

NAWS at 30 Years: A Systematic Review of Studies Using NAWS data to Understand the Human  
Condition of Farmworkers and their Families

Joseph G. Grzywacz, Ph.D.  
Department of Family & Child Sciences  
Florida State University

Direct all correspondence to Joseph G. Grzywacz, Ph.D., Chair and Norejane Hendrickson  
Professor of Family & Child Sciences, 120 Convocation Way, Tallahassee FL, 32306.  
[jgrzywacz@fsu.edu](mailto:jgrzywacz@fsu.edu).

A grant to the Southeastern Coastal Center for Agricultural Health and Safety (U54 OH011230)  
enabled this paper. None of the authors have a financial, consultant, institutional and other  
relationships that might lead to bias or a conflict of interest.

The National Agricultural Worker Survey (NAWS) has characterized farmworkers and documented the primary organization of crop agriculture for 30 years. Beyond this essential task, the NAWS surveillance produces valuable information about farmworkers quality of life, it is a definitive source of information about farmworkers' families, and it provides estimates of public service utilization. Collectively, these data have been invaluable to characterizing shifts in the terms and conditions of employment in crop agriculture, putting a statistical "face" to the workers who enable the United States' (U.S.) to serve as the world's "breadbasket," and for correcting misconceptions about this worker population and their families. These data have, in turn, been invaluable to regional, state and federal program planning and delivery. NAWS data have also been scientifically useful.

The NAWS data have been used by public health scientists to test theoretical ideas about the maintenance and perpetuation of health inequalities. Occupational health and industrial medicine scientists have deployed the NAWS to generate accurate estimates of injury burden and to identify occupational sources of latent or chronic disease. Demographers and policy scientists have used the NAWS to characterize shifts in domestic and international migration and to probe the intended and unanticipated consequences of federal policies. Indeed, over the life of the NAWS, an average of one scientific paper per year has been published in the peer-reviewed scientific literature.

The overall goal of this paper is to summarize how the NAWS has been used for the past 30 years to study the human condition and to highlight critical areas for growth in the next 30 years. To achieve this goal, the paper will identify and characterize dominant themes of inquiry undertaken by scientists outside using the NAWS outside the field of agricultural economics; it

will characterize gaps and problems commonly reported by scientists using the data, and it will use those gaps and problems to identify possible directions for the future of NAWS.

### NAWS Data Utilization: Dominant Themes

The NAWS data have been applied to three primary scientific areas outside of agricultural economics, each of which has a dominant theme. By way of overview, the first scientific area is best characterized in terms of "the organization of work" in field agriculture. Elaborated more fully later in this paper, the "organization of work" refers to the coordinated forces and processes that shape how work gets done (Grzywacz et al., 2013; NIOSH, 2002). Because scientists working in partnership with the National Institute for Occupational Safety and Health developed the concept, it seeks to understand possible sources of poor occupational health outcomes. The second scientific area follows from the first, and it characterizes the occupational health and health care utilization of the crop agriculture workforce. Finally, because field agriculture since the commercial expansion of the "family farm" has relied heavily on foreign-born workers, the third area of scientific inquiry undertaken using NAWS data focuses on sociopolitical issues about migrants and immigration.

#### The Organization of Work

The organization of work is a complex, multidimensional and multilevel framework that attempts to capture how work gets done or the processes underlying work (NIOSH, 2002). Work organization is multilevel in the sense that it recognizes the same task performed by occupants of comparable jobs throughout the world vary meaningfully. As such, variability in performance will contribute to variability in occupational health outcomes, because of the management practices used by the occupants' superiors (including whether or not supervision

exists), the production methods and human resources policies of the employer, and the presence and depth of government oversight. Work organization is multidimensional in the sense that the potential of a job task to affect the health of the individual performing that task is shaped by more than one factor at each level ranging from immediate work context to the multinational agreements governing work standards. Within this framework, scientists have used the NAWS to understand how work in field agriculture gets done systematically.

