

# DESCRIPTIVES AND CORRELATES OF OFF-ROAD-VEHICLE INJURIES ATTENDED BY EMS IN MISSOURI

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## BACKGROUND

Off-Road-Vehicle (ORV) injuries requiring treatment at emergency departments have been increasing annually since 2016.<sup>1</sup> Characteristics of ORV incidents attended by emergency medical services (EMS) have been minimally studied. Our objective was to describe ORV incident characteristics and identify characteristics associated with head injuries sustained from ORV incidents in the state of Missouri.

## METHODS

- Using the Missouri EMS dataset, 9-1-1 ORV (ATV, UTV or dirt bike) incidents occurring from 2020 to 2023 were analyzed.
- Patient level (e.g. age, biological sex), clinician level (e.g. provider impression, patient disposition), and incident level (e.g. scene location, presence of head injury) variables were examined in this analysis.
- Injury-related incidents were defined as a patient with a cause of injury (NEMSIS eInjury.01) or suspected injury (NEMSIS eSituation.02) documented.
- ORV incidents were defined utilizing cause of injury or patient care narrative.
- Head injury was defined using a composite of provider impressions, chief complaint anatomical location and assessment findings.
- Descriptive statistics were calculated and multivariable logistic regression (OR, 95%CI) was performed to assess associations between occurrence of an ORV incident-related head injury with patient and incident characteristics.

## RESULTS

- 488,254 injury-related incidents in Missouri
- 2,827(0.6%) ORV injuries attended by EMS were.
- A majority of incidents involved:
  - Males (67%)
  - White race (89%)
  - Treated and transported (82%)
  - Located in metro areas (56%)
  - Normal GCS (92%).

Table 1. Incident Characteristics for Off-Road-Vehicle (ORV)<sup>a</sup> Incidents Attended by EMS, 2020-2023<sup>b</sup>

Variable	N (%)
<b>N Injuries</b>	<b>482,835</b>
<b>N ORV Injuries</b>	<b>2,827 (0.6%)</b>
<b>Patient Sex</b>	
Male	1,903 (67.3%)
Female	924 (32.7%)
Unknown	3
<b>Patient Age</b>	
Median [IQR]	31 [17,49]
<15 years	451 (16.0%)
≥15 years	2,371 (84.0%)
Unknown	8
<b>Patient Race<sup>c</sup></b>	
White	2,344 (89.2%)
Non-White	284 (10.8%)
Unknown	202
<b>Patient Disposition</b>	
Treated and Transported	2,305 (81.5%)
No EMS Transport	467 (16.5%)
Dead	58 (2.1%)
<b>Urbanicity<sup>d</sup></b>	
Metro Area	1,584 (58.7%)
Non-metro	842 (31.2%)
Rural	273 (10.1%)
Unknown	131
<b>Documented Helmet Use</b>	
Yes	220 (7.8%)
No/Unknown	2,602 (92.2%)
<b>Documented Head Injury</b>	
Yes	1,058 (37.4%)
No	1,769 (62.6%)
<b>Total Glasgow Coma score (Lowest recorded)</b>	
Mild 13-15	2,437 (92.4%)
Moderate 9-12	53 (2.0%)
Severe 3-8	148 (5.6%)
Unknown	192
<b>Scene Location Type (Top 3)</b>	
Street, Roadway, Highway	1,192 (42.1%)
Private Residence	770 (27.2%)
Recreational Area	265 (9.4%)
<b>Counties with Highest ORV Incidents (Top 3)</b>	
Jackson	186 (6.6%)
St. Louis	170 (6.0%)
St Francois	130 (4.6%)

<sup>a</sup> Includes ATV, UTV and Dirtbike  
<sup>b</sup> 911 response  
<sup>c</sup> Non-White included all Black/African American, Hispanic, Asian, other and a combination of multiple races  
<sup>d</sup> Metro area includes counties located within a metropolitan area that has over 250,000 residents. Non-Metro area includes urban counties with at least 2,500 residents, that may or may not be adjacent to a metropolitan area. Rural denotes counties that are completely rural or urban with less than 2,500 people in an urban area.

