# Supplemental surveillance: a review of 2015 and 2016 agricultural injury data from news reports on AgInjuryNews.org

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## ABSTRACT

**Background** Agriculture, forestry, fishing and hunting industry is the most hazardous occupational sector in the USA. Even with this level of occupational risk, several national and state-level occupational injury surveillance programmes have been eliminated, leaving regional efforts to analyse multiple sources and compile data on agricultural injuries and fatalities. No up-to-date centralised national database for agricultural injuries/fatalities in the USA currently exists.

**Objective** Using the public data on AgInjuryNews.org, this study considered a wide range of variables to examine fatalities and injuries of the industry in 2015 and 2016. The results reported in this paper sought to explore and understand common data elements of US news reports.

**Methods** As of 5 April 2017, more than 3000 articles across 36 years were contained in the dataset. We selected 2 years to review, 2015 and 2016, which represented the most complete years to date; 2015 was the first year in which systematic collection was initiated by the AgInjuryNews.org team. Data were coded based on the Occupational Injury and Illness Classification System source and event/exposure types.

**Results** A total of 1345 victims were involved in 1044 incidents. Leading sources of injuries were vehicles and machinery, and the most common event/exposure type was transportation.

**Conclusions** This study demonstrated that data from AgInjuryNew.org is consistent with previous literature, and it can supply up-to-date data as an open-source surveillance supplement, disseminated for health and safety stakeholders.

## INTRODUCTION

Farming remains among the most dangerous occupations in the USA with an annual death rate of 26.0/100 000 persons compared with 3.3/100 000 persons overall.[1] In Wisconsin, a worker in the agriculture, forestry and fishing (AgFF) sector is over 13 times more likely to die while working than the average Wisconsin worker.[2] Nationally, workers in the AgFF industries are up to 33 times more likely to die on the job than workers in other industries.[3] When last examined by Leigh *et al*[4] in 2001, the cost of farm-related injuries nationally averaged an estimated $4.57 billion/year. This represents a contribution of 30% more than the national average to occupational injury costs.[4] Even with this level of occupational risk, several national and state-level occupational injury surveillance programmes have been eliminated, including the National Institute of Occupational Safety and Health's (NIOSH) agricultural worker injury surveillance through agreements with the Department of Labor and the US Department of Agriculture.[5] This 2015 decision has left regional efforts to analyse multiple sources (eg, news reports and police blotters) and compile data on AgFF injuries and fatalities. No up-to-date centralised national database for AgFF injuries/fatalities in the USA currently exists.

### Federal injury surveillance

Occupational injuries and fatalities are collected by the Bureau of Labor Statistics (BLS) in the USA, and the Census of Fatal Occupational Injuries (CFOI) captures occupational fatality data.[3] Additionally, non-fatal occupational injuries are captured through Survey of Occupational Injuries and Illnesses (SOII). However, both CFOI and SOII data contain only work-related injuries. CFOI covers all workers, including volunteer workers and undocumented workers.[6] SOII data are solicited from agricultural employers having 11 or more employees, a strategy that misses a majority of the 2.16 million US farms and ranches.[7 8]

### Regional and state-based injury surveillance using news reports

AgFF health and safety has had limited success in conducting national surveillance programmes, and regional efforts are often difficult to scale to a national level for many reasons, notably cost. Nevertheless, regional efforts in several states, including Indiana, Nebraska/Central States, Pennsylvania and Texas/Southwest have endured and continue to use news reports as sources for their collections (personal communication, M Madsen, 17 August 2015; personal communication, D Murphy, 31 March 2017).[9 10] Even while the NIOSH was conducting its national telephone survey-based programme, other organisations were using news reports as data sources in surveillance-related projects.[11–14] Additionally, international research groups, such as the Canadian Agricultural Safety Association and the Australian Centre for Agricultural Health and Safety, collect and analyse injury surveillance data through media reports (personal communication, M L Hacault, 25 August 2016).[15 16]

Though it is unlikely that any surveillance programme will claim to have captured all AgFF fatalities, much less all injuries, some surveillance strategies do contain the core elements needed to