*Degrees of separation shapes work in field agriculture.* Factors reflecting the degree of separation between workers and growers has been studied in a handful of published papers using NAWS data. Asfaw and colleagues (2014) studied differences in access to worker compensation, health insurance, and employer-paid health insurance among farmworkers. These researchers focused on variability between “noncontingent workers” or those directly employed by a grower and those working through a labor contractor whom they labeled as “contingent workers.” Analyses of pooled data from 2000-2009 indicated a 13-percentage point disparity in access to workers compensation, an 18-percentage point disparity in health insurance, and a 12-percentage point disparity in access to employer-paid insurance. Specifically, farmworkers directly employed by growers were more likely to report access to workers compensation, health insurance, and employer-paid health insurance than farmworkers working through a labor contractor.

Work authorization, another factor shaping the formality of the employment relationship between worker and grower has received empirical attention. Evidence suggests that 30 to 50% of the disparities in access to worker compensation and health insurance is explained by work authorization (Asfaw, 2014). That is, farmworkers employed by a labor

contractor are over-represented in the group of workers without work authorization, thereby impeding access to workers compensation and insurance. Kandilov and Kandilov (2010) partially replicated and extended this finding using a narrower set of pooled data (i.e., 2000 – 2006). Specifically, they found that farmworkers with authorization were 6-9% more likely to report receiving employer-paid health insurance than their counterparts without authorization. Work authorization is related to occupational task assignments. Kandel and Donato (2009), using pooled data from 1989 -2006, noted that unauthorized workers were less involved in tasks involving handling and applying pesticides. These authors argued their results are consistent with labor market segmentation theory suggesting that experienced workers with higher market value acquire specialized skills. Finally, results from pooled 2008-2012 data indicated that undocumented workers performed less-skilled tasks and were more likely to be paid piece rate than those without a green card or work authorization (Reid & Schenker, 2016).

*Variation in work characteristics is not random in crop agriculture.* The Occupational Safety and Health Administration (OSHA) requires that farmworkers have access to potable water, toilets, and hand-washing facilities through the Field Sanitation Standard. Although field sanitation standards violations are not prevalent, farmworkers with less education and those who do not speak English well are more likely to report violations than their better educated and more English-fluent peers (Pena & Teather-Posadas, 2018). Nearly all (92%) US-born farmworkers are classified as “settled out” and the largest percentage of US-born farmworkers work year-round (Reid & Schenker, 2016), whereas undocumented workers are over-represented in the “follow the crop” classification, and fewer report having year-round work. Similarly, average wages per hour (regardless of how pay is determined) are lower, and rates of

family poverty are higher undocumented farmworkers relative to U.S.-born farmworkers and those with work authorization (Reid & Schenker, 2016).

In 2009 and 2010, the NAWS fielded the Work Organization and Psychosocial Factors module in addition to its typical instrument. Manuscripts published during the preparatory phases of the module (Alterman et al., 2015; Grzywacz et al., 2009) indicated that identified instruments could be reliably used to measure critical concepts of the Job Demands/Control model, specifically decision latitude and psychological demands (Karasek & Theorell, 1992). Approximately 18% of farmworkers were found to have "low decision latitude" or little opportunity to render decisions about the type of work performed or how work is performed, and nearly 12% were found to have "high psychological demand" or stressors arising from the pace and intensity of work (Grzywacz et al., nd). Foreign-born workers, those without employment options outside of farm work, and those without year-round employment were over-represented in the "low decision latitude" group. Surprisingly, farmworkers with year-round employment are almost 3-times more likely to be in the "high psychological demand" group, but workers without authorization and those without non-farm employment options were also more likely to be in this group. Decision latitude was not associated with self-rated physical health or elevated depressive symptoms, but high psychological demand was associated with both fair/poor health and elevated depressive symptoms (Grzywacz et al., 2014).

#### Health and Health Care Utilization

Several researchers have used the NAWS to document variation in discrete health outcomes among farmworkers, some of what are occupationally based, whereas others may not have occupational antecedents but have different salience among farmworkers.

