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# Morbidity and mortality from farm tractor-related injuries in Arkansas

**Victor M. Cardenas**[1], **Ruiqi Cen**[1], **Melissa M. Clemens**[1], **Jennifer L. Conner**[2], **Jennifer L. Victory**[3], **Lorann Stallones**[4], **Robert R. Delongchamp**[1]

[1)]University of Arkansas for Medical Sciences Fay W. Boozman College of Public Health, Little Rock, AR

[2)]University of Arkansas Cooperative Extension Service, Lake Village, AR

[3)]Arkansas Farm Bureau, Little Rock,

[4)]Colorado School of Public Health at Colorado State University, Fort Collins, CO

## Abstract

This study applied a text string search algorithm to ascertain suspect farm tractor or agricultural machinery-related injuries in data sources available for 2000-2014 in the state of Arkansas. The occurrences of tractor or other agricultural machinery-related injuries were compared with data available from the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) and the Bureau of Labor Statistics' Census of Fatal Occupational Injuries (CFOI). For death certificates that assigned an external cause of death, the authors first collected all those that were coded as related to agricultural machinery, based on search strings for occupation and industry and a description of how the injury occurred. They then inspected each case individually and removed those that were likely unrelated to agricultural machinery. This approach significantly increased (by 7.8 times) the number of suspect agricultural machinery-related fatalities compared to the number reported to CFOI, but there was only a 17% (not statistically significant) increase compared to NCHS. All hospital records with any discharge diagnosis coded as related to agricultural machinery were selected. Descriptive analysis of the fatalities and hospital records showed a significantly increased risk among men above retirement age, peaks during the summer, and an increased risk in the Mississippi delta region. About one-third of the agricultural machinery-related fatalities were due to overturns. The use of the algorithm can improve ascertainment of fatal agricultural machinery-related injuries in Arkansas. The death records were found to be rich in data on the circumstances of the injuries, which can be used to screen for tractor-related fatalities and, if confirmed, translated into action to improve the safety of Arkansas farmers.

### Keywords

Agricultural machinery; Farm; Farming; Injury; Risk; Statistics; Tractors

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In 2010, 43.8% of the population of Arkansas lived in areas not considered urban (≤2,500 people); therefore, Arkansas is considered a largely rural state (U.S. Census Bureau, 2012). However, only a small fraction of the population are farmers. For instance, in 2011-2015, it

was estimated that 40,904, or 3%, of the 1,256,081 civilian employed persons age 16 years and older were employed in the agriculture, forestry, fishing (AgFF) and hunting sectors (U.S. Census Bureau, 2018).

Only two previous reports in the peer-reviewed literature have addressed the occurrence of occupational agricultural injuries in Arkansas. One previous study used newspaper clippings collected by a contractor to the University of Arkansas Cooperative Extension Service. According to this source, in Arkansas between 1990 and 2000, there were 482 cases of injuries in the AgFF sector, of which 221 were fatal, including 42 tractor rollover fatalities (Huitink et al., 2005). According to the second previous report, which used public health surveillance sources of data but was limited to seven counties in the Arkansas delta region, in 1998-2001, there were 59 fatal injuries resulting from the use of agricultural machinery (Richter et al., 2007).

Farm tractor and other agricultural machinery-related injuries are a significant public health problem. Tractor rollovers were involved in 1,412 fatalities between 1992 and 2005 (Tinc et al., 2015). The 2008 review of the National Institute of Occupational Safety and Health (NIOSH) AgFF program by the National Research Council and the Institute of Medicine identified, among the program's limitations, the "difficulty in applying the principles of and engaging in surveillance" and recommended implementation of a comprehensive surveillance system (NRC, 2008). Public health surveillance is by definition "the systematic, ongoing collection, management, analysis, and interpretation of data followed by the dissemination of these data to stimulate public health action" (Thacker, 2012). The effective use of public health surveillance to assist in developing programs to address occupational injuries was illustrated by a project undertaken by the NIOSH Alaska Field Station in the 1990s, which resulted in a 46% reduction in occupational injury fatalities. The Alaska Occupational Injury Surveillance System engaged several state and federal agencies, local governments, and community groups to address the major factors highlighted in surveillance reports (Conway et al., 1999). Most of the previous research evaluating the effectiveness of rollover protective structures to prevent farm tractor injuries has relied on data in the Census of Fatal Occupational Injuries (CFOI) (BLS, 2018). In the most comprehensive U.S. study of farm tractor deaths to date (Hard and Myers, 2011), Arkansas was among the states that did not contribute data on tractor overturn fatalities. Hence, our study addresses an important rural issue for an understudied population.

In 2015-2016, we implemented a NIOSH-funded Southwest Center for Agricultural Health, Injury Prevention, and Education (SW Ag Center) feasibility project, loosely patterned after the Alaska Occupational Injury Surveillance System, that, in addition to death certificates and hospital records, used data available to the National Transportation Safety Board, the U.S. Department of Labor, the Occupational Safety and Health Administration (OSHA), and partnerships with industry and labor organizations (Conway et al., 1999). Our AgFF surveillance project was developed in partnership with several agencies in Arkansas. These include the Secretary of Agriculture, the Farm Bureau, the Arkansas Department of Health (ADH), the Department of Labor, the Poison Center, and representatives of agricultural cooperative insurance groups. The project was put together with the initiative of the University of Arkansas for Medical Sciences (UAMS) Fay W. Boozman College of Public

Health, Department of Epidemiology. The main goals were to establish a steering committee, secure data to assess the current situation and needs, and improve on programs and activities of the stakeholders in surveillance and control of occupational injuries in the AgFF sector. As a first step, the project obtained several years of hospital discharge and death certificate records. This article focuses on the descriptive epidemiology of farm tractor and other agricultural machinery-related injuries and examines an approach that aims to improve the ascertainment of suspect farm tractor or other agricultural machinery-related injuries for public health surveillance in Arkansas.

