

March 2019 Update from the Field: Roadway Safety

The Effects of Roadway Characteristics on Farm Equipment Crashes: A Geographic Information Systems Approach. (2016). Greenan M, Toussaint M, Peek-Asa C, Rohlman D, & Ramirez MR. *Injury Epidemiology*, 3(31), DOI 10.1186/s40621-016-0096-1.

Background: Tractors and other slow-moving self-propelled farm equipment are often used on public roadway to transfer goods from the farm to a market or distributor. Increased roadway exposure has led to a growing concern on the occurrence of farm equipment crashes. This study aims to compare characteristics of road segments with farm equipment crashes to road segments without farm equipment crashes in the state of Iowa. **Methods:** Data were obtained from the Iowa Department of Transportation from 2005 to 2011 on all crashes involving farm equipment, and features of all Iowa roadways. Geographic Information Systems (GIS) was used to identify geospatial features, such as road type, speed limit, traffic volume surface type, road and shoulder width of where a crash occurred. Logistic regression models were used to measure the associations between road characteristics and the occurrence of farm equipment crashes. Crude and adjusted odds ratios and 95% confidence intervals were reported. **Results:** A total of 1371 farm equipment crashes were reported in Iowa over the 6-year period and geocoded onto a street location. As traffic volume increased, the odds of a crash occurring also increased. Roadways with posted speed limits between 50 and 60 mph were associated with a higher odds of having crashes on them compared to roadways with speeds less than 35 mph (OR = 8.05, 95% CI: 6.59–9.84). Iowa routes (OR = 5.98, 95% CI: 4.97–7.20) had the highest odds of having crashes compared to local routes. Increased road width (OR = 0.90, 95% CI: 0.86–0.94) was associated with a 10% decrease in the odds of a crash. **Conclusions:** Higher traffic volume, higher posted speed limits, road type, and smaller road widths were associated with the occurrence of farm equipment crashes. Findings from this study can be used to guide policy to improve roadway design and conditions for all road users.

Lighting and Marking Policies are Associated with Reduced Farm Equipment-Related Crash Rates: A Policy Analysis of Nine Midwestern US States. (2016). Ramirez M, Bedford R, Wu H, Harland K, Cavanaugh JE, & Peek-Asa C. *Occupational and Environmental Medicine*, 73, 621-626.

Objective: To evaluate the effectiveness of roadway policies for lighting and marking of farm equipment in reducing crashes in Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota and Wisconsin. **Methods:** In this ecological study, state policies on lighting and marking of farm equipment were scored for compliance with standards of the American Society of Agricultural and Biological Engineers (ASABE). Using generalized estimating equations negative binomial models, we estimated the relationships between lighting and marking scores, and farm equipment crash rates, per 100 000 farm operations. **Results:** A total of 7083 crashes involving farm equipment was reported from 2005 to 2010 in the Upper Midwest and Great Plains. As the state lighting and marking score increased by 5 units, crash rates reduced by 17% (rate ratio=0.83; 95% CI 0.78 to 0.88). Lighting-only (rate ratio=0.48; 95% CI 0.45 to 0.51) and marking-only policies (rate ratio=0.89; 95% CI 0.83 to 0.96) were each associated with reduced crash rates. **Conclusions:** Aligning lighting and marking policies with ASABE standards may effectively reduce crash rates involving farm equipment.

Characteristics of Farm Equipment-Related Crashes Associated with Injury in Children and Adolescents on Farm Equipment. (2017). Toussaint M, Faust K, Peek-Asa C, & Ramirez M. *The Journal of rural Health*, 33, 127-134.

Purpose: Operating or riding on farm equipment is one of the leading causes of farm-related injuries and fatalities among children and adolescents. The aim of this study is to examine environment, crash, vehicle, and occupant characteristics and the probability of injury, given a crash, in youth under age 18 on farm equipment. **Method:** Data from the Departments of Transportation on farm equipment related crashes across 9 Midwestern states from 2005-2010 were used. Odds ratios were calculated using logistic regression to assess the relationship between environment, crash, vehicle, and occupant characteristics and the probability of injury, given a crash. **Findings:** A total of 434 farm equipment-related crashes

involved 505 child or adolescent occupants on farm equipment: 198 passengers and 307 operators. Passengers of farm equipment had 4.1 higher odds of injury than operators. Occupants who used restraints had significantly lower odds of injury than those who did not. Furthermore, occupants on farm equipment that was rear-ended or sideswiped had significantly lower odds of injury compared to occupants on farm equipment involved in noncollision crashes. Likewise, occupants on farm equipment that was impacted while turning had significantly lower odds of injury compared to those on equipment that was impacted while moving straight. **Conclusion:** Precautions should be taken to limit or restrict youth from riding on or operating farm equipment. These findings reiterate the need to enforce policies that improve safety measures for youth involved in or exposed to agricultural tasks.