, the rider being distracted by their phone, the rider carrying something large or heavy that impeded their riding, or the rider's clothing getting entangled in the bicycle.

10. **Contact Injury:** This includes non-crash injuries such as the pedal hitting the patient's leg, straddle injuries, the patient getting scratched by a bike part while riding, etc.

11. **Overexertion:** The injury was exercise-induced—for example, shortness of breath, muscle strain without crash, heat stroke, frostbite, blisters, and earlier injuries exacerbated by bike riding. This category also includes sprains and strains caused by the rider putting their foot on the ground and twisting it.

12. **Fall:** The cyclist fell off the bike. This includes incidents where the rider lost control, caught a leg on the spokes and fell, fell while getting on or off the bicycle, or fell by any other mechanism that did not result from external influence. This also includes reports that read "patient fell off bike" with little to no other information.

13. **Flip Over Handlebars:** The rider flipped, flew, fell, or otherwise went over the handlebars of the bike, and no other details about the reason for the crash were reported.

14. **Crash/Wreck/Accident:** The incident is reported as a bike crash, wreck, or accident with no external factors mentioned in the report.

15. **Unknown/Other:** The details of the incident are unknown or unclear, such as when the rider was "thrown off" or "knocked off" the bicycle and no other information was provided. This also includes incidents where the patient was found downed near a bicycle with little to no recollection of the incident.

Incidents involving multiple hazard patterns were categorized according to the priority ranking in the list above. For example, if a cyclist's brakes failed prior to crashing into a parked car, that incident would be categorized as "Bike Malfunction" instead of "Motor Vehicle Involved." If a cyclist swerved or braked suddenly to avoid an animal and crashed into a telephone pole or parked car, that incident would be categorized as "Swerve/Brake" instead of "Hit Stationary Object" or "Motor Vehicle Involved." And so on. Exceptions to these rules are noted in the list above. In general, incidents were categorized according to the primary *cause* of the incident, and if the cause was unknown, then they were categorized according to the most severe *effect*.

The most common hazard patterns were falls and incidents where a motor vehicle was involved in some way. These two hazard types alone constituted an estimated 63.4% of ED visits involving bicycle riding in 2022. Other common patterns included crashes of unspecified cause (7%), road hazards (6%), overexertion (5%), and crashes into stationary objects (4%).

Table 9: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Hazard Pattern, 2022

Priority	Hazard Pattern	Cases	Estimate[α]	Percent	C.V.
1	Bike Malfunction	156	6,700	2%	0.16
2	Tricks/Racing	261	11,000	3%	0.17
3	Road Hazard	518	21,500	6%	0.16
4	Swerve/Brake	81	3,400	1%	0.15
5	Motor Vehicle Involved	2,114	79,900	21%	0.17
6	Collision, Non-Powered	156	5,500	1%	0.19
7	Hit Stationary Object	348	13,200	3%	0.11
8	Environmental Encounter	101	4,300	1%	0.16

9	Other Interference	86	3,900	1%	0.17
10	Contact Injury	320	11,100	3%	0.17
11	Overexertion	363	17,800	5%	0.20
12	Flip Over Handlebars	333	12,800	3%	0.16
13	Fall	4,097	163,000	42%	0.17
14	Crash/Wreck/Accident	546	24,800	7%	0.18
15	Unknown/Other	98	4,500	1%	0.16
	Total	***9,578***	***383,700***	***100%***	***0.13***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.

Hazard Pattern Differences Between Mountain Bicycles and Road Bicycles

Some hazard patterns had notable differences in frequency between mountain bikes and road bikes—that is, incidents associated with product code 5033 (*Mountain or all-terrain bicycles or accessories*) and those associated with product code 5040 (*Bicycles or accessories, excluding mountain or all-terrain bicycles*). Table 10 shows the differences between the percentages of estimated ED visits associated with mountain bicycles and road bicycles for each hazard pattern, sorted in descending order starting with hazards seen more frequently with mountain bikes. Mountain bikes were more frequently associated with crashes, flipping over handlebars, tricks/racing, and road hazards. Road bikes were more frequently associated with motor vehicle involvement and falls with no external factors. Most of these discrepancies align with and can likely be explained by the differences in terrain choice and level of user expertise between these types of bicycles.

