

Health Status of Migrant Farm Workers in South Georgia  
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## **Abstract**

*Objectives:* To evaluate the health status of migrant farmworkers served in the Farm Worker Family Health Program (FWFHP) in Moultrie, GA, and to compare their health status to that of the general U.S. population and Mexican-American population.

*Methods:* We compared the prevalence of elevated blood pressure, overweight, obesity, and elevated blood sugar in the FWFHP population to the general U.S. male and Mexican-American male population.

*Results:* Among men in the FWFHP, prevalence of overweight and obesity, elevated systolic blood pressure, elevated diastolic blood pressure, and high blood sugar were 56.8%, 17.2%, 19.1%, 30.3% respectively. Men in the FWFHP had a higher prevalence of elevated blood pressure and blood sugar but a lower prevalence of overweight and obesity than men in the U.S. and Mexican-American populations. Of the participants in the FWFHP, 43.2% had musculoskeletal complaints.

*Conclusions:* We observed an elevated risk for elevated blood pressure and high blood sugar, but a lowered risk for overweight and obesity in migrant farm workers.

## Introduction

Migrant farmworkers are vital to the agricultural industry in the United States. There are an estimated 4.2 million seasonal and migrant farmworkers working in 42 out of 50 U.S. states.<sup>1</sup> The “Findings from the National Agricultural Workers Survey (NAWS) 2001- 2002” found that approximately 75% of crop farm workers were born in Mexico and 42% were defined as migrants.<sup>2</sup> Georgia is one of the states benefitting from these workers with a \$65 billion agricultural industry, and up to 90% of the crops being harvested by migrant farmworkers in the past.<sup>3,4</sup> Due to working conditions, occupational exposures, low socioeconomic status, mobile lifestyle, separation from family, and other factors, migrant farmworkers face unique health issues and barriers to accessing care.

Over a quarter of farmworkers report experiencing injury due to work.<sup>1</sup> Others report high risk for rash from pesticide exposure, parasitic infections, and stress from long work hours.<sup>5</sup> Apart from the risks inherent to farming, migrant farm workers face additional stressors due to acculturation, language barrier, discrimination, separation from family, and difficulty accessing health care. Despite their great health needs, only 5% of the workers are covered by employer-provided health insurance.<sup>6</sup> Clinics, like the Ellenton Clinic in South Georgia, do exist to provide low cost medical care specifically for migrant workers, but it is reported that only 12-15% of the workers have access to these federally funded services.<sup>7</sup> A study in California found that 31% of workers had never seen a doctor in the United States.<sup>8</sup>

Aside from lack of health insurance, the language barrier, low cultural competence of the clinics, lack of transportation, and high out of pocket costs keep workers from seeking care.<sup>1</sup> The implications for the lack of health care may include undiagnosed hypertension, uncontrolled diabetes, or chronic complications from initially acute issues. Low socioeconomic status, low educational level, and high stress levels among migrant workers may further increase risk of obesity and chronic disease. According to the NAW, the average education level completed among migrant workers was seventh grade, and the average annual income was between \$10,000 and \$12,499.<sup>2</sup>

A survey of migrant farmworkers in North Carolina found that over 50% of the workers reported high stress levels.<sup>9</sup> Another North Carolina study of 125 migrant farmworkers reported 41.6% had depression and 18.4% had impairing anxiety.<sup>5</sup> A survey in South Georgia found lower levels of depression (7%), but also reported that 25% of workers had hypertension, 10% had diabetes, and 8.6% had gastrointestinal disorders.<sup>3</sup> Previous studies have found that foreign-born Mexican Americans actually have lower Body Mass Indexes (BMI) on average than those born in the U.S. and BMI tends to increase with increasing length of residence.<sup>10,11</sup> It is unknown if migrant farmworkers follow this trend. More studies are needed to fully understand the burden of chronic disease in this population.

The purpose of this study was to examine the health status of migrant farmworkers in South Georgia using data from Emory University's Neil Hodgson Woodruff School of Nursing's Farm Worker Family Health Program (FWFHP).

We compared health indicators in our study population to the general U.S. population and the Mexico-born U.S. population to explore the differences between these groups. Health indicators such as BMI, blood pressure, and blood glucose were investigated to explore the risk of chronic diseases such as diabetes and heart disease.

## **Methods**

### *Farmworker Family Health Program*

The Farmworker Family Health Program (FWFHP) exists in order to provide culturally competent health screening services to migrant farmworkers and their families living in South Georgia while serving as an educational service learning experience to students in different health disciplines. The program is run by the Emory University's Neil Hodgson Woodruff School of Nursing in partnership with the Ellenton Clinic, Georgia State University physical therapy department, the University of Georgia College of Pharmacy, and the dental hygiene departments at Clayton State University and Darton College.

