

Principal Investigator:

Thomas A. Arcury, PhD
Center for Worker Health
Wake Forest School of Medicine
336-716-9438
tarcury@wakehealth.edu

Institution:

Wake Forest University Health Science
Medical Center Boulevard
Winston-Salem, NC 27157

Project Title: Agriculture, Forestry, and Fisheries in the Southeast: Immigrant Worker Health

Date: June 19, 2012

Co-investigators:

Michael J. Agnew, PhD
Industrial Ergonomics and Biomechanics Laboratory
Grado Department of Industrial and Systems Engineering
Virginia Tech

Joseph G. Grzywacz, PhD
Department of Family and Community Medicine
Center for Worker Health
Wake Forest School of Medicine

Timothy D. Howard, PhD
Department of Pediatrics
Center for Human Genomics
Wake Forest School of Medicine

Bradley G. Klein, PhD
Department of Biomedical Sciences and Pathobiology
Virginia-Maryland Regional College of Veterinary Medicine
Virginia Tech

Maury A. Nussbaum, PhD
Industrial Ergonomics and Biomechanics Laboratory
Grado Department of Industrial and Systems Engineering
Virginia Tech

Sara A. Quandt, PhD,
Department of Epidemiology and Prevention, Division of Public Health Sciences
Center for Worker Health
Wake Forest School of Medicine

Grant Number: R13 OH009744

Project Starting and Ending Dates: 04/01/2010 – 03/31/12

Date the Final Report was Completed: June 19, 2012

Table of Contents	Page
Title Page	1
Abstract	3
Final Progress Report	4
Scientific Report	5
Background for the Project	5
Specific Aims	6
Methodology	7
Results and Discussion	9
Conclusions	12
References	13
Appendix	17

List of Terms and Abbreviations

AgFF Sector	Agriculture, Forestry, and Fishing Sector
CAFO	Confined animal feeding operations
VT	Virginia Polytechnic Institute and State University
WFSM	Wake Forest School of Medicine

Abstract

Agricultural production in the southeastern United States often requires the hand labor of agricultural workers, and much of this agricultural labor is provided by immigrant, migrant, and seasonal workers, who are largely Latinos/Hispanics from Mexico and other Central American nations, as well as Afro-Caribbeans. A growing number of hired immigrant workers are involved in the production of poultry, hogs and fish in the Southeast due to the increasing demand for labor by confined animal feeding operations (CAFOs). In the Southeast, like agriculture, immigrants are providing the labor needed by the forestry and fishing industries. The forestry and fishing industries share many of the organizational and environmental characteristics of agricultural production. Similarities of the agriculture, forestry and fishing industries include exposure to hazards in the natural environment, use of hazardous machinery, and unconventional work arrangements. Another characteristic common to the agriculture, forestry, and fishing industries is the high rate of occupational injuries. However, although the number of immigrant workers in these industries continues to grow, efforts to delineate the occupational injuries which these workers experience and to reduce these occupational injuries have not kept pace.

A group of investigators from the Center for Worker Health, Wake Forest School of Medicine (WFSM) and Virginia Polytechnic Institute and State University (VT) organized a conference to address the occupational health and safety of immigrant workers in the Agriculture, Forestry, and Fishing Sector. The long term goal of this conference was to improve safety in agriculture, forestry, and fishing, and reduce the occupational injuries and illnesses experienced by workers in these industries by facilitating new research, education, and engineering. This two day conference achieved three specific aims:

1. Consolidate and disseminate current knowledge on immigrant agriculture, forestry, and fishing workers' health and safety by commissioning experts to write reviews of the health and safety problems facing these workers.
2. Delineate the most pertinent directions and areas for health and safety research for immigrant agricultural, forestry, and fishing workers through the presentation and detailed discussion of the commissioned reports.
3. Facilitate the development of working groups to support the implementation of research, education, and engineering projects that can address the major directions and areas identified during the conference.

The 23 conference participants produced five reports that summarize their findings.

- Overview of Immigrant Worker Occupational Health and Safety for the Agriculture, Forestry, and Fishing (AgFF) Sector in the Southeastern United States
- Organization of Work in the Agricultural, Forestry and Fishing Sector in the US Southeast: Implications for Immigrant Workers' Occupational Safety and Health
- Occupational Health Outcomes of Immigrant Workers in the Agriculture, Forestry and Fishing Sector for the Southeastern US
- Health Care Access and Health Care Workforce for Immigrant Workers in the Agriculture, Forestry and Fishing Sector in the Southeastern US
- Occupational Health Policy and Immigrant Workers in the Agriculture, Forestry, and Fishing Sector

Final Progress Report

Key Findings. The reports developed for this conference synthesized current knowledge on immigrant agriculture, forestry, and fishing workers' health and safety. Actual data on the occupational health and safety of immigrant workers in the Agriculture, Forestry, and Fishing (AgFF) Sector, and the risk factors affecting the health and safety of these immigrant workers are limited. Greater effort is needed to obtain an accurate count of the workers in this sector, and to implement a surveillance system documenting the occupational injuries and illnesses among AgFF Sector workers. Work organization in this sector is important to worker health and safety; a systematic program of research and intervention is needed to develop strategies that eliminate or substantially mitigate the deleterious health effects of occupational exposures whose origins likely lie in the organization of AgFF work.

Although immigrant workers in the AgFF sector bear a disproportionate burden of poverty and ill health and additionally face significant occupational hazards, they largely are uninsured, ineligible for benefits, and unable to afford health services. Improving worker access to health care through strengthening and expanding the community health center system, and establishing and sustaining a medical home system would help address health care access for this population. Finally, worker safety policy and regulation in the AgFF Sector is limited. Regulatory protections are generally weaker than other industrial sectors and enforcement of existing regulations is woefully inadequate. A systematic policy approach to strengthen occupational safety and health in the AgFF Sector must address both immigration policy and worker protection regulations.

Translation of Findings. The conference report findings indicate the need for research, intervention, and policy to improve health and safety for immigrant workers in the AgFF Sector. Research should continue to focus on major occupational groups (e.g., migrant farmworkers, tree planters), but with improved surveillance systems. Research should expand to include additional occupational groups, including fishing workers and crab pickers, as well as other demographic groups, including women and children. This research is needed to delineate the characteristics of who is working in the AgFF Sector, their exposures, the health effects of these exposures, and how to prevent these exposures. Intervention is difficult due to a lack of access to work sites. Community approaches, including lay health advisors, which are culturally appropriate and use different media are needed to improve the occupational health of these immigrant workers. Improving policy will require compiling data that documents exposures and health outcomes for these workers. Research also needs to document whether existing regulations are enforced, and areas in which new regulation is needed.