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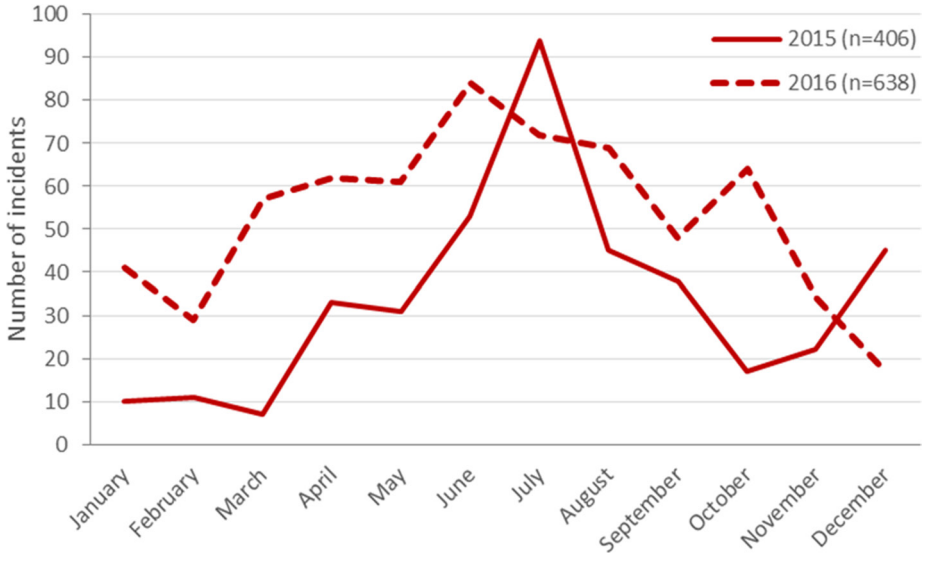


**Figure 1** Monthly change of number of incidents in 2015–2016 in the USA.

provide a rich dataset for agricultural safety and health stakeholders. New York researchers identified that newspapers were needed as one of four sources to sustain a surveillance programme, and the team also found that Fatality Assessment and Control Evaluation Program contacts use death certificates and newspapers (digital and print) as their primary data sources.[17] Additionally, the national gap was further emphasised through a review of the NIOSH AgFF research programme. The 2007 National Academy of Science committee published its conclusions to 'Implement a Comprehensive Surveillance System' including: (1) 'conduct research on the potential use of both ongoing and non-routine surveillance systems to identify priority topics for future research and intervention' and (2) 'implement pilot surveillance systems'.[18]

### National news reports collection

To address many of these challenges, the National Farm Medicine Center (NFMC), Marshfield, Wisconsin, began development of a national collection of news reports in January 2015.[19] The system, AgInjuryNews.org, was designed for public use with an Orchard content management system and SQL database and contains the growing dataset that was used in this paper. In 2016, the BLS announced AgInjuryNews.org as a resource for states' data analysts to use in validating labour-related injuries and fatalities in their respective regions.[19] AgInjuryNews.org was referenced and cited in several 2016 news stories and by an organic growers association's web blog on farm safety.[20–23] It also served as a data source for a 2017 study assessing news reports' role in child agricultural injury prevention.[24] To expand on recent work, this study was designed to: (1) examine the magnitude of the agricultural related fatalities and injuries nationwide from 2015 to 2016 and (2) evaluate the applicability of news reports on AgInjuryNews.org for agricultural injury analysis.

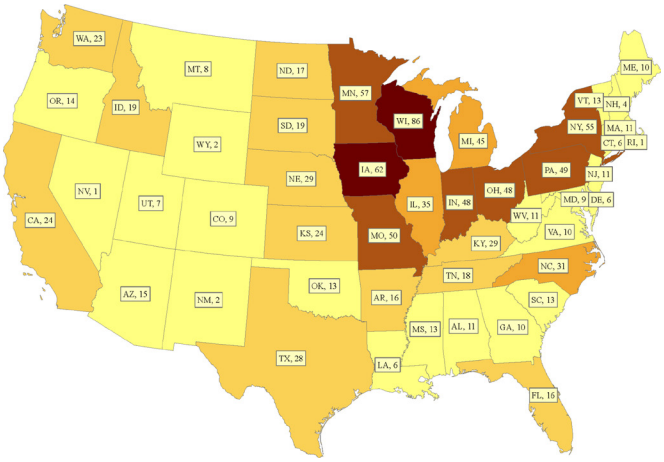


**Figure 2** The number of incidents in states, 2015–2016.

## METHODS

### Data collection

The primary source of data for this study was the news reports dataset available on AgInjuryNews.org. The article dataset is available through a web-based system providing an interactive display of publicly available news reports data. Articles are indexed using various elements, including publication year, publication month, farm type, injury agent, US state, incident year, month and time of day, victim age, gender and others. The database of agriculture, forestry and commercial fishing related articles is populated using several sources. In addition to submissions from colleagues, social media (eg, sheriff departments' Facebook pages and GoFundMe) and Google Alerts, a news clipping subscription service uses an algorithmic combination of keywords to mine daily digital media for related cases.[25] Technology and practices are ever-changing, especially in agriculture. To stay abreast of recent advances in the industry, our team reviews and revises the AgFF relatedness definition and documented system inclusion/exclusion regularly with input from our 15-member national steering committee.[26]