## Methods

### Population

The study population comprised the farmers and ranchers in Arkansas for the years 2000-2014, as estimated from the sources described below under “Denominator Data.” Data were derived from death certificates for 2008-2014 and from hospital discharge records for 2000-2014.

### Data Acquisition and Ethical Review

We obtained two datasets from the ADH, which are described below without identifiers. This study was exempt from the UAMS IRB human subjects review because only de-identified secondary data were used.

### Sources of Data

**Death Certificate Data—**In the case of fatal injuries, the death certificate includes the date, time, place, work-relatedness, location of the injury, and (if transportation-related) if the decedent was the driver, passenger, or pedestrian. As shown in the facsimile in figure 1, which we populated with data from a typical fatality in the series examined, there is descriptive data on the place of injury and a description of the injury that can be searched for specific strings to flag suspect events. We obtained all death certificate records with dates of occurrence for the years 2008-2014 in Arkansas. The death certificate data were submitted to the NCHS for selection and coding of the underlying and contributing causes of death by nosologists. We created a subset of records using the following criteria: (1) the death was determined to be due to unintentional injuries with “agricultural machines including tractors” as the underlying external cause of death [International Classification of Disease (ICD) 10th revision codes V84.x (occupant of special vehicle mainly used in agriculture injured in transport accident) or W30.x (contact with agricultural machinery)]; or (2) the record had any mention of “farmer” or “rancher” in the occupation field or any mention of “farm”, “ranch”, “cattle”, “agriculture” or “cotton” in the industry code, and “tractor” was mentioned in the field describing how the injury occurred. Each of the selected records was then independently reviewed by two of the authors (VC and RDD) to determine if the record was possibly occupational in nature and to gather the circumstances surrounding the injury.

**Hospital Discharge Data—**We selected for analysis hospital discharge records with any mention of injuries due to “agricultural machines, including farm tractors,” by the presence

of ICD 9th revision clinical modification (CM) code 919.0 during the 15-year period from 2000 to 2014.

**Census of Fatal Occupational Injuries Data and NCHS Data—**We abstracted the data available online for 2008-2014 from the BLS CFOI website (BLS, 2018) to retrieve records that specifically mentioned tractors as the primary source of injury (853XXX for 2008-2010 and 8631XX for 2011-2014). We also looked into deaths classified from external causes under ICD-10 W30 and available at the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) using a WONDER system query for the same period (2008-2014) with external cause of death codes W30.x and V84.x (CDC, 2018).

**Denominator Data—**Information from the U.S. Census Bureau's American Community Survey (U.S. Census Bureau, 2018) was used for estimates of persons 16+ years of age employed in the AgFF sector. For age-specific estimates of the population engaged in agriculture in Arkansas, we used estimates from the current population survey (CPS) files available at the University of Minnesota's Minnesota Population Center Integrated Public Use Microdata Series (Flood et al., 2018) for the years 2008-2014. We specifically retrieved records using industry codes 10 and 11 according to the 1990 Census of Population Industrial Classification System. However, because CPS data on industry are not available by county, for analysis of regions within the state, we used estimates from the census data and added person-time denominators to calculate rates by regions.

**Statistical Analysis—**From the death certificates and hospital discharge records, we obtained age, gender, year, and month and weekday of occurrence or admission. In addition, race/ethnicity was available for both data sets, and level of education was available for decedents. For both fatal and hospitalized tractor or other agricultural machinery-related injuries, the zip code of the residence was available, and spot maps were generated in RStudio (RStudio, 2015). The scan statistic was used to identify clusters by place (Kulldorff, 2009). We obtained tabulations and cross-tabulations of the data and estimated age-adjusted rates using the 2000 U.S. Census as the standard. We compared the number of occupational deaths identified as due to farm tractors using our methods with those available through CFOI (BLS, 2018) and CDC WONDER (CDC, 2018) for the period 2008-2014. We grouped the counties by region (lower delta, upper delta, southwest, central, northwest, and north central) using the entire male population 16+ years of age as person-time denominators from the census data. The level of statistical significance was set to 0.05. The data were assembled and analyzed using SAS (v.9.4, SAS Institute Inc., Cary, N.C.). We used the FIND function in SAS for substrings of characters in a character string, and the program is available in the Appendix.

## Results

### Deaths from Farm Tractor or Other Agricultural Machinery-Related Injuries

For 2008-2014, we identified a set of 59 death records that met the inclusion criteria as potentially related to agricultural machinery, with ICD-10 codes V84.x or W30.x, or that involved individuals who were engaged in farming according to their occupation or industry

and a tractor was involved in the injury. On further examination of each record, we excluded four of the records based on the detailed review of the description of how the injury occurred. Of these four exclusions, in two instances a farmer or rancher was driving a non-agricultural vehicle and had a collision with a “tractor trailer” (deaths were assigned ICD-10 codes V44.9 and V87.7). The other two exclusions were an injury that occurred when a truck tractor was loaded (ICD-10 code W23) and a farmer who suffered a probable acute myocardial infarction before falling into the power takeoff shaft of a tractor [ICD-10 W31, but ICD-10 code I219 (acute myocardial infarction, unspecified) listed in the multiple causes of death data field].