Outcomes/ Impact. The immediate outputs of this conference are the five reports produced by the conference participants.

- Overview of Immigrant Worker Occupational Health and Safety for the Agriculture, Forestry, and Fishing (AgFF) Sector in the Southeastern United States
- Organization of Work in the Agricultural, Forestry and Fishing Sector in the US Southeast: Implications for Immigrant Workers' Occupational Safety and Health
- Occupational Health Outcomes of Immigrant Workers in the Agriculture, Forestry and Fishing Sector for the Southeastern US
- Health Care Access and Health Care Workforce for Immigrant Workers in the Agriculture, Forestry and Fishing Sector in the Southeastern US
- Occupational Health Policy and Immigrant Workers in the Agriculture, Forestry, and Fishing Sector

These reports delineate the most pertinent directions and areas for health and safety research for immigrant AgFF Sector workers.

The immediate outcomes of the conference are the increased collaboration of participants to address research, intervention and policy to improve the occupational health and safety of immigrant AgFF Sector workers. Conference participants have collaborated on several research applications and they have worked together in addressing policy.

Scientific Report

Background for the Project

Immigrant Workers in the Southeastern US: The number of immigrants in the Southeast continues to grow (Table B1). Although no statistics are available documenting the number of immigrant workers in this region, the growing number of these workers is reflected in the growing size of the population. The proportion of these immigrant workers in the Agriculture, Forestry, and Fishing (AgFF) Sector is also large. The National Agricultural Workers Survey (NAWS) indicates that most agricultural workers are Latino (83%), and most were born outside the US, largely in Mexico (75%) (Carroll et al. 2005). Of the 2006 resident population age 16 and older who worked in the past five years in the AgFF Sector in the US, 677,400 of the 3,391,289 workers were foreign-born and 82% of those foreign-born workers were Mexican natives (Pew Hispanic Center 2008).

Immigrant Worker Health in the AgFF Sector:

Agriculture remains a major industry in the Southeast that employs immigrant workers. Agriculture in the Southeast is diverse; it includes fruit and vegetable crops, as well as tobacco and Christmas trees, aquaculture, and confined livestock and poultry feeding operations (CAFOs). Much of the literature on the

State	2007 Number	2007 Percent	2000 Number	2000 Percent	1995 Number	1995 Percent
Florida	3,453	19.10%	2,960	19%	2,178	14.70%
Georgia	953	10.20%	378	4.80%	268	3.70%
Virginia	856	11.40%	552	8.10%	336	5.10%
North Carolina	623	7.00%	373	4.80%	170	2.40%
Tennessee	286	4.80%	110	2.00%	39	0.70%
South Carolina	144	3.40%	65	1.70%	37	1.00%
Alabama	190	4.20%	78	1.80%	73	1.70%
Louisiana	113	2.70%	118	2.70%	103	2.40%
Arkansas	111	4.00%	54	2.10%	39	1.60%
Kentucky	110	2.70%	102	2.60%	22	0.60%
Mississippi	66	2.30%	29	1.10%	31	1.20%
West Virginia	15	1.60%	16	0.90%	15	0.80%

Source: Camarota 2007

occupational injuries and illness of immigrant agricultural workers in the Southeast is summarized by Arcury and Quandt (2007; 2009). This literature documents the pesticide exposure of farmworkers and their families (Quandt et al. 2004; Arcury et al. 2007a, 2012); skin disease among farmworkers (Arcury et al. 2007b; Vallejos et al. 2008); farmworker eye injuries (Quandt et al. 2008, 2012a); oral health deficits of farmworkers and their families (Quandt et al. 2007a, 2007b); green tobacco sickness among farmworkers (Arcury et al. 2001a, 2001b); and mental health of farmworkers (Grzywacz et al. 2006; Hiott et al. 2006). Investigators for this application have conducted analyses of farmworker respiratory health and infectious disease. Little research has documented the occupational health of immigrant workers involved in livestock and poultry production (Quandt et al. 2012b). In general, farmworkers and their families experience extensive occupational and environmental exposures, and high levels of injury and illness.

Forestry includes timber production, maintenance of wildlife habitat, water-quality protection, wilderness preservation, and recreation. This workforce includes individuals involved in harvesting forest and forest-related products or providing resources for forest maintenance. Due to the increasing labor demand, the number of immigrant workers has increased; between 1990 and 2004, 2.4 million Latino immigrants moved to the Southeast in order to meet the demand for forestry, agricultural, and manufacturing jobs (Melton et al. 2007). Tasks such as logging and felling result in high injury rates. Rodriguez-Acosta and Loomis (1997) argue that more training and management responsibility are needed in order to maintain a healthy working environment within the forestry and logging industries. Within the Southeast, most work within the forestry industry is done on private lands, resulting in a lack of federal regulation or oversight. Many immigrant workers lack verbal or literacy skills in English, leaving them isolated, unaware of their basic rights, unable to complain, afraid of losing their jobs, and having to rely on the word of labor contractors (Sarathy & Casanova 2008).

The landscape industry includes aspects of agriculture and forestry. It includes irrigation installation, lawn care, and tree removal. Landscape workers apply pesticides and fertilizers, and use power tools, such as chain saws and mowers. Landscape workers in the United States in 2006 were 41% Hispanic or Latino. Landscape work resulted in 197 deaths between 2003 and 2006 (NIOSH 2008). Most of these injuries can be prevented through training, proper equipment, and hazard control.

Work in fishing results in high rates of injury and illness (Jeebhay et al. 2001; Lipscomb et al. 2004; Marshall et al. 2004). However, little literature documents the health of immigrant workers in the fishery industries. Crab processing is a major industry in this sector that employs immigrant workers. Most workers employed in the crab picking houses are Mexican women with H-2B visas (Aizenman 2007; Selbey et al. 2001). Immigrant workers commonly experience lacerations and chemical irritations of the hands, musculoskeletal injuries, depression, urinary tract infections, and respiratory symptoms (Antol et al. 2006). "Crab rash," a form of irritant contact dermatitis, is also common (Selbey et al. 2001). Medical services available to immigrant workers are generally not sufficient to their needs. Respiratory disease, particularly occupational asthma, has been widely documented among non-immigrant crab processing workers (Cartier et al. 1984; Neis 1995; Ortega et al. 2001; Howse et al. 2006).

