Increasing Skin Cancer Awareness in Southeastern North Carolinian Farmers

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Acknowledgments

Many people, both professional and personal, have made this journey possible. The most thanksgiving is reserved for Jesus Christ, my Lord, and Savior, who loves me in spite of myself and has strengthened me to endure this path. His guidance has helped me endure and not give up. I am thankful for His provision and guidance to and through this journey called DNP. My Lord is the source of my strength and peace, which are needed in abundance in this program.

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Dedication

To farmers past, present, and future.

To my great grandfather Tiderman who inspired this project posthumously. Remembering your suffering from melanoma on the nose and surgical removal of the entire nose as a result of sun exposure fueled this project.

To my family of farmers: great grandfather, grandfathers, grandmothers, mother, father, husband, and father-in-law.

To farmers who work in the harshest weather conditions and sacrifice so that we may eat.

To future farmers who will work tirelessly to provide a mostly ungrateful world the food it needs to survive.

Be patient therefore, brethren, unto the coming of the Lord. Behold, the farmer waiteth for the precious fruit of the earth, and hath long patience for it, until he receive the early and latter rain. Be ye also patient; stablish your hearts: for the coming of the Lord draweth nigh. James 5:7-8

Abstract

Farmers are at increased risk of occupational disease of skin cancer related to sun exposure and hesitancy to use protective methods. The purpose of this project was to increase skin cancer awareness among the farmers of southeastern NC. A collaborative, interprofessional relationship was formed with the agriculture center to provide preventive education in a community setting. Community settings are less threatening; primary (sun protection) and secondary prevention (early detection) education may be better received by nonhealthcare avenues. The project aimed to train 100% of the agriculture extension farm agents in using the educational session during 80% of meetings with farmers. The health belief model and protection motivation theory guided the methodology. Agriculture agents were trained to use an educational session (ES) which consisted of a voice-over PowerPoint (VOPP), display of sun protection items, poster, and handouts. The agents used the ES in meetings with all types of farmers and farm workers. The agents completed the data collection sheet, which the project lead tallied and reported results. The project educated 337 farmers, 100% of agents were trained, and the ES was used in 80% of the meetings. Barriers included implementation during the fall season and lack of a VOPP in Spanish. The agriculture center was receptive to partnership and assisting farmers to improve healthcare. The project spread to three other counties during implementation. This sustainable, cost-effect project can be replicated to other agriculture centers and translated to other community settings and populations.

Key words: skin cancer, skin protection methods, farmer, farmworker, agriculture center, agriculture agent, education session, community setting

Table of Contents

Chapter One: Overview of the Problem of Interest

The purpose of this proposed Doctor of Nursing Practice (DNP) Project was to increase skin cancer awareness among the farmers of southeastern North Carolina. Formerly, there was not a formal presentation to inform farmers of their skin cancer risk at the North Carolina agricultural center located in the coastal plains (Site Director, personal communication, January 22, 2019). Advanced Practice Registered Nurses (APRNs) are leaders in the community and can identify and respond to healthcare deficits in the community. Furthermore, farmers are at increased risk of occupational disease of skin cancer related to sun exposure and hesitancy to use protective methods (Smit-Kroner & Brumby, 2015). This project proposed to offer a novel way to reduce the skin cancer risk in farmers by educating them at the North Carolina agricultural center in lieu of a healthcare environment. Innovation to increase skin cancer awareness in the farmers was aimed at providing an education session about skin cancer and the use of sun protection methods by farmers.

This doctoral project was intended to educate farmers about the risk of skin cancer and accessible sun protection methods. This project proposed to create an educational presentation that can be used by agriculture agents and staff during regularly scheduled meetings with farmers (see Appendix A). Using the DNP prepared presentation, the agents/staff at the North Carolina agricultural center can advise farmers about the risk of skin cancer and subsequently take proper actions to prevent skin cancer.

Background Information

Problem identification. Occupational skin cancers of farmers are under-recognized and include melanoma, squamous cell carcinoma, and basal cell carcinoma (Chern et al., 2019). Ninety percent of squamous cell carcinomas (SCC) and two-thirds of melanomas are triggered

by ultraviolet light exposure (Chern et al., 2019). Skin exposed to ultraviolet radiation (UVR) often develops lentigo maligna, which becomes malignant over time (Salako & Chowdhury, 2014). Additionally, farmers are among the least likely to attend skin cancer screening events (Zink, Wurstbauer, Rotter, Wildner, & Biedermann, 2017). The occupational exposure to the sun demands a need for farmers to understand their increased risk and proper use of protective measures.

Exposure. Over one-third of adults reported at least one sunburn in the past year (Healthy People 2020, 2019). Farmers have the most exposure to UVR of all outdoor workers (Smit-Kroner & Brumby, 2015). Subsequently, farmers are at an increased risk for skin cancer related to occupational exposure to the UVR of the sun (World Health Organization, 2017). In addition, UVR exposure may be intensified by pesticides and oils on the skin (Salako & Chowdhury, 2014). Farmers have two factors compounding their risk of skin cancer: significant exposure to UVR and intensification of that light by oils or pesticides on the skin.

Lack of protective measures. Only two-thirds of the people over the age of 18 use protective measures to reduce the risk of skin cancer (Healthy People 2020, 2019). Furthermore, farmers report inadequate protection methods. The reluctance of farmers to wear sunscreen and wide-brimmed hats increases the risk of skin cancer (Smit-Kroner & Brumby, 2015). One study reports as few as 10% of outdoor workers use effective sun protection methods (Chern et al., 2019). Specifically, less than 25% of farmers report using sun protection methods (Babazadeh, Nadrian, Banayejeddi, & Rezapour, 2017). Farmers report an inadequate use of sun protection methods, which leaves them exposed to more UVR and increases their risk of skin cancer.

Healthcare deficit. Farmers are hesitant to seek health guidance and often delay health care visits for serious health conditions, which decreases the opportunities for health education

by healthcare providers (Smit-Kroner & Brumby, 2015). Compounding the problem is the fact that healthcare providers are not necessarily aware of patient's occupation or risks involved and are often so overburdened with their caseload that skin checks are omitted (Smit-Kroner & Brumby, 2015). Research shows that providers are not offering skin checks and prevention education as part of a routine health screening (Smit-Kroner & Brumby, 2015). Limited time with patients may contribute to inconsistent screening, which can result in an increased risk of developing skin cancer.

Knowledge deficit. Farmers and other outdoor workers do not often consider the sun a source of cancer or health problems (Salako & Chowdhury, 2014). Although there is excellent evidence in the literature regarding skin cancer risks and sun protection, farmers are not yet aware of the relationship (Zink et al., 2017). Surprisingly, 30% of the outdoor workers surveyed reported they were adequately protected from the harmful effects of the sun when only 13% recognized the need for increased protection based on the ultraviolet index (UVI) (Trakatelli, Barkitzi, Apap, Majewski, & De Vries, 2016). Although 80% of farmers thought skin cancer could be deadly, only 60% thought melanoma was serious and about 60% thought a cloudy day protected them from the sun's harmful effects (Carley & Stratman, 2015). One study revealed outdoor workers with lower educational levels were less comfortable completing medical forms (Trakatelli et al., 2016). This may explain the incongruence between evidence and reality. Farmers' knowledge deficit on the sun's harmful effects and protection measures needed reveal a need for education to increase the farmers' awareness of skin cancer and the need for protective measures.

Risk factors. Moreover, farmers with fair skin and light-colored hair and eyes more frequently develop skin cancer from the carcinogenic effects of UVR (Salako & Chowdhury,

2014). Farmers with personal or family history of melanoma or nonmelanoma skin cancer (NMSC), history of sunburn, and having 50 or more nevi are at increased risk of skin cancer (Robinson & Jablonski, 2018). Although these risk factors cannot be changed, physical characteristics and attributes can increase the risk of a farmer for skin cancer.

Description of the problem.

Financial impact. Minimal costs incurred by the facility during the implementation of the doctoral project will be offset by the improved healthcare and cost savings in overall healthcare. For the patient and the country, the financial impact of skin cancer is massive. The Centers for Disease Control (CDC) report the annual treatment of skin cancer in the United States costs $8.1 billion (CDC, 2015). Each case of basal cell carcinoma (BCC) is estimated to cost $5,670, while each case of squamous cell carcinoma is $10,555 (Institute for Work and Health, 2018). The individual cost includes healthcare costs, transportation to and from healthcare facilities for treatment, lost time at work, and other associated expenses which have a substantial impact on the individual, their family, and their community.

Incidence. Skin cancer is the most common type of cancer, with 5.4 million basal and squamous cell skin cancers diagnosed each year in the United States (American Cancer Society, 2019). Nearly 400,000 of new cases of NMSC occur annually in the United States (Salako & Chowdhury, 2014). Another, 71,434 new cases of melanoma of the skin were reported in 2018 (Global Cancer Observatory, 2019). Currently, it is estimated that 20% of Americans will develop skin cancer (American Academy of Dermatology, 2018). Farmers can be proportionally at increased risk of skin cancer related to the increased time spent in the sun.

Mortality and morbidity. Reluctance to seek healthcare frequently leads to deteriorating health and higher mortality rates (Smit-Kroner & Brumby, 2015). In 2007,

melanoma cancer deaths occurred at a rate of 2.7 per 100,000 (Healthy People 2020, 2019). Each day nearly 20 Americans die from melanoma, but the survival rate is 99% when treated early (American Academy of Dermatology, 2018). About 4,420 more people are expected to die from NMSC in 2019 (American Academy of Dermatology, 2018). These statistics illustrate the need for innovative ways to reduce skin cancer risk in farmers.

Significance of Clinical Problem

Skin cancer awareness in farmers is a current problem that this project can address. Formerly, there was not an educational session provided by the agents of the North Carolina agricultural center for farmers about skin cancer risk and sun protection. One of the Healthy People 2020 objectives is to increase adult use of protective measures that reduce the risk of skin cancer (Healthy People 2020, 2019). Creating and implementing an education session to increase awareness also aligns with the CDC strategic goal of promoting education to prevent skin cancer (CDC, 2015). By increasing farmers' awareness of skin cancer risks, farmers can engage in better sun protection methods and reduce their risk of skin cancer. Even though cancer is the leading cause of death in North Carolina, skin cancer is not specifically addressed in the county community health assessment (Sampson County Public Health, 2014). The NC Department of Health and Human Services (NCDHHS) only gave statistics for the incidence of melanoma at a rate of 21.5 per 100,000 persons (NCDHHS, 2014). Compounding the problem was the fact that there were no educational sessions for skin cancer offered within the county based on the community health assessment and extensive research online (SCEDC, 2016).

The improvement of the health of the population of farmers aligns with the Institute for Healthcare Improvement (IHI) Triple Aim Initiative to improve the health of populations (Institute for Healthcare Improvement, 2017). Improving skin health and reducing the number of

skin cancer cases can reduce the financial impact that skin cancer has on a person, the family, and the community. This is in alignment with the IHI Triple Aim Initiative to reduce the cost of healthcare per capita (Institute for Healthcare Improvement, 2017). Farmers have increased risk of sun exposure and skin cancer and need an understanding of protective measures to improve the quality of care and decrease the cost of care. With skin cancer prevention methods, in the United States, an estimated 21,000 melanomas could be prevented and save $250 million a year by 2030 (CDC, 2015). This project can provide an educational session to promote increased awareness of skin cancer for farmers in NC coastal plains.

Question Guiding Inquiry (PICO)

Agriculture agents at the North Carolina agricultural center will use an educational session to educate farmers to increase their awareness of skin cancer and prevention methods. A comparison can be made between current educational sessions for farmers and the skin cancer educational sessions attended by farmers.

Population. The population for this proposed project is the agents and staff at the North Carolina agricultural center and the farmers of NC coastal plains. Outdoor workers are defined as those people who spend three or more hours exposed to the sun daily (Chern et al., 2019). Due to the nature of farm work requiring extensive time outside, farmers are considered outdoor workers. Farmers in this proposed project refer to farm owners and farm workers working in the agriculture industry of NC coastal plains.

The farmers within the county include cattle, swine, and poultry farmers, blueberry and grape farmers, row crop farmers, apiarists, and others. Most farms are owned and operated by single-family farm owners, although some large farming operations employ hundreds of people (Sampson County Economic Development Commission [SCEDC], 2016). The average age of

farmers within the county is 56 years, with a total of 1,203 farms recorded (SCEDC, 2016). The SCEDC does not include the number of farmers within the county.

Intervention. This quality improvement project proposes to establish a resource in the North Carolina agricultural center that will encourage the use of the educational session prepared to increase awareness of skin cancer risk in farmers. Producing awareness and sun protection education to specifically address the agricultural worker is required to prevent repetitive sunburns and reduce the incidence of skin cancer (Backes, Milon, Koechlin, Vernez, & Bulliard, 2017). The aim of this quality improvement project is to teach agriculture extension agents who will then be able to educate the farmers. The farmers must recognize their increased risk of skin cancer for them to adopt effective sun protection methods.

The educational session will include the prevalence of skin cancer, the farmers' increased risk of skin cancer, along with facts about sunscreen and other protective methods farmers can use to reduce their exposure to the UVR. Skin cancer prevention behaviors can be increased by promoting perceived susceptibility using the protection motivation theory (PMT) (Babazadeh et al., 2016). Protection includes sunscreen and other protective methods, which are effective ways to minimize the harmful effects of the sun and reduce the incidence of skin cancer (Smit-Kroner & Brumby, 2015). Skin protection also includes long sleeve shirts, long pants, wide-brimmed hats, and wrap-around sunglasses (Smit-Kroner & Brumby, 2015). Although peak UVR exposure is between 10 am and 3 pm, avoidance of outdoor work during this time is unlikely for farmers and is considered ineffective as a prevention strategy (Smit-Kroner & Brumby, 2015). Farmers consider daylight hours prime working hours and are not likely to go indoors to avoid UVR exposure (Smit-Kroner & Brumby, 2015). Also, farmers can be taught to ask their healthcare provider about skin examinations, which can reduce the incidence of malignancy

(Smit-Kroner & Brumby, 2015). The purpose of this intervention is to bring awareness to the farmers of their personal increased risk of skin cancer and to increase motivation to use personal protective methods to reduce exposure to the sun.

Knowledge of skin cancer and sun protection alone is not enough to decrease the incidence of skin cancer; behavior change and early detection must occur to prevent skin cancer (Smit-Kroner & Brumby, 2015). A change in behavior to include regular use of sunscreen and suitable clothing is effective in preventing skin cancer (Chern et al., 2019). By training the agriculture extension agents and staff about the importance of sun protection and the increased risk that farmers have of skin cancer, the agents can share this knowledge with farmers. The knowledge of the increased risk can be motivation for the farmer to change behavior.

Comparison. The North Carolina agricultural center does not provide formal education programs for the farmers within the county regarding skin cancer risks and sun protection methods (Site Director, personal communication, January 22, 2019). The North Carolina agricultural center is interested in expanding the education offered to farmers to include skin cancer risks and sun protection methods to improve health and reduce skin cancer risks of farmers within the county (Site Director, personal communication, January 22, 2019). Equally important, lack of current educational sessions offered to increase awareness of skin cancer can be compared with educational sessions offered during the implementation of this project.

Outcomes. The intended outcomes for this quality improvement (QI) project are twofold. First, an educational session about skin cancer awareness will become a tool used by the agriculture agents of the North Carolina agricultural center. This can be measured by the inclusion of the educational session in the North Carolina agricultural center's standard educational opportunities. Secondly, the number of farmers educated prior to the educational

session and after implementation of the educational session can be counted and should be increased after implementation. The agricultural center agents propose a range of 100-150 farmers can be educated about the increased awareness of skin cancer in the fall of 2019 (Site Director, personal communication, February 1, 2019).

Summary

Farmers are at increased risk of skin cancer related to occupational sun exposure and minimal protection use. Aggravating the already high risk for farmers is the fact that many may have healthcare deficits or knowledge deficits. Additional risks occur when the farmer has physical characteristics that predispose the farmer to skin cancer. By educating farmers on the risks of skin cancer and sun protection methods, the incidence of skin cancer can be reduced, which results in a higher quality of life and reduced cost of healthcare.

The financial impact of skin cancer can be devastating for a family and greatly impact the community and healthcare system. The three main types of skin cancer (melanoma, basal cell, and squamous cell) are increased by exposure to UVR from the sun. As incidence increases, so does the mortality and morbidity of skin cancer.

Previously, there was no formal training of agents or farmers from the North Carolina agricultural center about skin cancer risk and sun protection. Educating the farmers on their risk of skin cancer enables the farmer to reduce cancer risk and improve quality of life. This project aligns with IHI Triple Aim, CDC strategic goals, and Healthy People 2020 goals. The proposed presentation can be used by agents to purposefully educate farmers about skin cancer risk and sun protection during regular training meetings with farmers or special called meetings. Farmers in this rural county will benefit from this QI project, which implements an educational session to increase awareness of skin cancer at the North Carolina agricultural center. Creating the

educational session and educating the agents provide sustainability and long-lasting effects of this project.

Chapter Two: Review of the Literature

An extensive review of the literature revealed an increased incidence of skin cancer in farmers and the need for community-based educational programs to improve the health literacy of farmers and increase the use of skin protection methods. Databases were searched using keywords and MeSH (Medical Subject Heading) terms appropriate to skin cancer in farmers, which revealed a total of 1,655 articles. After removal of duplicates and irrelevant articles, 30 articles remained for inclusion in the literature review (see Appendix B). A wide range of levels of evidence was discovered that support the need for an educational intervention for farmers to increase skin cancer awareness. Although limitations of self-report surveys and international studies were discovered, the preponderance of the evidence agrees that farmers are at an increased risk of skin cancer and can benefit from educational sessions about skin cancer and skin protection methods.

Literature Appraisal Methodology

Sampling strategies. Databases searched include Access Medicine, Agricultural Sciences and Technology (AGRIS), Biomedical Reference Collection: Comprehensive, Centers for Disease Control, Cumulative Index to Nursing and Allied Health Literature (CINAHL), CINAHL Complete, CINAHL Plus with Full Text, Clinical Key, Google Scholar, Medline via PubMed, and Medline via Ovid. The bibliographies of included articles were reviewed for possible additional articles. Furthermore, the author subscribed to Google Scholar and National Center for Biotechnology Information (NCBI) for automatic emails of articles released containing search terms.

Selected MeSH and keywords related to the topic included farmer, outdoor worker, agricultural worker, sun exposure, sun protection, skin cancer, and melanoma. The literature

review found 1,655 resources with 30 kept for inclusion (see Appendix B). Ongoing search strategies include Google Scholar automatic resource drops in email and NCBI resource drops.

Evaluation criteria. The literature search was limited to articles published in English between January 1, 2014 and March 9, 2019 (see Appendix B). A total of 1,655 resources were found and 92 redundant resources were removed (see Appendix B). The remaining 1,563 resources were screened. After screening the abstracts, 1,533 irrelevant resources were excluded. Articles published before January 1, 2014 were excluded. Studies were included if they were related to the topic of increasing skin cancer awareness in farmers. Articles that focused on pesticide or chemical use but did not include UVR were not included. Alternatively, articles that included pesticide, chemical, and UVR were included and statistics relevant to the topic were used. Articles referring to UVR from artificial sources were excluded.

Two Level I systematic reviews were found by searching PubMed and MedLine for articles (Melnyk & Fineout-Overholt, 2011). Both articles specifically focused on farmers; one focused on prevention of keratinocyte carcinoma and one focused on risks of non-melanoma skin cancer (see Appendix C). The Level I articles agreed that more studies are needed on occupational exposure to the sun and skin cancer risks.

Two Level II articles were randomized control trials focused on Iranian farmers (Melnyk & Fineout-Overholt, 2011). Both studies applied the PMT to prevent skin cancer and improve prevention behaviors in farmers. Two Level III, controlled trial articles were found (Melnyk & Fineout-Overholt, 2011). One study applied PMT to increase the use of skin cancer protection methods, while another article used the health belief model (HBM) to promote skin cancer prevention behaviors.

Eleven Level IV case-control or cohort studies were included (Melnyk & Fineout-Overholt, 2011). Two of these studies concentrated on the increased risk of skin cancer for farmers. Three studies focused on the prevention of skin cancer and six concentrated on farmers or agricultural workers. The studies were mixed between basal cell carcinoma, epithelial skin cancer, and melanoma. There was one Level V qualitative-review study which focused on educational interventions to limit sun exposure in farmers (Melnyk & Fineout-Overholt, 2011). A total of seven Level VI descriptive studies were included (Melnyk & Fineout-Overholt, 2011). These studies focused on the knowledge level of participants, health beliefs, and trends in skin cancer. Three Level VII expert opinion articles were included, which focused on the prevention of skin cancer (Melnyk & Fineout-Overholt, 2011).

Literature Review Findings

Risks. Several studies compared the risk of skin cancer in farmers to nonfarmers. Bauer, Beissert, and Knuscke (2015) found the primary factors influencing skin cancer risk in farmers were increased exposure to UVR and insufficient protection behaviors of farmers. While outdoor workers were 15% less likely to use sunscreen, they were 8% more likely to have outdoor hobbies (Trakatelli et al., 2016). Half of all farmers reported having at least one sunburn in the previous year (Moeini et al., 2018). The majority felt that sunscreen did not help decrease their risk of developing skin cancer (Nahar, Hosain, Sharma, Jacks, & Brodell, 2016). This study underscores the need for education.

Farmers acknowledged the increased risk of skin cancer and thought they were more likely to get skin cancer (Carley & Stratman, 2015). Despite this fact, farmers are among the least likely to attend skin cancer screening events and least likely to wear sunscreen when compared to other outdoor workers (Zink et al., 2017). Sixty-six percent of farmers have never

had a skin check and 65% are unlikely to use sunscreen (Smit-Kroner & Brumby, 2015). Adding to the high risk related to UVR exposure, farmers are less likely to seek healthcare and 43% had never seen a dermatologist (Zink et al., 2018). Lack of skin cancer screening and skin cancer prevention behaviors (SCPB) increase the farmers' risk of skin cancer.

Contradictory to other studies, Nahar, Hosain, Sharma, Jacks, & Brodell (2016) found 82.2 % of farmers did not perceive that their job made them more susceptible to skin cancer. Perceived low cancer risk was associated with decreased use of sun protection methods (Zink et al., 2017). Since the farmers did not perceive a risk of skin cancer; the use of sun protection methods was decreased.

Patients at higher risk of advanced cancer related to socioeconomic factors (low socioeconomic class, male gender, and old age) are screened less often for melanoma (Rat et al., 2016). Outdoor workers have lower knowledge of skin cancer, risk factors for skin cancer, and are exposed to many years of UVR for 2-8 hours a day (Trakatelli et al., 2016). Health illiteracy complicates the farmers' plight with skin cancer even more.

