ADHERENCE TO FOLLOW-UP RECOMMENDATIONS AFTER HEALTH SCREENING FAIRS AMONG NORTH WILLAMETTE VALLEY VINEYARD WORKERS

By

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A THESIS

Presented to the Department of Public Health and Preventive Medicine
and the Oregon Health & Science University
School of Medicine
in partial fulfillment of
the requirements for the degree of

Master of Public Health

July 2013

School of Medicine

Oregon Health & Science University

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ACKNOWLEDGEMENTS

I would like to thank the members of my committee, Dr. Donald Austin, Dr. Thuan Nguyen, and Dr. Daniel Lopez-Cevallos for their support and guidance through my thesis process. Additionally, I would like to express my gratitude to Tuality Healthcare ¡Salud! Services, especially Leda Garside for her endless enthusiasm for research and practice. I would like to thank my family and friends for their encouragement in this endeavor, and my classmates who have persevered alongside me every day. Finally, thanks to the clients of ¡Salud! Services and other farmworkers across our nation, whose labor brings food and wine to our tables.

ABSTRACT

Farmworkers experience disparities in both access to health care services and health outcomes. The State of Oregon hosts a large farmworker population, often characterized by many predictors of inadequate health care access. These include racial/ethnic minority groups, rural residence, lack of health insurance, linguistic and cultural barriers, financial strains, and lack of documentation for legal residence.

A variety of organizations work to decrease these disparities by providing free health screening services to farmworkers for indicators of chronic conditions such as diabetes and hypertension. Tuality Healthcare ¡Salud! Services is a unique program that provides such assistance to vineyard workers in the North Willamette Valley, as well as small grants for healthcare visits. Early detection of risk factors for chronic disease can allow patients and providers the opportunity to establish a treatment plan that may delay the onset of illness or even reverse it. For screening services to have an impact on health outcomes, adherence to follow-up instructions is vital.

In 2011, 1268 uninsured vineyard workers were registered participants in the ¡Salud! Services program. The majority were male (81.8%) and Spanish-speaking (75.2%). Among those, approximately half (51.3%) attended a health screening fair.

In a cross-sectional comparison of those who attended a health screening fair to those who did not, and this study found that there were significantly more males and Spanish-speakers who attended health screening fairs. While marital status did not differ between the two groups, there were fewer individuals who had family registered into the program and were currently living with family members who attended the screening fair than did not. Overall, there was no significant difference in the prevalence of ICD-9 diagnostic codes for clinical visits relating to cholesterol, blood pressure, or general medical

exams between the two groups. There was a marginally significant higher prevalence of visits relating to blood glucose or diabetes among those who did not attend a screening fair.

Among those that attended the screening fair, 168 individuals were given a referral to a clinic for at least one abnormal screening result. Twenty-five individuals that received referrals (14.9%) sought follow-up care in a clinical setting. This study found that seeking follow-up care was significantly associated with the individual having other family members registered into the ¡Salud! program, but was not significantly associated with other family support level variables including marital status and living with relatives. Additionally, seeking follow–up care was significantly associated with being given a referral for abnormal blood glucose levels, but seeking care was not significantly associated with being given a referral for multiple abnormal results. The implications of these findings are discussed in terms of designing outreach screening, health education, and referral techniques to improve adherence to follow-up recommendations.

CHAPTER 1

INTRODUCTION

Introduction and Significance

This study aims to evaluate the utilization of health services among vineyard workers in Oregon after receiving a referral at an outreach health screening. In Oregon, the farmworker population is large and faces many barriers to accessing health services including: socioeconomic status, insurance status, documentation status, race/ethnicity, cultural and language barriers, migrant lifestyle, and rural residence. As a result of these barriers, many farmworkers do not receive adequate health care and have poor health outcomes. Various local outreach programs, like Tuality Healthcare ¡Salud! Services, seek to provide farmworkers with the opportunity for early detection of chronic diseases through outreach health screenings. Early detection of risk factors for chronic disease can allow patients and providers the opportunity to establish a treatment plan that may delay the onset of illness or even reverse it, especially in the case of complex disease management, such as diabetes. However, this requires that the individual adheres to the follow-up advice associated with the screening outcome and utilizes health services available to them. Little research has evaluated the relationship between outreach screenings and subsequent clinical follow-up of health referrals. Evaluation of such a program may lead to an improvement in terms of designing outreach screening, health education, and referral techniques to increase adherence to follow-up recommendations. The proposed evaluation seeks to analyze follow-up health service utilization specifically around family support level, abnormal blood glucose screening result, and multiple abnormal screening results. ¡Salud! Services considers these as potential areas for future intervention.

Research Questions

1. Is the health status of ¡Salud! Services clients who attended workplace health screening fairs different than those who did not attend in terms of diagnoses received by each group?
2. Is adherence to follow-up instructions given to individuals with abnormal screening results at ¡Salud! Services health screening fairs associated with family support level, abnormal blood glucose screening result, or multiple abnormal screening results?

Specific Aim 1

In a cross-sectional design, compare the proportion of ICD-9 codes for Medicaid reimbursement of diabetes mellitus, hypercholesterolemia, hypertension, and general medical exam for those uninsured vineyard workers who attended a ¡Salud! Services health outreach screenings to those who did not attend. Additionally, compare the proportion of individuals with comorbidity for diabetes mellitus, hypercholesterolemia, and hypertension between these two groups.

Specific Aim 2

Use multiple logistic regression to establish associations/correlations between covariates and adherence to follow-up instructions by vineyard workers.

a. Determine the frequency of seeking recommended clinical follow-up care among individuals who received referrals for one or more abnormal results at a 2011 ¡Salud! Services health screening fair.
b. Among uninsured vineyard workers who received a written referral at a ¡Salud! Services health screening fair, test the association between seeking recommended clinical follow-up and family support level. This study posits:

(H1) Adherence to follow-up instructions will be predicted by increased family support level as measured by marital status, number of family members registered into the ¡Salud! program, and relationship to those sharing housing, after controlling for age and gender.

c. Among uninsured vineyard workers who received a written referral at a ¡Salud! Services health screening fair, test the association between those seeking recommended clinical follow-up care and specific abnormal health indicators. This study posits:

(H2) Adherence to follow-up instructions will be predicted by an abnormal blood glucose result after controlling for age and gender.

(H3) Adherence to follow-up instructions will be predicted by an increased number of abnormal screening results after controlling for age and gender.

CHAPTER 2

REVIEW OF LITERATURE

Background of Farmworkers in the United States

Agriculture and food production in the United States has a long history of reliance on immigrants for labor. As crop production in the U.S. increased in the mid-nineteenth century and slavery was abolished, the demand for labor grew, with seasonal variations in the number of farmworkers required. To address this seasonal shortfall of labor, poor Americans and immigrants from several countries began to fill in as migrant workers; their socioeconomic circumstances made them willing to travel to varied geographical locations to accommodate harvest times. While predominantly Europeans and African Americans in the eastern part of the country, the west coast had its agricultural workforce needs met by immigrants from China, Japan, and Mexico. It was not until the 1930's that the farm labor workforce shifted towards Mexico. A further labor shortage during World War II, led to the creation of the Bracero Program in 1942, which ultimately sponsored the influx of some five million temporary guest workers from Mexico during its 22-year existence (Martin, 2002).

The Bracero Program ended in 1964, however Latin American immigrants, both documented and undocumented, continue to make up the vast majority of the agricultural workforce in the United States, and remain a vital component of America's food production. Today, it is estimated that three million migrant and seasonal farmworkers live in the United States (Larson, 1993). The Department of Labor estimated that in 2002 seventy-eight percent of farmworkers were born outside of the United States. Seventy-five percent of farmworkers were born in Mexico, and an additional two percent were born in Central American countries. The Department of Labor report estimated that fifty-three percent lacked proper documentation to work in the United States (United States Department of

Labor, 2011). In Oregon, there are an estimated 160,429 farmworkers and their dependents currently living in the state (Larson, 2013).

Enumerating and describing the farmworker population in the United States is difficult. Available knowledge about US farmworkers is surprisingly limited, despite a number of federal and state programs that provide health services to them (Villarejo et al., 2000). This may be due in part to a lack of funding for fundamental research on this population, however certain inherent characteristics of the population create other challenges. Farmworkers and their jobs tend to be transient in nature, making systematic assessment of them difficult (Zahm & Blair, 2001). As a result, most research about farmworkers tends to occur on a small scale and is region-specific, often relying on observational or self-reported data. The National Agricultural Workers Survey (NAWS) is the only national information source for demographic characteristics, employment, health and living conditions of farmworkers. While NAWS is a very important dataset, it has some limitations. It surveys only working farmworkers, excluding anyone who may be unable to work due to illness, injury, or disability, and responses about clinic utilization, documentation status, and other factors are self-reported which may lead to some bias. Many farmworkers have limited English literacy, plus a high percentage of them are undocumented, which can decrease their willingness to interact with individuals outside their known community, including health care workers and researchers, for fear of losing their jobs or of deportation (Arcury & Quandt, 2007). All of this contributes to a limited understanding of how farmworkers utilize the health services available to them.

Factors Affecting Health Service Utilization of Farmworkers

Farmworkers are a vulnerable population; they can be described by many factors that have been linked to disparities in access to health care and consequently in elevated

risk for poor health outcomes and mortality (Hansen & Donohoe, 2003). Understanding the complex determinants of farmworker health is an important public health issue (Ward, 2007). Research has indicated overall low rates of health services utilization among farmworkers, especially men. One California study found that about half of male farmworkers had not had any clinic visit in the prior two years, and some 31.8% had never been to a doctor or clinic in their entire lives (Villarejo et al., 2000). Women farmworkers tend to seek health services more frequently, as nearly three-quarters of them reported a medical visit in the previous two years (Villarejo et al., 2000). Beyond the association with gender, health care utilization among ethnic minorities has been found to be associated with age and marital status (Hoerster et al., 2011; Scheppers, van Dongen, Dekker, Geertzen, & Dekker, 2006). The 2001-2002 NAWS data show that nationwide, the farmworker population is relatively young with an average age of 33 and predominantly male (79%). Fifty-eight percent of farmworkers said they were married (Carroll, Samardick, Bernard, Gabbard, & Hernandez, 2005). Disparities in health care utilization have been additionally linked to socioeconomic status, minority race/ethnicity, and insurance status, as well as other factors more specific to the farmworker living conditions. These include family separation, cultural and language barriers, migration, and documentation status. An improved understanding of the complex etiology of health service utilization among farmworkers will lead to more informed interventions at the individual, family, and community levels (Ward, 2007).

Educational Attainment and Income

Low educational attainment and low income are often associated with low health care utilization among ethnic minorities (Scheppers et al., 2006). Educational attainment is generally low among the farmworker population. According to the 2001-2002 NAWS data,

seventh grade was the average highest grade completed by farmworkers, and only thirteen percent had completed high school (Carroll et al., 2005). Literacy levels are low among farmworkers, and many are functionally illiterate in both English and Spanish (Arcury & Quandt, 2007; Ward, 2007). Even if eligible for assistance programs such as Medicaid, farmworkers with limited literacy may find difficulty completing the complex application and enrollment process required to receive care. Similarly, limited literacy capabilities can create challenges when farmworkers attempt to navigate private insurance or the health care system in general.

Farmworkers have one of the lowest median weekly earnings in the United States and are rarely provided benefits by their employers (Ward, 2007). The 2001-2002 NAWS data indicate that the average individual income of a farmworker is between $10,000 and $12,499 per year, and that the average family income ranges from $15,000 to $17,499 (Carroll et al., 2005). Thirty percent of farmworkers interviewed for the NAWS survey had total family incomes below the poverty guidelines (Carroll et al., 2005). Documented agricultural workers in the United States earn substantially more per hour and per week than those who are unauthorized to work in the US (Ise & Perloff, 1995). Undocumented workers are especially vulnerable to receive pay that is lower than minimum wage (Passel & Cohn, 2009). Compounding the issue of low wages is widespread underemployment; due to the seasonal nature of their work, farmworkers experience fluctuations in their income depending upon the planting and harvest seasons. During peak harvest seasons, farmworker income may be high enough to disqualify them from federal assistance; however their annual income could still be below the federal poverty level. Most farmworkers are contractually employed and are paid hourly or by piece rate, therefore many are not willing to take unpaid time off from work to seek medical attention.

Race/Ethnicity and Foreign-Born

Farmworkers often experience the same barriers to health care as do racial and ethnic minority groups and foreign-born immigrants. The majority of farmworkers in the United States are of Mexican descent; of those interviewed for the 2001-2002 NAWS, eighty-three percent of farmworkers self-identified as being Hispanic or Latino, and seventy-five percent stated they were born in Mexico (Carroll et al., 2005; National Center for Farmworker Health, Inc., 2009). Only twenty-three percent of farmworkers were born in the United States (Carroll et al., 2005). Evidence indicates that Hispanics seek health care services less frequently than the general US population. One study found that a significantly smaller proportion of Hispanics made at least one ambulatory health care visit in the last year than that of all other ethno-racial groups (Ezzati-Rice & Rohde, 2008). Hispanics are significantly less likely to be insured and to have a regular health care provider than white populations (Hargraves, 2004). Additionally, Hispanics are significantly less likely than non-Hispanic whites to have participated in preventive care measures such as colorectal cancer screening or receiving a flu vaccine (Centers for Disease Control and Prevention, 2004).

Documentation Status

Approximately seventy-seven percent of the farmworker population is foreign-born, and fifty-three percent are not authorized to work in the United States (Carroll et al., 2005). Documentation status has been cited as a barrier to health care utilization among farmworkers; however there is conflicting evidence of the effect residency status has on health care use (Leavitt, 2006). Undocumented immigrants often report that they lack a primary health care source; immigrants in general have lower rates of health care use compared to U.S. natives (Ortega et al., 2007). Fear that their legal status may be reported

to immigration officials is an additional barrier to seeking health care (Arcury, Preisser, Gesler, & Powers, 2005; Massey, 2005; Perilla, Wilson, Wold, & Spencer, 1998). However, one study in California found that neither residency status nor insurance status influences whether an individual sought needed health care among non-elderly Mexican and other-Latino immigrants (Marcelli, 2004). This result was reiterated recently in another study that found that fear of deportation was not associated with use of medical or dental care at Federally Qualified Health Centers (FQHCs) (Lopez-Cevallos, Lee, & Donlan, 2013). Despite abundant speculation that undocumented immigrants are a burden on the United States health care system, the cost of providing health care to immigrants is lower than that of providing care to regular citizens, according to a study from the Medical Expenditure Panel Surveys from 1999 to 2006. However, noncitizen immigrants were found to be more likely than U.S. natives to have a health care visit classified as uncompensated or charity, which likely reflects their poor access to care and low socioeconomic status (Stimpson, Wilson, & Eschbach, 2010).

