Work-Related Non-Fatal Farm Injuries in Michigan:

Fourth Report

(January 2022 – December 2023)

MICHIGAN STATE
U N I V E R S I T Y

Department of Medicine

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Michigan State University

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EXECUTIVE SUMMARY

Michigan State University's Occupational and Environmental Medicine Division compiles data on work-related farm injuries in the state of Michigan. This is the fourth report on non-fatal occupational farm-related injuries in Michigan; it covers two years, 2022 and 2023. These are the key findings:

- Work-related farm injuries were identified through hospital medical records, the state's poison center, physician reporting, and ambulance companies
    - In 2022, there were 445 work-related farm injuries in 444 individuals, rate was 233.1/100,000.
    - In 2023, there were 447 work-related farm injuries in 445 individuals, rate was 234.2/100,000.
    - Over the two years combined, there were 892 work-related farm injury incidents in 881 individuals; three individuals each sustained two farm injuries in the same calendar year and nine individuals sustained two farm injuries in two separate calendar years, one of whom sustained two farm injuries in the same calendar year and another injury in a separate calendar year.
    - **From 2016-2021, the number and rate of work-related farm injuries decreased, 56% and 55% respectively. In 2022 and 2023 the number and rate increased 13% and 26% but are less than in 2019 and prior years.**
- Seventy-three percent of all farm-related injuries were among men; 94.0% were among White workers.
- The most common type of medical encounter was an emergency department visit (520; 84.8%).
- The most common part of the body injured was an upper limb (330; 39.7%), followed by a lower limb (220; 26.5%).
- The most common types of injury were fractures (189; 22.1%), sprains or strains (137; 16.0%) and contusions (114; 13.3%) which together accounted for 51.4% of all farm injuries.
- Injuries caused by cows were the predominant cause of work-related farm injuries and accounted for 20.8% (125) of all injuries. Dairy farms accounted for 24.8% (121) of all the injuries for which the farm type was recorded.
- Owners/operators accounted for 46.9% (159), hired workers for 26.5% (90), family for 25.7% (87), and migrant workers for 0.6% (2) of all individuals injured while working on a farm.
- Workers' compensation insurance was the expected payor for 351 (51.1%) of the injuries, followed by commercial insurance in 174 (25.3%) of the injuries.

BACKGROUND

Report purpose: This is the fourth report on non-fatal work-related farm injuries in Michigan. The report is based on data for the years 2022 and 2023.

Michigan State University's College of Human Medicine, Occupational and Environmental Medicine Division operates the farm-related injuries surveillance system as the bona fide agent for the State. The Michigan work-related farm injuries surveillance system uses data from Michigan hospitals, physicians, ambulance companies, the State's poison center and the Michigan Workers' Compensation system to identify cases of work-related farm injuries and their causes, and to target interventions to reduce these injuries and evaluate the effectiveness of interventions.

Background on agricultural injuries: The agriculture industry is one of the most hazardous industries. Farm operators and workers have a high rate of work-related fatalities. Farm-related injuries, like all occupational injuries, are potentially preventable. Health professionals and health facilities are required to report individuals with all injuries, including farm injuries, when requested by the Michigan Department of Health and Human Services (MDHHS). MDHHS regulations define traumatic injury as a "bodily damage resulting from exposure to physical agents such as mechanical energy, thermal energy, ionizing radiation, or resulting from the deprivation of basic environmental requirements such as oxygen or heat. Mechanical energy injuries include acceleration and deceleration injuries, blunt trauma, and penetrating wound injuries".[1]

The U.S. Department of Agriculture (USDA) conducts a Census of Agriculture every five years. The most recent census from 2022 reported 45,581 farms in Michigan with 82,548 producers, 68,950 hired farm labor including migrant and seasonal laborers, and 39,369 unpaid workers.[2] The term producer designates a person who is involved in making decisions for the farm operation; the producer may be the owner, a member of the owner's household, a hired manager, a tenant, a renter, or a sharecropper. Hired farm labor includes all hired farm workers, including paid family members, bookkeepers, office workers, maintenance workers, etc., if their work was primarily associated with agricultural production. Hired farm workers excludes contract laborers. The Census

divides hired farm workers into two categories based on the duration of work in a calendar year: working 150 days or more (28,940 workers) or less than 150 days (40,010 workers). Unpaid workers include agricultural workers not on the payroll who perform activities or work on a farm or ranch (e.g., family members). The number of migrant workers was not noted on the 2022 Agricultural Census, only that there were 1,208 farms that reported utilizing migrant labor.

DATA SOURCES AND METHODS

All 134 of Michigan's acute care hospitals, including Veterans' Administration Hospitals, were required to report work-related farm injuries. Discharge summaries and Emergency Department (ED) notes were reviewed to differentiate the work and non-work-related farm injuries treated at a hospital/emergency department or as an outpatient visit at a hospital-based clinic. Cases reported either received medical treatment at a Michigan hospital/ED/hospital outpatient clinic for:

(a) A farm injury-related ICD-10-CM diagnosis code[3] (Table 1), and
(b) The incident was recorded as having occurred while working on a farm. Injuries related to activity around the home even though the home was typically on the farm were not included.

OR

(a) A report from the Poison Center (PC) when a call was made regarding a consultation for a work-related farm exposure.

OR

(a) A report from the ambulance company (EMS) database when an ambulance responded to an illness or injury where the location was indicated as a farm, and
(b) The incident was recorded as having occurred while working on a farm. Injuries related to activity around the home even though the home was typically on the farm were not included.

OR

(a) An amputation, burn, crushing injury or skull fracture, and
(b) The incident was recorded as having occurred while working on a farm. Injuries related to activity around the home even though the home was typically on the farm were not included.

Table 1. Farm Injury ICD-10 Diagnosis Codes

ICD-10 Code	Description
T60 (excluding T60.0X2, T60.1X2, T60.2X2, T60.3X2, T60.4X2, T60.8X2, T60.92), Z57.4	Pesticides excluding intentional self-harm, Agricultural Chemical Poisoning
V80, V84	Animal-Drawn Vehicle Accidents
Y92.7	Place of Occurrence - Farm
W55.2-.4	Other Injury Caused by Animal
W30	Accidents Caused by Agricultural Machinery

Information from the hospital/ED medical reports, PC reports, and EMS reports on each case were abstracted, including: type of medical care (hospital overnight, ED, outpatient, PC call), hospital name, date of admission and discharge, patient demographics, city and county of residence, source of payment, occupation type (owner/operator/producer; family member, hired hand (except migrant worker), migrant worker, other (e.g., a friend, neighbor), farm information (type, name, address), part of body injured, cause of injury, nature of injury. Once these farm injury data were entered into a Microsoft Access database, records were manually linked to records in the Workers' Compensation database. The Michigan Workers' Disability Compensation Agency (WDCA) provided access to a database of workers who received claims for wage replacement due to lost work time. Individuals are eligible for wage replacement when they have had at least seven consecutive days away from work. Matches were identified using each individual's first and last name, date of birth and date of injury/date of hospital admission. Information from Workers' Compensation matched the database on 21 cases and added 279 cases to the database for 2022 and 2023.

Farm operators and workers in the surveillance system, who qualified for services from program called "Michigan AgrAbility" based on the severity of injury, received a letter and a brochure informing them about the Michigan AgrAbility program.[4] Michigan AgrAbility is a program of Michigan State University Extension and Easterseals of Michigan, a private charity, which designs specific adaptive tools and provides on-farm services to farmers with injury, illness or disability so they can continue to work.

