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Examining the Roles of Acculturative Stressors and Cultural Factors in Major Health and Safety Issues Among Hispanic/Latino Farmworkers

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**EXAMINING THE ROLES OF ACCULTURATIVE STRESSORS AND CULTURAL
FACTORS IN MAJOR HEALTH AND SAFETY ISSUES AMONG HISPANIC/LATINO
FARMWORKERS**

by

Brenda Berumen-Flucker

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ABSTRACT

EXAMINING THE ROLES OF ACCULTURATIVE STRESSORS AND CULTURAL FACTORS IN MAJOR HEALTH AND SAFETY ISSUES AMONG HISPANIC/LATINO FARMWORKERS

Brenda Berumen-Flucker
Old Dominion University, 2022
Director: Dr. Hadiza Galadima

Statement of the problem: Hispanic/Latino farmworkers are at increased risk of adverse health and safety outcomes. Heightened levels of acculturative stress and the unique cultural characteristics and beliefs reported by this group increase workers' vulnerability for adverse outcomes.

Method: The first project consisted of a systematic review examining threats to the health and safety of Hispanic/Latino agricultural workers attributable to climate change, focusing specifically on their risk for heat-related illnesses (HRI) and cultural factors and beliefs increasing workers' vulnerability for HRI. The second project was a secondary data analysis focused on identifying potential relationships between acculturative stressors, cultural factors, and workers' recent utilization of healthcare services in the United States. The final project was an exploratory study identifying COVID-19 associated stress experienced by a largely foreign-born group of Hispanic/Latino farmworkers in North Carolina. Like the preceding projects, this study focused on acculturative stressors and cultural beliefs potentially impacting workers' experiences with COVID-19.

Results: The first project determined that Hispanic/Latino farmworkers were indeed at increased risk for HRI. Workers occupational safety behaviors were informed by common cultural beliefs and misconceptions, increasing workers' risk for HRI. The second project found

that there were statistically significant associations between the outcome, workers' recent utilization of healthcare services in the United States, and the predictors foreign-born status, migrant worker status, work authorization (legal work authorization versus undocumented status), reading English language proficiency, and gender. The third project found that Hispanic/Latino farmworkers surveyed struggled with some level of COVID-19 stress with roughly half of participants reporting concerns about their ability to provide for and see family members as a result of COVID-19.

Conclusion: This dissertation identified a number of cultural factors and acculturative stressors impacting Hispanic/Latino farmworkers' health. Overall, the findings of this dissertation support the need for further research on the relationships between acculturative stressors, cultural factors, and health behaviors among Hispanic/Latino farmworkers. These relationships should be important considerations in research concerning Hispanic/Latino farmworkers.

This dissertation is dedicated to my parents, who worked tirelessly to provide me the privilege of education, and to my husband, who has always seen the promise and potential of my dreams.

Papi y Mami: Gracias por todos sus sacrificios, su apoyo, y todo su amor. Ustedes son y siempre serán mi razón para luchar y seguir adelante, mi bendición más importante, y mi más grande orgullo. Los amo con todo mi corazón.

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TABLE OF CONTENTS

	LIST OF TABLES	ix
	LIST OF FIGURES	x
Chapter		
I.	INTRODUCTION	1
	BACKGROUND.....	1
	STATEMENT OF THE PROBLEM	2
	PURPOSE OF THE STUDY	5
	GAP IN THE LITERATURE	6
	EXISTING THEORETICAL FRAMEWORK.....	7
	RESEARCH QUESTIONS, HYPOTHESES, AND AIMS.....	12
	LIMITATIONS	13
II.	CHAPTER II.....	15
	ABSTRACT.....	15
	INTRODUCTION.....	16
	MATERIALS AND METHODS	18
	RESULTS.....	19
	DISCUSSION	27
	CONCLUSIONS.....	33
III.	CHAPTER III	34
	ABSTRACT.....	34
	INTRODUCTION.....	36
	METHODS.....	37
	RESULTS.....	41
	DISCUSSION	47
	CONCLUSION.....	56

IV.	CHAPTER IV	58
	ABSTRACT	58
	INTRODUCTION.....	59
	METHODS.....	61
	RESULTS.....	65
	DISCUSSION	72
	CONCLUSION	77
	ACKNOWLEDGEMENT OF FUNDING	77
V.	CHAPTER V	78
VI.	REFERENCES	82
VII.	APPENDICES	99
	A. ENGLISH LANGUAGE COVID-19 STRESS QUESTIONNAIRE.....	99
	B. SPANISH LANGUAGE COVID-19 STRESS QUESTIONNAIRE	108
VIII.	VITA.....	118

LIST OF TABLES

Table

1. Summary of Articles in Review.....	22
2. NAWS Study Population Characteristics	42
3. Univariate Analysis Between Healthcare Utilization and Selected Predictors.....	46
4. Results of the Binary Logistic Regression by Predictor, with Selected Demographics	48
5. Study Population Demographic Characteristics	66
6. Study Population Farm Work Characteristics and COVID-19 Experiences	68
7. Summary of Participants COVID-19 Stress by Item and Worry Level (%(n)).....	70

LIST OF FIGURES

Figure

1. Berry's Model of Acculturative Stress (Berry, 2006)	9
2. Adapted Model of Acculturative Stress for Hispanic/Latino Farmworker Population	11
3. Article Extraction Process	20
4. Farmworker Healthcare Utilization within Two Years Preceding Survey by FY	43
5. Farmworker Payment Coverage for Healthcare Services (2007 - 2017).....	44

CHAPTER I

INTRODUCTION

BACKGROUND

The agriculture, forestry, fishing, and hunting sector is one of the most dangerous occupational sectors, consistently reporting one of the highest rates of fatal work injuries of all private sectors in the United States. In 2019, the fatal injury rate for crop production workers was 17.4 deaths per 100,000 full-time workers (Bureau of Labor Statistics, U.S. Department of Labor, & The Economics Daily, 2021). This same year, the fatal injury rate among animal production and aquaculture workers was 22.2 deaths per 100,00 full time workers. These rates were approximately five times the fatal injury rate for all private sector workers. This industry also reports among the highest rates of nonfatal occupational injuries and illnesses, at an incidence rate of five cases of injury or illness per 100 full-time workers (U.S. Bureau of Labor Statistics & U.S. Department of Labor, 2018).

Workers in this industry are exposed to various occupational and environmental hazards, including extreme weather conditions such as intense heat and rain, organic and inorganic dust, wild animals and plants, dangerous tools and equipment, hazardous chemicals, noise, and poor living conditions. Known occupational injuries and illnesses reported by this group include cuts, lacerations, eye injuries, skin conditions, hearing loss, respiratory conditions, chronic diseases, cancers, tuberculosis, and musculoskeletal problems among many others (Arcury & Quandt, 2011; Sargent & Larchanché, 2011).

Recent data indicate that among all industries in the United States, the agriculture, forestry, fishing, and hunting sector employs the second largest proportion of Hispanic/Latino

workers (U.S. Bureau of Labor Statistics & U.S. Department of Labor, 2015). In terms of occupation-specific proportions, this same group of workers makes up 43.4% of all farming, fishing, and forestry employees. In 2016, the number of fatal work injuries among foreign-born Hispanic/Latino workers was approximately double that of native-born Hispanic/Latino workers (U.S. Bureau of Labor Statistics & U.S. Department of Labor, 2015).

In the years ranging from 2016 to 2020, foreign-born workers consistently represented approximately two-thirds of all fatal work injuries involving Hispanic/Latino workers, annually (U.S. Bureau of Labor Statistics, 2021a). According to the most recent National Agricultural Workers Survey (NAWS) data, 78% of farmworkers surveyed in the United States in the fiscal years from 2019 to 2020 identified as Hispanic, 62% reported Spanish as their primary language, and 70% were foreign-born. The majority of workers (63%) listed Mexico as their country of birth (JBS International & U.S. Department of Labor, 2022).

STATEMENT OF THE PROBLEM

Hispanic/Latino farmworkers, particularly those born outside of the United States, specifically in Mexico and Central America, have long been recognized to be at increased risk for occupational illness and injury compared to U.S. born workers (Reid & Schenker, 2016). Foreign-born workers face language and cultural barriers in the workplace and report acculturative stressors, discrimination, and isolation (Mora, Quandt, Chen, & Arcury, 2016; Snipes, Cooper, & Shipp, 2017). Foreign-born workers often report feeling discriminated against by employers. Previously conducted studies have reported an observed hierarchy in Hispanic/Latino worker populations in which discrimination or injustices tend to affect those workers who lack legal status or are foreign-born more often than those who are legally authorized to work or are born in the United States (Snipes et al., 2017).

Foreign-born workers have historically and consistently reported lower levels of socioeconomic status, education, and literacy compared to U.S.-born workers (Caffaro, Micheletti Cremasco, Bagagiolo, Vigoroso, & Cavallo, 2018; Hansen & Donohoe, 2003; S. C. Moyce & Schenker, 2018; Reid & Schenker, 2016; Rust, 1990). The most recently published National Agricultural Workers Survey (2022) data reported that 4% of farmworkers surveyed had no formal schooling, 35% had education levels at or below 6th grade completion, 22% completed grade 7, 8, or 9, 26% completed grade 10, 11, or 12, and 14% reported some education beyond high school. The majority of workers surveyed reported personal annual incomes below thirty thousand dollars, and 20% of workers reported annual family incomes below the poverty line (JBS International & U.S. Department of Labor, 2022).

Workers who identify as foreign-born migrant or seasonal farmworkers (MSFWs), moving either state to state or internationally for seasonal employment in the agricultural sector, report high levels of work-related stressors that negatively impact their physical and mental health (Mora et al., 2016). A mobile lifestyle where there is a lack of control over social and environmental circumstances are some of the most commonly reported stressors among workers in this group. These stressors have been cited as major factors contributing to depressive symptoms among farmworkers (Tribble, Summers, Chen, Quandt, & Arcury, 2016; Whalley et al., 2009; Winkelman, Chaney, & Bethel, 2013). This perceived lack of control has been observed to not only put workers at risk for adverse mental health outcomes, but also negatively impacts workers' occupational safety behaviors putting them at increased risk for physical injury (Whalley et al., 2009).

In addition to the cultural, socioeconomic, and physical characteristics that increase Hispanic/Latino farmworkers' susceptibility to occupational injury, a large proportion of workers

face legal challenges that often impact their ability to earn wages equal to those of their U.S.-born counterparts. From 2013 to 2014, it is estimated that 47% of foreign-born workers lacked legal work authorization or reported undocumented status (U.S. Department of Labor Employment and Training Administration & Office of Policy Development and Research, 2016). This lack of legal work authorization increases worker vulnerability to poor working conditions, often impacts wages, and plays an important role in the ability of workers to respond to workplace risks (Reid & Schenker, 2016; Snipes et al., 2017). Without legal protections, undocumented workers may be required by employers to work overtime hours without overtime pay and may be denied workers compensation in the case of work-related injury or illness (Reid & Schenker, 2016; Snipes et al., 2017). Fear of job loss, employer retaliation, and deportation force undocumented workers into positions in which they feel obligated to accept overly strenuous workplace tasks while earning lower wages and working longer hours than their U.S.-born counterparts (S. C. Moyce & Schenker, 2018; Reid & Schenker, 2016; Tribble et al., 2016). Furthermore, fear of employer retaliation prevents undocumented workers who experience dangerous or hazardous work conditions from reporting workplace safety violations and continues to be a major contributor when it comes to adverse health outcomes (S. C. Moyce & Schenker, 2018).

In summary, workers in the agricultural sector are particularly vulnerable to adverse outcomes as a result of hazardous working conditions. Hispanic/Latino workers have historically been, and continue to be, overrepresented in the agricultural sector. These workers, especially migrant and foreign-born workers, face substantial threats and barriers to occupational health and safety. However, they are frequently expected to complete work-related tasks and accept environmental conditions that have the potential to result in physical injury, illness, depressive

symptoms, and death. In addition to the physical factors exacerbating workers' risk for adverse health and safety outcomes, cultural factors, acculturative stressors, and acculturation experiences among Hispanic/Latino farmworker populations further complicate workers' risk for adverse health and safety outcomes.

PURPOSE OF THE STUDY

While there have been studies conducted to assess working conditions and occupational health and safety issues among Hispanic/Latino farmworkers in the U.S., few have intentionally explored the roles that cultural beliefs and acculturation play in worker health and safety outcomes. This dissertation sought to identify and explore the roles shared cultural beliefs and acculturation experiences play in health and safety outcomes among Hispanic/Latino farmworkers within the contexts of major occupational health and safety hazards. Three major threats to the health and safety of Hispanic/Latino farmworkers were identified through literature review and chosen for exploration based on their relevance to and projected impact on the population of interest. The three topics to be explored in this dissertation include: Hispanic/Latino farmworkers' vulnerability to increasing temperatures, trends and disparities in accessing healthcare among Hispanic/Latino farmworkers, and Hispanic/Latino farmworkers' experiences during the COVID-19 pandemic.

The first part of this dissertation consists of a systematic review examining threats to the health and safety of Hispanic/Latino agricultural workers attributable to climate change. This study focused specifically on the risk of suffering from heat-related illnesses as an outdoor agricultural worker. Understanding the unavoidable hazards encountered by farmworker populations as a result of their outdoor occupational environments which have been widely researched and explored in existing literature, this study was conducted to further what is

presently understood about the relationship between cultural characteristics and occupational health and safety outcomes among Hispanic/Latino farmworkers.

The second part of this dissertation is a secondary data analysis utilizing the most recent publicly available National Agricultural Workers Survey (NAWS) data. This study focused specifically on workers' recent utilization of healthcare services in the United States. This study examined the differences in healthcare service utilization according to foreign-born status, migrant status, work authorization status, feelings of unwelcomeness in healthcare settings, reading English language proficiency, spoken English language proficiency, and selected demographic characteristics experiences.

The final part of this dissertation focused on stressors experienced by Hispanic/Latino farmworkers related to the COVID-19 pandemic. Like the preceding projects, this study paid close attention to the cultural characteristics of the farmworker population surveyed. At the time this project was being developed and conducted, it was novel. This project was one of the first to explore COVID-19 experiences among Hispanic/Latino farmworker populations, who were recognized as vital essential worker populations over the course of the pandemic.

GAP IN THE LITERATURE

Although workplace hazards posing threats to Hispanic/Latino farm and agricultural workers have been recognized and studied extensively in existing research, the impacts of shared social practices, cultural beliefs, and acculturative stressors on health and safety outcomes have received less attention within the contexts of occupational health and safety. Acculturative factors and cultural beliefs are undoubtedly among the most significant factors impacting Hispanic/Latino workers. The projects formulated and conducted as part of this dissertation sought to examine the roles of cultural characteristics, acculturative stressors, and acculturation

experiences on health and safety among Hispanic/Latino farmworker populations. These studies worked to not only identify important threats to the health and safety of agricultural worker populations within the U.S., but also to provide insight into the ways in which cultural factors influence health and safety behaviors and outcomes. The findings of these studies provide cultural context and utilize cultural considerations to frame health and safety issues among Hispanic/Latino farmworker populations that should be considered in future research.

EXISTING THEORETICAL FRAMEWORK

Previous research studies have identified several barriers and facilitators that could be used to develop pathways explaining the adoption or rejection of safe workplace practices among Hispanic/Latino workers. Most of these barriers and facilitators have been related to cultural factors, intrapersonal beliefs and interactions, and individual perceptions. Studies examining health and safety outcomes within this group of workers have consistently cited language, foreign born status, poor work conditions, feelings of perceived discrimination, little or no perceived control over work environments, and perceived inability to modify behavior, as barriers in the adoption of safe workplace practices (Arcury, Summers, Talton, Nguyen, et al., 2015; Caffaro et al., 2018; Flynn, Eggerth, & Jacobson, 2015; Menger, Rosecrance, Stallones, & Roman-Muniz, 2016; Schwartz, Unger, Zamboanga, & Szapocznik, 2010; Snipes et al., 2017; Winkelman et al., 2013). Given the critical importance of cultural factors in safety behavior adoption and rejection among Hispanic/Latino populations, and more specifically among Hispanic/Latino farmworkers, the underlying theoretical model guiding the development of research questions, hypotheses, and study procedures was Berry's Model of Acculturation.

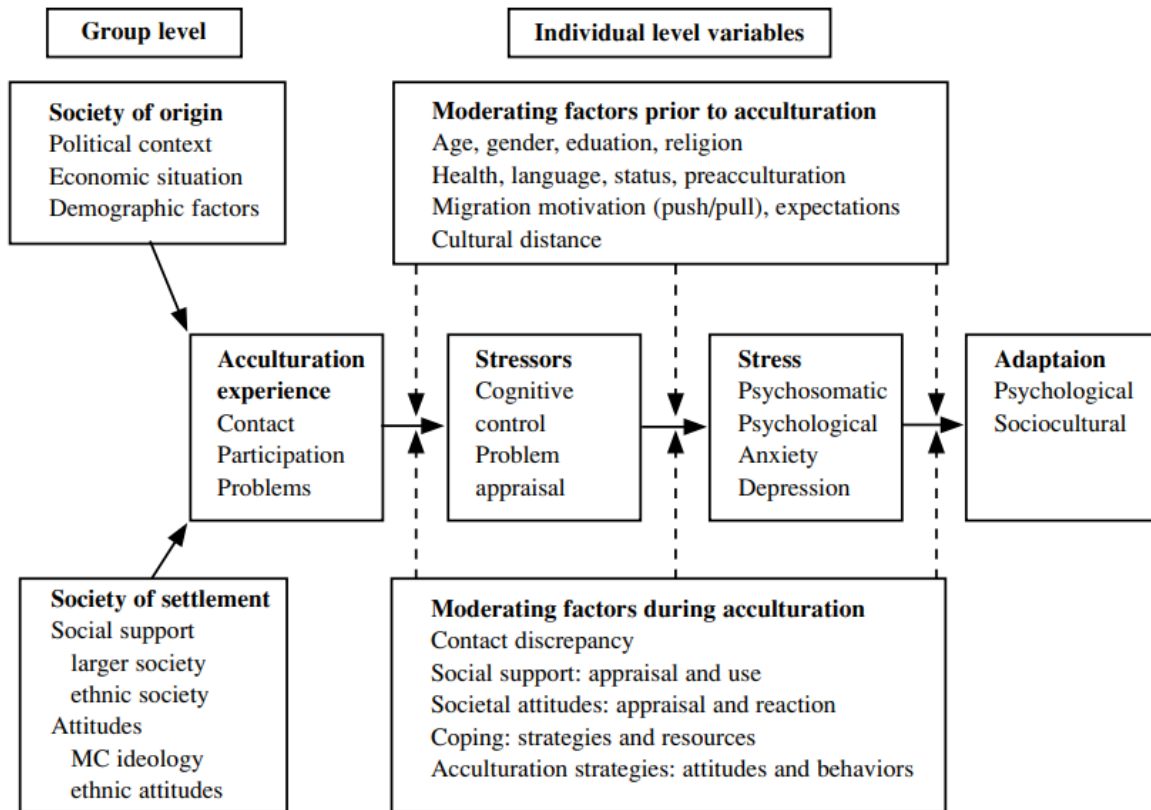
Acculturation can be defined as the process by and levels at which individuals adapt to a new or host culture. The process of acculturation is complex and consists of culture change, or

the extent to which an individual leaves one's indigenous cultural context to spend increasing time in another (Landrine & Klonoff, 2004). Throughout the process of acculturation it is expected that individuals will adapt to their new environment, potentially adopting the norms, values, and practices of their host culture. Despite individuals' potential desire to hold on to indigenous culture, as acculturation takes place, individuals may begin to lose some of their indigenous cultural beliefs, shifting their behaviors, practices, and values to reflect more of what they experience and observe in the host culture (Abraido-Lanza, Echeverria, & Florez, 2016; Landrine & Klonoff, 2004).