Insurance Status and Work Benefits

It has been well documented that having health insurance is positively and significantly associated with the use of outpatient services, preventive care, acute care in an outpatient setting, and inpatient care; a lack of health insurance is a common barrier to the utilization of health services among ethnic minorities and among farmworkers (Buchmueller, Grumbach, Kronick, & Kahn, 2005; Goertz, Calderon, & Goodwin, 2007; Leavitt, 2006; Scheppers et al., 2006). The rate of insurance coverage is low among farmworkers, especially those who are undocumented (Passel & Cohn, 2009). Only twenty-three percent of farmworkers interviewed for the 2001-2002 NAWS reported being covered by any type of health insurance (Carroll et al., 2005). A very small percentage of

farmworkers receive health insurance coverage by their employer (Villarejo, 2003). In Oregon in 2006 the overall Hispanic population was estimated to be twice as likely to be uninsured (at 34.2%) as the general population (State of Oregon, 2010).

Based strictly on income level, most farmworkers fit the eligibility requirements for federal and state assistance programs such as Medicaid, the Children's Health Insurance Program (CHIP), or Social Security Insurance, yet few can actually obtain these benefits due to documentation status and other factors. For example, farmworkers are often parents that live away from their children, barring them and their families from CHIP. Nationally, farmworkers report that their children are often uninsured; this is true at roughly three times the rate of all other children and at almost twice the rate of those at or near the federal poverty level (Rodriguez, Elliott, Vestal, Suttorp, & Schuster, 2008). The same holds true in Oregon; a study conducted in 2006 found that 15.7% of Hispanic children were without health coverage, compared to 9.5% of non-Hispanic children (State of Oregon, 2010). The 2001-2002 NAWS data showed that only twenty-two percent of farmworkers reported that they or someone in their household had accessed at least one type of public assistance program in the previous two years (Carroll et al., 2005).

Assistance programs often exclude potential enrollees because enrollment and eligibility standards do not accommodate people who must move frequently to find work and therefore do not meet state residency requirements. Others appear financially ineligible due to dramatic fluctuations during the agricultural season, even though their annual income may be below the poverty level (Leavitt, 2006). Additionally, many farmworkers are not aware that they are eligible for benefits, and therefore do not apply for these programs (Arcury & Quandt, 2007). It is also possible that undocumented farmworkers do not apply for those federal assistance programs that they or their family members do qualify for, due to a mistrust of government officials.

Most farmworkers encounter irregular work schedules, and consequently lack traditional work benefits through their employer, such as paid sick leave or workers' compensation. To keep a medical appointment during regular business hours, a farmworker may be faced with losing a day's wages or in some situations, even losing his or her job (Rose & Quade, 2006). As a consequence, many farmworkers access health services only when absolutely necessary, and the most common form of payment is out-of-pocket (Villarejo, 2003).

Migrant and seasonal agricultural workers are often provided little or no workers' compensation coverage, despite the occupational dangers of the industry. Sixty-five percent of documented farmworkers reported being covered by workers' compensation, but only thirty-three percent of undocumented farmworkers said that they had this type of coverage (Carroll et al., 2005). However, there are many obstacles preventing them from securing needed workers' compensation benefits. These include a lack of coverage, states reducing or denying claims for undocumented workers, or workers' reluctance to file claims for fear of employer retaliation. Missed work hours due to injury can lead to a substantial decline in the farmworker's salary, causing economic hardship. Therefore, many injured farmworkers without workers' compensation benefits will forgo treatment or go into debt to obtain necessary health care (Villarejo, 2003). Even if farmworkers are covered by workers' compensation or even health insurance, many may not understand how to use those benefits due to language and cultural barriers.

Migrant Lifestyle and Rural Residence

A *migrant farmworker* is a person whose principal employment is in agriculture on a seasonal basis. They must travel in order to secure employment and establish a temporary home during the period of employment. Migration may be from farm-to-farm, within a state,

interstate, or internationally. A *seasonal farmworker* is a person whose principal employment is in agriculture on a seasonal basis, but does not migrate. Both migrant and seasonal farmworkers may face extended periods of unemployment and are subject to many barriers to health services utilization. Migrant farmworkers tend to "follow the crops" as they ripen in a fairly predictable geographic pattern called a "stream" and then return to their home base are the end of the growing season (Ward & Atav, 2004).

Due to frequent residential changes, many farmworkers are unfamiliar with health and social services that are locally available to them (Arcury et al., 2005; Goertz et al., 2007). Evidence indicates that demand for and access to health services differs between home base and upstream areas (Arcury & Quandt, 2007). Furthermore, frequent worker turnover inhibits farmworkers from exchanging health service knowledge with each other (Arcury et al., 2005).

Due to temporary employment conditions, both migrant and seasonal farmworkers experience interference in obtaining benefits from their employer or public benefits. Medicaid plans are generally not portable between states and require a lengthy application process excluding most interstate migrant farmworkers (Leavitt, 2006). Many farmworkers live in geographically rural locations that lack medical facilities (Perilla et al., 1998; Sherrill et al., 2005). This may be especially true of low-income facilities and specialists, and farmworkers often cannot afford private providers (Leavitt, 2006).

Farmworkers often lack mobility and transportation to reach those medical facilities that do exist (Perilla et al., 1998; Rose & Quade, 2006). The farmworker lifestyle can create serious problems in an individual's ability to receive appropriate follow-up care for chronic conditions such as tuberculosis, diabetes, cancer, and HIV, which all require careful monitoring and frequent treatment (Arcury et al., 2005).

Family Separation

Migrant and seasonal farmworkers may be separated from their families for months to years (Massey, 2005). Farmworkers lack traditional family and social support while away from their homes, often leaving their family in their country of origin or at their home base while they travel seasonally (Ward, 2010). One study analyzing data from the 1998 cycle of the NAWS found that twenty-seven percent of married farmworkers were traveling without their spouse and/or children. Farmworkers who were separated from their families were disadvantaged compared to those who were single or traveling with their immediate family. They were less likely to be legally documented, have poorer working and housing conditions, and were more likely to be migrating with the crops as opposed to staying in one location and working seasonally (Ward, 2010). Farmworkers experiencing family separation identified more barriers to health care including language barriers, inconvenient locations or hours of clinics, lack of transportation, not feeling welcome, too expensive, and fear of losing their job (Ward, 2010). Additionally, separated farmworkers were less likely to access government services such as Medicaid, Women, Infants, and Children (WIC), and government clinics than were non-separated workers (Ward, 2010).

Cultural Beliefs and Language Barriers

Language and cultural barriers also prevent farmworkers from obtaining care or services (Goertz et al., 2007). For the majority of farmworkers, Spanish is their primary language. Eighty-one percent of farmworkers stated that Spanish was their primary language, according to the 2001-2002 NAWS data, and only eighteen percent claimed English as their primary language (Carroll et al., 2005). Effective and culturally-appropriate communication between patients and their providers is necessary for good health care, and individuals who speak some language other than English experience difficulty within the

predominantly English health care system in the United States. Language and cultural differences can impair the delivery of quality health care; if patients and providers do not speak the same language, their ability to effectively communicate diminishes, and this can lead to lower patient adherence to medication schedules and decrease participation in medical decision-making. Limited English proficiency of farmworkers and non-Spanish speaking health care providers have both been identified as major barriers for utilizing health services among farmworkers (Scheppers et al., 2006; Villarejo, 2003). There has been a rapid increase in the number of Latinos in the United States since 2000, and this has resulted in a greater need for appropriate health services provided in Spanish language (Cohn, Passel, & Lopez, 2011). One study compared Mexican-born immigrants to US-born Hispanics and found that those who had immigrated had a significantly harder time understanding their doctors, and were more likely to say they would get better care if they were of a different race/ethnicity (Ortega et al., 2007). Further complicating the issue of language barriers is the increased immigration to the United States of people from the southern states of Mexico with more indigenous people. For many of these farmworkers, their primary language is an indigenous language such as Mixteco, Tarasco, or Chuj, and Spanish is second language, making translation or interpretation all the more challenging (Weeks, Stoler, & Jankowski, 2011). From 2011 to 2012, the Oregon Judicial Department reported a 63% increase in the number of requests for assistance with 15 different indigenous languages from areas of Mexico (Larson, 2013). In one study of farmworkers in Oregon, indigenous workers reported that it was more likely for their physician not to speak their language and they did not have access to an interpreter than other Latino workers (Samples et al., 2009).

Cultural differences also interfere with farmworkers seeking proper medical care. Some farmworkers have indicated that they prefer to seek medical services in their home

communities where they are more familiar with the language and the cultural norms. To do so, they delay care until they can return (Arcury & Quandt, 2007; Sherrill et al., 2005). This delay in receiving care could prove detrimental to the farmworker's health in some cases. There is some evidence that with increased acculturation, Mexican-immigrants are more likely to seek health services in the United States rather than returning to Mexico (Su & Wang, 2012). This may be due to changes in cultural beliefs, experience, and familiarity with the U.S. health care system. A feeling of fatalism, which is common in Mexican culture, may be partially responsible for poor preventive care among farmworkers (Goldsmith & Sisneros, 1996). These beliefs may result in delaying medical care, ignoring medical treatment, or not to engaging in preventative behaviors. Many farmworkers may turn to using traditional herbal remedies, rather than seeking Western medicine, or they may purchase medications that require a prescription in the United States while in Mexico and use them as needed without consulting a medical provider here.

Health Status of Farmworkers

As a consequence of the multitude of barriers that farmworkers face in accessing adequate health services, they are subject to many poor health outcomes. Agriculture is an extremely dangerous industry with many physical and occupational risks. Ironically, the population that is responsible for growing and gathering much of our nation's food supply experiences high rates of many conditions that are associated with poor diet including obesity, hypertension, and hypercholesterolemia (Lighthall, 2001). A more complete understanding of the poor health outcomes experienced by farmworkers can allow adaptation of outreach programs to address their needs.

Occupational hazards

In the farming industry, occupational hazards may include operating heavy machinery, exposure to environmental health risk such as pesticides, and long hours of physically demanding work that occurs outdoors in weather conditions that include extreme heat, cold, rain and bright sun (Frank, McKnight, Kirkhorn, & Gunderson, 2004). Due to these hazards, the occurrence of job-related illness or injury is high for farmworkers. One Texas study found that the annual rate of unintentional injuries was 12.5 per 100 full-time farmworkers (Cooper et al., 2006). Many farmworkers experience unintentional injuries such as pain or sprains due to the repetitive motion that is required for their job (Arcury & Quandt, 2007; Villarejo, 2003). Chronic musculoskeletal injuries are common among farmworkers; their jobs often require stooped labor, repetitive lifting, quick wrist and hand movements, climbing, and carrying heavy loads (Anthony, Martin, Avery, & Williams, 2010; Hansen & Donohoe, 2003). Back pain is one of the most common physical complaints among farmworkers (Ward & Atav, 2004). This was found to be true as well among Oregon vineyard workers. One study found that nearly half of all vineyard workers surveyed had musculoskeletal symptoms. In both men and women, those symptoms were primarily in their back (Brumitt et al., 2011).

Farm labor often requires the use of sharp tools, which can be dangerous when used carelessly, in haste, or when the user is fatigued or otherwise impaired. Ladders are the most common type of equipment involved in occupational injuries of farmworkers. The risk of falling from a ladder is considerable, and ladders are involved in thirty percent of work injuries experienced by farmworkers (Arcury & Quandt, 2007).

Furthermore, farmworkers come into direct contact with plants and soil, which can be treated with pesticides, herbicides, and chemical fertilizers. Exposure to these dangerous compounds can lead to eye injuries, cancer, respiratory illness, and dermatitis

(Arcury, Quandt, & Russell, 2002; Snipes et al., 2009). Farmworkers face multiple hazards to their eyes including environmental exposure to dust, wind, allergens, and ultraviolet light, as well as the risk of traumatic eye injury from plants, tools, and other equipment (Villarejo et al., 2000). Yet, regular eye care is low among farmworkers. In California, the CAWHS found that more than two-thirds of farmworkers reported never having had an eye care visit (Villarejo et al., 2000). Crop production workers have the highest incidence of skin diseases of any industrial classification, due to exposure to pesticides and other chemicals, plants, and infectious agents (Arcury & Quandt, 2007; Feldman et al., 2009). Multiple studies in the state of Oregon evaluated the effects of pesticide exposure among farmworkers and their families. These studies found that the children of farmworkers can also experience increased exposure to pesticides caused by the "carry-home" toxins of adults working in the fields, and that exposure to these toxins can affect the neurobehavior of these children (Lambert et al., 2005; Rohlman et al., 2001).

Oral Health

Oral health has been cited as a major issue faced by migrant and seasonal farmworkers across the nation and in the Pacific Northwest (Arcury & Quandt, 2007; Koday, Rosenstein, & Lopez, 1990). The CAWHS found that more than two-thirds of farmworkers interviewed has at least one adverse oral health conditions, including untreated caries, periodontal disease, and missing or broken teeth. Other widespread dental problems included gingivitis, impacted wisdom teeth, and poorly fitting dentures (Villarejo et al., 2000). A study in Yakima, Washington found that migrant and seasonal farmworkers experience 150 to 300 percent more tooth decay than their peers (Koday et al., 1990). Half of both male and female farmworkers interviewed for the CAWHS stated they had never been to a dentist (Villarejo et al., 2000). The lack of preventive dental care among

farmworkers may be especially detrimental to children. Children who do not receive dental care are at increased risk of developing severe periodontal problems as adults (Koday et al., 1990).