Ensuring Occupational Health and Safety: Immigrant workers employed in the AgFF Sector in the southeastern US experience high rates of occupational injury and illness. The fatality rate for foreign-born workers is 5.7 per 100,000 workers. Foreign-born workers comprise about 28% of the workforce in the AgFF Sector; however, "their share of fatal work injuries rose by 60 percent, from one in five agriculture, forestry, and fishing fatalities in 1996 to one in three in 2001" (Loh & Richardson 2004:47). The South had the largest share of foreign-born worker fatalities over the 6-year study period with 37% (Loh & Richardson 2004). About 25% of all fatal injuries sustained by Mexican-born workers between 1996 and 2001 were in the AgFF Sector (AFL-CIO 2005). Substantial research has focused on the occupational health of immigrant workers employed in agriculture. Research has just begun to document the occupational injuries and illnesses experienced by immigrant workers employed in forestry and fishing.

Although the research documenting the occupational health of immigrant workers is growing, few programs exist to ensure the occupational health and safety of these workers. National organizations, such as the National Center for Farmworker Health, Migrant Clinicians Network, and Migrant Health Promotions provide programs for the occupational health of immigrant agricultural workers in specific areas (Booker et al. 1997; Cameron et al. 2006; Hovey et al. 2007; Liebman et al. 2007), but no such programs exist for forestry or fishing workers.

In the Southeast, programs such as Student Action with Farmworkers (<http://saf-unite.org/>) provide occupational health programs for agricultural workers. Investigators at Wake Forest School of Medicine have produced a series of materials and programs aimed at reducing pesticide exposure among farmworkers and their families (Arcury et al. 2000, 2002a, 2004; Lane & Arcury 2003; Lane et al. 2003, 2008). They have also produced health education materials on green tobacco sickness (Arcury et al. 2002b; Quandt & Arcury 2001). However, the Southeast lacks a coherent program of occupational health and safety research and intervention for immigrant workers. The lack of coherent programs for the occupational safety of immigrant workers in the AgFF Sector is a major cause of occupational and social injustice for these workers (Arcury et al. 2009; Melton et al. 2007; Sarathy & Casanova 2008).

Specific Aims

A characteristic common to the agriculture, forestry, and fishing industries is a high rate of occupational injuries. Although the number of immigrant workers in these industries continues to grow, efforts to delineate the occupational injuries that these workers experience and to reduce these occupational injuries have not kept pace. This conference was organized to address the occupational health and safety of immigrant workers in these industries. The long term goal of this conference was to improve safety in agriculture, forestry, and fishing, and reduce the occupational injuries and illnesses experienced by workers in these industries by facilitating new research, education, and engineering. This two day conference addressed three specific aims.

1. Consolidate and disseminate current knowledge on immigrant agriculture, forestry, and fishing workers' health and safety by commissioning experts to write reviews of the health and safety problems facing these workers.
2. Delineate the most pertinent directions and areas for health and safety research for immigrant agricultural, forestry, and fishing workers through the presentation and detailed discussion of the commissioned reports.
3. Facilitate the development of working groups to support the implementation of research, education, and engineering projects that can address the major directions and areas identified during the conference.

Methodology

This conference was designed to meet the three specific aims. The design of the conference included three phases: (1) pre-conference – reports addressing immigrant worker health in the AgFF Sector in the Southeast were commissioned and completed; (2) conference – the reports were presented, critiqued, discussed; and (3) post conference – the reports were revised, edited, and prepared for publication.

Pre-Conference

The Organizing Committee included the application investigators from WFSM and VT: Thomas A. Arcury, PhD, PI and Organizing Committee Chair, Joseph G. Grzywacz, PhD, Timothy Howard, PhD, and Sara A. Quandt, PhD, from WFSM, and Michael J. Agnew, PhD, Bradley G. Klein, PhD, and Maury A. Nussbaum, PhD, from VT. This committee did the actual work of organizing the conference. This committee selected the conference participants and members of each writing group. The committee members critically reviewed the reports before distribution to conference participants. All of the members of this Organizing Committee had expertise related to occupational health, although not all of the members had experience working with immigrant workers. By bringing their expertise to bear through their collaboration in organizing this conference they expected that they could all gain the background to move forward a research agenda on immigrant worker health.

Writing group members / conference participants included representatives from diverse stakeholder groups (Appendix 1), including researchers, cooperative extension professionals, health care providers and health educators, and worker advocates. Writing group members for each report were:

Overview of Immigrant Worker Occupational Health and Safety for the Agriculture, Forestry, and Fishing (AgFF) Sector in the Southeastern United States

Thomas A. Arcury, PhD, Department of Family and Community Medicine, Wake Forest School of Medicine; Center for Worker Health, Wake Forest School of Medicine

Joseph G. Grzywacz, PhD, Department of Family and Community Medicine, Wake Forest School of Medicine; Center for Worker Health, Wake Forest School of Medicine

Jill Sidebottom, PhD, Mountain Conifer Integrated Pest Management, North Carolina State University

Melinda Wiggins, MTS, Student Action with Farmworkers

Organization of Work in the Agricultural, Forestry and Fishing Sector in the US Southeast: Implications for Immigrant Workers' Occupational Safety and Health

Joseph G. Grzywacz, PhD, Department of Family and Community Medicine, Wake Forest School of Medicine; Center for Worker Health, Wake Forest School of Medicine

Hester J. Lipscomb, Division of Occupational and Environmental Medicine, Duke University Medical Center

Vanessa Casanova, Labor Studies and Employment Relations, Rutgers, The State University of New Jersey

Barbara Neis, Department Sociology, SafetyNet Centre for Occupational Health and Safety Research, Memorial University of Newfoundland

Clermont Fraser, North Carolina Justice Center, Immigrants Legal Assistance Project
Paul Monaghan, Department of Agricultural Education and Communication, University of Florida
Quirina Vallejos, Department of Family and Community Medicine, Wake Forest School of Medicine;
Center for Worker Health, Wake Forest School of Medicine

Occupational Health Outcomes of Immigrant Workers in the Agriculture, Forestry and Fishing Sector for the Southeastern US