Berry's model considers six major constructs, group and individual level influences, and moderating factors (e.g. migration motivation, social support, and societal attitudes) (Figure 1) (Berry, 2006; Renner, Laireiter, & Maier, 2012). At the group level of influence, the model suggests that individuals' acculturation experiences are impacted by factors unique to the societies from which they originate and those that they settle into. These acculturation experiences can be positive or negative and result in stressors at the individual level that translate into stress. Individuals' stress can result in adverse physical or mental health outcomes, ultimately influencing their ability and desire to adapt to the host culture.

Figure 1

Berry's Model of Acculturative Stress (Berry, 2006)



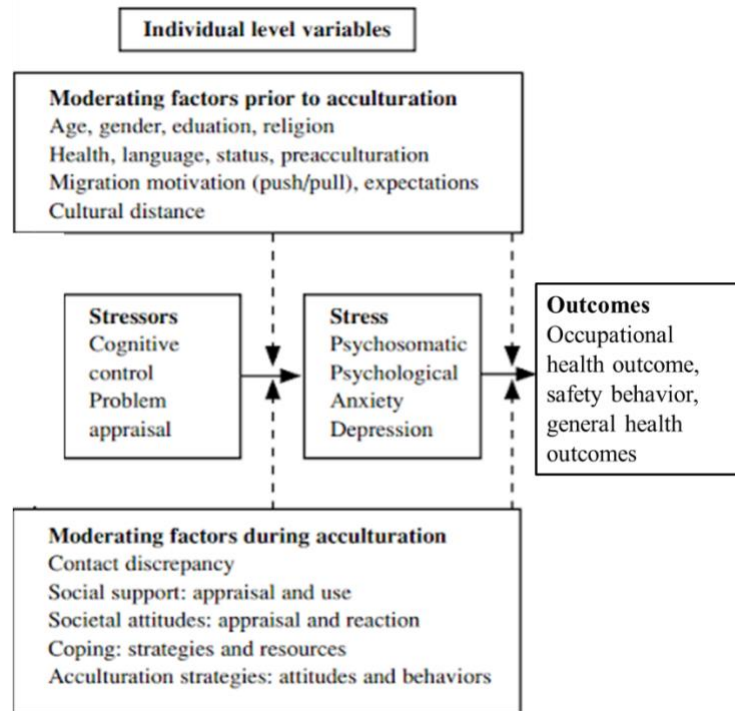
When looking specifically at Hispanics/Latinos in the U.S., there have been various stressors associated with the process of acculturation, referred to as acculturative stressors. Acculturative stressors for individuals pertaining to this ethnic minority group include discrimination, negative context of reception, anti-immigrant sentiments in host countries, unauthorized immigration status, pressures associated with learning a new language while simultaneously maintaining native language, balancing differing cultural values, and brokering between native and host culture (Cheng, Hitter, Adams, & Williams, 2016; Lorenzo-Blanco et al., 2016; Salgado, Castaneda, Talavera, & Lindsay, 2012). Among Hispanic/Latino

farmworkers, acculturative stressors, particularly discrimination, have been associated with an increased risk of occupational injury (Snipes et al., 2017).

Understanding the importance of the relationships between acculturative stressors and health outcomes among Hispanic/Latino populations and the relationships between acculturative stressors and adverse occupational health and safety outcomes among Hispanic/Latino farmworker populations, the present dissertation adapted Berry's Model to create a model more focused on the relationships between select key model constructs and health and safety outcomes specific to Hispanic/Latino farmworker populations (Figure 2). The adapted model was utilized to identify cultural factors and acculturative stressors commonly reported by the population of interest and worked to explore potential relationships between identified cultural factors, acculturative stressors, shared beliefs, shared practices observed among Hispanic/Latino farmworker populations in the U.S. within the context of occupational health and safety.

Figure 2

Adapted Model of Acculturative Stress for Hispanic/Latino Farmworker Population



While Berry's model is comprehensive, works to consider various aspects of acculturation in the process of adaptation to host environments/cultures, and was important in the development and completion of this dissertation, it is important to note that its application to Hispanic/Latino populations in existing research fails to account for significant differences between population subgroups. For example, Cuban immigrants settling in the U.S. tend to possess greater social capital, like increased levels of educational attainment, be older, and financially stable (Cooper, Bachem, Meentken, Aceves, & Barrios, 2020). Cuban immigrants often migrate for political reasons. Puerto Ricans have citizenship status, report high levels of English language proficiency, and struggle less with acculturative stress (Cooper et al., 2020). In contrast, Mexican immigrants migrate to the U.S. at younger ages, report low levels of

educational attainment, high levels of acculturative stress, and stress resulting from being frequently targeted by immigration authorities (Cooper et al., 2020; Cooper, Bamaca-Colbert, Layland, Simpson, & Bayly, 2021). Mexican immigrants often migrate for employment and financial opportunities (Cooper et al., 2020). The strengths and limitations identified in existing theories and frameworks were important considerations in this dissertation and are discussed in limited detail in the secondary analysis project.

RESEARCH QUESTIONS, HYPOTHESES, AND AIMS

Study 1

The overall aims of the systematic review were to assess Hispanic/Latino farmworkers' vulnerability to increasing temperatures, identify and consider the impacts of Hispanic/Latino farmworkers demographic and cultural characteristics on workers' risk for heat-related illnesses, identify existing gaps in the literature, and suggest directions for future research.

Study 2

The aims of the secondary analysis were to utilize data from the National Agricultural Worker Survey (NAWS) to assess trends in healthcare utilization among Hispanic/Latino farmworkers and explore potential relationships between key demographic and cultural characteristics and recent healthcare service utilization in the U.S among the study population. Hypotheses for the secondary analysis were that there would be a statistically significant associations between recent healthcare utilization and cultural and demographic factors, mainly foreign-born and migrant status. It was hypothesized that (1) those identifying as foreign-born would report recent healthcare service utilization less frequently than those identifying as U.S. born and (2) that those identifying as migrant workers would report less healthcare utilization compared to non-migrant workers.

Study 3

The primary data collection in the third and final study sought to answer the research question: “How have U.S. farmworkers been impacted by the COVID-19 pandemic?”. The objectives of the study were to (1) characterize farmworkers’ experiences with stress over the course of the pandemic and (2) identify cultural and acculturative factors potentially impacting Hispanic/Latino farmworkers COVID-19 stress experiences. Research hypotheses for this study were that (1) Hispanic/Latino farmworkers surveyed would report elevated levels of stress related to COVID-19 danger and contamination fears and that (2) farmworkers would express concerns over their ability to financially provide for their families as a result of the COVID-19 pandemic.

LIMITATIONS

Study 1

The systematic collection of articles for the systematic review was likely impacted by the phraseology utilized in the search strategy. Throughout literature, agricultural workers are referred to as both “farmworkers” and “farm workers”. There presently is no differentiation in the definition of either of these terms and they are used interchangeably to refer to the population of interest. It is possible that the literature search strategy utilized unintentionally excluded relevant articles as a result of using “farmworkers” as the key term in the literature search.

Study 2

The secondary analysis conducted faced challenges associated with collecting data from a population that would rather remain anonymous. Because of the sensitive nature of some NAWS questionnaire items (e.g., migrant status, foreign-born status, country of birth, feelings of unwelcomeness, undocumented status), the data set assessed was missing data. The influence of

missing data likely introduced non-response bias into the present study. There were likely significant differences between respondents who elected to provide sensitive information and those who did not. Respondents may have felt compelled to respond to questionnaire items in ways that better protected their privacy (e.g. disclosing inaccurate legal status, age, foreign-born status, country of birth).

Study 3

The primary data collection resulted in a study population that was overwhelmingly female. The over recruitment of female participants was not intentional but instead likely a result of having an all-female data collection team and female community partners. These partnerships, while invaluable, may have impacted participant recruitment and influenced the willingness of male farmworkers to participate. Participant recruitment was also impacted by COVID-19 related challenges that arose over the data collection period. There were necessary pauses in data collection to protect the study team and population of interest from COVID-19 exposure. Over the data collection period, several farms in the region where data collection was taking place experienced COVID-19 outbreaks. Pauses in data collection may have resulted in the unintentional exclusion of eligible participants. Additionally, the number of participants recruited, while a respectable sample given the known difficulties in accessing Hispanic/Latino farmworker population, was relatively small. The small sample size limits the statistical power of the study.

CHAPTER II

ARTICLE I

Cultural Factors, Migrant Status, and Vulnerability to Increasing Temperatures among Hispanic/Latino Farmworkers: A Systematic Review

ABSTRACT

Hispanic/Latino farmworkers have been widely recognized as a particularly vulnerable population in the United States, reporting among the lowest levels of income and educational attainment in the country. Existing research has identified and explored factors, including cultural and demographic characteristics, that increase the vulnerability of these workers to suffer adverse occupational health and safety outcomes. The present review sought to assess Hispanic/Latino farmworker vulnerability to increasing temperatures and intense heat events, focusing on the role and importance of demographic and cultural characteristics on heat-related health outcomes. A systematic literature search was conducted using the search terms Heat and (Hispanic or Latino) farmworkers and health over the years from 2000 to 2020. A total of 348 articles were screened through a title review. Articles included in the final review focused primarily on heat-related illnesses and related symptoms among the population of interest. Hispanic/Latino workers were at heightened risk of suffering from heat-related illness symptoms as a result of their occupational environments, working conditions, acculturative stressors, cultural beliefs, and other cultural factors.

INTRODUCTION

Over the past decades, populations across the globe have had no choice but to endure the severe consequences of climate change. Increases in severe weather events, like heavy precipitation, harsh and prolonged drought, and extreme heatwaves have posed substantial challenges when it comes to the sustainability, health, and safety of human populations (Hathaway & Maibach, 2018; Myers et al., 2017). While the threats posed by climate change have been increasingly studied in more recent literature, there has been limited exploration of the impacts of these drastic climate and environmental fluctuations on occupational health outcomes (Applebaum et al., 2016; Moda, Filho, & Minhas, 2019).

Worker populations are among the first to be exposed to the effects of climate change, as they are expected or required to complete job tasks regardless of environmental conditions (Kiefer et al., 2016; Schulte et al., 2016). Outdoor workers, in particular, are at increased risk of suffering adverse outcomes attributable to the effects of climate change, as they are constantly exposed to hazardous conditions brought on by extreme weather events, humidity, heat, and patterns of increasing average temperatures (Schulte et al., 2016). These unavoidable workplace exposures increase outdoor workers' overall vulnerability to succumb to occupational injuries, heat stress, and heat-related illnesses (Schulte et al., 2016; Xiang, Bi, Pisaniello, & Hansen, 2014). The increasing frequency and intensity of hot weather days and events are serious and intensify challenges in the occupational health and safety of outdoor worker populations (Xiang et al., 2014).

Although several types of outdoor workers have been identified to be at increased risk for adverse outcomes associated with occupational exposures to extreme heat, farmworkers are a particularly vulnerable occupational group (Xiang et al., 2014). A study conducted in 2010 found that the heat-related fatality rate among crop workers was twenty times higher than the rate for all United States civilian workers (Jackson & Rosenberg, 2010). Farmworkers have long been

recognized as a vulnerable population in the United States as they are among the most economically disadvantaged and underserved groups in the nation, reporting low levels of educational attainment, frequent barriers in acquiring health insurance and accessing care, and poor living conditions (Arcury, Summers, Talton, Chen, et al., 2015; Hansen & Donohoe, 2003; Pulgar et al., 2016; Reid & Schenker, 2016; M. Stoecklin-Marois, Hennessy-Burt, Mitchell, & Schenker, 2013).

Presently, Hispanics/Latinos are overrepresented in the United States agricultural sector, comprising more than three-fourths (83.0% in 2015-2016) of the total population of farmworkers in the country (JBS International, 2018). Hispanic/Latino farmworkers, particularly foreign-born and migrant or seasonal workers, face additional challenges in their occupational setting, including language barriers, discrimination, and lack of legal work authorization (Hansen & Donohoe, 2003; S. C. Moyce & Schenker, 2018). Migrant or seasonal Hispanic/Latino farmworkers, or those workers who physically follow the crops throughout the duration of the growing season, are a subpopulation of Hispanic/Latino farmworkers recognized to be at increased risk for adverse occupational outcomes as they report little formal education, extremely low incomes, suffer through social isolation resulting from the transient nature of their occupation, and increased acculturative stressors (Ramos, Su, Lander, & Rivera, 2015). These factors further complicate the risk for occupational injuries and illnesses as fears of deportation, job loss, and retaliation from employers often force Hispanic/Latino farmworkers to perform exceedingly strenuous tasks in dangerous workplace or environmental conditions (Arcury, Summers, Talton, Chen, et al., 2015).

As outdoor workers, Hispanic/Latino farmworkers are among the most exposed to the environmental effects resulting from climate change, principally increasing temperatures, and more frequent heat events. This group represents a vulnerable subpopulation of outdoor workers,

not presently well studied within the context of climate change. The present systematic review sought to assess Hispanic/Latino farmworkers' vulnerability to increasing temperatures, identify and consider the impacts of Hispanic/Latino farmworkers demographic and cultural characteristics on workers risk for heat-related illnesses, identify existing gaps in the literature, and suggest directions for future research.

MATERIALS AND METHODS

In order to answer the proposed research question, literature searches were conducted using the search terms (((heat) AND Hispanic) OR Latino) AND farmworkers) AND health. Given the anticipated challenges finding literature relevant to the present review, preliminary searches were conducted to develop an adequate search strategy aimed at capturing the widest breadth of relevant literature. The preliminary literature searches utilized Google Scholar, Environment Complete, and PubMed. These databases were chosen for preliminary searches based on their abilities to return results from an array of peer-reviewed sources and relevance to the subject matter.

Studies eligible for inclusion were limited to only those whose population of interest consisted of adult Hispanic/Latino farmworkers operating in the United States. To be included, studies must have established a link between extreme or intense heat and the health outcome of interest under study. No limitations or exclusions were made based on health outcomes. All health outcomes previously associated with extreme heat events, including heat-related illnesses, cardiovascular diseases and related conditions, as well as respiratory conditions were considered, and eligible for inclusion in the present analysis. Only peer-reviewed English language publications were considered.

Articles excluded from the present review included those that were overly focused on preventative efforts/interventions or research methodologies without discussing the relationships

between extreme heat and the health outcome of interest (Mitchell et al., 2017), those that were focused in migrant agricultural worker populations outside of the United States, those focused on health and safety issues reported by the population of interest resulting from social and political contexts unrelated to heat exposures (Clouser, Bush, Gan, & Swanberg, 2018), and those concerned with health outcomes whose onsets were not directly associated with extreme heat or increasing temperatures (e.g., diabetes and HIV) (Quandt et al., 2018). Articles focused solely on the implementation of heat-related illness prevention strategies and outcomes related to the implementation of such strategies were excluded for the purposes of this study (Grzywacz et al., 2019), as the main focus of this review was to assess Hispanic/Latino farmworkers' vulnerability to increasing temperatures. Articles focused on the implementation and assessment of interventions reviewed during preliminary literature searches and reviews tended to be more focused on intervention efficacy and outcomes rather than heat-related outcomes among the population of interest, and as such were not eligible for inclusion. In order to capture the most recent and accurate data and statistics, publication dates were restricted to the last twenty years (2000 to 2020).

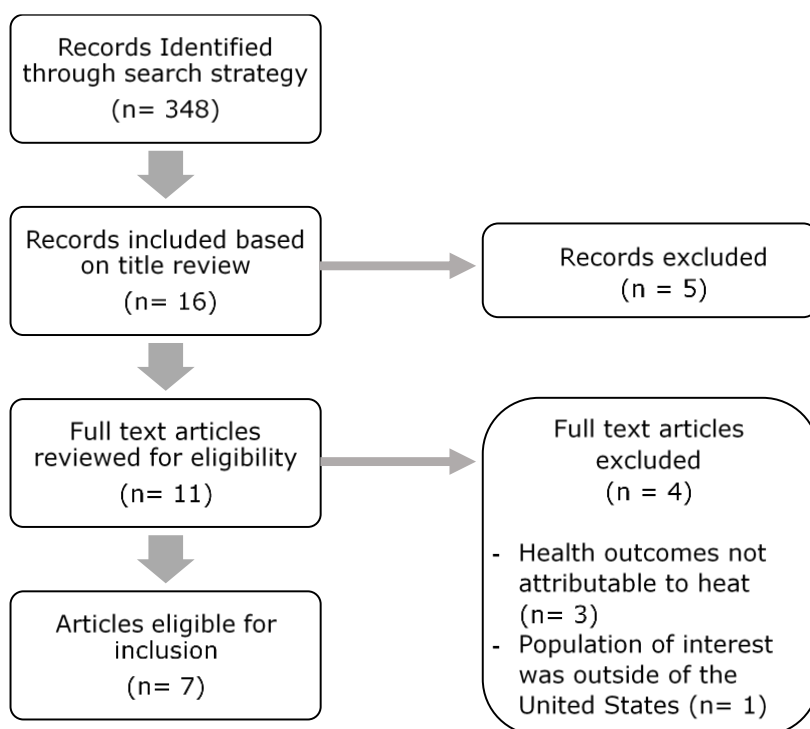
RESULTS

Of the three databases utilized in the preliminary literature searches, PubMed returned the greatest number of relevant results upon title review, and, as such, was deemed the most effective database for literature extraction. The PubMed literature search resulted in a total of 348 articles for screening through title review. A detailed depiction of the article extraction process, illustrating the PRISMA flow, can be found in Figure 3 (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). After the title review, a total of 16 articles were extracted for abstract review. Articles were excluded during the title review based on their superficial relevance to the research objective. The

articles whose titles indicated a focus on health risks unrelated to heat exposures, on populations outside of the United States, or on non-farmworker populations were deemed ineligible for inclusion during this phase of review. Abstract review of the 16 articles extracted after the title review resulted in the elimination of five records. Records eliminated after abstract review were deemed ineligible because they focused solely on health outcomes not directly attributable to heat, general outcomes within the context of broader social issues, or the political contexts causing poor health outcomes among Hispanic/Latino farmworker populations without relating such issues and outcomes to increases in average temperature or extreme heat events (n= 4). One article was excluded after abstract review because it dealt with populations outside of the United States. Overall, a total of seven articles met all eligibility criteria and were included in the final analysis.

