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## Depression, perceived stress and *nervios* associated with injury in the MICASA Study, a California farm worker population

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**Abstract. Introduction:** While many studies report on the risks of agricultural injury, few have examined psychosocial factors associated with injury, especially among Latino farm workers. We examined psychological factors, including depression, perceived stress, social support and *nervios* that may be associated with an increased risk of injury. **Methods:** MICASA is a population-based study of occupational exposures and health in farm workers. An interviewer-administered questionnaire collected data on 759 Latinos, 18-55 years old, engaged in farm work and residing in Mendota, CA. The questionnaire assessed self-reported psychosocial factors and injury risk. A qualifying injury was defined as one with the need for medical care, going to a medical setting, loss of consciousness,  $\geq 1/2$  day lost work time or restricted from normal activities. **Results:** Mean age was 37.9 years. 65.0% of participants were born in Mexico and 27.7% were born in El Salvador. The past-year cumulative incidence of injury was 9.0%. A higher cumulative incidence of past-year injury was observed among participants older than 40 years (55.9% vs. 37.1%), current smokers (17.7% vs. 10.7%), working in agriculture more than 11 years (65.7% vs. 52.7%), and long-term U.S. residents (more than 21 years) (58.8% vs. 42.6%). After adjusting for age, sex, and current smoking, depression (OR=5.4, 95% CI: 3.1-9.4) and *nervios* (OR=2.2, 95% CI: 1.3-3.8) were significantly associated with injury. **Conclusions:** The findings may be useful for guiding prevention and management of injury. Further cohort research to confirm the temporality of the association between psychosocial variables and injury is needed.

**Keywords.** Farmworker, Stress, Injury, Agriculture, Depression, Perceived Stress, Agriculture, *Nervios*, Latino, Hispanic

### 1. Introduction

Farming is an arduous occupation (Schenker 1996; Schenker 2010) and produces a high number of related injuries. Agriculture ranks among the three occupational groups with the highest occupational fatality rate (Schenker 2010). The occupational fatality rate in agriculture remained high (22/100,000 workers) during the 1990s (Rautiainen and Reynolds 2002). The United States Department of Agriculture (USDA) reported a fatality rate of 28/100,000 workers in 2002. In California, there are more than 20,000

disabling non-fatal injuries each year among agricultural workers, and it is estimated that the actual number may be even higher (Villarejo and Baron 1999). National data suggest that livestock, machinery, and falls are the most important sources for farm worker injury (Meyers 1998). Strains and sprains are the most common injuries among migrant farm workers in California (McCurdy, Samuels et al. 2003).

California's agriculture industry generates products worth over \$36 billion/year, and relies primarily on hired farm labor in all aspects of production (CDFA 2008). Hired farm workers are often

immigrants with little or no safety training who face language and cultural barriers and may experience additional challenges because of their undocumented status (Schenker 2010). These characteristics place farm workers at high risk of injury (Schenker 2010; Villarejo, McCurdy *et al.* 2010).

Psychological hazards have been associated with agricultural work, (Gregoire 2002) including depression (Sanne, Mykletun *et al.* 2004), stress (Simkin, Hawton *et al.* 1998), and low level of social support (Linn and Husaini 1987). The 12 month prevalence of mood disorder was 9.5% in US adult population according to Kessler and colleagues' report (Kessler, Chiu *et al.* 2005). Only half of them received minimally adequate treatment (Wang, Lane *et al.* 2005). Women are 50 % more likely to experience a mood disorder than men during their lifetime. Latinos are more likely to experience a mood disorder than non-Latinos during their lifetime (Kessler, Berglund *et al.* 2005). Linn and Husaini reported a 20% prevalence of depression among Tennessee farm residents (Linn and Husaini 1987). Eight percent of Ohio cash grain farmers screened positive for depressive symptoms (Elliott, Heaney *et al.* 1995), and a 9.3% prevalence of depressive symptoms was reported in Colorado farmers (Stallones, Lefft *et al.* 1995). Depression has been associated with occupational injuries in agriculture (Park, Sprince *et al.* 2001; Tiesman, Peek-Asa *et al.* 2006). However, there have been only few studies on mental health outcomes and injury among Latino farm workers (Alderete, Vega *et al.* 2000).