Sara A. Quandt, PhD, Department of Epidemiology & Prevention, Division of Public Health Sciences, Wake Forest School of Medicine
Maury A. Nussbaum, PhD, Department of Industrial and Systems Engineering, School of Biomedical Engineering and Sciences, Virginia Tech
Kristen L. Kucera, PhD, ATC, Division of Occupational & Environmental Medicine, Department of Community & Family Medicine, Duke University
Courtney Haynes, Department of Industrial and Systems Engineering, School of Biomedical Engineering and Sciences, Virginia Tech
Timothy Howard, PhD, Center for Genomics & Personalized Medicine Research, Wake Forest School of Medicine
Bradley G. Klein, PhD, Department of Biomedical Sciences & Pathobiology, College of Veterinary Medicine, Virginia Tech University
Ricky Langley, MD, MPH, Division of Public Health, North Carolina Department of Health and Human Services
Michael J. Agnew, PhD, Department of Industrial and Systems Engineering, School of Biomedical Engineering and Sciences, Virginia Tech
Jeffrey L. Levin, MD, MSPH, Department of Occupational Health Sciences, University of Texas Health Science Center at Tyler

Health Care Access and Health Care Workforce for Immigrant Workers in the Agriculture, Forestry and Fishing Sector in the Southeastern US

Arthur L. Frank, MD, PhD, Department of Environmental and Occupational Health, Drexel University School of Public Health
Amy K. Liebman, MPH, MA, Migrant Clinicians Network
Bobbi Ryder, National Center for Farmworker Health, Inc.
Maria Weir, MAA, MPH, Department of Family and Community Medicine, Wake Forest School of Medicine; Center for Worker Health, Wake Forest School of Medicine
Thomas A. Arcury, PhD, Department of Family and Community Medicine, Wake Forest School of Medicine; Center for Worker Health, Wake Forest School of Medicine

Occupational Health Policy and Immigrant Workers in the Agriculture, Forestry, and Fishing Sector

Amy K. Liebman, MPA, MA, Migrant Clinicians Network
Melinda F. Wiggins, MTS, Student Action with Farmworkers
Clermont Fraser, JD, North Carolina Justice Center, Immigrants Legal Assistance Project
Jeffrey Levin, MD, MSPH, The University of Texas Health Science Center at Tyler
Jill Sidebottom, PhD, Mountain Conifer Integrated Pest Management, North Carolina State University
Thomas A. Arcury, PhD, Department of Family and Community Medicine, Wake Forest School of Medicine; Center for Worker Health, Wake Forest School of Medicine

Process and Procedures: The writing groups developed their reports under the direction of the lead authors. The lead authors and the organizing committee decided on a standard format for the reports. The key participants (organizing committee and lead authors) had a monthly conference call to discuss progress and problems in writing the reports. Lead authors were free to organize and assign writing responsibilities for their groups. Draft reports were completed during the first six months of the project period. The organizing committee completed critical reviews of the draft reports and lead authors completed revisions. The reports were distributed to all conference participants a month prior to the conference.

Conference

The conference was held October 5-6, 2010. Each writing group had a two hour period in which to present and discuss its report with all of the conference participants. The majority of each two hour working group presentation was an exchange of questions and comments of the working group with the other participants. Participants had the option of providing written comments to the working groups. Each of these working group presentation sessions had a designated reporter, and it was tape recorded. Each writing group had a two hour working session. In this session they summarized the discussion and critical comments of the previous day. The groups made decisions on how they would respond to the suggestions they receive. The 23 conference participants are listed in Appendix 1.

Post-Conference

The lead authors and writing groups used the comments and discussion from the conference to revise their report. The writing groups had the notes and tape recording of their session available to assist in making the revisions. The organizing committee reviewed the revised reports.

The final reports are being assembled into a final conference publication. Several approaches are being used to disseminate the final conference reports. (1) The final reports are being posted on the website of the WFSM Center for Worker Health as down-loadable .pdf files. (2) Availability of the final conference reports is being announced on listserv and newsletters of organizations with members interested in immigrant worker health and research. (3) The final reports are being edited by the lead authors and prepared for submission for publication as a special journal issue.

Results and Discussion

Report 1: Overview of Immigrant Worker Occupational Health and Safety for the Agriculture, Forestry, and Fishing (AgFF) Sector in the Southeastern United States

Background: Manual labor in the AgFF Sector is provided primarily by immigrant workers. Limited information is available that documents the demographic characteristics of these manual workers, the occupational illnesses, injuries and fatalities they experience; or the risk factors to which they are exposed.

Methods: A working conference of experts on occupational health in the AgFF Sector was held to address information limitations. This is the overview report for that conference. Other reports address organization of work, occupational health and safety policy, health outcomes, health care access, and policy.

Contents: This report addresses how best to define the population and the AgFF Sector, occupational exposures for the sector, data limitations, characteristics of immigrant workers, reasons for concern for immigrant workers in the AgFF Sector, regulations, a conceptual model for occupational health, and directions for research and intervention.

Directions for Research and Intervention: Immigrant workers are a major force in the AgFF Sector. Work in the AgFF Sector is dangerous for everyone. However, the characteristics of these workers raise concerns for their occupational health and safety. These characteristics include limited English language skills and limited educational attainment. At the same time, we have very limited information on the number of immigrant workers in the AgFF Sector; their characteristics; the occupational illness, injury, or mortality experienced by these workers; and the occupational health and safety training that is provided to them (or that they need). Current occupational health and safety policy for immigrant workers in the AgFF Sector, particularly those employed in agriculture, is also a concern. Conceptually, several domains should be considered when documenting the risk factors for occupational illness, injury, and mortality among immigrant workers in the AgFF Sector. These domains begin with the diverse occupational exposures in the AgFF Sector and include the characteristics of the immigrant workers, the organization of work, and the healthcare infrastructure. Each of these domains rests on the socio-cultural context of work in this sector.

Needed research on the occupational health and safety of immigrant workers in the AgFF Sector, and research on illness, injury, and mortality of immigrant workers in the AgFF Sector include:

- The accurate count of immigrant workers and all workers across this sector as well as the geographic distribution of these workers. Knowledge of the education and language of these workers is also important for health and safety training.
- A surveillance system for occupational injuries and illnesses among AgFF Sector workers so that we know the issues that health and safety training materials for these workers should address. We need state surveillance systems for the AgFF Sector; state data could then be aggregated to regions and the nation.
- Documentation of the healthcare needs of AgFF Sector workers.
- Delineation of the beliefs of immigrant workers and of their employers about health and safety is lacking. This includes documentation of their perceptions and acceptance of risk and of their health beliefs.
- Understanding of how a migratory life among many of these workers affects their health.
- A thorough review of occupational health and safety policy that will document what policies and regulations are working, which need to be enforced, and which need to be modified or expanded.
- Occupational health and safety training that is culturally, linguistically, literacy, and educationally appropriate for workers and their employers needs to be developed (Arcury et al. 2010).