Figure 3

Article Extraction Process



The full-text analysis revealed extreme similarities across publications. All the full-text articles included in the review focused on heat-related illness and related symptoms (n = 7). Articles mentioned climate change briefly, primarily to assert the impending occupational hazards and threats resulting from increased temperatures and more frequent extreme heat events.

The studies compiled for the present review were focused on assessing heat-related symptoms and illnesses and were concentrated in regions with elevated average temperatures. Three studies took place in Washington, one in North Carolina, one in South Carolina, one in Iowa, and one in Florida. Study designs differed, utilizing qualitative, quantitative, and mixed methodologies. Quantitative study designs utilized mobile and interviewer-administered questionnaires, while qualitative methodologies utilized focus group designs. Qualitative studies tended to focus more on worker experiences with heat-related illness symptoms, while quantitative studies worked to examine the frequency of symptom occurrence, as well as the associations between worker characteristics, behaviors, and heat-related symptom prevalence. The single mixed methods study included in the present review utilized cross-sectional surveying techniques, coupled with medical record audits, and intensive surveillance with multi-parameter monitoring wearable sensors (Culp & Tonelli, 2019). A summary of the articles included in the present review can be found in Table 1.

Table 1
Summary of Articles Included in Review

<i>Article Title</i>	<i>Author</i>	<i>Year</i>	<i>Study Design</i>	<i>Region</i>	<i>Worker/Crop Type</i>	<i>Symptoms</i>	<i>Behavioral, Cultural, and Supplemental Findings</i>
Identification of barriers to the prevention and treatment of heat-related illness in Latino farmworkers using activity-oriented, participatory rural appraisal focus group methods	Lam et al.	2013	Focus Groups	Central Washington	Blueberry, peach, apple, and cherry crop workers	Participants accurately reported symptoms of heat-related illnesses, despite the fact that very few reported having heat-illness training. Participants reported symptoms consistent with heat rash, heat exhaustion, heat cramps, and heat syncope. Participants cited not drinking water as a factor leading to dehydration, dizziness, and headaches while at work. Reported symptoms of dehydration included lack of sweating, lack of energy to work, nausea, dizziness, or feeling like their skin was loose. Participants reported that working long hours in the hot sun and high temperatures contributed to heat-related illness symptoms.	Some study participants reported using lighter colored clothing and believed that darker colored clothing "burnt more". Other participants preferred darker colored clothing because they believed it helped burn fat. Women wore girdles to help with weight loss while working. Workers consumed sports drinks, beer, local drinks, soda, energy drinks, and coffee. Piece-rate workers refrained from drinking water to avoid upsetting supervisors. Most study participants did not receive formal heat-related illness training.
Heat Illness Among North Carolina Latino Farmworkers	Arcury et al.	2015	Cross sectional; Follow-up contact interviews; Interviewer-administered questionnaires	East Central North Carolina	Crop workers	Two-thirds of participants reported working outside in extremely hot weather in the three months preceding the date of the questionnaire. More than one-third of the total sample had at least one symptom of heat-illness. Over half of the sample that worked outside in extremely hot weather had at least one heat-illness symptom. Common symptoms of heat illness among outdoor workers were muscle cramps, hot, dry skin, and dizziness. More than three-quarters of the sample that reported working inside in extremely hot weather conditions had at least one heat-illness symptom while working inside.	Most participants reported using some sort of PPE while at work. One-third of participants were problem drinkers. Most participants consumed caffeinated beverages daily. Spending time after work in hot housing increased the risk for reporting heat-related illnesses.
Risk Factors for Heat-Related Illness in Washington Crop Workers	Spector, Krenz, & Blank	2015	Audio Computer-Assisted Self Interviews	Washington	Tree Fruit Crop Workers	One-third of study subjects indicated experiencing heat-related illness symptoms during a hot day at work in the week preceding the interview.	Female participants were more likely to report heat-related illness symptoms. Piece rate compensation and lack of heat-related illness training in the year preceding the study increased workers' risk for heat-related illness symptoms. Workers who did not feel that they could take extra water or rest breaks were at increased risk for reporting symptoms. Workers reported consuming soda and sports drinks while at work, which increased their risk for heat-related illness symptoms. Personal protective equipment or lighter colored clothing use was common.

Heat exposure and productivity in orchards: Implications for climate change research	Quiller et al.	2017	Cross-sectional; computer-assisted self-interview survey	Central and Eastern Washington	Tree fruit harvesters	Twenty-five workers (74.0%) exceeded the American Conference of Governmental Industrial Hygienist (ACGIH) Heat Stress Action Limit in August. Fifteen workers (44.0%) exceeded the ACGIH Threshold Limit Value in August. More than half (54.0%) of workers exceeding the heat stress action limit exceeded the maximum recommended heart rate or core temperature for acclimatized workers set by the ACGIH. Unadjusted models identified an inverse relationship between Wet Bulb Globe Temperature and worker productivity, however after adjusting for confounders the association approached the null.	Workers were compensated by piece-rate, potentially incentivizing them to push past heat-stress symptoms. Rest periods provided to workers were inadequate.
Classification of Heat-Related Illness Symptoms Among Florida Farmworkers	Mitic et al.	2018	Cross-sectional; Interviewer administered survey	Florida	Farmworkers	A majority (84.0%) of participants reported experiencing at least one heat-related illness symptom during the work week preceding the survey. On average, workers experienced 2.2 heat-related illness symptoms. Heavy sweating and headache were the most commonly reported symptoms. Dizziness and muscle cramps were reported by about 30.0% of participants.	Female farmworkers reported more symptoms. Study authors hypothesized that this finding may have been attributable to cultural biases. Male Hispanic/Latino farmworkers are often unwilling to report symptoms. Younger farmworkers were more likely to experience three or more heat-related illness symptoms compared to older workers.
Heat-Related Illness in Midwestern Hispanic Farmworkers: A Descriptive Analysis of Hydration Status and Reported Symptoms	Culp & Tonelli	2019	Mixed methods, cross-sectional, medical record audit, intensive surveillance	Iowa	Crop workers	Extreme thirst was most frequently reported symptom across all farmworkers. Younger workers were more likely to report distressing heat symptoms, like stomach cramps, while older participants were more likely to report less distressing symptoms like skin rash. Heat-stress symptoms were more prevalent among obese participants. Field conditions above 27 degrees Celsius resulted in higher heart and respiratory rates as well as physiological intensity scores compared to lower temperature conditions.	Workers consumed sports drinks and caffeinated beverages for fluid replenishment instead of water. Younger workers also consumed/utilized salt tablets to treat symptoms of heat illness. Younger workers reported less farm and crop experience. Workers over the age of 35 tolerated field trials and hotter climate conditions better than younger workers. The use of long sleeve shirts as personal protective equipment was common, especially among unauthorized workers.
"I Think the Temperature was 110 Degrees!": Work Safety Discussions Among Hispanic Farmworkers	Luque et al.	2019	Focus Groups	South Carolina	Farmworkers, including those who worked in maintenance positions	Participants expressed concerns about working in the heat for long periods of time. Workers stated that they had seen ambulances coming for workers who had fallen ill or become dehydrated during the work from working too hard. Workers expressed symptoms like dizziness, dehydration, nausea, excessive sweating, rashes, nosebleeds, simultaneous feelings of both hot and cold body temperatures, vomiting, headaches, muscle cramps, weakness, irritated eyes, feeling ill for more than one day, and heart problems.	More than three-quarters of participants self-identified as overweight or obese. More experienced workers reported training newer workers. Workers used various types of PPE and adopted different protective behaviors, including the use of sunscreen. Farmworkers reported increased risk for overworking themselves as a result of piece-rate pay. Workers reported using saline solutions or sports drinks to treat heat-related illness symptoms. Water provided to workers by employers was poor in quality.

Heat and Farmworker Health

There were several commonalities across each of the study types. In the qualitative studies eligible for inclusion in the present analysis, heat-related illness knowledge and beliefs were assessed with the overall goal of understanding the ways in which this knowledge impacted worker behaviors. The first of the qualitative studies assessed focused on heat-related illness knowledge, beliefs, and perceptions reported by Hispanic/Latino agricultural workers operating in central Washington (Lam et al., 2013). The majority of workers interviewed for the purposes of this study were aware of the effects of heat on health, although none received formal heat-related illness training. Consistent with studies examining heat-related illnesses across general populations of farmworkers, participants were able to identify heat illness symptoms and ways to prevent succumbing to heat-related illnesses despite the lack of training. The second qualitative study in the present analysis reported similar findings, with the majority of workers reporting knowledge on heat-related symptoms and an understanding of the risks associated with working in extreme heat (Luque, Bossak, Davila, & Tovar-Aguilar, 2019). Participants across both studies described instances of dizziness, dehydration, and nausea as common symptoms resulting from working long periods during hot days.

Like the findings from the qualitative studies, results across quantitative studies were similar. These quantitative studies sought to assess the presence and prevalence of heat-related illness symptoms across groups of workers from different regions. All studies found elevated reports of heat-related illness symptoms including excessive sweating, headaches, dizziness, muscle and stomach cramps, and skin rashes. Arcury et al. (2015) found that more than one-third of farmworkers in their study sample reported heat illness symptoms over the agricultural season from June to August while working outside in extremely hot weather. Interestingly, Arcury et al. also found a high prevalence of heat-related illness symptoms among farmworkers completing work tasks

indoors during extremely hot weather. Mutic et al. (2018) reported an elevated burden of heat-related illness symptoms ranging from mild to severe across their study population, with more than 80.0% of study participants experiencing at least one heat-related illness symptom over the week preceding the survey.

Work Characteristics as Risk Factors for Heat-Related Illness Symptoms

Each of the quantitative studies sought to understand the effects of previously recognized risk factors associated with heat illness-related symptom presence across their study populations. These studies varied in their findings, with some emphasizing participant demographic characteristics as significant risk factors for illness and symptom occurrence, while others cited no statistically significant elevated risk attributable to demographic characteristics. While these studies reported differences in the effects of certain demographic characteristics on the risk for and reporting of heat-related illness symptoms, all studies concluded that exposure tasks, such as working in wet clothes and shoes and operating in extremely hot weather conditions, were associated with elevated risk for heat illness (Arcury, Summers, Talton, Chen, et al., 2015; Culp & Tonelli, 2019; Mutic et al., 2018; Spector, Krenz, & Blank, 2015).

The final study eligible for inclusion in the present analysis, conducted in Washington to examine heat stress and heat strain among orchard and adult piece-rate fruit harvesters, aimed to assess the effects of heat on worker productivity and physiological processes. Unlike the aforementioned studies examining heat symptom prevalence and self-reported worker behaviors, Quiller et al. (2017) were working to assess the ways in which extreme temperatures affect workers' overall productivity, utilizing established heat stress action limits and threshold limit values to assess for heat strain. Approximately three-fourths (74.0%) of workers exceeded heat stress action limits, and almost half (44.0%) exceeded threshold value limits. Slightly more than half (54.0%) of workers exceeding the

action limit also exceeded maximum recommended heart rates and core temperatures, which indicated heat strain. Authors noted that rest periods that ideally should have allowed workers to remain below the threshold values and limits were often inadequate. Ultimately, their study found no statistically significant effects of increased temperatures on worker productivity. However, despite insignificant findings, the study authors concluded that the relationship between heat exposure and worker productivity is complex and likely affected by economic factors, work characteristics, management and harvesting practices, as well as environmental conditions (Quiller et al., 2017).

Piece-rate compensation was identified as a major factor further increasing workers' risk for heat-related illness in three of the quantitative studies and both of the qualitative studies (n=5) (Arcury, Summers, Talton, Chen, et al., 2015; Lam et al., 2013; Luque et al., 2019; Quiller et al., 2017; Spector et al., 2015). These studies hypothesized that piece-rate compensation was a major factor driving workers to push past physical limits or signs of heat-related illnesses across populations of Hispanic/Latino farmworkers. A single study in the present review was able to identify a statistically significant difference in the prevalence of heat-related symptoms between hourly and piece-rate workers, with piece-rate workers more frequently reporting symptoms (Spector et al., 2015).

Hispanic/Latino Farmworker Beliefs, Practices, and the Risk of Heat-Related Illnesses

Six out of the seven studies included in the present analysis touched on behaviors commonly observed specifically among Hispanic/Latino farmworkers (Arcury, Summers, Talton, Chen, et al., 2015; Culp & Tonelli, 2019; Lam et al., 2013; Luque et al., 2019; Mutic et al., 2018; Spector et al., 2015). Commonly observed behaviors across studies were intended to be protective and were believed to prevent heat-related illnesses or treat symptoms among workers. Frequently observed behaviors included the consumption of caffeinated beverages and sports drinks on the job,

consumption of salt tablets, use of personal protective equipment, wearing lighter colored clothing, and wearing clothing items that protected workers from the sun (i.e., long sleeves and hats). Additional behaviors observed among farmworkers, although less common, included consuming beer on the job, using girdles while working, and avoiding taking breaks for water, rest, or shade.

DISCUSSION

The present review examined what is presently understood about Hispanic/Latino farmworkers' risk for heat-related illnesses. Unsurprisingly, workers self-reported an elevated burden of heat-related illness symptoms and were able to describe experiences in which prolonged exposure to heat within the workplace setting resulted in negative health consequences like extreme thirst, sweatiness, and dizziness (Arcury, Summers, Talton, Chen, et al., 2015; Culp & Tonelli, 2019; Lam et al., 2013; Luque et al., 2019; Mutic et al., 2018; Spector et al., 2015). Workers across studies seemed well aware that working in intense heat had the potential to result in short-term health consequences and symptoms, despite a lack of training on heat-related illnesses (Lam et al., 2013; Luque et al., 2019; Spector et al., 2015).

Although Hispanic/Latino farmworkers are a vulnerable subpopulation of farmworkers at increased risk for heat-related illnesses, the risk for heat-related illness symptoms is not uniform across this group. Women, obese and overweight individuals, and younger workers are at increased risk to succumb to the impacts of extreme heat (Culp & Tonelli, 2019; Mutic et al., 2018; Spector et al., 2015). Across the presently reviewed studies, older workers were less likely to report heat-related illness symptoms while younger individuals were found to be at increased vulnerability for symptoms (Culp & Tonelli, 2019; Mutic et al., 2018; Spector et al., 2015). These findings were expected, given that younger farmworkers typically report less relevant work experience and as such are more likely to unknowingly engage in unsafe occupational behaviors.

Notably, obesity and overweight status were concentrated among younger farmworkers (Culp & Tonelli, 2019). The direct mechanisms putting these subgroups of workers at increased vulnerability for heat-related illness outcomes have not yet been thoroughly explained in existing research; however, risk factors such as preexisting health conditions, pregnancy, excess consumption of caffeinated beverages, and obesity, which has been increasing among populations of Hispanics/Latinos over the past decades and is prevalent among Hispanic/Latino women, have been identified for further exploration (Culp & Tonelli, 2019; Flocks et al., 2013; Isasi et al., 2015).

Among the most interesting, and arguably the most important, findings of the present study, were the roles and influences of acculturation experiences and cultural beliefs on workers' behavioral practices (Flocks et al., 2013; Lam et al., 2013; Luque et al., 2019). Previous studies examining health and safety outcomes among Hispanic/Latino farmworkers have consistently cited factors like language, foreign-born status, poor work conditions, feelings of perceived discrimination, little or no perceived control over work environments, and perceived inability to modify behaviors as determinants of occupational behavior practices (Arcury, Summers, Talton, Nguyen, et al., 2015; Caffaro et al., 2018; Flynn et al., 2015; Menger et al., 2016; Schwartz et al., 2010; Snipes et al., 2017; Winkelman et al., 2013). In the present review, Hispanic/Latino farmworkers reported a number of acculturative stressors increasing their risk for heat-related illness symptoms, including foreign-born status and legal work authorization.

These findings are in accordance with other existing research focused on Hispanic/Latino, migrant, and foreign-born farmworker populations. Previous studies have reported significant differences in farmworkers' knowledge of occupational and personal risk factors for heat-related illnesses, as well as different experiences with heat-related symptoms, associated with farmworkers' legal status and their self-reported time spent in the United States. (Bethel & Harger, 2014; Mirabelli

et al., 2010). A study by Bethel & Harger (2014) found that foreign-born farmworkers living in the United States for 10 years or more reported higher heat knowledge scores than those living in the United States 10 years or less. Time spent living in the United States is often used throughout existing research as a proxy measure of an individual's level of acculturation, with those having spent more time in the United States thought to be more acculturated or adapted to host culture or norms, as a result of being exposed to the host culture for a longer period of time, compared to individuals having spent less time in the United States (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005).

Like foreign-born status, legal work authorization has been identified as a significant factor impacting Hispanic/Latino worker health and safety. Hispanic/Latino farmworkers lacking legal work authorization report feelings of perceived discrimination by employers and increased workloads compared to legally authorized workers, which can adversely impact workers' overall health (Arcury, Summers, Talton, Nguyen, et al., 2015; Caffaro et al., 2018; Flynn et al., 2015; Menger et al., 2016; Schwartz et al., 2010; Snipes et al., 2017; Winkelman et al., 2013). A study by Mirabelli et al. (2010) found that farmworkers with H-2A visas self-reported heat-related symptoms less frequently when compared to non-H-2A farmworkers. Because work authorization status plays a significant role in workers' perceived abilities to decline difficult or dangerous workplace tasks and can inhibit workers' ability to protect themselves from occupational hazards, legal work authorization should continue to be explored in future research, where possible (Arcury, Summers, Talton, Chen, et al., 2015; Hansen & Donohoe, 2003).

Despite the overwhelming prevalence of heat-related illness symptoms across studies, study authors observed and hypothesized an underreporting of heat-related illnesses and symptoms attributable to foreign-born and legal work authorization (Culp & Tonelli, 2019; Mutic et al., 2018; Spector et al., 2015). Groups of foreign-born and unauthorized workers may have felt inclined to

underreport heat-related symptoms, abstain from seeking medical care or attention, or refrain from participating in studies to avoid employer retaliation or protect their employment position (Arcury & Quandt, 2011; Culp & Tonelli, 2019).

In addition to the role of acculturative stressors like foreign-born status and work authorization, Hispanic/Latino farmworkers' common cultural beliefs and practices further complicate their susceptibility to heat-related illnesses. This group of workers shares common misconceptions about things like water consumption, caffeinated beverage consumption, and excessive sweating, among various others. Workers' beliefs surrounding cold water, sport drinks, and caffeinated beverage consumption were discussed in five of the seven studies included in the present analysis (Arcury, Summers, Talton, Chen, et al., 2015; Culp & Tonelli, 2019; Lam et al., 2013; Luque et al., 2019; Spector et al., 2015). Farmworkers across the two quantitative studies disclosed strong negative beliefs and perceptions surrounding the consumption of cold water in high temperatures or immediately after performing work-related tasks (Lam et al., 2013; Luque et al., 2019). Workers believed that consumption of cold water after exposure to extreme heat could result in serious illness, muscle spasms, mouth blisters, or cramps in the lungs (Lam et al., 2013; Luque et al., 2019). Additionally, some workers believed that using cold water for cooling treatments topically could lead to serious health consequences. Workers stated that family members had advised them to avoid putting cold water on the body because it could lead to fainting or headaches (Lam et al., 2013). Workers also feared the possibility of developing arthritis as a result of wetting overworked hands with cold water at the end of the workday, a belief that has been documented in other studies (Barker, Guerra, Gonzalez-Vargas, & Hoeft, 2017; Lam et al., 2013).

