

ASSESSING DAIRY FARM EMPLOYEES HEALTH

BY

LEYBY GUIFARRO RODRIGUEZ

A thesis submitted in partial fulfillment of the requirements for the

Master of Science

Major in Biological Sciences

Specialization in Dairy Science

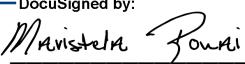
South Dakota State University

2021

## THESIS ACCEPTANCE PAGE

Leyby Guiarro Rodriguez

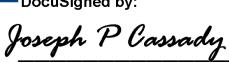
This thesis is approved as a creditable and independent investigation by a candidate for the master's degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

DocuSigned by:  
  
68933F973703446...

1/25/2021 | 07:13 PST

Maristela Rovai  
Advisor

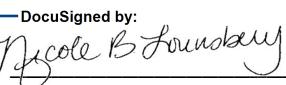
Date

DocuSigned by:  
  
85945FAA06B949F...

1/25/2021 | 15:20 PST

Joseph P Cassady  
Department Head

Date

DocuSigned by:  
  
1CD8E984DF2647F...

1/26/2021 | 08:39 CST

Nicole Lounsbury, PhD  
Director, Graduate School

Date

First and above all

I dedicate my thesis to God for the numerous blessings, the grace, and the strength that

He has bestowed upon me throughout my professional journey.

To My Mom and siblings, for all the support and for encouraging me to follow my

dreams even though when I had to travel far away from home.

## ACKNOWLEDGMENTS

Special thanks to my advisor Dr. Maristela Rovai for all the support and the opportunity to study at South Dakota State University. I came to South Dakota with high interest to learn about the dairy industry because of the strong passion for learning she transmits. My appreciation to Dr. Rovai to have her as an advisor. Thank you very much for the guidance, patience, motivation, and incredible leader during my education and personal growth throughout my professional performance.

I would like to express my gratitude to the members of my graduate committee Dr. Reinaldo Tonkoski, Dr. Mireille Chahine, Dr. Vikram Mistry, and Dr. Joseph Cassady, thank you for reviewing my thesis and for all the support, advice, and wisdom.

I would like to acknowledge the funding and support provided by HICAHS (High Plains Intermountain Center for Agricultural Health and Safety) for my research projects. This was an amazing experience and I believe it will help a lot the dairy industry labor. Thank you so much to Dr. John Rosecrance, Dr. Loraan Stallones, and M.Ph. Whitney Pennington.

I want to thank the producers in SD to conduct the study on their farms. The authors are also grateful to the dairy farm employees for their time and appreciation of participating in the study.

I specially thank Kristi Prunty, I owe much gratitude to you, for your advices, support, generosity, patience and for making a difference in the lives of students, faculty, and staff is immeasurable, we will always be grateful for all you do.

It is essential to recognize the valuable help provided by Marcelo Rovai (Data Science Institute, Faculty of Engineering, Universidad del Desarrollo, Santiago, Chile) with Python analysis and figures visualization.

I take this opportunity to thank the faculty, staff and friends of the Dairy and Food Science Department: Steven Beckman, Dr. Sanjeev Anand, Dr. Karla Rodriguez, Dr. Rhea Lawrence, Kaavya, Pratishtha, and Shayanti. Our international internship students: Miriam Cabello and Moises Sanchez. I also express my gratitude to Dr. Ahmed Salama, Dr. Patricia Rosa, and Dr. Carmen Manuelian. Also, I acknowledge a few of my friends who were instrumentals on making this journey of my life memorable: David, Giovanna Rovai, Cristina Lammers, Jose, Raul, Eden, Rediet, Priscilla, Achyut & Rama, Rubi & Hector, and Andrea.

No words can explain my gratitude but, I would like to express all my love and appreciation to my Mom, Idalia, and my siblings Dixie & Marvin, Luis, Alfredo, and Dorian, for all their support, prayers, and motivation. Thank you for always believing in me and helping me to grow in this memorable professional and personal experience, for the hours connected through the phone while I was writing to feel that I have all of you close to me. Last, but not least, I would love to thank Zach for your love and patience.

The work of this thesis has been presented in the following national institutions and international journals proceedings:

American Dairy Science Association:

- L. Guifarro, L. Stallones, J. Rosecrance, and M. Rovai. 2020. “*Assessing dairy employees’ mental health status in South Dakota: family and community.*” *J. Dairy Sci.* 2021. Vol. 104, Suppl. 1
- L. Guifarro, L. Stallones, J. Rosecrance, and M. Rovai. 2020. “*Assessing dairy employees’ mental health status in South Dakota: workplace.*” *J. Dairy Sci.* 2021. Vol. 104, Suppl. 1
- M. Rovai and L. Guifarro. 2020. “*Use of energy drinks, alcohol and tobacco by dairy farm employees.*” *J. Dairy Sci.* 2021. Vol. 104, Suppl. 1
- L. Guifarro, P. da Rosa, and M. Rovai. 2019. “*Assessing dairy employees’ health status in South Dakota: Vision care.*” *J. Dairy Sci.* 2019. Vol. 102, Suppl. 1.
- L. Guifarro, P. da Rosa, and M. Rovai. 2019. “*Assessing dairy employees’ health status in South Dakota: Eating habits and general health care.*” *J. Dairy Sci.* 2019. Vol. 102, Suppl. 1.

Other Publications:

- Da Rosa P., Guifarro L., and Rovai M. “*Assessing Oral Health Needs of Latino Dairy Farmworkers in South Dakota. 2019*”. American Public Health Association 2019 Annual Meeting.
- M. Rovai, Da Rosa P., Guifarro L. Hoard's Dairyman. We must prioritize employee health. January 10, 2020.
- M. Rovai and L. Guifarro. 2020. “*Keep an Eye on Your Dairy Farm Employee Vision Health.*” Available at: <https://extension.sdstate.edu/keep-eye-your-dairy-farm-employee-vision-health>

Oral Presentations:

- HEC Graduate Student Communication Conference 2020. Marvin, SD  
Presentation 1: “*Assessing Dairy Farm Employees Health.*”  
Presentation 2: “*Optimal Health for people, animals, & our environment*”
- HICAHS  
Research Day 2020: Agriculture Health and Safety. “*Sources of Stress in Hispanics Dairy Workers in the I-29 Corridor.*”

## TABLE OF CONTENTS

LIST OF FIGURES CHAPTER 1 .....	xv
LIST OF FIGURES CHAPTER 3 .....	xvi
LIST OF FIGURES CHAPTER 4 .....	xviii
LIST OF FIGURES CHAPTER 5 .....	xix
LIST OF TABLES CHAPTER 1.....	xx
LIST OF TABLES CHAPTER 3.....	xxi
ABSTRACT .....	xxi
CHAPTER 1 .....	1
1. LITERATURE REVIEW .....	1
1.1. INTRODUCTION .....	1
1.2. Dairy production in the U.S. .....	2
1.3. Farmworkers in the U.S.....	3
1.3.1. Seasonal farmworkers .....	3
1.3.2. Permanent farmworkers .....	5
1.4. The growth of the dairy industry in the Midwest.....	7
1.5. The growth of the dairy industry in the South Dakota .....	7
1.6. South Dakota agriculture and workers .....	8
1.7. Latinos & Hispanics preferences.....	9
1.8. Cultural differences .....	9

1.9. Education background.....	10
1.10. General health of Hispanics in the U.S. ....	10
1.11. REFERENCES .....	13
<b>CHAPTER 2</b> .....	<b>24</b>
2. HYPOTHESIS AND OBJECTIVES: .....	24
2.1. Assess dairy farm employee's general health including dental care and eating behavior (Chapter 3).....	24
2.2. Detect possible impaired vision issues within dairy farm employees and raise eye health awareness (Chapters 4).....	25
2.3. Gather information on the main causes of stress in dairy farm employees related to their workplaces, family, and community where they live and how these stressors would impact their job performance and lifestyle (Chapters 5) .....	25
<b>CHAPTER 3</b> .....	<b>28</b>
3. ASSESSING DAIRY EMPLOYEES' HEALTH STATUS IN SOUTH DAKOTA: EATING HABITS AND GENERAL HEALTH CARE .....	28
3.1. ABSTRACT .....	28
3.2. INTRODUCTION .....	29
3.3. MATERIALS AND METHODS .....	31
3.3.1. Recruitment of employees .....	31
3.3.2. Survey methodology .....	32

3.3.3. Body measurements .....	33
3.3.4. Blood pressure .....	33
3.3.5. Informative workshop .....	34
3.3.6. Statistical analysis .....	35
3.4. RESULTS AND DISCUSSION .....	37
3.4.1. Employees demographics .....	37
3.4.2. Educational level and English literacy .....	39
3.4.3. Health status and dental assistance .....	43
3.4.4. Sleep health .....	45
3.4.5. Body Mass Index and blood pressure measurements .....	46
3.4.6. Eating habits .....	49
3.4.7. Alcohol, energy drinks, and tobacco use .....	51
3.4.8. Final remarks and informative workshop .....	53
3.5. CONCLUSIONS .....	54
CHAPTER 4 .....	79
4. VISION SCREENING AND BARRIERS TO EYE CARE AMONG DAIRY FARM EMPLOYEES IN THE MIDWEST .....	79
4.1. ABSTRACT .....	79
4.2. INTRODUCTION .....	80
4.3. MATERIALS AND METHODS .....	82

4.3.1. Survey questionnaire .....	83
4.3.2. Vision screening .....	83
4.3.3. Statistical analysis .....	85
4.4. RESULTS AND DISCUSSION .....	87
4.4.1. Demographic data.....	87
4.4.2. Farm snapshot .....	87
4.4.3. Working length in the U.S.....	88
4.4.4. Self-reported vision.....	88
4.4.5. General attitudes about eye examinations and vision care .....	90
4.4.6. Knowledge about eye health.....	93
4.4.7. Vision acuity screening .....	94
4.5. CONCLUSIONS .....	99
4.6. REFERENCES .....	100
CHAPTER 5 .....	110
5. DAIRY EMPLOYEES' BEHAVIORAL HEALTH TOOL BOX:	
STRESS FACTORS AND IMPLICATIONS .....	110
5.1. ABSTRACT .....	110
5.2. INTRODUCTION .....	112
5.3. MATERIALS AND METHODS .....	115
5.3.1. Study design .....	115

5.3.2. Focus group design.....	116
5.3.3. Focus group sessions .....	116
5.3.4. Data analysis .....	117
<b>5.4. RESULTS .....</b>	<b>118</b>
5.4.1. Participants demographic .....	118
5.4.2. Thematic analysis .....	118
5.4.3. Phase-1. Mapping mental stress for you. ....	119
5.4.3.1. Question 1.1: What are the primary things that cause stress for you at work? .....	119
5.4.3.1.1. Unplanned time Interruptions at work.....	119
5.4.3.1.2. Cattle handling .....	120
5.4.3.1.3. Hospital pen (cows and calves) .....	121
5.4.3.1.4. Equipment failure .....	122
5.4.3.1.5. Summer and winter weather.....	123
5.4.3.1.6. Teamwork.....	125
5.4.3.2. Question 1.2: What are the primary things that cause stress for you related to your family? .....	125
5.4.3.2.1. Lack of quality family time .....	125
5.4.3.2.2. Sickness in family .....	126
5.4.3.2.3. Family estrangement due to long distances.....	127

5.4.3.2.4. Lack of child discipline .....	128
5.4.3.2.5. Lack of communication.....	129
5.4.3.3. Question 1.3: What are the primary things that cause stress for you in the community?.....	130
5.4.3.3.1. Lack of transport .....	130
5.4.3.3.2. Distance from city .....	131
5.4.3.3.3. Law enforcement.....	132
5.4.3.3.4. Cultural differences .....	133
5.4.3.3.5. Linguistic barrier .....	133
5.4.4. Phase-2. Practices that participants applied to reduce stress related to work, family, and the community .....	134
5.4.4.1. Question 2.1: What do you do or what can you do at work to reduce stress related to work?.....	134
5.4.4.1.1. Talking to someone and asking for help .....	134
5.4.4.1.2. Physical activities .....	135
5.4.4.1.3. Situation analysis.....	136
5.4.4.1.4. Self-motivation techniques.....	137
5.4.4.1.5. Social interaction.....	137
5.4.4.1.6. At-home activities .....	139
5.4.4.2. Question 2.2: What do you do or what can you do to reduce stress related to the family?.....	139

5.4.4.2.1. Family communication.....	139
5.4.4.2.2. Outdoor activities .....	140
5.4.4.2.3. Financial support .....	141
5.4.4.2.4. Family motivation .....	142
5.4.4.2.5. Home activities.....	142
5.4.4.3. Question 2.2: What do you do or what can you do to reduce stress related to your community? .....	143
5.4.4.3.1. Problems avoidance.....	143
5.4.4.3.2. Improve communication skills by studying English as second language .....	144
5.4.4.3.3. Outdoor activities .....	145
5.4.4.3.4. Community networks .....	146
5.4.5. Phase-3. Closing remarks .....	146
5.4.5.1. Question 3.1: What physical changes have you experienced due to stress? .....	146
5.4.5.2. Question 3.1: What causes you insomnia? .....	147
5.4.5.3. Question 3.1: How would you describe STRESS in one word? .....	148
5.5. DISCUSSION .....	148
5.6. CONCLUSION .....	152
5.7. REFERENCES .....	153

CHAPTER 6 .....	161
6. CONCLUSIONS AND RECOMMENDATIONS .....	161
6.1. CONCLUSIONS .....	161
6.1.1. Assess dairy farm employees general and oral health as their eating behavior (Chapter 3) .....	161
6.1.2. Detect possible impaired vision issues within dairy farm employees and raise eye health awareness (Chapters 4).....	161
6.1.3. Gather information on the main causes of stress in dairy farm employees related to their workplaces, family, and community and how these stressors impact their job performance and lifestyle (Chapters 5).....	162
6.2. RECOMMENDATIONS .....	163
6.2.1. Assist the dairy farm producers to: .....	163
6.2.2. Assist the dairy farmworkers to: .....	163

## LIST OF FIGURES CHAPTER 1

<b>Figure 1.1.</b> Age distribution of male H-2A workers certified for entry in the U.S in 2018.....	21
<b>Figure 1.2.</b> Country of origin for H-2A workers in 2018. ....	22

## LIST OF FIGURES CHAPTER 3

<b>Figure 3.1.</b> Participants data by age, country of origin and gender. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution.....	72
<b>Figure 3.2.</b> Participants educational attainment by country origin. The values represent the absolute numbers of participants in each educational level category. ....	73
<b>Figure 3.3.</b> Participants data by body mass index (BMI), country of origin and gender. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution. ....	74
<b>Figure 3.4.</b> Participants data by body mass index (BMI), years living in the U.S. (Years U.S.), and marital status. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution. ....	75

<b>Figure 3.5.</b> Participants absolute numbers by age, body mass index (BMI), country of origin (red = Mexico; gray = Guatemala), and years living in the U.S.....	76
<b>Figure 3.6.</b> Participants data by body mass index (BMI), country of origin and blood pressure range. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution. ....	77

## LIST OF FIGURES CHAPTER 4

<b>Figure 4.1.</b> Eye vision screening process using Spot Vision Screener. Device is 1 m distant from the participant. The screening begins immediately after touching the button “Go”. The device emits the sound of chirping birds to help focus the subject’s attention on the machine. ....	105
<b>Figure 4.2.</b> The figure outlines the subject results screen that appears at the end of the machine screening process. The results displayed can be: A) Screening complete “All measurements in range”, B) “Complete eye exam recommended”. Some of the measurements displayed for each eye are: OD: oculus dexter (right eye), OS: oculus sinister (left eye), SE: spherical equivalent (equal to the sum of the value of the sphere and half of the cylinder), DS: sphere (measure the power of the eye for myopia and hyperopia), DC: cylinder (measures the shape of the cornea), Axis: measurable location of astigmatism, and PD: pupillary distance. Results that are out-of-range are indicated in red. (source: Welch Allyn® Spot™ Vision Screener Model VS100 - Manual, 2018).....	106
<b>Figure 4.3.</b> Spot vision screener print out result form: within range. ....	107
<b>Figure 4.4.</b> Spot vision screener print out result form: for referral. ....	108

## LIST OF FIGURES CHAPTER 5

<b>Figure 5.1.</b> Focus Group: dairy farms (A & B); Community dairy employees (C & D).....	156
<b>Figure 5.2.</b> The word cloud shows the physical changes due to stress in the FG dairy workers participants. ....	157
<b>Figure 5.3.</b> The word cloud shows the main causes of insomnia in the FG dairy workers participants. .....	158
<b>Figure 5.4.</b> The word cloud shows how participants of all focus group sessions described <i>stress</i> in one word. ....	159

## LIST OF TABLES CHAPTER 1

<b>Table 1.1.</b> Visas H-2A and TN approved in 2019 by the U.S. Citizenship and Immigration Services .....	20
---	----

## LIST OF TABLES CHAPTER 3

<b>Table 3.1.</b> General traits of the participants expressed as frequency and relative frequency (RF, %) by gender. ....	63
<b>Table 3.2.</b> Dairy employees job positions, work schedule, years working at the dairy farm expressed as frequency and relative frequency (RF, %) by gender. ....	64
<b>Table 3.3.</b> Dairy farmworkers education background expressed as frequency and relative frequency (RF, %) by gender. ....	65
<b>Table 3.4.</b> General health information on physician visits and health insurance of the participants expressed as frequency and relative frequency (RF, %) by gender .....	66
<b>Table 3. 5</b> Participants body mass index (BMI) and blood pressure ranges expressed as relative frequency (RF, %) and 95% coefficient interval (95% CI) by gender. ....	67
<b>Table 3.6.</b> Self-reported regular dental specialist visits and oral care basics expressed as frequency and relative frequency (RF, %) by gender. ....	67
<b>Table 3.7.</b> Frequency and the relative frequency (RF, %) of study population eating habits behavior (n = 70).....	69
<b>Table 3.8.</b> Employees' perception (n = 70) of the relevance, in their own experience, regarding 5 issues related to health care, healthy food and eating habits on a scale of 1 to 10, with 1 having the least impact and 10 having the greatest impact on their daily life (expressed as frequency and relative frequency (RF, %)). ....	70

<b>Table 3.9.</b> General study population tobacco, alcohol and energy drinks consumption expressed as frequency and relative frequency (RF, %) by gender. ....	71
---	----

## LIST OF TABLES CHAPTER 5

<b>Table 5.1.</b> Questions guide for focus group Sessions .....	155
--	-----

## ABSTRACT

## ASSESSING DAIRY FARM EMPLOYEES HEALTH

LEYBY GUIFARRO RODRIGUEZ

2021

This Master thesis evaluates the impact of general health care and eating habits (Study 1), vision care (Study 2), and mental health status (Study 3) on Latino dairy farmworkers lifestyle and work performance in South Dakota. We hypothesized that the health status of dairy workers has a negative impact on the workers' job performance. *In study 1*, data from a total of 70 participants were collected, using a face-to-face survey in Spanish, which allowed us to assess various topics and details related to employees' daily routine tasks, eating habits, and general health status. Furthermore, recommendations to improve general health care were given at an educational workshop at the end of the survey period. The most participants were males (76%); the mean age of participants was  $28 \pm 1.7$  and  $34 \pm 1.6$  for female and male, respectively. The majority of the participants were Mexican (46%) and Guatemalan (44%) workers. The majority (80%) do not have health insurance; over half of them have not seen a physician in the last 3 years, and 65% have not seen a dentist in the last 6 months. Also, over half (53%) of the interviewed workers were overweight or obese (mean  $BMI = 25.6 \pm 4.2 \text{ kg/m}^2$ ). Workers living in the U.S. for up to four years had  $BMI = 25 \text{ kg/m}^2$ , whereas the  $BMI$  of those who had been in the U.S. for a long time was higher ( $> 28 \text{ kg/m}^2$ ). One-third reported sleeping between four to six hours a day and 46% reported eating in restaurants at least twice a week. They usually opted for healthier choices when arriving in the U.S.; however, their food habits change throughout the years with more fast food or frozen food consumption due to their

convenience. ***In Study 2***, 90 participants were enrolled for vision screening to identify visual impairments. Demographic data using a survey was collected. Almost one-fourth needed further eye examination and 43% had never been seen by an eye care provider either due to the cost of eye care or due to the language barrier. Among the participants that needed an eye exam, 60% were milking parlor workers. A full detailed report of pupillary diameter, ocular alignment, binocular refraction, and referral recommendation (e.g., anisometropia, hyperopia, strabismus, myopia, astigmatism, and anisocoria) was provided to participants at the end of the study. ***In study 3***, 50 dairy farm employees participated in a Focus Group (FG) for a qualitative study. A total of 7 FG sessions were conducted, 5 FG with 3 commercial dairy farms, and 2 FG in 2 different communities with dairy workers. Transcriptions of the FG were analyzed and coded line by line for each quotation and question using ATLAS.TI software (Scientific Software Development GmbH). Most of the participants were males (88%), and 54% were Mexicans, 30% Guatemalans and 16% other Latin American countries (e.g., El Salvador, Honduras, and Nicaragua). Participants were asked to share stress-causing factors in their workplace, at home, and in their community. Additionally, participants shared information on the strategies they apply or consider useful in reducing stress. Physical changes experienced due to stress, the main causes of their insomnia, and the meaning of stress in one word were included. Results show that over 35 factors were contributing to overall stress at the workplace, at home, and in the community, which were also qualitatively identified. Personal health care and mental health were influenced by individual values, culture, motivation, environment, and community. Overall, employee's well-being may impact

their job performance in a negative way. Strategic workshops designed to promote health education and healthy eating habits for farmworkers are needed in their native language.

# **CHAPTER 1**

## **Introduction & Literature Review**

## CHAPTER 1

### 1. LITERATURE REVIEW

#### 1.1. INTRODUCTION

Eighty-three percent of the global milk production corresponds to dairy cattle, and the largest milk producer (22%) country is India, followed by the United States with 12% (FAO, 2018 & 2020). During the last year (since October 2019), the U.S. reported an increase of 2.5% in milk production in 24 major States. Also, the report showed an increase in the number of cows (+57,000 head) in all the country (USDA, 2020).

According to the USDA (2020), South Dakota, which is one of the 24 leading dairy-producing states contributes 13% to U.S. milk production. The state also reported an increase in the number of cows from 127,000 in 2019 to 140,000 in 2020. The growth in milk production and the addition of cows to the herd in large dairy farms required more employees. In general, farmworkers play an essential role in the U.S. agriculture industry by developing activities in crops and livestock areas. It should also be noted that, while farmworkers can be seasonal or permanent depending on the sector, livestock workers tend to be permanent.

The workforce in livestock is made up of 48% foreign-born individuals, mainly of Mexican origins. An increase of 11% in the workforce was reported between 2010 and 2019; where 20% of the workers were added to crop services and 18% to the livestock sector. Between 2014 and 2016, 27% of the crop workers were U.S.-born, 4% were immigrants who obtained U.S. citizenship, and 21% were green card holders (USDA, 2020). Similar to agriculture workers, dairy employees are vital in the dairy industry.

Large dairy farms operate 24-h a day, 7 days a week; and the workforce (mainly Hispanics/Latinos) usually works 12 hours shifts (12-h a day and 12-h a night; 6 days a week). The long shifts and intensive schedule may hinder this group's ability to seek professional health and mental care. Furthermore, high exposure to extreme weather, lack of time and resources to follow healthy eating habits, lack of insurance, alienation from family and friends, difficulties in the process of acculturation, inability to speak English, etc., may impact the social life and psychological status of the Latino dairy workers. Sustaining a healthy, productive workforce is an important component of risk management and efficiency in dairy farms according to Hagevoort et al. (2013). The current literature review will focus on the dairy industry history of the U.S. and laborers (Latino/Hispanic) background (general health status, culture, and socio-economic background).

## **1.2. Dairy production in the U.S.**

The United States Department of Agriculture (USDA, 2020) reported an increase of 2.3% in milk production in the U.S. In addition, an increase of 2.5% was reported among the 24 major States (lead by California and Wisconsin with more than 30 million pounds in milk yield) from October 2019 to 2020. Also, the report mentioned an increase in the number of dairy cows (+57,000 head) in all the country (USDA, 2020). Although the number of licensed dairy herds has declined nationally year-over-year since 2004, the number of cows increased among large dairy farms. The main reason for the reduced number of dairy operations and why dairy farmers have struggled in the last several years is due to the low milk prices resulting from large supplies over the demand in the U.S. and around the world (Farm Bureau, 2020). The state of Wisconsin led the list in 2019 of

a decrease in the number of licensed operations, followed by Pennsylvania, New York, Ohio, and Minnesota.

### **1.3. Farmworkers in the U.S.**

Farmers heavily depend on farmworkers who are essentials for agriculture in the U.S. This group of workers is employed in various positions in the agriculture sector (crop production, animal production, and aquaculture; Census Bureau, 2020). Approximately 1.18 million farmworkers in 2019 worked in the agriculture sector in the U.S. (USDA, 2020). In a study conducted by Zahniser et al. (2018), farmers reported challenges to hiring farmworkers regardless of their legal status in the U.S. A farmer from California pointed out that if only legal labor is hired, parts of the industry in CA may not exist. In addition, Zahniser et al. (2018), stated that on several occasions, farmers had to increase laborers' salaries to reduce the turnover rate.

Agriculture jobs require an extensive work schedule (10-12 h daily), and dairy farms tend to have day & night 12-hour shifts 24/7. Furthermore, farmworkers in the U.S. and other countries are exposed to high physical work, a variety of hazards, psychological stressors, and different cultural environments (Arcury and Mora, 2020; Dianat et al., 2020). It is worth mentioning that, like men, women are also working actively as farmworkers. In 2018 there was an increased number (25.5%) of females in the agriculture sector compared to 18.6% in 2009 (USDA, 2020).

#### **1.3.1. Seasonal farmworkers**

This group of farmworkers was recently described as “the heart of the American food supply” by Haedicke (2020). In the 1930s, the outbreak of World War II gave a

window to farmers to “import” Mexicans as temporary workers under a system called Bracero or guest worker programs (Martin, 2002). The Bracero programs allowed 4.6 million legal Mexican farmworkers between 1942 to 1960; at the end of the program, many individuals returned to their country while others were employed because of their work experience. Since the Bracero program, the government required farmers to provide housing and also to hire equal U.S. citizens nonforeign who applied for the job. However, it was a challenge for farmers to find U.S. workers (Martin, 2002); for instance, the SAW program (Special Agriculture Worker) was created for the illegal farmworkers, while H2-A (maximum of 12 months visa) was created to hire more foreign workers in the 1990s. For three decades farmers have been hiring foreign-born workers in the seasonal or temporary agriculture program under the H-2A visa (USDA, 2020; Zahniser et al., 2018).

The seasonal workers are primarily located in crop farms, do not work all year round (few months of the year) due to the agricultural seasonal nature. Nevertheless, Barth (2017) and Duvall (2019) mentioned the H-2A program is costly for farmers, according to the U.S. Department of Labor (DOL) since farmers must provide house, transportation, wage guarantee, and other benefits to farmworkers. Additionally, H-2A visas take a long time for approval, and therefore farmers feel obligated to find permanent workers (Rosenthal, 2016). In 2018, the National Center for Farmworker Health (NCFH, 2020) reported that 10% of the farmworkers were under H-2A visa, 97% were male, and 47% were between 20 to 29 years old as shown in Figure 1.1. Most of the H-2A visas issued (over 277,000) were mainly from Mexico (Figure 1.2).

The H-2A visa does not require a high level of education for applicants. Nevertheless, the North American Free Trade Agreement (NAFTA) was another program

created in 1992 by the governments of Canada, Mexico, and the United States. A temporary entrance under the category TN (Trade National) allows professionals of different areas (i.e., architects, doctors, teachers, nutritionist) to apply for TN visas (for up to 3 years), including the agriculture sector (i.e., agronomists, biologists, veterinarians). A total of 21,191 TN (all sectors) vs 198,854 H-2A (agriculture sector) visas were issued in 2019. Mexico was the country with the highest number of visas (H-2A and TN visas) approved and followed by Guatemala, Peru, Nicaragua, and other Central American countries (Table 1.1).

### **1.3.2. Permanent farmworkers**

Permanent farmworkers (with citizenship, permanent residence, or those with a lack of legal status) are the ones working in sectors of the agriculture industry that need their assistance all the year round. One-third of all farm labor jobs, mainly animal farming and dairy, are the ones that need assistance throughout the year. Duvall (2019) indicated that an H-2A visa for seasonal employees is not the best option for dairy producers that must have employees all year round. The reality is that undocumented immigrants fill these crucial gaps in agriculture. Mexicans have been one of the largest population groups (USDA, 2020) hired as farmworkers with lacking work authorization in the U.S., followed by other Central American countries.

The undocumented term used for foreign-born in the U.S. is determined by (1) legally entered in the U.S. but remained in the country after their visa expired; (2) received a negative decision on their refugee/asylee application but remained in the country; (3) experienced changes in their socioeconomic position and could not renew residence permit but remained in the country; (4) used fraudulent documentation to enter

the country or territory; or (5) unlawfully entered the country or territory, including those who were smuggled (Martinez et al., 2015).

Forty-eight percent of farmworkers held no legal work authorization between 2014 and 2016; while 27% were U.S.-born, 4% were those who obtained U.S. citizenship, and 21% were authorized immigrants' permanent residents (USDA, 2020). The group of farmworkers described above are usually the permanent farmworkers. Researchers have found that the number of undocumented Mexicans in the U.S. declined to less than half (52% Mexicans living in the U.S. in 2007 vs 20% in 2017; Cohn D'Vera and Passel, 2019). Nevertheless, an increase in undocumented immigrants from around the world was reported including those who lose their legal status. In this situation, there were hundreds of Central Americans entering the U.S. during the last few years; especially from Guatemala, El Salvador, and Honduras where high rates of poverty and violence are the main reason for immigration (Gonzales, 2019). The states of Louisiana, Maryland, Massachusetts, North Dakota, and South Dakota were mainly the ones that reported an increase of unauthorized immigrants between 2007 to 2017 (Cohn D'Vera and Passel, 2019).

In the 1990s Hispanic dairy workers arrived in New York willing to do the hard work 24/7 since there were no U.S. citizens wanting the job and dairy farmers needed non-seasonal permanent workers (Grullón-Paz , 2017; Dudley, 2016). Today's producers are still struggling to hire U.S. born workers; however, dairy farms around the country that produce 79% of the U.S. milk supply rely on Latino/Hispanic laborers. The U.S. economy would be reduced by \$32.1 billion if a decrease in immigrant labor occurs, and

the dairy industry as well as other agriculture sectors will be highly impacted (Adcock et al., 2015; Perez, 2020).

#### **1.4. The growth of the dairy industry in the Midwest**

Milk production increased between 2019 and 2020 in the Midwest region. The USDA (2020) reported that 12.9, 10.7, and 8% of the U.S. milk production was from South Dakota, Indiana, and Illinois, respectively; while 5.1, 3.2, 3, 2.5, and 1.7% was from Ohio, Iowa, Michigan, Minnesota, and Wisconsin, respectively. The dairy industry in the U.S. shows a 16-fold increase in over 30 years, and the growth in the Midwest goes hand-to-hand with the number of plants that process the milk (Rook, 2018; Kirwan, 2020). In 2000, Wisconsin was leading the 5-top milk-producing (49%) states of the country followed by California, New York, Minnesota, and Pennsylvania (Blayney, 2002).

#### **1.5. The growth of the dairy industry in the South Dakota**

In 2011 South Dakota produced 1.8 billion pounds of milk and 90,000 to 92,000 was the number of milk cows (20,000 pounds per cow) according to the State Governor (Hoard's Dairyman, 2012). Currently, South Dakota is listed within the 24 leading dairy states, contributing 13% (26.7 million pounds) of the U.S. milk production with an increase of 13,000 cows in 2020 (137,000 cows in 2019) according to the USDA (2020).