The large majority of the migrant farmworkers in the FWFHP have entered the United States on a temporary H-2A visa. This visa allows farms that do not have enough willing workers in the United States to hire workers from other countries for temporary employment. Workers can stay for a maximum of 3 years. This is a unique subset of migrant farm workers, because of the regulations surrounding the H2A visa. Typically the farms are required to provide housing and provision for meals.<sup>12</sup> The FWFHP sets up mobile clinics at these

farms near Moultrie, GA where H2A farmworkers are living. During the June 2013 program, six locations hosted a clinic.

### *Data Collection*

Different stations were set up to measure height, weight, blood pressure, blood glucose, and hemoglobin. Nursing students were responsible for taking the measurements and were trained before arrival. If a high random blood glucose level was found (approximately greater than 130 mg/dL), the workers were sent to the diabetes station. At this station they were given a risk assessment for diabetes from the American Diabetes Association. If the assessment revealed a high risk for diabetes, an HbA1C test was administered. Participants were given basic information on nutrition and physical activity orally and on fact sheets in Spanish. Physical therapy students had a tent to provide care to workers with musculoskeletal complaints; dental hygienist students provided dental checks and education; volunteers provided foot care; and pharmacy students dispensed medications. Any workers that wanted to participate in the clinic could check in at the registration desk and were then guided through the stations. All stations were completely voluntary and translators were available to aid communications.

After the workers attended the various stations, they sat down with a nurse practitioner to discuss the results of their health screening and any health concerns or complaints. At the end of the screening, the workers were given a sheet with their health information, and another copy of the records were left with Emory. At the conclusion of the program, all data was de-identified and entered into a database.

The health indicators included in this study are body mass index (BMI), random blood sugar, blood pressure, hemoglobin, HbA1C, smoking status, and alcohol use status. A BMI of below 18.5 was underweight, between 18.5 and 24.9 was normal, between 25.0 and 29.9 was overweight, and 30.0 and above was obese. High blood sugar was defined as greater than 126 mg/dL. High systolic blood pressure was defined as greater than or equal to 140, and high diastolic blood pressure was defined as greater than or equal to 90. Less than 5.7% was defined as a normal HbA1c test result; 5.7% to 6.4% was defined as pre-diabetes; and 6.5% or higher was defined as diabetes. The workers that were classified as pre-diabetic or diabetic were encouraged to follow-up at the Ellenton Clinic, which provides year-round care to farmworkers in the area.

Comparison data came from the National Health and Nutrition Examination Survey (NHANES) from 2011-2012. The NHANES is a program of the National Center for Health Statistics that uses interviews and physical examinations to gather health information from a representative sample of the United States.<sup>13</sup>

### *Statistical Analysis*

All data analysis was conducted using SAS version 9.3 (SAS Institute, Cary, NC). Women (n=20) were excluded from the FWFHP dataset. All women and participants under 18 years old and over 70 years old were excluded from the NHANES data set. All men between 18 and 70 years old were used as a general U.S. population comparison, and the Mexican-American subset of this population was used for another comparison.

BMI, blood glucose, systolic blood pressure, and diastolic blood pressure means were compared across the three different populations using ANOVA testing. Then the variables were dichotomized into high or normal and compared using a chi-square test. A logistic regression was performed to determine the predictors of high blood pressure in the FWFHP population.

## **Results**

The Farm Worker Family Health Program (FWFHP) saw approximately 437 migrant farm workers in their mobile clinic during June of 2013. 100% of the participants identified as Latino. The overwhelming majority (95.6%) listed Mexico as their country of origin with the rest of the participants coming from El Salvador, Guatemala, and Honduras. Of the participants who were asked if they had any health complaints, 43.2% complained of musculoskeletal pain, 10.4% had a skin complaint such as a rash or burn, 4.06% had a dental complaint, and 2.3% had a foot fungus. 40% of the chief complaints were about other issues.

The FWFHP population had a significantly lower mean BMI compared to the other populations. The odds of the FWFHP participants being overweight or obese were 0.31 times the odds of the Mexican-American male U.S. population and 0.61 (0.4899, 0.7674) times the odds of the general male population being overweight or obese. Of the FWFHP population, 56.8% were classified as overweight or obese compared to 81.2% of the Mexican-American US male population and 68.2% of the general US male population.