Ultraviolet Radiation Exposure. Exposure of farmers to UVR leads to increased skin cancer rates (Ahmadi, Bakhtari, Kazeminezhad, & Ghavam, 2019). Most UVR exposure occurs between 12 noon and 4:00 pm for farmers (Smit-Kroner & Brumby, 2015). Only one-third of agricultural workers avoided the midday sun and took breaks in the shade (Ziehfreund et al., 2019). Ultraviolet radiation is a major carcinogen that farmers are exposed to almost daily (Darcey et al, 2018). Sixty-two percent of farmers reported spending 40 hours or more outdoors each week, and 73% reported perceiving themselves as a high skin cancer risk. (Zink et al., 2017). Nearly half of the farmers reported solar radiation exposure of 30 hours or more a week (Darcey et al., 2018). Daily exposure to UVR carcinogen leads to significant health problems.

Less than half of the farmers used sunscreen, which leaves them vulnerable to UVR exposure (Zink et al., 2017). As a result of overexposure, one-third of farmers have had a sunburn in the past year (Ragan et al., 2019). Farmers have an occupational risk of overexposure to UVR which increases the risk of skin cancer.

Skin Cancer. Inadequate use of skin protection methods leads to increased skin cancer rates (Ahmadi et al., 2019). Farmers were more likely to get sunburn and have photo damage from the sun (Apalla et al., 2016; Backes et al., 2017). Outdoor workers were 12% more likely to have signs of photo damage and 9% more likely to have two or more skin cancers in their lifetime (Trakatelli et al., 2016). Occupational exposure to UVR increases the farmers' risk of skin cancer. Skin cancers caused by overexposure to UVR include basal cell carcinoma, squamous cell carcinoma, melanoma, and metastatic skin cancers (Ahmadi et al., 2019). Agricultural, fishery, and forestry workers have increased NMSC and cutaneous melanoma (Shin, Chung, Park, Nam, & Yoon, 2018). Nonmelanoma skin cancer was found 21% more often in farmers than indoor workers (Zink et al., 2018). Basal cell carcinoma incidence was increased in farmers related to occupational exposure to UVR (Apalla et al., 2016). Farmers are significantly more likely to have melanoma (Kachuri et al., 2017; Lemarchand, Tual, & Leveque-Morlais, 2017). Farmers are at higher risk for actinic keratosis (AK), BCC, and SCC (Trakatelli et al., 2016). Farmers had double the risk of reoccurrence than nonfarmers (Szewczyk et al., 2016). Farmers have a very high risk for skin cancers of all kinds.

Location. The most common area was the face (81%) (Ahmadi et al., 2019). Farmers are more likely to have lip cancer (Kachuri et al., 2017; Lemarchand, Tual, & Leveque-Morlais, 2017). Farmers accounted for one-third of basal cell carcinoma cases and most tumors were found on nose and cheek (Szewczyk et al., 2016).

Mortality. Melanoma causes high mortality and is the most common malignancy (Ahmadi et al., 2019). Agricultural, fishery, and forestry workers had the highest mortality rates from skin cancer (Shin et al., 2018). Mortality from skin cancer remains a serious concern for farmers.

Skin Cancer Prevention Behaviors. Farmers are not reliable in using sun protection methods. Sunscreen, hats, long-sleeved shirts, and long pants are the most studied terms about protecting farmers from UVR exposure (Smit-Kroner & Brumby, 2015). In a large group of farmers that used limited skin protection, promoting the use of sunscreen did not improve use among farmers (Smit-Kroner & Brumby, 2015). While 91% reported wearing a hat, only 33% reported using sunscreen (Darcey et al., 2018). Another study reports that less than 22% of farmers use sunscreen, and only 50% wore protective clothing to minimize sun damage (Ragan et al., 2019). Nearly 63% of participants reporting wearing a baseball hat, 57% reported wearing long pants, 56% wore sunglasses, and 27% wore a wide-brim hat always or most of the time as methods of sun protection (Kearney, Balanay, Allen, & Rafferty, 2015). Only 16% of farmers reported wearing sunblock or sunscreen with a sun protection factor (SPF) 15 or higher (Kearney et al., 2015).

Barriers to sun protection included uncomfortable wearing long pants and long shirts, forgetting sunscreen use, and inconvenience of wide-brimmed hats (Carley & Stratman, 2015). Half of the farmers report forgetting to use sunscreen, and a few (3.7%) outdoor workers check the SPF of sunscreen before using it (Zink et al., 2017). Inadequate sun protection methods leave the farmer vulnerable to the sun's harmful UVR.

Intervention. Farmers are aware of dangers related to UVR and transitioning these concerns into proactive preventative action by the farmer should remain a priority (Kearney et

al., 2015). Improvement is needed in sun-related knowledge and sun protection behavior in agricultural workers (Ziehfreund et al., 2019). Agricultural workers need more knowledge of skin cancer and protection methods; nearly 53% would like more information about sun safety measures (Zink et al., 2017). Higher knowledge of skin cancer and prevention methods were associated with improved use of sun protection (Carley & Stratman, 2015). Sun safety initiatives can be used to educate farmers about prevention methods and improve the use of protection methods (Ragan et al., 2019). Examples of increasing sun protection use among farmers have been successful (Kearney et al., 2015). The farmers need assistance to translate vague knowledge of skin cancer into the real improvement of health behavior.

In NC, 58% of farmers perceived wearing a baseball cap as adequate sun protection (Smit-Kroner & Brumby, 2015). This perception correlates with recommendations that educational interventions are needed (de Andrade Moreira et al., 2015). While outdoor workers, in general, had a basic understanding of UVR and the associated risk of keratinocyte carcinoma (KC); agricultural workers did not (Ziehfreund, Schuster, & Zink, 2019). The incidence of skin cancer can be reduced by increasing awareness of outdoor workers (de Andrade Moreira et al., 2015).

Although sunscreen is the most studied sun-protective behavior, promoting sunscreen use did not improve use among farmers (Smit-Kroner & Brumby, 2015). However, the use of protective clothing was improved with education and may be the most promising avenue to improve on farmers' sun protection behaviors (Smit-Kroner & Brumby, 2015). Strong association with perceived susceptibility and rewards improved skin cancer prevention behaviors (SCPB) (Babazadeh et al., 2017).

A negative correlation between the increased cost of SCPB may reduce SCPB; subsequently, this negative correlation can be offset with education regarding long-term costs of skin cancer and cost-effective SCPB (Babazadeh et al., 2017). Sun protection may be considered expensive; however, skin cancer treatments are more expensive.

Agricultural events were considered effective in increasing the availability of skin protection education for farmers (Smit-Kroner & Brumby, 2015). Another recommendation is to educate health workers in performing skin checks (Smit-Kroner & Brumby, 2015). Agricultural events can be used to educate farmers about skin protection (Smit-Kroner & Brumby, 2015). Agricultural venues are great for educating farmers about the use of sun protective methods. Educational interventions in a familiar setting, such as the agricultural center, were promoted in the literature.

Capitalizing on the farmers' sense of self-reliance, the PMT was used to increase farmers' health behaviors. Protection motivation theory was used in one three-month study and showed improvement in skin cancer protection methods including the use of sunscreen 17.5%, use of long-sleeved shirts 50.8%, wide-brimmed hats 56.6%, and use of shade 17.5% (Babazadeh et al., 2016). Outdoor workers who were educated were less likely to have sunburns and more likely to use sun protection practices (Walkosz et al., 2018). Walkosz et al., (2018) found that education of sun protection practices and risks associated with UVR exposure were effective two years later. As self-efficacy improves SCPB and protection motivation improve (Moeini et al., 2018). Using PMT, farmers reported increased use of protective clothing (15.4%) (Moeini et al., 2018). Skin cancer protection methods can improve the farmers' health, but the farmer must be educated to be motivated to use them. One randomized study revealed increased SCPB in the intervention group, which used the PMT (Babazadeh et al., 2017). Increased

knowledge corresponded with the increased use of sun protection methods (Carley & Stratman, 2015). The farmers' increased knowledge of their vulnerability and ability to reduce the risk may improve sun protection behaviors.

Similarly, another study used the HBM to increase farmers' knowledge about skin cancer behaviors (Jeihooni & Rakhshani, 2018). The educational intervention using the HBM utilized posters, pamphlets, and a PowerPoint presentation (Jeihooni & Rakhshani, 2018). Perceived susceptibility increased from 14.31% to 29.34%, and perceived severity increased over 11% (Jeihooni & Rakhshani, 2018). Perceived benefits also increased from 11.25% to 14.26%, while barriers decreased from 19.24% to 9.21% in the experimental group (Jeihooni & Rakhshani, 2018). Protection motivation theory and HBM were successful at influencing the farmers' awareness of skin cancer.

Positive correlations between farmers and aspects of the HBM suggest this model can be used to increase farmers' use of sun protection methods such as sunglasses, long-sleeved shirts, wide-brimmed hats, and sunscreen (Moradhaseli, Ataei, Farhadian, & Ghofranipour, 2019). The HBM showed promising results in educating farmers about skin cancer.

Farmers are unique in their healthcare beliefs, use of sun protection methods, sources of healthcare information, and skin cancer knowledge (Carley & Stratman, 2015). Primary prevention should include educational interventions to prevent skin cancer (Nahar et al., 2016). Community prevention programs can be used to bridge the gap between the community and the healthcare system (Pirschel, 2017). Primary prevention (sun protection) and secondary prevention (early detection) may be better received by nonhealthcare avenues (Robinson & Jablonski, 2018). These settings are less threatening, and people can have more peer support and impact on better health (Robinson & Jablonski, 2018). Specific barriers to skin cancer

prevention that can be overcome by educational interventions include lack of access to information and health illiteracy (Pirschel, 2017). Community setting for skin cancer awareness can change the farmer's life and impact their neighborhoods.

Limitations of Literature Review Process

Limitations of this literature review include the lack of standardized measurements throughout the different studies. For example, one study only included wide-brimmed hats, while another study included all hats. Scarce literature on educational interventions for farmers was another limitation (de Andrade Moreira et al., 2015). Recall period of surveys varied widely, and several studies had very short (two months) follow-up periods. One study only included men; another only included English speaking persons, while another only included online surveys. Several studies were international and only one study was recorded in the field of nursing. Some information was gathered from an insurance database, which may have introduced bias. Recruitment efforts were limited, usually at local meetings. In addition, one study used the postal code as the representation for socioeconomic status, which may have introduced bias. Individuals who were especially concerned about their risk of skin cancer or who had not seen a dermatologist may have been more likely to participate in studies. Some participants may have had skin cancer prior to the start of some studies.

Self-report surveys were used often and may have introduced bias by over or underestimation of sun protection use. Word variations in surveys varied; one study used the term skin cancer prevention behaviors whereas another study used the term sun protection methods. Self-reports are susceptible to underestimation of UVR exposure. Another limitation was the lack of standard measurement of UVR dose a person has received. Self-reports may underestimate the incidence and severity of sunburns. Limitations include the inconsistent

methods of information gathering, reviewing, and reporting between international projects. These irregularities made it difficult to form conclusions.

Discussion

Conclusion of findings. Farmers have occupational exposure to the carcinogen UVR. The extended number of hours and nearly daily exposure to UVR increases the farmers' risk of skin cancer. Nonmelanoma skin cancer related to increased UVR exposure can include keratinocyte carcinoma, basal cell carcinoma, and squamous cell carcinoma. Farmers have significant risks of NMSC and melanomas.

Sun protection methods include hats, long-sleeved shirts, long pants, sunglasses, sunscreen, and shade. Farmers are less likely than nonfarmers to use skin protection methods and are more likely to experience sunburn; both factors increase the risk of skin cancer. Farmers are more likely to have outdoor hobbies, placing the farmer at risk while at work and during leisure activities.

Protection motivation theory and the HBM were used successfully to improved farmers' knowledge of skin cancer, skin cancer risks, and skin protection methods. Both methods used educational interventions to increase the health literacy of farmers and improve the use of skin protection methods. One study recommended using agriculture extension agents to educate farmers and community settings were suggested for educating farmers.

The proposed project seeks to create an evidence-based educational session about skin cancer risks and skin protection methods. The short educational session will be in PowerPoint format and implemented at the local agricultural center by agricultural extension agents. The educational session will be used to increase awareness of skin cancer in farmers.

Advantages and disadvantages of findings. The advantages of the proposed intervention are acknowledged in the literature. Findings of higher incidence of skin cancer in farmers undergird the need for skin cancer prevention methods for farmers (Ahmadi et al., 2019; Rat et al., 2016; Szewczyk et al., 2016). Farmers have poor skin protection behavior patterns which increase their risk of skin cancer and supports the need for intervention to increase farmers' awareness of skin cancer (Babazadeh et al., 2017; Kearney et al., 2015).

The farmers' increased risk of skin cancer in addition to farmers' knowledge deficit about skin cancer and the use of skin protection methods support the need for educational interventions for farmers (de Andrade Moreira et al., 2015; Ziehfreund et al., 2019; Zink et al., 2018). The use of an educational session to improve farmers' health literacy and skin protection methods is supported frequently in the literature (Babazadeh et al., 2017; Jeihooni & Rakhshani, 2018; Moeini et al., 2018). Concurrently, the implementation of extension agents in a community setting is supported by the literature (Moradhaseli et al., 2019; Pirschel, 2017; Robinson & Jablonski, 2018).

Disadvantages of findings include that farmers are reluctant to seek healthcare or skin cancer screenings; this may translate to the reluctance to participate in the proposed educational session (Zink et al., 2018). Eighty-two percent of farmers did not perceive that their job made them more susceptible to skin cancer and felt sunscreen did not decrease their risk of skin cancer (Nahar et al., 2016). One study by Smit-Kroner and Brumby (2015) found that educational sessions did not improve the use of sunscreen in farmers. One study found that outdoor workers had increased risk of KC while agricultural workers did not (Ziehfreund et al., 2019).

Disadvantages included barriers to skin protection methods, such as, uncomfortable long-sleeved clothing, forgetting to use sunscreen, and inconvenience of wide-brimmed hats (Carley

and Stratman, 2015). Scarce literature findings on educational interventions for outdoor workers is a disadvantage (de Andrade Moreira et al., 2015). Another weakness was most studies were not done in the United States. Cultural influences may impact the proposed intervention. Finally, some studies were conducted in the farmers' workplace; this improved participation and access to skin protection methods (Walkosz et al., 2018).

Utilization of findings in practice change. The agricultural extension agents will include the proposed educational session during meetings of farmers. When farmers meet at the agriculture center, the presentation to increase skin cancer awareness in farmers will be presented to them. Currently, the meetings include training on pesticide use or the business aspects of farming. Any time farmers are gathered together, there is an opportunity to promote skin cancer awareness. The literature supports the use of educational interventions to increase the health literacy of farmers and to increase use of skin protection methods (Babazadeh et al., 2017; Moeini et al., 2018; Moradhaseli et al., 2019; Pirschel, 2017; Walkosz et al., 2018).

Using agriculture extension agents is endorsed (Moradhaseli et al., 2019). Implementation at a community setting versus a healthcare setting was supported by the literature (Pirschel, 2017; Robison & Jablonski, 2018; Smit-Kroner & Brumby, 2015). Farmers are reluctant to seek healthcare advice and primary prevention efforts may be better received in a community setting (Robinson & Jablonski, 2018).

Summary

The proposed educational intervention is in alignment with Healthy People 2020 to increase the use of protective measures that reduce the risk of skin cancer. By increasing farmers' awareness of skin cancer with their risks and including education of skin protection methods, the use of skin protective measures can be improved. Sunscreen, sunglasses, long-

sleeved shirts, long pants, wide-brimmed hats, and shade are effective skin protection methods for farmers that can reduce the incidence of skin cancer in farmers.

The Institute for Healthcare Improvement (IHI) lists three arms of the initiative to optimize health system performance. The first dimension of the Triple Aim is to improve the patient's quality and satisfaction of care. The proposed educational intervention will meet this objective by improving the health literacy of the farmers, which will lead to improved satisfaction and understanding of patient care. The educational session proposes that by increasing farmers' awareness of skin cancer and improving the use of skin protection methods to meet the second objective of the Triple Aim: improving the health of populations. As skin cancer incidences are reduced, the cost per capita of healthcare is reduced and meets the third objective of the Triple Aim.

In conclusion, an educational session held in the local agricultural center to increase farmers' skin cancer awareness is supported in the literature. Increasing the farmers' awareness includes the risk of skin cancer, the cause of skin cancer, and the protection methods used to prevent skin cancer. The educational session is in accordance with Healthy People 2020 goals and IHI Triple Aim.

Chapter Three: Theory and Concept Model for Evidence-based Practice

Concepts pertaining to this project included farmer, skin cancer, ultraviolet radiation, risks, skin cancer prevention behaviors (SCPB), and increasing awareness interventions. The farmer was the beneficiary of the educational intervention. The farmer is an outdoor worker, who has increased occupational exposure to UVR and is at increased risk for skin cancer. Skin cancer includes melanoma and keratinocyte carcinoma (BCC and SCC). Increased exposure to UVR causes skin cancer and exposure can be minimized by use of SCPB. The farmer's primary risks of skin cancer are increased UVR and inadequate use of SCPB.

Protection motivation theory (PMT) has been used successfully to increase farmers' awareness of skin cancer and works well with the health belief model (HBM). Protection motivation theory uses one's desire to avoid disease and protect one's self to motivate a person to change the behavior. Fear of skin cancer and awareness of risk and preventative methods are strong motivational influences to change health behavior. The HBM uses perceived susceptibility, perceived severity, perceived benefits, and perceived barriers to assert change in health behavior (LaMorte, 2018). Increasing the farmers' awareness of susceptibility to skin cancer and severity of skin cancer while introducing ways to overcome barriers enable the farmer to realize the benefit of using SCPB.

Concept Analysis

Farmer. Agriculture workers are at high risk for fatal and nonfatal disease and injuries (National Institute for Occupational Safety and Health [NIOSH], 2018). Farmers have the greatest exposure to UVR of all outdoor workers (Smit-Kroner & Brumby, 2015). The majority of farmers reported spending 40 hours or more outdoors each week and almost three-fourths reported perceiving themselves as a high skin cancer risk. (Zink et al., 2017). Subsequently,

farmers have greater exposure to the UVR of the sun related to occupational demands (World Health Organization, 2017). Farmers' decisions regarding primary prevention of UVR damage is influenced by the farmer's knowledge and awareness of UVR exposure and its damaging effects (Zink et al., 2019). Perceived barriers to implementation of SCPB and individual life experiences influence the farmers' decisions regarding primary prevention of UVR damage (Zink et al., 2019). Farmers include farm owners and persons who work in agriculture. Farmers manage the land and water supply to grow vegetative crops and livestock. Agriculture includes cattle, swine, and poultry industries, blueberry and grape farmers, row crop farmers, apiarists, and others. Occupational demands require farmers to spend many hours outdoors in the sun exposed to UVR. Additionally, farmers need education about UVR and its damaging effects, and ways to overcome perceived barriers to facilitate a change in SCPB.

Skin cancer. The National Cancer Institute (NCI) considers melanoma and keratinocyte carcinoma (includes BCC and SCC) types of skin cancer (NCI, 2018; Zink, Schielein, Wildner, & Rehfuess, 2019). The skin cancer types are named according to the location of origination. Melanoma originates in the melanocytes of the skin and is the leading cause of death related to skin cancer (NCI, 2018). Squamous cell carcinoma originates in the surface of the skin while BCC originates in the lower aspect of the epidermis (NCI, 2018). Cancer includes any abnormal cells that divide rapidly and invade other tissues, which includes traveling via the lymphatic and circulatory systems (NCI, 2018). Carcinomas are caused by exposure to the sun (NCI, 2018). Prolonged exposure to the sun increases the risk of skin cancer. Skin cancer is the rapid growth and invasion of abnormal cells within the skin which destroy the normal cells. Skin cancer includes melanoma, SCC, and BCC. Carcinomas can metastasize to other areas of the body and

can decrease the quality of life, cause disfigurement, and cause death without early detection and intervention.

Ultraviolet radiation. Ultraviolet radiation is the invisible light from the sun that reaches the earth and causes changes to the skin (Blackwell & Manar, 2016). While small amounts of UVR are needed for vitamin D production, UVA and UVB radiation cause skin cancer (Blackwell & Manar, 2016). The UVA penetrates deep into the dermis of the skin and UVB penetrates the epidermis; effective sunscreen must have UVA and UVB protection (Blackwell & Manar, 2016). Ultraviolet radiation is a significant carcinogen that farmers are frequently exposed to (Darcey et al, 2018). Ultraviolet radiation from the sun causes skin cancer. Premature skin aging, sunburn, and wrinkle formation are direct effects of UVR exposure. Ultraviolet radiation exposure is reduced using sunscreen, which helps prevent skin cancer.

Skin cancer prevention behaviors. Sunscreen, hats, long-sleeved shirts, and long pants help protect the skin from UVR exposure (Smit-Kroner & Brumby, 2015). Additionally, shade, sunglasses, lip sunscreen are important methods of sun protection (Zink et al., 2017). Farmers reported forgetting to use sunscreen and uncomfortable or inconvenient clothing as barriers to SCPB (Carley & Stratman, 2015). Sunscreen, hats, and clothing that covers the skin are ways to reduce UVR exposure to the skin. Sunglasses and shade are additional methods to minimize UVR exposure. Methods to prevent skin cancer may be perceived as inconvenient or uncomfortable; however, consequences of skin cancer are more uncomfortable. A variety of SCPB offer the farmer the options to suit the work environment and prevent skin cancer.

Increasing awareness intervention. Increasing the farmer's awareness of skin cancer can be accomplished via the education of skin cancer, UVR, and overcoming perceived barriers. Research shows that farmers need more knowledge of skin cancer and protection methods

(Ziehfreund et al., 2019; Zink et al., 2017). As farmers' knowledge of skin cancer increases, their use of SCPB increases (Carley & Stratman, 2015; Ragan et al., 2019). Agricultural events and using agriculture agents have been effective in increasing skin cancer awareness (Moradhaseli et al., 2019; Pirschel, 2017; Robinson & Jablonski, 2018). Currently, the local extension office does not provide formal education to farmers about skin cancer (Site Director, personal communication, February 1, 2019). The outcome of this project would be establishing an evidence-based educational intervention that educates the agriculture extension agents and increases the farmers' awareness about skin cancer. The educational intervention will provide a sustainable teaching resource for the agents to use in meetings with the farmers. After the implementation of this project, the number of farmers educated about skin cancer can be totaled and compared to the number of farmers previously educated about skin cancer. A positive number will serve as a reference that farmers' awareness of skin cancer has increased.