The advances in animal and forage genetics, along with the adoption of best management practices are well known as factors influencing milk production performance (Garcia, 2006). However, studies have shown that labor-management activities such as employee hiring, training, and evaluation are perceived by dairy

producers as a key challenge or a threat for farm sustainability and expansion (Hadley et al., 2002; Mugera and Bitsh, 2005; von Keyserlingk et al. 2013). In fact, the expansion of the Dairy Industry in South Dakota provides a great economic value to the industry and other sectors, including rural communities (Rook, 2018).

South Dakota is wide-open and has helped to the relocation of dairy farms from other states like California or countries (e.g., The Netherlands, Ireland, Switzerland) along the I-29 corridor (Fugleberg, 2018). Once again, together with the expansion of the dairy industry, processors of milk needed to expand their facilities and increase their manufacturing capacity (i.e., Lake Norden Plant increased milk production from 3 to 9 million pounds a day). Additionally, many job opportunities were added and many of the laborers are foreign-born Latinos (Fugleberg, 2018).

### **1.6. South Dakota agriculture and workers**

The agriculture industry of South Dakota contributes \$32.5 billion to the South Dakota economy (\$11.2 billion to the U.S. economy) and represents an increase of 132,105 (22%) jobs since 2014. Livestock production and industries related is the largest contributor sector with \$5.8 billion (\$324.5 million from dairy cattle and milk production) and 75,516 jobs, while \$3.4 and \$2 billion corresponded to crop production and other agriculture industries. Jobs added by the crop production were 33,617 according to the South Dakota Department of Agriculture (2019). In 2019, 4.2% (37,400) of the population in South Dakota were of Latino/Hispanic origin. Since 2000 this demographic group has nearly tripled (Stepler and Lopez, 2016; U.S. Census Bureau, 2019).

### **1.7. Latinos & Hispanics preferences**

The Latino/Hispanic population is now the largest non-white ethnic-racial subgroup in the United States, having numerically surpassed African Americans (U.S. Census Bureau. 2010). In the 1970s the generic term for Hispanics was created by the Census Bureau of the U.S., and the term Hispanic may be considered offensive for some Spanish speakers or Latinos. Many Latinos (male) or Latinas (females) prefer to be called Latino/Latina over Hispanics since many people from Central and South America do not speak Spanish (i.e., Brazilians; Comas-Diaz, 2001; Tylor et al., 2012). The Merriam-webster provide two descriptions of the word “Hispanic”: (1) of, relating to, or being a person of Latin American descent and especially of Cuban, Mexican, or Puerto Rican origin living in the U.S. and (2) of or relating to the people, speech, or culture of Spain. On the other hand, the word “Latino” is described as (1) a native or inhabitant of Latin America and (2) a person of Latin American ancestry living in the U.S. The example of Puerto Ricans is clear; they are U.S. citizens who speak Spanish, therefore they fit within the Hispanic/Latino group (Tylor et al., 2012).

Despite the Latino/Hispanic term used in the U.S., these immigrants prefer other terms to describe their ethnicity. The ethnic label does not accurately describe their ethnicity, cultural values, religion, language, or country of origin.

### **1.8. Cultural differences**

Latinos have a diversity of cultures and traditions, and they are recognized for their hospitality and happiness. Latinos love to spend time together with family; they also help raise, support, and educate the younger members. The extended family to the

Latinos is like close family members (e.g., uncles, aunts, cousins, and grandparents), and they are involved in almost all their life events. Migrant Latinos in the U.S. are constantly missing their traditions and family members (Comas-Diaz, 2001; Tylor et al., 2012; Latin American Culture, 2018).

### **1.9. Education background**

The economic status and social resources are some of the factors that limit many of the Latinos to start or finish their education. The lower education level is one of the disadvantages for this demographic group while in the U.S. (Schneider et al., 2006); however, in recent years this trend has changed. Bustamante (2020) reported 26% of immigrants ages 25 and older holding a bachelor's degree and 67% with high school back in 2018. In the agriculture sector, the educational level when hiring immigrants is not a requirement from employers depending on the visa category. H-2A visas do not need a high school diploma whereas TN visas must have a bachelor's degree.

### **1.10. General health of Hispanics in the U.S.**

The Hispanic or Latino community is one of the largest immigrant populations in the US, but the least studied for their health status (Romero et al., 2018). In 2019, Hispanics (16%) were the largest population without health insurance coverage in the U.S. followed by Blacks with 9.6%, Asians 6.2%, and non-Hispanics with 5.2% (Starkey and Bunch, 2020). Some health challenges faced by farmworkers that can be linked to their occupation include pesticide exposure, infectious diseases, respiratory issues, hearing, vision problems, and musculoskeletal conditions. Usually, farmworkers experience multiple health conditions including but not limited to dental health problems,

diabetes, hypertension, and mental health. Farmworkers with H-2A visas have access to health care through the Workers Compensation system, while the group of undocumented workers does not have any type of health insurance (Arcury et al., 2015). Additionally, according to the National Center for Farmworker Health (NCFH) and other researchers, the lack of English language skills, lack of transportation, and fear of deportation are some of the biggest barriers to farmworkers to seek for medical attention (Hoerster et al., 2010; NCFH, 2014). The NCFH (2014) also reported musculoskeletal pain, oral, and mental health as some of the biggest health problems in dairy farmworkers.

In a study conducted by Quandt et al. (2008), farmworkers reported difficulty in seeing something like recognizing a friend across the street or reading a book. These authors also mentioned that farmworkers experienced problems such as eye pain, redness, and itching. These conditions were especially important to those that have never visit an eye care specialist. A farmworker with eye vision impairment is more prone to have accidents at their workplaces or to cause accidents to others. Farmworkers do not work just picking and packaging fruits or vegetables and feeding animals. Farmworkers work with driving machinery, identifying herd health status, performing A.I., treating the herd, registering data in the computer, writing medical records, and detecting abnormalities in milk, among others. Thus, their vision health is important to their job performance. Furthermore, researchers found that many Latino farmworkers with dental problems prefer to work sick rather than missing work and pay out-of-pocket for dental assistance in the U.S. because of the lack of dental insurance (Villarejo, 2003; López-Cevallos et al., 2014).

In complement, farmworkers experience a diversity of stressors including frequent relocations, (e.g., away from their homes and families for extended periods), residence in isolated locations with limited access to transportation, and discrimination (Magaña and Hovey, 2003). Poor family functioning, acculturative stress, and the lack of social supports are symptoms of depression associated with anxiety among Mexican farmworkers in the Midwest (Hovey and Magaña, 2002). Therefore, the objective of this work was to investigate the general health status of Latino dairy farm employees, including eating habits, vision care, dental health, and sources of stress with the aim to evaluate the impact on their lifestyle and job performance.

### 1.11. REFERENCES

Adcock, F., D. Anderson, and P. Rosson. 2015. Report: The economic impact of immigrant labor on U.S. dairy producers. Assessed May 15, 2020.  
<https://www.nmpf.org/wp-content/uploads/2018/12/immigration-survey-090915.pdf>.

Arcury T. A., D. C. Mora. 2020. Latinx Farmworkers and Farm Work in the Eastern United States: The Context for Health, Safety, and Justice. In: Arcury T., Quandt S. (eds) Latinx Farmworkers in the Eastern United States. Springer, Cham.  
[https://doi.org/10.1007/978-3-030-36643-8\\_2](https://doi.org/10.1007/978-3-030-36643-8_2).

Arcury, T. A., P. Summers, , J. W. Talton, H. T. Nguyen, H. Chen, and S. A. Quandt,. 2015. Job characteristics and work safety climate among North Carolina farmworkers with H-2A visas. *J. agromedicine*. 20(1): 64–76.  
<https://doi.org/10.1080/1059924X.2014.976732>.

Barth, B. 2017. The H-2A Temporary Agricultural Worker Visa Process, Explained. Modern Farmer. Accessed on December 10, 2020.  
<https://modernfarmer.com/2017/12/h-2a-temporary-agricultural-worker-visa-process-explained/>.

Blayney, D. P. 2002. The Changing Landscape of U.S. Milk Production. Electronic Report from the Economic Research Service. Bulletin N 978. Accessed on December 10, 2020.  
[https://www.ers.usda.gov/webdocs/publications/47162/17864\\_sb978\\_1\\_.pdf?v=41056](https://www.ers.usda.gov/webdocs/publications/47162/17864_sb978_1_.pdf?v=41056).

Bustamante, L. N. 2020. Fact Tank: Education levels of recent Latino immigrants in the U.S. reached new highs as of 2018. Pew Research Center. April 2020. Accessed on December 10, 2020. <https://www.pewresearch.org/fact-tank/2020/04/07/education-levels-of-recent-latino-immigrants-in-the-u-s-reached-new-highs-as-of-2018/>.

Cohn, D'V., and Passel J. 2019. Factank – News in the Numbers: Mexicans decline to less than half the U.S. unauthorized immigrant population for the first time. Accessed in November 18, 2020. <https://www.pewresearch.org/fact-tank/2019/06/12/us-unauthorized-immigrant-population-2017/>.

Comas-Diaz, L., 2001. Hispanics, Latinos, or Americanos: The evolution of identity. *Cultural diversity and ethnic minority psychology*. 7(2): 115. <https://psycnet.apa.org/buy/2001-06328-001>.

Dianat, I., D. Afshari, N. Srmasti, M. S. Sangdeh, and R. Azaddel. 2020. Work posture, working conditions and musculoskeletal outcomes in agricultural workers. *Int. J. of industrial Ergonomics*. 77: 102941. <https://doi.org/10.1016/j.ergon.2020.102941>.

Dudley, J. M. 2016. Voices of Mexico: Tense Spaces. Navigating Relations between Immigrant Workers and Dairy Farmers. *Autumn-Winter, 2016-2017*. 102: 119–123. <http://ru.micisan.unam.mx:8080/xmlui/handle/123456789/19575>.

Duvall, Z. 2019. Another Year of Farm Labor Shortages. Accessed on December 10, 2020. <https://www.fb.org/viewpoints/another-year-of-farm-labor-shortages>.

FAO — The Food and Agriculture Organization of the United Nations. 2018. Milk production: Milk Facts. Accessed on Dec 16, 2020. <http://www.fao.org/3/I9966EN/i9966en.pdf>.

FAO — The Food and Agriculture Organization of the United Nations. 2020. Overview of global dairy market developments in 2019. Accessed on Dec 16, 2020. <http://www.fao.org/3/ca8341en/CA8341EN.pdf>.

Farm Bureau. 2020. Largest Decline in U.S. Dairy Farms in 15-Plus Years in 2019. Accessed on December 14, 2020. <https://www.fb.org/market-intel/largest-decline-in-u.s.-dairy-farms-in15-plus-years-in-2019>.

Fugleberg, J. 2018. Argus Leader: Expansions, consolidations fuel remarkable dairy growth along I-29 corridor. Accessed on December 14, 2020. <https://www.argusleader.com/story/news/business-journal/2018/04/03/expansions-consolidations-fuel-remarkable-dairy-growth-along-29-corridor/472564002/>.

Garcia, A. 2006. The South Dakota Dairy Industry in 2006. Fact Sheets. 113. Accessed on December 5, 2020. [http://openprairie.sdstate.edu/extension\\_fact/113](http://openprairie.sdstate.edu/extension_fact/113).

Gonzales, D. 2019. The migrant: The 2019 migrant surge is unlike any we've seen before. This is why. *US Today*. Accessed on December 10, 2020. <https://www.usatoday.com/in-depth/news/nation/2019/09/23/immigration-issues-migrants-mexico-central-america-caravans-smuggling/2026215001/>

Grullón-Paz I. 2017. Invisible Hands. Accessed on December 10, 2020.  
[https://www.ithaca.com/news/invisible-hands/article\\_c2c75d4e-672e-11e7-b0a2-6fbb26688d72.html](https://www.ithaca.com/news/invisible-hands/article_c2c75d4e-672e-11e7-b0a2-6fbb26688d72.html).

Hadley, G. L., S. B. Harsh, and C. A. Wolf. 2002. Managerial and financial implications of major dairy farm expansion in Michigan and Wisconsin. *J. Dairy Sci.* 85:2053–2064. [https://doi.org/10.3168/jds.S0022-0302\(02\)74283-5](https://doi.org/10.3168/jds.S0022-0302(02)74283-5).

Haedicke, M. 2020. College of Natural Sciences, Forestry, and Agriculture\_How coronavirus threatens the seasonal farmworkers at the heart of the American food supply. College of Natural Sciences, Forestry, and Agriculture. 9.  
[https://digitalcommons.library.umaine.edu/c19\\_nsfa/9](https://digitalcommons.library.umaine.edu/c19_nsfa/9).

Hagevoort, R. G., D. I. Douphrate, and S. J. Reynolds. 2013. A Review of Health and Safety Leadership and Managerial Practices on Modern Dairy Farms. *J. Agromedicine.* 18(3): 265–273. <https://doi.org/10.1080/1059924X.2013.796905>.

Hoard's Dairyman. 2012. South Dakota is Open to the Dairy Industry. Accessed on December 15, 2020. <https://hoards.com/blog-4401-south-dakota-is-open-to-the-dairy-industry.html>.

Hoerster, K. D., S. Beddawi, K. M. Peddecord, and G. X. Ayala. 2010. Healthcare use among California farmworkers: Predisposing and enabling factors. *J. Immigrant and Minority Health.* 12(4): 506–512. <https://doi.org/10.1007/s10903-009-9305-0>.

Hovey, J. D., and C. G. Magaña. 2002. Psychosocial predictors of anxiety among immigrant Mexican migrant farmworkers: Implications for prevention and treatment. *Cultural Diversity and Ethnic Minority Psychology.* 8(3): 274–289.  
<https://doi.org/10.1037/1099-9809.8.3.274>.

Kirwan, H. 2020. USDA Report Describes Fast-Paced Consolidation In Dairy Industry, Centered In The Midwest. Published: Thursday, July 30, 2020. Accessed on December 15, 2020. <https://www.wpr.org/usda-report-describes-fast-paced-consolidation-dairy-industry-centered-midwest>.

Latin American Culture: Facts, Food & Traditions. 2018. Accessed on December 16, 2020. <https://study.com/academy/lesson/latin-american-culture-facts-food-traditions.html>.

López-Cevallos, D. F., J. Lee, and W. Donlan. 2014. fear of deportation is not associated with medical or dental care use among Mexican-origin farmworkers served by a federally-qualified health center—faith-based partnership: an exploratory study. *J. immigrant and minority health.* 16(4): 706–711. <https://doi.org/10.1007/s10903-013-9845-1>.

Magaña, C. G., and J. D. Hovey. 2003. Psychosocial stressors associated with Mexican migrant farmworkers in the Midwest United States. *J. Immigrant Health.* 5(2): 75–86. <https://doi.org/10.1023/A:1022955825650>.

Martin, P. 2002. Mexican workers and US agriculture: The revolving door. *International Migration Review.* 36(4):1124–1142. <https://doi.org/10.1111%2Fj.1747-7379.2002.tb00120.x>.

Martinez, O., E. Wu, T. Sandfort, B. Dodge, A. Carballo-Dieguer, R. Pinto, S. Rhodes, E. Moya, and S. Chavez-Baray. 2015. Evaluating the impact of immigration policies on health status among undocumented immigrants: a systematic review. *J. immigrant and minority health.* 17(3): 947–970. <https://doi.org/10.1007/s10903-006-9033-7>.

Merriam-webster: “*Hispanic*”. Accessed on December 20, 2020. <https://www.merriam-webster.com/dictionary/Hispanic>.

Merriam-webster: “*Latino*”. Accessed on December 20, 2020. <https://www.merriam-webster.com/dictionary/Latino>.

Mugera, A. W., and V. Bitsch. 2005. Managing labor on dairy farms: a resource-based perspective with evidence from case studies. *International Food and Agribusiness Management. Review.* 8:79–98. <https://doi.org/10.22004/ag.econ.8140>.

National Center for Farmworker Health – NCFH. 2020. H-2A Guest Worker Fact Sheet. Accessed December 10, 2020. <http://www.ncfh.org/h-2a-guest-workers.html>.

National Center for Farmworker Health – NCFH. 2014. Dairy Workers. Accessed December 10, 2020. <http://www.ncfh.org/dairy-workers.html>.

Perez, M. 2020. Wisconsin's dairy industry would collapse without the work of Latino immigrants - many of them undocumented. Milwaukee journal sentinel. Accessed on December 10, 2020. <https://www.jsonline.com/in-depth/news/special->

reports/dairy-crisis/2019/11/12/wisconsin-dairy-farms-rely-immigrant-workers-undocumented-laborers/2570288001/.

Quandt, S. A., S. R. Feldman, Q. M. Vallejos, M. R. Schulz, A. Verma, A. B. Fleischer, and T. A. Arcury. 2008. Vision Problems, Eye Care History, and Ocular Protection Among Migrant Farmworkers. *Archives of Environmental & Occupational Health*. 63(1): 13–16. <https://doi.org/10.3200/aeoh.63.1.13-16>.

Romero-Ibarguengoitia, M. E., G. Garcia-Dolagaray, A. Gonzalez-Cantu, and A. E. Caballero. 2018. Studying the gut microbiome of Latin America and Hispanic/Latino populations. *Insight into Obesity and Diabetes. Systematic Review. Curr. Diabetes Rev.* <https://doi.org/10.2174/1573399814666180730124817>.

Rook, M. 2018. Agweek: SD dairy industry continues to grow, expand and add economic value. Accessed on December 11, 2020.  
<https://www.agweek.com/business/agriculture/4461483-sd-dairy-industry-continues-grow-expand-and-add-economic-value>.

Rook, M. 2018. Agweek: Dairy industry continues to grow in I-29 corridor despite national trends. Accessed on December 11, 2020.  
<https://www.agweek.com/business/agriculture/4595262-dairy-industry-continues-grow-i-29-corridor-despite-national-trends>.

Rosenthal, L. 2016. Farmers Wait, And Wait, For Guest Workers Amid H-2A Visa Delays. *NPR's The Salt*. Accessed on December 10, 2020.  
<https://www.npr.org/sections/thesalt/2016/05/28/479633481/farmers-wait-and-wait-for-guest-workers-amid-h-2a-visa-delays>.

Schhneider, B, S. Martinez, A. Ownes. 2006. Barriers to Educational Opportunities for Hispanics in the United States. In: National Research Council (US) Panel on Hispanics in the United States; Tienda M, Mitchell F, editors. *Hispanics and the Future of America*. Washington (DC): National Academies Press (US); 6. Accessed on December 12, 2020. <https://www.ncbi.nlm.nih.gov/books/NBK19909/>.

South Dakota Department of Agriculture. 2019. South Dakota Agriculture Economic Contribution Study. Accessed on December 12, 2020. [https://sdda.sd.gov/office-of-the-secretary/Photos-Publications/2019\\_FinalSD\\_AECS.pdf](https://sdda.sd.gov/office-of-the-secretary/Photos-Publications/2019_FinalSD_AECS.pdf).

Starkey, K. K., and L. N. Bunch. 2020. Health Insurance Coverage in the United States: 2019. P60-271. Accessed December 11, 2020.  
<https://www.census.gov/content/dam/Census/library/publications/2020/demo/p60-271.pdf>.

Stepler, R., and H. M. Lopez. 2016. Ranking the Latino population in the states: U.S. Latino Population Growth and Dispersion Has Slowed Since Onset of the Great Recession. Accessed December 12, 2020.  
[https://www.pewresearch.org/hispanic/wp-content/uploads/sites/5/2016/09/PH\\_2016.09.08\\_Geography.pdf](https://www.pewresearch.org/hispanic/wp-content/uploads/sites/5/2016/09/PH_2016.09.08_Geography.pdf).

Taylor, P., M. H. Lopez, J. H. Martínez, and G. Velasco. 2012. When labels don't fit: Hispanics and their views of identity. Washington, DC: Pew Hispanic Center. Accessed on December 10, 2020. <https://media.kjzz.org/s3fs-public/field/docs/2012/04/04/Hispanic-Identity.pdf>.

U.S. Census Bureau. 2019. QuickFacts South Dakota. Accessed December 12, 2020.  
<https://www.census.gov/quickfacts/fact/table/SD/PST045219>.

U.S Census Bureau of Labor Statistics. 2020. Department of Labor, Occupational Outlook Handbook, Agricultural Workers. Accessed on November 27, 2020.  
<https://www.bls.gov/ooh/farming-fishing-and-forestry/agricultural-workers.htm>.

U.S. Census Bureau. 2010. Census Shows America's Diversity. CB11-CN.125. Accessed on November 27, 2020.  
[https://www.census.gov/newsroom/releases/archives/2010\\_census/cb11-cn125.html](https://www.census.gov/newsroom/releases/archives/2010_census/cb11-cn125.html).

U.S. Citizenship and Immigration Services: Nonimmigrant Visa Statistics. Accessed on December 10, 2020. <https://travel.state.gov/content/travel/en/legal/visa-law0/visa-statistics/nonimmigrant-visa-statistics.html>.

U.S. Department of Labor (DOL). H-2A: Temporary Agricultural Employment of Foreign Workers. Section 218. Accessed on December 10, 2020.  
<https://www.dol.gov/agencies/whd/agriculture/h2a>.

USDA - United States Department of Agriculture. 2020. Farm Labor. Accessed on December 14, 2020. <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#employment>.

USDA - United States Department of Agriculture. 2020. Milk Production. Accessed on December 15, 2020. <https://downloads.usda.library.cornell.edu/usda-esmis/files/h989r321c/j9602m84w/7p88d287w/mkpr0520.pdf>.

Villarejo, D. 2003. The health of US hired farm workers. *Annual Review of Public Health*. 24(1): 175–193.  
<https://doi.org/10.1146/annurev.publhealth.24.100901.140901>.

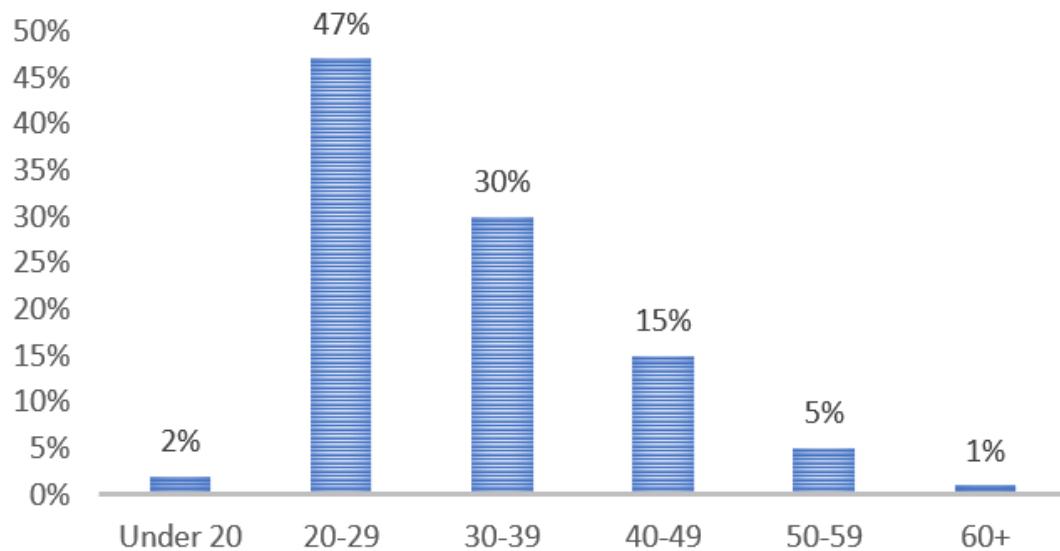
Von Keyserlingk, M. A. G., N. P. Martin, E. Kebreab, K. F Knowlton, R. J. Grant, M. Stephenson, C. J. Sniffen, J. P. Harner, A. D Wright, and S. I. Smith. 2013. Invited review: Sustainability of the US dairy industry. *J. Dairy Science*. 96(9):5405–5425.  
<https://doi.org/10.3168/jds.2012-6354>.

Zahniser, S., J. E. Taylor, T. Hertz, and D. Charlton. 2018. Farm labor markets in the United States and Mexico Pose challenges for US agriculture (No. 1476-2018-8188). Accessed on November 20, 2020.  
<https://www.ers.usda.gov/webdocs/publications/90832/eib-201.pdf?v=9727.4>.

**Table 1.1.** Visas H-2A and TN approved in 2019 by the U.S. Citizenship and Immigration Services

<b>Item</b>	<b>Fiscal Year 2019 - H-2A &amp; TN visas issued</b>	
	<b>H-2A</b>	<b>TN</b>
<b><i>North America</i></b>		
Belize	11	.
Canada	12	69
Costa Rica	205	.
Dominican Republic	51	.
El Salvador	<b>157</b>	.
Guatemala	<b>2,537</b>	.
Honduras	306	.
Mexico	<b>188,758</b>	<b>21,122</b>
Nicaragua	<b>593</b>	.
Panama	7	.
<b>Totals for North America</b>	<b>197,667</b>	<b>21,191</b>
<b><i>South America</i></b>		
Argentina	52	.
Brazil	41	.
Chile	28	.
Colombia	31	.
Ecuador	10	.
Peru	974	.
Uruguay	51	.
Venezuela	.	.
<b>Totals for South America</b>	<b>1,187</b>	<b>0</b>

Source: U.S. Citizenship and Immigration Services: Nonimmigrant Visa Statistics. Accessed on Dec 10. 2020. <https://travel.state.gov/content/travel/en/legal/visa-law0/visa-statistics/nonimmigrant-visa-statistics.html>



**Figure 1.1.** Age distribution of male H-2A workers certified for entry in the U.S. in 2018.

Source: Nonimmigrant Admissions by Selected Classes of Admission and Sex and Age. Department of Homeland Security. Published March 6, 2018.  
<https://www.dhs.gov/immigration-statistics/readingroom/NI/NonimmigrantCOAsexage>



**Figure 1.2.** Country of origin for H-2A workers in 2018.

Source: Non-immigrant Admissions by Selected Classes of Admission and Sex and Age. Department of Homeland Security. <https://www.dhs.gov/immigration-statistics/readingroom/NI/NonimmigrantCOAsexage> (Range of workers per country: 3 – 277,340)

## **CHAPTER 2**

### **Hypothesis and Objectives**

## CHAPTER 2

### 2. HYPOTHESIS AND OBJECTIVES:

This thesis is included in a large research project aimed to evaluate dairy farm employees' general health status including but no limited vision, dental care, and stress factors that impact their daily lifestyle. Several studies have been done for farmworkers in crop agriculture, but little is known about the general health, eating habits, vision impairments, and mental health of Latino dairy workers. Therefore, the first goal of the current thesis was to assess Latino dairy farm employees' general health as well as their eating behavior. The second main objective was to detect possible impaired vision issues within dairy farm employees and raise eye health awareness. The last objective was to gather information on the main causes of behavioral stress in dairy farm employees that impact their job performance, health, and living conditions.

Specifically, the hypotheses and objectives were:

#### 2.1. Assess dairy farm employee's general health including dental care and eating behavior (Chapter 3)

**Hypothesis:** Dairy farm employees lack of English language skills and basic health knowledge needed to improve their overall health may impact their decision to seek medical attention.

#### **Specific objectives:**

- Evaluate the demographics, health status, eating habits, and dental care.

- Improve overall worker health knowledge and wellbeing through educational workshops.
- Create a toolbox that contains available community resources, dental clinics, hospitals, and their services for the Latino community.

**2.2. Detect possible impaired vision issues within dairy farm employees and raise eye health awareness (Chapters 4)**

**Hypothesis:** Lack of information and vision insurance may have a negative influence on eye care in dairy workers. The identification of vision problems and the recommendations to visit the eye care specialist would improve work performance.

**Specific objectives:**

- Detect vision impairments in dairy farmworkers.
- Provide vision health recommendations for dairy workers.
- Create a toolbox that provides Latino workers with community resources and eye health services.

**2.3. Gather information on the main causes of stress in dairy farm employees related to their workplaces, family, and community where they live and how these stressors would impact their job performance and lifestyle (Chapters 5)**

**Hypothesis:** The appropriate knowledge on mental health in dairy workers would enhance the sustainability of the dairy industry by improving farm employee awareness on mental health care and its importance in increasing work performance.

**Specific objectives:**

- Identify the causes of stress at the workplace, family, and community.
- Identify practices used by dairy workers to reduce stress at the workplace, with their families, and in the community.

## **CHAPTER 3**

# **Assessing Dairy Employees' Health Status in South Dakota: Eating Habits and General Health Care**

## CHAPTER 3

### 3. ASSESSING DAIRY EMPLOYEES' HEALTH STATUS IN SOUTH DAKOTA: EATING HABITS AND GENERAL HEALTH CARE

#### 3.1. ABSTRACT

Dairy farmworkers' eating habits may be compromised by their daily 12-hour working shift. The intensive schedule demands high physical exertion with limited time for good healthy choices, including eating and general health care. This study aimed to assess South Dakota dairy farm employees' general and oral health as their eating behavior. A survey written in Spanish was conducted in person ( $n = 70$ ), assessing various topics and details related to employees' daily routine tasks, eating habits, and general health status. Recommendations on improving general health care were given at an educational workshop at the end of the survey period. The mean age was  $28 \pm 1.7$  and  $34 \pm 1.6$  for females and males, respectively. Most were males (76%), and the large majority were Mexican (46%) and Guatemalan (44%) workers. Over half (53%) of workers were overweight or obese (mean BMI =  $25.6 \pm 4.2$ ). Workers living in the US for up to four years had BMI = 25, whereas BMI was higher ( $> 28$ ) as years in the US increased. One-third reported sleeping between four to six hours a day, and 46% reported eating in restaurants at least twice a week. The majority (80%) do not have health insurance, 53% have not seen a physician in the last 3 years, and 65% have not seen a dentist in the last 6 months. Reasons for not receiving medical care run from cost, lack of information, to a language barrier. The only physical activity the workers' practice is their job duties. They usually opt for healthier choices when arriving in the US; however, as

years increase, their habits change for either convenient, fast food or frozen food. The workshop promoted education on healthier nutrition, awareness of cardiovascular diseases, and oral health risk factors relating to eating habits. Personal health care is influenced by individual values, culture, motivation, and environmental opportunities. Strategic workshops designed to promote health education and healthy eating habits for farmworkers are needed in their native language. Study Supported by HICAHS (Colorado State University).

**Keywords:** Latino, farmworkers, eating habits, Hispanic health

### **3.2. INTRODUCTION**

South Dakota's milk production ranked 17<sup>th</sup> in the nation, being the number one in growth within the 24 biggest dairy-producing states, with 12.9% more milk from October 2019 to November 2020 (USDA-NASS, 2020). The dairy industry's growth is mostly driven by the increased number of dairy cows (+ 33%) and the number of large dairies within the state. The growth trend will likely continue to expand into the future, with increased reliance on hired non-family workers, often immigrants of Hispanic ethnicity.

Of the 884,659 people living in South Dakota back in 2019, 4.2% were from Hispanic or Latino origins (U.S. Census Bureau, 2019). South Dakota and North Dakota have seen the fastest-growing Hispanic population from 2010 through 2019 (up 66% and 129% growth, respectively), corresponding to the growth of the dairy sector in SD. There is a tremendous amount of manual labor within South Dakota's dairy industry. The need for manual workers has led larger farms to employ immigrant Hispanic / Latino workers.

Dairy farmworkers play a vital role in providing quality animal care 24-h a day, 7 days a week (Hadley et., 2002; Mugera and Bitsh, 2005; Adcock et al., 2015). Cows are

milked on average two-three times per day, with large farms operating on two 12-hours working shifts, 6 days per week.

The intensive schedule demands high physical exertion with limited time for good healthy choices, including eating habits and general health care. Additionally, factors such as socioeconomic status, education, diversity in culture, and linguistic barriers have enormous impacts on workers' understanding of improving their health and wellbeing. Healthcare access is a critical component when referring to someone's health-related quality of life, including physical, mental, emotional, and social interaction.

Sustaining a healthy, productive workforce is an essential component of risk management and efficiency in dairy farms (Hagevoort et al., 2013). Dairy workers are critically essential since one-third of all U.S. dairy farms employ foreign-born workers, and those farms produce nearly 80% of the nation's milk (Adcock et al., 2015). Thus, to ensure their operations' sustainability, dairy producers should safeguard their employees' safety and health.