*Specific farmworkers bear the burden of injury, although overall rates are improving.*

Wang and colleagues (2011) were the first to study occupational injury with the NAWS using pooled data from 1999, 2002, 2003 and 2004. They documented an overall injury rate of 4.3/100 week-based full-time equivalents. Over-exertion from lifting was the most common event leading to injury, followed by struck by hand-held objects and falls from heights. Males, Mexican-born, and individuals classified as being a shuttle migrant experienced elevated rates of injury; results suggest that low access to safety training may contribute to injury risk. Subsequent analyses using data from two distinct periods (pre-2004 and between 2008-10) indicated that rates of injury dropped from 4.3/100 to 2.9/100 week-based full-time equivalents (Tonozzi & Layne, 2016). The same events reported by Wang and colleagues (i.e., overexertion, contact struck by objects, and falls from height) were the most common in both periods.

There is substantial variation in the farmworkers' seeking care for injuries experienced while working (Thierry & Snipes, 2015). Based on 393 distinct injuries observed in NAWS data from 1999, 2002-2004, and 2008-2010, Thierry and Snipes reported that education, gender, and migrant status were each associated with delaying care. Qualitative descriptions of how workers responded to injuries indicated that delaying care after experiencing an injury was primarily attributed to attitudes prioritizing work over pain, and when workers were able to work despite an injury. However, immediate treatment was sought when workers were wholly

debilitated and unable to work, when a supervisor was notified, or when exposed to pesticides during injury.

*An occupation-related disease is common among farmworkers.* Arroyo and colleagues (2018) used pooled data from 2003-14 to study asthma. They found that lifetime asthma was more common among female, U.S.-born farmworkers with better than some spoken English fluency, and who applied pesticides in the past 12 months. The pesticide application link, given the specific task, is suggestive of an occupational etiology. Medel-Herrero and colleague (2018) used pooled data from 2000-2012 to study tuberculosis and reported prevalence rates 6-times greater than those observed in the Hispanic non-farmworker population. They further reported that tuberculosis rates grew substantially across the great recession from 2008-2010, and attributed that growth to increases in poverty-related malnutrition, and decrements in housing quality. Individuals with a farmworker family member and those with health insurance and good spoken English were at increased risk of reporting tuberculosis. The association of having health insurance and good spoken English with tuberculosis is probably attributed to endogeneity; that is, good English speakers with health insurance are more likely to have visited a physician and received a diagnosis of tuberculosis. Mills and colleagues (2009) used data from NAWS to illustrate the potential increased risk for occupation-based cancers.

*Farmworker health care utilization is conditional.* Slightly over half of farmworkers report using health care in the U.S. (Hoerster et al., 2011), and several researchers point to discrete factors that may condition health care utilization. First, having health insurance is a strong predictor of seeking U.S. based health care in the past two years, as is having a green card (Hoerster et al., 2011). Of course, as already described in this paper, access to health

insurance, particularly employer-paid health insurance, is linked to documentation status (Asfaw, 2014; Kandilov & Kandilov, 2010). "Settled" farmworkers are more likely to use health care in the U.S., as are individuals with a doctor-diagnosed chronic condition (Hoerster et al., 2011; Ward, 2007). Georges and colleagues (2013) noted that farmworkers with elevated depressive symptoms were 45% more likely to seek health care in the U.S., most of the visits were to primary care physicians rather than mental health specialists.

### Socio-Political Issues Related to Migrants and Immigration

The NAWS, given its distinctive worker population, has been used to study diverse socio-political issues, particularly those to immigration and the use of social safety net services by migrants. Hamilton and colleagues (2018), for example, use farmworkers as a model for testing social determinants of health. These investigators reasoned that the absence of legal authorization to live and work in the U.S. created a basis for social stratification that inhibited the production of health. Hamilton et al. posited that reduced access to health care along and placement in more physically and psychosocially demanding jobs (topics already covered in this review) would result in systematically poorer health outcomes among unauthorized workers relative to citizens or authorized workers. Counter to expectation, analyses of pooled 2000-2015 data indicated that authorized workers had poorer health outcomes than unauthorized workers. The authors considered several possible explanations (e.g., "healthy worker effect," endogeneity of health insurance and doctor diagnosed condition) for the unexpected findings. Nevertheless, the authors concluded that work authorization is not a basis of social stratification that creates or sustains health disparities.