Data analysis was performed using queries conducted in Microsoft Access. Farm injury Agriculture Industry rates were calculated using the U.S. Department of Agriculture's 2022 Census of Agriculture for Michigan.[2] The denominator used was 190,867: the total of 82,548 producers, 68,950 hired farm labor, and 39,369 unpaid workers.[*] A small number of individuals sustained more than one injury in the two-year period; unless specified otherwise, data were analyzed by counts of injuries, not counts of individuals.

There are a number of issues associated with summing up the counts of hired labor, unpaid workers, and migrant/seasonal laborers in the denominator. According to the U.S. Department of Agriculture 2022 Census of Agriculture for Michigan, 1,063 farms indicated that they utilized migrant workers as part of their hired workers and 145 farms reported that they did not have hired farm workers, but they did have migrant contract workers on their operation. This indicates that these estimates may contain a classification error and/or classification overlaps, in which a farm worker may be counted more than once in different categories.

For the purpose of this report, migrant workers with farm-related injuries/illnesses are a separate category of hired hand workers and were counted separately. Category "workers" includes owner/operators, hired hand, migrant workers and family members.

For comparison, the numbers and incidence rates of non-fatal occupational injuries and illnesses by industry and case types were available from the Bureau of Labor Statistics (BLS) Survey of Occupational and Injuries and Illnesses (SOII).[5] SOII provides estimates and incidence rates for non-fatal cases of work-related injuries and illnesses from participating States, including Michigan, which are recorded by employers under the Occupational Safety and Health Administration's (OSHA's) recordkeeping guidelines. BLS provided numbers and rates for the Agriculture, Forestry, Fishing and Hunting Industry (NAICS code[6] 11), and two subindustries: Crop Production (NAICS code 111) and Animal Production and Aquaculture (NAICS code 112). The number of injuries in the Agriculture Industry, excluding Forestry, Fishing and Farming is a sum of the total number

[*]The USDA uses the following definitions: "Producer" is a person making decisions for the farm operation- the owner, a member of the owner's household, hired manager, tenant, renter, or sharecropper. "Hired farm labor" includes all hired farm workers, including paid family members, bookkeepers, office workers, etc., and excluding contract laborers. "Unpaid workers" include those not on the payroll who perform activities or work on the farm (family members).

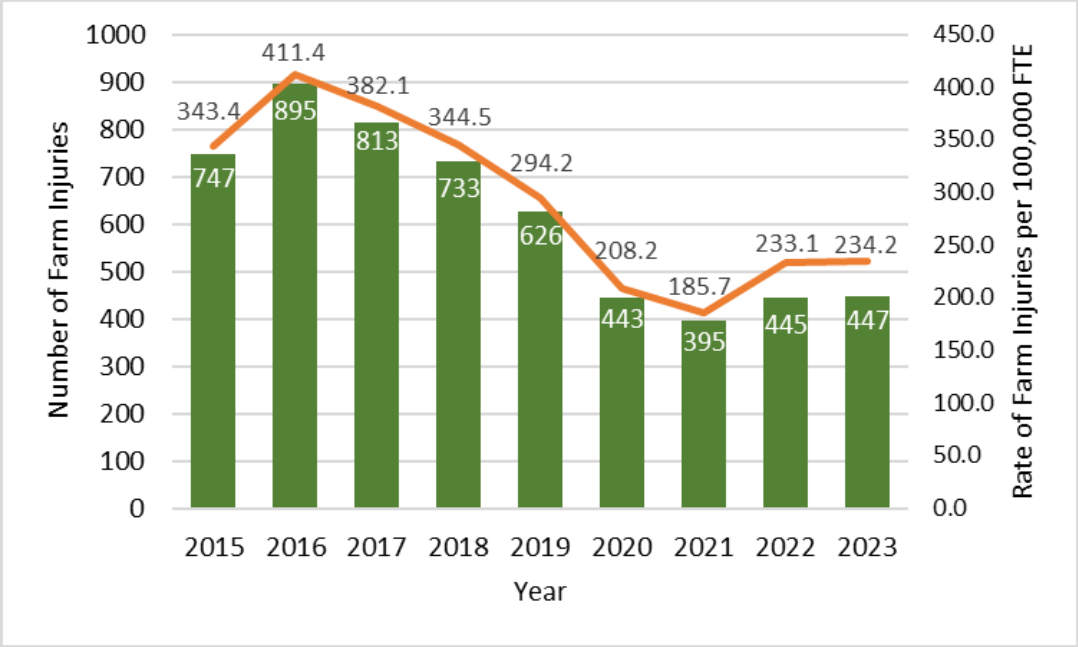
of injuries in the Crop Production and the Animal Production and Aquaculture. The incidence rate in the Agriculture Industry, excluding Forestry, Fishing and Farming represents the number of injuries per 100 full-time workers and were calculated as: (N/EH) x 200,000, where: N = number of injuries in the Crop Production and the Animal Production and Aquaculture; EH = total hours worked by all employees during the calendar year in the Crop Production and Animal Production and Aquaculture; 200,000 = base for 100 equivalent full-time workers (working 40 hours per week, 50 weeks per year).

The BLS Occupational Injuries, Illnesses and Fatal Injuries Profiles online tool was used to generate the 2021-2022 BLS biennial estimates of the number of non-fatal occupational injuries and illnesses involving days away from work by selected worker and case characteristics and occupation for both private and public ownerships.[7] Code GP2AFH (Agricultural Workers) was used to generate the estimates. BLS estimates for 2023-2024 were not available at the time of completion of this report.

RESULTS

In 2022, there were 445 work-related farm injuries in 444 individuals; one individual had two farm injuries. The rate was 233.1/100,000. In 2023, there were 447 work-related farm injuries in 445 individuals; two individuals each had two farm injuries. The rate was 234.2/100,000 workers (Figure 1).

Figure 1. Number and rate of work-related farm injuries, Michigan 2015-2023



2022-2023 Combined: There were 892 work-related farm injuries in 881 individuals because three individuals sustained two farm injuries in the same calendar year, and nine individuals sustained two farm injuries in two separate calendar years, one of whom sustained two farm injuries in the same calendar year and another injury in a separate calendar year (Table 2).

Table 2. Work-Related Farm Injuries by the Number of Individuals, Injuries and Injury Rates, Michigan 2022-2023

Year	Number of Individuals	Number of Injuries	Injury Rate[1]
2022	444	445	233.1
2023	445	447	234.2
2022-2023	881[2]	892	233.7

[1]Farm injury rates were calculated using the U.S. Department of Agriculture's 2022 Census of Agriculture for Michigan. Injury rates are the number of workers sustaining a farm injury per 100,000 workers.

[2]Total number of injured individuals in the two-year-period is 881; eleven individuals sustained two separate injuries during the two-year-period and one individual sustained three separate injuries during the two-year-period.

Type of Medical Encounter

An emergency department visit was the most common type of medical encounter: 520 (84.8%) injuries (Table 3). Ten percent of individuals were hospitalized due to the farm injury they sustained, and 0.5% were seen at a hospital-based clinic. The remaining 4.6% of work-related farm injuries received another type of medical care such as PC consultation or EMS services. Type of medical encounter was not reported for the 279 cases identified only in the WDCA data set.

