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Occupational Injury and Treatment Patterns of Migrant and Seasonal Farmworkers

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ABSTRACT. Migrant and seasonal farmworkers are thought to be at increased risk for occupational injury and illness. Past surveillance efforts that employed medical chart review may not be representative of all farmworkers, since the proportion of farmworkers using migrant health centers (MHCs) and area hospital emergency rooms (ERs) was unknown. The purpose of the current study was to determine the proportion of workers using MHCs versus other sources of occupational health care, and to use these data to correct previous occupational injury and illness rate estimates. Researchers conducted a survey of migrant and seasonal farmworkers in two sites: the Finger Lakes Region of New York and the apple, broccoli, and blueberry regions of Maine. Researchers also conducted MHC and ER medical chart reviews in these regions for comparison purposes. Proportions of occupational morbidity by treatment location were calculated from the survey, and a correction factor was computed to adjust chart review morbidity estimates for Maine and New York State. Among 1103 subjects, 56 work-related injuries were reported: 30 (53.6%) were treated at a MHC, 8 (14.3%) at an ER, 9 (16.1%) at some other location (e.g., home, relative, chiropractor), and 9 (16.1%) were untreated. Mechanisms of injuries treated at MHCs versus all other sources did not differ significantly. The survey-based multiplier (1.87) was applied to previous statewide MHC chart review injury counts from Maine and New York. The corrected injury rates were 7.9 per 100 full-time equivalents (FTE) per year in Maine, and 11.7 per 100 FTE in New York. A chart-review based surveillance system, combined with a correction factor, may provide an effective method of estimating occupational illness and injury rates in this population.

KEYWORDS. Agricultural health, migrant and seasonal farmworkers, occupational injury

INTRODUCTION

It is estimated that between three and five million migrant and seasonal farmworkers

(“farmworkers”) travel throughout the United States each year.¹ More than three-quarters (77%) of these farmworkers are foreign-born (mostly from Mexico and Central America),

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and an estimated 53% are undocumented.² Language and cultural differences, little formal education, and low income may obstruct these farmworkers' access to services, including health care.³⁻⁵

These farmworkers are thought to be at increased risk for occupational illness and injury due to the physical nature of their work and the unpredictable work environment.⁶⁻⁸ Group living conditions and lifestyle factors are thought to also contribute to health problems.^{9,10} However, available research indicates that farmworkers use medical services much less frequently than other populations, particularly for prevention.^{3,11}

The National Migrant Health Program maintains a network of farmworker health centers that offer culturally appropriate primary care and preventive services. Estimates of the proportion of farmworkers who use these migrant health centers range from 38%⁴ to 53%.^{3,12} Some sources suggest that farmworkers may instead access hospital emergency rooms for primary care purposes.¹³

Little research has been done on health care utilization as it specifically relates to occupational injuries and illnesses among farmworkers. The authors recently published a survey of 550 farmworkers in New York State showing that 54% of occupational injury and illness cases were treated at migrant health centers. Furthermore, 83% of farmworkers injured on the job received some form of medical treatment.¹⁴

Health care utilization by farmworkers is an important topic in its own right, but is also critically important for understanding the feasibility of using medical charts as the basis for occupational injury and illness surveillance. The Northeast Center for Agricultural Health (NEC) is working to determine whether chart review, worker survey, or some combination of the two is the most efficient approach to surveillance.

This paper revisits the New York survey¹⁴ and presents results from a similar survey conducted in Maine. Survey results from both states are presented in conjunction with chart review data gathered from the same regions. With data from two diverse study sites, it may now be possible to correct previous statewide chart review-based injury estimates with data from injured workers not using the migrant

health center system. This analysis will aid in the longer-term aim of specifying an effective surveillance model for this population.

METHODS

Survey Methods

Maine Survey

A list of camps in the wild blueberry, apple, and broccoli harvests in the study region was developed with assistance from local labor and migrant health experts. Blueberry camps were located in Washington County, apple camps were located in Androscoggin and Kennebec Counties, and broccoli camps were located in Aroostook County. During the 2006 season, visits were attempted at all camps served by the MHC for the broccoli and blueberry harvest areas. For the apple harvest, a sample of camps served by the MHC in the Central Maine region of Augusta and Auburn was visited. Growers in all commodities were contacted to gain consent to interview workers during nonworking hours.

Bilingual data collectors introduced the study in Spanish or English as appropriate. Interested participants were read informed consent prior to being surveyed. For workers younger than 18, consent of a parent or guardian was obtained. All participants received a \$10 money order.