Compared to non-Hispanic whites and other ethnic groups, a higher prevalence of depressive symptoms was also observed among a Latino adolescent population, especially among those living in rural areas and those with low socioeconomic status (Mikolajczyk, Bredehorst *et al.* 2007). *Nervios* is a culturally-interpreted syndrome which is expressed with a variety of somatic symptoms, such as headaches, fatigue, diarrhea, or dizziness; and psychological symptoms such as feeling sad, irritable, angry, or absent-minded (Salgado de Snyder, Diaz-Perez *et al.* 2000). *Nervios* represents the physical and emotional pain that may arise from family poverty, legal status, gender roles, rural background and social isolation and other stresses, and is expressed in anger and powerlessness (Salgado de Snyder, Diaz-Perez *et al.* 2000). *Nervios* has been significantly associated with stress and depressive symptoms in Latinos (Weller, Baer *et al.* 2008).

The National Institute for Occupational Safety and Health (NIOSH) has identified stress as a serious occupational health problem in agriculture (Carruth and Logan 2002). More than 50% of female farmers have reported symptoms of stress (Berkowitz and Perkins 1985). Social support had ameliorating effects on life stress and was more protective of psychological health among men, compared to women (Falcon, Todorova *et al.* 2009). Despite the importance of psychosocial factors, there are few studies examining these in the context of agricultural injury. The purpose of this study was to assess psychosocial factors, including depression, *nervios*, social support and perceived stress, and their relationship with injury among a population-based sample of Latino hired farm workers in California.

## 2. Methods

### 2.1 Sample description and eligibility

The Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) study is a population-based cohort study of occupational exposures and health in farm workers. Data for this analysis were derived from the MICASA baseline interview undertaken in 2006-2007. Eligible participants included men and women, 18-55 years old, who identified themselves as Mexican, Central American, Hispanic or Latino, with at least one member of the household engaged in farm work for at least 45 days in the last year and residing in Mendota, CA at the time of the interview.

### 2.2 Sample and recruitment

A stratified area probability design was used with census block as the primary sampling unit. A two-stage enumeration was employed to obtain information on age, gender, nationality, farm work, and years living in Mendota for each adult member of the household. Further details of the procedure are documented elsewhere (Stoecklin-Marois, T.E.Hennessy-Burt *et al.* 2011). A random list of eligible, enumerated households was created, and households were approached and asked to participate in the study. There were a total of 467 households, comprising 843 adults who were recruited and completed a baseline interview. Of these, 759 individuals answered "yes" to the question "have you ever worked in agriculture?" and are included in this analysis.

### 2.3 Data collection

All data collection was done by a local field team in Mendota. The interviewer-administered questionnaire assessed demographic characteristics, smoking status, acculturation, nutrition, occupational and environmental risk factors, psychosocial factors such as depression, perceived stress, and *nervios*, as well as a variety of health outcomes including injuries. Baseline interviews were conducted with participants between January 2006 and April 2007. Written consent in Spanish was obtained from each participant, and trained interviewers conducted all interviews in Spanish. Participants received \$15 gift cards for completing the interview. All study procedures were approved by the University of California, Davis Institutional Review Board.

### 2.4 Outcome measurement

A qualifying injury was defined as bodily damage within the 12 months prior to interview due to exposure to energy and requiring the need for medical care, loss of consciousness, at least one-half day of lost work time, or restriction from normal activities. All qualifying injuries, whether occupationally related or not, were included in the analysis.

