

**WAGES, WAGE VIOLATIONS, AND PESTICIDE SAFETY  
EXPERIENCED BY MIGRANT FARMWORKERS IN NORTH  
CAROLINA\***

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same time, farmworkers have limited access to health services [4] and to culturally

higher of the applicable state minimum wage or the federal minimum wage established by the Fair Labor Standards Act (FLSA). Immigrant farmworkers with H-2A visas must be paid the highest of 1) the Adverse Effect Wage Rate (AEWR) for the county in which they work; 2) the “prevailing rate” for a given crop, task, and area; or 3) the federal or applicable state minimum wage [30]. The Adverse Effect Wage Rate is a separate minimum wage set by the Department of Labor that will not have adverse effects on employment opportunities of United States workers [31]. The prevailing rate is established by the Department of Labor and reflects the hourly wage paid to the majority of workers in the largest city in each county [32].

### Aims

This analysis uses survey data collected from migrant farmworkers in eastern North Carolina to address three aims. First, it describes the wages and the presence of minimum wage violations among farmworkers. Second, it determines whether minimum wage violations are associated with personal characteristics of farmworkers. Finally, it determines whether minimum wage violations are related to violations of pesticide safety regulations.

## METHODS

This research is based on a community-based participatory research program that began in 1996. The primary partners for this collaboration are the North Carolina Farmworkers Project, a nonprofit service and advocacy organization located in Benson, North Carolina, and Wake Forest University School of Medicine. Data for this analysis are from a cross-sectional survey of migrant farmworkers completed from June through August, 2009. The Wake Forest University Health Sciences Institutional Review Board reviewed and approved the study protocol.

### Locale

This study includes migrant farmworkers in three eastern North Carolina counties: Harnett, Johnston, and Sampson. Migrant farmworkers in these counties include those who are documented permanent residents of the United States, those who have temporary H-2A work visas, and those who are undocumented. These farmworkers are overwhelmingly from Mexico. The levels of pesticide exposure experienced by farmworkers in these counties have been documented in previous studies [15, 19, 20]. These studies show that farmworkers in North Carolina are exposed to a variety of pesticides, including several organophosphorous and pyrethroid insecticides, carbamate fungicides, and numerous herbicides. These farmworkers are repeatedly exposed to these pesticides across the agricultural season. Many of these farmworkers are not provided with the training and field sanitation resources required by regulation to protect them from pesticide exposure [2]. Migrant farmworkers in these counties, including documented United States permanent residents, those with H-2A visas, and those who are undocumented, generally live in grower-provided housing, referred to as camps. Substandard conditions are common in North Carolina migrant farmworker camps. Based on repeated measures data, Vallejos and colleagues [33] report that at any point in the 2007 agricultural season, between 11 percent and 44 percent of camps had inadequate bathing, laundry, or storage facilities. When housing was assessed in 2008, 89 percent of camps had more than one condition that violated the Migrant Housing Act standards.

Farmworkers in this region commonly experience several additional health problems. Some of these health problems, such as green tobacco sickness [34], skin disease [35], and eye symptoms [36], result from occupational exposures. Other health problems, such as food insecurity [37], human immunodeficiency virus (HIV) and other sexually transmitted

infections [38], and psychological problems [39] are related to poverty and migratory lifeways.

### Participant Recruitment

Participant recruitment and selection involved two steps: 1) identifying and selecting camps; and 2) identifying and selecting workers within camps. As camps are widely distributed and not occupied every year, an approach similar to that described by Arcury and colleagues [35, 40] was used. The North Carolina Farmworkers Project serves the camps in the study counties. They provided their list of camps to the study team. Camps from the list were selected and visited in random order. If a randomly selected camp was not being used, interviewers went to the next camp on the randomized list. Access and participation of farmworkers in these camps was facilitated by the long-term relationship and trust between the North Carolina Farmworkers Project staff members and farmworkers in these counties. Following the standard procedures of this research program, growers were not consulted before camps were approached for participation. According to North Carolina law, farmworkers are considered *de facto* renters and they have the right to have any visitors whom they choose, including occupational health researchers. However, if a grower is present at a camp and asks the researchers to leave, they comply so as not to endanger themselves or the farmworkers.