Of the 55 death records that could increase the ascertainment of occupational fatalities, most (38, or 69.1%) had ICD-10 code W30, ten (18.2%) were classified with code V84, and seven had other ICD-10 codes, such as injuries to pedestrians (ICD-10 code V09.x, n = 2), collision of motor vehicles (ICD-10 code V87.7, n = 2), and one instance of each of the following: heavy transport vehicle in non-collision event (ICD-10 code V68.5), struck by falling object (ICD-10 code W20.x), and drowning (ICD-10 code W69.x). In all these seven instances, the description clearly stated that a farm tractor was involved. For instance, for a fatality to a farmer whose tractor rolled over into a lake that was coded as due to drowning (W69.x), the description reads as follows: “Tractor rolled over into Lake Hamilton, trapping decedent under water.” In 15 agricultural machinery-related fatalities, the description of how the injury occurred was left blank; ten of those were records from 2012, indicating an administrative reason for the missing data. Of the remaining 40 agricultural machinery-related deaths with data describing the injury, eight instances (20%) were due to farm tractor overturns.

All of the 55 fatalities occurred among men, 29 (or 52.7%) of whom were ≥67 years of age. In addition, 92.7% (n = 51) were non-Hispanic whites, two were Hispanic, one was black, and one was non-white of unknown Hispanic ethnicity. Thirty-four percent (n = 19) of the fatal tractor-related injuries occurred among persons with less than a high-school education. The number of fatalities did not vary significantly by year, month, quarter, or day of the week.

The spatial distribution of farm tractor-related deaths by zip code (area of residence) suggested two clusters in the Mississippi delta region, with mortality rate ratios of 31 for the upper delta and 11 for the lower delta (fig. 2). The quartile distribution of mortality rates among men 16+ years of age is shown in figure 3. The map indicates higher risks in the lower delta region.

The mortality rate from farm tractor or other agricultural machinery-related injuries in 2008-2014 was 14.2 per 100,000 farmer-years. There was a 10.7-fold increase in mortality from this cause among persons 65+ years of age compared to the rates among those under 50 years of age (table 1).

Comparison of Fatal Farm Tractor or Other Agricultural Machinery-Related Injuries in Different Sources

For the years 2008-2014, 55 fatalities were suspected of relatedness to a farm tractor or other agricultural machine based on the death certificate data, while only seven were found in the CFOI as deaths related to farm tractors. The difference was a 7.8-fold increase (95% CI: 3.6, 17.3; $p < 0.0001$). We were able to retrieve 47 deaths from farm tractor-related injuries (ICD-10 code W30 or V84) in Arkansas for the same period from the CDC WONDER website (CDC, 2018). The percent change or difference [8/47 deaths, or (55-47) / 47, or 17.0%] between the data available from this source and from our string search was not statistically significant ($p = 0.43$).

## Hospital Discharges with Farm Tractor or Other Agricultural Machinery-Related Injuries as Discharge Diagnosis

During the same years (2000-2014), there were 357 hospitalizations with any mention of "agricultural machines, including farm tractors," as indicated by ICD-9 code 919.0. Only nine (2.5%) of the injured individuals died during their stay. The typical length of stay was three days (median = 3, mean = 5.8, SD = 8.1).

Only 6.2% (n = 22) of the injured individuals were less than 16 years of age, and only 8.7% (n = 31) were females. The mean, median, mode, and standard deviation of the ages of the injured individuals admitted to a hospital were 54.5, 57.0, 51.0, and 21.0, respectively. Thirty-three percent of the persons admitted for farm tractor-related injuries were 65+ years of age. Ninety-one percent (n = 326) of those admitted were males, and 90% were non-Hispanic whites.

Among males age 16+, the rate of hospital admission for farm tractor-related injuries increased after age 50 and further increased among those age 65+ (table 2). However, the increase by age was not as sharp as seen for mortality rates.

The number of farm tractor and other agricultural machinery-related injuries discharged from hospitals in Arkansas did not vary much by year, with an average of about 24 per year. We observed a significant decrease from late fall to late winter, reaching a peak in the month of July (fig. 4). There was no clear pattern of variation by day of the week.

There were 27 records without a zip code to assess the occurrence by place of residence. The spot map in figure 5 shows a pattern consistent with the higher incidence in the delta region and is more evenly distributed than the spot map of fatal cases in figure 2. Three distinct, non-overlapping clusters were detected: one near the border with Oklahoma involving a single zip code and five cases, a second cluster in eight zip codes in central Arkansas involving 13 cases, and a large cluster involving 78 injuries in the northeastern region. The increases in the first two clusters were statistically significant, while the third cluster was borderline statistically significant ($p = 0.07$) (fig. 5).

The map in figure 6 shows the age-standardized rate by region, using the population of all males age 16+ in the 2000-2014 period as denominators. The age-adjusted hospital admission rates were higher across the entire Mississippi delta region, followed by the north central and northwest regions, with the central and southwest regions in the lower end of the risk distribution.

## Discussion

This article presents an assessment of the occurrence of agricultural injuries specifically linked to the use of farm tractors and other agricultural machinery at the state level in Arkansas. We found that the mortality from these type of injuries was 19 per 100,000 in 2008-2014, with a morbidity four times as large when the number of farmers was used as the denominator. Consistent with other studies (Myers and Hendricks, 2010), we identified that older persons have a ten-fold increased risk of mortality from these injuries when compared to young farmers. We found high rates of suspect farm tractor and other agricultural machinery-related fatalities and hospital discharges in the Mississippi delta region.

We also found that death certificates provide additional information that can be used to ascertain fatalities that could be related to farm tractors and other agricultural machines. Our method can improve the ascertainment of causes of death as assigned by NCHS. The use of string searching through electronic administrative databases is now extensively tested in the field of occupational health, in particular to assess the occurrence of injuries in the AgFF sector (Scott et al., 2015a, 2015b).

The use of the death certificate model to collect information on the circumstances surrounding an injury is crucial for determining the epidemiology of injuries systematically. The automated search for text strings substantially increased the number of fatalities that could be related to agricultural machinery, including farm tractors, and fatalities that could be occupational in nature. The text search can be easily adopted to improve the surveillance of fatal occupational injuries.