Hispanics/Latinos' overconsumption of caffeinated beverages, sugar-sweetened beverages, and sports drinks is a trend that has been well documented throughout existing literature (Bethel, Spector,

& Krenz, 2017; Bogart et al., 2013; S. Park, Blanck, Dooyema, & Ayala, 2016; Sohyun Park, Onufrak, Patel, Sharkey, & Blanck, 2019). While the studies reviewed in the present analysis cited a self-reported perceived need to stay energized as a potential rationale for workers overconsumption of caffeinated beverages on the job, literature suggests that beverage consumption practices among Hispanics/Latinos are influenced by negative perceptions and mistrust of water sources (Bogart et al., 2013; Lam et al., 2013; Sohyun Park et al., 2019). In general, Hispanics/Latinos are more likely to mistrust tap water and, as such, are more likely to consume unhealthy beverages (Sohyun Park et al., 2019). Farmworkers commonly cited concerns about tap water offered by employers on jobsites, believing water sources offered were potentially contaminated (Culp & Tonelli, 2019; Lam et al., 2013; Luque et al., 2019). While the general mistrust of tap water and water sources on jobsites was not thoroughly explored across the studies included in the present review, the availability of clean water and water consumption breaks for worker populations were identified as important factors associated with self-reported heat illness-symptoms and experiences in three studies (Lam et al., 2013; Luque et al., 2019; Spector et al., 2015). These findings strongly suggest that farmworkers' mistrust of on-site water sources should be further explored in future studies.

Although heat-related illnesses are the most common consequences of exposure to higher temperatures and are presently understudied among populations of Hispanic/Latino farmworkers, there is a need to study other health outcomes that are attributable to extreme heat within this population. Exposure to higher temperatures has been linked to adverse cardiovascular, kidney, and respiratory outcomes (Kiefer et al., 2016). Studies outside of the United States examining agricultural populations in Central America have established associations between agricultural work and decreased kidney function attributable to strenuous workloads completed in hot environments (Peraza et al., 2012). A study conducted in 2014 on heat strain and acute kidney injury incidence

among agricultural workers in California, found that heat strain was associated with increased odds of incident acute kidney injury among male study participants while occupational factors, including piece rate pay and number of years employed as an agricultural laborer, were associated with increased odds of incident acute kidney injury among female study participants (S. Moyce et al., 2017). The identification of increased vulnerability of farmworkers to health outcomes outside of heat-related illness but associated with prolonged exposures to hot environments in regions outside of the United States suggests a need for further exploration of the health impacts of heat among populations operating within the nation. The lack of publications examining effects outside of commonly observed heat-related illnesses and symptoms highlights a need for future research focusing on identifying prevalent health symptoms and conditions associated with occupation-specific environmental conditions.

Existing research has focused on risk factors and the immediate consequences of repeated exposure to extreme heat. Studies have followed workers for short periods of time or collected cross-sectional data that has provided meaningful insight into the prevalence and incidence of heat-related symptoms. While this data is both meaningful and necessary, the short-term follow up and cross-sectional study design do not have the capacity to assess the potential long-term impacts of exposures to increasing temperatures and extreme heat. Most studies relied on self-reported data from participants which is limited by things like recall bias, social desirability bias, and selection bias, suggesting a potential need for more novel approaches in the future. These limitations present issues when it comes to understanding the severity of the exposures, underscoring potentially serious threats to worker health and safety attributable to increasing temperatures.

The present review is not without limitations. In the present review, the systematic collection of articles may have been impacted by the phraseology utilized in the search strategy. Throughout

literature agricultural workers are referred to as both “farmworkers” and “farm workers”. There presently is no differentiation in the definition of either of these terms and they are used interchangeably to refer to the population of interest. It is possible that the literature search strategy utilized unintentionally excluded relevant articles as a result of using “farmworkers” as the key term in the literature search. An additional limitation of the present study was the exclusion of articles that had not undergone the peer-review process. Because articles included in the study were limited to those that had been peer-reviewed, there may have been publication bias.

CONCLUSIONS

The present study was able to describe heat-related illness experiences and identify a number of risk factors among Hispanic/Latino farmworkers in the United States. Cultural factors, shared beliefs and practices, and acculturative stressors were, unsurprisingly, major components exacerbating workers’ risks of succumbing to heat-related illness symptoms. The identification of these factors was a major strength of both this study as well as the studies included in the present analysis. Acculturative stressors and cultural factors are important elements of Hispanic/Latino health as they shape individuals’ beliefs and practices through complex pathways. The influence of cultural factors and acculturative stressors should not be underestimated. Studies examining the health and safety of populations of Hispanic/Latino farmworkers in the United States should make efforts to capture data on important cultural factors reported by the population of interest in order to further understand occupational health and safety behaviors among this group. Moreover, consideration of cultural factors is essential to the development of adequate health and safety interventions targeting this group of workers. Without a fundamental understanding of these factors, occupational health and safety researchers will likely yield limited success in improving health outcomes among this group.

CHAPTER III

Article II

Analyzing the National Agricultural Worker Survey Data to Assess Trends in Health Care Utilization Among United States Farmworkers

ABSTRACT

BACKGROUND: Hispanics/Latinos are overrepresented in the agricultural industry where they are at risk for adverse health outcomes as a result of dangerous machinery, hazardous chemicals, and poor working conditions. Acculturative stressors, like perceived discrimination and undocumented status, further exacerbate their risk for poor health outcomes. Despite increased risk for adverse health outcomes, these workers report low healthcare service utilization.

METHODS: A secondary analysis was conducted using the most recently publicly available National Agricultural Workers Survey (NAWS) data. A multivariable logistic regression model was used to model the odds of recent utilization of healthcare services in the U.S. as a linear combination of the predictors variables while adjusting for the demographic characteristics.

RESULTS: A total of 22,572 survey responses collected over the time period spanning from 2007 to 2018 were included in the present analysis. Female gender (OR = 3.35, 95% CI [3.100 – 3.642]) and foreign-born status (OR =2.721, 95 [2.097 – 3.530]) were associated with increased odds of recent healthcare utilization.

CONCLUSION: Foreign-born and undocumented farmworkers face a number of challenges when attempting to access healthcare services. Cultural characteristics and acculturation experiences are important factors to consider in the health of Hispanic/Latino populations. Exploring the roles

played by these factors is imperative to improving access to and utilization of healthcare services among Hispanic/Latino agricultural worker populations.

INTRODUCTION

Agricultural workers are exposed to various occupational and environmental hazards, including extreme weather conditions, organic and inorganic dust, loud or prolonged noise, poor living conditions, dangerous heavy machinery, tools, and equipment, and hazardous chemicals. Commonly reported occupational injuries and illnesses reported by farmworkers include cuts, lacerations, eye injuries, skin conditions, hearing loss, respiratory conditions, chronic diseases, cancers, tuberculosis and other infectious diseases, as well as musculoskeletal problems, and other acute and chronic health conditions (Arcury & Quandt, 2011; Sargent & Larchanché, 2011). The agriculture, forestry, fishing, and hunting sector consistently ranks as one of the most dangerous occupational sectors in the U.S., reporting some of the highest rates of both fatal and nonfatal work injuries of all private sectors in the country. In 2018, the United States Bureau of Labor Statistics reported an industry fatality rate of 23.4 deaths per 100,000 full-time equivalent workers and injury/illness incidence rate of 5.3 cases of injury/illness per 100 full-time equivalent workers (U.S. Bureau of Labor Statistics, 2019; U.S. Bureau of Labor Statistics & U.S. Department of Labor, 2019b).

Existing data has indicated that the agriculture, forestry, fishing, and hunting sector employs the second-largest proportion of Hispanic/Latino workers (27.5%) in the U.S. (U.S. Bureau of Labor Statistics & U.S. Department of Labor, 2019a). Recent statistics have estimated that Hispanic/Latino workers represent approximately 80% of all farmworkers in the U.S. (Snipes et al., 2017; Ulrich et al., 2018). Roughly three-fourths of the population of farmworkers in the U.S. are foreign-born, with the majority of foreign-born workers identifying Mexico as their country of birth/origin (U.S. Department of Labor Employment and Training Administration & Office of Policy Development and Research, 2016). Foreign-born Hispanic/Latino workers in the

U.S. report significantly worse occupational health and safety outcomes compared to their U.S.-born counterparts (Flynn et al., 2015). In the years ranging from 2003 to 2016, foreign-born workers consistently represented approximately two-thirds of all fatal work injuries involving Hispanic/Latino workers across all occupations in the U.S. (U.S. Bureau of Labor Statistics, 2018). According to recent statistics, the occupation associated fatality rate among Hispanic/Latino workers increased from 4.2 in 2019 to 4.5 in 2020 (U.S. Bureau of Labor Statistics, 2021b).

Although Hispanic/Latino farmworkers have been recognized as a vulnerable population at increased risk for poor health outcomes attributable to their occupation, healthcare access and utilization among this group of workers has remained low over the past decade (Feldman et al., 2009; Hoerster et al., 2011; Perez-Escamilla, Garcia, & Song, 2010). Given that Hispanic/Latino workers are overrepresented in the agricultural sector and are at increased vulnerability for adverse occupation associated health and safety outcomes, it is critical that the barriers in seeking and receiving healthcare services be identified and further explored. The present study utilized data from the National Agricultural Worker Survey (NAWS) to assess trends in healthcare access among Hispanic/Latino farmworkers and explore relationships between key demographic and cultural characteristics to identify potential issues in accessing healthcare services among this population.

METHODS

The National Agricultural Workers Survey (NAWS) is an employment-based random-sample survey of crop workers employed in the U.S. (U.S. Department of Labor Employment and Training Administration & Office of Policy Development and Research, 2016). The cross-sectional survey was first conducted in 1988 and utilizes stratified multi-stage sampling methodologies in order to account for seasonal and regional fluctuations in levels of farm

employment in the 12 geographic locations surveyed. NAWS primary data collection consists of face-to-face interviewer administered questionnaires. Interview sessions are typically conducted at respondents' worksites and take place before work, during breaks, or after work (U.S. Department of Labor, 2022a).

Survey questionnaire items cover demographic, employment, familial composition, and health data. Examples of some of the items in the survey include age, sex, level of income, foreign-born status, migrant status, and recent utilization of healthcare services either in the U.S. or in a foreign country. The NAWS data set was chosen for the present study because of its focus and collection of data specifically relating to workers' healthcare-seeking behaviors, cultural characteristics, and demographic characteristics.

For the purposes of this study, data included in the analysis was limited to that collected from fiscal years 2007 to 2018. The decision to focus on data collected during this specific time period was made in order to ensure that study analyses captured and reported on the most recently observed trends in healthcare utilization among the population of interest. Cases chosen for inclusion in the present analysis were weighted by survey year weights. Adjusting data using year weights, calculated as a ratio of the total number of farmworkers in a sampling year to the number of interviews in that sampling year, allowed for the combination of different sampling years without statistical bias attributable to increased responses from larger sampling years (U.S. Department of Labor, 2022b).

Variables

Demographics characteristics analyzed in the present study to summarize the population included age, gender, country of birth, race, and ethnicity. After reviewing the codebook and

NAWS data set, a limited number of variables were chosen for inclusion in the present analysis based on their relevance to the aims of the present study.

Dependent variable. The main outcome of interest in the present analysis, recent utilization of healthcare services in the U.S., was defined as access to any type of healthcare services (doctors, nurses, dentists, clinics, or hospitals in the U.S.) in the two years preceding survey completion. This was a categorical variable, coded as 0 = No, 1 = Yes, 9 = Not answered, 95= Don't know, 96 = Refuse. For the purposes of this analysis, levels of non-response (9, 95, 96) were considered missing and the variable was recoded to be binary (0 = No, 1 = Yes).

Predictor variables. A total of six categorical predictor variables were included in the analysis. They consisted of foreign-born status, migrant status, feelings of unwelcomeness in healthcare settings, work authorization status, reading English language proficiency, and spoken English language proficiency. These variables were chosen for analysis based on existing literature and research suggesting significant associations between these characteristics, feelings of discrimination, and healthcare access and utilization (Hansen & Donohoe, 2003; S. C. Moyce & Schenker, 2018).

Foreign-born status and Migrant status were binary variables coded as 0 = Born in the U.S. or Puerto Rico, 1 = Foreign born, and 0 = Not Migrant, 1 = Migrant. The variable feelings of unwelcomeness contained 3 categories of non-response which were recoded as missing values to create binary variable with levels 0 = welcome, 1 = don't feel welcome. Work authorization status was coded 1 = citizen, 2 = green card, 3 = other work authorization, 4 = Unauthorized. Reading and spoken English language proficiency were measured on an ordinal scale coded as 1= not at all, 2= a little, 3= somewhat, 4 = Well. Both English language proficiency variables were recoded to

binary variables where categories 1 and 2 were collapsed and reassigned a value of 1 = Limited, and categories 3 and 4 were collapsed and reassigned a value of 2 = Well.

Statistical Analysis

The data analysis in the present study employed both descriptive and exploratory methods. Prior to conducting the exploratory analyses, variables included in the study were assessed descriptively to identify potential issues within the data. Descriptive analysis provided the opportunity to understand each variable's distribution among the population under study, and more importantly, aided in identifying variables with large proportions of missing data. For the purposes of the present study, missing data was dropped/excluded from statistical analyses.

Weighted analyses were used to correct for any sampling errors, and the standard errors of the weighted estimates were used to compute 95% confidence intervals. Trends in healthcare service utilization and payment coverage type for healthcare services utilized were assessed through simple descriptive analyses in which patterns of care utilization and payment type were stratified by fiscal year for comparison. Chi-square tests were used in a univariate analysis to assess for associations between recent utilization of healthcare services and feelings of unwelcomeness, foreign-born status, migrant status, work authorization status, and English language proficiency. To assess the potential influences of select predictor variables on recent utilization of healthcare services, a multivariable logistic regression model was used to model the odds of recent utilization of healthcare services in the U.S. as a linear combination of the predictors variables while adjusting for the demographic characteristics. All critical values cutoff points in this analysis were set at 0.05, and all analyses were performed using SPSS version 28.

RESULTS

Demographic Overview

The total sample of farmworkers surveyed from 2007 to 2018 consisted of 22,572 respondents. The mean age of farmworkers across the years included in the analysis was 37.93 (SD = 13.45, 95% CI [37.77 – 38.10]) years. Farmworker ages over the study period ranged from 14 to 94 years of age. Males accounted for 72.28% (95% CI [71.73 – 72.82]) of the total surveyed population.

Foreign-born workers comprised 72.45% (95% CI [71.90 – 73.00]) of the population. On average, foreign-born workers represented more than two-thirds of the surveyed population annually from the years ranging from 2007 to 2018. The majority of the total sample of farmworkers surveyed over the study period indicated that Mexico was their country of birth (67.15%, 95% CI [66.57 – 67.72]). Interestingly, 57.42% (95% CI [56.81 – 58.03]) of workers self-identified their racial identity as “other” over the study period. When asked what term “best described” them, more than half of the total surveyed population self-identified as Mexican (64.33%, 95% CI [63.74 – 64.91]). Half of the total study population (46.50%, 95% CI [45.88 – 47.11]) reported unauthorized legal status, 21.59% (95% CI [21.08 – 22.09]) reported authorization through a green card or some other means, and 31.92% (95% CI [31.34 – 32.49]) identified as U.S. citizens. A relatively small proportion of the population identified as migrant farmworkers (19.51%, 95% CI [19.02 – 19.99]). In the NAWS data, migrant farmworkers are defined as farmworkers who follow the crop seasonally or who shuttle to worksites with home bases located more than 75 miles away from worksites. A detailed statistical overview of the population characteristics can be found in table 2.

Table 2
NAWS Study Population Characteristics

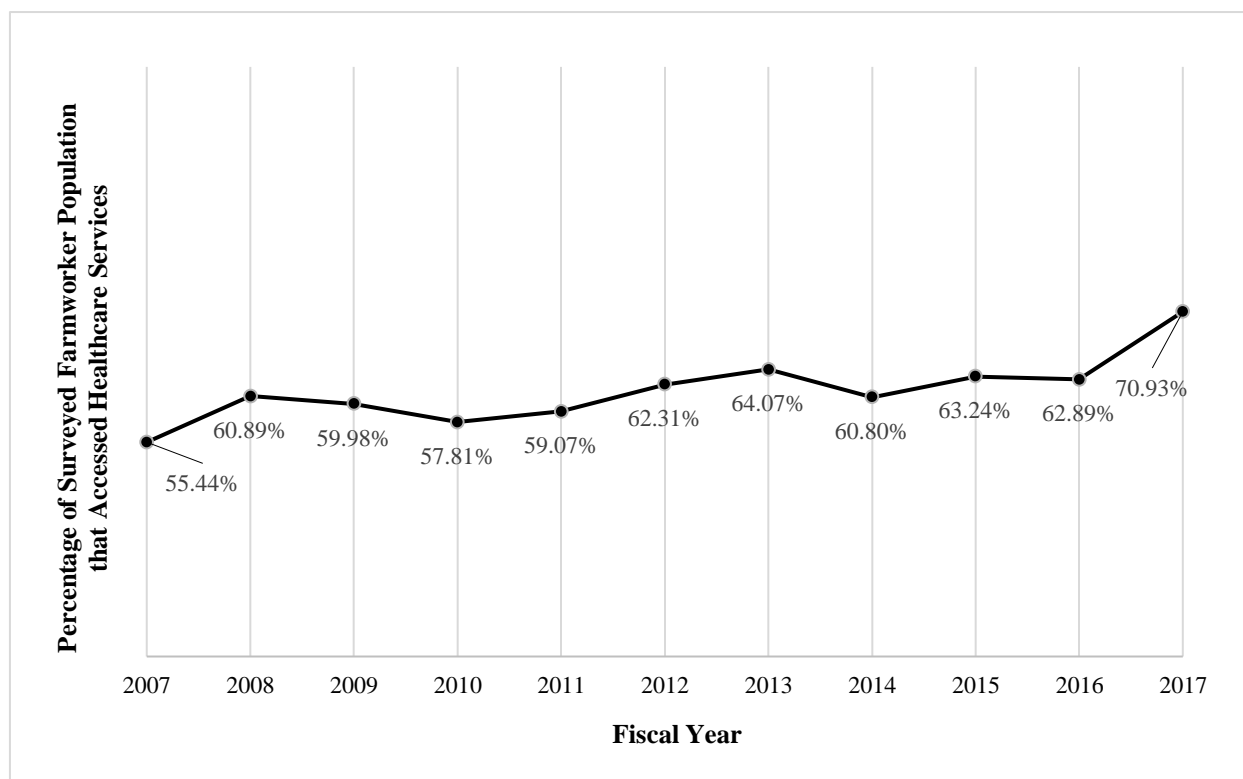
Variable	N	Weighted Percent %	95% CI	Mean	SD
Total Population	22,572			-	-
Weighted Population	25,694	100.0%			
Demographics					
Age	25,686	-	37.77 – 38.10	37.93	13.45
Male	17,801	72.28%	71.73 – 72.82	-	-
Female	4,771	27.72%	27.18 – 28.27	-	-
U.S.-born	5,094	27.55%	27.00 – 28.10	-	-
Foreign-born	17,478	72.45%	71.90 – 73.00	-	-
Non-Migrant Worker	18,914	80.49%	80.01 – 80.98	-	-
Migrant Worker	3,632	19.51%	19.02 – 19.99	-	-
Cultural Characteristics					
Country of Birth					
U.S.	4,921	26.96%	26.42 – 27.50	-	-
Puerto Rico	173	0.59%	0.50 – 0.69	-	-
Mexico	16,155	67.15%	66.57 – 67.72	-	-
Central America	1,052	4.47%	4.21 – 4.72	-	-
Other	271	0.83%	0.73 – 0.95	-	-
Ethnicity					
Mexican American	1,730	8.22%	7.89 – 8.57	-	-
Mexican	15,301	64.33%	63.74 – 64.91	-	-
Puerto Rican	204	0.66%	0.56 – 0.76	-	-
Other Hispanic/Latino	1,427	5.96%	5.68 – 6.26	-	-
Not Hispanic/Latino	3,786	20.83%	20.33 – 21.32	-	-
Legal Work Status					
U.S. Citizen	6,250	31.92%	31.34 – 32.49	-	-
Green Card or Other	5,100	21.59%	21.08 – 22.09	-	-
Unauthorized Status	11,017	46.50%	45.88 – 47.11	-	-
English Language Proficiency					
Speak English Well	5,816	31.10%	30.54 – 31.67	-	-
Speak English Limitedly	16,683	68.90%	68.33 – 69.46	-	-
Read English Well	5,608	30.25%	29.69 – 30.81	-	-
Read English Limitedly	16,864	69.75%	69.19 – 70.31	-	-
Healthcare Access					
Utilization of U.S. Healthcare in Past Two Years					
Used Healthcare Services	12,757	61.80%	61.18 – 62.42	-	-
Did not use Healthcare Services	8,416	38.20%	37.58 – 38.82	-	-
Common Methods of Payment					
Out of Pocket	5,452	39.91%	39.11 – 40.71	-	-
Medicaid/Medicare	1,671	15.58%	14.99 – 16.17	-	-
Employer provided Health Insurance	1,952	14.71%	14.14 – 15.30	-	-
Self/Family bought Health Insurance	1,151	10.51%	10.02 – 11.02	-	-