### Analysis

For this study, data were coded according to the Occupational Injury and Illness Classification System (OIICS), version 2.01.[27] Cases were collected, entered and coded by a primary data entry person. More than 10% were reviewed by a second coder prior to publishing the data to AgInjuryNews. All cases were reviewed and coded according to OIICS by a third coder for this study. Article descriptions were used to classify each case according to (1) the source of injury and (2) the event or exposure associated

**Table 1** Summary statistics of incident variables

| Variables | Total (n=1044) (n (%)) | 2015 (n=406) (n (%)) | 2016 (n=638) (n (%)) |
|---|---|---|---|
| Incident injury severity | | | |
| Fatal | 634 (60.7) | 265 (65.3) | 369 (57.8) |
| Non-fatal | 391 (37.5) | 135 (33.3) | 256 (40.1) |
| Unknown | 19 (1.8) | 6 (1.5) | 13 (2.0) |
| Total number of people | | | |
| One victim | 886 (84.9) | 342 (84.2) | 544 (85.3) |
| Two victims | 108 (10.3) | 43 (10.6) | 65 (10.2) |
| Three and more victims | 50 (4.8) | 21 (5.2) | 29 (4.5) |
| Incident location | | | |
| Worksite | 580 (55.6) | 224 (55.2) | 356 (55.8) |
| Public roadway | 249 (23.9) | 97 (23.9) | 152 (23.8) |
| Non-worksite | 81 (7.8) | 25 (6.2) | 56 (8.8) |
| Not reported/other | 134 (12.8) | 60 (14.8) | 74 (11.6) |
| Primary source | | | |
| Chemicals and chemical products | 5 (0.5) | 4 (0.6) | 1 (0.2) |
| Containers, furniture and fixtures | 11 (1.1) | 6 (0.9) | 5 (1.2) |
| Machinery | 107 (10.2) | 57 (8.9) | 50 (12.3) |
| Parts and materials | 19 (1.8) | 13 (2.0) | 6 (1.5) |
| Persons, plants, animals and minerals | 80 (7.7) | 49 (7.7) | 31 (7.6) |
| Structures and surfaces | 83 (8.0) | 60 (9.4) | 23 (5.7) |
| Tools, instruments and equipment | 14 (1.3) | 6 (0.9) | 8 (2.0) |
| Vehicles | 664 (63.6) | 404 (63.3) | 260 (64.0) |
| Other sources | 26 (2.5) | 22 (3.4) | 4 (1.0) |
| Non-classifiable | 35 (3.4) | 17 (2.7) | 18 (4.4) |
| Event/exposure | | | |
| Violence and other injuries by persons or animals | 64 (6.1) | 30 (7.4) | 34 (5.3) |
| Transportation incidents | 636 (60.9) | 259 (63.8) | 377 (59.1) |
| Fires and explosions | 24 (2.3) | 4 (1.0) | 20 (3.1) |
| Falls, slips and trips | 13 (1.2) | 4 (1.0) | 9 (1.4) |
| Exposure to harmful substances and environments | 70 (6.7) | 19 (4.7) | 51 (8.0) |
| Contact with objects and equipment | 189 (18.1) | 68 (16.7) | 121 (19.0) |
| Non-classifiable | 48 (4.6) | 22 (5.4) | 26 (4.1) |
| Extra rider | | | |
| Yes | 111 (10.6) | 60 (14.8) | 51 (8.0) |
| No | 933 (89.4) | 346 (85.2) | 587 (92.0) |

with the injury.[27] The primary source of injury and, when applicable, the secondary sources of injuries were determined from the article text. The primary injury source code is designed to capture 'the object, substance, element, or bodily motion that directly produced the injury,' while the secondary source code 'identifies the object, substance, or person that generated the source or contributed to the event or exposure'.[27] The event or exposure is defined as the manner in which the injury or illness was produced or inflicted by the primary source and, when applicable, by the secondary source. The following injury case involving a farm tractor provides an example. The injury description was: 'mowing ditches with a tractor when he struck a tree stump, causing the tractor to roll into the ditch and pinning him underneath'. In this case, the event is non-roadway transportation incident, the primary source of injury is a farm tractor and the secondary source of injury are trees, logs and limbs.