Table 10: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding: Hazard Pattern Differences Between Mountain Bicycles and Road Bicycles

Hazard Pattern	Est. % of Mountain Bicycle ED Visits	Est. % of Road Bicycle ED Visits	Difference in %[α]
Crash/Wreck/Accident	19%	6%	***13%***
Flip Over Handlebars	13%	3%	***10%***
Tricks/Racing	12%	2%	***9%***
Road Hazard	8%	6%	***2%***
Unknown/Other	3%	1%	***2%***
Environmental Encounter	1%	1%	***<1%***
Hit Stationary Object	4%	3%	***<1%***
Swerve	1%	1%	***<1%***
Contact Injury	2%	3%	***-1%***
Bike Malfunction	1%	2%	***-1%***
Other Interference	<1%	1%	***-1%***
Collision	1%	2%	***-1%***
Overexertion	2%	5%	***-3%***
Fall	33%	43%	***-10%***
Motor Vehicle Involved	2%	22%	***-20%***

Source: NEISS Database, March 2024
[α]Differences may not add up due to rounding.

Motor Vehicle Involvement

In 2022, 21% of ED visits associated with bicycle riding were associated with a motor vehicle. These are categorized in Table 11 according to the cause, mechanism, or error if one was connoted in the hospital ED narrative. Any incident in which the vehicle struck the cyclist was considered a driver error. If the driver pulled out of a parking spot, alley way, or driveway, crossed into the bike lane or crosswalk, or otherwise "cut off" a cyclist and was struck by a bicycle, this was also considered a driver error. If the car was parked or stationary and the bicycle crashed into it, this was a cyclist error. Incidents where a cyclist struck a car door that was being opened were categorized separately. Incidents where a cyclist swerved, braked suddenly, or jumped off their bicycle to avoid a car, as well as incidents where a car pulled out suddenly and it was not mentioned whether the bicycle struck the car, were categorized as a swerving incident. Cases of unclear error include those where there was no clear error on either side, as well as reports which listed a "bike vs. motor vehicle accident" or "bike collision with motor vehicle" with no other details.

Table 11: Estimated Hospital Emergency Department Visits Associated with Bicycle vs Car Accidents by Reported Error, 2022

Reported Error	Cases	Estimate[α]	Percent	C.V.
Collision, Driver Error	1,666	63,700	80%	0.19
Collision, Cyclist Error	197	7,200	9%	0.16
Cyclist hit car door being opened	67	*	3%	0.46
Cyclist swerved or jumped to avoid vehicle	91	3,500	4%	0.16
Unclear	93	3,500	4%	0.27
Total	***2,114***	***79,900***	***100%***	***0.17***

Source: NEISS Database, March 2024

[α]Estimates are rounded to the nearest 100.

**Does not meet criteria for publishing NEISS estimate of C.V. ≤ 0.33, estimate ≥ 1,200, and n ≥ 20*

Helmet Use

In 2022, among bicycle-riding patients seen in EDs, 11% had worn a helmet and 11% had not, as shown in Table 12. For the remaining ED visits, helmet use was unknown. This is an improvement from the 2013 edition of this report,[9] in which 5% of patients had worn helmets, 6% had not, and 89% were unknown.

Table 12: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Helmet Use, 2022

Helmet Use	Cases	Estimate[α]	Percent	C.V.
Helmet Worn	1,071	41,900	11%	0.19
Helmet Not Worn	1,072	41,500	11%	0.13
Helmet Not Mentioned or Unknown	7,435	300,400	78%	0.14
Total	***9,578***	***383,700***	***100%***	***0.13***

Source: NEISS Database, March 2024

[α]Estimates are rounded to the nearest 100.

Proper helmet usage is particularly important for preventing, or reducing the severity of, head injuries among cyclists. Table 13 presents helmet usage among bicycle-riding patients with head injuries. Among

[9] Bicycle Injuries Seen in Hospital Emergency Departments, 2013 | CPSC.gov

such patients where helmet use was known, an estimated 64% (18,100 out of 28,200) had not worn helmets.

Table 13: Estimated Hospital Emergency Department Visits with Reported Head Injuries Associated with Bicycle Riding by Helmet Use, 2022

Helmet Use	Cases	Estimate[α]	Percent	C.V.
Helmet Worn	245	10,100	13%	0.25
Helmet Not Worn	444	18,100	24%	0.18
Helmet Not Mentioned or Unknown	1,117	47,300	63%	0.18
Total	***1,806***	***75,600***	***100%***	***0.17***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.

Alcohol or Drug Involvement

Intoxication and other impairments pose a dangerous hazard for cyclists. Table 14 presents the estimates of ED visits associated with riding bicycles where alcohol or non-prescription drug use was mentioned in the ED visit report. Incidents where patients used prescription drugs as prescribed are not counted as drug use in this analysis.