A census was completed at the selected camps in which farmworkers gave preliminary consent to participate. Farmworkers at each camp were recruited from the census list; up to six participants were recruited at each camp. The overall sample size included 300 farmworkers recruited from 52 camps. Farmworkers at 62 camps were asked to participate in the study; workers at eight camps declined to participate, and growers refused to allow study personnel to recruit at two camps. At the 52 camps included in the sample, 157 individuals refused to participate, for a participation rate of 66 percent (300/457). Reasons for the refusals by camps and individuals were not recorded.

### Data Collection

Data collection included an interviewer-administered questionnaire. Questionnaire items addressed participant demographic and background conditions, hours worked, method of determining payment, and pesticide safety and safety training. The questionnaire was developed in English and translated into Spanish by a native Spanish speaker familiar with Mexican Spanish and farmworker vocabulary. Five farmworkers were recruited to pretest the questionnaire. Modifications to the questionnaire were made based on farmworker feedback. This approach to questionnaire development has been consistently used in this community-based participatory research program, and it has provided reliable and valid information.

The Spanish-speaking interviewers were former farmworkers who have had a long-term association with the North Carolina Farmworkers Project. Their backgrounds and their association with the North Carolina Farmworkers Project were helpful in establishing trust with the farmworkers participating in this study. The interviewers completed a one-day program conducted by investigators and project coordinators. The program included a thorough review of camp and participant selection, recruitment procedures, and interview data collection procedures. All participants provided signed informed consent before data collection began. Participants received an incentive of \$20 for participating in the study.

### Measures

Analysis is based on three sets of measures derived from the questionnaire data: 1) participant wages and earnings in the current agricultural season; 2) personal characteristics;

and 3) adherence to pesticide safety and training regulations. Measures of actual wages that participants received and whether a minimum wage rate violation occurred were determined by a series of questions on hours worked, total earnings, and whether earnings were based on an hourly rate, a daily rate, or a piece rate (e.g., paid by the bucket or by the barn). If a participant was paid hourly and reported an hourly rate that was below the current federal minimum wage, a minimum wage violation was recorded. If a participant was paid on a piece rate, effective hourly earnings were derived by dividing amount paid per unit (e.g.,

A greater percentage of those without an H-2A visa than with an H-2A visa were female (12.3% versus 1.0%). A greater percent of those without an H-2A visa were under 25 years of age (28.3% versus 14.9%), and had less than seven years of education (68.9% versus 45.4%). Those without an H-2A visa had less experience in U.S. agriculture; 23.6 percent of those without an H-2A visa were in their first year compared to 8.2 percent of those with an H-2A visa. More of those without an H-2A visa spoke English (17.9% versus 8.2%), and spoke an indigenous language (29.2% versus 14.9%).

### **Farmworker Wages**

Most farmworkers (90.0%) were paid hourly; two (0.7%) were paid daily; 23 (7.7%) were paid by the bucket; and 12 (4.0%) were paid by the barn (Table 2). A smaller percentage of participants without H-2A visas were paid hourly than were participants with H-2A visas (84.9% vs. 92.8%). A greater percentage of workers without H-2A visas were paid by the bucket than were participants with H-2A visas (17.0% versus 2.6%). A smaller percentage of participants without H-2A visas were paid by the barn than were participants with H-2A visas (none vs. 6.2%).

Five participants (1.7%) reported having difficulty in obtaining their pay from their supervisors; two (1.9%) were workers without H-2A visas and three (1.5%) were workers with H-2A visas. Fifty-five (18.3%) of the farmworkers reported wages that fell below the federally mandated minimum wage. Forty-eight (45.3%) of the workers without H-2A visas reported wages that fell below minimum wage. Seven (3.6%) of the workers with H-2A visas reported wages that fell below the minimum wage.

