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Identifying the Gaps in the Methodology of NH Farm Injury Surveillance Using Hospital Discharge Data

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IDENTIFYING THE GAPS IN THE METHODOLOGY OF NEW HAMPSHIRE FARM INJURY SURVEILLANCE USING HOSPITAL DISCHARGE DATA

INTRODUCTION

There are fewer farms in New Hampshire compared to many other states, and many of them are small family farms that do not fall under the Occupational Health and Safety Administration's (OSHA) jurisdiction. According to the 2012 Census of Agriculture, New Hampshire had 4,391 farms. While the number of farms in the state has been increasing over the past 15 years (NASS, 2012c), the average farm size has been decreasing. According to the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS), New Hampshire is ranked 46 for average farm size, only behind four states (NJ, CT, RI and MA). The state's average farm size of 108 acres is the smallest average farm size for NH in thirty years. An examination of NH agricultural data and farming indicators shows that 85 percent of NH farm households derive over 50 percent of the operator's total household income from non-farm sources (NASS, 2012a). In addition, 65.5 percent of NH farm operators are retired from a previous occupation (Retirement, 27.6 percent) or don't consider farming to be their primary occupation (Off-farm occupation, 37.9 percent) (NASS, 2012b). Farming statistics also indicate that 1) many principal operators have primary jobs outside the farm, which supplements the agricultural income and often provides fringe benefits such as health insurance; 2) the majority of operators and their families live on the farm; 3) most farms are family or individually owned, and not owned through a partnership; and 4) most farms are residential/lifestyle, a source of secondary income, or retirement farms (Table I).

Table I. NH Farming Characteristics; 2002, 2007, 2012

Operator Characteristic	2002		2007		2012
Principal Operators by Primary Occupation					
Farming	1,636		1,930		2,107
Other	1,727		2,236	**(53.7%)**	**2,284 (52.0%)**
Place of Residence					
On Farm	3,000	**(89.2%)**	3,756	**(90.2%)**	**3,917 (89.2%)**
Not on Farm	363		410		474
Average Years on Farm					
	18.7		20.2		20.5
Type of Organization					
Family or Individually Owned	2,917	**(93.4%)**	3,551	**(92.2%)**	**3,701 (84.3%)**
Partnership	206		299		320
Farm Typology					
Limited-resource Farms	-		18.2%		-
Retirement Farms	-		19.1%		27.6%
Residential/Lifestyle Farms	-		**35.3%**		-

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2012, Off-occupation			37.9%
Farming Occupation/Lower Sales	-	17.4%	-
2012, GCFI less than $150,000			26.6%
Farming Occupation/Higher Sales	-	2.1%	-
2012, GCFI $150,000 to $349,999			2.8%
2012, Mid-Size, GCFI $350,000 to $999,999			1.4%
Large Family Farms, $250,00 to $499,999	-	1.7%	
2012 Large Family Farms $1,000,000 to $4,999,999			0.6%
Very Large Family Farms $500,000 or more	-	1.3%	
2012 Very Large Family Farms $5,000,000 or more			0.1%
Nonfamily Farms (where the operator and related persons do not own a majority of the business)	-	4.9%	3.1%

Source: 2007 Census of Agriculture, Farm Typology, 2012 Census of Agriculture. Typology definitions changed in 2012.

BACKGROUND

Agriculture is well understood to be dangerous, and it is important to quantify and classify these dangers to prioritize safety interventions, along with measuring the impact of those efforts over time.   Data sources exist which capture work-related injury data to varying degrees. Many work related surveillance systems heavily rely on workers' compensation records to capture injury or illness (Bertke et al., 2012; Boden & Ozonoff, 2008), however the same does not hold true for agriculture (Costich, 2010). For many small family operated farms, workers' compensation data are not an appropriate means of injury surveillance. Other sources of occupational injury surveillance data in agriculture include the National Highway Transportation Agency (NHTA) (Gerberich, Robertson, Gibson, & Renier, 1996), the Survey of Occupational Illness and Injury (SOII) (Boden, 2014; Statistics, 2015), the Census for Fatal Occupational Injury (CFOI)(Statistics, 2014), active surveillance (Earle-Richardson, Jenkins, Scott, & May, 2011), ambulance reports (Scott, Krupa, Sorensen, & Jenkins, 2013), surveys (Hoskin A. F., 1988; Layne, Goldcamp, Myers, & Hendricks, 2009) and hospitalization data (Costich, 2010; Scott et al., 2013).