Infectious Diseases

There is abundant literature suggesting a higher than average prevalence of several infectious diseases among farmworkers including parasitic infections, HIV/AIDS and other sexually transmitted infections, and especially tuberculosis (Villarejo, 2003). Although required by Occupational Safety and Health Administration regulations, some farmworkers may find themselves in work or living situations without potable water, and proper toilet and hand-washing facilities. Stories persist of farmworkers resorting to irrigation ditches and run-off ponds when safe water is not available for drinking or washing (Ward & Atav, 2004). This is a potential contributor to the spread of parasites and other infectious microbes. Tuberculosis is six times higher among farmworkers than in the general working-age population. This is especially challenging to treat due to the high number of necessary follow-up appointments coupled with migratory lifestyle of the farmworkers (Ward & Atav, 2004). The housing conditions available, particularly to migrant farmworkers, are often inadequate and overcrowded. They often include dormitory-style houses or mobile homes, or even temporary structures such as tents, garages, and tool sheds (Villarejo et al., 2000). These conditions may also contribute to the spread of infectious illness.

Mental Health

The farmworker lifestyle is stressful, and mental health issues are an important concern for this population. A study of North Carolina farmworkers found that greater

social isolation and more stressful working conditions were associated with greater anxiety and depression symptoms (Hiott, Grzywacz, Davis, Quandt, & Arcury, 2008). Stressors for farmworkers may include characteristics of their work, such as physical difficulty, or other consequences of their lifestyle, such as unpredictable housing. These stressors have been linked to lower self-esteem and limited social support, as well as feelings of hopelessness, anxiety, depression and suicidality (Hovey & Seligman, 2006).

Diabetes

In contrast to the abundance of information that is available about infectious diseases and occupational injuries among farmworkers, far less is known about how chronic illness affects them (Villarejo, 2003). Interestingly, the majority of existing data on chronic diseases among farmworkers is based on self-reported diagnoses and therefore may be underreported (Arcury & Quandt, 2007). However, chronic illness among farmworkers occurs at elevated rates, and that it is a growing concern. Diabetes, in particular, has been identified as a leading chronic health condition among patients served by migrant and community health centers (Villarejo, 2003). Chronic diseases tend to require complex and continuous treatment to properly manage illness, which is only exacerbated by the lack of access to health services faced by farmworkers. While there is no national-level survey of diabetes rates among farmworkers, the 1999 CAWHS found that 4.3% of male subjects surveyed had a non-fasting serum glucose level (not reliable for clinical diagnosis) of above 200mg/dl (Villarejo et al., 2000). It is federally recognized that diabetes is a major health problem among Hispanics; Mexican-American adults are 1.8 times more likely than non-Hispanic white adults to have been diagnosed with diabetes by a physician and are at higher risk of complications due to diabetes, such as end-stage renal disease (Centers for Disease Control and Prevention, 2011).

Cardiovascular disease

Studies of California farmworkers have found that this population displays alarmingly high rates of high blood pressure, obesity, hypercholesterolemia, or a combination of these conditions that put them at elevated risk for diabetes and heart disease. The 1999 CAWHS measured several clinical indicators of chronic disease risk factors in California farmworkers. Fifty-two percent of male farmworkers had one or more of these clinical risk factors, and forty-five percent of females had at least one risk factor. The survey found that 81% of male and 76% of female farmworkers were overweight or obese. Compared with the U.S. general population, a higher percentage of male farmworkers had high serum cholesterol, however this was not true among female farmworkers. The incidence of high blood pressure was greater than in the U.S. population for both males and females, particularly in the 20–44 age range (Arcury & Quandt, 2007; Villarejo et al., 2000). These poor health outcomes tend to be even more exaggerated among undocumented farmworkers, compared to those who are documented (Villarejo et al., 2010). The large disparities between California farmworkers and the general population that were found in the CAWHS sample cannot be fully explained by ethnicity, age, and gender. The cause of these risk factors is unknown, however it is suspected that they may be related to some preventable "lifestyle" factors, including food insecurity and food choices. Limited income of farmworkers may be a significant cause of the problem (Villarejo et al., 2000; Villarejo et al., 2010).

Programs and Services Available to Farmworkers

Over the last several decades, various programs have been established to improve health and increase access to health services of farmworkers and their families on both the local and national level. The Health Resource and Services Administration's (HRSA) Bureau

of Primary Care has provided direct support in funding 125 migrant health centers and 843 community health centers throughout the United States, each designed to provide health services to farmworkers. Oregon is currently home to fourteen migrant health clinics (State of Oregon, 2010). Through grants, HRSA has provided significant support to programs including the Farmworker Justice Fund, Farmworker Health Services, Migrant Clinicians Network, Migrant Health Promotion, National Center for Farmworker Health, and the National Association of Community Health Centers. These programs, coupled with many other non-profit and local-level programs and organizations strive to improve the delivery of health services to farmworkers through innovative initiatives. These include conducting culturally appropriate community health assessments, using clinical models, using cultural brokers and outreach workers to improve service delivery, and using lay health advisors. Aspects of these initiatives have been cited and incorporated into other locales, and it appears that they can improve accessibility and utilization of health services among farmworkers. However, there has been very limited empirical evaluation of their continuation, replication, and outcomes (Arcury & Quandt, 2007).

One important aspect of many of these programs is providing preventive health screenings of clinical risk factors and subsequent referrals as a component of health outreach to farmworkers. These outreach screenings offer an opportunity for early detection of serious chronic conditions that are commonly faced by farmworkers. There is ample evidence that early detection of chronic diseases including type 2 diabetes and heart disease can lead to more adequate management of illness and sometimes even a reversal of effects. Screening services can both prevent and detect illness in their earlier, more treatable stages. This can greatly reduce the risk of illness, disability, early death, and medical care costs (United States Department of Health and Human Services, 2010). In the overall US population, it is estimated that one-third to one-half of type 2 diabetics are

undiagnosed and thus, untreated (Centers for Disease Control and Prevention, 2011). Treatment of diabetes is believed to prevent or delay many complications related to the disease, and improve health outcomes (National Center for Farmworker Health, Inc., 2009). Similar early diagnosis and treatment of heart disease can reduce the risk of heart attack and stroke (Roger et al., 2012).

Tuality Healthcare ¡Salud! Services is one such program, with the mission of providing access to health services for Oregon's seasonal vineyard workers and their families. ¡Salud! Services is funded by the wine industry of the Willamette Valley, and provides outreach, advocacy, and small health care grants for vineyard workers in the state, allowing them to receive primary care and other health services. One aspect of the ¡Salud! program is to provide annual, preventive health screenings to vineyard workers, and giving those with abnormal results referrals for follow-up at nearby migrant and community health clinics. Bilingual registered nurses at ¡Salud! Services are able to converse one-on-one with individuals who have abnormal screening results. They place special emphasis on those with elevated blood glucose levels, and encourage those suspected of having diabetes to seek clinical attention immediately.

There are many other organizations both in Oregon and across the nation that provide a similar screening and referral program. The ultimate goal of this screening program is to encourage early and preventive health service utilization among the farmworker population that they serve. A significant portion of the ¡Salud! budget is dedicated each year to these outreach screening, yet little evaluation has been done to determine their success in encouraging health service utilization. Few studies have examined the translation from outreach screenings to actual health service utilization among farmworkers; however published evaluation of these data could lead to vast improvements around these programs (Arcury & Quandt, 2007; Feldman et al., 2009).

The present project is an evaluation of the ¡Salud! Services outreach screening program. It examines the role that specific factors including family support level, abnormal glucose level, and number of abnormal results play in adherence to follow-up instructions among ¡Salud! Services participants who were screened at health screening fairs. A better understanding these factors may allow for a more focused intervention when it comes to managing chronic illness among farmworkers.

Preliminary Studies of ¡Salud! Services Data

Dr. Daniel Lopez-Cevallos and Leda Garside, Nurse Manager of ¡Salud! Services, have published on the utilization of health services among ¡Salud! clients (Lopez-Cevallos, Garside, Vazquez, & Polanco, 2012). Survey data were collected from 513 foreign-born workers during the 2009 ¡Salud! Services health outreach screenings. These data included information about relevant predisposing and enabling factors of the Behavioral Model of Health Care Utilization Among Vulnerable Populations (Gelberg, Andersen, & Leake, 2000). The majority of participants were male (87%), married or living with a partner (54%), had children (58%), and had full time employment (65%). Very few spoke English (5%), and only about a third had more than six years of formal education. About one-in-five of the participants had health insurance. Multiple regression analysis of the collected data showed that use of health services in the past two years was more likely among females, those workers who have children, have more than six years of education, work full time, are insured, and are currently attending school.

Two additional studies have been conducted with individuals from the ¡Salud! Services client population, in collaboration between Tuality Healthcare and Pacific University School of Physical Therapy. The first study collected demographic data and data about musculoskeletal health of vineyard workers. Nearly half (48.4%) of all vineyard

workers surveyed reported musculoskeletal symptoms in at least one region of the body. These were most in the back, and among older vineyard workers (Brumitt et al., 2011). The second study examined exercise habits and tobacco use among male Latino farmworkers. It surveyed 263 vineyard workers about exercise and health habits during ¡Salud! Services summer health screening fairs, and about half (58.2%) reported some exercise during the week, however only 16% reported meeting the Centers for Disease Control and Prevention guidelines for aerobic exercise. However, there may be more individuals who meet the requirements for the latter category, as the study did not take into consideration any intense activity that may have taken place during work hours. The study also found that 17% of subjects surveyed reported smoking and 10% reported chewing tobacco use (Brumitt et al., 2013).

To date, there have been no publications utilizing information extracted from the ¡Salud! Services database. I, as an OHSU MPH candidate, completed an internship and annual report for ¡Salud! Services using the 2009 and 2010 data, intended to be shared with patrons of the program. The present study proposes to extend the research, previously conducted by Dr. Lopez-Cevallos, to exam socio-demographic factors and health indicators as they are related to adherence to follow-up instructions on the part of farmworkers and their families, after having received a referral at a ¡Salud! Services health screening fair. First, this study compares the health status of those ¡Salud! clients who attended screening fairs to those who did not attend. Health status is measured by the prevalence of certain ICD-9 codes collected from clinical provider claims, and this evaluation determines if a difference exists in the health of those who receive a screening versus those who do not. Additionally, the study tests the hypothesis that individuals with an increased level of familial support as measured by marital status, number of dependents registered into the ¡Salud! program, and relationship with those sharing their housing, are

more likely to seek the recommended follow-up care after being given a written referral. The hypothesis is based on our assumption that lack of family support is a significant barrier to health service utilization (Ward, 2010). Additionally, this study hypothesizes that individuals receiving referrals for multiple abnormal health indicators and for elevated blood glucose are more likely to seek follow-up than those receiving referrals for single health indicators or non-glucose related health indicators, respectively. This hypothesis is based to the actions of ¡Salud! Services nurses, giving special consideration and attention to those suspected of having diabetes.

CHAPTER 3

METHODS

Overview of Study Design

This study examines the utilization of health care services and adherence to follow-up recommendations among Tuality Healthcare ¡Salud! Services clients. It employs logistic modeling techniques and chi square tests of independent, unpaired groups, utilizing data from the ¡Salud! Services database from 2011. All subjects in this study were active participants in the ¡Salud! Services program in 2011 and over the age of 18. There were 1,935 ¡Salud! participants in 2011 that met the inclusion criteria for this dataset, and 765 of those attended a ¡Salud! screening fair.

¡Salud! Services Data Collection

¡Salud! staff collects various pieces of information and enters them into the encrypted ¡Salud! Services database throughout the year. They collect key pieces of information at different times and in different forms. All staff members participate in data collection and entry; this includes 2 registered nurses, 2 health educators, and an office assistant. The time of the year in which these different pieces of data are collected is described in the Table 1 below.

- Registration into the ¡Salud! program lasts for up to 12 months, from February 28 of the current year to February 28 of the following year, and can be completed at any point. Each time an individual registers, they must update their personal information and show proof of employment at vineyard, winery or contractor. At the time of registration, a significant amount of data is collected on each individual. Depending on the literacy

level of the participant, the individual's information may be written on the hardcopy registration form by the ¡Salud! participant, or by a ¡Salud! Services staff member. Data include demographic information such as date of birth, gender, country of origin, marital status, primary language, health insurance status and information about other family members of each participant as they register into the program. One of the ¡Salud! staff members then records the collected information into the password-encrypted ¡Salud! Microsoft Access database. The hardcopy registration forms are kept in locked file cabinets in the ¡Salud! office in Hillsboro, Oregon. The bulk of these data were collected from January 1 to March 31, however individuals can continue to register into the program throughout the year by mailing in their applications to the ¡Salud! office to be processed or by stopping by in person. Upon initial registration into the program, each individual is assigned an identification number, which is used to track each participant across time. In 2011, there were approximately 2,500 active participants in the program.

- From May until September, the ¡Salud! team goes to the vineyard and winery locations in the Willamette Valley to provide health screening fairs for participants. Among all of the individuals who participate in the ¡Salud! program, approximately 30% are captured at the screening fairs. ¡Salud! Services partners with an Adventist Health mobile outreach van to measure health indicators for each individual using standardized equipment from Adventist Health. ¡Salud! Services then records and tracks the results using the participant's assigned identification number. The registered nurses at ¡Salud! Services are primarily responsible for collecting these data and entering them into the ¡Salud! database. The data collected during this time include blood pressure, blood glucose, total cholesterol, HDL cholesterol, body mass index, percent body fat and if a

referral was given for any one of these health indicators. In 2011, 765 ¡Salud! clients (30%) participated in health screening fairs.

- Throughout the year, ¡Salud! Services receives information from clinics and other health care providers about clinical services received by ¡Salud! participants. Again, this information is tracked using each participant's identification number. The information collected contains specific billing information (which was not used in this study) as well as the exact date of the service, the location of the service, and the ICD-9 diagnosis codes for each clinic visit. The ¡Salud! Services office assistant enters the majority of this information into the database. This information is based on the grants provided by ¡Salud! Services for health services received on the part of a ¡Salud! participant, and therefore data are only collected for those clinical services for which the ¡Salud! program is billed.

Table 1. Approximate Timeline Of ¡Salud! Services Data Collection

¡Salud! Activity	*Time Period*	*Data Collected*
Registration	Year-round, primarily January-March	Demographics, language, health insurance, family information, living situation, work history
Screening Fairs	May -September	Health indicators: blood pressure, cholesterol, glucose, BMI, percent body fat, referral information
Grants for Care	Year-round	Clinic information, date of service, ICD-9 diagnostic codes

Data Quality Control

As data are entered into the ¡Salud! database by all ¡Salud! staff members, it is necessary to perform quality control on the entered data on a regular basis. The office assistant performs this by verifying data previously entered into the database with hardcopy files that are maintained for each ¡Salud! program participant. For the purposes of this study, during the process of data cleaning and management, any abnormal data

entries were verified against the hardcopy information and excluded if the data could not be verified by a ¡Salud! Services staff member. One example of data reconciliation for this study included an individual that was given a referral, but had no record of having attended a screening fair. ¡Salud! Staff determined that the individual had multiple identification numbers assigned and merged the multiple accounts together.