The FWFHP population had a significantly higher systolic blood pressure ( $t=6.36$ ;  $p < 0.0001$ ) with a mean difference of 6.65 (95% CI 8.70, 4.59) and a

significantly higher diastolic blood pressure ( $t=10.11$   $p<0.0001$ ) with a mean difference of 8.69 (95% CI 7.00, 10.38) compared to the Mexican-American US male population. The odds of having high systolic blood pressure were 1.72 (1.0772, 2.7469) times higher in the FWFHP population compared to the Mexican-American US male population. The odds of having high diastolic blood pressure were 3.86 (2.1715, 6.8732) times higher in the FWFHP population compared to the Mexican-American US male population. There were similar differences when compared to the general male US population with a mean difference of 4.55 (95% CI 0.85, 15.21;  $t=5.33$ ;  $p<0.0001$ ) in systolic blood pressure and a mean difference of 7.07 (95% CI 0.67, 12.09;  $t=10.61$ ;  $p<0.0001$ ) in diastolic blood pressure. After dichotomizing systolic and diastolic blood pressure into high and low categories, there was not a significant difference in systolic blood pressure but the odds of having high diastolic blood pressure in the FWFHP population were 2.64 (1.983, 3.525) times higher compared to the general US male population.

Logistic regression found glucose level, age, BMI, and hemoglobin to be predictors of high systolic and diastolic blood pressure at an alpha level of 0.15. Only BMI was a predictor of systolic blood pressure at an alpha level of 0.05 with an odds ratio of 1.18 ( $p<0.0001$ ). Age and BMI were the most significant predictors of diastolic blood pressure with odds ratios of 1.08 ( $p <0.0001$ ) and 1.161 ( $p=0.0002$ ) respectively.

There was no significant difference in mean glucose levels between the study population and the Mexican-American US male population, but when

glucose was dichotomized into high and normal, the odds of having high glucose were significantly higher among the FWFHP compared to the Mexican-American US male population. The odds of having high glucose were 2.16 (1.2962, 3.5895) times higher in the FWFHP population. The FWFHP population had a significantly higher mean glucose level than the general US male population ( $t=3.96$ ;  $p<0.0001$ ) with a mean difference of 9.46 (95% CI 4.77, 14.15). The odds of having high glucose were 3.24 (2.3966, 4.3873) times higher in the FWFHP population compared to the general US male population.

*TABLE 1. Characteristics of Farm Workers in the Farm Worker Family Health Program\**

	Workers (n=413)	
<i>Characteristics</i>	n	%
<i>Country of Origin</i>		
<i>Mexico</i>	393	95.62
<i>El Salvador</i>	14	3.41
<i>Guatemala</i>	3	0.73
<i>Honduras</i>	1	0.24
<i>Missing</i>	2	
<i>Chief Complaint</i>		
<i>Musculoskeletal Pain</i>	149	43.19
<i>Skin Complaint</i>	36	10.43
<i>Dental complaint</i>	14	4.06
<i>Foot Fungus</i>	8	2.32
<i>Other</i>	138	40.0
<i>HbA1C**</i>		
<i>Normal</i>	30	51.72
<i>Pre-diabetes</i>	21	36.21
<i>Diabetes</i>	7	12.07
<i>Missing</i>	355	
* Participants under 18 and women were excluded		
**HbA1c was categorized into normal (<5.7%), pre-diabetes (5.7%-6.4%), and diabetes (>=6.5%). Only participants with a high glucose level or risk score were given an HbA1C (n=58)		

<i>TABLE 2. Logistic Regression Analysis of High Blood Pressure in FWFHP Population*</i>				
<i>Outcome: High Systolic Blood Pressure (&gt;=140)</i>				
<i>Covariate</i>	<i>Coefficient</i>	<i>Odds Ratio</i>	<i>Confidence Interval</i>	<i>P-value</i>
<i>**Glucose</i>	0.5607	1.752	0.891, 3.445	0.12
<i>Age</i>	0.0270	1.027	0.992, 1.064	0.07
<i>BMI</i>	0.1632	1.177	1.080, 1.284	<0.0001
<i>Outcome: High Diastolic Blood Pressure (&gt;=90)</i>				
<i>***Glucose</i>	-0.00951	0.991	0.980, 1.001	0.06
<i>Age</i>	0.0741	1.077	1.040, 1.115	<0.0001
<i>BMI</i>	0.1491	1.161	1.066, 1.264	0.0002
<i>Hemoglobin</i>	0.1512	1.163	0.950, 1.424	0.14
<i>* alpha level of 0.15</i>				
<i>**Random glucose dichotomized into high (&gt;=126 mg/dL) and normal</i>				
<i>***Continuous random glucose measurements</i>				