Nationally, the Bureau of Labor Statistics (BLS, 2015) gathers data on workplace injury and illness. This is accomplished through their Census of Fatal Occupational Injuries (CFOI) and Survey of Occupational Injuries and Illnesses (SOII). CFOI only captures fatal events and the SOII only captures events from employer maintained OSHA logs in establishments greater than 10 employees. Leigh et al. (2014) estimate that the BLS missed an average of 77.6% of nonfatal agricultural injuries and illnesses in 2011, due to 1) SOII's institutional exclusion of employees on small farms (less than 11 employees) and of farmers and family members, and 2) willful underreporting by employer and employee (NASS, 2015). Both of these surveillance systems lack data on large portions of the agricultural workforce, thus underestimating the true burden of agricultural injury and illness.

There is no standard indicator for injuries that occur within farming occupations, as is the case for many other occupations. It is important to fully understand a particular data source, including what variables are retained in the dataset, and how it might be used to

complement other data sources for injury surveillance. Approaches used for other occupations may be applied to agricultural injuries, though a unique aspect of farming injury is the intersection of the workplace and homestead. This fact further blurs the definition of what is defined as a work-related event, since the farm can be the site of both work and leisure. A key data source for injury surveillance is hospital discharge data. Injury is often defined by the action or event, through the use of International Classification of Disease 9 (ICD) External Cause of Injury Codes (E-codes) that point to such indicators or variables as agriculture, e.g. tractor, livestock, and even location such as "farm." More about these codes is described below under Data Sources.

METHODS

The objective of this study was to identify the gaps in methodology of farm injury surveillance in New Hampshire, specifically utilizing hospital discharge data between 2001 and 2009. To accurately illustrate NH farming characteristics during the study period, we used state level agricultural data from 2002 and 2007 (Table I). Census data is available for 2012; however, to best match the time period of hospital discharge data, we are using results from the two previous censuses. We defined farm injury as a non-fatal injury that occurs while in a farm location or while performing a farm-related activity. Our case definition of farm injury was modeled after definitions used by New York Center for Agricultural Medicine and Health (Earle-Richardson et al., 2011), Ohio Occupational Health Nurses in Agricultural Communities (OHNAC) NIOSH funded project (Database, 2002) and Canada Agricultural Injury Surveillance Program (CAISP)(CASA, 2015) and developed to be intentionally broad to include any injury event that occurs on a farm regardless of whether it was related to farm work, recreation, or any other activity occurring on farm property. This case definition is especially pertinent to NH because much of the farming and its associated injury isn't captured by traditional surveillance systems such as claims data. The farm setting is a unique location where work and lifestyle are often times integrated. While we can identify primary occupation by payer source (for example where workers' compensation is the payer) for injury surveillance purposes, farming, which in NH is often times a secondary worksite and a home site, is missed by data surveillance. Although the farm-related injury may not be work related in the traditional sense, it is agricultural-work related and should be measured and reported as such.

Injury events could encompass all ages, paid/unpaid workers, injuries related to agricultural work, injuries related to some aspect of the agricultural environment but not directly related to agricultural work (e.g. agricultural vehicles being used for recreational purposes, accidents caused by agricultural machinery, children playing near hazard, etc.), and agricultural injuries that occurred away from farm locations (such as injuries on public highways that involve agricultural vehicles/machinery/farm animals). Although forestry and logging, fishing, hunting and trapping fall within the same sector of work as farming, they are separate from the agricultural industry, and therefore, were not included in the study.