Data Management

Staff members of ¡Salud! Services with appropriate HIPAA permissions to access information in the ¡Salud! database ran queries on the entire ¡Salud! population that were registered as active participants in 2011. This included both those who attended a screening fair and those who did not. Using Microsoft Access queries, ¡Salud! staff members extracted and submitted to researchers the following variables of interest to be used during the analysis, as outlined in Table 2. The list of variables in Table 2 is a complete list of all variables that were made available for this research project. They were used for the creation of outcome variables and descriptive analysis but not necessarily for the regression models.

Table 2. List of Variables and Variable Descriptions

Variable Name	*Variable Description*	*Code*
Study ID	A random number associated with each 2011 ¡Salud! participant, randomized and assigned by ¡Salud! Services.	ID number
Gender	Male or female gender	0=Female 1 = Male
Age	Age of participant in years, between the ages of 18 and 89	Years
Dependent Type	Relationship to vineyard Worker: primary (vineyard worker), spouse, child, other	1=Primary 2=Spouse/partner 3=Child 4=Other
Marital Status	Participant married/domestic partner or single	0=Single 1=Married/partner
Share Housing	Participant shares housing with relatives, non-relatives, both relatives and non-relatives, or lives alone	0= Non-relatives only/ lives alone 1 = Relatives / both relatives and non-relatives
Family Registered	Individual has other family members registered into ¡Salud! program (indicating live nearby)	0 = No registered family 1 = One or more registered family member
Language	Participants' primary language English or Spanish	0 = English / bilingual 1 = Spanish
Health Insurance	Health insurance status of participant (any health insurance)	0 = No health insurance 1 = Has health insurance
Screening Date	Date of receiving health screening through at ¡Salud! Services health fair	MM/DD/YYYY
Cholesterol Referral	Was a referral given to this participant for cholesterol?	0 = No 1 = Yes
Hypertension Referral	Was a referral given to this participant for blood pressure?	0 = No 1 = Yes
Diabetes Referral	Was a referral given to this participant for blood glucose?	0 = No 1 = Yes
Multiple Referrals	Number of referrals given to participant for abnormal health indicators	numerical
Clinic Date	Date of receiving services at an established clinic for any type of service	MM/DD/YYYY
ICD9	ICD-9 Diagnostic code provided by clinic for participant's visit	ICD-9 Code
ICD9 Description	Description of ICD-9 diagnostic code provided by clinic for participant's visit	Written description

Upon receiving the data from ¡Salud! Services, I generated the binary outcome variable of "seeking health services". Any individual who is considered positive for "seeking health services" has received an ICD-9 diagnostic code related to one or more of the health

indicators for which they were referred for within a 12-month period of receiving the referral. An individual who is considered negative for the outcome "seeking health services" either a) had no clinic date within 12 months of the date they were given a referral or b) had an ICD-9 code that is unrelated to the referral that they were given during the summer health screen. ICD-9 codes are matched to referral categories based on Medicaid reimbursement codes, as described in Table 3.

Table 3. Medicaid Reimbursement Codes for Referral Categories.

Chronic Condition	*ICD-9 Code*	*Description*
Hypertension	401.*	Essential Hypertension
	796.2	Elevated blood pressure reading without diagnosis of hypertension
	V81.1	Special Screening for Hypertension
Diabetes Mellitus	790.2*	Abnormal Glucose
	249.*	Secondary Diabetes Mellitus
	250.*	Diabetes Mellitus
	V77.1	Special Screening for Diabetes Mellitus
Hypercholesterolemia	272.0	Pure Hypercholesterolemia
	V77.91	Screening for Lipid Disorders
Health Education	V65.4	Other counseling not elsewhere classified
Routine Medical Exam	V70.0	Routine general medical examination at a health care facility

* Indicates that the digits in the decimal places following the code number stated here may vary, i.e. 401.* may be 401, 401.0, 401.1, or 401.9 all of which refer to essential hypertension.

Participant Selection

All clients of ¡Salud! Services are employees of a vineyard, winery, or contractor that provides services to vineyards in the North Willamette Valley at some point during the current year, or are the immediate family members of a vineyard or winery worker. Inclusion criteria for the dataset for this study consist of the following:

a) Active participation in the ¡Salud! Services program in 2011

b) Individuals classified as primary workers, spouses, and other family members of the workers,

c) Individuals at least 18 years of age and 89 years of age or under

All data necessary for this analysis have been previously collected by ¡Salud! Services and assessed for the full inclusion criteria, using the Microsoft Access query process. After receiving the data from ¡Salud! Services, data subsets were created for the performed analyses. For the statistical analysis of Specific Aims 1 and 2, the subset was limited to only those who are:

a) Primary vineyard workers

b) Uninsured

¡Salud! Services health screening fairs are generally done at the work site. Of the 200 individuals who received a health screening, 190 (95%) of them were primary workers. While other family members are invited to utilize this service, they rarely do. Furthermore, primary workers tend to have less incomplete data, giving us a more valid understanding of the factors associated with follow up.

The data set was additionally restricted to only those individuals who are uninsured, due to the nature of the outcome measure that was selected for this evaluation. Insurance status is a commonly recognized factor that is associated with clinical utilization among farmworkers, however, in this situation including insured individuals could lead to bias. The outcome of interest, receiving follow-up care, is based on the ¡Salud! Services system of paying for small health care grants to the clinic on the part of the individual that has received a service. As a consequence of this system, ¡Salud! Services receives a claim from the clinic associated with that individual in their database, using the individual's identification number. Individuals who have insurance are very unlikely to request or receive a health care grant from ¡Salud! because they use their insurance to pay medical costs first. Therefore, it is unknown to ¡Salud! based on the claims they receive, whether or not insured individuals have followed-up in the clinic. Including individuals who have insurance would potentially create an underestimate of follow-up clinic visits and could

bias the results towards the null. According to the ¡Salud! database, 90.6% of the ¡Salud! population is uninsured.

The ¡Salud! program offers many services and benefits to its clients, although participation in all services is not required for enrollment. Some of these benefits include free health screenings in the workplace, and small grants paid on behalf of the client for seeking services at Federally Qualified Health Centers, private health care facilities, or other established clinics. Figure 1 provides a schematic of the ¡Salud! population, and how they are defined in terms of exposure and outcomes for the purposes of this study.

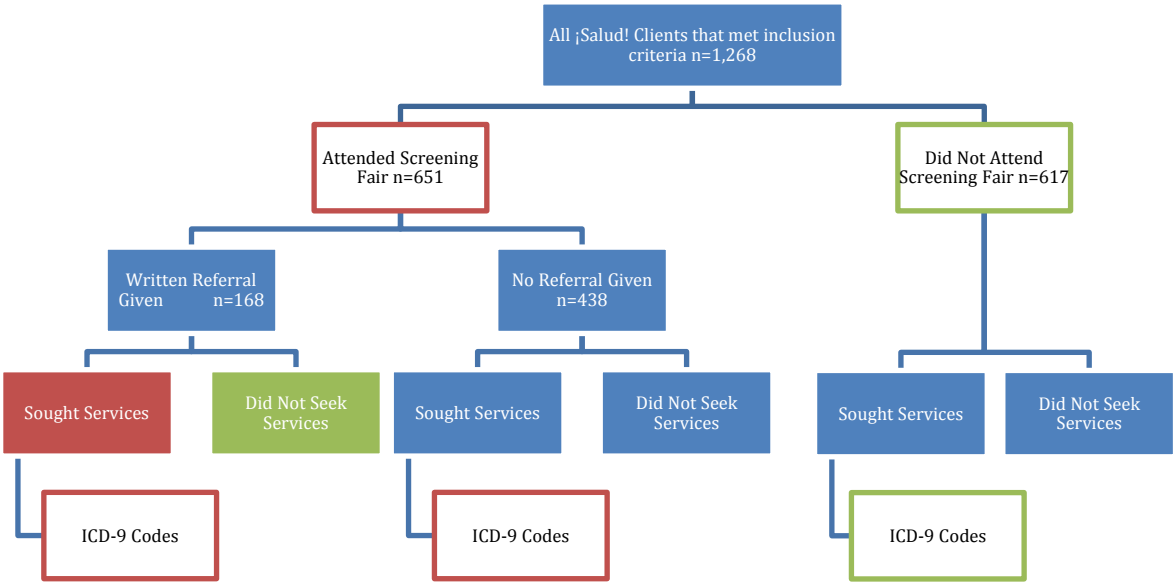

Figure 1. Schematic of Exposure and Outcome Classification

Definitions of Figure 1 Categories	
Attended Screening Fair	¡Salud! Services clients that attended a ¡Salud! Services screening fair in 2011.
Did Not Attend Screening Fair	¡Salud! Services clients that did not attend a ¡Salud! Services screening fair in 2011.
Written Referral Given	¡Salud! Service clients that had one or more "high risk" health indicators at the screening clinic, therefore receiving a written referral to an established medical clinic on the day of the screening or in the mail within 3 months of the screening. High risk health indicators are defined as: Blood Pressure Blood Pressure >140/90mmHg or Systolic BP >150 or Diastolic BP >100 Total Cholesterol >240mg/dL

Definitions of Figure 1 Categories	
	HDL Cholesterol <30mg/dL Total/HDL Ratio >6.5 Non-Fasting Blood Glucose >140mg/dL Fasting Blood Glucose >100mg/dL
No Referral Given	¡Salud! Service clients that had only normal or "moderate risk" health indicators at the screening clinic, and therefore were not given a referral to an established clinic.
Sought Services	¡Salud! Services clients that received a grant for medical services within 12 months of the date of the screening. Acts as a marker variable for the true outcome of interest of adhering to follow-up advice by seeking health services at an established clinic.
Did Not Seek Services	¡Salud! Services clients that did not receive any grant for medical services within 12 months of the date of the screening. Acts as a marker variable for the true outcome of interest of adhering to follow-up advice by seeking health services at an established clinic.

Participant Selection for Specific Aim 1

The first specific aim utilizes data from all uninsured, primary workers in the ¡Salud! population who sought services in a Federally Qualified Health Center, private health care facility, or other established clinic. This comparison can be seen in red and green outlined boxes in Figure 1.

Participant Selection for Specific Aim 2

For the second specific aim, the population of interest is primary workers who have attended a screening health fair, are uninsured, had one or more abnormal results, and were given a written referral. Those who sought services after receiving a referral are compared to those who did not seek services. This comparison can be seen in the solid red and green boxes in Figure 1.

Human Subjects Protection and Institutional Review Board Approval

¡Salud! Services staff members developed and ran queries on the ¡Salud! Services Microsoft Access database to extract relevant information about clients who were active in

the program in 2011. These data included demographic information, 2011 screening clinic health indicators, information about clinic utilization, and ICD-9 codes for clinic visits. The ¡Salud! team then merged these data using SAS 9.2, based on each ¡Salud! client's individual ID number. Following this merger of all desired data, ¡Salud! staff randomly assigned an identification number to each individual, before handing the data over to the research team. This allowed me, as the researcher, to obtain de-identified data from ¡Salud! Services at the earliest possible moment, with all unnecessary Personal Health Information already deleted, including the ¡Salud!-associated ID number, in order to protect individual privacy per IRB protocol.

As the investigator, I gained approval for analysis of the de-identified ¡Salud! Services data through the Oregon Health & Sciences University Electronic Institutional Review Board. I have followed all standards set forth by the OHSU IRB in order to protect participant privacy and information. Additionally, I followed the privacy standards of the Health Insurance Portability and Accountability Act, as is required by ¡Salud! staff for patient protection.

Statistical Analysis and Sample Size Considerations

All statistical analyses were performed using Statistical Analysis Software (SAS) version 9.3 (SAS Institute, Cary, NC) for Windows. I first ran descriptive frequencies on each of the variables described in Table 2 to determine their distribution and then detect the presence of any potentially influential outliers. For the uninsured, primary vineyard worker population, including those individuals who attended a health screening fair and those who did not attend a health screening fair, I calculated descriptive statistics for gender, age, dependent type, marital status, relationship to those sharing housing, number of family members in the ¡Salud! program, primary language, and health insurance status.

Descriptive statistics were calculated for all of the variables using counts and percentages of categorical and binary variables and means or medians for continuous variables.

Statistical Analysis for Specific Aim 1

Analysis for this aim explored the similarities and differences in demographic characteristics and in the health status of those who attended screening clinics compared to those who did not in 2011, using ICD-9 codes from clinic visits. This analysis was performed on a subset of the entire ¡Salud! population that includes only uninsured, primary vineyard workers. From the ¡Salud! database, staff members extracted ICD-9 codes that were reported to the program for services received during the 2011 fiscal year, as it aligned with current registration of the participants. I considered only those data for individuals who met the inclusion criteria for this study. I looked at ICD-9 codes associated with chronic illness of concern for this population, including hypercholesterolemia, hypertension, and diabetes mellitus. I specifically used the ICD-9 codes for these chronic illnesses as designated by Medicaid, as those are likely to be utilized in Federally Qualified Health Centers, as described in Table 4. The prevalence of these ICD-9 codes was compared in those individuals who were current in the program, but did not attend a screening fair to those who did attend a screening fair. I used chi-square tests to compare the two counts of each ICD-9 code in the two unpaired groups. Additionally, I examined different combinations of existing comorbidities of hypertension, diabetes mellitus, and hypercholesterolemia among individuals in both groups. Again, I used chi-square test to compare the prevalence of comorbidities between the two groups.

Table 4. ICD-9 codes for Chi-Square Comparisons

Chronic Condition	*ICD-9 Code*	*Description*
Hypertension	401.*	Essential hypertension
	796.2	Elevated blood pressure reading without diagnosis of hypertension
	V81.1	Special screening for hypertension
Diabetes Mellitus	790.2*	Abnormal glucose
	249.*	Secondary diabetes mellitus
	250.*	Diabetes Mellitus
	V77.1	Special screening for diabetes mellitus
Hypercholesterolemia	272.0	Pure hypercholesterolemia
	V77.91	Screening for lipid disorders
Routine Medical Exam	V70.0	Routine general medical examination at a health care facility

* Indicates that the digits in the decimal places following the code number stated here may vary, i.e. 401.* may be 401, 401.0, 401.1, or 401.9 all of which refer to essential hypertension.

