# Is Deer Hunting Effective at Reducing Deer-Related Car Accidents?

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*With over a million deer-related car accidents in the U.S. each year, it is disputed whether deer hunting effectively reduces deer-related car accidents or exacerbates them. The disparity between the evidence presented from both sides of the issue can be better understood by using county data instead of statewide data to reveal the possibility that the areas with the most deer-related car accidents do not experience much hunting. The results of this research support the argument that deer hunting is effective at reducing deer-related car accidents and may be of interest to communities that experience many deer-related car accidents.*

Deer-related car accidents are a major problem in the United States. According to State Farm, between July 1, 2011 and June 30, 2012 there were an estimated 1.23 million deer-related car accidents, costing an estimated $4 billion in damage. The Insurance Institute for Highway Safety (IIHS) also estimates that these accidents are responsible for about 200 deaths annually nationwide (Deer and Car Collisions Cause 200 Deaths). As people develop areas further into deer country, it is inevitable that the number of deer incidents will increase. Also, with a smaller predator population than in previous times, deer have undergone overpopulation. Because of these factors, it is undisputed that people need to be active in reducing the deer population and be proactive about avoiding car accidents with deer.

One such method of reducing the deer population, and hence the number of deer-related car accidents, is to harvest a portion of the deer population through hunting. Beloved by many sportspeople, deer hunting is a favorite pastime around the country, and hunting as a social and environmental responsibility adds another level of satisfaction. There is a lot of evidence to suggest that hunting is indeed an effective means of achieving this. However, there are also many people who oppose hunting for a variety of reasons. Whether they believe that hunting is ethical or not, there is reasonable evidence that would support their claim that hunting is not effective at reducing deer-related car accidents.

Deer hunting has been shown to be effective at reducing deer-related damage to human property in local communities. During a seven-year period, Kilpatrick and LaBonte conducted a study in the Mumford Cove community in Groton, Connecticut, where a local deer hunt with special regulations was conducted in order to reduce deer-related property damage, the spread of Lyme's disease, and the possibility of vehicular collisions with deer. The residents were surveyed before and after the hunt, which revealed that after the hunt deer sightings had significantly decreased, the opinion on the deer population generally shifted from being too high to fine as it is, and more people supported the hunt afterwards than before due to its efficacy (Kilpatrick and LaBonte).

Deer hunting has also been shown to reduce the movement of deer. On an 1861-ha property in Oklahoma, a controlled hunt was conducted by Little et al. with varying degrees of hunting intensity. Deer movement and relative displacement were high at the beginning of the study but decreased over time for every category. This is due to the deer becoming aware of the risk of hunters, with smaller movement and displacement decreasing their chance of an encounter. The most striking result from this study is that even though it was also breeding season, during which deer move around more, the risk of being hunted outweighed their desire to breed. This would suggest that hunting reduces the movement of deer, which decreases the likelihood of deer running across roads (Little et al.).

While there is ample evidence to suggest that hunting is an effective means of reducing deer-related car accidents, there is also strong evidence that would suggest the contrary. According to Erie Insurance, years of deer-related car accident data show that the two days of the year with the greatest amount of deer-related car accidents are opening day of deer hunting season and the first Saturday of deer hunting season. Missouri Insurance Information Service claims that hunting is a major factor in the amount of

deer-car related accidents (Deer-Car Collisions Increase During Hunting Season). According to the University of Illinois Extension Office, most deer-car related accidents occur from October to December, which is during deer hunting season (Living with Wildlife in Illinois). This pattern holds true for many other states as well. According to this evidence, deer hunting does not reduce deer-related car accidents, but rather increases them. This could be because the increased number of hunters in the woods and gunshots spook the deer out of the woods and into traffic.

On the one hand, various studies have shown that deer hunting is effective at reducing deer-related car accidents. On the other hand, statistics from insurance companies and states show that most deer-related car accidents occur during hunting season, which would suggest that hunting is counterproductive to reducing deer-related car accidents. Both sides present compelling arguments, and neither is clearly superior to the other. Also, neither directly refute the other's claims, but only uses its own claims to take a stance on hunting as a means to reduce deer-related car accidents. This raises the question, "Why is there such a disparity between the different evidence?"