Table 14: Estimated Hospital Emergency Department Visits Associated with Bicycle Riding by Alcohol/Drug Involvement, 2022

Alcohol/Drugs Reported	Cases	Estimate[α]	Percent	C.V.
Alcohol Only	278	12,900	3%	0.16
Drugs Only	84	3,900	1%	0.28
Both	25	*	<1%	0.36
No Drugs or Alcohol Use Mentioned	9,191	365,500	95%	0.13
Total	***9,578***	***383,700***	***100%***	***0.13***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.
**Does not meet criteria for publishing NEISS estimate of C.V. ≤ 0.33, estimate ≥ 1,200, and n ≥ 20*

Estimated Emergency Department Visits Associated with Bicycles, Non-Riding, 2022

Emergency Department visits associated with, but not riding on, bicycles stemmed from a variety of hazard patterns, as shown in Table 15. The most common hazards were pedestrians being struck by bicyclists, people tripping over bikes or falling onto them, and injuries caused by children playing with or misusing bicycles. Detailed descriptions of each hazard pattern are below:

- **Pedestrian hit by bicycle:** The patient was a pedestrian struck by a cyclist. This also includes cases where the patient was using a skateboard or roller skates when struck.
- **Trip/Fall:** The patient tripped over a bicycle or fell onto a bicycle.
- **Bike fell on person:** A bicycle not being ridden fell, slid, or otherwise struck a patient who was not moving. This includes three incidents involving a bicycle in the back of a motor vehicle that slid forward and struck a backseat passenger when the vehicle suddenly stopped.

- **Other Accidental Contact:** This includes accidental contact injuries with bicycles that did not involve the patient tripping or falling, nor the bike falling on the patient. For example, if the patient walked by and scraped themselves on a protruding bike part or kicked the bike intentionally.

- **Bicycle repair:** The patient injured themselves while repairing, modifying, or adjusting a bicycle. This includes reports of patients ages 13 or older who got a finger or hand caught in a bike chain with no other information.

- **Walking bike:** The patient was walking alongside their bike and was injured in a way related to the bicycle. This includes incidents where a parent was teaching their child to ride a bike by running alongside them and fell or crashed. This does not include incidents where the patient was walking alongside their bicycle and was injured in a way unrelated to the bicycle; for example, two incidents were reported where patients had walked their bicycles under an overpass when someone overhead dropped a rock or brick onto the person's head. In both cases, the patients were wearing helmets, so these are included in the Bicycle Accessory category in Table 2.

- **Carrying/Lifting a bicycle:** The patient attempted to carry, lift, drag, or otherwise move a bicycle, and injured themselves doing so. Most commonly, the patient dropped the bicycle on themselves or strained a muscle in the attempt.

- **Child play:** The patient was a child using a bicycle not as intended and got hurt, or the patient was someone else who got hurt by a child misusing a bicycle. This includes children climbing on bikes and falling, throwing bike parts at someone else, ingesting a small part of a bicycle, or standing on a bicycle propped up to reach something overhead and falling. This also includes reports of children ages 12 and under getting their finger or hand stuck in a bike chain, unless it was explicitly stated the child was trying to repair a bike.

- **Fall Avoiding Bicycle:** The patient was a pedestrian who jumped or fell out of the way of an oncoming bicycle to avoid a collision.

- **Hit by Car while Walking with Bicycle:** The patient was walking their bicycle or standing next to their bicycle, usually on a sidewalk or crosswalk, when struck by a car.

Table 15: Estimated Hospital Emergency Department Visits Associated with Non-Riding Bicycle Incidents by Hazard Pattern, 2022

Hazard Pattern	Cases	Estimate[α]	Percent	C.V.
Pedestrian hit by bicycle	145	4,600	27%	0.22
Trip/Fall	70	2,000	18%	0.15
Bike fell on person	17	*	4%	0.32
Other Contact Injury	25	*	4%	0.31
Bicycle Repair	57	2,100	12%	0.19
Walking with Bicycle	23	*	6%	0.28
Carrying/Lifting Bicycle	56	2,200	13%	0.17
Child Play	70	2,000	12%	0.18
Fall Avoiding Bicycle	6	*	2%	0.49
Hit by car while walking with bicycle	4	*	1%	0.47
Total	***473***	***17,000***	***100%***	***0.11***

Source: NEISS Database, March 2024
[α]Estimates are rounded to the nearest 100.
**Does not meet criteria for publishing NEISS estimate of C.V. ≤ 0.33, estimate ≥ 1,200, and n ≥ 20*

Fatalities Associated with Bicycle Riding, 2022

There were 1,395 bicycle riding-related deaths in 2022, according to data from the National Center for Health Statistics (NCHS), presented in Table 16.