Sample Size Considerations for Specific Aim 1

Specific Aim 1 compared the frequency of specific ICD-9 codes among two groups: those who attended a health screening fair, and those who did not attend a health screening fair. Due to the fact that there has been limited previous evaluation of the ¡Salud! Services population, the prevalence of specific illness within this population is unknown. However, I know from some preliminary analysis that approximately 15% of the ¡Salud! population receive a grant for care for the utilization of medical services. Therefore, I used this value as a "baseline" estimate for the proportion of individuals who have received an ICD-9 diagnostic code indicating they have some sort of illness. Additionally, we know that approximately 2700 individuals were registered into the ¡Salud! program 2011, according to annual reports by ¡Salud! Services. Based on a baseline illness rate of 15%, a sample size of 2700 individuals participating in the ¡Salud! program, and an alpha level of 0.05, this evaluation achieved a power of 88.2% if a 1.15 fold increase in illness diagnosis is detected.

Statistical Analysis for Specific Aim 2

Next, I used simple logistic regression to examine associations between independent variables and the dependent variable, "seeking health services". For the purposes of more easily interpreting the clinical significance of health screening results, I categorized each of these variables in a binary manner, as either no referral given (normal result) or referral given (abnormal result) for the logistic regression process. For each of these bivariate analyses, I examined the unadjusted odds ratios (OR), 95% confidence intervals (CI), and reported p-values. I determined if any of the primary predictors or the covariates was significantly associated with the seeking health services outcome at the level of alpha 0.1 in the bivariate analyses using Fisher's Exact Test. Covariates tested in this phase were selected because they were found in a review of the literature to have a significant association with health care utilization among farmworkers. Surprisingly, during the bivariate analysis, we found that no English-speaking individuals were positive for the outcome measure. This led to measure of association that was not meaningful, so we excluded language as a covariate in further analysis.

Following the bivariate analyses, I performed three separate multiple logistic regressions models to test each of the primary predictors posited to be associated with the outcome in the hypotheses (described in Table 5). I calculated adjusted odds ratios (AOR) using multiple logistic regression models that included covariates preselected based on a review of the current literature, in order to control for potential confounding. Each of the three models included only one of the primary predictors: family support level, blood glucose result, or multiple referrals for abnormal results. It is important to note that there are three separate variables that were used to create the primary predictor "family support level" including marital status, living with family members, and having other family members registered into the ¡Salud! program. Along with this primary predictor, the *a*

priori confounders (shown in Table 5) were included in each of the multiple regressions models. To understand the functional relationship between the outcome and the primary predictors of interest, all predictors and covariates described in Table 5 were maintained in the models, regardless of their significance in the bivariate analysis. I applied an alpha level of 0.05 for multiple regression analyses.

As part of the model diagnostics, I used the variance inflation factor (VIF) test to detect any multicollinearity between variables in the multiple logistic regression models. This was of particular importance in the model containing the family support level variables as it helped me to determine if any variables could be dropped from the models because of redundancy. Had high multicollinearity existed among these variables, I would have been able to select just one or two of the variables to be the primary predictor to represent family support level in the multiple logistic models, however no substantial multicollinearity was found in any of the models.

After obtaining each of the final models, I determined their overall significance. Additionally, I evaluated the Hosmer-Lemelshow Goodness of Fit test to determine if the model was a good fit for the data, and the ROC curve to assess the model's sensitivity and specificity of these data. I repeated these steps for each of the three multiple logistic regression models. Then, within each model, I examined each independent variable for significance by examining the two-sided Wald Chi-square value and the associated p-value. Finally, for each of the models I interpreted the odds ratios and 95% confidence intervals calculated from the parameter estimate.

Table 5. Multiple Logistic Regression Models

HYPOTHESIS 1		
Variable	***Variable Description***	***Code***
Outcome Variable		
Seeking Health Services	Individual received ICD-9 code related to original referral within 12 months of referral date	0 = No 1 = Yes
Primary Predictors		
Marital Status	Participant married/domestic partner or single	0=Single 1=Married/partner
Share Housing	Participant shares housing with relatives, non-relatives, both relatives and non-relatives, or lives alone	0= Non-relatives only/ lives alone 1 = Relatives / both relatives and non-relatives
Family Registered	Individual has other family members registered into ¡Salud! program (indicating live nearby)	0 = No registered family 1 = One or more registered family member
Covariates		
Gender	Male or female gender	0=Female 1 = Male
Age	Age of participant in years	Years
HYPOTHESIS 2		
Variable	***Variable Description***	***Code***
Outcome Variable		
Seeking Health Services	Individual received ICD-9 code related to original referral within 12 months of referral date	0 = No 1 = Yes
Primary Predictors		
Diabetes Referral	Was a referral given to this participant for blood glucose?	0 = No 1 = Yes
Cholesterol Referral	Was a referral given to this participant for cholesterol?	0 = No 1 = Yes
Blood Pressure Referral	Was a referral given to this participant for blood pressure?	0 = No 1 = Yes
Covariates		
Gender	Male or female gender	0=Female 1 = Male
Age	Age of participant in years	Years
HYPOTHESIS 3		
Variable	***Variable Description***	***Code***
Outcome Variable		
Seeking Health Services	Individual received ICD-9 code related to original referral within 12 months of referral date	0 = No 1 = Yes
Primary Predictors		
Multiple Referrals	Number of referrals give to participant for abnormal health indicators	0 = 1 referral 1 = 2 or more referrals
Covariates		
Gender	Male or female gender	0 = Female 1 = Male
Age	Age of participant in years	Years

Sample Size Considerations for Specific Aim 2

There is little information available about the ¡Salud! Services dataset, and the rate of health care utilization of the ¡Salud! population is unknown, making a proper power analysis for this evaluation difficult. Preliminary analysis of ¡Salud! Services data from previous years indicated that approximately 15% of the ¡Salud! population receive a grant for care for the utilization of medical services. I used this as a "baseline" estimate for the proportion of individuals who adhere to follow-up instructions by seeking services in an established clinic. Additionally, the approximate sample size of each of the study groups is already known, so I was able to use these estimates in calculating the power that this evaluation would yield. Power analyses were calculated using SAS 9.3.

Based on a baseline follow-up rate of 15%, a sample size of 200 individuals receiving clinic referrals, and an alpha level of 0.05, this evaluation achieved a power of 77.5% if a 1.5 fold increase in health service utilization is detected. If a 2.0 fold increase in health services utilization occurs, and all other factors are held the same, including an alpha level of 0.05, sample size of 200, and a baseline follow-up rate of 0.15, this study achieved 99.9% power. The calculated power is adjusted depending on the complexity of the models that are examined; the number of covariates and predictors included in the models increase or decrease the power accordingly.

CHAPTER 4

RESULTS

A total of 1,935 individuals originally met the inclusion criteria for the dataset created by ¡Salud! Services for this evaluation. However, a subset of 1,268 individuals, which included only those who are both uninsured and primary vineyard workers, was created for the chi-square comparisons in Specific Aim 1, as well as the bivariate and multiple logistic regression analyses in Specific Aim 2. From the original sample, approximately 95% of individuals who had attended a screening fair were primary workers. Reducing to only primary workers lends to an easier interpretation of the situation at hand. Similarly, including individuals with insurance could create an underestimation of those utilized clinical services, as they may not have requested a grant from ¡Salud! Services. This could potentially bias the results of the study towards the null value, and therefore the study sample was restricted to only include those who are uninsured. Figure 2 describes the selection of individuals for the subset of data. the green squares represent the population used for Specific Aim 1 and the red squares indicate the population that was used for analysis of Specific Aim 2 and.

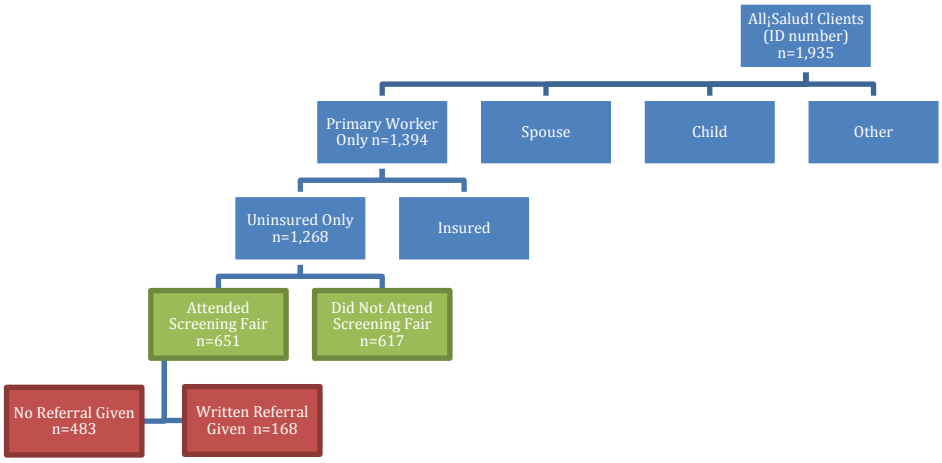

Figure 2. Schematic of Population Subset for Data Analysis

Table 6 provides complete descriptive statistics for the study population. Among the 1,268 individuals in the subset, the majority were male (81.8%) and Spanish-speaking (75.2%). The age range for this sample was 18 to 76 years, and the mean age and standard deviation was 35.4 years (±10.9). The family support variables indicated that 58.3% of the sample population was married, and 61.0% was living with at least one family member. However, only 28.2% of study participants had one or more family members registered into the ¡Salud! program. There was a considerable amount of missing demographic data from this sample, which may have affected the parameter estimates found in this study. 18.6% of the primary language data was missing, 7.6% of marital status data was missing, and nearly a quarter of living with relatives data was missing (24.2%). Among the 1,268 individuals in this study, 651 (51.3%) of them attended a health screening fair where they were screened for abnormal blood glucose, serum cholesterol, and blood pressure. Those with abnormal screening results, a total of 168, were given referrals to the clinic.

Among the 168 individuals who were given a referral, 128 (76.2%) of them were referred for abnormal cholesterol levels, 46 (27.4%) were referred for abnormal blood

glucose levels, and 60 (33.7%) were referred for abnormal blood pressure. The majority (64.9%) of individuals were referred to the clinic for only one abnormal result. However, 31.0% of individuals were referred for two abnormal screening results, and 4.1% were referred for abnormal cholesterol, blood glucose and blood pressure simultaneously. The overall rate of utilizing clinical services, was approximately the same for the subgroup having received referrals (35.6%) as it was for the overall ¡Salud! population in 2011 (36.3%). However, the prevalence of certain ICD-9 diagnostic codes, particularly those for serum cholesterol and blood glucose or diabetes, appeared to be higher. This is examined further in the cross-sectional analysis for Specific Aim 1.

Additionally at this time, we tested for correlation among family support variables (Table 7) and among types of referrals (Table 8) in the referral subset using chi-square tests. I found that marital status was significantly correlated with having family registered into the program ($p=0.003$), which is logical considering that spouses and partners of vineyard workers are among the few individuals that may also be registered into the program. Neither marital status nor having family registered were significantly correlated with living with relatives. This is perhaps due to the fact that many ¡Salud! Services clients live with extended family members. Also found that cholesterol referral was significantly correlated with both glucose referral ($p<0.001$) and blood pressure referral ($p<0.001$). However, blood pressure referral and glucose referral were not significantly correlated with each other ($p=0.216$).

Table 6. Descriptive Statistics of the 2011 Primary and Uninsured ¡Salud! Services Population (N=1268)

Variable	Number	Percent
Demographic Indicators		
Gender		
Female	231	18.2
Male	1037	81.8
Age Mean (SD) = 35.4 (10.9)		
Primary Language		
English	78	6.2
Spanish	954	75.2
Missing	236	18.6
Family Support Indicators		
Marital Status		
Single	433	34.1
Married	739	58.3
Missing	96	7.6
Lives with Relatives		
No	181	14.3
Yes	773	61.0
Missing	314	24.8
Has Family Registered into ¡Salud! Program		
No	911	71.8
Yes	357	28.2
Health Screening Indicators		
Attended a Health Screening Fair		
No	617	48.7
Yes	651	51.3
Given a Referral (n=651)		
No	438	74.2
Yes	168	25.8
Clinic Utilization Indicators		
Has a Clinic Visit in 2011 (received a ¡Salud! grant)		
No	882	69.6
Yes	386	30.4
Individuals receiving the following diagnostic codes at least once in 2011 (n=1268)		
Cholesterol ICD-9 Code	28	2.2
Blood Glucose/Diabetes Diagnostic Code	35	2.8
Blood Pressure Diagnostic Code	19	1.5
Health Education Diagnostic Code	2	0.2
General Medical Exam Diagnostic Code	61	4.8

Table 7. Chi-Square Correlation Tests between Family Support Level Variables (n=168)

Variable	Lives with Relatives				p-value	Family Registered				p-value
	Relatives		Non-Relatives			Yes		No		
	n	%	n	%		n	%	n	%	
Marital Status					0.676					0.003
Married	69	72.6	15	68.2		46	88.5	70	66.0	
Single	26	27.4	7	31.8		6	11.5	36	34.0	
Family Registered					0.062					
Yes	32	32.6	3	13.0		---		---		---
No	66	67.4	20	87.0		---		---		

Table 8. Chi-Square Correlation Tests between Health Screening Referral Variables (n=168)

Variable	Cholesterol Referral				p-value	Blood Pressure Referral				p-value
	Yes		No			Yes		No		
	n	%	n	%		n	%	n	%	
Glucose Referral					<0.001					0.216
Yes	26	20.3	20	50.0		13	21.7	33	30.6	
No	102	79.7	20	50.0		47	78.3	75	69.4	
Blood Pressure Referral					<0.001					
Yes	34	26.2	26	65.0		---		---		---
No	94	73.4	14	35.0		---		---		

Results for Specific Aim 1

The purpose of Specific Aim 1 was to evaluate differences in demographic characteristics, clinic utilization characteristics, and health status based in ICD-9 codes for those individuals who attended a health screening fair vs. individuals who did not attend a health screening fair. Due to the fact that the large majority of individuals who attended a health screening fair were primary vineyard workers, a subsample including only primary workers and those who are uninsured was selected for this cross-sectional analysis, leading to a total sample size of 1,268. This allows for a more specific comparison between the two groups, and increases the validity of applying the results from Specific Aim 2 to the entire

¡Salud! population. Furthermore, it was essential to exclude those individuals with health insurance, as they are likely to bias the results.