Rodríguez and colleagues (2008) studied the health insurance status of children in farmworker households. Using pooled NAWS data from 2000-2002, they reported that less than one-third of farmworkers reported having uninsured children. Children who were particularly at risk for being uninsured were those whose parents were older, Latino, and who had 6 or fewer years of education. These investigators also noted that shorter duration in the U.S., being a migrant worker, and those living in the Southeast or Southwest regions (relative to CA). Collectively, these results suggest that access to insurance by children of farmworkers with limited access to health insurance programs, either because of who they are or where they live and work.

*Stringent border policies grow the population of undocumented immigrants.* Although the International Labor Organization (2017) clearly illustrates that foreign-born immigrants are placed in several economic sectors, it is equally clear that immigrants concentrate in a few industrial sectors including agriculture. Consequently, a study of the farmworker population provides a barometer, of sorts, of international migration. One investigator team used this barometer to study translational families, which they operationalized in terms of a foreign-born worker reporting having at least one child under the age of 18 in a foreign country (Hamilton & Hale, 2016). Using pooled data from 1989-2012, they documented a pattern wherein the presence of transnational families differed over time and by documentation status. Over-time, the probability of transnational families decreased for all farmworkers, but the decrease was more precipitous for undocumented farmworkers. The authors interpret their findings in the context of a militarization of the border and the unintended consequence of ending "circular" migration.

A similar study examined settlement patterns of farmworkers by documentation status before and after the great recession, using pooled data from 2005-2007 and 2008-2010 to reflect each period (Ravuri, 2017). Before and after the great recession, patterns of settlement or self-classification of being “migrant” (i.e., follow-the-crop, shuttle, newcomer) were observed. Authorized farmworkers in NAWS regions outside of California (CA) were less likely than their counterparts in CA to settle in their region, but rather continued “migrating.” By contrast, unauthorized farmworkers outside of CA were more likely than unauthorized counterparts in CA to “settle” in their region. The authors speculated that unauthorized immigrants outside of CA, the state with the largest farmworker population, may have felt that migration posed a higher risk to apprehension and deportation than settling in their current region.

*Undocumented farmworkers are not heavy users of safety net programs.* Access and use of safety net programs intended to benefit citizens and authorized immigrants are one of the most common topics studied using the NAWS. The first published paper on the topic using pooled data from 1989-1995 found that undocumented farmworkers had one-quarter the utilization of farmworkers who were U.S. citizens to welfare programs like Aid to Families with Dependent Children, Medicaid, food stamps, support from the Women, Infants & Children (WIC) program, general assistance, or public housing (Moretti & Perloff, 2000). Use of these services among undocumented farmworkers was driven almost exclusively by the presence of young children, who were typically U.S. citizens by birth. These investigators also noted that undocumented farmworkers were higher users of public medical assistance.

Several other studies using the NAWS replicate and extend Moretti's and Perloff's (2000) findings into the future. In an analysis of Medicaid utilization using a broader panel of data (1989-2009), Chung & Leigh (2015) reported that undocumented farmworkers' households were about half as likely to use Medicaid as documented households and that undocumented household's usage was responsive to the presence of children. An analysis of farmworkers' use of the Supplemental Nutrition Assistance Program (SNAP) benefits using NAWS data spanning 2003 through 2012 indicated that SNAP utilization increased over time and that the odds of using SNAP were 43% lower for undocumented farmworkers than for farmworkers who were citizens (Medel-Herrero & Leigh, 2018). A study using NAWS data from before the Great Recession (2005-2009) reported low overall use of safety net services, and particularly low rates among individuals in households of farmworkers that were undocumented (Padilla, Scott, & Lopez, 2014). Only one study using NAWS data spanning 1993 to 2009 reported higher safety net use among individuals in undocumented farmworkers' households; that is, use of WIC benefits was higher among undocumented farmworker households than in documented farmworker households (Leigh & Medel-Herrero, 2015). One explanation for the greater use of WIC benefits by individuals in undocumented farmworker households is a comparatively stronger association of program utilization with the presence of young children among the undocumented relative to the documented.