Several studies on Hispanic/Latino health have been conducted in the past focusing separately on the specific age and gender groups, country of origin, migrant workers, risk behaviors, acculturation, specific health conditions, and access to health care (Pérez-Escamilla, 2011; Lommel and Chen, 2016; Ruiz et al., 2016). Some of them (Menger et al., 2016) were specific to the immigrant Latino dairy workers in the U.S.; however, health status and behaviors among dairy farmworkers are under-researched.

Assessing dairy farm employees' demographics and health status are keys to the dairy industry's sustainability in SD. This project's main objectives will be to assess SD dairy farm employees' general and oral health as their eating behavior using a survey

methodology and expand the level of employees' knowledge on healthy eating choices and how it might affect their daily work activities. Therefore, we believe that health education programs will dramatically improve the health status (e.g., physical, mental, emotional) of the migrant workers and their families; and increase their knowledge and influence their attitudes about their wellbeing.

### **3.3. MATERIALS AND METHODS**

The study was reviewed and approved by the South Dakota State University Institutional Review Board (IRB#1806006-EXP; Human Subject Committee), and informed consent was obtained from all the participants.

#### **3.3.1. Recruitment of employees**

The target dairy workers were primarily Spanish-speaking foreign-born Latino migrant workers. A total of 70 dairy farm employees associated with milking operations, cow handling, feeding, and hospital voluntarily enrolled in this study. Participants were recruited in a three-stage process from three different dairy farms located along South Dakota's I-29 corridor. The first stage required an in-person meeting with the farm producers to review and approve their collaboration with this project. The farms needed to provide a venue and access to their employees for participation. The second stage involved a recruitment meeting with all the farm employees at each farm (20-30 employees) immediately before or after their work shift.

During recruitment, the research team members explained the study and its benefits, addressed questions or concerns, and obtained contact information for those interested in participating. Furthermore, the study summary with consent forms was

distributed. The research team members were of the same race/ethnicity and spoke the same native language as the Spanish speaking participants.

The third stage involved the actual survey data collection, which required 6 months. The survey population was chosen based on perceived representative farmworkers along the I-29 corridor.

### **3.3.2. Survey methodology**

The questionnaire was developed in Spanish by the research team and was prescreened by a select pool of dairy farmworkers. This exercise provided feedback regarding question-wording, order, clarity, completion time, and any other questionnaire issues. Changes were made to enhance respondent's comprehension and improve data collection.

The survey questionnaire form consisted of 8 pages with 72 questions asking for responses using yes/no, multiple-choice, Likert scale questions (scale of 1 to 5, descriptors) or short open-ended written answers.

The survey was divided into six sections. The first section included demographic information (e.g., age, race, country of origin, job position, marital status, number of children, educational level). The second section consisted of questions about their lifestyle, including their tobacco and alcohol consumption and physical activity frequency. The third section of the survey sought information about their self-health evaluation, including the frequency of physician office visits (e.g., general doctor, dentist). The fourth section covered health insurance coverage and oral health practices. The fifth section inquired about their eating behaviors both at home and work. The sixth and final section was related to general topics on language barriers, health care costs, or

general access to community resources. Several questions of the Likert scale and yes/no answers provided employees the opportunity to make additional comments.

The employees were interviewed in Spanish following a pre-arranged in-person meeting for data collection. Employees were offered the option to set a schedule for the interview immediately before or after their work shift or on their day off. Research team members assisted employees with each question of the survey. This allowed the employees to fully comprehend and respond to the survey successfully, allowing accurate and complete data collection.

### **3.3.3. Body measurements**

After completing the survey responses, employees were weighed without their shoes using an electronic scale (Etekcity Digital Body Weight Scale - model EB9380H; Etekcity Corporation, Anaheim, CA) followed by having their height measured using a standard measuring tape (Security Height Rule, Oregon Rule Co, Oregon City, OR). Three separate measurements of body weight and height were recorded for each employee, then averaged for analysis. Body mass index (BMI) was calculated using the usual formula (weight [kilograms]/height squared [meters squared]) consistent with WHO guidelines, and categorized into five standard groups: underweight BMI,  $<18.5 \text{ kg/m}^2$ ; normal range or reference,  $18.5 \text{ kg/m}^2$  to  $<25 \text{ kg/m}^2$ ; overweight,  $25 \text{ kg/m}^2$  to  $<30 \text{ kg/m}^2$ ; and obese,  $>30 \text{ kg/m}^2$ .

### **3.3.4. Blood pressure**

Blood pressure was measured using a calibrated OMRON 3 Series blood pressure monitor (Model: BP710N; OMRON Healthcare Co, Ltd. Kyoto, Japan). Before taking

blood pressure readings, all employees rested for over 30 minutes or more in an air-conditioned or breakroom. Measurements were taken two times on the right arm with short intervals between readings, and the average of the readings was calculated and used for analysis.

Blood pressure numbers of less than 120/80 mmHg were defined within the normal range. The intervening levels, systolic blood pressure of 120 - 129 and diastolic blood pressure of < 80 mmHg, were classified as elevated. The hypertension group was defined in two stages: Stage 1, systolic between 130-139 or diastolic between 80-89 mmHg, and Stage 2, systolic at least 140 or diastolic at least 90 mmHg. The blood pressure classification intervals followed the ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA High Blood Pressure guidelines.

### **3.3.5. Informative workshop**

At the end of all survey data collection, an informative presentation was prepared to provide the participants' feedback about the overall questionnaire answers. The presentation provided a better understanding of the health-related topics covered during the questionnaire. Interactive models, figures, pictures, and flip charts were used to improve the employees' comprehension of the different topics covered during the program session. Participants received a folder containing detailed information on diseases, health advice, and community resource contact information. Along with the presentation, there was a "social time" (e.g., pizza, dessert, beverages, gifts) and a \$50 gift certificate offered to each employee.

### 3.3.6. Statistical analysis

Seventy surveys and body measurements were completed in 3 different farms in the I-29 region. Admittedly, this is a small sample size and may not represent all dairy farm employees' reality. However, the collection of responses will be useful as a reflection of what occurs in a specific group of dairy farmworkers in SD. Data were compiled into Excel spreadsheets and statistically analyzed using SAS procedures (version 9.4; SAS Inst., Cary, NC). Means and standard deviations were generated for appropriate items using PROC MEANS. The survey responses' frequencies were rounded to the nearest whole percentage point and calculated for categorical variables using PROC FREQ. Chi-square and Fisher analyses were used to determine differences among percentages. Data from the survey forms were merged with data from the body measurements taken from dairy workers. Further analyses on continuous variables (i.e., age, weight, BMI, blood pressure) were carried out using PROC GLM. The effect of individual parameters and interactions between relevant parameters was checked. Significance was declared at  $P < 0.05$ , and trends were discussed at  $0.05 < P \leq 0.10$ .

The BMI (Body Mass Index) and blood pressure categories were also analyzed as the relative frequency with 95% confidence interval (95% CI) for proportions expressed as a percentage. The 95 CI of the frequency was calculated as  $p \pm z \times \sqrt{p(1-p)}/n$ ; except when the sample size was  $n < 30$ , then 95% CI of the frequency was calculated as  $p \pm t_{(n-1)} \times \sqrt{p(1-p)}/n$ . This analysis was also conducted with SAS v9.4 (SAS Inst. Inc., Cary, NC, USA).

Surveys were categorized by gender, country of origin, employee age, years living in the U.S., job position, self-health evaluation, and length of time since last visited

with an eye doctor or dental specialist. Employee basic information categories were grouped as follows: age (<20, 20–29, 30–39, 40–49, and >50 years old); country of origin (Mexico, Guatemala, and other Spanish speaking countries); educational attainment (did not attend a school or educational stages: primary, secondary, high school, university, and technical); marital status (single and married or consensual union); years working in the U.S. (years: <2, 2–4, 4–8, and >8 years); job position (parlor worker, maternity area, feeder, hoof trimmer, herdsman, manager); physician office visits (<6, 7–12, >12 to 24, >25 to 72, > 72 months, and never); BMI (within range, overweight, and obese), blood pressure (within range, elevated, and hypertension stage 1 & 2); alcohol, tobacco, and energy drinks use (yes and no).

Data were compiled and analyzed using SAS procedures (SAS Inst., Cary, NC). Means and standard deviations were generated for appropriate items using PROC MEANS. Frequencies of responses for various categories were generated for other items as appropriate using PROC FREQ.

The visualizations (i.e., figures) were performed in Python using Jupyter Notebooks, jointly with Pandas, and visualization libraries as Matplotlib and Seaborn. The “bubbles” and “bar” figure types represent the absolute numbers of participants in each response category. The “violin” plot figure type is a method of plotting numeric data and it is similar to a box plot, with the addition of a rotated kernel density plot on each side.

### 3.4. RESULTS AND DISCUSSION

#### 3.4.1. Employees demographics

Socio-demographic characteristics of the dairy farm employees participating in this study are presented in Table 3.1. A total of 70 adult farmworkers working in medium to large dairy farms (with 1,000 or more cows) in the Midwest I-29 region participated in this study.

Most of the participants were male (75.7%), and 24.3% were female. Also, all the participants were Hispanics, and were reported as born outside of the U.S.

The Agriculture sector in the U.S. recognizes that foreign-born workers are increasingly becoming a vital part of the community and the local workforce, especially in the dairy industry. A study by the Center for North American Studies (CNAS) estimates that U.S. dairy farms, which supply over 79% of the nation's milk, use immigrant labor. It is estimated that 41 to 51% of overall dairy labor is foreign-born, mainly from Mexico (Rosson et al., 2009; Adcock et al., 2015; Liebman et al., 2016). Evidence from the American Farm Bureau (2006) suggests that the number of immigrant laborers could be higher.

Our results showed that most of the large dairy employees were originally from Mexico (46%) and Guatemala (44%), as shown in Table 3.1. Guatemalans have been increasing in numbers within the last years in part due to high homicide rates and violence in their home countries (Clemens, 2017). Recent studies have described that dairy farms rely on foreign-born, mostly from Mexico and Guatemala (Dudley, 2016).

Participants ranged in age from 18 to 61 years (33 years on average), with a mean age of  $28 \pm 1.7$  and  $34 \pm 1.6$  for females and males, respectively. Mexicans were usually

older (+7 years) than Guatemalans (as Figure 3.1 shows). The majority of the employees were single and living with their co-workers or friends (47 and 52%, respectively; Table 3.1). More than 60% of Mexicans reported being married, and 69% having children. On the other hand, approximately half of Guatemalans (52%) were married, and 58% had children.

The time spent in the U.S. is shown in Table 3.1., where approximately 68% of the employees have lived less than 4 years in the U.S. Mexican workers have been in the U.S. longer than Guatemalans (5 and 3 years on average, respectively). The Mexican Agriculture workers have a long and traditional history in the U.S., with guest worker program implementation dated from the late 1930s being the basis for Mexico-U.S. migration today (Martin, 2002).

In Table 3.2. there is a description of all employees' job roles at the farm used to collect the study information. U.S. large-herd dairies are unique because workers are assigned to specific farm operations such as milking, cow or calf-care, feeding, or maintenance. The majority of the participants (51%) were parlor workers (i.e., milkers including females and males) who perform highly specialized and repetitive tasks throughout the workday with an average of twelve-hour shifts. The average time spent in years working at the farm is shown in Table 3.2. Slightly more than half of the employees reported working less than 2 years at the dairies, while around 19% reported more than 4 years being at the job.

Most conventional dairy farms have more parlor workers and fewer other areas of specialized workers. This is expected since milkers are key workers providing essential service (i.e., milking cows) to the dairy farm. The number of milkers per farm will

depend on the milking parlor design, the number of lactating cows, milking frequency, and farm technology. In a standard milking procedure where milk ejection timing is respected, farmers will need, on average 1 milker per 10 cows being milked. For example, a dairy with a double 30 parallel parlor milking approximately 3,000 cows milked a day thrice will have around 10 parlor workers for 2 twelve work shifts (including pushers and scrapers).

### **3.4.2. Educational level and English literacy**

Educational attainment patterns varied considerably across the employees, as shown in Table 3.3. Interestingly, many participants have already completed their bachelor's degree in various agriculture fields (e.g., agronomy, biology, veterinary). In contrast, others had previous agricultural experiences (e.g., family farming, employment in the agriculture sector).

The most frequent educational level reported for employees was "high school graduate" at 33%, and interestingly, 30% had college and grad school degrees as reported in Table 3.3. The precise estimates provided in reports by the USDA (2020) mentioned that 52% of the farmworkers (e.g., crop laborers that cultivate and harvest vegetables and or fruits, field crops) have low levels of education (high school degree), compared with 37% of livestock employees.

In our study, participants with a low level of education were mainly those with more than 5 years living in the U.S whereas 40% of the employees with high school and college degrees have been up to 4 years residing in North America.

According to the USDA (2020), Hispanics of Mexican origin are more likely to have a low education level. Gonzalez (2015) and Brick et al. (2011) mentioned that Mexicans have a lower formal education level than any other immigration group. Central Americans and Mexicans also have lower levels of English proficiency than other immigrants. In our study, the Latino employees with the highest educational attainment levels ( $P<0.001$ ) were from Mexico with 28 and 34% followed by Guatemalans with 42 and 16% for high school and bachelor's degrees. Employees holding primary or elementary school were 34 and 35.5% for Mexicans and Guatemalans, respectively (Figure 3.2).

Hispanic workers (mainly from Mexico) working in the dairy industry who are college-educated have grown since the NAFTA program (TN visas) has been established. The North American Free Trade Agreement (NAFTA) was specially created to enhance the economic and trade relationships between the United States, Canada, and Mexico. This program permits qualified Canadian and Mexican citizens to seek temporary entry into the United States to engage in business activities (e.g., the dairy industry) at a professional level (holding bachelor's degree).

Besides employees with a bachelor's degree from Mexico, the increase in educational attainment among dairy farm employees from Guatemala comes as the socioeconomic situation in their country of origin – particularly in job opportunities and violence– is worse in the last years than in the past. Economic investors decreased in the last years in Guatemala and El Salvador due to the high risk of violence, extortion, and persecution, which leaves this population in poverty with a lack of job opportunities and increase their reasons to immigrate to the U.S. (Maurer, 2019). Besides, tension and fear

of return to the country due to high violence and socioeconomic situation were shared in a similar study by Brabeck et al. (2011).

Employees' rankings based on the percentage of males with bachelor's degrees tended ( $P<0.10$ ) to differ from rankings based on the percentage of females with any postsecondary degree. Females in the farm workforce were more likely to hold a bachelor's degree than male employees. More than half (58.8%) of employed dairy farm women ages 22 to 36 had a bachelor's degree or more in our study. Male farmworkers were less likely (20.8%) to hold a bachelor's degree compared with females. This gender gap is driven in part because women are more likely to finish college and less likely to drop out of high school than their male counterparts (U.S. Bureau of Labor Statistics, 2016).

It is interesting to mention that employees have indicated their desire (80%) to continue their education if possible. Moreover, the desire was also extended to learn English and the nuances of the U.S. culture.

The communication gap between non-English fluent speakers and Native English speakers' dairy farm personnel may have consequences in producing a safe food supply while contributing to the dairy industry's sustainability. Communication is vital, and the lack of it, especially in the workplace, where people need to be on the same page, can be a problem.

In our study, 43% of the employees stated that they have learned English as a second language and have basic knowledge of the English language, as shown in Table 3.3. English proficiency has become necessary for people that want to enter a global

workforce, understand the Media language, travel (world's second language), among other reasons. In many Latino Countries, the English language has become a required course in primary, secondary, or higher education curriculum. However, these schools (usually public) may have very limited English instructions that focus primarily on vocabulary and simple phrases (Borjian and Padilla, 2009; Martínez, 2009).

In Mexico, English proficiency can be seen as a route to upward economic mobility, and parents with economic means (i.e., middle and upper classes) have the opportunity to send children to attend private bilingual and immersion schools with teachers who are highly proficient in English (Borjian, 2015). However, it is estimated that less than five percent of the general Mexican population are conversationally proficient in English (Robles, Lima, and Morales, 2004), even though they learned at school.

The learned English at public schools, when in the U.S., will be enough to understand simple words but not to communicate and understand a Native speaker fully. Important to mention that confidence and courage in speaking the language are low, holding them back from communicating.

Many employees want to learn more English, but 73% of them shared that working schedule makes it harder to study English or continue studying. In this way, it is necessary to promote local dairy farms' training tools and other approaches to bridge language barriers and improve access to updated livestock training for farm migrant workers in the Dairy Industry. The growth of the dairy processing sector and the growth of the dairy farms (relocating dairies or establishing new operations or

increasing/enlarging the existing operations) contribute to the influx of immigrants into the dairy sector, particularly in the milking parlor.

### **3.4.3. Health status and dental assistance**

The data in Table 3.4 shows that more than half of the participants do not have health insurance, and 74% have not seen a physician in the last 3 years. The reasons for not receiving medical care included cost and lack of information due to the language barrier. Language barriers contribute to health care disparities, and Hispanics were categorized as the highest uninsured people among all the other races in the US (Starkey and Bunch, 2020). Having a healthy and productive workforce is a critical component of a successful and profitable dairy farm, and employee performance and productivity may dictate these outputs (Mugera and Bitsch, 2005; Reynolds et al., 2013).

These participants also answered a simple question on their self-perceived health, with 16, 47, and 37% rating their health status as poor, good, and very good, respectively. Self-assessment is the ability of someone to reflect on a particular area, and in this case, it may influence the person's behavior to identify areas of needs and improvement. Health self-assessment or self-rated health is a comprehensive and valid subjective measure of health, playing an increasing role in the estimation of risk factor models where the answers respondents give when asked to rate their health as excellent, good, fair, or poor are usually robust predictors of later health outcomes (Idler et al., 2000; Bombak, 2013).

When employees were asked how a hearing loss would affect their daily lives and the workplace, only 37% rated it as a factor affecting their quality of life.

We observed that the participants lack fundamental knowledge of diseases or temporary medical conditions. Participants shared some health issues ranging from toothaches, joints and back pain, and headaches but had no desire to visit a health specialist. Surprisingly, most dairy farm employees had no knowledge of the negative impact of high or low blood pressure, diabetes, cholesterol, and other health conditions in their lifetime. We urge the employees and employers to educate themselves on the U.S. health care system and the consequences of not seeking medical services.

Most participants (96%) reported not having dental insurance coverage; however, seventy percent did not consider cost as a barrier to visit the dental clinic. Furthermore, self-reported dental pain (i.e., difficulty chewing, eating, pain while eating sweet.) was shared by 33% of the employees in the last six months before this survey. Although, more than a quarter (26%) reported that they have not been to the dentist in a while or have been neglecting their dental care (in the last 6 months before this survey), while 20% have not seen a dentist in a period of more than 2 or 6 years. A small percentage of employees (11%) reported that they have never been to a dentist before, as shown in Table 3.6.

In our study, almost 30% of the participants shared the lack of transportation or distance as a factor associated with the last dental visit. In contrast, more than 70% shared the English language barrier as a significant reason for not attending health clinics. Actually, more than 80% of the participants are willing to pay for medical attention.

Our findings agree with Akinkugbe et al. (2020), where primarily psychological symptoms such as fear, nervousness with needles and cost, uncertainties in not knowing a

dentist or a Spanish-speaking dentist, and transportation are the reasons associated with Latinos not seeking dental assistance.

The fact is, there is no reason for dental anxiety or dentist phobia, whether they have never been or are avoiding dental care since the last appointment due to prior uncomfortable situations. Oral health is integral to systemic health, and dentistry is essential health care due to its association between periodontal and systemic diseases (Nazir et al., 2019). These authors also shared that access to oral care would improve people's awareness of the connection between oral and systemic health.

The situation of Hispanic educational attainment and language barrier are important causes of not seeking dental care. Therefore, this particular community of farm employees should be informed of the oral-systemic link to improve their oral health.

#### **3.4.4. Sleep health**

Employees reported sleeping an average of  $7.0 \pm 1.3$  hours daily, with 30% of the employees self-reporting 4-6 hours of sleep per night, whereas 65% slept 7-9 hours daily. There is a powerful assumption that individuals that obtain the right amount of sleep will wake up feeling well-rested and perform well during the day (Chaput, Dutil, and Sampasa-Kanyinga, 2018).

Participants were asked about their sleep problems or if they had ever taken any sleep aid medication. Sleep medication use was not reported, and slightly 2.5% of the participants mentioned using other medications to reduce muscle discomfort or help relieve tension after work. Longer working hours and job stress may keep people awake at night or make sleeping difficult. In our study, 64% of the employees do not have sleep

disturbances, while 36% do have problems sleeping due to low sleep quality. However, other studies reported that sleep disturbance frequently occurs due to longer working hours (Harrington, 2001; Virtanen et al., 2009). Alfonso, Fonseca, and Pires (2017) have also discussed the negative association between longer working hours on physical and mental health and sleep quality. These authors have mentioned the impact of low sleep quality at work with severe implications for employee performance and organizational outcomes (i.e., productivity).

The prevalence of pain killer drugs use was 6%, and it was higher in male employees. Employees reported taking the medicine sporadically due to headaches, cold, or muscle tension. Coffee and water were not frequently consumed.

#### **3.4.5. Body Mass Index and blood pressure measurements**

Most major health organizations usually take body Mass Index (BMI) as the first-level measure of adiposity. The mean BMI for the employees studied was  $25.9 \pm 4.2$  kg/m<sup>2</sup>, with a mean BMI value for males of  $26.5 \pm 1.2$  kg/m<sup>2</sup> and females of  $26.4 \pm 1.6$  kg/m<sup>2</sup> (Figure 3.3.). The prevalence of overweight and obesity was 28.6% and 14.3% in males and 7.1% and 2.9% in females. Females had a higher prevalence of normal weight than males (58.8% vs. 43.4%; Table 3.5).

There was no significant difference in overweight and obesity prevalence between men and women overall or by age group. The average BMI and the prevalence of obesity were lowest among Guatemalans (23.9 and 6.4%) compared with Mexicans (27.8 and 28.1%;  $p < 0.001$ ). Mexican's employees had the highest prevalence of overweight compared with Guatemalans.

Mean BMI increased ( $p<0.05$ ) in married couples ( $26.92\pm0.8$  kg/m $^2$ ) compared with singles ( $24.8\pm0.9$  kg/m $^2$ ).

Our study found that the BMI changed over time ( $p<0.05$ ) regarding the duration of employees living in the U.S. Participants presented higher BMI after being living in the U.S. for over 4 years ( $28.7\pm1.4$  kg/m $^2$  or overweight; Figure 3.4.). Interestingly, as mentioned above, most of the overweight and obese participants were mainly Mexicans. Mexicans are by far the largest Hispanic-origin population in the U.S. and the Mexican employees' participants have been more than 4-5 years residing in the U.S. (Figure 3.5.)

Isasi et al. (2015) conducted a study of the relationship between acculturation and obesity among Latinos. They reported that Latinos living in the U.S. for more than 20 years are more likely to have overweight, and individuals who mostly eat Hispanic foods are less likely to have high BMI than those eating Hispanic and American food in equal amounts. The World Health Organization (2020) mentioned that an increase in intake of energy-dense food that are high in fat and sugar, an increase of physical inactivity due to changing modes of transportation, and the increasing urbanization are reasons for being overweight people around the world.

Data in Table 3.5 show the blood pressure reading values, reaching 38.5% of the participants with blood pressure within the normal range (less than 120/80 mmHg). In comparison, 13.9% reported elevated blood pressure with a reading range from 120-129 systolic and less than 80 mm Hg diastolic. In the hypertension group, 26.2 and 21.5% were observed in stages 1 and 2 (stage-1: 130-139 systolic or 80-89 mm Hg diastolic.; stage-2: 140/90 mm Hg or higher), respectively. Considering the hypertension measurement, 14% Mexican, and 11% Guatemalan participants were classified as stage-1

hypertensive. Mexicans also presented more employees with stage-2 hypertensive compared to other Latino participants (Figure 3.6). In a similar study conducted by Muntner et al. (2017), 33% of Hispanic/Latinos presented hypertension stage-1, whereas 14% presented stage-2. The study participants were recommended to take antihypertensive medications according to the 2017 ACC/AHA guideline.

We found significant gender differences in blood pressure ( $P<0.001$ ), as shown in Table 3.5. The prevalence of hypertension between the two genders was in line with the prevalence of overweight, with males having a higher prevalence of hypertension than their female counterparts ( $60.4\% > 11.8\%$ ,  $p<0.001$ ). It is well known that blood pressure is higher in men than in women at similar ages, and men are at greater risk for cardiovascular and renal disease than women (Reckelhoff, 2001).

In our study, participants were recommended to follow up and monitor blood pressure at the community pharmacy to screen either elevated or hypertension. There were also recommendations and health care information for visiting the physician for further professional medical assistance.

Uncontrolled hypertension or high blood pressure can lead to damage to the coronary arteries, heart attack, heart stroke, heart failure, kidney disease or failure, vision loss, among other conditions (Whelton et al., 2018). Several studies highlighted the relationship between education and blood pressure where higher levels of education attainment showed the lowest risks and blood pressures, whereas the lower level of education was associated with a higher risk of hypertension in urban population (Ordunez, Espinosa-Brito, and Cooper, 2005; Wang et al., 2006).

This study highlights the need for new strategies such as educative programs targeting the local Hispanic/Latino employees to improve their health services access and knowledge. The employees have revealed limited-English proficiency and limitations to access health care.

#### **3.4.6. Eating habits**

The average Guatemalan farmworker has been living in the U.S. for less than 3 years, while the Mexican employee has been here on average, five years. Latinos usually opt for healthier food choices when arriving in the U.S.; however, as years increase, their eating habits may change slightly. Eighty percent of the participants (Table 3.7) reported not following any particular diet, and more than half (54%) did not consider job working hours as a related barrier to healthful eating. In 2018, 46% of the participants reported eating in a restaurant at least twice a week. Their cultural background leads them to choose restaurants over fast food or drive-thru.

The majority of the Hispanic dairy farmworkers (72%) did not consider South Dakota as having poorer food choices than their countries of origin; however, they miss the freshness of freshly harvested food. Participants from Mexico (66%) and Guatemala (90%) usually prepared their meals at the end of every working day (i.e., 12 hours shift), and typically included rice, beans, beef, chicken, soups, seafood, and corn or flour tortillas. Even though they usually cook their meals, the intensive work hours make cooking difficult for 50% of Guatemalans, whereas 72% of Mexicans did not consider it challenging. The difficulties shared by Guatemalans may be due to being younger and single.

Interestingly, even though Mexicans have been living in the U.S. longer and adapted to the fast-food culture compared to Guatemalans, most of them still maintain their traditional eating habits. To maintain their cultural identities, they continue to buy fresh food and cook their meals like back home. Mexicans shared their love of seafood; however, they feel that it is more expensive in the U.S. but are willing to pay for this traditional meal. Participants (63%) emphasized missing family or friends to motivate them to have a better healthy-eating habit of balanced and nutritious meals. In general, food is a social event around the Hispanic's table, serving a savoring meal, and enjoying each other's company.

Within years of adapting to the U.S. culture, they may shift from a traditional diet rich in fruits and vegetables to a western diet based on processed foods high in fats and added sugars. Therefore, this fact may explain the high BMI gain over time since arrival in the US. Therefore, we believe that educating this population (and any other on risk) on the importance of a healthy diet will dramatically improve the migrant workers' and their families' health status.

On a scale of 1 through 10 (minimum and most significant impact), employee perception on adequate quality food availability that may impact their general health and work performance were highest for the 5-point scale or average impact (37%), closely followed by the 10-point scale or most significant impact (33%). Using the same scoring scale, 39 and 24% (scale 5 and 10, respectively) shared that the lack of family and or friends influences their motivation to promote healthier eating behavior.

### **3.4.7. Alcohol, energy drinks, and tobacco use**

The frequency of energy drinks, tobacco, and alcohol consumption are shown in Table 3.9. Regarding alcohol, 49% (42% males) consumed alcohol after work daily and on social gatherings (e.g., parties, soccer), whereas 40% have never consumed it. The proportion of alcohol consumption related to their country of origin, 55% Guatemalans and 69% Mexicans reported frequent alcohol use. According to CDC (2018), 45% of Latinos reported frequent alcohol use, while 57 and 41% for White and American Indian or Alaska Native, respectively.

Working on dairy farms requires long work shifts, long workweeks, exposure to extreme weather, high physical demands, and interruption of circadian rhythms. This fate may drive employees to find ways to keep themselves alert and productive. Because of that, energy drinks, tobacco, and alcohol use commonly co-occur in dairy farm employees. Energy drinks are non-alcoholic beverages containing stimulant compounds such as caffeine, which is marketed to reduce fatigue and improve physical/mental performance. Although frequent use of these beverages has been linked to adverse health consequences like type 2 diabetes, risk of obesity, and dental caries (Bleich and Vercammen, 2018; Malik et al., 2006), farmworkers are not aware of that.

For dairy farm employees, alcohol may seem like the perfect cold-weather beverage that creates a sensation of warmth and comfort. It is important to remember that the Latino employees come from countries where temperatures in wintertime do not fall to single-digits, except for the mountains. Alcohol decreases core body temperature regardless of the temperature outside and will increase hypothermia risk. In this way, the feelings of warmth are momentary, and soon the desire for another alcoholic beverage.

Markers of acculturation to the U.S. and its influence on immigrant populations' health outcomes has been studied (Karriker-Jaffe & Zemore, 2009; González Wahl & McNulty Eitle, 2010; Castañeda et al., 2019). Significant associations between acculturation and higher odds of alcohol use among various immigrant groups, including Asian Americans, African Americans, and Hispanic Americans, were found (Zemore, 2007). Diversity-based intervention strategies within the Hispanic/Latino community when designing alcohol abuse prevention programs should be considered (Castañeda et al., 2019).

The results did not show that daily alcohol consumption was associated with an increase in BMI (BMI = 25.6 and 26.5 kg/m<sup>2</sup> for alcohol use and non-alcohol use, respectively) for both Mexican and Guatemalans. Other authors mentioned that subjects who consumed alcohol had significantly higher prevalence of obesity than those who did not (French et al., 2011; Booranasuksakul et al., 2019). On the contrary, other authors mentioned that the frequency of drinking was found to have an inverse relationship with BMI, suggesting that people who drink a small amount daily have a lower BMI (Arif and Rohrer, 2005; Nies et al., 2012).

In this study, 39% (mainly males) consumed energy drinks regularly (43% Monster® and Red Bull®), whereas 40% (mainly males) do not drink energy drinks at all. Only 21% consumed it in the past. The use of energy drinks was increased during winter weather and claimed to increase body temperature.

About tobacco use, 19% of participants currently smoked (only males), and 20% smoked in the past (mainly males). According to the CDC (2018), 16.7% of the Latinos in the U.S. reported the use of tobacco substances in 2017. By contrast, 25 and 42% were

White and American Indian or Alaska Native population, respectively. Health consequences such as liver cancer, colorectal cancer, diabetes, age-related macular degeneration (NCCDPHP, 2014), among others, may impact those that reported smoking as a habit.

Our results showed that tobacco use was not a more significant issue for farm employees; however, energy drinks used at work and alcohol at home may impact employees' wellbeing and increase their risk for future health issues. Measuring the energy drinks consumption and alcohol use is the first step towards understanding its use and risks. Increasing knowledge about energy drinks and their possible risks could decrease their consumption by the farm employees.

#### **3.4.8. Final remarks and informative workshop**

The survey's findings identified a lack of awareness or knowledge across the different subjects discussed above. Therefore, in this study, we designed a workshop to provide survey feedback while covering essential health topics. The workshop provided to farmworkers basic understanding of the importance of selecting foods and eating habits for themselves and their families, and how this impacts their mind, body, work performance and personal safety practices needed for working on the farm (e.g., vit A deficiencies). The workshop also covered the importance of having health insurance coverage and a periodic health screening, including eye care and dental checkups.

The workshop structure was designed to enable the participants to express themselves by sharing and discussing their knowledge and beliefs about various topics.

Summarizing, the dairy farm employees shared how much they enjoyed and appreciated the newly gained knowledge and understanding about how important eating

healthy foods and maintaining an active lifestyle could contribute to having a healthy body, dental, and general health status. We can help the dairy farmworkers become healthier and happier with the life they chose by giving informative talks. Healthy employees improve the dairy farm's morale, which increases the productivity of farm operations.