Trends in Healthcare Utilization

When examining trends in recent healthcare utilization in the U.S. over the study period, analyses found that 61.80% (95% CI [61.18 – 62.42]) of farmworkers accessed some type of healthcare service (Table 2). Healthcare utilization among farmworkers was at its highest in 2017, the most recent year for which data was available, with 70.93% of farmworkers surveyed reporting having utilized healthcare services in the U.S. within the two years preceding the survey (Figure 4). Paying medical bills out of pocket was the most common practice among workers over the course of the study period, with 39.91% (95% CI [39.11 – 40.71]) of the total sample participants reporting utilizing this method of payment to cover healthcare costs (Table 2).

Figure 4

Farmworker Healthcare Utilization (Within Two Years Preceding Survey), by Fiscal Year (%)

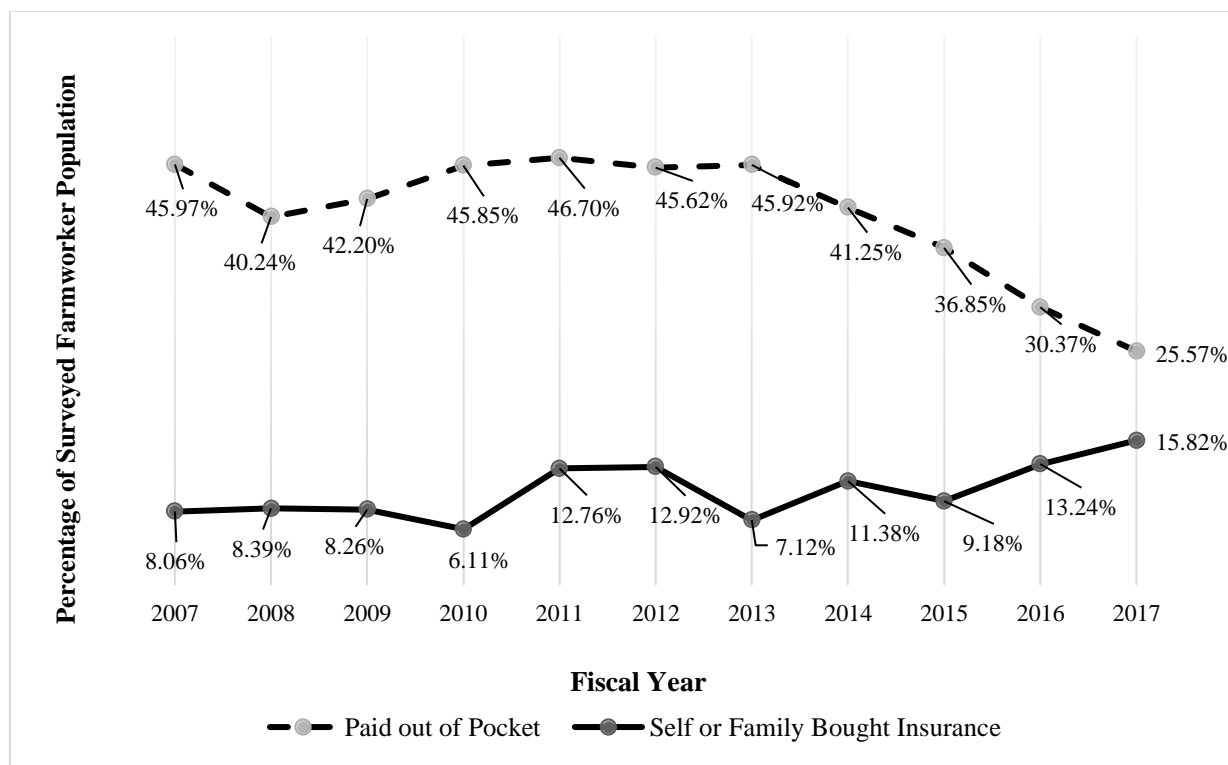


Trends in Payment for Healthcare Services

Over the course of the study period trends in payment types for healthcare service utilization changed drastically. Approximately half of farmworkers reported paying for services out of pocket in 2007. Out of pocket payments were reported relatively consistently early in the study period, with above 40% of workers utilizing this method of payment annually (Figure 5). A notable drop in the reporting of this payment method was observed in 2015. In 2017, only one-fourth of workers were utilizing this method of payment. Over this same time period, farmworkers' utilization of self or family bought insurance plans to pay healthcare service costs fluctuated greatly. Self or family bought plan usage doubled from 2010 to 2011, before experiencing a decline 2013 and doubling in 2017 (Figure 5).

Figure 5

Farmworker Payment Coverage Types for Healthcare Services (2007 – 2017)



Unadjusted Analyses

The univariate/unadjusted analyses revealed statistically significant associations between healthcare utilization, foreign-born status ($p < .001$), migrant status ($p < .001$), work authorization status ($p < .001$), unwelcomeness ($p = .007$), reading English language proficiency ($p < .001$), and spoken English language proficiency ($p < .001$) through chi-square analyses (Table 3). Foreign-born and migrant status reported the most notable differences in healthcare utilization by population percentage. Those who were foreign-born reported utilization of healthcare services more frequently than those who were U.S. born, with foreign-born participants accounting for 65.70% (95% CI [64.92 – 66.47]) of recent healthcare utilizations. Farmworkers who reported migrant status only accounted for 13.00% (95% CI [12.45 – 13.55]) of recent health care utilizations while non-migrants accounted for 87.00% (95% CI [86.45 – 87.55]) (Table 3).

Table 3*Univariate Analysis for the Association between Recent Healthcare Utilization and Selected Predictors*

	N	Recent Healthcare Utilization		P-Value
		Yes (N = 14,449) Weighted % (95% CI)	No (N = 8,931) Weighted % (95% CI)	
Foreign-born status				< .001
Born in the U.S. or Puerto Rico	6,389	34.30 (33.53 – 35.08)	16.05 (15.03 – 16.82)	
Foreign born	16,991	65.70 (64.92 – 66.47)	83.95 (83.18 – 84.70)	
Migrant status				< .001
Migrant	4,684	13.00 (12.45 – 13.55)	31.63 (30.67 – 32.60)	
Not Migrant	18,611	87.00 (86.45 – 87.55)	68.37 (67.40 – 69.33)	
Work Authorization Status				< .001
Citizen	7,310	39.89 (39.09 – 40.70)	18.11 (17.32 – 18.92)	
Green Card	4,583	20.99 (20.33 – 21.66)	17.84 (17.05 – 18.64)	
Other work authorization	251	1.07 (0.91 – 1.25)	1.10 (0.90 – 1.34)	
Unauthorized	11,023	38.05 (37.25 – 38.85)	62.95 (61.94 – 63.95)	
Unwelcomeness				0.007
Welcome	19,277	99.36 (99.21 – 99.49)	99.66 (99.50 – 99.77)	
Don't feel welcome	102	0.64 (0.51 – 0.79)	0.34 (0.23 – 0.50)	
Read English Language Proficiency				< .001
Limited	16,332	62.40 (61.61 – 63.19)	82.63 (81.83 – 83.41)	
Well	6,957	37.60 (36.81 – 38.39)	17.37 (16.59 – 18.17)	
Spoken English Language Proficiency				< .001
Limited	16,140	61.51 (60.72 – 62.31)	81.63 (80.82 – 82.43)	
Well	7,185	38.49 (37.69 – 39.28)	18.37 (17.57 – 19.18)	

Adjusted Analyses

The logistic regression is performed to ascertain the collective effects of foreign-born status, migrant status, work authorization status, feelings of unwelcomeness, and English language proficiency on the likelihood that participants had recently utilized healthcare services in the U.S. while adjusting for some demographics characteristics. Foreign-born status ($p < .001$), migrant status ($p < .001$), work authorization status ($p < .001$), reading English language proficiency ($p < .001$), age ($p < .001$), gender ($p < .001$), and ethnicity ($p < .001$) were statistically significantly associated with recent healthcare service utilization (Table 4). Among the statistically significant predictors and demographics identified, foreign-born status and gender reported the greatest effects on recent healthcare utilization. Foreign-born participants were 2.72 (OR = 2.721, 95% CI [2.097 – 3.530]) times more likely to report U.S. healthcare service utilization within the two years preceding the survey than those who were born in the U.S. or Puerto Rico. Female participants were 3.35 (OR = 3.35, 95% CI [3.100 – 3.642]) more likely to have utilized U.S. healthcare services compared to males.

Table 4*Results of the Binary Logistic Regression by Predictor Variable, with select Demographics*

	Odds Ratio (OR)	95% CI OR	p
Selected Demographics			
Age	1.006	1.004 – 1.009	< .001
Gender (female v. male)	3.352	3.100 – 3.642	< .001
Ethnicity (Mexican v. non-Hispanic)	0.634	0.524 – 0.769	< .001
Cultural Predictors			
Foreign-born Status (Foreign-born v. U.S./Puerto Rico)	2.721	2.097 – 3.530	< .001
Migrant Status (Migrant v non-Migrant)	0.447	0.413 – 0.485	< .001
Work Authorization Status (Unauthorized v. Citizen)	0.495	0.406 – 0.602	< .001
Unwelcomeness (Unwelcome v Welcome)	1.529	.943 – 2.481	.085
Read English Language Proficiency (Limited v Well)	0.494	0.386 – 0.632	< .001
Spoken English Language Proficiency (Limited v Well)	1.170	0.898 – 1.525	.245
Country of Birth (U.S. v. Mexico)	1.735	0.663 – 4.539	.261

DISCUSSION

Despite the increased risk of both U.S. and foreign-born Hispanic/Latino workers to suffer adverse occupational health and safety outcomes, they consistently report limited access to and utilization of healthcare services and related resources (Arcury et al., 2017; Flynn et al., 2015). This group of farmworkers encounters various barriers to accessing healthcare, including limited knowledge on how to obtain and utilize health insurance, language barriers, and a lack of transportation (Hoerster et al., 2011). Because many foreign-born Hispanic/Latino farmworkers are undocumented, they often avoid situations that require the disclosure of contact information and prefer to remain unknown/anonymous, which has historically limited their willingness and ability to seek out healthcare services (Arcury et al., 2017; Flynn et al., 2015). Undocumented workers report a perceived inability to take time away from work, fear of losing their job, fear of the medical system, and fear of encountering immigration officials as barriers in accessing healthcare (Arcury, Grzywacz, Sidebottom, & Wiggins, 2013; Arcury et al., 2017; Flynn et al., 2015; Hoerster et al., 2011).

Changes in trends of healthcare access

The present study identified small fluctuations in the proportion of workers who reported utilizing healthcare services over the study period that both conflicted and aligned with observed trends in healthcare access among the general population of Hispanics/Latinos in the U.S. Fluctuations in healthcare access and utilization among U.S. Hispanics/Latinos in the past decade have been partially associated with healthcare reforms nationwide. As a result of the healthcare reform signed into law in 2010, healthcare insurance coverage, access, and utilization among the general Hispanic/Latino population in the U.S. changed drastically from 2010 to 2014 (Buchmueller, Levinson, Levy, & Wolfe, 2016). During this period, there was a notable increase in

healthcare coverage and healthcare service use among Hispanics/Latinos (Manuel, 2018).

While healthcare access and utilization among the general population of the U.S. and Hispanics/Latinos was improving, utilization among farmworkers remained relatively low over the years ranging from 2010 to 2014. In 2010, only 57.81% of farmworkers reported utilizing healthcare services in the two years preceding the study period. Interestingly, utilization among farmworkers increased from 2010 to 2013, before experiencing a significant drop in 2014. The relatively low utilization among farmworkers and drop in service utilization during 2014 cannot be fully explained using the present data. Existing studies have suggested that healthcare access may have worsened for U.S. Hispanics/Latinos before ultimately improving (Manuel, 2018).

Costs of care as threats to health

Costs of care pose significant barriers to access for farmworker populations. A study conducted by Luque et al. (2019) found that farmworkers often refrained from seeking out healthcare services unless they felt their health issue was severe because they feared the cost of care would exceed \$1,500. To avoid costs associated with seeking out healthcare services, farmworkers commonly used online resources to check symptoms, find low-cost treatments, and treatment alternatives (Luque et al., 2019).

A large proportion of the overall sample population of workers reported paying for medical expenses out of pocket over the study period, which may have resulted in increased economic hardship among farmworkers given that this population reports among the lowest levels of income in the U.S. (Luque et al., 2019). The present study found that while out of pocket payments were frequently reported by the overall sample of workers, in more recent years, self or family bought insurance plans were being utilized as methods of payment for healthcare services more frequently. This observation is a promising finding as health insurance subsidizing or covering

costs of care are associated with improved healthcare access and health outcomes (Cohen, Cha, Terlizzi, & Martinez, 2021).

Cultural factors specific to Hispanic/Latino workers impacting care access and utilization

Although existing literature has explored various barriers in accessing care and factors related to the underutilization of healthcare services among Hispanics/Latinos living in the U.S., the role of cultural factors and processes of acculturation as facilitators and barriers to healthcare utilization and access among Hispanic/Latino farmworkers has been explored more limitedly. Throughout research, studies have focused on acculturation, health disparities, risky behaviors, and access to care separately, despite the fact that these factors are inextricably linked determinants impacting health outcomes among Hispanics/Latinos (Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016). Acculturative stressors, or those stressors associated with the process of adjusting and adapting to a new host culture, and cultural factors significantly impact this groups' vulnerability to morbidities and mortalities (Schwartz et al., 2010; Velasco-Mondragon et al., 2016).

Within healthcare settings specifically, experiences with acculturative stress and discrimination have been associated with dissatisfaction with healthcare services, mistrust in healthcare settings and systems, delayed healthcare seeking behaviors, and unmet medical needs among Hispanic/Latino populations (Hamed, Bradby, Ahlberg, & Thapar-Bjorkert, 2022). Fears of encountering problems with authority figures, such as Immigration and Customs Enforcement (ICE), has also been found to significantly impact Hispanic/Latino workers willingness and ability to seek out healthcare services (Flynn et al., 2015). In an extreme example, a respondent in a qualitative study conducted by Flynn et al. recounted an experience where a pregnant coworker sustained a significant workplace injury. Although the worker began to lose blood, she continued

to work. Supervisors' fear of ICE kept them from calling an ambulance, preventing the worker from receiving medical attention, and the injury sustained by the worker ultimately resulted in a miscarriage.

Respondents in the present study reported a number of cultural factors associated with acculturative stress including undocumented status, foreign-born status, and limited English language proficiency. As such, the population under study represented a group at increased likelihood to face challenges in accessing and utilizing healthcare services. These factors, recognized throughout existing research as barriers to care and risk factors for poor health outcomes, were found to be statistically significantly associated with healthcare service utilization. Surprisingly, farmworkers identifying as foreign-born were at increased likelihoods to have utilized healthcare services over the study period. This was an unexpected finding that suggests the need for further research into the potential relationships between foreign-born farmworkers' experiences with healthcare utilization and access.

Shared Cultural Beliefs and Practices Impacting Health Behaviors

The most statistically significant finding of the present study was the relationship observed between healthcare utilization and gender. Female respondents were three times more likely to have utilized healthcare services than males in the study population. The increased use of healthcare services among females identified within this study is in accordance with previous research (Gast, Peak, & Hunt, 2017). While this was an important finding of the present study, it was unsurprising given shared cultural beliefs and practices associated with health behaviors among Hispanic/Latino populations, particularly Hispanic/Latino males.

The constructs of *machismo* and *caballerismo*, commonly observed among Hispanic/Latino populations, have been long been identified as factors impacting health behaviors among

Hispanic/Latino males (Cancio, 2020; Gast et al., 2017; Getrich et al., 2012). *Caballerismo* is associated with the practices of protecting one's family and being chivalrous, while *machismo* is typically associated with hypermasculinity and adhering to cultured masculinity (e.g., gendered behaviors, dominance, emotion management). The practice of *caballerismo* has been associated with increased likelihood of engaging in protective health behaviors if such behaviors are associated with being able to work and provide for family, while *machismo* has been associated with decreased likelihood to engage in protective health behaviors (Gast et al., 2017). Presently, the roles of *machismo* and *caballerismo* have not been thoroughly studied among Hispanic/Latino farmworker populations in the U.S. Given the findings reported in this analysis, there is a potential for future research exploring the relationships between cultural identities as they relate to gender to assess for relationships between these factors, healthcare utilization and health outcomes.

In addition to observed relationships between cultured gender roles and health behaviors, another important consideration not yet thoroughly explored in existing research on farmworker populations are the potential differences in the need for care based on gender. There may be significant differences in the need for and types of care and services utilized based on farmworkers' gender that have not yet been identified or explored.