Table 16: Fatalities Associated with Bicycle Riding, 2022

Year	Deaths	U.S. Population	Deaths per 1M Pop.
2022	1,395	333,271,411	4.2

Source: NCHS Mortality Database, March 2024

Gender

The gender disparity seen in fatalities associated with bicycle riding is wider than that seen in ED visits associated with bicycle riding. While men were seen three times as often as women for bicycle riding injuries in EDs, they were involved in fatal bicycle riding incidents seven times as often. The gender disparity in fatalities reported to NCHS, seen in Table 17, echoes the 2021 NHTSA data, where 86% of bicycle fatalities were men.[10]

Table 17: Fatalities Associated with Bicycle Riding by Gender, 2022

Gender	Cases	Percent
Male	1,220	87%
Female	175	13%
Total	***1,395***	***100%***

Source: NCHS Mortality Database, March 2024

Age

Table 18 presents the ages of bicycle-riding fatalities in 2022. People ages 45 and above were the most frequently seen in fatal bicycle-riding incidents, together accounting for 65% (903 out of 1,395) of reported riding-related fatalities. People ages 45-64 were seen twice as frequently per capita as people ages 18-44 in riding-related fatalities, despite these age groups reporting more similar levels of injury per capita (114 per 100K and 101 per 100K, respectively). That is, in the occurrence of a bicycle-riding incident, people over 45 are at higher risk of fatal injuries.

Table 18: Fatalities Associated with Bicycle Riding by Age, 2022

Age	Cases	Percent	2022 U.S. Pop.	Deaths per 1M Pop.
<5	10	1%	18,657,742	0.5
5-17	81	6%	54,567,582	1.5
18-44	401	29%	119,740,789	3.3
45-64	552	40%	82,835,114	6.7
65+	351	25%	57,470,184	6.1
Total	***1,395***	***100%***	***333,271,411***	***4.2***

[10] Bicycle Safety (nhsta.gov), 2023.

Source: NCHS Mortality Database, March 2024

Race and Ethnicity

The race and ethnicity distributions among bicycle riding fatalities in 2022 can be seen in Table 19. Non-Hispanic American Indian/Alaska Natives were disproportionately affected, accounting for 4% of fatalities but only 1% of the U.S. population. Also disproportionately affected was the white population of any ethnicity, accounting for 81% of deaths—higher than their 76% representation in the U.S. population. The Black, Asian, and Other/Multiple race groups all showed lower frequencies of bicycle related fatalities than their percentage of the population.

Table 19: Fatalities Associated with Bicycle Riding by Race and Ethnicity, 2022

Ethnicity	Race	Cases	Percent	Percent of 2022 U.S. Population[α]
Hispanic	White	280	20%	17%
	Black	4	<1%	1%
	Asian	1	<1%	<1%
	American Indian/Alaska Native	0	-	1%
	Native Hawaiian/Pacific Islander	0	-	<1%
	Other/Multiple	1	<1%	1%
	Total	***286***	***21%***	***19%***
Non-Hispanic	White	853	61%	59%
	Black	159	11%	13%
	Asian	17	1%	6%
	American Indian/Alaska Native	50	4%	1%
	Native Hawaiian/Pacific Islander	2	<1%	<1%
	Other/Multiple	23	2%	2%
	Total	***1,104***	***79%***	***81%***
Ethnicity Unknown	White	3	<1%	-
	Black	1	<1%	-
	Asian	0	-	-
	American Indian/Alaska Native	1	<1%	-
	Native Hawaiian/Pacific Islander	0	-	-
	Other/Multiple	0	-	
	Total	***5***	***<1%***	**-**
Total	White	1,136	81%	76%
	Black	164	12%	14%
	Asian	18	1%	6%
	American Indian/Alaska Native	51	4%	1%
	Native Hawaiian/Pacific Islander	2	<1%	<1%
	Other/Multiple	24	2%	3%

	Total	***1,395***	***100%***	***100%***

Source: NCHS Mortality Database, March 2024
[a]Source: Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States: April 1, 2020 to July 1, 2023 (NC-EST2023-SR11H), U.S. Census Bureau, Population Division, June 2024

Hazard Pattern

Table 20 presents the causes of bicycle-riding fatalities recorded in the NCHS database. The most common causes were collisions with cars, pick-up trucks, or vans; non-collision transport accidents; and unspecified transport accidents. Motor vehicle accidents, including heavy transport vehicles and trains, accounted for 526 fatal incidents. There were 674 fatalities associated with other and unspecified transport accidents; this category includes collisions involving a cyclist and a motor vehicle where either the type of bicycle or type of vehicle was unknown, as well as incidents where it was unspecified whether a collision occurred.