A comprehensive description of the survey instrument has been published previously.¹⁴ Minor changes were made due to the change in study site from New York to Maine.

New York Survey

Methods for the New York survey have been published in detail.¹⁴ Briefly, a random sample of 75 housing camps was drawn from the study region of Ontario, Steuben, Wayne, and Yates counties. Interviewers visited these camps over a twelve-week period in the fall of 2005.

Survey Data Form Review

Injuries were classified as being treated at an "MHC," "ER," "other location," or "no treatment" based on the subject's report. Care received at a "hospital," was classified as "ER." Treatment

not received at a MHC or ER was classified as “other.” Cases where treatment was deliberately not sought were classified as “no treatment.” Five cases where the worker specifically stated that treatment was not needed were excluded.

Occupational injuries and illnesses were placed into one of five mechanism categories: musculoskeletal strain/sprain; chemical or natural irritant exposure (including dust, poison ivy, sun and heat exhaustion/stroke); cut/crushed; struck by an object or animal; fall; and other/unknown. These categories were dictated by self-reported survey responses, and as such, the term “mechanism” actually represents a mixture of injury mechanisms and diagnoses.

Chart Review Methods

Migrant Health Centers

The Maine chart review was conducted at the Maine Migrant Health Program following conclusion of the 2006 harvest. All visits occurring during the wild blueberry, apple, or broccoli harvest were reviewed. In New York, a random sample of medical charts was reviewed at the two clinic locations of the Finger Lakes Migrant Health Care Project following the 2005 harvests. A detailed account of the New York chart review methods has been published.¹⁴

For each chart, researchers confirmed farmworker status and assessed the presence of occupational illness or injury using registration forms and the physician or nurse’s progress notes. In order to qualify as occupational, the injury or illness must have been attributable to, or aggravated by, working in the field, orchard, or packing house. For all occupational cases, information on injury date, type, cause, location on the farm, commodity, and body part was collected. The patient age, gender, and country of origin were also recorded. No personal identifiers were collected.

Emergency Rooms

In the Finger Lakes Region of New York,¹⁴ a nurse collaborated with six hospital emergency departments to collect data on injuries during the 2005 harvest season. The nurse abstracted

information from occupational cases as above. Emergency room data from Maine were not available.

Previous New York State and Maine Chart Review (2001–2002)

Data from a previous chart review study of these same regions in 2001–2002 were utilized in the current analysis.⁷ In order to estimate injury and illness rates for the entire states of New York and Maine, chart review data from four additional MHCs in New York, as well as additional commodity groups in Maine, were included.

Classification of Traumatic and Nontraumatic Injuries

Following the U.S. Department of Labor Bureau of Labor Statistics definition of traumatic injury,¹⁵ the assignment of each occupational injury or illness as being traumatic or nontraumatic was made independently by two researchers. Cases where the researchers did not concur were discussed and ultimately agreed upon.

Statistical Analyses

Continuous variables, such as age and weeks worked, were summarized using means and standard deviations. Categorical variables, such as region of origin, were summarized as frequencies and proportions. Comparisons between New York and Maine farmworker demographics were conducted using the unpaired *t* test (for continuous variables) and chi-square or Fisher’s exact test (for categorical variables). Probability values less than .05 were considered statistically significant.

Health care utilization data and mechanisms of injury were compared between Maine and New York using Fisher’s exact test. Fisher’s exact test was also used to identify differences in proportions of mechanisms of injuries treated at the MHC versus all other locations. Chi-square tests were used to compare chart review injuries between Maine and New York.

Calculation of Injury Multipliers

Using survey data, the percentage of injuries treated at MHCs as a proportion of all treatment

sources was computed (53.6%). Average chart review MHC injury counts from 2001 to 2002 were multiplied by the inverse of this value ($1/0.536 = 1.87$) to estimate the total number of injuries in Maine and New York (see Table 3). To estimate injury counts for each of the remaining treatment categories (ER, other, and no treatment), the same method was used.

Calculation of Injury Incidence

Statewide injury incidence was estimated for Maine and New York, using chart review injury counts adjusted according to the above multiplier. Person-time denominators were calculated using a minimum-labor-demand method.¹⁶ In this method, total person-hours required to harvest all hand-worked crops in each state (in New York, only the counties north of New York City were included) were compiled using state data sources and farm-worker enumeration reports.^{16,17} Total person hours for Maine and New York were converted into "worker-seasons" using an average 49.5 hour work-week¹⁶ and an average season length of 8.6 weeks (based on current survey data). To express rates in full-time equivalents (FTE), the rate in worker-seasons was multiplied by 6.04, to account for a 52-week working year.