Limitations in the Applications of Existing Theoretical and Conceptual Frameworks to Understand Healthcare Utilization Among Hispanic/Latino Populations

Although various theoretical frameworks have been adapted in efforts to formulate effective interventions targeting specific adverse health outcomes impacting populations of Hispanics/Latinos in the U.S., few frameworks assessing Hispanic/Latino health in the U.S. comprehensively considering acculturative stressors exist (Velasco-Mondragon et al., 2016). Many theories examining the process of acculturation assume similar acculturation experiences

among migrant populations and attribute differences in acculturation experiences to individual choices (Berry, 2006; Schwartz et al., 2010). Many existing theories focused on assessing behavior and intention overlook important social and contextual factors outside the realm of control of individuals, like context of reception, discrimination, and immigrant status/type, which are key components in behavioral decision making, particularly among Hispanic/Latino populations (Lorenzo-Blanco et al., 2016; Schwartz et al., 2010).

While individual choice undoubtedly plays a role in the acculturation experiences of migrants, the role and importance of social and contextual factors should not be overlooked. For example, Hispanic/Latino migrants, are more likely to report more negative acculturation experiences when compared to European or Canadian migrants (Schwartz et al., 2010). Foreign-born Hispanic/Latino workers often report feeling discriminated against by employers asserting that U.S. born Hispanic/Latino workers are offered comparatively better workplace conditions, considerations, and workplace protections (Snipes et al., 2017). Over the past decades, opinions of Hispanic/Latino migrants have been increasingly negative among U.S.-born populations (Schwartz et al., 2010). Negative opinions of Hispanic/Latino migrants create negative contexts of reception where individuals are more likely to be subjected to experiences of discrimination increasing their levels of acculturative stress and risks for negative social, mental, and physical health outcomes (Lorenzo-Blanco et al., 2016; Schwartz et al., 2010; Velasco-Mondragon et al., 2016).

Present limitations in existing theoretical and conceptual frameworks pose challenges in researching Hispanic/Latino farmworker populations and understanding the pathways through which health and safety behaviors are evaluated, adopted, or rejected among this group. Present research has struggled to clearly define and explain the roles of acculturative stressors on health outcomes. Some studies have considered acculturation as an enabling factor, treating higher levels

of acculturation as a factor facilitating the individual's ability to access healthcare services, while others have considered cultural factors and acculturation as individual predisposing factors impacting individuals' probable need to access healthcare services (Finlayson, Gansky, Shain, & Weintraub, 2010; Hong, Tauscher, & Cardel, 2018).

Study Strengths and Limitations

The NAWS data is unique in that it spans decades of employed farmworkers, collects sensitive information on surveyed participants, like legal application status, and employs strategic data collection methodologies to capture a representative sample of farmworkers across 12 regions in the United States. The data collection methodologies employed by the NAWS are among its greatest strengths. The survey is delivered to farmworkers at worksites according to their availability which eliminates barriers to participation among the population, specifically barriers to participation resulting from lack of reliable sources of transportation and inability to take time away from work. Additional considerable strengths of the NAWS and its resulting data are its large sample size and wide data collection period. The publicly available data set was able to recruit and report data on over 22,000 farmworkers over the time period spanning from 2007 to 2018. The large data set and wide data collection period allowed for a meaningful examination of trends in healthcare service utilization and payment methods among the population of interest, which were important findings reported in the present study that warrant further exploration in future research.

The present study is not without limitations. While the NAWS is unique in both the methods employed to collect data and the variables included in the survey, it is not exempt from the challenges associated with collecting data from a population that would rather remain anonymous. Because of the sensitive nature of some of the questionnaire items (e.g., migrant

status, foreign-born status, country of birth, feelings of unwelcomeness, undocumented status), the data set assessed was riddled with missing data that presented difficulties when it came time to complete the statistical analysis. The influence of missing data likely introduced non-response bias into the present study. There were likely significant differences between respondents who elected to provide sensitive information and those who did not. It is possible that the methodology employed in the survey and the sensitive nature of the questionnaire items resulted in participant self-exclusion. Furthermore, participating respondents may have felt compelled to respond to questionnaire items in ways that better protected their privacy (e.g. disclosing inaccurate legal status, age, foreign-born status, country of birth). An additional limitation of the present study was the utilization of retrospective questionnaire items. The outcome variable healthcare utilization and predictor variable unwelcome asked participants to report on their experiences with healthcare service utilization over the two years preceding the study period. These questionnaire items were likely subject to recall bias.

While the NAWS data provides a large breadth of data, the last year for which data was made publicly available was 2018. Since then, a number of political, contextual, social, and health factors directly impacting Hispanic/Latino farmworkers in the U.S. have changed. More recent studies have found that experiences of discriminations are widespread among Hispanics/Latinos, with Hispanics/Latinos reporting significantly higher experiences of discrimination in healthcare and social institution settings (Findling et al., 2019).

CONCLUSION

Decades of research have uncovered significant racial/ethnic disparities in healthcare access and usage among minority groups in the U.S. (Manuel, 2018). Differences in healthcare use

among differing racial/ethnic groups has been attributed to factors like access to care, poverty and health insurance coverage, culture, language, and discrimination. In a future full of increasingly concerning threats to human health like chronic illness, emerging and reemerging infectious diseases, and ongoing pandemics, improved access to and utilization of healthcare services is essential to the health, safety, and well-being of human populations. Hispanic/Latino farmworkers are an extremely vulnerable population at risk for a myriad of adverse health outcomes attributable to poor living conditions, health inequities, and occupation associated hazards. Despite their risk for adverse health outcomes, these workers face a number of challenges in accessing healthcare services. While some of the differences in access and utilization of healthcare services can be explained by physical barriers to care, healthcare costs, and policy, barriers to healthcare more specific to Hispanic/Latino farmworkers, including cultural characteristics and acculturative experiences, like legal work authorization and negative experiences in healthcare settings should be further explored and diminished to improve utilization and ultimately health outcomes among this group.

CHAPTER IV

Article III

Experiences with COVID-19 Stress among Hispanic/Latino Farmworkers

ABSTRACT

BACKGROUND: Hispanics/Latinos, particularly those that identify as foreign-born, are overrepresented in the agricultural sector in the U.S. Over the course of the COVID-19 pandemic, this subpopulation of farmworkers was recognized as an invaluable group of essential workers unable to implement COVID-19 protections.

METHODS: Previously validated COVID-19 stress scale measures were identified, adapted, and translated to collect COVID-19 stress data from Hispanic/Latino agricultural workers in two heavily agricultural counties in northeastern North Carolina. Participants were recruited using purposive convenience sampling. Data collection took place from June to November of 2021.

RESULTS: The majority of Hispanic/Latino agricultural workers surveyed reported experiencing worries about catching COVID-19 (92.00%) and being infected with the virus (95.95%). A small proportion of the surveyed population indicated experiencing COVID-19 traumatic stress. More than half of participants were concerned about the impacts COVID-19 would have on their ability to see (53.42%) and provide for their families (58.33%).

CONCLUSION: Farmworkers bore relatively heavy stress burdens associated with the COVID-19 pandemic. Because this group is a vulnerable population at risk for adverse health outcomes, reports numerous barriers to healthcare access, and faces health and safety challenges related to acculturative stress, understanding their experiences with COVID-19 is essential for the development of protective and preventative efforts to improve outcomes among Hispanic/Latino farmworkers.

INTRODUCTION

Farmworkers have long been recognized as a vulnerable population in the U.S., reporting low levels of educational attainment, low incomes, and limited access to health care services (Arcury et al., 2013; Hansen & Donohoe, 2003; M. Stoecklin-Marois et al., 2013). These workers, who often report feeling little to no control over their work environments, represented a particularly vulnerable group of essential workers over the course of the COVID-19 pandemic (Arcury, Summers, Talton, Chen, et al., 2015; Quandt et al., 2020). Farmworkers in the U.S. were unable to implement recommended COVID-19 preventative and protective behaviors employed throughout the country, like sheltering in place or working from home (Quandt et al., 2020). These workers were required to continue living in crowded employer provided housing, utilize transportation methods where social distancing was impossible, and complete work tasks in close proximity to one another, all while having limited access to clean water and sanitation supplies both in their employer provided housing and at worksites (Quandt et al., 2021).

Foreign-born Hispanics/Latinos, who are overrepresented in the agricultural sector, are a unique population of workers whose social and demographic characteristics further complicate their risk for poor health outcomes, including COVID-19 infection (Handal, Iglesias-Rios, Fleming, Valentin-Cortes, & O'Neill, 2020). Acculturative stressors like limited English language proficiency, experiences with discrimination, and undocumented status have been recognized as major factors exacerbating foreign-born Hispanics/Latinos risk for adverse COVID-19 outcomes (Arcury, Summers, Talton, Chen, et al., 2015; Handal et al., 2020; Quandt et al., 2020). Demanding and stressful working conditions in which workers have little decision-making power, working conditions not compliant with basic infection-prevention measures, power differentials that leave workers feeling unable to approach employers about health and safety measures (e.g.

personal protective equipment, accommodations to reduce COVID-19 risk), and poor living conditions have been identified as factors specific to farmworker populations potentially increasing their risk of COVID-19 infection. Furthermore, early efforts made to combat negative economic impacts of COVID-19 systematically excluded foreign-born and undocumented farmworkers, despite recognizing these same overrepresented populations as essential workers. Farmworkers who were unauthorized or undocumented were ineligible for COVID-19 specific aid and relief, despite their increased economic and social vulnerability, further escalating their risk for adverse health outcomes and COVID-19 infection (Quandt et al., 2020).

Given the vulnerability of farmworker populations, their role as essential workers, and their heightened risk for COVID-19 infection, it is of crucial importance to further what is presently understood about the ways in which the pandemic has impacted farmworker communities in the U.S. Developing a more comprehensive understanding of the effects of the pandemic on Hispanic/Latino farmworker communities, in particular, is vital for the formulation of comprehensive health and safety interventions, workplace policies and protections, and health and safety guidelines.

The present study sought to answer the research question: “How have U.S. farmworkers been impacted by the COVID-19 pandemic?”. The objectives of the study were to (1) characterize farmworkers’ experiences with stress over the course of the pandemic and (2) identify cultural and acculturative factors potentially impacting Hispanic/Latino farmworkers COVID-19 stress experiences. Research hypotheses for this study were that (1) Hispanic/Latino farmworkers surveyed would report elevated levels of stress related to COVID-19 danger and contamination fears and that (2) farmworkers would express concerns over their ability to financially provide for their families as a result of the COVID-19 pandemic.

METHODS

Northeastern North Carolina consists of a 16-county region. Agricultural production within this region is comprised of various crops, including soybeans, cotton, peanuts, corn, and tobacco, among others. The 2017 Census of Agriculture estimated the total number of hired farm laborers in North Carolina at over 60,000 workers, almost 30,000 of which were migrant/seasonal workers (United States Department of Agriculture & National Agricultural Statistics Service, 2019). Many agricultural regions face challenges to population health similar to those observed in Eastern North Carolina including low population density, which typically translates to fewer healthcare services and diminished accessibility to healthcare resources, physical barriers to healthcare, limited knowledge on health problems and indicators of severe conditions, and difficulties in providing medical attention and preventative care to agricultural workers. These factors, the large population of farmworkers, and the importance of the state's agricultural yield to the country, in conjunction with the increased media coverage examining adverse COVID-19 health outcomes among NC farmworkers over the course of the pandemic, made the state the ideal place to conduct the proposed study.

This study recruited participants self-identifying as farmworkers from Pasquotank and Camden counties in North Carolina. For the purposes of the present study, farmworkers were defined as individuals employed in the agricultural sector actively performing labor tasks related to the cultivation and harvesting crops or other agricultural yields. These counties were chosen for participant recruitment because of their large agricultural populations, notable regional health disparities, and accessibility. Camden county is home to 81 farms covering 59,239 acres (United States Department of Agriculture National Agricultural Statistics Service & North Carolina Department of Agriculture & Consumer Services, 2019). Pasquotank county is home to 126 farms

covering 72,174 acres of land (United States Department of Agriculture National Agricultural Statistics Service & North Carolina Department of Agriculture & Consumer Services, 2019).

Understanding the vulnerability and sensitivity of the population of interest to be recruited, the methodology employed in the study consisted of culturally appropriate participant recruitment and data collection strategies, non-experimental methodologies, and a cross-sectional survey. Sampling methods for the proposed study consisted of purposive convenience sampling. Participants were recruited using convenience methodologies and consisted of groups of farmworkers accessible to the research team through collaborative community partnerships specific to the region of interest. Participant eligibility criteria required participants to (1) be presently employed in the agricultural sector in Pasquotank or Camden County, (2) be over the age of 18 at the time of participation, and (3) be able to provide written or verbal informed consent to participate in the study. The study was determined to be exempt from IRB review, according to federal regulations, by Old Dominion University's Institutional Review Board (IRB).

Bilingual members of the research team facilitated data collection interview sessions during which consent, demographic, and COVID-19 data were collected using an adapted questionnaire tool. The questionnaire collected data on a limited number of demographic characteristics. Demographic questionnaire items inquired about participants' age, race, ethnicity, gender, marital status, highest level of education, number of years employed as an agricultural worker in the United States, current crop/agricultural yield worked with (i.e. fruit, vegetable, livestock, dairy, etc.), English language proficiency, foreign-born status, and home country if foreign-born (Appendix A). Demographic, occupational health, and occupational history questionnaire items were adapted from a validated English/Spanish occupational health and safety questionnaire, utilized in a previous study among Eastern NC farm workers (Akpinar-Elci,

Pasquale, Abrokwah, Nguyen, & Elci, 2016). The questionnaire also included a limited number of items surrounding COVID-19 infection status (i.e., ever exposed to COVID-19, ever had positive COVID-19 test, ever suspected having COVID-19).

The COVID-19 data collection instrument was adapted from the COVID-19 Stress Scales (CSS). The CSS was one of the only existing measures that worked to assess COVID-19 associated mental health issues comprehensively at the time this study was developed and took place (Chandu, Marella, Panga, Pachava, & Vadapalli, 2020). The CSS consists of 36 items measured on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely) (Taylor et al., 2020). Items on the questionnaire inquire about COVID danger and contamination fears, fears about economic consequences, xenophobia, compulsive checking and reassurance seeking, or traumatic stress symptoms experienced over the seven-day period preceding questionnaire completion.

To formulate the finalized survey tool, CSS items were carefully evaluated for relevancy to the population of interest. For the purposes of the present study, the CSS measures adapted and included in the finalized tool consisted of those concerned with danger (n=6), contamination (n=5), and traumatic stress (n=6) experienced over the year preceding questionnaire completion (Appendix A). The present study purposely chose to omit questions concerned with xenophobia, economic consequences, and compulsive checking and reassurance seeking as the CSS questionnaire items measuring each of these constructs failed to account for cultural sensitivities and population specific characteristics. For example, the phrasing of CSS items covering xenophobia may have been perceived as insensitive by those study participants identifying as foreign-born or undocumented while those covering economic consequences inquired over experiences of economic distress that would not have been relatable for Hispanic/Latino

farmworker populations. After screening questionnaire items for relevancy and cultural sensitivity, questionnaire items were compiled into a finalized survey tool and translated to ensure linguistic appropriateness.

The translation of the adapted instrument consisted of (1) drafting and finalizing an English language questionnaire, (2) the translating of the finalized English language questionnaire into Spanish by a member of the study team, (3) subsequent back-translation by both a native Spanish speaker and a fluent Spanish speaker, (4) a consolidation of back-translations by the research team, (5) a review of the consolidated translated questionnaire by a native Spanish speaking community partner familiar with the target population, (6) finalization of the translated questionnaire, and (7) the delivery of test questionnaires to assess finalized questionnaire clarity and time needed to complete to a sample of five members of the population of interest (Appendix B). It is important to note that study team members involved in the processes of translation, back translation, and questionnaire consolidation employed to finalize the Spanish-language instrument were native speakers or fluent in Spanish from differing regions. Team members involved in the translation process spoke Spanish regionally specific to Mexico, Puerto Rico, Costa Rica, and Venezuela. The diversity in the translation team allowed for the identification of and elimination of terminology with regionally different meanings that would have potentially confused study participants. The methods for translation employed in the present study were developed based on methodologies applied throughout existing research on translation processes and recommendations for community engaged research (Manchaiah et al., 2020; Marinez-Lora, Boustani, Del Busto, & Leone, 2016; UCLA Clinical and Translational Science Institute, n.d.).

Data collection took place from June to November of 2021. Statistical analyses were conducted using SPSS version 28. Data collection and analyses utilized descriptive statistics

procedures appropriate for the exploration of primary data. Demographic information collected were assessed using frequencies and percentages to summarize the characteristics of the sample population and provide an overview of participant experiences with COVID-19 stress over the year preceding participation in the study.

RESULTS

A total of 75 participants were recruited for the present study. The mean age of study participants was 41.32 (SD = 11.32) years. The youngest and oldest participant ages recorded were 18 and 63. The majority of surveyed participants identified as female (75.00%). The majority of the study sample identified as single (unmarried) (68.92%). As expected, levels of educational attainment were low among the population. One-third (33.33%) of the population reported educational attainment of high school completion or higher. One-fourth (24.00%) of the population reported receiving no formal schooling at all. The majority of respondents identified as foreign-born (90.41%).

Among foreign-born participants, Mexico was the most commonly reported country of birth (79.41%). A smaller proportion of respondents reported Guatemala (8.82%), Honduras (7.35%), Venezuela (1.47%), or an unspecified country (2.94%) as their country of birth. The majority of participants identified as Hispanic/Latino (90.54%) and reported Spanish as their first language (89.33%). Limited English language proficiency was common among participants, with 91.67% reporting limited ability to understand English and 91.67% reporting limited ability to speak English. A detailed statistical overview of the study population demographic characteristics can be found in Table 1.

Table 5*Study Population Demographic Characteristics*

Variable	N	Mean (SD)
Total Population	75	100.00
Age	75	41.32 (11.32)
Demographics	N	%
Gender	72	
Male	18	25.00
Female	54	75.00
Marital Status	74	
Single	51	68.92
Married	22	29.73
Divorced	1	1.35
Educational Attainment	75	
No formal education	18	24.00
Less than high school	32	42.67
High school graduate	21	28.00
College graduate	3	4.00
Professional-level education	1	1.33
Born Outside of U.S.	73	
No	7	9.59
Yes	66	90.41
Cultural Characteristics		
Country of Birth	68	
Mexico	54	79.41
Guatemala	6	8.82
Honduras	5	7.35
Venezuela	1	1.47
Other	2	2.94
Ethnicity	74	
Black, Not Hispanic/Latino	4	5.41
White, Not Hispanic/Latino	3	4.05
Hispanic/Latino	67	90.54
Language	75	
First Language English	8	10.67
First Language Spanish	67	89.33
English Language Proficiency	72	
Speak English Well	6	8.33
Do Not Speak English Well	66	91.67
Understand English Well	6	8.33
Do Not Understand English Well	66	91.67

The average number of years worked as an agricultural worker among the study population was 10.36 (SD = 8.84) (Table 6). Most participants (92.96%) self-identified as general agricultural workers (crop pickers, crop harvesters, etc.). A smaller proportion identified as machine operators (2.82%), crew leaders (2.82%), or held more than one labor position (1.41%). Types of agricultural yields reaped/worked with included fruit (45.83%), vegetables (54.17%), cattle (5.56%), aquatic (47.22%), and others not specified (1.39%). Most farmworkers reported working 20 to 40 hours weekly (89.06%).