Report 2: Organization of Work in the Agricultural, Forestry and Fishing Sector in the US Southeast: Implications for Immigrant Workers' Occupational Safety and Health

Background: There is widespread agreement that work organization is an important element of occupational safety and health, but the health effects of many aspects of work organization are likely to vary considerably across different sectors of work and geographies.

Methods: We examined existing employment policies and work organization-related research relevant specifically to immigrant workers in the agriculture, forestry, and fishing sector of the US workforce focusing, when possible, on the southeastern US.

Results: A number of specific aspects of work organization within AgFF subsectors have been described, but most of this literature exists outside the purview of occupational health. There are few studies that directly examine how attributes of work organization that are relevant to the AgFF sector affect workers', much less immigrant workers', occupational health exposures and outcomes.

Conclusions: In contrast to the broader literature, research linking occupational health outcomes to work organization in the AgFF sector is limited and weak. A systematic program of research and intervention is needed to develop strategies that eliminate or substantially mitigate the deleterious health effects of occupational exposures whose origins likely lie in the organization of AgFF work.

Report 3: Occupational Health Outcomes of Immigrant Workers in the Agriculture, Forestry and Fishing Sector for the Southeastern US

Background: Workers in the AgFF Sector experience exposures directly related to the work itself, as well as the physical environment in which the work occurs. Health outcomes vary from immediate to delayed, and from acute to chronic.

Methods: We reviewed existing literature on the health outcomes of work in the AgFF sector and identified areas where further research is needed to understand the impact of these exposures on immigrant Latino Workers in the southeastern US.

Results: Outcomes related to specific body systems (e.g., musculoskeletal, respiratory) as well as particular exposure sources (e.g., pesticides, noise) are reviewed. The largest literature exists for agriculture, with a

particular focus on chemical exposures. Little research in the southeastern US has examined health outcomes of exposures of immigrant workers in forestry or fishing.

Conclusion: As the AgFF labor force includes a growing number of Latino immigrants, more research is needed to characterize a broad range of health outcomes experienced by this population, particularly in forestry and fishing.

Report 4: Health Care Access and Health Care Workforce for Immigrant Workers in the Agriculture, Forestry and Fishing Sector in the Southeastern US

Background: The AgFF Sector workforce in the US is comprised primarily of Latino immigrants. Health care access for these workers is limited and increases health disparities.

Methods: A working conference of experts on occupational health in the AgFF Sector was held to address information limitations. This report addresses health care access for immigrant workers in the AgFF Sector, and the workforce providing care to these workers.

Contents: Immigrant workers bear a disproportionate burden of poverty and ill health and additionally face significant occupational hazards. AgFF laborers largely are uninsured, ineligible for benefits, and unable to afford health services. Community and Migrant Health Centers (C/MHCs) are the frontline of health care access for immigrant AgFF workers. C/MHCs offer discounted health services that are tailored to meet the special needs of their underserved clientele. C/MHCs struggle, however, with a shortage of primary care providers and staff prepared to treat occupational illness and injury among AgFF workers. A number of programs across the US aim to increase the number of primary care physicians and care givers trained in occupational health at C/MHCs. While such programs are beneficial, substantial action is needed at the national level to strengthen and expand the C/MHC system and to establish widely Medical Home models and Accountable Care Organizations. System-wide policy changes alone have the potential to reduce and eliminate the rampant health disparities experienced by the immigrant workers who sustain the vital AgFF Sector in the US.

Policy Implications and Recommendations:

- Strengthen and Expand the Community Health Center System: Migrant Sensitive Health Systems are those that systematically address the health, financial, linguistic, and cultural needs of migrants in need of care. There are a wide variety of programs and interventions that have proven successful in helping immigrants' access health services. These include (1) language services such as interpretation and language-appropriate written materials; (2) cultural competency or culturally-informed care delivery; (3) culturally-tailored health promotion, disease prevention, and disease support programs; and (4) institutional and community-based cultural support staff. C/MHCs with an emphasis on outreach and enabling services and programs that include *promotores de salud* offer a promising model for a migrant-sensitive health system in the US. However, these centers need to be strengthened by focusing policy efforts on issues such as recruiting and retaining clinicians and preparing providers to deal with complex occupational illnesses and exposures. Additionally, cultural competency training is needed for health care providers working with immigrants. Such training should be integrated into all health professional education.
- Partner with Mexican Government Officials: Consideration also should be given to forging a more cooperative working relationship with the Mexican offices of the Secretariat of Health and the Secretariat of Foreign Relations to address the health needs of immigrants of Mexican origin. The Ventanillas de Salud Program demonstrates the feasibility and effectiveness of joint national efforts. Strengthening US-Mexico partnerships to improve health care and the health status of Mexican immigrants is just as critical to both nations as is our partnership against drug trafficking.
- Establish and Sustain a Medical Home System and Accountable Care Organizations: The broad implementation of Medical Home models and Accountable Care Organizations (ACOs), as well as the

provision of funding incentives to sustain them (in the private for profit, private not for profit, and the public sector) could greatly improve health care for AgFF workers and other underserved populations. The Medical Home model is a team-based approach to providing comprehensive primary care that is led by a personal physician who provides continuous and coordinated care throughout a patient's lifetime (American Academy of Family Physicians et al. 2007). An extensive 2008 literature review found that utilization of patient-centered medical homes reduced errors as well as improved outcomes, patient satisfaction, and quality of care (Rosenthal 2008). The Commonwealth Fund 2006 Health Care Quality Survey found, however, that only 15% of Latinos had a medical home, the lowest of any racial/ethnic group (Beal et al. 2007).

Report 5: Occupational Health Policy and Immigrant Workers in the Agriculture, Forestry, and Fishing Sector

Background: Immigrant workers makeup an important portion of the hired workforce in the AgFF Sector, one most hazardous industry sectors in the US. Despite the inherent dangers associated with work in the AgFF sector, worker protection is limited.

Methods: This report describes the current occupational health and safety policies and regulatory standards in the AgFF sector and underscores the regulatory exceptions and limitations in worker protections. Immigration policies and their effects on worker health and safety are also discussed. Emphasis is placed on policies and practices in the southeastern US.