Most Hispanic dairy employees learn better from actively engaging learning formats (e.g., visuals, video, games) that are interactive and hands on. As the Hispanic population is culturally sensitive, it is essential to prepare a workshop content that accounts for the concepts of family, respect, faith, and community (Kilanowski, 2014). For example, successful implementation of safety practices might require a collectivist approach among the Hispanic population, as Hispanics are a group-oriented culture and seek peers for orientation (CDC, 2020).

### **3.5. CONCLUSIONS**

The survey approach attempted to capture various aspects that may affect the employee's health and wellbeing in the workplace and at home, whether directly or indirectly affected by educational level, acculturation, language barrier, and health knowledge. Besides low wages, medical costs, hard physical work, and cultural differences were the reasons for not receiving proper medical care, which puts this rapidly growing population in a challenging position.

It is important to remember that employees' health status directly influences work behavior. The workers' only physical activity is their job duties and usually avoid or delay seeking medical attention. As years increase, employees, eating habits change for either convenient fast or pre-packaged food. In summary, the survey results and the

informative workshop raised awareness, increased knowledge, and built confidence in promoting changes in their quality of life and health status.

Strategic workshops designed to promote health education and healthy eating habits for farmworkers in their native language and initiatives that could provide immigrants' available health resources are needed.

## REFERENCES

ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA. 2017. Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. Whelton, P. K., R. M. Carey, W. S. Aronow, D. E. Casey, K. J. Collins, C. D. Himmelfarb, S. M. DePalma, S. Gdding, K. A. Jamerson, D. W. Jones, E. J. MacLaughlin, P. Muntner, B. Ovbiagele, S. C. Smith, C. C. Spencer, R. S. Stafford, S. J. Taler, R. J. Thomas, K. A. Williams, J. D. Williamson, and J. T. Wright. *Hypertension*. 71:1269–1324. <https://doi.org/10.1161/HYP.0000000000000066>.

Akinkugbe, A. A., S. E. Raskin, E. E. Donahue, M. E. Youngblood, N. N. Laniado, and K.M. Perreira. 2020. Prevalence and Patterns of Dental Care Utilization among US-Born and Non-US Born Hispanics in the Hispanic Community Health Study/Study of Latinos. *JDR Clinical & Translational Research*. <https://doi.org/10.1177/2380084420923338>.

Adcock, F., D. Anderson, and P. Rosson. 2015. Report: The economic impact of immigrant labor on U.S. dairy producers. Assessed May 15, 2020. <https://www.nmpf.org/wpcontent/uploads/2018/12/immigration-survey-090915.pdf>.

Afonso, P., M. Fonseca, and J. F. Pires. 2017. Impact of working hours on sleep and mental health. *Occupational Medicine*. 67(5): 377–382. <https://doi.org/10.1093/occmed/kqx054>.

American Psychological Association. 2018. Stress About Health Insurance Costs Reported by Majority of Americans. APA Stress in America™ Survey Reveals. Assessed November 23, 2020. <https://www.apa.org/news/press/releases/2018/01/insurance-costs.aspx>.

Arif, A. A., and J. E. Rohrer. 2005. Patterns of alcohol drinking and its association with obesity: data from the third national health and nutrition examination survey, 1988–1994. *BMC Public Health*. 5: 126. <https://doi.org/10.1186/1471-2458-5-126>.

Bleich, S.N., and K. A. Vercammen. 2018. The negative impact of sugar-sweetened beverages on children's health: an update of the literature. *BMC obesity*. 5(1):6. <https://doi.org/10.1186/s40608-017-0178-9>.

Bombak, A. E. 2013. Self-rated health and public health: a critical perspective. *Frontiers in public health*. 1:15. <https://doi.org/10.3389/fpubh.2013.00015>.

Brabeck, K. M., M. B. Lykes, and R. Hershberg. 2011. Framing immigration to and deportation from the United States: Guatemalan and Salvadoran families make meaning of their experiences. *Community, Work & Family*. 14(3):275 –296. <https://doi.org/10.1080/13668803.2010.520840>.

Brick, K., A. E. Challinor, and M .R. Rosenblum. 2011. Improving US and EU immigration systems. Mexican and Central American immigrants in the united states. Washington: Migration Policy Institute. Accessed December 15, 2020. [https://imumi.org/attachments/article/113/Mexican\\_and\\_Central\\_American\\_Immigrants\\_in\\_the\\_United\\_States.pdf](https://imumi.org/attachments/article/113/Mexican_and_Central_American_Immigrants_in_the_United_States.pdf).

Booranasuksakul, U., A. Singhato, N. Rueangsri, and P. Prasertsri. 2019. Association between Alcohol Consumption and Body Mass Index in University Students. *Asian/Pacific Island nursing journal*. 4(1): 57–65. <https://doi.org/10.31372/20190401.1035>.

Borjian, A., A. M. Padilla. 2009. Voices from Mexico: How American Teachers can Meet the Needs of Mexican Immigrant Students. *Urban Rev.* 42:316–328. <https://doi.org/10.1007/s11256-009-0135-0>.

Borjian, A.2015. Learning English in Mexico: Perspectives from Mexican Teachers of English. *CATESOL J.* 27(1):163-173 2015. Accessed December 18, 2020. <https://files.eric.ed.gov/fulltext/EJ1111752.pdf>.

Bureau of Labor Statistics U.S. 2016. Department of Labor, The Economics Daily, Women more likely than men to have earned a bachelor's degree by age 29. Accessed December 15, 2020. <https://www.bls.gov/opub/ted/2016/women-more-likely-than-men-to-have-earned-a-bachelors-degree-by-age-29.htm>.

Castañeda, S. F., M. L. Garcia, M. Lopez-Gurrola, M. Stoutenberg, and K. Emory K. 2019. Alcohol use, acculturation and socioeconomic status among Hispanic/Latino men and women: The Hispanic Community Health Study/Study of Latinos. *PLOS ONE*. 14(4): e0214906. <https://doi.org/10.1371/journal.pone.0214906>.

Centers for Disease Control and Prevention. 2020. Cultural insights. Communicating with Hispanic / Latinos. Assessed November 23, 2020.

[https://www.cdc.gov/healthcommunication/pdf/audience/audienceinsight\\_culturalinsights.pdf](https://www.cdc.gov/healthcommunication/pdf/audience/audienceinsight_culturalinsights.pdf).

Centers for Disease Control and Prevention. 2018. Health, United States, 2018 – Data Finder. Assessed November 23, 2020.

[https://www.cdc.gov/nchs/hus/contents2018.htm#Table\\_020](https://www.cdc.gov/nchs/hus/contents2018.htm#Table_020).

Chaput, J. P., C. Dutil, and H. Sampasa-Kanyinga. 2018. Sleeping hours: what is the ideal number and how does age impact this? *Nat Sci Sleep*. 10:421–430.

<https://doi.org/10.2147/NSS.S163071>.

Clemens, M. A, 2017. Violence, Development, and Migration Waves: Evidence from Central American Child Migrant Apprehensions. CGD Working Paper 459. Center for Global Development. <https://www.cgdev.org/publication/violencedevelopment-and-migration-waves-evidence-central-american-child-migrant>.

Dudley, M. J. 2016. Navigating Relations between Immigrant Workers and Dairy Farmers. *Tense Spaces. Voices of Mexico*. 102:119-123. Accessed Dec. 18, 2020.

<http://www.revistascisan.unam.mx/Voices/pdfs/10226.pdf>.

French, M. T., E. C. Norton, H. Fang, and J. C. Maclean. 2010. Alcohol consumption and body weight. *Health economics*. 19(7): 814–832. <https://doi.org/10.1002/hec.1521>.

Gonzalez-Barrera, A. 2015. Rise in US immigrants from El Salvador, Guatemala and Honduras outpaces growth from elsewhere. Pew Hispanic Center. Accessed December 11, 2020. <https://www.pewresearch.org/hispanic/2017/12/07/rise-in-u-s-immigrants-from-el-salvador-guatemala-and-honduras-outpaces-growth-from-elsewhere/>.

González, R. R. O., Vivaldo L. J., and Castillo M. A. 2004. Competencia lingüística en inglés de estudiantes de primer ingreso a instituciones de educación superior: Del área metropolitana de la Ciudad de México. México: Unidad Autónoma Metropolitana, Unidad Iztapalapa.

Hadley, G. L., S. B. Harsh, and C. A. Wolf. 2002. Managerial and financial implications of major dairy farm expansion in Michigan and Wisconsin. *J. Dairy Sci*. 85:2053–2064. [https://doi.org/10.3168/jds.S0022-0302\(02\)74283-5](https://doi.org/10.3168/jds.S0022-0302(02)74283-5).

Hagevoort, R. G., D. I. Douphrate, and S. J. Reynolds. 2013. A Review of Health and Safety Leadership and Managerial Practices on Modern Dairy Farms. *J.*

Agromedicine. 18(3): 265–273. <https://doi.org/10.1080/1059924X.2013.796905>.

Harrington, J. 2001. Health effects of shift work and extended hours of work. *Occup. Environ. Med.* 58:68–72. <http://dx.doi.org/10.1136/oem.58.1.68>.

Idler, E. L., Russell L. B., D. Davis. Survival, Functional Limitations, and Self-rated Health in the NHANES I Epidemiologic Follow-up Study, 1992. *American Journal of Epidemiology*. 152(9): 874–883. <https://doi.org/10.1093/aje/152.9.874>.

Isasi, C. R., G. X. Ayala, D. Sotres-Alvarez, H. Madanat, F. Penedo, C. M. Loria, J. P. Elder, M. L. Daviglus, J. Barnhart, A. M. Siega-Riz, and L. Van Horn. 2015. Is acculturation related to obesity in Hispanic/Latino adults? Results from the Hispanic community health study/study of Latinos. *J. Obesity*, 2015. <https://doi.org/10.1155/2015/186276>.

Karriker-Jaffe, K. J., and S. E. Zemore. 2009. Associations between acculturation and alcohol consumption of Latino men in the United States. *J. studies on alcohol and drugs*. 70(1):27–31. <https://doi.org/10.15288/jsad.2009.70.27>.

Kilanowski, J. F. 2014. Challenges in community-based research with Latino migrant farmworker children and families. *J. pediatric health care*. 28(5):461–465. <https://doi.org/10.1016/j.pedhc.2014.05.008>.

Liebman, A. K., P. M. Juarez-Carrillo, I. A. Reyes, and M. C. Keifer. 2016. Immigrant dairy workers' perceptions of health and safety on the farm in America's Heartland. *Am. J. Ind. Med.* 59(3):227-235. <https://doi.org/10.1002/ajim.22538>.

Lommel, L. L., J. L. Chen JL. 2016. The relationship between self-rated health and acculturation in Hispanic and Asian adult immigrants: a systematic review. *J Immigr Minor Health/Center Minor Public Health*. 18:468–78. <https://doi.org/10.1007/s10903-015-0208-y>.

Malik, V. S., A. Pan, A., W. C. Willett, and F. B. Hu. 2013. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. *The American journal of clinical nutrition*. 98(4):1084–1102. <https://doi.org/10.3945/ajcn.113.058362>.

Martin, P. 2002. Mexican Workers and U.S. Agriculture: The Revolving Door. *The International Migration Review*. Host Societies and the Reception of Immigrants: Institutions, Markets and Policies. 36(4):1124-1142. Accessed December 18, 2020.

[https://www.jstor.org/stable/4149494.](https://www.jstor.org/stable/4149494)

Martínez, N. 2009. Insuficiente dominio del inglés en maestros (Teachers' insufficient knowledge of English). Mexico: El Universal. Accessed December 18, 2020. <http://www.eluniversal.com.mx/nacion/168800.html>.

Maurer, C. 2019. Salvadoran and Guatemalan Immigrants in the United States: The Long-term Implications of Civil War and Violence on Successful Integration (Doctoral dissertation, Brandeis University). <http://bir.brandeis.edu/bitstream/handle/10192/36750/MaurerThesis2019.PDF.pdf?sequence=1&isAllowed=y>.

Mugera, A. W., and V. Bitsch. 2005. Managing labor on dairy farms: a resource-based perspective with evidence from case studies. *International Food and Agribusiness Management. Review*. 8:79–98. <https://doi.org/10.22004/ag.econ.8140>.

Muntner, P., R. M. Carey, S. Gidding, D. W. Jones, S. J. Taler, J. T. Wright, and P.K Whelton. 2018. Potential US population impact of the 2017 ACC/AHA high blood pressure guideline. *J. American College of Cardiology*, 71(2):109–118. <https://doi.org/10.1016/j.jacc.2017.10.073>.

National Center for Chronic Disease Prevention and Health Promotion (U.S.) Office on Smoking and Health. 2014. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Centers for Disease Control and Prevention (U.S.). Accessed on November 18, 2020. <https://www.hhs.gov/sites/default/files/consequences-smoking-exec-summary.pdf>.

Nazir, M. A., F. Izhar, K. Akhtar, K. Almas. 2019. Dentists' awareness about the link between oral and systemic health. *J. family & community medicine*. 26(3):206–212. [https://doi.org/10.4103/jfcm.JFCM\\_55\\_19](https://doi.org/10.4103/jfcm.JFCM_55_19).

Nies, M. A., S. Linman, D. Kazemi, A. Carriker, and J. Dmochowski. 2012. Relationship of body mass index to alcohol consumption in college freshmen. *Scientific World J*. 2012:849018. <https://doi.org/10.1100/2012/849018>.

Ordunez, P., J. L. Munoz, A. Espinosa-Brito, L. C. Silva, R. S. Cooper. 2005. Ethnicity, education, and blood pressure in Cuba. *Am. J. Epidemiol.* 1:49–56. <https://doi.org/10.1093/aje/kwi163>.

Pérez-Escamilla, R. 2011. Acculturation, nutrition, and health disparities in Latinos. *Am. J. Clin. Nutr.* 93:1163S–7S. <https://doi.org/10.3945/ajcn.110.003467>.

Reckelhoff, J. 2001. Gender Differences in the Regulation of Blood Pressure. *Hypertension*. 37(5):1199–208. <https://doi.org/10.1161/01.HYP.37.5.1199>.

Reynolds, S. J., P. Lindqvist, and C. Colosio. 2013. International dairy health and safety. *J. Agromedicine*. 18:179–183. <https://doi.org/10.1080/1059924X.2013.812771>.

Ruiz, J. M., H. A. Hamann, M. R. Mehl, and M. F. O'Connor. 2016. The Hispanic health paradox: from epidemiological phenomenon to contribution opportunities for psychological science. *Group Process Intergroup Relat.* 19:462–76. <https://doi.org/10.1177/1368430216638540>.

Rosson, P., F. Adcock, D. Susanto, and D. Anderson. 2009. The Economic Impacts of Immigration on U.S. Dairy Farms. Agri Life Research Texas A&M System. Accessed November 20, 2020. <http://cnas.tamu.edu/Publications/The%20Economic%20Impacts%20of%20Immigration%20on%20U.S%20Dairy%20Farms.pdf>.

Starkey K.K, and L. N. Bunch. 2020. Health Insurance Coverage in the United States: 2019. P60-271. Accessed December 11, 2020. <https://www.census.gov/content/dam/Census/library/publications/2020/demo/p60-271.pdf>.

USDA-NASS (National Agricultural Statistics Service). 2015- 2020. Milk Production report. Acessed December 2, 2020. <https://usda.library.cornell.edu/concern/publications/h989r321c>.

USDA. 2020. Economic Research Service United States Department of Agriculture: Farm Labor. Accessed Dec. 11, 2020. <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#demographic>.

United States Census Bureau. Quick facts - South Dakota. 2019. Accessed December 2, 2020. <https://www.census.gov/quickfacts/SD>.

Virtanen, M., J. E. Ferrie, J. Vahtera, M. Elovainio, A. Singh-Manoux, M. G. Marmot, and M. Kivimäki. 2009. Long working hours and sleep disturbances: the whitehall ii prospective cohort study. 32(6):737–745. <https://doi.org/10.1093/sleep/32.6.737>.

Wahl, A. M., and T. M. Eitle. 2010. Gender, acculturation and alcohol use among

Latina/o adolescents: a multi-ethnic comparison. *J. immigrant and minority health.* 12(2): 153–165. <https://doi.org/10.1007/s10903-008-9179-6>.

Wang, Y., J. Chen, and K. Wang, K. 2006. Education as an important risk factor for the prevalence of hypertension and elevated blood pressure in Chinese men and women. *J. Hum. Hypertens.* 20:898–900. <https://doi.org/10.1038/sj.jhh.1002086>.

Whelton, P. K., R. M. Carey, W. S. Aronow, D. E. Casey, K. J., C. D. Collins Himmelfarb. 2018

ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelinesexternal icon. *J. Am. Coll. Cardiol.* 71(19):127–248. <https://doi.org/10.1016/j.jacc.2017.11.006>.

World Health Organization (WHO). 2020. Obesity and Overweight. Accessed December 4, 2020. <https://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight>.

Zemore, S. E. 2007. Acculturation and Alcohol Among Latino Adults in the United States: A Comprehensive Review. *Alcoholism Clinical and Experimental Research.* 31(112):1968-199. <https://doi.org/10.1111/j.1530-0277.2007.00532.x>.

**Table 3.1.** General traits of the participants expressed as frequency and relative frequency (RF, %) by gender.

<b>Item</b>	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>P-value<sup>1</sup></b>
		(n = 53)	(n = 17)	
Age, years				< 0.001
< 20	5 (7.1%)	3 (5.7%)	2 (11.8%)	
20 - 29	27 (38.6%)	20 (37.7%)	7 (41.2%)	
30 - 39	23 (32.9%)	16 (30.2%)	7 (41.2%)	
40 - 49	8 (11.4%)	7 (13.2%)	1 (5.9%)	
>50	7 (10.0%)	7 (13.2%)	-	
Country of origin				< 0.001
Mexico	32 (45.7%)	27 (50.9%)	5 (29.4%)	
Guatemala	31 (44.3%)	22 (41.5%)	9 (52.9%)	
Other Latino countries	7 (10.0%)	4 (7.6%)	3 (17.6%)	
Marital Status				< 0.001
Married	30 (42.9%)	26 (49.0%)	4 (23.5%)	
Single	33 (47.1%)	23 (43.4%)	10 (58.8%)	
Consensual union	7 (10.0%)	4 (7.6%)	3 (17.6%)	
Years living in U.S.				< 0.05
< 2	23 (33.8%)	17 (32.1%)	6 (40.0%)	
2 to 4	23 (33.8%)	16 (30.2%)	7 (46.7%)	
> 4 to 8	9 (13.2%)	9 (16.9%)	-	
> 8	13 (19.1%)	11 (20.8%)	2 (13.3%)	
Living with (current)				< 0.001
Spouse	26 (37.1%)	18 (34.0%)	8 (47.1%)	
Friends	24 (34.3%)	21 (39.6%)	3 (17.6%)	
Alone	7 (10.0%)	4 (7.6%)	3 (17.6%)	
Co-workers	12 (17.4%)	10 (18.9%)	2 (11.8%)	
With kids	1 (1.4%)	-	1 (5.9%)	

<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .

**Table 3.2.** Dairy employees job positions, work schedule, years working at the dairy farm expressed as frequency and relative frequency (RF, %) by gender.

Item	Total	Male	Female	P-value <sup>1</sup>
		(n = 53)	(n = 17)	
Job Position				
Milker	36 (51.4%)	30 (56.6%)	6 (35.3%)	
Maternity	15 (21.4%)	8 (15.1%)	7 (41.2%)	
Feeder	2 (2.9%)	2 (3.8%)	-	
A.I. technician	3 (4.3%)	3 (5.6%)	-	
Assistant manager	3 (4.3%)	2 (3.8%)	1 (5.9%)	
Hoof trimming	2 (2.9%)	2 (3.8%)	-	
Various activities	9 (12.9%)	6 (11.3%)	3 (17.6%)	
Work shift				
Day shift (6 am to 6 pm)	45 (64.3%)	36 (67.9%)	9 (52.9%)	
Night shift (6 pm to 6 am)	25 (35.7%)	17 (32.1%)	8 (47.1%)	
Years working at the farm				
< 2	41 (58.6%)	27 (50.9%)	14 (82.4%)	< 0.001
2 to 4	16 (22.9%)	14 (26.4%)	2 (11.8%)	
> 4 to 10	11 (15.7%)	10 (18.9%)	1 (5.9%)	
> 10 to 15	2 (2.9%)	2 (3.8%)	-	

<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .

**Table 3.3.** Dairy farmworkers education background expressed as frequency and relative frequency (RF, %) by gender.

Item	Total	Male	Female	<b>P-value<sup>1</sup></b>
		(n = 53)	(n = 17)	
Educational attainment				< 0.001
No school background	2 (2.9%)	2 (3.8%)	-	
Elementary school	17 (24.3%)	15 (28.3%)	2 (11.8%)	
Middle school	5 (7.1%)	4 (7.6%)	1 (5.9%)	
High school	23 (32.8%)	20 (37.8%)	3 (17.6%)	
College	21 (30.0%)	11 (20.8%)	10 (58.8%)	
Technical school	2 (2.9%)	1 (1.9%)	1 (5.9%)	
Desire to continue education				< 0.001
Yes	56 (80.0%)	43 (81.1%)	13 (76.5%)	
No	14 (20.0%)	10 (18.9%)	4 (23.5%)	
English course as ESL <sup>2</sup>				= 0.232
Yes	30 (42.9%)	22 (41.5%)	8 (47.1%)	
No	40 (57.1%)	31 (58.5%)	9 (52.9%)	

<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .

<sup>2</sup>ESL - English as a second language

**Table 3.4.** General health information on physician visits and health insurance of the participants expressed as frequency and relative frequency (RF, %) by gender.

<b>Item</b>	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>P-value<sup>1</sup></b>
	(n = 53)	(n = 17)		
Last time visiting primary doctor, months				< 0.001
0 to 6 months	26 (37.1%)	22 (41.5%)	4 (23.5%)	
7 to 12 months	10 (14.3%)	6 (11.3%)	4 (23.5%)	
1 to 2 years	16 (22.9%)	9 (17.0%)	7 (41.2%)	
3 to 5 years	7 (10.0%)	5 (9.4%)	2 (11.8%)	
> 6 years	4 (5.7%)	4 (7.6%)	-	
Never	7 (10.0%)	7 (13.2%)	-	
Job health insurance benefits				< 0.001
Yes	11 (15.7%)	7 (13.2%)	4 (23.5%)	
No	53 (75.7%)	41 (77.4%)	12 (70.6%)	
Private	3 (4.3%)	3 (5.7%)	-	
No knowledge	3 (4.3%)	2 (3.8%)	1 (5.9%)	
In the last 12 months, skipped medical attention due to cost				< 0.001
Yes	18 (26.5%)	10 (19.6%)	8 (47.0%)	
No	50 (73.5%)	41 (80.4%)	9 (53.0%)	
Language as a barrier in medical care				< 0.001
Yes	50 (71.4%)	39 (73.6%)	11 (64.7%)	
No	20 (28.6%)	14 (26.4%)	6 (35.3%)	

<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .

**Table 3.5** Participants body mass index (BMI) and blood pressure ranges expressed as relative frequency (RF, %) and 95% coefficient interval (95% CI) by gender.

Trait	Female (n = 17)		Male (n = 53)		Total (n = 70)		P-value <sup>1</sup>
BMI (kg/m <sup>2</sup> )							< 0.05
Within range	58.8	33.6 to 84.0	43.4	30.1 to 56.7	47.1	35.4 to 58.8	
Overweight ( $\geq 25$ )	29.4	6.1 to 52.7	37.7	24.7 to 50.8	35.7	24.5 to 46.9	
Obesity ( $\geq 30$ )	11.8	0 to 28.8	18.9	8.3 to 29.4	17.1	8.3 to 26.0	
Blood pressure							< 0.01
Within range	82.4	62.8 to 100	22.9	11.0 to 34.8	38.5	26.6 to 50.3	
Elevated	5.9	0 to 18.0	16.7	6.1 to 27.2	13.9	5.4 to 22.2	
Hypertension							
Stage-1	5.9	0 to 18.0	33.3	20.0 to 46.7	26.2	15.5 to 36.8	
Stage-2	5.9	0 to 18.0	27.1	14.5 to 39.7	21.5	11.5 to 31.5	

<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .

**Table 3.6.** Self-reported regular dental specialist visits and oral care basics expressed as frequency and relative frequency (RF, %) by gender.

Item	Total	Male (n = 53)	Female (n = 17)	P-value <sup>1</sup>
Last seen a dentist				< 0.001
0-6 months	18 (26.1%)	12 (23.1%)	6 (35.3%)	
7-12 months	4 (5.8%)	4 (7.7%)	-	
1-2 years	25 (36.2%)	18 (34.6%)	7 (41.2%)	
3-5 years	7 (10.1%)	4 (7.7%)	3 (17.6%)	
> 6	7 (10.1%)	7 (13.5%)	-	
Never	8 (11.0%)	7 (13.5%)	1 (5.9%)	
Dental visit frequency				< 0.05
Once a year	18 (25.7%)	10 (18.9%)	8 (47.1%)	
Twice a year	11 (15.7%)	9 (16.9%)	2 (11.3%)	
Once every 2 years	2 (2.9%)	2 (3.8%)	-	
Rarely	10 (14.3%)	9 (17.0%)	1 (5.9%)	
In case of pain	17 (24.3%)	12 (22.6%)	5 (29.4%)	
Never	12 (14.1%)	11 (20.8%)	1 (5.8%)	
Cost as a barrier for dental care				< 0.01
Yes	21 (30.0%)	15 (28.3%)	6 (35.3%)	
No	49 (70.0%)	38 (71.7%)	11 (64.7%)	
Other				
Dental insurance				< 0.001
Yes	1 (1.4%)	-	1 (5.9%)	
No	67 (95.7%)	52 (98.1%)	15 (88.2%)	
Do not know	2 (2.9%)	1 (1.9%)	1 (5.9%)	
Daily toothbrush frequency				< 0.001
Once a day	8 (11.4%)	8 (11.3%)	2 (11.8%)	
Twice a day	41 (58.6%)	32 (60.4%)	9 (52.9%)	
Thrice or more	21 (30.0%)	15 (28.3%)	6 (35.2%)	
Daily interdental cleaning				< 0.001
Do not use it	31 (44.9%)	25 (48.1%)	6 (35.3%)	
Once a week	9 (13.1%)	7 (13.5%)	2 (11.8%)	
Twice or more a week	15 (21.7%)	9 (17.3%)	6 (35.3%)	
Rarely	14 (20.3%)	11 (21.1%)	3 (17.6%)	
Tooth cleaning before bedtime				< 0.001
Yes	66 (94.3%)	49 (92.4%)	17 (100%)	
No	4 (5.7%)	4 (7.6%)	-	

<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .

**Table 3.7.** Frequency and the relative frequency (RF, %) of study population eating habits behavior (n = 70).

Questions	Yes (%)	No (%)	Alternate with roommates	P-value <sup>1</sup>
Do you follow a special diet?	14 (20.0)	56 (80.0)	-	< 0.001
Do working hours make it difficult to have access to adequate food?	31 (45.7)	38 (54.3)	-	< 0.001
Do working hours make it difficult for you to cook?	26 (37.0)	44 (63.0)	-	< 0.001
In the last 12 months, eating poorly due to lack of time to cook	24 (34.3)	46 (65.7)	-	< 0.001
Are you the primary grocery shopper in your household?	42 (60.0)	9 (12.9)	19 (27.1)	< 0.001
Are you responsible for cooking in your household?	30 (42.9)	15 (21.4)	25 (35.7)	< 0.001
After you finish work for the day, do you cook?	53 (76.8)	16 (23.2)	-	< 0.001
In the last 7 days, did you prepare any meals with meat, poultry, or seafood?	61 (93.8)	4 (6.2)	-	< 0.05
Do considerer finding poor food choices in SD compared to your country of origin?	18 (27.7)	47 (72.3)	-	< 0.001
In the last 7 days, did you buy prepared food for immediate consumption?	45 (65.2)	24 (34.8)	-	< 0.001

<sup>1</sup>Chi-square and Fisher test were used to determine differences among participants responses percentage, and statistical significance was declared at  $P < 0.05$ .

**Table 3.8.** Employees' perception (n = 70) of the relevance, in their own experience, regarding 5 issues related to health care, healthy food and eating habits on a scale of 1 to 10, with 1 having the least impact and 10 having the greatest impact on their daily life (expressed as frequency and relative frequency (RF, %)).

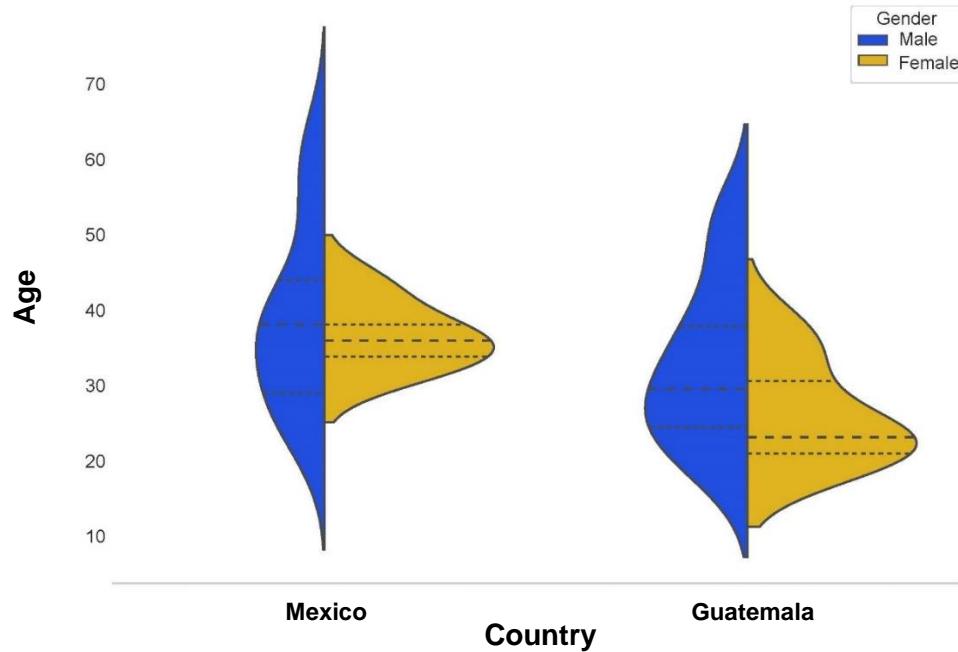
Item	Scale 10	Scale 5	Scale 1	Not sure	P-value <sup>1</sup>
		n (%)			
Limited access to adequate & nutritious food affecting their general health	23 (32.9)	26 (37.1)	19 (27.1)	2 (2.9)	< 0.001
Limited access to adequate & nutritious food affecting work performance	20 (29.0)	27 (39.1)	18 (26.1)	4 (5.8)	< 0.001
Transportation affecting access to health care	12 (17.4)	15 (21.8)	34 (49.3)	8 (11.6)	< 0.001
Family income limiting access to health care	17 (24.6)	28 (40.6)	23 (33.3)	1 (1.4)	< 0.001
Lack of family and/or friend network(s) to motivate health eating habits	17 (24.3)	27 (38.6)	24 (34.3)	2 (2.9)	< 0.001

<sup>1</sup>Chi-square and Fisher test were used to determine differences among participants perception response (%), and statistical significance was declared at  $P < 0.05$ .