Table 3. Work-Related Farm Injuries by the Type of Medical Encounter, Michigan 2022-2023[1]

Medical Encounter Type	Number	Percent
Emergency Department	520	84.8
In-patient Hospitalization	62	10.1
Hospital Outpatient	3	0.5
Other[2]	28	4.6
Total	613	100.0

[1]Type of medical encounter was not reported for the 279 cases identified only in the WDCA data set.

[2]Other includes PC consultations and other unspecified medical care visits.

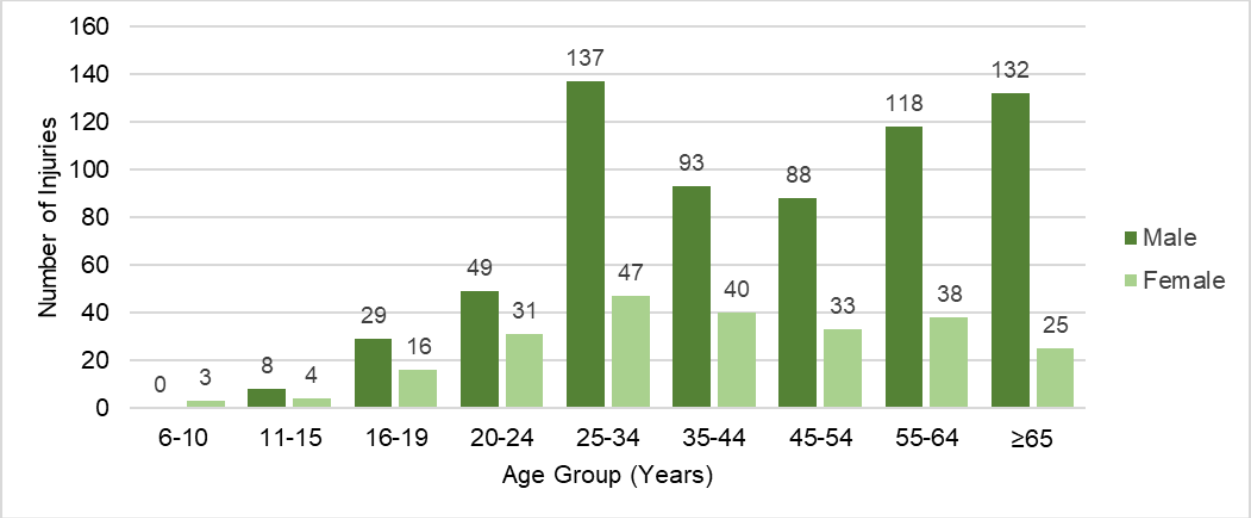
Characteristics of Injured Farm Operators, Working Family Members, Hired Hands and Migrant Workers

Age and Sex

The age of injured farm operators and workers varied from 9 to 91 years; age was not provided for one worker. The average age was 45 and the median age was 44. Six hundred and fifty-four (73.3%) of all work-related farm injuries were among men. Figure 2 displays farm injuries by age group and sex. Among males, the most injuries were in the 25-34 and 65+ age groups, 137 and 132 injuries, respectively. For females, the age groups with the highest number of farm injuries were 25-34 and 35-44 with 47 and 40 injuries, respectively.

There were three children 10 years and under injured while performing chores on a farm. The injuries of the three children were: sustaining a puncture wound to their leg after running through bushes while chasing cows; a calf stepping on their foot causing a bone fracture; a laceration to their leg from a piece of metal in the hay barn.

Figure 2. Work-Related Farm Injuries by Age Groups and Sex, Michigan 2022-2023

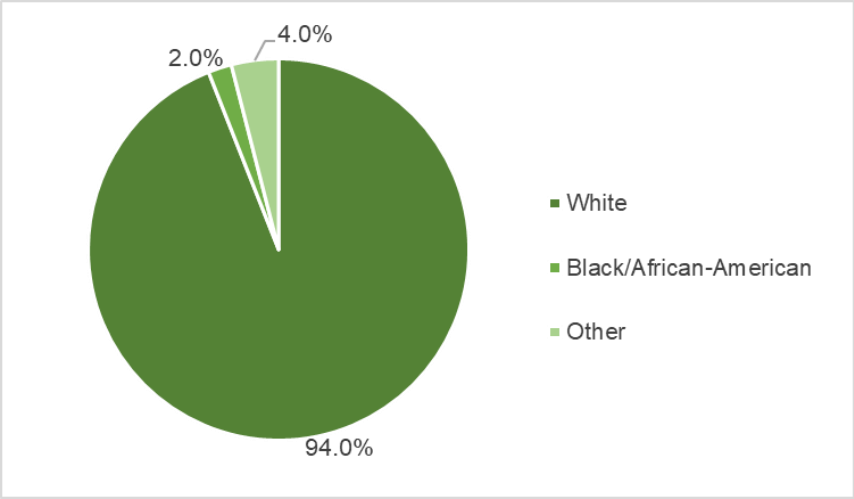


Race and Ethnicity

The race of farm operators and workers with work-related farm injuries was available for 200 (32.6%) of the individuals reported; 188 (94.0%) were White, four (2.0%) were

Black/African American, and 8 (4.0%) were of another unspecified race (Figure 3). Information on race was not reported for the 279 cases identified only in the WDCA data set.

Figure 3. Race Distribution of Work-Related Farm Injuries, Michigan 2022-2023[1]



[1]Information on race was available for 200 of the 613 (32.6%) individuals in the state reporting database. Information on race was not reported for the 279 cases identified only in the WDCA data set.

Information on ethnicity was provided for 159 (25.9%) of the individuals reported. Information on ethnicity was not reported for the 279 cases identified only in the WDCA data set. Of the 159 individuals, 32 individuals (20.1%) were of Hispanic origin. Hispanic workers were more likely to be a hired hand (85.7%) than non-Hispanic workers who were more likely to be owner/operators (70.4%) (Table 4). Most farm injuries in Hispanic workers occurred on dairy and fruit farms with 10 (34.5%) cases each. Most farm injuries in non-Hispanic workers occurred on livestock and grain farms with 17 (30.4%) and 12 (21.4%) cases, respectively. Injured Hispanic workers were more likely to have worked on dairy, fruit and vegetable farms (75.9%) than non-Hispanic workers (21.5%) and were less likely to have worked on livestock and grain farms (6.9%) than non-Hispanic workers (51.8%).