Health behavior. The health behavior concept includes all actions perceived to improve health or avoid illness. Health behavior is a person's actions which affect the person's health and are affected by a person's motivation to protect themselves (Moeini et al., 2018). Health behavior is composed of two basic components: the desire to get well or avoid illness and the belief that certain actions or behaviors can prevent illness or improve wellness (LaMorte, 2018). Health behaviors increase when the behavior is perceived to prevent illness or improve wellness; conversely, health behavior decreases as costs increase (Babazadeh et al., 2016). Farmers' health behavior in relation to skin cancer includes wearing sunscreen, long-sleeved shirts, wide-brimmed hats, and use of shade can help protect a person from UVR (Babazadeh et al., 2016). Health behavior includes actions which cumulatively define a person's health and are related to the person's perception of their individual risk and motivation to change.

Behavior change. Behavior change can be encouraged through educational interventions (Babazadeh et al., 2016). A person contemplates perceived susceptibility, perceived severity, perceived benefits, and perceived barriers when making a behavior change (LaMorte, 2018). Strong motivational factors to facilitate behavior change are the fear of skin cancer and awareness of risk. Behavior change occurs when a person decides the benefits outweigh the risks and that the change is achievable. By using an educational intervention, farmers can be educated about their risks of skin cancer and achievable protective methods to minimize the risk.

Health threat. Health threat can be anything that diminishes or decreases a person's health. Skin cancer is a real health threat for farmers. The primary health threats related to skin cancer in farmers were increased exposure to UVR and insufficient skin cancer prevention behaviors (Bauer, Beissert, & Knuscke, 2015). Farmers are exposed to dangerous UVR nearly daily and are less likely to use skin cancer prevention behaviors. Ultraviolet radiation exposure increases the risk of skin cancer. Health threat can be minimized when the farmer is motivated to use skin cancer protection methods.

Theoretical Framework

Naming the theory. Protection motivation theory (PMT) was introduced as a social cognitive theory by Rogers in 1975 and is used to assist in health behavior change through educational interventions (Babazadeh et al., 2016). Behavior change is mediated by assisting the farmer in assessing the threat and the coping mechanisms (Babazadeh et al., 2017). The PMT adopts the idea that a person's choosing to change their behavior is directly related to the persons' motivation to protect one's self (Moeini et al., 2018). In other words, a person's fear of disease motivates the person to adopt healthy behavior change (see Appendix D). The PMT

asserts that educational interventions can increase a person's awareness of a health threat and coping mechanisms. As the person learns of the health threat and appropriate coping mechanisms the potential for behavior change is increased. A person is motivated to change the behavior to protect one's self.

Assessment of the threat includes perceived severity, perceived vulnerability, and intrinsic and extrinsic rewards (Babazadeh et al., 2017). The perceived severity is a person's perception of how bad the disease is, while the perceived vulnerability pertains to a person's perception of their likelihood of acquiring the disease (Babazadeh et al., 2017; Moeini et al., 2018). The perceived severity and perceived vulnerability form fear and fear can motivate a person to change behavior (Moeini et al., 2018). Intrinsic and extrinsic rewards refer to the benefit of implementing behavior change (Babazadeh et al., 2017). The person's assessment of the threat considers the severity or harm that can come from the threat while also considering if the person can do anything to minimize the threat. The person considers rewards for healthy behavior. The more severe the threat and the more the person feels he will acquire harm from the threat result in greater motivation for behavior change. Rewards are a motivation for prevention behavior.

Assessment of coping mechanisms includes response efficacy, self-efficacy, and response cost (Babazadeh et al., 2017; Moeini et al., 2018). Increased coping skills corresponds to increased protection motivation, which leads to increased behavior change (Babazadeh et al., 2016). Response efficacy refers to the likelihood that changing the behavior can remove or minimize the threat, whereas self-efficacy is a person's perception of their ability to successfully change the behavior (Babazadeh et al., 2017; Moeini et al., 2018). The response cost assesses the belief about how much it will cost to change the behavior (Babazadeh et al., 2017). The

response costs include financial and nonfinancial costs such as money, discomfort, time, and effort (Babazadeh et al., 2016; Moeini et al., 2018). Increased response efficacy and self-efficacy correspond with improved behavior change; in contrast, increased costs correspond with decreased behavior change (Babazadeh et al., 2016). A person's coping mechanisms affect how or if the person will adopt behavior change. When a person perceives that the threat can successfully be minimized within the person's own ability, the motivation for behavior change increases. A person considers the cost of the behavior change before deciding to change. The more expensive the change, the less likely the person is to adopt the behavior change.

Application to practice change. Protection motivation theory has been used successfully to increase SCPB in farmers (Babazadeh et al., 2016; Babazadeh et al., 2017; Moeini et al., 2018). Initially, the educational intervention educated the farmer on UVR, the source of UVR, and the effects of UVR on the skin. The educational intervention informed the farmer of the severity of skin cancer, including disfigurement, decreased quality of life, and death. Continuing with PMT, the educational intervention informs the farmers of their vulnerability to skin cancer including the risk factors of high levels of UVR exposure related occupational demands and deficient use of SCPB (see Appendix E). Included in the intervention were potential rewards of changing health behavior. The intrinsic rewards included better health, better quality of life, and longer life. Extrinsic rewards included increased financial resources related to not spending money on treatment for skin cancer and not losing time from work. Extrinsic rewards also included more quality time with family, since time was not spent seeking skin cancer treatment and longer quality of life was achieved.

Aligning with the PMT, the educational intervention taught the farmer about coping mechanisms to decrease the threat. The intervention explained how correct use of SCPB

decreases the farmer's exposure to UVR and decreases the farmer's risk of skin cancer. Next, the intervention demonstrated how the farmer could be self-efficient at reducing the threat by using sunscreen, protective clothing, proper hats, sunglasses, and shade to decrease UVR exposure. Ideas to improve self-efficacy were included in the presentation, such as to hang protective hats by the door, keep sunscreen on the tractor, use a sunglass leash, and to wear protective clothing made from breathable materials. These ideas can help the farmer envision himself as successful in behavior change.

The response cost was compared to the cost of skin cancer treatment. The cost of treatment for one BCC costs $5,670, and for one SCC $10,555 were compared to the cost of SCPB (see Appendix F) (Institute for Work and Health, 2018). The additional costs of skin cancer treatment included transportation to and from treatment centers, lost time from work, time away from family, and the physical and psychological effects of illness. Skin cancer preventative behaviors for one-year cost much less. Ten ultraviolet protection factor (UPF) 50 long sleeved shirts, ten pair of long pants, two wide-brimmed UPF 50 hats, two pair of sunglasses and two leashes, 12 lip sunscreens, and 12 each of two different sunscreen products were $654.46 with shipping (Walmart, 2019). The educational intervention included a chart demonstrating the comparative costs of skin cancer and skin cancer prevention behaviors (see Appendix F). The educational intervention equipped the farmer to recognize the threat of skin cancer, improved the farmer's response and self-efficacy, and explained the costs of skin cancer when compared to skin cancer prevention methods. Hopefully, the educational intervention motivated the farmer to adopt SCPB.

Evidenced Based Practice Change Model

Naming the change model. The health belief model (HBM) was developed by social scientists in public health to understand why people do not adopt disease prevention approaches (LaMorte, 2018). The HBM was derived from psychological and behavioral theory (LaMorte, 2018). The HBM is complementary to the PMT. Both support the idea that a person's perceived threat of disease in conjunction with the person's perceived belief in the effectiveness of health behavior determines the person's likelihood of adopting the behavior (LaMorte, 2018). The HBM originally had four components: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (LaMorte, 2018). As research continued, two more components were added: cue to action and self-efficacy (LaMorte, 2018). The HBM is a model to help influence health behavior change (see Appendix G).

Perceived susceptibility implies a person's subjective perspective on the risk of acquiring the disease (LaMorte, 2018). Subjective perception varies widely concerning a person's perceived vulnerability (LaMorte, 2018). The second component, perceived severity, denotes a person's perception of the seriousness of the disease, which varies when the person considers medical and social consequences (LaMorte, 2018). Thirdly, perceived benefits refer to a person's perception of the effectiveness of recommended health behavior (LaMorte, 2018). For example, a person may consider if the recommended health behavior will prevent or cure a certain disease (LaMorte, 2018). This model assumes a person is motivated to make behavior change when the perceived susceptibility and severity of disease is high and perceived barriers are low. High self-efficacy and benefits, along with a cue to action, are also implemented in the HBM.

Fourthly, perceived barriers refer to a person's perception of reasons not to adopt health behavior (LaMorte, 2018). Barriers may be financial costs, time requirements, or inconvenience (LaMorte, 2018). The fifth component of the HBM is a cue to action. Cue to action is the stimulus that prompts the health behavior change (LaMorte, 2018). Self-efficacy is the sixth component of the HBM. Self-efficacy refers to a person's perceived ability to perform health behavior successfully (LaMorte, 2018). All components of the HBM work together to motivate a person to health behavior change. The more components that are involved in a person's decision to make a change in health behavior, the more likely the person is to change the behavior.

Application to practice change. The health belief model (HBM) was used to influence health behavior change in farmers (Jeihooni & Rakhshani, 2018). By using the six components of the health belief model, this project increased skin cancer awareness in farmers. The farmers were educated about the perceived threat of skin cancer and the farmer's likelihood of developing skin cancer based on UVR exposure and minimum use of skin cancer prevention behaviors (SCPB). The severity of skin cancer is taught in the educational session using facts such as 19 people die each day in the United States from melanoma (Skin Cancer Foundation, 2019). The diagnosis of melanoma can have dramatic medical and social consequences, including disfigurement and depression.

The perceived benefit of longer life and improved quality of life is established in the educational intervention. The effectiveness of the SCPB is demonstrated in the educational intervention using statistics. The educational intervention explained that the sun protection factor (SPF) 50 broad-spectrum sunscreen only allows 2% of the UVA and UVB rays to reach the skin (Skin Cancer Foundation, 2019). The same is true for UPF 50 clothing and sunglasses.

Self-efficacy and overcoming barriers are related in that farmers report forgetfulness, uncomfortable clothing, and inconvenience as the main reasons for not using SCPB (Carley & Stratman, 2015). Barriers are overcome by offering breathable sun protective clothing, reminder tips, and simple strategies for implementing SCPB. Self-efficacy was encouraged by promoting simple ways to block UVR and offering a variety of methods to diminish the effects of inconvenience or forgetfulness. The cue to action is the educational intervention presentation. Hopefully, farmers are prompted to decide to increase SCPB.

Quality Improvement Framework

Naming the framework. The plan, do, study, act (PDSA) model is a quality improvement framework introduced by Walter Schewhart in the 1920s (Anderson, 2015). The premise of the PDSA is to start with the problem that needs to be improved and plan an intervention or action to correct or improve the problem. Next, implement the plan and evaluate the effectiveness of the intervention. As the model moves forward, the interventions should be implemented according to the plan. Effectiveness, problems, risks, and unexpected observations should be documented in the Do stage. Thirdly, the Study stage is an examination or critique of the Plan compared to the Do. In other words, interventions are evaluated for effectiveness. Once completed, the Act stage is introduced and the plan is altered, abandoned, or adopted (Taylor et al., 2014). This cycle can be repeated until effective quality improvement interventions are discovered and implemented. Finally, use the evaluation to improve the plan, abandon the plan, or adopt the plan.

Application to practice change. This project used the plan, do, study, act (PDSA) model to implement and educational session about increasing skin cancer awareness in farmers for agricultural agents at the local extension office. By implementing the project with the agents,

weaknesses in the model can be changed before implementing the process with the farmers. Agents were educated about implementation plans before implementation begins. Problems, strengths, weaknesses were summarized and decisions for future QI were made. Using the PDSA Model, the educational session was evaluated at 1, 3, and 6-week intervals. The success of this quality improvement project measured two criteria. Success was determined by:

1. Were 90% or more of agents trained in the use of the educational session about increasing skin cancer awareness in farmers?
2. Did the agents use the educational session at 80% or more of meetings with farmers?

Weaknesses and strengths were analyzed from the documentation and changes were made as needed to adapt the plan for the next PDSA cycle. By educating farmers on the risks of skin cancer and sun protection methods, the incidence of skin cancer can be reduced which results in higher quality care and cost-effective healthcare. Appendix H helps visualize the stages and steps of the PDSA Model as cyclic. This project was completed in three months.

Summary

Farmer, skin cancer, ultraviolet radiation, skin cancer prevention behaviors (SCPB), and increasing awareness interventions, health behavior, behavior change, and health threat were concepts for this project. The farmer works outdoors in agriculture and has increased occupational exposure to UVR and is at increased risk for skin cancer. Farmers are less likely to use adequate SCPB even though they report perceiving themselves as high-risk for skin cancer. Increased exposure to UVR causes SCC, BCC, and melanoma. Skin cancer can decrease the quality of life and cause death. Exposure to UVR can be minimized by use of SCPB. Farmers' knowledge of skin cancer, primary prevention or UVR damage, and SCPB is deficient. As the farmers' awareness of skin cancer increases, their use of SCPB increases, which can reduce UVR

exposure. Health behavior was encouraged in the educational session. The educational session was designed to motivate behavior change to minimize the health threat posed by skin cancer caused by UVR and inadequate use of SCPB. The local extension office did not offer a formal education program for skin cancer awareness. This project offered a sustainable teaching tool that agriculture extension agents can use to increase the awareness of skin cancer in farmers.

Protection motivation theory (PMT) has been used successfully to increase farmers' awareness of skin cancer and harmonizes with the health belief model (HBM). Protection motivation theory implements the desire to avoid disease and protect one's self to motivate a person to change their behavior. Fear of skin cancer and awareness of risk and prevention methods are strong motivational influences to change health behavior. The HBM uses perceived susceptibility, perceived severity, perceived benefits, and perceived barriers asserting change in health behavior (LaMorte, 2018). In accordance with the HBM, this project educated the farmers about the severity of skin cancer and the increased skin cancer risk that farmers have. Benefits of quality of life were emphasized and ways to overcome barriers were demonstrated. Self-efficacy was supported by offering SCPB that were simple and achievable. This project can increase farmers' skin cancer awareness by educating farmers using the PMT and the HBM. The PDSA was used to improve the educational session during the implementation phase of the project.

Chapter Four: Pre-implementation Plan

The purpose of this Doctor of Nursing Practice (DNP) Project was to increase awareness of skin cancer among farmers in southeastern NC. This project was a product of interprofessional collaboration with the local agricultural extension office and the various extension agents. The risk management assessment revealed strengths in areas of evidence-based research, flexibility, and project site commitment and support. Weaknesses involved a small number of agents to train and the project leader's inexperience. Opportunities included expanded use of the educational session in other agricultural centers and improvement of the network between agricultural agents and health care providers. Threats included adverse weather conditions and unexpected changes in staff at the agricultural center.

The agricultural center director approved the organizational approval process after a series of meetings. Basic technology, such as Microsoft Word and PowerPoint, were used to construct and present the educational session. The total financial cost of the project was $1,030, which would be offset by the prevention of only one skin cancer. Institutional review board (IRB) approval was not required by the agency or university. Outcome measurements determined the success of the project. The goal was for agents to use the educational session in 80% of the meetings with farmers. Data were stored securely for two years and then destroyed.

Project Purpose

This Doctor of Nursing Practice (DNP) Project proposed to increase skin cancer awareness among the farmers of southeastern North Carolina. This intervention aimed to bring awareness to the farmers of their personal increased risk of skin cancer and to increase motivation to use personal protective methods to reduce exposure to the UVR. The purpose of this project was to teach agriculture extension agents who would then be able to educate the

farmers to increase skin cancer awareness. The method to increase skin cancer awareness in the farmers was aimed at providing an education session about skin cancer and the use of sun protection methods by farmers. The protection motivation theory and the health belief model were used to guide the educational session and revisions were made using the PDSA model.

Project Management

Organizational readiness for change. The agricultural center was ready for change. Conversations with the director were positive and open-minded from the beginning. The director was the project champion and responded to all correspondence quickly and was willing to adjust her schedule to accommodate the project. The agents at the agricultural center were ready for change after meeting with them to discuss the project purpose and implementation method. The staff needed clear standards for the implementation of the educational session. The project leader identified the following barriers: time to meet with all agents, time constraints for farmers' meetings, and language differences. The project leader overcame these barriers with flexibility and live translation of the educational session into Spanish.

Interprofessional collaboration. The director of the agricultural center is the project champion and was instrumental in the project's approval and success. The livestock extension agents implemented the educational session during meetings with livestock farmers, which include swine, cattle, sheep, and goat farmers. The horticulture agents were able to implement the educational session in meetings with the landscapers, vineyard farmers, commercial growers, and gardeners. The small farm management agent met with small farmers and implemented the educational session. The field crops agent brought the educational session to tobacco, cotton, peanut, corn, small grain, soybean, and honeybee farmers. The farmworker educator was influential in helping reach the farmers in migrant camps with the educational session. The site

director is the top of the hierarchy, but she values team input and considers the team before making decisions regarding the project.

Risk management assessment. The strengths, weaknesses, opportunities, and threats (SWOT) analysis was used for the risk management assessment (see Appendix I). The agriculture center currently does not have an educational session for farmers about skin cancer. The strengths of this project included a commitment from the site director, evidence-based research that supports the need for the project, and support by the agents at the center. Strengths also included flexibility within the meeting times and translation into Spanish for Spanish-speaking farmers. Other strengths were the motivation of the project lead and project faculty.

The weaknesses of this project included a limited time frame to implement the project and a small number of agents to train to use the educational session. Other weaknesses included the project leader's inexperience and limited financial resources.

Opportunities included the development of an educational session for use in agriculture centers and networking with interdisciplinary professions to improve the health of farmers. Other opportunities included the sharing of the educational session with other agriculture centers for use with farmers.

Threats of this project included potential adverse weather, such as hurricanes, and unpredictable attendance of farmers at the meetings. Additional threats included abrupt changes in staff at the agriculture center or health threats of project team leader.

Organizational approval process. Initially, telephone calls to the project site were made 12 to 16 months before the project approval letter was requested. These phone calls were used to establish a need for the intervention, establish a relationship, and give a brief description of the project. Then meetings were organized with the director, which were followed by

meetings with the extension agents. During these meetings, the purpose of the project was presented, and statistical facts were given to establish the need for increasing skin cancer awareness. The project leader shared personal farming history to build comradery. The meeting with the extension agents was also used to determine the approximate number of farmers that could be reached, the number of agents that could be trained, and the acceptable length of the educational session. The meeting was also used to discuss each agent's specific role in the agricultural center and which type of farmers the agent could reach. At the end of the meeting, the agency director, who is the project champion, asked the agents if they were in support of the project. All the agents expressed support, and the director emailed the letter of support (see Appendix A).

Information technology. The technology used for this project included PowerPoint, Excel, and Microsoft Word. PowerPoint was used to present the educational session used with agents and farmers. Spreadsheets, such as the literature review matrix, and graphs were created in Excel. Excel was also used to perform statistical analyses. The written documentation used for this project was completed using Microsoft Word.

Cost Analysis of Materials Needed for Project

The improved healthcare and cost savings would offset minimal costs incurred by the implementation of the project in healthcare. During the years of 2007-2011, 5 million adults were treated for skin cancer at a cost of $8.1 billion annually (Guy, Machlin, Ekwueme, & Yabroff, 2014). The average cost of $1,620 per patient treated for skin cancer. While it would only take the prevention of one skin cancer to offset the financial cost of this project ($1,030), it was expected to prevent many skin cancers over the lifetime of the farmers who attend the educational sessions (see Appendix J).

Additional costs to implement this project include the agents' time and the farmers' time. These costs were minimized by including the educational session into meetings the agents and farmers were already attending. Alternatively, the farmers' quality of life and life expectancy can be increased by the prevention of skin cancer. The farmers will benefit by reducing the lost days of work related to melanoma and other skin cancers. Also, by teaching self-care prevention methods to this population, the farmers' concept of self-reliance was improved. The Cooperative Extension Agency benefits because this QI project was designed for sustaining the innovation. The project includes adaptability into the current workflow and can yield measurable results. The project produces value for the Cooperative Extension Agency and farmers. Continued implementation will further increase the impact of this project. Preventing skin cancers can positively impact the financial status of the farmers and the communities where they live.

Plans for Institutional Review Board Approval

The Cooperative Extension Agency does not have an IRB process. The meetings with the director and agents were used to gain approval for the project. The project leader explained the purpose of the project and answered questions from the director and agents. After some discussion about time frames and the number of farmers attending meetings, it was agreed upon to approve this project. The director sent the formal approval letter. The East Carolina University (ECU) IRB process was initiated by completing the Program Evaluation Self-Certification Tool Guidance worksheet. After obtaining approval from the faculty lead, the tool was submitted online. The project was deemed quality improvement and an immediate response was received stating that IRB review was not required.

Plan for Project Evaluation

Demographics. Demographic information was collected using a five-question survey (see Appendix K). Gender and highest degree earned were reported as the actual number with the percentage and presented in a pie chart. The agents' ages, years of farming, and years of working as an agent were reported as an average with standard deviation. The agents' ages, years of farming, and years of working as an agent were presented in a table. The agents completed the survey at the first educational training session, and the results were entered into Excel. Excel was used to calculate statistical results.

Outcome measurement. Two process measures were used to determine the success of this project. The first process measure was determining if 90% or more of the agricultural extension agents were trained in the use of the educational session. The second process measure was determining if the agents used the educational session during 80% or more of the meetings with farmers. These two process measures were used to evaluate the success of this project.

Evaluation tool. The agents were asked to sign in at each training session. The total number of agents trained was divided by the total number of agents at the agricultural center and then multiplied by 100 to determine the percent of agents trained in the use of the educational session (see Appendix L).

Secondly, each agent was provided with an "Evaluation Tool for Agents to Track the Number of Educational Sessions" tool (see Appendix M). Each agent was asked to log each meeting with farmers and note whether the educational session was used. The total number of times the educational session was used was divided by the total number of meetings with farmers then multiplied by 100 to compute the percent of the use of the educational session. Narrative remarks and themes were captured in response to why the educational session was not used.

Data analysis. There are no national, state, local, or organizational benchmarks for the data collected in this project. To determine if 90% or more of the agricultural extension agents were trained in the use of the educational session, the total number of agents trained was divided by the total number of agents at the agricultural center and then multiplied by 100 to determine the percent of agents trained in the use of the educational session. Ninety percent or more of the agents trained was considered a success.

The second process measure was determining if the agents used the educational session during 80% or more of the meetings with farmers. This was calculated by dividing the total number of times the educational session was used by the total number of meetings with farmers, then multiplied by 100 to compute the percent of use of the educational session. Narrative remarks answering why the educational session was not used were grouped into categories: lack of time, computer malfunction, and other. Use of the educational session 80% or more of the time was considered successful.

