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Authors

Fernandez, Adrian M
Li, Kevin D
Patel, Hiren V
et al.

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RESEARCH LETTER

Electric Bicycle Injuries and Hospitalizations

Electric bicycles (e-bicycles) are a popular consumer choice in the clean transportation revolution. Imports of e-bicycles topped 1.1 million in 2022 compared with 437 000 in 2020.[1] We examined e-bicycle injuries and hospitalizations in the US from 2017 to 2022.

Methods | This cross-sectional study used data from the National Electronic Injury Surveillance System (NEISS), which provides estimates of patients with injuries presenting to US emergency departments. We queried NEISS for e-bicycle injuries (codes 5035 and 3215 and keywords *electronic*, *electric*, *electrical*, *bike*, *bicycle*, *e-bike*, *e-bicycle*, *ebike*, *ebicycle*, *e bike*, *e bicycle*, *power*, *powered*) between 2017 and 2022, excluding injuries from traditional bicycles, mopeds, motor bikes, electric scooters, and minibikes. Injury narratives were reviewed to identify helmet use. Narratives without mention of helmet status were excluded from helmet-related calculations. The NEISS complex sampling design was used to obtain US population projections of emergency department visits and hospitalizations. Stratified, weighted, nested, and year-adjusted estimates were calculated using the R survey package, version 4.3.1 (R Project for Statistical Computing). Estimates were log transformed and modeled using linear regression. We applied survey-weighted logistic regression to assess changes in injury patterns and odds of head injury. Helmet use between sexes was compared using the χ^2 test with Rao-Scott second-order correction. A 2-sided $P < .05$ was considered significant. The study was exempt from institutional review board review according to the Common Rule, as the data used were public and deidentified.

Supplemental content

Results | From 2017 to 2022, a weighted estimated total of 45 586 (95% CI, 17 079-74 094) e-bicycle injuries occurred in the US (1038 NEISS cases), leading to an estimated 5462 hospitalizations (95% CI, 2148-8777; 143 NEISS cases) (**Table 1**). There was a 30-fold rise in e-bicycle injuries (>99% annually; $P < .001$) and a 43-fold increase in hospitalizations (>108% annually; $P < .001$). Injuries in children increased from 0% to 13% of total injuries, while injuries in young adults aged 18 to 34 years decreased from 63% to 30% of total injuries (**Table 2**). The incidence of head trauma from e-bicycle accidents in 2022 was approximately 49 times higher than in 2017, increasing from approximately 163 (95% CI, 0-370) to approximately 7922 (95% CI, 4136-11 708) head injuries, a growth rate that outpaced overall e-bicycle injuries (Table 2). Odds of helmet use decreased by 5.6% each year ($P = .01$). Helmets were worn by 44% (6095 of 13 914) of injured e-bicyclists, at similar rates in men and women (44% vs 43%, $P = .92$). The odds of sustaining a head injury for nonhelmeted e-bicyclists were 1.9 times higher (95% CI, 1.25-2.84; $P = .005$) compared with those using helmets.

Discussion | We found that health care use associated with e-bicycle injuries has surged in the US. This trend started in the early 2000s as e-bicycles emerged on the market[2] and mirrors increasing health care use related to pedal-powered bicycles and electric scooters.[3,4]

This study corroborates prior findings that soft tissue injuries and fractures predominate among adult e-bicyclists.[2] However, the increasing proportion of head injuries in our study warrants further examination, as traumatic brain injuries are more severe in e-bicyclists than in traditional bicyclists.[5]

The decrease in helmet use may be associated with increasing head injuries. Only 44% of injured e-bicyclists wore helmets, with proportionally fewer wearing helmets each year. Although helmet use by e-bicyclists varies worldwide, Swiss studies report helmet use as high as 69%.[5] E-bicycle ride-sharing companies may not include helmets given rider preference and logistical challenges (accessibility, cost, hygiene, or safety concerns).

Study limitations include lack of detailed clinical information with each report. The incidence of e-bicycle-related injuries may be underestimated, as injured individuals may not seek medical care or may visit physicians outside the emergency department.

Table 1. E-Bicycle Injury and Hospitalization Estimates From 2017 to 2022[a]

Trend	2017	2018	2019	2020	2021	2022	Cumulative total
Injury cases							
No. (95% CI)	751 (0-1586)	1615 (318-2912)	2215 (614-3815)	5627 (1107-10 147)	11 885 (3869-19 901)	23 493 (11 043-35 994)	45 586 (17 079-74 094)
Increase from 2017, %	NA	115	195	649	1483	3028	NA
Hospitalizations							
No. (95% CI)	66 (0-142)	235 (0-520)	188 (0-387)	558 (0-1154)	1519 (294-2743)	2897 (1154-4641)	5462 (2148-8777)
Increase from 2017, %	NA	256	183	745	2202	4289	NA

Abbreviation: NA, not applicable.