#### Common limitations and shortcomings

Authors of the peer-reviewed papers using the NAWS to study the social condition of farmworkers report obvious limitations and shortcomings of the data. Foremost is the absence of longitudinal data. Of course, the NAWS monitors employment conditions like duration of

work, wages, and benefits as well as tasks and training. Nevertheless, the NAWS has demonstrated its scientific value to other domains of inquiry including occupational health, public health, and social services. Each of these fields would benefit from alternative designs that would allow following some portion of farmworkers over time. Just as the National Longitudinal Study of Youth was birthed from employment and labor surveys, so to an embedded longitudinal cohort of farmworkers and their families would yield significant insight into the well-documented occupational health disparities borne by farmworkers. Moreover, an embedded longitudinal cohort could also benefit employment and labor researchers by enabling more refined forecasts of entrances and exits from farm labor, intergenerational legacies of farm work, and potentially evidence-based cost-benefit analyses of competing for employment practices.

The NAWS purposefully overlooks a large segment of the agricultural workforce; that is, those working under the auspices of the H2-A temporary worker program. Although longstanding initiatives like the NAWS cannot respond to vagaries of the sociopolitical landscape, they cannot also remain blind to important occupational trends. Estimates from the U.S. Department of Homeland Security indicate a near doubling of workers entering the U.S. between 2000 (139,406) and 2017 (413,820). When the Bureau of Labor Statistics estimates approximately 850,000 agricultural workers in 2016, or when the U.S. Department of Agriculture's Economic Research Services unit estimates a 1.13 million hired workers in 2000, 413,820 is not a trivial fraction. Adequate representation of the agricultural workforce requires an expansion of the sample design to include H2-A workers.

The depth of measurement in several key areas is a commonly reported weakness of the NAWS. Measurement is particularly crude in several critical aspects of everyday life on the job. The sample design and data collection protocol purposefully assess current activities and current crops. Although having some benefits, this design specification woefully simplifies activities undertaken by farmworkers in both discrete periods (say the past month) and longer durations (past agricultural season). In my personal experience working with farmworkers, I am aware of crews that spend early spring in southern Florida working in peppers and plant, late-spring and early summer in southern Georgia working in carrots and tomatoes, and late summer/early fall in North Carolina working in Tobacco. Importantly, each of these shifts has the potential to change compensation systems and wages, shifts in housing and occupational exposures, and shifts in social contexts: none of which are captured in the current data collection protocol.

There are also other areas of measurement weakness in the NAWS. In the health domain, measures are either weak or challenged by endogeneity issues (e.g., doctor-diagnosed conditions). Alternative short-form assessments such as overall self-rated health, task impairment, and somatic complaints could offer meaningful substitutes. The NAWS captures very little about the basics of every-day work life that affect employability and productivity, such as housing quality and access to sufficient food. Housing quality and food insecurity have both been demonstrated to be issues in small samples of farmworkers (Arcury et al., 2015; Early et al., 2006; Ip et al., 2015). Assessment of safety net program utilization in the NAWS is crude and likely over-estimates actual utilization. Poverty researchers have long known that households move into and out of poverty based on a variety of labor market and personal

factors: Ip and colleagues (2015) clearly illustrated this possibility in an analysis of household food security – something that closely tracks with poverty. They noted that 49% of farmworker families were food insecure at least one time across eight quarterly assessments spanning two years. However, less than 1% were chronically food insecure. Knowing that poverty is a core criterion for eligibility, any utilization of services in the past two years likely over-estimates utilization at any given time by as much as 40% (Ip et al., 2015).