## 2.5 Exposure measurement

The primary exposure measurements were self-reported assessments of depression, perceived stress, family support, and *nervios*. Depression was assessed with an eight-item screener for depressive disorders developed by Burnam and colleagues, based upon the Center for Epidemiologic Studies Depression Scale (CES-D) (Burnam, Wells *et al.* 1988). These elements are scored and calculate the probability of being depressed using a regression algorithm. A value of 0.06 was used as the cut-point for possible depression, according to suggested criteria by Burnam *et al.*

Perceived stress was measured with a six items drawn from the 14-item Perceived Stress Scale (Cohen, Kamarck *et al.* 1983). Items assessed included: 1) “how often have you dealt successfully with daily problems and hassles?”; 2) “how often have you coped well with important changes that were taking place in your life?” 3) “how often have you felt confident about your being able to handle your personal problems?”; 4) “how often have you been able to control your anger in your life?”; 5) “how often have you felt that you were on top of things?” and 6) “how often did you feel that things were going well?” Responses were assessed on a four-point Likert scale ranging from “never” to “all the time.” Scores for perceived stress were obtained by summing all items and was included as a continuous variable in logistic regression models. The internal reliability coefficient, Cronbach’s alpha for the six items on the Perceived Stress scale was 0.80.

Family support was assessed with seven items drawn from the Family Dimension of the Provision of Social Relations (PSR) Scale (Turner, Grindstaff *et al.* 1990). Participants rated each statement on a Likert scale response ranging from strongly disagree to strongly agree. Items included statements such as: “No matter what happens, I know my family will always be there for me should I need them,” and, “I am not sure if I can completely rely on my family.” Responses were summed to create a continuous index for inclusion in logistic regression models. The internal reliability coefficient, Cronbach’s alpha for the seven items on the Family Support scale, was 0.88.

*Nervios* was assessed by an affirmative response to the question, “Sometimes in your life have you suffered from *nervios*?” (Salgado de Snyder, Diaz-Perez *et al.* 2000). Symptoms of *nervios* assessed were having an idea stuck in your mind, feeling distracted or absent-minded, feeling sad, down or depressed, and feeling irritable or angry. Participants were also asked how much their *nervios* interfered with activities and what they believed caused their *nervios*.

## 2.6 Statistical analysis

Initial descriptive statistic analyses were conducted for injury and the psychosocial exposure measures and important covariates. Logistic regression was subsequently employed to calculate odds ratios (ORs) and 95% confidence intervals (CIs) for assessing the association

between psychosocial exposure variables and injury, with adjustment for relevant potential confounders, including age, gender, current smoking, and years of working in agriculture. Although gender and current smoking were not confounders in this analysis, they were retained in the models because other studies have reported associations with injury (Ratzlaff, Gillies *et al.* 2007). “Years of working in agriculture” was correlated with age and was not a cofounder and thus was not included in models for analyses. Final models were adjusted for age, gender and current smoking. All analyses were conducted using SAS 9.1.3 (Cary, North Carolina, USA).

## 3. Results

### 3.1 Demographic characteristics

Overall, 759 participants, 339 (44.7%) women and 420 (55.3%) men, were included in the present analysis. Ninety-four percent of participants were married or living with someone. More than half worked in agriculture 11+ years, and 64% earned less than \$20,000/year. Nearly two-thirds of the subjects were born in Mexico and 27.6% were born in El Salvador, and the majority of participants were classified as low acculturated. Eleven percent of participants reported they were current smokers (Table 1).

### 3.2 Characteristics of Injury

Sixty-eight (9.0%) subjects reported a qualifying injury within the preceding year. Of these, 50 (74%) were injured requiring treatment, 60 (88%) went to medical settings for help, 10 (15%) were unconscious due to injury, 41 (60%) missed at least ½ day of work, and 24 (35%) reduced work load due to the injury. Injured subjects were more likely to be older than 40 years (55.9% vs. 37.1%), current smokers (17.7% vs. 10.7%), working in agriculture more than 11 years (65.7% vs. 52.7%), and long-term U.S. residents (more than 21 years) (58.8% vs. 42.6%) (Table 1).