Data management. Data were collected from the agents and stored in the project leader's locked car trunk. Paper hard copies of data were stored in a locked file cabinet, and electronic copies of data were stored on a computer with a strong password. Data will be kept for two years. At the end of two years, a computer technologist will be hired to destroy all copies of sensitive information from the hard drive. Paper copies of sensitive information will be burned. The data were only available to the project leader, site director, and project faculty. The project did not involve any personal health information and personal health information was not collected.

Summary

This innovative DNP project proposes to use an educational session at the agricultural extension agency to increase skin cancer awareness in farmers in southeastern NC. The agricultural agency was ready for change and supportive in forming an interdisciplinary collaborative partnership between agricultural agents and healthcare providers. After performing a risk management assessment, the strengths and opportunities outweighed the weakness and threats. Flexibility and communication were key factors needed to overcome weaknesses and threats. Telephone calls and meetings with the agriculture center director and the agriculture agents helped form a relationship which aided in the organizational approval process. Basic technology software was used to construct and present the educational session. Prevention of lost time at work for farmers, increasing life expectancy, and improving self-care of farmers offset the $1,030 financial cost of the project.

Demographic information of the agricultural agents included years of experience as an agent and years of experience in agriculture (see Appendix K). Two process measures were used to establish the efficacy of the project. The goal was for 90% of the agents to be trained to use the educational session and 80% of the meetings with farmers to include the educational session. The project leader computed the percent of agents trained and percent of meetings, which included the educational session by using the information provided by the agents on the evaluation tools (see Appendices L and M). Electronic and paper copies of the data were securely stored for two years.

Chapter Five: Implementation Process

This project was implemented in a rural agricultural center and engaged the extension agents to participate. Participants included the agricultural agents who were recruited at the regularly scheduled extension agent staff meeting with the center's director in attendance. Agents were trained to use the educational session and complete the data collection tool. The PDSA cycle was used to adapt the plan to the needs of the agents and farmers. Agent training was 100% and 80% use of educational sessions in meetings with farmers. Plan variation allowed for specific measures to better reach the Hispanic population.

Setting

The project setting was in a rural agricultural center in southeastern NC. The center was a public, nonprofit community setting where farmers come to sell cattle and access resources for all aspects of farming. The setting was a state agency affiliated with NC State University. The agency served all farmers within the county and was funded by NC State, county, and private funds. The interest of the agency in this project was to serve the farming population better and improve the health of farmers.

Participants

The agricultural extension agents, the farmworker educator, and the director were the participants in this project. The director of the extension agents coordinated meetings with farmers, project leader, and extension agents. The project site champion was proactive in implementing the educational session a rural farmer workshop meeting, which included other counties as well. The livestock extension agent implemented the educational session in informal meetings with farmers, such as the street fair. The horticulture agents implemented the educational session during a master gardener meeting. The small farm management agent

implemented the educational session in a farmer management meeting. The field crop agent implanted the educational session during a beekeeper meeting. The farmworker educator was instrumental in implementing the educational session to non-English speaking populations, and the educational session was implemented during food distribution and festival days. All agents and staff were included that met directly with farmers. Agents and staff that did not work directly with farmers were excluded.

Recruitment

Participants were recruited at the weekly staff meeting. After the project was explained, the director asked if the agents were interested, and all the agents who work with the farmers volunteered. The convenience sample included agents that work directly with farmers within the local area. All participants were employees of the agency, and no contractual agreements were required. The participants volunteered to participate in order to serve the farmers in the area better. All agents seem to be excited about a new tool to use with the farmers that is cost-effective and sustainable. The project champion and the small farm management agent were able to facilitate the implementation of the educational session in different counties.

Initially, some agents were unclear about who qualified as farmers. As a result, the implementation session was not used during two meetings. The project leader addressed the concern and the educational session was used in later meetings. Some agents did not have meetings with farmers during the project implementation time frame which was a limitation. Spring and summer are seasons of higher interaction between agents and farmers.

Farmers and farmworkers from many different areas of farming were included in the training. Apiarists, master gardeners, cattle and swine producers, field crop producers, small

farmers, farmworkers, large farmers, and others participated in the educational sessions. Three different counties were included during this project implementation.

Implementation Process

Project implementation began with coordinating a time to meet with the extension agents. This meeting was used to train the agents in the use of the educational session and the tools associated with the project and to establish meeting times that were scheduled with the farmers. The training session was detailed and included time to answer questions from the agents and practice with the educational session. Agents completed the "Project Data Collection Tool" after the training session (see Appendix K). The educational session included showing a voice-over PowerPoint, displaying sun protection methods, and handing out information cards from the CDC. Agents were given the "Evaluation Tool for Agents to Track Number of Educational Sessions" and instructed on how to complete it (see Appendix M). Agents were instructed that these tools would be collected at the end of the data collection period. The PDSA cycle was performed after the first, second, fourth, sixth, eighth, and tenth weeks of implementation with the farmers (see Appendix N). Implementation was revised as needed.

The first training session did not include two of the agents who were unavailable that day. The project leader trained them at the next available time the agent had available. All of the agents were trained. Each agent was encouraged to implement the educational session in all meetings held with farmers. Meetings included formal and informal gatherings. Some agents were unclear about who was considered a farmer; the project leader clarified that a farmer is any person working in agriculture.

The project leader worked in conjunction with the farmworker educator to reach the Hispanic population. Food distribution days and festivals were meetings used to reach the

Hispanic population. The farmworker educator suggested using more pictures with the Hispanic population. Picture cards with the melanoma mole chart and skin protection methods were printed to distribute to the farmers and farm workers. A large poster was also printed to display with the skin protection methods.

The "Evaluation Tool for Agents to Track Number of Educational Sessions" were collected by the project leader and used to analyze the effectiveness of the project.

Outcome measurements. This innovative project stepped out of the healthcare facility to reach farmers in a different setting. Interprofessional collaboration with the agriculture agents was effective in reaching farmers. One hundred percent of the agricultural agents were educated on the use of the educational session, and the educational session was used in 80% of the meetings. These process outcomes were evaluated compared to outcome goals of 90% agent education and use of the educational session in 80% of meetings. Both outcome goals were met; and the project was successful. Three hundred thirty-seven farmers were educated about skin cancer awareness through the use of the educational session. These findings were disseminated within the project site.

Plan Variation

This quality improvement project adapted to the needs of the agency and farmers by making four variances in the original plan. The first variance was to train the two agents who were unavailable during the initial training session. The project leader arranged individual appointments with agents and trained them at their convenience.

The second and third variations included more pictures to reach the Hispanic population. A large poster was printed to display with the skin protection methods, and business card size handouts were printed to give to the farmers. The cards had the melanoma mole chart on one

side and the five methods of skin protection on the other side. These variations were beneficial in reaching the farmers.

The fourth variation included additional outreach opportunities that the project was implemented in. These included street fair, Hispanic festival, and Hispanic food distribution day. These opportunities brought the educational session to the farmer and increased the outreach of the educational session.

Summary

This innovative quality improvement project was implemented in a rural agricultural center and engaged the extension agents to educate framers about skin cancer awareness. Participants included agricultural agents. The agents were recruited at the regularly scheduled extension agent staff meeting with the center's director in attendance. Agents were trained to use the educational session. The educational session included a voice-over PowerPoint, sun protection methods for display, poster, and handouts. Agents were also trained to complete the data collection tool. About every two weeks, the PDSA cycle was used to adjust the plan to the needs of the agents and farmers. Agent training was 100%, which met the outcome goal. Additionally, the goal of using the educational session in 80% of the meetings with farmers was also met. The project was successful in meeting both outcome goals and was disseminated within the project site. Plan adaptation of posters and visual handouts allowed for improved measures to better reach the Hispanic population.

Chapter Six: Evaluation of the Practice Change Initiative

This innovative Doctor of Nursing Practice (DNP) Project provided a sustainable intervention that the agricultural center can continue using. The intervention was an educational session which included a voice-over PowerPoint presentation, Centers for Disease Control handouts, mole chart handouts, poster, and display of sun protection items. The project was a collaborative effort between the project lead, the project champion, and the agricultural agents. This intervention aimed to teach agriculture extension agents who would then be able to educate the farmers to increase skin cancer awareness.

The majority of the agricultural agents were male, and half held bachelor's degrees. The project outcomes were successful, and the project remains in use at the agricultural center. The educational session was used in 80% of the meetings held with farmers, and 100% of the agricultural agents were trained in the use of the educational session. The agricultural center was ready for the change and were receptive to using the educational session. The fall season is a time of fewer meetings with farmers than the spring, which led to a low number of meetings.

Participant Demographics

The demographic information of the agricultural agents was collected using a five-question survey (see Appendix K). Demographic information was collected from the eight agriculture extension agents who participated in the project. Age, gender, highest level of education, years of work in agriculture, and years of work as an agent were the demographic data collected. The demographic information was collected during the agent's initial training session. Demographic information was entered in Excel, and this spreadsheet was used to calculate statistical results.

Ages ranged from 22 to 60 years old, while years in agriculture ranged from 10 to 48 and years as an agriculture agent ranged from 0.4 to 26. Males represented 87% of the agriculture agents and female 13% (see Appendix O). Levels of education varied from associate degree (12%), bachelor's degree (38%), and master's degree (50%) of the agricultural agents (see Appendix P).

The demographic information revealed wide variances between average of ages, years in agriculture, and years as an extension agent, while the standard deviation was not as varied (see Figure 6.1). The average age was 43.13 years with an average of 29.13 years in agriculture and 13.68 average years as an extension agent. The standard deviation revealed a wide variance in each category (see Figure 6.1).

Figure 6.1. Age, Agricultural Experience, and Extension Agent Experience in Years

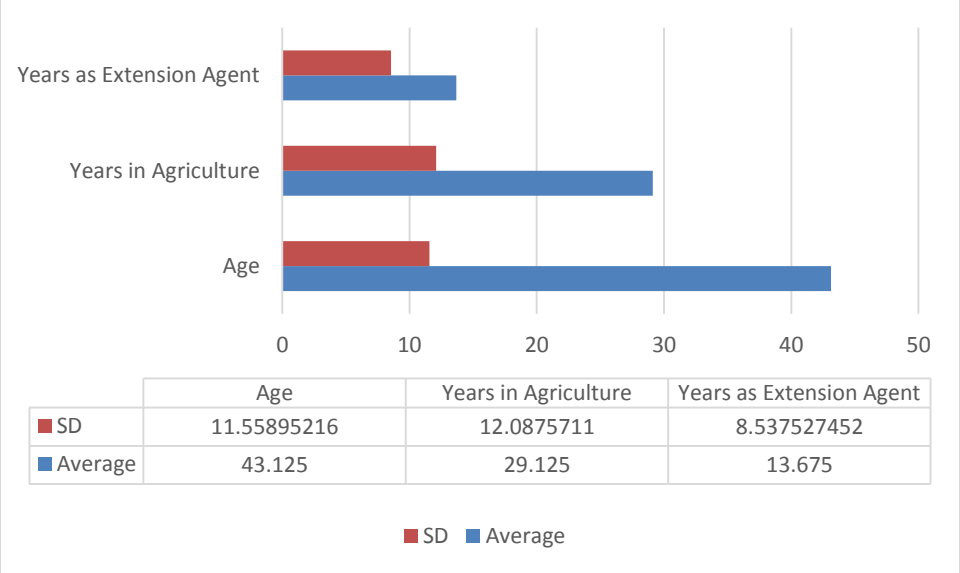

Figure 6.1. Chart comparing standard deviation and average of age, years in agriculture, and years as an agent for the agriculture agents.

Intended Outcomes

This quality improvement project addressed short-, intermediate-, and long-term goals. Short-term outcome of this project includes 100% of agricultural agents were trained to use the educational session in meetings with farmers. The eight agricultural agents were trained in three different sessions during the first month of the project (see figure 6.2).

Figure 6.2 **Number of Meetings Educational Session was used in**

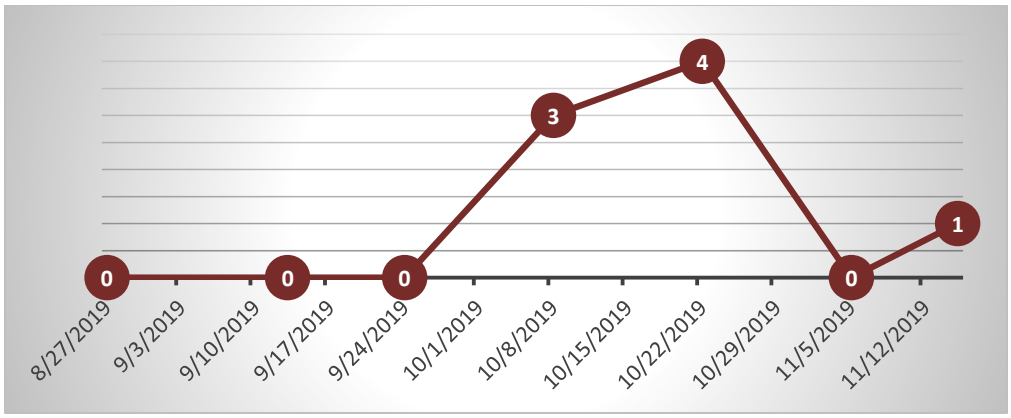

Figure 6.2. Chart depicting the number of meetings held with farmers.

Intermediate-term outcome includes the use of the educational session during 80% of the meetings held with farmers. There was a total of ten meetings with the farmers during the implementation period. The educational session was used in eight of these meetings. These meetings included apiarists, cattle, crop, swine, and other farmers. The total number of farmers reached during the educational sessions was 337.

Long-term outcome of this QI project includes a sustainable educational session housed at the agriculture extension office. This session is available for continued use by the agents in meetings with farmers.

Findings. The agricultural agents completed the data collection tools, and the project lead collected them and entered the data into Excel. The "Evaluation Tool for Agents to Track Number of Educational Sessions" collected what type of meeting was held, if the educational

session was used, if not, why it was not used, and number of farmers attending. Excel was used to report statistical data. The first outcome was met as 100% of the agricultural agents were trained in the use of the educational session. Determining if the agents used the educational session in at least 80% of the meetings with farmers was also met. During one PDSA cycle, the agents discussed concerns about which farmers should the educational session be used in. The agents' questions were clarified that all meetings with any farmers were to include the educational session.

Some farmers verbalized subjective comments during the implementation period. One farmer stated, "I never knew sunscreen expired." Another farmer lamented, "I wish we had seen this before. I had a melanoma removed three months ago." A third farmer stated, "I had basal cell carcinoma on my head from not wearing hats." These comments seemed to pique the interest of the other farmers in the room and increase attentiveness to the educational session.

During another PDSA cycle, the agent who works with the Hispanic population discussed concerns that this population responds better to images than written words. The CDC handout (see Appendix Q) presented during the sessions was primarily written words. This led to the development of a business-card size handout by the DNP student. On one side, the five ways of skin protection were depicted in images and the other side had the mole chart. Farmers responded well to this handout. Farmers were observed by the agents holding the mole chart next to skin lesions on their arms and making comparisons (see Appendix R).

Another finding included the receptiveness of the agriculture extension agency and the agents. All the agents were engaged and receptive to bringing the information to the farmers. The project spread into three other counties and was well received. The fall season was a time of

few meetings with the farmers. The spring season is when most of the farmer meetings are held and would be a better time to reach increased number of farmers.

Summary

The QI project to increase skin cancer awareness among southeastern NC farmers was successful when the outcomes were revealed. The interprofessional collaboration between a healthcare worker and agriculture agents provided a successful QI project that is sustainable. Eight agents were trained to use the educational session and 337 farmers were reached during the implementation period. The average age of the agents was 43.13 years with 13.68 average years of experience as an agent. The agents used the educational session 80% of the meetings held with farmers. The PDSA cycles proved to be an effective method of correcting and streamlining the project.

Short- and intermediate-term goals were met during the implementation period. The educational session is sustainable and able to meet long-term goals. The agricultural extension office was receptive to change and willing to work to educate the farmers about skin cancer. The expressive comments by farmers during the meetings confirmed the need for the QI project. This QI project could be replicated in other agencies for different populations or different health care concerns.

Chapter Seven: Implications for Nursing Practice

The American Association of Colleges of Nursing (AACN, 2006) established the eight *Essentials* of a doctorally prepared nurse. Competency in all eight areas is necessary for Doctor of Nursing Practice (DNP) nurses. The first four essentials include scientific underpinning for practice, leadership for quality improvement, clinical scholarship in evidence-based practice, and technology improvement in health care. The final four essentials include advocacy in health care, interprofessional collaboration, disease prevention to improve population health, and advanced nursing practice. These eight essentials are the foundation of the education of a doctorally prepared nurse.

This quality improvement (QI) project revealed several implications for advanced nursing practice. This project established an interprofessional relationship with the agriculture center and healthcare professionals and provided a sustainable educational session to increase skin cancer awareness in farmers in the local area. Future implications include establishing more relationships with community organizations in order to foster improved healthcare and increased use of technology in advance practice nursing.

Practice Implications

Essential I: Scientific underpinnings for practice. The first *DNP Essential* includes the analysis and use of information to develop practice and the translation of research to improve practice (AACN, 2006). The integration of research, theory, and practice is included to develop new approaches toward improved practice and outcomes (AACN, 2006). This DNP project integrates research, theory, and practice to develop new approaches toward improved outcomes. Analyzation of the research reveals that farmers are more likely to develop skin cancer than most outdoor workers (Smit-Kroner & Brumby, 2015). Farmers are less likely to use skin protection

methods and have the most UVR exposure of all outdoor workers (Smit-Kroner & Brumby, 2015). The literature review demonstrated that farmers are less likely to attend skin cancer screenings and have knowledge deficits about healthcare and skin cancer (Zink et al., 2017).

The protection motivation theory (PMT) was integrated with the health belief model (HBM) and the plan-do-study-act model (PDSA) to guide implementation. The PMT was used to promote the perceived susceptibility of skin cancer in farmers and include protection methods to promote self-protection (Babazadeh et al., 2016). Protection motivation theory employs one's desire to avoid skin cancer to cause a change in behavior of increasing the use of skin protection methods. The HBM was used in conjunction with the PMT to increase the likelihood that the farmers would adopt a change in behavior and increase the use of skin protection methods. The PDSA model was used to guide changes during the implementation. The educational session used in this project integrated the research and theory to form a new method of improving the health of farmers, which is replicated in other project sites. A suggestion for future implementation would include using the educational session with different populations, for example, youth in farming families.

Essential II: Organization and systems leadership for quality improvement and systems thinking. *Essential II* encompasses the crucial leadership requirements required in a DNP nurse. The doctorally prepared nurse must demonstrate critical and reflective thinking while advocating for improved quality, access, and cost-effective healthcare (AACN, 2006). The leadership of a DNP nurse includes effective written and oral communication and the ability to develop and implement innovative ways to incorporate change (AACN, 2006). This DNP project demonstrates critical and reflective thinking in the assimilation of the educational session.

Research and theory are combined to form an effective method of communicating the farmers' risk of skin cancer and skin protective methods that can be used to decrease skin cancer risk. This project was cost-effective and remained within the budget at $1,030, which is less than the cost of treating one skin cancer at the cost of $5,670-$10,555 (Institute for Work and Health, 2018). The innovative educational session incorporates principles of change and demonstrated interprofessional collaboration, including professionals outside of the healthcare arena. The educational session provided oral communication of skin cancer risks and protection measures farmers can use to improve their healthcare. The literature review reflected the written knowledge needed to improve the quality of health for farmers. Suggestions to advance nursing practice include developing strong partnerships in the community and using the interprofessional network to continue the use of the educational session with different populations of farmers who were not accessible during the time frame of this project. Implications for future practice also include different educational sessions directed to farmers, including topics such as post-traumatic stress disorder and anxiety management.

Essential III: Clinical scholarship and analytical methods for EBP. *Essential III* contains the critical analyzation of literature and evaluation of processes to measure outcomes (AACN, 2006). The doctorally prepared nurse is educated to design and implement quality improvement strategies to promote safety, efficiency, and equitable quality of health care (AACN, 2006). Doctorally prepared nurses are competent to disseminate findings of projects (AACN, 2006). This quality improvement project included analyzation of the literature in determining gaps in skin cancer prevention in farmers and the best methods of closing those gaps.

Farmers often have knowledge deficits and health care deficits, which contribute to the ineffective use of skin protection methods (Trakatelli et al., 2016; Zink et al., 2017). The educational session included graphics and pictures with audio to increase the learning and receptiveness of farmers. A visual poster and business card size handouts with graphics of sun protection methods and the skin cancer mole chart were used to increase the effectiveness of the educational session. The interprofessional collaboration with the agriculture agents was effective in reaching farmers. One hundred percent of the agricultural agents were educated on the use of the educational session, and the educational session was used in 80% of the meetings. These process outcomes were evaluated and considered successful when compared to outcome goals of 90% agent education and use of the educational session in 80% of meetings. These findings were disseminated within the project site. Future implications would include the use of electronic surveys to gather information from agents and implementation in additional agricultural centers.

Essential IV: Information systems/technology and patient care technology for the improvement and transformation of healthcare. *Essential IV* discusses technology use in the improvement and transformation of health care (AACN, 2006). Doctorally prepared nurses are equipped to use software technology to integrate research from the literature in a way that patients can understand (AACN, 2006). Design, use, and evaluation of technology in health care are essential competencies doctorally prepared nurses possess (AACN, 2006). The use of technology in this quality improvement project was critical to the success of the project.

An educational session rooted in evidence from the literature review was translated into a PowerPoint presentation using Microsoft PowerPoint software. The design and use of this project integrated technology and transformed the way farmers were educated about skin cancer

awareness in the local agriculture center. The use of the software allowed the presentation to be very portable and distributed efficiently. Microsoft Excel software was used to evaluate the effectiveness of the project and to create graphs to display outcomes and demographic data. Microsoft Word software was used to compile the literature review and create evaluation tools used by the agriculture agents. Communication via email with project champion, agents, project faculty proved to be an invaluable use of technology in this project. The use of email allowed for quick responses between all parties. Future recommendations include using a Qualtrics survey to gather data from agents. Another implication would include a mobile application that farmers can use to assess moles, skin cancer risk, and hours spent in the sun.

Essential V: Healthcare policy for advocacy in healthcare. *Essential V* focuses on health care policy and advocacy. The doctorally prepared nurse is competent to provide leadership in the development and implementation of health strategy (AACN, 2006). A competent nurse leader is skilled in analyzing health design, educating stakeholders, and advocating for nursing (AACN, 2006). Leadership, education, and advocating for nursing were all crucial aspects of this DNP project.