#### Recommended Future directions for the NAWS

1. Expand the NAWS sample design to enable appropriate representation of temporary agricultural workers in descriptions of the agricultural workforce. Historically, H2-A workers represented a small segment of the agricultural workforce, but trends suggest that temporary workers may account for 30-50% of the documented workforce: this is a non-negligible fraction. Further, although the U.S. Department of Homeland Security tracks entrances into the country and country of origin, nothing more is known about these individuals.
2. Secure support to create and follow an embedded longitudinal cohort of farmworkers and their families. A longitudinal cohort, consisting of quarterly assessments across a 2-5 year period would yield a myriad of benefits. First and foremost, it would enable a more vibrant, more accurate portrayal of employment, wages and compensation, as well as training and exposures among farmworkers. Whereas the current NAWS provide a valuable "snapshot" of crop agricultural labor, a cohort could provide a nuanced "motion picture" of this shifting population. Second, a longitudinal cohort would enable discernible observations of entrances and exits from the crop agriculture workforce, a figure that would be invaluable

for forecasting workforce supply relative to need. Third, a longitudinal cohort would provide metrics for characterizing best practices for maintaining an efficient and productive agricultural workforce. Fourth and finally, a longitudinal cohort would enable stronger determination of potential “causal” associations for the growing number of researchers outside of agricultural economics using the NAWS data.

3. Sharpen assessment of health outcomes. Add the often-used global indicator of self-rated health, an item that has been widely used and validated. Add items that capture distinct forms of morbidity such as health-related impairment, symptom intensity for ailments common in the farmworker population (e.g., heat-related illness, musculoskeletal pain). Importantly, recognizing that farmworkers work through pain even when injured (Thierry & Snipes, 2015), it is essential that questions probe impairment assuming continued work. If the presence of chronic conditions is asked, expand the questioning beyond doctor-diagnosed conditions (e.g., "Have you ever been treated for, or has anyone ever told you that you have...."). The SF-12 or comparable instrument may be useful, in part because it provides norm-based standards that can be compared to other population groups.
4. Expand the assessment of farmworkers' basic needs, particularly housing quality and food sufficiency. Screen farmworkers for homelessness and essential features of quality housing should be asked (e.g., a working refrigerator that keeps food cold, a stove or place to heat food, a working toilet, a secure place to keep personal items, a mattress to sleep on). Assess food security with the 6-item USDA Food Security Short-form.
5. Adjust assessment of farmworkers' (and their households') use of social services. The key adjustment is to differentiate any use in the past two years from the intensity of use. Given

low base-prevalence of use for many queried items, the 2-3 additional questions probing positive responses should not meaningfully lengthen most surveys. Those 2-3 questions would be, (1) To the best you can recall, when did you start receiving services/support from...?, (2) Are you still receiving this service/support? If the second question is answered "no," ask, (3) When did you stop receiving this service/support?

- Alterman, T., Gabbard, S., Grzywacz, J. G., Shen, R., Li, J., Nakamoto, J., ... Muntaner, C. (2015). Evaluating Job Demands and Control Measures for Use in Farm Worker Health Surveillance. *Journal of Immigrant and Minority Health / Center for Minority Public Health*, 17(5), 1364–1373. <https://doi.org/10.1007/s10903-014-0090-z>
- Arcury, T. A., Trejo, G., Suerken, C. K., Grzywacz, J. G., Ip, E. H., & Quandt, S. A. (2015). Housing and Neighborhood Characteristics and Latino Farmworker Family Well-Being. *Journal of Immigrant and Minority Health*, 17(5), 1458–1467. <https://doi.org/10.1007/s10903-014-0126-4>
- Arroyo, A. J. C., Robinson, L. B., Downing, N. L., & Camargo, C. A. (2018). Occupational exposures and asthma prevalence among US farmworkers: National Agricultural Workers Survey, 2003–2014. *The Journal of Allergy and Clinical Immunology. In Practice*, 6(6), 2135–2138.e2. <https://doi.org/10.1016/j.jaip.2018.03.006>
- Asfaw, A. (2014). Disparities in Access to Health Insurance and Workers' Compensation Benefit between Non Contingent and Contingent Farm Workers in U.S. Agriculture. *Journal of Health Disparities Research & Practice*, 7(3), 81–96.
- Chung, Y.-K., & Leigh, J. P. (2015). Medicaid use by documented and undocumented farm workers. *Journal of Occupational and Environmental Medicine*, 57(3), 329–333. <https://doi.org/10.1097/JOM.0000000000000357>
- Early, J., Davis, S. W., Quandt, S. A., Rao, P., Snively, B. M., & Arcury, T. A. (2006). Housing characteristics of farmworker families in North Carolina. *Journal of Immigrant and Minority Health*, 8(2), 173–184. <https://doi.org/10.1007/s10903-006-8525-1>