Table 6*Study Population Farm Work Characteristics and COVID-19 Experiences*

Variable	N	Mean (SD)
Total Population	75	100.00
Number of years worked as an agricultural worker	69	10.36 (8.84)
Work Characteristics	N	%
Job title	71	100.00
General Agricultural worker	67	92.96
Machine Operator	3	2.82
Crew Leader	2	2.82
More than one job title held	1	1.41
Agricultural yield worked with	72	
Fruit	33	45.83
Vegetables	39	54.17
Cattle	4	5.56
Aquatic yields	34	47.22
Other	1	1.39
Weekly Hours Worked	64	100.00
20 to 40 hours	57	89.06
More than 40 hours	7	10.94
COVID-19 Experiences		
Known exposure to COVID-19 in the past 12 months	74	100.00
Yes	67	90.54
No	7	9.46
Suspected COVID-19 in the past 12 months	74	100.00
Yes	22	29.73
No	52	70.27
Positive COVID-19 test in the past 12 months	74	100.00
Yes	16	21.62
No	58	78.38
At least one COVID-19 vaccine dose	72	100.00
Yes	46	63.89
No	26	36.11
Intend to get vaccinated (among those not yet vaccinated)	25	100.00
Yes	21	84.00
No	4	16.00

A large proportion of the population reported a known exposure to COVID-19 at some point over the year preceding participation in the study (90.54%) (Table 6). More than one-fourth of the population suspected having had COVID-19 in the year preceding participation in the study (29.73%). A slightly smaller proportion of participants reported having had a positive COVID-19 test at some point during the year preceding participation in the study (21.62%). More than half of participants reported having a COVID-19 vaccine (63.89%). Of those who were unvaccinated at the time of study participation, 84.00% reported intention to get a COVID-19 vaccine.

When it came to self-reported danger fears, 92.00% of the population reported some degree of worry about contracting COVID-19, 94.67% reported worrying that basic hygiene would not protect them from contracting COVID-19, 88.00% reported worrying that the healthcare system would not be able to protect them from COVID-19, 93.33% reported worrying about being unable to protect their family from the COVID-19 virus, 91.89% reported some level of concern about the healthcare system being unable to protect loved ones from COVID-19, and 94.52% worried that social distancing would not be able to protect them from contracting the COVID-19 virus. Degrees of concern varied for each of the danger fears (0= “not at all”, 1= “slightly”, 2= “moderately”, 3= “very”, 4= “extremely”). Across all danger fears, worries about being unable to protect family yielded the highest percentage of increased contamination fears (degree of concern ≥ 2) with 37.33% of participants reporting being moderately concerned, 22.67% reporting being very concerned, and 8.00% reporting being extremely concerned. A detailed summary of participant self-reported COVID-19 stress by questionnaire item can be found in table 7.

Table 7*Summary of Participants' COVID-19 Stress by Item and Worry Level (% (n))*

Questionnaire Item	Not at all	Slightly	Moderately	Very	Extremely	Ever Worried*
D1. I was worried about catching the virus.	8.00 (6)	70.67 (53)	17.33 (13)	1.33 (1)	2.67 (2)	92.00 (69)
D2. I was worried that basic hygiene (e.g. handwashing) would not be enough to keep me safe from the virus.	5.33 (4)	52.00 (39)	37.33 (28)	4.00 (3)	1.33 (1)	94.67 (71)
D3. I was worried that the healthcare system would be unable to keep me safe from the virus.	12.00 (9)	36.00 (27)	34.67 (26)	16.00 (12)	1.33 (1)	88.00 (66)
D4. I was worried that I wouldn't be able to keep my family safe from the virus.	6.67 (5)	25.33 (19)	37.33 (28)	22.67 (17)	8.00 (6)	93.33 (70)
D5. I was worried that the healthcare system wouldn't be able to protect my loved ones.	8.11 (6)	32.43 (24)	37.84 (28)	16.22 (12)	5.41 (4)	91.89 (68)
D6. I was worried that social distancing would not be enough to keep me safe from the virus.	5.48 (4)	28.77 (21)	36.99 (27)	17.81 (13)	10.96 (8)	94.52 (68)
C1. I was worried that people around me would infect me with the virus.	4.05 (3)	39.19 (29)	31.08 (23)	22.97 (17)	2.70 (2)	95.95 (71)
C2. I was worried that if I touched something in a public space (e.g. handrail, door handle), I would catch the virus.	5.48 (4)	35.62 (26)	46.58 (34)	8.22 (6)	4.11 (3)	94.52 (69)
C3. I was worried that if someone coughed or sneezed near me, I would catch the virus.	2.74 (2)	23.29 (17)	32.88 (24)	24.66 (18)	16.44 (12)	97.26 (71)
C4. I was worried that I might catch the virus from handling money or using a debit machine.	8.22 (6)	53.42 (39)	28.77 (21)	9.59 (7)	0.00 (0)	91.78 (67)
C5. I was worried about taking cash in transactions.	6.85 (5)	56.16 (41)	28.77 (21)	8.22 (6)	0.00 (0)	93.15 (68)
T1. I had trouble sleeping because I was worried about the virus.	72.60 (53)	26.03 (19)	1.37 (1)	0.00 (0)	0.00 (0)	27.39 (20)
T2. I had bad dreams about the virus.	98.57 (69)	1.43 (1)	0.00 (0)	0.00 (0)	0.00 (0)	1.43 (1)
T3. I thought about the virus when I didn't mean to.	73.61 (53)	25.00 (18)	0.00 (0)	0.00 (0)	1.39 (1)	26.39 (19)
T4. Disturbing mental images about the virus popped into my mind against my will.	95.89 (70)	2.74 (2)	1.37 (1)	0.00 (0)	0.00 (0)	4.11 (3)
T5. I had trouble concentrating because I kept thinking about the virus.	95.89 (70)	4.11 (3)	0.00 (0)	0.00 (0)	0.00 (0)	4.11 (3)
T6. Reminders about the virus caused me to have physical reactions, such as sweating or a pounding heart.	97.26 (71)	1.37 (1)	0.00 (0)	1.37 (1)	0.00 (0)	2.74 (2)

* The ever-worried variable represents the total population (% (n)) of participants reporting experiencing any degree (slight to extreme) of self-reported stress per questionnaire item.

When it came to contamination fears 95.95% of participants reported some degree of worry about being infected with COVID-19 by the people around them, 94.52% reported some degree of worry about contracting COVID-19 from touching things in public spaces, 97.26% were worried about contracting the virus from someone coughing or sneezing around them, 91.78% were worried about contracting the virus from handling money or using a debit machine, and 93.15% were worried about taking cash in transactions. Across all contamination fears worries about contracting the virus from people around them and worries about contracting the virus from people coughing or sneezing around them yielded the highest percentage of increased contamination fears.

Measures of COVID-19 traumatic stress were reported more infrequently by study participants with 27.39% reporting some level of difficulty sleeping attributable to worries about COVID-19, 1.43% reporting having nightmares about the virus, 26.39% reporting experiencing intrusive thoughts about the virus, 4.11% reporting having experienced struggling with intrusive disturbing mental images concerned with COVID-19, 4.11% reporting trouble concentrating because of thinking about the virus, and 2.74% reporting having had physical reactions, such as sweating or pounding heart, because of reminders about the virus.

Respondents reported differing experiences of COVID-19 occupation associated and familial stress. Approximately one-third of participants (35.62%) reported worrying that their workplace would begin laying off workers as a result of the COVID-19 pandemic, 40.28% worried about losing their job if they contracted COVID-19, and 38.89% were worried that they would lose their job if they needed to take time off to recover from COVID-19. More than half of farmworkers also reported worrying that they would be unable to provide for their family (58.33%) or see friends and family (53.42%) because of COVID-19.

DISCUSSION

The present study sought to characterize Hispanic/Latino farmworkers with COVID-19 associated stress in a predominantly agricultural region in northeastern North Carolina. In accordance with study hypotheses, this study found that Hispanic/Latino farmworkers struggled with worries about COVID-19 danger and contamination and reported instances of traumatic stress related to COVID-19. Unsurprisingly, study participants reported increased levels of concern (degree of concern ≥ 2 using Likert scale) related to COVID-19 danger and COVID-19 contamination, specifically. These findings suggest that workers experienced a significant amount of stress stemming from concerns related to contracting the virus and the threat posed by the virus to individual health, as well as the health of loved ones.

While COVID-19 traumatic stress was uncommonly reported by participants, the reporting of these experiences was an unexpected finding. Trouble sleeping and intrusive thoughts about the virus were the most frequently reported traumatic stress experiences. Trouble sleeping was an important self-reported outcome as poor sleep quality, coupled with hot work environments, unavoidable in outdoor occupational settings, has been shown to increase workers' risk for adverse occupational safety outcomes (Sandberg et al., 2016). These experiences were important findings not only because of their relationship to occupational health, but because these factors are more transparently mental health outcomes. In Hispanic/Latino populations, mental health issues and conditions are negatively stigmatized (S. Moyce et al., 2022; Washburn et al., 2021). As such, participants' willingness to divulge experiencing traumatic stress related to COVID-19 was a significant strength of the present study.

Cultural Factors, Acculturative Stress, and COVID-19

Studies have suggested that the COVID-19 pandemic resulted in increased fear and anxiety among Hispanic families. Data from a national survey conducted in the U.S. found that two-thirds of Hispanic adults considered COVID-19 a major threat to the health of the U.S. population, while less than half of the general public reported this same concern (Calo, Murray, Francis, Bermudez, & Kraschnewski, 2020). This same survey found that 39% of Hispanic adults considered COVID-19 a major threat to their personal health and safety, compared to 27% of other American adults. The high levels of COVID-19 fear and anxiety among Hispanic populations in the U.S. are not presently well understood, but has been hypothesized to be associated with increased risk of COVID-19 exposure and infection, as Hispanics are more likely to be employed in essential service sectors, decreased access to healthcare services, and language barriers impacting the populations' access to COVID-19 health information (Calo et al., 2020; Podewils et al., 2020).

This study found that approximately half of farmworkers surveyed were worried about their ability to provide for and see their families because of COVID-19. The prevalence of these concerns was unsurprising given the importance of familial and social ties in Hispanic/Latino culture (Kilanowski, 2014). *Familismo*, defined in existing research and literature as the emphasis placed on maintaining close relationships and strong ties with immediate and extended family members, is a distinctive cultural characteristic observed among Latino populations (Ayon, Marsiglia, & Bermudez-Parsai, 2010; Rojas et al., 2021). The emphasis on maintaining familial ties and the obligation to take care of one another observed in Latino culture attributable to the shared cultural belief and practice of *familismo*, likely influenced workers' experiences with and perceptions of COVID-19. While the social connectedness observed within Hispanic populations has been identified as a protective factor against chronic health conditions and

adverse mental health outcomes in previous research, in the case of COVID-19 close networks were associated with increased risk of exposure and infection (Podewils et al., 2020). Future studies should work to further explore the relationship between *familismo* and COVID-19 stress.

Farmworkers who identify as foreign-born have been disproportionately affected by COVID-19 and have struggled with increased mental health issues and stress as a result of the loss of family members because of COVID-19, loss of income over the course of the pandemic, lost and reduced work because of the pandemic, and lack of COVID-19 personal protective equipment (California Institute for Rural Studies, 2020; Keeney, Quandt, Villasenor, Flores, & Flores, 2022). In accordance with existing research, the present study found that farmworkers struggled with increased levels of stress related to COVID-19. Future studies should work to further explore the associations between the acculturative stressors reported specifically by foreign-born Hispanic/Latino farmworkers and COVID-19 to better understand the impact of these factors on COVID-19 outcomes.

Strengths

To the knowledge of the authors, the present study is among the first to utilize a validated COVID-19 stress measure for adaptation, translation, and delivery to a population of farmworkers in the U.S. As such, the findings reported in this study are novel and serve to provide unique insight on a limitedly researched topic. Because this study sought to characterize past and presently ongoing experiences related to COVID-19 as the pandemic persisted in 2021, recruited farmworkers were willing to participate in the study and provide details on recent experiences with COVID-19. Participants were very open to discussing their experiences. Very few participants elected to withhold responses to questionnaire items. Workers were very communicative about personal obstacles and challenges they faced as a result of COVID-19.

This study was able to recruit 75 farmworkers from two agricultural counties in North Carolina for participation. Populations of farmworkers are notoriously typically difficult to access (Kilanowski, 2014; M. T. Stoecklin-Marois, Hennessy-Burt, & Schenker, 2011). Research concerning these populations must overcome cultural, linguistic, and political barriers in order to recruit study participants safely and respectfully (Kilanowski, 2014). COVID-19 increased barriers to access and resulted in additional obstacles in working with the population of interest. Despite both the anticipated and unanticipated challenges in accessing the population, a respectable number of farmworker participants were recruited.

An additional strength of the present study was the recruitment of a particularly vulnerable group of farmworkers. Most study participants identified as foreign-born, reported limited levels of educational attainment, and limited English language proficiency. These factors are heavily associated with higher levels of acculturative stress. The increased prevalence of these factors among the population recruited for participation allowed a unique opportunity to explore COVID-19 stress in a group of farmworkers recognized to be at higher vulnerability for adverse health outcomes compared to U.S. born farmworkers who report lower levels of acculturative stress comparatively.

Limitations

The present study is not without limitations. The study population was overwhelmingly female. While this made the study population a unique sample of farmworkers, typically males are overrepresented in the agricultural sector and should be well represented in farmworker study populations. The over recruitment of female participants was not intentional but instead likely a result of having an all-female data collection team. Additionally, the community partnerships established and utilized to recruit study participants consisted of primarily female community

leaders. These partnerships, while invaluable, may have impacted participant recruitment and influenced the willingness of male farmworkers to participate.

Because study recruitment and data collection took place over the second year of the COVID-19 pandemic in the U.S., COVID-19 related challenges arose. There were necessary pauses in data collection to protect the study team and population of interest from COVID-19 exposure. Over the data collection period, several farms in the region where data collection was taking place experienced COVID-19 outbreaks. The necessary pauses in data collection may have resulted in the unintentional exclusion of eligible participants. In the present sample, approximately half of the farmworkers surveyed reported working with aquatic agricultural yields. This finding was likely due to increased accessibility of these workers year-round. Farmworkers working with vegetable and fruit crops travel in and out of the regions under study as growing seasons begin and end, making them more difficult to identify and access. The original data collection and recruitment plan accounted for migrant and seasonal farm work, however revisions to data collection strategies had to be made on an ongoing basis.

Although the sample size collected for the present study was respectable given the known obstacles in accessing and recruiting Hispanic/Latino farmworker populations, the small sample limits the statistical power of study results. A larger, more heterogeneous, population sample would improve statistical power and allow for more complex analyses examining differences in COVID-19 experiences based on major demographic and cultural characteristics like foreign-born status and English language proficiency. An additional constraint resulting from the limited sample size recruited for the present study was the inability to conduct an exploratory analysis to statistically assess and report on the psychometric quality of the adapted instrument.

CONCLUSION

Hispanic/Latino farmworkers reported experiencing COVID-19 stress associated with perceived danger and contamination fears, as well as instances of traumatic stress. These findings, while expected, are important in furthering the understanding of how the pandemic impacted farmworker populations. Based on the results of the present study, it can be concluded that this group of farmworkers bore relatively heavy stress burdens associated with the COVID-19 pandemic. Because this group is a vulnerable population at risk for adverse health outcomes, reports numerous barriers to healthcare access, and faces health and safety challenges related to acculturative stress, understanding their experiences with COVID-19 is essential for the development of protective and preventative efforts targeting improved COVID-19 outcomes among Hispanic/Latino farmworkers.

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CHAPTER V

SUMMARY

The overall purpose of this dissertation was to explore the roles that cultural beliefs and acculturative factors play in health and safety outcomes among populations of U.S. Hispanic/Latino farmworkers. Three major threats to the health and safety of Hispanic/Latino farmworkers were identified through literature review and chosen for exploration based on their relevance to and projected impact on the population of interest including: Hispanic/Latino farmworkers' vulnerability to increasing temperatures, trends in healthcare service utilization among Hispanic/Latino farmworkers, and Hispanic/Latino farmworkers' experiences during the COVID-19 pandemic. This dissertation identified shared cultural beliefs, acculturative factors, and acculturation experiences impacting health and safety outcomes among Hispanic/Latino farmworkers through the conduction of a systematic review (study one, chapter II), secondary data analysis (study two, chapter III), and exploratory study that collected primary data from a population of farmworkers in North Carolina (study three, chapter IV).

CONCLUSION

The systematic review conducted in the present dissertation was able to describe heat-related illness experiences and identify a number of heat-related illness risk factors among populations of Hispanic/Latino farmworkers in the U.S. Studies included in the review touched on cultural factors, shared beliefs and practices, and acculturative stressors as important factors exacerbating workers' risks of succumbing to heat-related illness symptoms. Practices like the consumption of caffeinated beverages, mistrust of sources of water, and misconceptions about water consumption were some of the shared beliefs held by Hispanic/Latino farmworkers potentially increasing their vulnerability for heat-related illnesses.

The findings of study two supported research hypotheses that statistically significant differences exist in recent healthcare utilization among farmworkers based on cultural and acculturative factors including foreign-born status, migrant status, work authorization status, and reading English language proficiency. While statistical associations did exist between foreign-born status and recent healthcare utilization, this analysis reported higher odds of healthcare utilization among those who were foreign-born, which was an unexpected finding. Healthcare utilization was observed less frequently among those reporting migrant status. Interestingly, gender was a significant predictor of recent healthcare utilization, with the odds of recent healthcare utilization among female farmworkers three times higher than males.

The objectives of the study three were to characterize farmworkers' experiences with stress over the course of the pandemic and identify cultural and acculturative factors potentially impacting Hispanic/Latino farmworkers COVID-19 stress experiences. The study population recruited consisted primarily of foreign-born farmworkers with levels of education at or below high school completion and limited English language proficiency. As such, the study population represented a particularly vulnerable group of farmworkers reporting increased prevalence of factors heavily associated with higher levels of acculturative stress. The overall findings of this study supported the research hypotheses that Hispanic/Latino farmworkers surveyed would report elevated levels of stress related to COVID-19 danger and contamination fears and would express concerns over their ability to financially provide for their families as a result of the COVID-19 pandemic. Stress about being unable to provide for or see family members was reported by approximately half of all study participants.

IMPLICATIONS

This dissertation was able to identify and explore three major issues in the health and safety of farmworker populations utilizing an “acculturative stress” focus. The approach taken in this dissertation to examine not only important health and safety issues but to work to identify and understand the roles played by cultural beliefs and other acculturative factors is distinct from common approaches taken in existing research.