Leadership in the development and implementation of an innovative design to increase skin cancer awareness in farmers was the foundation of this project. New partnerships were formed with interprofessional colleagues outside of the healthcare arena while advocating for nursing. These partnerships allowed for the education of site champion, agents, and farmers about the need for increased skin cancer awareness and skin protection methods. Recommendations for future projects include reaching out to community leaders in different aspects of community life. Partnering with these leaders can reduce healthcare knowledge deficits and improve the healthcare of the community.

Essential VI: Interprofessional collaboration for improving patient and population health outcomes. Utilizing interprofessional collaboration to improve health outcomes is the goal of *Essential VI* (AACN, 2006). A DNP nurse is competent to provide leadership in interprofessional and interprofessional teams to improve health outcomes (AACN, 2006). This leadership includes effective collaboration and communication employed to develop and implement practice and standards of care (AACN, 2006). The DNP professional can consult interprofessionally to improve health outcomes (AACN, 2006).

Interprofessional collaboration of this project included professionals in agriculture in establishing a sustainable educational session to increase the awareness of skin cancer in farmers. Interprofessional collaboration between nursing colleagues and project faculty aided in the development of presentation ideas and project guidelines. The DNP nurse contributed to the improved partnership between nursing and the agricultural agency by leading collaboratively and demonstrating quality improvement that benefits the mutual population-farmers. The quality improvement project acted as an initial framework for future expansion within the agricultural setting. Future expansion could address nutritional and health concerns in the youth population. Future implications include creating diverse partnerships within the local community that establishes lasting collaborative relationships between health care professionals and other community leaders.

Essential VII: Clinical prevention and population health for improving the nation's health. *Essential VII* comprises synthesizing information and integrating epidemiology to improve population health care delivery (AACN, 2006). The development and use of disease prevention and health promotion strategies are included in *Essential VII* (AACN, 2006). The

educational session is a synthesis of the literature review and integrates disease prevention strategies to reduce the incidence of skin cancer.

The professional DNP nurse is influential in population health. The use of effective quality improvement projects and the ability to communicate evidence-based practice effectively improve population health and reduces disease. Initiating an educational session that increases the farmers' awareness of skin cancer and effective skin protection methods works to improve the population health. Utilizing cultural competency in the development and use of the educational session inspired more referrals to other meetings. The educational session was presented in other meetings with farmers. Future implications include the use of culturally competent methods to decrease gaps in farmers' healthcare related to post-traumatic stress disorder, anxiety, depression, and suicide.

Essential VIII: Advanced nursing practice. *Essential VIII* incorporates diversity and cultural sensitivity in the development and maintenance of relationships (AACN, 2006). Assessment of health parameters in various settings is a competency the DNP nurse is skilled in (AACN, 2006). The DNP nurse is competent to analyze and evaluate the efficiency, financial costs, ethics, and outcome measures of health care measures (AACN, 2006). The DNP nurse contributes to a wide variety of health improvements.

The QI project included the design, implementation, and evaluation of the educational session for agriculture agents and farmers. The DNP nurse initiated the relationship between the agriculture agency and healthcare in this project. The diverse setting and cultural sensitivity of farmers were successfully navigated by the DNP nurse to complete the project. The NP nurse instituted a culturally sensitive educational session that is sustainable and reproducible. Evaluation of the quality improvement project reveals that the project was efficient for

agriculture agents and cost-effective. The project remained within the budget without ethical compromise. The advanced nursing practice outcome goals of 90% agent training and 80% use of the educational session in the meetings were met. Future implications include mentoring a DNP nursing student to continue to advance this project or initiate another project within the agriculture center. Since farmers are reluctant to seek health care (Zink et al., 2018), another recommendation is to facilitate mobile health buses to deliver services at the agriculture center.

Summary

The *Eight Essentials of the Doctorally Prepared Nurse* confirm this QI project. The Essentials provide the foundation to develop, implement, and use the educational session about increasing skin cancer awareness in farmers. Future implications include continued work in the agriculture center and other agencies within the community. Advanced practice nurses educated in a doctoral program are equipped to communicate effectively in writing and orally, problem-solve to meet the health care needs of the community, educate the community, and collaborate interprofessionally. As technology improves and health care changes, the DNP professional nurse is prepared to remain current about ongoing health care needs and methods to meet them.

Chapter Eight: Final Conclusions

This quality improvement (QI) project established a collaborative interprofessional relationship between healthcare providers and the agriculture center. Outcomes of this project include a sustainable educational session, trained agriculture agents, and 337 farmers educated about skin cancer awareness. Partnership with a community setting fostered increased farmer attendance. Project strengths included flexibility, evidence-based research, and project site commitment. Weaknesses included project lead's inexperience and lack of Spanish translation. Limitations included short implementation time and minimal use of electronics.

This relationship was clinically significant in increasing skin cancer awareness in farmers and offered an avenue for future collaborative work to improve the health of communities. Educational sessions are sustainable methods for reducing cost of healthcare and improving the health of communities. Educational sessions in community settings can be adapted to other health problems and different populations.

Significance of Findings

The first outcome of this QI project was the creation and implementation of a sustainable educational session that increases awareness of skin cancer risks and prevention measures. The educational session included a PowerPoint presentation, poster, handouts, and display items. The ten-minute, interactive PowerPoint presentation discussed farmers increased risk of skin cancer, types of skin cancer, and skin protection methods farmers can use to prevent skin cancer. The poster highlighted skin cancer facts, normal and abnormal moles, and five methods of skin protection. Handouts included the CDC Fast Facts sheet entitled "Protecting Yourself from Sun Exposure" and a business-card sized handout with the five methods of sun protection on one side and the mole chart on the other side. The display items included sunscreen, wide-brimmed hat,

long-sleeved shirt, sunglasses with leash, and sunscreen. This outcome is in alignment with the CDC strategic goal of promoting education to prevent skin cancer (CDC, 2015).

The project demonstrated interprofessional collaboration with agriculture agents to increase skin cancer awareness in farmers. One hundred percent of the eight agents at the agriculture center were educated about using the educational session. The agents used the educational session in 80% of the meetings held with farmers during the implementation period and continue to use the session in meetings. Both outcome goals were successfully met. During these educational sessions, 337 farmers were educated about skin cancer awareness using the educational session.

This project highlights the clinical significance of interprofessional collaboration including professions outside healthcare. Nurse practitioners and other healthcare providers can improve overall community health by stepping outside the current healthcare setting and embracing the community setting to offer healthcare education. The agriculture center was eager to participate in the project, and the agents were willing to implement the session in previously scheduled meetings. The project site champion was eager to offer the educational session in other counties and a total of four counties used the educational session during the implementation period. Before this project, there was not an educational session for farmers and skin cancer within the local county (SCEDC, 2016).

Lessons learned included preparing for the importance of flexibility with training schedules and to make provisions for non-English speaking populations. The project lead learned that interest from other counties and populations about the educational session was higher than anticipated. The agriculture centers gained a sustainable education session that can be used in upcoming meetings and events with farmers. This project could be translated to other

agriculture centers and other community-based centers to improve farmer education about skin cancer risk and prevention. This project could also be translated to other populations with increased UV exposure, such as youth in farming, 4-H groups, construction workers, pilots, and lifeguards.

Preventive education is cost-effective. This project cost $1,030. Treatment of one basal cell carcinoma costs $5,670, and one squamous cell carcinoma $10,555 (Institute for Work and Health, 2018). The CDC (2015) estimates that 21,000 melanomas ($250 million) could be prevented by using skin protection methods. Prevention of one skin cancer would more than recoup the cost of this project and future educational endeavors.

Project Strengths and Weaknesses

This QI project demonstrated strengths in areas of evidence-based research, flexibility, and project site commitment and support. The need for educational intervention is supported in the literature and reiterated in the farmer meetings (de Andrade Moreira et al., 2015). Research-based evidence supports the use of educational interventions in community settings to improve health in farmers (Moradhaseli et al., 2019; Pirschel, 2017; Robinson & Jablonski, 2018). This project was flexible with time schedules and restraints. The presentation was limited to ten minutes, which enabled its use in a variety of meetings with farmers. The presentation was concise and used words and situations that directly relate to farmers. The project was flexible enough to be presented and applied to all types of farmers. The presentation was easy to teach to the agriculture agents and simple for them to use. The project site was committed, and the agents were willing to participate in the project to improve the farmers' health. The project site champion was invaluable in encouraging the agents to participate and allowing the presentation

to be used in any meeting with farmers. The site champion also stimulated the use of the project in other counties.

This project required a minimum of time from the agents and a minimum of personnel to implement. The agents' training took 30 minutes and implementation took 10 minutes during the farmer meetings. When needed, this project was translated into Spanish during the educational sessions, which allowed use with the Hispanic population. The motivation of the project lead and the commitment of the project faculty were significant strengths for this project.

The financial costs of this project were also minimal which strengthened the project. The agriculture agency incurred only costs for agents' training and implementation time. There were no overhead expenses incurred by the agency for this project. Actual costs totaled $1,029.82 (see Appendix J). Cost to sustain project are less than $100 for every 1,000 farmers educated. This project was time and money efficient.

The weaknesses of this QI project included the project lead's inexperience and a small number of agriculture agents at the agriculture center. The project was also weakened by not having a separate voice over PowerPoint narrated in Spanish. The project lead depended on translators at the agriculture center or meeting site to translate.

Project Limitations

Project limitations included the short implementation period of three months and the fall season. Spring and summer seasons would have included more farmer meetings and potentially reached more farmers. Meeting times with agents as a group was limited to staff meetings, which are only twice a month. This required training sessions to be completed individually for the agents who did not attend the first training session. Limited financial resources contributed to lack of mobile apps for farmers to use to detect skin cancer and track sun exposure. This

project was also limited to face-to-face meetings. Web meetings or links to YouTube channel for presentation could be an effective method of reaching the young farmer population.

Project Benefits

The agriculture center benefited by having a sustainable educational session that can be used in the future to educate farmers about their skin cancer risks and ways to prevent skin cancer. The farmers benefited by acquiring knowledge to prevent skin cancer. By preventing skin cancer, the farmers improve their quality of life and reduce financial burden of skin cancer within their families and communities. This includes lost days of work, health care costs, family's lost time at work, and travel to and from a treatment facility.

Healthcare providers benefit by forming a collaborative relationship with the community and community agencies, which can be used to promote healthcare. Additional agriculture agencies include the Rural Advancement Foundation International, Sampson County Friends of Agriculture, and the Future Farmers of America. Collaborative relationships can be formed with community senior centers and include staff education about healthy diets for special populations such as chronic kidney disease and diabetes mellitus. Other topics for staff education could include depression, suicide warning signs, anxiety, negligence, and food insecurity. The educational session for seniors could include educational sessions about safe exercise programs, falls prevention, importance of medication review with provider, and health diets. A collaborative relationship with the domestic violence center could educate women about anxiety and depression, healthy communication, and importance of social support networks. These collaborative relationships can use prevention to decrease the cost of healthcare and improve the health of communities.

Practice Recommendations

This project established an interprofessional relationship with the agriculture center, and future recommendations include continuing that relationship and establishing more interprofessional relationships in the community. This educational session could be used in other agriculture centers across the state. Another recommendation is to offer electronic surveys to gather information from the agriculture agents during the implementation of the project. Healthcare providers and community leaders working together to improve healthcare can have a positive impact on the community's health.

Within the agriculture centers, nutritional and health concerns of the youth population could be addressed in educational sessions. This educational session could be modified to address skin cancer prevention in the youth of farming families. Use of a mobile application to track sun exposure, compare skin lesions, and use of skin protection is recommended in this population. Mobile applications could also be used by farmers to track amount of time exposed to UV light and by project leads to gather demographic information.

Recommendations also include development of other educational sessions on topics relative to farmers, such as post-traumatic stress disorder, depression, suicide, anxiety, and preventative healthcare. Other recommendations include expanding the community interprofessional collaboration and address seniors in the community senior centers. Topics could include diabetes management, hypertension, weight management, and anxiety.

Final Summary

Evidence-based practice demands that providers use the results of evidence-based research to improve healthcare. Evidence-based research supports the use of community settings to educate farmers. This DNP QI project implemented evidence-based research to develop an

educational session that the agriculture agents used to educate farmers about their increased risk of skin cancer. The educational session included a voice-over PowerPoint, display items of skin protection methods, poster, and handouts. The agriculture center was a committed partner and all of the agents were trained in use of the educational session. During meetings with farmers, the agents delivered the educational session to the farmers. The farmers were educated about their risk of skin cancer and prevention techniques using the frameworks provided by the protection motivation theory and the health belief model. This interprofessional collaboration was successful in educating 337 farmers across four counties about their risk of skin cancer.

Project strengths included flexibility, project site support, and evidence-based foundation. Barriers included time of implementation and need of voice-over PowerPoint in Spanish. With minor changes, such as implementing in the spring, the project can reach more farmers. The addition of mobile applications can augment awareness and increase the use of information learned. This sustainable, cost-effective project can be replicated in various settings and populations. This project can be modified to reach different populations at risk for skin cancer from sun exposure. Also, future educational sessions on topics of interest to farmers' health are recommended. These topics include anxiety, PTSD, suicide, depression, and preventative healthcare. Lastly, the use of community setting partnerships with healthcare providers are recommended to increase awareness on various health topics. The commitment of the project site and site champion greatly influenced the success of this project.

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Zink, A., Tizek, L., Schielein, M., Bohner, A., Biedermann, T., & Wildner, M. (2018). Different outdoor professions have different risks - a cross-sectional study comparing non-

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Appendix A
Letter of Support

[redacted]

January 23, 2019

To whom it may concern,

The agricultural staff and myself of NC Cooperative Extension, Sampson County Center have reviewed Mrs. Beverly Mott, DNP's Project titled "Sun Safety & Skin Cancer Awareness". Mrs. Mott has organizational support and approval to conduct her project with us. We understand that for Mrs. Mott to achieve completion of the DNP Program, dissemination of the project will be required by East Carolina University which will include a public presentation related to the project and a manuscript submission will be encouraged.

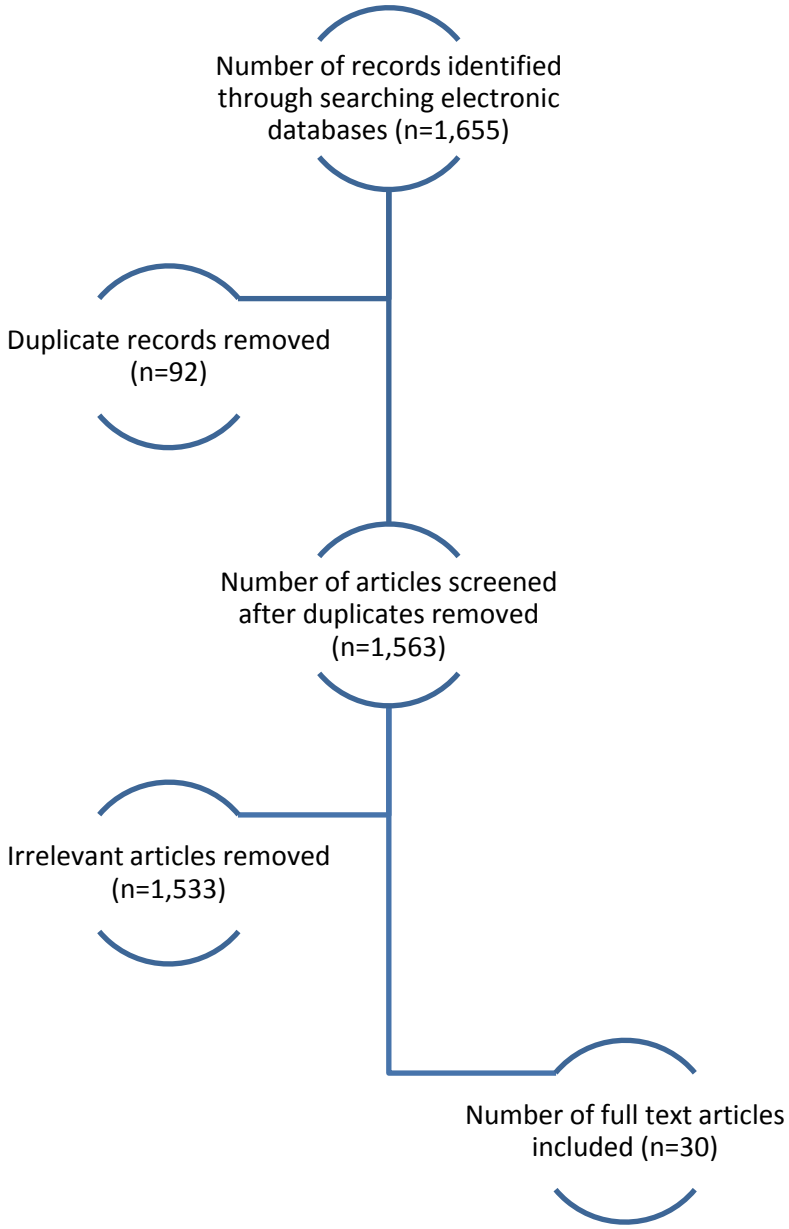
Our organization has deemed this project as a quality improvement initiative and not requiring IRB review.

Thank you,

[redacted]
County Extension Director

Appendix B

Flow Diagram of Article Review



Appendix C

Literature Review Matrix

Increasing Skin Cancer Awareness in Farmers				
Article	**Level of Evidence** (I to VII)	**Data/Evidence Findings**	**Conclusion or Summary**	**Use of Evidence in EBP Project Plan**
Ziehfreund, S., Schuster, B., & Zink, A. (2019). Primary prevention of keratinocyte carcinoma among outdoor workers, the general population and medical professionals: A systematic review updated for 2019. *Journal of the European Academy of Dermatology and Venereology*. Retrieved from https://doi-org.jproxy.lib.ecu.edu/10.1111/jdv.15525	I	An extensive review of Medline and Pub Med for articles between January 1, 2012 and December 31, 2018. The review identified 51 relevant cross-sectional studies and 22 interventional studies. Sun protection behavior (SPB) was insufficient in examining sun protection measures.	While overall outdoor workers had a fundamental understanding of UVR and the associated risk of keratinocyte carcinoma (KC), agricultural workers did not. Only one-third of agricultural workers avoided the midday sun and took breaks in the shaded areas. The studies varied enormously; however, improvement is needed in sun-related knowledge and sun protection behavior.	Limitations include lack of standardized measurements, word variations in surveys, recall period of surveys, and short follow up periods.
de Andrade Moreira, A. P., Sabóia, V. M., & Batista Ribeiro, C. R. (2015). Non-melanoma skin cancer and occupational risk of outdoor workers: Integrative review. *Journal of Nursing UFPE / Revista de Enfermagem*	I	Eighty-seven articles were reviewed and 6 were excluded, leaving 71 articles for review after removing duplicates.	This article concludes that the incidence of skin cancer can be decreased by increasing awareness or outdoor workers. Seven articles focused on educational interventions for outdoor workers and discussed the	This article focused on studies up to ten years old and excluded articles on treatment and articles focused on children.

UFPE, 9(12), 1310–1319. doi: 10.5205/reuol.8127-71183-1-SM.0912201533			scarce literature on educational activities for outdoor workers.	
Babazadeh, T., Nadrian, H., Banayejeddi, M., & Rezapour, B. (2017). Determinants of skin cancer preventive behaviors among rural farmers in Iran: An application of protection motivation theory. *Journal of Cancer Education, 32*(3), 604-612. doi:http://dx.doi.org.jproxy.lib.ecu.edu/10.1007/s13187-016-1004-7	II	Skin cancer preventative behaviors (SCPB) were at 22% with a strong association with perceived susceptibility (r=0.534) and rewards (r=0.460) to improve SCPB.	Protection motivation theory (PMT) had a significant influence on changing behavior in farmers. Healthcare providers should consider using PMT to develop educational interventions to improve skin cancer preventative behaviors in farmers. Increasing the farmers' knowledge and rewards improved SCPB. Improving self-efficacy may also improve SCPB, as farmers believe they can overcome a given problem. A negative correlation between the increased cost of SCPB may lower SCPB. This negative finding may be addressed with education about long-term costs of skin	This was a short three-month study in Iran and only included men. A self-report tool may introduce bias and over or underestimation.

			cancer and cost-effective SCPB.	
Moeini, B., Ezati, E., Barati, M., Rezapur-Shahkolai, F., Mohammad Gholi Mezerji, N., & Afshari, M. (2018). Skin cancer preventive behaviors in Iranian farmers: Applying protection motivation theory. *Workplace Health & Safety.* doi: 10.1177/2165079918796850	II	This randomized study revealed that one unit of increase in the self-efficacy could result in an increase in protective behavior of 26% and protection motivation of 20%.	Farmers can benefit from educational programs that focus on skin protection and skin cancer prevention using the protection motivation theory. Farmers reported using protection methods as follows: sunscreen (8.6%), hats (3.2%), gloves 3.9%, sunglasses 4.6%, and protective clothing 15.4%. More than 50% of farmers also reported having a sunburn at least once during the past year.	Limitations included geographic area of Iran and short time frame of 2 months.
Babazadeh, T., Kamran, A., Dargahi, A., Moradi, F., Shariat, F., & Rezakhani Moghaddam, H. (2016). Skin cancer preventive behaviors among rural farmers: An intervention based on protection motivation theory. *Medical Journal of the Islamic Republic of Iran*, *30*(1), 444-449.	III	Three months post-intervention, the farmers in the experimental group increased use of skin cancer protection methods by: use of sunscreen 17.5%, use of long-sleeved shirts 50.8%, wide-brimmed hats 56.6%, and stay in shade 17.5%.	Protection motivation theory was used to change sun protection methods in farmers. The intervention included an educational session. Quasi-experimental study that compared the aspects of the protection motivation theory in relation to skin cancer before and	Limitations include only male farmers were included and a self-report tool was used.

Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5307611/#R1			3 months after. The control and experimental groups showed no significant differences before the intervention, however, after the intervention to the experimental group was more likely to use skin cancer protection methods.	
Jeihooni, A., & Rakhshani, T. (2018). The effect of educational intervention based on health belief model and social support on promoting skin cancer preventive behaviors in a sample of Iranian farmers. *Journal of Cancer Education*, 1-10. doi: 10.1007/s13187-017-1317-1	III	Perceived susceptibility increased from 14.31 to 29.34 and perceived severity increased from 10.18-21.87. Perceived benefits also increased from 11.25-14.26, while barriers decreased from 19.24 to 9.21 in the experimental group. The control group remained stable in the before and after numbers with ranges only 2-3 points apart.	The quasi-experimental study used the HBM to increase knowledge of farmers in promoting skin cancer behaviors. The study conducted a 3-month and 6-month post-intervention to assess its effectiveness. The educational intervention included posters, pamphlets, and PowerPoint presentation. Also, a farmer diagnosed with skin cancer was invited to speak at the educational session.	The limitations are recruitment efforts were only at 2 local health centers and may have selection bias.