- Georges, A., Alterman, T., Gabbard, S., Grzywacz, J. G., Shen, R., Nakamoto, J., ... Muntaner, C. (2013). Depression, social factors, and farmworker health care utilization. *The Journal of Rural Health : Official Journal of the American Rural Health Association and the National Rural Health Care Association*, 29 Suppl 1, s7-16. <https://doi.org/10.1111/jrh.12008>
- Grzywacz, J. G., Alterman, T., Gabbard, S., Shen, R., Nakamoto, J., Carroll, D. J., & Muntaner, C. (nd). Prevalence and correlates of low decision latitude and high job demand among U.S. famworkers: Evidence from the NAWS. Unpublished analyses.
- Grzywacz, J. G., Alterman, T., Gabbard, S., Shen, R., Nakamoto, J., Carroll, D. J., & Muntaner, C. (2014). Job control, psychological demand, and farmworker health: evidence from the national agricultural workers survey. *Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine*, 56(1), 66–71. <https://doi.org/10.1097/JOM.000000000000025>
- Grzywacz, J. G., Alterman, T., Muntaner, C., Gabbard, S., Nakamoto, J., & Carroll, D. J. (2009). Measuring job characteristics and mental health among Latino farmworkers: results from cognitive testing. *Journal of Immigrant and Minority Health / Center for Minority Public Health*, 11(2), 131–138. <https://doi.org/10.1007/s10903-008-9170-2>
- Grzywacz, J. G., Lipscomb, H. J., Casanova, V., Neis, B., Fraser, C., Monaghan, P., & Vallejos, Q. M. (2013). Organization of work in the agricultural, forestry, and fishing sector in the US southeast: implications for immigrant workers' occupational safety and health. *American Journal of Industrial Medicine*, 56(8), 925–939. <https://doi.org/10.1002/ajim.22169>

- Hamilton, E. R., & Hale, J. M. (2016). Changes in the Transnational Family Structures of Mexican Farm Workers in the Era of Border Militarization. *Demography*, 53(5), 1429–1451. <https://doi.org/10.1007/s13524-016-0505-7>
- Hamilton, E. R., Hale, J. M., & Savinar, R. (2018). Immigrant Legal Status and Health: Legal Status Disparities in Chronic Conditions and Musculoskeletal Pain Among Mexican-Born Farm Workers in the United States. *Demography*. <https://doi.org/10.1007/s13524-018-0746-8>
- Hoerster, K. D., Mayer, J. A., Gabbard, S., Kronick, R. G., Roesch, S. C., Malcarne, V. L., & Zuniga, M. L. (2011). Impact of individual-, environmental-, and policy-level factors on health care utilization among US farmworkers. *American Journal of Public Health*, 101(4), 685–692. <https://doi.org/10.2105/AJPH.2009.190892>
- Ip, E. H., Saldana, S., Arcury, T. A., Grzywacz, J. G., Trejo, G., & Quandt, S. A. (2015). Profiles of Food Security for US Farmworker Households and Factors Related to Dynamic of Change. *American Journal of Public Health*, 105(10), e42-47. <https://doi.org/10.2105/AJPH.2015.302752>
- Kandel, W. A., & Donato, K. M. (2009). Does Unauthorized Status Reduce Exposure to Pesticides? Evidence From the National Agricultural Workers Survey. *Work & Occupations*, 36(4), 367–399. <https://doi.org/10.1177/0730888409347599>
- Kandilov, A. M. G., & Kandilov, I. T. (2010). The Effect of Legalization on Wages and Health Insurance: Evidence from the National Agricultural Workers Survey. *Applied Economic Perspectives and Policy*, 32(4), 604–623. <https://doi.org/10.1093/aep/ppq022>
- Karasek, R., & Theorell, T. (1992). *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life*. Basic Books.