Results: Worker protection in the AgFF sector is limited. Regulatory protections are generally weaker than other industrial sectors and enforcement of existing regulations is woefully inadequate. The vulnerability of the AgFF workforce is furthered by the immigration status of the workers. Agricultural workers in particular are impacted by a long history of "exceptionalism" under the law as many regulatory protections specifically exclude this workforce.

Conclusions: A vulnerable workforce and a high-hazard industry merit regulatory protections, that are at a minimum, provided to workers in other industries. A systematic policy approach to strengthen occupational safety and health in the AgFF Sector must address both immigration policy and worker protection regulations.

Conclusions

This conference accomplished all three of the specific aims presented in the application. The conference participants wrote reports that consolidated current knowledge on immigrant agriculture, forestry, and fishing workers' health and safety. These reports delineate the most pertinent directions and areas for health and safety research for immigrant agricultural, forestry, and fishing workers. The reports are being disseminated for use by other professionals interested in the health and safety of workers in the AgFF Sector. Working groups have been developed that support the implementation of research, education, and engineering projects addressing the major directions and areas identified during the conference. These working groups have worked together on issues of policy, including child labor and housing for immigrant workers in the AgFF Sector. The working groups have written several research applications for projects to document health and safety issues confronting workers in the AgFF Sector. These applications have included a center grant application addressing a variety of immigrant worker health and safety across the AgFF Sector, a competing revision of an existing project to include measures of neurological outcomes of pesticide exposure among immigrant farmworkers, a new application to examine musculoskeletal injuries and prevention among immigrant farmworkers, and a new application to develop improved methods to communicate health and safety information to immigrant workers in the AgFF Sector.

References

AFL-CIO. 2005. Immigrant Workers at Risk: The Urgent Need for Improved Workplace Safety and Health. Available at: http://www.gcir.org/system/files/immigrant_risk.pdf. Accessed February 2, 2009.

Aizenman NC. 2007. Crab processors await decision on guest worker visas. Washington Post, October 13; B01. Available at: www.washingtonpost.com/wp-dyn/content/article/2007/10/12/AR2007101202238_pf.html. Accessed January 22, 2009.

American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), American Osteopathic Association (AOA). 2007. Joint principles of the patient-centered medical home. <http://www.medicalhomeinfo.org/downloads/pdfs/jointstatement.pdf> (Accessed May 2011).

Antol S, Lipscomb J, Kauffman K. 2006. Health issues of female Mexican crab pickers. American Public Health Association 134th Annual Meeting and Exposition, Boston, MA, November 4-8.

Arcury TA, Quandt SA. 2007. Delivery of health services to migrant and seasonal farmworkers. *Annual Review of Public Health*, 28:345-363.

Arcury TA, Quandt SA, eds. 2009. *Latino Farmworkers in the Eastern United States: Health, Safety, and Justice*. New York: Springer.

Arcury TA, Quandt SA, Preisser JS, Norton D. 2001a. The incidence of green tobacco sickness among Latino farmworkers. *Journal of Occupational and Environmental Medicine*, 43:601-609.

Arcury TA, Quandt SA, Preisser JS. 2001b. Predictors of incidence and prevalence of green tobacco sickness among Latino farmworkers in North Carolina, U.S.A. *Journal of Epidemiology and Community Health*, 55:818-824.

Arcury TA, Quandt SA, McCauley L. 2000. Farmworkers and pesticides: community-based research. *Environmental Health Perspectives*, 108(8):787-792.

Arcury TA, Quandt SA, Lane, CM. Jr., Marin T, Rao P. 2002a. El Terror Invisible: Pesticide Safety for North Carolina. [Spanish language pesticide safety education video.]

a. Safety with Pesticides: Pesticide Risk and the Invisible Terror (Seguridad con pesticidas: Riesgos de los pesticidas y el terror invisible): 27 minutes.

b. Pesticide Handler: What's Important to be a Pesticide Handler (Manipulador ¿Qué significa ser un manipulador de pesticidas?): 17.5 minutes.

c. The Green Monster: Green Tobacco Sickness (El monstruo verde: Enfermedad del tabaco verde): 9 minutes. Winston-Salem, NC: Wake Forest University School of Medicine.

Arcury TA, Quandt SA, Norton D. [drawings by Tim Rickard]. 2002b. El Monstruo Verde: La Enfermedad del Tobacco Verde [Spanish language green tobacco sickness safety comic]. Winston-Salem, NC: Wake Forest University School of Medicine.

Arcury TA, Quandt SA, Rao P, Doran A, Early J, Lane C, Marín T. 2004. Programa La Promotora: Pesticide Safety Education Materials. Winston-Salem, NC: Department of Family and Community Medicine, Wake Forest University School of Medicine.

Arcury TA, Grzywacz JG, Barr DB, Tapia J, Chen H, Quandt SA. 2007a. Pesticide urinary metabolite levels of children in eastern North Carolina farmworker households. *Environmental Health Perspectives*, 115:1254-1260.

Arcury TA, Feldman SR, Schulz MR, Vallejos QM, Verma A, Fleischer AB, Rapp SR, Davis SF, Preisser JS, Quandt SA. 2007b. Diagnosed skin diseases among migrant farmworkers in North Carolina: prevalence and risk factors. *Journal of Agricultural Safety and Health*, 13:407-418.

Arcury TA, Wiggins M, Quandt SA. 2009. Conclusions: An Agenda for Farmworker Social Justice in the Eastern United States. Pp 221-234. In Arcury TA, Quandt SA, eds. *Latino Farmworkers in the Eastern United States: Health, Safety, and Justice*. New York: Springer.

Arcury TA, Grzywacz JG, Talton JW, Chen H, Vallejos QM, Galván L, Barr DB, Quandt SA. 2010. Repeated pesticide exposure among North Carolina migrant and seasonal farmworkers. *American Journal of Industrial Medicine*, 53:802-813.

Arcury TA, Weir M, Chen H, Summers P, Pelletier LE, Galván L, Bischoff WE, Mirabelli MC, Quandt SA. 2012. Migrant farmworker housing regulation violations in North Carolina. *American Journal of Industrial Medicine*, 55:191-204.

Beal AC, Doty MM, Hernandez SE, Shea KK, Davis K. 2007. Closing the divide: How medical homes promote equity in health care. Results from the Commonwealth Fund 2006 Health Care Quality Survey. *The Commonwealth Fund*, 62:1-40.

Booker VK, Robinson JG, Kay BJ, Najera LG, Stewart G. 1997. Changes in empowerment: Effects of participation in a lay health promotion program. *Health Education & Behavior*, 24(4):452-464.