SPSS for Windows (V.24.0) was used to analyse the 2015–2016 data. Univariate statistics (ie, frequency distributions) were used to describe characteristics of the victims and the surrounding circumstances. The variables analysed were severity of incidents, number of victims involved, incident location, primary source, grain-related incidents and incidents involving extra riders. To determine significant differences between the variables for fatal and non-fatal injuries, $\chi^2$ tests were used.[28] Proportions were compared, and P values were adjusted using the Bonferroni method at a 0.05 significance level.

## Inclusion/exclusion for this analysis

As of 5 April 2017, more than 3000 articles spread across 36 years were present in the dataset. We selected 2 years to review—2015 and 2016. These 2 years represented the most complete years to date, with 2015 being the first year in which systematic collection was initiated by the AgInjuryNews.org team at NFMC.[19] Duplicates for the incidents and victims were excluded from data before conducting statistical analysis. Data were sorted based on victim's name and place and date of the incidents and carefully reviewed for duplicates. A total of 51 duplicates were detected and removed.

Within the victim-level statistical analyses, we excluded any reports without sufficient information. For example, if age was not reported, we did not include it in the analysis. Injury severities available in the database were fatal, non-fatal and not reported.

**Table 2** Summary Statistics of Victim Specific Variables

| | Variables* | Total | Fatal (n=681) | Non-fatal (n=640) | $\chi^2$ |
|---|---|---|---|---|---|
| Year | 2015 | 504 (38.2%) | 285† (56.5%) | 219‡ (43.5%) | 8.143, p=0.004 |
| | 2016 | 817 (61.8%) | 396† (48.5%) | 421‡ (51.5%) | |
| Gender | Male | 980 (84.5%) | 580† (59.2%) | 400‡ (40.8%) | 14.498, p<0.001 |
| | Female | 180 (15.5%) | 79† (43.9%) | 101‡ (56.1%) | |
| Age | Under 18 (children/youth) | 225 (21.2%) | 137† (60.9%) | 88† (39.1%) | 0.128, p=0.720 |
| | 18 and older (adult) | 836 (78.8%) | 498† (59.6%) | 338† (40.4%) | |
| Incident location | Worksite | 656 (55.2%) | 385† (58.7%) | 271‡ (41.3) | 53.891, p<0.001 |
| | Non-worksite | 120 (10.1%) | 67† (55.8%) | 53† (44.2%) | |
| | Public Roadway | 379 (31.9%) | 134† (35.4%) | 245‡ (64.6%) | |
| | Other | 34 (2.9%) | 16† (47.1%) | 18† (52.9%) | |
| Working situation | Working | 730 (71.1%) | 415† (56.8%) | 315‡ (43.2%) | 19.298, p<0.001 |
| | Not working | 297 (28.9%) | 124† (41.8%) | 173‡ (58.2%) | |
| Primary source | Machinery | 110 (8.3%) | 70† (63.6%) | 40‡ (36.4%) | 15.573, p=0.004 |
| | Persons, plants, animals, and minerals | 136 (10.3%) | 65† (47.8%) | 71† (52.2%) | |
| | Structures and surfaces | 87 (6.6%) | 55† (63.2%) | 32‡ (36.8%) | |
| | Vehicles | 836 (63.3%) | 424† (50.7%) | 412† (49.3%) | |
| | Other sources | 152 (11.5%) | 67† (44.1%) | 85† (55.9%) | |
| Event | Violence and other injuries by persons or animals | 125 (9.8%) | 58† (46.4%) | 67† (53.6%) | 40.074, p<0.001 |
| | Transportation incidents | 804 (63.2%) | 411† (51.1%) | 393† (48.9%) | |
| | Fires and explosions | 49 (3.8%) | 8† (16.3%) | 41‡ (83.7%) | |
| | Falls, slips, trips | 17 (1.3%) | 9† (52.9%) | 8† (7.1%) | |
| | Exposure to harmful substances and environments | 87 (6.8%) | 61† (70.1%) | 26‡ (29.9%) | |
| | Contact with objects and equipment | 191 (15.0%) | 109† (57.1%) | 82† (42.9%) | |
| Grain involved | Yes | 59 (4.5%) | 28† (47.5%) | 31† (52.5%) | 0.414, p=0.520 |
| | No | 1262 (95.5%) | 653† (51.7%) | 609† (48.3%) | |
| Extra rider | Yes | 249 (18.8%) | 92† (36.9%) | 157‡ (63.1%) | 26.202, p= p<0.001 |
| | No | 1072 (81.2%) | 589† (54.9%) | 483‡ (45.1%) | |

*Missing and unknown data not included in calculations.
Values in the same row followed by different designators († and ‡) are significantly different at the 0.05 level.
Column percentages are shown for 'total'. Row percentages are shown for fatal/non-fatal.