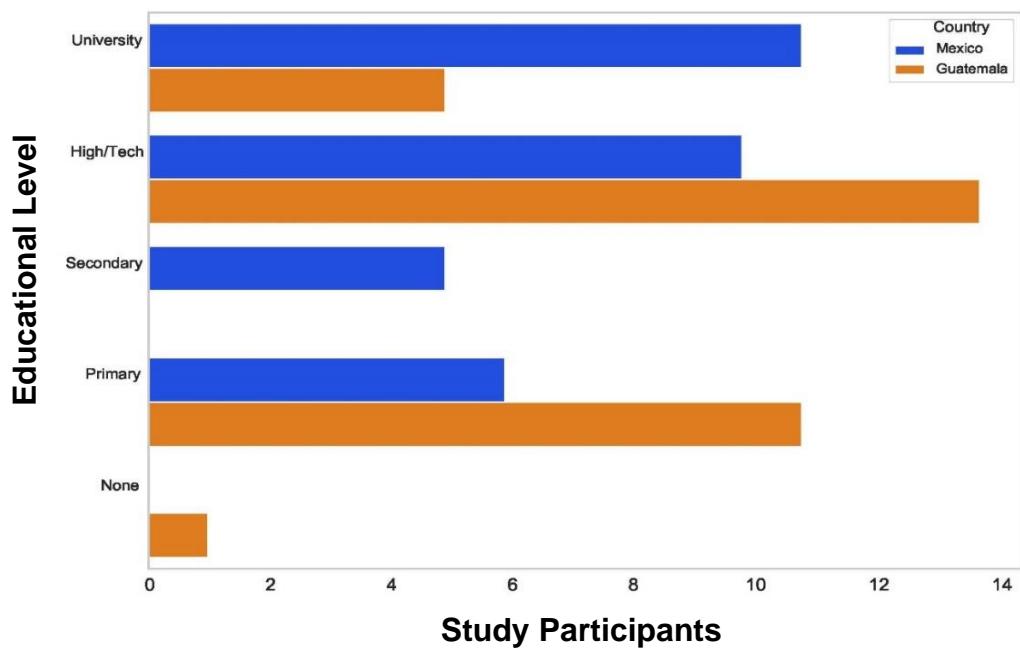
**Table 3.9.** General study population tobacco, alcohol and energy drinks consumption expressed as frequency and relative frequency (RF, %) by gender.

Item	Total	Male (n = 53)	Female (n = 17)	P-value <sup>1</sup>
Tobacco use				< 0.001
Yes	9 (12.9%)	9 (17.0%)	-	
No	43 (61.4%)	30 (56.6%)	13 (76.5%)	
Yes, in the past	14 (20.0%)	11 (20.8%)	3 (17.6%)	
Occasional (social meetings)	4 (5.7%)	3 (5.7%)	1 (5.9%)	
Alcohol use				< 0.001
Yes	27 (38.6%)	23 (43.4%)	4 (25.5%)	
No	28 (40%)	18 (34.0%)	10 (58.8%)	
Yes, in the past	8 (11.4%)	6 (11.3%)	2 (11.8%)	
Occasional (social meetings)	7 (10.0%)	6 (11.3%)	1 (5.9%)	
Energy drinks use				< 0.001
Yes	21 (30.0%)	19 (35.8%)	2 (11.8%)	
No	29 (41.4%)	23 (43.4%)	6 (35.3%)	
Yes, in the past	14 (20.0%)	7 (13.2%)	7 (41.2%)	
Occasional	6 (8.6%)	4 (7.6%)	2 (11.7%)	

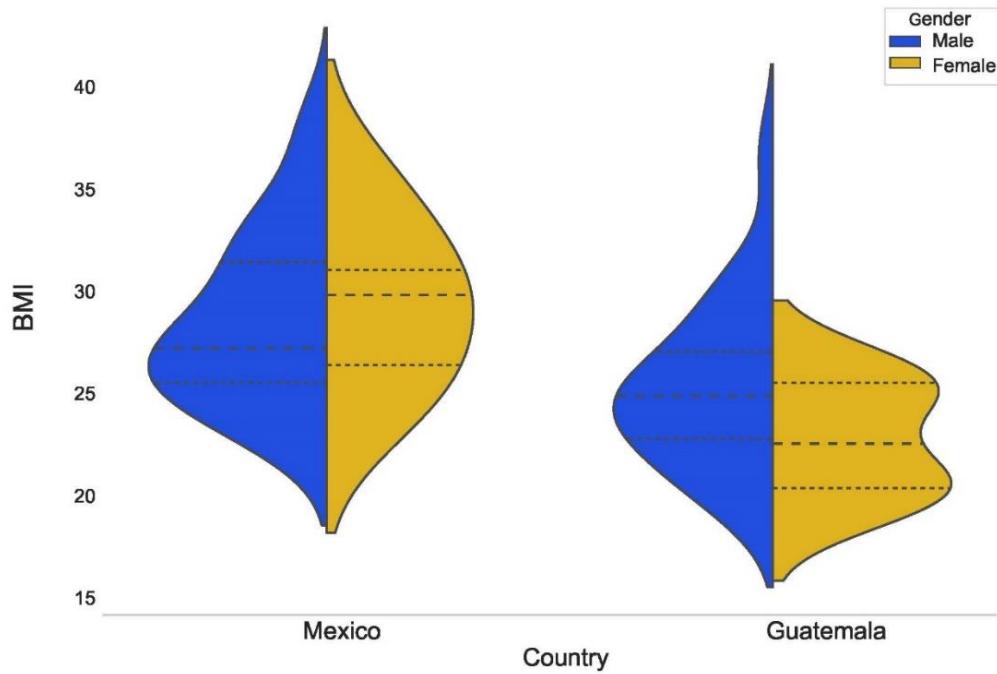
<sup>1</sup>Chi-square and Fisher test were used to determine differences among gender percentages, and statistical significance was declared at  $P < 0.05$ .



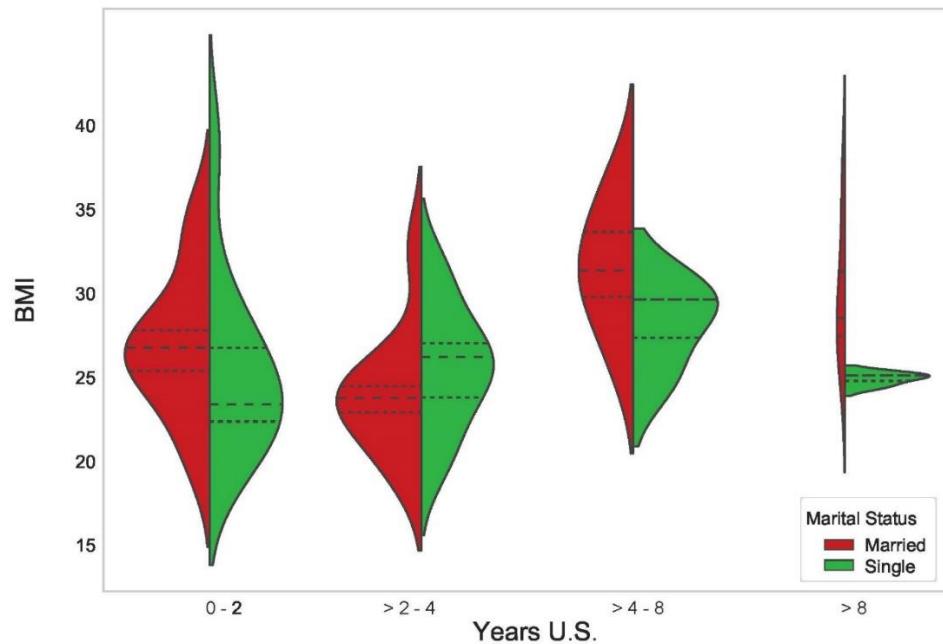
**Figure 3.1.** Participants data by age, country of origin and gender. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution.



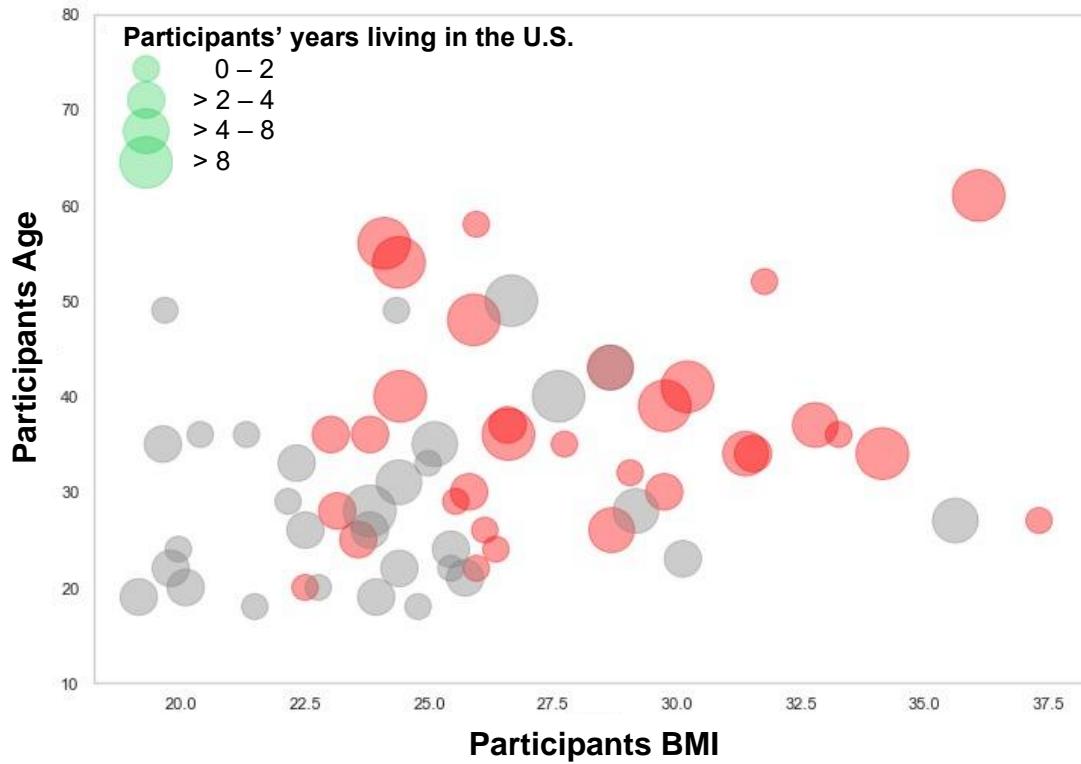
**Figure 3.2.** Participants educational attainment by country origin. The values represent the absolute numbers of participants in each educational level category.



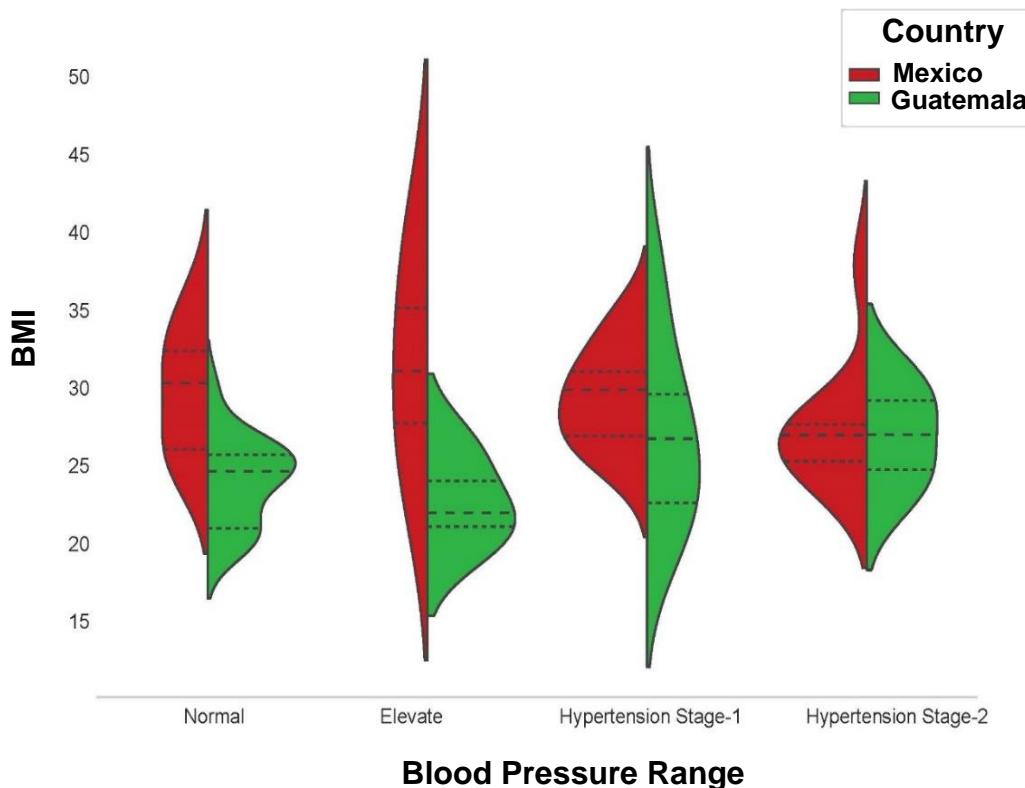
**Figure 3.3.** Participants data by body mass index (BMI), country of origin and gender. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution.



**Figure 3.4.** Participants data by body mass index (BMI), years living in the U.S. (Years U.S.), and marital status. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution.



**Figure 3.5.** Participants absolute numbers by age, body mass index (BMI), country of origin (red = Mexico; gray = Guatemala), and years living in the U.S.



**Figure 3.6.** Participants data by body mass index (BMI), country of origin and blood pressure range. Each violin plot has a marker for the median of the data and a marker indicating the interquartile range of all actual data points. The figure was plotted in Python using modules “pandas,” “matplotlib,” and “Seaborn”; and Kernel density estimation was used to estimate the overall shape of the variables distribution.

## **CHAPTER 4**

**Vision screening and barriers to eye care  
among dairy farm employees in the Midwest**

## CHAPTER 4

### 4. VISION SCREENING AND BARRIERS TO EYE CARE AMONG DAIRY FARM EMPLOYEES IN THE MIDWEST

#### 4.1. ABSTRACT

A dairy farm typically involves many day-to-day activities, use of machinery and equipment, and most importantly milking. Mastitis, a common disease in dairy cows, ultimately affects profitability of the dairy. Mastitis care includes following written protocols, signs detection, and safe medication practices that require the farmworker to have optimal vision. We are observing elevated rates of vision impairment while providing farm trainings. If not corrected, the vision impairment may interfere with the employee's ability to perform important daily tasks (e.g., milking procedures and/or driving machinery). The aim of this study was to detect possible impaired vision issues within dairy farm employees and raise eye health awareness. Ninety dairy farm employees were randomly invited for eye examinations using the Spot Vision Screener (Welch Allyn Inc., Skaneateles Falls, NY). The screener is a handheld non-invasive device that quickly and easily detects potential presence of vision issues on people of all ages. The device instantly displays a full detailed report of pupillary diameter, ocular alignment, binocular refraction, and referral recommendation including the potential presence of anisometropia (unequal refractive power), hyperopia (farsightedness), strabismus (eye misalignment), myopia (nearsightedness), astigmatism (blurred vision) and anisocoria (pupil size deviations). Participants using eyeglasses or contact lenses were included to ensure their prescriptions were still the proper strength for their vision

impairment. The average age of those enrolled was  $28 \pm 6.5$  and  $34 \pm 11.2$  years old for female and male, respectively. Seventy-seven percent were male, and 92% were Latino. Almost one-fourth needed further eye examination and 43% had never been seen by an eye care provider either due to the cost of eye care or language barriers. From the participants that needed an eye exam, 60% were parlor workers. If vision is impaired, the cow's wellbeing and quality of milk might be at risk due to the milker's vision challenges. Preliminary evidence using the screener suggests that future vision care programs should be developed for farmworkers, particularly for the parlor workers subgroup.

#### **4.2. INTRODUCTION**

The large dairy operations of 1,000 or more cows hold 55.2% of all U.S. cows (MacDonald, Law, and Mosheim, 2020). With cows and production shifting from smaller to larger farms, the increased dependence on contract laborers or Latino immigrant workers has been growing for many years. One third of all U.S. dairy farms employ foreign-born workers, mostly Latinos. These farms produce nearly 80% of the nation's milk (Anderson et al, 2017). Latinos are the country's second largest ethnic group, behind white non-Hispanics and constituting 18.3% of the U.S. total population (U.S. Census Bureau, 2019).

Dairy production represents a significant contributor to the Upper Midwest economy, where South Dakota is showing a vibrant and growing industry (USDA, 2020). Fueled by this boom, several thousand migrants workers now live and work in South Dakota. Factors such as socioeconomic, immigration anxiety, cultural differences,

limited English proficiency, and lack of medical insurance coverage put this rapidly growing population in an especially difficult position and have an enormous impact on worker's safety, health, and wellbeing.

A dairy farm typically involves many day-to-day activities, use of machinery and equipment, and most importantly milking cows. Multiple factors can interfere with milk quality and quantity, and the most important is udder health. One of the most prevalent and costly diseases affecting dairy cows is the intramammary infection or mastitis (Down et al., 2017) that will negatively affect milk quality, quantity and ultimately the dairy profitability. Good farming management practices can reduce mastitis prevalence in dairy animals when prevention measures, early disease detection, appropriate vet care and standard procedure protocols are followed. Mastitis care includes following written protocols and administering proper medication dosage which requires the farmworker in charge to have good vision skills. Policies, protocols, procedures, and guidelines are usually expressed in a written format (sentences and paragraph format) independent of the language chosen. Along with that, safe medication practices will include special consideration on proper drug administration (i.e., drug, dosage, route, time, and animal).

Large dairy farm operations favor milking cows three times daily and usually operate on two 12-hours working shifts for 6-7 days a week. This intensive schedule is not accompanied by a healthy lifestyle including routine medical care which is vital in ensuring physical and mental health balance. Health challenges may compromise employees' well-being on work performance and farm productivity.

In regular outreach trainings, difficulties in reading written documents or screen projections were observed among farm employees. This situation is also especially

important following protocols, driving machinery and adapting to living conditions (i.e., driving, grocery shopping). High rates of occupational injuries within the Dairy Industry are known; however, there is no data relating vision problems or literacy difficulties to work injuries.

Therefore, we believe that education on the importance of vision health with periodically vision checks will dramatically improve the wellbeing status of the migrant workers and their families. The identification of vision problems and the recommendations to visit an eye care specialist will increase considerably their efficiency, reading skills, and safely use of farm machinery. The aim of the present study was to evaluate the use of the Spot Vision Screener for detection of vision impairments in dairy farm employees' adults, and provide vision health recommendations for the dairy clientele.

#### **4.3. MATERIALS AND METHODS**

The study was reviewed and approved by the South Dakota State University Institutional Review Board (IRB#1806006-EXP; Human Subject Committee), and an informed consent was obtained from all the participants (70 eye vision tests). Twenty extra participants were not included in the initial IRB; however, employees signed a consent form.

A total of 90 dairy farm employees, females and males were included and voluntarily enrolled in this study. Participants were recruited from 4 dairy farms located along the I-29 corridor in the Midwest region. Each dairy farm had approximately 20-30 employees on two 12-hour working shifts daily.

#### **4.3.1. Survey questionnaire**

A series of questions (n = 13) were included in a survey (n = 90) related to demographic information and healthy habits focusing on vision care (i.e., eye care specialist visits, general health self-reported, and vision insurance). The survey was developed in Spanish and transcribed to English for data analysis. The interview was conducted face-to-face by a native Spanish speaker and did not take longer than 10 minutes.

#### **4.3.2. Vision screening**

The handheld Spot Vision Screener device (v. 3.1.00; Welch Allyn® INC, Skaneateles Falls, NY) was used to examine the dairy workers' vision health. This non-invasive portable device is an easy autorefractor that accurately identifies refractive error and ocular misalignment in children and adults. The device provides information whether the individual should be referred to an eye care specialist for further evaluation or simply be monitored at future screenings. This screening device was not intended to replace a full eye examination.

The following participant data was collected and stored within the machine: birthdate, gender, eyewear prescription, pupillary size, ocular alignment, distance between eyes, estimated binocular refraction and recommendation ("complete eye exam recommended" - refer, and "all measurements in range" - pass) according to manufacturer criteria and AAPOS (American Academy of Pediatric Ophthalmology and Strabismus) referral criteria. The device required a birthdate and test screening date for accurate results on visual acuity related to age.

The exam was performed in a lower-level subdued lighting environment to not affect the pupil size which would interfere with the machine accuracy. The device is held approximately 1 m (3-feet) distance from the subject while the participant looks at the display of twinkling lights and sounds (Figure 4.1). Screening results display an output that is either in- or out-of-range, accompanied by the immediate output recommendation. The screening process takes 2 seconds approximately to immediately display the screen recommendation (Figure 4.2). When a subject reading is not achieved, the device will provide a note as pupils are too small, not found, or out of range. The data stored will be available for printing or transferred to a spread sheet.

The machine generated results listing potential vision conditions in both English and Spanish as shown in Figure 4.3 and 4.4. Possible vision conditions identified with the spot vision screener were: myopia ("nearsighted" people can see close objects clearly, but objects farther away appear blurred); hyperopia (commonly known as being "farsighted" causing difficulty focusing on near objects); anisometropia (the two eyes have unequal refractive power; one eye had near-perfect vision and the other eye was near or farsighted), astigmatism (is an optical defect in which vision is blurred due to the inability of the optics of the eye to focus a point object into a sharp focused image on the retina); anisocoria (a condition characterized by an unequal size of the eye's pupils); and gaze (deviation commonly referred to as "strabismus").

The Spot vision screener manufacturer's criteria cut off values used for > 20 year of age were: myopia 1.5 diopters (D), astigmatism >-1.5 D, hyperopia >1.5 D, anisocoria >1 D, anisometropia >1 D, and Gaze >8 D. For participants under 20 years old, the referral guideline was the same for most of the conditions, except for myopia and

hyperopia with cut-off values of 1 D and 2.5 D, respectively. When values of any of the eye conditions extrapolate the cut off criteria, the machine will show indications of one or more vision conditions and a complete eye exam is recommended (e.g., 1. OD DC = 1.49 Raw = no indication of astigmatism; 2. OD DC = 1.75 Raw = has indication of astigmatism).

In figures 4.3 and 4.4, the screening summary report shows the referral criteria cut off values for each eye conditions screened and represented by color bar charts where blue and red colors represent “in range” and “out of range”, respectively. Thus, these bar charts do not show a numerical value for the referral cut-off (i.e., diopters, degrees). It is important to point out that the further the bar is out of range into the red section, the more severe the condition relative to the age specific cut offs. In the case of the blue section, the closer the bar is to the red section, the increased probability of trending towards being out of range (close to the referral cut-off criteria) and greater the risk of developing a specific visual impairment. The numerical measurement values could be retrieved in a different file and transferred to a spreadsheet. The referral values close to the eye conditions cut-off criteria were considered as “under risk”.

#### **4.3.3. Statistical analysis**

Ninety surveys and eye exams were completed in 4 different farms in the I-29 region. Admittedly, this is a small sample size and may not represent the reality of all dairy farm employees. However, the results of the survey and the eye reports do provide a great preliminary research data for future recommendations. Data were compiled into Excel spreadsheets and statistically analyzed using SAS procedures (version 9.4; SAS

Inst., Cary, NC). Means and standard deviations were generated for appropriate items using PROC MEANS. Frequencies of the survey responses were rounded to the nearest whole percentage point and calculated for categorical variables using PROC FREQ. Chi-square and Fisher analyses were used to determine differences among percentages. Data from the survey forms were merged with data from the Spot Vision Screener completed by dairy workers. Further analyses on continuous variables (i.e., age, eye measurements) were carried out using PROC GLM. The effect of individual parameters and interactions between relevant parameters was checked. Significance was declared at  $P < 0.05$ , and trends were discussed at  $0.05 < P \leq 0.10$ .

Surveys were categorized by gender, country of origin, employee age, years living in the U.S., job position, quality of vision they consider, and length of time since last visited with an eye doctor. Employee basic information categories were grouped as follows: age (<20, 20 - 30, >30 - 40, >40 - 50, >50 - 60, and >60 years old); country of origin (Mexico, Guatemala, other Spanish speaking countries, and non-Spanish speaking countries); years working in the U.S. (years: <2, 2 to 4, >4 to 10, >10 to 15, and >15 year.); job position (parlor worker, maternity area, feeder, hoof trimmer, herdsman, manager); last time visited an eye doctor (<6, 6 to 10, >10 to 24, >24 to 72, > 72 months, and never);

For vision screening data analysis: all eye conditions measurement values and manufactures recommendation criteria (i.e., “complete eye exam recommended” and “all measurements in range”) were used. Participants with the “all measurement in range” result (i.e., no referral) but with their measurement values close to the cut-off criteria were considered “under risk”. From the data retrieved from the device three groups were

considered for eye vision problems: Astigmatism: < -1, no indication; -1 to -1.5, under risk; and > -1.5, indication of astigmatism; and Myopia: -1 to 1, no indication; 1 to 1.5, under risk; and > 1.5 indication of myopia.

#### **4.4. RESULTS AND DISCUSSION**

##### **4.4.1. Demographic data**

Out of the 90 adult participants, seventy-seven percent were male ( $P = 0.001$ ). There was no significant difference between the two groups on age ( $P > 0.05$ ;  $34 \pm 11.2$  years old for male participants and  $28 \pm 6.5$  for female participants). The majority were Hispanic or Latino (92%), originally from Guatemala (42%), Mexico (39%) and other Central and South American countries (11%). The remaining participants were U.S. born involved in farm management positions (e.g., managers, herdsman, and technicians; 8%). The Hispanics immigrants were involved in various farm tasks as milker, cow feeder, calf feeder, breeder, hoof trimmer, and others.

##### **4.4.2. Farm snapshot**

The dairy farms ( $n = 4$ ) participating in this study were located along the I-29 corridor in South Dakota and Iowa. Herd sizes ranged from 1,500 to 4,200 lactating cows and they employed on average 30-40 employees depending on manual labor needs. Everyday farm tasks were covered by two 12-hour shift crews ensuring 24-hour coverage on the farm. The majority of the participants (50%) were parlor workers (i.e., milkers), 19% performed various activities (e.g., hoof trimmer, farm maintenance including but not limited to driving and maintaining tractors), and 16% were responsible for maternity area and calf care. In general, these farms had 1 or 2 people for feeding (i.e., feeder; 3%),

reproduction (i.e., pre-check and I.A; 3%), hoof care (i.e., hoof trimming, 2%), and administrative assistance (i.e., manager or herdsman; 7%).

Large dairy farms are increasing their number of cows, and hired labor is of vital importance to the sustainability of the industry (Adcock et al, 2015).

#### **4.4.3. Working length in the U.S.**

The average amount of time within the U.S. did not differ significantly depending on the country of origin (71, 46 and 80 months for Mexico, Guatemala, and other Latino countries; respectively), and gender (50 and 64 months for female and males; respectively). Among the Hispanic immigrant subgroups, Mexicans generally rank as the largest group of Latinos in the U.S. (Rosson et al., 2009; Ennis, et al., 2011).

The results showed that 51% of the participants have been working for less than one year on the dairy farms enrolled in this study, and 24% between 2 and 4 years. Twenty percent of the participants worked from 5 to 10 years, and 6% worked for more than 12 years. Coincidentally, the group of laborers working for more than 12 years in the US has always worked on the same the farm.

#### **4.4.4. Self-reported vision**

Participants were asked to evaluate themselves on eyesight and healthy vision. Interestingly, 51 and 20% of the workers considered their vision health as good and excellent, respectively. Consecutively, 16 and 13% believed having fair and poor vision, respectively. In a similar study, migrant Latino farmworkers were found to value their vision health as in very good (7%), good (30%), and moderate (59%) conditions (Quandt

et al., 2016). The question remains on why the interviewed participants judged their eyesight predominantly as in moderate condition instead of very good or good. The reason may be related to experiencing some vision problems to an extent. Baker and Chappelle (2012) found that 70% of farmworkers are aware that eye health is important and can have a substantial impact on their work productivity. In our study, 93% of the respondents strongly agreed that vision impairment may interfere with their ability to detect milk abnormalities, and consequently, mastitis.

In our research, 49% of the participants believed that losing eyesight may impact their wellbeing when asked to utilize a 10-point grading scale (being 1 of less impact, 5 low impact, and 10 of great impact). Successively, 29% slightly believed (score of 5) that losing their vision would have an important impact in their life-style. Interestingly, 15% of the farmworkers did not consider losing their eyesight as being impactful (score of 1) in their daily life whereas 6% were not completely sure. On the other hand, participants in a similar study ( $n = 180$ ) considered vision loss a major contributor to a less independent and less productive lifestyle. They also described their eyesight as indispensable and the possibility of losing it would be devastating (Alexander et al., 2008). The findings in our study emphasize that a word scale is very subjective to the respondents but allows them to internalize their own feelings on the subject and decide which label reflects their opinion best. We anticipate this group will need more guidelines and awareness of the negative implications of losing vision.

#### **4.4.5. General attitudes about eye examinations and vision care**

In our study, 30% of farmworkers reported last visiting an eye care specialist over 5 years ago (> 60 months) whereas 19% have visited over 2 years ago and 8% in the last 10 months when this study was conducted. On the other hand, 43% of the participants had never visited an eye care specialist neither in the U.S. nor in their home country. People often avoid seeking medical care even when they suspect major health problems or experiencing clinical symptoms (Byrne, 2008).

Migrant farmworkers, in general, have near- and distant-vision problems, but three-quarters (289 total) of the participants had never visited an eye care specialist for a vision screening test (Quandt et al., 2016). Along with the lack of worries related to vision health, farmworkers prefer not to wear protective glasses as reported by Verma et al. (2011). It is important to point out that none of the dairy employees participating in our study wore protective eye glass, or face shields while using chemicals (e.g., clorox, soap, sanitizer), cleaning stalls or feeding the animals. It should be noted that protective eye protection was available. The American Optometric Association suggested that wearing eye protection can lessen 90% of eye injuries and OSHA recommends wearing eye and face protection (29 CFR 1910.133) when workers are exposed to eye or face hazards such as flying objects, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or other potentially injurious. Many activities on a farm (e.g., milking parlor, maternity, cleaning) may expose the eyes to hazardous materials including chemicals, and eye protection should be encouraged for the employees.

In the employee's country of origin vision insurance is part of their health insurance versus in the United States where the plan is a supplemental insurance. Ninety

eight percent of the farmworkers did not have a vision coverage plan, and only 2% carried a private insurance with vision care. Quandt et al. (2016) reported that 11.6% of the Latino farmworkers did not have eye insurance contrasting with our study where most of the participants did not carry a vision insurance plan. These finding emphasize the vulnerability of this population in terms of health care. It is known that Latinos or Hispanics had the lowest level of general health insurance coverage (government and private insurance) in the U.S. (Berchick et al., 2018). Taber et al. (2015) reported that the avoidance of medical care can occur because of factors that limit access to or ease of obtaining quality health care (e.g., language differences, financial concerns, time constraints, lack of insurance, fear of diagnosis, prior negative experiences). Usually, this population will be seeking care only after determining a potential need or due to an emergency related to the job. We should also emphasize that in most of the Latino countries, basic health care is free and available to everyone.

In our pool of participants, costs seem not to be a problem to seek health assistance since 86% of the employees shared the willingness to pay the eye specialist visit if needed. However, employees (79%) shared that health care costs (e.g., medical bills) are too expensive and they are afraid of not being able to afford it. Nonetheless, it is common to hear employees commenting on health cost not from their own experience but from other's. When asked to mention some factors that could serve as barriers to visit with an eye care specialist, language barriers and low English proficiency were mentioned by 71% of the participants. Given this feeling of seeking an eye specialist is too expensive, we have called vision care clinics (e.g., optometrist, optician, or ophthalmologist; n=15) located along the I-29 corridor to inquire the costs related to

visiting the specialist. A regular specialist clinic visit averaged \$127.00 (July 2020) whereas vision screen in a commercial store center averaged \$75.00 (e.g., Walmart vision center). The vision health clinics did not have a Spanish interpreter working full time in the clinics; however, 3 of the clinics shared the willingness to provide help either by the use of digital apps or external interpreter. Importantly, 83% of the participants shared the desire to receive assistance in finding an affordable health insurance that will also cover vision care.