### 3.3 Characteristics of depression and *nervios*

Women reported a much higher prevalence of depressive symptoms and *nervios* than men. Participants who earned less than \$20,000/year and those with longer years working in agriculture reported higher prevalences of depression and *nervios* (Table 2). Overall, fifteen percent of participants reported having depressive symptoms, and 29.6% of participants reported having *nervios* (Table 3). *Nervios* was more commonly reported among injured compared with uninjured subjects (46.3% vs. 28.0%) (Table 3). Feeling sad/down and irritable/angry were the most frequently reported *nervios* symptoms (Table 4).

### 3.4 Psychosocial factors and injury

Logistic regression was used to assess associations between psychosocial factors and injury. After adjusting for

**Table 1.** Demographic characteristics of 759 farm worker participants by injury

Characteristic	Overall (n=759)	Non-injury n (%)	Injury n (%)	p-value of chi-square test
<b>Age</b>				0.01
<30	202 (26.6)	192 (27.8)	10 (14.7)	
31-40	263 (34.7)	243 (35.2)	20 (29.4)	
41-50	196 (25.8)	169 (24.5)	27 (39.7)	
50+	98 (12.7)	87 (12.6)	11 (16.2)	
<b>Gender</b>				0.70
Male	420 (55.3)	381 (55.1)	39 (57.4)	
Female	339 (44.7)	310 (44.9)	29 (42.6)	
<b>Family income</b>				0.48
\$0-10,000	144 (19.5)	126 (18.7)	18 (27.7)	
>\$10,000	323 (43.7)	296 (43.9)	27 (41.5)	
>\$20,000	174 (23.6)	162 (24.0)	12 (18.5)	
>\$30,000	98 (13.3)	90 (13.4)	8 (12.3)	
<b>Marital status</b>				0.34
Married/live w/someone	711 (93.8)	648 (93.9)	63 (92.6)	
Divorce/separated/widow	18 (2.4)	17 (2.5)	1 (1.5)	
Single (never married)	29 (3.8)	25 (3.6)	4 (5.9)	
<b>Country of birth</b>				0.46
US	32 (4.2)	29 (4.2)	3 (4.4)	
México	493 (65.0)	443 (64.1)	50 (73.5)	
El Salvador	210 (27.7)	196 (28.4)	14 (20.6)	
Other	24 (3.2)	23 (3.3)	1 (1.5)	
<b>Education level</b>				0.35
No school	43 (6.2)	39 (6.1)	4 (6.5)	
Primary education or less	393 (56.4)	353 (55.6)	40 (64.5)	
> primary education	261 (37.5)	243 (38.3)	18 (29.0)	
<b>Years of working in agriculture</b>				0.01
0-5 years	164 (21.8)	152 (22.2)	12 (17.9)	
6-10 years	183 (24.3)	172 (25.1)	11 (16.4)	
11+ years	405 (53.9)	361 (52.7)	44 (65.7)	
<b>Years of living in the US</b>				0.06
0-5 years	109 (14.4)	103 (15.0)	6 (8.8)	
6-10 years	162 (21.4)	149 (21.7)	13 (19.1)	
11-20years	152 (20.1)	143 (20.8)	9 (13.2)	
21+years	333 (44.1)	293 (42.6)	40 (58.8)	
<b>Acculturation level</b>				0.43
Low	701 (94.6)	639 (94.8)	62 (92.5)	
Medium/high	40 (5.4)	35 (5.2)	5 (7.5)	
<b>Current Smoking</b>				0.07
Yes	86 (11.4)	74 (10.7)	12 (17.7)	
No	672 (88.7)	616 (89.3)	56 (82.3)	

note: p-value for differences between injury and non-injury across the demographic variables