RESULTS

Survey

Subject Demographics

In Maine, 15 of the 29 known camps were visited in 2006 (three broccoli, five apple, and seven blueberry). In the blueberry harvest, it was not possible to reach all of the camps due to the remoteness of the region and the time required to interview workers in the evening and during time off.

Of the 619 farmworkers invited to participate in the survey, 553 agreed to do so (89.3%). The average age of 33 was virtually identical to that of New York farmworkers interviewed the year before.¹⁴ In both regions, the largest nationality groups were Latin American: 41% of Maine farmworkers and 81.1% of New York farmworkers. Maine's next largest group (28.4%)

TABLE 1. Demographic Profile of Maine and New York Surveyed Farmworkers

	Maine (n = 553)	New York (n = 550)	p value
Age (years)			
Mean (SD)	33.6 (13.2)	33.3 (13.0)	.6723
Range	12–70	14–74	
Origin, n (%)			
Latin America	227 (41.0)	445 (81.1)	<.0001
Caribbean	94 (17.0)	81 (14.8)	
United States	73 (13.2)	21 (3.8)	
Canada	157 (28.4)	0	
Other	2 (0.4)	2 (0.4)	
Time living in state (days)			
Mean (SD)	54.3 (43.2)	90.1 (47.7)	<.0001
Median	28	76	
Range	4–183	6–287	
Seasons migrated to state			
Mean (SD)	7.7 (8.7)	4.7 (6.3)	<.0001
Median	4	3	
Range	1–50	1–52	

was Native Americans from the Canadian provinces of New Brunswick and Nova Scotia, a group not present in New York (Table 1).

Health Care Utilization

Of the 553 subjects in Maine, 32 reported an injury, versus 24 of the 550 subjects in New York. The migrant health centers treated 53% of injuries in Maine and 54% in New York (Table 2). Medical treatment at an ER, MHC, or other location was sought for 84% of the Maine and 88% of the New York injuries. The proportions

TABLE 2. Observed Proportions of Farmworker Occupational Injuries Treated at Various Locations as Ascertained by Survey

Treatment location	Maine	New York*	Combined
MHC	17 (53.1%)	13 (54.2%)	30 (53.6%)
ER	3 (9.4%)	5 (20.8%)	8 (14.3%)
Other	6 (18.8%)	3 (12.5%)	9 (16.1%)
No treatment	6 (18.8%)	3 (12.5%)	9 (16.1%)

*Percentages differ slightly from Earle-Richardson et al. (2008) due to reclassification of one worker from "other" category to "ER."

seeking care at each location (MHC, ER, other, or no treatment) did not differ significantly between the two study regions nor did the distribution of injuries by mechanism. Therefore, data from both surveys was pooled for the remainder of the analyses.

Mechanisms of Injury

Combined survey data showed the most common mechanism to be musculoskeletal strain/sprain ($n = 22$; 39.3%). Chemical or irritant exposures (including natural irritants such as dust, poison ivy, sun and heat exhaustion/stroke) accounted for 13 injuries (23.2%), followed by cuts from tools or machines ($n = 11$; 19.6 %), strikes by an object ($n = 4$; 7.1%), and falls ($n = 4$; 7.1%). Two injuries (3.6%) were classified as other or unknown. No statistically significant differences were found in the distributions of mechanisms for injuries treated at MHCs versus all other sources.

Chart Review

Of the 241 cases identified through chart review, 139 (57.7%) were musculoskeletal strain. This was followed by chemical or natural irritant exposure ($n = 34$; 14.7%), cuts from tools or machines ($n = 19$; 7.9%), being struck by an object ($n = 19$; 7.9%), and falls ($n = 16$; 6.7%). Fourteen injuries (5.8%) were classified as other or unknown.

The chart review showed the vast majority of injuries treated at the MHCs to be nontraumatic (83.7%). Conversely, the majority of injuries (88.5%) treated in emergency rooms were traumatic.

Application to Previous Chart Review Surveillance Data

Combining adjusted injury counts from our previous study's chart review data (corrected using the 1.87 multiplier) with the estimated worker hours at risk from previous research,^{16,17} the statewide occupational injury incidence was 7.9 injuries per 100 FTE per year for Maine and 11.7 per 100 FTE per year for New York (Table 3).