Zink, A., Tizek, L., Schielein, M., Bohner, A., Biedermann, T., & Wildner, M. (2018). Different outdoor professions have different risks - a cross-sectional study comparing non-melanoma skin cancer risk among farmers, gardeners and mountain guides. *Journal of the European Academy of Dermatology and Venereology, 32*(10), 1695-1701. doi: 10.1111/jdv.15052	IV	Nonmelanoma skin cancer was diagnosed in 27.4 % of farmers compared to 5.6% of indoor workers. About 43% had never seen a dermatologist and are reluctant to seek healthcare.	As an outdoor worker, farmers have significant risks for nonmelanoma skin cancer and have different risk behavior. Prevention efforts to decrease NMSC can reduce the global burden of occupation NMSC.	The limitations are recruitment efforts were only at local meeting of outdoor professionals and may have selection bias. Also, individuals who had not seen a dermatologist may have been more eager to participate and may have led to higher incidence numbers of NMSC. Self-completed questionnaires are also susceptible to underestimation of UV light exposure and overestimation of protection methods.
Apalla, Z., Lallas, A., Sotiriou, E., Lazardiuu, E., Trakatelli, A., . . . Ioannides, D. (2016). Farmers develop more aggressive histologic subtypes of basal cell carcinoma: Experience from a tertiary hospital in northern Greece. *Journal of the European Academy of Dermatology and Venereology, 30*(33), 17-20. doi: 10.1111/jdv.13605	IV	Farmers are 6 times more likely to have photodamaged skin than non-farmers.	Basal cell carcinoma was increased in farmers related to occupational UV exposure.	Limitations include the lack of measurement of UV dose that was received by the study group and UV exposure during leisure activities. The study was conducted in Greece.

Backes, C., Milon, A., Koechlin, A., Vernez, D., & Bulliard, J. (2017). Determinants of sunburn and sun protection of agricultural workers during occupational and recreational activities. *The Journal of Occupational Environmental Medicine, 20*(10), 1-6. doi: 10.1097/JOM.0000000000001140	IV	Agricultural workers experienced severe sunburn 19.8% during work and 11.5% during leisure activities.	Farmers are at risk of sunburn at work and leisure time. Sunburn increases the risk of skin cancer.	Limitations include self-completed questionnaires are also susceptible to under estimation of sunburn.
Bauer, A., Beissert, S., & Knuschke, P. (2015). Prevention of occupational solar UV radiation-induced epithelial skin cancer. *Der Hautarzt; Zeitschrift fur Dermatologie, Venerologie, und verwandte Gebiete, 66*(3), 173-178. doi: 10.1007/s00105-015-3584-2	IV	Farmers are outdoor workers and are at increased risk for skin cancer.	The primary factors influencing the increased risk of skin cancer for farmers are increased exposure to UV light and the protection behaviors of the farmers.	Efforts to increase education about skin cancer protection methods should be increased to minimize the future development of skin cancer in farmers.
Kachuri, L., Harris, M., MacLeod, J., Tjepkema, M., Peters, P., & Demers, P. (2017). Cancer risks in a population-based study of 70,570	IV	Agricultural workers had increased risk of melanoma (HR = 1.15, 95% CI = 1.02–1.31) and lip cancer (HR = 2.14, 95% CI = 1.70–2.70).	Ultraviolet light is an occupational carcinogen that farmers are exposed to. Farmers have a lower prevalence of cigarette smoking and	Limitations include a lack of information regarding longevity in farming and the possibility that some participants were diagnosed

agricultural workers: Results from the Canadian census health and environment cohort. *BMC Cancer, 17*(1)1-15. doi: 10.1186/s12885-017-3346-x			increased physical activity which is reflected in a lower incidence of tobacco-related cancers. Farmers have a higher incidence of lip cancer and melanoma.	with cancer prior to study start.
Lemarchand, C., Tual, S., & Leveque-Morlais, N. (2017). Cancer incidence in the AGRICAN cohort study (2005-2011). Cancer Epidemiology, 49, 175-185. https://doi.org/10.1016/j.canep.2017.06.003	IV	Agricultural workers had increased incidence of skin melanoma (SIR=1.23, 95%CI 1.05-1.43).	Farmers had a decreased incidence of tobacco-related cancers and increased incidence of skin melanoma related to occupational status.	This study was a retrospective study done in France.
Moradhaseli, S., Ataei, P., Farhadian, H., & Ghofranipour, F. (2019). Farmers' preventive behavior analysis against sunlight using the health belief model: A study from Iran. *Journal of Agromedicine, 24*(1), 110-118. doi: 10.1080/1059924X.2018.1541036	IV	The study showed a positive correlation between the farmers and the aspects of the HBM. The Pearson correlations are perceived self-efficacy .34, perceived barriers .29, perceived benefits .149, perceived severity .363, perceived susceptibility .39.	This study concludes that the HBM can be used to increase the use of sun protection methods by farmers. These methods include sunglasses, long-sleeved shirts, wide-brimmed hats, and sunscreen.	Recommends using extension agents to educate farmers about skin cancer risks and protection methods.

Rat, C., Quereux, G., Grimault, C., Fernandez, J., Poiraud, M., Gaultier, A., … Nguyen, J. (2016). Inclusion of populations at risk of advanced melanoma in an opportunistic targeted screening project involving general practitioners. *Scandinavian Journal of Primary Health Care*, *34*(3), 286–294. https://doi-org.jproxy.lib.ecu.edu/10.1080/02813432.2016.1207149	IV	The characteristics of 57,279 patients were reviewed: 2711 were included in the project, and 54,568 consulted general practitioners without being included. A total of 23 had been identified to be at high risk of melanoma by the general practitioners but refused to be included.	This study found inequalities (low socioeconomic status, old age, male gender) in the inclusion of patients in a melanoma screening. Patients at risk of advanced cancer were screened less often. Clinicians should be educated and encouraged to increase their awareness of the screening of these populations.	The ability of the general practitioner to identify eligible patients was not able to be assessed. Also, the information was gathered from an insurance database which may not have been representative of the French population.
Szewczyk, M., Pazdrowski, J., Golusinski, P., Pazdrowska, A., Luczewski, L., Marszalek, S., & Golusinski, W. (2016). Basal cell carcinoma in farmers: An occupation group at high risk. *International Archives of Occupational and Environmental Health, 89*(3), 497-501. doi: 10.1007/s00420-015-1088-0	IV	Farmers accounted for 33% of BCC cases, and the most common location for tumors on farmers was nose and cheek (49% of farmers).	This retrospective study of 312 people found farmers at double the risk of disease reoccurrence than non-farmers. The study recommends educational programs to increase preventative measures in farmers.	Limitations include the inability to evaluate outdoor activities of patients and other types of UVR skin damage.

Trakatelli, M., Barkitzi, K., Apap, C., Majewski, S., & De Vries, E. (2016). Skin cancer risk in outdoor workers: A European multicenter case–control study. *Journal of the European Academy of Dermatology and Venereology, 30*(3). Retrieved from https://onlinelibrary-wiley-com.jproxy.lib.ecu.edu/doi/full/10.1111/jdv.13603	IV	Outdoor workers are 15% less likely to use sunscreen when outdoors and 8% more likely to have outdoor hobbies. Outdoor workers were 12% more likely to have signs of photo damage and 9% more likely to have 2 or more skin cancers in their lifetime. Farmers are at higher risk for AK, BCC, and SCC. This study did not find an increased risk of melanoma.	Outdoor workers are at increased risk of AK and NMSC and have a higher risk of developing 2 or more skin cancers. Contributing factors include occupation and leisure activities are outside, reduced use of sunscreen, increased sunburns, and increased difficulty in understanding medical information and billing forms. Outdoor workers have lower knowledge of skin cancer and its risk factors and farmers are exposed to many years of ultraviolet radiation for 2-8 hours a day. Screenings should begin early and continue after retirement to detect skin cancers early at a treatable stage.	Funding was provided by Leo Pharma.
Walkosz, B. J., BuIIer, D., Buller, M., Wallis, A., Meenan, R., Cutter, G., … Scott, M. (2018).	IV	Results: Outdoor workers (n = 1724) completed surveys on personal sun protection	The study included surveying 1724 outdoor workers about sun protection practices and then	Educational programs can improve sun protection practices and reduce sunburns.

Sun Safe Workplaces: Effect of an Occupational Skin Cancer Prevention Program on Employee Sun Safety Practices. *Journal of Occupational & Environmental Medicine, 6*0(11), 990–997. https://doi-org.jproxy.lib.ecu.edu/10.1097/JOM.0000000000001427		practices. Employees' sun protection improved significantly in the intervention group receiving the Sun Safe Workplace (SSW) program. SSW's effect was mediated by the number of workplace actions to implement elements of the policy, including sun protection messages and equipment and employee reports of sun safety training.	the intervention group was educated on sun protection practices and risks associated with ultraviolent radiation exposure. Employees were the post-tested and 2 years later another follow up was conducted. Sun protection practices improved which included the use of sunscreen, wide-brimmed hats, and using sunglasses. These outdoor workers also reported fewer sunburns. These findings could be used to inform education and prevention initiatives addressing skin cancer. Sun-safety initiatives may include modifying work sites to increase shade and adding sun safety to workplace policies and training. Employers can help reduce occupational health inequities and protect workers by creating	

			workplaces that facilitate sun protection.	
Smit-Kroner, C. & Brumby, S. (2015). Farmer's sun exposure, skin protection, and public health campaigns: An Australian perspective. *Preventative Medicine Reports, 2,* 602-607. doi: 10.1016/j.pmedr.2015.07.004	V	Search results found 181 articles with 144 articles excluded based on abstracts with a final number of 35 articles included. Most UV exposure for farmers was between 12 and 4 pm and when working in an upright position in an open paddock, e.g. mustering cattle and fixing fences. Sunscreen is the most studied term with hat and long pants/long-sleeved shirts next. Sixty-six% of US farmers have never had a skin check and 65% unlikely to use sunscreen. In NC farmers, 58% perceived wearing a baseball cap as good sun protection. While lack of knowledge affects the use of sun protection increased knowledge does not always improve sunscreen use.	A large group of farmers that use limited skin protection. Promoting the use of sunscreen did not improve usage amongst farmers. Protective clothing use was improved with education and is the most promising avenue to improve on farmers' skin protection and prevent skin cancers. Another recommendation is to educate health workers in performing skin checks. Agricultural events can increase the availability of skin protection education in farmers. Farmers experience the most UVR exposure of all outdoor workers.	Limitations include the inconsistent methods of information gathering, reviewing, and reporting between international projects. These irregularities make it difficult to draw conclusions.

Ragan, K. R., Lunsford, N. B., Thomas, C. C., Tai, E. W., Sussell, A., Holman, D. M., & Buchanan Lunsford, N. (2019). Skin cancer prevention behaviors among agricultural and construction workers in the United States. *Preventing Chronic Disease, 16*, 1–14. https://doi-org.jproxy.lib.ecu.edu/10.5888/pcd16.180446	VI	About one-third of farmers and construction workers have had a sunburn in the past year and less than 22% use sunscreen. Only 50% of farmers wore protective clothing to minimize sun damage.	Sun safety initiatives can be used to educate farmers about prevention methods and improve the use of protection methods.	This study supports the need for educational sessions for farmers about sun protection methods and skin cancer.
Ahmadi, M., Bakhtari, Z., Kazeminezhad, B., & Ghavam, S. (2019). Evaluating the trend of cutaneous malignant tumors in Ilam from 2002 to 2011. Journal of Family Medicine and Primary Care, 8, 717-21. Retrieved from http://www.jfmpc.com/article.asp?issn=2249-4863;year=2019;volume=8;issue=2;spage=717;epage=721;aulast=Ahmadi	VI	Melanoma causes high mortality and is the most common malignancy. Out of 347 cases, 240 (69.2%) had basal cell carcinoma, 63 (18.2%) had squamous cell carcinoma, 16 (4.6%) had melanoma and the rest were metastatic or other skin cancers. The most common area was the face (81%).	Exposure of farmers and inadequate use of skin protection methods leads to increased skin cancer rates.	This study does not focus on farmers and has a small sample size of Iranian people.

Darcey, E., Carey, R. N., Reid, A., Driscoll, T., Glass, D. C., Benke, G. P., … Fritschi, L. (2018). Prevalence of exposure to occupational carcinogens among farmers. *Rural and Remote Health, 18*(3), 4348. https://doi-org.jproxy.lib.ecu.edu/10.22605/RRH4348	VI	The study included 166 farmers (men and women) in which nearly half reported solar radiation exposure of 30 hours or more a week. While 91% reported wearing a hat only 33% reported using sunscreen. Livestock farmers (98%) reported more UV exposure than crop farmers (94%).	Farmers are exposed to multiple carcinogens: UV radiation, pesticides, engine exhausts, and others. Ultraviolet radiation is a major carcinogen that farmers are exposed to almost daily.	Limitations include the use of the postal area as substitution for socioeconomic status and small sample size.
Kearney, G. D., Xu, X., Balanay, J. A. G., Allen, D. L., & Rafferty, A. P. (2015). Assessment of Personal protective equipment use among farmers in eastern North Carolina: A cross-sectional study. *Journal of Agromedicine, 20*(1), 43–54. https://doi-org.jproxy.lib.ecu.edu/10.1080/1059924X.2014.976730	VI	Nearly 63% of participants reporting wearing a baseball hat, 57% reported wearing long pants, 56% wore sunglasses, and 27% wore a wide-brim hat always or most of the time as methods of sun protection. Only 16% of farmers reported wearing sunblock or sunscreen with SPF15 or higher.	This study offers insight on the behaviors and attitudes of farmers towards ultraviolet light. Behavior, decision to use sun protection, and training preferences were consistent with similar studies on farmers. Farmers are aware of dangers related to ultraviolet light and transitioning these concerns into proactive preventative action by the farmer should remain a priority. Examples of increasing sun protection use among farmers	There were several limitations of this study: the relatively small number of participants and self-reporting bias of either over- or underreporting of PPE behavior, which limits the generalizability to the broader farming community.

			have been successful.	
Shin, J., Chung, K., Park, E., Nam, K., & Yoon, J. (2018). Occupational differences in standardized mortality ratios for non-melanotic skin cancer and melanoma in exposed areas among individuals with Fitzpatrick skin types III and IV. *Journal of Occupational Health, 00,* 1-7. https://doi. org/10.1002/1348-9585.12040	VI	Agricultural/fishery/forestry workers had the highest mortality rates from skin cancer.	Early diagnosis of skin cancer may decrease mortality. Agricultural/fishery/forestry workers have increased NMSC and cutaneous melanoma.	This study was a retrospective look at the cause of death in Koreans between the years of 1993-2012.
Zink, A., Schielein, M., Wildner, M., & Rehfuess, E. (2019). "Try to make good hay in the shade, it won't work!" – A qualitative interview study on the perspectives of Bavarian farmers regarding primary prevention of skin cancer. *British Journal of Dermatology.* doi: 10.1111/bjd.17872	VI	Primary areas that influence farmers view of primary prevention of skin cancer are knowledge and awareness of UVR and KC, perceived barriers to sun protection, and individual experiences.	Barriers associated with agricultural work limit sun protective behavior. Deficient knowledge of farmers about KC and UVR increase the risk of skin cancer and are determinants in use of sun protection behavior.	This study reveals the need to educate farmers about UVR, skin cancer, and sun protection methods.

Zink, A., Wurstbauer, M., Rotter, M., Wildner, M., & Biedermann, T. (2017). Do outdoor workers know their risk of NMSC? Perceptions, beliefs and preventive behavior among farmers, roofers and gardeners. *Journal of the European Academy of Dermatology and Venereology, 31*(10). Retrieved from https://onlinelibrary-wiley-com.jproxy.lib.ecu.edu/doi/full/10.1111/jdv.14281	VI	This study surveyed 353 (63% were farmers) outdoor workers and found that 43.4% reported never using sunscreen during work. This study found that perceived low cancer risk was associated with decreased use of sun protection methods.	Farmers are among the least likely to attend skin cancer screening events and least likely to wear sunscreen when compared to other outdoor workers. Sixty-two percent of farmers reported spending 40 hours or more outdoors each week and 73% reported perceiving themselves as having a high skin cancer risk. Only 3.7% of outdoor workers check SPF of sunscreen before using it. While 50% reported they forget about using sunscreen, simultaneously nearly 53% would like more information about sun safety measures.	This study was conducted in Germany, and limitations include the questionnaire was online and may have attracted younger groups. Another consideration is that outdoor workers concerned about NMSC or sun protection may have been more likely to participate. As with all self-reported surveys, overestimation of protection may have been biased.
Carley, A. & Stratman, E. (2015). Skin cancer beliefs, knowledge, and prevention practices: A comparison of farmers and nonfarmers in a midwestern	VI	Farmers acknowledged increase risk of skin cancer yet 23% used sunscreen when outside 15 minutes or more. Farmers thought they were more likely to get	This study found that farmers are unique in their healthcare beliefs, use of sun protection methods, sources of healthcare information, and skin cancer knowledge. This	This original research can be used to support the educational session. Limitations of this study include demographic differences between farming and nonfarming

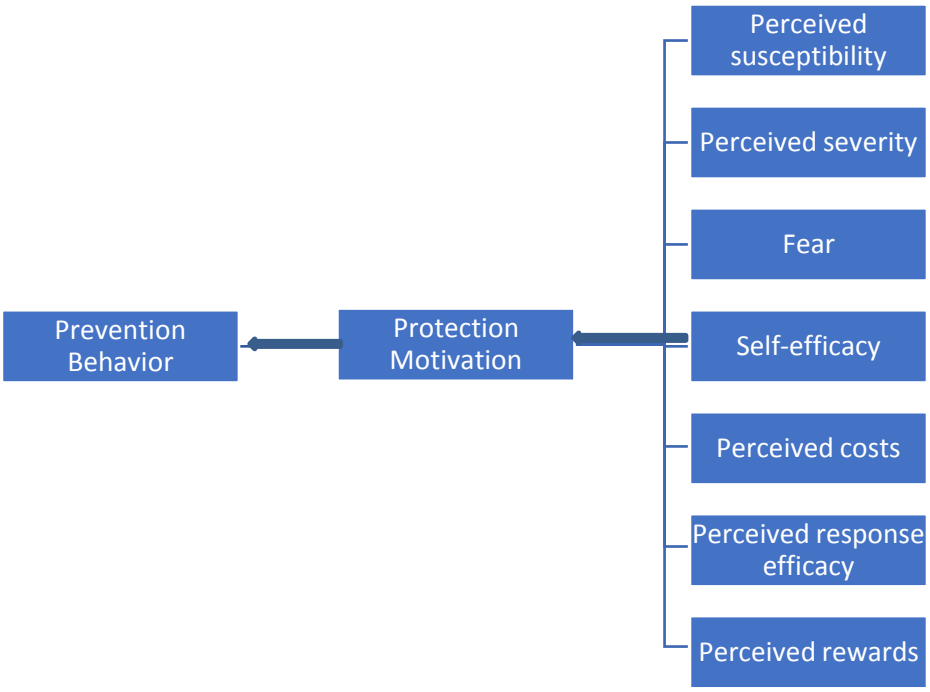
population. *Journal of Agromedicine, 20*(2), 85-94. doi: 10.1080/1059924X.2015.1010059		skin cancer (P = .0107).	study found that higher knowledge of skin cancer and prevention methods were associated with improved use of sun protection. Barriers to sun protection included uncomfortable wearing long pants and long shirts, forgetting sunscreen use, and inconvenience of wide-brimmed hats. Increased knowledge corresponded with increased use of sun protection methods.	populations. This study was also limited to English speaking persons and a self-report survey was used to collect information. Participants were recruited at a free skin cancer screening in Wisconsin.
Nahar, V. K., Hosain, A., Sharma, M., Jacks, S. K., & Brodell, R. T. (2016). Comment on: Need for primary prevention for skin cancers in Iran. *Journal of Research in Health Sciences, 16*(3), 170–171. Retrieved from http://jproxy.lib.ecu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=120221	VII	Primary prevention should include educational interventions to prevent skin cancer.	Eighty-two percent of farmers did not perceive that their job made them more susceptible to skin cancer and the majority felt that sunscreen did not help decrease their risk of developing skin cancer. These statistics reveal the need for primary prevention education to reduce skin cancer incidence in farmers.	This study supports the need for educational programs for farmers to prevent skin cancer.

26&site=ehost-live&scope=site				
Pirschel, C. (2017). Cancer prevention through community-based programs. *ONS Voice, 32*(10), 16–20. Retrieved from http://jproxy.lib.ecu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=125590194&site=ehost-live&scope=site	VII	Community prevention programs are needed to bridge the gap between the community and the healthcare system	Community education programs can help overcome the barriers to the prevention of cancers, including skin cancer. Some of the specific barriers that can be overcome by educational programs in the community are health illiteracy, lack of access to information, and inconsistent messaging.	Skin cancer is one of the most preventable cancers, and an educational session in a community environment can be used to prevent skin cancer in farmers.
Robinson, J. K., & Jablonski, N. G. (2018). Sun protection and skin self-examination and the US Preventive Services Task Force recommendation on behavioral counseling for skin cancer prevention.	VII	Sun exposure in occupational and leisure activities, as well as sun protection habits, should be assessed by healthcare providers.	The USPSTF does not recommend self-examinations of skin which can lead to unnecessary biopsies. Patients with a history of melanoma should perform routine skin checks, especially of moles. Primary	This article was not a study, but recommendations. This was also very general and not directed toward outdoor workers or farmers.

JAMA: Journal of the American Medical Association, *319*(11), 1101–1102. https://doi-org.jproxy.lib.ecu.edu/10.1001/jama.2018.0163			prevention (sun protection) and secondary prevention (early detection) may be better received by nonhealthcare avenues. These avenues are less threatening, and people can have more peer support and influence toward better health.	