It is unclear why there is such large deficit in the CFOI in the number of fatalities assigned to farm tractors, but several factors could contribute, including the designation of occupation, as many part-time farmers may not perceive themselves as farmers. This limitation has been extensively discussed in the literature and in large part arises from the difficulty in distinguishing occupational from non-occupational injuries when the worksite is also the place of residence (Stallones, 1995; Murphy, 1990). In addition, the CFOI requires the work-relatedness of an injury is substantiated by two or more source documents or a source document and a follow-up questionnaire (Toscano and Windau, 1993); therefore, it is possible that the required effort hinders the case ascertainment. The check box for “at work” injury on the death certificate could be left unchecked, as it may not be obvious to a coroner that the death of a farmer is related to work on the farm. In addition, the CFOI may list tractors as a secondary source of fatalities under the BLS system, which may not match the ICD system. In any case, the proposed method only flags suspect or potential fatalities that might be worth investigating.

We found that the death certificate data are tremendously rich compared to the hospital discharge data, as the latter are primarily for billing purposes, while death certificates are the first and still one of the most important sources of public health surveillance data.

Although the number of injuries seen in hospitals is seven-fold that of fatal injuries, it seems that the number of admissions will be affected by patterns of hospital utilization and referral, access to healthcare, and perceived susceptibility. It is worth noting that few fatalities were

seen in the most affluent part of the state (the northwest region), but there was a significant number of admissions.

We also confirmed the known increased risk of fatal farm tractor and other agricultural machinery-related injuries among older men. This could reflect higher susceptibility and increased exposure due to adopters of a “town and country” lifestyle among retirees and soon to be retirees, avocational farmers, and hobby farmers, who may be systematically excluded from the CFOI. In addition, this population may lack adequate safety training for the operation of farm tractors and other agricultural machines, as well as the use of older equipment without rollover protection structures among older farmers with limited resources that prevent them from updating their machinery. In addition, declines in cognitive functioning with aging (e.g., reaction time, visual acuity, and hearing loss) may increase the risk of injuries. All these factors require focused research and action.

## Limitations

There are several limitations to the data and the analyses reported. The administrative electronic databases of hospital discharges do not collect data on occupation or industry. As mentioned before, false positives have been found using string search algorithms (Scott et al., 2015a, 2015b). However, hospital discharge data contain considerably less information than death certificates about the circumstances surrounding the injury; therefore, the extent of a low positive predictive value may be more prominent in morbidity data than in mortality data. Admissions to out-of-state hospitals are not recorded in the Arkansas hospital discharge data. This results in gross undercounts of hospitalizations among populations residing near Texarkana and Memphis. There are substantial acreages in row crops in those regions. Death certificates do not code data on occupation or industry and are liable to omissions in data entry, as illustrated by the lack of descriptions of the injury in death certificates for the year 2012. The data from death certificates using the string search, or the selected records coded as related to farm tractors or other agricultural machinery, only flag suspect events worth investigating for potential occupational connections. The analysis of the data presented here on the patterns of occurrence by location are based on a rough approximation of the place of occurrence of the injury, as the injury could have happened far from the residence of the injured person. Our estimates could also benefit from more detailed area analysis and could be considered only preliminary.

The systems that made possible the collection of data are already in place. A common misunderstanding in public practice is that it is enough for public health surveillance to exist. Data collected by public health systems are acted upon to bring closure to rumors and to confirm or rule out suspect cases. As the definition quoted before clearly indicates, there should be more effort in the ongoing analysis of data and its interpretation, dissemination, and utilization to guide the development of interventions. The Arkansas public health surveillance project on occupational injuries in the AgFF sector will benefit from the dissemination of the findings among healthcare providers who fill out death certificates and electronic medical systems, as well as the decision-makers and technical personnel of public agencies that serve Arkansas farmers.

## Conclusion

Using existing data sources, we found levels of occurrence from death certificate data, with as many as 55 deaths possibly related to agricultural machines, that exceeded the seven occupational fatalities reported to the CFOI for 2008-2014. We described patterns of occurrence that distinguish geographic areas at risk and high-risk groups. Such information can guide prevention efforts. The Arkansas public health surveillance project on occupation injuries in the AgFF sector will benefit from the dissemination of the findings among healthcare providers who fill out death certificates and electronic medical systems, as well as decision-makers and technical personnel of public agencies that serve Arkansas farmers.

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## Appendix

```
/* SAS code used to identify suspect farm tractor and other agricultural machinery related fatalities; in
death certificate files; */
*                                                                                                    *
|  ------------------------------------------------------------------------------------------------  |
|      Code names                                                                                    |
|      Occup: Occupation                                                                             |
|      Industry: Industry                                                                            |
|      mc: underlying cause/contributing causes of death selected by NCHS nosologist                 |
*  ------------------------------------------------------------------------------------------------  *; options
nocenter ls = 200 ;
libname x " ;
data ; set x.farm08 x.farm09 x.farm10  x.farm11  x.farm12  x.farm13  x.farm14 ; x =
find(occup,'FARM')
 + find(occup,'RANCH')
 + find(industry,'FARM')
 + find(industry,'RANCH')
 + find(industry,'CATTLE')
 + find(industry,'AGRICULTURE')
 + find(industry,'COTTON') ;

y = find(INJDESC,'TRACTOR') ;
 if (x > 0 and y > 0) or find(mc, 'W30') or find(mc, 'V84') ; run ;

ods listing close ;
ods html file = "list.html" ;
```