**Table 2.** Demographic characteristics of farm worker participants by depression and nervios

	Non-depression n (%)	Depression n (%)	P-value	Non-nervios n (%)	Nervios n (%)	p-value
<b>Age</b>			0.03			0.26
<30	175 (27.3)	27 (22.9)		146 (27.6)	54 (24.2)	
31-40	232 (36.2)	31 (26.3)		189 (35.7)	73 (32.7)	
41-50	155 (24.2)	41 (34.8)		125 (23.6)	68 (30.5)	
50+	79 (12.3)	19 (16.1)		70 (13.2)	28 (12.6)	
<b>Gender</b>			0.0002			0.001
Male	373 (58.2)	47 (39.8)		333 (62.8)	84 (37.7)	
Female	268 (41.1)	71 (60.2)		197 (37.2)	139 (62.3)	
<b>Family income</b>			0.0003			0.004
\$0-10,000	105 (16.8)	39 (33.9)		85 (16.4)	58 (26.7)	
>\$10,000	285 (45.7)	38 (33.0)		226 (43.7)	94 (43.3)	
>\$20,000	148 (23.7)	26 (22.6)		135 (26.1)	38 (17.5)	
>\$30,000	86 (13.8)	12 (10.4)		71 (13.7)	27 (12.4)	
<b>Marital status</b>			0.25			0.05
Married/live w/someone	604 (84.4)	107 (90.7)		502 (94.9)	204 (91.5)	
Divorce/separated/widow	13 (2.0)	5 (4.2)		8 (1.5)	10 (4.5)	
Single (never married)	23 (3.6)	6 (5.1)		19 (3.6)	9 (4.0)	
<b>Country of birth</b>			0.32			0.06
US	27 (4.2)	5 (4.2)		16 (3.0)	15 (6.7)	
México	412 (64.3)	81 (68.6)		353 (66.6)	137 (61.4)	
El Salvador	184 (28.7)	26 (22.0)		147 (24.7)	61 (27.4)	
Other	18 (2.8)	6 (5.1)		14 (2.7)	10 (4.5)	
<b>Education level</b>			0.46			0.24
No school	36 (6.1)	7 (6.6)		32 (6.6)	10 (4.8)	
Primary education or less	328 (55.5)	65 (61.3)		281 (57.9)	111 (53.4)	
> primary education	227 (38.4)	34 (32.1)		172 (35.5)	87 (41.8)	
<b>Years of working in agriculture</b>			0.73			0.06
0-5 years	142 (22.3)	22 (19.1)		106 (20.1)	56 (25.6)	
6-10 years	155 (24.3)	28 (24.4)		123 (23.3)	60 (27.4)	
11+ years	240 (53.4)	65 (56.5)		298 (56.6)	103 (47.0)	
<b>Years of living in the US</b>			0.99			0.52
0-5 years	91 (14.3)	18 (15.3)		74 (14.0)	34 (15.3)	
6-10 years	137 (21.5)	25 (21.2)		115 (21.8)	47 (21.2)	
11-20years	128 (20.1)	24 (20.3)		100 (18.9)	51 (23.0)	
21+years	282 (44.2)	51 (43.2)		239 (45.3)	90 (40.5)	
<b>Acculturation level</b>			0.41			0.006
Low	595 (94.9)	106 (93.0)		501 (96.2)	196 (91.2)	
Medium/high	32 (5.1)	8 (7.0)		20 (3.8)	19 (8.8)	
<b>Current Smoking</b>			0.85			0.53
No	568 (88.8)	104 (88.1)		471 (89.0)	195 (87.4)	
Yes	72 (11.3)	14 (11.9)		58 (11.0)	28 (12.6)	

note: p-value for differences between depression and non-depression, nervios and non-nervios across the demographic variables

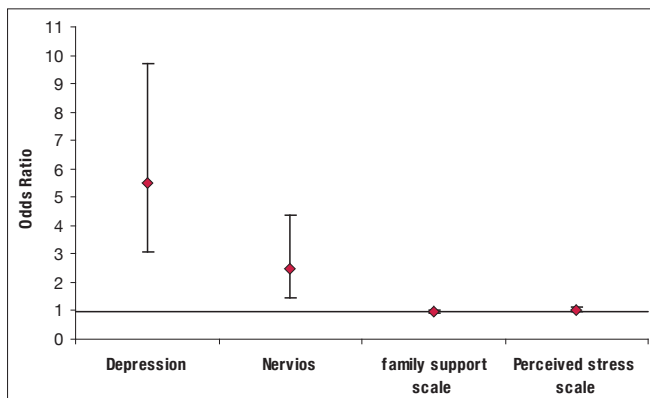
**Table 3.** Distribution of psychosocial variables