### **Personal Characteristics and Wage Violations**

Almost all farmworkers with H-2A visas reported receiving correct wages. Therefore, all remaining analyses of minimum wage violations were limited to workers without H-2A visas. Among farmworkers without H-2A visas, no associations between worker personal characteristics and wage violations were statistically significant (Table 3).

### **Farmworker Pesticide Safety and Training**

Many of the farmworkers reported a lack of adherence to pesticide safety regulations where they worked (Table 4). Only a third (34.8%) reported being provided pesticide safety instruction by their supervisor, and 14.8 percent were provided with pesticide safety equipment. About half were told when pesticides were applied (51.0%) and when the no-reentry interval had ended (51.3%). About one-quarter (25.2%) were asked to enter fields before the no-reentry interval had ended, 16.0 percent worked in fields when pesticides were being applied, and 28.0 percent worked in areas adjacent to fields in which pesticides were being applied. Most (75.3%) had water available in the fields for hand washing, but only 44.3 percent had soap.

The work environments of farmworkers without H-2A visas differed in many aspects of pesticide safety from the work environments of farmworkers with H-2A visas. Farmworkers without H-2A visas were less likely to be provided with pesticide safety equipment (1.4% versus 18.2%), to be told when pesticides were applied (34.9% versus 59.8%), and to be told when the no reentry interval had ended (33.0% versus 61.3%). Fewer of those without H-2A visas reported being asked to enter fields before the no-reentry interval had ended (17.1% versus 29.5%). However, those without H-2A visas more often reported working in fields when pesticides were being applied (21.7% versus 12.9%), and working in areas adjacent to fields in which pesticides were being applied (41.5% versus 20.6%).



employers who follow the pesticide safety regulations [2, 23]. Workers with H2-A visas are likely to live in housing with fewer violations [33].

Although regulatory scrutiny is far from adequate, the employers of farmworkers with H-2A visas are under far greater scrutiny than are other migrant farmworkers' employers. The greater compliance available to migrant farmworkers with H-2A visas for wages and pesticide safety, as well as housing regulations, indicates that we could expect higher compliance for all farmworkers with more regulations and with greater monitoring and review of these regulations.

Limitations of this study need to be noted when considering the results. First, we could not fully assess H-2A wages because no information was collected to determine the exact crop in which the farmworkers were working or the exact task being completed by workers. This may have affected determining the number of workers with H-2A visas experiencing wage violations. Secondly, farmworkers did not report their paycheck amount, only hours worked and wage rate. Finally, a community partner identified the camps included in this study; camps not known to the community partner could not be included. The study was also limited to the farmworkers present at the time of recruitment. However, the camp list compiled by the community partner was very extensive and was randomized before beginning data collection. A strength of this study is its high participation rate (65.6%).

Implications that arise from this research are the obvious need for designated regulatory staff to oversee farmworker wages. Also, due to the relationship between pesticide safety violations and wage violations, inspectors should investigate for wage violations when pesticide safety violations are found. This could greatly benefit the lives of all farmworkers as well as streamline the process of investigation for inspectors. These results argue for greater regulation and greater enforcement of regulation resulting in safer work and living conditions for all farmworkers.

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## **NOTES**



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Table 1

Participant Characteristics: Farmworkers, Eastern North Carolina, 2009

Personal characteristics	Total sample N = 300		Participants without H-2A visas N = 106 (35.3%)		Participants with H-2A visas N = 194 (64.7%)		p-value
	N	%	N	%	N	%	
Gender							<0.0001
Male	285	95.0	93	87.7	192	99.0	
Female	15	5.0	13	12.3	2	1.0	
Age							0.0023
18 to 24 years	59	19.6	30	28.3	29	14.9	
25 to 29 years	35	11.7	12	11.3	23	11.9	
30 to 39 years	110	36.7	25	23.6	85	43.8	
40 years and older	96	32.0	39	36.8	57	29.4	
Educational attainment							0.0005
0 to 6 years	161	53.7	73	68.9	88	45.4	
7 or more years	139	46.3	33	31.1	106	54.6	
Years in agriculture in the United States							0.0030
1 year or less	41	13.7	25	23.6	16	8.2	
2 to 7 years	141	47.0	53	50.0	88	45.4	
8 or more years	118	39.3	28	26.4	90	46.4	
Language spoken							
Spanish	299	99.7	105	99.1	194	100.0	NA
English	35	11.7	19	17.9	16	8.2	0.0247
Indigenous	60	20.0	31	29.2	29	14.9	0.0387

\* Data missing for one participant.