DATA SOURCES
We performed a secondary data analysis utilizing NH hospital discharge data (inpatient and emergency room) from 2001 to 2009. Only demographic, ICD diagnosis code, E-Code, and payer source variables were exported to Microsoft Excel for analysis.

ICD-9
The ICD-9 is the 9th revision of the International Classification of Diseases (ICD) used for healthcare billing and reporting at the time of this study. Diagnosis codes and E-Codes and contained within the ICD-9.

DIAGNOSIS CODES
Diagnosis codes are used to define the injury that is present. There is one primary diagnosis code and 10 secondary diagnosis fields to accurately describe and bill for the incident. The primary diagnosis is the only field required for reporting; the secondary diagnosis fields are optional.

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E-CODES

E-Codes are designed to capture external cause of injury for billing and reporting. They are contained within the International Classification of Diseases (ICD) manuals and act as supplemental codes to diagnosis codes that can reveal intent and/or location of event. E-Codes are not required and should never be contained within the primary diagnosis field. The E-Codes used in this study are currently being used by occupational surveillance programs conducting exploratory work in farm injury surveillance. The E-codes selected for farm injury were vetted to be farm-related or correlated with farm activity, such as pesticides and fertilizers.

STUDY CRITERIA

E-Codes were used to determine study inclusion and were categorized in two ways: sure to be (Table II) and suspected to be (Table III). Only cases with one or more sure to be or suspected to be farm injury E-Code were included in the analysis. Only cases with E-Codes E849.1 and/or E919.0 - farm as place of occurrence and injury caused by agricultural machinery, respectively - were categorized as sure to be farm injury cases. Cases with one or more of the suspected farm injury E-Codes (see Table III) were considered suspected to be farm injury.

Table II. Sure to Be Farm Injury E-Codes

E-code	Description
E849.1	Place of occurrence is farm (buildings and land under cultivation)
E919.0	Agricultural machines (animal-powered agricultural machine; combine; derrick, hay; farm machinery not otherwise specified; farm tractor; harvester; hay mower or rake; reaper; thresher)

Table III. Suspected to Be Farm Injury E-Codes

E-code	Description
E827	Animal-drawn vehicle accident (collision between animal-drawn vehicle and animal, non-motor road vehicle – excluding pedal cycles, or other object. Also includes fall from,
	knocked down by; overturning of; run over by; or thrown from an animal-drawn vehicle)
E828	Accident involving animal being ridden (collision between animal being ridden and another animal; non-motor road vehicle – excluding pedal cycle, and animal-drawn vehicle; or other object. Also includes ridden animal stumbled and fell; and fall from, knocked down by; thrown from; trampled by; or thrown from an animal being ridden)
E863	Accidental poisoning by agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers (insecticides, carbamates, herbicides, fungicides, rodenticides, fumigants, other and unspecified)
E866.5	Accidental poisoning by plant foods and fertilizers
E906.8	Other specified injury caused by animal (butted by animal; fallen on by animal, not being ridden; gored by animal; implantation of quills; pecked by bird; run over by animal, not being ridden; stepped on by animal, not being ridden)
E980.7	Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers (injury undetermined whether accidentally or purposely inflicted)

Cases containing E-Codes indicative of one or more of the following were excluded from the study:

• Cases with discharge records containing location E-Codes (E849) for a public building, residential institution, or recreation/sport, were excluded (n = 40) because farm-related activity would not likely be conducted at these locations.

• Cases where mental illness was indicated as the primary diagnosis were excluded (n = 5). These cases reflect that the healthcare provider determined that the primary reason for services was mental illness and not a farm-related injury.

• E-Codes for suicide and self-inflicted injury or homicide and injury purposefully inflicted by other persons (E-Codes E950-E969), were excluded (n = 17) due to the purposeful intent of the injury by oneself or another and its irrelevance to the farm/farming.

Although the intent was not determined, we did not exclude any cases containing E980.7 because the secondary fields did not indicate that these were purposefully inflicted. After exclusions, 450 sure to be and 8,456 suspected to be farm injury cases were included in the analysis (N=8,906).