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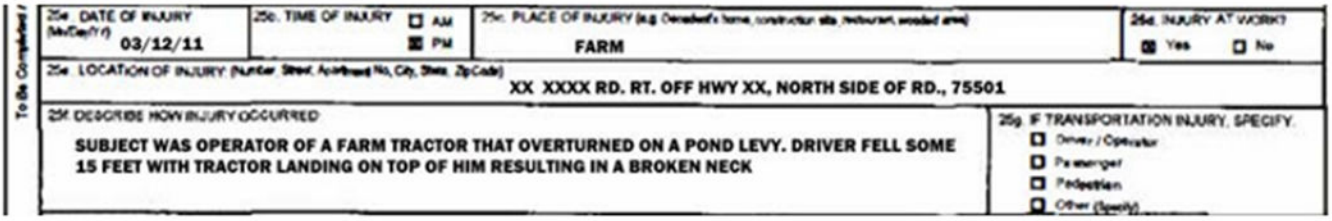

| To Be Completed | | | | |
|---|---|---|---|---|
| 25a. DATE OF INJURY (Mo/Day/Yr) 03/12/11 | 25b. TIME OF INJURY ☐ AM ☒ PM | 25c. PLACE OF INJURY (e.g. Decedent's home, construction site, restaurant, wooded area) FARM | | 26d. INJURY AT WORK? ☒ Yes ☐ No |
| 25e. LOCATION OF INJURY (Number, Street, Apartment No, City, State, ZipCode) XX XXXX RD. RT. OFF HWY XX, NORTH SIDE OF RD., 75501 | | | | |
| 25f. DESCRIBE HOW INJURY OCCURRED SUBJECT WAS OPERATOR OF A FARM TRACTOR THAT OVERTURNED ON A POND LEVY. DRIVER FELL SOME 15 FEET WITH TRACTOR LANDING ON TOP OF HIM RESULTING IN A BROKEN NECK | | | 25g. IF TRANSPORTATION INJURY, SPECIFY ☐ Driver / Operator ☐ Passenger ☐ Pedestrian ☐ Other (Specify) | |

**Figure 1.**
Facsimile of a death certificate showing the circumstances and a description of the injury.

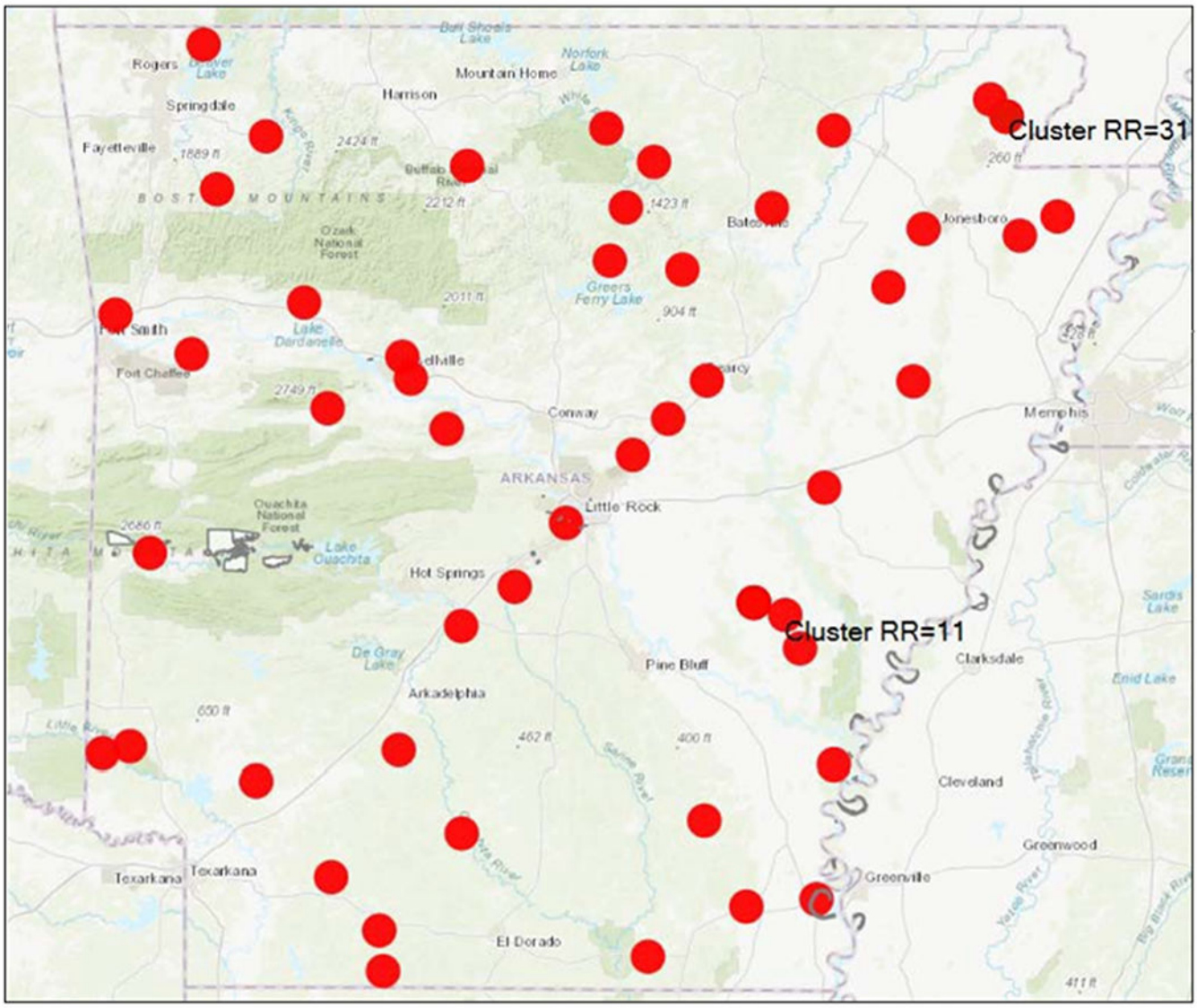


**Figure 2.**

Distribution of fatal farm tractor or other agricultural machinery-related injuries by place of residence in Arkansas, 2008-2014.