Table 4. Hispanic and Non-Hispanic Workers by Occupation Type and Farm Type, Michigan 2022-2023

Occupation Type[1]	Hispanic Workers		Non-Hispanic Workers	
	Number	Percent	Number	Percent
Hired hand	18	85.7	15	18.5
Migrant worker	2	9.5	0	—
Owner/operator	1	4.8	57	70.4
Family member	0	—	9	11.1
Total	21	100.0	81	100.0
Farm Type[2]	**Hispanic Workers**		**Non-Hispanic Workers**	
	Number	Percent	Number	Percent
Dairy	10	34.5	9	16.1
Fruit	10	34.5	3	5.4
Livestock	2	6.9	17	30.4
Poultry	2	6.9	2	3.6
Vegetable	2	6.9	0	—
Grain	0	—	12	21.4
Other	3	10.3	13	23.1
Total	29	100.0	56	100.0

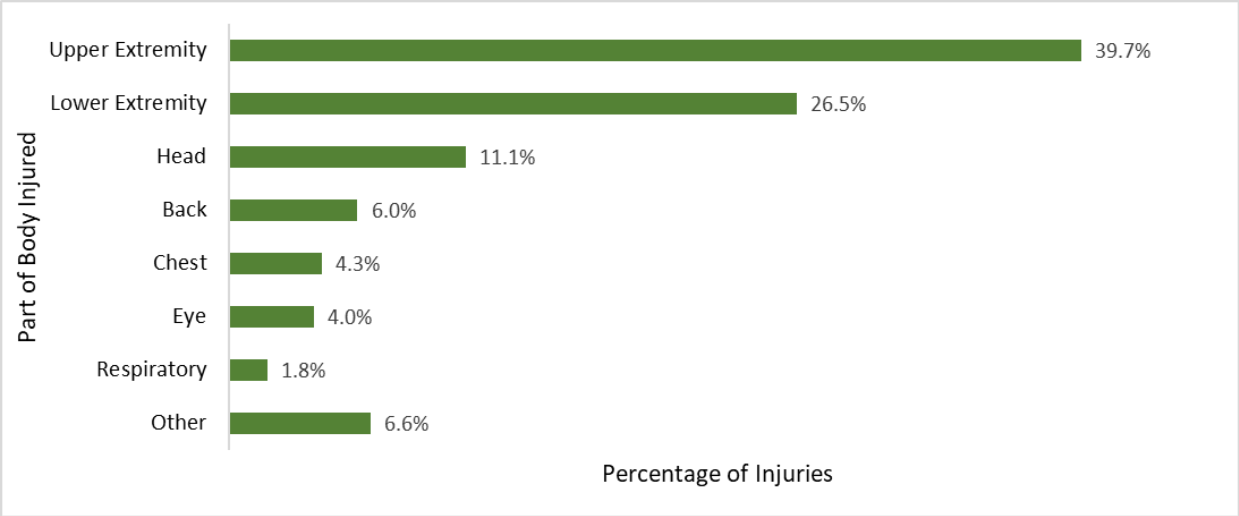
[1]Information on occupation type was available for 102 (64.1%) individuals for whom ethnicity was also known.

[2]Information on farm type was available for 79 (49.7%) individuals for whom ethnicity was also known.

Part of Body Injured

Figure 4 shows the distribution of the part of body injured by the primary ICD-10 code and/or primary description in the discharge summary identified in the medical records. Farm injuries of upper limbs occurred most often (39.7%), followed by injuries of lower limbs (26.5%).

Figure 4. Work-Related Farm Injuries by Part of Body Injured, Michigan 2022-2023[1]



[1]Information on part of body injured was available for 831 (93.2%) of injuries. Percentages are based on the primary diagnosis of the injury.

Injury Source

For 600 (97.9%) of the injuries, the source of the injury was provided in the medical records (Table 5). Information on injury source was not reported for the 279 cases identified only in the WDCA data set. Injuries caused by cattle were the most common (125, 20.8%). The next most common injury sources were from tractors and falls at ground level, with 77 (12.8%) and 60 (10.0%) injuries, respectively (Table 5). Category "Other" contained different types of injury sources that did not fall into the nine specific categories. Examples of injuries categorized under "Other" category include being poked in the eye by chicken wire, having a hand impaled by the latch on a gate, being burned by a hot radiator, being struck by a falling hay bale, and being struck by a falling tree.

Table 5. Work-Related Farm Injuries by Injury Source, Michigan 2022-2023[1]

Injury Source	Number	Percent
Cattle	125	20.8
Tractor	77	12.8
Fall at Ground Level	60	10.0
Non-Tractor Machine	55	9.2
Chemical	49	8.2
Fall from Height	37	6.2
Tool	34	5.7
Livestock	31	5.2
Horse	23	3.8
Other	109	18.1
Total	600	100.0

[1]Information on injury source was available for 600 (97.9%) injuries in the state reporting database. Information on injury source was not reported for the 279 cases identified only in the WDCA data set.

Nature of Injury

The most common type of injury was a fracture, in 22.1% of cases (189), followed by a sprain, strain or tear, in 16.0% of cases (137) (Table 6). These two natures of injury accounted for over a third (38.1%) of all types of injuries identified. Information on the nature of injury was available for 857 (96.1%) injuries. Category “Other” contained different types of injuries that did not fall into the thirteen specific categories. Examples of injuries categorized under “Other” category include degloving injuries, eye injuries, and inhalation injuries.

Table 6. Work-Related Farm Injuries by Nature of Injury, Michigan 2022-2023[1]

Nature of Injury	Number	Percent
Fracture	189	22.1
Sprain/Strain/Tear	137	16.0
Contusion[2]	114	13.3
Laceration/Puncture	92	10.7
Crushing Injury	54	6.3
Burn	48	5.6
Skull Fracture	36	4.2
Head Injury (no fractures)	26	3.0
Amputation	17	2.0
Abrasion	12	1.4
Concussion	8	0.9
Dislocation	7	0.8
Animal Bite	5	0.6
Other	112	13.1
Total	857	100.0

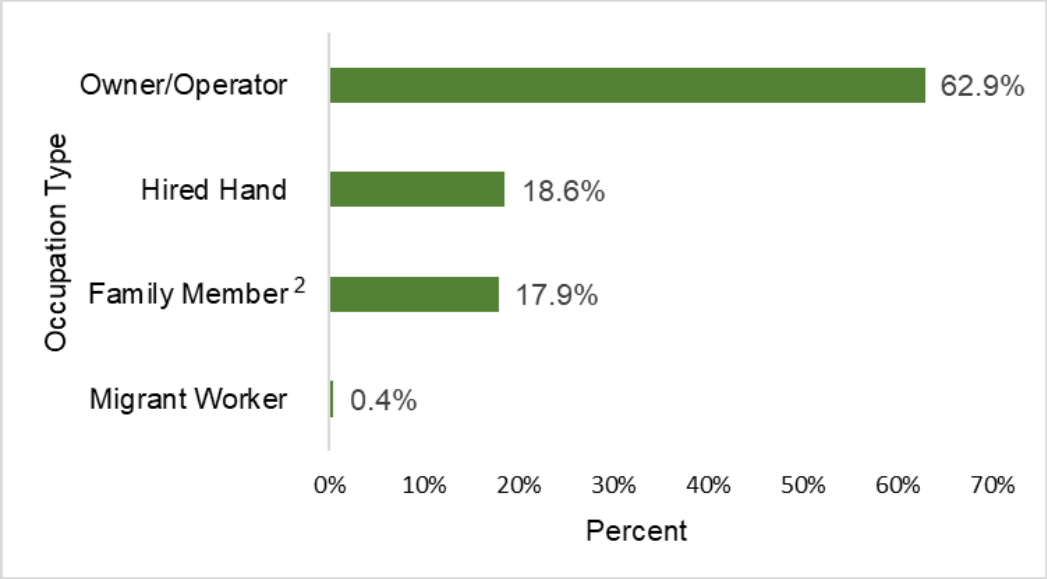
[1]Information on nature of injury was available for 857 (96.1%) injuries. Numbers were based on the primary diagnosis.

[2]Contusion injuries were indistinguishable from crushing injuries on 15 injuries due to coding in the WDCA data set.