<i>TABLE 3. Comparison of Health Indicators Among the FWFHP study population with all US Males and Mexican-American US males using the ANOVA test</i>				
<i>Population</i>	<i>Study Population from FWFHP N=(413)</i>	<i>NHANES- all males 18-70 years old (n=3211)</i>	<i>NHANES- Mexican-American males 18-70 years old (n=293)</i>	<i>F-statistic (p-value)</i>
<i>Mean Age</i>	31.495 (SE=0.74)	42.39 (SE=0.30)	40.59 (SE=0.87)	92.9 (<0.0001)
<i>Glucose</i>				
<i>Mean</i>	118.81 (SE=2.15)	109.35 (SE=1.13)	115.64 (SE=3.24)	8.34 (0.002)
<i>BMI</i>				
<i>Mean</i>	26.06 (SE=0.31)	28.16 (SE=0.12)	29.35 (SE=0.36)	38.05 (<0.0001)
<i>Systolic Blood Pressure</i>				
<i>Mean</i>	128.24 (SE=0.79)	123.68 (SE=0.33)	121.59 (SE=0.96)	18.08 (<0.0001)
<i>Diastolic Blood Pressure</i>				
<i>Mean</i>	79.98 (SE=0.61)	72.91 (SE=0.25)	71.29 (SE=0.75)	62.76 (<0.0001)

<i>TABLE 4. Comparison of Dichotomized Health Indicators using the Chi-Square Test</i>				
<i>Population</i>	Study Population from FWFHP N=(413)	NHANES- males 18-70 years old (n=3211)	NHANES- Mexican-American males 18-70 years old (n=293)	Chi-Square (p-value)
<i>Glucose*</i>				
<i>Normal</i>	69.68 %	88.17%	83.21%	Normal vs. High
<i>High</i>	30.32 %	11.83%	23%	62.2 (<0.0001)
<i>BMI**</i>				
<i>Underweight</i>	0.81 %	6.27 %	7.19 %	Underweight/Normal vs. Overweight/Obese
<i>Normal</i>	42.82 %	29.78 %	17.47 %	39.9 (<0.0001)
<i>Overweight</i>	43.63 %	33.56 %	36.64 %	All vs. Obese
<i>Obese</i>	12.74 %	30.39 %	38.70 %	72.1 (<0.0001)
<i>Systolic Blood Pressure***</i>				
<i>Normal</i>	82.81 %	85.80 %	89.23 %	Normal vs. High
<i>High</i>	17.19 %	14.20 %	10.77 %	5.47 (0.0648)
<i>Diastolic Blood Pressure***</i>				
<i>Normal</i>	80.87 %	91.79 %	94.23 %	Normal vs. High
<i>High</i>	19.13 %	8.21 %	5.77 %	52.9 (<0.0001)
<p><i>*Glucose was dichotomized into normal (&lt;126 mg/dL) and high (&gt;=126 mg/dL)</i>  <i>**BMI was categorized into Underweight (&lt;18.5), Normal (18.5-24.9), Overweight (25-29.9), Obese (&gt;=30)</i>  <i>***Blood pressure was dichotomized into normal (systolic &lt;140 OR diastolic &lt;90) and high (systolic &gt;=140 OR diastolic &gt;=90)</i></p>				

## Discussion

Data was collected from 413 of the Farm Worker Family Health Program participants. Some participants had incomplete data due to leaving the clinic before completing all of the stations, not wishing to complete a station, or clinic getting rained out early. Almost half of the workers had musculoskeletal complaints indicating that overexertion, muscle fatigue, and injury should be top

concerns when working with farmworkers. Skin complaints were another major category with approximately 10% of the workers complaining of a rash, burn, or other skin irritation or infection. Many of these skin complaints may be due to pesticide exposure. Education is key to preventing pesticide exposure as it has been shown that farm worker's may not perceive dry pesticides as harmful, may not use protective equipment in order to increase work speed, and may delay taking a shower after work.<sup>14</sup>

Measurement of health indicators found that the study participants had on average lower BMIs than the general U.S. male population and the Mexican-American male population. This suggests that migrant farm workers follow the trend of foreign-born Mexican-Americans having lower BMIs than US-born Mexican-Americans.<sup>10</sup> Due to the worker's lack of transportation and long work hours, they are relatively isolated on the farms. This may explain why they have lower BMIs than their Mexican-American counterparts who may have had more time to adapt to an American diet. In this study, we actually found that the Mexican-American population from NHANES had a higher mean BMI than the general US population. However, no data on length of residence in the U.S. or country of birth was included, which may be why this trend was not observed.