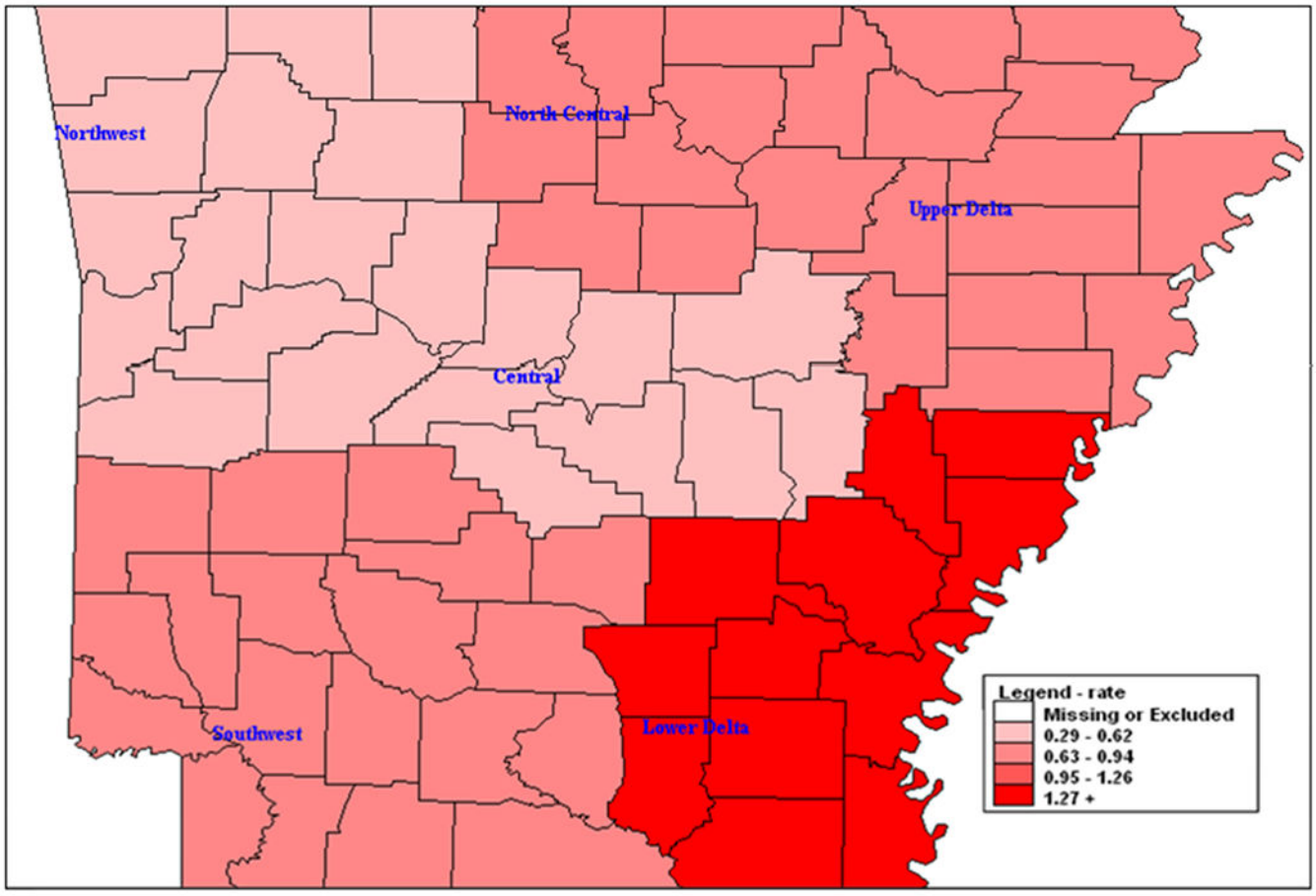


**Figure 3.**
Deaths due to farm tractor or other agricultural machinery-related injury per 100,000 males 16+ and older in Arkansas, 2008-2014.