The studies conducted and discussed in the present dissertation provided insight into some of the pathways through which acculturative stressors impact the health and well-being of Hispanic/Latino populations. The reporting of commonly shared misconceptions perpetuated within groups of Hispanic/Latino farmworkers identified in the first study is an important example of how shared cultural beliefs have the potential to influence occupational safety behaviors. The associations between foreign-born status and gender on the likelihood of recent healthcare utilization reported in the second study, served to demonstrate the increasing complexity in the relationships between cultural factors and healthcare utilization among farmworkers. The findings reported in this study highlighted a need for future research examining the roles of acculturative factors and influence of cultural factors on healthcare utilization. Finally, the COVID-19 stress experiences reported by the vulnerable group of largely foreign-born Hispanic/Latino farmworkers, disproportionately at risk for COVID-19 exposure, in the third study was an important call to research and intervention development to combat COVID-19 stressors specific to this population. This population’s cultural beliefs surrounding the importance of familial connectedness likely played a large factor in the prevalence of certain stressors associated with COVID-19 which should be further explored in future research.

The overall findings of this dissertation demonstrate the need for continued research on acculturative stressors and cultural practices commonly reported among Hispanic/Latino farm

workers. Future research should continue to focus on furthering what is understood about the roles of specific acculturative stressors and cultural factors on the adoption and rejection of occupational health and safety practices. Factors of potential interest for future research identified through this dissertation include: the relationships between foreign-born status and healthcare utilization, relationships between farmworkers' healthcare utilization and gender, *machismo* in populations of Hispanic/Latino farmworkers, the roles of shared cultural beliefs in general occupational safety behaviors, and the relationships between shared cultural beliefs and practices and COVID-19 stress.

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APPENDICES

A. ENGLISH LANGUAGE COVID-19 STRESS QUESTIONNAIRE

ELIGIBILITY CRITERIA SCREENING

For this study, participant eligibility criteria will dictate that participants (1) be presently employed in the agricultural sector in Pasquotank or Camden County, (2) be over the age of 18 at the time of participation, and (3) be able to provide written or verbal informed consent to participate in the study.

ARE YOU PRESENTLY EMPLOYED IN THE AGRICULTURAL SECTOR?

1. No (**STOP HERE, NOT ELIGIBLE FOR PARTICIPATION**)
2. Yes

ARE YOU PRESENTLY OVER 18 YEARS OF AGE?

1. No (**STOP HERE, NOT ELIGIBLE FOR PARTICIPATION**)
2. Yes

DEMOGRAPHIC QUESTIONNAIRE

1. **Age:** __ __
2. **Gender:**
 1. Male
 2. Female
 3. I prefer not to respond
3. **Marital Status**
 1. Single
 2. Married
 3. Divorced
 4. Widowed
 5. I prefer not to respond
4. **Highest level of schooling:**
 1. No formal schooling
 2. Less than high school
 3. High school graduate
 4. College graduate
 5. Professional-level education
 6. I prefer not to respond
5. **Race (Please choose all that apply):**
 1. American Indian or Alaska Native
 2. Asian or other Pacific Islander
 3. Black, not of Hispanic origin
 4. White, not of Hispanic origin
 5. Hispanic or Latino
 6. Other

5A. If other, please specify:

 7. I prefer not to respond

ACCULTURATIVE AND CULTURAL DEMOGRAPHIC QUESTIONS

6. **Were you born outside of the United States?**
 1. No
 2. Yes
 3. I prefer not to respond

IF "NO" GO TO 9
7. **Home country**
 1. Mexico
 2. Guatemala
 3. Honduras
 4. Other

7A: If other, please specify:

 5. I prefer not to respond
8. **Is the United States currently your primary country of residence?**
 1. No
 2. Yes
 3. I prefer not to respond
9. **What was your first language?**
 1. English
 2. Spanish
 3. Other

9A: If other, please specify:

 4. I prefer not to respond

IF "ENGLISH" GO TO 12**10. How well do you understand English?**

1. Not at all
2. Not very well
3. Moderately
4. Very well
5. Extremely well
6. I prefer not to respond

11. How well do you speak English?

1. Not at all
2. Not very well
3. Moderately
4. Very well
5. Extremely well
6. I prefer not to respond

EMPLOYMENT SPECIFIC**DEMOGRAPHICS****12. How many years have you worked as an agricultural worker? ____ ____****13. Employment Position**

1. General agricultural worker (picker, harvester, etc.)
2. Machine operator (tractor driver, etc.)
3. Crew leader
4. Other

13A. If other, please specify:

5. I prefer not to respond

14. Average hours you work per week.

1. 20 to 40 hours
2. More than 40 hours
3. I prefer not to respond

15. Which crops or types of livestock do you work with?

1. Fruit
2. Vegetable
3. Cattle
4. Aquatic
5. Other

15A. If other, please specify:

6. I prefer not to respond

**COVID SPECIFIC HEALTH
QUESTIONS**

16. Have you ever been exposed to COVID-19, that you know of?

1. No
2. Yes
3. I prefer not to respond

17. Do you suspect that you may have had COVID-19?

1. No
2. Yes
3. I prefer not to respond

18. Have you ever tested positively for COVID-19?

1. No
2. Yes
3. I prefer not to respond

IF NO GO TO 20

19. Date of positive test: Month/4-digit year

**25A. I prefer not to respond
(check box option)**

20. Have you received the COVID-19 vaccine?

1. No
2. Yes
3. I prefer not to respond

**IF YES CONTINUE TO COVID-19
STRESS SCALES**

IF NO GO TO 21

21. Are you going to get the vaccine?

1. No
2. Yes
3. I prefer not to respond

COVID-19 STRESS SCALES

GENERAL INSTRUCTIONS

The following asks about various kinds of worries that you might have experienced over the past year. In the following statements, we refer to COVID-19 as "the virus".

(0=Not at all, 1= Slightly, 2= Moderately, 3= Very, 4= Extremely)

	Not at all	Slightly	Moderately	Very	Extremely
D1. I was worried about catching the virus.	0	1	2	3	4
D2. I was worried that basic hygiene (e.g. handwashing) would not be enough to keep me safe from the virus.	0	1	2	3	4
D3. I was worried that the healthcare system would be unable to keep me safe from the virus.	0	1	2	3	4
D4. I was worried that I wouldn't be able to keep my family safe from the virus.	0	1	2	3	4
D5. I was worried that the healthcare system wouldn't be able to protect my loved ones.	0	1	2	3	4
D6. I was worried that social distancing would not be enough to keep me safe from the virus.	0	1	2	3	4

GENERAL INSTRUCTIONS

The following asks about various kinds of worries that you might have experienced over the past year. In the following statements, we refer to COVID-19 as "the virus".

(0=Not at all, 1= Slightly, 2= Moderately, 3= Very, 4= Extremely)

	Not at all	Slightly	Moderately	Very	Extremely
C1. I was worried that people around me would infect me with the virus.	0	1	2	3	4
C2. I was worried that if I touched something in a public space (e.g., handrail, door handle), I would catch the virus.	0	1	2	3	4
C3. I was worried that if someone coughed or sneezed near me, I would catch the virus.	0	1	2	3	4
C4. I was worried that I might catch the virus from handling money or using a debit machine.	0	1	2	3	4
C5. I was worried about taking cash in transactions.	0	1	2	3	4

GENERAL INSTRUCTIONS

In the following statements, we refer to COVID-19 as "the virus". Please read each statement and indicate how frequently each problem has been for you during the past year.

(0= Never, 1= Rarely, 2= Sometimes, 3= Often, 4= Almost always)

	Not at all	Slightly	Moderately	Very	Extremely
T1. I had trouble sleeping because I worried about the virus.	0	1	2	3	4
T2. I had bad dreams about the virus.	0	1	2	3	4
T3. I thought about the virus when I didn't mean to.	0	1	2	3	4
T4. Disturbing mental images about the virus popped into my mind against my will.	0	1	2	3	4
T5. I had trouble concentrating because I kept thinking about the virus.	0	1	2	3	4
T6. Reminders of the virus caused me to have physical reactions, such as sweating or a pounding heart.	0	1	2	3	4

SELF-REPORTED JOB-RELATED STRESSORS

GENERAL INSTRUCTIONS

The following is a list of things you may have experienced over the past year as a result of the COVID-19 pandemic.

	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.
I have worried that my job/workplace would start laying off workers because of the virus.	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.
I have worried that I would lose my job if became sick with the virus.	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.
I have worried that I would lose my job if I needed to take time off to recover from the virus.	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.

OTHER SELF-REPORTED STRESSORS

GENERAL INSTRUCTIONS

The following is a list of things you may have experienced over the past year as a result of the COVID-19 pandemic.

	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.
I have worried that I would not be able to provide for my family because of the virus.	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.
I have worried that I would be unable to see my friends or family because of the virus.	No, this was not a problem I faced.	Yes, this was a problem I faced.	I prefer not to respond.

B. SPANISH LANGUAGE COVID-19 STRESS QUESTIONNAIRE

SELECCIÓN DE CRITERIOS DE ELEGIBILIDAD

Para este estudio, los criterios de elegibilidad requieren que los participantes (1) estén actualmente empleados en el sector de agricultura en los condados de Pasquotank o Camden, (2) sean mayores de 18 años de edad al tiempo de participación y (3) que puedan proporcionar consentimiento informado escrito o verbal para participar en el estudio.

¿ESTÁ EMPLEADO ACTUALMENTE EN EL SECTOR DE AGRÍCULTURA?

1. No **(PARE AQUÍ, NO ES ELEGIBLE PARA PARTICIPAR)**
2. Si

¿ES USTED MAYOR DE 18 AÑOS DE EDAD?

1. No **(PARE AQUÍ, NO ES ELEGIBLE PARA PARTICIPAR)**
2. Si

CUESTIONARIO DEMOGRÁFICO

1. Edad: __ __

2. Sexo:

1. Hombre
2. Mujer
3. Prefiero no responder

3. Estado civil

1. Soltero/a
2. Casado/a
3. Divorciado/a
4. Viudo/a
5. Prefiero no responder

4. Nivel más alta de educación completada:

1. Sin educación formal
2. Menos que la escuela secundaria
3. Graduado de secundaria
4. Graduado de la universidad
5. Educación de nivel profesional
6. Prefiero no responder

5. Raza (por favor elija todas las que correspondan):

1. Indio americano o nativo de Alaska
2. Asiático o de otras Islas del Pacífico
3. Afro Americano, no de origen Hispano
4. Blanco, no de origen Hispano
5. Hispano o Latino
6. Alguna otra raza
- 5A. Si identifica como alguna otra raza, por favor especifique:

7. Prefiero no responder

PREGUNTAS DEMOGRÁFICAS ACULTURATIVAS Y CULTURALES

6. ¿Nació fuera de los Estados Unidos?

1. No
2. Si
3. Prefiero no responder

**SI LA RESPUESTA ES "NO",
ADELANTESE A LA PREGUNTA
NUMERO 9**

7. ¿Cuál de los siguientes es su país de origen/el país en que nació?

1. México
2. Guatemala
3. Honduras
4. Algún otro

7A. Si es algún otro país, por favor especifique:

5. Prefiero no responder

8. ¿Los Estados Unidos actualmente es su país de residencia principal?

1. No
2. Si
3. Prefiero no responder

9. ¿Cuál fue su primer idioma?

1. Inglés
2. Español
3. Algún otro

9A: Si su primero idioma fue otro, por favor especifique:

4. Prefiero no responder

**SI LA RESPUESTA FUE "INGLÉS",
ADELANTESE A LA PREGUNTA
NUMERO 12**

10. ¿Qué tan bien entiendes inglés?

1. Para nada
2. No muy bien
3. Moderadamente
4. Muy bien
5. Extremadamente bien
6. Prefiero no responder

11. ¿Qué tan bien habla inglés?

1. Para nada
2. No muy bien
3. Moderadamente
4. Muy bien
5. Extremadamente bien
6. Prefiero no responder

DEMOGRAFÍAS DE EMPLEO

12. ¿Cuántos años ha trabajado como trabajador agrícola? ____ ____

13. Posición laboral

1. Trabajador agrícola en general (recolector, etc.)
2. Operador de maquinaria (conductor de tractor, etc.)
3. Crew Líder
4. Alguna otra posición

13A. Si su posición de trabajo es otra, por favor especifique:

5. Prefiero no responder

14. ¿Cuántas horas trabaja por semana?

1. 20 a 40 horas
2. Más de 40 horas
3. Prefiero no responder

15. ¿Con qué cultivos o tipos de ganado trabaja?

1. Fruta
2. Vegetal
3. Ganado
4. Acuático
5. Otro

15A. En otro caso, por favor especifica:

6. Prefiero no responder

**PREGUNTAS DE SALUD ESPECÍFICAS
DE COVID**

16. ¿Ha estado expuesto alguna vez al COVID-19, que usted sepa?

1. No
2. Si
3. Prefiero no responder

17. ¿Sospecha que pudo haber tenido COVID-19?

1. No
2. Si
3. Prefiero no responder

18. ¿Alguna vez ha dado positivo en la prueba de COVID-19?

1. No
2. Si
3. Prefiero no responder

**SI LA RESPUESTA FUE NO,
ADELTANTESE A LA PREGUNTA
NUMERO 20**

**19. Fecha de la prueba positiva: mes / año
de 4 dígitos:**

**25A. Prefiero no responder
(opción de casilla de verificación
en forma electrónico)**

20. ¿Ha recibido la vacuna COVID-19?

1. No
2. Si
3. Prefiero no responder

**SI LA RESPUESTA FUE SÍ, CONTINÚE
CON LAS ESCALAS DE ESTRÉS DE
COVID-19**

**SI LA RESPUESTA FUE NO,
COMPLETE LA PREGUNTA NUMERO
21**

21 ¿Va recibir la vacuna?

1. No
2. Si
3. Prefiero no responder

ESCALAS DE ESTRÉS COVID-19

INSTRUCCIONES GENERALES

A continuación, se le pregunta sobre varios tipos de preocupaciones que podría haber experimentado durante el año pasado. En las siguientes declaraciones, nos referimos a COVID-19 como "el virus".

(0 = Nada, 1 = Un poco, 2 = Moderadamente, 3 = Mucho, 4 = Extremadamente)

	Nada	Un poco	Moderadamente	Mucho	Extremadamente
D1. Estaba preocupado/a sobre contractar el virus.	0	1	2	3	4
D2. Estaba preocupado/a que la higiene básica (por ejemplo, lavarme las manos) no iba ser suficiente para protegerme del virus.	0	1	2	3	4
D3. Estaba preocupado/a que el sistema de salud no iba poder protegerme del virus.	0	1	2	3	4
D4. Estaba preocupado/a que no iba poder proteger a mi familia del virus.	0	1	2	3	4
D5. Estaba preocupado/a que el sistema de salud no iba poder proteger a mis seres queridos del virus.	0	1	2	3	4
D6. Estaba preocupado/a que el distanciamiento social no iba ser suficiente para protegerme del virus.	0	1	2	3	4

INSTRUCCIONES GENERALES

A continuación, se le pregunta sobre varios tipos de preocupaciones que podría haber experimentado durante el año pasado. En las siguientes declaraciones, nos referimos a COVID-19 como "el virus".

(0 = Nada, 1 = Un poco, 2 = Moderadamente, 3 = Mucho, 4 = Extremadamente)

	Nada	Un poco	Moderadamente	Mucho	Extremadamente
C1. Me preocupaba que las personas a mi alrededor me contagiaran con el virus.	0	1	2	3	4
C2. Me preocupaba que si tocaba algo en un espacio público (por ejemplo, pasamanos, manija de la puerta), contrataría el virus.	0	1	2	3	4
C3. Me preocupaba que si alguien tosía o estornudaba cerca de mí, contrataría el virus.	0	1	2	3	4
C4. Me preocupaba que pudiera contratar el virus por manejar dinero o usar una máquina de débito.	0	1	2	3	4
C5. Me preocupaba aceptar dinero en efectivo en transacciones.	0	1	2	3	4

INSTRUCCIONES GENERALES

A continuación, se le pregunta sobre varios tipos de preocupaciones que podría haber experimentado durante el año pasado. En las siguientes declaraciones, nos referimos a COVID-19 como "el virus".

(0 = Nada, 1 = Un poco, 2 = Moderadamente, 3 = Mucho, 4 = Extremadamente)

	Nada	Un poco	Moderadamente	Mucho	Extremadamente
T1. Tuve problemas para dormir porque me preocupaba el virus.	0	1	2	3	4
T2. Tuve pesadillas sobre el virus.	0	1	2	3	4
T3. Pensé en el virus cuando no era mi intención.	0	1	2	3	4
T4. Imágenes mentales perturbadoras sobre el virus aparecieron en mi mente, en contra de mi voluntad.	0	1	2	3	4
T5. Tuve dificultades concentrándome por pensar en el virus.	0	1	2	3	4
T6. Recordatorios del virus me provocaron reacciones físicas, como sudoración o palpitaciones.	0	1	2	3	4

ESTRESORES RELACIONADOS CON EL TRABAJO AUTORREPORTADOS

INSTRUCCIONES GENERALES

La siguiente es una lista de cosas que puede haber experimentado durante el último año como resultado de la pandemia de COVID-19.

	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.
Me preocupaba que mi trabajo / lugar de trabajo iba comenzar a despedir trabajadores a causa del virus.	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.
Me preocupaba perder mi trabajo si me enfermaba con el virus.	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.
Me preocupaba perder mi trabajo si fuera a necesitar tomar tiempo para recuperarme del virus.	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.

OTROS ESTRESORES AUTORREPORTADOS

INSTRUCCIONES GENERALES

La siguiente es una lista de cosas que puede haber experimentado durante el último año como resultado de la pandemia de COVID-19.

	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.
Me preocupaba no poder mantener a mi familia a causa del virus.	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.
Me preocupaba no poder ver a mis amigos o familiares a causa del virus	No, este no fue un problema para mí.	Sí, este fue un problema para mí.	Prefiero no responder.

VITA
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Funded Projects

Project Title: Assessing the Impacts of the COVID-19 Pandemic on Hispanic/Latino Farmworkers. **PIs:** Hadiza Galadima, PhD, Sylvia Shangani, PhD, and Brenda Berumen-Flucker, MPH. **Funding Agency:** Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) John Hopkins Education and Research Center for Occupational Safety and Health, 2021 – 2022 Pilot Project Research Training Awards. **Total Budgeted:** \$9,500. **Role:** Principal Investigator (2021 – 2022).

Selected Manuscripts

Berumen-Flucker B, Galadima H, Shangani S, Akpinar-Elci, M. Experiences with COVID-19 Stress among Hispanic/Latino Farmworkers.

Berumen-Flucker B, Akpinar-Elci M, Galidima H. Analyzing the National Agricultural Worker Survey Data to Assess Trends in Health Care Utilization Among United States Farmworkers.

Berumen-Flucker B, Kekeh M, Akpinar-Elci A. (2022) Cultural Factors, Migrant Status, and Vulnerability to Increasing Temperatures among Hispanic/Latino Farmworkers: A Systematic Review. *Journal of Agricultural Safety and Health*. 28(1):49-63. DOI: 10.13031/jash.14952