Leigh, J. P., & Medel-Herrero, A. (2015). Participation in the Women, Infants, and Children (WIC) Program as Reported by Documented and Undocumented Farm Worker Adults in the Households. *Journal of Agromedicine*, 20(4), 409–418.

<https://doi.org/10.1080/1059924X.2015.1074973>

Medel-Herrero, A., & Leigh, J. P. (2018). Changing SNAP-Participation Trends Among Farmworker Households in the U.S., 2003-2012. *Journal of Immigrant and Minority Health*, 20(3), 507–516. <https://doi.org/10.1007/s10903-017-0600-x>

Medel-Herrero, A., Martínez-López, B., Silva-Del-Rio, N., Pires, A. F., Edmondson, A., & Schenker, M. (2018). Tuberculosis Prevalence Among US Crop-Workers, 2000 to 2012: Trends and Contributing Factors. *Journal of Occupational and Environmental Medicine*, 60(7), 603–611. <https://doi.org/10.1097/JOM.0000000000001257>

Mills, P. K., Dodge, J., & Yang, R. (2009). Cancer in migrant and seasonal hired farm workers. *Journal of Agromedicine*, 14(2), 185–191. <https://doi.org/10.1080/10599240902824034>

Moretti, E., & Perloff, J. M. (2000). Use of Public Transfer Programs and Private Aid by Farm Workers. *Industrial Relations*, 39(1), 26–47.

Padilla, Y. C., Scott, J. L., & Lopez, O. (2014). Economic insecurity and access to the social safety net among Latino farmworker families. *Social Work*, 59(2), 157–165.

Pena, A. A., & Teather-Posadas, E. R. (2018). Field Sanitation in U.S. Agriculture: Evidence from NAWS and Future Data Needs. *Journal of Agromedicine*, 23(2), 123–133.

<https://doi.org/10.1080/1059924X.2018.1427642>

- Ravuri, E. (2017). The great recession and its effect on authorized and unauthorized Mexican agricultural workers in the United States: Who settles in the U.S.? *Journal of Rural & Community Development, 12*(1), 149–167.
- Reid, A., & Schenker, M. B. (2016). Hired farmworkers in the US: Demographics, work organization, and services. *American Journal of Industrial Medicine, 59*(8), 644–655.  
<https://doi.org/10.1002/ajim.22613>
- Rodríguez, R. L., Elliott, M. N., Vestal, K. D., Suttorp, M. J., & Schuster, M. A. (2008). Determinants of health insurance status for children of Latino immigrant and other US farm workers: findings from the National Agricultural Workers Survey. *Archives of Pediatrics & Adolescent Medicine, 162*(12), 1175–1180.  
<https://doi.org/10.1001/archpedi.162.12.1175>
- Thierry, A. D., & Snipes, S. A. (2015). Why do farmworkers delay treatment after debilitating injuries? Thematic analysis explains if, when, and why farmworkers were treated for injuries. *American Journal of Industrial Medicine, 58*(2), 178–192.  
<https://doi.org/10.1002/ajim.22380>
- Tonozzi, T. R., & Layne, L. A. (2016). Hired crop worker injuries on farms in the United States: A comparison of two survey periods from the National Agricultural Workers Survey. *American Journal of Industrial Medicine, 59*(5), 408–423.  
<https://doi.org/10.1002/ajim.22578>
- Wang, S., Myers, J. R., & Layne, L. A. (2011). Injuries to hired crop workers in the United States: a descriptive analysis of a national probability survey. *American Journal of Industrial Medicine, 54*(10), 734–747. <https://doi.org/10.1002/ajim.20980>

Ward, L. S. (2007). Preliminary tests of an ecological model of Hispanic farmworker health.

*Public Health Nursing (Boston, Mass.)*, 24(6), 554–564. <https://doi.org/10.1111/j.1525->

1446.2007.00668.x