RESULTS

Of the 8,906 total injury cases from 2001 to 2009, only 450 were categorized as sure to be farm injury cases (Table IV). Approximately 95% of the cases in this study fell under the suspected to be category, each study year. The overrepresentation of suspected to be cases was consistent from year to year.

**Table IV. Farm Injury Cases, 2001-2009 (N = 8,906)**
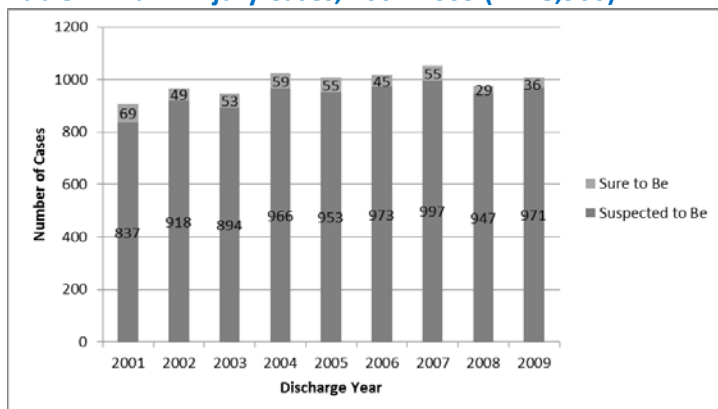
Not surprisingly, the top three counties in NH with the greatest number of farm injuries, overall, also had the largest populations and the greatest number of farms. However, when we separated sure to be and suspected to be farm injuries by county, we found that Sullivan county ranked second for farm injury but 7th for

number of farms and 9th for population (out of 10 counties, total). After close review of the farming data, we found that Sullivan County has a greater number of farm acres to number of farms (~130 acres/farm) than any other county in NH (NASS, 2012d).

The top three E-Codes for suspected to be farm injury are illustrated in Table V. Over half (58.3%) of the suspected to be cases contained E-Code E906.8 (Injury Not Elsewhere Classified [NEC] caused by animal). While E906.8 (injury NEC caused by animal) and E980.7 (accidental poisoning – pesticide, etc.) definitions are strongly farm related, it is unclear whether E828 (ridden animal – accident rider), is truly farm related. While E828 had the second highest number of cases (n=3,251), due to the absence of language to discern recreational riding from farm-related riding, the true cause of injury cannot be delineated.

Table V. Top 3 E-Codes Related to Suspected Farm Injury (n = 8,138)
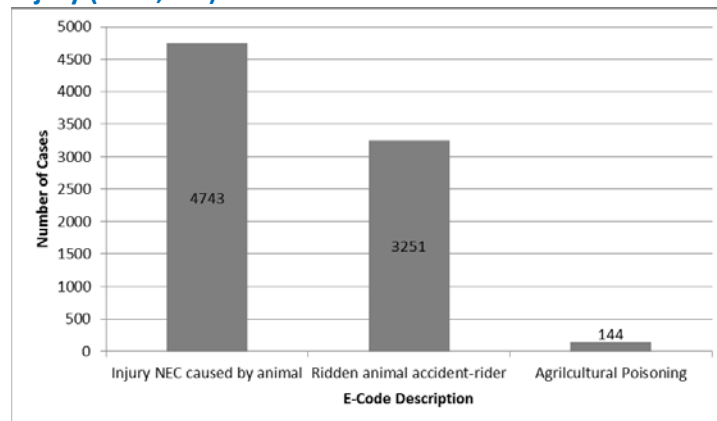
Women, compared to men, were overrepresented in Injury NEC Caused by Animal and Ridden Animal Accident-Rider categories, accounting for approximately ¾ of the combined cases (Table VI). This ratio was consistent across all study years. The majority of both suspected to be and sure to be farm injury cases had commercial insurance payers versus workers' compensation (Table VII, Table VIII). Over 80% of Ridden Animal Accident – Rider events had a commercial payer. Although the "Poisoning" category in suspected to be farm injuries had the lowest

percentage of workers' compensation, the Ridden Animal Accident - Rider category had the lowest percentage of State-administered program payers (Medicaid, Medicare, workers' compensation). There were a greater percentage of cases covered by workers' compensation in the sure to be farm injury category due to the presence of unequivocal farming E-Codes, indicative of farm-related work.