Occupation Type

The occupation was specified in 55.3% (339) of the 613 medical records. Information on occupation type was not reported for the 279 cases identified only in the WDCA data set. Owner/operators accounted for nearly half (46.9%) of all the 339 individuals injured, followed by hired farm labor (26.5%), family members, including two non-paid friends (25.7%), migrant workers (0.6%), and one (0.2%) “other” type of worker was a student working on a farm (Figure 5).

Figure 5. Work-Related Farm Injuries by Occupation Type, Michigan 2022-2023[1]



[1]Occupation type was specified for 339 (55.3%) individuals. One student worker was considered another type of worker than the four categories above. Information on occupation type was not reported for the 279 cases identified only in the WDCA data set.

[2]Includes two non-paid friends.

County of Residence and County of Farm

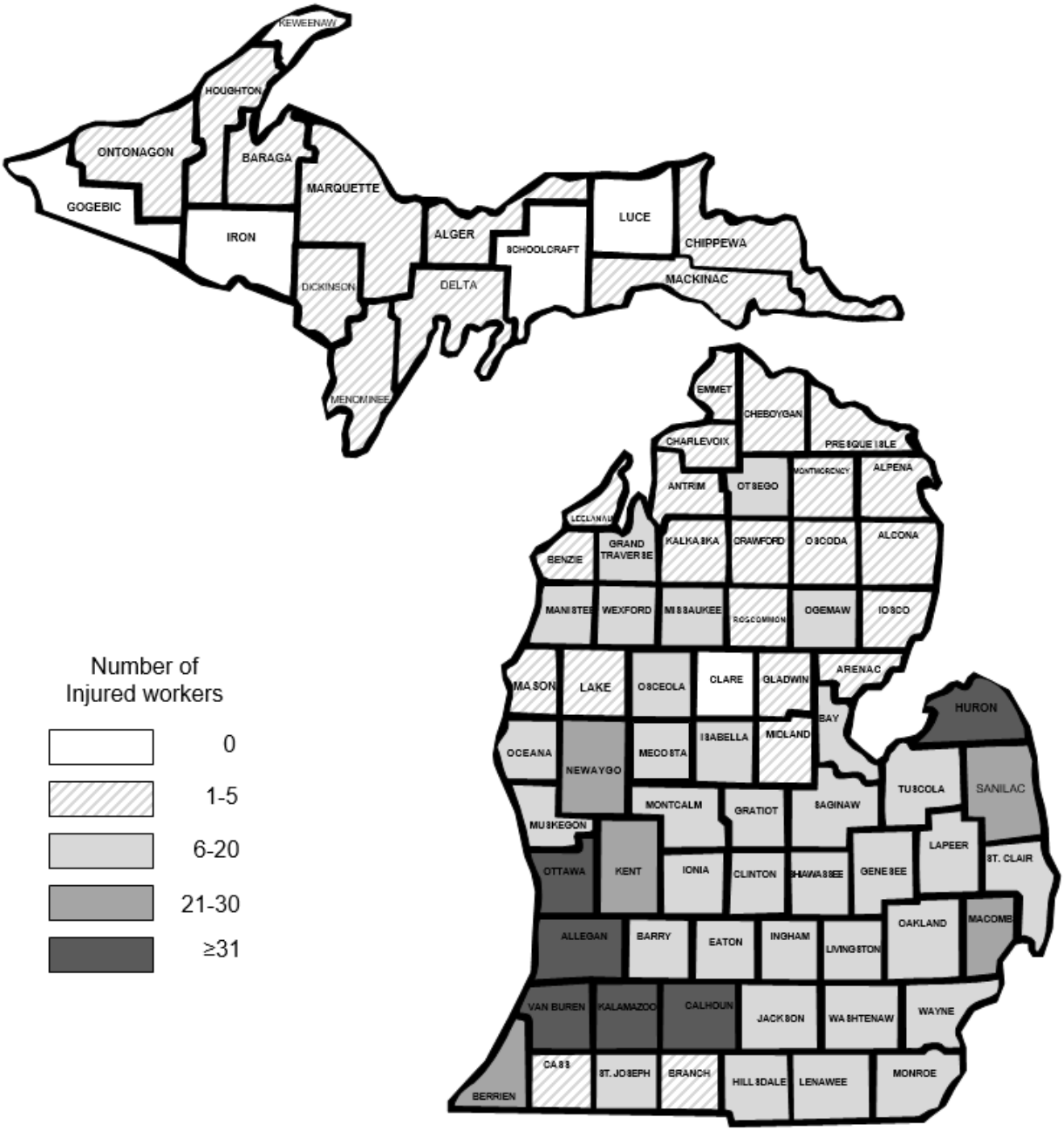
The Michigan county of residence was known for 839 (94.1%) of the injured workers; another 14 were out-of-state workers, and for 39 residents of Michigan the county was unknown. It should be noted that the county of residence would not necessarily be the same county where the individual was injured and where the farm was located. Huron County had the highest number of residents with a work-related farming injury with 48 (5.4%) cases, followed by Calhoun County with 46 (5.2%) cases, and then Van Buren County with 44 (4.9%) cases (Table 7 and Figure 6).

Information on the county where the farm was located and where the injury occurred was specified for 624 (70.0%) injuries (Table 8 and Figure 7). Huron County had the highest number of farm work-related injuries with 44 (4.9%) cases, followed by Calhoun County with 39 (4.4%) cases, and then Ottawa County with 36 (4.0%) cases.

Table 7. Number and Percent of Individuals with Work-Related Farm Injuries by County of Residence, Michigan 2022-2023

Michigan County	2022-2023		Michigan County	2022-2023	
	Number	Percent		Number	Percent
Alcona	1	0.1	Leelanau	4	0.4
Alger	1	0.1	Lenawee	7	0.8
Allegan	32	3.6	Livingston	7	0.8
Alpena	1	0.1	Luce	0	−
Antrim	5	0.6	Mackinac	4	0.4
Arenac	1	0.1	Macomb	28	3.1
Baraga	4	0.4	Manistee	6	0.7
Barry	10	1.1	Marquette	4	0.4
Bay	7	0.8	Mason	2	0.2
Benzie	2	0.2	Mecosta	7	0.8
Berrien	23	2.6	Menominee	3	0.3
Branch	5	0.6	Midland	1	0.1
Calhoun	46	5.2	Missaukee	12	1.3
Cass	5	0.6	Monroe	7	0.8
Charlevoix	2	0.2	Montcalm	18	2.0
Cheboygan	2	0.2	Montmorency	1	0.1
Chippewa	5	0.6	Muskegon	14	1.6
Clare	0	−	Newaygo	21	2.4
Clinton	7	0.8	Oakland	16	1.8
Crawford	1	0.1	Oceana	19	2.1
Delta	1	0.1	Ogemaw	6	0.7
Dickinson	1	0.1	Ontonagon	1	0.1
Eaton	14	1.6	Osceola	16	1.8
Emmet	1	0.1	Oscoda	2	0.2
Genesee	14	1.6	Otsego	7	0.8
Gladwin	2	0.2	Ottawa	39	4.4
Gogebic	0	−	Presque Isle	1	0.1
Grand Traverse	13	1.5	Roscommon	1	0.1
Gratiot	15	1.7	Saginaw	6	0.7
Hillsdale	7	0.8	Saint Clair	6	0.7
Houghton	1	0.1	Saint Joseph	18	2.0
Huron	48	5.4	Sanilac	28	3.1
Ingham	17	1.9	Schoolcraft	0	0.1
Ionia	13	1.5	Shiawassee	16	1.8
Iosco	5	0.6	Tuscola	16	1.8
Iron	0	−	Van Buren	44	4.9
Isabella	10	1.1	Washtenaw	8	0.9
Jackson	17	1.9	Wayne	8	0.9
Kalamazoo	42	4.7	Wexford	8	0.9
Kalkaska	3	0.3	Out of State	14	1.6
Kent	28	3.1	Unknown	39	4.4
Keweenaw	0	−	**Total**	892	100.0
Lake	1	0.1			
Lapeer	14	1.6			