	Non-injury	Injury	p-value
<b>Nervios n (%)</b>			<0.001*
No	494 (72.1)	36 (53.7)	
Yes	192 (28.0)	31 (46.3)	
<b>Depression scores, mean (SD)</b>	0.05 (0.15)	0.16 (0.25)	0.001**
<b>Family support scores, mean (SD)</b>	13.97 (3.91)	13.8 (3.78)	0.70**
<b>Perceived stress scores, mean (SD)</b>	5.14 (3.34)	5.50 (3.47)	0.42**

\*: chi-square test    \*\*: two-sided *t* test

**Table 4.** Prevalence of psychological symptoms of nervios among men and women

	Women (N =339)	Men (N =420)	P-value Chi-square test
Nervios Symptoms	n (%)	n (%)	
Having ideas stuck in mind	119 (35.5)	87 (20.8)	0.0001
Distracted or absent-minded	146 (43.3)	140 (33.5)	0.006
Sad, down or depressed	293 (86.7)	317 (75.7)	0.0001
Irritable or angry	305 (90.2)	345 (82.3)	0.002
Nervios interfered with activities	131 (40.8)	74 (18.8)	0.0001



note: models adjusted for age, sex and current smoking

**Figure 1.** Adjusted ORs and 95% CI for psychosocial factors associated with injury in California farm workers

age, sex, and current smoking, depressive symptoms were significantly associated with injury (OR=5.4, 95% CI: 3.1-9.4) (Figure 1). Participants reporting *nervios* had more than twice the odds of injury compared to those without *nervios* (OR=2.2, 95% CI: 1.3-3.8). Perceived stress and levels of family support were not associated with injury.

#### 4. Discussion

The goal of this analysis was to assess whether psychosocial factors are associated with injury among Latino farm workers. Depression and *nervios* were both associated with injury, whereas perceived stress and family support showed no association with injury.

A consistent association of depression with the risk of injury has been found in previous studies. Tiesman and colleagues reported that depressive symptoms predicted injury in a prospective study of 1493 Iowa farm residents (Tiesman, Peek-Asa *et al.* 2006). Park and Sprince reported that depressive symptoms were significantly associated with injury, with odds ratios up to 3.22 in a cohort study of Iowa farmers (Park, Sprince *et al.* 2001). Researchers also found that feeling irritable, feeling depressed and having difficulty sleeping were associated with an increased risk of injury in a cohort study of Ohio grain workers (Atrubin, Wilkins *et al.* 2005). These studies lend support to our finding that depression is associated with injury.

There was a strong association between

depression and injury in our study, with the results suggesting that participants who had depressive symptoms were nearly six times more likely to have been injured at work than those without depressive symptoms. One possible mechanism is that depression reduces concern about personal protection leading to injury (Beseler and Stallones 2010). It is also possible that psychological stress impedes a worker’s perception, assessment, judgment, and ability to respond to short-term demands on attention and readiness (acute stress reaction) (Schaubroeck and Ganster 1993), degrading safety performance and ultimately leading to injury (Kidd, Scharf *et al.* 1996).

In the Ontario Farm Family Health Study (Simpson, Sebastian *et al.* 2004), financial concerns were a prominent source of stress. Financial problems were significantly associated with depression in Colorado farm workers (Beseler and Stallones 2010), a population in which depression was associated with injury. In our study, income was also associated with depression, and injury was more frequent among participants earning less than \$10,000/year. As two-thirds of participants earned \$20,000 or less annually in our study, financial concerns are likely to be important for this population. For example, financially stressed workers paid piece-rate may work at a rapid and unsafe pace to maximize income, increasing the risk of injury (McCurdy, Samuels *et al.* 2003).