Appendix D

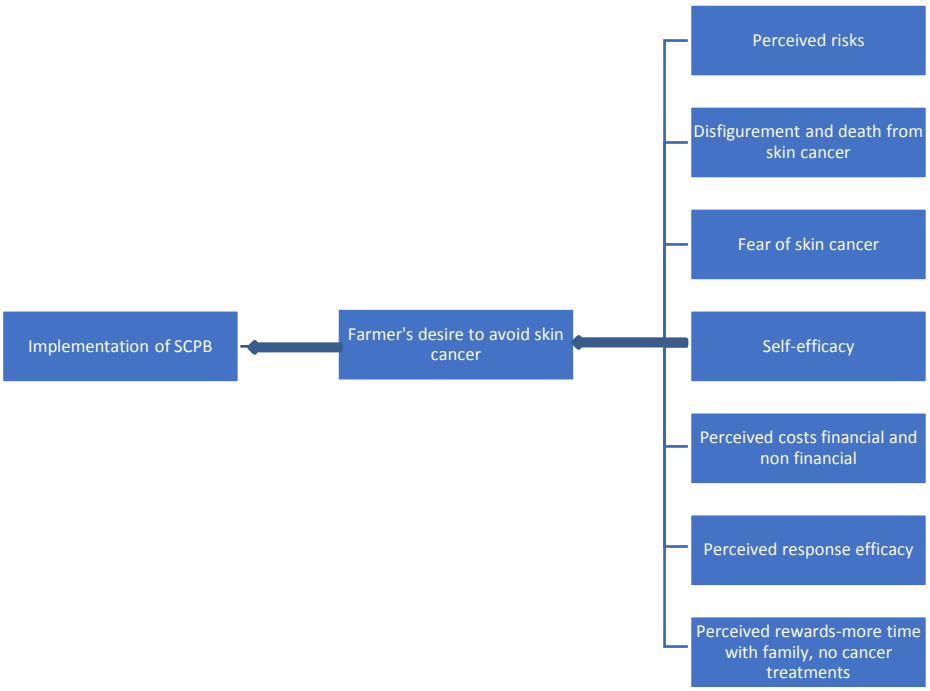
Protection Motivation Theory



Representation of the Protection Motivation Theory, its components, and their relationship. Adapted from "Skin cancer preventive behaviors in Iranian farmers: Applying protection motivation theory," by B. Moeini, E. Ezati, M. Barati, F. Rezapur-Shahkolai, N. Mohammad Gholi Mezerji, & M. Afshari, 2018, *Workplace Health & Safety*.

Appendix E

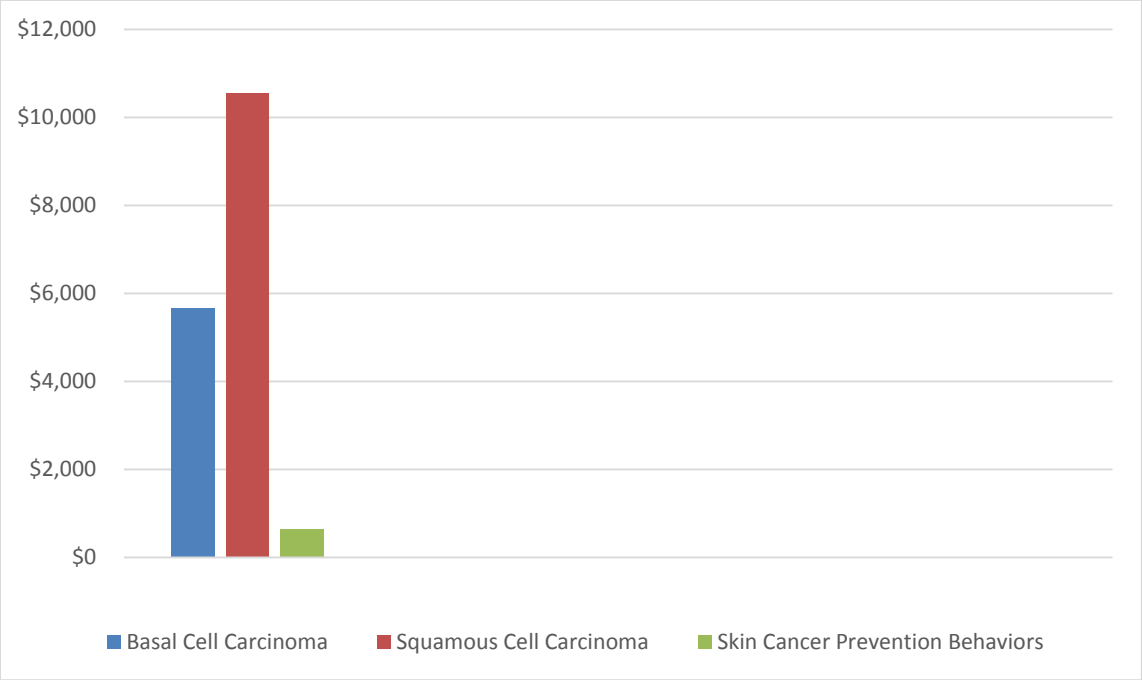
Application of Protection Motivation Theory



Representation of the Protection Motivation Theory, its components, and their relationship. Adapted from "Skin cancer preventive behaviors in Iranian farmers: Applying protection motivation theory," by B. Moeini, E. Ezati, M. Barati, F. Rezapur-Shahkolai, N. Mohammad Gholi Mezerji, & M. Afshari, 2018, *Workplace Health & Safety*.

Appendix F

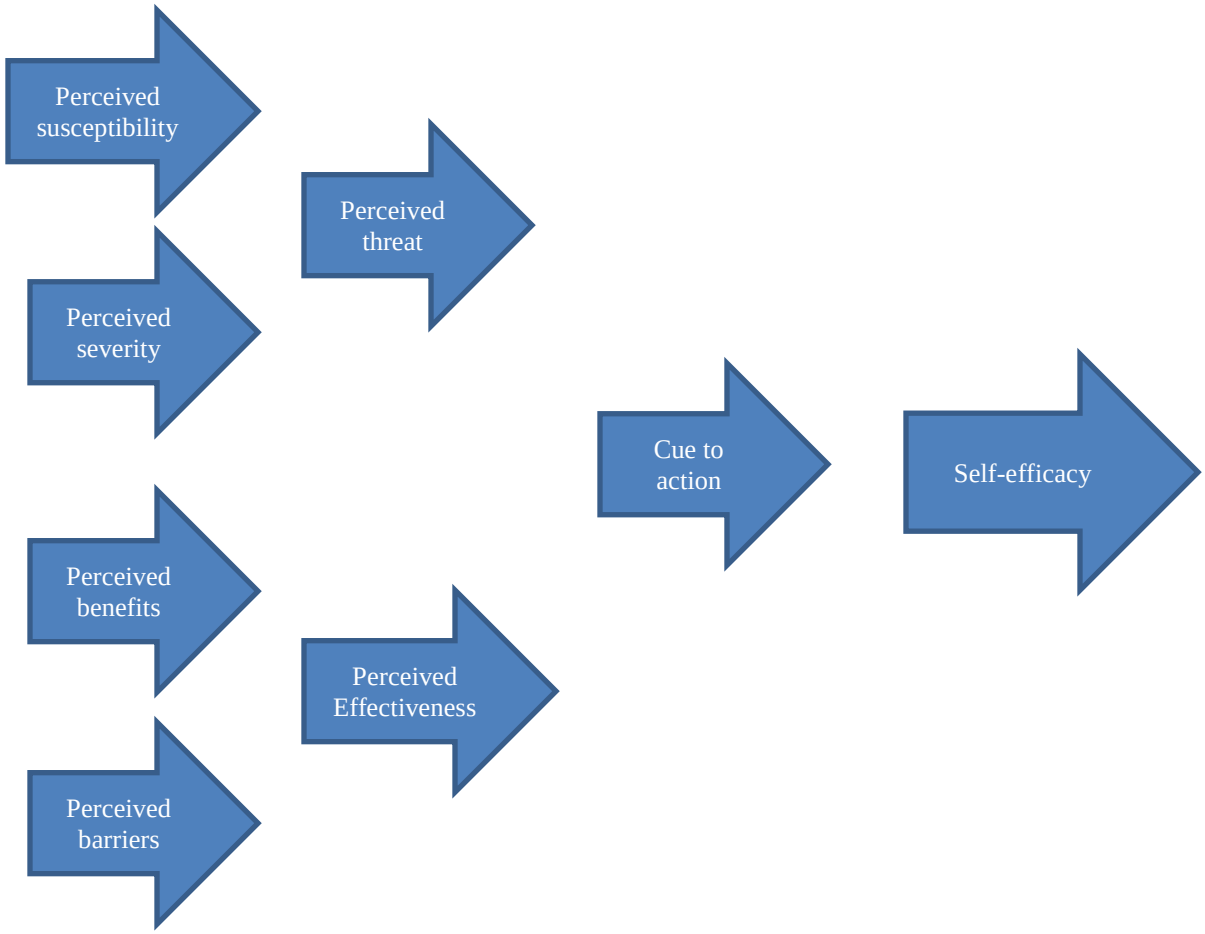
Cost Comparison of Skin Cancer and Prevention Methods



Adapted from "Institute for Work and Health study estimates costs of non-melanoma skin cancers due to sun exposure at work," 2018, *Institute for Work and Health, 92.*

Appendix G

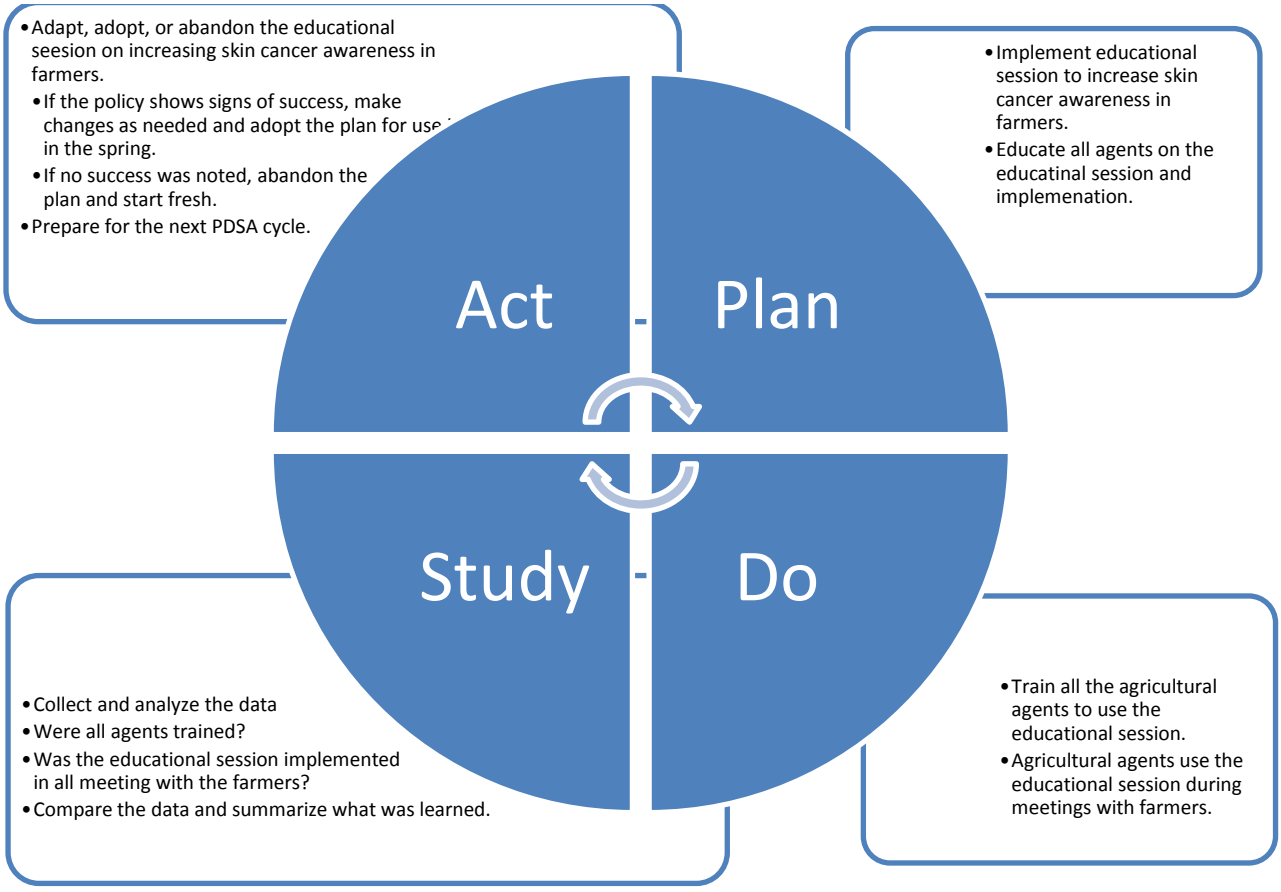
Health Belief Model



Adapted from "The Health Belief Model," 2018, *Behavioral Change Models.*

Appendix H

Plan, Do, Study, Act Model



Appendix I

Risk Management Assessment using SWOT

Appendix J
Operating Budget for Project

Operating Budget for Project			
Mileage	Unit cost	Quantity	Total
Sampson County Exension Office			
20 roundtrips (50 miles each)	$ 0.54	1000	$ 540.00
Educational Materials			
Educational Brochure (free from CDC)	$ -	200	$ -
Educational Display Poster Board (24"x3	$ 24.95	1	$ 24.95
16 Gigabyte Flash Drive	$ 15.99	1	$ 15.99
Copies of Tools	$ 0.10	30	$ 3.00
Mole Chart per thousand	$ 79.95	1	$ 79.95
Display Items			
Full Rim UVA/UVB sunglassess	$ 30.00	1	$ 30.00
Sunglass leash	$ 3.39	1	$ 3.39
Habit Men's Long-Sleeve River Shirt	$ 15.98	1	$ 15.98
Sport Mens Cool DRI Tshirt	$ 11.45	1	$ 11.45
Men's Crushable wide Brimmed hat	$ 24.99	1	$ 24.99
Banana Boat Sunscreen lip balm	$ 1.97	2	$ 3.94
No Ad sunscreen SPF 45	$ 7.49	1	$ 7.49
Equate Ultra Protection sunscreen lotio	$ 6.98	1	$ 6.98
Equate Sport Broad Spectrum Spray	$ 6.98	1	$ 6.98
Miscellaneous			
Breakfast and juice for agents	$ 60.00	1	$ 60.00
water (3 each day for 15 days)	$ 0.50	45	$ 22.50
sales tax for all applicable items	$ 22.23	1	$ 22.23
1 Meal per day	$ 10.00	15	$ 150.00
Total			$ 1,029.82

Appendix K
Project Data Collection Tool for the Extension Agents

1. What is your age? _____
2. How many years have you farmed or worked in agriculture? _____
3. How many years have you worked as an extension agent? _____
4. Do you identify yourself as: Male Female Other Prefer not to answer
5. What is your highest level of education?
    a. Did not complete high school
    b. High School Diploma
    c. Associate degree
    d. Bachelor's Degree
    e. Master's Degree
    f. Doctorate Degree

Appendix L

Evaluation Tool for Agents Trained to Use the Educational Session

	Initials of Agent	Date of Educational Session
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

Appendix M

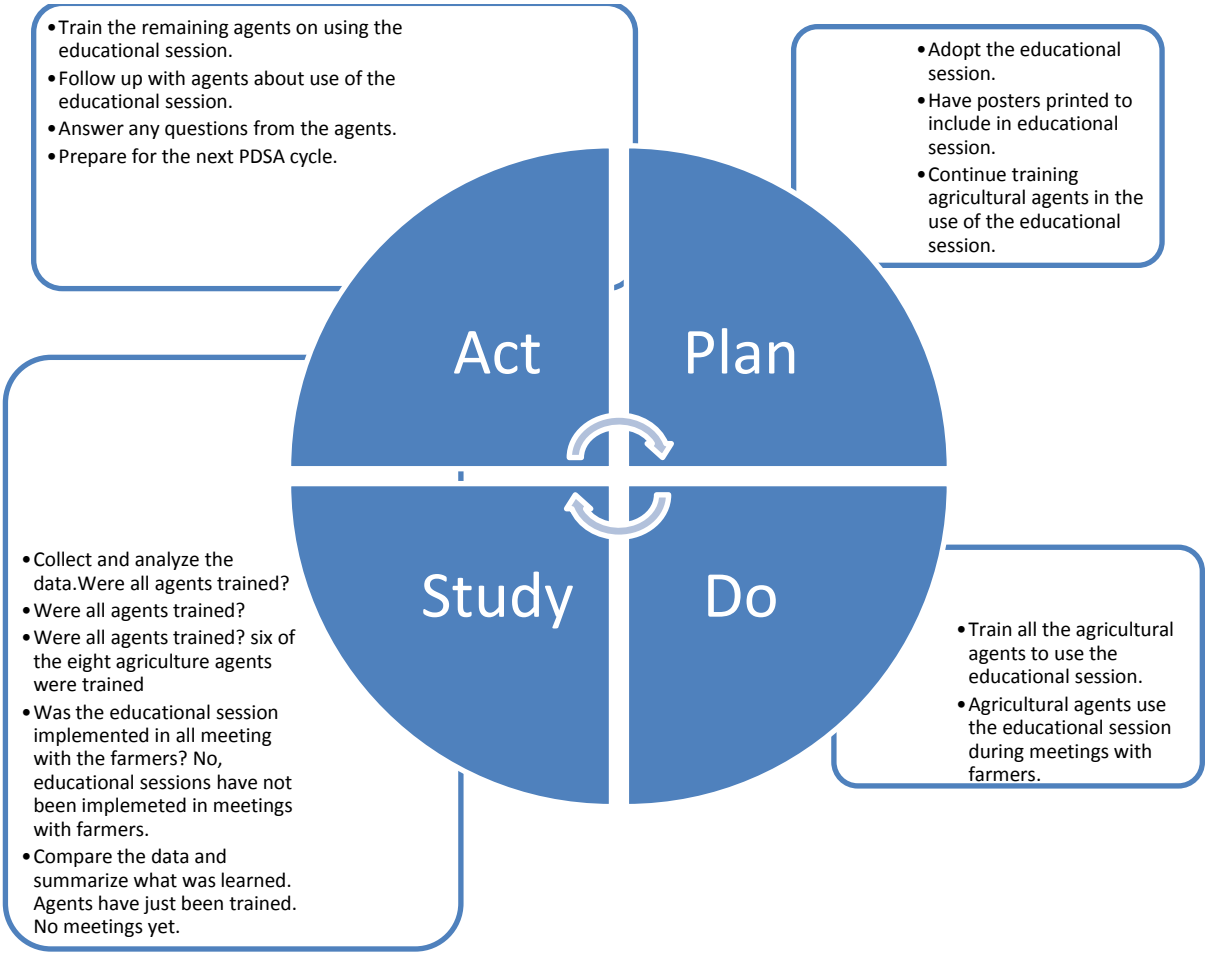
Evaluation Tool for Agents to Track Number of Educational Sessions

	Date	Name of Meeting with Farmers	Did you use the educational session titled "Increasing Skin Cancer Awareness in Farmers"?	If the educational session was not implemented, why?	How many farmers were in attendance?
1.			YES NO		
2.			YES NO		
3.			YES NO		
4.			YES NO		
5.			YES NO		
6.			YES NO		
7.			YES NO		
8.			YES NO		
9.			YES NO		
10.			YES NO		
11.			YES NO		
12.			YES NO		
13.			YES NO		
14.			YES NO		
15.			YES NO		
16.			YES NO		
17.			YES NO		
18.			YES NO		
19.			YES NO		
20.			YES NO		

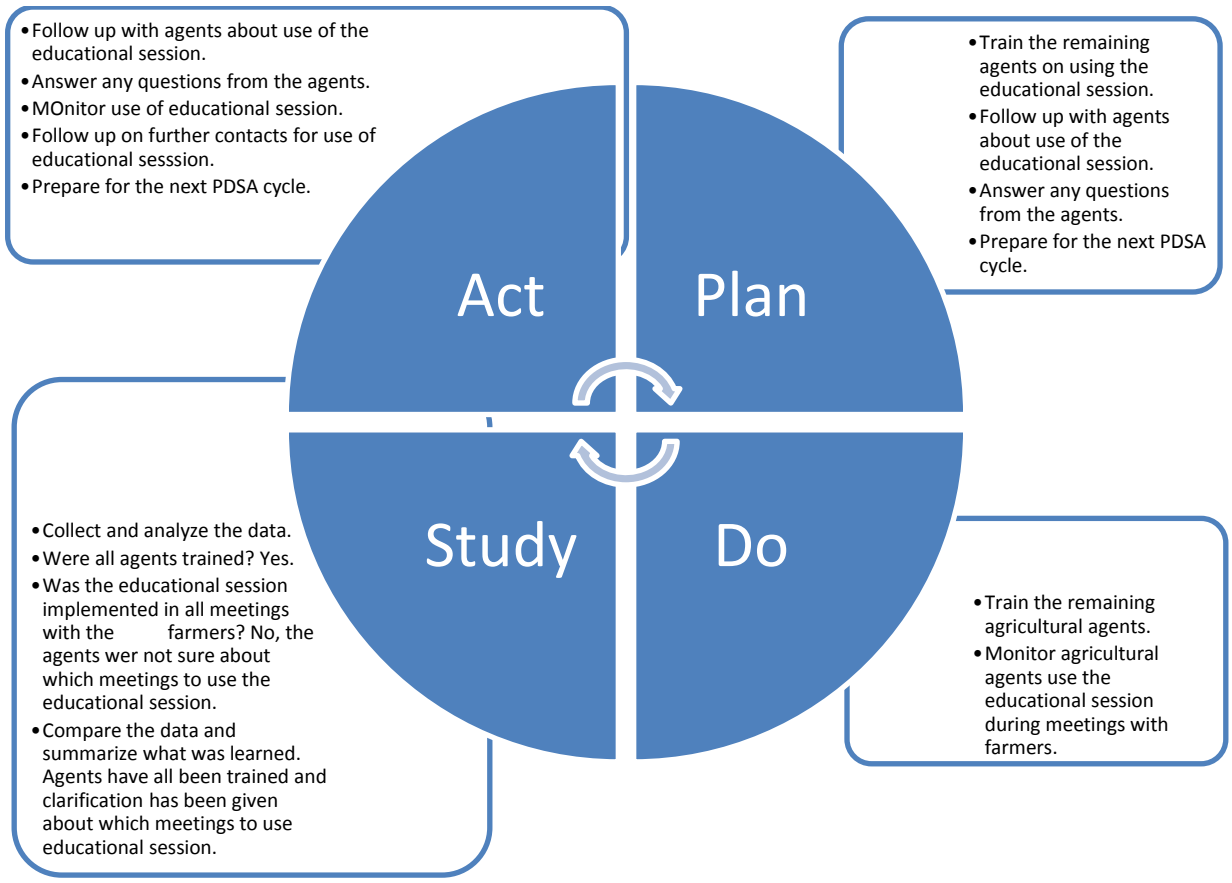
Appendix N
PDSA Model with Changes Through Implementation Period