[a] Weighted estimates from the National Electronic Injury Surveillance System.

Table 2. E-Bicycle Injury Characteristics From 2017 to 2022[a]

Characteristic	2017	2018	2019	2020	2021	2022	% Change	*P* Value
Patient demographics								
Male sex								
No. (95% CI)	518 (410-995)	1268 (61-2476)	1734 (274-3195)	4302 (163-8440)	8784 (2684-14 884)	14 884 (6381-28 358)	NA	.40
% (95% CI)	69 (35-90)	79 (51-93)	78 (51-93)	76 (58-88)	74 (68-79)	74 (64-82)	7	
Female sex								
No. (95% CI)	233 (0-631)	346 (73-620)	480 (40-920)	1325 (656-1995)	3101 (1032-5170)	6124 (4195-8053)	NA	.40
% (95% CI)	31 (10-65)	21 (7-49)	22 (7-49)	24 (12-42)	26 (21-33)	26 (18-36)	−16	
Age group								
<18 y								
No. (95% CI)	0	5 (0-15)	182 (0-407)	445 (120-769)	922 (359-1485)	3024 (1578-4471)	NA	.005
% (95% CI)	0	0 (0-3)	8 (2-32)	8 (4-16)	8 (5-13)	13 (8-20)	63	
18-34 y								
No. (95% CI)	477 (0-1046)	563 (0-1258)	1028 (0-2185)	2000 (0-4437)	4100 (336-7865)	7099 (1434-12763)	NA	.009
% (95% CI)	63 (40-82)	35 (16-61)	46 (22-72)	36 (21-54)	35 (24-46)	30 (22-41)	−52	
35-54 y								
No. (95% CI)	83 (0-219)	640 (59-1221)	629 (148-1110)	1672 (198-3146)	3451 (675-6227)	7302 (2873-11 731)	NA	.61
% (95% CI)	11 (4-27)	40 (23-59)	28 (16-46)	30 (23-38)	29 (23-36)	31 (26-37)	182	
≥55 y								
No. (95% CI)	191 (0-396)	407 (76-737)	376 (17-736)	1510 (756-2264)	3411 (1832-4991)	6068 (3984-8152)	NA	.73
% (95% CI)	25 (8-57)	25 (9-55)	17 (5-42)	27 (14-46)	29 (18-42)	26 (19-35)	4	
Type of hospital								
Urban								
No. (95% CI)	676 (0-1497)	1289 (45-2533)	2046 (461-3632)	4499 (36-8963)	9718 (1832-17 604)	18 497 (6265-30 730)	NA	.27
% (95% CI)	90 (30-99)	80 (42-96)	92 (70-98)	80 (54-93)	82 (60-93)	79 (62-89)	−12	
Rural								
No. (95% CI)	76 (0-224)	321 (0-687)	163 (0-382)	1074 (362-1786)	2065 (630-3500)	4902 (2584-7220)	NA	.26
% (95% CI)	10 (1-70)	20 (4-57)	7 (1-31)	19 (6-45)	17 (7-39)	21 (10-38)	110	
Children's								
No. (95% CI)	0	5 (0-15)	6 (0-16)	53 (29-78)	102 (34-170)	94 (26-162)	NA	.64
% (95% CI)	0	0 (0-3)	0 (0-2)	1 (0-2)	1 (0-2)	0 (0-1)	0	
Type of injury								
Head								
No. (95% CI)	163 (0-370)	577 (73-1081)	485 (66-904)	1741 (427-3055)	3777 (1689-5864)	7922 (4136-11 708)	NA	.03
% (95% CI)	22 (6-55)	36 (22-53)	22 (9-44)	31 (24-39)	32 (24-40)	34 (29-39)	55	
Trunk								
No. (95% CI)	92 (0-243)	110 (0-234)	383 (0-1034)	720 (0-1476)	1409 (586-2232)	4049 (1227-6872)	NA	.11
% (95% CI)	12 (1-68)	7 (3-13)	17 (4-49)	13 (8-20)	12 (8-17)	17 (13-23)	42	
Upper extremity								
No. (95% CI)	235 (0-633)	546 (126-965)	804 (210-1398)	1550 (0-3108)	3511 (1155-5866)	5322 (2660-7984)	NA	.004
% (95% CI)	31 (10-64)	34 (12-65)	36 (20-57)	28 (20-37)	30 (26-34)	23 (19-27)	−26	
Lower extremity								
No. (95% CI)	261 (0-571)	382 (0-961)	493 (53-933)	1560 (419-2700)	3057 (46-6068)	6076 (2347-9805)	NA	.89
% (95% CI)	35 (16-61)	24 (8-53)	22 (10-41)	28 (20-37)	26 (17-36)	26 (21-32)	−26	
Blunt soft tissue								
No. (95% CI)	179 (0-387)	308 (10-607)	586 (46-1126)	1136 (108-2165)	3023 (556-5490)	6986 (2808-11 164)	NA	.07
% (95% CI)	24 (7-57)	19 (10-34)	26 (12-48)	20 (15-27)	25 (20-32)	30 (25-35)	20	
Sharp soft tissue								
No. (95% CI)	134 (0-398)	257 (0-591)	118 (0-285)	1564 (300-2828)	1579 (610-2548)	2761 (1246-4277)	NA	.06
% (95% CI)	18 (4-51)	16 (7-34)	5 (1-22)	28 (22-35)	13 (9-19)	12 (9-15)	−33	