Camarota SA. 2007. Immigrants in the United States, 2007: A Profile of America's Foreign-Born Population. *Center for Immigration Studies*. Washington, DC. Available at: http://www.cis.org/immigrants_profile_2007. Accessed February 4, 2009.

Cameron L, Lalich N, Bauer S, Booker V, Bogue HO, Samuels S, Steege AL. 2006. Occupational health survey of farm workers by camp health aides. *Journal of Agriculture Safety and Health*, 12(2):139-153.

Carroll DJ, Samardick R, Bernard S, Gabbard S, Hernandez T. 2005. Findings from the National Agricultural Workers Survey (NAWS) 2001-2002: A Demographic and Employment Profile of United States Farm Workers. Rep. 9, Washington, DC: US Department of Labor, Office of the Assistant Secretary for Policy.

Cartier A, Mal JL, Forest F, Lafrance M, Pineau L, St Aubin JJ, Dubois JY. 1984. Occupational asthma in snow crab-processing workers. *Journal of Allergy and Clinical Immunology*, 74:261-269.

Grzywacz JG, Quandt SA, Early J, Tapia J, Graham CN, Arcury TA. 2006. Leaving family for work: ambivalence and mental health among Mexican migrant farmworker men. *Journal of Immigrant and Minority Health*, 8:85-97.

Hiott A, Grzywacz JG, Arcury TA, Quandt SA. 2006. Gender differences in anxiety and depression among immigrant Latinos. *Families, Systems & Health*, 24:137-146.

Hovey JD, Booker V, Seligman LD. 2007. Using theatrical presentations as a means of disseminating knowledge of HIV/AIDS risk factors to migrant farmworkers: An evaluation of the effectiveness of the Infórmate program. *Journal of Immigrant and Minority Health*, 9(2):147-156.

Howse D, Gautrin D, Neis B, Cartier A, Horth-Susin L, Jong M, Swanson MC. 2006. Gender and snow crab occupational asthma in Newfoundland and Labrador, Canada. *Environmental Research*, 101:163-174.

Jeebhay MF, Robins TG, Lehrer SB, Lopata AL. 2001. Occupational seafood allergy: a review. *Occupational and Environmental Medicine*, 58(9):553-562.

Lane CM, Jr., Arcury TA. 2003. Cómo Controlar Plagas (How to Control Pests) Residential Pesticide Safety. [Spanish language residential pesticide safety education video.] 6.5 minutes. Winston-Salem, NC: Department of Family and Community Medicine, Wake Forest University School of Medicine.

- Lane CM, Jr., Arcury TA, Quandt SA, Marín A. 2003. Dígame Adios a las Plagas. [Spanish residential pesticide safety education comic book]. Winston-Salem, NC: Department of Family and Community Medicine, Wake Forest University School of Medicine.
- Lane CM, Jr., Vallejos QM, Marín A, Quandt S, Arcury TA. 2008. ¡Pesticidas: No Los Traiga A La Casa! / Don't Take Pesticides Home With You! [Family-focused pesticide safety education flip chart]. Winston Salem, NC: Department of Family and Community Medicine, Wake Forest University School of Medicine.
- Liebman AK, Juárez PM, Leyva C, Corona A. 2007. A pilot program using promotoras de salud to educate farmworker families about the risk from pesticide exposure. *Journal of Agromedicine*, 12(2):33-43.
- Lipscomb, HJ, Loomis D, McDonald MA, Kucera K, Marshall S, Li L. 2004. Musculoskeletal symptoms among commercial fishers in North Carolina. *Applied Ergonomics*, 35(5):417-426.
- Loh K, Richardson S. 2004 Foreign-born workers: Trends in fatal occupational injuries, 1996-2001. *Monthly Labor Review*, 127(6):42-53.
- Marshall SW, Kucera K, Loomis D, McDonald MA, Lipscomb HJ. 2004. Work related injuries in small scale commercial fishing. *Injury Prevention*, 10(4), 217-221.
- Melton M, Debonis M, Krasilovsky E. 2007. Maltreatment and injustice: An overview of the plight of Latino forest workers in the Southeast. Sante Fe, NM: Forest Guild. Available at: http://www.forestguild.org/publications/Latino_Forest_Workers_07.pdf.
- Neis B. 1995. Can't get my breath: Snow crab workers' occupational asthma. Pp. 3-28. In: Messing K, Neis B, Dumais L, eds. *Invisible Issues in Women's Occupational Health*. Charlottetown, Canada; Gynergy.
- NIOSH. 2008. Fact Sheet: *Fatal Injuries among Landscape Service Workers*. DHHS (NIOSH) Publication No. 2008-144. Cincinnati, OH: National Institute for Occupational Safety and Health.
- Ortega HG, Daroowalla F, Petsonk E, Lewis D, Berardinelli S, Jr., Jones W, Kreiss K, Weissman DN. 2001. Respiratory symptoms among crab processing workers in Alaska: Epidemiological and environmental assessment. *American Journal of Industrial Medicine*, 39:598-607.
- Pew Hispanic Center. 2008. Statistical Portrait of the Foreign-Born Population in the United States, 2006. Available at: <http://pewhispanic.org/factsheets/factsheet.php?FactsheetID=36>. Accessed February 2, 2009.
- Quandt SA, Arcury TA. 2001. Aprende sobre la enfermedad del tabaco verde: la experiencia de Juan – una fotonovela / Learning about Green Tobacco Sickness: Juan's Experience. – A Photonovel. Winston-Salem, NC: Department of Family and Community Medicine, Wake Forest University School of Medicine.
- Quandt SA, Arcury TA, Rao P, Mellen BG, Camann DE, Doran AM, Yau AY, Hoppin JA, Jackson DS. 2004. Agricultural and residential pesticides in wipe samples from farmworker family residences in North Carolina. *Environmental Health Perspectives*, 112:382-387.
- Quandt SA, Hiott AE, Grzywacz JG, Davis SW, Arcury TA. 2007a. Oral health and quality of life of migrant and seasonal farmworkers in North Carolina. *Journal of Agricultural Safety and Health*, 13:45-55.
- Quandt SA, Clark HM, Rao P, Arcury TA. 2007b. Oral health of children and adults in Latino migrant and seasonal farmworker families. *Journal of Immigrant and Minority Health*, 9:229-235.
- Quandt SA, Feldman SR, Vallejos QM, Schulz MR, Verma A, Fleischer AB, Arcury TA. 2008. Vision problems, eye care history, and ocular protective behaviors of migrant farmworkers. *Archives of Environmental and*

Occupational Health, 63:13-16.