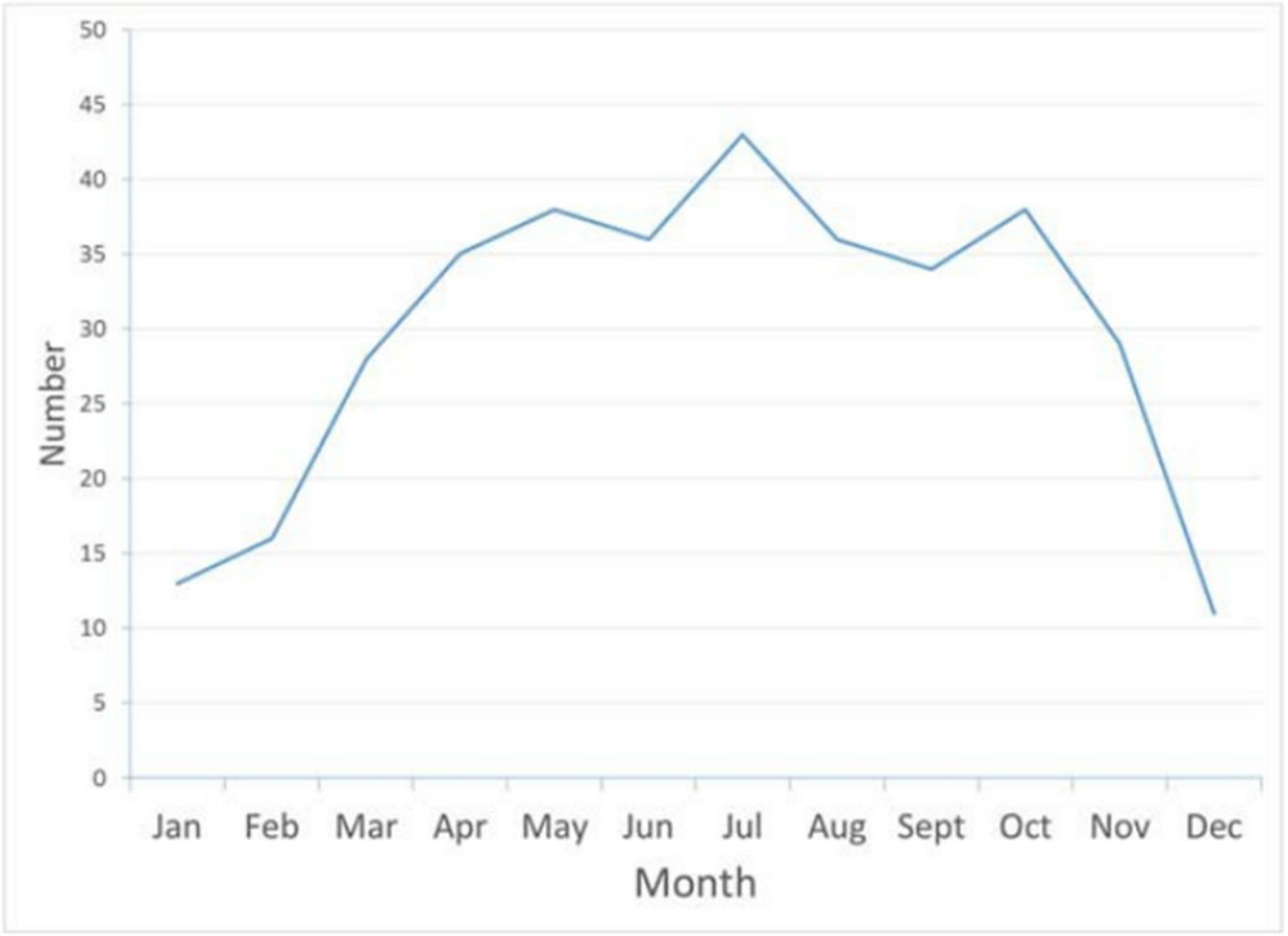


**Figure 4.**
Hospital admissions for farm tractor or other agricultural machinery-related injuries by month in Arkansas, 2000-2014.

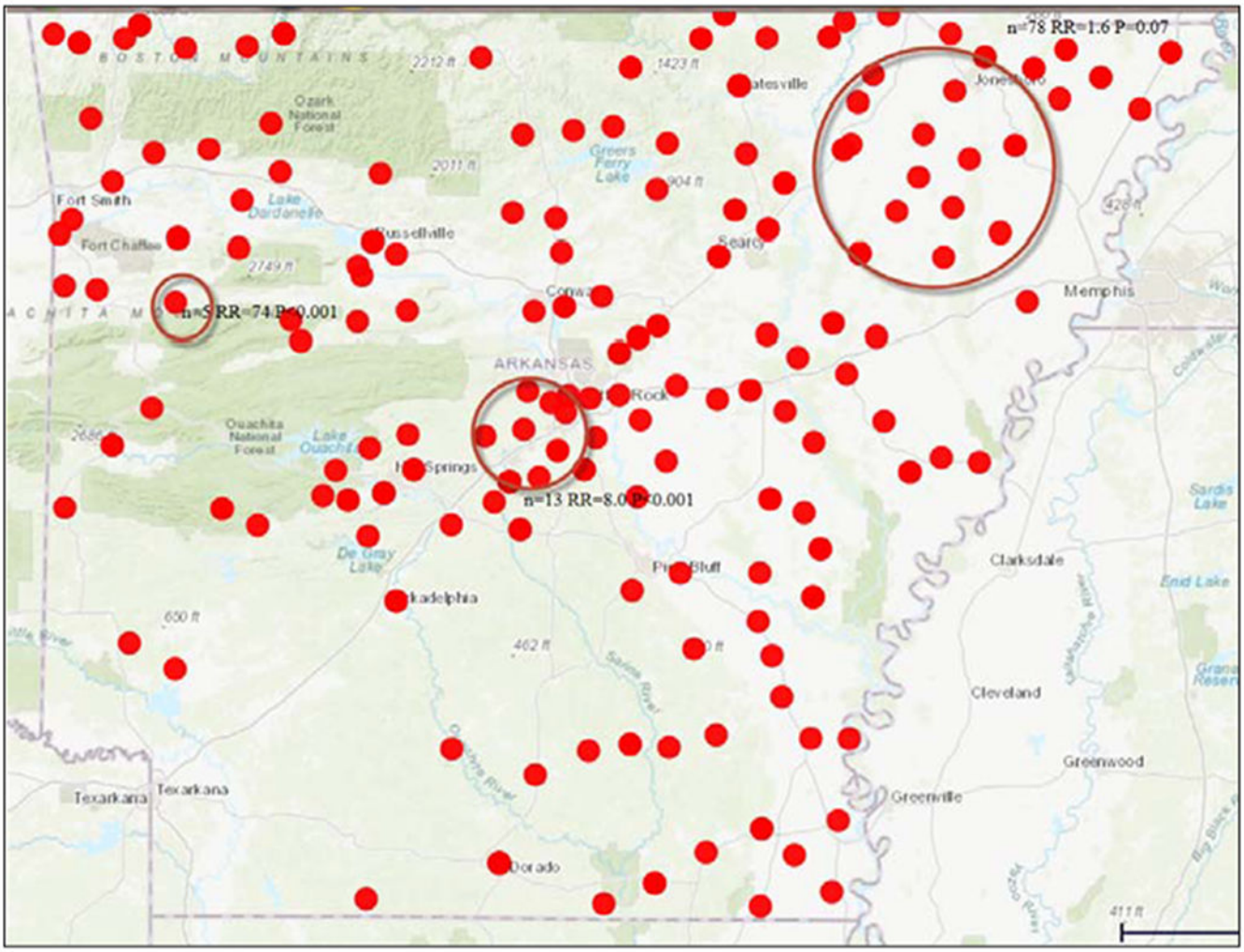


**Figure 5.**
Distribution of hospital admissions for farm tractor or other agricultural machinery-related injuries by place of residence in Arkansas, 2000-2014.