I do not think that the different evidence necessarily must be contradictory. For example, both the claims made by Erie Insurance and Little et al. acknowledge that deer activity is high at the beginning of hunting season. However, Little et al. suggests that hunting reduces deer movement as the season progresses while Erie Insurance claims the number of deer-related car accidents during this time is high throughout the whole hunting season. There are many different factors that play into deer-related car accidents that can help explain this disparity. The most probable reason for this disparity is that the majority of deer involved in car accidents do not face much hunting intensity, allowing breeding season to be the deer's dominating motive, causing them to move more and get in more accidents. To support this claim, I will perform statistical tests of correlation to show that most deer-related car accidents happen in areas with high human populations, and then I will show that it is not likely that these areas experience much deer hunting.

It is necessary to know where the deer-related car accidents are happening. Looking at statewide data alone does not reveal much about the conditions of the locations of the accidents, such as how much traffic goes through the areas, if the locations are wooded or developed, or if there is a lot of deer hunting near the areas. By looking at smaller areas with known geographical characteristics, the factors that cause deer-related car accidents can more easily be determined. In addition, the smaller areas can be compared with one another in order to show correlations between different factors.

Two factors that might be correlated are an area's human population and the number of deer-related car accidents. Statistical data of deer-related car accidents by county were taken from the Minnesota Department of Public Safety from 2017 (2017 Deer/Motor) and the Wisconsin Department of Transportation from 2013 (2013 Wisconsin Traffic) and were compared to county census data from their respective states (Population Data), (List of Counties). Due to an order of magnitude difference in the total number of deer-related car accidents in Minnesota vs. Wisconsin, the two state's data were not combined. Since the number of fatalities and injuries were comparable between the two states, it is likely that they define deer-related car accidents differently. Also, it is assumed that within each state that correlation between deer-related car accidents and population is unaffected by the way deer-related car accidents are defined. That is to say, it is not the exact relationship between the two factors being considered, but rather the strength of the correlation between the two factors.

Deer-related car accidents by county was evaluated as a function of county population, and correlation coefficients $r$ and coefficients of determination $r^2$ were determined. Fig. 1 and Fig. 2, shown below, display the data for each state with a least-squares regression method used to fit linear models to the data.

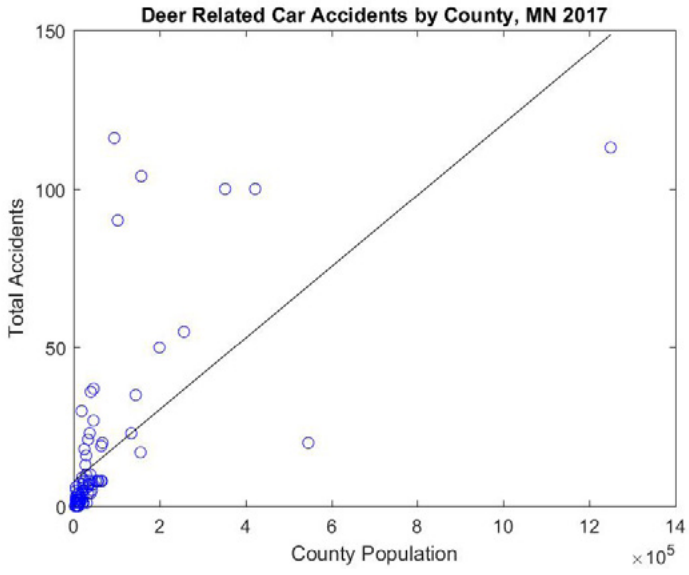


Fig 1.
Deer-related card accidents by county as a function of county population for Minnesota in 2017. A least-squares regression method was used to fit the linear model to the data.



[Back to Table of Contents]