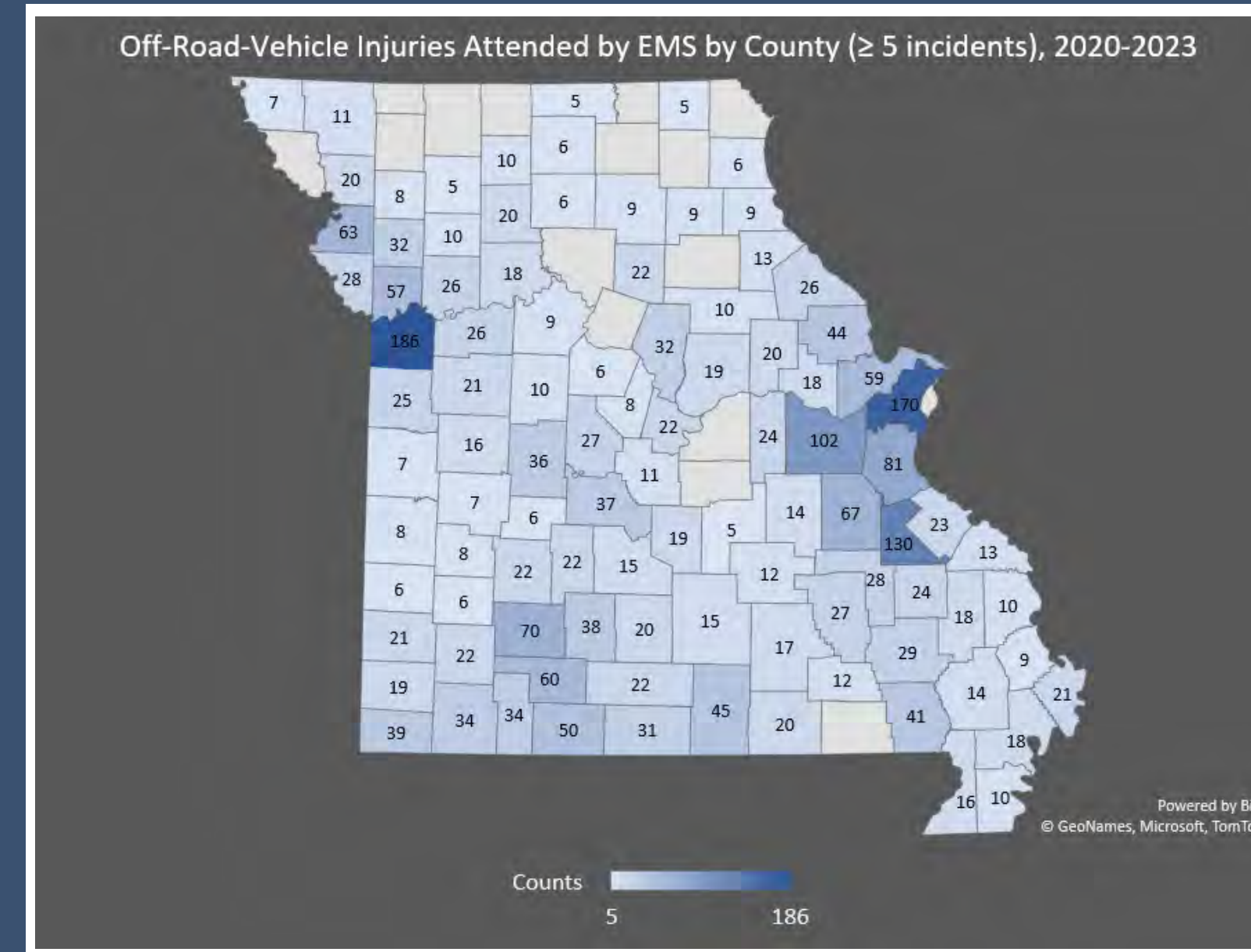


Table 3. Factors Associated with Head Injuries from Off-Road-Vehicle<sup>a</sup> EMS Incidents, 2020-2023<sup>b</sup>

Variables	Unadjusted OR, 95% CI	Adjusted OR, 95% CI
<b>Patient Age</b>		
<15 years	0.98(0.80-1.21)	1.04(0.83-1.30)
≥15 years	1.00	1.00
<b>Patient Sex</b>		
Male	1.00	1.00
Female	0.78(0.66-0.92)	0.74(0.62-0.89)
<b>Race</b>		
White	1.00	1.00
NonWhite <sup>c</sup>	0.64(0.49-0.84)	0.67(0.50-0.88)
<b>Urbanicity<sup>d</sup></b>		
Metro	1.00	1.00
Non-Metro	1.10(0.93-1.31)	1.06(0.89-1.28)
Rural	1.12(0.86-1.46)	1.01(0.77-1.33)
<b>Helmet Use Documented</b>		
Yes	1.00	1.00
No/Unknown	1.60(1.18-2.18)	1.80(1.30-2.50)

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<sup>b</sup> 911 Response  
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<sup>d</sup> Metro area includes counties located within a metropolitan area that has over 250,000 residents. Non-Metro area includes urban counties with at least 2,500 residents, that may or may not be adjacent to a metropolitan area. Rural denotes counties that are completely rural or urban with less than 2,500 people in an urban area.  
 Hosmer-Lemeshow Goodness of Fit: p=0.24

## RESULTS

- Head injuries were documented in 37% of ORV incidents.
- Jackson, St. Louis, and St. Francois Counties reported the most ORV incidents.
- Pediatric patients (< 15 years) accounted for 16% of ORV incidents, but experienced 18.6 ORV incidents per 1,000 injury-related incidents compared to 11.9 for ages 15-24 years and 5.2 for all other age groups (≥ 15 years).
- Those more likely to experience a head injury from an ORV injury had no helmet use documented (1.80,1.30-2.50; ref: helmet documented).
- Those less likely to experience an ORV-related head injury were female (0.74, 0.62-0.89; ref male) and Non-White patients (0.67, 0.50-0.88; ref: White).
- There was no correlation between age and urbanicity for ORV-related head injuries.

## LIMITATIONS

- There may have been instances where a helmet was or was not worn, but was not documented by EMS provider.
- Not all ORV incidents may be captured in the prehospital setting if patient did not seek medical care or was transported directly to emergency department/hospital by lay person.

## CONCLUSION

Our findings suggest that demographic and EMS incident characteristics are associated with ORV incidents in Missouri. Promotion of helmet use should be considered. Public health officials may consider targeted campaigning in populations of high ORV incidence to prevent ORV injuries requiring EMS, especially in children.

References:

1. <https://www.cpsc.gov/s3fs-public/2021-Report-of-Deaths-and-Injuries-Involving-Off-Highway-Vehicles-with-more-than-Two-Wheels.pdf>

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