## RESULTS

After the deduplication process, there were 1044 incidents available in the AgInjuryNews.org database for 2015 and 2016. The monthly number of incidents for each year is contrasted in figure 1, and a national map of the distribution of 2015 and 2016 incidents by state is shown in figure 2. The distribution of the incidents is shown based on where the incident took place. As seen on the map, Wisconsin, Iowa, Minnesota, New York and Missouri had the highest number of the incidents over the study period.

Summary statistics of the specific incident variables are presented in table 1. Analyses uncovered that 61% of the incidents identified in the media resulted in a fatality. Approximately 85% of all incidents involved only one victim. The majority of incidents occurred on the worksite (56%), and approximately 24% of all incidents occurred on public roadways, involving farm machinery, vehicles or both (table 1). In this study, 'worksite' is defined as 'an area where AgFF business is located or where agricultural work takes place'. The major source of injury across all incidents was vehicles (64%), followed by machinery (10%). Additionally, the major event exposure of incidents was transportation (61%) followed by contact with objects and equipment (18%). Extra riders were involved in 111 incidents (9.4% of all incidents).

A total of 1345 victims were involved in the 1044 incidents (514 victims in 2015 and 831 in 2016). Within these incidents, 681 victims were fatally injured. Table 2 provides an overview of the victims involved in the reported incidents. Contingency table analysis was used to compare the injury severity. Results indicate that the proportion fatally injured among males was higher than for females (59% vs 44%; $\chi^2=14.498$, df=1, P<0.001). Across children/youth and adults, there was no significant difference between the proportions of those fatally injured (61% vs 60%), suggesting that media consistently report fatalities, regardless of victim age.

In terms of the primary source of the injury, almost 64% of machinery and 63% of structures and surfaces resulted in fatalities. Being at a 'worksite' and in a 'working' situation at the time of the incident also resulted in more fatalities than being involved in an incident in a place other than worksite and while non-working. A total of 59 victims involved in grain-related incidents resulted in 28 fatalities (48%). In terms of event or exposure type, 'exposure to harmful substances and environment' was associated with proportionally more fatalities than injuries.

### Injury source and event/exposure characteristics

Primary sources of injuries and event or exposure types with subcategories are given in tables 3 and 4, respectively. The 'non-classifiable' category includes the cases where there was insufficient information to assign a code. The primary sources of injuries were vehicles (63.3%); persons, plants, animal and minerals (10.2%); machinery (8.4%); structures and surfaces (6.8%); and others.