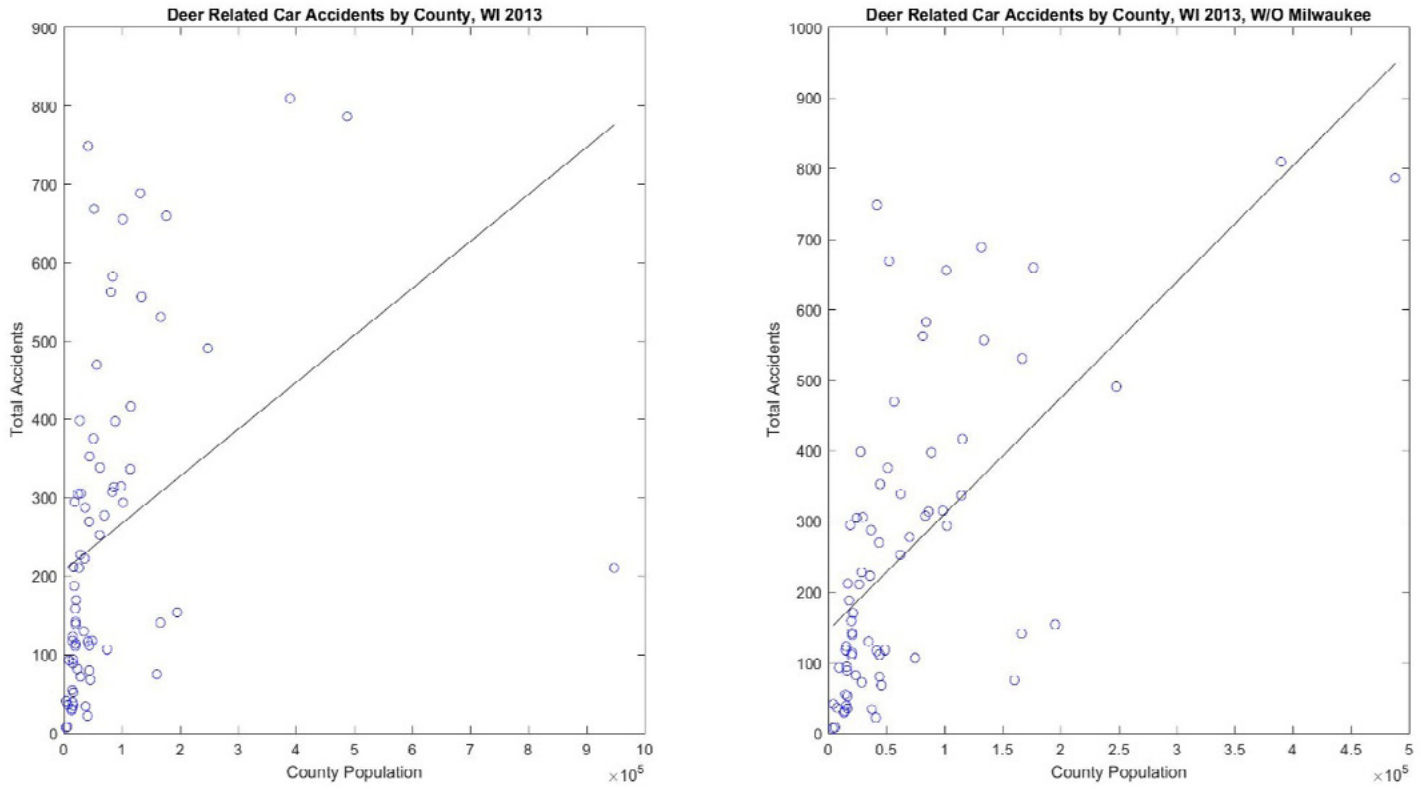


Fig. 2
Deer-related card accidents by county as a function of county population for Wisconsin in 2013. A least-squares regression method was used to fit the linear model to the data. Milwaukee County is an evident outlier (bottom right point on the left plot) and is justifiably omitted because it is a highly populated, small, industrial county. The figure on the right does not include Milwaukee County.

All the plots show a positive correlation. For Minnesota, the correlation coefficient $r$ was determined to be and the coefficient of determination $r^2$ was determined to be . Using a significance threshold of $\alpha$=0.05, the p-value is $P < 0.001$, which shows that there is a statistically significant correlation between the number of deer-related car accidents by county and county populations. For Wisconsin, $r$=0.374 and $r^2$=0.140, with $P$=0.0012. This is statistically significant; however, the coefficient of determination shows that the correlation is not very strong. However, Milwaukee County is an evident outlier in the data, having fewer deer-related car accidents than would be predicted by the model. Milwaukee County is not very large, only occupying 241 square miles of land, and is a very industrial area, which may be significant reasons for why it is an outlier. Omitting Milwaukee County results in $r$=0.635 and $r^2$=0.404, with $P < 0.001$. This is statistically significant, and the correlation has greater strength, comparable to the results from the Minnesota data.

These results have big implications. The statistically significant correlations reveal that human population plays a large factor in how many deer-related car accidents there are. Intuitively, the more people who drive in a given area, the higher the probability that a deer gets hit by a car. Also, drivers often swerve to try to avoid deer. The more drivers there are on the road, the higher the probability that a swerving driver will collide with another vehicle. These ultimately show that it is not appropriate to make any conclusions concerning deer-related car accidents using state data as a whole. It is important to remember though that there must also be sizeable deer populations too, which for many places in Minnesota and Wisconsin, there are.