The complete results for the analysis done in Specific Aim 1 can be found in Table 9. There were significantly fewer women who attended a screening fair than did not attend a screening fair ($p<0.001$). Approximately 14.1% of those who attended a screening fair were female, while 22.5% of those who did not attend a screening fair were female. The average age was not significantly different between the two groups ($p=0.66$) and was just over 35 years in both groups. Significantly fewer English speakers attended screening fairs ($p=0.009$.) Also, interestingly, there were a lot more missing data for primary language among those who attended a screening fair than those who did not attend (28.7% and 7.9%, respectively.) Among the family support level variables, differences in marital status was not significant ($p=0.840$) however both living with relatives and having family registered into the program were significantly different between those attending and those not attending ($p=0.007$ and $p=0.016$, respectively.) There was a smaller proportion of both individuals who live with relatives and individuals who have family registered into the program who attended a screening fair than did not attend a screening fair.

Approximately 31.3% of individuals who did not attend a screening fair had received a grant for care from ¡Salud! Services at some point during the 2011 registration year from February 28, 2011 to February 28, 2012, indicating that they had received clinical services during that time. Similarly, among the individuals who did attend a screening fair, approximately 29.7% received a grant for care for clinical services at some point during the time period of February 28, 2011 to February 28, 2012. The proportion of general clinic utilization was not significantly different between the two groups ($p=0.528$). Additionally, I compared the prevalence of specific IDC-9 codes for blood pressure, blood glucose or diabetes, and cholesterol within the two groups, as a proxy for the health status of each of

the groups. I found that the prevalence of ICD-9 codes for blood pressure, cholesterol, and general medical exam was similar for the two groups. There was not a significant difference in the prevalence of ICD-9 codes for any of these factors among those who did not attend a screening fair compared to those who did attend a screening fair. The difference in prevalence of ICD-9 codes for blood glucose or diabetes was marginally significant ($p=0.088$). There was a slightly higher proportion of individuals receiving ICD-9 codes for blood glucose/diabetes among those who did not attend a screening fair compared to those who did attend a screening fair.

Additionally, I examined differences in the prevalence of comorbidities of cholesterol, blood pressure, and glucose/diabetes ICD-9 codes between the two groups. There were a total of fourteen individuals (1.1% of the total population) who had received ICD-9 codes for two or more of the illnesses of interest. The majority of these were for two illnesses. Among those with any comorbidities, the most common combination was for cholesterol IDC-9 codes and glucose or diabetes ICD-9 codes (50.0%). Only three individuals were found to have comorbidities of all three illnesses of interest, and none of those three individuals had attended a screening fair. Overall there were seven individuals with comorbidities who attended a screening fair and seven individuals with comorbidities who did not attend a screening fair. There was no significant difference in the prevalence of comorbidities between the two groups ($p=0.745$).

Table 9. Cross-Sectional Comparison of Groups that Attended Screening Fairs and Did Not Attend Screening Fair (n=1,268)

Variable	Did Not Attend Screening Fair		Attended Screening Fair		p-value [a]
	Number	Percent	Number	Percent	
TOTAL	617	48.7	651	51.3	---
Demographic Indicators					
Gender					<0.001
Female	139	22.5	92	14.1	
Male	478	77.5	559	85.9	
Age					0.662
	617		651		
	Mean(SD)=35.2(11.0)		Mean(SD)=35.5(10.8)		
Primary Language					0.009
English	54	9.5	24	5.2	
Spanish	514	90.5	440	94.8	
Missing	49	7.9	187	28.7	
Family Support Indicators					
Marital Status					0.840
Single	213	37.2	220	36.7	
Married	359	62.8	380	63.3	
Missing	45	7.3	51	7.8	
Lives with Relatives					0.007
No	69	15.4	112	22.2	
Yes	380	84.6	393	77.8	
Missing	168	27.2	146	22.4	
Has Family Registered into Salud Program					0.016
No	424	68.7	487	74.8	
Yes	193	31.3	164	25.2	
Clinic Utilization Indicators					
Has a Clinic Visit in 2011 (received a ¡Salud! grant)					0.528
No	424	68.7	458	70.4	
Yes	193	31.3	193	29.7	
Cholesterol ICD-9 Code (at least one)					0.535
No	605	98.1	635	97.5	
Yes	12	1.9	16	2.46	
Blood Glucose/Diabetes Diagnostic Code (at least one)					0.088
No	595	96.4	638	98.0	
Yes	22	3.6	13	2.0	
Blood Pressure Diagnostic Code (at least one)					0.417
No	606	98.2	642	98.8	
Yes	11	1.8	8	1.2	

Variable	Did Not Attend Screening Fair		Attended Screening Fair		p-value [a]
	Number	Percent	Number	Percent	
General Medical Exam Diagnostic Code (at least one)					0.659
No	589	95.5	618	94.9	
Yes	28	4.5	33	5.1	
Comorbidities					0.745
No (1 illness only)	28	4.5	23	3.5	
Yes (2 or 3 illnesses)	7	1.1	7	1.1	

[a] Chi-square test.

Results for Specific Aim 2

Bivariate Regression Analysis

Unadjusted, bivariate analysis (Table 10) was performed on each of the primary predictors of interest and the covariates, comparing them to the outcome of interest: receiving clinical follow-up with-in 12 months of a health screening referral. Among the 168 individuals who were given a referral for abnormal screening results, 25 (14.9%) sought follow-up care in a clinical setting. None of the demographic covariates were found to be independently associated with the outcome at an alpha level of 0.10. For all variables, significance was calculated using Fisher's Exact Test, as many of the cell sizes were small. Age was test for normality using the Shapiro-Wilks test. Age was not found to have a normal distribution at the alpha level of 0.05 (W=0.983, p=0.035) however, it was treated as a continuous variable in the bivariate and multivariate analyses (Figure 3). Age and gender were not found to be significantly associated with the outcome. Despite previous evidence that language is an important predictor of health care utilization among farmworkers, it was not analyzed in the bivariate analysis because it was determined previously that no English speakers sought follow-up care in this study population. Upon further consideration, I believe the language variable in this study is collected differently than the language variable in other studies, and therefore holds less importance in this analysis.

Only one of variables used to determine family support level was found to be significantly associated with the receiving health services at the 0.10 level. Surprisingly, being married or having a domestic partner was not associated with seeking follow-up care [OR=0.86, 90% CI (0.38, 1.92)]. Nor was living with at least one family member significantly associated with the outcome [OR=2.05, 90% CI (0.56, 7.50)]. Perhaps due to the moderate sample size of this dataset, and the abundance of missing data, statistical significance was hard to establish. Individuals who have one or more family members registered into the program were significantly more likely to have a positive outcome [OR=2.30, 90% CI (1.12, 4.74)]. The association between having family members registered into the ¡Salud! program and the outcome measure was significant (p=0.059) at the alpha level 0.1.

Individuals who were referred to the clinic for abnormal blood glucose were significantly more likely to receive follow up than individuals who were given referrals of things other than blood glucose (p=0.015). Individuals who received a referral for multiple abnormal results were more likely receive follow-up care than those who were referred for only one abnormal result [OR=1.89, 95% CI (0.80, 4.45)], however, this was not a significant result (p=0.148). Although they were not primary predictors of interest in this study, individuals given a blood pressure referral were significantly less likely to seek follow-up care than those not given a blood pressure referral [OR=0.40, 95% CI (0.14, 1.13)], while being given a cholesterol referral [OR=1.77, 95% CI (0.57, 5.49)] was not significantly associated with seeking follow-up care.

Table 10. Bivariate Associations between Clinical Follow-Up within 12 Months of a Health Screening Referral[a] and Covariates (n=168)

Variable	No Follow-Up		Follow-Up		OR	95% CI		p-value[b]
	Number	Percent	Number	Percent		Lower	Upper	
TOTAL	143	85.1	25	14.9	---	---	---	---
Demographic Indicators								
Gender								0.107
Female	9	69.2	4	30.8	Referent			
Male	134	86.5	21	13.5	0.35	0.09	1.72	
Age					1.02	0.98	1.06	0.411
Primary Language								0.978
English	6	100.0	0	0.0	Referent			
Spanish	99	84.6	18	15.4	<0.01	<0.01	>999.99	
Missing	43	86.0	7	14.0	---	---	---	---
Family Support Indicators								
Marital Status								0.756
Single	35	83.3	7	16.7	Referent			
Married	99	85.3	17	14.7	0.86	0.33	2.24	
Missing	9	90.0	1	10.0	---	---	---	---
Lives with Relatives								0.363
No	21	91.3	2	8.7	Referent			
Yes	82	83.7	16	16.3	2.05	0.44	9.62	
Missing	40	85.7	7	14.0	---	---	---	---
Has Family Registered into Salud Program								0.059
No	102	88.7	13	11.3	Referent			
Yes	41	77.4	12	22.6	2.30	0.97	5.45	
Health Screening Indicators								
Cholesterol Referral								0.326
No	36	90.0	4	10.0	Referent			
Yes	107	83.6	21	16.4	1.77	0.57	5.49	
Glucose Referral								0.015
No	109	89.3	13	10.7	Referent			
Yes	34	73.9	12	26.1	2.96	1.24	7.09	
Blood Pressure Referral								0.083
No	88	81.5	20	18.5	Referent			
Yes	55	91.7	5	8.3	0.40	0.14	1.13	
Number of Referrals								0.148
1	96	88.1	13	11.9	Referent			
>1	47	79.7	12	20.3	1.89	0.80	4.45	

[a] Reference category is receiving follow-up care.
[b] Fisher's Exact Test

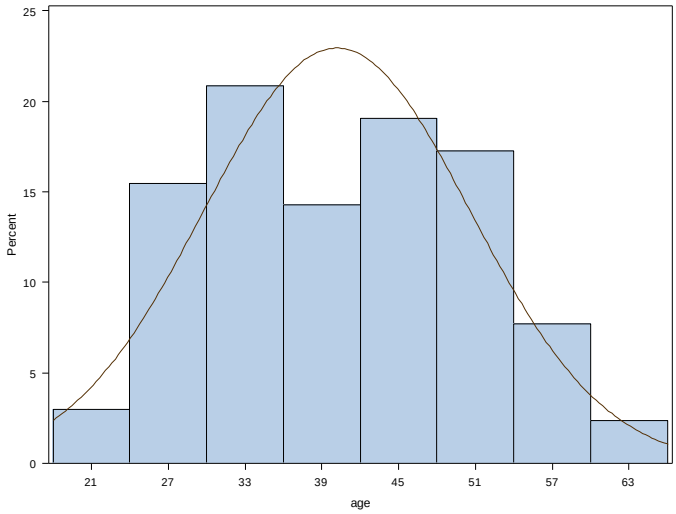

Figure 3. Histogram of Age Distribution

Multiple Logistic Regressions

To test the hypotheses posited in this study, logistic regression analysis was performed to examine the relationship between family support variables, glucose referral, and multiple referrals, and receiving follow-up care within a twelve-month period of a health screening referral. Adjusted odds ratios, 95% confidence intervals, and p-values are presented in Tables 11-15, each representing a different model that was run.

First, the three-predictor variables representing family support level (marital status, living with relatives, and having family registered into the program) were run simultaneously in a model (Table 11) with the demographic covariates gender and age, which were preselected through a review of the literature. Both marital status and living with relatives, which were not significantly associated with seeking follow-up care in the bivariate analysis, remained insignificant after adjusting for age and gender (p=0.194 and p=0.922, respectively.) However, having relatives registered into the ¡Salud! program was a significant predictor of clinical follow-up after adjusting for age and gender [AOR=5.68, 95% CI (1.57, 20.58)]. While family registered into the program is significant in this model

(p=0.008), it should be noted that the confidence intervals are extremely wide, which is indicative of the small sample size being used in this analysis and wide variation in this binary data. Multicollinearity was a concern in this model among the family support level variables. I used the Variance Inflation Factor to test for multicollinearity among the variables, and found that no significant multicollinearity existed. A Hosmer-Lemelshow test was conducted to evaluate the fit of the multiple regression model for family support level. The test was not significant (p=0.075), indicating that the model has an adequate fit. Additionally, I plotted a receiver operating characteristic (ROC) curve. The area under the ROC curve for this model was 0.744, indicating that the model was a fair test of sensitivity and specificity of the data.

The second multiple regression model examined the relationship between referral given for abnormal glucose levels and seeking clinical follow-up care within a 12-month period, while adjusting for age and gender. Table 12 shows the results of this model. I determined that being given a hyperglycemia referral is significantly associated with the outcome (p=0.030), and that individuals who were given a hyperglycemia referral were 2.71 times more likely [CI 95% (1.10, 6.68)] to seek follow-up care within 12 months of their referral than individuals who received referrals for other health indicators such as blood pressure and/or cholesterol after adjusting for age and gender. In order to isolate the effect of a blood glucose referral among those who may have been given referrals for multiple screening results, the variables for blood pressure referral and cholesterol referrals were also added into this model (Table 13). Cholesterol referral was added to this model, despite the fact that it was not significantly associated with the outcome in the bivariate analysis, because I had previously determined that cholesterol and glucose referrals were significantly correlated with each other, and I felt that it was important to adjust for potential confounding. The point estimate for association of interest increased

[AOR=3.61, CI95% (1.34, 9.69)] and the association remained significant (p=0.011). While chi-square correlation tests demonstrated that cholesterol referral was significantly correlated with both glucose referral and blood pressure referral, there was no sign of multicollinearity among the variables in this model according to the VIF test. A Hosmer-Lemelshow test was performed on both of the models and was not significant in either case, indicating that the models adequately fit the data (p=0.082 and p=0.398, respectively). ROC curves were created for each of the models as well. The model containing only glucose referral, age and gender had an area under the ROC curve of 0.631 indicating that it is a poor test to the data. The model containing all three types of referrals and age and gender had an area under the ROC curve of 0.706 indicating a fair test of the data.