**Table 3** Victims with primary source and subcategories (n=1345), 2015 and 2016

| Primary source and subcategories | Total number (%) | Fatal | Non-fatal | Unknown |
|---|---|---|---|---|
| Vehicles (n=851, 63.3%) | | | | |
| Off-road and industrial vehicles—powered (tractors: 429, ATV: 190, others) | 636 (74.7) | 333 | 293 | 10 |
| Highway vehicles, motorised (pickup trucks: 62, automobile: 60, passenger van: 31 and others) | 197 (23.1) | 80 | 114 | 3 |
| Plant and industrial vehicles—non-powered (carts and wagons: 9) | 9 (1.1) | 6 | 2 | 1 |
| Others (agricultural aircraft, water vehicle and animal-powered vehicles) | 9 (1.1) | 5 | 3 | 1 |
| Persons, plants, animals and minerals (n=137, 10.2%) | | | | |
| Animals (bees: 19, others) | 62 (45.3) | 19 | 43 | |
| Person—other than injured or ill worker | 30 (21.9) | 26 | 4 | |
| Animal and plant byproducts (dairy products: 19, animal waste products: 1) | 20 (14.6) | 2 | 17 | 1 |
| Plants, trees, vegetation—not processed (trees, logs and limbs: 20) | 20 (14.6) | 14 | 6 | |
| Person—injured or ill worker | 5 (3.6) | 4 | 1 | |
| Machinery (n=113, 8.4%) | | | | |
| Agricultural and garden machinery (harvesting and threshing machinery: 23, others) | 69 (61.1) | 40 | 26 | 3 |
| Construction, logging and mining machinery (skid steers: 16, loaders: 10, excavating machinery: 4, log loaders: 1) | 31 (27.4) | 26 | 5 | |
| Others (augers: 10, elevators and lifts: 2 and others: 1) | 13 (11.5) | 4 | 9 | |
| Structures and surfaces (n=91, 6.8%) | | | | |
| Confined spaces (silo: 42, manure pits: 12, ditches: 2 and wells: 2) | 58 (63.7) | 34 | 20 | 4 |
| Geographical structures (ponds: 20) | 20 (22) | 17 | 3 | |
| Other structural elements (roofs: 3, walls, trusses, fences and gates) | 8 (8.8) | 3 | 5 | |
| Buildings—office, plant and residential (barns: 2) | 2 (2.2) | 1 | 1 | |
| Others (structures other than buildings, floors, walkways and ground surfaces) | 3 (3.3) | | 3 | |
| Parts and materials (n=22, 1.6%) | | | | |
| Power lines (17) | 17 (77.3) | 9 | 7 | 1 |
| Trailers (2) | 2 (9.1) | 1 | 1 | |
| Others (beams: 1, nails, nuts and bolts: 1, chains: 1) | 3 (13.5) | 1 | 2 | |
| Tools, instruments and equipment (n=20, 1.5%) | | | | |
| Firearms, law enforcement and other self-defence equipment (firearms: 17) | 17 (85.0) | 11 | 6 | |
| Others (chainsaws: 1, power washers: 1, needles: 1) | 3 (15.0) | 3 | | |
| Chemicals and chemical products (n=17, 1.3%) | | | | |
| Chemical products—general (drugs and alchohol: 14) | 14 (82.4) | 2 | 12 | |
| Others (petroleum fuels and products, other chemicals) | 3 (17.6) | | 3 | |
| Containers, furniture and fixtures (n=13, 1.0%) | | | | |
| Containers (bales: 8, tanks, bins and vats: 5) | 13 (100) | 6 | 7 | |
| Other sources (n=45, 3.3%) | | | | |
| Environmental and elemental conditions (fires: 35, lightning: 8, high winds: 2) | 45 (100) | 14 | 31 | |
| Non-classifiable (n=36, 2.7%) | 36 (100) | 20 | 16 | |

Most of the vehicles involved in the incidents were off-road powered industrial vehicles including tractors (n=429). Tractors were the most common injury source and caused 429 (31.9%) of the victims' injuries/fatalities. Almost 49% of the tractor caused injuries were fatal. Second most common source of off-road and industrial vehicles was ATVs, causing 190 (63% were fatal) injuries or deaths.

A secondary source was involved in or identifiable for 20% (264 of 1345) of all incidents (data not shown). Tractors were involved in the incidents as a secondary source in 92 injuries or fatalities. In the cases where tractors were secondary source of injury, most of the incidents involved other vehicles in public roadways (83 cases). Other secondary injury sources were passenger vehicles (n=56), multipurpose highway vehicles (n=34), agricultural machinery (n=27), animals (n=11), semitruck (n=5), trains (n=6) and others (n=33).

Event/exposure characteristics of the injuries were also examined (table 4). Some of the event/exposure categories (n=49) could not be assigned to the cases since there was not sufficient details in the news report (non-classifiable category). The event or exposure is defined as the manner in which the injury or illness was produced or inflicted by the primary source and, when applicable, the secondary source. About 60% of the victims were injured in transportation incidents.

### Injuries/fatalities to children/youth

Children/youth victims were involved in 235 of the analysed articles. The characteristics of these injuries are assessed by age category and displayed in table 5. The percentage of these fatalities, aged 0–6 years, was significantly higher than the other ages. In this young age group, 68% of children were fatally injured (53 of 77). For the majority of the incidents, the primary injury source was vehicles, which was especially high among victims aged 0–6, at nearly 65% (50 of 77). Among the vehicles, a total of 52 fatal and 26 non-fatal injuries were caused by ATVs and 18 fatal and 24 non-fatal injuries were tractor related.

In regard to event/exposure type, most of the injuries were transportation incidents, and children aged 0–6 years old were involved in 52 of these incidents (roadway: 25 and non-roadway: 27). Furthermore, 39% of children (91 of 235) in these incidents were involved as an extra rider.