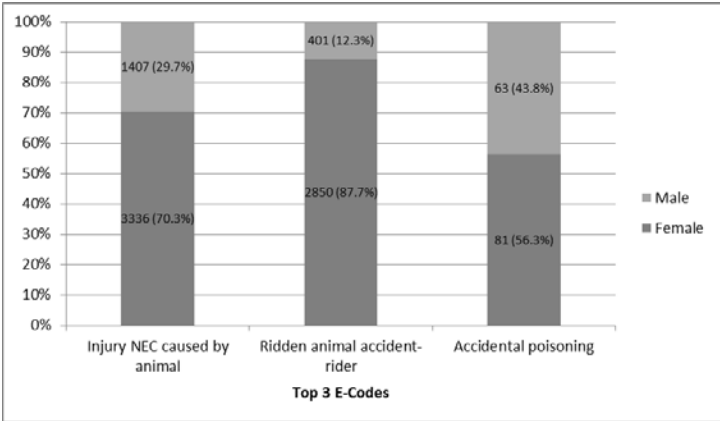**Table VI. Top 3 E-Code by Gender, Suspected to Be Farm Injury Cases (n = 8,138)**

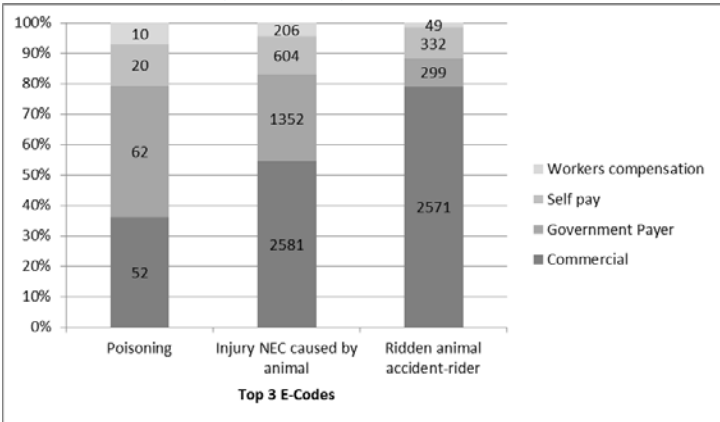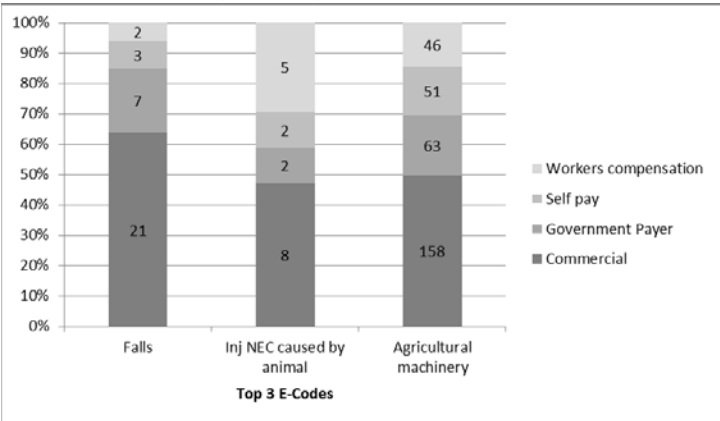**Table VII. Payer Source of Suspected to Be Farm Injury Cases, 2001-2009 (n = 8,138)**

Table VIII. Payer Source of Sure to Be Farm Injury Cases, 2001-2009 (n = 368)

DISCUSSION

This study aimed to characterize farm-related injury in NH by utilizing E-Codes in hospital discharge data. However, it became evident, very early on, that accurately enumerating farm injury utilizing this key administrative data source in NH is not feasible. The study intent shifted from quantifying injury to uncovering gaps in this surveillance method.