The average age of the migrant population was also significantly lower than that of the other populations, which may explain some of the difference in mean BMI. Food insecurity may also play a role in risk of becoming overweight or obese. Migrant farmworkers are at a high risk for food insecurity. A study in Georgia found that 62.8% of workers reported not having enough food. However,

it also found that being an H2A workers was highly protective against food insecurity.<sup>15</sup> Because our study population was primarily H2A workers, there was most likely a lower prevalence of food insecurity. A more likely cause for the difference in mean BMI is the amount of physical labor that each worker does each day, which may be protective against becoming overweight or obese. The relative isolation of the farms may also slow the While the migrant farmworker population may have had a lower prevalence of high BMI, over half of the population is still considered overweight or obese despite their high levels of physical activity. Weight management and nutrition education should still be considered a high priority in this population.

Despite the lower prevalence of high BMI, the study population was at a greater risk for high blood sugar compared to the other populations. In the FWFHP population, 30.2% had high blood sugar compared to 23% of the Mexican-American male population and 11.83% of the general US male population. A probable contributor to the prevalence of high blood sugar in this population is the typical diet of a farmworker. While providing nutrition counseling at the diabetes station, many of the farmworkers reported drinking soda during the work day to keep energized and eating dozens of tortillas each day. Having alternative, sugar-free drinks available during the workday would be helpful in reducing risk of high blood sugar. Another important factor to consider is the environment in which the measurements were taken. During the FWFHP, participants were encouraged to come to the health screening whenever they were available. There was no way to control when the workers had last eaten. So

while the other two populations had true fasting glucose measurements, the worker's measurements were most likely skewed due to recent food or drink intake.

In order to further explore the health of the worker's with high glucose levels more accurately, HbA1c tests were provided. 58 of the workers deemed to be at high risk for diabetes due to their blood sugar measurement and their score on the risk assessment were administered an HbA1c test. Out of these 58 participants, 12.1% were classified as having diabetes, 36.2% were classified as pre-diabetic, and 51.7% were found to have a normal HbA1c. It was important to administer these tests during the health screening, because it is unlikely that many of the workers with high blood sugar measurements would follow up for testing elsewhere due to transportation and financial barriers. They were provided with educational information and those with abnormal HbA1c results were instructed to follow-up at the Ellenton Clinic.

In addition to blood sugar, the study population was also found to be at a greater risk for hypertension. A limitation of the measurements was that only one blood pressure measurement was recorded during the program. In order to account for possible bias, this measurement was compared to the first blood pressure measurement taken in the NHANES populations. Additionally, the worker's often came straight from working in the fields to the screening clinic, which may have biased the results. Despite these limitations, there were still significantly higher rates of high blood pressure in the study population. Stress may be a major contributing factor to the high prevalence of hypertension.

Environmental stressors such as working conditions and hours and living conditions are common among workers. The majority of the workers were separated from their families and living in on-site housing with other workers. The living conditions are often crowded and poorly kept. Due to lack of transportation options, the language barrier, and low socio-economic status, coping with stress may be more difficult for the workers.

Based on the results of this study, migrant farm workers may be at an increased risk for chronic diseases such as diabetes and heart disease due to an elevated risk of hypertension and high blood sugar despite their lowered risk for high BMI. While considering how to improve the health status of migrant farm workers, environmental and policy change will be key factors. Increasing access to health care, providing healthier drink and meal options for workers, and creating a healthy work environment may help decrease risk of chronic disease. Behavioral interventions may be useful for decreasing musculoskeletal injury, increasing effective stress management, and decreasing exposure to pesticides. More studies are needed to further explore the health status of migrant farmworkers and how to improve health in this population.

For diabetes care, the community guide recommends diabetes self-management education to increase quality of life for diabetics in a cost-effective manner. A unique aspect of self-management education is that it can be implemented in different locations making it convenient for the patient. Sufficient evidence is available to implementing the intervention for community gathering places, but more evidence is needed to prove effectiveness in worksites.<sup>16</sup>

Worksite interventions would be convenient for migrant workers by avoiding issues with transportation. Because the workers live on-site, it is relatively easy to access the population for interventions if the support of the farm owners is gained.

To combat the high incidence of hypertension, the Community Guide recommends team-based care to improve blood pressure control and reduce both systolic and diastolic blood pressure. Team-based care involves support from a multidisciplinary team to coordinate care and provide support. This strategy would be very difficult to implement in migrant farm workers due to their mobile lifestyle, language barrier, and limited access to health insurance. The community guide also recommends reducing out-of-pocket costs for medications to control high blood pressure.<sup>17</sup> This may be useful for this population, because of their low SES. However, the recommendation is within the context of health insurance, which is not applicable to the large majority of migrant workers. More research is needed to develop recommendations that are appropriate for the unique needs of a migrant worker.

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