TABLE 3. Projected Statewide Average Annual Injury Count, Applying Survey-Derived Multipliers to Maine and New York MHC Chart Review Data (2001 and 2002 Data)

Treatment location	Maine	New York	Combined
Observed MHC	52	278	330
Estimated ER	14	74	88
Estimated other	16	84	100
Estimated no treatment	16	84	100
Projected total cases	98	520	618
Injury incidence per 100 FTE per year	7.9	11.7	10.8

DISCUSSION

Given the differences in the farmworker populations and migrant health care programs in these two states, the congruence in occupational injury mechanisms and health care utilization patterns is noteworthy. Muscular strain/sprain was the leading mechanism. This is consistent with the authors' previous chart review study and other studies.^{7,18}

It is important to note that our results relate to workers within the catchment regions of local migrant health centers. Other researchers have found similar utilization patterns for general health care as those observed for occupational health care in this study. In Chi's survey of farmworkers in Wayne County, New York, he found that 53% of those interviewed received general care from the local MHC¹². Similarly, Slesinger and Cautley's survey from Wisconsin³ found that "more than half" of interviewees received general health care from the MHC. In contrast, a study by White-Means⁴ in Orange County, New York, found that only 38% of farmworkers used the MHC for general health care.

The authors had previously used only MHC chart reviews to identify cases.⁷ However, current survey data show that not all cases can be captured through this method because only 53.6% of injured farmworkers sought treatment at the MHC. These survey findings make it possible to develop a mathematical multiplier to adjust for cases seeking care elsewhere or choosing not to seek care: ($1/0.536 = 1.87$).

Dividing these corrected counts by the estimated FTE at risk^{16,17} yields an estimate of annual statewide morbidity in Maine and New York. Our estimates of 7.9 injuries per 100 FTE in Maine and 11.7 per 100 FTE in New York are similar to other published rates for this population. Two separate studies of farmworker occupational injury in California have shown rates of 9.3¹⁸ per 100 FTE and 12.7¹⁹ per 100 FTE, respectively, whereas a study in Texas showed an injury rate of 12.5 per 100 FTE.²⁰

The fact that more than 88% of farmworker injuries treated at ERs were classified as “traumatic” implies that this population is not using ERs as a source of primary care, as has been suggested elsewhere.¹³ Although ERs treat a small overall proportion of farmworker injuries, it is clear that they treat the majority of farmworker occupational trauma. In contrast, less than 17% of injury cases seen at the MHC were traumatic.

Our survey found no significant difference between the distributions of mechanisms for injuries treated at MHCs versus those treated elsewhere or receiving no treatment. This finding, when combined with the data on traumatic versus nontraumatic injury, indicates that the primary difference between cases identified at MHCs versus ERs is most likely one of urgency.

Our survey had some important methodological strengths. It provided a single source of data for all different sources of care, and also provided data on untreated cases. Survey methods also have well known weaknesses, including recall bias, and the lack of detail in self-reported information. In our survey, contributing factors and specific diagnoses were often not captured. Therefore, stratification of injuries was necessarily based on a mixture of diagnoses and mechanisms. Also, it is possible that the most seriously injured or ill farmworkers would have left the area before being surveyed.

In contrast, for chart review methods, concerns related to self-report bias are alleviated. For injuries identified at the MHCs, detailed information about injury events and contributing factors were frequently included in the medical note. However, chart review methods also have some disadvantages. Because these

methods are typically applied at only one or two sources of care, the data may not be applicable to the local farmworker population at large, which may be seeking care at multiple locations.

There are additional challenges associated with chart reviews at ERs as compared to MHCs. In many areas, farmworkers might go to any one of a number of ERs, making the case yield within any one ER small. Gathering information on so few cases is quite labor intensive, and has discouraged hospitals from participating. Although the study had obtained the necessary administrative approvals to conduct ER chart reviews in Maine, it turned out not to be possible to perform this review.

CONCLUSIONS

It appears that a combination of MHC chart review and worker surveys can be used to estimate farmworker occupational morbidity. From our survey, it is evident that a surveillance system based solely on MHC chart reviews would underestimate total injury counts by roughly half. We present one option to account for cases treated elsewhere or not seeking treatment in the form of a survey-derived multiplier (1.87) to adjust MHC chart review injury counts.

An MHC-only surveillance system would miss the majority of occupational trauma, which could be identified through logistically difficult ER chart reviews. Survey results indicate that adding an ER chart review component to the MHC chart review would have identified 67.9% of all farmworker occupational morbidity. A multiplier of 1.47 ($1/0.679$) would still be required to account for cases treated at other locations or not seeking treatment.

The similarity of findings between these two distinct agricultural regions (Maine and New York) suggests that our results may generalize to farmworkers throughout the Northeast. However, it remains unclear whether similar health care utilization or occupational injury patterns would emerge when gathered from farmworkers outside this area. Further research is required to address this issue.

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