Quandt SA, Schulz MR, Talton JW, Verma A, Arcury TA. 2012a. Occupational eye injuries experienced by migrant farmworkers. *Journal of Agromedicine* 17:63-69.

Quandt SA, Arcury-Quandt AE, Lawlor EJ, Carrillo L, Marín AJ, Grzywacz JG, Arcury, TA. 2012b. 3-D Jobs and Health Disparities: The Health Implications of Latino Chicken Catchers' Working Conditions. *American Journal of Industrial Medicine*, in press.

Rodriguez-Acosta RL, Loomis DP. 1997. Fatal Occupational Injuries in the Forestry and Logging Industry in North Carolina, 1977-1991. *International Journal of Occupational and Environmental Health*, 3(4):259-265.

Rosenthal TC. 2008. The medical home: Growing evidence to support a new approach to primary care. *Journal of the American Board of Family Medicine*, 21:427-440.

Sarathy B, Casanova V. 2008. Guest workers or unauthorized immigrants? The case of forest workers in the United States. *Policy Sciences*, 41:95-114.

Selby EF, Dixon DP, Hapke HM. 2001. A woman's place in the crab processing industry of eastern Carolina. *Gender, Place and Culture*, 8:229-253.

Vallejos QM, Schulz MR, Quandt SA, Feldman SR, Galvan L, Verma A, Fleischer AB, Rapp SR, Arcury TA. 2008. Self Report of Skin Problems among Farmworkers in North Carolina. *American Journal of Industrial Medicine*, 51:203-212.

Appendix 1: Conference Participants

Name	Affiliation
Michael J. Agnew, PhD mjagnew@vt.edu	Department of Industrial and Systems Engineering School of Biomedical Engineering and Sciences Virginia Tech 250 Durham Hall Blacksburg, Virginia, 24061
Thomas A. Arcury, PhD tarcury@wakehealth.edu	Department of Family and Community Medicine Center for Worker Health Wake Forest School of Medicine Winston-Salem, NC 27157-1084
Vanessa Casanova, PhD vancasan@work.rutgers.edu	Labor Studies and Employment Relations Rutgers, The State University of New Jersey 50 Labor Center Way New Brunswick, NJ 08901
Arthur L. Frank, MD, PhD alf13@drexel.edu	Department of Environmental and Occupational Health Drexel University School of Public Health 1505 Race Street, 13th floor Philadelphia, Pa 19102.
Clermont L. Fraser, JD Clermont@ncjustice.org	Immigrants Legal Assistance Project North Carolina Justice Center 224 South Dawson Street Raleigh, North Carolina 27601
Joseph G. Grzywacz, PhD grzywacz@wakehealth.edu	Department of Family and Community Medicine, and Center for Worker Health Wake Forest School of Medicine Medical Center Boulevard Winston-Salem, NC 27157-1084
Timothy D. Howard, PhD tdhoward@wakehealth.edu	Center for Genomics & Personalized Medicine Research Wake Forest School of Medicine Medical Center Blvd. Winston-Salem, NC 27157
Bradley G. Klein, PhD bklein@vt.edu	Department of Biomedical Sciences and Pathobiology College of Veterinary Medicine Virginia Tech Blacksburg, VA 24061-044
Kristen L. Kucera, PhD, ATC kristen.kucera@duke.edu	Division of Occupational & Environmental Medicine Department of Community & Family Medicine Duke University 2200 W Main St, Suite 400 Durham, NC 27705

Ricky Langley MD, MPH
rick.langley@dhhs.nc.gov

Division of Public Health
North Carolina Dept of Health and Human Services
1912 Mail Service center
Raleigh, NC 27699-1912

Jeffrey L. Levin, MD, MSPH
jeffrey.levin@uthct.edu

Department of Occupational Health Sciences
The University of Texas Health Science Center at Tyler
11937 U. S. Highway 271
Tyler, TX 75708-3154

Amy K. Liebman, MPA, MA
aliebman@migrantclinician.org

Director of Environmental and Occupational Health
Migrant Clinicians Network – Maryland Office
5120 River Circle
Quantico, MD 21856

Hester J. Lipscomb, PhD
hester.lipscomb@duke.edu

Division of Occupational and Environmental Medicine
Duke University Medical Center
Box 3834
Durham, N.C. 27710

Paul Monaghan, PhD
paulf@ufl.edu

Department of Agricultural Education and Communication
University of Florida
305 Rolfs Hall
P.O. Box 110540
Gainesville, FL 32611-0540

Barbara Neis, PhD
bneis@mun.ca

Department Sociology
SafetyNet Centre for Research in Occupational health
Memorial University
St. John's, Newfoundland
NL A1C 5S7

Maury A. Nussbaum, PhD
nussbaum@vt.edu

Department of Industrial and Systems Engineering
School of Biomedical Engineering and Sciences
Virginia Tech
250 Durham Hall (0118)
Blacksburg, VA 24061

Sara A. Quandt, PhD
squandt@wakehealth.edu

Department of Epidemiology & Prevention
Division of Public Health Sciences
Wake Forest School of Medicine
Medical Center Boulevard
Winston-Salem, North Carolina 27157-1063

Bobbi Ryder
www.ncfh.org

National Center for Farmworker Health, Inc.
1770 FM 967
Buda, TX

Jill R. Sidebottom, PhD
jill_sidebottom@ncsu.edu

Forestry & Environmental Resources
North Carolina State University
455 Research Drive
Mills River, NC 28759-3423

Chaya Spears, PhD
cspears@wakehealth.edu

Department of Family and Community Medicine
Wake Forest Medical School
Medical Center Boulevard
Winston-Salem, NC 27157-1084

Quirina M. Vallejos, MPH
qvallejo@wakehealth.edu

Department of Family and Community Medicine
Center for Worker Health
Wake Forest School of Medicine
Medical Center Boulevard
Winston-Salem, NC 27157-1084

Maria Weir, MS, MPH
mweir@wakehealth.edu

Department of Family and Community Medicine
Wake Forest School of Medicine
Medical Center Boulevard
Winston-Salem, NC 27157-1084

Melinda F. Wiggins, MTS
mwiggins@duke.edu

Student Action with Farmworkers (SAF)
1317 W. Pettigrew St.
Durham, NC 27705