In 2015, the CDC's Vision Health Initiative (VHI) and NORC at the University of Chicago partnered to develop the National Vision and Eye Health Surveillance System (VEHSS) which was included in the National Health Interview Survey (NHIS). The VEHSS aimed to help healthcare professionals and researchers gain a better understanding of the extent of vision loss, eye disorders, and eye care services in the U.S. In the 2016-2017 survey, there were 46 vision-related questions about service utilization in addition to those that provide an understanding of the prevalence of visual impairment. The percentage of adults who have seen or talked to an optometrist, optician, or ophthalmologist about their own health during 12-month interval was 47 and 32% for white and Hispanics, respectively (NHIS, 2018). In regard to the prevalence rate of Hispanics who wear glasses were lower compared to non-Hispanic White and non-Hispanic Black (45.9, 65.8, and 54.2 %, respectively; NHIS).

Interestingly, the information from NHIS can be related to our results where most of the respondents have not visit an eye specialist in a long time. Wearing glasses is also cultural and it is related to general appearance which can change people's perception of us

regarding deficiencies and age, since almost all of the older generation needs glasses, contacts or other vision correctors.

#### **4.4.6. Knowledge about eye health**

Many participants reported to have some knowledge of common vision disorders. In summary, 93% of the farmworkers have some knowledge of cataract but never heard of diabetic retinopathy, glaucoma eye disease, and age-related macular degeneration (73, 63, and 64 %, respectively). Among participants (77%) who indicated some knowledge on diabetes medical condition, there was a lack of knowledge that diabetes negatively affect vision health and can lead to poor vision or even blindness (NIDDK, 2017). Additionally, participants (64%) were not aware of the potential eye vision deterioration with age called macular degeneration which was the major cause of blindness reported in the U.S. The incidence of vision problems was reported higher among multicultural population compared to Americans living in urban areas (Sommer et al., 1991). The rate of knowledge on vision impairments was also reported as low in Latinos under 60 years old. There may also be literacy deficiencies which will affect the knowledge about health care access to the Latino population in the U.S. (Muñoz et al., 2008).

In the past, one of the biggest concerns was the low literacy and English proficiency level among Latino dairy workers when Extension farm trainings were offered. However, during the trainings the employees reported that some of their difficulties reading (e.g., written documents or wall projections) were due to poor vision.

#### 4.4.7. Vision acuity screening

The spot vision device referred (EXR, exam recommendation) almost one-fourth of the participants (22/90) and from this group, 60% were milkers. None of the eye conditions tested were significantly affect by gender or age.

The eye referral measurements in females and males for myopia was 0.72 and 0.59 D respectively; and for astigmatism -81 and -0.65 D, respectively. The referral cut-off criteria considered in this study was: Astigmatism: < -1, no indication; -1 to -1.5, under risk; and > -1.5, indication of astigmatism; and Myopia: -1 to 1, no indication; 1 to 1.5, under risk; and > 1.5 indication of myopia.

In regard to age, myopia was -0.18, -0.86, -0.72, -0.61, and -1.01 diopters for age range 1, 2, 3, 4, and 5, respectively; and astigmatism 0.84, 0.83, 0.75, 0.60, and 1.26 diopters for age range 1, 2, 3, 4, and 5, respectively.

Participants astigmatism (blurred vision) was detected in 46% of the EXR results, and myopia (nearsightedness) was present in 23% of them. These results are especially important since milking parlor workers' training is one of the most important efforts of the dairy industry through years (Ligero-Toro et al., 1990; Rovai et al., 2016). The dairy industry is constantly looking for a high engaged workforce to develop their work with – “their skills, knowledge, and ability to execute on the task” (Jackson, 2015). Employees are the most important resource on a dairy farm. Milkers are responsible for following the milking routine which includes stripping to detect milk abnormalities (i.e., clot milk, different color) before attaching the milking machine teat cups for harvesting. Therefore, milkers visually impaired will not have the eye vision skills needed to early detect and

report cases of clinical mastitis which will negatively impact milk quality, herd health and profitability (e.g., SCC increase, yield losses, culling).

Distance visual acuity decreases significantly in people with astigmatism, a very common eye disorder. Reading speed, lack of ability to drive (i.e., oncoming traffic headlights) during the night or while raining may be intensified in people with astigmatism (Wolffsohn et al., 2011). Typically, dairy workers' tasks involve protocols reading, driving tractors, and control other countless machinery used at the farm. Night vision (e.g., blurry vision at a distance, blurry close-up vision) and driving may be compromised in night-shift employees whose astigmatism is detected.

Of the total employees tested, 75% of participants did not need to be referred for further eye care. However, results within the range but classified as “under risk” (i.e., reading values near the machine cut off criteria) were 25% for both astigmatism and myopia vision condition ( $n = 17$ ). These results are important since it may lead to the need of visiting an eye specialist soon due to a potential risk of having future vision problems. Moreover, participants with MIR (measurements in range) results were suggested to visit the eye care specialist at least once a year.

The other vision conditions such as hyperopia that causes near and distant objects to appear blurry was observed in 4% of the participants. Additionally, anisocoria (different pupil size) was observed in 3% the workers. According to the American Academy of Ophthalmology, anisocoria does not need to be treated since it does not affect eyesight or eye health. However, it might be related with other health problems as dropping eyelid, headache, risk of a stroke, and nervous system problems (AAO, 2020). Participants with anisocoria were recommended to have routine medical checkups for

early detection or prevent health problems since their farm tasks requires an intense work schedule.

Anisometropia was detected in 4% of the participants. Our results are in agreement with other authors (Borchert et al., 2010) that observed this condition in also 4% of the Hispanic/Latino participants. This author related age, biological, or environmental risk factors standing out in association with anisometropia.

Gaze (eye misalignment or strabismus) was observed in 7% of the participants. None of the participants with ocular misalignment shared any bad experience or had the feeling of wandering eye as some people under this condition experienced according with AAPOS (2020). Strabismus may be a result of being untreated in childhood or recurred in adulthood and may be effectively treated despite many people are under the misconception that nothing could be done to treat this condition (Kushner, 2014).

The most common vision problems occur in adults between their 19 and 40 years old due to stress and injury (AOA, 2020); however, we did not find any close relationship between age and vision conditions in our study. It is known also that eye fatigue has been important nowadays due to the time spent using screen technology (e.g., cellphone, computer, and tv); however, this is not common tasks of a dairy farm employee.

In our study, almost 40% of the exams referred were participants in the 20 – 29 year-old bracket and 23% in the 30 - 40 year old bracket. We suspect that vision problems in young people may be related to the lack of medical assistance at an early age in their country of origin.

Finally, besides the vision impairments diagnosed with the Spot Vision Screener machine, color deficiency may be another critical factor on performing specific activities for dairy farm employees. Color vision deficiency or color blindness represents a group of conditions that affect the perception of color, with red-green color vision defects being the most common form of color deficiency. The ability to distinguish between some shades of red, yellow, and green will be compromised. Important to add that color deficiency will not affect the visual acuity.

In dairy herds, color leg bands for mastitis and chalk / crayon color for a variety of farm tasks (e.g., heat detection, breeding, sorting cows) are used to temporarily mark the cows. Color deficiency is easy to be detected with the use of a colored dotted card plates test (Ishihara's test for color deficiency) that is free online or in-store purchases (\$50.00 approximately). In our study, only one employee mentioned being color blind and not being able to differentiate the green and red colors.

We agreed with several authors (Mendez et. al., 2015; Marzolf et al. 2017) that the Spot Vision Screen device demonstrated effectiveness and helped to assess participants on an early risk of vision problems. As observed in this study, vision impairments vary from person to person. The average of cost of the Spot Vision Screener device is \$8,000 and it has been widely used by organizations such as the Lions Club (Lions Kid Sight USA Foundation) to improve the lives of the visually impaired people and prevent avoidable blindness. To our knowledge, there are no organizations or programs designed to check adult farm employees vision health.

The machine is a versatile and easy to handle vision screening device. Its portability will allow anyone (e.g., farm manager, secretary, employee) to perform vision

screening and collect accurate refractive data on farm employees. There are other inexpensive ways of checking your employees eye vision as the Snellen Chart used for driving test (detect impaired eyesight and primarily distance vision) and Jaeger Eye Chart (detect reading up close and general visual performance).

Majority of dairy employees come from a rural setting. Rural people tend to be more self-sufficient and neglectful of their health; perhaps due to decrease access to healthcare. In regard to vision health, as we cannot force people to periodically have a vision test, we can adapt farm communication approaches for the employee. Written protocols or a simple note to the employee should be in reasonable font size (i.e. 12 or higher) and understandable.

Poor vision can affect one's quality of life, self-esteem, independence, and mobility. As our results showed, most of the farm employees are Latinos / Hispanics, and vision care has not been taken seriously. A health informative workshop or appropriate fliers can provide more awareness to farm employees about the importance of vision check-ups. We believe that bringing health information and awareness into focus will keep farmworkers motivated to follow a healthier life in general. Employees play an important role at the farm, where most of the farm productivity is in their hands. Thus, an employee's eye health assessment after an employee has been hired is advised.

Common vision problems due to refractive errors can be easily corrected with eyeglasses, contact lenses or surgery. Regardless the results, all participants were suggested to visit an eye care specialist. Each participant also received a printed copy of their eye exam.

#### **4.5. CONCLUSIONS**

This study was limited by our sample size; however, the data collected was sufficient to detect the existence of vision conditions in Latino dairy farm employees. Our results provided important evidence of the value in assessing dairy farm employees' vision health since it may affect their job performance. The use of the Spot Vision Screener device is effective for its portability, time, and results interpretation (Spanish and English); however, the expense of the device is a hindrance for a producer. The device will assist in detecting early vision conditions allowing employees to be referred to an eye care specialist. The employee cannot perform their job duties adequately if their vision is impaired. The cow's wellbeing, herd health, high-quality milk and farm profitability might be at risk due to the employee's vision challenges. Preliminary evidence using the screener suggest that future vision care program should be developed for farmworkers, particularly for the milker's subgroup.

#### 4.6. REFERENCES

Adcock, F., D. Anderson, and P. Rosson. 2015. The economic impact of immigrant labor on U.S. dairy producers Report. Assessed June 12, 2020. <https://www.nmpf.org/wp-content/uploads/2018/12/immigration-survey-090915.pdf>.

Alexander Jr, R. L., N. A. Miller, M. F. Cotch, and R. Janiszewski. 2008. Factors That Influence the Receipt of Eye Care. *Am. J. Health Behav.* 32(5):547–556. <https://doi:10.5555/ajhb.2008.32.5.547>.

American Optometric Association (AOA). Protecting your eyes at work. Accessed June 23, 2020. <https://www.aoa.org/healthy-eyes/caring-for-your-eyes/protecting-your-vision?sso=y>

American Optometric Association. What is Anisocoria? Accessed June 24, 2020. <https://www.aoa.org/eye-health/diseases/what-is-anisocoria>.

American Association for Pediatric Ophthalmology and Strabismus (AAPOS). Adult Strabismus (Eye Misalignment). Accessed June 30. 2020. <https://aapos.org/glossary/adult-strabismus>.

Anderson, D. P., F. Adcock, and C. P. Rosson. 2017. The Economic Impacts of Immigrant Labor on US Dairy Farms. Agricultural Outlook Forum 2017 260504, United States Department of Agriculture. [http://ageconsearch.umn.edu/record/260504/files/David\\_Anderson.pdf](http://ageconsearch.umn.edu/record/260504/files/David_Anderson.pdf).

Baker, D., and D. Chappelle. 2012. Health status and needs of Latino dairy farmworkers in Vermont. *J. agromedicine.* 17(3):277–287. <https://doi.org/10.1080/1059924X.2012.686384>.

Berchick, E. R., E. Hood, and J. C. Barnett. 2018. Health insurance coverage in the United States: 2017. Current population reports. Washington DC: US Government Printing Office. Assessed June 12, 2020. <https://www.census.gov/content/dam/Census/library/publications/2019/demo/p60-267.pdf>

Borchert, M., K. Tarczy-Hornoch, S. A. Cotter, N. Liu, S. P. Azen, and R. Varma. 2010. Anisometropia in Hispanic and African American infants and young children: The

multi-ethnic pediatric eye disease study. *Ophthalmology*. 117(1): 148–153. <https://doi.org/10.1016/j.ophtha.2009.06.008>.

Byrne, S. K. 2008. Healthcare avoidance: a critical review. *Holist Nurs Pract*. 22(5):280–292. <https://doi.org/10.1097/01.HNP.0000334921.31433.c6>.

Down, P. M., A. J. Bradley, J. E. Breen, and M. J. Greena, 2017. Factors affecting the cost-effectiveness of on-farm culture prior to the treatment of clinical mastitis in dairy cows. *Prev Vet Med*. 145:91–99. <https://doi.org/10.1016/j.prevetmed.2017.07.006>.

Ennis, S. R., M. Ríos-Vargas, and N. G. Albert. 2011. The Hispanic population: 2010. U.S. Department of Commerce Economics and Statistics Administration U.S. Census Bureau. Accessed June 24, 2020. <http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf>

Ishihara's Test for Colour Deficiency: 38 Plates Edition. Accessed June 30, 2020. <https://www.color-blindness.com/ishiharas-test-for-colour-deficiency-38-plates-edition/>.

Jackson, R. 2015. Knowing Your Employees and Matching Their Responsibilities with Their Strengths and Interests. Assessed June 17, 2020. <https://ecommons.cornell.edu/bitstream/handle/1813/44442/Jackson%20-%20Employee%20Strengths%20Responsibilities.pdf?sequence=2&isAllowed=y>

Kushner, B. J. 2014. The benefits, risks, and efficacy of strabismus surgery in adults. *Optom Vis Sci*. 91(5):e102–109. <https://doi: 10.1097/OPX.0000000000000248>.

Ligero-Toro, F., M. L. McGilliard, R. E. James, and D. M Kohl. 1990. Production changes related to employee management in Virginia dairy herds. *J. Dairy Science*. 73(9):2574 –2579. [https://doi.org/10.3168/jds.S0022-0302\(90\)78943-6](https://doi.org/10.3168/jds.S0022-0302(90)78943-6).

MacDonald, J. M., J. Law, and R. Mosheim. 2020. Consolidation in U.S. Dairy Farming, ERR-274, July 2020. USDA - Economic Research Service Economic Research Report. Assessed November 12, 2020. <https://www.ers.usda.gov/webdocs/publications/98901/err-274.pdf?v=5978>.

Marzolf, A.L., M. M. Peterseim, B. D. Forcina, C. Papa, M. E. Wilson, E. W. Cheeseman, and R. H. Trivedi. 2017. Use of the Spot Vision Screener for patients

with developmental disability. *J. American Association for Pediatric Ophthalmology and Strabismus*. 21(4): 313–315. <https://doi.org/10.1016/j.jaapos.2017.04.008>.

Mendez, M. A., L. Arguello, J. Martinez, M. S. Vargas, A. M. Alvarado Rodriguez, C. E. Papa, C. M. Peterseim, M. Otárola Víquez, R. H. Trivedi, and M. M. W. Peterseim. 2015. Evaluation of the Spot Vision Screener in young children in Costa Rica, *J AAPOS*. 19:441–444. <https://doi.org/10.1016/j.jaapos.2015.08.002>.

Miller, J. M., and H. R. Lessin. 2012. Instrument-based pediatric vision screening policy statement. *Pediatrics*. 130(5): 983–986. <https://doi.org/10.1542/peds.2012-2548>

Muñoz, B., M. O’Leary, F. Fonseca-Becker, E. Rosario, I. Burgess, M. Aguilar, C. Fickes, and S. K. West. 2008. Knowledge of diabetic eye disease and vision care guidelines among Hispanic individuals in Baltimore with and without diabetes. *Archives of ophthalmology*. 126(7): 968–974. <https://doi.org/10.1001/archopht.126.7.968>.

National Agricultural Statistics Service South Dakota. 2020. South Dakota Milk Production – National Agricultural Statistics Service. Accessed June 12, 2020. [https://www.nass.usda.gov/Statistics\\_by\\_State/South\\_Dakota/Publications/Livestock\\_Releases/Milk\\_Production/2020/SD-milk2005.pdf](https://www.nass.usda.gov/Statistics_by_State/South_Dakota/Publications/Livestock_Releases/Milk_Production/2020/SD-milk2005.pdf).

NHIS-Summary Data Report for the Vision & Eye Health Surveillance System. 2018. Accessed June 12, 2020. <https://www.norc.org/PDFs/VEHSS/NHISDataSummaryReportVEHSS.pdf>.

National Institute of Diabetes and Digestive and Kidney Diseases. 2017. Diabetic Eye Disease. Assessed June 12, 2020. <https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/diabetic-eye-disease#:~:text=Diabetic%20eye%20disease%20is%20a,poor%20vision%20or%20even%20blindness>.

Quandt, S. A., M. R. Schulz, H. Chen, and T. A. Arcury. 2016. Visual acuity and self-reported visual function among migrant farmworkers. *Optom Vis Sci*. 93(10):1189–1195. <https://doi.org/10.1097/OPX.0000000000000948>

Rosson, P., F. Adcock, D. Susanto, and D. Anderson. 2009. The Economic Impacts of Immigration on U.S. Dairy Farms. Prepared for National Milk Producers Federation (NMPF). Agri Life Research Texas A&M System. Assessed November 16, 2020.

<https://cnas.tamu.edu/Publications/The%20Economic%20Impacts%20of%20Immigration%20on%20U.S%20Dairy%20Farms.pdf>

Rovai, M., H. Carroll, R. Foos, T. Erickson, and A. Garcia. 2016. Dairy Tool Box Talks: A Comprehensive Worker Training in Dairy Farming. *Front. Public Health* 4:136. <https://doi.org/10.3389/fpubh.2016.00136>

Sommer, A., J. M. Tielsch, J. Katz, H. A. Quigley, J. D. Gottsch, J. C. Javitt, J. F. Martone, R. M. Royall, K. A. Witt, and S. Ezrine. 1991. Racial differences in the cause-specific prevalence of blindness in east Baltimore. *N Engl J Med.* 325(20):1412–1417. <https://doi.org/10.1056/NEJM19911143252004>

South Dakota Department of Agriculture: <https://sdda.sd.gov/education-outreach/livestock-industry/#:~:text=South%20Dakota%20Livestock%20Facts,pounds%20of%20milk%20per%20year>.

Spot Vision Screener. Welch Allyn Machine specifications. Accessed June 12, 2020. <http://www.welchallyn.com/en/products/categories/physical-exam/eye-exam/vision-screeners/spot-vision-screener.html>.

Taber, J. M., B. Leyva, and A. Persoskie. 2015. Why do People Avoid Medical Care? A Qualitative Study Using National Data. *J. Gen. Intern Med.* 30(3):290–297. <https://doi.org/10.1007/s11606>.

U.S. Census Bureau. 2019. Quick facts. Accessed November 12, 2020. <https://www.census.gov/quickfacts/fact/table/US>

USDA. 2020. South Dakota Milk Production. Assessed June 12, 2020. [https://www.nass.usda.gov/Statistics\\_by\\_State/South\\_Dakota/Publications/Livestock\\_Releases/Milk\\_Production/2020/SD-milk2005.pdf](https://www.nass.usda.gov/Statistics_by_State/South_Dakota/Publications/Livestock_Releases/Milk_Production/2020/SD-milk2005.pdf)

Verma, A., M. R. Schulz, S. A. Quandt, E. N. Robinson, J. G. Grzywacz, H. Chen, and T. A. Arcury. 2011. Eye Health and Safety Among Latino Farmworkers. *J. Agromedicine.* 16(2): 143–152. <https://doi.org/10.1080/1059924X.2012.686384>.

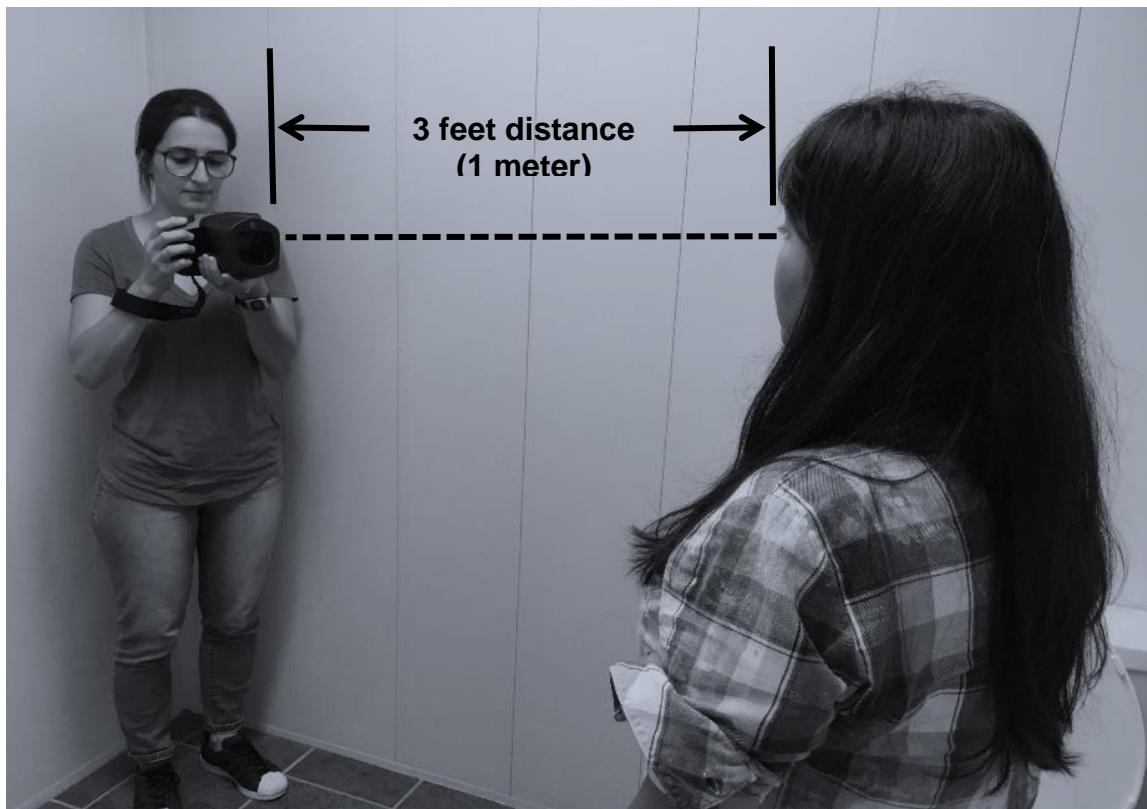
Villarroel, M. A., D. L. Blackwell, and A. Jen. 2019. Summary Health Statistics for U.S. Adults: 2018 National Health Interview Survey. National Center for Health Statistics. Accessed June 12, 2020.

[https://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/NHIS/SHS/2018\\_SHS\\_Table\\_A-18.pdf](https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2018_SHS_Table_A-18.pdf).

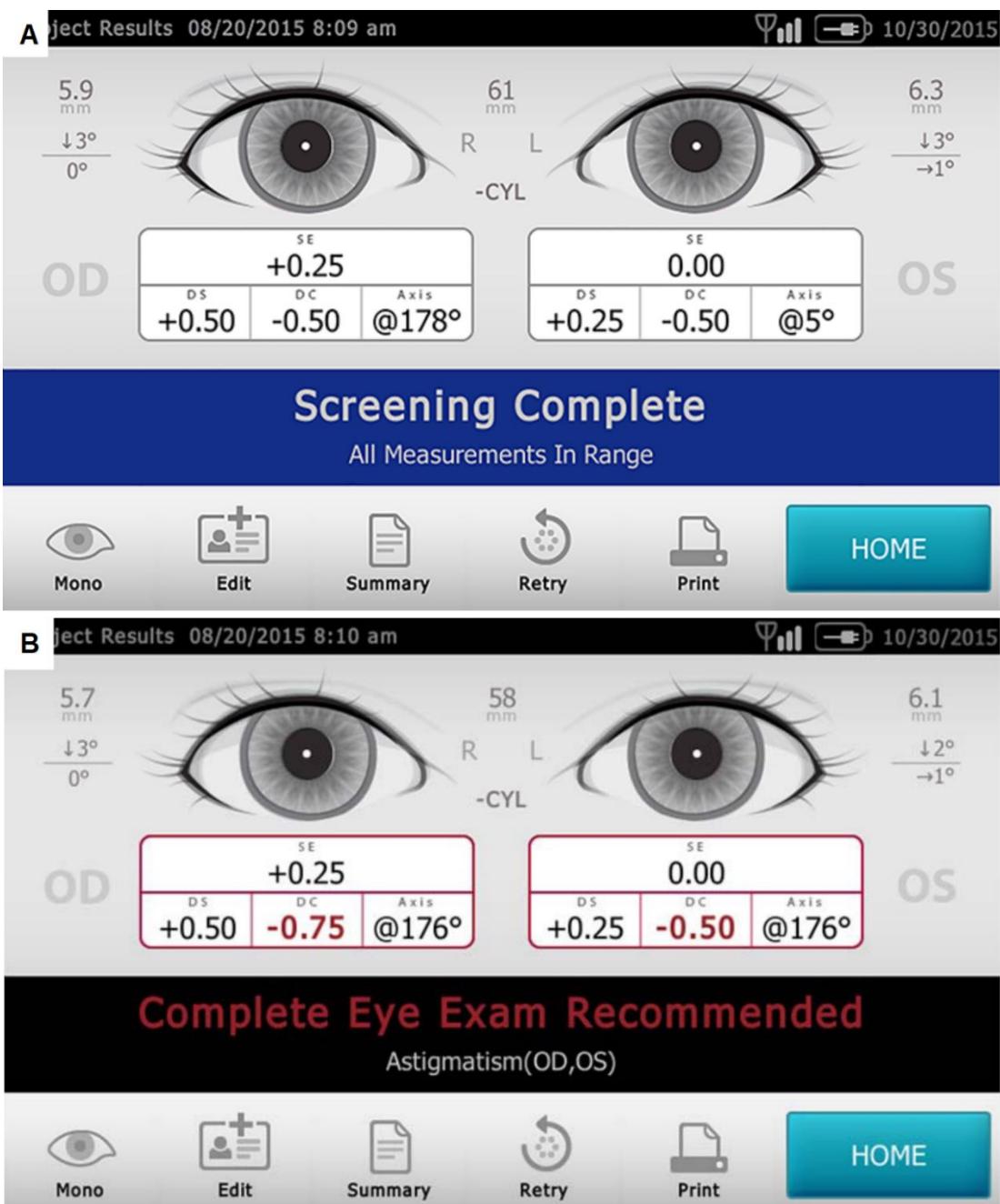
Welch Allyn® Spot™ Vision Screener Model VS100 – Manual. 2018. Assessed September 10, 2020.

<https://www.welchallyn.com/content/dam/welchallyn/documents/sap-documents/LIT/80024/80024271LITPDF.pdf>

Wolffsohn, J.S., G. Bhogal, and S. Shah. 2011. Effect of uncorrected astigmatism on vision. *Journal of Cataract & Refractive Surgery*. 37(3):454 –460.  
<https://doi.org/10.1016/j.jcrs.2010.09.022>



**Figure 4.1.** Eye vision screening process using Spot Vision Screener. Device is 1 m distant from the participant. The screening begins immediately after touching the button "Go". The device emits the sound of chirping birds to help focus the subject's attention on the machine.



**Figure 4.2.** The figure outlines the subject results screen that appears at the end of the machine screening process. The results displayed can be: A) Screening complete “All measurements in range”, B) “Complete eye exam recommended”. Some of the measurements displayed for each eye are: OD: oculus dexter (right eye), OS: oculus sinister (left eye), SE: spherical equivalent (equal to the sum of the value of the sphere and half of the cylinder), DS: sphere (measure the power of the eye for myopia and hyperopia), DC: cylinder (measures the shape of the cornea), Axis: measurable location of astigmatism, and PD: pupillary distance. Results that are out-of-range are indicated in red. (source: Welch Allyn® Spot™ Vision Screener Model VS100 - Manual, 2018).

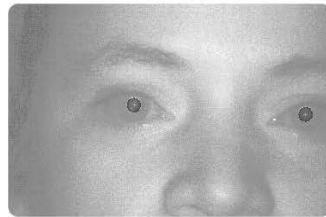
**Figure 4.3.** Spot vision screener print out result form: within range.

Vision screening does not replace a complete eye examination by an ophthalmologist or optometrist.

**Complete Eye Exam Recommended**

**Vision Screening Summary**

SUBJECT ID: 001  
 SCREENING: 08/25/2018 5:32 pm GENDER: F  
 AGE: 01/12/1993  
 FIRST NAME: Leyby  
 LAST NAME: Guiarro



**POTENTIAL CONDITION**

- Myopia (OD,OS) [nearsighted]

OD: Eye diagram with dimensions 5.5 mm (top), 66 mm (right), and 5.4 mm (left). Refraction values: SE -5.25, DS -5.25, DC -0.25, Axis @64°. CYL -0.25, Axis @166°.

OS: Eye diagram with dimensions 5.4 mm (top), 66 mm (right), and 5.5 mm (left). Refraction values: SE -5.25, DS -4.75, DC -1.00, Axis @166°. CYL -0.25, Axis @64°.

*Vision screening should be conducted regularly as eyes may change over time.*

RIGHT EYE		LEFT EYE		BOTH EYES	
OUT OF RANGE	IN RANGE	IN RANGE	OUT OF RANGE	anisocoria	anisometropia
myopia			hyperopia		
hyperopia			astigmatism		
astigmatism			gaze dev.		
gaze dev.					

Welch Allyn is a registered trademark of Welch Allyn, Inc. Copyright © 2014-2018 by Welch Allyn. All rights reserved.

**WelchAllyn® Spot™ Vision Screener**  
[WWW.WELCHALLYN.COM](http://WWW.WELCHALLYN.COM)

25566\_OR\_001\_20180825\_173247\_0 08/25/2018 5:32 pm

**Figure 4.4.** Spot vision screener print out result form: for referral.

## **CHAPTER 5**

### **Dairy Employees' Behavioral Health Tool Box: Stress Factors and Implications**

## CHAPTER 5

### 5. DAIRY EMPLOYEES' BEHAVIORAL HEALTH TOOL BOX: STRESS FACTORS AND IMPLICATIONS

#### 5.1. ABSTRACT

The dairy industry's dynamics are changing, trending toward a larger number of cows on a single farm with more hired employees. While most of the U.S. large dairy farm workforce is Latino, little is known about the causes of stress in this group. The challenge that dairy workers face is finding a balance between the effort needed to work toward a better future and an employee's ability to integrate with the culture. The quality of milk production is directly related to the wellbeing of dairy farm employees, and stress might have a negative impact on both employees and the farm. Behavior and health assessments will help to identify anxiety and stress caused by various sources. This study aimed to gather information on the main causes of behavioral stress in dairy farm employees along the I-29 corridor and evaluate how it affects their job performance, health, and living conditions. Seven focus groups (FG) of 1.5 h each in Spanish were conducted with dairy workers ( $n = 50$ ; 88% male) from Mexico, Guatemala, and other Latino countries (54%, 30%, and 16%, respectively). Transcriptions of the FG questions were analyzed and coded line by line for each quotation by using ATLAS.TI software (Scientific Software Development GmbH). Participants were asked to share factors that represent stress for them at the workplace, with their family, and community where they lived. Additionally, participants shared practices that they applied or considered important to use in reducing stress. Physical changes experienced due to stress, causes of insomnia, and the definition

of stress in one word according to employees' understanding were also included. Over 35 qualitative factors contributing to overall stress at the workplace, family, and community, were identified. Example of stress factors in dairy workers included: A) Workplace: 1. Unplanned time interruptions at work; 2. Cattle handling; 3. Hospital pen (cows & calves); 4. Equipment failure; 5. Weather; and 6. Teamwork - coordination. B) Family: 1. Lack of family time; 2. Sickness in the family; 3. Family estrangement due to longer distances; 4. Lack of child's discipline; and 5. Lack of communication. And C) Community: 1. Lack of transportation; 2. Long travel time to grocery shopping due to city distance; 3. The police; 4. Diversity differences; and 5. English language barrier. Although, some of the practices (over 30) to reduce stress such as: improving communication skills, physical exercise, outdoor sports activities, family activities, hobbies, self-motivation, social interactions, and financial support to the family among others were shared across all the FG sessions. We concluded that Latinos are more likely to be stressed as a result of their current life situation and working circumstances than prior to coming to the U.S. (e.g., hard-physical work, long working shifts). Over time, stress may contribute to health problems including depression or anxiety as participants expressed. Therefore, the importance of employees' well-being is essential for achieving consistent and successful levels of production. Instructional workshops for workers designed to promote behavioral stress awareness and strategies on how to better manage and cope with their specific stressors are needed. Supported by HICAHS Community-Initiated Grant Program (Colorado State University).