Table 20: Fatalities Associated with Bicycle Riding by Hazard Pattern, 2022

Hazard Pattern	Cases	Percent
Collision with pedestrian or animal	1	<1%
Collision with other pedal cycle	7	1%
Collision with two- or three-wheeled motor vehicle	10	1%
Collision with car, pick-up truck or van	463	33%
Collision with heavy transport vehicle or bus	49	4%
Collision with railway train or railway vehicle	14	1%
Collision with other nonmotor vehicle	0	-
Collision with fixed or stationary object	23	2%
Non-collision transport accident	154	11%
Other and unspecified transport accidents	674	48%
Total	***1,395***	***100%***

Source: NCHS Mortality Database, March 2024

Alcohol or Drug Involvement

Table 21 presents known alcohol or drug involvement in fatalities recorded in the NCHS database. Each fatality is recorded with up to eleven associated conditions, including underlying diseases or substances posthumously found in the blood.[11] Fatalities were identified as involving alcohol if there was a condition indicating alcohol was used on the day of the fatality, such as “alcohol use” or “alcohol found in the blood.” However, fatalities associated with underlying conditions such as alcohol dependency were not labeled as involving alcohol unless another condition variable indicated alcohol involvement the day of the fatality. Similarly, fatalities were identified as involving drug use if there was a condition indicating

[11] The eleven condition variables in the NCHS mortality database utilize ICD-10 codes. The ICD-10 codes used to identify alcohol involvement were those starting with alphanumeric characters T51, R780, and Y90. The ICD-10 codes used to identify drug involvement were those starting with T40-T44 and R781-R785, covering narcotics, opiates, cocaine, hallucinogens, anesthetics, antiepileptic or sedative-hypnotic drugs, psychotropic drugs, drugs affecting the nervous system, and other drugs of addictive potential.

drug use on the day of the fatality but not if there was only an underlying condition such as substance dependency. Alcohol or drugs were involved in about 2% of bicycle-riding fatalities.

Table 21: Fatalities Associated with Bicycle Riding by Alcohol or Drug Involvement, 2022

Alcohol/Drug Involvement	Cases	Percent
Alcohol Only	11	1%
Drugs Only	10	1%
Both	3	<1%
No Alcohol or Drug Use Mentioned	1,371	98%
Total	***1,395***	***100%***

Source: NCHS Mortality Database, March 2024

Appendix: Methodology

The databases searched were the National Electronic Injury Surveillance System (NEISS) and the National Center for Health Statistics (NCHS) Mortality Database.

National Electronic Injury Surveillance System (NEISS)

The estimate of hospital emergency department (ED) visits was derived from NEISS, which is a probability sample of approximately 100 U.S. hospitals having 24-hour EDs and more than six beds. NEISS collects injury data from these hospitals. Coders in each hospital code the data from the ED record and then transmit the data electronically to CPSC. Because NEISS is a probability sample, each case collected represents a number of cases (i.e., the case's *weight*) of the total estimate of visits in the U.S. Different hospitals carry different weights, based on stratification by their annual number of ED visits.[9]

The search for this report used product codes 5033 (*Mountain or all-terrain bicycles or accessories*) and 5040 (*Bicycles or accessories, excluding mountain or all-terrain bicycles*), and incident dates 1/1/2022 – 12/31/2022. The data were pulled in March 2024.

A coefficient of variation is the ratio of the standard error of the estimate (i.e., variability) to the estimate itself. This is generally expressed as a percent. A C.V. of 10% means the standard error of the estimate equals 0.1 times the estimate. Large C.V.'s indicate the estimate has considerable variability. This is often due to a small sample size.[12] Estimates and confidence intervals are usually not reported unless the number of cases is 20 or more, the estimate is 1,200 or more, and the C.V. does not exceed 33%.

NCHS Mortality Database

Fatalities in the U.S. are recorded in the NCHS Multiple Cause of Death database based on death certificates provided by each U.S. county. Each death certificate includes a primary cause of death along with up to twenty additional multiple causes and demographic data including age, race, Hispanic ethnicity, gender, and year. The causes of death are coded with 4-digit ICD-10 codes.[13] The search for this report used ICD-10 codes starting with the first three alphanumeric characters of V10-V19, which represent causes associated with riding pedal bicycles. The NCHS Mortality data were pulled in March 2024.

[12] Schroeder T, Ault K. *The NEISS Sample (Design and Implementation)*. U.S. Consumer Product Safety Commission. 2001.

[13] *National Center for Health Statistics: Mortality Data on CDC WONDER,* Centers for Disease Control and Prevention. 2024.