**Table 2**

**Table 3**

Association of Personal Characteristics and Minimum Wage Violations for Farmworkers without H-2A Visas, Eastern North Carolina, 2009 ( $N = 106$ )

Personal characteristics	Minimum wage violation		Minimum wage adherence		<i>p</i> -value <sup>a</sup>
	<i>N</i>	%	<i>N</i>	%	
Participants without H-2A visas	48	45.3	58	54.7	
Age					0.2298
18 to 24 years	13	27.1	17	29.3	
25 to 29 years	5	10.4	7	12.1	
30 to 39 years	12	25.0	13	22.4	
40 years and older	10	37.5	21	36.2	
Gender					0.9810
Male	40	83.3	53	91.4	
Female	8	16.7	5	8.6	
Educational attainment					0.4973
0 to 6 years	35	72.9	38	65.5	
7 or more years	13	27.1	20	34.5	
Seasons in U.S. agriculture					0.3162
1 year or less	12	25.0	13	22.4	
2 to 7 years	27	56.3	26	44.8	
8 or more years	9	18.8	19	32.8	
Indigenous language					0.2116
No	37	77.1	38	65.5	
Yes	11	22.9	20	34.5	

<sup>a</sup> *p*-value accounts for camp clusters.

**Table 4**Adherence to Pesticide Safety Regulations for Farmworkers, Eastern North Carolina, 2009 (*N* = 300)

Pesticide safety and training regulations	Total sample <i>N</i> = 300		Participants without H-2A visas <i>N</i> = 106		Participants with H-2A visas <i>N</i> = 194		<i>p</i> -value <sup>a</sup>
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Safety instructions given by supervisor	104 <sup>b</sup>	34.8	36	34.0	68 <sup>b</sup>	35.2	0.8874
Safety equipment provided by supervisor	45 <sup>†</sup>	14.8	9 <sup>c</sup>	1.4	36 <sup>b</sup>	18.2	0.1912
Told by supervisor when pesticides applied	153	51.0	37	34.9	116	59.8	0.0074
Told by supervisor when no reentry interval has ended	154	51.3	35	33.0	119	61.3	0.0038
Asked by supervisor to enter field before no reentry interval ended	75 <sup>c</sup>	25.2	18 <sup>b</sup>	17.1	57 <sup>b</sup>	29.5	0.0411

Association of Adherence to Pesticide Safety Regulations and Minimum Wage Violations for Farmworkers without H-2A Visas, Eastern North Carolina, 2009 (N = 106)

**Table 5**

Pesticide safety and training regulations	Minimum wage violation		Minimum wage adherence		p-value <sup>d</sup>
	N	%	N	%	
	N = 48		N = 58		
Safety instructions given by supervisor	14	29.2	22	37.9	0.4621
Safety equipment provided by supervisor	4	8.5	5	8.6	0.9843
Told by supervisor when pesticides applied	11	22.9	26	44.8	0.0077
Told by supervisor when no reentry interval has ended	10	20.8	25	43.1	0.0350
Asked by supervisor to enter field before no reentry interval ended	8	17.0	10	17.2	0.9774
Worked in field when pesticides applied	14	29.2	9	15.5	0.1183
Worked in field adjacent to where pesticides applied	22	45.8	22	37.9	0.5299
Water for hand washing always available in the field	39	81.3	46	79.3	0.8622
Soap for hand washing always available in the field	19	39.6	26	44.8	0.6749
Compliance with regulations – mean (standard deviation)	46 <sup>b</sup>	4.9 (1.9)	58	4.1 (1.9)	0.1399