**Table 4** Victims based on event/exposure type (n=1345), 2015 and 2016

| Event/exposure and subcategories | Number (%) |
|---|---|
| Transportation incidents (n=817, 60.7%) | |
| Roadway incidents involving motorised land vehicle | 460 (56.3) |
| Non-roadway incidents involving motorised land vehicles | 347 (42.5) |
| Animal and other non-motorised vehicle transportation incidents | 6 (0.7) |
| Aircraft incidents | 3 (0.4) |
| Water vehicle incidents | 1 (0.1) |
| Contact with objects and equipment (n=196, 14.6%) | |
| Caught in or compressed by equipment or objects | 100 (51.0) |
| Struck by object or equipment | 65 (33.2) |
| Struck, caught or crushed in collapsing structure, equipment or material | 30 (15.3) |
| Struck against object or equipment | 1 (0.5) |
| Violence and other injuries by persons or animals (n=126, 9.4%) | |
| Intentional injury by person | 37 (29.4) |
| Injury by person—unintentional or intent unknown | 15 (11.9) |
| Animal and insect related incidents | 74 (58.7) |
| Exposure to harmful substances or environments (n=91, 6.8%) | |
| Exposure to oxygen deficiency, n.e.c. | 44 (48.4) |
| Exposure to electricity | 24 (26.4) |
| Exposure to other harmful substances | 23 (25.3) |
| Fires and explosions (n=49, 3.6%) | |
| Fires | 28 (57.1) |
| Explosions | 21 (42.9) |
| Falls, slips and trips (n=17, 1.3%) | |
| Falls to lower level | 17 (100) |
| Non-classifiable (n=49, 3.6%) | 49 (100) |

## DISCUSSION

This study examined injuries and fatalities of 1044 incidents from AgInjuryNews.org between 2015 and 2016. The findings are consistent with previous literature, specifically in regards to leading causes of injury within the population, such as tractors and all-terrain vehicles.[27 29] Vehicles (which includes tractors) and machinery were the two leading sources of injuries and fatalities, and most of the events were transportation incidents including both roadway and non-roadway incidents. Our findings regarding a high fatality rate (53 fatalities among 77 cases) of young children (ages 0–6 years) may highlight the newsworthiness of these types of cases. This finding also reinforces an ongoing regulatory gap that allows children to be in the agricultural worksite, and the rooted cultural tradition that romanticises and praises youth involvement at a young age, even at the expense of lives lost.

During a time when all-inclusive and up-to-date federal, centralised systems are not available, news reports and other alternative sources of data can provide a surveillance-like view into the injuries occurring on AgFF operations across the USA. Moreover, the use of electronic systems, search algorithms and other informatics-based techniques can augment health and safety stakeholders' efforts to locate, store, analyse and redistribute injury data. The review of these data has led to a number of new questions and new lines of research. Each category within the incident variables warrants further investigation. For example, public roadways and the prevalence of agricultural injuries in this environment—why is the percentage of news report cases so high? The data may point to farm equipment lighting and signage issues, increased road time for farmers or distracted drivers; however, the spike may also be explained by an increase in crowdsourced reporting of these event types via smartphone cameras. Since roadway incidents often occur on public property, they may be reported to law enforcement or media by passersby, also known as citizen reporters.

An encouraging justification for a continued and enhanced national news reports collection effort is the past work of other regional efforts, including a news reports collection led by Dr William Field at Purdue University and another led by Dr Dennis Murphy at Penn State University. Both article collections have led to annual reports and publications, including the creation of and a subsequent analysis of the Farm and Agricultural Injury Classification code.[30] The work of AgInjuryNews.org, through the National Farm Medicine Centre and its

**Table 5** Characteristics of children/youth injuries/fatalities

| | Age categories (years) | | | | | |
|---|---|---|---|---|---|---|
| Variables | 0–6 (n=77) | 7–9 (n=48) | 10–12 (n=39) | 13–15 (n=39) | 16–17 (n=29) | Total |
| Severity* | | | | | | |
| Fatal | 53 | 25 | 18 | 26 | 15 | 137 |
| Non-fatal | 20 | 23 | 19 | 13 | 13 | 88 |
| Primary source* | | | | | | |
| Machinery | 7 | 5 | 5 | 2 | 5 | 24 |
| Persons, plants, animals and minerals | 6 | 6 | 2 | 1 | 1 | 16 |
| Structures and surfaces | 6 | 2 | 0 | 1 | 4 | 13 |
| Vehicles | 50 | 31 | 27 | 34 | 15 | 157 |
| Other sources | 6 | 6 | 2 | 2 | 2 | 18 |
| Event/exposure* | | | | | | |
| Violence and other injuries by persons or animals | 6 | 6 | 1 | 1 | 1 | 15 |
| Transportation incidents | 52 | 31 | 30 | 33 | 14 | 160 |
| Fires and explosions | 0 | 2 | 0 | 1 | 0 | 3 |
| Falls, slips and trips | 0 | 2 | 3 | 0 | 0 | 5 |
| Exposure to harmful substances and environments | 11 | 3 | 1 | 1 | 3 | 19 |
| Contact with objects and equipment | 6 | 4 | 2 | 3 | 8 | 23 |
| Extra rider* | | | | | | |
| Yes | 34 | 23 | 12 | 14 | 8 | 91 |
| No | 43 | 25 | 27 | 25 | 21 | 141 |