Because of the agricultural landscape in NH (e.g. small farms with limited sales, negative net cash income, family ownership, leisurely/retirement farming, not the primary occupation, etc.), farm injuries are missed by existing surveillance systems such as the National Institute for Occupational Safety and Health's Agricultural Injury Surveillance Program. While some other federal programs captured a portion of such injuries of interest, recent changes have cut funding for these programs; therefore epidemiologists must rely increasingly on alternative methods to quantify these injuries (CDC, 2015). Other occupational injury surveillance systems rely heavily on industry and occupation indicators, which can prove problematic for farming. Because the majority of NH farmers report a different occupation as their primary (Table I), this indicator is futile. Further, because the vast majority of NH farmers live on the farm with their family (Table I), this indicator does not account for family members who are injured by exposure to the farm environment. Primary occupation is typically regarded as a meaningful

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indicator to identify farm-related work and thus, provides a numerator and denominator. Assigning a meaningful value for a farm denominator population has been difficult, although more recent iterations of the census of agriculture have added variables including unpaid workers and volunteers, which help bridge the gap.

Utilizing hospital discharge records as a source to quantify farm injury also fails to uncover the true burden of injuries occurring on a farm, or associated with farm work. The only true indicators, farm as place of occurrence and injury caused by agricultural machinery, do not capture farm-related injury that resulted off the farm (e.g. on agricultural vehicles, transporting farm animals, etc.). If the farmer's primary residence is at the farm, it is unclear whether the injury is coded as taking place at a farm or at home. Also, considering the size and type of agricultural production in NH compared with national figures (the negative net income of operations, and the small acreage of most farms), it's possible that NH farmers focus primarily on harvesting crops for family/local consumption. This would make the two sure to be (farm as place of occurrence and contact with agricultural machinery) indicators less predictive of farm injury in NH.

Because discharge records are for billing purposes and not public health surveillance, providers and other healthcare workers may not be compelled to fully document the injury as farm related, even if the patient described a farm injury, if it does not warrant workers' compensation reimbursement. If discharge data is to be used for public health surveillance, it is important to understand these limitations. Ideally healthcare workers and coders should receive additional training on documentation and the public health need and uses for discharge data. There is an E-Code field and 10 diagnosis fields (one primary and nine secondary) to ensure that the injury assessment is thorough (though, again, this is mainly for billing purposes). The lack of field entry consistency present in the discharge data further supports the need for documentation training. Only a small percentage of cases contained an E-Code field and most of the 10 secondary fields. The majority

of injury cases only contained the primary diagnosis code with no additional information.

The dearth of data present in hospital discharge records makes enumerating farm-related injury nearly impossible. What's more, due to de-identification of patient records but no proxy to count persons, hospital discharges only account for cases not people. There is no unique data contained in the records to tell cases apart. Therefore, our denominator in this study (or "N"), was the number of cases, not persons injured. Single patients who frequent the hospital due to follow-up visits or reoccurring injuries may have accounted for multiple cases in the records.

Another barrier to quantifying farm-related injury is the ICD-9, referred to by all medical coders to succinctly document the incident for billing purposes. The ICD-9 variables are not comprehensive, as most categories of E-Codes have an "unspecified" option, without any additional guidance for use. One of the greatest confusions in these data is the inclusion of E-Code 828 (accident involving animal being ridden). It appears that many of the injury cases could be simply from horseback riding accidents but without supporting variables/definitions, we could not be certain. About one quarter (2,032) of the 8,456 suspected to be farm injury cases were of those 15 years old or younger. We found that of the 3,251 cases with E-Code 828 (accident involving animal being ridden), 1,454 (44.7%) of the cases were of those 24 and younger. As illustrated in Table V, accident involving animal being ridden E-Code had the second most number of cases (n = 3,251). However, unlike E-Code 906.8 (other specified injury caused by animal), which includes farm-related animal injuries such as butted by an animal and gored by animal, E-Code 828 (accident involving animal being ridden) is most likely recreational horseback riding accidents with approximately 90% of the animal being ridden injuries occurring to women (2,850 compared to 401).