Figure 6. Geographic Distribution of Individuals with Work-Related Farm Injuries by County of Residence, Michigan 2022-2023[1]

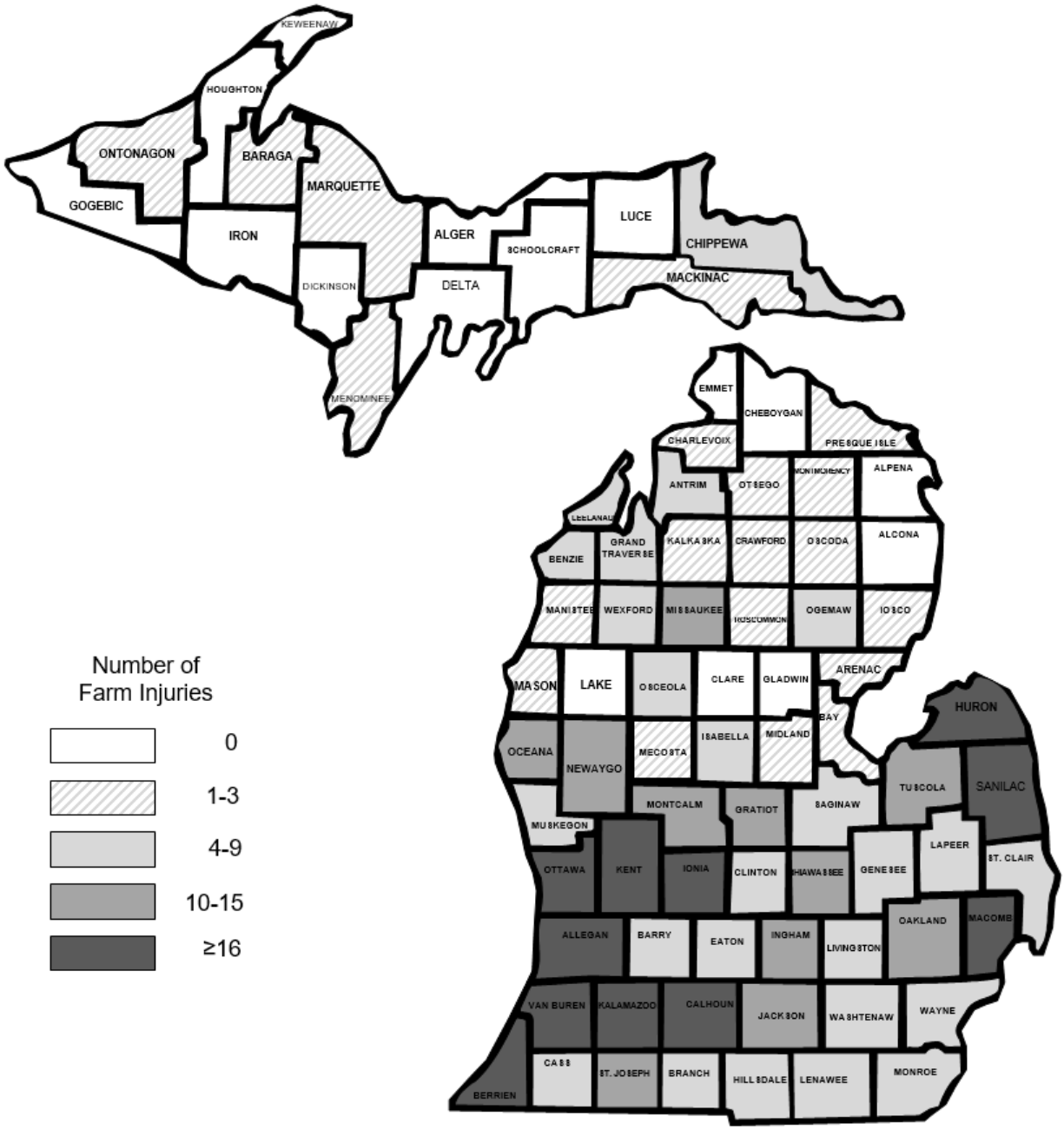


[1]Total number of Michigan Residents was 878, of which county of residence was unknown for 39 individuals. An additional 14 were out of state workers.

Table 8. Number and Percent of Individuals with Work-Related Farm Injuries by County of Farm, Michigan 2022-2023

Michigan County	2022-2023		Michigan County	2022-2023	
	Number	Percent		Number	Percent
Alcona	0	−	Leelanau	7	0.8
Alger	0	−	Lenawee	4	0.4
Allegan	22	2.5	Livingston	6	0.7
Alpena	0	−	Luce	0	−
Antrim	9	1.0	Mackinac	1	0.1
Arenac	2	0.2	Macomb	17	1.9
Baraga	1	0.1	Manistee	3	0.3
Barry	7	0.8	Marquette	2	0.2
Bay	3	0.3	Mason	2	0.2
Benzie	4	0.4	Mecosta	3	0.3
Berrien	20	2.2	Menominee	3	0.3
Branch	4	0.4	Midland	1	0.1
Calhoun	39	4.4	Missaukee	12	1.3
Cass	4	0.4	Monroe	8	0.9
Charlevoix	1	0.1	Montcalm	14	1.6
Cheboygan	0	−	Montmorency	1	0.1
Chippewa	5	0.6	Muskegon	9	1.0
Clare	0	−	Newaygo	13	1.5
Clinton	5	0.6	Oakland	15	1.7
Crawford	1	0.1	Oceana	13	1.5
Delta	0	−	Ogemaw	4	0.4
Dickinson	0	−	Ontonagon	1	0.1
Eaton	8	0.9	Osceola	5	0.6
Emmet	0	−	Oscoda	2	0.2
Genesee	5	0.6	Otsego	1	0.1
Gladwin	0	−	Ottawa	36	4.0
Gogebic	0	−	Presque Isle	1	0.1
Grand Traverse	7	0.8	Roscommon	1	0.1
Gratiot	12	1.3	Saginaw	7	0.8
Hillsdale	4	0.4	Saint Clair	4	0.4
Houghton	0	−	Saint Joseph	13	1.5
Huron	44	4.9	Sanilac	20	2.2
Ingham	10	1.1	Schoolcraft	0	−
Ionia	19	2.1	Shiawassee	12	1.3
Iosco	3	0.3	Tuscola	11	1.2
Iron	0	−	Van Buren	30	3.4
Isabella	5	0.6	Washtenaw	6	0.7
Jackson	14	1.6	Wayne	6	0.7
Kalamazoo	26	2.9	Wexford	5	0.6
Kalkaska	2	0.2	Unknown	268	27.8
Kent	32	3.6			
Keweenaw	0	−	**Total**	892	100.0
Lake	0	−			
Lapeer	7	0.8			

Figure 7. Geographic Distribution of Work-Related Farm Injuries by County of Farm Location, Michigan 2022-2023[1]



[1]Total number of Michigan injuries was 892, of which county of farm location was unknown for 268 cases.