*Missing and unknown data not included.

collaborators, will build on and expand these regional efforts to track AgFF injuries and fatalities in the USA. The work is also supported and encouraged by the National Occupational Research Agenda AgFF goals and objectives, specifically addressing Intermediate Goals 1.1 and 1.2 by enhancing national surveillance data.[31]

It is anticipated that news reports as a data source will continue to grow in use and application. Further research is needed to unveil additional novel applications of this type of injury data. Cross-comparisons with other datasets could further explore the use of news reports as a supplemental surveillance tool. One such study is currently underway, comparing news reports to CFOI data from a nine-state region of the Midwest (personal communication, R Rautiainen, 26 April 2017). Other lines of research may include: assessing media reporting changes over time in comparison with other sectors such as transportation (eg, mention of prevention strategies such as helmet and seatbelt use); testing effects of messaging in news media reports on readers knowledge, attitudes and intended behaviours; exploring economic impact using news reports as a data trail about a particular farm, family or community that was affected by a traumatic injury or fatality; or assessing incidents for age-appropriate work and the significance of extra rider hazards for youth.

### Limitations and strengths

Limitations with news report data are evident through previous literature[24] and our own preliminary findings. Perhaps most notably, media reports do not always collect enough detail, do not cover all AgFF fatalities and cover even less stories relating to AgFF non-fatal injuries. There is also a bias in media reporting of fatal over non-fatal injuries. Additionally, it is possible that some non-fatal injuries later result in a fatality that is not reported via traditional media. These are somewhat rare and will not likely have a major bearing on overall findings. Furthermore, victims are not just those who work, live, visit or volunteer in AgFF. The victims in our database include those injured or killed in AgFF-related incidents such as a driver or passenger of a vehicle that struck or was struck by farm-related equipment on a public roadway. This inclusion further complicates the ability to calculate incidence/injury rates.

Even with these limitations, news media reports may increasingly be the best source of data available. This is especially true when AgInjuryNews.org serves as a content pipeline for readily available data on the depth of circumstantial details surrounding an incident including follow-up interviews, legal actions, community response, fate of the farm and health outcomes.

### Public health implications and conclusions

AgFF remains the most dangerous occupational sector in the USA, yet NIOSH discontinued the national agricultural worker injury surveillance programme in 2015.[5] Meanwhile, existing surveillance programme struggle in monitoring trends and capturing detailed data about individual events—data crucial to building effective prevention strategies. The ever-changing entrepreneurial endeavours within the sector continue to complicate formal monitoring programme, and agriculture-related injuries span beyond occupational, into more difficult to track subsegments: undocumented workers, unpaid child labourers, non-farm work on farm sites, agritourism visitors and volunteers. With the existing challenges facing national injury surveillance programme, news reports may fill a gap.

News reports have the potential to populate a national dataset, and low-cost data collection efforts like AgInjuryNews.org can then disseminate near real-time data, enabling more timely and targeted interventions. In this paper, we have provided evidence of applicability—that data from media reports provide value for researchers, policymakers and other stakeholders. Results from this study may yield implications for future cross-sector research, injury prevention interventions and other uses of accessible and up-to-date injury surveillance information from news reports.

### What is already known on the subject

- Agriculture, forestry, fishing and hunting continue to be the most dangerous industrial sector in the USA.
- Despite this, agriculture, forestry, fishing and hunting remain one of the least regulated industries for health and safety of youth and adults.

### What this study adds

- News reports can be an information source, fill an injury surveillance gap and provide near real time, humanised, data-rich stories for policymakers focused on the future of agriculture.
- Results may yield implications for future cross-sector research, injury prevention interventions and other uses of accessible and up-to-date injury surveillance.

**Correction notice** This article has been corrected since it was published Online First. In the "Analysis" section, we have corrected the following sentence: "The primary source of injury and, when applicable, the secondary sources of injuries were determined from the article text" ("text" has replaced "title").

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