Table IV illustrates the number of cases in each of the two categories, sure to be and suspected to be. As evidenced in this chart, only 5% of the cases fell in the

sure to be farm injury category. The overrepresentation of suspected to be cases was consistent from year to year. Again, the poor reflection of farm injury in NH is due to identifying farm-injury cases with only two variables; place of occurrence on a farm (n = 130) and caused by agricultural machinery (n = 320).

Tables VII and VIII, suspected to be and sure to be farm injuries, respectively, illustrate the payer source for injuries and includes commercial, self-pay, workers' compensation, and public payers (i.e. Medicare and Medicaid). For all injuries, there are a greater percentage of commercial payers than any other type, including workers' compensation. Of the cases in each of the top E-Codes for each injury category, 50% or more had a commercial payer. In contrast, the sure to be E-Code categories had a higher percentage of workers' compensation as payer. New Hampshire law does not require farm owners to carry workers' compensation on themselves; however, they do have to provide it for their employees. Since most of the farms in NH are small and more "recreational" it is difficult to use workers' compensation as a proxy for work related farm injury.

LIMITATIONS

There is no formal standardized indicator for farm injuries (especially work related), thus expertise of occupational health surveillance professionals was used to develop the best possible definition of farm injury. These data are also not representative of the entire realm of farm injuries because only emergency department and inpatient hospital discharge data were used. Often, farmers will self-transport to their primary providers to avoid emergency care.

De-duplication of the hospital discharge data was not done; therefore these data count the number of discharges and not the number of individual patients. Ten people may go to the hospital once, or one person may go ten times for the same condition and both situations are counted as ten discharges. Another limitation to hospital discharge data is that, as of this report, only data through 2009 are available.

CONCLUSIONS

Utilizing hospital discharge data to define a farm injury has the potential to capture both sure to be and suspected to be cases, depending on how broadly the definition encompasses various farm activities and exposures. It is the use of E-codes that improves our ability to confirm these cases, particularly those in our sure to be farm injury category, while others in the suspected to be category can be teased out to a certain degree. However, relying on one data source to accurately measure the magnitude of farm injuries is limited. Developing a surveillance system for farm injuries should involve the use of various public health data sources, as well as medical record data, trauma and emergency medical services (pre-hospital) data, and survey data. This multi-faced approach is more likely to cover a broad spectrum of injuries, from minor to severely traumatic. With the elimination of many federal agricultural injury surveillance programs, researchers need creative solutions to guide injury prevention programming and evaluation.

Relying on workers' compensation as payer to discern work-related farm injuries is also limited, particularly in a state where farming is primarily family-owned and recreational. Since state law does not require farm owners to carry workers' compensation insurance on themselves, we are limited in our ability to capture injuries to these farm owners working on their own farms. Improvements to public health surveillance systems may be coming with the introduction of the ICD-10 system. This system dramatically increases the number of variables for hospital discharge coding. More detail will be available to classify agricultural cases; however it will only be useful if coders and those writing medical records are well trained in using it.

With the promotion of electronic medical records and "meaningful use" of the data therein, there's potential to capture additional data fields that describe the incident in more detail and to allow public health professionals to access this information for population based surveillance purposes. These may include collection of occupation and industry information, as well as race, ethnicity and language, and other health

behaviors such as smoking status, which will allow researchers to explore cumulative injury, illness and chronic disease in these working populations. This will increase the use of clinical documentation in the healthcare setting to better understand health and disease outcomes from a public health perspective.