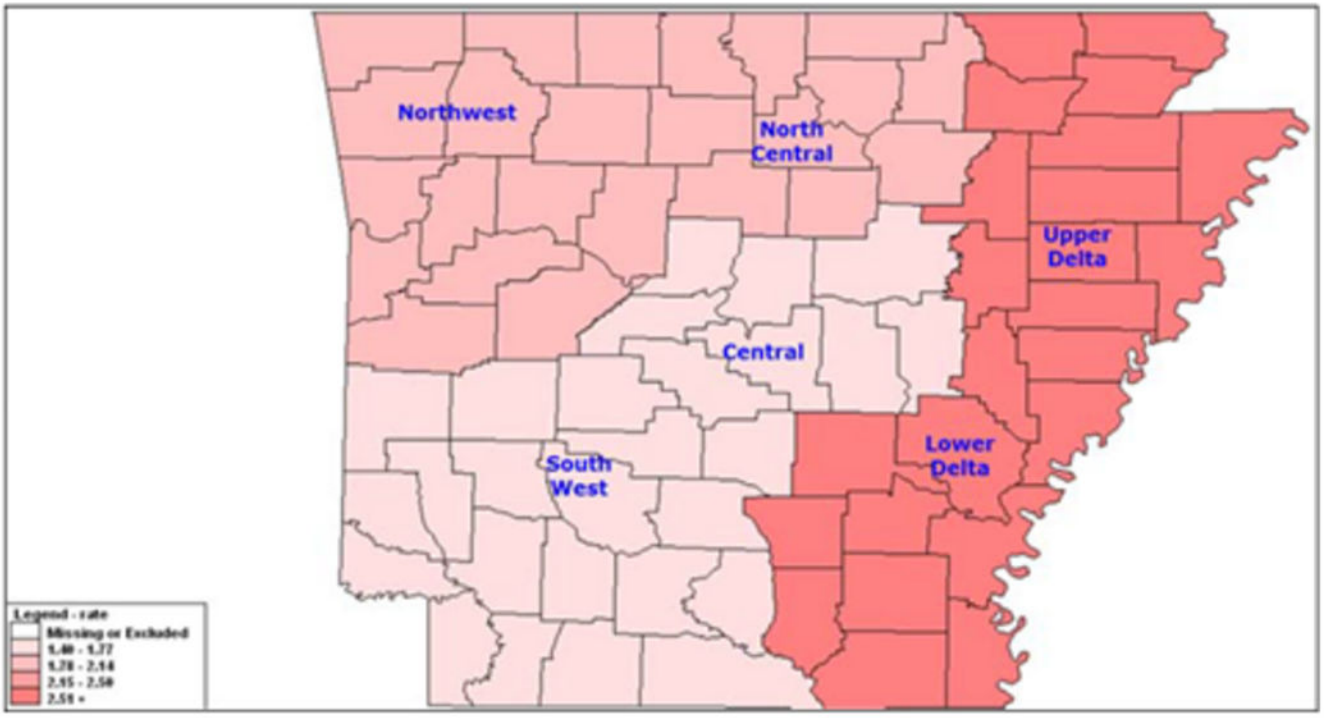


**Figure 6.**

Hospital admissions for farm tractor or other agricultural machinery-related injuries per 100,000 males age 16+ in Arkansas, 2000-2014.

**Table 1.**

Deaths due to farm tractor and other machinery-related injury[a] per 100,00 male farmers 16+ years of age, Arkansas, 2008-2014.

| Age Group[b] | Deaths | Estimated Person-Years | Mortality Rate[c] | Rate Ratio | (95% CI) |
|---|---|---|---|---|---|
| 16-49 | 9 | 222,057 | 4.1 | 1 | Referent |
| 50-64 | 16 | 95,009 | 16.8 | 4.2 | (2.5, 6.8) |
| 65+ | 30 | 69,247 | 43.3 | 10.7 | (7.4, 15.3) |
| Total | 55 | 386,313 | 14.2 | | |

[a] ICD-10 codes V84 or W30 or ruled as agricultural machine-related.

[b] Weighted frequency from estimates of the CPS for 2008-2014 for 1990 industry codes 010-011. The CPS data for the entire period were aggregated using weighted estimates.

[c] Rate per 100,000 person-years

**Table 2.**

Farm tractor injury[a] hospital admission rates and rate ratios among male farmers age 16+ in Arkansas, 2000-2014.

| Age Group[b] | Deaths | Estimated Person-Years | Mortality Rate[c] | Rate Ratio | (95% CI) |
|---|---|---|---|---|---|
| 16-49 | 90 | 328,639 | 27.4 | 1 | Referent |
| 50-64 | 92 | 138,904 | 66.2 | 2.4 | (1.9, 3.1) |
| 65+ | 128 | 81,705 | 156.7 | 5.7 | (4.6, 7.2) |
| Total | 310 | 549,248 | 56.4 | | |

[a] ICD-9 code 919.0.

[b] Weighted frequency from estimates of the CPS for 2000-2014 for 1990 industry codes 010-011.

[c] Rate per 100,000 person-years