

Roadway Accidents

The effects of roadway characteristics on farm equipment crashes: A geographic information systems approach

Greenan, M., Toussaint, M., Peek-Asa, C., Rohlman, D., & Ramirez, M. R. (2016). The effects of roadway characteristics on farm equipment crashes: a geographic information systems approach. *Injury epidemiology*, 3(1), 1-7.

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. 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. 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. 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.

Farm vehicle crashes on public roads: Analysis of farm-level factors

McFalls, M., Ramirez, M., Harland, K., Zhu, M., Morris, N. L., Hamann, C., & Peek-Asa, C. (2021). Farm vehicle crashes on public roads: Analysis of farm-level factors. *The Journal of Rural Health*.

Rural public roads experience higher crash fatality rates than other roadways, with agricultural equipment adding greater risk of injury and fatality. This study set out to describe farmers' experiences with farm equipment crashes and predictors of crashes at the farm level. A survey of farm operators was conducted in 9 Midwestern states (IL, IA, KS, MN, MO, NE, ND, SD, and WI) in collaboration with the US Department of Agriculture's National Agricultural Statistical Service. From 1,282 farms operating equipment on public roads in 2013, 7.6% of farmers reported that equipment from their farm had ever been in a crash (n = 97). Crashes occurred most often in June-August (44.0%) and were most often reported as being during the daytime

(71.3%), on dry roads (79.4%), or in clear weather (71.4%). While most farmers responded that they were driving the farm equipment at the time of the crash (52.0%), nearly half of crashes involved their employees as the driver (48.0%). Crashes often went unreported to law enforcement (28.6%). To illustrate crash probabilities for farms with different profiles, we included farm acreage, crop farming, vehicle horsepower, annual miles driven, and the total number of farm vehicles driven on public roads in a predictive model. Large crop farms of 241+ acres, those who drove farm vehicles 1,430+ miles per year, and those with 20 or more farm vehicles had the highest probability of crash of 0.14.

Lighting and marking policies are associated with reduced farm equipment-related crash rates: A policy analysis of nine Midwestern US states

Ramirez, M., Bedford, R., Wu, H., Harland, K., Cavanaugh, J. E., & Peek-Asa, C. (2016). Lighting and marking policies are associated with reduced farm equipment-related crash rates: a policy analysis of nine Midwestern US states. *Occupational and environmental medicine*, 73(9), 621-626.

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. 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. 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. Aligning lighting and marking policies with ASABE standards may effectively reduce crash rates involving farm equipment.