Farm Type

Information on farm type was available in the medical records for 488 (54.7%) injuries. Dairy farms accounted for almost a quarter (24.8%) of all injuries, followed by livestock farms with 20.3% of injuries (Table 9).

Table 9. Work-Related Farm Injuries by Farm Type, Michigan 2022-2023[1]

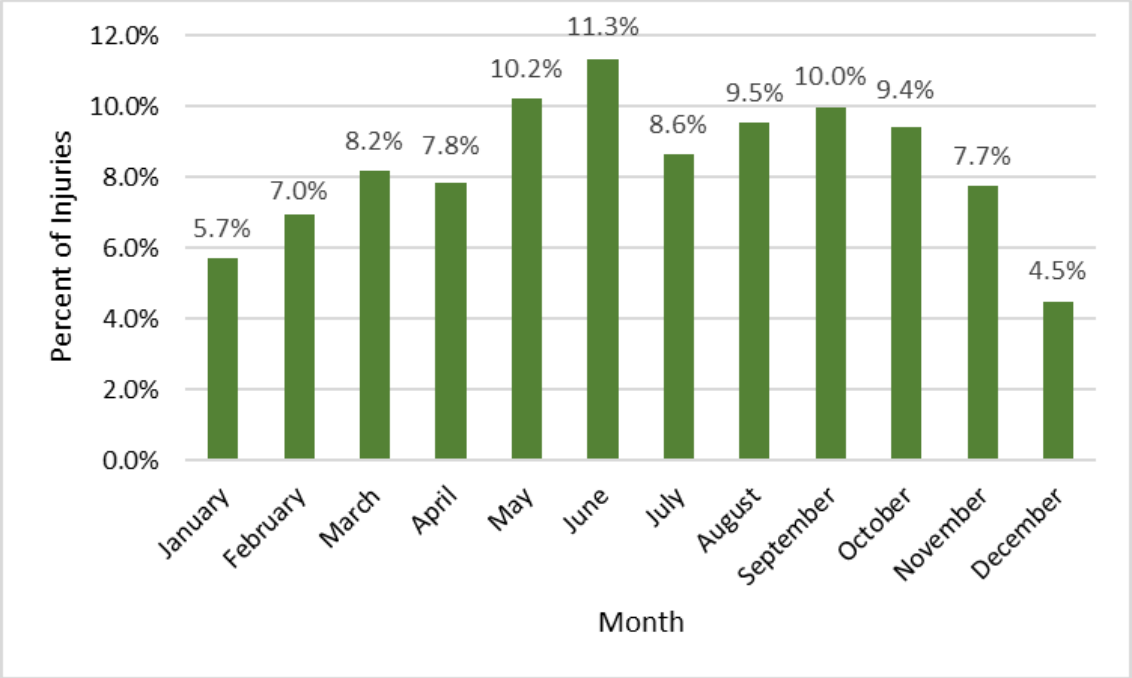
Farm Type	Number	Percent
Dairy	121	24.8
Livestock	99	20.3
Fruit	57	11.7
Grain	32	6.6
Vegetable	24	4.9
Poultry	23	4.7
Other	132	27.0
Total	488	100.0

[1]Information on farm type was available for 488 (54.7%) cases.

Month of Injury and Farm Type by Seasonality

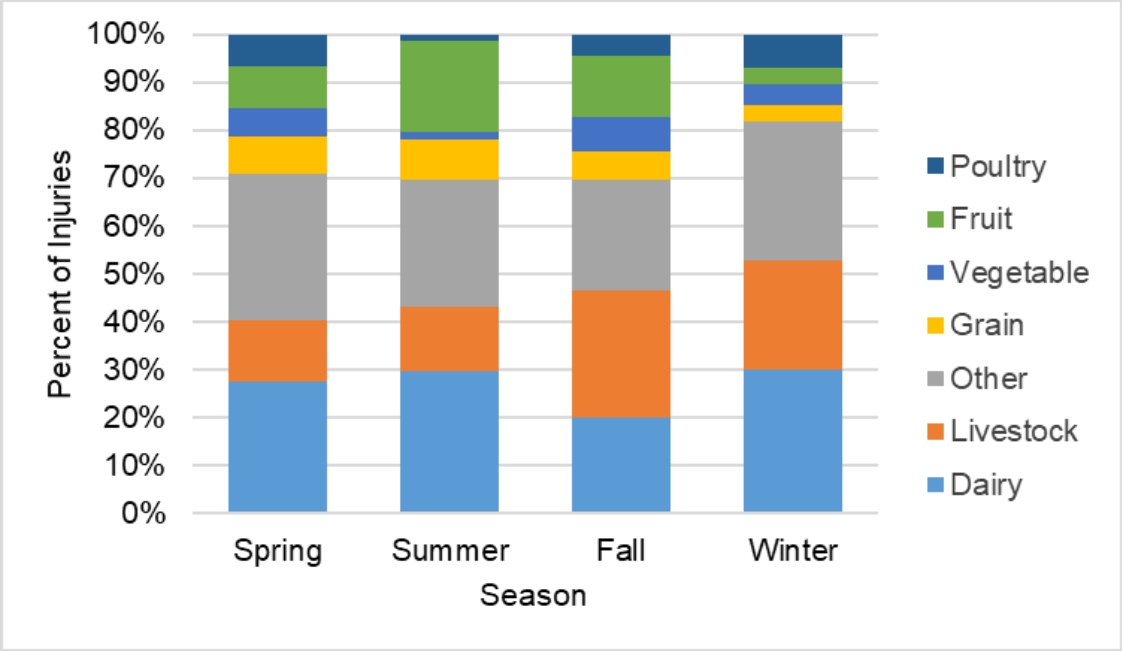
The date of the injury was available for all cases. More injuries occurred in the summer, late spring and early fall months (29.4%); June, May, and September were the months with the highest number of injuries (Figure 8).

Figure 8. Work-Related Farm Injuries by Month of Medical Encounter, Michigan 2022-2023



Across all the types of farms, work-related farm injuries occurred most often at dairy farms in the winter, summer, and spring months and accounted for 29.9%, 29.5%, and 27.4% of injuries, respectively (Figure 9). Injuries at livestock farms were the most common in the fall months (26.5%) and second to injuries on dairy farms during winter and spring months, with 23.0% and 12.8% respectively. Injuries on fruit farms were second to injuries on dairy farms in the summer, with 18.9% of injuries. The highest percentage of injuries on grain farms occurred in the summer (8.3%), on poultry farms in the winter (6.9%), and on vegetable farms in the fall (7.3%) (Figure 9).

Figure 9. Work-Related Farm Injuries by Farm Type and Seasonality, Michigan 2022-2023



Source of Payment

Information on source of payment for medical care was available for 687 (77.0%) injuries. Workers' Compensation insurance was the expected payor for 351 (51.1%) of the injuries, followed by Commercial Insurance for 174 (25.3%) of the injuries, Medicare or Medicaid for 144 (21.0%) of the injuries, self-pay for 12 (1.7%) of the injuries and other source of payment for 6 (0.9%) of the injuries (Table 10). For 205 farm injuries, payment source could not be identified.