**Keywords:** dairy farm, dairy workers, stress factors, focus group, qualitative research

## 5.2. INTRODUCTION

In 2020 the U.S Census Bureau stated that 18.5% of the United States population is Latino or Hispanic, surpassing the African Americans as the nation's largest minority group. The American Psychological Association (APA) indicates that 64% of Hispanic adults had experienced mental stress when thinking about themselves, their loved ones or accessing health care services (2018). Stress and anxiety can have negative impacts on both the employee and the organization (Malik, 2011) affecting everyone's ability to cope with stress at work. Nevertheless, evidence of previous research suggests stress is a factor in several types of chronic health problems as cardiovascular disease, musculoskeletal disorders, and psychological disorders. These problems present early warning signs i.e., a headache, sleep disturbances, difficulty in concentrating, short temper, upset stomach, job dissatisfaction, and low morale as reported by the National Institute for Occupational Safety and Health (NIOSH, 1999).

Hiott et al. (2008) considered that monitoring and treating mental health in rural areas is a challenge. It is known that a significant portion of farmworkers in some rural areas are Hispanics/Latinos; however, little is known about the associated factors related to mental health and its implications on their community. On the other hand, Hiott et al. (2008) found 5 factors as an indicator of mental stress in migrant farmworkers: 1. the legality and logistics; 2. social isolation resulting from being separated from friends and family; 3. work conditions (work problems, feeling of discrimination, and lack of respect); 4. family and the concerns the employee have for family members; and 5. substance abuse including alcohol and drugs. Other authors (Ward et al., 2010) shared that all Latino farmworkers interviewed experienced stress due to separation from friends

and family, and from isolation. The acculturative stress, poor family functioning, and the lack of social supports are associated with greater symptoms of depression and anxiety among Mexicans farmworkers working in the Midwest (Hovey et al., 2002).

Dairy production is a significant contributor to the upper Midwest economy. The number of dairy farms in South Dakota (SD) is about 199 with an increase from 114,000 to 119,000 of dairy cows between 2016 and 2018 (Agriculture United for South Dakota, 2018). The dairy expansion and increased milk production within South Dakota are a result of: 1. Current SD farmers have expanded their operations with more cows and not necessarily increasing the number of employees due to low milk prices; 2. Relocation of farms from other states; and 3. Newly opened network of dairy farms subsidiaries in SD.

Due to South Dakota's recent growth boom within the dairy industry, immigrant workers have come to live and work in the state. A couple of Central American countries, primarily Honduras and Guatemala, have shaped the dairy employee workforce. Currently, these countries have a stressful socioeconomic status and environment. The countries' extortion and violence have forced their countrymen and women to leave their homes and find safety in the U.S. The South Dakota's farm employee's country of origin is uncertain; however, it is known that most of them are from Latin America. Latin America includes more than multi-ethnic 20 nations (i.e., people of different ethnic and national backgrounds).

In South Dakota, the number of farmworkers is equally between Guatemalans and Mexicans (Guifarro, Da Rosa, and Rovai, 2020 – Data not published). The labor-intensive physical work, immigration issues, long work shifts, cultural differences,

linguistic barriers and their native social economic background (i.e., death threats, violence, extortion, poverty) puts migrant worker in an especially stressful position.

In addition, farmworkers experience frequent relocations, (e.g., away from their homes and families for extended periods), living in isolated locations with limited access to transportation, and may be subject to discrimination (Magaña and Hovey, 2003) which adds to the acculturative stress. Other factors that may contribute to stress are health care access, language barriers, weather conditions and lack of social networks and shared community experiences to build a sense of belonging and new place identity.

The key for managing mental stress within the Hispanic farmworkers' community is to identify the sources of stress and ways to overcome their current living challenges without significant health consequences. According to the American Psychological Association, there are steps that people can follow to manage their stress in healthy and productive ways (i.e., exercising, spending time with friends and family, and finding ways to get involved in your community (APA, 2018).

The employee's work performance is of the outmost importance for the dairy industry. The employee's wellbeing is at the heart of a great organization. The importance of behavioral stress evaluation in dairy employees is essential on achieving consistent and successful levels of production. The aim of this study was to gather enough information on the main causes of behavioral stress in dairy farms employees along the I-29 corridor, and evaluate how it affected their job performance, their health and living conditions. Behavior and health assessments helped identify anxiety and stress caused by various sources. The data was collected using a focus group methodology

primarily where ideas and solutions were generated in a “safe” environment for all employee participants.

### **5.3. MATERIALS AND METHODS**

The focus group protocol and related informed consent procedure were reviewed and approved by the Human Research Ethics Committee of South Dakota State University. The study was reviewed and approved by the South Dakota State University Institutional Review Board (IRB# 000459-EXP; Human Subject Committee), and an informed consent was obtained from all the participants.

#### **5.3.1. Study design**

This study was designed to evaluate stress factors in dairy farm employees that impact their job performance and lifestyle. The target participants were primarily Spanish-speaking foreign-born Latino migrant dairy workers. A total of 50 dairy farm employees relating to milking operations, cow handling, feeding, and hospital voluntarily enrolled in this study. Participants were recruited in a three-stage process from three different dairy farms and 2 different dairy communities (Figure 5.1) located along South Dakota’s I-29 corridor. The first stage required an in-person meeting with the farm producers to review and secure their collaboration with this project. The farms needed to provide a venue and access to their employees for participation.

The second stage involved a recruitment meeting with all the farm employees at each farm (20-30 employees) immediately before or after their work shift. The research team distributed flyers within the dairy community and to other dairy individuals to

recruit the dairy community participants. These participant focus group interviews were conducted in local community centers.

During recruitment, the research team members explained the study and its benefits, addressed questions or concerns, and obtained contact information for those interested in participating. Furthermore, the study summary with consent forms were distributed. The research team members were of the same race/ethnicity and spoke the same native language as the Spanish speaking participants.

The third stage involved the actual focus group interviews which required 4 months to be completed. The focus group participants were chosen based on representative demographics of farmworkers along the I-29 corridor.

### **5.3.2. Focus group design**

Between May and August 2019, seven focus groups were conducted in Spanish with dairy farm employees. The dairy farm employee focus groups were held in 3 separate locations, divided into five ( $n = 5$ ) focus groups (A, B, C, D, and G) and were conducted at two different commercial dairy farms. Additionally, the dairy community participants were in two ( $n = 2$ ) focus groups, (E and F) from the Elkton and Flandreau region (25 miles out of Brookings, SD). Demographic data were also collected, and follow-up sessions were scheduled according to the participants' availability. At the end of each FG sessions, each participant received a gift card (\$30) for their participation.

### **5.3.3. Focus group sessions**

The focus group's interviews were conducted within 1.5 hour and were video and audio-recorded for further analysis. Before starting each session, each employee was asked to read and sign an informed consent form approved by the South Dakota State

University. A brief explanation of the aim of the FG was given one more time at the beginning of each FG to the participants by the facilitator. The participants had a previous relationship with the facilitator which assisted in having all the participants more comfortable during the sessions to share their thoughts and experiences.

Prior to the study, the open-ended questions were developed with the guide of Dr. Loraan Stallones (Psychology Department, Colorado State University, Fort Collins, CO) to facilitate the focus group discussions. The open-ended questions related to stress factors at their workplace, family, and community are shown in Table 5.1. Additionally, most participants shared their different practices used to manage stress.

A total of 9 questions were divided into 3 phases: Phase-1 - mapping mental stress for you (dairy workers) related to workplace, family, and community; Phase-2 - practices that you (dairy workers) apply to reduce stress; and Phase-3 - closing remarks in few words with 3 questions added: (1) What physical changes have you experienced due to stress? (2) What causes you insomnia? (3) How would you describe stress in one word?

All questions in Table 5.1. were answered by the participants from each FG sessions. Three additional questions (closing remarks in few words) were asked at the very end of the meetings.

#### **5.3.4. Data analysis**

The videos and audio recordings were first transcribed into Spanish and then translated into English. The translation required 8 to 10 hours ( $n = 7$  documents) for each focus group that consisted of a 30-page word document per group. Each word document was reviewed several times for its English translation accuracy. One of the main reasons why the documents were sizeable is due to the different dialects expressed by each

participant. All the answers were evaluated separately, and codes were assigned across all the 7 FG.

Data, codes, and qualitative analysis were performed with ATLAS.ti 8 software (ATLAS.ti Scientific Software Development, Berlin, Germany). Factors of stress and practices were tagged/coded according to each participants testimony. The codes were grouped as was the co-occurrence of factors and practices (Krippendorff, 2004). The FG session files were coded by line, sentence, or paragraph for qualitative analysis followed the method of Krippendorff (2004). Examples of quotations are described in results with a unique identifier (e.g., Employee A1: A = FG A, participant number 1; Employee B1: B = FG B, Participant number 1, etc.).

## 5.4. RESULTS

### 5.4.1. Participants demographic

A total of 50 participants from three different commercial dairy farms and two communities located in South Dakota voluntarily enrolled in this study. The dairy farm participants were from both day and night-shift crews. In this study, 88% of the participants were males and the majority were originally from Mexico (54%), thirty percent were from Guatemala, and 16% were from different countries of Central America (e.g., El Salvador, Honduras, and Nicaragua).

### 5.4.2. Thematic analysis

Stress factors in Latino/Hispanic dairy employees were the principal focus within each session and different questions were developed for qualitative analysis. Table 5.1. (Material and Methods session) shows the questions that all the participants were asked to share their comments. The phases covered during the FG session were: Phase-1 with

mapping mental stress for the dairy workers related to workplace, family, and community; Phase-2 covering dairy workers practices applied to reduce stress; and Phase-3 with closing remarks in just few words.

### **5.4.3. Phase-1. Mapping mental stress for you.**

#### **5.4.3.1. Question 1.1: What are the primary things that cause stress for you at work?**

##### **5.4.3.1.1. Unplanned time Interruptions at work**

The daily routine duties of participants in this study included milking parlor, maternity, reproduction (artificial insemination), hospital management, nutrition (feeders), among others. In this first phase of questions, most of the participants from all FG shared that a common stressor is time due to the interruptions at work. For example, Employee B7: stated "*Well, stresses me out that things (machinery) do not work properly and delays the work process... if things do not work as expected, I get stressed out.*"

Then, the Employee C1 shared that when the plan to accomplish tasks gets delayed due to work accumulation, he gets stressed "... *When things are not done in time it's stressful... let's say that I had to finish an activity today, but I couldn't today, or tomorrow, or even on the next day. This situation is very stressful... not enough time to complete my daily activities stresses me a lot.*"

The following examples show stress caused by the lack of time at workplace according to participants of this study:

Employee C4: "*Sometimes I make mistakes when I am running out of time... and I ask myself, is this correct or not? Then, I decide not to think about it because, honestly it causes me stress...*"

Employee C5: “Yes, for example: if I’m doing something, and as he [Employee C4] said, I don’t have time and I need to finish it fast... it is like doing everything in a rush and I do it wrong... it is very stressful.”

Employee F4: “Especially when I have to finish something in a very specific period of time, but I run out of time I will end up making the other employees work be delayed as well...”

This factor co-occurred with “*equipment failure*”, “*pressure to finish my work*”, “*lack of communication with colleagues*”, “*cattle handling*”, and “*personal problems*”.

#### **5.4.3.1.2. Cattle handling**

Participants described a great amount of stress while handling the herd in their normal work routine. Cattle handling in the barn or milking parlor, checking the health status of the cows, restraining, etc., were some of the activities that caused stress on dairy employees. A participant shared that sometimes cows do not cooperate and the task of moving these animals requires assistance. For example, Employee E6 shared, “*My stress is when I cannot restrain a cow and I am working alone... sometimes I look around for someone, but nobody is close to help me... that is what stresses me out.*”

The new heifers in the milking parlor were also a shared stress factor. For instance, Employee C6 stated, “*Stress for me is... usually with the newest cows, the heifers... when we bring the heifers to the milking parlor and they kick or throw the milking units... we have to attach the units back several times and, that’s very stressful for me*”. Heifer that are not used to being in the milking parlor, and usually re-act with sudden movements or kicking the milkers during the milking routine are common.

Employee B9 said, *"The cows kick me a lot during the milking, and that causes me a lot of stress."*

In addition, participants discussed the stress caused by moving cows from one pen to another one. For example, Employee D4 said, *"Sometimes I want the cows going to a specific area and they run to a different one. I get stressed out because I have worked especially with pregnant cows and they are not easy to move"*. On the other hand, participants also shared the importance of being patient while moving cows to avoid stressful moments. Employee F2 said, *"When moving heifers especially, sometimes we get stressed because the animals do not know how to get into the headlock, and we struggle a lot trying to restrain them... it is very stressful but even so, we have to be patient and careful, otherwise we get desperate."*

#### **5.4.3.1.3. Hospital pen (cows and calves)**

Participants shared that the increased number of cows or calves in the hospital pen was a factor of stress contributing to an increased work pressure. The work with hospital cows pen co-occurred with *"cattle handling"*, *"equipment failure"*, *"pressure to finish my work"*, and *"summer weather"*. For instance, Employee A2 said, *"I love my job, but when I see calves not responding to the treatment or their behavior completely change, causes me stress"*. Consecutively, Employee A5 said, *"I like a lot what I do in my job area as well, but yes, when the number of sick cows increases, I feel a lot of pressure and it stresses me out"*. Additionally, it is important to mention that the mix of stress and feeling down (sad) was mentioned when dealing with cows that required assistance at calving, and calves are born dead. For example, Employee A7 stated, *"When the calves die because I couldn't pull it off on time, I feel frustrated and stressed"*. From another

FG, Employee E6 added to this topic: *"It is the same to me, having a lot of cows in the hospital is stressful".* Another participant mentioned the stress felt when they use antibiotics to treat sick cows. Comparatively, Employee E8 said, *"Stress me out when I have to treat cows or when I cannot find their vein"*. Overall, it is evident that dairy workers were experiencing stress due to various factors as herd health status which clearly shows that these groups of employees felt highly responsible for cattle wellbeing.

The level of concern for the increase number of cows in the hospital pen occasionally worried the participants, even though farmers have a veterinarian that routinely visits the farm to approach herd health issues.

#### **5.4.3.1.4. Equipment failure**

Participants mentioned that when equipment/machinery such as feed mixer trucks, tractor implements (i.e., loader, grapple rake, pallet forks, etc.), skid loaders, pasteurizers, milking equipment, among others do not work properly, it caused stress on them. A co-occurring relationship was observed with *"equipment failure"* and *"cattle handling"*. For example, Employee F3 mentioned, *"I've worked with the milking unit's maintenance. I know that if I don't fix it at the same day or moment the problem happened, it might lead to other several problems (e.g., waste of time). The problem is that, sometimes, I don't have the right tools to fix the machines, and it stresses me out because I feel that I'm delaying my colleague's job activities."* Additionally, Employee F4 said, *"I get stressed when I'm waiting on colleagues to get equipment or machinery fixed. I know that, if it's taking extra time to be fixed, I will not be able to go home early that day"*.

In general, equipment failure creates stress for employees, and it will have a negative impact on their productivity (i.e., low productivity). The following dialogue shows more examples of the FG participants testimony regarding machinery failure:

Employee D3: *“In my case, stresses me out when the equipment stops working, and even more when they say, “It’s fixed now!” However, I keep experiencing problems with that machine”.*

Employee D5: *“Yeah!! As he mentioned [employee D3], equipment failure causes me a lot of stress... for example, right now the tractor air conditioner does not work and is summer season... I tried to be positive but to be working for hours without AC is really hard”.*

Employee E2: *“For me stress is... when the wagon gets disconnected and it is not easy to re- connect it again. This situation adds me extra work which causes me a lot of stress”.*

Employee F5: *“Well, I get stressed out when feeding the cows tractor present failure... I’m always in a rush and especially if I do not have the parts that I need to fix it... I get stressed out because I cannot do anything at that moment”.*

#### **5.4.3.1.5. Summer and winter weather**

Participants of the focus group highlighted how weather (i.e., summer, winter) conditions impact their daily work, even though when some of them preferred either winter or summer. A co-occurrence of “summer weather” was found with “*cattle handling*” and “*lack of communication at the farm*”. On the other hand, “*winter weather*” co-occurred with “*equipment failure*”, “*unplanned time interruptions at work*”, and

*“pressure to finish my work”*. For example, Employee A1 said, *“I don’t like the summer, I get stressed out when it is too hot since the high temperatures irritate me a lot...”*.

Some participants also pointed out that wintertime was better than the summer. Employee A2 shared: *“The same as my colleague [employee A1], stresses me out when it is too hot... I prefer the wintertime a thousand times than summer”*. Consecutively, Employee A3 mentioned, *“Well, if it’s too hot or warm I get stressed. I’ve worked already during winter, but the problem with the heat is especially in the milking parlor because you cannot stop [take breaks] and you have to keep going”*. One participant from another FG, Employee E4 added: *“Agree!! The weather, when it is too hot, always stressed me out”*.

On the other hand, some participants mentioned winter weather as a stressful factor in the workplace. Employee A4 said, *“Well if it’s too cold, I get very stressed. I think it’s the only bad experience I have had here in SD. In winter, we have a lot of problems with equipment and machinery that do not work properly because it’s too cold”*. Additionally, employee A6 stated, *“I am used to hot temperatures, but winter here is stressful with snow and cold temperatures that break down everything”*. In another FG, Employee F4 shared, *“I like summer, but not the winter!! During winter days with a lot of snow I feel that I have to work two to three times more than the normal workday. And this extra work under winter conditions, it is extremely hard”*.

The testimony of the participants showed that working under unfavorable weather conditions causes stress which might affect their work performance.

#### 5.4.3.1.6. Teamwork

Participants reported that teamwork in the workplace generated some levels of stress and impacts their performance. This source of stress co-occurred with “coordination of work activities,” “absence of another employee,” and “managing positions”. The absence of a colleague (e.g., day off or absence not notified) was also shared as an important factor of stress, which could impact the relocation of some employees during the daily routine tasks. The following statements correspond to few examples of the participants' testimony:

Employee B6: “*The lack of teamwork with colleagues stresses me out a lot at the farm.*”

Employee E1: “*I get very stressed when my colleagues do not show up to work without notice or when they arrive late to work.*”

Employee E4: “*I get stressed out as well when I have to become a leader of the employees and don't see teamwork*” [employee E4 – milking parlour leader].

#### 5.4.3.2. Question 1.2: What are the primary things that cause stress for you related to your family?

##### 5.4.3.2.1. Lack of quality family time

Participants of the focus group mentioned the lack of time flexibility with family or the requested time by their families as a stressful factor. The lack of time was conveyed as a challenge in dairy workers due to the low energies or tiredness after working a 12 h shift. To ensure quality time spent with their relatives and especially children after work, employees sometimes use their needed resting time to make their loved ones happy.

A common co-occurring pattern of stressful factor was “*tiredness after work*,” “*working until late*,” and “*kids requesting time*”. The following dialogue shows the participants testimony due to quality time stress factor:

Employee F3: “*I, sometimes, leave my work early when I have the opportunity; however, my two kids demand me a lot of attention and my energy levels are very low after work. This situation of not giving them quality time, stresses me a lot*”.

Employee F4: “*I feel really stressed out when I get home very tired and my kids want to play. On one hand, they are my kids, but I feel very tired. On the other hand, I feel stressed out if I don't spend quality time with them*”.

Employee F5: “*When we get social invitations (e.g., birthday party, friends' get together) and I cannot bring my family to these events because I must work extra hours, I feel really stressed.*”

#### **5.4.3.2.2. Sickness in family**

A co-occurring pattern observed with this factor was “*distance of country of origin*”, “*family behavior*”, and “*financial situation*”. Employees shared that stress levels spike when their family living back home (country of origin) have health problems. For instance, employee A3 highlighted, “*I do feel more stressed out when I know that my mom is sick*”. Consecutively, Employee A6 shared, “*This is something that has happened to me, when someone from my family back in my country gets sick, I get stressed about it*”.

Participants also described that not being able to provide emotional support in person for their families, is a cause of stress. For example, Employee D4 said, “*When my*

*son is sick in Guatemala and I'm not able to be there to help or motivate him, it causes me a lot of stress".*

With regard of In regards of living in different countries to their families, few employees mentioned the desire to leave everything behind to be close to their families.

Employee E6 shared, *"When someone calls me and says that my mom is sick, I feel like runninf and leaving everything behind to go back to my country"*. Addionally, Employee E9 said, *"Stress related to my family is the same... if someone gets sick and I'm not able to do something to help them, it stresses me out."*

#### **5.4.3.2.3. Family estrangement due to long distances**

In the context of not being close to the family due to the distance, participants shared it as a source of stress affecting their emotional wellbeing. Regardless of whether participants have their spouses and/or kids living with them in the U.S., being away from other members of their family causes stress in Latino dairy workers. For example, Employee F2 said: *"I feel specially stressed havng our extended family back home. We miss them a lot and I wish I could be there [country of origin] and here [USA] at the same time, but I know it is impossible".*

The family unit is more than just the spouse and children for Latino/Hispanic dairy workers. The Employee F3 said: *"The truth is that, I feel really stressed out not having my family here. I do have my wife and my two kids with me but I miss my parents, my siblings, and other family members".*

At the same time, some of the participants of this study shared that not having their kids or spouse living together is extremely stressful for them. Case in point, Employee A2 said, *"There was a really stressfull period when I didn't have my two little*

*girls with me. I knew my parents were taking a good care of the kids, but even trusting their caring, it's not the same".* While one of the participants (Employee D1) that don't live together with her kids shared: *"I feel really stressed that my kids don't live with me since my ex-husband takes care of them. I miss my kids a lot".*

In addition, there were some participants that never met their children prior to moving to the U.S., for example, Employee E4 shared, *"I haven't met my boy yet and it causes me stress. My wife was pregnant when I came to the U.S. I'm my kid's dad and I would love to be closer to him"*. Then, Employee E7 said, *"Well, I do think a lot about my kids, and I have a little girl that I was not able to meet her as well. When I call her, I felt sad because I want to meet her and she constantly asks me when I will go home. This special situation causes me a lot of stress"*.

#### **5.4.3.2.4. Lack of child discipline**

Parenting after a long work shift might be difficult as shared by participants of the focus group. A common co-occurrence pattern of this factor was with *"distance of country"*. Participants shared the following statements related with their kids discipline or behavior:

Employee B4: *"I get stressed sometimes with my children's behavior since they usually do things as they want which stress me out. They don't listen to me."*

Employee B13: *"In my case, my little brother is like a son to me... I am doing all my best to give him a better future, but his behavior drives me crazy. His grades [school] are bad, and it makes me feel very sad and causing a lot of stress"*.

Employee E1 & E2: *"When my kids do not obey me, that is really stressful"*.

Employee E8: “*My little girl stresses me a lot when she does not want to do her homework even though I ask her to do it. She never listens to me, and that stresses me out a lot.*”

#### **5.4.3.2.5. Lack of communication**

The lack of communication was one of the most stressful factors mentioned by participants. A common co-occurring pattern with this factor was “*abandoned family*”, “*distance from country of origin*”, “*family behavior*”, and “*lack of closeness*”.

The lack of communication factor was mentioned as a common behavior occurring between employee’s families current in the U.S., and also with the family members living in their country of origin. For example, Employee B1 said, “*I feel stressed out when I call my son and he doesn’t answer me. Then I don’t understand what is happening because we usually have good communication. If he doesn’t answer the phone is because something has happened to him*”. As a result of withheld family information from their native countries, participants state communication is a stress factor. For instance, Employee B5 said, “*First of all, communication is the main cause of stress, sometimes something bad has happened back home and my family don’t say anything to me, I get very stressed*”. Likewise, a participant was more specific by providing a reason of the factor that causes stress due to communication. Employee B6 shared, “*I get stressed out if my mom doesn’t answer my calls. I know she spends all day at church and is not easy to reach her. After church hours, she doesn’t call me back and get really worried something bad happened to her.*” Consecutively, Employee B3 said, “*The communication with my mother stresses me out because sometimes we don’t talk for*

*3 consecutives days. I have not time to call and she doen't call either. This situation stresses me out a lot".*

Furthermore, in an opposite trend, participants also shared an increased stress level when their family members constantly call them during work hours. For example, Employee B2 said, *"It stresses me out when I'm having a bad time at work and I start getting calls from my mom or my brother ... sometimes It makes me feel bad because I'm stressed at work and I don't answer them in a pleasant way. Then I regret it later but I feel like I have both the stress of work, and the stress of my family"*.

#### **5.4.3.3. Question 1.3: What are the primary things that cause stress for you in the community?**

##### **5.4.3.3.1. Lack of transport**

In this study, the lack of transportation (i.e., personal, public, and private) was shared by the participants as a stress factor. The factor "*lack of transport*" co-occurred with "*city development*" and was mentioned by those employees living far away (rural town/areas) from the nearest city or town, and do not have personal transport. In several cases, participants had to depend on someone else to go to the grocery store, doctor appointments and get to the workplace. The following dialogue shows the participants testimony related to this stressful factor:

Employee B9: "*Well, I do not have a car... My life is just from work to home and from home to work... I have not been in the closest town in the area at all.*"

Employee C2: "*Sometimes I would like to visit another city... but, it is impossible because I don't have a car... so I have to ask someone else for a ride, and this is stressful at a times. The worse case scenario is when I need to go to the clinic or have*

*an emergency situation. Then, I depend either on others' availability to take me or their free time to schedule an appointment".*

Employee E4: “*The lack of personal or public transport is very stressful to me.”*

As a suggestion to overcome the lack of transportation issue, Employee F3 mentioned the importance of available public transportation around town: “*I think it is important to have a taxi company for example. We must drive long distances between home and grocery, and other places. We have only one gas station here, and only the nearby town has Walmart. Without transportation, our quality of life is compromised*”.

#### **5.4.3.3.2. Distance from city**

The majority of the participants of this study, lived in places located more than 25 miles from the city area. A co-occurrence behavior was found between this factor and “*city development*”, “*lack of entertainment*”, and “*lack of public transportation*”. The dairy workers shared there was not enough time to visit the city and find needed supplies on their one (n = 1) day off per week. Additionally, weather conditions impact their decisions to travel the 30 min or longer to the city, depending on the road conditions. Along with mentioned distances, tiredness influences their decision to stay at home and use the day off to rest. The following dialogue supports participants statements related to stress caused by the distance of their living places from the city:

Employee B2: “*Distances to everywhere is stressful to me, specially those days that I want to stay at home and sleep after a long week; however, I know it is the only available day I have to get all that I need*”.

Employee B8: “*I think not having sort of “shopping centers” in our town is stressful. Sometimes you want to buy clothes, shoes, and things like that... or sometimes just to*

*get distracted. As we don't have option, we have to drive a lot to the city, and by the time you get to the shopping center, it's about to close. We don't have enough time and this situation is frustrating and very stressful".*

Employee F2: “*The distances between towns are stressful. Sometimes I need to run to the bank and I have only 20 minutes to get there before closing. The fact is that it might take 20 minutes or more just to drive there*”.

Employee F6: “*The fact of having to drive everywhere stresses me out since everything is so far away. It takes basically 30 minutes to go and 30 minutes to head back... it is stressful.*”

#### **5.4.3.3. Law enforcement**

Among the study, participants shared the level of stress they face when the local law enforcement is seen while they are driving. They fear that police officers will stop them when seeing they are Latinos/Hispanic of origin. A common co-occurring pattern observed was the relationship of “*law enforcement*” with “*city development*”, “*lack of communication*”, “*cultural differences*”, “*English language barrier*”, “*lack of confidence*”, and “*lifestyle*”. The following examples show the different dairy workers’ perceptions of how the police officers contributed to increasing their stress levels:

Employee A7: “*The police stress me a lot. I have the feeling that they are constantly looking at you... and observing the mistakes you are about to make, and then, they [police] will stop you*”.

Employee C3: “*I get very stressed out when I see the police officer, just because immigration is an important topic in this country... this is the reason I don't leave the house when not needed. I feel the need of isolating myself. Usually, when I need to get*

*out, I look constantly around to every car I see if it is or not the police officer. Being honest, it's very stressful".*

Employee C4 & C6: *"The police stresses me out... I have never been stopped but when I see the police car, I get really nervous and stressed out."*

#### **5.4.3.3.4. Cultural differences**

The negative emotions associated with the acculturation increase the levels of stress among Latino participants. The experience of being exposed and judged by a different culture increased the level of stress in FG participants. For example, Employee C1 said, *"In the community where I'm living, I feel that people look different at me just because I am Latino and I culturally different"*. Consecutively, Employee C3 stated, *"I have felt the same. I think people hear a Spanish word... or see someone Latino ... Automatically they associate with bad people... This situation stress me out and I think they are not aware of the reasons behind the Latinos immigration"*.

On the other hand, the Employee D4 felt discriminated by other non-Latino immigrants that act differently towards him *"I know when someone from another country look at me with a total disregard. It is stressful"*.

The participants shared that they would like to feel accepted and the situations described above make them feel sad.

#### **5.4.3.3.5. Linguistic barrier**

English language barrier commonly co-occurred with *"lack of communication"* and *"city development"*. The employees that are unable to communicate in English shared having high levels of stress. For example, Employee A1 said, *"The language barrier we have, honestly, stress me out. In situations that I need to communicate and I*

*cannot speak in English, I feel really stressed. I use my phone to help me with translations and even not being accurate, at least give me the directions I need". Then, Employee A2 agreed with Employee A1 stating that "The fact of not being able to understand what people are saying is very stressfull and brings desesperation. I also use a translator app as he said (employee A1), but it is not the same".*

Moreover, Employee C5 shared that even when trying to communicate in English, it is stressfull because the other person does not understand him, *"Usually, when I go to the store and I have to speak English, I feel that the person at the store don't understand what I am saying. On the other hand, I don't understand what they are trying to tell me".*

Participants shared the importance of learning English; however, they feel good and safe when a Spanish interpreter or speaker is available. Places where signs in Spanish or both languages are displayed were mentioned as something that the nearby communities should implement to make them feel welcome.

#### **5.4.4. Phase-2. Practices that participants applied to reduce stress related to work, family, and the community**

##### **5.4.4.1. Question 2.1: What do you do or what can you do at work to reduce stress related to work?**

###### **5.4.4.1.1. Talking to someone and asking for help**

Talking to someone or asking for help was a good strategy to relieve stress at work according to all the FG participants. There are many individuals to talk to, including their colleagues, friends, or family according to the participants. A common co-occurring patter of this factor with *"situation analysis"* and *"avoiding problems"* as found. For example, Employee A1 mentioned, *"It is important to talk to someone at work to help*

*solving a situation that causes you stress...if something is stressing me out, I like to talk about it".* Similarly, Employee A6 shared, *"That's right! You might get a good advice when sharing your feelings. Getting our worries out also help to continue with our day activities"*. In the same way, Employee A3 said, *"I agree. We should socialize more at work because helping each other will reduce our stress"*.

The same strategy and thoughts were expressed by others FG participants. The following dialogues show more examples and recommendations used by dairy workers:

Employee B6: *"Having a good talk to someone helps me a lot... I actually recommend it to reduce stress."*

Employee B7: *"I like to eat hahaha... [sense of humour] ...but I agree that talking to someone is a good way to reduce stress... I have experienced that, and just by making jokes, or sharing something funny helps me to feel better"*.

Employee C4: *"I believe it is good to talk to someone."*

Employee C6: *"By talking with someone who is a friend or a colleague help to reduce stress... I have used this practice and it has helped me a lot."*

Employee E6: *"I reserve time to call either my family or a friend. When I call my sister, she understands me a lot and makes me feel better after talking to her."*

#### **5.4.4.1.2. Physical activities**

Physical exercise helping to alleviate the physical and psychological impact caused by the stress at work was shared during the FG sessions. A co-occurring pattern of this factor with *"communication"*, *"consumption habits"*, *"family activities after work"*, and *"self-motivation and hobbies"* were observed.