In a separate model (Table 14) I examined the association between cholesterol and blood pressure referral and the outcome variable of seeking health services among only those individuals that were given a referral for blood glucose. This allowed for more in depth understanding of the association between follow-up care and the situation in which an individual was given a glucose referral plus another referral for blood pressure, cholesterol, or both. In this model, seeking follow-up care was not significantly associated with blood pressure referral (p=0.631). Cholesterol referral, however, was significantly associated with seeking follow up care (0.044). The confidence intervals for this measure of association were extremely wide [AOR=10.79, CI95% (1.07, 108.90)] which is likely due to wide variation in the data, and a very small sample size used for this model; there were a total 46 individuals that had been given a referral for blood glucose, and only 26 of those had also received a referral for cholesterol. These results give us some insight into which combinations of screening results might encourage individuals to follow-up. The Hosmer-Lemelshow test was p=0.423, and the area under the ROC curve was c=0.750.

Finally, I examined a model to test the third hypothesis for Specific Aim 1, the association between being given multiple referrals for multiple health indicators and seeking clinical follow-up within 12 months (Table 15). Being given a referral for multiple abnormal results was not significantly associated with seeking follow-up care after adjusting for age and gender (p=0.142). This is a very similar result to that which was found in the bivariate analysis, before adjustment. The Hosmer-Lemelshow test of this model was not significant, indicating that the model is an adequate fit for the data (p=0.092). The area under the ROC curve for this model was 0.595, indicating that the model was a very poor test of the data. I opted not to adjust this model for any other the specific types of referrals, as it adequately answered the intended research question in its simpler form. While this model demonstrates that individuals receiving more than one referral are not significantly more likely to seek follow-up care than those receiving only one referral, it provides no information about the effect that specific combinations of referrals might have, and does not take into account that certain combinations of referrals are more highly correlated than others.

Table 11. Multiple Logistic Regression Model 1: Association between Clinical Follow-Up within 12 Months of a Health Screening Referral[a] and Family Support Level Variables and Covariates (n=168)

Variable	OR	95% CI		p-value[b]	Variance Inflation Factor
		Lower	Upper		
Demographic Indicators					
Gender				0.051	1.08
Female	Referent				
Male	0.18	0.03	1.01		
Age	1.04	0.98	1.10	0.163	1.04
Family Support Indicators					
Marital Status				0.194	1.12
Single	Referent				
Married	0.42	0.11	1.56		
Lives with Relatives				0.922	1.06
No	Referent				
Yes	1.09	0.21	5.78		
Has Family Registered into ¡Salud! Program				0.008	1.13
No	Referent				
Yes	5.68	1.57	20.58		

[a] Reference category is receiving follow-up care.
[b] Chi-square test.

Table 12. Multiple Logistic Regression Model 2a: Association between Clinical Follow-Up within 12 Months of a Health Screening Referral[a] and Glucose Referral and Covariates (n=168)

Variable	OR	95% CI		p-value[b]
		Lower	Upper	
Demographic Indicators				
Gender				0.20
Female	Referent			
Male	0.43	0.12	1.57	
Age	1.01	0.96	1.05	0.793
Health Screening Indicators				
Glucose Referral				0.030
No	Referent			
Yes	2.71	1.10	6.68	

[a] Reference category is receiving follow-up care.
[b] Chi-square test.

Table 13. Multiple Logistic Regression Model 2b: Association between Clinical Follow-Up within 12 Months of a Health Screening Referral[a] and Glucose Referral and Covariates, Adjusted for Blood Pressure and Cholesterol Referrals (n=168)

Variable	OR	95% CI		p-value[b]	Variance Inflation Factor
		Lower	Upper		
Demographic Indicators					
Gender				0.101	1.04
Female	Referent				
Male	0.32	0.08	1.25		
Age	1.01	0.96	1.05	0.729	1.06
Health Screening Indicators					
Glucose Referral				0.011	1.18
No	Referent				
Yes	3.61	1.34	9.69		
Blood Pressure Referral				0.276	1.19
No	Referent				
Yes	0.55	0.19	1.62		
Cholesterol Referral				0.089	1.31
No	Referent				
Yes	3.26	0.84	12.71		

[a] Reference category is receiving follow-up care.
[b] Chi-square test.

Table 14. Multiple Logistic Regression Model 2c: Association between Clinical Follow-Up within 12 Months of a Health Screening Referral[a] and Cholesterol and Blood Pressure Referral for Individuals with Abnormal Glucose Levels (n=46)

Variable	OR	95% CI		p-value[b]
		Lower	Upper	
Demographic Indicators				
Gender				0.038
Female	Referent			
Male	0.06	0.01	0.85	
Age	1.06	0.97	1.17	0.203
Health Screening Indicators				
Blood Pressure Referral				0.631
No	Referent			
Yes	0.64	0.10	4.03	
Cholesterol Referral				0.044
No	Referent			
Yes	10.79	1.07	108.90	

[a] Reference category is receiving follow-up care.
[b] Chi-square test.

Table 15. Multiple Logistic Regression Model 3: Association between Clinical Follow-Up within 12 Months of a Health Screening Referral[a] and Multiple Referrals and Covariates (n=168)

Variable	OR	95% CI		p-value[b]
		Lower	Upper	
Demographic Indicators				
Gender				0.11
Female	Referent			
Male	0.35	0.10	1.27	
Age	1.01	0.97	1.06	0.563
Health Screening Indicators				
Number of Referrals				0.142
1	Referent			
>1	1.92	0.80	4.59	

[a] Reference category is receiving follow-up care.
[b] Chi-square test.

CHAPTER 5

DISCUSSION

This study was conducted to evaluate an important segment of Tuality Healthcare ¡Salud! Services' outreach program. ¡Salud! Services provides annual workplace health screenings to vineyard workers each year, with the intention of encouraging access to needed clinical services. This study compared the health status of individuals who attended health screening fairs compared to those who did not attend. Additionally, this study examined the relationship between family support level and health indicator factors in relation to seeking appropriate follow-up care in a clinical setting among the uninsured ¡Salud! Services vineyard worker population. Demographic factors that have been identified as significant predictors of health care utilization among farmworkers in previous studies were selected as covariates for this analysis.

Chi-Square Comparisons

In 2011, 1,935 individuals over the age of 18 were registered into the ¡Salud! program. However, the analysis in this study was performed on a subset of 1,268 individuals in the ¡Salud! population that includes only primary vineyard workers and the uninsured. The first part of this analysis was a cross-sectional comparison between individuals who attended a screening fair and those who did not attend a screening fair. All of the ¡Salud! Services health screening fairs occur at vineyard and winery worksites. Membership and the benefits of the ¡Salud! Services program are available to any individual who is employed at a vineyard, winery, or vineyard contractor. However, due to time and financial constraints, ¡Salud! Services is able to provide health screening fairs at the worksites of approximately half of its members. Individuals from other locations, as well as

family members, are invited to attend these screenings, but it should be acknowledged that individuals may be less likely to attend a screening fair if the location is inconvenient. Participation in the screening is completely voluntary; however it is rare for someone to opt out of participating in the screening when it is offered at his or her place of work. The location of each screening fair is selected based on geographical location and personal relationship between the vineyard/winery and the ¡Salud! program. Location is never selected based on the health status of the individuals who work there.

There were significantly larger proportions of males, and Spanish-speakers among those who attended a screening fair than those who did not attend a screening fair. There were smaller proportions of individuals living with relatives, and individuals who have family registered into the ¡Salud! program. There was no difference in the mean age between the two groups or in the proportion of married individuals. A large amount of data was missing, especially among the variables for language and living with relatives. This missing data could have potentially affected the measure of association between the two groups.

None of the variables reflecting clinic utilization appeared to be different between the two groups. The overall proportion of individuals who had utilized any clinical service between February 28, 2011 and February 28, 2012 was approximately 30% among both those who had attended a health screening and those who did not. This indicates that approximately the same percentage of individuals in the two groups were knowledgeable about how to use the ¡Salud! Services grants for care program, and present their identification card at a clinical provider. Furthermore, there were no significant differences in the prevalence of ICD-9 codes for cholesterol, blood glucose or diabetes, blood pressure, or general medical exams between the two groups. Differences in the prevalence of ICD-9 codes for blood glucose or diabetes were nearly significant, with a higher prevalence of

diabetes-related ICD-9 codes among those who did not attend a screening fair. There was no significant difference in the prevalence of multiple risk factors of chronic illnesses of interest between the two groups. The most frequent combination of risk factors was elevated blood glucose and cholesterol, possibly indicating comorbidities of diabetes and heart disease. Overall, this tells us that the prevalence of these risk factors was not higher among one group than the other. Given the results of the first part of this analysis, I do not believe there is any reason to suspect bias among those who attended the health screening fairs. They do not appear to be either healthier or sicker than those who did not attend the screening fair.

Clinic Utilization and Follow-Up

The prevalence of a visit to any health care facility between February 28, 2011 and February 28, 2012 among this subset was approximately 30%. This is comparable to other studies that have found approximately half of farmworkers utilized health services in the last 2 years, and as high as 66% of farmworkers utilized health services in the last 2 years(Lopez-Cevallos et al., 2012; Villarejo et al., 2000). One major difference however, is that other studies have relied on self-reported health care utilization, in contrast to the ¡Salud! dataset, which is based on claims data. While the claims data may be a more reliable source for the date of service and the treatment received by each individual, they only allow us to see those clinical visits where claims were submitted to the ¡Salud! program on behalf of their clients, and therefore might be an underestimate of the actual number of clinical visits, as those visits where no claim was submitted will not be found in the dataset. There may be instances where a claim is not submitted to the ¡Salud! program because a client fails to present their ¡Salud! card to the provider, or because the provider is unfamiliar with the ¡Salud! process, however I suspect that these instances are rare.

Few individuals adhered to follow-up recommendations after a health screening fair by visiting a clinic regarding their referral. Eighty-five percent of those given a referral at the screening fair did not seek follow-up care in a clinical setting. This study provides evidence to support several suggestions that may increase follow-up among the clients of ¡Salud! Services, which will be discussed later. Several demographic covariates were tested in the bivariate analyses, however none were found to be significantly associated with the outcome. Overall, a very small proportion of those given a screening referral were female. Gender was not significantly associated with seeking follow-up care, which is contrary to results that have been found in other studies showing females more likely to utilize clinical services than males (Scheppers et al., 2006). Although not significant in this study, males were found to be less likely than females to seek follow-up care [OR=0.35, 95% CI (0.09, 1.72)], which would have important clinical meaning, has significance been achieved. Similarly, age was not found to be significantly associated with seeking follow-up care in this study, despite that fact that it has been identified as an important confounder in the literature (Hoerster et al., 2011).

Other studies have found that low English proficiency is a barrier to receiving medical care (Villarejo et al., 2000). In this study, however, primary language was eliminated as a variable because there were no individuals with English as their primary language who had a positive follow-up outcome. It should be noted that past studies have looked at English speaking ability, and the ¡Salud! dataset contains only information around primary language. In other words, an individual may have high English-speaking ability, but they may still consider their primary language to be Spanish. For these reasons, the language variable was removed from the multiple regression analysis. Another potential explanation as to why language may not be an important variable in the ¡Salud! population is that the program provides bilingual services and assistance to individuals seeking health

care. ¡Salud! staff frequently plays a role in contacting health care providers to schedule appointments or obtain results on behalf of the client; therefore it may not be necessary for an individual to speak English in order to connect with services. Interestingly, there was a much larger amount of missing language data among those that attended a health screening fair than those that did not (28.7% and 7.9%, respectively). It is unclear as to why this may occur during the Salud! Services data collection process. I suspect that many individuals are registered into the program during the screening fair if they had not previously signed up for the program. It is possible that the quality of data collected during that screening fair is not as high as it is during other times of the year due to time constraints of the screening fairs.

Family Support Level

Three variables indicating family support level were tested: marital status, living with relatives, and having family registered into the ¡Salud! program. Of these three indicators, only having family members registered into the ¡Salud! program was a significant predictor of seeking follow-up care within 12 months of a health screening referral. Other studies have identified family separation as an important barrier to social conditions and medical care access (Massey, 2005; Ward, 2010). In this study, having family registered into the ¡Salud! Program may be the best indicator of proximity of the individual's nuclear family. Many farmworkers are married; however, they may leave their spouses and children either in their home country or at their home base as they travel and work for part or all of the year. Similarly, in the collection of data by ¡Salud! Services the responses pertaining to living with relatives may include living with extended family members, which is common among farmworkers. It is unknown if living with extended family such as aunts, uncles, and cousins, provides the same level of family support as living

with immediate family members. While the association between living with relatives and seeking follow-up care was not significant in this study, the point estimate calculated in the unadjusted analysis was clinically important and warrants further exploration through research.

¡Salud! Services generally only extends program registration and benefits to immediate family members of vineyard workers, including spouse, children, and parents who currently live with the primary worker and are financially dependent on him or her. Therefore, having family registered into the program is, perhaps, the best predictor of family proximity. After adjusting for age and gender and other family support variables, individuals who have family registered into the ¡Salud! program were 5.68 times more likely to seek appropriate follow-up within 12 months of a referral than individuals who do not have family registered into the program. I would also hypothesize those individuals who take the steps to register their immediate family into ¡Salud! Services are potentially more familiar with how the program functions, and therefore, more comfortable using their identification card to request assistance for clinical services. In order to tease out the true relationship between family registered and seeking follow-up care, it may be necessary for ¡Salud! Services to collect more specific information regarding with whom the farmworkers live and how well they understand the ¡Salud! program. These data may indicate that an important point of intervention among the ¡Salud! population would be to more clearly explain how to get the most benefit from their membership.

Blood Glucose and Diabetes

As hypothesized, individuals who were given a referral for abnormal blood glucose level were significantly more likely to seek clinical follow-up care with 12 months than individuals who were given referrals for other health indicators, after adjusting for age and

gender. Diabetes mellitus is a very common illness; it is nearly twice as likely in Hispanic American adults than in non-Hispanic White adults. Diabetes also has some very apparent symptoms and complications that make it recognizable. The familiarity of this disease and the severity of its complications could likely affect both the beliefs of the individual, and of ¡Salud! Services staff as they communicate these risk associated with an abnormal glucose result to the individual.