In the Mexican American Prevalence and Services Survey (MAPSS), Mexican immigrants had a lower rate of psychiatric symptoms and disorders than did US-born Mexican Americans migrant farm workers in Fresno County, California (Alderete, Vega *et al.* 2000). However, a cross-national study found that migrants were at higher risk than non-migrants for psychiatric symptoms (Breslau, Borges *et al.* 2011). The prevalence of psychiatric symptoms might be more strongly associated with the age at migration rather than the duration of living in the U.S. based on the finding that Mexican-origin Latinos who spent their childhood in the U.S. had worse mental health status than those who did not migrate (Breslau, Borges *et al.* 2011). In our study, increased age was significantly associated with depression. No association was observed between depression and acculturation or years of living in the U.S.

Hispanic immigrants are less likely to use mental health services compared to non-Hispanics, but they do use general practitioners over specialists for mental health care (Vega,

Kolody *et al.* 1999). They prefer counseling or counseling plus medication over antidepressant medication alone (Dwight-Johnson, Lagomasino *et al.* 2010). It has been suggested that individual education, transportation assistance, family involvement, providing Spanish-speaking staff, and offering different services in a single community primary care location could improve attendance and keep them in treatment (Santiago-Rivera, Kanter *et al.* 2010) so as to better control depressive symptoms and decrease the risk of injury.

*Nervios* was strongly associated with injury in our study. Chen *et al.* reported that many personality traits are associated with increasing risks of unintentional injuries. One possible mechanism may be poor judgment and impulsivity leading to injuries (Chen, Sinclair *et al.* 2008). We are not aware of any literature reporting *nervios* associated with injury among farm workers.

In an Ontario farm family health cross-sectional study, a significant association was observed between perceived stress and farm injury among operators working on farms (Simpson, Sebastian *et al.* 2004). However, in our study we did not observe an association between perceived stress and injury. This may relate to social and cultural differences between the predominantly White Ontario population and our Hispanic population, potentially affecting both risk for injury and reporting.

Social support is viewed as a protective factor according to the stress buffering model of social support (Cohen and Wills 1985). However, we did not find a significant association between family support and injury. Social support may not play a key role in preventing injury although it may indirectly be associated with injury by mediating stress. Since our population included primarily married subjects, we may also have not included subjects with the least social support (e.g. single males) and our findings may not be generalizable to that population.

There were some limitations in this study: First, temporality of the association is uncertain in cross-sectional studies because of potential reciprocal relationship between depression or *nervios* and injury. *Nervios* was assessed at any time in the person's life. Therefore, it is not certain if the injury preceded or followed the *nervios* condition. Secondly, study data were based on self-report, which is subject to recall bias. Finally, this study focused on Latino farm workers in California, and results might not be generalizable to other industries and ethnic groups.

On the other hand, there were strengths of this study in the use of a representative population-based sample of a hard to reach demographic group, large sample size, and strict data quality control and data management. Although study data are based on self-report, we used standardized questions from the National Health and Nutrition Examination Survey. Interviews were conducted in Spanish by trained personnel, minimizing interview biases. Strict data quality control and management was performed to minimize information bias and ensured the validity and precision of the study.

## 5. Conclusions

Psychosocial variables were strongly associated with injury

in this sample of California Hispanic farm workers. These findings may be useful for guiding prevention and management of injury. For example, persons with psychiatric symptoms, especially depression and *nervios*, represent a high-risk group for injury and may benefit from recognizing this and more intensive educational and other measures for prevention. Also, persons suffering agricultural injury should be evaluated and monitored for psychiatric symptoms that may have preceded their injury or resulted from it. Further research is needed to confirm the temporality of the association between psychosocial variables and injury and to evaluate the effectiveness of prevention and treatment measures.

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