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REFERENCES

Bertke, S. J., Meyers, A. R., Wurzelbacher, S. J., Bell, J., Lampl, M. L., & Robins, D. (2012). Development and evaluation of a Naïve Bayesian model for coding causation of workers' compensation claims. J Safety Res, 43(5-6), 327-332. doi: 10.1016/j.jsr.2012.10.012

BLS. (2015). Injuries, Illnesses, and Fatalities. from http://www.bls.gov/iif/

Boden, L. I. (2014). Capture-recapture estimates of the undercount of workplace injuries and illnesses: sensitivity analysis. Am J Ind Med, 57(10), 1090-1099. doi: 10.1002/ajim.22247

Boden, L. I., & Ozonoff, A. (2008). Capture-recapture estimates of nonfatal workplace injuries and illnesses. Ann Epidemiol, 18(6), 500-506. doi: 10.1016/j.annepidem.2007.11.003

CASA. (2015). Canadian Agricultural Injury Surveillance Program (CAISP).

CDC. (2015). Future Directions for the Surveillance of Agricultural Injuries; Public Meeting; Request for Comments. Retrieved from https://www.federalregister.gov/articles/2015/02/26/2015-03949/future-directions-for-the-surveillance-of-agricultural-injuries-public-meeting-request-for-comments.

Costich, J. (2010). Who pays for agricultural injury care? J Agromedicine, 15(1), 54-57. doi: 10.1080/10599240903389714

Database, N. A. S. (2002). Occupational Health Nurses in Agricultural Communities. from http://www.nasdonline.org/document/1614/d001441/occupational-health-nurses-in-agricultural-communities.html

Earle-Richardson, G. B., Jenkins, P. L., Scott, E. E., & May, J. J. (2011). Improving agricultural injury surveillance: a comparison of incidence and type of injury event among three data sources. Am J Ind Med, 54(8), 586-596. doi: 10.1002/ajim.20960

Gerberich, S. G., Robertson, L. S., Gibson, R. W., & Renier, C. (1996). An epidemiological study of roadway fatalities related to farm vehicles: United States, 1988 to 1993. J Occup Environ Med, 38(11), 1135-1140.

Hoskin A. F., T. A. M., W. D. Hanford, and S. R. Landes. (1988). Occupational injuries in agriculture: a 35-state summary. NIOSHTIC-2 Publications Search - 20039768. from http://www.cdc.gov/niosh/nioshtic-2/20039768.html

Layne, L. A., Goldcamp, E. M., Myers, J. R., & Hendricks, K. J. (2009). Youth living on Hispanic-operated farms: injuries and population estimates in the U.S., 2000. J Agric Saf Health, 15(4), 377-388.

NASS. (2012a). NH Summary By Age and Primary Occupation of Principal Operatior: 2012. from http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/New_Hampshire/st33_1_069_069.pdf

NASS. (2012b). Summary by Farm Typology Measured by Gross Cash Farm Income, Primary Occupation of Small Family Farm Operators, and Non-Family Farms - New Hampshire: 2012. from http://www.agcensus.usda.gov/Publications/2012/Online_Resources/Typology/typology13_nh.pdf

NASS. (2012c). Table 1. Historical Highlights: 2012 and Earlier Census Years, NH. from http://agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/New_Hampshire/st33_1_001_001.pdf

NASS. (2012d). Table 45. Selected Operation and Operator Characteristics: 2012 and 2007. from http://www.agcensus.usda.gov/Publications/2012/Full_Repo

rt/Volume_1,_Chapter_2_County_Level/New_Hampshire/st33_2_045_045.pdf

NASS. (2015). Table 1. Historical Highlights: 2012 and Earlier Census Years, NH. from http://agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/New_Hampshire/st33_1_001_001.pdf

Scott, E. E., Krupa, N. L., Sorensen, J., & Jenkins, P. L. (2013). Electronic merger of large health care data sets: cautionary notes from a study of agricultural morbidity in New York State. J Agromedicine, 18(4), 334-339. doi: 10.1080/1059924X.2013.826608

Statistics, B. o. L. (2014). Fatal Work Injury Preliminary Numbers 2013. from http://www.bls.gov/iif/oshwc/cfoi/cfch0012.pdf

Statistics, B. o. L. (2015). Survey of Occupational Injuries and Illnesses (SOII) Respondents Home Page. from http://www.bls.gov/respondents/iif/