There are likely differences in the outreach and education that is extended towards individuals suspected of pre-diabetes or diabetes. While no data have been collected specifically around education and intervention, anecdotally, ¡Salud! Services nurses may place more individual attention on those with abnormal glucose levels than they do on individuals with other abnormal screening results, as per conversations with current ¡Salud! Services staff. These individuals may get more one-on-one time with the nurses, a more in-depth explanation of the cause and risk of their suspected illness, and more on-going communication and encouragement to follow-up. The time and resources of ¡Salud! Services staff are limited, and therefore when prioritizing their time and efforts, it is likely that individuals with abnormal glucose levels make it to the top of the list.

Additionally, multiple studies have demonstrated that Hispanic farmworkers are very familiar with the diagnosis of diabetes and with the long-term complications (Bastida, Cuellar, & Villas, 2001; Heuer & Lausch, 2006). One study demonstrated that while there is still misconception around the cause of diabetes, 11 out of 12 farmworkers interviewed had at least one close friend or relative with diabetes, and many of them described serious complications of the illness that had occurred to their loved one (Heuer & Lausch, 2006). Again, familiarity with this illness and symptoms is likely to impact how an individual reacts to news that they may to have it themselves. Individuals who have experienced the impact of diabetes in someone close to them may be more likely to take steps to manage it.

Diabetes is widely recognized as an important issue in Mexico; it is the leading cause of death in women and the second leading cause of death in men in the country (Rull et al., 2005). In recent years, the Mexican government has taken steps to increase public awareness, prevention, and treatment of the disease. This too may play a role in familiarity with diabetes among farmworkers (Rull et al., 2005).

Both the actions of ¡Salud! Services staff and the personal beliefs of farmworkers offer opportunities for intervention. To improve follow-up across the board, ¡Salud! Services may want to create a more standardized intervention procedure for interacting with all individuals with abnormal results. In doing so, ¡Salud! Services may be able to clarify which intervention techniques are most effective in encouraging appropriate follow-up care. Additionally, ¡Salud! Services may consider incorporating witness accounts of complications that can arise from poorly managed diabetes into their outreach services. Appealing to a more "emotional" side of illness may lead to increased follow-up and early management of the diabetes.

Multiple Referrals

Surprisingly, the number of abnormal results was not significantly associated with seeking follow-up care within 12 months of the referral. The odds ratio produced in the multiple regression analysis of this primary predictor indicated that those with more than one abnormal result are more likely to follow up, but this did not reach statistical significance. In all of these analyses, sample sizes were small, making it difficult to produce significant or precise results. Furthermore, this study did not take into consideration all possible specific combinations of referrals. This study examined the association with follow-up care if an individual was given a referral for more than one factor, and it also examined specific combinations including diabetes. Interestingly, those with both

cholesterol and glucose referral were significantly more likely to follow-up, but those with both blood pressure and glucose referral were not.

There are a number of social, economic, institutional and cultural factors that may play a role in explaining the result found in this study. It is possible that farmworkers with multiple abnormal screening results feel a greater sense of overwhelm when it comes to dealing with illness. Financial and time barriers have been well documented among the farmworker population when it comes to utilizing health services (Leavitt, 2006; Rose & Quade, 2006; Villarejo, 2003). Farmworkers are often faced with a choice of missing a day of work in order to seek care, and it is possible that those with multiple indicators of illness feel more emotional distress around seeking follow-up (Rose & Quade, 2006). Multiple health issues may be perceived as more expensive and time-consuming to treat. Cultural and religious beliefs, such as fatalism, are also known to affect the actions of farmworkers. It is commonly believed that one's health is in the hands of God, which may lead to inaction. Many individuals may choose not to seek further care due to this fatalistic attitude (Goldsmith & Sisneros, 1996).

Lack of significant association with having multiple referrals is, perhaps, another indication that seeking follow-up care is more of a reflection of the outreach and education that is provided to the individual on the part of ¡Salud! Staff, than what the abnormal results actually are. Anecdotally, ¡Salud! staff has expressed concern that individuals may perceive the health screening fairs as a clinic visit. Simply by attending a screening, an individual with abnormal results may feel that they have received "sufficient" treatment, and consequently not seek any further care. This study also did not take into account the actual biomarker measurements of the screening results, only if an individual was given a referral. It is possible that individuals with extremely high results react differently than individuals

who fall just over the cutoff line for a referral. This may be an important factor to take into consideration in a future study.

Key Findings

Approximately half of the participants in this study attended a health screening fair in 2011. The overall prevalence of clinic utilization was about 30% among those who did attend a screening fair and those who did not. The prevalence of ICD-9 codes specifically for abnormal blood glucose or diabetes was slightly larger for those who did not attend a health screening fair than for those who did attend. There was no difference in the prevalence of clinic visits for elevated blood pressure, cholesterol, or individuals who had clinic visits for more than one of these factors between the two groups.

Few uninsured primary vineyard workers who receive a referral for abnormal health indicators at a ¡Salud! Services health outreach fair sought follow-up care in a clinical setting (15%). Having family members registered into the ¡Salud! program was significantly associated with seeking follow-up care. Having a referral for abnormal blood glucose level was significantly associated with follow-up. However, receiving a referral for multiple abnormal screening results was not significantly associated with follow-up.

Strengths

This evaluation offers several strengths that previous studies have lacked. The study provides information that is both novel and important to the farmworker community and their allies in the State of Oregon and throughout the nation. The results of this study offer a deeper understanding of the vital link between early detection of chronic illnesses through free screening services and seeking primary care services for these illnesses among farmworkers in Oregon. While this study was performed on one specific section of the

farmworker population, the results may be applied to other programs similar to Tuality Healthcare ¡Salud! Services, which provide similar assistance to the farmworker population. Health screenings are widely provided at events that tend to draw in farmworkers and their families, such as health fairs, community events, and local farmers markets. In addition to evaluating specifically the ¡Salud! program, these results help to determine if free screening services are an important and viable component of migrant health services. The sample size for this study is relatively large; n=1,268 uninsured, primary vineyard workers participated in the ¡Salud! program in 2011. Furthermore, this study utilized data that were previously collected by ¡Salud! Services for administrative purposes, creating an inexpensive route to evaluate an important segment of this program.

This study employed a unique method of capturing clinic utilization and diagnosis, as a result of the integral component of the ¡Salud! program of providing grants for participating individuals to access health care services. For many similar programs, this information would be based on self-reported survey data, which is more prone to recall bias. Additionally, predictor variables (health screening referrals) were given to participants of this study were determined by actual measured biomarker data for chronic diseases, from the ¡Salud! screening fairs. Generally, data on chronic disease among farmworkers are based on self-reported diagnoses, and must be considered underreported. This study adds to the scientific body of knowledge about the disparities that surround one of our nation's most vulnerable populations.

Limitations

A study of this scope and magnitude has limitations that must be recognized. First, the data that was used in this study were not collected for the purposes of research, but for administrative records for the ¡Salud! program. Therefore, the data were more susceptible

to inconsistencies and errors, as can be seen by the large amount of missing data for certain variables. It is important to acknowledge that these missing data could have potentially affected the parameter estimates found in this study. The quality control process was a very important step in this study. Errors and inconsistencies of these data were reduced by validating electronic data against hardcopy data.

Secondly, the method that was used for capturing clinic utilization has never been validated. While I suspect that the data captured the majority of clinic visits through the grant for care procedure, it is possible that some clinic visits were missed if the participant had not requested financial assistance from the ¡Salud! program, or if a full set of diagnostic codes were not obtained from the clinic. If this was a source of potential bias in the results, however, as it would have led to an underestimate of the total clinic visits, and the outcome would be biased toward the null, so any found association is only likely to be more significant in reality. In the future, it would be worthwhile to validate this data with survey data of a portion of the ¡Salud! clients to determine how well this key piece of information is captured. For the purposes of this program evaluation, although there were likely some missing clinic utilization data, I do not suspect it being in anyway systematic.

This study did not take into account some potentially influential factors, such as the number of times an individual has been to a screening fair, if they had recently had a clinic visit prior to the screening fair, or if they are aware of the illness and are already seeking treatment. These factors may all influence whether or not an individual seeks follow-up in the 12 months following a health screening. For example, if an individual is already aware that they have high blood pressure and they have recently spoken to a provider about it, they may not seek follow-up care with in the study period, regardless of their screening fair result.

Finally, the results of this study cannot be easily applied to other farmworker populations, in terms of prevalence of service utilization. The actions of ¡Salud! clients were evaluated under a very specific set of circumstances, in that, while primarily uninsured, they were given financial assistance with health care services. This could have greatly influenced their utilization of clinics, and the results may not be generalizable to other programs. However, I consider that the comparison of clinic utilization is a valid one among ¡Salud! clients, who are all eligible to receive financial assistance. The study results still show how screening fairs affect service utilization within this population.

Despite these limitations, the results of this study provide us with valuable information to better understand methods for overcoming some of the barriers to health care that the farmworker population faces.

Recommendations for ¡Salud! Services

This study provides a good deal of insight into health outreach and follow-up among farmworkers, and much of this information can be used to make immediate improvements to the ¡Salud! program. As discussed, the majority of individuals that received a referral at a health screening fair did not seek appropriate follow-up care in a clinical setting within 12 months. In order to best utilize their limited resources, ¡Salud! Services should take steps to improve this central component of their program. There are several things that ¡Salud! Services could do in order to facilitate and encourage an increase of follow-up care, and well as to enhance overall rates of clinic utilization among their clients.

This study has demonstrated that seeking follow-up care may be linked to increased family support. To maximize the benefits that family support has on health behaviors, ¡Salud! Services should take steps to increase registration of their clients' family members into the program and encourage family participation in outreach events such as health

screening fairs. Currently, ¡Salud! Services contacts vineyard management to arrange health outreach events, who in turn inform the vineyard workers. As a result, approximately 95% of those individuals participating in the health screening are primary vineyard workers. Participation of family members is uncommon. More family members may participate in ¡Salud! activities if they are communicated with directly via postcards, emails, text messaging, or phone calls. Pending the individual's consent, this could create the opportunity to discuss health screening results as a family, which may lead to more accountability on the part of the person receiving the referral.

¡Salud! Services may also consider a more standardized screening process, to encourage consistency in seeking follow-up care. Registered Nurses should spend approximately the same amount of time with each individual receiving a referral and address not only the screening result, but also other social, economic, familial, cultural, or health barriers that might affect an individual's decision to follow-up. One important component of this standardized referral process should include offering to make a clinic appointment on behalf of the vineyard worker at the time of the referral. In this way ¡Salud! staff members may be able to minimize some of these barriers that workers face in utilizing clinic services, such time constraints, or having to request time off from their employer.

A greater emphasis should be placed on explaining how to utilize the benefits of ¡Salud! Services at every interaction with the clients. It is possible that not know how to present the Salud card in a clinical setting is actually adding another barrier in utilizing health services. Focusing on how to overcome this will be of great benefit to all clients of the Salud! program and likely increase overall rates of clinic utilization.

Finally, I would encourage ¡Salud! Services to take the time to collect complete and accurate data throughout the year, in order to reduce the amount of missing data in the

database. This will add to the certainty around point estimates in future studies. And additionally,

Future Research

A good number of programs have been developed and implemented to address the health services needs of farmworkers and their dependents, however, few data exist on service utilization patterns in this population. Many of ¡Salud! Services' clients have participated in the program for 10 or more years, offering a unique opportunity to follow seasonal farmworkers for longer periods of time. In the future, I would propose to continue research to better understand the translation of health outreach into primary care, by creating a prospective cohort of ¡Salud! clients. This could include annual health indicator screenings, tracking service utilization and ICD-9 codes of participants, regular follow-up phone calls, house visits, and educational materials from ¡Salud! staff. Examining the trends in adherence to follow-up over time might provide valuable information to inform outreach services, as it could account for how comfortable an individual feels in using the benefits of the program. In addition to this, I believe it would be worthwhile for ¡Salud! Services to validate their claims data collection process though a phone survey, to compare clinic utilization from claims data to self-report data.

It is common for ¡Salud! Services to implement surveys with their client, and in the future I would recommend collecting more information around family support level, such as how frequently an individual communicates with their nuclear family and who they speak to about health issues. Additionally, it may be worthwhile to collect information around farmworker's access to primary care providers and recent clinic utilization to help narrow the gap in the data available on the health service needs of farmworkers, or on assessments of the services they do receive.

CHAPTER 6

CONCLUSIONS

Overall rates of healthcare utilization are low among farmworkers. While many organizations work to provide early detection of chronic illness through health screenings and outreach programs, little is known about how this translates into direct clinical access for farmworkers. It is a worthwhile endeavor to better understand the relationship between health outreach for farmworkers and access to care, in order to best utilize limited resources. The results of this study indicate that adherence to follow-up recommendations may be tied to both family support level and better understanding of the Tuality Healthcare ¡Salud! Services program. Individuals with family also registered into the program were more likely to follow-up after a referral, however it is difficult to say if this is due to having more nuclear family members in the area, or if individuals who are most comfortable with the program sign their family up for it. Either way, with continued investigation ¡Salud! Services may be able to improve the rates of follow-up care among their clients by placing more emphasis on how to utilize the program and all of its benefits, as well as developing family-oriented interventions that may involve spouses/partners, children, and parents into the conversation about an individual's health. This study further indicates that individuals with abnormal glucose levels are more likely to seek follow-up care. I suspect that this is due to cultural perceptions around diabetes on the part of farmworkers and ¡Salud! Services staff RNs. Farmworkers may perceive diabetes as a more serious issue, one that they are familiar with through affected friends and family members, and they may be more likely to seek follow-up care. Additionally, ¡Salud! Services staff may recognize the importance of follow-up care for individuals with diabetes and prioritize their time to give more attention in individuals with abnormal glucose results, explaining to individuals what the

complications may be of their illness, and encouraging them to follow-up. There was not a significant association between receiving a referral for multiple abnormal screening results and seeking follow-up care. There are many factors that may play a role in explaining this result, such as cultural beliefs around healthcare on the part of farmworkers, and emotional distress attached to multiple abnormal screening results. It should also be recognized that this study has limitations to fully understand which combinations of factors may influence individuals to seek follow-up care. The results of this study provide ¡Salud! Services with valuable information to better understand and improve their program. They can use the results of this study to develop a more standardized program to encourage individuals with abnormal screening results to continue to receive care in a clinical setting.

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