Physical activities indoors or outdoors were practices at the workplace between breaks or at home after work according to participants. Outdoor activities included playing soccer, fishing, walking, running, hiking, etc. The following statements show examples of stress release strategies related to physical activities shared by the participants:

Employee B4 & E2: “*I like to work out because it helps a lot to alleviate stress*”.

Employee B6: “*It might sound funny but, during my breaks I like to dance with my friends at work... we play music... it reduces negative effects of the routine*”.

Employee E5: “*Agree! Workout is a good technique... or dancing*”.

Employee E9: “*I like to shower after work, and then, I ride my bike... it is helpful to reduce stress by just going out for a few minutes or hours*”.

#### **5.4.4.1.3. Situation analysis**

As the participants shared, evaluating what is causing stress helps manage the stress levels at the workplace. Therefore, employees were able to control what was causing disruption at work by analyzing the situation and making the right decisions. In this regard, Employee A2 said, “*I like to take a pause for example, and go for a walk to think about the situation. After that, I feel much better to get back to my daily routine*”. Employee A5 added, “*I agree. If I think about the situation which is bothering me and trying to find ways of making things better is the best way to reduce stress*”. Employee A7 mentioned, “*Well, I just try to analyze the situation and adjust it*”.

Furthermore, a change of activities may help to reduce stress as shared by others FG participants. For example, Employee F2 said, “*I prefer to find something else to do. It helps me to understand what is going on and handle the stress*”. Employee F2 agreed, “*I*

*think it is good to consider slowing down sometimes. If I want to perform my job in a proper way and knowing which activities are causing me stress, I try either to control it or control myself.”*

#### **5.4.4.1.4. Self-motivation techniques**

According to participants in this study, the key to reduce stress was techniques of self-motivation associated with having hobbies. Interestingly, the great hobby was listening to music and singing. Self-motivation co-occurred with “*situation analysis*”, “*communication*”, “*family activities*”, and “*physical activities*”. The following examples shows the participants’ testimony:

Employee A4: “*When I am stressed about something related to work, I get my phone to play music since it helps me to calm down... and I like to sing as well*”.

Employee B4: “*Listening to music helps reducing stress ... with headphones I play the music I like. ... Reading is another strategy I like because I can learn about something*”.

Employee C3: “*I like all types of music, but when I play marimba from Guatemala, I feel much better*”.

Employee F2: “*If I feel stressed out at work, I prefer to do something else that motivates me like reading a book or the news and listen to music*”.

Employee G7: “*I listen to classic music to motivate myself and to reduce my stress at work*”.

#### **5.4.4.1.5. Social interaction**

Both the quantity and the quality of social relationship that individuals have with others at work help reduce stress levels among employees. A common co-occurring

pattern between this factor with “*communication*”, “*consumption habits*”, “*family activities*”, “*self-motivation & hobbies*”, “*physical activities*”, and “*psychological needs*” were found.

Changing the topic or telling stories that make them feel happy seemed to be a great way to reduce stress between dairy workers. Some of the participants shared that the use of humour and appreciating peer jokes helped them to reduce stress. They also mentioned only sharing jokes with closer co-workers to avoid misunderstandings with other employees. Jokes may have religious, political, or other content that may be offensive to other people beliefs. For example, Employee A3 said, “*I believe that making jokes or sharing fun facts with my colleagues helped me a lot to reduce stress...*”. In addition, Employee A6 said, “*I agree. Interacting with my colleagues makes getting through the day a lot better ... Together with my team workers we sometimes make jokes or talk about something that we love sharing... the social time is very important to us.*” Employee B7 also added, “*Socializing with my colleagues is a good way to reduce stress at work... sometimes just by telling something fun or “cotorrear” ... [cotorrear, Mexican terminology for jokes] ... I feel that it helps me a lot at work.*”

In addition to social work time, participants also mentioned the importance of sharing time with colleagues after work in reducing stress. For example, Employee D5 said, “*I meet my colleagues after work to cook and have some drinks... spending time with friends helps to relax, especially if there is someone from our same place (country of origin city/hometown) ... we share stories about home and it's just amazing*”. From another FG, Employee F1 mentioned, “*We try to spend some time together after work. It drastically reduces our stress levels*”.

#### 5.4.4.1.6. At-home activities

Interestingly, participants did not hesitate to share that spending quality time with their families or doing home activities (i.e., hobbies) helped them cope with work-related stress. The following examples were shared by participants during the FG sessions:

Employee B2: “*I like to cook; it is something that has helped me a lot to reduce stress after work.*”

Employee E1: “*Sharing time with my family, especially with my kids, is something that has helped me to reduce stress after work.*”

Employee C2: “*Spending time with my family, it is something that has helped me to reduce stress.*”

Employee F2: “*When I get home from work, I like to spend time with the kids and play something. This activity helps me to be relaxed and forget about my job problems*”.

#### 5.4.4.2. Question 2.2: What do you do or what can you do to reduce stress related to the family?

##### 5.4.4.2.1. Family communication

Qualitative comments from dairy farm employees concerning family communication and coping with stress were uniformly positive. This strategy was observed as one of the most important practices used by the dairy workers, particularly if they have family back in their country of origin. For instance, a farmworker said, “*Well, communication with family is the most important thing... reduce a lot of stress and makes you feel good (Employee A4 & A5)*”. Other employees agreed and added “*I have some problems with my daughters because they don't understand some of the processes we*

*have to go through. But after communicating they understand better, and it is the best way that has helped me to reduce stress (Employee A2 said)” and “I think that, if you have problems, it is important to communicate... it is the only way that helped me to reduce stress (Employee E1)”.*

Furthermore, participants mentioned ways they communicate with their families back in their country of origin which is by phone or video calls. For instance, Employee D1 said, “*I have to call my dad more often because if he doesn’t hear from me, he gets sad and this stresses me out... so, I have to call him almost every day*”. Then, Employee D3 said, “*I have to call my family at least every 2 days to avoid stress... they think I don’t want to talk to them and so... that made me to have called them more often*”. The following statements are more examples shared during the FG sessions:

Employee E3: “*I think that calling the family, or make video calls, it is a good way to communicate and reduce stress.*”

Employee E4: “*I have to call my mom, make video calls while I am in bed so she can see that I am fine... otherwise, if I do not call her she will stress me out*”.

Employee E8: “*I think that communication is the key to reduce stress... I feel much better after calling my family*”.

Employee G4: “*I send text messages with my family constantly. I know that if I do it, they will add less stress on me by asking if I am okay*”.

Employee G6: “*Just by talking with my family, my parents, I feel less stressed out.*”

#### **5.4.4.2.2. Outdoor activities**

The habit of participating in outdoor activities helped workers in reducing stress caused by their family members. Outdoor activities included playing with their children,

riding a bike, fishing, walking, going to the gym, short trips to a different city/town, etc.

A co-occurrence association was found between this factor and “communication” and “family activities”. Among these, were unique ways of describing this relation:

Employee A3: “I enjoy playing with my kids. I feel that changing the routine by doing this has helped me to reduce stress”.

Employee A5: “I like to go for a walk and appreciate the nature. It helps me to feel less stressed out.”

Employee B8: “I love to play basketball. It is the key to reduce my stress.... I also walk with my sisters. We talk and enjoy each other”.

Employee C5: “I usually go to the gym with my brother. We both get tired after working out, but we feel much better, less stressed and more relaxed”.

Employee F2: “My favorite activity is to ride my bike, going around and seeing different places. It helps me to reduce stress”.

#### **5.4.4.2.3. Financial support**

A common expressed thought was the possibility of providing financial support to their families back in their countries of origin helped reducing stress. Financial support co-occurred with “*communication*”. Especially, according to participants’ testimony when family members have health problems or for children’s education. Focus group participants were asked to

describe some examples related to managing their finances and reduce stress. Below some examples:

Employee G4: “*I have to support my family financially and when I can send some money, it makes me feel good*”.

Employee G3: “*Helping my family financially makes me feel happy because I know that after I send them some money, they will be fine for a few days*”.

Employee G8: “*I do not see my family often, but I know they need help with money... and this is something (financial support) that I can do to make me feel better*”.

#### **5.4.4.2.4. Family motivation**

Family relationships can also help people to stay motivated when trying to achieve their goals or having to address a problem. Participants commented that on several occasions they motivate members of their family to help with their current life situation. This type of assistance helps the employees in reducing stress. Co-occurrence was observed with “*communication*”, “*family activities*”, and “*financial support*”. For example, Employee A7 said, “*Well, I do not have another option... we go through difficult moments and those make me feel sad. So I have to motivate my mom... when I see her happy, it makes me feel better*”. A participant from another FG shared a similar example. Employee E7 stated, “*I think the best way to reduce stress is to motivate my family. This helps me to reduce stress and... I avoid a higher stress by motivating them*”. Employee E9 added, “*I have also to motivate my family encouraging them to visit other people. It helps me to reduce a lot of my stress if I know they are doing fine. I don't want them thinking about the problems I have.*”

#### **5.4.4.2.5. Home activities**

Additionally, participants mentioned that home activities helped them to reduce levels of stresses caused by their family members and a pattern association was observed with “*communication*”. Activities such as watching tv, playing with the children, playing

music, dancing, etc., were ways that the participants interacted with the family. The next examples were shared by participants during the FG sessions:

Employee A2: “*I watch tv with my kids, we watch movies... or we play music too.*”

Employee B5: “*I like to watch soccer games.*”

Employee E5: “*I watch soccer games and also I dance the guajolote [Mexican dance].*”

Employee F3: “*I like to watch tv with my daughter.*”

#### **5.4.4.3. Question 2.2: What do you do or what can you do to reduce stress related to your community?**

##### **5.4.4.3.1. Problems avoidance**

Participants shared that not being exposed to unsafe places within the community, helped reduce their stress levels. For instance, Employee B1 said, “*I prefer to visit the places where I feel comfortable... I don't visit those that I know I will get stressed.*”

While Employee C4 said, “*Well, I think is good to avoid participating in some events that will cause me stress, and then will give me some problems.*” Furthermore, a participant shared this strategy related to his country of origin. For example, Employee E1 said, “*In my country, I always think that the best option is to don't get exposed to unsafe places... not hanging out until late... or going to bars... it is less stressful.*”

Consecutively, Employee E2 supports his statement, “*I agree with him... the best thing to avoid stress is not getting exposed to the community that has unsafe places.*” One person described a situation where we should educate the children and youth about the consequences that may happen by getting exposed when visiting unsafe places, and stated, Employee E3 “*We need to teach our kids why it is so important to study, to work...*

*It will help them to don't get exposed to unsafe places or to don't join a dangerous group of people... it will be less stressful for us as parents also." Likewise, other participants would say, Employee E8, "Avoid the problem by getting exposed is the best way to reduce stress." And finally, Employee E9 shared, "I do not like to have problems... if there is something that makes me feel uncomfortable is better to talk to fix the situation... or just as they said [FG participants]... avoid problems, get away from places what will give more problems."*

#### **5.4.4.3.2. Improve communication skills by studying English as second language**

Patterns associated with this factor to reduce stress were "avoid problems", and "city development". Learning English as a second language has helped some of the participants to reduce stress caused by the community where they reside. Additionally, some of the employees shared this strategy as a recommendation for the ones that mentioned the lack of communication due to the language barrier. For instance, Employee A4 said, "Learn some English might be the key to reduce stress when we visit places that do not have Spanish or translators available". Additionally, Employee A5 stated, "Yes!! Learn English can help us to improve our communication with the community in general." A participant from another FG shared his experience when he interacts with his neighbor, Employee D5 shared, "I feel good practicing English because makes me feel more comfortable to interact with my neighbor... I feel more confident now by saying, hi! Good morning! Good night! So, that is why I think it's important to learn English." Also, Employee F2 said, "I try to learn English so I can communicate in my community... I also have met people that help me to improve my pronunciation and that makes me feel happy." Then, Employee F4 shared, "I like to go to the English

classes that the community offers... it is like a relax time to me, makes feel part of the community... and I know it will help me to communicate."

#### 5.4.4.3.3. Outdoor activities

Participants, in general, were residing in rural areas with minimum recreational options which reflect on their outdoor activities. There are several outdoor activities in other areas, but they need to drive travel more than 5-10 miles (bigger cities) from their homes to recreate.

A common co-occurrence pattern to this factor was "*city development*", "*communication*", and "*self-motivation & hobbies*". Participants considered that visiting other places is important, and according to them, it helps to reduce stress. For instance, Employee F4, "*I take my car and I drive to another city to spend some time shopping*". A similar strategy was shared by Employee G5, "*I like to travel, make a short trip to the nearby city that has a variety of places to visit*". Also, Employee G7 added, "*Since the place where I live is too small and we do not have a gas station, I have to drive to another city to get gas but to me is like to make a trip... I visit other places and it makes me feel less stressed. This changes my routine in some way.*"

On the other hand, participants that do not have a personal vehicle mentioned that being able to go to the grocery store at least, helps to reduce some stress. For example, Employee G1 said, "*Only when I go to the main city to pick some groceries up at Walmart, I get relaxed walking inside the store*". Then Employee G4 added, "*I agree. I do not have a car. Only when I go to Walmart, I see something different and it helps in some way to feel less stressed out*". Then Employee G3 said, "*It would be nice to enjoy some outdoor activities, but I don't have a car*".

#### 5.4.4.3.4. Community networks

The participants shared that the community is lacking more public options for interaction during social meetings to reduce stress. A common co-occurrence association to this factor was “*communication*”, “*consumption habits*”, “*hobbies*”, and “*outdoor activities*”. During the groups’ discussion, the social gatherings with friends in the community were share as a factor that decreases stress in the Latino dairy workers. And also attending local events help people to get more involved in their community. For example, Employee A6 said, “*I like to spend time with friends of the community... we cannot go to the movies (language barrier) but we can go at least to the Mexican restaurant and enjoy friends' company. It has helped me to reduce a lot of stress*”. A participant from another FG shared something similar, Employee B8 stated, “*It's always good to socialize because I avoid topics that cause me stress which makes me feel good, I think*”. Also, a participant mentioned the importance to help each other by socializing. For instance, Employee E7, “*The best thing within the community is to help each other... socialize and participate in the community*”. Additionally, the Employee F5 said, “*The best way is socializing with other. For me, I go to church and it helps a lot*”.

#### 5.4.5. Phase-3. Closing remarks

##### 5.4.5.1. Question 3.1: What physical changes have you experienced due to stress?

At the end of the FG sessions, participants self-reported the physical changes they experienced due to stress. All participants described a single and co-occurring physical change due to stress. *Body tension* was the most frequent word reported among participants, as observed in the word cloud (Figure 5.1). In our results, the body tension symptom co-occurred with “*headache*”, “*feeling of pressure*”, and “*tiredness*” as shared

by the participants. “*Anger*” was another word that often emerged during group discussions. Feeling “*anger*” was associated with “*pressure feeling*” and “*lack of sleep*”; furthermore, some participants related this anger emotion with the desire to consume alcohol. Additionally, in this study, the sign of “*feeling pressured*” was reported as a single response to physical changes due to stress. Additionally, alcohol and tobacco use co-occurred with signs of “*feeling depressed*” and “*feeling pressured*”.

Signs of “*depression*” were also mentioned, and it co-occurred with “*gained weight*” as a response to stress. Among the association of the symptoms mentioned above, “*gained weight*”, “*headache*”, “*lack of attention*”, “*lack of sleep*”, and “*feeling tired*” were also highlighted as a single physical pattern due to stress by other FG participants.

#### **5.4.5.2. Question 3.1: What causes you insomnia?**

Specific causes of insomnia due to stress were self-reported by participants of this study as shown in the word cloud (Figure 5.2.). According to participants, *the family* was quoted as the single cause of insomnia, while others related to “*financial situation*” and “*personal problems*”. Furthermore, another cause of insomnia due to stress was highlighted as being their job (“*my job*”) which was the second major pattern shared by participants.

In this study, a common pattern that co-occurred with “*my job*” was “*social habits*” and “*consumption habits*”. Other common causes of insomnia included “*not being able to travel*”, “*immigration concerns*”, “*the use of technology*”, and “*feeling anxious*” were shared across all the FG meetings.

#### 5.4.5.3. Question 3.1: How would you describe STRESS in one word?

All FG participants shared their way to describe stress in one word at the end of each session. Not surprisingly, the most stated word (Figure 5.3.) was “*winter weather*” which co-occurred with “*driving in snow*” and “*summer weather*”. Participants quickly added the word “*summer weather*” as a stress factor secondary to the long periods of low temperatures because summer is short but has few weeks of high temperatures.

Participants also mentioned, “*the job*” as a definition of stress, which co-occurred with “*the routine*” at their workplace. Participants that shared “*the routine*” as a stress factor added “*waking up too early*” or “*trying to sleep in the daytime*” (night crew) as causes of stress.

The following words shared by the participants as “*behavior*”, “*tiredness*”, “*anger*”, “*pressure*,” and “*worried or anxious*” were grouped in “*physical and psychological effects*” category. Another single description of stress such as “*English language barrier*”, “*family*,” “*the lack of time*,” and finally “*immigration concerns*” were highlighted across all focus groups sessions.

## 5.5. DISCUSSION

This study helped to identify the variety of factors that cause stress in dairy workers. Furthermore, it identified several practices that participants used to manage stress levels related to work, families, and communities. Our study shows the validation of the focus group methodology to explore and observe the leading causes of stress that negatively affects Latino/Hispanic dairy farm employees. Lack of communication, interruptions at work, cattle handling, hospital pen (cows & calves) management,

equipment failure, summer & winter season, job productivity, teamwork, and leadership emerged as the main stressors related to the workplace.

The discussions highlighted the importance of specific educational programs aimed at improving cattle handling, prevention and animal diseases management, and improve communication skills. Latinos workers are among the population that has been the most affected by the winter season in the Midwest due to their lack of experience living and working in cold environments. Trivial as it seems, it is essential that producers communicate effectively with them about freezing temperatures, road conditions, and resources related to winter weather.

Family relationships were highlighted as a source of stress. Stressors caused by participants' family members included the lack of family quality time, illness within the family abroad, family estrangement, lack of child's discipline, and lack of communication. Furthermore, stressors related to the community were associated with the lack of transportation, travel distance across cities, law enforcement, cultural differences, and the English language barrier.

Participants also discussed some of the coping strategies they used in response to stressful situations. These strategies could be summarized as: improve communication skills, dedicate to outdoor activities, spend time with family/home activities, practice self-motivation, engage social interactions, and provide family financial support.

In general, according to participants of this study, the majority of their stress factors relate to the workplace which effects their work efficiency and productivity, their personal relationships, and their stability within the community. Previous researchers reported stressors in Latino employee and also related to the workplace as "*I make little*

*money*", "*I have been taken advantage of by my employer or supervisor*", "*There is not enough water to drink when I am working*", among others (Ward et al., 2010). Magaña and Hovey (2003) also found rigid work demands (e.g., long hours working shifts, absence of days off, working when raining) as the most typical responses of stress in Latino farmworkers. A few participants shared in our study the stress caused by the strong personality of some mid-managers on employees; however, these stressors were not considered as abusive or exploitative work. Nevertheless, our study has shown how the dairy farm employees daily work routine are related to their stress levels (e.g., cattle handling, equipment failure, hospital pen activities, calves, maternity) as indicated above. Besides, it is important to mention that a group of participants shared a common feeling of being comfortable with their workplace and job tasks (e.g., "*I love my job*" and "*I like a lot what I do at my job*"); however, these feelings besides improving their morale do not help to decrease stress caused by their job routines.

Our findings agree with previous research on family stability or estrangement, lack of communication, and financial problems that impact the mental health and well-being of Latino/Hispanic dairy workers (Magaña and Hovey, 2003; Ward et al., 2010; Salas et al., 2015). Grzywacz et al. (2006) mentioned that Latino farmworkers frequently leave family, friends, and community for protracted periods of time while facing cultural and language differences. This finding was also supported by Piedra et al. (2010), that foreign born Latinos living in the U.S. have increased stress due to culture and language barriers.

Our study highlights the stressors related to the community where participants reside. The shared particular circumstances of lack of entertainment places, lack of public

transportation, English language barrier, cultural differences, immigration concerns, lack of community support, lack of proper housing, among others are in line with previous studies (Hiott et al., 2008; Ward et al., 2010; Salas et al., 2015; O’Neal et al., 2016).

Nevertheless, participants shared coping skills that they apply to manage stress either at home or at their workplace. Several of the skills included: improving communication, asking for help, learning English, re-evaluating situations, holding social events, performing outdoor activities, having more family time, discovering new hobbies, visiting other cities, etc. These are some of the most common practices mentioned by participants regardless of their educational background, gender and country of origin.

Alegria et al. (2008) mentioned that the Latino population have not been assessed in mental health or treatment centers. According to Arcury and Quandt (2007), this demographic group has typically limited access to health and social services. Furthermore, we believed the language barrier coupled with the lack of free personal time which limits this group to accessing professional help. In chapter one, our results on health status revealed that 50% of the participants did not visit health clinics because of language barriers. The participants also commented the minimal or lack of community resources (e.g., translators, public health centers) as a stress factor which contributes to not seeking medical or mental health assistance.

Furthermore, this population may have a higher mental health risk due to stressors impact related to their job performance and lifestyle. These stressors include but are not limited to, insomnia, general physical body changes and the workplace. Additionally, the participants’ workplace is far more complicated than it had been years ago. Their co-

workers are no longer only family members or friends, but people of different ages, gender, and countries.

## **5.6. CONCLUSION**

The present study revealed evidence of the different stress factors related to work, family, and community. The findings suggest the importance of providing training to dairy workers on how to reduce stress concerning work activities (e.g., cattle handling) and employee's management (e.g., leadership, team group). Furthermore, workshops on managing personal stress (e.g., how to communicate, how to manage time) may increase employee motivation and morale and consequently might assist in reducing stress. Also, future studies are needed to evaluate the impacts of stress on general health among dairy farmworkers.

## 5.7. REFERENCES

Alegría, M., G. Canino, P. E. Shrout, M. Woo, N. Duan, D. Vila, M. Torres, C. N. Chen, and X. L. Meng. 2008. Prevalence of mental illness in immigrant and non-immigrant US Latino groups. *Am. J. psychiatry*. 165(3): 359–369.  
<https://doi.org/10.1176/appi.ajp.2007.07040704>.

American Psychological Association. 2018. Stress About Health Insurance Costs Reported by Majority of Americans, APA Stress in America™ Survey Reveals.  
<https://www.apa.org/news/press/releases/2018/01/insurance-costs.aspx>.

Arcury, T. A., and S. A. Quandt. 2007. Delivery of health services to migrant and seasonal farmworkers. *Ann. Rev. Public Health*. 28: 345–363.  
<https://doi.org/10.1146/annurev.publhealth.27.021405.102106>.

Grzywacz, J. G., S. A. Quandt, and T. A. Arcury,. 2008. Immigrant farmworkers' health-related quality of life: An application of the job demands-control model. *J. Agricultural Safety and Health*. 14(1): 79–92. <https://doi.org/10.13031/2013.24125>.

Hiott, A. E., J. G. Grzywacz, S. W. Davis, S. A. Quandt, and T. A. Arcury. 2008. Migrant farmworker stress: mental health implications. *The Journal of Rural Health*. 24(1): 32 –39. <https://doi.org/10.1111/j.1748-0361.2008.00134.x>.

Hovey, J. D., and C. G. Magaña. 2002. Psychosocial predictors of anxiety among immigrant Mexican migrant farmworkers: Implications for prevention and treatment. *Cultural Diversity and Ethnic Minority Psychology*. 8(3): 274–289.  
<https://doi.org/10.1037/1099-9809.8.3.274>

Magaña, C. G., and J. D. Hovey.2003. Psychosocial stressors associated with Mexican migrant farmworkers in the Midwest United States. *J. Immigrant Health*. 5(2): 75–86. <https://doi.org/10.1023/A:1022955825650>.

Malik, N. 2011. A study on occupational stress experienced by private and public banks employees in Quetta City. *African Journal of Business Management*. 5(8): 3063–3070. <https://doi.org/10.5897/AJBM10.199>.

National Institute for Occupational Safety and Health (NIOSH). 2014. Stress at work. Accessed August 22, 2020. <https://www.cdc.gov/niosh/docs/99-101/default.html>.

O'Neal, C. R., M. M. Espino, A. Goldthrite, M. F. Morin, L. Weston, P. Hernandez, and A. Fuhrmann. 2016. Grit under duress: Stress, strengths, and academic success among non-citizen and citizen Latina/o first-generation college students. *Hispanic Journal of Behavioral Sciences*. 38(4):446–466.  
<https://doi.org/10.1177/0739986316660775>.

Piedra, L.M., Furman, R. and Negi, N., 2010. Latinos & Spanish: The awkwardness of language in social work practice. *Social work practice with Latinos*, pp.262-281.

Salas-Wright, C. P., E. H. Robles, M. G. Vaughn, D. Córdova, and R. E. Pérez-Figueroa. 2015. Toward a typology of acculturative stress: Results among Hispanic immigrants in the United States. *Hispanic J. Behavioral Sciences*. 37(2): 223–242.  
<https://doi.org/10.1177/0739986315573967>.

United States Census Bureau. 2020. Hispanic Heritage Month 2020. Accessed December 8, 2020. <https://www.census.gov/newsroom/facts-for-features/2020/hispanic-heritage-month.html>.

Ward, L. S., A. D Tanner, and R. Officer. 2010. Psychosocial stress and health-related quality of life for Latino migrant farmworkers. *Southern Online Journal of Nursing Research*. 10 (1): 15. Assessed on December 15, 2020.  
<https://www.snrss.org/sites/default/files/SOJNR/2010/Vol10Num01Art07.pdf>.

**Table 5.1.** Questions guide for focus group Sessions

<b>Topic</b>	<b>Questions guide</b>
<b>Phase-1.</b> Mapping mental stress for you	Q1.1: What are the primary things that cause stress for <u>you</u> at work?
	Q1.2: What are the primary things that cause stress for <u>you</u> related to your family?
	Q1.3: What are the primary things that cause stress for <u>you</u> in the community?
<b>Phase-2.</b> Practices that you (dairy workers) apply to reduce stress	Q2.1: What do you do or what can you do at work to reduce work related stress?
	Q2.2: What do you do or what can you do to reduce the stress related to the family?
	Q2.3: What do you do or what can you do to reduce stress related to your community?
<b>Phase-3.</b> Closing remarks in few words	Q3.1: What physical changes have you experienced due to stress?
	Q3.2: What causes you insomnia?
	Q3.3 How would you describe stress in one word?



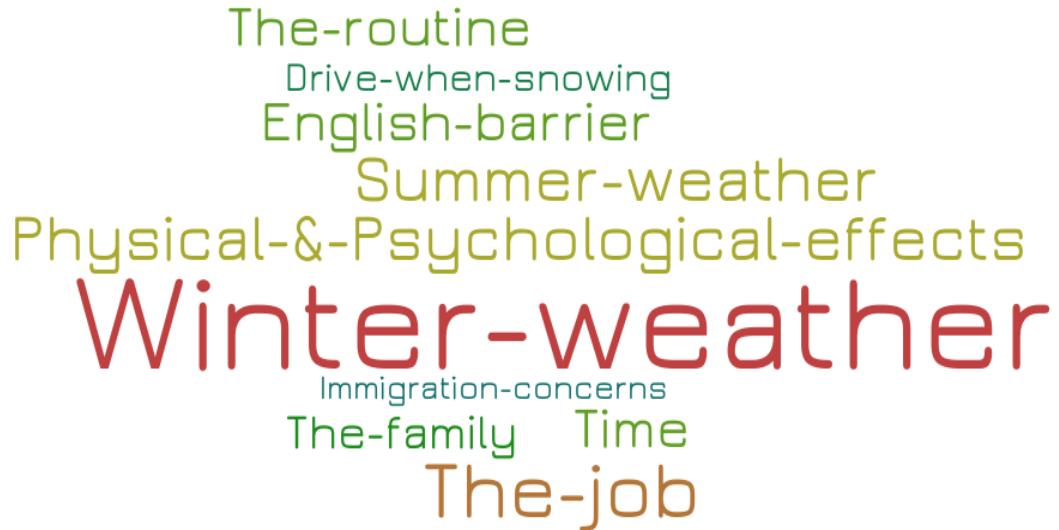
**Figure 5.1.** Focus Group: dairy farms (A & B); Community dairy employees (C & D)



**Figure 5.2.** The word cloud shows the physical changes due to stress in the FG dairy workers participants.



**Figure 5.3.** The word cloud shows the main causes of insomnia in the FG dairy workers participants.



**Figure 5.4.** The word cloud shows how participants of all focus group sessions described *stress* in one word.

## **CHAPTER 6**

### **Conclusions & Recommendations**

## **CHAPTER 6**

### **6. CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1. CONCLUSIONS**

This research fulfilled our initial overall objectives to assess dairy farm employees' general health. The conclusions obtained in the different studies carried out in this master thesis are:

##### **6.1.1. Assess dairy farm employees general and oral health as their eating behavior**

###### **(Chapter 3)**

- Participants' health status is important for their lifestyle and job performance.
- English language barrier and medical cost influence dairy workers decision to seek medical attention.
- Lack of transportation and lack of time due to work schedule limited dairy workers to visit the physician or dental care specialist.
- The workshop helped to share with dairy workers the impact of their eating habits on their health status and motivate them to follow a better lifestyle.

##### **6.1.2. Detect possible impaired vision issues within dairy farm employees and raise**

###### **eye health awareness (Chapters 4)**

- Participants' job performance may be affected due to their vision problems.
- The wellbeing of the herd, high-quality milk, farm profitability might be at risk due to employees' vision impairment.
- The safety of employees who work with heavy machinery might be at risk or may put others' lives in danger.

- The portable Spot Vision machine was a useful tool to detect vision impairments among dairy farmworkers and helped to encourage participants who need further evaluation to visit eyecare specialists.

**6.1.3. Gather information on the main causes of stress in dairy farm employees related to their workplaces, family, and community and how these stressors impact their job performance and lifestyle (Chapters 5)**

- Communication, interruptions at work, cattle handling, and equipment failure were common stressors that impact participants while working. These stressors negatively affect their work routine and efficiency.
- Employees at large dairy farms require more assistance or training that will increase their knowledge of how to mitigate stressful situations.
- Stress-related to participants' relatives was found regardless of their location (e.g., U.S. and country of origin).
- Lack of communication with family members was associated with stress.
- English language barrier hinders the ability of dairy workers to get more involved in the community where they live, causing stress.
- The lack of transportation, poor public transportation, and distance an employee travels to a nearby town contribute to additional stress.
- Participants feel insecure and avoid traveling to different places in the community because they fear being stopped by the police.

## **6.2. RECOMMENDATIONS**

### **6.2.1. Assist the dairy farm producers to:**

- Encourage the employees to have their health and mental status checked, which will benefit their efficiency and productivity.
- Build the right environment to encourage the creative ideas sharing (e.g., farm meetings).
- Encourage them to learn English and understand the cultural differences between the U.S. and their countries of origin.

### **6.2.2. Assist the dairy farmworkers to:**

- Understand that their eating habits can contribute to stress, tiredness, and their capacity to work (negatives and/or positive effects).
- Understand the importance of visiting the doctor periodically (i.e., general physician, eye, dental).

ProQuest Number: 28316265

INFORMATION TO ALL USERS

The quality and completeness of this reproduction is dependent on the quality and completeness of the copy made available to ProQuest.



Distributed by ProQuest LLC (2021).

Copyright of the Dissertation is held by the Author unless otherwise noted.

This work may be used in accordance with the terms of the Creative Commons license or other rights statement, as indicated in the copyright statement or in the metadata associated with this work. Unless otherwise specified in the copyright statement or the metadata, all rights are reserved by the copyright holder.

This work is protected against unauthorized copying under Title 17,  
United States Code and other applicable copyright laws.

Microform Edition where available © ProQuest LLC. No reproduction or digitization of the Microform Edition is authorized without permission of ProQuest LLC.

ProQuest LLC  
789 East Eisenhower Parkway  
P.O. Box 1346  
Ann Arbor, MI 48106 - 1346 USA