Table 10. Work-Related Farm Injuries by Expected Source of Payment, Michigan 2022-2023[1]

Expected Source of Payment	Number	Percent
Workers' Compensation	351	51.1
Commercial	174	25.3
Medicare/Medicaid	144	21.0
Self-Pay	12	1.7
Other	6	0.9
Total	632	100.0

[1]Payment source was unknown for 205 (23.0%) injuries.

DISCUSSION

This is the fourth report on non-fatal work-related farm injuries in Michigan. It covers two years, 2022 and 2023. Michigan surveillance identified 892 work-related farm injuries in 881 individuals for the two years combined. The number and rate of injuries per 100 workers in 2022 was 445 and 0.23 and in 2023 was 447 and 0.23. The number of farm-related injuries in 2022 and 2023 were more than the two previous years; 395 in 2021 and 443 in 2020 but were less than the years prior; 626 in 2019, 733 in 2018, 813 in 2017, 895 in 2016, and 747 in 2015. In 2022 and 2023 ambulance companies began reporting farm-related injuries, which may explain the slight increase in number of injuries. There has otherwise not been a change in the surveillance system and ideally the overall downward trend since 2016 reflects an actual decrease in farm-related injuries.

There were an additional 34 agricultural fatalities (13 in 2022 and 21 in 2023) identified by the Michigan Fatality Assessment and Control Evaluation (MIFACE) Program and WDCA data set that are not included in this report.[8] This is in comparison to 19 in 2021, 26 in 2020, 32 in 2019, 23 in 2018, 19 in 2017, and 19 in 2016.

By comparison, the employer-based system from BLS estimated 1,200 farm injuries for Michigan with 600 injuries and a rate of 2.5 per 100 full-time equivalents in 2022, and 600 injuries and a rate of 2.8 per 100 full-time equivalents in 2023 (Table 11).[5] Similarly to Michigan's surveillance, the BLS rates for 2022 and 2023 decreased when compared to previous years (600 and 3.4 in 2021, 600 and 4.0 in 2020, 800 and 4.0 in 2019, 1,000 and 4.7 in 2018, 1,300 and 6.6 in 2017). The number of BLS reported farm injuries has remained consistent since 2020. The BLS rates are higher than the Michigan surveillance system's rates because BLS reported more injuries and the denominator used to calculate the rates did not include farm owners/operators, family members and farm workers who work on farms with less than 11 employees, all of which were included in Michigan surveillance. The inclusion of producers and family members and all hired hands regardless of the number of employees on a farm in the Michigan surveillance system increased the denominator we used in calculating the rates by at least 119,000 individuals. The occurrence of a larger number of reported injuries in the BLS system could be because the Michigan surveillance system counts severe injuries (i.e., treated in an ED or hospital) and the BLS system counts all injuries that require more than first

aid. Additionally, hired hands and migrant farmers are receiving medical care from migrant health clinics and other outpatient facilities that do not report to the Michigan surveillance system. Another possibility is that since the BLS count is a statistical extrapolation and not a census and the extrapolation is based on a small number of reporting farms and therefore overestimated the count.

Table 11. U.S. Bureau of Labor Statistics (BLS) Number and Incidence Rates of Work-Related Farm Injuries by Industry and Case Types, Michigan 2022-2023

Industry	2022				2023			
	Total Recordable Cases		Cases with Days Away from Work, Job Transfer, or Restriction		Total Recordable Cases		Cases with Days Away from Work, Job Transfer, or Restriction	
	Number	Rate[3]	Number	Rate[3]	Number	Rate[3]	Number	Rate[3]
Agriculture[1]	600	2.5	300	1.3	600	2.8	200	1.1
Crop Production[2]	400	3.0	200	1.4	300	2.1	100	0.9
Animal Production and Aquaculture[2]	200	2.0	100	1.1	300	3.4	100	1.2

[1]Excludes Forestry, Fishing and Hunting

[2]Excludes farms with fewer than 11 employees

[3]The incidence rates represent the number of injuries and illnesses per 100 full-time workers and were calculated as: (N/EH) x 200,000 where N = number of injuries and illnesses; EH = total hours worked by all employees during the calendar year; 200,000 = base for 100 equivalent full-time workers (working 40 hours per week, 50 weeks per year)

The biennial BLS estimate of Michigan non-fatal work-related farm injuries for 2021-2022 was analyzed by age groups, location and type of injury[7] (BLS estimate of 2023 data was not available at the time of completion of this report). Farm injuries of lower extremities were the most common location both in the BLS data set (35.2%) and the second most common in the Michigan surveillance system (26.5%). Farm injuries among workers 45-54 years of age were the most common age group in the BLS data set (33.9%), while workers 25-34 years of age were the most common age group in the Michigan surveillance system (20.7%). Soreness, pain followed by fractures were the most common types of injury in the BLS data set (37.9% and 34.5%, respectively), while fractures were the most common type of injury in the Michigan surveillance system (22.1%).

In this report, Workers' Compensation was identified as the payer for 51.1% of the work-related farm injuries treated at Michigan hospital and emergency department in 2022 through 2023. The data from the Michigan Hospital Administrative (MHA) Database, where workers' compensation was the primary expected payer and place of occurrence was farm, identified a smaller number of farm work-related injuries in 2022 and 2023; 71 and 56 respectively, than Michigan's surveillance system. The number of injuries identified in the MHA database with workers' compensation as payor was down to a greater extent than the percentage decrease in the number of injuries from 2017 (202), 2018 (162), 2019 (137), 2020 (90), and 2021 (93).

The Workers' Compensation database (i.e., WDCA) identified 279 (31.3%) of the 892 work-related farm injuries. The possible explanations for the Workers' Compensation difference between WDCA and Michigan's surveillance system include: 1) The WDCA data set only included farm injuries that caused seven or more consecutive days away from work, presumably the most severe cases; 2) Agricultural employers if they employ less than three employees do not have to carry workers' compensation coverage; 3) WDCA excluded the self-employed (Michigan's surveillance identified 159 owner/operators) and family members (Michigan's surveillance identified 87 family members); 4) It is possible that some companies are handling farm injuries unofficially and not reporting them to Workers' Compensation insurance companies or the WDCA.

There were an additional 34 agricultural fatalities (13 in 2022 and 21 in 2023) identified by the Michigan Fatality Assessment and Control Evaluation (MIFACE) Program and WDCA data set.[8]

Surveillance of work-related farm injuries is crucial to the recognition and prevention of these conditions. A large advantage of the Michigan surveillance system is that it not only provides a reliable count of the total number of work-related farm injuries requiring hospitalization or an emergency department visit but the reports can also be used to identify specific farms to provide educational information.

Outreach activity included providing information on the Michigan AgrAbility Program[4] to farm operators and workers whose injury suggested they may have ongoing serious

impairment. We mailed thirty-nine letters and AgrAbility brochures to individuals with farm injuries in 2022 and 2023 combined.

We have developed educational materials for distribution to farm employers and employees where we see patterns in causes for the farm injuries; safe animal handling; farm-related machine entanglements; safe use of tractors; slippery clutch pedal; farmers and trees; tractors with ROPS (Rollover Protection Structure); safely starting a tractor; and using a controlled atmosphere (CA) apple storage room.[9] Development and distribution of this information will allow employers to work with employees to implement effective prevention strategies including maintenance of equipment and safer work practices to prevent future farm injuries.

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