Not only do the correlations show that human population size is a significant factor in the amount of deer-related car accidents, it also reveals the type of area most deer-related car accidents occur. Since the majority of deer-related car accidents happen in counties with larger populations, it also means that they occur in more developed areas. However, deer still need natural, wooded areas, so they are more likely to be in the suburbs and outwards from the urban areas they surround. This is confirmed by the Wisconsin Department of Transportation, which says that most deer-related car accidents occur on rural roads in exurban areas (2016 Wisconsin Safety), which are areas just beyond the suburbs that have a large population that is generally wealthy.

The exurbs are an environment in which there is a large human population and more habitable areas for deer. There may well be some deer hunting grounds near these areas. However, it is likely that in such highly populated areas that hunting may not be allowed or at least be very regulated. If there is hunting, the areas may not be very large. For example, deer permit zone 601 in Minnesota, which includes many of the counties with the most deer-related car accidents in the state, contains 1,625 square miles of land but only 23 square miles of land for public hunting, which does not include private land and the occasional special hunt (Deer Permit Area 601 Hunting Information), such as the one described in the study by Kilpatrick and LaBonte.

If most deer populations behave like the ones in the controlled hunt conducted by Little et al., then hunting may reduce the movements of deer, having a stronger influence on the deer than breeding season. However, in the absence of hunting, breeding season will be the strongest driving factor and cause them to move more, resulting in more deer-related car accidents. If this is the case, then the disparity between hunting being effective at reducing deer-related car accidents and most deer-related car accidents occurring during hunting season might be explained by most deer-related car accidents happening in areas that do not have much hunting.

There are a few things to consider with this hypothesis. In citing deer permit zone 601 as an example, it should also be known that 3,195 deer were harvested there during the 2017 deer hunting season (Deer Permit Area 601 Hunting Information). However, it is difficult to know what percentage of the local deer population this is, because the deer population is often quantified by how many deer were harvested. Deer population density also plays a big factor. Although 3,195 deer were harvested, these are from a relatively small amount of land within the entire deer permit zone (1.4%, not including private land or areas with special hunts). It is likely that the majority of the exurban areas in this zone are not immediately near hunting areas. These areas probably do benefit from population reduction of migrating deer, but not necessarily the movement reduction that may be caused by hunting pressure.

In order to resolve this ambiguity of whether most of the deer in car accidents encounter hunting pressure, a future study could record how far away the accidents are from the nearest deer hunting lands in each county and the distance distribution could be analyzed. A distribution with most accidents happening near deer hunting lands and decreasing accidents with distance would contradict my claim, while other distributions would not. This study could also address the claim that most deer-related car accidents occur on the opening day of deer hunting season and the first Saturday of deer hunting season. While this is not necessarily contradictory with the research from Little et al., who found that deer movement was higher at the beginning of the hunt, knowing the proximity of these deer-related car accidents to deer hunting lands would provide much insight.

The results of this research should be of interest to towns with high deer populations, especially exurban communities, having high human populations, high deer populations, and plenty of habitable areas for deer. Special hunts, such as the one described in the study by Kilpatrick and LaBonte, could be conducted to reduce the number of deer-related accidents in their communities. With highly trained hunters and extra regulations, a local hunt could be a safe method of making the roads safer for drivers. This research should also be of interest to the state government and insurance companies, who want to make sure their citizens and clients, respectively, are safe.

In conclusion, the disparity between evidence that deer hunting is effective at reducing deer-related car accidents and most deer-related car accidents can be explained by the fact that most deer-related car accidents happen in areas without much hunting intensity. State data from Minnesota and Wisconsin show that there are statistically significant correlations between county population and the number of deer-related car accidents in each county for each state. This suggests that human population plays a big factor in the number of deer-related car accidents. It also shows that most deer-related car accidents happen in more populated areas, with the Wisconsin Department of Transportation saying that most of these accidents happen in the exurbs. Because of the high human population in the exurbs that make hunting these areas unlikely and the small area of hunting lands in the most populated counties, it is unlikely that the deer in these areas experience much hunting intensity. This allows the breeding season the be the dominant factor that influences the movement of deer, which motivates them to move more, increasing their chances of getting in a car accident. Exurban communities could consider special hunts to reduce local deer-related car accidents.

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