(continued)

Table 2. E-Bicycle Injury Characteristics From 2017 to 2022[a] (continued)

Characteristic	2017	2018	2019	2020	2021	2022	% Change	*P* Value
Fracture or dislocation								
No. (95% CI)	283 (0-687)	544 (129-959)	434 (94-775)	1732 (417-3047)	3252 (1311-5194)	6365 (3845-8886)	NA	.51
% (95% CI)	38 (17-64)	34 (9-72)	20 (11-33)	31 (23-40)	27 (22-34)	27 (19-36)	−29	
Internal organ								
No. (95% CI)	79 (0-234)	260 (0-550)	374 (19-730)	507 (37-977)	1660 (696-2624)	3254 (1764-4745)	NA	.76
% (95% CI)	11 (1-72)	16 (7-32)	17 (7-37)	9 (5-17)	14 (9-22)	14 (10-19)	27	
Unknown								
No. (95% CI)	76 (0-224)	246 (0-695)	476 (0-1244)	627 (0-1412)	2115 (0-4388)	3655 (0-7406)	NA	.73
% (95% CI)	10 (1-70)	15 (4-46)	21 (6-54)	11 (6-19)	18 (11-28)	16 (9-27)	60	
Helmet use								
Yes								
No. (95% CI)	83 (0-219)	268 (20-515)	333 (8-658)	941 (0-1972)	1986 (561-3410)	2484 (287-4682)	NA	.01
% (95% CI)	50 (33-67)	44 (14-79)	62 (36-83)	62 (42-78)	47 (32-62)	36 (30-43)	−28	
No								
No. (95% CI)	83 (0-219)	337 (0-719)	202 (0-462)	578 (163-993)	2270 (0-4836)	4348 (513-8184)	NA	.01
% (95% CI)	50 (33-67)	55 (21-86)	38 (17-64)	38 (22-58)	53 (38-68)	64 (57-70)	28	

Abbreviation: NA, not applicable.

[a] Weighted estimates from the National Electronic Injury Surveillance System.

E-bicycle ridership may grow in the US as Congress considers extending the Inflation Reduction Act tax credits offered to electric car purchasers to e-bicycle buyers.[6] The safety profiles of e-bicycles should be studied to promote a safe e-bicycle infrastructure and riding practices.

Adrian M. Fernandez, MD
Kevin D. Li, BS
Hiren V. Patel, MD, PhD
Isabel Elaine Allen, PhD
Umar Ghaffar, BS
Nizar Hakam, MBBS
Benjamin N. Breyer, MD, MAS

Author Affiliations: Department of Urology, University of California, San Francisco (Fernandez, Li, Patel, Ghaffar, Hakam, Breyer); Department of Epidemiology and Biostatistics, University of California, San Francisco (Allen, Breyer).

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Corresponding Author: Benjamin N. Breyer, MD, MAS, Department of Urology, University of California, San Francisco, 1001 Potrero Ave, Ste 3A, San Francisco, CA 94110 (Benjamin.Breyer@ucsf.edu; Adrian.Fernandez@ucsf.edu).

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Concept and design: Fernandez, Li, Patel, Allen, Ghaffar, Breyer.
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Drafting of the manuscript: Fernandez, Li, Patel, Ghaffar.
Critical review of the manuscript for important intellectual content: Fernandez, Li, Allen, Ghaffar, Hakam, Breyer.
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Nationwide Propensity-Matched Comparison of Surgical Site Infections in Safety Net Hospitals

Since 2014, the Centers for Medicare and Medicaid Services (CMS) has been imposing financial penalties on hospitals with high rates of health care-associated infections and financially rewarding hospitals with low rates.[1] These penalties and rewards have been ineffective at reducing infection rates at safety net hospitals, which disproportionately serve economically disadvantaged and medically complex patients, who often are at higher risk for infections.[2] This phenomenon has been termed *reverse Robin Hood effect* for essentially stealing from hospitals that treat poorer and sicker patients while giving to hospitals with wealthier and healthier patients.[3] We compared rates of surgical site infections (SSIs) in patients undergoing gastrointestinal surgery in safety net hospitals vs all other hospitals.

Supplemental content