PDSA model Initial plan

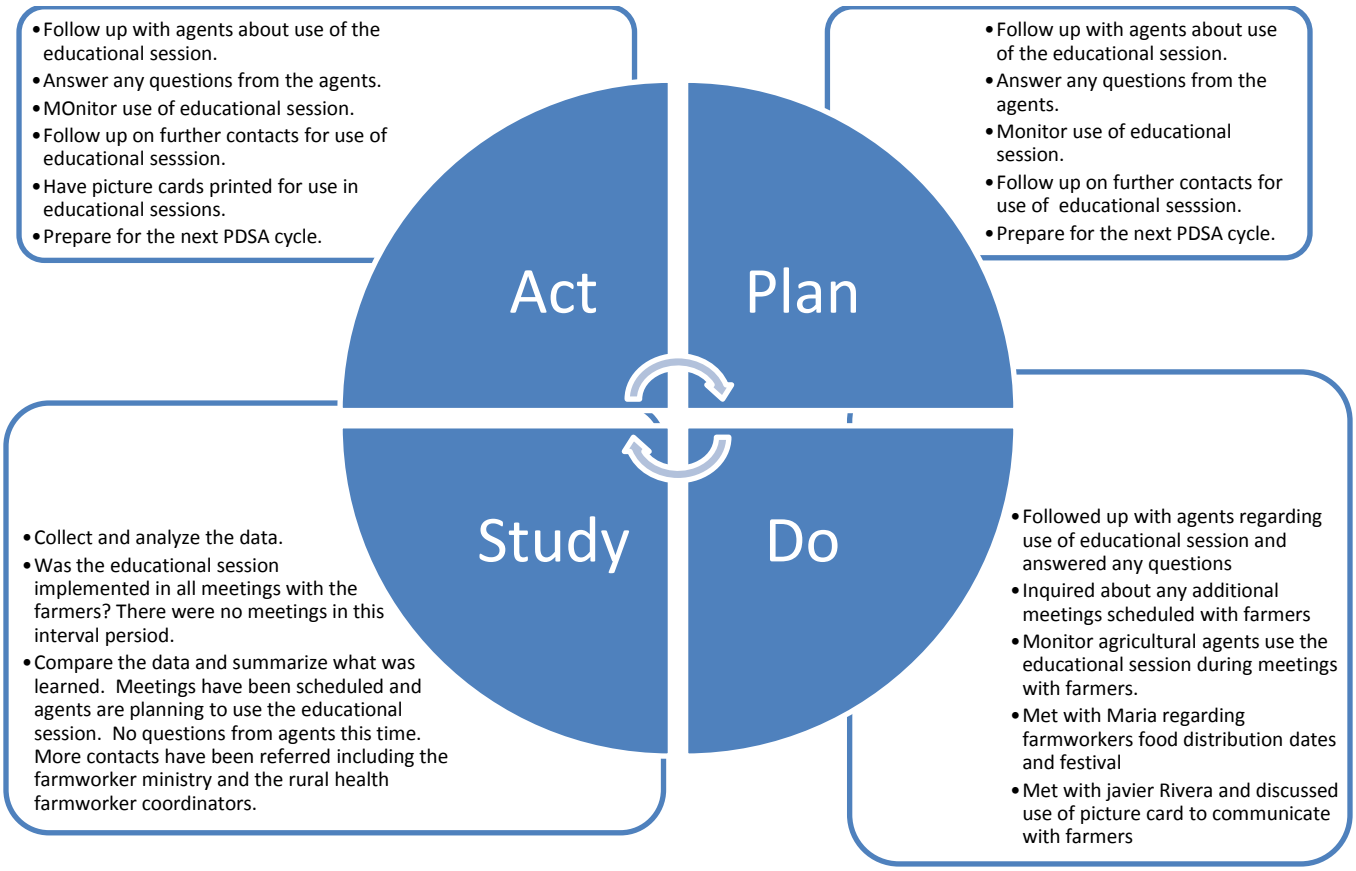
PDSA cycle 1 August 27, 2019



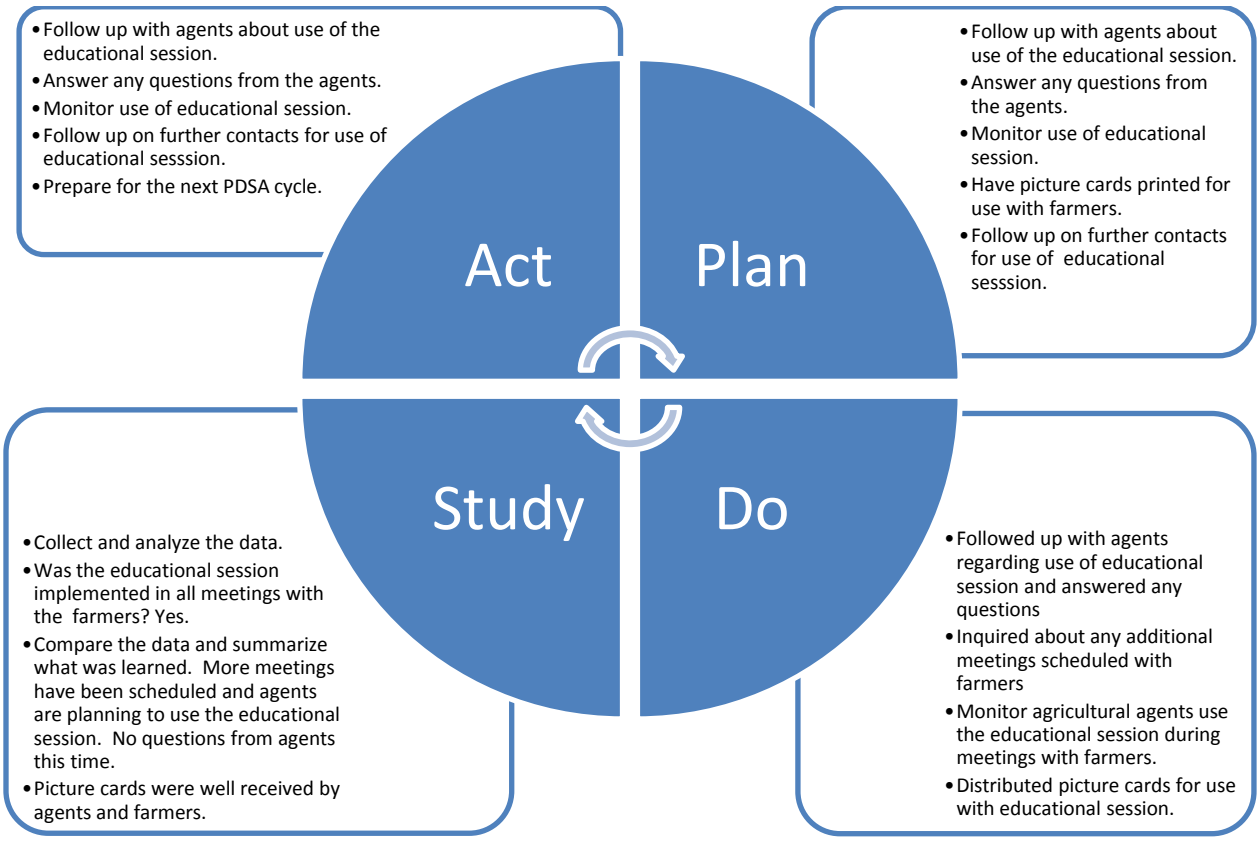
PDSA cycle 2 September 18, 2019



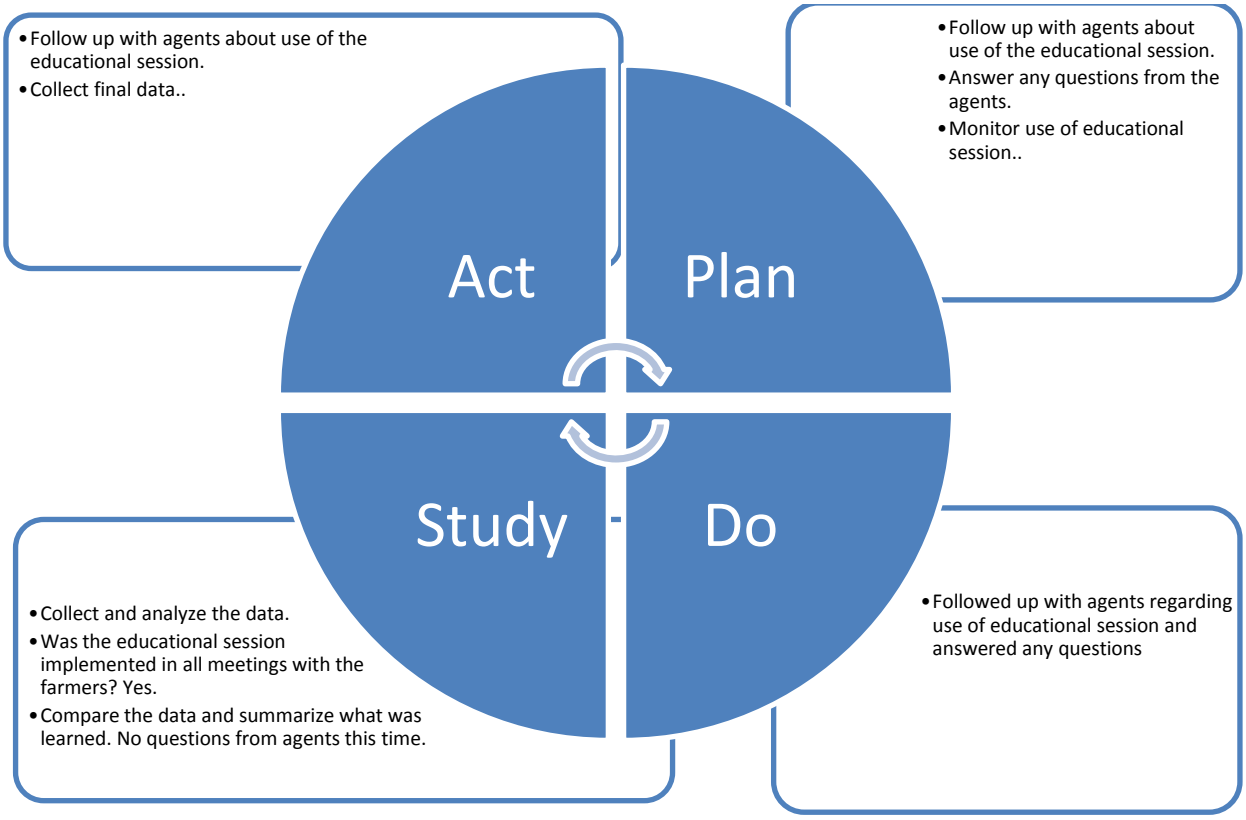
PDSA cycle 3 September 24, 2019



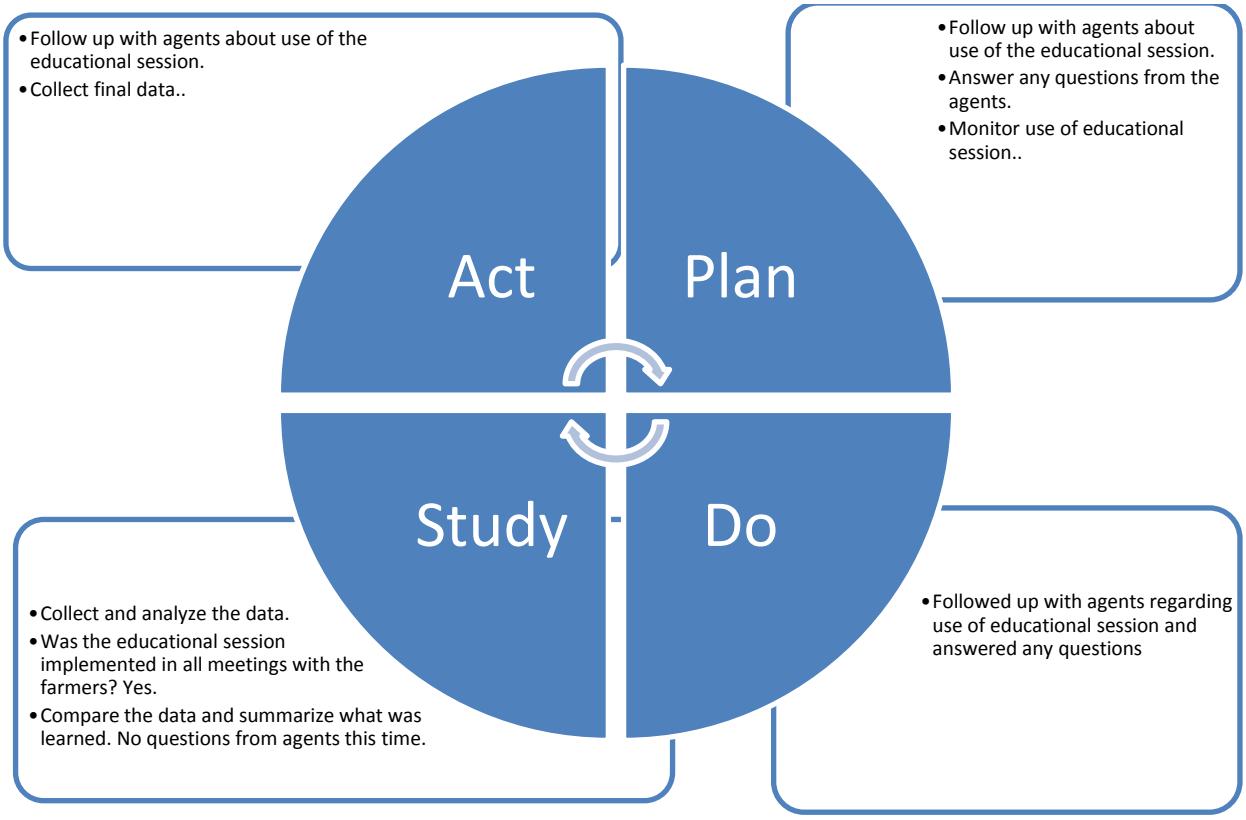
PDSA Cycle 4 October 8, 2019



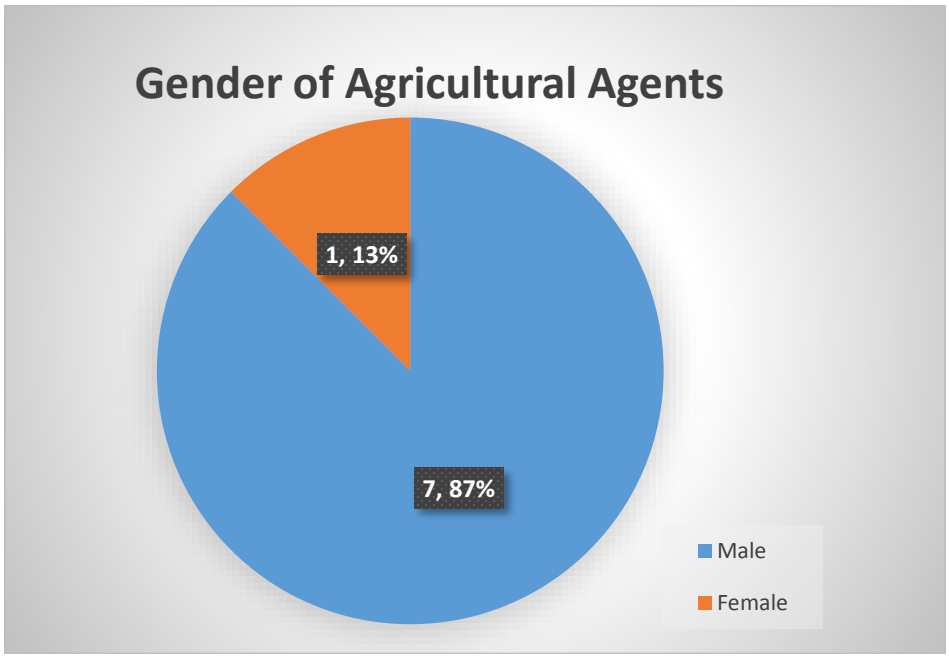
PDSA Cycle 5 October 22, 2019



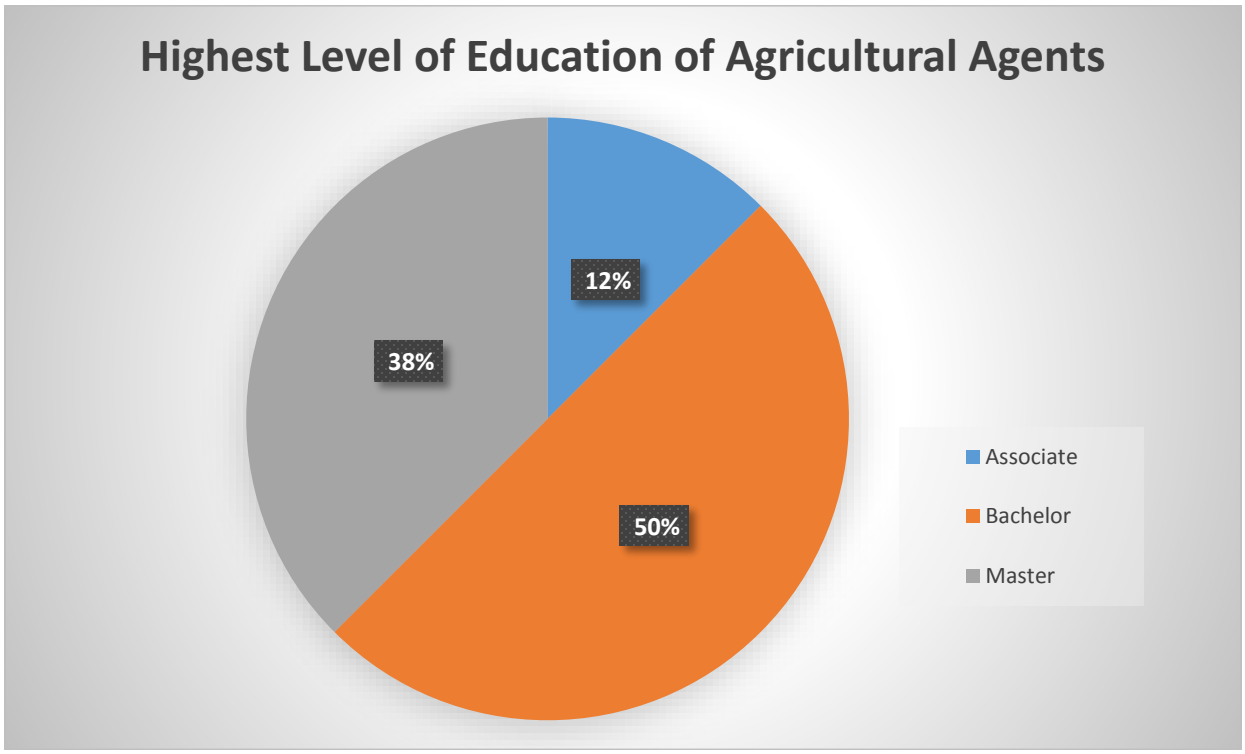
PDSA Cycle 6 November 8, 2019, no changes needed



Appendix O
Gender of Agricultural Agents



Appendix P
Highest Level of Education of Agricultural Agents



Appendix Q
CDC Handout

Skin Cancer

Skin cancer is the most common form of cancer in the United States. The most common types of skin cancer include basal cell carcinoma, squamous cell carcinoma, and melanoma.

Indicators of skin cancer may include:

- Irregular borders on moles (ragged, notched, or blurred edges)
- Moles that are not symmetrical (one half doesn't match the other)
- Colors that are not uniform throughout
- Moles that are bigger than a pencil eraser
- Itchy or painful moles
- New moles
- Sores that bleed and do not heal
- Red patches or lumps

Protect Yourself

- Avoid prolonged exposure to the sun when possible.
- Wear sunscreen with a minimum of SPF 15.
  - SPF refers to how long a person will be protected from a burn. (SPF 15 means a person can stay in the sun 15-times longer before burning.) SPF only refers to UVB protection.
  - To protect against UVA, look for products containing: Mexoryl, Parsol 1789, titanium dioxide, zinc oxide, or avobenzone.
  - Sunscreen performance is affected by wind, humidity, perspiration, and proper application.
  - Throw away sunscreens after 1–2 years (they lose potency).
  - Apply liberally (minimum of 1 oz) at least 20 minutes before sun exposure.
  - Apply to ears, scalp, lips, neck, tops of feet, and backs of hands.
  - Reapply at least every 2 hours and each time a person gets out of the water or perspires heavily.
  - Some sunscreens may lose their effectiveness when applied with insect repellents. You may need to reapply more often.
- Wear clothing with a tight weave or high-SPF clothing.
- Wear wide-brimmed hats and sunglasses with UV protection and side panels.
- Take breaks in shaded areas.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
www.cdc.gov/niosh/topics/outdoor/
DHHS (NIOSH) Publication No. 2010–116

Telephone: 1–800–CDC–INFO
TTY: 1–888–232–6348
E-mail: cdcinfo@cdc.gov

NIOSH
Fast Facts

Protecting Yourself from
Sun Exposure

Anyone working outdoors is exposed to the sun's ultraviolet (UV) rays, even on cloudy days. UV rays are a part of sunlight that is an invisible form of radiation. There are thre types of UV rays. UVA is believed to damage connective tissue and increase the risk for developing skin cancer. UVB penetrates less deeply into the skin, but can still cause some types of skin cancer. Natural UVC is absorbed by the atmosphere and does not pose a risk.

Sunburn

Sunburn is not immediately apparent. Symptoms usually sta about 4 hours after sun exposure, worsen in 24–36 hours, and resolve in 3–5 days. They include red, tender and swolle skin, blistering, headache, fever, nausea, and fatigue. In addition to the skin, eyes can become sunburned. Sunburne eyes become red, dry, painful, and feel gritty. Chronic eye exposure can cause permanent damage, including blindness

First Aid

- Take aspirin, acetaminophen, or ibuprofen to relieve pain, headache, and fever.
- Drink plenty of water to help replace fluid losses.
- Comfort burns with cool baths or the gentle application of cool wet cloths.
- Avoid further exposure until the burn has resolved.
- Use of a topical moisturizing cream, aloe, or 1% hydrocortisone cream may provide additional relief.

If blistering occurs:

- Lightly bandage or cover the area with gauze to prevent infection.
- Do not break blisters. (This slows healing and increases risk of infection.)
- When the blisters break and the skin peels, dried skin fragments may be removed and an antiseptic ointment hydrocortisone cream may be applied.

Seek medical attention if any of the following occur:

- Severe sunburns covering more than 15% of the body
- Dehydration
- High fever (>101 °F)
- Extreme pain that persists for longer than 48 hours

Appendix R
Mole Chart